patient samples were most similar to one another and most dissimilar from the three patient groups across all nine scales.

For comparison purposes the scale scores which corresponded to a complete lack of symptoms on any given scale are listed in the seventh row of Table 127. Immediately below this row is the symptomatic cut-off score designated by this study team.

The symptomatic cut-off score was established as being greater than or equal to one standard deviation above the urban community sample, or two standard deviations above the urban community leaders sample, whichever was greater. The cut-off score was rounded off to the next highest integer when it was below 50; cut-off scores above 50 were rounded down to the next full integer. This procedure was followed because the score of 50, in and of itself, was the mean of psychiatric inpatients on each scale in the original standardization study. As can be seen, the symptomatic cut-off scores established for the air traffic controllers were almost identical to and sometimes higher than the scores of former inpatients. The scores used to establish significant symptomatology also were equal to or greater than the average scores of pre-treatment outpatients. Finally, and perhaps most dramatically, with the exception of subjective distress, and perhaps wage-earner rate, the cut-off scores also were equivalent to the mean scores achieved by psychiatric inpatients. Consequently, when we report that an air traffic controller had significant symptomatology in an area, it is usually equivalent to saying that the controller was at least as symptomatic as outpatients and inpatients receiving or about to receive treatment.

Thus the symptomatic cut-off scores had both statistical and clinical meaning in that they were equivalent to the mean for inpatients and outpatients, were one full standard deviation or more above the scores of an urban community sample, and represented a level of symptomatology found in persons involved with psychiatric treatment.

Monthly Self-Reports Of Anxiety and Depression

In addition to the evaluation of psychiatric status by means of the structured clinical interview conducted at Boston University, we were interested in obtaining more frequent estimates of the psychological functioning of the subjects. After the intake evaluations at Boston University, it became clear that the most common psychological problems were anxiety and depression. Consequently, we searched the literature for self-report inventories that would be easy to administer, simple to score, and clinically

relevant.

With the valuable assistance of James Barrett, M.D., a psychiatric epidemiologist, our research led to the work and instruments of William Zung, M.D. Zung had developed a special scale for the assessment of clinically significant depression, and a scale for the assessment of clinically significant anxiety (Zung, 1965; Zung, 1971). In both instances Zung used clinical diagnostic criteria to select the self-report items in such a way that a high score on his scales would represent a higher intensity of either anxiety or depression. Both instruments were reported to be reliable and valid for the quantitative assessment of clinically significant anxiety and depression (Zung, 1965, 1967a, 1967b, 1969, 1971a, 1971b).

In addition, both the Self-rating Anxiety Scale (SAS) and the Self-rating Depression Scale (SDS) were self-report measures with established degrees of subject acceptability and were practical to use as repeated measures. They were short, only twenty items, and easy to score. Finally, and of particular relevance for our selection of these instruments, they both had received wide use in various patient groups and in normals, making available considerable validation data as well as a large number of comparison groups to aid us in the interpretation of results.

We decided to use these instruments, but we needed to decide on the optimum frequency of self-report. The length of time between interval examinations averaged nine months, and the PSS evaluation at each examination was made on the basis of the previous month's symptomatic behavior. Hence, between PSS evaluations we would have no knowledge of a man's general psychiatric status for eight of every nine months.

Although there were reasons why more frequent or less frequent self-reports might be useful, we felt that a monthly report of the two prominent syndromes of depression and anxiety symptomatology would be most useful. Therefore, after the second examination visits to Boston University, we began to include the SAS and the SDA as part of the monthly self-report package mailed to each subject at the end of each month to be filled out and returned with information relating to that particular month.

Over 90% of the men cooperated by completing the SAS and SDA each month along with their Monthly Health Review (see Section IIIC). The SAS and SDS continued to be sent each month until an ATC became ineligible for the study by virtue of promotion, transfer, or discharge from

the agency.

Table 128 displays the form of the SDS as we used it on a monthly basis. Table 129 displays the SAS as we used it. The directions were slightly different from those originally used by Zung because a nurse or other person was not available (as Zung would have it) to explain how to answer the questions. At the top of each form we noted the month for which the SAS or the SDS was to be completed. Both instruments have positively worded items and negatively worded items so that a response tendency to say "yes" or "no" would not lead to an artifically inflated or deflated score.

The first month's returns were carefully scrutinized to ascertain whether or not the air traffic controllers understood the directions. Any responses which suggested a misunderstanding of directions or unusual response tendencies were followed up by a call to the controller to determine and correct the difficulty. Examination of the next month's forms showed that all such difficulties had been resolved.

TABLE 128

Self-Rating Depression Scale

PLEASE CHECK THE APPROPRIATE ANSWER FOR THE MONTH OF: _____.

DIRECTIONS: Please read each question very carefully. Although some questions may be difficult to answer, please give your best answer by making a check in the appropriate answer column. Also, please note that the answers change meaning depending on the question. For example, "none" does not always mean no difficulty.

		NONE OR A LITTLE OF THE TIME	SOME OF THE TIME	GOOD PART OF THE TIME	MOST OR ALL OF THE TIME
1.	I feel down-hearted and blue				
2.	Morning is when I feel the best				
3.	I have crying spells or feel like it				
4.	I have trouble sleeping at night				
5.	I eat as much as I use to				
6.	I still enjoy sex				
7.	I notice that I am losing weight				
8.	I have trouble with constipation				
9.	My heart beats faster than usual				
10.	I get tired for no reason				
11.	My mind is as clear as it used to be				
12.	I find it easy to do the things I use to do				
13.	I am restless and can't keep still				
14.	I feel hopeful about the future				
15.	I am more irritable than usual				
16.	I find it easy to make decisions				
17.	I feel that I am useful and needed				
18.	My life is pretty full				
19.	I feel that others would be better off if I were dead				
20.	I still enjoy the things I used to do				

TABLE 129

Self-Rating Anxiety Scale

PLEASE CHECK THE APPROPRIATE ANSWER FOR THE MONTH OF: _____

	NONE OR A LITTLE OF THE TIME	SOME OF THE TIME	GOOD PART OF THE TIME	MOST OR ALL OF THE TIME
1. I feel more nervous and anxious than usual				
2. I feel afraid for no reason at all				
3. I get upset easily or feel panicky				
4. I feel like I'm falling apart and going to pieces				
5. I feel that everything is all right and nothing bad will happen				
6. My arms and legs shake and tremble				
7. I am bothered by headaches, neck and back pains				
8. I feel weak and get tired easily				
9. I feel calm and can sit still easily				
10. I can feel my heart beating fast				
11. I am bothered by dizzy spells				
12. I have fainting spells or feel like it				
13. I can breathe in and out easily				
14. I get feelings of numbness and tingling in my fingers, toes				
15. I am bothered by stomach aches or indigestion				
16. I have to empty my bladder often				
17. My hands are usually dry and warm				
18. My face gets hot and blushed				
19. I fall asleep easily and get a good night's rest				
20. I have night mares				

SUMMARY

Indexing Psychological Health Change By Levels of Severity

Two tasks were accomplished to index the levels of severity for psychological health change. First, severity levels were established for each criterion symptom scale of the PSS, SDS and SAS. Second, severity levels were established for psychological health change across symptoms and over time.

Several indices of severity were investigated for the PSS criterion scales. Results indicated that a dichotomous, asymptomatic versus symptomatic, classification was most appropriate.

The final determination of psychiatric status and severity was made two ways. Susceptibility to psychistric problems was defined by three groupings.

1) Incidence cases were defined as those men who on any of the five PSS criterion scales were classified symptomatic after, but not at, intake.
2) Prevalence cases were defined as those men who had any of the five PSS criterion scales classified symptomatic at intake.
3) Asymptomatic controls were defined as those men who never had a symptomatic PSS criterion score in five evaluations.

The second overall psychiatric status assessment classified men into four groups according to the extent of psychiatric problems.

1) Asymptomatic controls never had a symptomatic PSS criterion scale in five evaluations.
2) Acute cases had only a single symptomatic criterion score at only one evaluation of the five.
3) Intermittent cases had one or more symptomatic criteria at 2 or 3 of five evaluations.
4) Chronic cases had one or more symptomatic criteria at 4 or 5 of five evaluations.

Severity for the monthly evaluation of depression and anxiety also was evaluated two ways.

For a given month, the severity was classified according to the level of symptomatology reflected by a score.

1) Level 0 was established at a range indicative of no or insignificant symptomatology.

2) Level 1 reflected definite depression or anxiety at the symptom level.
3) Level 2 was established at a syndrome level equivalent to outpatients with a diagnosis of depression or anxiety.
4) Level 3 was established as the highest level, representing a severe depressive or anxiety neurosis needing clinical treatment.

Men were classified into four groups representing their characteristic psychiatric morbidity over their time in the study using annualized rates of Level 1, 2 or 3 episodes. A minimum of one interval between examinations with at least five returned questionnaires was needed to make these classifications. The four groups were:

1) Asymptomatic controls had an average annual rate of episodes of less than .5 per year.
2) Acute cases had an average annualized rate of episodes between .6 and 2.9 per year.
3) Intermittent cases had an average annualized rate ofepisodes between 3 and 8.9 per year.
4) Chronic cases had an average annualized rate of episodes of 9 or more per year.

2. Indexing Psychological Health Change By Severity

Elimination of Levels of Severity for Scores on Specific PSS Scales

Two issues in classifying the severity of psychological health problems had to be considered. First, we had to consider the use of severity levels for each of the symptom scales; and second, we had to consider the use of severity levels to classify overall psychiatric health or illness. The first task was to consider the use of severity levels on the individual symptom scales.

Table 130 displays the two major methods that we examined for classifying Psychiatric Status Schedule severity on a given criterion scale. The first method produced ordinal categories so that a "Level 0" on a criterion scale represented an asymptomatic assessment. Even though symptoms may have been present, they would not be sufficient to exceed the cut-off score established for significant symptomatology. As previously mentioned, these cut-off scores were established by comparison with a number of clinical groups (see Table 127). A Level 1 psychiatric symptom was established as one in which the PSS score was above the cut-off criterion but less than one standard deviation above the psychiatric inpatient group. Hence a Level 1 psychiatric health outcome was derived from significant but clinically mild symptomatology. A Level 2 psychiatric health change was established as one in which the PSS criterion score was greater than one standard deviation above the psychiatric inpatient average. Finally a Level 3 health change required a PSS criterion score of more than one standard deviation above the psychiatric inpatient average and in addition required hospitalization for the psychological condition.

This method of establishing levels of symptomatology attempted to include the absolute level of symptomatology involved in the dysfunctional status. However, we conducted a large number of analyses that compared individuals classified at the various levels on each of the PSS criterion scales and found that there was very little difference between the three symptomatic groups on measures of personality, attitudes toward work, life change, laboratory or personal history variables. This rather surprising finding suggested that the concept of level was not a useful one since there were few, if any, distinguishing characteristics between people at the three upper levels. We determined, therefore, that it was most feasible simply to classify individuals as asymptomatic or symptomatic.

Our eventual method of classification according to the Psychiatric Status Schedule criterion scales was, therefore, dichotomous. If an individual scored above the cut-off for a

TABLE 130

Methods For Classifying PSS Severity On Criterion Scales

Method 1 Level of symptomatology

A. Level 0 - asymptomatic, below cut-off score for significant symptomatology

B. Level 1 - above cut-off score but less than one standard deviation above psychiatric inpatient average

C. Level 2 - more than one standard deviation above psychiatric inpatient average

D. Level 3 - Level 2 plus hospitalization

Method 2: Asymptomatic vs symptomatic

A. Level 0 - equal to or less than cut-off score

B. Level 1 - above cut-off score

criterion scale, he was classified as symptomatic. If an individual scored at or below the cut-off level, he was considered asymptomatic. This method had the obvious drawback that some individuals could score exceedingly close to the cut-off on one or more criterion scales without being considered symptomatic. This was a problem common to categorical measurement of any kind.

We investigated the problem of cut-off score boundaries by examining the actual symptoms that contributed to the classification of our subjects as symptomatic on a given scale. Conversely, we examined the specific symptoms for individuals scoring at or just a few points below the criterion cut-off score. We found that the combinations of symptoms that actually occurred to symptomatic individuals were clinically significant, i.e., the symptoms resulting in a classification of symptomatic for an individual were reflected by clinically diagnosable conditions.

On the other hand, those scoring just below the criterion cut-off tended to have somewhat unrelated symptoms that reflected either a pre-clinical state or a non-diagnosable series of scattered symptoms.

Throughout this report we have used only a classification of symptomatic or asymptomatic to describe or group subjects on specific Psychiatric Status Schedule criterion scales. Clinical psychiatric diagnoses were not made in this study, nor were levels of severity assigned to scores on the specific PSS scales.

Levels of Severity for Overall PSS Assessment

We needed then to consider establishing severity levels to categorize the men's overall psychiatric status. Table 131 displays a number of methods that were possible for classifying an individual's overall psychiatric status in a particular examination by levels of severity.

Methods 2, 3 and 4 were usable only if classification by levels were used on the individual scales. We investigated the predictive differences between the groups using all five methods. We found that there were very few differences between the groups distinguished by level (as in the investigation of the usefulness of levels of severity for classifying individuals on the individual scales), whereas the number of scales on which the individual was classified symptomatic seemed to be the more powerful discriminator between persons.

TABLE 131

Methods For Classifying Levels Of
Overall Psychiatric Status
At A Given Examination

Method 1: Number of Symptomatic Criterion Scales

A. None
B. One
C. Two
D. Three or more of eight

Method 2: Number and Level of Symptomatic Criterion Scales

A. None
B. One level 1, all others normal
C. Multiple level 1's, no level 2's or 3's
D. At least one level 2
E. At least one level 3

Method 3: Number and Level of Symptomatic Criterion Scales

A. None
B. One level 1; all others normal
C. One level 2 or 3; all others normal

Method 4: Number and Level of Symptomatic Criterion Scales

A. None
B. One level 1; all others normal
C. One level 2 or 3; all others normal
D. Two at any level, 1-3, all others normal
E. Three or more at any level, 1-3

Method 5 Number of Symptomatic Criterion Scales

A. None
B. One
C. Two or more

We decided, therefore, to use Method 5, with three categories for the number of symptomatic criterion scales at a given examination to classify an individual's overall level of psychiatric status. These three categories were: 1) none of the criterion scales were symptomatic; 2) a single criterion scale was symptomatic; or 3) two or more scales were at symptomatic levels. Individuals with no symptomatic criterion scales were considered asymptomatic with respect to their overall psychiatric status at a given examination. Individuals with only one criterion scale at a symptomatic level were considered to have a mild psychiatric disorder, and individuals with two or more symptomatic scales were considered to have a moderate psychiatric disorder.

Severe psychiatric disorders characterized by hospitalizations, suicide attempts, or psychosis were very infrequent as one would expect. These few cases are discussed with the descriptive findings.

Psychiatric Status Schedule: Classification of Severity Over Time

Finally, we investigated a number of methods for classifying an individual's psychiatric status across examinations; that is, an individual's psychiatric status over his entire period of enrollment in the study. We finally were satisfied with four different classifications, the first two of which applied to single criterion scales, the second two of which applied to an individual's overall psychiatric status.

Table 132 displays the final methods we used for classifying psychiatric status across the examinations. With respect to individual criterion scales such as subjective distress or alcohol abuse, we determined that two major issues were of paramount importance to the purposes of this contract. First, one would want to know the variables that could predictively distinguish between people who first developed their problem during the study, and those who remained asymptomatic. Secondly, one would want to know what the significant predictors were for people with varying frequencies of occurrence for a given problem.

The problem of determining the significant predictors of the first onset of psychiatric problems was one which had not been developed particularly well in the literature in the area. Consequently, we devised a method labeled a "sliding interval" onset analysis.

The primary purpose of this design was to discover the predictors of the first onset of a psychiatric difficulty. Cases were defined as men with the first occurrence of a problem after

TABLE 132

Methods For Classifying Psychiatric Status Across Examinations

Criterion Scales

1. First occurrence of a problem - sliding interval onset analysis

   A. Cases - men with the first occurrence of a problem after intake
      1. Exclude men with problem at intake
      2. Exclude men with unremitting problems

   B. Controls - men who never had any problem
      1. Sample in same proportion from each round as those who were cases

   C. Predictors - selected from examination preceding onset examination, e.g., when cases were asymptomatic

2. Frequency of occurrence of a problem

   A. Categories
      1. Never
      2. Once only
      3. Twice or more

   B. Exclude drop-outs-true frequency unknown
   C. Predictors - intake and background variables

Overall Status

1. Susceptibility to psychiatric problems

   A. Incidence Cases - anyone who had any PSS symptomatic score after intake, but not at intake, including drop-outs

   B. Prevalence cases - anyone who had any PSS symptomatic score at intake, including drop-outs

   C. Controls - those who never had a symptomatic score, exclude drop-outs

2. Extent of psychiatric problems - exclude drop-outs

   A. Mild - a single occurrence of a single symptomatic score

   B. Moderate - one or more symptomatic criteria at two or three examinations

   C. Severe - one or more symptomatic criteria at four or five examinations

   D. Controls - those who never had a symptomatic criterion score

intake. Men with either problems at intake or unremitting problems were excluded from the case group. Both of these exclusions were necessary so that we would avoid predicting psychiatric problems from pre-existing psychiatric problems. Controls were defined as men who never had any symptomatic psychiatric criterion scale throughout the entire period of enrollment in the study. Because predictors could vary from round to round due to historical events and maturation of individuals, the predictor data on the controls was taken from specific rounds of examinations to match the cases with predictor data from specific rounds. Predictor data were selected from an examination preceding the onset examination; that is, from a time when the ATC was asymptomatic. Our design compared predictor data from cases before they became asymptomatic with predictor data from those who never developed a problem on a particular criterion scale. Therefore, for each sliding interval onset analysis, individuals were simply classified as having developed a problem or not. There was no further differentiation in the level of their difficulty.

The second method for classifying status across examinations on a given scale was to categorize individuals in terms of the frequency with which they experienced a problem. We established these categories as: (1) never having had the problem over the course of the study; (2) having had a problem on a particular criterion scale only once; and (3) having had a particular problem two or more times out of the five examinations. For these analyses, men who dropped out and did not have complete Psychiatric Status Schedule examinations were excluded from the analysis since the true frequency for which they may have had problems was not determinable. Predictors for this type of analysis were drawn from intake, personality and background data looking forward over the course of this study to determine if there were significant differences between people who experienced particular problems at different rates.

There were also two methods for classifying an individual's overall psychiatric status across all examinations. The first method was concerned with the problem of determining the characteristics of individuals who were susceptible to psychiatric problems. This method classified individuals according to three criteria. First, incidence cases were defined as those men who had any PSS symptomatic criterion score <u>after</u> intake, but who did not have any PSS symptomatic scores <u>at</u> intake. Men who later dropped out, but who had developed a problem prior to dropping out were considered as incidence cases, assuming they also did not have a problem at intake. Secondly, prevalence cases were defined as those men who had any PSS symptomatic criterion score at intake. Prevalence cases could include drop-outs, since even

drop-outs had intake evaluations. Prevalence cases remained classified as prevalence cases even if new or different problems developed after intake. Third, control cases were defined as those who never had a PSS symptomatic criterion score. For the control group, drop-outs had to be excluded since the presence or absence of symptomatic scores could not be determined after they left the study.

Since any problem was sufficient to result in either a prevalence or incidence classification, the comparison of cases and controls resulted in a study of susceptibility to psychiatric problems. Intake psychological characteristics, sociodemographic characteristics, personality, physiological responsivity to work, and other data were used to differentiate between asymptomatic controls, prevalence cases and incidence cases.

The second overall psychiatric status assessment was made according to the extent of psychiatric problems. For this classification scheme drop-outs had to be excluded since they would not have full data on which to classify their status. Four groups were defined for these analyses. Acute cases were those who had a single occurrence of a single symptomatic criterion score on the PSS. Intermittent cases were defined as those men who had one or more symptomatic criteria at two or three of the five examinations. Chronic cases were defined as those men who had one or more symptomatic criteria at four or five out of the five examinations. Controls were defined as those who never had a PSS symptomatic criterion score. Again, these groups were compared by their intake psychological tests, their sociodemographic background data, their responsivity to work, and their physical health symptoms.

Levels of Monthly Depression And Anxiety

Table 133 displays the criteria by which we established levels of monthly depression and anxiety episodes. Level 0 was established at a range indicative of no or insignificant symptomatology. Although a person could have a number of symptoms and be classified at Level 0, one would not consider him to have had a significant problem.

Levels 1, 2, 3 were established to discriminate between people with symptoms of varying intensity and medical significance. Level 1 represented definite symptoms of depression (or anxiety). Scores in this range reflected significant depression or anxiety at the symptom level, but one would not necessarily expect persons scoring at this level to obtain treatment.

Having established these levels for the scores obtained in

TABLE 133

Levels Of Monthly Depression and Anxiety

Level	Standard Score Range Depression	Anxiety	Descriptive Meaning for Depression (Anxiety)
0	25-49	25-44	No or insignificant symptomatology
1	50-59	45-54	Definite symptoms of depression (anxiety). Scores in this range should reflect the presence of significant depression (anxiety) at the symptom level, but below that which would ordinarily result in referral for treatment.
2	60-69	55-64	Depressive (anxiety) symptomatology present at a level which might be seen in actual patients who present with depression (anxiety) as the main problem. Level 2 represents the syndrome level of an out-patient group with a diagnosis of depressive (anxiety) neurosis.
3	70+	65+	Depressive (anxiety) symptomatology present to a marked degree, dominating the clinical picture. This range should be equivalent to that seen in patients either hospitalized for depression (anxiety) or experiencing a severe depressive (anxiety) neurosis.

any given month, we considered how many monthly responses we should require to assign a level for a given interval. Table 134 displays the monthly response rates during the second interval of the study. The monthly questionnaires were not sent until a man completed his second examination at Boston University. Not only had 24 men become ineligible between the first and second examinations, but an additional 20 were becoming ineligible at the time of their second evaluation. Consequently, 44 individuals were not sent any monthly questionnaires during the second interval as can be seen in the first row of Table 134.

Table 134 was organized in ascending order of the number of questionnaires returned because it is only on the basis of returned questionnaires that diagnostic assessments would be made. Clearly the more questionnaires a man returned, the higher his average response rate. In fact, the overall response rate during this interval was 95.6%. However, response rates for people who returned few questionnaires were much lower.

Since it was possible that the response rates were a function of the number of questionnaires men were sent between their second and third evaluations, we needed to determine a reasonable response rate and to establish a minimum number of returned questionnaires for an individual to be given a valid assessment for the interval.

There was a major change in the response rate between those who returned four or fewer questionnaires and those who returned five or more. If an individual returned four or fewer questionnaires, the response rate was at least 66%. Furthermore, five questionnaires represented at least half of the average interval length of 9 months. In addition, there were very few people who were on the borderline level of five returned questionnaires. Consequently, for the purpose of classifying individuals according to their depression and anxiety between examinations, we established a minimum standard of at least five returned questionnaires. In all cases, returning five or more questionnaires meant that an individual returned at least two out of the three sent to him during an interval.

For the great majority of men who returned six or more questionnaires, the response rate was much higher. We felt confident that our minimum criterion of five questionnaires per interval provided a reliable and valid data base on which to evaluate a man's episodic experience of depression and anxiety.

Finally, we had to consider how to classify the levels of

TABLE 134

Response Rates During
Second Interval For Monthly
Depression And Anxiety Questionnaires

Number of Questionnaires Returned	Number of Individuals	Total Number of Questionnaires Returned	Total Number of Questionnaires Sent	Average Response Rate
N/A*	(44)	N/A	0	N/A
0**	2	0	0	0
1	3	3	26	11.5%
2	5	10	36	27.8%
3	4	12	32	37.5%
4	3	12	29	41.4%
5	5	25	36	69.4%
6	27	162	178	91.0%
7	58	406	424	95.8%
8+	265	2439	2450	99.6%
Totals	372	3069	3211	95.6%
	+(44) Ineligible			
	416 Total at intake			

* Ineligible because of changed status by the time questionnaires were sent out

** These 2 subjects exercised their right to refuse to complete these questionnaires even though they remained as study participants.

depression and anxiety episodes over time. Having established levels for classifying the monthly self-reports, we needed to establish the characteristic psychiatric morbidity of our subjects during the interval between examinations. Table 135 displays our definitions and criteria for levels of annualized rates of depression and anxiety episodes. An episode was defined as a month in which a controller had a Level 1 or above score. If a man had at least one interval in which he returned a minimum of five questionnaires, then he was classified into one of four groups based on this average rate of episodes calculated across all intervals for which the minimum criterion of five questionnaires was met.

An individual was classified as asymptomatic if his average annual rate of episodes was less than 1 month per year. An individual was classified as having acute episodes if his average annualized rate was greater than 1 month but less than 3 months per year. Intermittent classifications were made if the average annual rate was greater than 3 months but less than 9 months per year. An individual was classified as having chronic anxiety or depression if the average annualized rate of episodes was equal to or greater than 9 months per year.

These classifications of chronicity were based purely on numbers of episodes without consideration of the levels of severity. We did examine the combined influence of both the level of severity and the number of episodes. These results are shown in Table 136.

Table 136 displays the number of months out of 36 that individuals were asymptomatic, acute, intermittent, or chronic at each of the defined levels of depression or anxiety. For example, those subjects classified asymptomatic had no Level 1, Level 2, or Level 3 episodes over the three intervals in the study. The sum of months do not total 36 exactly because of rounding error in the annualization calculations for each interval.

Clearly the overall classification based on number of episodes was associated also with severity of episodes. For example the chronic group had seven times the annual rate of Level 2 depressive episodes as the intermittent group, and the intermittent group had twice the annual rate of Level 2 episodes as the acute group. On the other hand, the Level 3 episodes of depression were experienced about equally by the three clinical groups.

The same picture held true for anxiety. The chronic group (as expected by definition) had the highest annual rate

TABLE 135

Levels Of Annualized Rates Of
Depression And Anxiety Episodes From
Second Through Fifth (Exit) Examinations

Episodes: defined as Level 1 or above for a given month.

Annualized rate: defined as the average number of months per year an individual experienced episodes of depression or anxiety calculated for each between - examination interval.

Subjects: an individual received an interval annualized rate only if he returned at least five monthly questionnaires in an interval.

Levels: Asymptomatic - average annualized rate of episodes less than one month per year

Acute - average annualized rate of episodes equal to or greater than one month but less than three months per year

Intermittent - average annualized rate of episodes equal to or greater than three months but less than nine months per year

Chronic - average annualized rate of episodes equal to or greater than nine months per year

NOTE: The average annualized rates were rounded off according to the following algorhythym:

Actual average	Rounded to	Descriptive label
0.00-0.55	0.0-0.5	Less than one month per year
0.56-2.95	0.6-2.9	Greater than one but less than 3 months per year
2.96-8.95	3.0-8.9	Greater than 3 but less than 9 months per year
8.96-12.00	9.0-12.0	Greater than or equal to 9 months per year.

TABLE 136

Overall Annualized Rates*
Of Depression And Anxiety Episodes As
A Function Of The Level Of Episodes

Overall Level Classification of Average Annual Rate	Rates of Levels of Episodes							
	Depression				Anxiety			
	Level 0	Level 1	Level 2	Level 3	Level 0	Level 1	Level 2	Level 3
Asymptomatic[1]	35.14	N/A	N/A	N/A	35.16	N/A	N/A	N/A
Acute[2]	32.06	2.30	.53	.22	32.44	2.39	.23	.11
Intermittent[3]	20.33	13.84	.98	.33	17.63	16.11	.76	.25
Chronic[4]	4.82	23.46	6.67	.43	4.37	26.99	3.99	.00

* Based on the sum of three intervals of calculable annualized rates to yield figures representing the number of months out of 36 that an individual had episodes of the particular level; total N with 3 intervals = 271; N/A=not applicable by definition

1 Depression, N=178; Anxiety, N=187

2 Depression, N=66; Anxiety, N=57

3 Depression, N=18; Anxiety, N=18

4 Depression, N=9; Anxiety, N=9

of Level 1 anxiety episodes. In addition, they had more than four times the rate of Level 2 anxiety episodes compared to the intermittents who themselves had three times the anxiety episode rate of the acute group. The results for Level 3 anxiety episodes were not clear. For some reason the chronic anxiety group had no Level 3 episodes of anxiety. The intermittent anxiety group experienced Level 3 episodes at a rate of 1 in 12 years. The acute group experienced a Level 3 anxiety episode at a rate of only one in approximately 30 years. Thus Level 3 anxiety episodes were extremely rare on the whole and were not particularly associated with the overall level classification based on the average annual rates.

These results indicated generally that subjects classified as chronic according to their average annual rate of episodes had not only more episodes but also more severe episodes than those classified as intermittent or acute. This finding was true for both anxiety and depression. As a consequence of this finding we were able to simplify our overall classification of levels to that based simply on the annual average rate.

Before making this decision we checked to see how well the annualized rate in each interval was correlated with the overall annual rate across all intervals. We also checked how well the rates calculated for each of the three intervals correlated with one another, and finally we examined whether or not the number of intervals influenced the average annual rate that was calculated.

Table 137 displays these final checks. As can be seen in Part A of this table, the annual rate calculated for any given interval was very highly related to the average annualized rate across all intervals. The correlations were above .9 and approximately equal.

Part B of Table 137 shows that the annual rates calculated for each interval were highly correlated with one another for both depression and anxiety. That is, the assessment of an annual rate of episodes during one interval was quite comparable to the annual rate calculated for another interval. These correlations, however, were not as high as the correlations between the intervals and the overall annualization rates, which suggested that a given interval could not be used to represent the entire experience of depression and anxiety episodes. On the other hand, the overall average annualized rate well represented the experience of anxiety and depression episodes by individual controllers.

Part C of Table 137 displays the correlations between the number of valid intervals and the rates calculated for them. There were no significant relationships between the number of valid intervals and the annual rates either over all intervals or for any given interval. Consequently we were assured that the number of intervals did not influence the annual rates.

After making these various checks, we were confident about using our overall level classification based on the average annual rate for depression and anxiety episodes. In the remainder of this study the classification of individuals based on monthly psychiatric morbidity is reported in two ways--first, in terms of the overall average annualized rates of episodes, and, secondly, in terms of the asymptomatic, acute, intermittent, and chronic groupings.

SUMMARY

Prevalence and Incidence of Psychological Health Change

Over the three years in the study, 32.5% of the controllers remained symptom free in our five criterion areas of psychiatric status. About one quarter (23.8%) of the men had some significant symptomatology at intake and an additional 28.1% manifested significant problems after, but not at, intake. A few men (15.6%) were asymptomatic up to the point they dropped out but their later status was not known.

The prevalence of significant symptomatology was 12.7% for impulse control disturbances, 7.6% for mate role problems, 7.5% for alcohol abuse, 6.0% for subjective distress, and 4.1% for work role disturbances.

Alcohol use and abuse were investigated further. Using a standard protocol, 42-61% of the controllers were classified as heavy drinkers compared to 28-31% of a national sample of men, depending on the age group but controlling for race and socioeconomic status. On the other hand, we found that 7.5% were classified as alcohol abusers using behavioral and psychiatric criteria and less than 1% were alcoholics using strict physiological criteria. Other data indicated that most drinking was used as a coping mechanism by the men.

In terms of the overall extent and severity of psychiatric problems for three years, 2.9% of the men were hospitalized for psychiatric reasons, 12% had chronic problems, 22.4% had intermittent problems, 14.95 had an acute problem, 32.5% never had a criterion problem in five evaluations, and 15.4% had no problem by the time they became ineligible for further evaluation.

Evaluations of the average monthly morbidity due to depression revealed that 4.2% had chronic depression (nine or more months with an episode of depression in a year), 6.8% had intermittent depression (3-8.9 months in a year with an episode), 22% had acute depression (.6-2.9 months in a year with an episode) and 66.8% had no, or very infrequent depressive episodes.

The monthly morbidity of anxiety was quite similar with 2.8% experiencing chronic anxiety, 6.8% having intermittent anxiety, 20.5% having acute anxiety episodes and 69.9% having very infrequent or no anxiety episodes over two and a half years.

The monthly morbidity rate of depression was not significantly different from that of other non-patient groups while the monthly morbidity of anxiety was less than that of general non-patient populations.

3. Prevalence of Significant Psychiatric Symptomatology and Morbidity of Depression and Anxiety

Table 138 displays our findings of significant psychiatric symptomatology in the PSS examinations at Boston University over the three years of controller participation. These findings relate to the individual symptom criterion scales. At intake, 6% of the controllers were experiencing significant subjective distress, representing primarily depression and anxiety. By the end of the study, 12.5% had experienced significant subjective distress problems at least once in the three years. The prevalence figure of 6% at intake was somewhat below the prevalence figure of 9.9% in an urban community sample, calculated from data provided by Dr. Jean Endicott of the Evaluation Section, New York State Department of Mental Hygiene and originally collected by Dr. Bruce Dohrenwend (see Table 127). Thus the controllers experienced 39% less significant subjective distress than did the urban community sample. However, as 58% of the community sample were women, the data are not fully comparable. No better comparisons were found.

Impulse control disorders as assessed by the PSS primarily reflect the inability to control anger, drug abuse, and antisocial behaviors. As seen in Table 138 the air traffic controllers experienced a relatively high proportion of impulse control disturbances compared to the urban community sample noted above. In fact, the controllers had four times the prevalence of impulse control disturbances compared to this group. By the end of the study, almost one-third of the controllers had manifested some problem with impulse control. This result was confirmed by our findings on the California Psychological Inventory (see Section IIIB3). In that section we noted that controllers scored very low on their responsibility and socialization scales of the CPI, which reflect dimensions of impulse control problems.

The work role disturbance scale of the PSS assesses whether or not the psychiatric status of an individual interferes significantly with his job performance according to a number of criteria. For this dimension of psychiatric dysfunction, the controllers had a prevalence of 4.1% compared to 2.1% of the urban community sample. The high rate of work-related disturbances was understandable in light of the high level of impulse control disturbances experienced by the controllers, since one would have to have other psychiatric problems before one could find disruptive functioning in the occupational role.

The mate role scale of the PSS assesses whether or not there is dysfunction in the mate relationship of the individual in terms of activities, sexual functioning, communication pat-

TABLE 138

Prevalence Of Significant Psychiatric Symptomatolcgy By PSS Examination

Symptom Criterion	Total Number of ATCs	Percent Asymptomatic at Intake	Percent ATCs Symptomatic at Intake (Prevalence)	Percent of Urban Community Sample Symptomatic at First Evaluation	Percent ATCs Who Had or Developed the Problem at Least Once in Three Years
Subjective Distress	416	94.0%	6.0%	9.9%	12.5%
Impulse Control	416	87.3%	12.7%	3.1%	30.3%
Work Role	416	95.9%	4.1%	2.1%	23.8%
Mate Role	384[2]	92.4%	7.6%	6.1%	21.6%
Alcohol Abuse	416	92.5%	7.5%	2.3%	19.0%

[1] See Table III.D.1-3 for complete comparison data.

[2] 384 of 416 were married or had a cohabitation mate.

terns with the mate or social patterns of the couple. The prevalence for controllers with this problem was 7.6% compared with 6.1% for the urban community sample, essentially the same rate. Approximately one in five controllers had a disturbance in mate role functioning at some time over the three years of the study.

Finally, the symptom criterion of alcohol abuse was evaluated and the controllers experienced a prevalence of 7.5% at intake, compared with a prevalence of 2.3% among the urban community sample. One needs to exercise restraint in interpreting this comparison because of the sex differences in alcohol use and abuse, and the majority of women in the community sample. In addition, it is quite likely that the urban sample was underreporting their use of alcohol.

Since alcohol abuse was mentioned very frequently by the air traffic controllers and by the facility administrators as a problem area, we undertook a particularly intense and detailed examination of alcohol use and abuse problems among air traffic controllers. These results are presented separately following the other findings, but generally, the 7.5% prevalence of alcohol abuse problems among the controllers at intake is similar to Northeastern USA prevalence of persons defined as problem drinkers and alcoholics (Chafetz, 1974), but is lower than prevalence figures for a similar occupational group (Cahalan, Gisin, Gardner, Smith, 1972). Hence although the prevalence of alcohol abuse was higher than that of the urban community sample, it was comparable to, or even slightly lower than, a more appropriate comparison group.

Table 139 displays the frequency of occurrence of significant psychiatric symptomatology for those men who were studied all five times by PSS examination at Boston University. These results differ from the preceding in that any man who did not have all five evaluations was not included and hence the total percentage of men experiencing a problem is slightly, but not greatly, different.

The frequency of occurrence of significant psychiatric symptomatology was notable primarily because of the relatively low rates of occurrence of problems two or more times during the three years. The single exception to this observation was impulse control disturbances, which occurred in approximately 15% of the men two or more times.

Table 140 addresses the final overall psychiatric status accorded each man as a result of his examinations at Boston University. The table displays the results using our two methods for describing a man's overall psychiatric status. Part A of

TABLE 139

Frequency Of Occurrence
Of Significant Psychiatric
Symptomatology In Those Studied
All 5 Times By PSS Examination

Symptom Criterion	Total Number of ATCs[1]	% Experiencing		
		Never	Once	Twice or More
Subjective Distress	307	87.9%	7.2%	4.9%
Impulse Control	307	74.3%	11.1%	14.7%
Work Role	305[2]	80.3%	14.4%	5.2%
Mate Role	271[3]	30.1%	11.4%	8.5%
Alcohol Abuse	307	81.1%	9.4%	9.4%

1
Only those evaluated all 5 times are included, including men who were disqualified from the study.

2
Two men had not worked due to physical illness for an entire interval between examinations.

3
113 men changed their mate (not just spouse) status at different examinations and therefore did not have 5 evaluations.

TABLE 140

Overall Psychiatric Status

A. Susceptibility to Psychiatric Problems in Three Years

	No Problems-Incomplete*	No Problems	Any Problems at Intake	Any New Problems After Intake	Total Who Had or Developed A Problem
Number of ATCs	65	135	99	117	216
% of 416	15.6%	32.5%	23.8%	28.1%	51.9%

B. Extent of Psychiatric Problems in Three Years

	No Problems-Incomplete*	No Problems	Acute	Intermittent	Chronic
Number of ATCs	65	135.	65	99	52
% of 416	15.6	32.5	15.6	23.8	12.5

	No Problems-Incomplete*	No Problems	Acute	Intermittent	Chronic	Psychiatric Hospitalization
Number of ATCs	64	135	62	93	50	12
% of 416	15.4	32.5	14.9	22.4	12.0	2.9

* These subjects had no problems before dropping out and their later status was not fully assessed.

Table 140 displays the prevalence of problems according to susceptibility categories discussed earlier. Sixty-five men were classified as having no problems, but this was a result of their having incomplete data. We classified them separately since we felt it was unjustified to consider them the same as those who had no problems at all.

Over the three years in the study 32.5% of the men, or 135 individuals, had no problems on any of the five PSS symptom criterion scales. They were completely asymptomatic. Ninety-nine men, or 23.8%, had one or more significant problems at intake.

One hundred and seventeen men, or 28.1%, developed at least one problem after intake into the study. This group of men did not have any problems at intake, but developed them later.

Finally, Table 140 shows that 216 men either had a problem at intake or developed a problem subsequent to intake. Slightly over half of the men initially enrolled in the study manifested some psychiatric problem either at intake or during the three years. Thus, the susceptibility of air traffic controllers to psychiatric problems was quite high when one considers that by the end of the study, half of the men had at least some psychiatric problem or psychological dysfunction. Unfortunately, there is no comparison group to help interpret whether this figure is particularly high relative to any other occupational groups. However, the magnitude of this value certainly suggests a high prevalence of psychological difficulty.

Part B of Table 140 displays the results of our assessment of the extent of psychiatric problems in three years as opposed to the susceptibility to different problems. Part B of the table is split into two parts, the first including psychiatric hospitalizations in the general statistics, the second displaying hospitalizations separately.

Again, sixty-five men had no problems by the time they dropped out of the study, but since they did not have full assessments, it was impossible to describe accurately the extent of psychiatric problems they may have had throughout the three years. Consequently, their data was considered incomplete. The group with no problems is exactly the same group as in Part A of Table 140. Sixty-five men, or 15.6%, had an acute psychiatric problem, which by definition meant that they had only one significant evaluation of one psychiatric problem over the entire three years. Another 99 men had one or more problems at two or three psychiatric evaluations. These men were defined as having intermittent

psychiatric problems, and they comprised 23.8% of the original group of 416 men enrolled in the study. Men who had one or more problems at four or five of the evaluations were defined as having chronic problems. There were 52 such men or 12.5% of the original study group.

The second half of Table 140, Part B, groups those men who had psychiatric hospitalization into a special category. Three men who were hospitalized for psychiatric reasons had been defined as having acute problems. Six had intermittent problems, and two had chronic problems according to our assessments. Thus a total of 12 men were hospitalized for psychiatric reasons, or 2.9% of the original group. Since these special cases would seemingly indicate particularly significant psychiatric difficulty, we examined their data somewhat more closely across other variables.

Table 141 displays the reported diagnosis, the assessment of psychopathology at intake or later in the study, the extent of psychiatric problems, the burnout category and the FAA award category for these men. The reported diagnoses were obtained either from the medical records of the hospital or were reported directly by the subject on either a Monthly Health Review or during a psychiatric examination. Five of the twelve men had been hospitalized twice during the study.

The reported diagnoses were all psychoneuroses or alcoholism. Alcoholism accounted for 33% of the psychiatric hospitalizations. The remaining diagnoses were basically anxiety or depressive neuroses.

With the exception of one man, the hospitalized subjects were found to have had at least one psychiatric problem on the Psychiatric Status Schedule evaluation. The single man who did not manifest problems on the Psychiatric Status Schedule also was found to have no problems in terms of the extent of psychiatric problems. He was not classifiable according to our burnout category because of incomplete data, and he fell in the high average category for FAA awards for performance. This man would seem to be somewhat of an anomaly since we had no data substantiating his difficulties sufficient to require hospitalization.

Eleven of the 12 men were found to have some psychiatric difficulty on their Psychiatric Status Schedule evaluations. In addition, our burnout classification of men (which used work role pathology as one of four indices) had defined two men as cases of definite burnout, 7 men as preclinical, and

TABLE 141

Psychiatric Hospitalizations

N = 12 Men [1]

Reported Diagnosis [2]	Problem at Intake or Later	Extent of Psychiatric Problems on PSS Exams	Burnout Category	FAA Award Category
Anxiety Neurosis*	None	None	N/A	High Average
Depressive Neurosis	Later	Intermittent	Preclinical	Low Average
Psychoneurosis*	Later	Acute	Preclinical	High Average
Alcoholism	Later	Intermittent	Definite	N/A
Alcoholism	Later	Chronic	Preclinical	Low
Alcoholism	Later	Acute	Preclinical	High
Anxiety Neurosis*	Intake	Intermittent	N/A	Low
Anxiety Neurosis	Later	Acute	Preclinical	Low
Character Disorder	Intake	Intermittent	Mixed	Low
Alcoholism	Intake	Chronic	Preclinical	Low
Anxiety Neurosis*	Later	Intermittent	Definite	High
Psychoneurosis*	Later	Intermittent	Preclinical	High Average

[1] From medical record or reported by subject

[2] 5 of the 12 were hospitalized twice. These are marked with an asterisk (*).

one man as a mixed case of positive and negative signs. Hence, 75% of these men were classified as being pre-clinical or definite cases of burnout (See Section IIIE for a more complete description of the meaning and significance of these burnout outcomes).

We also had collected data on a number of different awards men received from the FAA for their occupational performance (see Section IIIE). Table 141 shows that five of the twelve hospitalized men were in the very lowest category of FAA performance awards. On the other hand, another five men fell in the highest category of FAA awards for performance. And finally, one man received a low average number of awards. One man could not return for the fifth evaluation during which this information was collected and therefore could not be classified in terms of FAA performance. These data are important to note because they certainly suggest that psychiatric hospitalizations were not related to performance in terms of the awards the FAA would make for such performance. Because of the nature of the data, we were not able to determine whether the awards were made before or after psychiatric hospitalization, but regardless of that fact, it is important for two reasons: If men received their performance award before hospitalization, then clearly their performance was not particularly associated with later hospitalization. On the other hand, if awards were made after psychiatric hospitalization, then the significance of their psychiatric problem did not necessarily interfere with their performance on the job. Hence, although our descriptive results have indicated that certain particular problems such as impulse control disturbances were quite prevalent among controllers, and that psychiatric problems as a whole were experienced by approximately 50% of the men over three years, psychiatric difficulties may not necessarily affect or be related to work performance of air traffic controllers. Findings presented later in this report on the predictive association between certain variables such as the amount of work done, the amount of time spent working, and other of the job measures provided additional support for this suggestion.

As previously described, we also evaluated the monthly morbidity of depression and anxiety. Table 142 displays the prevalence of monthly depression by interval and by the overall average annual levels as previously defined. During the intervals between examinations, only 3.1% to 5.9% of the men experienced chronic depression; 2.6-7.0% experienced intermittent problems; and 7.9-11.8% experienced acute problems during the intervals. During any given interval 76.3% to 80.3% of the men experienced no significant depressive symptomatology.

TABLE 142

Prevalence Of Monthly Depression By Interval And Overall Average Annual Level

Level	Interval 2		Interval 3		Interval 4		Overall Average Annual Level*	
	N	%	N	%	N	%	N	%
Asymptomatic	271	76.3	245	80.3	218	79.0	235	66.8
Acute	42	11.8	24	7.9	34	8.2	79	22.2
Intermittent	25	7.0	18	5.9	11	2.6	24	6.8
Chronic	17	4.8	18	5.9	13	3.1	15	4.2
Totals	355		305		276		353	

*Based on the average annualized rate over the three intervals for the 353 men who had one or more interval rates

With respect to the overall average annual level of the depressive episodes experienced by men over the three years, 66.8% were asymptomatic the entire time, 22.2% had acute episodes, 6.8% had intermittent episodes, and 4.2% had chronic difficulties. If one considers the intermittent and chronic groups to have the more severe episodes of depression, as was shown in Table 136 then approximately 11% of the men experienced significant depressive episodes at a level certainly suggesting a need for treatment. This 11% figure is very similar to that found in psychiatric epidemiological studies of depressive disorders in the general population (Barrett, Hurst, DiScala, Rose, 1978).

Table 143 displays our results on the extent of monthly anxiety by intervals and according to the overall average annual level. It can be seen that 3.9 - 4.8% of the men experienced chronic anxiety during the three intervals between Examinations 2-5. In addition, 5.9% to 6.9% of the men experienced intermittent anxiety episodes, and 6.9% to 13% of the men experienced acute episodes of significant anxiety. Seventy-six percent to 83.3% of the men experienced no anxiety at all during these intervals between examinations.

Considering the overall extent of monthly anxiety over the three years, we found that 2.8% experienced chronic anxiety episodes, 6.8% experienced intermittent episodes. 20.5% experienced acute episodes, and the remaining 69.9% were asymptomatic over the entire period of the study.

The extent of anxiety and depression on a monthly basis was very similar, and in fact, it was quite common for men with depressive problems also to have anxiety problems. The important point is that the more severe intermittent and chronic levels were experienced by only 9.6% of the men with respect to anxiety and 11.0% with respect to depression. As previously noted, these figures are very similar to those found for other populations of non-psychiatric patients.

Psychological problems, including some psychiatric syndromes, were quite prevalent among the men in the study. Slightly more than half had at least one psychiatric difficulty. The most prevalent psychiatric difficulty was impulse control disturbances which reflected a relatively high number of men who had an inability to control overt anger, anti-social impulses, and illicit drug use. Alcohol use was quite high, but alcohol abuse was about the same as in comparable groups of subjects. Anxiety and depression were experienced at levels equal to or less than that experienced in general populations of non-patients. The experience of psychiatric problems was not particularly

TABLE 143

Prevalence Of Monthly Anxiety By Interval And Overall Average Annual Level

Level	Interval 2		Interval 3		Interval 4		Overall Average Annual Level*	
	N	%	N	%	N	%	N	%
Asymptomatic	270	76.0	254	83.3	227	82.2	246	69.9
Acute	46	13.0	21	6.9	19	6.9	73	20.5
Intermittent	22	6.2	18	5.9	19	6.9	24	6.8
Chronic	17	4.8	12	3.9	11	4.0	10	2.8
Totals	355		305		276		353	

* Based on the average annualized rate over the three intervals for the 353 men who had one or more interval rates.

related to FAA performance criteria, but on the other hand, these problems in turn affected the men's work role performance. Psychiatric problems in mate role relationships were experienced at approximately the same rate as among the urban community group, and therefore, we would conclude that mate role difficulties were not more frequent among air traffic controllers than among others. Finally, since alcohol use and abuse were problem areas of great concern to both the air traffic controllers and management, we made an especially detailed evaluation of this problem area which is presented in the next section.

4. Alcohol Abuse

Information for the assessment of alcohol use and abuse, drinking behavior and consumption patterns was collected by use of the 16-item alcohol abuse scale of the Psychiatric Status Schedule, by an eight-item scale generated by factor analysis which assessed the ATCs' use of alcohol as a coping mechanism, and by a set of questions relative to frequency, amount, variability and volume of alcoholic beverage consumption.

Problems with Alcohol Revealed By The PSS

The symptoms reported most frequently were the following: they keep drinking at times even though they feel they should stop; they admit to becoming regularly intoxicated; they report periods in which they cannot recall what occurred the night before, and while alone, they have three or more drinks. The symptoms reported least often were those associated with physiological functioning and generally indicative of the symptom cluster labeled "alcoholism." The distribution and ranking of symptoms indicated that the type of problem experienced by the ATCs was generally a psychological dependence rather than physiological addiction.

The relationships between other psychiatric difficulties ! alcohol abuse are displayed in Table 144. From 69% to of the sample experienced neither psychiatric problems alcohol problems at a given evaluation. In two-thirds of cases in which problems related to alcohol did occur, appeared in conjunction with other psychiatric difficulties as impulse control, mate role impairment and work role irment. These findings indicated that difficulties with ol were associated with difficulties in other areas as w

By Drinking

e Coping by Drinking Factor of the ATC Questionnaire as d alcohol usage as a means of unwinding from work-related t , and the effectiveness of drinking as a means of coping rk-related difficulties. High scores were indicative ively frequent usage of alcohol as a means of coping w ess or tension. This scale revealed that drinking as a of unwinding after work was a fairly regular occurrence for ollers. Approximately 50% were inclined to drink as a means of unwinding on 15 of 20 working days. Sixty to 70% found that when they did drink, it was effective in helping em to unwind and relax. The results shown in Table 145

TABLE 144

Overlap Between Psychiatric Problems And Alcohol Abuse At Each PSS Evaluation

Exam	No Problem N(%)	Psychiatric Problem without Alcohol Abuse N(%)	Psychiatric Problem and Alcohol Abuse N(%)	Alcohol Abuse Only N(%)
1	305(73.3)	80(19.2)	20(4.8)	11(2.6)
2	273(69.6)	95(22.8)	17(4.1)	7(1.8)
3	251(71.9)	61(17.5)	21(6.0)	16(4.6)
4	216(69.0)	65(15.6)	21(6.7)	11(3.5)
5	280(72.2)	76(18.3)	23(5.9)	9(2.3)

TABLE 145

Correlation Matrix: Exam One Through Five
For Coping By Drinking Scale

	Exam 1	Exam 2	Exam 3	Exam 4
Exam 1	-			
Exam 2	.80			
Exam 3	.77	.84		
Exam 4	.71	.78	.84	
Exam 5	.71	.76	.79	.91

All correlation coefficients are significant beyond the .001 level.

also indicated that the ATCs exhibited a high degree of stability in their use of drinking to cope.

Categorizing the men into low, moderately low, and moderately high and high users of alcohol for coping purposes and then cross-tabulating the classifications at the different examinations resulted in the finding that between 57% and 60% of the controllers remained in the same category from exam to exam. About 10% of the men consistently relied on heavy alcohol usage every day of the month to cope with tension from the job.

Alcohol Use As Revealed By Quantity-Frequency-Variability Measures

Frequency of drinking:

A special interview questionnaire about alcohol use was devised for the fourth and fifth examination visits. A systematic evaluation of the frequency, amount, variability and kind of alcohol usage was conducted. The different types of alcoholic beverages were combined by using pure ethanol equivalents. The frequency of drinking represents the number of times that the individual drank in the course of a week, month or year. Table 146 indicates that about 36% of the controllers drank nearly every day and another 20% drank three or four times a week. Cumulatively, about 56% drank at least three or more times a week; only 7% did not drink at all (abstainers).

Quantity of Alcohol Consumed:

Data on the amount of alcohol consumed is presented in Table 147 in terms of the number of ounces consumed per week. About 31% drank between 1 and 7 ounces; 21% drank between 8 and 14; and the remaining 41% drank 15 or more ounces per week. The mean consumption for Examination 4 was 16 ounces per week, while for Examination 5 it was 14 ounces. The correlation between reported alcohol consumption at Examinations 4 and 5 was .64.

Quantity-Frequency-Variability:

Table 148 indicates that approximately half of the ATCs were heavy drinkers (between 47% and 54%) while about a third were light or infrequent drinkers, or abstainers (32% to 39%).

Drinking Occasions:

The controllers were asked if they drank more on their days off or their workdays after work, or if it did not make a difference. Most controllers indicated that their drinking practices were the same for workdays after work and days off.

TABLE 146

Frequency Of Drinking Alcoholic Beverages Among ATC Study Sample

Frequency	Exam* 4 N(%)	Exam 5 N(%)
1. Two times a day	2(.7)	2(.7)
2. Nearly every day	107(35.2)	107(35.2)
3. 3-4 times a week	62(20.4)	58(19.1)
4. 1-3 times a week	74(24.3)	78(25.9)
5. 2-3 times a month	17(5.6)	20(6.6)
6. About once a month	15(4.9)	11(3.6)
7. Less than once a month/ at least once a year	4(1.3)	7(2.3)
8. Never	23(7.6)	21(6.9)

*Figures are adjusted to include those ATCs present at both exam 4 and exam 5 and include only journeyman controllers (N=304).

TABLE 147

Quantity Of Alcohol Consumed By ATC Study Sample In Ounces Per Week, As Reported In Rounds 4 And 5

Total Consumption: Exams 4 and 5

Ethanol Equivalent Ounces Per Week	Exam 4* N(%)	Exam 5* N(%)
0	23(7.4)	26(6.7)
1-7	92(29.8)	131(6.7)
8-14	67(21.7)	83(21.4)
15-21	37(12.0)	56(14.5)
22-28	34(11.0)	36(9.3)
29-35	21(6.8)	25(6.5)
Over 35	35(11.3)	30(7.8)
Mean	16.37	14.20
S.D.	16.45	14.2
N	309	387
Range	0-140	0-120

* All men who were evaluated were included.

TABLE 148

Quantity-Frequency-Variability Classification

Classification	Exam 4*		Exam 5*	
	N	%	N	%
Heavy Drinker	164	54.1	144	47.5
Moderate Drinker	42	13.9	40	13.2
Light Drinker	70	23.1	91	30.0
Infrequent Drinker	4	1.3	7	2.3
Abstainers	23	7.6	21	6.9
Totals	304	100.0	304	99.9

*Figures are adjusted to include those ATCs present at exam four and five and include only journeyman controllers.

Type of Beverage:

For those controllers who drank, the beverages most frequently consumed were hard liquor and beer, while wine represented the least frequent beverage.

Comparison of Controllers to National Survey Samples on Quantity-Frequency-Variability

The special alcohol questionnaire given at the fourth and fifth examinations enabled us to compare the controllers to adult males of similar demographic characteristics. National survey data using the same questionnaire was available for comparison.

Compared to the national survey results, ATCs were heavy drinkers about four times more often than those in the national survey. Both samples had similar prevalences of light and moderate drinkers. Controllers were also 4 times less likely to fall within the abstainer group (Table 149).

Age was a possible influence on the difference between national and ATC drinking prevalences. Table 150 indicates less drinking as age increases for the national survey as well as for controllers. In terms of heavy drinking, the national survey results were unaffected by age while heavy drinking tended to decrease with age among controllers. Overall, controllers had a higher percentage of drinkers and heavy drinkers.

Medical Diagnoses of Alcoholism

We declined to make psychiatric diagnoses in order to avoid the pejorative implications and the unreliability associated with these diagnoses. However, in the medical sphere, the internist for the study rendered diagnoses based on medical history, physical examination, serology, urology, radiology, monthly self-reports, and hospital records. Diagnoses rendered on the basis of these data were considered more reliable and subject to specific physical findings and symptoms. Thus, diagnoses of alcoholism made by the internist represented physiological addiction with substantive physical findings present.

The internist diagnosed alcoholism for one man at intake and three men after intake. Thus, the total number of men receiving diagnoses of alcoholism on physiological grounds was four, or 0.97%. These men had findings of liver disease, tremors, peripheral neuropathy, blackouts, and other physiological symptoms of addiction to alcohol in association with a history of heavy, prolonged intake of alcoholic beverages. All four were hospitalized at least once

A Comparison Of Quantity-Frequency-Variability Classification Between A National Survey Sample And The ATC Sample At Exam Four And Five

	National Survey		Exam Four*		Exam 5*	
	N	%	N	%	N	%
Heavy Drinkers	324	12	168	54.4	185	47.8
Moderate Drinkers	354	13	42	13.6	49	12.7
Light Drinkers	766	28	72	23.3	118	20.5
Infrequent Drinkers	404	15	4	1.3	9	23.0
Abstainers	893	32	23	7.4	26	6.7
Total			309		387	

*All men who were evaluated were included for these comparisons.

TABLE 150

A Comparison Of Drinkers And Non-Drinkers In A National Survey Sample And The ATC Study Sample At Exams Four And Five Analyzed By Age And Controlling For Socioeconomic Status [1]

Age Categories	Percent Drinkers			Percent Heavy Drinkers		
	National Sample	ATCs Fourth Exam	ATCs Fifth Exam	National Sample	ATCs Fourth Exam	ATCs Fifth Exam
21-29	84	94	96	28	61	56
30-39	86	92	91	30	52	48
40-49	79	90	88	31	56	42

[1] All ATCs from the fourth (N=309) and fifth (N-387) were included. The data for the national sample was drawn from results for white males, high school to college level education, in the same income bracket as ATCs.

because of their condition.

The incidence of alcoholism according to this stringent criterion was about 0.25% per year, a figure nearly identical to the prevalence at intake of 0.24% (1/416). Hence, a strict physiologically based diagnosis of alcoholism was quite rare.

In summary, slightly over 50% of the air traffic controllers were heavy drinkers. At intake into the study, 7.5% had alcohol abuse problems according to psychiatric and behavioral criteria. Nineteen percent experienced an alcohol abuse problem at some point during the three years. According to physiological criteria, less than 1% suffered from alcoholism during the three years. Alcoholism was newly diagnosed at a rate of about 0.25% per year, a figure nearly identical to the prevalence of physiological alcoholism at intake (0.24%).

It is important to recognize that we examined alcohol-related behavior from a variety of perspectives. We did not wish to enter the highly controversial issue surrounding the diagnosis and definition of alcoholism and therefore used several definitional aspects of "alcoholism." From all perspectives, the controllers drank a great deal but relatively few had physiological disorders as consequences.

SUMMARY

JOB OUTCOMES

Certain job outcomes were measured and analyzed as an adjunct to the health outcomes: burnout, promotion, medical disqualification, amount of work performed and special recognition.

Definite burnout was defined as a decline during the course of the study in two or more of four variables: work satisfaction, competence ratings of peers, bounceback/burnout and work role pathology. Partial burnout was defined as a decline in one of these variables.

Using the definition decided upon, 35 men were found to have developed definite burnout after intake into the study. Forty-nine men were promoted to supervisor; 11 men received medical discharges for psychiatric reasons, and 12 men received medical discharges for physical problems.

The men who were promoted received more awards, on the average, than others, and the men who were disqualified for psychiatric reasons had, on the average, fewer awards than those disqualified for physical health reasons, and all other men.

E. Job Outcomes

In addition to the health outcomes in the previous sections, we measured and analyzed certain job outcomes that we considered important adjuncts to our health change data or that were of particular importance to the FAA.

These job outcomes were:

1. Burnout
2. Promotion
3. Medical disqualification
4. Amount of work performed
5. Special recognition awards

The definition, method of measurement, and frequency of occurrence of these outcomes among the study population are reported in this section.

Methods of Measurement

1) Burnout

The phenomenon of burnout has been of great interest both to the controllers and to the FAA. However, no accepted definition of burnout exists; and its importance, if it is an actual phenomenon, has been a matter of controversy. After considerable discussion with participating controllers, the members of the research team decided upon a definition of burnout that might capture the meaning of the term to controllers. We defined burnout as the occurrence in individuals of a significant negative change, over the three years of the study, in two or more of the following four variables: Work satisfaction, bounceback-burnout factor on the ATC Questionnaire, number of times chosen for competence by peers on the sociometric questionnaire, and the presence of significant work role pathology on the Psychiatric Status Schedule. We designated individuals who showed a significant decline in scores on two or more of these variables as a definite case of burnout, and those who declined one of four variables as a case of partial burnout. In order to make this determination, we calculated the average of the scores for each of these variables on Rounds 1 and 2 and again on Rounds 4 and 5. We then examined the differences in these two average scores, subtracting the average of Rounds 1 and 2 from that of Rounds 4 and 5. For the burnout-bounceback factor, the competence ratings and work satisfaction,

those individuals who had the largest declines (in the lowest one-quarter to one-third of the distribution) were designated as having had a significant change in the particular factor. For the work role pathology, individuals who developed work role pathology after not having it at intake were designated as having significant change in this variable. We also eliminated from all groups individuals who were consistently low from intake onward on two or more of the four factors. We wished to discriminate between men who developed burnout during the time they were in the study and those who were already manifesting burnout at intake into the study.

In general there were three selection criteria for determining cases of burnout, potential burnout, and comparison groups.

1. Individuals had to have completed all five rounds of examinations at B.U. They could not have dropped, have been promoted, or have been disqualified. This was necessary because we were measuring change and had to have the data for all times for the necessary calculation. (Medical drop-outs are covered in a separate job outcome variable).

2. Men had to experience significant decline in scores of two or more of the four variables to be labeled a case of burnout.

3. If individuals showed scores in the lowest quartile at Rounds 1 and 2 on two or more of the four defining variables, they were excluded from the analysis (17 cases were found).

These criteria yielded the following grouping of men:

97 men -- comparison group, no significant fall on any of the variables

115 men -- partial burnout cases, fall in only one of the criterion factors

35 men -- burnout cases, fall in two or more of the criterion factors

---

246 men able to be classified.

The bounceback-burnout factor consisted of scores on four questions in the Air Traffic Controller Questionnaire. As described in a previous section these were found to intercorrelate highly enough to form a single scale. Men who scored high on burnout and hence low on bounceback on this bipolar dimension answered the following questions as indicated:

1. "In the past six months it has been becoming more difficult for me to bounceback to peak performance when I've been away from the boards"
(Answer: Positively)

2. "In the past six months, it's been harder to shift between peak and slow periods."
(Answer: Positively)

3. "How often do you find yourself worrying about your own burnout?"
(High burnout answers: very often or constantly)

4. "At the present time, how close to burnout do you feel?"
(Answer: extremely close or very close)

A second defining criterion for burnout was the score on work satisfaction taken from the Job Description Index (Smith). This scale is answered by the individual indicating his agreement from "completely true" to "completely false" for a list of 19 adverbs describing work such as good, fascinating, routine, satisfying, etc.

The third score used was the number of competence ratings an individual received from co-workers on the first two rounds compared to the fourth and fifth round. Individuals were scored in the direction of burnout when there was a major decline in the number of men who rated them as among the most competent.

The fourth criterion was work role pathology on the PSS for which individuals received a positive (burned out) score if they were found by the interviewer to have significant interference in their ability to work because of psychological problems.

Table 151 lists the number of cases of burnout over the course of the study in terms of the combinations of the four variables used to define the concept. Of 35 cases of burnout, 29 showed a combination of two of the four factors declining seriously, 5 men showed changes on three of the four, and one man showed all four variables changing in a negative direction. By analysis of this table, one can deduce that 24 men had negative changes in bounceback-burnout along with something else and 23 men had negative changes in work satisfaction along with one or more other factors, while 16 had significant declines in competence ratings by co-workers and 14 had significant increases in work role pathology. Thus one may conclude that our definition of burnout was highly weighted by an individual's own estimation of his abilities and satisfaction. Those individuals who

TABLE 151

Combinations Of Significant Declines Over The Course Of the Study Of The Four Variables Used To Define A Case Of Burnout (Two or More Required For Definition)

Combination of Variables Defining Cases of Burnout	Number of Men	Frequency
Work Satisfaction + Competence Rating	3	8.5%
Work Satisfaction + Bounceback-burnout	9	25.7%
Work Satisfaction+ Work Role Pathology	5	14.3%
Competence Rating + Bounceback-burnout	9	25.7%
Competence Rating + Work Role Pathology	1	2.9%
Bounceback-burnout + Work Role Pathology	2	5.7%
Work Satisfaction + Bounceback-burnout+ Work Role Pathology	3	8.6%
Work Satisfaction + Competence Rating + Work Role Pathology	2	5.7%
All 4 Variables	1	2.9%
Total	35	100.0 %

were defined as "burnout" were very likely to have received that rating because they had shown a significant decrease over the three years in their own estimation of their work satisfaction and ability to bounceback.

2) Promotions and Medical Qualification

The ATCs reported any of these changes to the study teams as they occurred. The reports by the ATCs were then confirmed at the end of the study by FAA records. Table 152 summarizes these changes.

3) Amount of Work Performed

A description of the rationale and procedure for measuring this job outcome is contained in Section IIIB. Briefly, amount of work performed by the ATCs was measured during on-the-job studies. This objective workload measure was standardized across facilities and sectors and an average workload was derived for all ATCs who had participated in field studies at least two times. By reference to these average workload measures, categories of low, medium, and high workload change over the three years in average workload were established.

4) Special Recognitions and Awards

ATCs received various awards and recognitions from the FAA for their job performance. These included: Outstanding Performance Award, Point with Pride, Quality Step-increase, Award for Valor, Yearly-in-grade, Suggestion Award, Special Act Award (group), and Special Achievement Award. The ATCs were asked at Round 5 how many of these awards and recognitions had been received during the three years of the study.

In order to have another dimension of job performance, a total awards index was created in a way that would reflect differences in ATC performance. Of the eight awards, Suggestion Awards, Special Act Awards (group) and Award for Valor were eliminated from the total awards score as these were considered specialized events and not accurately reflective of individual day-to-day job performance. The remaining five awards were differentially weighted to reflect their differing prestige as indices of the quality of ATC job performance.

For example, a yearly in-grade promotion was clearly less important in defining job performance than a Point with Pride Award. Based on Nunnally's (1967) suggestion that variables in linear combinations should be weighted by the inverse of their standard deviations, the following weights were attached:

TABLE 152

Administrative Job Changes

Status	Absolute Frequency	Relative Frequency
No Change	283	68.0%
Medical Discharge-Psychiatric	11	2.6%
Medical Discharge-Physical	12	2.9%
Promotion to Supervisor	49	11.8%
Change to DSS	10	2.5%
Transfer to ATC work elsewhere	27	6.5%
Other[1]	24	5.8%

[1]The other category represents those ATCs who discontinued participating in the study for a variety of personal reasons.

a) Yearly in-grade = 0.7; b) Quality step-increase = 1.5; c) Outstanding performance award = 1.8; d) Special Achievement Award = 2.6; and e) Point with Pride = 3.6. Thus the total award was equal to the sum of the products of the number of each type of award and the weights for each type respectively. A review of the frequency of each of these recognitions and awards follows.

a) Yearly In-Grade Increase

There was considerable variation in the number of times the ATCs received this increase, with 27 of the men reporting that they received none. Less than 5% of the respondents received four or more such increases. The high incidence rate of this type of recognition justifies its lower weight in the total awards index.

b) Quality Step Increase

The incidence rate for this performance measure is presented in Table 153. As can be seen, 199 men did not receive a quality step increase while 3 controllers reported receiving five such increases during the course of the study. This distribution of awards indicated that this was a measure which could be used to differentiate between ATCs. It was interesting to note that 188 men received a Quality Step Increase while 128 men received an Outstanding Performance Award. It is likely these two were interrelated, but not perfectly, and the lower incidence rate for the latter supports its higher weighting in the total performance awards index.

c) Outstanding Performance Award

The incidence rates for this and other awards are presented in Table 153. As can be seen, 259 ATCs (62%) did not receive an Outstanding Performance Award during the three years they were in the study, whereas one of the controllers received four such awards. The fact that 128 ATCs received this award at least once during the course of the study, while 259 did not, indicates that this award is probably reflective of higher performance as an ATC. If all of the men in the study had received such an award or if none had, it would be a meaningless measure of performance.

d) Special Achievement Award

This award was given to approximately 16% (63 ATCs) of the respondents. Three hundred and twenty-four ATCs reported not receiving any such award during the three years of the

Awards Received

No of[1] Awards	Yearly In-Grade Increase # Men %	Quality Step Increase # Men %	Outstanding Performance Award # Men %	Special Achievement Award # Men %	Point with Pride # Men %	Suggestion Award # Men %	Special Act Award # Men %	Award For Valor # Men %
0	27 6.5%	199 47.8%	259 72.3%	324 77.9%	364 87.5%	351 84.4%	351 84.4%	386 92.8%
1	146 35.1%	141 33.9%	90 21.6%	56 13.5%	15 3.6%	19 4.6%	15 3.6%	1 0.2%
2	130 31.3%	42 10.1%	30 7.2%	3 0.7%	5 1.2%	6 1.4%	11 2.6%	
3	58 13.9%	1 0.2%	7 1.7%	2 0.5%		4 1.0%	5 1.2%	
4	10 2.4%	1 0.2%	1 0.2%	1 0.2%			1 0.2%	
5	11 2.6%	3 0.7%			3 0.7%	2 0.5%		
6	2 0.5%					3 0.7%		
7	2 0.5%					1 0.2%	3 0.7%	
8				1 0.2%			1 0.2%	
9	1 0.2%					1 0.2%		
No Response	29 7.0%	29 7.0%	29 7.0%	29 7.0%	29 7.0%	29 7.0%	29 7.0%	29 7.0%

[1] During the 3-year study period

study, while one of the men received eight awards. The incidence rate distribution supports the higher weight assigned this award in the total awards index.

e) Point with Pride Award

This award was given quite infrequently as 364 of the ATCs had not received one during the course of the study. On the other hand, it was interesting to note that 3 ATCs reported receiving five awards during the three years of the study.

f) Total Awards Index

Since this measure was a weighted linear combination of the five selected award categories, examination of the score distribution was skewed positively, reflecting the fact that a large number of ATCs received only a few (or no) awards.

In order to provide some evidence for the validity of this index, the relationship between selected job changes and this total awards index was examined. It was expected that those ATCs who were promoted would have higher scores on the awards index while those medically disqualified would have lower scores. As shown in Table 154, the mean awards index for those ATCs promoted was significantly higher ($p < .01$), and the mean awards index for those ATCs medically discharged for psychological reasons was significantly lower ($p < .05$). There was no difference between the mean award index scores for those ATCs medically discharged for physical reasons and those ATCs who remained in the study.

Part C of Table 137 displays the correlations between the number of valid intervals and the rates calculated for them. There were no significant relationships between the number of valid intervals and the annual rates either over all intervals or for any given interval. Consequently we were assured that the number of intervals did not influence the annual rates.

After making these various checks, we were confident about using our overall level classification based on the average annual rate for depression and anxiety episodes. In the remainder of this study the classification of individuals based on monthly psychiatric morbidity is reported in two ways--first, in terms of the overall average annualized rates of episodes, and, secondly, in terms of the asymptomatic, acute, intermittent, and chronic groupings.

SUMMARY

Prevalence and Incidence of Psychological Health Change

Over the three years in the study, 32.5% of the controllers remained symptom free in our five criterion areas of psychiatric status. About one quarter (23.8%) of the men had some significant symptomatology at intake and an additional 28.1% manifested significant problems after, but not at, intake. A few men (15.6%) were asymptomatic up to the point they dropped out but their later status was not known.

The prevalence of significant symptomatology was 12.7% for impulse control disturbances, 7.6% for mate role problems, 7.5% for alcohol abuse, 6.0% for subjective distress, and 4.1% for work role disturbances.

Alcohol use and abuse were investigated further. Using a standard protocol, 42-61% of the controllers were classified as heavy drinkers compared to 28-31% of a national sample of men, depending on the age group but controlling for race and socioeconomic status. On the other hand, we found that 7.5% were classified as alcohol abusers using behavioral and psychiatric criteria and less than 1% were alcoholics using strict physiological criteria. Other data indicated that most drinking was used as a coping mechanism by the men.

In terms of the overall extent and severity of psychiatric problems for three years, 2.9% of the men were hospitalized for psychiatric reasons, 12% had chronic problems, 22.4% had intermittent problems, 14.95 had an acute problem, 32.5% never had a criterion problem in five evaluations, and 15.4% had no problem by the time they became ineligible for further evaluation.

Evaluations of the average monthly morbidity due to depression revealed that 4.2% had chronic depression (nine or more months with an episode of depression in a year), 6.8% had intermittent depression (3-8.9 months in a year with an episode), 22% had acute depression (.6-2.9 months in a year with an episode) and 66.8% had no, or very infrequent depressive episodes.

The monthly morbidity of anxiety was quite similar with 2.8% experiencing chronic anxiety, 6.8% having intermittent anxiety, 20.5% having acute anxiety episodes and 69.9% having very infrequent or no anxiety episodes over two and a half years.

The monthly morbidity rate of depression was not significantly different from that of other non-patient groups while the monthly morbidity of anxiety was less than that of general non-patient populations.

3. Prevalence of Significant Psychiatric Symptomatology and Morbidity of Depression and Anxiety

Table 138 displays our findings of significant psychiatric symptomatology in the PSS examinations at Boston University over the three years of controller participation. These findings relate to the individual symptom criterion scales. At intake, 6% of the controllers were experiencing significant subjective distress, representing primarily depression and anxiety. By the end of the study, 12.5% had experienced significant subjective distress problems at least once in the three years. The prevalence figure of 6% at intake was somewhat below the prevalence figure of 9.9% in an urban community sample, calculated from data provided by Dr. Jean Endicott of the Evaluation Section, New York State Department of Mental Hygiene and originally collected by Dr. Bruce Dohrenwend (see Table 127). Thus the controllers experienced 39% less significant subjective distress than did the urban community sample. However, as 58% of the community sample were women, the data are not fully comparable. No better comparisons were found.

Impulse control disorders as assessed by the PSS primarily reflect the inability to control anger, drug abuse, and antisocial behaviors. As seen in Table 138 the air traffic controllers experienced a relatively high proportion of impulse control disturbances compared to the urban community sample noted above. In fact, the controllers had four times the prevalence of impulse control disturbances compared to this group. By the end of the study, almost one-third of the controllers had manifested some problem with impulse control. This result was confirmed by our findings on the California Psychological Inventory (see Section IIIB3). In that section we noted that controllers scored very low on their responsibility and socialization scales of the CPI, which reflect dimensions of impulse control problems.

The work role disturbance scale of the PSS assesses whether or not the psychiatric status of an individual interferes significantly with his job performance according to a number of criteria. For this dimension of psychiatric dysfunction, the controllers had a prevalence of 4.1% compared to 2.1% of the urban community sample. The high rate of work-related disturbances was understandable in light of the high level of impulse control disturbances experienced by the controllers, since one would have to have other psychiatric problems before one could find disruptive functioning in the occupational role.

The mate role scale of the PSS assesses whether or not there is dysfunction in the mate relationship of the individual in terms of activities, sexual functioning, communication pat-

TABLE 130

Prevalence Of Significant Psychiatric Symptomatolcgy By PSS Examination

Symptom Criterion	Total Number of ATCs	Percent Asymptomatic at Intake	Percent ATCs Symptomatic at Intake (Prevalence)	Percent of Urban Community Sample Symptomatic at First Evaluation	Percent ATCs Who Had or Developed the Problem at Least Once in Three Years
Subjective Distress	416	94.0%	6.0%	9.9%	12.5%
Impulse Control	416	87.3%	12.7%	3.1%	30.3%
Work Role	416	95.9%	4.1%	2.1%	23.8%
Mate Role	384[2]	92.4%	7.6%	6.1%	21.6%
Alcohol Abuse	416	92.5%	7.5%	2.3%	19.0%

[1] See Table III.D.1-3 for complete comparison data.

[2] 384 of 416 were married or had a cohabitation mate.

terns with the mate or social patterns of the couple. The prevalence for controllers with this problem was 7.6% compared with 6.1% for the urban community sample, essentially the same rate. Approximately one in five controllers had a disturbance in mate role functioning at some time over the three years of the study.

Finally, the symptom criterion of alcohol abuse was evaluated and the controllers experienced a prevalence of 7.5% at intake, compared with a prevalence of 2.3% among the urban community sample. One needs to exercise restraint in interpreting this comparison because of the sex differences in alcohol use and abuse, and the majority of women in the community sample. In addition, it is quite likely that the urban sample was underreporting their use of alcohol.

Since alcohol abuse was mentioned very frequently by the air traffic controllers and by the facility administrators as a problem area, we undertook a particularly intense and detailed examination of alcohol use and abuse problems among air traffic controllers. These results are presented separately following the other findings, but generally, the 7.5% prevalence of alcohol abuse problems among the controllers at intake is similar to Northeastern USA prevalence of persons defined as problem drinkers and alcoholics (Chafetz, 1974), but is lower than prevalence figures for a similar occupational group (Cahalan, Gisin, Gardner, Smith, 1972). Hence although the prevalence of alcohol abuse was higher than that of the urban community sample, it was comparable to, or even slightly lower than, a more appropriate comparison group.

Table 139 displays the frequency of occurrence of significant psychiatric symptomatology for those men who were studied all five times by PSS examination at Boston University. These results differ from the preceding in that any man who did not have all five evaluations was not included and hence the total percentage of men experiencing a problem is slightly, but not greatly, different.

The frequency of occurrence of significant psychiatric symptomatology was notable primarily because of the relatively low rates of occurrence of problems two or more times during the three years. The single exception to this observation was impulse control disturbances, which occurred in approximately 15% of the men two or more times.

Table 140 addresses the final overall psychiatric status accorded each man as a result of his examinations at Boston University. The table displays the results using our two methods for describing a man's overall psychiatric status. Part A of

TABLE 139

Frequency Of Occurrence
Of Significant Psychiatric
Symptomatology In Those Studied
All 5 Times By PSS Examination

Symptom Criterion	Total Number of ATCs[1]	% Experiencing		
		Never	Once	Twice or More
Subjective Distress	307	87.9%	7.2%	4.9%
Impulse Control	307	74.3%	11.1%	14.7%
Work Role	305[2]	80.3%	14.4%	5.2%
Mate Role	271[3]	30.1%	11.4%	8.5%
Alcohol Abuse	307	81.1%	9.4%	9.4%

1
Only those evaluated all 5 times are included, including men who were disqualified from the study.

2
Two men had not worked due to physical illness for an entire interval between examinations.

3
113 men changed their mate (not just spouse) status at different examinations and therefore did not have 5 evaluations.

TABLE 140

Overall Psychiatric Status

A. Susceptibility to Psychiatric Problems in Three Years

	No Problems-Incomplete*	No Problems	Any Problems at Intake	Any New Problems After Intake	Total Who Had or Developed A Problem
Number of ATCs	65	135	99	117	216
% of 416	15.6%	32.5%	23.8%	28.1%	51.9%

B. Extent of Psychiatric Problems in Three Years

	No Problems-Incomplete*	No Problems	Acute	Intermittent	Chronic
Number of ATCs	65	135	65	99	52
% of 416	15.6	32.5	15.6	23.8	12.5

	No Problems-Incomplete*	No Problems	Acute	Intermittent	Chronic	Psychiatric Hospitalization
Number of ATCs	64	135	62	93	50	12
% of 416	15.4	32.5	14.9	22.4	12.0	2.9

* These subjects had no problems before dropping out and their later status was not fully assessed.

Table 140 displays the prevalence of problems according to susceptibility categories discussed earlier. Sixty-five men were classified as having no problems, but this was a result of their having incomplete data. We classified them separately since we felt it was unjustified to consider them the same as those who had no problems at all.

Over the three years in the study 32.5% of the men, or 135 individuals, had no problems on any of the five PSS symptom criterion scales. They were completely asymptomatic. Ninety-nine men, or 23.8%, had one or more significant problems at intake.

One hundred and seventeen men, or 28.1%, developed at least one problem after intake into the study. This group of men did not have any problems at intake, but developed them later.

Finally, Table 140 shows that 216 men either had a problem at intake or developed a problem subsequent to intake. Slightly over half of the men initially enrolled in the study manifested some psychiatric problem either at intake or during the three years. Thus, the susceptibility of air traffic controllers to psychiatric problems was quite high when one considers that by the end of the study, half of the men had at least some psychiatric problem or psychological dysfunction. Unfortunately, there is no comparison group to help interpret whether this figure is particularly high relative to any other occupational groups. However, the magnitude of this value certainly suggests a high prevalence of psychological difficulty.

Part B of Table 140 displays the results of our assessment of the extent of psychiatric problems in three years as opposed to the susceptibility to different problems. Part B of the table is split into two parts, the first including psychiatric hospitalizations in the general statistics, the second displaying hospitalizations separately.

Again, sixty-five men had no problems by the time they dropped out of the study, but since they did not have full assessments, it was impossible to describe accurately the extent of psychiatric problems they may have had throughout the three years. Consequently, their data was considered incomplete. The group with no problems is exactly the same group as in Part A of Table 140. Sixty-five men, or 15.6%, had an acute psychiatric problem, which by definition meant that they had only one significant evaluation of one psychiatric problem over the entire three years. Another 99 men had one or more problems at two or three psychiatric evaluations. These men were defined as having intermittenc

psychiatric problems, and they comprised 23.8% of the original group of 416 men enrolled in the study. Men who had one or more problems at four or five of the evaluations were defined as having chronic problems. There were 52 such men or 12.5% of the original study group.

The second half of Table 140, Part B, groups those men who had psychiatric hospitalization into a special category. Three men who were hospitalized for psychiatric reasons had been defined as having acute problems. Six had intermittent problems, and two had chronic problems according to our assessments. Thus a total of 12 men were hospitalized for psychiatric reasons, or 2.9% of the original group. Since these special cases would seemingly indicate particularly significant psychiatric difficulty, we examined their data somewhat more closely across other variables.

Table 141 displays the reported diagnosis, the assessment of psychopathology at intake or later in the study, the extent of psychiatric problems, the burnout category and the FAA award category for these men. The reported diagnoses were obtained either from the medical records of the hospital or were reported directly by the subject on either a Monthly Health Review or during a psychiatric examination. Five of the twelve men had been hospitalized twice during the study.

The reported diagnoses were all psychoneuroses or alcoholism. Alcoholism accounted for 33% of the psychiatric hospitalizations. The remaining diagnoses were basically anxiety or depressive neuroses.

With the exception of one man, the hospitalized subjects were found to have had at least one psychiatric problem on the Psychiatric Status Schedule evaluation. The single man who did not manifest problems on the Psychiatric Status Schedule also was found to have no problems in terms of the extent of psychiatric problems. He was not classifiable according to our burnout category because of incomplete data, and he fell in the high average category for FAA awards for performance. This man would seem to be somewhat of an anomaly since we had no data substantiating his difficulties sufficient to require hospitalization.

Eleven of the 12 men were found to have some psychiatric difficulty on their Psychiatric Status Schedule evaluations. In addition, our burnout classification of men (which used work role pathology as one of four indices) had defined two men as cases of definite burnout, 7 men as preclinical, and

TABLE 141

Psychiatric Hospitalizations

N = 12 Men [1]

Reported Diagnosis [2]	Problem at Intake or Later	Extent of Psychiatric Problems on PSS Exams	Burnout Category	FAA Award Category
Anxiety Neurosis*	None	None	N/A	High Average
Depressive Neurosis	Later	Intermittent	Preclinical	Low Average
Psychoneurosis*	Later	Acute	Preclinical	High Average
Alcoholism	Later	Intermittent	Definite	N/A
Alcoholism	Later	Chronic	Preclinical	Low
Alcoholism	Later	Acute	Preclinical	High
Anxiety Neurosis*	Intake	Intermittent	N/A	Low
Anxiety Neurosis	Later	Acute	Preclinical	Low
Character Disorder	Intake	Intermittent	Mixed	Low
Alcoholism	Intake	Chronic	Preclinical	Low
Anxiety Neurosis*	Later	Intermittent	Definite	High
Psychoneurosis*	Later	Intermittent	Preclinical	High Average

1 From medical record or reported by subject

2 5 of the 12 were hospitalized twice. These are marked with an asterisk (*).

one man as a mixed case of positive and negative signs. Hence, 75% of these men were classified as being pre-clinical or definite cases of burnout (See Section IIIE for a more complete description of the meaning and significance of these burnout outcomes).

We also had collected data on a number of different awards men received from the FAA for their occupational performance (see Section IIIE). Table 141 shows that five of the twelve hospitalized men were in the very lowest category of FAA performance awards. On the other hand, another five men fell in the highest category of FAA awards for performance. And finally, one man received a low average number of awards. One man could not return for the fifth evaluation during which this information was collected and therefore could not be classified in terms of FAA performance. These data are important to note because they certainly suggest that psychiatric hospitalizations were not related to performance in terms of the awards the FAA would make for such performance. Because of the nature of the data, we were not able to determine whether the awards were made before or after psychiatric hospitalization, but regardless of that fact, it is important for two reasons: If men received their performance award before hospitalization, then clearly their performance was not particularly associated with later hospitalization. On the other hand, if awards were made after psychiatric hospitalization, then the significance of their psychiatric problem did not necessarily interfere with their performance on the job. Hence, although our descriptive results have indicated that certain particular problems such as impulse control disturbances were quite prevalent among controllers, and that psychiatric problems as a whole were experienced by approximately 50% of the men over three years, psychiatric difficulties may not necessarily affect or be related to work performance of air traffic controllers. Findings presented later in this report on the predictive association between certain variables such as the amount of work done, the amount of time spent working, and other of the job measures provided additional support for this suggestion.

As previously described, we also evaluated the monthly morbidity of depression and anxiety. Table 142 displays the prevalence of monthly depression by interval and by the overall average annual levels as previously defined. During the intervals between examinations, only 3.1% to 5.9% of the men experienced chronic depression; 2.6-7.0% experienced intermittent problems; and 7.9-11.8% experienced acute problems during the intervals. During any given interval 76.3% to 80.3% of the men experienced no significant depressive symptomatology.

TABLE 142

Prevalence Of Monthly Depression By Interval And Overall Average Annual Level

Level	Interval 2		Interval 3		Interval 4		Overall Average Annual Level*	
	N	%	N	%	N	%	N	%
Asymptomatic	271	76.3	245	80.3	218	79.0	235	66.8
Acute	42	11.8	24	7.9	34	8.2	79	22.2
Intermittent	25	7.0	18	5.9	11	2.6	24	6.8
Chronic	17	4.8	18	5.9	13	3.1	15	4.2
Totals	355		305		276		353	

*Based on the average annualized rate over the three intervals for the 353 men who had one or more interval rates

With respect to the overall average annual level of the depressive episodes experienced by men over the three years, 66.8% were asymptomatic the entire time, 22.2% had acute episodes, 6.8% had intermittent episodes, and 4.2% had chronic difficulties. If one considers the intermittent and chronic groups to have the more severe episodes of depression, as was shown in Table 136 then approximately 11% of the men experienced significant depressive episodes at a level certainly suggesting a need for treatment. This 11% figure is very similar to that found in psychiatric epidemiological studies of depressive disorders in the general population (Barrett, Hurst, DiScala, Rose, 1978).

Table 143 displays our results on the extent of monthly anxiety by intervals and according to the overall average annual level. It can be seen that 3.9 - 4.8% of the men experienced chronic anxiety during the three intervals between Examinations 2-5. In addition, 5.9% to 6.9% of the men experienced intermittent anxiety episodes, and 6.9% to 13% of the men experienced acute episodes of significant anxiety. Seventy-six percent to 83.3% of the men experienced no anxiety at all during these intervals between examinations.

Considering the overall extent of monthly anxiety over the three years, we found that 2.8% experienced chronic anxiety episodes, 6.8% experienced intermittent episodes. 20.5% experienced acute episodes, and the remaining 69.9% were asymptomatic over the entire period of the study.

The extent of anxiety and depression on a monthly basis was very similar, and in fact, it was quite common for men with depressive problems also to have anxiety problems. The important point is that the more severe intermittent and chronic levels were experienced by only 9.6% of the men with respect to anxiety and 11.0% with respect to depression. As previously noted, these figures are very similar to those found for other populations of non-psychiatric patients.

Psychological problems, including some psychiatric syndromes, were quite prevalent among the men in the study. Slightly more than half had at least one psychiatric difficulty. The most prevalent psychiatric difficulty was impulse control disturbances which reflected a relatively high number of men who had an inability to control overt anger, anti-social impulses, and illicit drug use. Alcohol use was quite high, but alcohol abuse was about the same as in comparable groups of subjects. Anxiety and depression were experienced at levels equal to or less than that experienced in general populations of non-patients. The experience of psychiatric problems was not particularly

TABLE 143

Prevalence Of Monthly Anxiety By Interval And Overall Average Annual Level

Level	Interval 2		Interval 3		Interval 4		Overall Average Annual Level*	
	N	%	N	%	N	%	N	%
Asymptomatic	270	76.0	254	83.3	227	82.2	246	69.9
Acute	46	13.0	21	6.9	19	6.9	73	20.5
Intermittent	22	6.2	18	5.9	19	6.9	24	6.8
Chronic	17	4.8	12	3.9	11	4.0	10	2.8
Totals	355		305		276		353	

* Based on the average annualized rate over the three intervals for the 353 men who had one or more interval rates.

related to FAA performance criteria, but on the other hand, these problems in turn affected the men's work role performance. Psychiatric problems in mate role relationships were experienced at approximately the same rate as among the urban community group, and therefore, we would conclude that mate role difficulties were not more frequent among air traffic controllers than among others. Finally, since alcohol use and abuse were problem areas of great concern to both the air traffic controllers and management, we made an especially detailed evaluation of this problem area which is presented in the next section.

4. Alcohol Abuse

Information for the assessment of alcohol use and abuse, drinking behavior and consumption patterns was collected by use of the 16-item alcohol abuse scale of the Psychiatric Status Schedule, by an eight-item scale generated by factor analysis which assessed the ATCs' use of alcohol as a coping mechanism, and by a set of questions relative to frequency, amount, variability and volume of alcoholic beverage consumption.

Problems with Alcohol Revealed By The PSS

The symptoms reported most frequently were the following: they keep drinking at times even though they feel they should stop; they admit to becoming regularly intoxicated; they report periods in which they cannot recall what occurred the night before, and while alone, they have three or more drinks. The symptoms reported least often were those associated with physiological functioning and generally indicative of the symptom cluster labeled "alcoholism." The distribution and ranking of symptoms indicated that the type of problem experienced by the ATCs was generally a psychological dependence rather than physiological addiction.

The relationships between other psychiatric difficulties alcohol abuse are displayed in Table 144. From 69% to of the sample experienced neither psychiatric problems alcohol problems at a given evaluation. In two-thirds of cases in which problems related to alcohol did occur, appeared in conjunction with other psychiatric difficulties as impulse control, mate role impairment and work role rment. These findings indicated that difficulties with ol were associated with difficulties in other areas as

By Drinking

e Coping by Drinking Factor of the ATC Questionnaire alcohol usage as a means of unwinding from work-related , and the effectiveness of drinking as a means of coping k-related difficulties. High scores were indicative ively frequent usage of alcohol as a means of coping ess or tension. This scale revealed that drinking as f unwinding after work was a fairly regular occurrence for ollers. Approximately 50% were inclined to drink as a means of unwinding on 15 of 20 working days. Sixty to 70% found that when they did drink, it was effective in helping em to unwind and relax. The results shown in Table 145

TABLE 144

Overlap Between Psychiatric Problems And Alcohol Abuse At Each PSS Evaluation

Exam	No Problem N(%)	Psychiatric Problem without Alcohol Abuse N(%)	Psychiatric Problem and Alcohol Abuse N(%)	Alcohol Abuse Only N(%)
1	305(73.3)	80(19.2)	20(4.8)	11(2.6)
2	273(69.6)	95(22.8)	17(4.1)	7(1.8)
3	251(71.9)	61(17.5)	21(6.0)	16(4.6)
4	216(69.0)	65(15.6)	21(6.7)	11(3.5)
5	280(72.2)	76(18.3)	23(5.9)	9(2.3)

TABLE 145

Correlation Matrix: Exam One Through Five
For Coping By Drinking Scale

	Exam 1	Exam 2	Exam 3	Exam 4
Exam 1	-			
Exam 2	.80			
Exam 3	.77	.84		
Exam 4	.71	.78	.84	
Exam 5	.71	.76	.79	.91

All correlation coefficients are significant beyond the .001 level.

also indicated that the ATCs exhibited a high degree of stability in their use of drinking to cope.

Categorizing the men into low, moderately low, and moderately high and high users of alcohol for coping purposes and then cross-tabulating the classifications at the different examinations resulted in the finding that between 57% and 60% of the controllers remained in the same category from exam to exam. About 10% of the men consistently relied on heavy alcohol usage every day of the month to cope with tension from the job.

Alcohol Use As Revealed By Quantity-Frequency-Variability Measures

Frequency of drinking:

A special interview questionnaire about alcohol use was devised for the fourth and fifth examination visits. A systematic evaluation of the frequency, amount, variability and kind of alcohol usage was conducted. The different types of alcoholic beverages were combined by using pure ethanol equivalents. The frequency of drinking represents the number of times that the individual drank in the course of a week, month or year. Table 146 indicates that about 36% of the controllers drank nearly every day and another 20% drank three or four times a week. Cumulatively, about 56% drank at least three or more times a week; only 7% did not drink at all (abstainers).

Quantity of Alcohol Consumed:

Data on the amount of alcohol consumed is presented in Table 147 in terms of the number of ounces consumed per week. About 31% drank between 1 and 7 ounces; 21% drank between 8 and 14; and the remaining 41% drank 15 or more ounces per week. The mean consumption for Examination 4 was 16 ounces per week, while for Examination 5 it was 14 ounces. The correlation between reported alcohol consumption at Examinations 4 and 5 was .64.

Quantity-Frequency-Variability:

Table 148 indicates that approximately half of the ATCs were heavy drinkers (between 47% and 54%) while about a third were light or infrequent drinkers, or abstainers (32% to 39%).

Drinking Occasions:

The controllers were asked if they drank more on their days off or their workdays after work, or if it did not make a difference. Most controllers indicated that their drinking practices were the same for workdays after work and days off.

TABLE 146

Frequency Of Drinking Alcoholic Beverages Among ATC Study Sample

Frequency	Exam* 4 N(%)	Exam 5 N(%)
1. Two times a day	2(.7)	2(.7)
2. Nearly every day	107(35.2)	107(35.2)
3. 3-4 times a week	62(20.4)	58(19.1)
4. 1-3 times a week	74(24.3)	78(25.9)
5. 2-3 times a month	17(5.6)	20(6.6)
6. About once a month	15(4.9)	11(3.6)
7. Less than once a month/ at least once a year	4(1.3)	7(2.3)
8. Never	23(7.6)	21(6.9)

*Figures are adjusted to include those ATCs present at both exam 4 and exam 5 and include only journeyman controllers (N=304).

TABLE 147

Quantity Of Alcohol Consumed By ATC Study Sample in Ounces Per Week, As Reported In Rounds 4 And 5

Total Consumption: Exams 4 and 5

Ethanol Equivalent Ounces Per Week	Exam 4* N(%)	Exam 5* N(%)
0	23(7.4)	26(6.7)
1-7	92(29.8)	131(6.7)
8-14	67(21.7)	83(21.4)
15-21	37(12.0)	56(14.5)
22-28	34(11.0)	36(9.3)
29-35	21(6.8)	25(6.5)
Over 35	35(11.3)	30(7.8)
Mean	16.37	14.20
S.D.	16.45	14.2
N	309	387
Range	0-140	0-120

* All men who were evaluated were included.

TABLE 148

Quantity-Frequency-Variability Classification

Classification	Exam 4* N	Exam 4* %	Exam 5* N	Exam 5* %
Heavy Drinker	164	54.1	144	47.5
Moderate Drinker	42	13.9	40	13.2
Light Drinker	70	23.1	91	30.0
Infrequent Drinker	4	1.3	7	2.3
Abstainers	23	7.6	21	6.9
Totals	304	100.0	304	99.9

*Ns are adjusted to include those ATCs present at exam four and five to include only journeyman controllers.

Type of Beverage:

For those controllers who drank, the beverages most frequently consumed were hard liquor and beer, while wine represented the least frequent beverage.

Comparison of Controllers to National Survey Samples on Quantity-Frequency-Variability

The special alcohol questionnaire given at the fourth and fifth examinations enabled us to compare the controllers to adult males of similar demographic characteristics. National survey data using the same questionnaire was available for comparison.

Compared to the national survey results, ATCs were heavy drinkers about four times more often than those in the national survey. Both samples had similar prevalences of light and moderate drinkers. Controllers were also 4 times less likely to fall within the abstainer group (Table 149).

Age was a possible influence on the difference between national and ATC drinking prevalences. Table 150 indicates less drinking as age increases for the national survey as well as for controllers. In terms of heavy drinking, the national survey results were unaffected by age while heavy drinking tended to decrease with age among controllers. Overall, controllers had a higher percentage of drinkers and heavy drinkers.

Medical Diagnoses of Alcoholism

We declined to make psychiatric diagnoses in order to avoid the pejorative implications and the unreliability associated with these diagnoses. However, in the medical sphere, the internist for the study rendered diagnoses based on medical history, physical examination, serology, urology, radiology, monthly self-reports, and hospital records. Diagnoses rendered on the basis of these data were considered more reliable and subject to specific physical findings and symptoms. Thus, diagnoses of alcoholism made by the internist represented physiological addiction with substantive physical findings present.

The internist diagnosed alcoholism for one man at intake and three men after intake. Thus, the total number of men receiving diagnoses of alcoholism on physiological grounds was four, or 0.97%. These men had findings of liver disease, tremors, peripheral neuropathy, blackouts, and other physiological symptoms of addiction to alcohol in association with a history of heavy, prolonged intake of alcoholic beverages. All four were hospitalized at least once

A Comparison Of Quantity-Frequency-Variability Classification
Between A National Survey Sample And The ATC Sample At Exam Four And Five

	National Survey		Exam Four*		Exam 5*	
	N	%	N	%	N	%
Heavy Drinkers	324	12	168	54.4	185	47.8
Moderate Drinkers	354	13	42	13.6	49	12.7
Light Drinkers	766	28	72	23.3	118	20.5
Infrequent Drinkers	404	15	4	1.3	9	23.0
Abstainers	893	32	23	7.4	26	6.7
Total			309		387	

*All men who were evaluated were included for these comparisons.

A Comparison Of Drinkers And Non-Drinkers In A National Survey Sample And The ATC Study Sample At Exams Four And Five Analyzed By Age And Controlling For Socioeconomic Status [1]

	Percent Drinkers			Percent Heavy Drinkers		
Age Categories	National Sample	ATCs Fourth Exam	ATCs Fifth Exam	National Sample	ATCs Fourth Exam	ATCs Fifth Exam
21-29	84	94	96	28	61	56
30-39	86	92	91	30	52	48
40-49	79	90	88	31	56	42

[1] All ATCs from the fourth (N=309) and fifth (N-387) were included. The data for the national sample was drawn from results for white males, high school to college level education, in the same income bracket as ATCs.

because of their condition.

The incidence of alcoholism according to this stringent criterion was about 0.25% per year, a figure nearly identical to the prevalence at intake of 0.24% (1/416). Hence, a strict physiologically based diagnosis of alcoholism was quite rare.

In summary, slightly over 50% of the air traffic controllers were heavy drinkers. At intake into the study, 7.5% had alcohol abuse problems according to psychiatric and behavioral criteria. Nineteen percent experienced an alcohol abuse problem at some point during the three years. According to physiological criteria, less than 1% suffered from alcoholism during the three years. Alcoholism was newly diagnosed at a rate of about 0.25% per year, a figure nearly identical to the prevalence of physiological alcoholism at intake (0.24%).

It is important to recognize that we examined alcohol-related behavior from a variety of perspectives. We did not wish to enter the highly controversial issue surrounding the diagnosis and definition of alcoholism and therefore used several definitional aspects of "alcoholism." From all perspectives, the controllers drank a great deal but relatively few had physiological disorders as consequences.

SUMMARY

JOB OUTCOMES

Certain job outcomes were measured and analyzed as an adjunct to the health outcomes: burnout, promotion, medical disqualification, amount of work performed and special recognition.

Definite burnout was defined as a decline during the course of the study in two or more of four variables: work satisfaction, competence ratings of peers, bounceback/burnout and work role pathology. Partial burnout was defined as a decline in one of these variables.

Using the definition decided upon, 35 men were found to have developed definite burnout after intake into the study. Forty-nine men were promoted to supervisor; 11 men received medical discharges for psychiatric reasons, and 12 men received medical discharges for physical problems.

The men who were promoted received more awards, on the average, than others, and the men who were disqualified for psychiatric reasons had, on the average, fewer awards than those disqualified for physical health reasons, and all other men.

E. Job Outcomes

In addition to the health outcomes in the previous sections, we measured and analyzed certain job outcomes that we considered important adjuncts to our health change data or that were of particular importance to the FAA.

These job outcomes were:

1. Burnout
2. Promotion
3. Medical disqualification
4. Amount of work performed
5. Special recognition awards

The definition, method of measurement, and frequency of occurrence of these outcomes among the study population are reported in this section.

Methods of Measurement

1) Burnout

The phenomenon of burnout has been of great interest both to the controllers and to the FAA. However, no accepted definition of burnout exists; and its importance, if it is an actual phenomenon, has been a matter of controversy. After considerable discussion with participating controllers, the members of the research team decided upon a definition of burnout that might capture the meaning of the term to controllers. We defined burnout as the occurrence in individuals of a significant negative change, over the three years of the study, in two or more of the following four variables: Work satisfaction, bounceback-burnout factor on the ATC Questionnaire, number of times chosen for competence by peers on the sociometric questionnaire, and the presence of significant work role pathology on the Psychiatric Status Schedule. We designated individuals who showed a significant decline in scores on two or more of these variables as a definite case of burnout, and those who declined one of four variables as a case of partial burnout. In order to make this determination, we calculated the average of the scores for each of these variables on Rounds 1 and 2 and again on Rounds 4 and 5. We then examined the differences in these two average scores, subtracting the average of Rounds 1 and 2 from that of Rounds 4 and 5. For the burnout-bounceback factor, the competence ratings and work satisfaction,

those individuals who had the largest declines (in the lowest one-quarter to one-third of the distribution) were designated as having had a significant change in the particular factor. For the work role pathology, individuals who developed work role pathology after not having it at intake were designated as having significant change in this variable. We also eliminated from all groups individuals who were consistently low from intake onward on two or more of the four factors. We wished to discriminate between men who developed burnout during the time they were in the study and those who were already manifesting burnout at intake into the study.

In general there were three selection criteria for determining cases of burnout, potential burnout, and comparison groups.

1. Individuals had to have completed all five rounds of examinations at B.U. They could not have dropped, have been promoted, or have been disqualified. This was necessary because we were measuring change and had to have the data for all times for the necessary calculation. (Medical drop-outs are covered in a separate job outcome variable).

2. Men had to experience significant decline in scores of two or more of the four variables to be labeled a case of burnout.

3. If individuals showed scores in the lowest quartile at Rounds 1 and 2 on two or more of the four defining variables, they were excluded from the analysis (17 cases were found).

These criteria yielded the following grouping of men:

97 men -- comparison group, no significant fall on any of the variables

115 men -- partial burnout cases, fall in only one of the criterion factors

35 men -- burnout cases, fall in two or more of the criterion factors

---

246 men able to be classified.

The bounceback-burnout factor consisted of scores on four questions in the Air Traffic Controller Questionnaire. As described in a previous section these were found to intercorrelate highly enough to form a single scale. Men who scored high on burnout and hence low on bounceback on this bipolar dimension answered the following questions as indicated:

1. "In the past six months it has been becoming more difficult for me to bounceback to peak performance when I've been away from the boards"
(Answer: Positively)

2. "In the past six months, it's been harder to shift between peak and slow periods."
(Answer: Positively)

3. "How often do you find yourself worrying about your own burnout?"
(High burnout answers: very often or constantly)

4. "At the present time, how close to burnout do you feel?"
(Answer: extremely close or very close)

A second defining criterion for burnout was the score on work satisfaction taken from the Job Description Index (Smith). This scale is answered by the individual indicating his agreement from "completely true" to "completely false" for a list of 19 adverbs describing work such as good, fascinating, routine, satisfying, etc.

The third score used was the number of competence ratings an individual received from co-workers on the first two rounds compared to the fourth and fifth round. Individuals were scored in the direction of burnout when there was a major decline in the number of men who rated them as among the most competent.

The fourth criterion was work role pathology on the PSS for which individuals received a positive (burned out) score if they were found by the interviewer to have significant interference in their ability to work because of psychological problems.

Table 151 lists the number of cases of burnout over the course of the study in terms of the combinations of the four variables used to define the concept. Of 35 cases of burnout, 29 showed a combination of two of the four factors declining seriously, 5 men showed changes on three of the four, and one man showed all four variables changing in a negative direction. By analysis of this table, one can deduce that 24 men had negative changes in bounceback-burnout along with something else and 23 men had negative changes in work satisfaction along with one or more other factors, while 16 had significant declines in competence ratings by co-workers and 14 had significant increases in work role pathology. Thus one may conclude that our definition of burnout was highly weighted by an individual's own estimation of his abilities and satisfaction. Those individuals who

TABLE 151

Combinations Of Significant Declines Over The Course Of the Study Of The Four Variables Used To Define A Case Of Burnout (Two or More Required For Definition)

Combination of Variables Defining Cases of Burnout	Number of Men	Frequency
Work Satisfaction + Competence Rating	3	8.5%
Work Satisfaction + Bounceback-burnout	9	25.7%
Work Satisfaction+ Work Role Pathology	5	14.3%
Competence Rating + Bounceback-burnout	9	25.7%
Competence Rating + Work Role Pathology	1	2.9%
Bounceback-burnout + Work Role Pathology	2	5.7%
Work Satisfaction + Bounceback-burnout+ Work Role Pathology	3	8.6%
Work Satisfaction + Competence Rating + Work Role Pathology	2	5.7%
All 4 Variables	1	2.9%
Total	35	100.0 %

were defined as "burnout" were very likely to have received that rating because they had shown a significant decrease over the three years in their own estimation of their work satisfaction and ability to bounceback.

2) Promotions and Medical Qualification

The ATCs reported any of these changes to the study teams as they occurred. The reports by the ATCs were then confirmed at the end of the study by FAA records. Table 152 summarizes these changes.

3) Amount of Work Performed

A description of the rationale and procedure for measuring this job outcome is contained in Section IIIB. Briefly, amount of work performed by the ATCs was measured during on-the-job studies. This objective workload measure was standardized across facilities and sectors and an average workload was derived for all ATCs who had participated in field studies at least two times. By reference to these average workload measures, categories of low, medium, and high workload change over the three years in average workload were established.

4) Special Recognitions and Awards

ATCs received various awards and recognitions from the FAA for their job performance. These included: Outstanding Performance Award, Point with Pride, Quality Step-increase, Award for Valor, Yearly-in-grade, Suggestion Award, Special Act Award (group), and Special Achievement Award. The ATCs were asked at Round 5 how many of these awards and recognitions had been received during the three years of the study.

In order to have another dimension of job performance, a total awards index was created in a way that would reflect differences in ATC performance. Of the eight awards, Suggestion Awards, Special Act Awards (group) and Award for Valor were eliminated from the total awards score as these were considered specialized events and not accurately reflective of individual day-to-day job performance. The remaining five awards were differentially weighted to reflect their differing prestige as indices of the quality of ATC job performance.

For example, a yearly in-grade promotion was clearly less important in defining job performance than a Point with Pride award. Based on Nunnally's (1967) suggestion that variables in linear combinations should be weighted by the inverse of their standard deviations, the following weights were attached:

TABLE 152

Administrative Job Changes

Status	Absolute Frequency	Relative Frequency
No Change	283	68.0%
Medical Discharge-Psychiatric	11	2.6%
Medical Discharge-Physical	12	2.9%
Promotion to Supervisor	49	11.8%
Change to DSS	10	2.5%
Transfer to ATC work elsewhere	27	6.5%
Other[1]	24	5.8%

[1]The other category represents those ATCs who discontinued participating in the study for a variety of personal reasons.

a) Yearly in-grade = 0.7; b) Quality step-increase = 1.5; c) Outstanding performance award = 1.8; d) Special Achievement Award = 2.6; and e) Point with Pride = 3.6. Thus the total award was equal to the sum of the products of the number of each type of award and the weights for each type respectively. A review of the frequency of each of these recognitions and awards follows.

a) Yearly In-Grade Increase

There was considerable variation in the number of times the ATCs received this increase, with 27 of the men reporting that they received none. Less than 5% of the respondents received four or more such increases. The high incidence rate of this type of recognition justifies its lower weight in the total awards index.

b) Quality Step Increase

The incidence rate for this performance measure is presented in Table 153. As can be seen, 199 men did not receive a quality step increase while 3 controllers reported receiving five such increases during the course of the study. This distribution of awards indicated that this was a measure which could be used to differentiate between ATCs. It was interesting to note that 188 men received a Quality Step Increase while 128 men received an Outstanding Performance Award. It is likely these two were interrelated, but not perfectly, and the lower incidence rate for the latter supports its higher weighting in the total performance awards index.

c) Outstanding Performance Award

The incidence rates for this and other awards are presented in Table 153. As can be seen, 259 ATCs (62%) did not receive an Outstanding Performance Award during the three years they were in the study, whereas one of the controllers received four such awards. The fact that 128 ATCs received this award at least once during the course of the study, while 259 did not, indicates that this award is probably reflective of higher performance as an ATC. If all of the men in the study had received such an award or if none had, it would be a meaningless measure of performance.

d) Special Achievement Award

This award was given to approximately 16% (63 ATCs) of the respondents. Three hundred and twenty-four ATCs reported not receiving any such award during the three years of the

Awards Received

No of Awards[1]	Yearly In-Grade Increase # Men %	Quality Step Increase # Men %	Outstanding Performance Award # Men %	Special Achievement Award # Men %	Point with Pride # Men %	Suggestion Award # Men %	Special Act Award # Men %	Award For Valor # Men %
0	27 6.5%	199 47.8%	259 72.3%	324 77.9%	364 87.5%	351 84.4%	351 84.4%	386 92.8%
1	146 35.1%	141 33.9%	90 21.6%	56 13.5%	15 3.6%	19 4.6%	15 3.6%	1 0.2%
2	130 31.3%	42 10.1%	30 7.2%	3 0.7%	5 1.2%	6 1.4%	11 2.6%	
3	58 13.9%	1 0.2%	7 1.7%	2 0.5%		4 1.0%	5 1.2%	
4	10 2.4%	1 0.2%	1 0.2%	1 0.2%			1 0.2%	
5	11 2.6%	3 0.7%			3 0.7%	2 0.5%		
6	2 0.5%					3 0.7%		
7	2 0.5%					1 0.2%	3 0.7%	
8				1 0.2%			1 0.2%	
9	1 0.2%					1 0.2%		
No Response	29 7.0%	29 7.0%	29 7.0%	29 7.0%	29 7.0%	29 7.0%	29 7.0%	29 7.0%

[1] During the 3-year study period

study, while one of the men received eight awards. The incidence rate distribution supports the higher weight assigned this award in the total awards index.

e) Point with Pride Award

This award was given quite infrequently as 364 of the ATCs had not received one during the course of the study. On the other hand, it was interesting to note that 3 ATCs reported receiving five awards during the three years of the study.

f) Total Awards Index

Since this measure was a weighted linear combination of the five selected award categories, examination of the score distribution was skewed positively, reflecting the fact that a large number of ATCs received only a few (or no) awards.

In order to provide some evidence for the validity of this index, the relationship between selected job changes and this total awards index was examined. It was expected that those ATCs who were promoted would have higher scores on the awards index while those medically disqualified would have lower scores. As shown in Table 154, the mean awards index for those ATCs promoted was significantly higher ($p < .01$), and the mean awards index for those ATCs medically discharged for psychological reasons was significantly lower ($p < .05$). There was no difference between the mean award index scores for those ATCs medically discharged for physical reasons and those ATCs who remained in the study.

TABLE 154

Mean Total Award Scores by Administrative Status

Status	N	Mean
Change	282	38.25
oted	45	50.24
cally Disqualified-Psychological	5	21.40
ally Disqualified-Physically	9	35.67

IV. Evidence For The Validity of Self-Reported Data

An important part of the data in the ATC HCS was collected by means of questionnaires answered directly by the study subjects. As in any research project utilizing subject responses to questionnaires, there was some question about the truthfulness of the responses. We were concerned that some of the questionnaire responses might be biased by subjects who might wish to influence the findings toward changes in management policy or in their own job situation.

It was critical, therefore, that we determine the accuracy of the responses to our questionnaires. Reported in this section are a number of checks that were made to ascertain the validity of various self-reports.

SUMMARY

Validity of Self-Report Job Scales

The ATCs' scores on "faking good," "faking bad" and "random response" scales included in the California Psychological Inventory were correlated with scores on job attitude scales as a check on the validity of self-reported job attitudes.

The generally low correlations indicated that the men were responding honestly and without strong bias to the job attitude questionnaires.

A. Validity of Self-Report Job Scales

Although it is difficult to detect directly whether or not questionnaire responses are "faked" (answered to effect a desired conclusion) or answered haphazardly, an indirect means to determine "faking" is to include "faking" scales in the questionnaires or inventories.

Such "faking" scales are included in the California Psychological Inventory (CPI). As this inventory was administered to our ATC subjects during their second examination at Boston University Medical Center, we were able to assess indirectly whether or not answers on job attitude scales were honest by correlating the variables involved with the three response irregularity scales of the CPI.

One of the CPI scales, the "sense of well-being" scale, is generally used as a measure of "faking bad" (Megargee, 1972), although close examination of the evidence would seem to indicate that this scale has excess meaning in terms of measuring the self-reported "well-being" of the respondent.

A second scale, the "good impression" scale, has been used to assess "faking good" or social desirability. Again, close examination of the literature, particularly the adjectives characterizing high and low scoring men (Megargee, 1972), seems to indicate excess meaning for this scale in terms of kindness-unkindness and satisfaction-dissatisfaction.

The third scale, "communality," has been used to identify those respondents who answered in a random fashion. Although meager, the existing evidence (Megargee, 1972) does seem to support this meaning of the scale.

The correlations between these CPI scales and eight measures of job attitude are displayed in Table 155. A high correlation between a person's score on the faking scales and other scales is evidence that the person was falsifying his answers on the second scale. The generally low or non-significant correlations indicate that the ATCs responded honestly to questions concerning their job satisfactions and their supervisors. The low "communality" correlations indicated that the ATCs did not respond in a random fashion to the job attitude questions.

Although there were some statistically significant correlations which might be taken to indicate some degree of faking in responses to the job attitude questionnaires, the low magnitude of the correlations reassured us that if there were some fake responses, they did not represent any strong biases. For

TABLE 155

Correlations Between Job Attitude Scales

and Selected CPI Scales

Round 2 (N = 392)

Scales	CPI Scales		
	Sense of Well-Being	Good Impression	Communality
Work Satisfaction	.19	.23	.06
Coworker Satisfaction	.34	.26	.13
Pay Satisfaction	.12	.08	.01
Individual Satisfaction	.26	.22	-.01
Group Morale	.19	.17	.02
Initiation of Structure	.04	.04	.03
Consideration	.14	.11	.05
Tolerance of Freedom	.13	.08	.06

For N=392, correlations of .10 and .13 are significant at the 5% and 1% respect levels respectively

example, the highest correlation (.34) only indicates 11.5% of shared co-variation between these two variables. Furthermore, the excess meaning attached to the first two CPI scales would lead to the expectation of a positive relationship between the two CPI variables and measures of job satisfaction. That is, the "well being" emphasis of the first CPI scale and the "happiness-unhappiness" excess meaning of the second CPI scale would lead to the expectation of a positive relationship with job satisfaction as this empirical relationship has been found previously (Kavanagh and Halpern, 1977). If the correlations between the CPI scales and the industrial scales were larger, in the .60 to .80 range, we could conclude that the ATCs were biasing their answers. However, the results in Table 155 suggest that the ATCs were thoughtful and honest in their responses to the job attitude questionnaires.

SUMMARY

External and Internal Validators vs. MHR

The accuracy of the self-reports on the Monthly Health Review were checked by both external information and internal comparisons of information reported.

Telephone interview by the study's physician with selected ATCs resulted in confirmation of the MHR diagnosis of 43 of 58 illness events.

Comparisons of reported gastrointestinal symptoms with actual serum pepsinogen 1 levels demonstrated that reports of continuing gastrointestinal problems were much more frequent, as expected, among those with high pepsinogen 1 levels.

Internal analysis of data on upper respiratory infection (URI) showed that:

1) With an increase in number of URI symptoms reported, use of medical care increased, and proportion of episodes involving four or more days lost from work increased sharply;
2) the same symptoms reported as isolated events were less often attended by a physician and resulted in fewer days down;
3) reports of symptoms followed known seasonal variations.

Generally, the MHR self-reports were affirmed as accurate in all of these checks.

B. External and Internal Validators vs. MHR

Two general approaches to checking the accuracy of self-reported illness information on the Monthly Health Review (MHR) were utilized: external and internal criteria.

The external validations involved 1) telephone interviews by the study's physician to ATCs reporting respiratory symptoms to assess the accuracy of the diagnoses made on the basis of MHR information; and 2) comparison of reported gastrointestinal symptoms with actual serum pepsinogen levels to ascertain whether or not expected relationships were actually observed.

Internal validation of the MHR was assessed by analysis of reported symptoms to ascertain whether or not their frequency followed known seasonal variations in prevalence of specific illness conditions (e.g. upper respiratory infections in winter), and to check whether reports of symptoms as "episodes," "isolated events," and "continuing problems" reflected clinical medical expectations with regard to level of medical care involved, to days of restricted activity, and to known clusters of symptoms for the illnesses diagnosed.

Results of the telephone interviews confirmed that diagnoses based on the MHR information alone were identical to the diagnosis rendered by the physician on the basis of the telephone interviews in 43 of 58 events. Among the 15 remaining events, all but 2 were diagnosed within the same group of illness conditions as the MHR diagnosis. Of the remaining 2 diagnoses, 1 was considered an isolated symptom by the physician, but an episode of common cold on the basis of MHR scoring; the other was considered to be too non-specific to be diagnosed by the physician while it was categorized as an upper respiratory infection on the basis of the MHR symptoms.

The comparison of reported gastrointestinal symptoms with actual serum pepsinogen I levels demonstrated that, as would be expected, those with the lowest serum pepsinogen I levels did not report having symptoms such as nausea and/or vomiting as a continuing problem; and again as would be expected, those with the highest pepsinogen levels reported having such symptoms at an average rate of 37.5 symptomatic months per 100 person-years. Reports of stomach pain, abdominal cramps or heartburn were also more common as continuing problems in persons with high pepsinogen I levels, as would be expected.

Analysis of 125 URI episodes in the months from February through April, 1975 showed that as the number of reported symp-

toms in the URI cluster increased, the number of events utilizing doctors' care also increased, and the proportion of episodes involving 4 or more days lost from work increased sharply. Another indication of the validity of the MHR reports was that the same symptoms reported as isolated events occurred much less frequently, were less often attended by a physician, and resulted in fewer days lost from usual activities. Again, the ebb and flow of symptoms reported followed known seasonal variation.

Analysis of the clustering of individual respiratory symptoms showed that the ATCs related the symptoms to the three alternative choices of chronicity: illness episode, isolated symptom or continuing problem. The symptoms checked as illness episodes were in fact reported far more frequently in fall and winter than in spring and summer. "Sneezing, stuffy or runny nose," for example, was checked most frequently as part of an illness episode, but far less frequently as an isolated symptom, and only rarely as a chronic problem. On the other hand, frequent dry cough, productive cough, and "aches or pains in muscles or joints other than back" were reported as chronic problems by almost as many ATCs as those reporting them as acute episodes.

Other reports of symptoms with the expected chronicity - e.g. reports of diarrhea, stomach pain/abdominal cramps, back pains, headaches, sleep problems, heartburn, excess fatigue, and others primarily as isolated events - also tended to affirm the accuracy of the MHR reports.

An extended discussion of the methods of validation summarized briefly above, and more detailed results of the analyses performed to assess the accuracy of the MHR reports is available in a paper prepared for publication, "Use of a Monthly Health Review to Ascertain Illnesses and Injuries in the Air Traffic Controller Health Change Study."

SUMMARY

Validity of Self-Reported Marital Satisfaction: Relationship with Mate-Role Function as Evaluated by PSS Interviewer

Self-reported marital satisfaction, checked against the diagnoses of mate role problems made by a trained interviewer during the psychological examinations, appeared to be accurate and honest, as was also self-reported compatibility between mates on family goals.

C. Validity of Self-Reported Marital Satisfaction: Relationship with Mate-Role Function as Evaluated by PSS Interviewer

As discussed in Section IIIB, the Air Traffic Controller Biographical Questionnaire (ATC BQ) contained a self-reported measure of the ATC's marital satisfaction. In order to examine the accuracy of this self-reported data, the relationship between mate role dysfunction on the basis of the PSS interview and self-reported marital satisfaction were examined. Correspondence between diagnosed mate role problems, as determined by a trained interviewer, and a self-reported measure of marital satisfaction would provide some evidence that the ATCs responded honestly.

Analysis revealed strong and statistically significant differences in degree of marital satisfaction between ATCs diagnosed as asymptomatic and those diagnosed as symptomatic in mate role dysfunction on the PSS ($p < .0001$). ATCs diagnosed in the PSS interview as having mate role problems had a mean of 3.519 on the marital satisfaction item, whereas those judged to have no problems by the interviewer had a mean of 1.655 on a response scale ranging from 1, "very happy and satisfied," to 5, "very unhappy and dissatisfied." The mean of the symptomatic ATCs was midway between "neutral, or very mixed feelings" and "somewhat unhappy and dissatisfied."

In addition to the self-report of marital satisfaction, the ATC BQ also contained a measure of the ATC's perception of how well he and his wife agreed on family goals (see Section IIIB.). Examinations of the relationship between the total goals compatibility score for the self-report and the mate role status as evaluated in the PSS interview provided strong evidence that the ATCs' perceptions of the compatibility in their marriages, as self-reported, were accurate. Those ATCs diagnosed as asymptomatic perceived much greater compatibility between themselves and their spouses than did those diagnosed as symptomatic ($P < .0003$). This result provides additional evidence for the validity of the self-reported data.

SUMMARY

Technological and Management Changes Reflected in Job Attitude Questionnaire Results

Self-reported individual satisfaction of ATCs and group morale showed an expected positive change at the Islip facility as a result of a change in management policy.

At the same time, introduction of new technological equipment, for radar control at all facilities, resulted, as expected, in a negative change in work satisfaction.

The lack of any changes in coworker or pay satisfaction at this time tended to affirm the honesty of the responses on the other scales.

Together, the reflection of events in the responses to the attitude scales provided evidence of the honesty of the responses.

D. Technological and Management Change Reflected in Job Attitude Results

In late 1974, the study team received a request from the new facility head at Islip to evaluate the impact of his new managerial philosophy and policies. Coincidentally, the new technology for controlling aircraft was implemented in all of the facilities in the study. This technological change in the radar equipment was made to simplify the ATC's job, and thus to improve the quality of job performance. However, it was the study team's observation, while talking to the men, that they really did not like this technological change.

Thus, there were two significant changes that we wished to investigate. One of the most common findings in the literature on organizational change is that employee attitudes are usually affected by any change (cf. French and Bell, 1973; Huse, 1975; Thomas and Bennis, 1972). In this case, we expected the technological change to have a negative effect on the attitudes of the ATCs toward their work, while the change in management policy at Islip was expected to lead to positive attitude changes in general.

Actual occurrence of the hypothesized attitudinal changes would constitute evidence for the validity of the responses on attitude questionnaires. That is, if the ATCs were responding honestly to the job attitude questionnaires, these "natural" changes in their work environment should have been manifested in attitudinal changes.

Since job attitudes were collected continuously during the time when the changes were made, it was possible for us to test our hypotheses. The facility chief change occurred in December, 1974, approximately the same time as the technological change. Using attitudinal data collected during October and November 1974 as a pre-measure and that collected during January and February 1975 as a post-measure, we were able to assess attitudinal changes.

For the analysis, we contrasted the attitudinal changes at Islip with those at the other facilities. As expected, the ATCs' satisfaction with their work itself decreased significantly at Islip. Furthermore, work satisfaction decreased significantly in the other facilities, and the negative change at Islip was the same as the change in all other facilities. As discussed in Section IIIB5, this specific aspect of job satisfaction is concerned with the actual work the ATC does. The negative change in satisfaction with this aspect in part is due to the technological change introduced into the ATC's job. Since this change

occurred in all facilities, it provides strong evidence that the ATCs were responding honestly on this attitude scale.

The significant positive changes in both individual satisfaction and group morale at Islip were as expected. These two variables did not show any change for the other facilities. These two scales measure overall or general satisfaction in terms of individual and group factors on the job. Thus, a change in management philosophy or policy would be expected to affect these overall measures.

Finally, the lack of any changes in co-worker or pay satisfaction also provides indirect evidence that the ATCs were responding honestly to these scales. One would not expect either a technological or management policy change to affect the ATCs' attitudes toward their co-workers or their pay.

In summary, the pattern of changes in attitudes coincidental with important changes in their work environment provided strong evidence that our study group responded honestly to the self-report measures of their attitudes.

SUMMARY

Relation of Hypochondriasis, Hysteria, Depression and Anxiety to the Frequency of Diagnosed Physical Health Changes

To test whether or not a psychological propensity to complain might generate self-reports of symptoms and ultimate diagnoses of illness conditions, hypochondriasis, hysteria, depression and anxiety scales were administered and scores were correlated with number and level of illnesses reported during the interval following.

ATC scores were lower than the average of the norm group in all except hysteria, in which higher than average scores were attributed to a tendency to deny personal problems. There was no evidence that men with greater psychological propensity to complain had a higher frequency of any level of physical health changes.

E. Relation of Hypochondriasis, Hysteria, Depression and Anxiety to the Frequency of Diagnosed Physical Health Changes

When the diagnosis of physical health changes is based in whole or in part on self-report, one must consider the possibility that illness reporting, and hence, the probability of rendering diagnoses will be influenced by such personality characteristics as tendencies toward hypochondriasis, hysteria, depression and anxiety, all of which could generate a propensity to complain about minor physical symptoms.

In order to examine this possibility in the ATC HCS, the hypochondriasis and hysteria scales from the MMPI, and brief but validated depression and anxiety scales from the same test, were administered at the third round of examinations. The scores obtained were compared with population norms established for the MMPI and correlated with the frequency of physical health diagnoses at Level 0, Level 1, Level 2, and Level 3 during the interval which followed the third round of examinations. This analysis was thus a prospective determination of the relationship between these psychological tendencies and the frequency of diagnoses made by the study physician on the basis of the health surveillance procedures utilized in the study.

Results

For the 295 ATCs having complete data for interval 3, the mean, the maximum and the minimum number of health changes at each level is listed below:

Level of Health Change	Mean	Maximum	Minimum
Level 0	0.5	6	0
Level 1	1.5	9	0
Level 2	0.2	3	0
Level 3	0.04	1	0

It is correct to infer that the majority of men had zero health changes at each level indicated. A fairly good distribution of Level 0 and Level 1 health changes occurred, but for Level 2 and Level 3, the distribution was extremely truncated.

The mean scores for each of the psychological scales on the PSY 130 instrument adminstered at Round 3 are shown below in standardized metric with 50 equal to the mean of Minnesota normal adults and 10 equal to the standard deviation of their distribution.

Scale	Mean	Maximum	Minimum
Hypochondriasis	47.8	72	39
Hysteria	57.1	80	36
Depression (D30)	48.6	82	37
Bendig Anxiety	44.7	80	34
Hysteria Subscales:			
Admission of symptoms	47.8	74	38
Denial of problems	60.1	81	34

The table reveals that this sample of ATCs had a lesser tendency toward hypochondriasis than the standardizing group of "Minnesota normal adults." Depression score was also somewhat lower than the normative sample of college students free of psychological disorders. The Bendig Anxiety scale -- a short form of the Taylor Manifest Anxiety Scale -- had a considerably lower mean than the original standardizing sample. On the hysteria scale, however, the ATCs scored higher than the Minnesota normals. When the hysteria scale was broken down into its two components, however, it became apparent that this elevation in mean score came completely from the tendency of ATCs to deny personal and interpersonal problems (this scale being one standard deviation above the normative mean). On the other hand, the tendency to admit physical symptoms, as measured by the "admission" scale coincided with the finding for the hypochondriasis scale that ATCs were slightly below average adults.

The correlations between the six psychological scales and the frequency of diagnosed health changes at Levels 0, 1, 2, and 3 can be summarized simply. The 24 correlations in this matrix all ranged between +.08 and -.10. Fourteen of these small insignificant correlations were in the negative direction and 10 in the positive direction. Under the hypothesis that psychological problems would generate greater numbers of diagnosed physical health changes, one would expect the great majority of these correlations to be positive and to be of much greater magnitude.

Conclusion

The evidence from these data analyses was clear and consistent. ATCs were not hypochondriacal, anxious or depressed to greater degrees than the average population. The only elevations in their personality which could have been considered

"hysterical" in nature were somewhat higher frequencies of denial of problems. Although the range of psychological scores was considerable for this sample of ATCs, there was no tendency for men with greater psychological propensities to complain to have a higher frequency of any level of physical health change as diagnosed by the study physician.

SUMMARY

Relationship of Subjective Distress in the Psychiatric Interview to Prior Depression and Anxiety

Monthly self-reports of anxiety and depression were checked against the assessments of anxiety and depression by the professional psychologists administering the PSS (Subjective Distress Scale).

Cross tabulations of interviewer and self assessments showed that the interviewer's positive findings of anxiety and depression were largely substantiated by the earlier self-reports, but there were in addition a large number of self-reports of symptoms that were not matched by interviewers' assessments of significant symptomatology. This surfeit of self-reports may have reflected less significant, or transient symptoms, or general over-reporting.

F. Relationship of Subjective Distress in the Psychiatric Interview To Prior Depression and Anxiety

The monthly assessments of depression and anxiety were self-report, pencil-and-paper instruments. On the other hand, the psychiatric interviews were conducted in a structured, clinical format which allowed professional judgment in ascertaining symptomatology. We checked the validity of the monthly self-reports by comparing them with the impressions of the professional interviewer. As the Subjective Distress criterion scale of the psychiatric interview (PSS) primarily assessed significant symptoms of depression and anxiety, it was chosen as the most appropriate PSS scale for comparison with the self-reports.

Table 156 shows that men assessed by the professional interviewer as having significant subjective distress had previously reported rates of depression nine times higher than those found in asymptomatic persons during their psychiatric interview. The cross-tabulation results shown in the lower half of this table indicate that only 2 of 17 men who were symptomatic in the interviews had self-reported rates of depression categorized as asymptomatic. On the other hand, 66 of 81 men who were symptomatic by self-report were asymptomatic by interview.

Table 157 shows the same comparisons for monthly anxiety. Essentially the same results were found for anxiety as for depression.

An appropriate conclusion from the validity check might be that men who were having problems with anxiety and depression by assessment of the PSS interviewer had self-reported the problems previously. However, an additional group of men reported that they were having these problems, but appeared not to be having significant symptomatology by the time of the interview. These men may have been overreporting less significant symptoms, or their symptoms may have been transient. The validity check did establish that the positive findings of the PSS interviewer were substantiated by the previous self-report.

TABLE 156

Annualized Rate Of Monthly Depression Between The Second And Third Examinations At Boston University For ATCs With And Without Subjective Distress At Their Third Examinations

	Total Available Subjects	Subjective Distress Asymptomatic	Subjective Distress Symptomatic
	347	330	17
ge Rate isodes hs/year)	.76	.57	4.50
	1.90	1.60	2.70

t = 9.37 p <.0001

Cross-tabulation Of Monthly Depression Asymptomatic And Symptomatic Categories Between The Second And Third Examinations At Boston University ATCs With And Without Subjective Distress At Their Third Examinations

	Monthly Depression		
	Asymptomatic	Symptomatic (Acute to Chronic)	Totals
Asymptomatic	264 (observed) (253) (expected)	66 (77)	330
Symptomatic	2 (13)	15 (4)	17
Totals	266	81	347

X^2 = 38.34 p <.00001

TABLE 157

Annualized Rate Of Monthly Anxiety Between The Second And Third Examinations At Boston University For ATCs With And Without Subjective Distress At Their Third Examinations

	Total Available Subjects	Subjective Distress Asymptomatic	Subjective Distress Symptomatic
	347	330	17
Rate of (monthly/	.78	.68	2.80
	2.01	2.00	2.70

$t = 4.26$ $p < .0001$

Cross-tabulation Of Monthly Anxiety Asymptomatic And Symptomatic Categories Between The Second And Third Examinations At Boston University For ATCs With And Without Subjective Distress At Their Third Examinations

	Monthly Depression		
	Asymptomatic	Symptomatic (Acute to Chronic)	Totals
Asymptomatic	262 (252)	68 (78)	330
Symptomatic	3 (13)	14 (4)	17
Totals	265	82	347

$x^2 = 30.82$ $p < .00001$

SUMMARY

Liver Function Tests as an Index of the Validity of Alcohol Abuse and Drinking Assessments

Three tests sensitive to liver damage were performed during the physical examinations and provided a means of checking the validity of the alcohol use and abuse assessments.

Two of the liver function tests discriminated the heavy drinkers and the alcohol abusers from the others, with the strongest association between alcohol abusers and liver damage. The PSS assessments of alcohol abuse were confirmed by the Liver Test data.

G. Liver Function Tests As An Index Of The Validity Of Alcohol Abuse And Drinking Assessments

Three liver function tests were performed as part of the serology studies conducted at each evaluation at Boston University - serum glutamic oxalacetic transaminase, serum glutamic pyruvic transaminase and alkaline phosphatase. These tests are sensitive to liver damage and the values generated become elevated as the liver becomes impaired. The tests, therefore, provided a means of checking on damage to the liver that might be associated with alcohol use and abuse.

Table 158 displays the results of comparisons of the liver function tests of those who were asymptomatic on the Psychiatric Status Schedule evaluation of alcohol abuse with those who were symptomatic according to our criteria. Two of the liver tests were significantly elevated among those classified as symptomatic alcohol abusers according to behavioral and psychiatric criteria. There was also greater variability in the liver function tests among those classified as symptomatic.

Table 159 displays the ethanol consumption per week among those who had abnormal liver function tests and those who did not at the end of the study. As expected, ethanol intake was significantly higher among those who were abnormal on two of the three tests.

It was interesting to note that the relationship between alcohol abuse and abnormal liver functioning was stronger than that between ethanol intake and liver functioning (this comparison can be made by comparing the absolute magnitude of the t-tests).

In sum, two of the liver function tests were clearly elevated among those having alcohol abuse problems defined in psychiatric and behavioral terms. In addition, men with abnormal liver function as determined either by SGOT or alkaline phosphatase, independently reported higher volumes of ethanol consumption to the study interviewers. Hence, a completely different and blind (to the psychiatric interviewers) source of data confirmed the validity of our interview data and the significance of our classification of alcohol abuse.

TABLE 158

Alcohol Abuse Effects On Liver Function Tests At Intake

		Alcohol Abuse Status At Intake Examination			
		Asymptomatic (N=383)	Symptomatic (N=31)*	t	p
Serum Glutamic Oxalacetic Transaminase**	Mean (S.D.)	43.83 (13.67)	58.13 (44.98)	4.27	.0001
Serum Glutamic Pyruvic Transaminase**	Mean (S.D.)	23.85 (12.64)	26.58 (26.15)	1.04	N.S.
Alkaline Phosphatase**	Mean (S.D.)	60.70 (20.43)	82.68 (28.81)	3.29	.002

* The results of two men were excluded because the laboratory assay was invalid.

** Normal limits: SGOT, 0-45 International units/liter
SGPT, 0-41 International units/liter
Alk.Phos., 33-110 units/liter

TABLE 159

Ethanol Consumption Differences Between Men With And Without Abnormal Liver Function Tests At Their Final Examinations

Normal Serum Glutamic Oxalacetic Transaminase (N=376)	13.92 (14.05)	t=2.23 p<.03
Abnormal Serum Glutamic Oxalacetic Transaminase* (N=9)	24.56 (17.21)	
Normal Serum Glutamic Pyruvic Transaminase (N=339)	13.74 (14.15)	t = 1.76 p = N.S.
Abnormal Serum Glutamic Pyruvic Transaminase** (N=44)	17.75 (14.46)	
Normal Alkaline Phosphatase (N=364)	13.76 (13.08)	t = 2.44 p<.02
Abnormal Alkaline Phosphatase*** (N=23)	21.77 (25.72)	

* Normal limits: 0-45 International units/liter

** Normal limits: 0-41 International units/liter

*** Normal limits: 33-110 units/liter

SUMMARY

Legal Problems as Validation of Impulse Control Symptomatology Classifications

To check the possibility that our finding of a high rate of impulse control symptomatology might have been due to an unrealistic cut-off score on the PSS Impulse Control scale, we checked for legal problems indicated in the life change inventories completed at each examination at Boston University Medical Center.

We found that men with impulse control disturbances at intake had significantly more legal problems before and after intake than others, and that these problems did not particularly distress them. These findings confirmed the validity of the classification system for impulse control disorders.

H. Legal Problems As Validation Of Impulse Control Symptomatology Classifications

We found a high rate of impulse control disorders among the air traffic controllers, and we wondered if this high rate might have been generated by a cut-off score that was unrealistic. Therefore, we undertook several checks on the appropriateness of our impulse control criterion cut-off score. One check involved an investigation of the relationship between legal life events and our impulse control classifications.

By definition and theory, men with impulse control problems should have a higher probability of having legal problems because their antisocial behavior would be likely to cause attention from law enforcement officials, or be the cause of legal actions against such individuals. The ROLE life events inventory contained a number of legal life events such as being jailed, sued, foreclosed and so on. Different events were subsumed by the Holmes and Rahe (HR) and the Paykel, Prusoff and Uhlenhuth (PUP) list; the ROLE listed all of these and several others. Since subjects completed the ROLE at intake and subsequent examinations, it was possible to determine if the theory was correct. If our data supported the theory, we could be much more confident about our findings of higher rates of impulse control disorders being real. If we were misclassifying subjects, then we would not find the expected association with legal problems.

Table 160 shows that men with impulse control disturbances at intake (prevalence cases) had significantly higher HR and PUP legal scores than either asymptomatic controls or those diagnosed after intake. Since the correlation between these scores and the number of events was .90 or above (see Jenkins and Rose, 1978), we could safely conclude that men assigned to have impulse control disorders had the expected greater number of legal problems prior to intake.

The results in Table 160 also suggest that legal problems do not lead to impulse control disorders since the incidence rates are not different from the asymptomatic cases.

Table 161 shows that men with impulse control disturbances at intake had significantly higher legal life event scores for the interval between intake and the second evaluation. (These scores were derived from their reports at the second evaluation looking backwards over this time span). Overall, our data showed that our case assignments of impulse control disorders did differentiate those men who

TABLE 160

Legal Life Events As A
Validity Index Of Impulse Control
Symptomatology: Comparison Of
Asymptomatic Controls, Prevalence Cases And Incidence Cases

Life Event Score For 6 Months Prior To Intake		Asymptomatic Controls* N=131	Prevalence Cases* N=50	Incidence Cases* N=71	F	p
Holmes and Rahe Legal Life Changes	Mean (S.D.)	2.33 (7.50)	5.38 (13.39)	1.39 (3.69)	3.50	.04
Paykel, Prusoff & Uhlenhuth Legal Life Changes	Mean (S.D.)	2.40 (5.64)	4.04 (8.49)	1.38 (3.46)	3.04	.05
ROLE Legal Life Change Distress	Mean (S.D.)	6.52 (18.79)	13.55 (35.39)	4.27 (11.68)	2.51	.09

*
Asymptomatic controls were ATCs who never had any significant symptomatology in the 5 criterion areas of the Psychiatric Status Schedule examination. Four controls did not complete the life change assessment and were excluded from this analysis. Prevalence cases had significant impulse control symptomatology at intake. One such case did not complete the life change assessment and was excluded from this analysis. Incidence cases developed significant impulse control symptomatology after intake and did not have it at intake.

TABLE 161

Legal Life Events As A Validity Index Of Impulse Control Symptomatology: Later Events As A Function Of Intake Status

ife Event Score tween Intake d Second aminations		Asymptomatic* N=341	Symptomatic* N=51	t	p
lmes and Rahe gal Life Changes	Mean (S.D.)	1.64 (7.35)	6.67 (18.62)	3.50	.0009
ykel, Prusoff and lenhuth Legal e Changes	Mean (S.D.)	1.91 (5.27)	4.90 (10.35)	3.23	.002
E Legal Life nge Distress	Mean (S.D.)	9.84) (28.26)	28.24 (57.71)	3.65	.0006

mptomatic = No impulse control disturbance assessed in Psychiatric Status dule examination at intake.

tomatic = Impulse control disturbance above criterion level on Psychiatric us Schedule examination at intake.

had and would have more legal problems than men without this disorder.

In summary these data supported our impulse control disorder classifications and reassured us that the high rate of impulse control disorders was not an artifact of our criterion cut-off scores.

SUMMARY

Predictors of Mild and Moderate Health Change

Average annualized illness rates were computed and were related to psychological variables measured before onset of the illnesses.

The following factors were found to be related to total morbidity:

1) The group with the most illness had the most work-related anxiety, as measured by the ATC questionnaire;
2) The high illness group had the lowest ability to discharge tension effectively and reported that ATC work "cost" them a lot in terms of interference with other aspects of their lives;
3) Those in the high illness group were least often chosen by their peers for amicability or as ideal team members;
4) The high illness group had the lowest group morale as measured by the Kavanagh scale, the least satisfaction with management, and consistently rated their supervisors as having inadequate consideration for others;
5) The high illness group was more job-involved, more Type A, as measured by the Jenkins Activity Survey, and more dominant, more sociable and more accepting of themselves as measured by the CPI;
6) The high illness group had significantly more life changes that were distressing, and this proved to be one of the strongest predictors of total morbidity;
7) The high illness group showed significantly lower cortisol secretion and significantly less variability in blood pressure at field studies.

Discriminant function analyses, using the variables that were significant in univariate studies, indicated that the predictor variables were best for discriminating between individuals in the highest and the lowest illness groups, but not of great value in discriminating individuals in the middle groups of health change. The variables that predicted low vs. high rates were: Amount of distressing life change, systolic residual range (range beyond that expected from the level of blood pressure), total cortisol secretion, and Type A personality.

Using these four variables, 76.7% of the individuals in the high

group and 79.1% in the low group were predicted. Predictors were determined separately for each of the four diagnostic categories in which mild and moderate illness was most frequent.

V. PREDICTIVE FINDINGS

1. Predictors of Mild and Moderate Physical Health Changes

Mild and moderate health changes were defined for purposes of this study as those illnesses and injuries scored at severity levels 1 and 2. The frequency of these events was treated as a continuous score adjusted for the amount of time each respondent was in the study and the percentage of Monthly Health Reviews returned. The derivation of the basic statistic, the average annualized compressed illness rate, was described earlier (Section III C). The present section describes the psychological, biographical and field predictors of average annual illness rates for all causes of morbidity and then separately for nine major categories of medical diagnoses.

Average annualized illness rates were computed for all four intervals of the study and these were related to psychological variables measured at Round 1. Because a larger array of psychological variables were available for Round 2, these were also entered into the analyses but in order to avoid the problems of circularity caused by the presence of interval one illness events in the overall averages, new indexes of morbidity were calculated based on the average for intervals 2, 3, and 4. For these indexes, all Round 1 and Round 2 psychological data were truly predictive inasmuch as the data on the predictor variables were collected before the beginning of interval 2. The average illness rates for this shorter time period also eliminated from consideration a number of men who participated in the study only through interval 1, i.e., to the second round of examinations. To the extent that there were unreliabilities in psychological data and in medical data at the beginning of the study which were eliminated after both participants and staff became more familiar with the routine, the average rates for intervals 2 through 4 may also be more reliable expressions of respondents' particular morbidity patterns.

Total Average Morbidity

The total of average annualized morbidity for all diagnostic categories including injuries represents the best single overall index of physical health change available to the study. It is heavily weighted by the most common diagnostic categories such as acute respiratory disorders which comprise 45% of all illness episodes. The total index is also administratively important because it represents also short term absenteeism from work due to illness, and those factors which predict the total index will also predict the short term absenteeism.

ATCs were divided into four groups on the basis of their average annualized illness rate. Only men who had at least one adequately reported interval of observation were included in the analyses. The low illness group averaged less than one minor illness episode or

injury per year, the high illness group averaged five or more illness episodes or injuries of any kind per year and the two intermediate groups had correspondingly less illness. The exact delimitations of the groupings and the number of men in each category for the analyses based on all four intervals and those based on the three intervals after the first are shown in the small table below:

AVERAGE NUMBER OF ILLNESS EPISODES

	Total Sample	Less Than One Per Year	1.0 - 2.5 Per Year	2.6 - 4.5 Per Year	5.0 or More Per Year
Analyses for intervals 1-4	378	58	129	131	60
Intervals 2-4 only	344	72	103	112	57

The one-way analyses of variance grouped men in the four categories above and calculated mean scores on the possible psychosocial predictors. Fifty-two such predictors were used from Round 1 of examinations and 57 from Round 2. Utilizing the $P = .05$ level of statistical significance, 7 of 52 Round 1 predictors and 18 of the 57 Round 2 predictors were significantly different across groupings by degree of illness averaged for all four illnesses of observation. When the outcome variable was the average illness rates for the three intervals excluding the first, 3 variables from Round 1 were found significant, whereas 15 Round 2 predictors were significantly associated with illness rates in the three ensuing intervals. To eliminate the possible effect of controllers' first interval illness on their psychological responses during the Round 2 examinations, Round 2 variables are discussed only as possible predictors of illnesses occurring after the second examination, i.e., the average rates based on intervals 2-4. The reason why Round 1 variables were so much weaker as predictors of total illness rates is not clear. We suspect that the greater length of the interview and questionnaire procedures at the intake examination may have led to fatigue and carelessness in subjects' responses and that this may have weakened the validity of the psychological variables. We also believe that reporting of illnesses became more reliable as the study progressed and that the procedures for assigning diagnoses became more methodical after the first few months. For these several reasons the analysis of predictors of mild and moderate illnesses will concern mainly the illness averages generated by the last three intervals of observation and the psychological data gathered at Round 2.

Psychological and Job-Related Predictors of Total Morbidity

There was a consistent tendency for variables reflecting psychological distress and anxiety to be predictive of future physical illnesses as diagnosed by the study physician. Scores on the work-related anxiety factor generated by the Air Traffic Controller Questionnaire were associated with future illness in that the most healthy group had the lowest mean and the group with 5 or more illnesses per year had the highest mean of the four groups considered ($P = .004$). This high illness group also had the lowest ability to discharge tension effectively ($P = .003$) and reported that ATC work "cost" them a lot subjectively in terms of expenditure of efforts, countering of inconveniences and creating a drain on their emotional resources ($P = .02$).

Nominations by the controllers of those among their peers whom they found to be most amicable and those whom they would wish to work with on their ideal team also were associated with future illness rates. Men in the highest illness categories were least often chosen for amicability or as ideal team members ($P = .001$ and $P = .005$). Ratings of technical competence as an ATC were not associated with future illness risks.

Three variables dealing with an ATC's satisfaction with the work situation were associated with future illness. Group morale as measured by the Kavanagh Scale was lowest both at Round 1 ($P .03$) and at Round 2 (but only marginally significant at $P = .09$) in men who had highest illness rates for intervals 2-4. This high illness group also had least satisfaction with management ($P = .01$) and consistently rated their supervisors as showing less than adequate amounts of consideration for others. Although many of the 344 men included in these specific data analyses had the same limited number of supervisors, the men who perceived supervisors as more considerate remained physically healthier than those who perceived them as having less consideration for the employees ($P > .02$).

Several long-standing personality traits were strongly predictive of future illness. Both the Jenkins Activity Survey, a test for the coronary-prone behavior pattern, and the California Psychological Inventory, a multidimensional personality measure, had predictive qualities. Men who were most Type b -- that is, those who had fewer of the competitive, hurried, achievement-oriented traits of coronary proneness -- were the most healthy of the study population. The high illness group was significantly more Type A ($P = .02$). This tendency came mostly from the greater job involvement which was characteristic of the higher illness groups ($P = .02$) and secondarily from the greater haste, impatience and irritability which high illness persons tended to show ($P = .02$). On the CPI, high illness persons were significantly more dominant ($P = .04$) -- a finding consistent with their tendency to be more Type a. They were also more

sociable (P = .03) and more accepting of themselves (less self-critical and less prone to guilt) (P = .02).

Among the strongest predictors of total morbidity was the amount of life stress and life change encountered in the period immediately preceding the beginning of intervals 2-4. This study used three different methods for scoring life change. These variously reflected either effort for adjustment and/or amount of distress associated with the changes in one's life circumstance. All of these variables were strongly related in that the two groups have illness rates above the sample median, had substantially more life changes than the healthier groups. The Holmes-Rahe Scale was significant at P = .009, the Paykel Scale was significant at P = .002 and the self ratings of distress associated with life change, developed specifically for this study, were significant at P = .0001.

Biographical Predictors of Total Morbidity

Several of the biographic items revealed by the ATCs on the Biographical Questionnaire that was completed at the intake examination were found to be associated with total average annual rate of illness. However, among these, only two associations were considered sufficiently significant to report.

The amount of education completed was associated with the illness rates, though not in linear fashion. College graduates had the lowest rates, high school and grade school graduates had intermediate values, and men with some college education short of a college degree had the highest average illness rates among these different groups (P = .004).

Men who lost a parent before age 18 because of separation or divorce had higher illness rates than those who lived in a two-parent household or those who lost a parent by death.

None of the biographical variables predicted total illness with the clarity or statistical strength of the stronger psychological or field predictors.

Biological Field Predictors of Total Morbidity

Two of the major predictors of increased moderate and mild health change observed in the study were related to the measurement of serum cortisol and blood pressure in the field studies. In order to obtain a more stable estimate of individuals' physiological responses to air traffic work, we selected men who had three or more field studies, and averaged their responses over all studies to obtain a characteristic value for cortisol and blood pressure response. In doing this, we were unable to use these characteristic levels of cortisol or blood pressure response as predictors of health change,

because they were actually measured concurrently with the health changes observed during the course of the study. However, we were able to separate individuals' values from their first blood pressure or cortisol examination. These values obtained during this first study could be used as a predictor variable, as it preceded interval two.

We totaled each man's cortisol values collected every twenty minutes for five hours. We then averaged the three or more studies to obtain an average total cortisol for the 227 men who were studied this frequently. We then divided these men into terciles of high, middle and low values. The high group did not get below 13 µg/100 ml while the individuals who were in the low group in the morning went below 10 µg/100 ml. Similar differences were observed in the afternoon. These groups are shown in Figure Y. Because each of the three groups, high, middle and low, were actually composed after three or more studies, the results are very stable and very significantly different.

We were surprised to observe that individuals in the lowest cortisol group had significantly more health change during the course of the study as is shown in Table 162. These differences are highly significant and whether one measures total cortisol for the day or the maximum cortisol on position, those men with the lowest values had significantly more health change ($p < .003$ and $p < .003$ respectively).

Because of the rather surprising finding that individuals who had low or perhaps suppressed levels of cortisol at work had a greater amount of moderate or minor illness, we decided to investigate whether or not the first cortisol values obtained during the first field study would be predictive of the average annualized health change in the same way that the values obtained for the average total cortisol were correlated with increased health change. These data are presented in Table 163, and it is clear from this table that the individuals in the lowest level of annualized health change, i.e., those with less than 1.0 illness episodes per year, had a total cortisol in the first field study of 1205 µg/100 ml compared to those in the highest illness category, those with 5 episodes per year, who had a total cortisol of 1102 µg/100 ml. This difference is significant at the .02 level. Therefore, the lowered secretion of cortisol observed in the first field study is predictive of individuals who showed more frequent health change, the same result that was observed when the cortisol for all visits was averaged. It is of note that the first field study was performed, on the average, 3.9 months before the start of the second interval, at which time we began averaging the cortisol data as explained earlier in this section. Only 12% of the sample had the first field study after their second examination at B.U. and the beginning of the second interval.

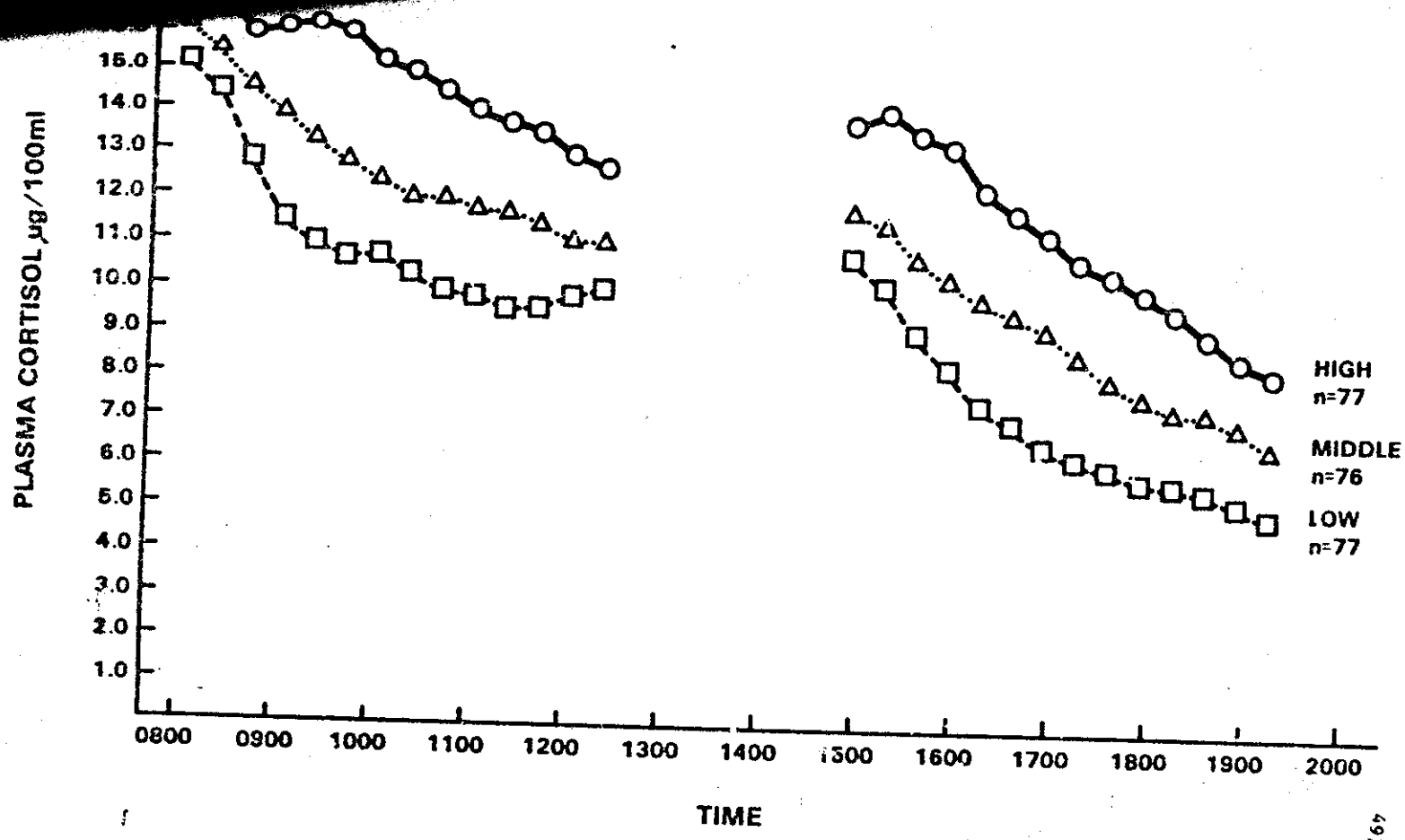
PLASMA CORTISOL µg/100ml
16.0
14.0
13.0
12.0
11.0
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0800
0900
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
TIME
HIGH
n=77
MIDDLE
n=76
LOW
n=77

TABLE 162

Differences In Rate Of Physical Health Change As A Function Of Cortisol Levels At Work Among ATCs

AVERAGE TOTAL CORTISOL FOR MEN With ≥ 3 FIELD STUDIES

		LOW	MIDDLE	HIGH	F	P
AVERAGE TOTAL	MEAN	3.80	2.75	2.75	6.24	<.003
ANNUAL RATE	STD	2.72	1.63	1.84		

MAXIMUM CORTISOL ON POSITION

		LOW	MIDDLE	HIGH	F	p
AVERAGE TOTAL	MEAN	3.91	2.79	2.59	9.36	<.0003
ANNUAL RATE	STD	2.62	1.91	1.56		

TABLE 163

Total Cortisol At Work As A Predictor Of
Average Annualized Health Change

Average Annualized Health Change Category	n	Average Total Cortisol (All Visits) Mean ± S.D. (ug/100ml)	Total Cortisol First Field Study Mean ± S.D. (ug/100ml)
<1.0/yr	(47)	1231 ± 137	1205 ± 200
1.0-2.5/yr	(68)	1219 ± 134	1203 ± 210
2.6-4.9/yr	(68)	1186 ± 99	1158 ± 176
> 5.0/yr	(44)	1145 ± 120	1102 ± 122
		F = 4.63	3.38
		p = .004	.02

(Performed on the average of 3.9 months before start of second interval)

We were interested in how useful the initial visit values were in classifying individuals compared to the classification obtained by averaging the total cortisol across all visits. These data are presented in Table 164. It is clear that there was a highly significant relationship between classification of individuals on their initial visit and the classification obtained by averaging all three visits. Part of this relationship was due to the fact that the average across all visits contained the initial visit, but nevertheless it was apparent that individuals who were high in the first visit tended to remain high while individuals who were low on the first visit tended to remain low, and individuals in the middle tended to be high, middle or low subsequently. The relationship was highly significant with a chi square of 88.99, $p < .00001$, and the correlation between visit one and the total average was .71. It was possible to classify men by the first visit, and the reliability of this classification was enhanced at the higher and lower range of cortisol.

We were interested in trying to clarify the relationship between lower cortisol secretion and higher illness rates. We compared individuals' maximum cortisol while working on position during a day when their workload was very heavy and a day when it was very light. We selected men who experienced maximum differences in workload, the workload one day being in the highest quartile of the distribution for all men and another day being in the lowest quartile. These data are presented in Table 165. It is clear from this table that the maximum cortisol on position, controlling for time of day, was significantly higher during the high workload day for all men and lower on the low workload day. However, the 90 men who could be selected in terms of having experienced these extremes of workload showed relatively small differences in maximum cortisol secretion between high workload and low workload. This can be explained by a look at the distribution of differences among these 90 individuals. Thirty-four individuals showed relatively little change and 23 individuals showed a significant <u>decrease</u> in cortisol when workload increased. These individuals might be labeled as "inverse responders." We were interested in seeing whether individuals who showed this inverse response - cortisol falling when workload was increased - had a different incidence of mild to moderate health change. Again, this was not a predictive finding but a correlational one as it was done concurrently with the measurement of health change. Nevertheless, we did find a significant relationship between inverse responders and increased health change. Table 166 compares men whose maximum cortisol on position increased, did not change or decreased when workload increased. Those individuals who were inverse responders had an annualized health change of 4.22 episodes compared to 2.76

TABLE 164

Prediction Of Average Total Cortisol
(3 to 5 Visits) By First Visit

AVERAGE CORTISOL ALL VISITS

		HIGH	MIDDLE	LOW	RAW TOTAL
INITIAL VISIT	HIGH	50 (26)	25 (27)	4 (26)	79
	MIDDLE	25 (27)	32 (28)	25 (27)	82
	LOW	1 (23)	20 (23)	47 (23)	68
COLUMN TOTAL		76	77	76	229

Chi Square 88.99
df = 4, p < .00001

CORRELATION VISIT 1 X TOTAL AVERAGE = .71

TABLE 165

Comparison Of Individuals' Maximum Cortisol While Working On Position When Workload Is Heavy Versus Light

	HIGH WORKLOAD	LOW WORKLOAD
NORMALIZED MAXIMUM CORTISOL ON POSITION	125.5	118.3

ONE WAY ANOVA REPEATED MEASURES $F = 4.52$ $(38,1)$ $p < .05$

Individuals Fall Into 3 Groups When Calculating Differences Between Maximum Cortisol On High Minus Low Workdays

		n	
INCREASES	>15	34	
NO CHANGE	-10 to 15	33	
DECREASES	<-10	23	'INVERSE RESPONDERS'

TABLE 166

Comparison Of Men Whose Maximum Cortisol On Position Increases, Does Not Change, Or Decreases When Workload Increases In Terms Of Total Annualized Health Change

	ANNUALIZED HEALTH CHANGE EPISODES			
POPULATION VALUE	3.20	±	1.95	n = 90
MAXIMUM CORTISOL INCREASES	2.76	±	1.61	n = 34
MAXIMUM CORTISOL NO CHANGE	2.94	±	1.97	n = 33
MAXIMUM CORTISOL DECREASES 'Inverse responders'	4.22	±	2.07	n = 23

one-way anova $F = 4.65$ $(87,2)$ $p < .012$

for those whose cortisol increased and 2.94 for those whose cortisol did not change when workload increased. This difference was significant at the .012 level.

In summarizing the relationship between cortisol secretion and annualized health change, three findings were made. The first was that during the study, individuals who showed lower cortisol levels at work experienced more health change, a concurrent relationship. Second, we found that individuals whose first field study revealed lower levels of cortisol at work also showed in the subsequent two to three years an increased level of illness. Third, those individuals whose cortisol decreased when traffic increased, so-called "inverse responders," also showed an increased level of annualized health change.

The significance of these findings are not yet clear. The relationship appears to be a stable finding and has prompted us to begin to investigate more carefully what characteristics might describe individuals who do show this inverse response or diminished cortisol responsivity at work that seems to carry with it an increased risk for developing health change. Since in some ways this finding is replicated in terms of blood pressure responsivity, the potential implications are all the more interesting and must be pursued.

The other major physiological response which correlated with and to some extent possibly predicted health change was the systolic residual range at work. The systolic residual range was a variable representing the variability of systolic blood pressure at work when one controlled for initial levels. Because variability or range is correlated with average level, we regressed each individual's average level from the range to obtain a systolic residual range for blood pressure while working.

The results of our study of blood pressure response may be viewed as parallel with the cortisol response. Those individuals who showed diminished systolic variability (diminished systolic residual range) had an <u>increased</u> amount of mild to moderate illness. These data are shown in Table 167. The average systolic residual range for all visits for those who showed the lowest amount of health change (less than one episode per year) was 2.0 ± 6.6 mm Hg as contrasted with those in the highest category of health change, those with ≥ 5 episodes per year, who showed a systolic residual range of 1.32 ± 4.2. This difference was significant at the .03 level. We also attempted to clarify whether or not the average systolic residual range during the first field study was predictive of the subsequent health change. The values were clearly in the right direction with individuals at the lowest level of health change showing a residual range of 3.13 mm Hg while individuals in the

TABLE 167

Systolic Residual Range At Work As A Predictor
Of Average Annualized Health Change

Average Annualized Health Change Category	n	Average Systolic Residual Range All Visits Mean ± S.D. (mm Hg)	Average Systolic Residual Range First Field Study Mean ± (mm Hg)
< 1.0/yr	(56)	2.01 ± 6.6	3.13 ± 13.3
1.0-2.5/yr	(72)	-0.11 ± 4.9	-1.28 ± 10.5
2.6-4.9/yr	(86)	-0.15 ± 6.9	-1.14 ± 11.5
≥ 5.0/yr		-1.32 ± 4.2	0.53 ± 12.52
	F =	2.95	1.88
	p =	.0328	.132 N.S.

(performed on the average of 4.4 months before start of second interval)

highest level of health change showed a residual range of 0.53. However, as is evident from the table, the standard deviation was considerably higher for the first field study for each of these categories compared to the average data, reflecting the lack of stability from one study alone. Consequently these differences were not statistically significant, $p = .132$. Viewed from another perspective, the first blood pressure study did not correlate as highly with the average data obtained on three or more visits ($r = .51$) as the first cortisol value correlated with that obtained on three or more visits. Nevertheless, these data were provocative in that individuals who did show throughout the course of the study a reduced variability in blood pressure independent of level were experiencing an increased amount of health change. As noted previously, this observation was parallel from a physiological perspective with the fact that individuals who showed lower cortisol response to work also had increased health change.

It was interesting that among the 10 individuals who had the highest amount of health change, i.e. two standard deviations from the mean, or more than 7 episodes per year, 7 had total cortisol values and systolic residual range below the mean. Seven of these 10 men therefore would be considered hyporesponders in both physiological systems.

Health History and Health Habits as Predictors of Total Morbidity

As noted in a previous section, all individuals had a very careful review of their medical history along with their physical examination at their intake examination into the study. One of the reasons for collecting history of past illnesses as well as a record of current physical health was to be able to ascertain whether or not individuals who experienced increased levels of health change during the course of the study had come into the study with more previous illness. One might argue that individuals who had more health change during the three years of surveillance simply came into the study less well to begin with, with more chronic illnesses, etc. Therefore it was necessary to collect, as well as we could, information about their health status at intake.

In addition to dividing intake diagnoses into various physical systems, we also totaled all intake diagnoses to be studied as a potential predictor of the individual's average annualized health change. These data are presented in Table 168. There was no relationship between the total intake diagnoses and the annualized health change, $f = 0.56$, N.S. For two categories of health change, allergies and GU complaints, there was a significant relationship between intake diagnoses and the subsequent number of illness episodes in these two specific categories. However, as allergies only accounted for 6% of the total annualized health change and GU 3%,

TABLE 168

Total Intake Diagnoses As A Potential
Predictor Of Average Annualized Health Change

Average Annualized Health Change Category	Number of Men	Mean ± S.D. Intake Diagnoses
< 1.0/yr	(72)	4.35 ± 2.56
1.0-2.4/yr	(103)	4.56 ± 1.88
2.6-4.9/yr	(112)	4.73 ± 2.25
≥ 5.0/yr	(57)	4.75 ± 2.07

F = 0.56 N.S.

the relationship between intake and subsequent diagnoses within these two categories did not significantly affect the total. Nonetheless, this specific relationship was important in studying potential predictors of illness episodes in these two systems.

Health habits were also investigated as potential predictors. In the first round of examinations we asked individuals the number of cigarettes, cigars and pipes of tobacco they smoked, the amount of coffee they drank, the amount of medications they took, etc. These health habits did not significantly predict the annualized health rates, and therefore did not influence the various psychosocial and work-related predictors of mild to moderate illness.

Discriminant Function Analyses of Significant Predictors of Total Morbidity

In an effort to examine the overall predictive utility of the psychosocial and the cortisol and blood pressure predictors, discriminant function analyses were performed using the ten variables that were significant when studied in a univariate fashion. We found that we were best able to discriminate between individuals in the highest and lowest groups and that our predictors were not of great value in discriminating individuals in the middle groups of health change. The variables that differentiated between men with high and low annual rate of mild or moderate physical health change are shown in Table 169. These could be summarized as follows: The individuals who showed greater amounts of physical health change, i.e., those with five or more episodes a year, had approximately three times the amount of life change events in the period of time before the illnesses occurred, were more Type A in their personality, were chosen less often by their peers in terms of their amicability (ease to work with), rated themselves as having more anxiety at work, scored higher on the self-acceptance scale of the CPI, rated themselves as having more subjective costs relating to controlling traffic, showed more job involvement on the Jenkins Activity Scale, part of the Type A personality complex, and showed lowered systolic residual range at work and lowered total cortisol at work and maximum cortisol on position.

Of the ten variables which individually discriminated between those with low and high rates of annualized health change, only four were found by stepwise discriminant function analysis significantly to predict low vs. high rates. These data are shown in Table 170. The major variable that discriminated between the two groups was the amount of life change distress, labeled as life change distress rating, followed by the two physiological measures at work, systolic residual range and total cortisol, and the fourth variable that contributed to the significant discrimination between these groups was the increased Type A personality among those with high

TABLE 169

Variables That Differentiate Between Men With High And Low Annual Rate Of Mild And Moderate Physical Health Change

(10 SIGNIFICANT UNIVARIATE)

VARIABLE	MEAN VALUE < 1 per yr.	5 +/yr.	F	p
Life Change Distress	125.7	359.8	20.15	.0001
Type A Personality	-6.28	-.00	12.19	.001
Amicability Choices (peer)	2.30	1.51	9.92	.01
Anxiety Factor	46.42	53.33	9.61	.01
Self Acceptance Scale (CPI)	56.65	61.60	8.02	.01
Subjective Costs	49.56	54.72	6.96	.01
Job Involvement (JAS)	-7.49	-3.85	5.27	.05
Average systolic BP residual range at work	1.86	-1.33	7.00	.01
Average total cortisol at work	1222.19	1142.45	8.39	.01
Average maximum cortisol on position	123.30	114.30	6.80	.05
N	43	43		

TABLE 170

Stepwise Discriminant Function Analysis
To Predict Low Versus High Annual Illness Rate

STEP	VARIABLE	F	p
1	Life change distress	20.15	.0001
2	Average systolic BP residual range at work	9.79	.01
3	Average total cortisol at work	8.27	.01
4	Type A personality	7.17	.01

		PREDICTED			
		<1/yr	5+/yr	Total	%Correct
ACTUAL	<1/yr	[34]	9	43	79.1%
	5+/yr	10	[33]	43	76.7%
			TOTAL	86	

rates of annualized illness. Using these four variables we were able to predict correctly 76.7% of the individuals in the high group and 79.1% of individuals in the low group.

Predictors of Average Annualized Health Change Rates For the Three Most Frequent Diagnostic Categories

In addition to determining the predictors of total average annualized mild and moderate health changes, we also analyzed the predictors of these health changes by diagnostic category within the total. Nine major sub-categories were identified and analyzed: Respiratory, Acute Gastrointestinal, Chronic Gastrointestinal, Non-Specific Viral, Skin Diseases, Bones, Muscles and Joints, Allergies, Genitourinary and Injuries. Preliminary efforts to determine predictors showed that for those diagnostic categories with small numbers of affected persons, such as chronic G.I., Skin, GU and Bones, Muscles and Joints, it was difficult to establish valid relationships. Therefore, the discussion is confined to the four categories in which average annualized mild and moderate health changes were most frequent: Respiratory, Acute Gastrointestinal, Non-Specific Viral and Injuries.

Respiratory Illness

As compared with men who had more respiratory problems, the men most free of respiratory problems were older and more experienced ($P = .002$ and $p = .005$ respectively), did not have psychological problems that interfered with their work role performance (measured by PSS, Round 2 vs. respiratory illness in intervals 2-4, $p = .03$), were most likely to have higher average blood pressures on busy work days than on quieter days (systolic increases, $p = .05$, diastolic increase, $p = .01$), secreted significantly more serum cortisol at work ($p = .02$), served in the armed forces the modal 4 years found for all subjects in this study ($p = .003$), had wives who were employed full time ($p = .04$), went out with their wives less frequently than three times a week ($p = .003$), were less satisfied with their marital situation ($p = .003$), and were more alienated from social values (measured by Srole Anomie scale, $p = .05$).

The high respiratory illness group was, by comparison, more job involved ($p = .02$), had considerably higher anxiety concerning their work ($p = .02$), had greater marital resource support ($p = .03$), had lower cortisol and blood pressure reactivity at work ($p = .02$), were younger and had less experience with the FAA ($p = .002$ and .005 respectively) had some college but did not graduate ($p = .05$), had wives who were homemakers ($p = .04$), were more likely to go out frequently with their wives ($p = .003$), had either neutral or happy feelings about their marital situation ($p = .003$) and were not alienated from social values ($p = .05$).

Acute Gastrointestinal Illness

Men who tended to have the highest levels of acute G.I. disease showed a complete absence of clinical degrees of subjective distress and work role disorder, freedom from clinically significant alcohol abuse, greater social alienation (anomie scale, $p = .02$), greater expressed discrepancies between their own and their wives' goals for their marriage ($p = .001$), lower socio-economic status in childhood than their wives ($p = .02$) and perceptions of their parents as very different from one another in personality and values ($p = .02$).

In addition concurrent associations were revealed between increased risk for acute G.I. episodes and less cortisol responsivity ($p = .04$) and less blood pressure responsivity on the job.

Non-specific Viral Disease (NSV)

The strongest predictors of NSV were the sociometric ratings at Round 2. ATCs who were free of NSV in the ensuing 2-21 years were frequently selected by their co-workers as being amicable ($p = .007$), competent ($p = .002$) and as ideal team members ($p = .004$).

The second strongest predictors were the life change scores preceding the intervals at risk. Men with frequent NSV had the highest life change scores by two methods of measurement (Holmes-Rahe and Paykel, Uhlenhuth and Prusoff, $p = .03$) and somewhat lower scores by the third method (self-ratings of life change distress preceding a period at risk, $p = .06$).

Additional predictors of higher rates of NSV were: low interviewer judgments from the intake round on coping with training responsibilities ($p = .02$) and overall coping score ($p = .04$), more anxiety about potential air traffic incidents ($p = .02$) and work-related anxiety (ATC Questionnaire, $p = .0007$), feelings that the supervisor gave inadequate structuring to the job situation and had little consideration of others ($p = .0007$ and $p = .005$ respectively), feelings of higher subjective costs associated with ATC work ($p = .04$), less ability to discharge tensions promptly ($p = .02$), higher job involvement ($p = .02$), greater hard-driving characteristic (Jenkins Activity Survey, $p = .004$), less social conformity (communality scale, $p = .03$), longer residence in the same county (more than 20 years), substantial upward mobility.

All in all, the picture of the NSV-prone man is that of a person with less than an average amount of esteem from his peers, but nonetheless highly job involved, hard-driving, competitive and perhaps somewhat non-conforming. These men at high risk for NSV find

that their job takes a lot of energy and resilience from them, often arouses anxiety, and leaves them less able to discharge tensions and cope with difficulties. There appears to be a large psychosocial component in vulnerability to non-specific viral disease.

Injuries

There were more predictors of injuries than of any other category of health change in the study. Sixteen psychosocial predictors were associated with injuries at the $p = .05$ level or better.

Men who incurred the most mild or moderate injuries were chosen less often both for "ideal" team members (in peer nominations, $p = .06$ and $p = .002$ for Round 1 and Round 2 data, respectively) and for amicability ($p = .05$ and $p = .01$ for Rounds 1 and 2, respectively), were by far the strongest Type A in their behavior ($p = .0001$), had greater life change distress (Paykel, $p = .03$; self-ratings of distress, $p = .004$; Holmes-Rahe, $p = .008$), had a much higher frequency of work role disorders (Psychiatric Status Schedule Round 2, $p = .008$), greater anxiety concerning the possibility of traffic incidents ($p = .05$) and other work-related anxiety, less satisfaction with management ($p = .05$), more difficulty in discharging their tensions ($p = .02$ for both Round 1 and Round 2 data), and lower blood pressure responsivity at work (lower maximum blood pressure during the first 3 to 5 days they were measured in the job both for systolic, $p = .01$ and diastolic, $p = .04$).

In addition, men with high injury rates reported that they got along with their parents somewhat worse or much worse than other teenagers ($p = .05$), and they were least satisfied with their marriages ($p = .03$).

Among those men (99%) who had served in the Armed Forces, the 64% who were non-commissioned officers had substantially more injuries than those who remained at the enlisted man level ($p = .02$).

The fact that the injury category had the largest number of psychosocial predictors of all categories may be due to the clearly overriding involvement of behavior and psychological factors in the causation of injury, but also may be influenced by the fact that large numbers of men generated moderate and high numbers of injuries, thus leading to the kind of distribution of values which allows more powerful tests of the role of psychosocial predictors. These findings have important implications because they may lead to interventions to reduce the second most common cause of lost time from work and need for medical attention.

SUMMARY

Predictors of Hypertension

Predictors were sought primarily for the development of hypertension during the course of the study, that is, predictors of the 36 new cases of hypertension that developed by the study's own criteria for determination of the disease. Some additional analyses involved intake cases of hypertension.

The following relationships were found:

1) Compared to those who stayed normotensive, body weight at intake was significantly higher in intake cases of hypertension but not in new cases developing during the study; however, body weight increased slightly over the course of the study for those who developed hypertension during this time;
2) Compared with those who remained normotensive, intake cases were older, but new cases were not older;
3) Compared with those who remained normotensive, systolic and diastolic blood pressure measured at the intake interview was elevated both in those who had hypertension at intake and in those who developed it during the course of the study, systolic and diastolic blood pressure measured at work were significantly higher in those who developed hypertension, and were as high during the first field study as in those who already were diagnosed hypertensive at intake; measurements made at work on high workload and low workload days showed that the 36 new cases of hypertension had significantly greater elevations of systolic blood pressure on the high workload day compared with those diagnosed hypertensive at intake and with normotensives;
4) The major change that occurred to cause the diagnosis of hypertension among the 36 new cases was a rise in diastolic pressure, while systolic pressure remained at the same level or, in some cases, was reduced;
5) Coping with difficulties by use of alcohol was more prevalent among future hypertensives, as was ability to cope on heavy days (rated by a psychologist interviewer);
6) Individuals who became hypertensive had significantly lower marital resources, significantly less distressing life change events, and were more Type B (less hard-driving) personalities.

Discriminant function analysis showed that the most important variable discriminating between those who remained normotensive and those who developed hypertension was the systolic average at work, and other variables contributing to discrimination were Type B behavior, diastolic average at work, interview rating of coping on heavy days, decreased marital support and decreased life change distress.

2. Predictors of Hypertension

In an earlier section describing the nature of physical health findings, we reviewed the prevalence and incidence of hypertension in our population. These values varied significantly depending on the criteria that were employed, i.e., whether they were the HANES, Framingham, our own research criteria, or the FAA criteria. For predictive purposes, we used the most rigorous research criteria for defining hypertension that could be employed. We called men hypertensive at intake or subsequently only if their blood pressure readings in two successive visits were above the criterion level, systolic pressure of 140 or more or diastolic pressure of 90 or more. The tabulation of participants according to the research criteria is displayed in Table 171. Most of the predictors to be discussed were studied in an attempt to discriminate between the men who remained normotensive and those who developed hypertension after intake into the study. However, other predictors that differentiated between normotensive and prevalence cases (intake cases) are also discussed.

Perhaps the first approach that might reasonably be taken in a search for predictors of future hypertension would be to examine the relationship between hypertension in our men and variables known to predict hypertension in the general population. These include body weight, chronological age, and blood pressure while visiting the physician at the first examination. It is well known that people who develop hypertension tend to have increased blood pressure on previous physical examination. Body weight and age are also known to be predictive of development of hypertension. The values at the intake examination for weight, age and first blood pressure measures for the three groups of men (normotensive, prevalence cases and new cases) are given in Table 172.

Body weight at intake was significantly higher in those with hypertension at intake but was not significantly higher in those developing new cases of hypertension compared to the normotensives. Similarly, those who had hypertension at intake were older, but those developing new cases of hypertension were not older compared with the normotensives. The systolic and diastolic blood pressures (from the second reading during the first, intake exam) showed a different distribution among three groups. Compared with normotensives, systolic blood pressure was elevated not only in those individuals who had hypertension at intake but also in those who developed hypertension later. Similarly, in comparison with those who remained normotensive, diastolic blood pressure at the first examination was elevated for those who had hypertension at intake and those who later developed the condition.

We compared the three groups of men - normotensives, hypertensives at intake and new cases - with respect to their blood pressure

TABLE 171

Prevalence And Incidence Of Hypertension
Among Participants In ATC HCS By The Study Criteria

Normotensive Men	245
Prevalence Cases (Intake And Second Round)	135
New Cases During Study Must Meet Criteria Over 2 Successive Visits (3 Year Incidence)	36
Total Participants	416

TABLE 172

Physical Measures On 3 Groups Of ATCs At Intake Exam

Variable		Normotensive (n=245)	Hypertensive At Intake (n=135)	New Cases Of Hypertension (n=36)	F	p
WEIGHT	mean	179.5	194.4	181.8	15.10	.0001
	s.d.	24.9	26.6	22.4		
AGE	mean	35.6	37.4	35.9	5.98	.003
	s.d.	5.0	4.8	5.6		
2nd SITTING SYSTOLIC BP	mean	125.5	139.0	132.1	81.62	.0001
	s.d.	9.1	9.3	9.2		
2nd SITTING DIASTOLIC BP	mean	83.1	96.5	86.0	131.0	.0001
	s.d.	7.5	6.7	5.4		

on the initial and final examination. We did this in order to clarify whether or not it was a change in systolic or diastolic blood pressure, or both, that resulted in the classification as a case of hypertension. These data are presented in Table 173. This table also gives body weight and shows a slight increase in body weight from intake to final exam for new cases. However, the most interesting finding was that there was not a significant increase in systolic blood pressure. The systolic blood pressure actually fell in the normotensive group approximately 4.2 mm Hg and even showed a very small, but nonsignificant fall in the new cases of hypertension. This fall in systolic blood pressure perhaps reflects a return to usual pressure after the increased arousal attendant upon coming to B.U. for the first time. This initial arousal phenomenon was one reason why we established the criterion that elevated blood pressures must be evident on both their initial and second round examinations for classification as a prevalence case and on any two successive exams after intake for classification as a new case.

The major change that occurred to cause our population to be classified hypertensive was the change in diastolic blood pressure. There was a slight increase of approximately 2 mm Hg in the normotensive and 0.5 mm Hg of diastolic blood pressure in those hypertensive at intake, while there was a relatively large increase in diastolic blood pressure from 86.0 at intake to 93.9 mm Hg at final exam, a change of almost 8 mm Hg, in the men who developed hypertension. It is evident from these data that individuals who developed hypertension in this study were experiencing an increase in diastolic blood pressure above criterion value rather than increased systolic blood pressure.

We found 9 variables, listed in Table 174, that were significantly different between the group who developed hypertension and the group that remained normotensive. Since we required all individuals to have values for all variables when we performed discriminant analyses, there was slight attrition of the number of men compared, leaving 28 of 36 new cases and 183 of 245 normotensives. As noted, systolic blood pressure at the first physical exam was significantly higher in individuals who later developed hypertension. We also found, as is discussed later in this section, that systolic and diastolic blood pressure at work were significantly higher in cases who developed hypertension compared to those who remained normotensive. Another univariate predictor of new cases was coping by drinking, which was more prevalent in future hypertensives. This score was taken from the Air Traffic Controller Questionnaire in which individuals responded to such items as "going drinking with other controllers after work to unwind," etc. Another variable that discriminated between hypertensive and normotensive cases was an interview rating by a psychologist of the ATC's effort and success in coping on heavy days. Those individuals who developed

TABLE 173

Comparison Of Physical Findings On Initial And Final Examinations (3 Years Apart) On Three Groups

	Normotensive	Hypertensive At Intake	New Cases Of Hypertension
WEIGHT			
INTAKE	179.5	194.4	181.8
FINAL	180.0	192.9	184.7
SYSTOLIC BP (SITTING)			
INTAKE	125.5	139.0	132.1
FINAL	121.3	136.1	131.8
DIASTOLIC BP (SITTING)			
INTAKE	83.1	96.5	86.0
FINAL	85.4	97.0	93.9

TABLE 174

Variables That Predict New Cases Of Hypertension Compared To Those Who Stay Normotensive

VARIABLE	MEAN VALUE			
	Normotensive	Develop H.T.	F	p
lst Systolic BP t physical exam	125.4	132.3	12.88	.0001
ystolic at work	126.4	138.8	25.69	.0001
iastolic at work	84.6	91.8	21.76	.0001
oping by drinking	48.4	52.4	4.69	.05
terview rating of ping on heavy days	3.75	4.46	5.19	.05
ital resources	49.4	45.4	4.12	.05
e change distress	275.8	134.2	7.29	.01
'A' personality	-2.6	-6.6	4.93	.05
driving factor	-.31	-6.1	11.50	.001
N	183	28		

hypertension were rated by the interviewer as higher in this coping characteristic. This implies that better copers are more susceptible to blood pressure increases or that the increased effort to cope, despite its apparent success, may force up diastolic blood pressure. We also found that individuals who became hypertensive had significantly lower marital resources and significantly less distressing life change events. New cases of hypertension were found to have more Type B and less Type A personality. In addition, individuals who developed hypertension were also found to be less hard-driving, consistent with their more Type B personality.

In order to assess how well psychological variables could predict future cases of hypertension, we performed a discriminant analysis that utilized only psychological variables and found that they were able to predict correctly 67.9% of new cases as shown in Table 175. The most important psychological factor was the less hard-driving, more Type B personality.

As noted earlier, one of the most important predictors of new cases of hypertension was the blood pressure responses of men while actually controlling traffic. Table 176 shows the mean blood pressure responses at work during the first field study. We compared normotensive individuals, those hypertensive at intake, those who had a diagnosis of hypertension after nine months in the study, i.e., beginning with the second examination, and those who were found to be hypertensive at 18 months or later. It can be seen from this table that compared to normotensives those individuals who developed hypertension either earlier or later in the study had significantly elevated blood pressure responses during their first field study. As a matter of fact it is evident from this table that those who developed hypertension later had blood pressure responses as elevated during their first field study (before the diagnosis was made) as those who were diagnosed hypertensive at intake. Furthermore, as there was no difference between those who developed hypertension later in the study and those who developed it earlier, proximity of the diagnosis was not a crucial variable. This further supports the power of the first field study for prediction of hypertension.

In order to clarify the nature of the relationship between increased blood pressure responses at work and the later diagnosis of hypertension, we made another comparison of normotensives with those who were hypertensive at intake and those who later developed hypertension. We selected 257 men whose workload on one day while they were studied was significantly greater than that on another study day. Only 257 men met this criterion of two study days differing significantly in magnitude of workload. Of this number, 149 were normotensives, 84 were hypertensive at intake and 24 were new cases of hypertension. Table 177 compares the average systolic blood pressure on the high work day with the average systolic blood pres-

TABLE 175

Stepwise Discriminant Function Using Only Psychological Predictors

STEP	VARIABLE	F	p
1.	Hard driving on JAS	11.51	.001
2.	Coping by drinking	4.84	.05
3.	Life change distress	4.67	.05
4.	Interview coping heavy days	5.50	.025
5.	Marital support	6.26	.025

Using These 6 Predictors Yields:

67.9% correct prediction of H.T. cases (Sensitivity)
72.1% correct prediction of normotensives (Specificity)

Mean BP Responses At Work During First Field Study

mm Hg	Normotensive n = 194	Hypertensive At Intake n = 86	Hypertensive After 9 mos. n = 16	Hypertensive After 18 mos. n = 15	F	P
AVERAGE SYSTOLIC	126.7	136.6	135.8	138.8	19.86	.0001
MAXIMUM SYSTOLIC	146.8	158.1	157.2	159.0	12.32	.0001
AVERAGE DIASTOLIC	84.3	90.7	92.7	89.4	19.12	.0001
MAXIMUM DIASTOLIC	97.9	104.6	105.5	103.5	12.88	.0001

TABLE 177

Comparison Of Normotensives, Those With Hypertension At Intake, And New Cases Of Hypertension In Terms Of Blood Pressure Responses To High Versus Low Workload

roup	Normotensives	Intake HT	New HT	Total
n	149	84	24	257
Hg verage systolic on High work-ad day	127.4	137.7	139.1	
erage systolic on Low work-ad day	124.9	134.6	127.5	
fference High inus Low day	2.5	3.1	11.6	
fference High inus Low day ontrolling for vel on Low day	-2.46	2.15	7.76	

sure on the low work day for these groups. All three groups showed an increase in systolic blood pressure on the high day compared to the low day, but the biggest differences were observed for the new cases of hypertension, who averaged 11.6 mm hg difference between these two days. Because one might argue that the value on the high day could also be a function of the value of the low day since low day and high day were correlated, we calculated differences in the high day minus low day, controlling for the low by regression analysis. This removed the influence of initial blood pressure, i.e., blood pressure on the low day, from the value observed on the high day. When this adjustment was made, it was still apparent that the new cases of hypertension showed significant elevations of blood pressure on the high day compared to the low day, averaging 7.6 mm Hg compared to only 2.5 for those who had hypertension at intake and -2.46 for the normotensives, a highly significant difference. These data suggest that men who were becoming hypertensive not only showed elevated blood pressures during work, but also a highly significant increase in systolic blood pressure when they worked a heavier day compared to when they worked a lighter day.

We wanted to evaluate the predictive power of the biological variables by themselves in discriminating new cases of hypertension from those who remained normotensive. These data are presented in Table 178. This table lists the average systolic blood pressure at work, as well as the first blood pressure on physical exam. It can be seen from this table that the average systolic blood pressure at work was the most significant discriminator of normotensive and new cases of hypertension, with F value of 25.69, and only a small amount of variance was accounted for by diastolic blood pressure at work and by the first blood pressure on physical exam at B.U. The average systolic blood pressure at work represents the mean systolic blood pressure for those men with three or more study days and actually represents a value that was concurrent but not predictive because it was collected during the entire course of the study. In many instances one or more field studies included in this average were performed after the diagnosis of hypertension had been made. From this point of view the average of the field studies is merely correlated with hypertension. However, as was seen in Table 177, individuals who developed hypertension also had significantly elevated blood pressure responses during their first field study, and use of this data was predictive. The average blood pressures are used to illustrate the associative nature of a stable measure and are presented as a more stable reflection of the first field study pressures, which were predictive. Using these three biological measures, we could identify 73.2% of the new cases of hypertension and 71.4% of those who remained normotensive.

From the perspective of blood pressure responses at work, the men who developed hypertension were different in three ways. The

TABLE 178

Stepwise Discriminant Function Using Only Biological Variables

STEP	VARIABLE	F	P
1	Average Systolic BP at Work	25.69	.0001
2	Average Diastolic BP at work	5.49	.025
3	1st BP at physical exam	4.17	.05

Using these 3 predictors yields:

73.2% correct prediction of H.T. cases (sensitivity)
71.4% correct prediction of normotensives (specificity)

first way was the increased average blood pressure during the first field study, the second was that their average systolic blood pressure for all times at work was significantly higher, and the third way was that they had significantly increased blood pressure response to increasing workload compared to those who remained normotensive.

The final analysis was to evaluate how accurately we could predict new cases of hypertension using all the variables at our disposal, i.e., psychological variables, initial blood pressure, and blood pressure at work. These data are provided in Table 179. Six variables contributed to the discrimination between individuals who remained normotensive and those who developed hypertension. These six predictors yielded an 85.7% correct prediction of new cases of hypertension and an 82.0% correct prediction of normotensives. The most important variable in discriminating between these two groups of men remained the systolic average at work, and other variables which added to a correct prediction were Type B behavior, diastolic average at work, interview rating of coping on heavy days, decreased marital support, and decreased life change events.

The final table, 180, compared the various predictors from the point of view of implementing a screening procedure. We addressed ourselves to the question of how would one predict new cases of hypertension taking into consideration the cost and difficulty in making these predictions. It was apparent that the easiest thing to do would be to evaluate a man's blood pressure at physical examination. As this was a significant predictor, we examined how well this variable by itself could discriminate between new cases of hypertension and those who remained normotensive. Using the first systolic blood pressure measured in the physician's office, we found that this variable value correctly predicted 64% of new cases and 64% of normotensives. However, it did falsely classify 66 as new cases of hypertension, and although it predicted 18 out of 28 cases who did develop hypertension correctly, it missed 10 cases, i.e., false negatives. We therefore examined how much we could increase our predictive power by studying men in the field. We added the field measures of average systolic at work and average diastolic at work to the predictive equation. We had a significant increase in accuracy in predicting both new cases as well as those who remained normotensive. Finally we added the psychological predictors to the field predictors and we again improved our predictive power. Using the entire array of variables that we collected in the study, we correctly predicted 24 of 28 cases (85.7%) who developed hypertension and 150 out of 183 who did not.

We also examined data collected in the biographical questionnaire filled out by the participants for any association between background data and the development of hypertension. Similar to the marital satisfaction questionnaire we found that in the data collected

TABLE 179

Stepwise Discriminant Function Using
All Possible Predictors To Predict New Cases Of Hypertension

(Significant Univariate)

STEP	VARIABLE	F	p
1	Systolic Average at Work	25.69	.0001
2	Hard Driving on JAS	9.55	.005
3	Diastolic Average at Work	5.90	.025
4	Interview Rating Coping Heavy Days	5.03	.025
5	Marital Support	5.55	.025
6	Life Change Distress	7.29	.01

Using these 6 predictors yields:

85.7% correct prediction of H.T. cases (sensitivity)
82.0% correct prediction of normotensives (specificity)

TABLE 180

Improvement Of Prediction Of New Cases Of Hypertension By Field Studies And Psychological Variables

I. 1st Systolic BP Measured In Physician's Office

		PREDICTED		Total	% Correct
		Norm	New Hypertension		
ACTUAL	Normotensive	[117]	66	183	63.9
	New Hypertension	10	[18]	28	64.3
			Total	211	

II. Adding Field BP Measures

		PREDICTED		Total	% Correct
		Norm	New Hypertension		
ACTUAL	Normotensive	[134]	49	183	73.2
	New Hypertension	8	[20]	28	71.4
			Total	211	

III. Adding Psychological Predictors

		PREDICTED		Total	% Correct
		Norm	New Hypertension		
ACTUAL	Normotensive	[150]	33	183	82.0
	New Hypertension	4	[24]	28	85.7
			Total	211	

in the biographical questionnaire, men who were more happy with their marital relationship were more likely to remain normotensive whereas those who were only moderately happy were more likely to become hypertensive. Both intake cases of hypertension and new cases after intake were associated with growing up in an above average neighborhood. Growing up in better economic circumstances than one's wife was also associated with increased risk for hypertension, as was having parents with somewhat different social background and education than oneself.

In summary, as noted earlier, air traffic controllers did have an elevated incidence and prevalence of hypertension in our study compared to other studies. Furthermore, we were able to predict significantly those individuals who developed hypertension and this related to several psychological factors as well as to increased blood pressure responsivity at work. We also found that men who developed hypertension had increased blood pressure responses to workload - lower blood pressure on a low day of workload and increased blood pressure on a high workload day. One might conclude that when individuals are predisposed to develop hypertension, for whatever combination of genetic and biological factors, their increased blood pressure responses to increased work significantly contribute to the development of the disease along with such characteristics as a more Type B personality, less life change and less marital support.

SUMMARY

Predictors of Other Serious Illnesses and Injuries

Comparison of those who incurred serious illnesses or injuries with a "clean control group" who were free of serious illnesses, injuries and hypertension and who had less than the median level of mild and moderate health changes, produced the following differences:

1) Those who experienced severe injuries were more likely to have grown up in moderately large cities and suburbs, and were more likely to have moved residence frequently in childhood;
2) Men with serious injuries more often reported that they had occasionally wanted to quit high school, and men with serious illnesses had considered quitting high school even more frequently,
3) Men who later developed serious illnesses or injuries were selected significantly less often by peers as ideal team members; men who incurred serious injuries had the fewest number of peer selections for competence, those who developed serious illnesses had an intermediate number of peer selections, and the "clean controls" had the greatest number of selections for competence;
4) Men who later developed serious illnesses and injuries had higher levels of work satisfaction and social resources for coping with problems;
5) Men who later developed serious illnesses had less experience with the agency for their age; men with serious injuries had the lowest average experience with the agency;
6) The ATC's report of pay satisfaction declined in the round before they incurred a serious injury or illness;
7) Diastolic blood pressures at work were highest for the "clean control group," intermediate for the injuries group, and lowest for those with other serious illnesses.

3. Predictors of Other Serious Illnesses and Injuries

Illnesses and injuries serious enough to be rated as Level 3 were relatively infrequent in the ATC study. Of all the men with adequate amounts of predictive data to permit analysis, only 18 developed one or more injuries at L-3, and 23 developed severe (L-3) illnesses. Psychosocial predictors from Round 1 were utilized, and in addition a "sliding interval analysis" (see Section II) was conducted for those psychological and work-related variables gathered at each round. The biographical questionnaire and field data were also examined for their predictive possibilities. In all of these analyses, comparison was made with a "clean control group." To be eligible for inclusion in this group, men had to be free of all Level 3 injuries and illnesses, to be free of hypertension by the ATC study criteria both at intake and subsequently, and also to have less than the median level of average annualized mild and moderate health changes. These criteria were fulfilled by 167 men, who comprised the "clean control group."

Findings

Analyses of the biographical questionnaire completed at intake into the study revealed that the 17 men who later experienced severe injuries were more likely to have spent their childhoods in moderately large cities and in suburbs of large metropolitan areas. They did not come from small towns or rural areas ($p = .002$). Mobility of residence during childhood was a marker of men who later developed L-3 illnesses. Such men were more likely than controls to have moved residence four or more times prior to reaching age 13 ($p = .006$). Men who later qualified for the "clean control group" more often reported that they had never seriously considered quitting high school during their adolescence. Those men who developed L-3 injuries more often reported occasionally wanting to quit whereas those with L-3 illnesses seriously considered this still more frequently ($p = .02$).

Six psychosocial predictors from the first examinations were significantly distinctive across the illness, injury and control groups. Men who later developed L-3 injuries and illnesses were selected significantly less often than controls on the peer selections for ideal controlling team ($p = .04$). In addition, the selections for competency as a controller were significantly different, with men who later had accidental injuries scoring by far the lowest, men with L-3 illnesses scoring at an intermediate level, and the clean control group being picked far more frequently ($p = .02$).

Two other variables went "in the wrong direction" in terms of the hypothesis originally held for them. Men who later developed serious illnesses and injuries had higher levels of work satisfaction and social resources for coping with problems than the clean

control group at Round 1 ($p = .01$ and $p = .005$ respectively). It is difficult to see how increased work satisfaction or greater availability of social coping resources could prove a risk factor for each of these kinds of serious conditions. One might, however, entertain the notion that there may be a subjective distortion of perception about these variables among men who are about to develop serious problems.

The remaining two significant variables at the intake examination dealt with the relation of age to experience. They both tell the same story. Men who later developed L-3 illnesses were older relative to the amount of experience they had than was the clean control group ($p = .02$). Another way of saying this was that they had less experience with the agency for their age than the clean control group ($p = .006$). These findings were interesting inasmuch as age was not significantly associated with risk of serious health changes ($p = .30$), but years of experience considered alone approached a significant difference among the three groups ($p = .07$), but for this table it was the men with serious injuries who had the lowest average experience. The equivocal nature of these latter two statistics leads us to accept the more significant and more consistent findings first reported. The implication for the agency, if these findings are replicated on larger samples of people with serious problems (such as those receiving medical discharges from the agency) would be to reconsider the advisability of hiring men into the agency at ages beyond those which are average for incoming ATCs, but the benefits of this action would need to be reconciled with costs in terms of other results.

The sliding interval analyses identify the time at which an L-3 illness or injury occurred and then move to the immediately prior round of examinations to gather predictive data. Of course this method of analysis can be done only for those psychosocial variables which are gathered at each round of examinations. This analysis yielded one replication of Round 1 findings and one new finding. ATCs' choices among their peers for competence were associated with later serious health change: The clean control group had the most frequent selections (mean = 3.45), whereas the L-3 injury and L-3 illness group were picked significantly less often (means = 1.35 and 2.00 respectively for a probability of .023). Another finding was that ATCs' reports of pay satisfaction declined in the round before they incurred a serious injury or illness and no such decline was apparent in the clean control group. This resulted in the sliding interval analyses showing both health change groups to have significantly lower pay satisfaction than the healthy controls ($p = .02$).

A number of biological variables gathered in the field were also significantly associated with the presence of serious health changes. There are some problems in the interpretation of these

findings, however, as they are based on anywhere from 3 to 10 days of on-the-job study, some of which may have taken place after the L-3 event occurred. Nevertheless it is possible that the L-3 event may not have affected the behavior or the blood pressure of these men, and so these findings will be reported but with the above note of caution.

The amount of behavior arousal and motor activity at work was significantly different among the three groups ($p = .01$) with men who developed other illness having by far the least amount of motor arousal and those who incurred injuries being the most active per period of observation. This finding needs further examination before being judged to be with or without circularity.

Diastolic blood pressures at work were highest for the clean control group, intermediate for the accident group and lowest for those with other illnesses. This was true for two measures of diastolic blood pressure, the average of all readings for three to five work days of study ($p = .04$) and the average maximum peak of diastolic pressure reached on each of the three to five days of study ($p = .02$). These findings were consistent with those reported elsewhere for average annualized mild and moderate health changes. In those analyses also, the group with the most frequent illness or injury outcomes had the lowest levels of blood pressure reactivity.

Despite the fact that a number of variables from the biographical questionnaire, psychosocial predictors, and field predictors were significantly associated with the presence of serious health changes, it must be remembered that a very large number of variables existed in each of these data pools and only a small minority of these achieved statistical significance. The basic question regarding these findings is whether or not the predictors of this small group of severe health changes are the same as those for mild and moderate illnesses and for hypertension.

SUMMARY

Predictive and Concurrent Risk Factors For Psychological Health Change

We found that a great variety of medical, on-the-job, and psychological variables differentiated between people with psychiatric problems and those without such problems. The clearest distinction could be made between men without any problems over three years, those who had problems at intake, and those who developed problems only after intake. There was a slight association between total health change rates and psychiatric health change, but this association was accounted for by a large number of other significant differences between these groups. In general, only three to five variables out of the large number that were significantly different between the various psychological health change outcome groups accounted for the majority of significant differences between these groups.

It was very difficult to distinguish between new cases with different extents of psychiatric problems and between cases with varying frequencies of monthly depression and anxiety. On the other hand, the predictive accuracy for new nine month onset cases versus asymptomatic controls for the five primary psychiatric areas was quite good. The classification results were sufficiently sensitive and specific that programs could be implemented to identify subjects at risk for these five psychiatric problems, and for people who might develop new problems across several areas. On the other hand, the specificity and sensitivity of predictive results for closely related groups, who were distinguished only by their rate or extent of problems was not sufficiently good to suggest programs for implementation of risk identification and intervention.

Finally, we found that those who had psychiatric problems according to our overall susceptibility index were disqualified at much higher rates from the FAA for both medical and psychiatric reasons than were asymptomatic subjects. There also was a tendency for subjects with a heightened susceptibility and a greater extent of psychiatric problems to have fewer FAA performance awards. Asymptomatic subjects tended to have the highest number of these awards.

redictive and Concurrent Risk Factors for Psychological
ealth Change

he predictive and concurrent risk factors for psychological
h change presented in this section were assessed by question-
, interview and physiological responses on the job. Although
ge number of variables were tested for their predictive abil-
for purposes of clarity and simplicity only significant find-
are reported. We used considerable caution in our statistical
lyses since the large number of variables would make it possible
enerate a large number of significant differences purely by
nce. To control for this factor we used rigorous statistical
ndards for significance, and in almost all cases, subjected all
riables showing a significant relationship to a particular out-
e to further analyses which would control for the overlap and
ance relationship between predictor variables.

Most of the predictive findings reported in this section are
ased on assessments made at intake into the study. However, on
occasion, predictive variables were assessed at the second evalua-
tion, and persons with problems preceding that evaluation were
excluded from the analyses. For example, this procedure was re-
quired when analyzing the monthly depression and anxiety morbid-
ity since the depression and anxiety questionnaires were not sent
out until after the second evaluations.

In other analyses, concurrent measures were used. These con-
current measures primarily were derived from our field studies and
represented the average work, blood pressure, cortisol, or other
assessment of an individual over the three years in the study. As
these measurements were relatively unstable over time, concurrent
assessments were necessary to arrive at the most stable character-
istics of the men and then to associate them with changes in psycho-
logical functioning. We have made an effort to distinguish clearly
between predictive and concurrent findings in tables and text.

Finally, although a large number of psychiatric outcomes were
discussed and evaluated for descriptive purposes in Section IIID,
these outcomes were not all significantly associated with other
factors and are not all, therefore, discussed below. Rather, we
concentrated on five major assessments of psychological functioning:
subjective distress, impulse control disorders, alcohol abuse, mate
role and work role.

One outcome discussed in this section is susceptibility to
psychiatric problems, defined by an assessment of abnormality on
any of the five criterion scales of the Psychiatric Status Schedule.
Comparisons of susceptibility were made among three groups: those
having no psychiatric problems over the three years, those with

roblems at intake, and those who developed problems after intake.

Another overall assessment was the extent of psychiatric problems defined by quantity and frequency of problems. Four groups ere compared: men who had no problems on any of the criterion cales across the three years of the study; mild new cases with one riterion scale abnormal at only one of five examinations; moderate ases with one or more criterion scales abnormal at two or three f five examinations; and, chronic cases with one or more criterion cales abnormal at four or five examinations.

Predictors of the onset of psychiatric problems were deterined by a procedure that was called "sliding interval" analyses, n which men who developed a problem during the study were compared n a number of variables with men who never developed a problem - case and control procedure, with the special feature that the ata on the predictor variables was taken from an examination immeiately preceding onset of the symptoms, and the data for the comarison group was taken from matching time periods.

The monthly self-reports of depression and anxiety were used o define the following comparison groups for predictive analyses: symptomatic controls, acute cases, intermittent cases and chronic ases. Asymptomatic controls were men who had an average rate of - 8.9 monthly episodes per year, and chronic cases had 9 or more onthly episodes per year. As was discussed in Section III D, all ut a few of the men could be classified in this fashion. These lassifications and definitions are repeated in the tables for larity.

Finally, a summary is presented of the relationship between sychological health change and other outcomes in this study includng mild and moderate health changes, FAA performance awards, and ob-related outcomes of varying kinds.

1. Susceptibility to Psychiatric Problems

The three groups delineated above - an asymptomatic group, prevalence cases and incidence cases - were compared on a number of predictor variables. Men who had no problems, but who did not have all five evaluations (N = 65 for most analyses) were excluded because we did not know their later psychiatric status. As is indicated in the tables following, some subjects had incomplete data and therefore, the number of subjects in each of these groups was reduced. The reductions in each area are indicated on each table.

A number of measures of on-the-job behavior responsivity were devised and used as concurrent risk factors for psychiatric health change. Table 181 displays the relationship between on-the-job behavioral response and overall psychiatric susceptibility status. Men who remained asymptomatic throughout the study tended to have extremely low behavioral responses at work, whereas men who developed problems over the course of the study tended to have higher levels of behavioral response on the job. Men who came into the study with psychiatric problems had behavioral responses at about the levels expected by chance.

The relationship between the average normalized cortisol on the job and the overall psychiatric susceptibility is displayed in Table 182. The lowest level of cortisol expressed either in terms of total cortisol output or maximum cortisol output, on position, was found among men who never developed any psychiatric problems in the study. The highest levels of cortisol output were associated with having psychiatric problems at intake into the study. Those men who developed psychiatric problems during the study had cortisol output in between these two groups. Hence, cortisol responsivity was associated with the presence rather than the development of psychiatric problems.

A large number of blood pressure measures were devised to assess cardiovascular responsivity at work. Table 183 displays the relationship of the average systolic blood pressure at work to overall psychiatric status susceptibility. Men who remained asymptomatic throughout the study tended to have either very low average systolic blood pressure or very high systolic blood pressure at work, whereas men who developed psychiatric problems tended to have an average level of systolic blood pressure and were very much less likely to have very low or very high average systolic blood pressures. Men who came into the study with psychiatric problems tended to have much higher than expected rates of high average systolic pressure at work, and were under-represented in the very low average systolic blood pressure at work categories.

Behavioral Response to Diversity
Susceptibility Status
(N=233)*

	Ratio of Observed to Expected Numbers of Subjects in Each Psychiatric Susceptibility Group			
	Asymptomatic Cases	Prevalence Cases	Incidence Cases	Total N
Extremely low behavioral response (less than -1 s.d,), controlling for total time worked	1.32	1.00	.57	73
Average (+ 1. s.d.) behavioral response, controlling for total time worked	.89	1.04	1.12	190
Extremely high behavioral response (greater than + 1 s.d.), controlling for total time worked	.96	.93	1.12	54

$X^2 = 9.64$ df = 4 $p < .05$

*

Men w/o psychiatric problems but who were not evaluated all 5 times (N=65) and men with less than 3 on the-job results for behavior (N=34) were excluded from this analysis. The psychiatric groups were reduced as follows: Asymptomatic (135 remained 135), Prevalence cases (reduced from 99 to 84) and Incidence cases (reduced from 117 to 98).

**

A ratio of 1.00 means that the number of men observed in a category was exactly equal to that expected by chance.

TABLE 132
The Relationship of Average Normalized Cortisol On-The-Job To Overall Psychiatric Susceptibility Status*

		Asymptomatic Group	Prevalence Cases	Incidence Cases	F	p
Average Normalized Total Cortisol Output	Mean	1179.1	1231.1	1198.9	3.20	<.05
	S.D.	121.8	119.2	133.2		
	N**	95	60	64		
Average On-Position Maximum Cortisol Output in 20 minutes	Mean	117.9	126.3	119.5	6.32	<.003
	S.D.	14.4	15.5	15.0		
	N***	101	61	65		

* Overall Psychiatric Susceptibility Status groups were defined as:
Asymptomatic - all 5 PSS criterion scales were asymptomatic at all 5 evaluations (N=135)
Prevalence cases - any of the 5 PSS criterion scales were symptomatic at intake (N=99)
Incidence cases - any of the 5 PSS criterion scales were symptomatic after intake but not at intake (N=117)

** Men who had no problems but who did not have all 5 PSS evaluations (N=65) and men who did not have the specified cortisol assessment (N=132) for three or more field studies were excluded.

*** Men who had no problems but who did not have all 5 PSS evaluations (N=65) and men who did not have the specified cortisol assessment (N=124) for three or more field studies were excluded.

TABLE 183

The Relationship Of Average Systolic Blood Pressure At Work To Overall Psychiatric Status Susceptibility Groups*

	Ratio of Observed to Expected Numbers of Subjects in Each Psychiatric Susceptibility Group**			
	Asymptomatic	Prevalence Cases	Incidence Cases	Total N
ry low average systolic (less than-1s.d.) at work	1.44	.50	.77	41
rage systolic BP (1s.d.) at work	.88	1.04	1.15	193
ry high average systolic (greater than +1.s.d.) work	1.18	1.30	.50	39

$X^2 = 13.44$ df=4 $p < .01$

n with no psychiatric problems but who were not evaluated all 5 times =65) and men with less than 3 on-the-job blood pressure studies (N=145) re excluded from this analysis. The psychiatric groups were reduced as llows: Asymptomatic (135 reduced to 122), Prevalences cases (99 reduced 67) and Incidence cases (117 reduced to 84).

ratio of 1.00 means that the number of men observed in a category was actly equal to that expected by chance.

Hence, men who were susceptible to psychiatric problems over the course of the study tended to have higher than expected levels of behavioral response, slightly higher than average cortisol output on the job, average levels of systolic blood pressure at work and less than expected low and high blood pressure levels at work, whereas men who came into the study with psychiatric problems had average behavioral responses to work, much higher than average cortisol outputs, and more average systolic blood pressures at work. Men who remained free of psychiatric problems over the course of the study tended to have extremely low behavioral responses at work, low cortisol output, and either high or low, but not average, systolic blood pressure responses at work.

The ATCs were also administered a large number of psychological tests at intake and at their second evaluations. Table 184 displays differences on the Job Description Index, the ATC Questionnaire and by age and experience levels. Men who developed problems were significantly younger and had significantly less experience than men who remained asymptomatic or who had problems at intake. In fact, those who developed new problems during the course of the study had a lower age than their experience would suggest, whereas men who remained asymptomatic were older than their experience would indicate.

Men who came into the study with problems had significantly lower satisfaction with work and with their co-workers. Moderate levels of satisfaction with work and co-workers were expressed by those who developed new problems, and the greatest satisfaction was expressed by those who remained asymptomatic over the course of the study. Men who tended to avoid work in order to cope with the pressures of the job tended already to have problems at the beginning of the study. Also, as indicated in Table 134 it was interesting to find that the more an ATC was invested in his identity as a controller, the more likely he was to develop problems over the course of the study. Those men who had less of a need to be super controllers tended to remain asymptomatic. Men who came into the study with psychiatric problems felt that their job cost them a lot in many areas of their lives. Those who remained symptom free felt that the job had cost them relatively less in terms of their personal lives.

Table 185 displays differences on the ATC Questionnaire and on our interview ratings of coping, burnout, and investment. Men who came into the study with psychiatric problems used physical activities as a coping mechanism significantly less often than asymptomatic controls or men who developed new psychiatric problems. The use of alcoholic beverages as a coping mechanism was significantly higher among men who came into the study with psychiatric problems than either asymptomatic controls or the incidence cases. Both those who

TABLE 184

Intake Differences Between Overall Psychiatric Susceptibility Status Groups: Age, Experience And Job Related Characteristics*

Intake Variables JDI=Job Description Index ATCQ=ATC Questionnaire		Asymptomatic Group (N=135)	Prevalence Cases (N=99)	Incidence Cases (N=117)	F	P
Age	Mean (S.D.)	36.60 (4.85)	36.80 (5.16)	34.68 (5.27)	6.14	.003
Experience	Mean (S.D.)	11.16 (4.68)	11.79 (4.57)	10.05 (4.74)	3.91	.02
Age With Experience Controlled	Mean (S.D.)	.40 (2.73)	.02 (2.74)	-.46 (2.39)	3.35	.04
JDI Work Satisfaction	Mean (S.D.)	52.07 (8.83)	45.52 (10.82)	50.55 (9.97)	13.10	.0001
JDI Co-Worker Satisfaction	Mean (S.D.)	52.69 (9.69)	47.76 (9.96)	48.02 (10.46)	10.10	.0002
ATCQ Work Avoidance Factor	Mean (S.D.)	48.85 (9.12)	52.03 (10.15)	49.57 (9.39)	3.27	.04
ATCQ Investment In ATC Identity Factor	Mean (S.D.)	48.81 (10.32)	49.02 (10.76)	51.89 (9.79)	3.27	.04
ATCQ Subjective Costs Factor	Mean (S.D.)	48.05 (8.65)	53.97 (10.71)	50.97 (9.74)	10.52	.0001

*Asymptomatic - no PSS criterion scale abnormal in 5 evaluations; Prevalence - any criterion scale symptomatic at intake; and Incidence - any criterion scale symptomatic after intake but not at intake. Men who were asymptomatic but who were not evaluated all 5 times were excluded (N=65), since their later status could not be determined. Group sizes varied slightly due to missing or not applicable data for some subjects.

TABLE 185

Intake Differences Between Overall Psychiatric Susceptibility Status Groups: Coping And Interview Assessments*

Intake Variables ATCQ=ATC Questionnaire, Interview=Global rating from 1(low) to 7(high)		Asymptomatic Group (N=135)	Prevalence Cases (N=99)	Incidence Cases (N=177)	F	p
ATCQ Coping by Physical Activities Factor	Mean (S.D.)	52.61 (9.02)	47.20 (9.85)	50.14 (9.97)	8.82	.0004
ATCQ Coping by Drinking Factor	Mean (S.D.)	47.18 (7.97)	54.14 (11.06)	50.64 (9.82)	14.80	.0001
ATCQ Marital Coping Resources Factor	Mean (S.D.)	52.55 (8.13)	47.06 (10.80)	48.30 (10.15)	9.53	.0003
Interview: Coping with Difficult Days at Work	Mean (S.D.)	4.16 (1.57)	3.20 (1.55)	3.75 (1.54)	10.73	.0001
Interview: Coping with Trainees and Training	Mean (S.D.)	3.80 (1.37)	3.25 (1.49)	3.61 (1.53)	4.02	.02
Interview: Overall Coping	Mean (S.D.)	4.04 (1.34)	3.21 (1.25)	3.69 (1.40)	10.85	.0001
Interview: Global Burnout	Mean (S.D.)	1.96 (1.08)	3.00 (1.79)	2.11 (1.24)	18.33	.0001
Interview: Investment in ATC Identity	Mean (S.D.)	5.17 (1.59)	4.22 (2.14)	4.91 (1.67)	8.27	.0006

*

Asymptomatic - no PSS criterion scale abnormal in 5 evaluations; Prevalence - any criterion scale symptomatic at intake; and Incidence - any criterion scale symptomatic after intake but not at intake.

Men who were asymptomatic but who were not evaluated all 5 times were excluded (N=65), since their true status could not be determined. Group sizes varied slightly due to missing or not applicable data for some subjects.

had problems coming into the study and those who developed problems over the course of the study rated themselves as having much lower marital coping resources than those who remained symptom-free over the course of the study. By self-report measures, therefore, coping mechanisms were primarily different between those who already had psychiatric problems and those who remained symptom-free. Those who developed new psychiatric problems tended to score between those two groups.

Our special interview to assess coping, burnout, and investment also significantly discriminated between groups. Those men who came into the study with psychiatric problems were given coping ratings significantly lower than the asymptomatic group and the incidence cases. Coping was rated as highest among those men who remained asymptomatic throughout the study. It is important to remember that these are predictive results. The interviewers at that time had no idea how men would change in their psychiatric status over the course of the study.

Two other ratings are of particular interest. Burnout was rated highest amongst those who had psychiatric problems at intake and lowest amongst those who continued asymptomatic throughout the study. Investment in the air traffic controller identity was rated lowest amongst those who had problems at intake, and highest amongst those who remained asymptomatic throughout the study. This result contrasted with the self-reported difference in investment (see Table 184) where the asymptomatic cases scored lowest on investment, and new cases of psychiatric problems were higher.

Other psychological intake differences between the overall psychiatric susceptibility groups are shown in Tables 186-188. The sense of anomie and alienation was highest amongst men who had problems coming into the study, and lowest amongst those who remained symptom-free. Psychophysiological anxiety symptoms, life changes, and ethanol consumption per week were highest amongst those who came into the study with psychiatric problems. Men who were more Type B tended to have no psychiatric problems at all over the course of the study.

These many significant differences between men who had no problems, men who had problems coming into the study, and men who developed problems over the course of the study were subjected to multi-variate discriminant analyses in order to find the most significant and parsimonious set of predictors. Table 189 displays the five variables which contributed to the maximum discrimination between these groups. Once these five variables were taken into account, none of the other significant differences reported thus far contributed to a significantly greater differentiation between groups. As seen in Table 189, the CPI sense of well being and

TABLE 186

Intake Differences Between Overall Psychiatric Susceptibility Status Groups: Psychological Characteristics, Life Changes, And Ethanol Consumption*

Intake Variable ATCQ=ATC Questionnaire LCU=Life Change Units		Asymptomatic Cases (N=135)	Prevalence Cases (N=99)	Incidence Cases (N=117)	F	p
Srole's Anomie (High scores = less anomie)	Mean (S.D.)	13.71 (1.94)	12.81 (2.22)	13.20 (2.01)	5.72	.004
ATCQ Psychophysiological Anxiety Factor	Mean (S.D.)	47.82 (8.74)	53.47 (11.16)	50.39 (9.20)	9.54	.0002
ATCQ Bounceback (High)-Burnout (Low) Factor	Mean (S.D.)	52.29 (8.58)	47.30 (11.81)	50.69 (9.49)	7.16	.0015
ATCQ Tension Discharge Rate Factor	Mean (S.D.)	52.72 (8.96)	47.78 (11.17)	48.53 (9.79)	8.56	.0005
Paykel, Uhlenhuth, And Prusoff LCU Total For 6 Months prior to Intake	Mean (S.D.)	28.24 (23.08)	36.56 (24.07)	36.00 (27.25)	4.21	.02
Review of Life Events Distress Total for 6 months prior to Intake	Mean (S.D.)	171.80 (79.71)	206.55 (192.97)	241.22 (240.54)	6.25	.003
Ethanol Consumption per week in absolute ounces	Mean (S.D.)	7.75 (13.30)	14.24 (12.13)	8.44 (8.93)	8.57	.0005

*

Asymptomatic - no PSS criterion scale abnormal in 5 evaluations; Prevalence - any criterion scale symptomatic at intake; and Incidence - any criterion scale symptomatic after intake but not at intake.

*

Men who were asymptomatic but who were not evaluated all 5 times were excluded (N=65), since their true status could not be determined. Group sizes varied slightly due to missing or not applicable data for some subjects.

TABLE 187

California Psychological Inventory (CPI) Differences Between Overall Psychiatric Susceptibility Status Groups*

CPI Characteristics**		Asymptomatic Cases (N=134)*	Prevalence Cases (N=94)	Incidence Cases (N=111)*	F	p
Capacity for Status	Mean	52.61	49.42	50.51	3.61	.03
	(S.D.)	(8.55)	(8.78)	(10.25)		
Sociability	Mean	53.24	49.28	52.23	4.60	.02
	(S.D.)	(9.80)	(10.36)	(9.52)		
Sense of Well-Being	Mean	52.31	43.15	47.60	25.01	.0001
	(S.D.)	(8.21)	(10.93)	(10.24)		
Responsibility	Mean	44.40	38.57	39.46	11.61	.0001
	(S.D.)	(9.53)	(10.34)	(10.49)		
Socialization	Mean	50.62	42.10	44.22	29.52	.0001
	(S.D.)	(7.55)	(10.52)	(8.80)		
Self-Control	Mean	50.39	42.67	45.51	23.99	.0001
	(S.D.)	(8.36)	(8.52)	(8.79)		
Tolerance	Mean	50.28	44.55	46.83	11.32	.0001
	(S.D.)	(8.15)	(9.71)	(9.84)		
Good Impression	Mean	47.78	40.27	43.56	14.85	.0001
	(S.D.)	(10.05)	(9.77)	(9.08)		

*Asymptomatic - no PSS criterion scale abnormal in 5 evaluations; Prevalence - any criterion scale symptomatic at intake; and Incidence - any criterion scale symptomatic after intake but not at intake. Men who were asymptomatic but who were not evaluated all 5 times were excluded (N=65) since their true status could not be determined. Eleven others dropped out before completing the CPI and 1 asymptomatic subject answered the CPI invalidly.

**See Table for interpretive descriptions of these characteristics.

TABLE 188

California Psychological Inventory (CPI) And Jenkins Activity Survey (JAS) Differences Between Overall Psychiatric Susceptibility Status Groups*

CPI or JAS Characteristic**		Asymptomatic Cases (N=134)*	Prevalence Cases (N=94)*	Incidence Cases (N=111)*	F	P
Communality	Mean (S.D.)	55.88 (6.62)	52.32 (8.23)	52.16 (9.14)	8.50	.0005
Achievement Conformity	Mean (S.D.)	54.33 (8.89)	45.79 (9.73)	49.32 (9.49)	24.12	.0001
Intellectual Efficiency	Mean (S.D.)	51.48 (8.91)	45.98 (9.99)	47.50 (10.59)	9.90	.0002
Flexibility	Mean (S.D.)	47.73 (10.98)	51.13 (9.86)	50.23 (11.64)	3.09	.05
Feminity	Mean (S.D.)	47.39 (8.39)	50.59 (8.20)	48.10 (8.39)	4.26	.02
JAS Type A Personality	Mean (S.D.)	-4.54 (8.26)	-2.76 (9.10)	-1.41 (9.60)	3.79	.03
JAS Speed And Inpatience Factor	Mean (S.D.)	-5.14 (8.27)	-4.01 (8.89)	-.03 (9.67)	14.50	.0001
JAS Hard Driving Factor	Mean (S.D.)	-1.62 (8.56)	-2.00 (8.88)	1.03 (9.18)	3.80	.03

*
Asymptomatic - no PSS criterion scale abnormal in 5 evaluations; Prevalence - any criterion scale symptomatic at intake; and Incidence - any criterion scale symptomatic after intake but not at intake. Men who were asymptomatic but who were not evaluated all 5 times were excluded (N=65) since their true status could not be determined. Eleven others dropped out before completing the CPI and JAS and 1 asymptomatic subject answered the CPI invalid and was excluded.

**
See Table for interpretive descriptions of CPI characteristics and Chapter for interpretive descriptions of JAS characteristics.

TABLE 189

The Most Significant And Parsimonious Discriminators Between Asymptomatic, Prevalence And Incidence Cases of Overall Psychiatric Susceptibility Status*

...nating ...eristic	Asymptomatic Controls	Prevalence Cases	Incidence Cases
...lfornia Psychological Inventory ...C Questionnaire ... Description Inventory	High=highest of three groups Medium = middle of three groups Low = Lowest of three groups		
...nse of Well-Being	High	Low	Medium
...sponsibility	High	Low(tie)	Low(tie)
...Tension Discharge Rate Factor	High	Low	Medium
...ork Satisfaction	High	Low	Medium
...ol consumption per week ...bsolute ounces	Low	High	Medium

...ymptomatic controls for this analysis (N=104 of 135) were defined as never ...ving had any significant symptomatology on any PSS criterion scale. Prev...ence cases (N=79 of 99) were defined as men having any of the 5 PSS cri...erion scales abnormal at intake. Incidence cases (N=88 of 117) were defined ...s men having any of the 5 PSS criterion scales abnormal after intake but not ...t intake. Men without 5 PSS evaluations who were asymptomatic (N=65) were ...excluded because their later status could not be determined. The reduced group ...izes were due to missing data on any of the predictor variables.

responsibility scales were differentiating traits between the groups. Men who had a high sense of well being and a high responsibility score tended to remain symptom-free throughout the study. Those who scored low on the well being or responsibility scales tended to have problems or develop problems. Men with high rates of tension discharge tended to remain symptom-free whereas men who had low tension discharge rate either had or developed psychiatric problems. Work satisfaction was greatest among those who remained symptom-free and lowest among those who had problems at intake. Finally, ethanol consumption per week was highest among those with psychiatric problems at intake and lowest among those who remained symptom-free.

These variables were combined in the discriminant functions for predicting the overall psychiatric susceptibility status of men during the study. Table 190 displays the classification accuracy of these discriminant functions. As can be seen, the specificity of these classifications was 70.2%, which represents the percentage of controls who were correctly identified. The sensitivity of the discriminant functions to pick up cases was 57.0% for those who had problems at intake and 47.7% for those who later developed problems. The overall percentage correct of the classification functions was 59.0%. One-fourth to one-third of the men were incorrectly classified as false negatives or false positives.

The discriminant and classification results were good, though not excellent. They indicated that it would be possible to identify with a high degree of statistical significance those men who remained symptom-free in a three-year period of time, but that the identification of men with problems or who developed problems was more difficult. The greatest amount of misclassification occurred between those who had problems and those predicted to develop problems. From a standpoint of implementing programs this would be of minimal significance since individuals predicted either to have problems or to have a high likelihood of developing problems could be defined as the at-risk group, who might then profit from counseling or other intervention services.

The results presented were the strongest of a larger group from a conceptual, methodological and statistical standpoint. A number of other statistically significant results were found but because of the level of measurement (categorical) and/or the number of results that could have occurred by chance in these areas, they are presented separately. Subsequent studies may be able to integrate the results reported on the pages following with the results reported above, but at the time of this report, we are not convinced of their overall significance and meaning. However, since they may prove to be illuminating or of particular significance in their own right, they are presented next.

TABLE 190

Classification Accuracy Of The
Most Parsimonious And Significant Discriminants
Between Overall Psychiatric Status Susceptibility Groups*

	Asymptomatic Controls	Prevalence Cases	Incidence Cases
Specificity -- % of controls correctly identified	70.2%		
Sensitivity -- % of cases correctly identified		57.0%	47.7%

Classification Matrix

		Predicted Group			
		Asymptomatic	Prevalence	Incidence	Total
	Asymptomatic	73	7	24	104
Actual	Prevalence	14	45	20	79
Groups	Incidence	26	20	42	88
					271

Overall Percent Correct = 73+45+42/271 = 59.0%

Percent False Positives = 31/104 = 29.8%

Percent False Negatives = 14+26/167 = 24.0%

*
Asymptomatic (N=104 of 135) defined as never having had any significant symptomatology on any PSS criterion scale. Prevalence cases (N=79 of 99) were defined as men having any of the 5 PSS criterion scales abnormal at intake. Incidence cases (N=88 of 117) were defined as men having any of the 5 PSS criterion scales abnormal after intake but not at intake. Men without 5 PSS evaluations who were asymptomatic (N=65) were excluded because their later status could not be determined. The reduced group sizes were due to missing data on any of the predictor variables.

Table 191 displays the relationship between mild and moderate health change rates and overall psychiatric susceptibility status. Men who developed psychiatric problems over the course of the study had higher rates of respiratory illness than men who had problems at intake, but only marginally higher respiratory illness rates than asymptomatic men. There were no significant differences in other categories of mild and moderate illness between those with and those without psychiatric susceptibility. On the other hand, when we summed across all the illness categories, the men who developed psychiatric problems over the course of the study had significantly higher average mean illness rates of mild and moderate health changes than men who remained asymptomatic, or who had problems coming into the study.

In general, therefore, we found only a slight association between mild and moderate health change and susceptibility to psychiatric problems. This association was due primarily, if not solely, to an increased rate of respiratory problems among those who developed new psychiatric problems during the study compared to those who had such problems coming into the study.

An important implication of this finding was that a general complaint, or malaise, syndrome was ruled out of our results. If such a syndrome was predominant or even a general factor, we would have had considerable overlap in our medical and psychiatric outcomes. Since we did not, we could rule out this possible factor.

We also were interested in the possibility that a man's general medical history might account for his later psychiatric status. Out of nearly one hundred possible items we assessed in their medical history prior to intake, only six were significant at the .05 level. By chance we could have expected at least five significant items. Therefore the following results are offered for the sake of completeness in describing our results.

Table 192 displays the significant differences between the overall psychiatric susceptibility groups on certain facets of medical history prior to intake. Men who later developed problems in the study had a history of frequent night sweats, prostate trouble, and close contact with tuberculosis. Men who had psychiatric problems coming into the study reported previous history of pain in the chest or with breathing; operations on the head, neck, or face; and allergic reactions to penicillin. Some of these findings make intuitive sense; we are not sure of the overall meaning of the others.

In summary, we can say that a man's prior history of physical illness had little, if any, effect upon his psychiatric status during the study.

TABLE 191

Mild To Moderate Health Change Rates As A Function Of Overall Psychiatric Susceptibility Status*

nge		Average Number of Months Per Year During Which Illness/Disorder Was Experienced**				
		Asymptomatic Controls	Prevalence Cases	Incidence Cases	F	p
y	Mean	1.64	1.42	1.84	4.23	.02
	(S.D.)	.99	1.08	.98		
tro-	Mean	.52	.36	.51	1.97	N.S.
	(S.D.)	.67	.55	.63		
fic	Mean	.42	.43	.53	1.10	N.S.
ness	(S.D.)	.58	.65	.69		
t-	Mean	.14	.14	.16	.06	N.S.
atro-	(S.D.)	.35	.35	.36		
al						
orders	Mean	.15	.12	.20	1.29	N.S.
	(S.D.)	.36	.33	.40		
Joint	Mean	.22	.15	.20	.70	N.S.
le	(S.D.)	.41	.36	.40		
rs						
les	Mean	.30	.25	.36	.89	N.S.
	(S.D.)	.52	.53	.63		
es	Mean	.53	.52	.64	.96	N.S.
	(S.D.)	.66	.75	.80		
o-urinary	Mean	.14	.11	.06	2.44	.10
ders	(S.D.)	.35	.31	.23		
ll Average	Mean	2.44	2.44	2.73	3.66	.03
ss Rate	(S.D.)	.88	.98	.95		

Significant Differences Between Overall Psychiatric Susceptibility Groups On Certain Facets of Medical History Prior To Intake*

Significant Items from Health History Prior to Intake	Ratio of Observed to Expected Positive Responses for Overall Psychiatric Susceptibility				
	Asymptomatic**	Prevalence**	Incidence**	X^2	p
Frequent night sweats	.50	1.00	1.56	6.05	<.05
Pain in chest or with breathing	.25	2.33	.75	7.62	<.03
Close contact with tuberculosis	1.38	.17	1.29	6.19	<.05
M.D. told ATC had prostate trouble	.27	1.33	1.50	11.15	<.005
Had operation on head/neck/face	1.26	1.17	.55	7.96	<.02
Allergic to penicillin	.43	2.20	.83	9.09	<.02

*Overall Psychiatric Susceptibility groups were defined as (1) Asymptomatic if all 5 PSS criterion scales were normal throughout the study; (2) Prevalence cases if any of the PSS criterion scales were symptomatic at intake; or (3) Incidence cases if any of the PSS criterion scales were symptomatic after intake. Men with no problems but who did not have all 5 evaluations (N=65) were excluded.

** Some subjects had incomplete medical histories and therefore the number of subjects was reduced for these analyses to: Asymptomatic (135 down to 130), Prevalence (99 down to 97) and Incidence (117 down to 115)

2. Sociodemographic Relationships to Psychological Health Change

In their intake evaluation for the study the controllers were administered a biographical questionnaire that assessed many areas of each man's functioning in the past as well as in the present. In this section, we present a description of the sociodemographical variables which were significantly related to psychological health change up to but not including the final evaluation in the study. A very large number of findings could have been generated from the more than 500 analyses conducted in this area. However, only the statistically significant and more interesting findings will be described in general terms in order to help present a more global image of those who had or developed psychiatric problems.

We used a number of indices of social mobility. One was defined as the difference in socioeconomic level of one's home neighborhood between childhood and the present. We found that those with the least social mobility tended to develop more psychological health changes. Those whose present home neighborhood was in a better socioeconomic area than the home neighborhood of childhood had fewer psychological problems develop over the course of the study.

We asked about the sibling composition of men's parental families. We found that men who were the only child had the fewest psychological health changes with 72% having no problems over the course of the study. Of those with one or more siblings, 50-55% had no problems over the course of the study.

We inquired about the educational level of both the controller and his parents. Thirty-six percent of those ATCs who had far more education than their fathers had an impulse control problem at some time during the first four rounds, whereas only 17% of those whose fathers had equal or more education were so affected. More generally only 40% of those controllers with far higher levels of education than their fathers remained free of psychological health problems over the first four evaluations, whereas 50% of those with lesser differences in education between the father and the controllers, and 67% of those whose fathers had equal or greater education remained free of psychological difficulties over the first four rounds.

The educational level of the controller himself was significantly related to impulse control problems. Those who completed high school and had some vocational training had the fewest such problems. Those few who did not graduate from high school or who did graduate from college had somewhat more impulse control problems. Over all areas of psychological functioning, the two majority groups having middle levels of schooling - high school graduates with vocational

training and high school graduates with some college - had the lowest percentage of psychological problems over the first four rounds.

A special set of five questions on the biographical questionnaire asked the controller to compare his parents with regard to five areas which might have generated a conflict of values or expectations in the study subject. The controllers were asked to indicate how similar or different their parents were in terms of social background, education, religious emphasis, their goals for child rearing, and their personality. A composite score was calculated across these areas.

The 25% of men who reported the greatest differences between their parents had substantially higher frequencies of impulse control problems. This was true both for men with and without such problems at intake. Overall this parental discrepancy variable showed a strong predictive relationsh . Only 34% of those men who reported their parents as being very different from one another showed no psychological abnormalities over the first four rounds, whereas 56-60% of those with more similar parents were free from such psychological difficulties.

[redacted] asked about their relationship with their parents dur[redacted] teenage years. Those who reported worse than average relationships developed psychological problems significantly more often than those who said their relationship with their parents was average or better than average.

Our sociodemographic background variables included an assessment of the size of the city in which a man was reared and certain other habits and characteristics. It was found that men who were born in large cities had fewer problems with subjective distress (anxiety and depression) than those men who were born in small towns or suburbs. However, those men born in large cities also had more work role difficulties than those born in small towns or suburbs.

Subjects also were asked how often they had seriously considered quitting high school. Those who had never considered quitting had significantly fewer impulse control problems and less susceptibility to any psychiatric problems over the first four evaluations. Men who said they never seriously considered quitting high school developed one or more psychological difficulties only 28% of the time, whereas those who had occasionally or frequently considered quitting school later developed one or more psychiatric problems 42% of the time.

The few men who had never married had more impulse control and alcohol problems. In addition, they had a much greater frequency of having three or more problem areas over the first few rounds, than did those men who were married one or more times. Men who were married only once compared to those who were married more than once were not significantly different from one another.

We also assessed the difference between controllers and their wives in socioeconomic level (SES) during their childhood. Men with a higher background than their wives had half the incidence of new problems (14%) than did men with equal or lower SES backgrounds than their wives (34-38%).

A general marital satisfaction question was asked; "All things considered, how happy and satisfied have you been this year in your relationship with your wife?" Only about 16% of the married men gave neutral or unhappy answers. These individuals with lower marital satisfaction experienced six times as much subjective distress at intake and developed seven times as many new problems over the course of the study. These particular men who were unhappy in their marriages had significantly more impulse control disorders, more alcohol abuse, and of course, also far more mate role disturbances. This single question was highly related to the later development of psychological health changes.

We considered all of these findings to be particularly interesting since the characteristics assessed with respect to background and current life situation should be quite stable. However, all of these variables were categorical or ordinal in nature. In addition more than one hundred background variables were examined for these same outcome groups and many of the differences observed could have been due to change. Further analyses may be able to determine their overall significance in the prediction of men who develop psychiatric problems.

3. Extent of Psychiatric Problems

All of the preceding types of analyses were repeated for men differentiated according to extent of their psychiatric problems over the course of the study. The asymptomatic control group remained the same as for the analyses on susceptibility to psychiatric problems. Three case groups were labeled as mild new cases, moderate new cases, and chronic new cases. Men who had problems at intake and men who had incomplete evaluations were excluded from these analyses. All of the same predictive variables (medical history, field study, and psychological variables) were subjected to these analyses.

A fewer number of variables discriminated among the groups of men who had different levels and frequencies of psychiatric problems for the first time. Table 193 displays significant intake predictor differences between these groups. Men who became chronic new cases of psychiatric problems had the highest tension discharge rate, the highest level of coping by drinking, the lowest satisfaction with their co-workers, the highest life change by either of two methods, the highest marital coping resources, and were the youngest and least experienced controllers. Mild and moderate new cases had the lowest tension discharge rate, the next highest levels of drinking to cope, moderately low satisfaction with their co-workers, and moderately high levels of life change. They also tended to be younger and less experienced than asymptomatic controls and reported the lowest levels of marital coping resources.

Table 194 displays significant personality correlates associated with extent of psychiatric problems. There were a large number of significant differences on these personality variables. Here again it is clear that the least adjusted and most hurried and impatient Type A individuals developed the most severe psychiatric problems.

Again, the large number of significant intake predictors and personality characteristics were subjected to discriminant analysis to find the most significant and parsimonious set of discriminators between the extent of psychiatric problem groups. Table 195 displays the results of the discriminant analyses. The coping by drinking factor, life change experience in the six months prior to intake, the CPI responsibility scale, the JAS speed and impatience factors, and the marital coping resources factor were the primary discriminants between groups. No other variables contributed to a further differentiation between these groups once these five variables were taken into account. The pattern of results on each of these variables is displayed in Table 195. These variables were then placed into discriminant functions for predicting and differentiating between the groups.

TABLE 193

Significant Intake Predictors
Of The
Extent Of Psychiatric Problems
Among Air Traffic Controllers*

Contrast Among Asymptomatic Controls (N = 135) And
New Cases Of Mild (N=52), Moderate (N=54) And
Chronic (N=11) Disorders Over Three Years, Excluding
Prevalence Cases At Intake (N=99) And Incomplete Cases (N=65)**

Predictive Intake Variable	Asymptomatic Controls Mean (S.D.)	Mild New Cases Mean (S.D.)	Moderate New Cases Mean (S.D.)	Chronic New Cases Mean (S.D.)	F-ratio between groups	p of F-ratio
Tension Discharge Rate Factor	52.72 (8.96)	49.02 (9.83)	47.09 (9.45)	53.27 (10.43)	5.56	.002
Coping by Drinking Factor	47.18 (7.79)	48.65 (8.42)	51.76 (10.97)	54.54 (8.69)	5.03	.003
Satisfaction with Co-Workers	52.69 (8.69)	47.49 (10.65)	48.79 (10.46)	46.82 (10.30)	5.12	.003
"PUP" Life Change Units	28.24 (23.08)	36.20 (30.12)	31.68 (21.07)	55.91 (33.20)	4.91	.003
"ROLE" Life Change Distress	171.31 (140.49)	253.96 (310.09)	204.28 (145.51)	357.50 (219.13)	4.31	.006
Age	37.13 (4.61)	34.62 (4.50)	34.96 (5.57)	30.50 (4.09)	8.49	.0001
Experience	11.56 (4.61)	9.93 (4.42)	10.09 (4.99)	7.00 (3.33)	4.20	.007
Marital Coping Resources (Asymptomatic, N=107, 79%) (Mild, N=43, 83%) (Moderate, N=46, 88%) (Chronic, N=7, 64%)	52.52 (8.20)	47.33 (9.27)	48.48 (11.22)	55.57 (7.23)	4.91	.003

TABLE 193 cont'd.

Footnotes

ent of psychiatric problems was evaluated using the Psychiatric Status
e, Subjective Distress, Impulse Control Disturbances, Work Role Dis-
es, Mate Role Disturbances and Alcohol Abuse were used as the criterion
.

omatic controls: Never had a symptomatic criterion scale
ases: 1 criterion scale abnormal at only 1 of 5 examinations
te cases: 1 + criterion scales abnormal at 2 or 3 of 5 examinations
c cases: 1 + criterion scales abnormal at 4 or 5 of 5 examinations
plete cases: Asymptomatic up to time of dropping out - later status
valuated

TABLE 194

Significant Personality Correlates
Of The
Extent Of Psychiatric Problems Among
Air Traffic Controllers

t Among Asymptomatic Controls (N=134) And New Cases Of Mild Moderate (N=50), And Chronic (N=11) Disorders Over Three Excluding Prevalence Cases At Intake (N=99) And Incomplete (65 On PSS, 7 On CPI And JAS)**

ality Charac- c CPI: Cali- Psychological ory, JAS: Jen- tivity Survey	Asympto- matic Controls Mean (S.D.)	Mild New Cases Mean (S.D.)	Moderate New Cases Mean (S.D.)	Chronic New Cases Mean (S.D.)	F-ratio between groups	p of F-ratio
lf-Acceptance	58.68 (8.54)	58.24 (11.07)	62.16 (8.72)	52.73 (12.88)	3.71	.02
Well-Being	52.31 (8.21)	49.04 (10.29)	47.66 (9.77)	40.82 (10.66)	7.90	.0002
Responsibility	44.40 (9.53)	40.08 (10.13)	39.72 (10.29)	35.46 (13.03)	5.64	.002
Socialization	50.62 (7.55)	44.96 (8.94)	44.40 (8.10)	40.00 (10.77)	13.74	.0001
Self-control	50.39 (8.36)	48.06 (7.91)	43.78 (8.93)	41.82 (9.47)	9.68	.0001
Tolerance	50.28 (8.15)	47.34 (9.02)	47.50 (9.84)	41.46 (12.49)	4.53	.005
Good Impression	47.28 (10.05)	45.34 (9.20)	42.64 (9.08)	39.64 (7.14)	4.40	.006
Communality	55.88 (6.62)	51.96 (10.08)	53.04 (6.77)	49.09 (13.47)	5.31	.002
PI Achievement- nformity	54.33 (8.89)	50.82 (7.46)	49.26 (9.86)	42.82 (13.57)	8.50	.0001
PI Intellectual fficiency	51.48 (8.91)	47.98 (11.18)	47.98 (9.20)	42.82 (13.42)	4.40	.006
AS Type A score	-4.54 (8.21)	-3.70 (8.67)	.52 (10.42)	.44 (7.89)	4.65	.004
AS Speed and mpatience Factor	-5.14 (8.27)	-3.39 (8.17)	3.18 (10.12)	.63 (9.59)	11.72	.0001

TABLE 194 cont'd.

Footnotes

xtent of psychiatric problems was evaluated using the Psychiatric
us Schedule. Subjective Distress, Impulse Control Disturbance, Work
Disturbance, Mate Role Disturbance, and Alcohol Abuse were used as
criterion scales.

ptomatic controls: Never had a symptomatic criterion scale
cases: 1 criterion scale abnormal at only 1 of 5 examinations
rate cases: 1 + criterion scales abnormal at 2 or 3 of 5 examinations
ic cases: 1 + criterion scales abnormal at 4 or 5 examinations
plete cases: Asymptomatic up to time of dropping out - later status
evaluated. Seven other subjects also did not complete the California
hological Inventory (CPI) or Jenkins Activity Survey (JAS).

TABLE 195

The Most Significant And Parsimonious Discriminators Of The Extent Of Psychiatric Problems Among Air Traffic Controllers*

riminating cteristics	Asymptomatic Controls	Mild Cases	Moderate Cases	Chronic Cases
alifornia Psychological Inventory -ATC Questionnaire enkins Activity Survey	High=Highest of four groups Med. High=Next to highest group Med. Low=Next to lowest group Low=Lowest of four groups			
Coping by Drinking	Low	Med. Low	High	Med. High
el, Uhlenhuth and Prusoff Change Units	Low	Med. High	Med. Low	High
Responsibility	High	Med. Low	Low	Med. High
Speed and Inpatience Factor	Low	Med. Low	High	Med. High
Marital Coping ources	Med. High	Low	Med.Low	High

Overall Extent of Psychiatric Problems was defined using the 5 criterion ptom scales from the PSS evaluations. The asymptomatic controls were men never had a symptomatic criterion scale (116 of 135 possible men for this lysis). The mild cases had 1 criterion scale abnormal at only 1 of 5 examtions(45 of 52 possible men). The moderate cases had 1 or more criterion les abnormal at 2 or 3 of 5 examinations (46 of 54 possible men). Chronic es had 1 or more abnormal scales at 4 or 5 of 5 examinations (7 of 11 posle men). Reduced group sizes were due to missing or not applicable data some men.

Table 196 displays the classification accuracy of these discriminant functions. The specificity of these discriminant functions was 59.5%, representing the percent of controls correctly identified. Sensitivity was 37.8% for mild cases, 41.3% for moderate cases, and 28.6% for chronic cases of psychiatric difficulties. The overall percent exactly correct over 4 categories was 50.0%. A relatively high percentage of false positives (40.5%) was obtained, but a much lower rate of false negatives occurred (24.5%). The classification matrix indicates that the primary difficulty of the classification analyses was distinguishing between the amount of psychiatric difficulties as opposed to the simple asymptomatic versus case distinction. These results were not good enough to suggest that one could implement a system of predicting the extent of psychiatric problems, whereas previous results indicated that it would be much more feasible to implement a program distinguishing among men with a susceptibility to psychiatric problems.

TABLE 196

Classification Accuracy Of The
Most Parsimonious And Significant Discriminants
Between Overall Extent Of Psychiatric
Problem Groups*

	Asymptomatic Controls	Mild Cases	Moderate Cases	Chronic Cases
ificity--% of ols correctly ified	59.5%			
itivity--% of correctly ified		37.8%	41.3%	28.6%

Classification Matrix

		Asymptomatic	Mild	Moderate	Chronic	Totals
	Asymptomatic	69	14	20	13	116
al	Mild	12	17	7	9	45
ps	Moderate	11	11	19	5	46
	Chronic	1	2	2	2	7
						214

rall Percent Correct = 69+17+19 +2/214 = 50.0%
ent False Positives = 14+20+13/116 = 40.5%
ent False Negatives = 12+11+1/98 = 24.5%

Overall Extent of Psychiatric Problems was defined using the 5 criion symptom scales from the PSS evaluations. The asymptomatic controls men who never had a symptomatic criterion scale (116 of 135 possible for this analysis). The mild cases had 1 criterion scale abnormal at 1 of 5 examinations (45 of 52 possible men). The moderate cases had more criterion scales abnormal at 2 or 3 of 5 examinations (46 of 54 ible men). Chronic cases had 1 or more abnormal scales at 4 or 5 of xaminations (7 of 11 possible men). Reduced group sizes were due to ing or not applicable data for some men.

4. Onset of Specific Psychiatric Problems

We were also interested in the possibility of distinguishing between men who had developed specific kinds of problems for the first time during the study, and men who did not develop any psychiatric problems. Separate analyses were performed for subjective distress, impulse control disorders, work role disorders, mate role disorders, and alcohol abuse as evaluated in the Psychiatric Status Schedule examination. As described elsewhere for the "sliding interval" type of analysis, predictors were derived from the examinations preceding the development of problems in each of these areas. Predictor variable data for the asymptomatic controls were taken from certain examinations to match the number who became symptomatic for the first time at a particular examination. Table 197 displays the final set of the most parsimonious and significant intake discriminators between completely asymptomatic controls and new nine-month onset cases in these five psychiatric symptom areas.

Those who developed subjective distress for the first time had significantly lower work satisfaction, co-worker satisfaction, and tension discharge rates than asymptomatic controls. They also had significantly higher investment in their ATC identities and significantly higher distress from life changes preceding the development of their problems for the first time.

On the other hand, those who developed impulse control disorders were most distinguished from the asymptomatic controls by their high levels of investment in the ATC identity, high levels of subjective cost that controller work exacts from other areas of their lives, and high levels of drinking to cope.

Those who developed work role disorders had significantly lower work satisfaction but significantly higher subjective costs, life change distress, and drinking to cope, scores than did their asymptomatic controls.

Those who developed mate role problems were significantly different from the asymptomatic controls in that they had lower satisfaction with their co-workers, lower tension discharge rates, lower use of physical activities to cope, and higher life change units assessed with the Paykel, Uhlenhuth, and Prusoff Inventory.

Those who developed alcohol abuse had significantly higher use of drinking to cope, more life change units and higher shift change costs compared to their asymptomatic controls.

It is important to remember that all of these assessments occurred at the time that these onset cases were asymptomatic. Therefore, even though it is possible that they may have been preclinical at that time, it is also possible that some of the controls

TABLE 197

The Most Parsimonious And Significant Intake Discriminators Between Completely Asymptomatic Controls(N=131-135) And New, 9-Month, Onset Cases In Five Psychiatric Symptom Areas: Common And Distinctive Contrasts*

	Subjective Distress (N=25)	Impulse Control (N=68)	Work Role (N=72)	Mate Role (N=51)	Alcohol Abuse (N=44)
faction	Low	_____	Low	_____	_____
Satisfaction	Low	_____	_____	Low	_____
scharge Rate	Low	_____	_____	Low	_____
	High	High	_____	_____	_____
Costs	_____	High	High	_____	_____
Change Distress	High	_____	High	_____	_____
Drinking	_____	High	High	_____	High
Physical Activities	_____	_____	____	Low	_____
Change Units	_____	_____	____	High	High
e Costs	_____	_____	____	_____	High

of psychiatric problems in each of the five criterion areas was the first occurrence of significant symptomatology after intake ng those with any significant symptomatology at intake. Asymptrols were sampled proportionately and randomly from examinading to the proportion found symptomatic at an examination. "Low" refers to the onset cases in comparison to controls. The onious set of predictors were derived from the complete set of univariate discriminants between groups using a simultaneous ultivariate discriminant analysis.

re sampled at the same time were pre-clinical as well. By rge, the results in Table 197 indicate that particular psych- disorders are predicted by some distinctive variables as s by some common characteristics.

These variables were then all placed into respective discrimi- functions for classifying the subjects as either cases or ols in each of these five areas of psychiatric dysfunctions. 198 displays the classification accuracy of the discriminant ions.

The specificity of the discriminant functions was quite good, ng from 70.4% for impulse control disorders to 84.3% for ctive distress disorders. The sensitivity of the discriminant tions also was quite good, ranging from 64.0% for subjective ress to 72.7% for alcohol abuse cases. The overall percent ct range from a low of 60.5% for impulse control disorders to gh of 81.1% for subjective distress disorders.

This relatively sophisticated methodology indicated that it ot only possible but perhaps feasible to distinguish men who lop particular problems over a set period of time from those do not develop those problems. The results for specificity sensitivity for particular kinds of problems are much better n they were for the overall psychiatric variables of susceptibility extent of problems.

Classification Accuracy Of The Most Parsimonious And Significant Intake Discriminators Between Completely Asymptomatic Controls (N=131-135) And New, 9-Month, Onset Cases In Five Psychiatric Symptom Areas

	Subjective Distress (N=25 cases vs 134 controls)	Impulse Control (N=68 cases vs 135 controls)	Work Role (N=72vs134 controls)	Mate Role (N=51 cases vs 131 controls	Alcohol Abuse N=44 cases vs 132 controls)
SPECIFICITY					
Actual % Correct--Asymptomatic	84.3	70.4	71.6	78.6	79.5
SENSITIVITY					
Actual % Correct--New Onset	64.0	67.6	68.1	70.6	72.7
Overall % Correct--Total	81.1	69.5	70.4	76.4	77.8
% False Asymptomatic of Symptomatic	36.0	32.0	32.0	29.0	27.0
% False New Onset of Asymptomatic	16.0	30.0	28.0	21.0	20.0

5. Monthly Depression Morbidity

In addition to evaluation of psychiatric status at Boston University, we evaluated self-reported depressive and anxiety episodes on a monthly basis after the second examinations at Boston University. Men were grouped into asymptomatic controls, acute cases, intermittent cases, or chronic cases according to their frequency of depressive or anxiety episodes. These groups were then contrasted in terms of their health history, field measures, and psychological measures at Boston University as well as on the job.

Table 199 displays significant health history, workload, blood pressure, and mild to moderate health change differences among the monthly depression morbidity groups. The use of tranquilizers in the six months prior to intake was significantly different among the depression morbidity groups. Men who became chronic cases of monthly depression had significantly higher use of tranquilizers prior to coming into the study, in spite of the fact that men who had subjective distress difficulties on the PSS evaluations at intake were excluded to prevent circularity in these findings. In addition, men who were acute or chronic cases of depression on a monthly basis used significantly more sleeping pills prior to intake than did those who were intermittent or asymptomatic cases.

The remaining variables on Table 199 are average assessments of field measures over three or more field studies. The results showed that asymptomatic controls had a significantly lower average timeload on the job than men who were acute, intermittent or chronic cases. The case groups did not differ among themselves on this particular variable.

The average psychological response to work was highest among those who became chronic cases, next highest among those who were intermittent cases, and lowest among those who were acute cases of depressive disorders. This result indicated that those who were chronic cases of depressive disorders on a monthly basis tended to feel that their workload on the job was much higher than it was rated according to our objective measures. On the other hand, those men who experienced only a few depressive episodes rated their job difficulty less than the objective difficulty that we assessed.

The average systolic range at work, controlling for average systolic blood pressure at work, over three or more field studies also differentiated between the case groups but not between the case and control groups. Chronic cases of depression and intermittent cases of depression had significantly higher average systolic range at work than did men who were acute cases. The

TABLE 199

Significant Health History, Workload, Blood Pressure Response To Work And Mild-To-Moderate Health Change Differences Among Monthly Depression Morbidity Groups*

Predictive Characteristics	Asymptomatic Controls N=169 Mean (S.D.)	Acute Cases N=42 Mean (S.D.)	Intermittent Cases N=18 Mean (S.D.)	Chronic Cases N=5 Mean (S.D.)	F	p
Use of tranquilizers in six months prior to intake (0=none, 1=monthly, 2=bi-weekly, 3=weekly, 4=daily)	.02 (.16)	.09 (.43)	.06 (.24)	.60 (1.35)	9.19	.0001
Use of sleeping pills in six months prior to intake (0=none, 1=monthly, 2=bi-weekly, 3=weekly, 4=daily)	.04 (.22)	.16 (.53)	.00 (.00)	.20 (.63)	4.10	.02
Average Timeload over three or more field studies (Timeload = total time on position + maximum consecutive time on position)	13.85 (2.06)	14.58 (1.74)	14.78 (2.32)	14.79 (2.15)	3.36	.02
Average Psychological Response to Work over three or more field studies (>100=subjective difficulty higher than actual objective difficulty; <100 = subjective difficulty less than actual objective difficulty; s.d.=10, Mean = 100)	100.17 (5.09)	98.86 (6.03)	102.54 (4.40)	103.24 (4.32)	3.61	.02
Average Systolic Range at Work, controlling for average systolic B.P. at work, over three or more field studies	.02 (5.72)	-1.32 (5.33)	3.79 (9.37)	.72 (4.06)	3.06	.03
Average Annualized Rate of Mild-to-Moderate Injuries (only for those with at least 1 internal with 5 returned Monthly Health Reviews)-Number of months, on the average, in which an injury was sustained out of 12	.48 (.69)	.58 (.70)	.94 (.87)	.73 (.91)	2.91	.03

TABLE 199 cont'd.

Footnotes

tes with Subjective Distress difficulties on the PSS evaluation at intake
re excluded (N=20). Classifications of monthly depression were based on
average annual rate of depression episodes between the second and fifth
minations at B.U. The predictive characteristics were assessed at the
cond examination which preceded the monthly questionnaire evaluations.
mptomatic controls were defined as having an average annual rate of less
n 1 monthly episode per year; acute cases had a rate of 1-2.9 monthly
isodes per year; intermittent cases had a rate of 3-8.9 monthly episodes
year; chronic cases had 9+ monthly episodes per year. A total of 234 men
e included in these analyses after excluding those without health his-
y or three or more field studies.

asymptomatic controls had almost exactly the average systolic range at work of the total study group.

Finally, the average annualized rate of mild to moderate injuries was significantly higher for the intermittent and chronic groups than for the asymptomatic and acute groups. Men with intermittent and chronic depressive episodes had the highest rates of injuries, whereas the asymptomatic controls had the lowest rate of injuries.

Table 200 displays the job specific and life change differences among the monthly depression morbidity groups. The chronic cases were notable by scoring very low on the assertive good controller factor on the ATC Questionnaire, scoring very high on the psychophysiological anxiety reaction factor, scoring very high on the subjective cost factor, scoring very high on the burnout factor, by having very low social coping resource scores and by having an extremely high life change distress total for the six months prior to intake. The results on all of these scales were almost linear and monotonically increasing from low levels for chronics to high levels for controls.

More general job-related attitudes and dispositional variables were assessed by means of the Job Description Inventory, the Kavanagh Life Attitude Profile, and the Jenkins Activity Survey. (Table 201). Chronic cases scored very low on work satisfaction, co-worker satisfaction, and group satisfaction. They were very dissatisfied with FAA management policy, but on the other hand very satisfied with FAA training policy. They tended to score in the Type A speed and impatience direction on the JAS. On the other hand, the asymptomatic controls in particular scored relatively high on JDI work satisfaction and co-worker satisfaction scales, and on the KLAP group satisfaction index. They were also relatively satisfied with managerial and training policies. They scored in the Type B direction on the JAS speed and impatience factor.

Table 202 displays differences among the monthly depression morbidity groups on the California Psychological Inventory scales. There were obviously a large number of highly significant differences between these groups with the chronic cases of depression appearing most abnormal on all scales. And as expected, the asymptomatic controls scored more nearly normal according to the CPI normative statistics. From an overall standpoint, one would say that those who were asymptomatic in depression over the course of the study were most similar to normal comparison groups, and the case groups were deviant.

All of the preceding significant differences among the monthly depression groups were subjected to a multi-variate discriminant

TABLE 200

Job-Specific And Life Change Differences
Among Monthly Depression Morbidity Groups*

ictive Characteristics	Asympto-matic Controls N=230 Mean (S.D.)	[illegible] Mean (S.D.)	ter-tent es Mean (S.D.)	Chronic Cases N=11 Mean (S.D.)	F	p
ATC Questionnaire Review of Life Events urst, Jenkins and Rose						
Q Good Controller Factor	47.85 (8.93)	46.34 (10.68)	48.79 (8.28)	38.82 (7.87)	3.75	.02
Q Psychophysiological ety Reaction Factor	47.08 (7.73)	49.33 (8.88)	51.33 (10.69)	54.64 (7.09)	5.04	.003
Q Subjective Costs Factor	48.44 (9.50)	51.43 (9.03)	52.28 (8.04)	55.27 (8.01)	4.38	.006
Q Bounceback(High)-nout (Low) Factor	50.17 (8.72)	46.69 (9.61)	47.33 (9.98)	41.82 (5.95)	5.54	.002
Q Social Coping Resources tor	50.12 (9.69)	45.73 (9.18)	45.11 (8.23)	45.46 (9.17)	5.39	.002
E Life Change Distress al	196.96 (188.37)	242.88 (244.98)	254.67 (261.36)	536.46 (436.97)	8.58	.0001

es with Subjective Distress difficulties on the PSS evaluation at intake e excluded (N=20). Classifications of monthly depression were based on average annual rate of depression episodes between the second and fifth minations at B.U. The predictive characteristics were assessed at the cond examination which preceded the monthly questionnaire evaluations. ymptomatic controls were defined as having an average annual rate of less n 1 monthly episode per year; acute cases had a rate of 1-2.9 monthly isodes per year; intermittent cases had a rate of 3-8.9 monthly episodes r year; chronic cases had 9 + monthly episodes per year. A total of 333 n were included in these analyses.

TABLE 201

General Job-Related Attitudinal And Dispositional Differences Among Monthly Depression Morbidity Groups*

dictive Characteristics =Job Description Inven- y, KLAP=Kavanagh Life ltude Profile, JAS= kins Activity Survey	Asympto-matic Controls N=230 Mean (S.D.)	Acute Cases N=74 Mean (S.D.)	Inter-mittent Cases N=18 Mean (S.D.)	Chronic Cases N=11 Mean (S.D.)	F	p
Work Satisfaction	48.44 (9.11)	46.30 (10.05)	43.50 (8.00)	37.82 (12.99)	6.11	.0007
Co-Worker Satisfaction	53.40 (10.23)	50.19 (10.54)	45.28 (9.96)	39.82 (11.94)	9.75	.0001
Group Satisfaction	53.72 (9.13)	52.12 (8.56)	53.83 (8.81)	45.55 (8.31)	3.33	.02
sfaction with FAA gement Policy	49.94 (9.14)	46.34 (9.54)	49.39 (7.30)	46.73 (6.84)	3.18	.03
sfaction with FAA ning Policy	48.41 (9.89)	51.28 (9.90)	47.39 (9.40)	54.00 (7.13)	2.70	.05
Speed And Inpatience or	-3.58 (8.81)	-1.27 (9.44)	2.16 (9.24)	1.70 (11.44)	3.90	.01

s with Subjective Distress difficulties on the PSS evaluation at intake excluded (N=20). Classifications of monthly depression were based on verage annual rate of depression episodes between the second and fifth inations at B.U. The predictive characteristics were assessed at the nd examinations which preceded the monthly questionnaire evaluations. ptomatic controls were defined as having an average annual rate of less l monthly episode per year; acute cases had a rate of 1-2.9 monthly des per year; intermittent cases had a rate of 3-8.9 monthly episodes year; chronic cases had 9+ monthly episodes per year. A total of 333 are included in these analyses.

TABLE 202
California Psychological Inventory Differences
Among Monthly Depression Morbidity Groups*

ctive Characteristics alifornia Psychological tory	Asympto-matic Controls N=230 Mean (S.D.)	Acute Cases N=74 Mean (S.D.)	Inter-mittent Cases N=18 Mean (S.D.)	Chronic Cases N=11 Mean (S.D.)	F	p
ominance	57.35 (11.08)	53.01 (12.30)	51.61 (11.88)	46.73 (14.75)	5.88	.001
apacity for Status	52.64 (8.26)	48.76 (9.39)	51.11 (9.51)	47.18 (13.46)	4.59	.004
ociability	53.85 (8.65)	49.46 (10.46)	48.11 (10.43)	49.00 (12.20)	6.07	.001
ocial Presence	53.90 (9.38)	55.84 (10.44)	57.33 (10.83)	51.46 (14.29)	5.25	.002
ense of Well-Being	51.96 (9.46)	46.32 (9.03)	48.78 (10.49)	37.91 (11.59)	14.71	.0001
esponsibility	43.18 (9.93)	39.14 (10.40)	36.56 (9.70)	36.73 (11.15)	5.72	.002
ocialization	48.47 (8.64)	45.03 (9.03)	43.83 (8.33)	44.09 (11.63)	4.48	.005
elf-Control	49.78 (8.64)	44.70 (8.18)	46.78 (6.36)	42.82 (11.00)	7.47	.0002
olerance	49.87 (8.72)	46.27 (8.47)	47.11 (8.45)	43.55 (10.83)	4.76	.004
ood Impression	46.99 (10.00)	41.19 (9.24)	44.89 (10.20)	39.36 (11.48)	7.81	.0002
ommunality	55.48 (6.60)	53.22 (8.33)	52.22 (6.03)	49.09 (10.74)	4.43	.005
Achievement-Conformity	53.88 (8.25)	46.89 (9.72)	48.61 (9.41)	44.73 (11.53)	15.19	.0001
Intellectual Efficiency	50.79 (9.17)	45.84 (9.11)	47.44 (10.33)	44.18 (12.76)	6.65	.0004
Psychological Mindedness	55.47 (8.46)	52.11 (8.94)	53.67 (8.51)	51.91 (14.05)	3.12	.03

TABLE 202 cont'd.

Footnotes

*
Cases with Subjective Distress difficulties on the PSS evaluation at intake were excluded (N=20). Classifications of monthly depression were based on the average annual rate of depression episodes between the second and fifth examinations at B.U. The predictive characteristics were assessed at the second examination which preceded the monthly questionnaire evaluations. Asymptomatic controls were defined as having an average annual rate of less than 1 monthly episode per year, acute cases had a rate of 1-2.9 monthly episodes per year; intermittent cases had a rate of 3-8.9 monthly episodes per year; chronic cases had 9+ monthly episodes per year. A total of 333 men were included in these analyses.

is. Table 203 displays the most parsimonious and significant minants among these groups. Only three variables accounted e majority of differences between the monthly depression s. These variables were the CPI sense of well-being, the ROLE change distress total for the six months prior to intake, and DI co-worker satisfaction scales. The asymptomatic controls d highest on the CPI sense of well being and JDI co-worker faction scales, and lowest on the ROLE life change distress l, whereas the chronic cases scored in exactly the opposite tern on these three scales.

The discriminant functions derived from these analyses were n used to classify subjects predictively. Table 204 displays classification accuracy of the discriminant functions. The cificity was 57.2% for the asymptomatic controls. Sensitivity, presenting the percent of cases correctly identified, was 36.5% r acute cases, 38.9% for intermittent cases, and 45.4% for chronic ases. The overall percent of correct classifications was 51.2%. very high false positive rate of 42.8% was found and a relatively ow rate of 21.4% was found for false negatives. As in previous nalyses the major difficulty in making accurate classifications as found in differentiating among the case groups as can be seen in the classification matrix of Table 204. The specificity and sensitivity of these analyses would not be sufficient for implementation in a risk identification program. Further work would need to be done on developing the discriminant functions or one might need to revert to a simple case versus control comparison to improve the predictive classifications sufficiently for an implementation program.

TABLE 203

The Most Parsimonious And Significant Discriminants Among Monthly Depression Groups*

riminant cteristic	Asymptomatic Controls N=229	Acute Cases N=74	Intermittent Cases N=18	Chronic Cases N=11
Sense of -Being	High	Med. Low	Med.High	Low
Life e Total	Low	Med. Low	Med.High	High
Co-Worker faction	High	Med. High	Med.Low	Low

with Subjective Distress difficulties on the PSS evaluation were ded (N=20). Classifications of monthly deperssion were based on verage annual rate of depression episodes between the second and examinations at B.U. The predictive characteristics were asse- at the second examination which preceded the monthly question- evaluations. Asymptomatic controls were defined as having an ge annual rate of less than 1 monthly episode per year; acute had a rate of 1-2.9 monthly episodes per year; intermittent had a rate of 3-8.9 monthly episodes per year; chronic c. es had nthly episodes per year. A total of 332 men were included in analyses.

TABLE 204

Classification Accuracy Of The Most Parsimonious And Significant Discriminants Among Monthly Depression Groups*

	Asymptomatic Controls	Acute Cases	Intermittent Cases	Chronic Cases
city-% ols y led	57.2%			
vity-% of orrectly led		36.5%	38.9%	45.4%

Classification Matrix

	Predicted Groups				
	Asymptomatic Controls	Acute Cases	Intermittent Cases	Chronic Cases	Totals**
Asymptomatic	131	33	44	21	229
Acute	17	27	19	11	74
Intermittent	5	2	7	4	18
Chronic	0	2	4	5	11
					332

l Percent Correct = 51.2%
t False Positives = 42.8%
t False Negatives = 21.4%

with Subjective Distress difficulties on the PSS evaluation were ded (N=20). Classifications of monthly depression were based on verage annual rate of depression episodes between the second and examinations at B.U. The predictive characteristics were assessed e second examination which preceded the monthly questionnaire evalns. Asymptomatic controls were defined as having an average annual of less than 1 monthly episode per year; acute cases had a rate of monthly episodes per year; intermittent cases had a rate of 3-8.9 ly episodes per year; chronic cases had 9+ monthly episodes per A total of 332 men were included in these analyses.

6. Monthly Anxiety Morbidity

Table 205 displays the significant workload, psychological response to work and mild to moderate health change differences among the monthly anxiety morbidity groups. The asymptomatic controls had a significantly lower average normalized workload over three or more field studies compared to any of the case groups. The highest levels of normalized workload were achieved by the acute and chronic cases. It is not known whether the higher level of workload resulted in the higher rates of depression, or if the men who were depressed worked more in order to avoid focusing on their depressed feelings, since the average normalized workload was computed over the course of the study and is only an associated and not predictive characteristic.

The chronic cases also had a significantly higher average psychological response to work indicating that they perceived their workload as higher than the actual objective workload that we measured. Acute cases estimated their workload at levels significantly lower than what we assessed with our objective difficulty measures. Asymptomatic controls scored exactly at the average.

Table 206 displays job specific and life change differences among the monthly anxiety morbidity groups. On the ATC Questionnaire chronic cases scored significantly higher on the psychophysiological anxiety reaction factor, significantly lower on the tension discharge rate factor, significantly higher on subjective cost, significantly lower on bounceback-burnout factor, significantly lower on the marital coping resources factor, and moderately low on the social coping resource factor. They also scored extremely high on the ROLE life change distress total for the six months prior to intake. The asymptomatic controls scored in exactly the opposite way as the chronic cases, and the acute and intermittent cases scored between these two groups. These results were all predictive in nature as opposed to the prior table of results which were concurrent.

Table 207 displays general job-related and dispositional differences among the monthly anxiety morbidity groups. The JDI work satisfaction, co-worker satisfaction, and pay satisfaction scales were significantly lower among the chronic cases of anxiety than among the asymptomatic controls. The chronic cases also were significantly less satisfied with individual job related characteristics and were significantly less satisfied with group related job characteristics, both as assessed by the Kavanagh Life Attitude Profile. The intermittent and chronic cases also scored significantly lower than the other groups on the satisfaction with FAA managerial and promotional policy scales. Finally, there was a tendency for intermittent and chronic cases to score high on the

TABLE 205

Significant Workload, Psychological Response to Work, And Mild-To-Moderate Health Change Differences Among Monthly Anxiety Morbidity Groups*

Associated Characteristics	Asymptomatic Controls N=217 Mean (S.D.)	Acute Cases N=60 Mean (S.D.)	Intermittent Cases N=18 Mean (S.D.)	Chronic Cases N=8 Mean (S.D.)	F	p
Average Normalized Workload over three or more field studies	496.01 (22.32)	504.67 (25.30)	500.83 (20.43)	505.13 (22.22)	2.60	.05
Average Psychological Responses to work over 3 or more field studies (> 100= subjective difficulty higher than actual objective difficulty; <100= subjective difficulty less than actual objective difficulty; S.D.= 10, Mean = 100	100.26 (5.07)	98.62 (5.96)	100.95 (5.34)	104.77 (4.51)	3.91	.01

*Cases with Subjective Distress difficulties on the PSS evaluation were excluded (N=20). Classifications of monthly anxiety were based on the average annual rate of anxiety episodes between the second and fifth examinations at B.U. The predictive characteristics were assessed at the second examination which preceded the monthly questionnaire evaluations. Asymptomatic controls were defined as having an average annual rate of less than 1 monthly episode per year; acute cases had a rate of 1-2.9 monthly episodes per year; intermittent cases had a rate of 3-8.9 monthly episodes per year; chronic cases had 9+ monthly episodes per year. A total of 303 men were included in these analyses after excluding those without three or more field studies.

TABLE 206

Job-Specific And Life Change Differences
Among Monthly Anxiety Morbidity Groups*

ctive Characteristics = ATC Questionnaire = Review of Life Events rst, Jenkins, and Rose	Asympto-matic Controls N=241 Mean (S.D.)	Acute Cases N=64 Mean (S.D.)	Inter-mittent Cases N=20 Mean (S.D.)	Chronic Cases N=8 Mean (S.D.)	F	p
Psychophysiological ety Reaction Factor	46.67 (7.44)	50.71 (9.65)	53.80 (8.71)	54.50 (7.60)	9.92	.0001
Tension Discharge Factor	50.87 (9.15)	47.31 (10.41)	41.60 (8.23)	43.75 (7.31)	8.92	.0001
Subjective Costs or	48.47 (9.12)	51.84 (10.23)	53.45 (7.93)	56.50 (7.76)	5.09	.003
Q Bounceback (High)-out (Low) Factor	50.12 (8.91)	47.52 (9.37)	44.10 (8.58)	41.00 (4.90)	5.79	.001
Q Marital Coping ources Factor	49.53 (9.46)	50.07 (9.08)	43.88 (12.56)	44.25 (8.23)	2.64	.05
Q Social Coping ource Factor	49.54 (9.33)	47.63 (10.98)	43.30 (7.72)	46.88 (9.72)	3.09	.03
LE Life Change tress Total	195.66 (200.76)	278.53 (231.32)	274.75 (298.53)	388.88 (448.51)	4.41	.005

ses with Subjective Distress difficulties on the PSS evaluation at intake re excluded (N=20). Classifications of monthly anxiety were based on the erage annual rate of anxiety episodes between the second and fifth exami-tions at B.U. The predictive characteristics were assessed at the second xamination which preceded the monthly questionnaire evaluations. Asympto-tic controls were defined as having an average annual rate of less than monthly episode per year; acute cases had a rate of 1-2.9 monthly episodes er year; intermittent cases had a rate of 3-8.9 monthly episodes per year; hronic cases had 9+ monthly episodes per year. A total of 333 men were ncluded in these analyses.

TABLE 207

General Job-Related And Dispositional Differences Among Monthly Anxiety Morbidity Groups*

dictive Characteristics = Job Description Inventory; KLAP= Kavgh Life Attitude Profile = Jenkins Activity Survey	Asymptomatic Controls N=241 Mean (S.D.)	Acute Cases N=64 Mean (S.D.)	Intermittent Cases N=20 Mean (S.D.)	Chronic Cases N=8 Mean (S.D.)	F	p
Work Satisfaction	47.92 (9.38)	47.95 (9.62)	41.60 (8.39)	39.75 (13.34)	4.54	.005
Co-Worker Satisfaction	53.03 (10.26)	50.88 (10.66)	43.75 (11.22)	42.13 (12.04)	7.55	.0002
Pay Satisfaction	49.42 (9.45)	49.50 (9.98)	47.80 (10.04)	40.00 (8.21)	2.67	.05
P Individual Satisfaction	52.74 (8.76)	51.47 (9.01)	42.25 (7.89)	43.63 (6.12)	4.36	.005
P Group Satisfaction	53.47 (8.90)	53.66) (9.21)	49.05 (7.37)	47.86 (12.04)	2.48	.05
lsfaction with FAA agement Policy	49.60 (9.52)	48.63 (8.30)	43.53 (6.84)	47.63 (6.16)	2.84	.04
lsfaction with FAA notional Policy	49.60 (9.37)	48.33 (10.12)	43.45 (6.89)	46.38 (5.37)	3.02	.03
Speed and Impatience Factor	-3.59 (8.80)	-1.30 (9.29)	4.98 (8.38)	-1.35 (12.76)	6.25	.0006

s with Subjective Distress difficulties on the PSS evaluation at intake excluded (N=20). Classifications of monthly anxiety were based on the rage annual rate of anxiety episodes between the second and fifth examinas at B.U. The predictive characteristics were assessed at the second ination which preceded the monthly questionnaire evaluations. Asymptoic controls were defined as having an average annual rate of less than 1 hly episode per year; acute cases had a rate of 1-2.9 monthly episodes year; intermittent cases had a rate of 3-8.9 monthly episodes per year; nic cases had 9+ monthly episodes per year. A total of 333 men were uded in these analyses.

JAS Speed and Impatience factor especially as contrasted with the asymptomatic control subjects.

Table 208 displays the California Psychological Inventory differences among the monthly anxiety morbidity groups. The results were very similar to those for the monthly depression morbidity groups inasmuch as the case groups deviated considerably from the norms, whereas the asymptomatic controls were much more similar to the original normative groups on which the CPI scoring was devised.

Finally, we once again submitted the variables which were significantly different between the morbidity groups to a multivariate discriminant analysis. Table 209 displays the most parsimonious and significant discriminants among these groups. Only three variables accounted for all the significant differences between the monthly anxiety morbidity groups. The ATC Questionnaire psychophysiological anxiety reaction factor, the ATC Questionnaire tension discharge rate factor and the ROLE life change distress total accounted for all of the significant differences between these groups. Table 209 also indicates the relative standing of anxiety groups on these three variables.

The discriminant functions using these three variables were then applied in the classification analysis. Table 210 displays the results of the classification analysis.

The results of the classification analysis were not particularly good. The specificity was only 53.1%. Sensitivity was calculated at 15.4% for acute cases, 56.2% for intermittent cases, and 28.6% for chronic cases. The overall percent correct was 45.4%, a very low figure. And conversely, the percentages of false positives and false negatives were very high at 46.9% and 37.3% respectively.

Although statistically significant, these results were not sufficiently good to suggest that an accurate risk identification program could be implemented for persons with varying degrees of anxiety episodes. Again, further analyses and refinements of our methodology might result in a program of implementable risk identification procedures.

TABLE 208

California Psychological Inventory Differences Among Monthly Anxiety Morbidity Groups*

Predictive Characteristics CPI= California Psychological Inventory	Asymptomatic Controls N=241 Mean (S.D.)	Acute Cases N=64 Mean (S.D.)	Intermittent Cases N=20 Mean (S.D.)	Chronic Cases N=8 Mean (S.D.)	F	p
CPI Dominance	57.00 (11.03)	52.86 (12.61)	53.65 (14.18)	45.38 (12.92)	4.61	.004
CPI Capacity for Status	52.51 (9.61)	49.11 (8.36)	48.35 (10.40)	48.75 (13.86)	3.72	.02
CPI Sociability	53.55 (9.03)	49.44 (10.31)	48.80 (9.00)	50.50 (10.46)	4.43	.005
CPI Social Presence	59.85 (9.84)	55.50 (9.55)	55.70 (11.34)	52.00 (10.50)	5.13	.003
CPI Sense of Well-Being	51.99 (8.47)	46.78 (9.34)	42.00 (10.64)	38.75 (11.44)	16.61	.0001
CPI Responsibility	42.75 (10.13)	40.03 (10.13)	37.30 (11.09)	34.75 (7.32)	3.94	.009
CPI Socialization	48.24 (8.29)	45.92 (9.49)	40.80 (10.59)	46.63 (9.02)	5.21	.002
CPI Self-Control	49.13 (8.31)	46.66 (8.08)	40.90 (11.78)	44.50 (9.58)	6.99	.0003
CPI Tolerance	49.90 (8.44)	46.64 (8.84)	43.35 (11.03)	44.13 (7.75)	6.21	.0007
CPI Good Impression	46.18 (10.11)	44.34 (9 63)	40.80 (11.42)	39.13 (10.09)	3.11	.03
CPI Communality	55.48 (6.97)	52.98 (7.41)	51.70 (7.41)	50.25 (9.74)	4.36	.006
CPI Achievement-Conformity	53.35 (8.60)	48.78 (9.49)	44.20 (10.50)	45.75 (9.91)	10.90	.0001
CPI Intellectual Efficiency	50.71 (9.24)	46.30 (8.61)	43.75 (11.71)	44.13 (10.76)	7.24	.0003
CPI Psychological Mindedness	55.43 (8.69)	53.38 (8.35)	52.05 (8.58)	50.00 (14.50)	3.35	.02
CPI Feminity	47.20 (8.10)	50.03 (9.06)	51.65 (5.46)	48.50 (7.39)	3.57	.02

TABLE 208 cont'd.

Footnotes

with Subjective Distress Difficulties on the PSS evaluation at
e were excluded (N=20). Classifications of monthly anxiety were
on the average annual rate of anxiety episodes between the second
fifth examinations at B.U. The predictive characteristics were
ssed at the second examination which preceded the monthly question-
evaluations. Asymptomatic controls were defined as having an
age annual rate of less than 1 monthly episode per year; acute
s had a rate of 1-2.9 monthly episodes per year; intermittent cases
a rate of 3-8.9 monthly episodes per year; chronic cases had 9+
thly episodes per year. A total of 333 men were included in these
lyses.

TABLE 209

The Most Parsimonious And Significant Discriminants Among Monthly Anxiety Groups*

Discriminant Characteristics	Asymptomatic Controls N=241	Acute Cases N=64	Intermittent Cases N=20	Chronic Cases N=8
ATC Questionnaire: Psychophysiological Anxiety Reaction Factor	Low	Med Low	Med High	High
ATC Questionnaire: Tension Discharge Rate Factor	High	Med High	Low	Med Low
HOLE Life Change Distress Total	Low	Med High	Med Low	High

*Cases with Subjective Distress difficulties on the PSS evaluation were excluded (N=20). Classifications of monthly anxiety were based on the average annual rate of anxiety episodes between the second and fifth examinations at B.U. The predictive characteristics were assessed at the second examinations which preceded the monthly questionnaire evaluations. Asymptomatic controls were defined as having an average annual rate of less than 1 monthly episode per year; acute cases had a rate of 1-2.9 monthly episodes per year; intermittent cases had a rate of 3-8.9 monthly episodes per year; chronic cases had 9+ monthly episodes per year. A total of 333 men were included in these analyses.

TABLE 210

Classification Accuracy Of The Most Parsimonious And Significant Discriminants Among Monthly Anxiety Groups*

	Asympto-matic Controls	Acute Cases	Inter-mittent Cases	Chronic Cases
Specificity --% of controls correctly identified	53.1%			
Sensitivity --% of cases correctly identified		15.4%	56.2%	28.6%

Classification Matrix

		Predicted Groups				
		Asympto-matic Controls	Acute Cases	Inter-mittent Cases	Chronic Cases	Totals**
Actual Groups	Asymptomatic	104	38	31	23	196
	Acute	24	8	15	5	52
	Intermittent	3	0	9	4	16
	Chronic	1	1	3	2	7
						271

Overall Percent Correct = 45.4%

Percent False Positive = 46.0%

Percent False Negative = 37.3%

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* Cases with Subjective Distress difficulties on the PSS evaluation were excluded (N=20). Classifications of monthly anxiety were based on the average annual rate of anxiety episodes between the second and fifth examinations at B.U. The predictive characteristics were assessed at the second examination which preceded the monthly questionnaire evaluations. Asymptomatic controls were defined as having an average annual rate of less than 1 monthly episode per year; acute cases had a rate of 1-2.9 monthly episodes per year; intermittent cases had a rate of 3-8.9 monthly episodes per year; chronic cases had 9+ monthly episodes per year.

** The reduced number of subjects is due to the fact that all subjects must have all variables to permit discriminant and classification analyses.

7. Psychiatric Status vs Other Outcomes

Psychiatric outcomes could be considered one of the softer areas in the study from the standpoint that one might question whether they make a difference to the Agency. Therefore, we investigated whether the psychiatric status classifications of individuals were related to other outcomes. Table 211 displays comparative statistics on psychiatric status assessed in the study and medical disqualifications from the FAA during the three years of the study. The top half of this table shows that only one in 135 asymptomatic controls were medically disqualified, whereas 9.1% of prevalence cases and 8.5% of incidence cases were so disqualified by the Federal Aviation Administration. The lower half of Table 211 shows that this association between psychiatric status in the study and being medically disqualified by the FAA was statistically significant. Of the 20 men who were medically disqualified by the FAA, 19 men had an abnormal psychiatric status as assessed by the study team. One person who was an asymptomatic control was disqualified for reasons not known to the study team. It is important to note that of these twenty cases, half were disqualified by the FAA for psychiatric reasons and half for medical reasons, indicating that psychiatric status was a risk factor for both medical and psychological disorders as assessed by FAA federal air surgeons.

Table 212 displays the relationship of FAA performance awards to other outcomes including the psychiatric outcomes assessed in the study. We found that the highest award group had somewhat fewer psychiatric problems at intake or later, and that men with chronic problems had the fewest awards. The asymptomatic group received more awards in general. However, there was no significant association between the monthly morbidity of depression or anxiety and FAA performance awards. And finally, as indicated in other sections of this report, there was no relationship between mild and moderate health changes or hypertension and FAA performance awards.

Psychiatric Status And Medical Disqualifications From The FAA

Group	Percent Medically Disqualified			
	No Psychiatric Problems Prior To Dropping From Study*	Asymptomatic Controls*	Prevalence Cases*	Incidence Cases*
Number and percent	3/65 = 4.6%	1/135 = 0.7%	9/99 = 9.1%	10/117 = 8.5%

Cross-tabulation Of Psychiatric Status In Study And Medical Disqualification By FAA

		Psychiatric Status In Study			
		Asymptomatic Controls	Prevalence Cases	Incidence Cases	Row Totals
Medically Disqualified By FAA?	YES	1 Observed (8) Expected	9 (6)	10 (6)	20
	NO	134 (127)	90 (93)	107 (111)	331
Column Totals		135	99	117	351

$x^2 = 10.92$ df = 2 $p < .01$

*No Psychiatric Problems Prior To Dropping From Study - these men (N=65) were not evaluated all 5 times and therefore could have developed problems we did not know about.
Asymptomatic - these men had no abnormalities on the 5 PSS criterion scales at all of their psychiatric evaluations.
Prevalence cases - these men had one or more symptomatic criterion scales on the PSS at intake.
Incidence cases - these men had one or more symptomatic criterion scales on the PSS after intake but not at intake.

TABLE 212

Relationship Of FAA Performance Awards To Other Outcomes

tcome	Relationship To Performance Awards
ceptibility to Psychiatric blems	Highest award group had fewest psychiatric problems at intake or later ($p < .10$)
ent of Psychiatric blems	Chronic problem group had fewest awards, No problem group more awards ($p < .20$)
thly Depression Morbidity	No significant relationships ($p > .50$)
thly Anxiety Morbidity	No significant relationships ($p > .50$)
d-to-Moderate Health nge Rate	No significant relationship ($p > .50$)
ertension	No Significant relationship ($p > .50$)

SUMMARY

Predictors of Work-Related Changes

Analysis of relationships between predictor variables and work-related changes produced the following associations:

1) Individuals who later developed burnout showed, at intake or Round 2, more vigor, friendliness and elation (measured by Profile of Mood States), less anxiety regarding work, better tension discharge rate, less coping by drinking and more coping by physical activity, less anxiety with training, and more assertiveness;
2) By the end of the study, men who developed burnout had more subjective distress than others;
3) Individuals who developed burnout did not show any differences in average amount of work done or time spent on position on the days they were monitored, nor did they show any deterioration in physical health;
4) Men who were promoted were generally more satisfied with FAA policies, had more personal job morale, were generally more hard-driving, dominant and job-involved, had more life change just before being promoted, had more peer nominations for competence, were slightly older and had slightly more experience than those not promoted. At the same time, those who were promoted rated themselves as more burned out on the bounceback-burnout question in the ATC Questionnaire;
5) Men who were medically disqualified during the course of the study were chosen much less often than others as ideal team members or as among the most competent, were not as invested in the job, had fewer marital resources, scored lower on feelings of well-being, responsibility, tolerance and intellectual efficiency, the last being the most important predictor emerging from a discriminant function analysis;
6) Analysis of PSS scores showed that psychiatric symptomatology either at intake or later was highly related to eventual medical disqualification;
7) Differences in the amount of work performed were in general not predictable; however, total time on position and time spent consecutively on position was related to age, the older men spending less time on position; those who spent less time on position also had higher rates of impulse control disorders and showed more coping by drinking;
8) Men who received more awards were chosen more frequently as ideal team members, as amicable and competent; they

received high ratings for coping on heavy days, coping with training and overall coping;

9) FAA performance awards were generally unrelated to other outcomes.

1. Burnout

After study of the four criterion variables defining burnout ver all five rounds of examinations, three groups of men were sel- cted for comparison. The burnout group was made up of those show- ng significant decline on at least two of the four criterion vari- bles, described in Section III E. The partial burnout group com- rised those who had one of four variables reaching criterion values. he comparison group showed no decline on any of these variables. excluded from all three groups men who were showing significant rnout at the beginning of the study as we were primarily inter- ted in studying predictors of developing burnout.

We were primarily interested in whether or not we could dis- minate between those who developed burnout and those who did not, ing data collected in our first two rounds of examinations. Psy- logical variables which did discriminate between these two groups listed in Table 213. This table shows that those individuals later developed burnout scored significantly higher at intake at the second round of examinations on a number of positive fac- s or variables. They had more vigor, friendliness and elation the Profile of Mood States (POMS). They showed less anxiety arding work on Round 1. They had a higher tension discharge rate Round 1. They coped by drinking less often than the comparison up (Round 1), coped by physical activity more often (Round 2), showed less anxiety with training on Round 2. They also showed assertiveness on Round 2, a measure of their interest in doing od job as a controller. Therefore, one would conclude that viduals who later developed burnout showed more psychological th early in the study than the comparison group. They did not t out as dissatisfied, as alienated or as having more anxiety, rather were committed, and from their own estimation as well he estimation of others, (they did not have significantly lower nominations in the beginning), were functioning as well or er than others.

We were concerned that some of the differences observed were o our definition of burnout. That is, men who showed signi- t declines on various factors later in the study scored higher ally on other factors because they were related to our defini- . We therefore reviewed the scores of the four variables used fine burnout, i.e., bounceback-burnout factor, competence nomi- s, work satisfaction and work role pathology. The men who developed burnout scored significantly higher than the compa- group only on the bounceback-burnout factor on Round 1 or 2, re no different on the other three. This suggested that the ences observed in the burnout group early in the study were tifacts of the definitions but reflected true differences these men in comparison to those who remained unchanged hout the course of the study.

TABLE 213

Psychological Variables Measured In The Beginning Of The Study That Differentiated Individuals Who Later Developed Burnout (Round 1 Or Round 2)

ychological riable	Comparison Group (N=96)	Burnout Group (N=35)
	Mean ± S.D.	
MS Vigor	51.5 ± 8.60	57.7 ± 9.11
MS Friendly	48.5 ± 8.55	53.9 ± 10.60
MS Elation	48.6 ± 7.98	54.1 ± 9.22
xiety Factor-Rnd 1	51.6 ± 8.78	48.5 ± 7.50
nsion Discharge Rate-Rnd 1	48.1 ±10.3	52.4 ± 9.38
pe by Drinking-Rnd 1	51.3 ± 8.94	48.9 ± 10.01
xiety with Training-Rnd 2	53.7 ± 8.45	50.7 ± 10.03
sertive Factor-Rnd 2	45.3 ± 9.27	49.8 ± 9.02
ysical Activity-Rnd 2	47.3 ± 9.20	51.3 ± 8.87

The men who developed burnout showed on Round 5 an increased incidence of subjective distress compared to the other two groups. This was impressive as none of these 35 men showed problems in subjective distress on the PSS on Round 1, as presented in Table 214. It was apparent that although they started out feeling good about themselves and scoring low on psychological distress in the beginning, during the course of the study and by Round 5 they were showing increased psychological problems compared to the control group. These observations suggested that some individuals (3/35) who developed burnout began to have behavior and psychological problems that were not present earlier.

It is notable that the individuals who did develop burnout did not show any differences in average amount of work done or time spent on position during the times they were physiologically monitored over the course of the study. Furthermore, they showed no differences in any of the physiological measures taken at work i.e., cortisol and blood pressure, nor did they show a higher incidence of hypertension or a higher incidence of mild to moderate health change. From these data it was apparent that their physical health, at least over the relatively short period of time that they were studied, was not undergoing a rapid deterioration, but their burnout status was associated with increased incidence of psychological problems, which perhaps if followed over a longer period of time, could result in a disruption of their work and place them at risk for future medical disqualification.

In some ways the men who developed burnout showed some of the characteristics observed in the mean at intake of those who were later promoted, and this is discussed in detail in the next section on promotions.

TABLE 214

Appearance Of Subjective Distress In Cases Of Burnout In The Fifth Round Of Examinations

	Round 1 Exam	Round 5 Exam
ation 46	0.053 ± .224 (n=13)	0.020 ± .141 (n=5)
rison Group 6	0.073 ± .261 (n=7)	0.010 ± .102 (n=1)
l Burnout 5	0.052 ± .223 (n=6)	0.009 ± .093 (n=1)
t	0.000 ± .000 (n=0)	0.086 ± .284 (n=3)
	F = 2.73	F = 4.49
	p = .09	p = .012

2. Promotion

As noted in Section III E. on Job Outcomes, 49 ATCs received promotions to supervisor during the course of the study. We reviewed the psychological and other data collected during the first and second visits for factors that would differentiate between men who were promoted in subsequent visits and those remaining journeyman controllers for all three years of the study.

Fifteen variables were found significantly to discriminate between those who were promoted and the comparison group (see Table 215). The comparison group consisted of men who were in the study for the entire 5 rounds and were not medically disqualified or did not drop out for personal reasons. One qualification that should be added is that of the 49 promotions, 7 took place prior to the second round of examinations. Round 2 data were not truly predictive but were associated with their being promoted. In a similar vein individuals might have learned that they were being considered seriously for promotion by the second visit. We were unsure how many men fell into this category, but realized that the situation did in some way reduce the predictive significance of some of the variables that were collected in the second round. Data collected in the first round were not affected.

In general, the men who were promoted were more satisfied with FAA policies, had higher amounts of personal job morale and were generally more hard-driving and more job-involved than those who were not promoted. The individuals who were promoted were also characterized by increased amounts of life change in the period of time prior to being promoted as well as by high scores on the dominance scale of the CPI. They were slightly older than those not promoted (37.8 vs. 35.9 years) and had slightly more years of experience (13.2 vs. 10.8 years).

Two variables that discriminated between these two groups deserve special mention. These are the increased frequency of peer competence nominations collected in Round 1 among those who were promoted as contrasted with the comparison group. Those who were promoted received on Round 1 an average of 2.67 nominations by their peers contrasted with only 1.84 nominations for the comparison group. This difference is highly significant, $F = 16.22$, $p < .0001$. At the same time that the men who were later promoted were receiving more competence nominations from their peers, they also were rating themselves as more burned out on the bounceback-burnout factor also collected on Round 1. The men who were promoted scored lower on the bounceback-burnout factor, indicating they thought themselves less able to bounceback and more likely to burnout. Their average score was 46.3 compared to 51.1, also highly significant, $F = 9.76$, $p < .005$.

TABLE 215

Variables That Differentiate Between Men Who Were Promoted And Others Remaining In The Study For All 5 Rounds Of Examinations
(Univariate Predictors)

Variable	Comparison Group	Promoted	F	p
	Means			
Peer competence nominations - Rnd 1	1.84	2.67	16.22	.0001
Age	35.90	37.80	5.46	.025
Years of Experience	10.80	13.20	10.75	.005
Investment Factor Rnd 1	49.20	52.50	4.38	.05
Bounceback-burnout Factor - Rnd 1	51.10	46.30	9.76	.005
Pay Satisfaction - Rnd 1	49.00	54.10	10.22	.005
Holmes-Rahe Life Change-Rnd 2	97.50	145.70	14.58	.001
Self Morale - Rnd 2	5 .40	58.90	29.75	.0001
Group Morale - Rnd 2	52.88	57.20	8.78	.005
Satisfaction with FAA Management Policy - Rnd 2	48.24	56.65	31.49	.0001
Satisfaction with FAA Promotion Policy - Rnd 2	47.91	57.26	38.14	.0001
MUP Life Change - Rnd 2	29.00	40.02	7.25	.01
Dominance Scale CPI - Rnd 2	55.57	62.11	12.87	.001
Job Involvement Factor (Type A) - Rnd 2	-5.25	-2.04	7.28	.01
Hard Driving Factor (Type A) - Rnd 2	-1.49	2.21	7.21	.01
Number of men	245	46		

Since both the bounceback-burnout factor and the peer nominations remained as significant discriminators between the two groups in the stepwise discriminant function analysis, some discussion of the presence of these two seemingly disparate factors is relevant.

The men who were later promoted did describe themselves early in the study as more burned out at the same time that they were showing more satisfaction with management and higher morale and were receiving significantly more peer nominations for competence. Therefore, one might conclude that these individuals viewed themselves as less able than they had been in the past, less able to bounceback, and more concerned about burnout. This occurred at the same time they were receiving a relatively high frequency of peer nominations for competence by team-mates. This finding, along with the finding that men who developed burnout scored high on many positive areas when they first entered the study, suggests that individuals who do feel more concerned with or more certain that they will burnout, may also be among the more competent individuals.

Further, it suggests that competent controllers can and do experience concerns about burnout, and as a matter of fact, ATCs with such concerns were more frequently represented among individuals who were promoted than among individuals who were not promoted. One might therefore speculate that burnout is not a characteristic of individuals who are poor controllers, but may relate to the concern that one will not be as good as one has been and will fall in the estimation of one's peers. As answers to the four questions comprising the burnout factor (bounceback-burnout) represented self estimations, we might conclude that developing lower scores, having more burnout concerns, may function as self-fulfilling prophecy. What is of note from this analysis of the promotion data is that these individuals did rate themselves as having more concern about burnout while they were still receiving high peer nominations for competence.

The eight variables that accounted for the most significant differences between the group who were promoted and the group not promoted, are noted in Table 216. The most important variable that remained was satisfaction with promotion policy of the FAA as measured at Round 2. For a few men, this finding may in some way have reflected either a recent promotion (9/49) or knowledge of a possible pending promotion. However, the bounceback-burnout factor remained as strong a discriminant variable as did competence nomination by peers. Life change was greater in individuals who were promoted, as were self-morale and dominance as measured on the CPI. The increased level of experience with the FAA remains a significant predictor although it was the weakest discriminator on the list with $F = 4.12$ when the other variables were taken into consideration. The combination of these eight variables in the stepwise discriminant function analysis

TABLE 216

Stepwise Discriminant Function Analysis Of Men Promoted Versus Those Remaining In Study

Step	Variable	F	P
1	Satisfaction with promotion policy of FAA	38.14	.0001
2	Bounceback-burnout factor	16.90	.0001
3	Peer competence nominations	15.40	.0001
4	Life change (Holmes & Rahe)	15.30	.0001
5	Self Morale	11.50	.001
6	Dominance CPI Scale	7.33	.01
7	Life Change (P & U)	4.25	.05
8	Experience	4.12	.05

Predicted correctly 37/46 - 80.4% promoted.

Predicted correctly 203/245 - 82.9% not promoted.

correctly predicted 80.4% of those promoted and 82.9% of those not promoted.

In summary, men who were promoted were characterized by higher satisfaction with FAA management policy, more peer nominations for competence, more concern (before they were promoted) with the specter of burnout, higher self-morale, and higher dominance scores.

3. Medical Disqualifications

There were 23 men who were medically disqualified during the course of the study. Eleven of these disqualifications were for psychiatric reasons and 12 were attributed to various physical problems. Eight of these men were medically disqualified in the first interval, i.e., between intake examination and the second examination. Fifteen of the 23 men, however, were present at both the intake exam and the second round, and information on their responses to various questionnaires given in these rounds was therefore available.

We examined the responses of these 15 men to see what variables might differentiate them from the individuals who remained in the study. We elected to compare individuals who were medically disqualified both for psychiatric and medical reasons with those who remained in the study but were not promoted. Thus the comparison group was made up of those who remained in the study for the entire time, were not promoted, were not disqualified and did not drop out for personal reasons.

Table 217 lists the variables that significantly discriminated medically disqualifed men from ATCs who remained in the study (by one-way analyses of variance). The men who were medically disqualified were chosen much less often by their peers as ideal team choices or as among the most competent. They also were given a lower investment score by the psychologists in the Round 1 interview. On Round 1 they also rated themselves as having less marital resources and scored lower on four scales of the California Psychological Inventory (CPI). They were lower on feelings of well being, responsibility, tolerance, and intellectual efficiency.

Step-wise discriminant function analysis of these eight predictors yielded four that contributed significantly and independently to predict those who were medically disqualified and those who were not, as shown in Table 218. The most important predictor was the CPI intellectual efficiency score, followed by the investment score, ideal team choices and marital resources. By this analysis, we correctly predicted 11 out of 15 men who were disqualified or 73.3%, and 188 of 245 or 76% of those remaining and not disqualified.

Although these variables did significantly discriminate and predict men who were medically disqualified, a more striking prediction came from analysis of the data collected on the Psychiatric Status Schedule (PSS) comparing men who were medically disqualified and those who remained in the study. Table 219 shows the difference in the intake prevalence and later incidence of psychiatric problems between the group who were disqualified and the comparison group. This analysis yielded 135 men who were asymptomatic on the

TABLE 217

Variables That Predict Medical Disqualifications
(Univariate)

Variable	Comparison Group (mean)	Disqualification (mean)	F	p
Ideal Team Choices	1.96	1.13	6.73	.01
Competence Categories	1.83	1.07	5.02	.025
Investment Score on Round I Interview	4.98	3.53	9.41	.005
Marital Resources	49.92	44.07	4.98	.05
Feeling of Well Being Scale CPI	48.83	40.87	9.16	.005
Responsibility Scale CPI	41.72	34.53	7.24	.01
Tolerance Scale CPI	47.97	41.47	7.52	.01
Intellectual Efficiency Scale CPI	48.93	40.53	10.31	.005
n =	245	15		

TABLE 218

Stepwise Discriminant Function Analyses of Predictors Of Medical Disqualifications

Variable	F	p
Intellectual Efficiency Scale CPI	10.31	.005
Investment score in Interview-Rnd 1	8.04	.005
Ideal Team Choices	5.74	.025
Marital resources	4.47	.025

Correctly predicted 11/15 or 73.3% of those medically disqualified.

Correctly predicted 188/245 or 76.7% of those remaining - not disqualified.

Group:	Problems Prior To Dropping From Study*	Asymptomatic Controls*	Prevalence Cases*	Incidence Cases*
Number and percent	3/65 = 4.6%	1/135 = 0.7%	9/99 = 9.1%	10/117 = 8.5%

Cross-tabulation Of Psychiatric Status In Study And Medical Disqualification By FAA

		Psychiatric Status In Study			
		Asymptomatic Controls	Prevalence Cases	Incidence Cases	Row Totals
Medically Disqualified By FAA?	YES	1 Observed (8) Expected	9 (6)	10 (6)	20
	NO	134 (127)	90 (93)	107 (111)	331
Column Totals		135	99	117	351

$x^2 = 10.92$ df = 2 $p < .01$

*No Psychiatric Problems Prior To Dropping From Study - these men (N=65) were not evaluated all 5 times and therefore could have developed problems we did not know about.

Asymptomatic- These men had no abnormalities on the 5 PSS criterion scales at all of their psychiatric evaluations.

Prevalence cases - these men had one or more symptomatic criterion scales on the PSS at intake.

Incidence cases- these men had one or more symptomatic criterion scales on the PSS after intake but not at intake.

PSS throughout the course of the study; 99 individuals who had one or more symptomatic criterion scales on the PSS at intake, referred to as prevalence cases; and 117 men free of PSS pathology at intake who had one or more symptomatic criterion scales on the PSS after intake, defined as incidence cases. Twenty out of the total of 23 disqualified men were able to be identified by their psychiatric status category. Of these 20 men who were medically disqualified, 19 were either classified by PSS as a prevalence or an incidence case. Therefore, as indicated in the table, 9 men who were medically disqualified were prevalence cases, or 9.1% of all prevalence cases were eventually medically disqualified, and 10 cases out of 117 incidence cases were medically disqualified or 8.5% of the total incidence cases. This contrasted with the observation that among the 135 rated as asymptomatic on the PSS, only one individual was medically disqualified during the course of the entire study. One may conclude that having difficulties on the PSS either at intake or later in the study was predictive of, or correlated with, medical disqualification from the FAA. Also as noted earlier, the increased incidence and prevalence of psychiatric difficulties was apparent both for men who were disqualified for somatic illnesses and those who were disqualified for psychiatric reasons. These data strongly support the conclusion that mental health changes observed in the controllers had a significant relationship with career longevity.

4. Amount of Work Performed

In general, we were unable to predict differences in the amount of work performed during field work observations. The major work variable, "manwork," was a composite score based on the total number of planes normalized for facility, sector and position, normalized peak numbered planes and normalized range of number of planes. Men who did more work versus less work, using this summary measure as the outcome variable, differed significantly on only a very few of our psychological or interview variables. We did not study this set of psychological predictor variables in terms of the differences in various aspects of work assessed separately, e.g., peak planes, and wish to do this in the future.

We did find that men showing the highest amount of manwork, (greater than one standard deviation above the mean, N = 57), also showed significantly more active behavior at work compared to the others, $F = 17.02$, $p < .0001$. This suggests that those who do more work also show more signs of behavioral arousal associated with the increased workload.

There were, however, several significant correlates of the total amount of time and the longest consecutive time that individuals spent on position, summarized as the variable "timeload." Those in the lowest 1/6th of the group (One standard deviation below the mean, N = 40) were significantly older, 38.8 years, compared with those spending average time on position, 35.6 years, or more time on position, 35.4 years. This relationship still held when experience was controlled (age with experience controlled). Those with less timeload also had significantly higher rates of impulse disorders, $F = 6.53$, $p < .0043$. They also showed more coping by drinking, $F = 4.35$, $p < .014$. These findings suggest the possibility that the variable "timeload" may be an early identifier of that subgroup of older men who are beginning to experience emotional problems and deterioration of ATC skills.

5. Special Recognitions and Awards

Two main groups of psychological factors predicted the men who eceived awards during the course of the study. These are listed in able 220. The first related to the sociometric evaluations or er nominations. The men who received more awards were consistly chosen more frequently for an ideal team, for amicability and r competence compared with those receiving few or no awards. In similar way, the interview ratings, made in terms of ability to pe at Round 1 significantly differentiated among men receiving ne versus some awards. The men receiving more awards received high tings for coping on heavy days, coping with training, and overall ping score compared with those who received zero awards. One her factor discriminating among the men was the amount of physical tivity engaged in on Round 1, greater physical activity being nd in individuals who received more awards.

There were relatively few relationships, however, between FAA formance awards and other outcomes. There was some tendency for ividuals who received the most awards to have fewer psychiatric blems at intake, but this was not linear through the ranks of se receiving fewer or zero awards. Similarly, the group of those d as severe in the extent of psychiatric problems had fewest rds while those with no problem had more awards. There was no ificant relationship between awards and the average monthly idence of anxiety and depression, the development and prevalence ypertension, or the average annualized illness rate.

These results suggest that the men receiving more awards were gnized for their greater competence and were regarded as more l team choices by the controllers as well as recognized by the y. Similarly, these individuals were judged by interviewers better able to cope with life problems. However, these men ot consistently describe themselves as more satisfied with or show more bounceback, or score differently on the Calif- Psychological Inventory or a variety of other scales during first or second rounds of exams, nor did these men differ in mount of work they did in the course of field studies, the amount of time they spent on position, or in their cortisol ood pressure responses to work.

TABLE 220

Variables That Differentiate Among Men With Low, Middle And High Frequency Of Receiving Awards

	Total Awards Category (Mean)					
riable	0	1-4	5-8	9+	F	p
l Team Choices	1.56	1.83	2.23	2.21	4.45	.005
ability Choices	1.56	1.89	2.14	2.33	3.58	.014
tence Choices	1.42	1.79	2.11	2.17	3.53	.015
ical Activity-Rnd 1	46.12	50.04	51.03	51.49	2.62	.05
rview Rating-Rnd 1						
g Heavy Day	3.10	3.82	3.92	4.08	3.12	.025
g with Training	2.95	3.59	3.91	3.96	4.59	.004
ll Coping	3.00	3.73	3.92	3.96	4.61	.004
of Men tegory	41	245	95	22		

SUMMARY

Concordance of Different Categories of Outcomes

In order to determine whether or not men who had one health outcome were more likely to have another, they were divided into two groups by extent and frequency of illness or injury and all groups were cross-tabulated for indications of association.

It was determined that there were no significant associations between any of the major categories of health outcomes.

D. Concordance of Different Categories of Outcomes

We were quite interested in whether or not individuals who had one type of health outcome were any more or less likely to have other types of health outcomes. Since the health outcomes were derived from procedures and on metrics of considerable diversity, we dichotomized the men on each health outcome index and then cross-tabulated the groupings.

Men with severe, Level 3 injuries were divided into those who had none (N=399) and those who had one or more (N=17). Men with severe, Level 3 medical illnesses were similarly grouped into those who had none (N=394) and those who had one or more (N=22). Men who received all 5 Psychiatric Status Schedule examinations (N=351) were divided into two groups also. One group (N=151) had no problems at all (the asymptomatic control) or had only one symptomatic criterion scale at one examination (those with acute problems). The second group (N=200) had moderate or chronic problems (one or more problems at two or more examinations). Men who had at least one scorable health change interval of five Monthly Health Review evaluations (N=378) were divided into two groups, one below and one above the median rate of 2.5 mild-to-moderate health changes per year (low rate, N=216; high rate, N=162). All combinations of these groupings were cross-tabulated and evaluated for significant associations using the chi-square statistic.

Table 221 displays the final results of these analyses. There were no significant associations between any of the health outcomes. That is, men with one type of problem were no more or less likely to have other health outcomes. If our health outcome measures were contaminated by complaint behavior or if the controllers had a predisposition to have several types of health changes when they had any at all, we would have found some associations. Since we did not find any significant associations on these global categorizations of our health outcomes, we concluded that there was no predisposition to respond with general illness - or injury-proneness.

These overall results did not exclude the possibility that certain subtypes of outcomes would have significant associations. For example, as was reported in Section V B., there was a higher rate of respiratory disorders among men who developed psychiatric problems, and more injuries among men with moderate and chronic psychiatric difficulties. Specific types of problems may have an association, but in general, we found no indications of general proneness to illness and injury.

TABLE 221

Concordance of Different Categories
Of Illness Outcomes

1. Severe Injury versus Severe Other Medical Health Change

   $X^2 = 1.12$, df = 1 N.S.**

2. Severe Other Medical Health Change versus Extent of Psychiatric Problems

   $X^2 = 0.22$, df = 1 N.S.

3. Severe Other Medical Health Change versus Annual Mild-to-Moderate Illness Rate

   $X^2 = 0.00$, df = 1 N.S.

4. Severe Injury versus Extent of Psychiatric Problems

   $X^2 = 0.00$, df = 1 N.S.

5. Severe Injury versus Annual Mild-to-Moderate Illness Rate

   $X^2 = 0.27$, df = 1 N.S.

6. Extent of Psychiatric Problems versus Annual Mild-to-Moderate Illness Rate

   $X^2 = 0.05$, df = 1 N.S.

Each outcome variable was dichotomized for these analyses

N.S. = Non-significant.

VII. IMPLICATIONS FOR FAA PURPOSES

A. Introduction

In a study as large and comprehensive as the ATC HCS it is difficult to reduce the plethora of data and findings to conclusive fundamental implications for future consideration or action. As there are complexities and perplexities in our developing understanding of the interactions between our subjects and their work, these irregularities manifest themselves in diverse specific findings that do not always have consistent implications. Actions that may ameliorate one kind of problem may not help, and may even exacerbate, another kind of problem. The implications communicated in this section, therefore, are of two kinds: some specific findings, it seemed to us, carried limited implications that would have to be reconciled with other requirements and goals of the FAA; other findings were of a more general nature and had implications that might be more broadly applicable.

Our goals in this study were: 1) to monitor our sample of air traffic controllers sufficiently over a three-year period to be able to determine the frequency, type and severity of their physical and psychological health changes; 2) to establish whether or not we could predict which controllers would later develop problems, by analysis of their performance on a multitude of social, psychological, behavioral, physiological and workload measures; 3) to determine where possible (given the fact that data on other groups is usually not sufficiently comparable to be used) whether they were at excess risk for any health changes by virtue of the nature of their job or the characteristics of the men who enter this occupation or their habits or practices after they enter it.

We attempted to reach these goals by the following major strategies:

1) studying the relationship between years on the job (age-controlled) and various pathologies;

2) studying the relationship of workload and worktime on position to such biological predictor variables as cardiovascular and endocrine measurements on the job and also to frequency and type of eventual health changes;

3) comparing men with differing rates of illness on a large number of additional predictor variables including psychological, biographical and attitudinal measures for which data was gathered at repeated BUMC examinations;

4) comparing rates of illness and injury where possible to population norms, and also comparing predictor data where possible to population norms.

Although population norms were not available for comparisons of rates of many types of illnesses, we were fortunately able to make such comparisons in several important areas, including prevalence of hypertension, psychological and psychiatric problems, including alcohol abuse. Our most important findings in this study concerned the increased risk among ATCs of hypertension and certain psychiatric problems, including alcohol abuse, and the associations of mild and moderate illness, and of burnout, with certain psychological, social, work, or physiological factors.

Our findings in these areas suggest some possible courses of action that we think may be ameliorative or preventive. The implications of these findings are organized as answers and comments to questions posed by the FAA under the contract. Although the contract requires only that the data be organized and reported in such a manner as to be "readily addressable" to these questions, we have addressed our findings directly to them, and present whatever ameliorative or preventive suggestions we have within these comments.

Each of the questions posed in the contract is stated and followed by our comments on the meaning of our findings with respect to the particular question.

B. Specific Questions Posed in the Contract

1. What is the nature, derivation, extent, and significance of health changes among air traffic controllers? How do these changes affect performance, career longevity?

2. Do controllers experience stress? If so, what is the nature and extent of the stress? How much is related to the job? What causes it? To what job conditions, including social and psychological forces or factors does it relate?

3. To what extent do management, supervision and manpower management policies, practices, programs or procedures contribute to health changes and especially to the degree of stress present in an air traffic job? E.g., does how work is assigned, work schedules, hours on duty, length of work periods, etc. relate to stress and if so, how?

4. Are there predictive factors or measures that could be applied before employment of air traffic controllers which would indicate to management officials which candidates might be more prone toward deleterious health changes?

5. Are there ways by which individuals can be identified who need counseling or help due to their increased potential risk for illness? Is this risk increased because of their particular personality, family problems or because of the nature of the working environment that they are in?

6. How do the stress levels in the air traffic occupation compare with other occupations, e.g., pilots, business executives, etc.? Although the data collected in this study may not provide for direct comparison of Air Traffic Controllers with other individuals in other occupations, attempts should be made to compare the results that are obtained with those from other investigators studying other occupations.

7. Is there a "burn-out" phenomenon? If so, what is it?

   a. Can the individuals who are more prone to early physical deterioration be identified?

   b. Can we identify work situations that are more prone to produce widespread early physical deterioration than other work situations may be, so that early counselling and other career possibilities can be identified and considered.

1. What Is The Nature, Derivation, Extent and Significance of Health Changes Among Air Traffic Controllers? How Do These Health Changes Affect Performance, Career Longevity?

Over the three years of surveillance for health changes, 4,300 diagnoses of illnesses and injuries were rendered. One-third of these were considered trivial inasmuch as they involved isolated symptoms which did not cause loss of function or call for medical care (Level 0). Nearly 60% were minor health changes involving a symptom complex, such as an upper respiratory infection or minor injury, often entailing a day or two of reduced activity but not usually requiring medical attention. Another 6% of diagnoses were more severe than this but they were less disabling and less dangerous in their implications than the 2% of diagnoses (labeled Level 3) that constituted major medical problems.

The most common of the acute minor health changes were respiratory ailments (36% of the total) and injuries (12.5% of the total), of which sprains were the most frequent type. No other major category accounted for more than 10% of the diagnoses. Among the chronic and more serious conditions, the most common was hypertension. This approached an epidemic proportion among air traffic controllers, and is discussed in more detail following this summary of other medical problems. The next most frequent chronic, though usually not serious, conditions were back pain (including low back pain), hemorrhoids, and hay fever.

The rates of acute minor health changes did not seem grossly different from those reported among men of these ages in the general population, where population data was available. It should be noted, however, that general population data are usually derived from cross-sectional surveys, which are not as reliable as the continued surveillance that provided the data on the ATCs. The median number of mild or moderate health changes among our ATC population was 2.5 per year (after annualizing our monthly data). Twenty percent of the men had virtually no health change during a year, but 16% had an average of 5 or more diagnosed illnesses and injuries annually.

Excluding hypertension, other serious illnesses and serious injuries occurred to about 10% of the men over the three years of the study. Eighteen men incurred severe injuries calling for hospitalization and more than one month of restricted activity. Forty-three men (including two who also had serious injuries) incurred disabling or life-threatening conditions spread across specific diagnoses. It is important to note that there was a significant correlation between having hypertension, having a severe (Level 3) health change and having more than the average number of mild and moderate illnesses.

Neither medical disqualifications nor burnout was associated with frequency of mild and moderate health changes. Men with more mild and moderate health change, however, had a higher frequency of psychological health problems.

The serious (Level 3) injuries and illnesses affect performance and career longevity in that they are either life-threatening, such as hypertension, myocardial infarction, bleeding peptic ulcer, or they cause periods of disability of a month or more. There was one death among participants during the study, and this resulted from a Level 3 injury (automobile accident).

The actual causes of most of the major kinds of health changes experienced by ATCs in this study are only partially understood by medical science, and are under intensive investigation in many biological laboratories devoted to specific causal research. One of our major efforts was directed to the determination of predictors of specific types of health changes. The predictors may or may not be causal, but in any event, they provide the foundation for future experimental approaches to prevention of these health problems.

Several categories of predictors of total morbidity (average annual illness rates) among ATCs were identified. Men who had large numbers of life changes, which they identified as distressing, were at high risk of illness and injury. Similarly, those who were the competitive, hurried behavior Type A, particularly if they were deeply involved in their job, and those who were more sociable and dominant but less self-critical, also had more illness. A number of factors related to the job situation were predictive of high illness rates. Those men who had high frequencies of anxiety and tension on the job, who feared the possible problems of air traffic controlling, had more illness. Similarly, those with lowest work group morale, least satisfaction with management, and the greatest feeling that their supervisors were not considerate of them, also had more illness. These same high illness men were least often chosen by co-workers either for their amicability or for their value as ideal team members, at the examination preceding the intervals for which illness rates were averaged.

Several psychosocial variables and job-related factors predicted Level 3 serious injuries and illnesses. Peer selections as being a competent controller, or being most desired for the ideal team seldom went to those men who later incurred a serious injury or illness. It was interesting to note, but contrary to our expectations, that men with later serious health changes had higher work satisfaction at intake and reported a greater amount of social resources to help them cope with problems. In the examination immediately prior to their serious injury or illness, however, their

satisfaction with their pay dropped considerably.

Among the many diagnostic categories of health changes that ent into the total morbidity experience, non-specific viral diseases nd injuries had large numbers of social and psychological predictors. hese are dealt with in the respective sections of th' project eport. It will suffice to state here that a number of findings have plications for preventive or therapeutic programs.

Hypertension was the most common of all chronic diseases in our udy population. If our study group is at all representative of S. air traffic controllers, this is an occupation with an extremely h prevalence and incidence of this disease. Epidemiologic studies hypertension in the U.S. have used a variety of diagnostic teria. Our ATC HCS data were collected in such a way that they ld be evaluated by several of these criteria. Compared to the a for males from the DHEW Health and Nutrition Examination Survey 1971 - 1974 and to men in the Framingham Heart Study, ages 35-39, ATC sample had 1.5 to 1.6 times the prevalence of definite hyper- ion of these other two comparison populations. This was true though our ATCs were younger on the average than the two compar- groups, so that the excess risk of the ATCs was probably under- mated.

Another way to compare prevalence of definite hypertension in TC HCS is to use a comparison group of men with similar income erform a linear extrapolation to the age range in our study. was done using the Western Collaborative Group Study as the rison population. For their participants, with mean age 43.2 the prevalence was 8.4% using the criterion of seated blood re reading exceeding 160 sbp or 95 dbp. This was considerably than observed by other epidemiologic studies. In contrast, served prevalence in the ATC using these criteria was 19.5%, han twice the WCGS rate, despite the fact that the WCGS group d 7 years older than the ATC group.

ere is inadequate information on incidence of hypertension U.S. However, estimates have been offered by experts in the ased on their reviews of the medical literature (Stamler, ge 152; Julius and Schork, 1971). Incidence was estimated ithin the range of 1% to 4% per year among persons aged ately 30 - 60 years, with lower incidence rates prevailing er years. One could extrapolate from these estimates that e of new hypertension for males averaging 36 years of age ur ATCs), should be 1% to 1½% per year.

ake another comparison of the incidence of hypertension in CS vs. men of comparable age and geographic region, we

obtained access to the computer printouts from the Framingham Heart Study. This was arranged through the courtesy of Dr. H. Emerson Thomas, Co-principal Investigator of the Framingham Heart Study, Ms. Pat McNamara, Research Associate, and Dr. Bernard E. Kreger who serves as examining physician, both for the Framingham Study and the ATC HCS. Careful review of the printouts revealed 362 men ages 30-39 years who were normotensive at intake into the Framingham Study. Their hypertensive status was followed for 3 biennial examinations, a period of six years. When the observed changes in hypertensive status were converted to annualized rates, the incidence of borderline hypertension was 4.6% per year, of definite hypertension 0.4% per year, for a total hypertension incidence of 5%. In comparison, using the same criteria and annualizing the three years of follow up in the ATC study, the comparable incidence rates were 18.4% borderline hypertension, 3.1% definite hypertension, for a total hypertension incidence of 21.5%. For each category this would represent a relative risk of 4 to 1. However, the comparison is not altogether defensible in that the Framingham incidence might be higher if Framingham men had been at risk of exceeding the 140/90 mm hg cut-off at five examinations rather than only at biennial exams.

Our estimates are that air traffic controllers currently on the job have 50% to 100% higher prevalence of hypertension than "the average man the same age in U.S. communities." In addition, ATCs have an even greater risk than other men of developing new hypertension and this risk may be more than 200% that of other men.

The ATC HCS developed its own criteria for diagnosis of hypertension. These rest upon the presence of elevated blood pressures at two successive medical examinations, usually 9 months apart. By this more stringent criterion, 36 new cases of hypertension were discovered over an average observation period of 2.25 years (as reduced by the nature of the criterion above) for an average annualized incidence of 5.7% per year. Our criteria for diagnoses have not been used in other studies, thus precluding exact comparisons. It would seem, however, that this is about 3 times the incidence rate described above as the estimate of expert epidemiologists, but inasmuch as the latter is based on blood pressure readings from a single examination it may represent a more lax criterion and the stated relative risk of 3 to 1 may underestimate ATCs true excessive risk of hypertension.

The predictors of hypertension are discussed at length in Section V. In summary, 86% of the new 36 hypertensive cases (by HCS criteria) were correctly "predicted" by a discriminant function equation incorporating office blood pressures, blood pressure elevations while at work and psychological predictors. The best predictors of the development of new hypertension included the excess

of systolic and diastolic blood pressure averages at work above the resting pressures observed by the study physician. In addition, low scores on the hard driving scale of the Jenkins Activity Survey, a good interviewer rating of ability to cope on heavy work days, below average coping resources from one's marriage and below average amounts of distress due to life change were also significant predictors of new hypertension. It thus appears that there is a definite pattern of on-the-job blood pressure responsivity and psychological characteristics which are found in men who later develop hypertension.

Neither the presence of hypertension at intake into the study or its development during the three years of follow up were associated with increased drop-out from the study or with poor performance as a controller as rated by co-workers. Job-related outcomes are just as good for hypertensives as normotensives and the presence of a blood pressure abnormality did not predispose to the concurrent or later development of psychiatric difficulties. The main impact of hypertension on career longevity is that the diagnosis of hypertension or the practice of taking anti-hypertensive medications is currently grounds for disqualification from active duty as a journeyman controller. It should be emphasized, however, that the FAA criteria for hypertension differ from those of the HANES, Framingham Study, or our own Health Change Study. The FAA hypertension criteria calls for blood pressure to be measured while supine, for repeated measurements to be taken with the lowest reading to be counted, and for an age adjustment factor allowing higher blood pressures in older ages. The FAA criteria thus yield a lower incidence and prevalence of hypertension for this sample than do other criteria used.

The regulation that use of anti-hypertensive drugs provided grounds for dismissal from active work as an ATC was formulated many years ago when the usual first line anti-hypertensive drugs were phenobarbitol and reserpine, both of which could, in susceptible individuals, cause drowsiness and slowing of response rate. The pharmacopoeia for treatment of hypertension has changed drastically in the last 15 years. Presently the most commonly used drugs for hypertension are the diuretics. The increase kidney output with potent of excreting sodium, reducing total blood volume and thus lowering blood pressure. The diuretics have no central nervous system effect and therefore do not cause drowsiness, sluggishness, slowed response rates. For persons whose blood presure cannot be adequately controlled on diuretics a variety of stepped-care regimens are commonly used. These involve combinations of diuretics and more potent anti-hypertensive drugs. A few of these may cause slowed response rates or drowsiness in susceptible individuals, but many of the more potent drugs do not have such

effects. It is vitally important that the FAA reconsider its criteria for medical disqualification as they involve hypertension. We do not recommend that controllers with hypertension who are concerned about the possible progression of their disease be forced to remain as ATCs, but we feel that mandatory disqualification simply on the grounds or the presence of hypertension or the taking of diuretics or other drugs having no side effects that might influence alertness or controlling skills should not continue to be agency policy.

2. Do Controllers Experience Stress? If So, What is That Nature And Extent Of The Stress? How Much Is Related To The Job? What Causes It? To What Job Conditions, Including Social And And Psychological Forces Or Factors Does It Relate?

By the operational measures of stress used in this study, controllers differ in their experience of stress. Primarily physiological and behavioral measurements at work were used in this study to reflect stress on the job. Additionally, self-reports of job difficulty were used to some extent. Stress may be inferred from other data gathered in the study, but its sources are not determinable. Illness outcomes in themselves were not considered to be reflective of stress because the causes of specific illnesses, and illness in general, are multiple, and that part which may be due to stress on the job or elsewhere would be difficult, if not impossible, to isolate. The observations that we used to estimate stress were relatively direct and simple to quantify. They represent only a few of the many possible physiological, psychological or social responses or adaptations that individuals might make to stressful situations.

For this study we hypothesized that stress would be reflected in the differences in blood pressure levels, in cortisol and growth hormone levels and in behavior among and within men while working under conditions of varying difficulties. Further reflection of stress might be obtained, we thought, from the men's own reports of their perception of difficulties during a day's work. Although we knew that these indicators of stress might not be sensitive to all situations, we were interested in observing their relationships to other phenomena.

We knew from the scientific literature on stress that current knowledge in the field was not enough advanced to identify the precise body mechanisms by which stress may be mediated. We also knew that transient or repeated physiological or psychological responses to difficult situations had not yet been shown conclusively to have a causal relationship to the onset of illness in human beings.

Respecting the scientific frontier in this area, we can only state that the relationships that were found between our selected indicators of stress and some few outcomes may implicate work difficulty as having some partial role, when combined with other biological and psychological factors, toward ultimate illness experience. Specifically, the physiological measures at work did significantly predict hypertension and mild and moderate illness.

The same physiological measures did not in general predict psychiatric illness or alcohol abuse although individual responses to the stress of work did correlate with the development of many of the psychiatric or psychological problems.

With respect to hypertension, those ATCs who had higher systolic and diastolic blood pressures during their first field study had a significantly increased rate of developing hypertension during the course of the study. Evidence for a role of stress in development of hypertension was most persuasive in studies of blood pressure variability within the same person. These studies showed that those who were developing hypertension during the course of the study were responding to heavy air traffic with blood pressure increases four to five times greater than the increases of those who remained normotensive. Only a minority of those who responded to increased traffic with higher blood pressure developed hypertension. In general, individuals who showed more variability were at greater risk for developing hypertension. This risk was clear for those who showed the increased blood pressure responses to work.

Interestingly, those ATCs who responded to difficult days on the job with low cortisol or low variability in blood pressure were more prone to have mild or moderate illnesses during the course of the study. We thing that there was a suppression of their physiological system, and this may have represented their way of responding to stress.

The fact that ATCs who had more job involvement and who reported more job difficulties, including work dissatisfaction, were at increased risk for developing psychological problems was construed as a consequence of job stress in vulnerable individuals. However, many individuals who were dissatisfield with their work, or with management policies, or those with more distressing life changes could also be said to indicate stressful responses, but often without negative health change.

In summary, while we have little doubt that controllers experience stress, and that their work itself and their attitudes toward their work and the management generates some of this experience of stress, our data suggest that individuals experience stress in differing ways and amounts, and that experience of stress does not necessarily imply illness consequences, although in the case of hypertension, the implication is quite forceful. The psychological expressions of distress were also forcefully related to near-future psychological problems of clinical severity.

3. To What Extent Do Management, Supervision And Manpower Management Policies, Practices, Programs Or Procedures Contribute To Health Changes And Especially To The Degree of Stress Present In An Air Traffic Job? E.g.: How Work Is Assigned, Schedules, Hours On Duty, Length Of Work, etc., Relate To Stress And If So, How?

Our inquiries, by means of questionnaires, regarding the controllers' perspectives, attitudes and satisfaction with various policies and programs brought varied responses. We attempted to determine whether or not the controllers who were more dissatisfied with policies, procedures, shifts, schedules, etc. were more likely to develop health changes during the course of the study.

We concluded that work dissatisfaction was an extremely important predictor of psychiatric problems. Similarly, dissatisfaction with co-workers and reduced ability to discharge tensions were also found to be highly prevalent among those who developed psychiatric problems. Therefore, it can be said that individuals who perceive their work or their co-workers as less satisfactory are at greater risk for developing psychiatric problems, and possibly for eventual medical disqualification on that score. Co-worker dissatisfaction was greater among the controllers than among a comparison group of workers in other industries and occupations. The morale problems that dissatisfaction with co-workers creates would appear to be of sufficient potential seriousness to warrant some study of possible ameliorative or remedial action.

Questions regarding the controllers satisfaction with management and management policies elicited responses indicating dissatisfaction among a large enough group to warrant a review of management policies and practices, and an attempt to arrive at mutually satisfactory revisions where beneficial.

It is worth noting that controllers who showed greater involvement in the job, for whom it was important to be a "good controller," experienced an additional risk for developing psychiatric and psychological problems. In other words, it is not among those who don't care, but among those who care a great deal and are highly invested, that the risk for future psychological problems is more apparent. This finding, together with the reporting of increased subjective costs from air traffic control work suggests that the agency might investigate means by which individuals can discharge their tensions at the end of the work day with greater efficiency and benefit. The use of alcohol to cope with difficulties and to discharge tension increased the risk for psychiatric problems. This finding, too,

addresses the potential benefit of a search for alternative methods of discharging tension and unwinding from the rigors of work. In this regard, it is noteworthy that individuals who reported increased subjective costs associated with frequent shift change were at greater risk for alcohol abuse.

Responses to a questionnaire regarding sleep problems indicated that change of schedule (shifts) was most frequently thought to be the reason for sleep problems among the approximate one-third of controllers who had them on 4 or more times during the month. Controllers also varied in the time of day or night during which they functioned best. These findings suggest that there may be reason to investigate the assigning of shifts on the basis of whether an individual is better able to function at one time or another, and perhaps study optimum shift scheduling with consideration also of the physiological sleep problems associated, for some people, with shift changes.

In summary, management attention might be directed to the dissatisfactions that were reported with co-workers, with management policies, and with schedules. Additionally, more productive and health-promoting methods of discharging tension might be explored.

4. Are There Predictive Measures Or Factors Which Could Be Applied Before Employment Of Air Traffic Controllers Which Would Indicate To Management Officials Which Candidates Might Be More Prone To Deleterious Health Changes?

Our studies of the antecedent conditions of various disorders resulted in several findings: first, those who scored very low on the sense of well-being, responsibility, socialization, self-control, tolerance and intellectual efficiency scales of the California Psychological Inventory (CPI) were at much higher risk for psychiatric health change and had a much higher rate of medical disqualifications from the FAA for either psychiatric or medical conditions. Men who scored lower on the dominance, sociability and self-acceptance scale of the CPI had more injuries of a mild to moderate nature. While men who were especially young for their experience were at greater risk for psychiatric problems, older men with less experience had more mild, moderate and severe illness and injuries.

The psychological predictors suggested that the California Psychological Inventory might be added to the screening battery currently used for pre-employment selection. Alternatively the correlations between the 16-Personality Factor (16-PF) and the CPI scales could be calculated for air traffic controllers, and if the correlations are sufficiently high, equivalent scores on the CPI might possibly be derived from the 16-PF scale scores. The present study administered the CPI at the second evaluations of 392 men and administered the 16-PF to 388 men at the final exit examinations. Thus the data is available on a sufficiently large sample to attempt to derive these specification equations so that the FAA may not need to add an additional battery to those currently used, but could perhaps derive the predicted scores on the CPI from the 16-PF.

The results on age and experience suggested that men hired at too young an age might not have sufficient maturity and experience with life stresses to cope with the particular stresses and environment of air traffic controlling, and that older men without a great deal of prior experience in air traffic control work might have particular difficulty in adjusting to this work. In combination with the psychological predictive results for both psychiatric and medical outcomes in this study, we would suggest that the selection procedures might be modified to emphasize selection of psychologically mature individuals. The minimum age for beginning training as a controller might be raised to age 25 and the maximum age for beginning training might be reduced to age 30. These suggestions from our relatively limited data should be first bolstered by the FAA's

own personnel and medical disqualification data, to assure that our findings are typical for the whole system.

Two other sets of psychological findings may have predictive value if in fact their use is feasible in pre-employment screening. A history of legal events (more prevalent histories of being arrested, sued, jailed and so forth) was associated with the expression of impulse control disorders, psychiatric problems in general, and eventual disqualification. Similarly we found that exceptional alcohol use was highly related to the development of alcohol abuse problems as well as to all psychiatric problems. This was true not only in terms of quantity of alcohol consumed to cope with the pressure of the job, but also with respect to age at which the individual began to drink. That is, men who reported that they began to drink at earlier ages tended to have more alcohol abuse problems and more psychiatric problems. Such data also might be included in the biographical history information requested prior to employment.

A large number of other pre-employment data may be associated with deleterious health changes. However, time and personnel constraints do not allow us to pursue this investigation. Adoption of any pre-employment screening must, of course, pass the test of appropriateness and adherence to statutory requirements. It is our overall impression that preventive and ameliorative services after employment might be a more appropriate way to reduce health changes among the air traffic controllers.

5. Are There Ways By Which Individuals Can Be Identified Who Need Counseling Or Help Due To Their Increased Potential Risk for Illness? Is This Risk Increased Because Of Their Particular Personality, Family Problems Or Because Of The Nature Of The Working Environment That They Are In?

Our predictive studies of both medical and psychiatric health change indicated a number of risk factors for illness. Although the results were sometimes different, as one might expect for the predictors of these two areas, there was also some commonality in findings and instrumentation which could be used for risk detection procedures.

We found that individuals who had a large amount of life change and distress due to that life change were at risk for physical and psychiatric illness. Men who were more Type A on the Jenkins' Activity Survey also were at greater risk for both medical (other than hypertension) and psychiatric illness. Individuals who had a large number of psychophysiological anxiety symptoms at work, and who had difficulty discharging tension arising from work were at risk for both types of health changes. Those who coped by drinking were at particular risk for psychiatric health change, as were men who had a larger number of legal problems or decreased marital coping resources. Men who were highly dissatisfied with their work and their coworkers, and sometimes those men who were not rated very high by their peers were at increased risk for health change. Men who were highly invested in their job from a personal psychological standpoint were at a particular risk for health change. A number of dimensions from the California Psychological Inventory differentiated among those men with medical health changes, and also among those men with psychiatric health changes, although the particular dimensions were different for the two outcomes. Finally, men who became hypertensive were notable by having a high degree of job involvement, a tendency to avoid hard-driving competitive behavior, fewer distressful life changes, and a high level of cardiovascular reactivity on the job.

These results certainly suggested that individuals can be identified who need counseling or other help due to their increased potential risk of illness. In some cases our predictive validities were exceptionally good; in other cases not quite as good. In most instances, one would be making errors in the direction of false positives rather than false negatives, which is better from the standpoint of preventive care. Those who would be false positives would receive the counseling and assistance which might be ameliorative, whereas men who were false negatives would fail to have

their risk identified and thus would not receive any special counseling or assistance.

The instruments providing our predictive assessment are either published and commonly available, or available from the study team. For example, the California Psychological Inventory and the Jenkins Activity Survey are published instruments available from their commercial producers. The Review of Life Events (ROLE) is available from the investigators, although it would need a number of changes to be useful on the job and to improve the ease of scoring. The Air Traffic Controller Questionnaire also is available from the investigators and would need some revisions for the greatest ease of application and eventual utility. All of these instruments also have the advantage that they are self-administered, and if given in a neutral setting with appropriate validity checks, could be an economic series on which to base an annual risk detection procedure.

The work satisfaction variables of most significance in this study are commercially available in the Job Description Inventory of Dr. Patricia Smith. The Job Description Inventory is simple to use, easy to score, and relatively inexpensive. It is self-administered and could be quite valuable in screening for individuals at risk for either medical or psychiatric illness.

The most prevalent and serious disease among these air traffic controllers was hypertension. Hypertension was predicted by intake systolic blood pressures and from measures of blood pressure reactivity while working on the job. Once the intake blood pressure was taken into account, neither age, experience, nor obesity contributed to the prediction, so they are less useful than intake blood pressure for identifying individuals at risk for hypertension. Men who were already overweight, however, had a much higher prevalence of hypertension. A special evaluation procedure could be conceived for screening and counseling individuals at risk for developing hypertension.

We could foresee the possibility of assessing blood pressure and pulse rates in the way that we did in the study while men were either working live traffic or working on a simulator. However, to change to a simulator condition might require another study to establish comparability. Blood pressure measurements while working live traffic could be made using the same equipment that we used, which is commercially available. This equipment interfered very little, if at all, with the men while they were working. It was a non-intrusive procedure and caused no discomfort to any controller. Individuals who were found to be particularly responsive might be apprised of this fact and might be referred for relaxation training, or perhaps other medical procedures that might assist them in retarding the development of hypertension.

Both of the medical and psychiatric evaluations done in this study were quite good at detecting problems after they had developed. Our self-report measures, which were paper and pencil tests of varying kinds, were quite good at predicting who would develop problems. The particular factors which put men at risk were ones that were not necessarily socially undesirable, and hence information could be requested without causing an individual to feel that he might disqualify himself. This is an important concept for any risk detection program. It is quite unlikely that the same quality of assessment and honesty in evaluation could take place in an everyday work environment as took place in this study, where great importance was placed on maintaining the confidentiality of information given to us. Some type of outside risk screening procedures might therefore be quite useful in conjunction with the Federal Aviation Administration's current medical evaluation program.

Risk detection as opposed to medical disqualification procedures should be confidential and not part of a man's government personnel file. Rather, an individual going through such a program would be apprised of his particular results and of the interventions that were possible. Since most of the interventions would be in the nature of counseling, relaxation training, bio-feedback training, and so forth, they would be relatively innocuous, but useful from the individual's perspective. If any part of a risk detection program were to become part of the medical surveillence and disqualification program, then not only would the quality of answers and assessments be compromised, but any interventions might be seen as punishment or negative consequences.

We did not find that the ATC work environment and the workload within that environment were the most predictive factors for illness. Rather, we found that particular types of people with their own personal psychological and biological reactions were susceptible to illness when placed in the air traffic control environment. Since we did not have any other environment in which to study these men and a comparable group of men, we cannot say whether or not these personality or personal characteristics would predispose to illness in other work settings. There were some elements of the work environment that led individuals to be more or less satisfied and more or less psychophysiologically responsive, which factors in turn were related to later illness.

Consequently, the results that we found would be most germane to establishing risk detection and evaluation programs of men already in the agency. As noted in various other sections of this report, implications for screening prior to employment were less numerous and less generalizable than our implications for men already employed as air traffic controllers. It would be our strong recommendation

that a semi-independent risk detection, prevention, and intervention program be set up for air traffic controllers. The potential benefits both to the individuals concerned and to the agency could be substantial.

6. How Do The Stress Levels In The Air Traffic Occupation Compare With Other Occupations, e.g., Pilots, Business Executives, etc.? Although The Data Collected In This Study May Not Provide For Direct Comparison Of Air Traffic Controllers With Other Individuals In Other Occupations, Attempts Should Be Made To Compare The Results That Are Obtained With Those From Other Investigators Studying Other Occupations.

As the measures used in this study to assess the amount of stress felt by the controllers were devised for this study, it is not possible to compare controllers' responses on these measures with those of men in other occupations.

In our comments regarding Question 2, we indicated that it is not the air traffic control work per se that produces indicators of stress, but rather, according to the measures we used to reflect stress. The work appears to provoke the stressful responses in vulnerable persons. Given this finding we cannot compare "stress levels" in the air traffic "occupation" with those in other "occupations." The stress level, we believe, is not altogether dependent on the occupational activity and hazards, but is determined in part by the psychological and physiological "interpreters" of the individual.

However, we can supply some comparisons between the participants in our study and persons in other occupations regarding measures defined as reflections of stress in another study, that of Caplan et al. in 1975. The Caplan group defined stress as "any characteristics of the job environment which pose a threat to the individual," and strain as "any deviation from normal responses in the person." Their measures of stress included: job future ambiguity; social support from supervisors, co-workers, friends, relatives and family; and role conflict.

These Caplan et al. measures were included in our Round 5 data collection for comparison purposes, as was one of the Caplan et al. measures of strain, boredom.

We compared the scores of our controllers not only with the Caplan Study's controllers but also with the study's comparison group from 21 other occupations.

Our controllers were similar to the Caplan group's controllers on the stress measures, but showed significantly greater boredom, a high score reflecting the boredom of controllers in centers.

The tower controllers in our study did not differ from the Caplan group.

When the means of the responses by the ATCs in our study were ranked with the 21 other occupation groups in the Caplan study, the following comparison emerged:

1) Job future ambiguity: ATC HCS controllers ranked fifth, indicating that they were relatively more certain about their future in their jobs than most other occupational groups;

2) Social support from supervisor: ATCs ranked 15th in terms of their perceptions of the amount of support provided by their supervisors. The only occupational groups reporting lower supervisory support were unskilled and semi-skilled blue collar employees;

3) Social support from co-workers: ATCs ranked 17th in terms of perceptions of support provided by co-workers, the only occupational groups reporting less support were blue collar employees;

4) Social support from friends, relatives and family: ATCs tied at rank 18. There were only three other occupational groups reporting less perceived support from their friendship and home social networks;

5) Role conflict: ATCs tied for 2nd in terms of perception of a low amount of role conflict. The ATC HCS controllers, relative to the persons in these other occupational groups, were experiencing fairly low perceived amounts of role conflict.

6) Boredom: ATCs ranked 15th in perception of boredom in their jobs. Our center controllers particularly saw their jobs as more boring, while the tower controllers were less bored.

7. Is there a "burn-out" phenomenon? If so, what is it?

   a. Can the individuals who are more prone to early physical deterioration be identified?

   b. Can we identify work situations that are more prone to produce widespread early physical deterioration than other work situations may be, so that early counselling and other career possibilities can be identified and considered?

Our definition of burnout related to whether or not a man:

1. Showed significantly increased work dissatisfaction as the study progressed;

2. Was selected significantly less often by his peers for his competence;

3. Developed work role pathology not previously present;

4. Reported significant decrease in his ability to bounceback and increase in his concern about burnout during the course of the study.

Individuals who had no difficulties in these areas at intake but who experienced negative changes in two or more of these areas during the course of the study were considered cases of burnout.

Thirty-five men, or approximately 15% of the 234 men for whom we had 5 Rounds of data, showed clear signs of burnout over the 3 years of the study.

The phenomenon of burnout relates more to psychological than to physical deterioration, as we have viewed it, and is, by our measures, weighted heavily on individuals' estimation of their own abilities and concerns about their abilities in the future. These two subjective factors were combined with the more objective assessments of work role pathology by means of the PSS interview and of competence by means of nominations from co-workers.

Our definition of burnout required that we follow men throughout the study, and therefore, we were not able to determine the relative risk of burnout cases for medical disqualification. However, the major characteristic of the burnout cases was their

development of psychiatric problems that were not present at intake. Inasmuch as the presence of psychiatric problems represented an increased risk for medical disqualification in the other studies that we made, it is possible that we would find an increased risk for medical disqualification among burnout cases if we were able to continue to follow the men we designated as burned out at the end of the study.

Individuals who developed burnout had average or above average abilities at the beginning of the study, were enthusiastic and vigorous as controllers, had high tension discharge rate, and showed less coping by drinking compared to the control group. The men who became burned out, therefore, were not from a poorer group of controllers and did not have lower peer ratings at intake compared to the control group. It was also noteworthy that those who became burned out by our definition did not show diminished amount of work performed during the days of physiological monitoring over the course of the study nor did they spend less time working.

It was interesting that the men who were promoted (not the same as men who burned out in our study) also showed increased concern about burnout prior to their promotions, although they were receiving high ratings from their peers on competence. Thus, developing burnout does not appear to be associated with doing a poor job as a controller, while concern about developing burnout is actually shared by those who are promoted and those who actually do burnout.

There were not clear-cut psychological characteristics that discriminated men who burned out from those who did not, except for their somewhat increased enthusiasm and vigor on the job, along with increased psychological coping.

We were impressed with the subjective nature of the burnout phenomenon and the relationship with developing psychiatric problems. Since burnout may represent a self-fulfilling prophecy, in which the man with concerns about his future ability becomes thereby less able, we believe that persons manifesting such concerns, or other evidence of early burnout, should be afforded an opportunity for counseling and career planning. Provision of counseling services may also help to deal with this subjective phenomenon in a way that would not reinforce malingering.

REFERENCES

Alexander, F.: The influence of psychologic factors upon gastro-intestinal distrubances: A symposium. I. General principles, objectives, and preliminary results. Psychoanal. Quar. 3: 501, 1934.

Alexander, F.: Psychoanalytic study of a case of essential hypertension. Psychosom. Med. 1: 139-152, 1939.

Anastasi, A.: Psychological Testing. 3rd Ed. New York: Macmillan, 1968.

Antonovsky, A.: Social class and major cardiovascular disease. J. Chronic Dis. 21: 65-107, 1968.

Arad, B.A.: Preliminary report: The control load, the control capacity, and optimal sector design. Washington DC: Federal Aviation Admin., 1963.

Arad, B.A.: Notes on the measurement of control load and sector design in the environment. Washington DC: Federal Aviation Administration System Design Team, 1964 (a).

Arad, B.A.: The control load and sector design. J. Air Traffic Control. May: 12-31, 1964 (b).

Avnet, H.H.: Physician Service Pattern and Illness Rates. Group Health Insurance, Inc., 1967.

Barrett, J., Hurst, M.W., DiScala, C., Rose, R.M.: Prevalence of depression over a twelve month period in a non-patient population. Arch. Gen. Psychiat. 35: 741-744, 1978.

Bendig, A.W.: The development of a short form of The Manifest Anxiety scale. J. Consult. Psychol. 20: 384, 1956.

Bittner, R.H.: Quantitative predictions from qualitative data: predicting college entrance from biographical information. J. Psychol. 19: 97-108, 1945.

Benet, S.: Why they live to be 100, or even older, in Abkhasia. New York Times Magazine, December 26, 1971, 3.

Cahalan, D., Gisin, I.H., Gardner, G.L., Smith, G.C.: Drinking practices and problems in the U.S. Army, Report #73-6. Washington DC: Dept. of Army, 1972.

Campbell, J.P., Dunnette, M.D., Lawler, E.E., Weick, K.E.: Managerial Behavior, Performance, and Effectiveness. New York: McGraw-Hill, 1970.

Caplan, R., Cobb, S., French, J.R.P., Jr., Van Harrison, R., Pinneau, S.R., Jr.: Job Demands and Worker Health, DHEW Publication No. (NIOSH) 75-160, Washington DC: Superintendent of Documents, 1975.

Caplan, R.: Organizational stress and individual strain: A social-psychological study of risk factors in coronary heart disease among administrators, engineers, and scientists. Unpublished doctoral dissertation, University of Michigan, 1971.

Carlestam, G.: The individual, the city and stress. In Levi, L.: Society, Stress and Disease, 1971, pp. 134-147.

Cattell, R.B. (ed.): Handbook of Multivariate Experimental Psychology. Chicago: Rand McNally, 1966.

Cattell, R.B.: The Sixteen Personality Factor Questionnaire (Forms A and B) and Manual. Champaign, Ill: Institute for Personality and Ability Testing, 1962.

Cattell, R.B., Eber, H.W., Tatsuoka, M.M.: Handbook for the Sixteen Personality Factor Questionnaire (16PF). Champaign, Ill: Institute for Personality and Ability Testing, 1970.

Chafetz, M.E. (Chairman): Second Special Report to the U.S. Congress on Alcohol and Health. National Institute on Alcohol Abuse and Alcoholism, DHEW Publication No. HSM-72-9099. Washington DC: U.S. Government Printing Office, 1974.

Cobb, S.: Borderlands of Psychiatry. Cambridge: Harvard Univ. Press, 1943.

Cobb, S., Rose, R.M.: Hypertension, peptic ulcer, and diabetes in air traffic controllers. JAMA 224 (4): 489-492, April 23, 1973.

Cohen, J.B.: Sociocultural change and behavior patterns in disease etiology: an epidemiologic study of coronary disease among Japanese Americans. Ph.D. dissertation in epidemiology, School of Public Health, Univ. of Calif. at Berkeley, August, 1974.

Comstock, G.W., Partridge, K.G.: Church attendance and health. J. Chronic Dis. 25: 665-672, 1972.

Corson, J.J., Bernard, P.W., Cotterson, A.D., Fleming, R.W., Lewis, A.D., Mitchell, J.M., Ruttenberg, S.H.: The Career of the Air Traffic Controller - A Course of Action. Washington, DC: Report of the Air Traffic Controller Career Committee, Office of the Secretary of Transportation, January, 1970.

Dahlstrom, W.G., Welsh, G.S., Dahlstrom, L.E.: An MMPI Handbook, Vol. 1. Minneapolis: Univ. of Minnesota Press, 1973.

Dempsey, P.: A unidimensional depression scale for the MMPI. J. Consul. Psychol. 28: 364-270, 1964.

Dohrenwend, B.S., Dohrenwend, B.P. (eds.): Stressful Life Events: Their Nature and Effects. New York: Wiley, 1974.

Dunbar, H.F.: Emotions and Bodily Changes. New York: Columbia Univ. Press, 1954.

Engel, G.L., Reichsman, G.F., Segal, H.L.: A study of an infant with a gastric fistula. I. Behavior and the rate of total hydrochloric acid secretion. Psychosom. Med. 18: 374-398, 1956.

Fleishman, E.A.: Manual for the Supervisory Behavior Description Questionnaire. Washington, DC: American Institutes for Research, 1972.

French, J.R.P., Caplan, R.: Psychosocial factors in coronary heart disease. Indus. Med. 39: 31-46, 1970.

French, W.L., Bell, C.H., Jr.: Organization Development. Englewood Cliffs, N.J.: Prentice-Hall, 1973.

Friedman, M., Rosenman, R.H., Carroll, V.: Changes in the serum cholesterol and blood clotting tim. of men subject to cyclic variation of occupational stress. Circ. 17: 852, 1958.

Haderus, B.: Psychosocial factors in relation to coronary heart disease and associated risk factors. Nord Hygitidskr, Supplement 6, 1974.

Hemon, F.R.: Computer diagnosis of headache. Headache. July: 49-56, 1968.

Tiselli, E.C.: The Average Utility of Various Types of Tests. Berkeley: University of California Press, 1955.

Theorell, E.L., Comstock, G.W.: Life events and subsequent illness. Am. J. Epidem. 104: 146-158, 1976.

Goldsmith, D.B.: The use of the Personnel History Blank as a salesmanship test. J. App. Psychol. 6: 149-155, 1922.

Gough, H.G.: The California Psychological Inventory and Manual for the California Psychological Inventory (Rev. Ed.). Palo Alto, CA: Consulting Psychologists Press, 1960.

Groen, J.J., Prory, S.: Influence of psychosocial factors on coronary heart disease. Pathologia Et Microbiologia. 30: 779-788, 1967.

Guilford, J.P.: Psychometric Methods. New York: McGraw-Hill, 1954.

Guilford, J.P., Lacey, J.I. (eds.): Printed Classification Tests. Army Air Force Psychology Research Program Report 5. Washington, DC: U.S. Government Printing Office, 1947.

Harmon, D.K., Masuda, M., Holmes, T.H.: The social readjustment rating scale: a cross-cultural study of Western Europeans and Americans. J. Psychosom. Res. 14: 391-400, 1970.

Harmon, H.H.: Modern Factor Analysis. Chicago: Univ. of Chicago Press, 1960.

Hawkins, N.G., Davies, R., Holmes, T.H.: Evidence of psychosocial factors in the development of pulmonary tuberculosis. Am. Rev. of Tuberculosis and Pulmonary Dis. 75: 768-780, 1957.

Henry, J.P.: Understanding the early pathophysiology of essential hypertension. Geriatrics. 31: 59-72, 1956.

Herd, J.A., Morse, W.H., Kelleher, R.T., Jones, L.G.: Arterial hypertension in the squirrel monkey during behavioral experiments. Am. J. Physiol. 217: 24-29, 1969.

Hinkle, L.E., Plummer, N., Metraux, R., Richter, P., Gittinger, J.W., Thetford, W.N., Ostfeld, A.M., Dane, F.D., Goldberger, L., Mitchell, W.E., Leichter, H., Pinsky, R., Goebel, D., Bross, I.D.J., Wolff, H.G.: Studies in human ecology. Am. J. Psychiatry. 114: 214-220, 1958.

Hinkle, L.E., Wolff, H.G.: The nature of man's adaptation to his total environment and the relation of this to his illness. Arch. Intern. Med. 99: 442, 1957.

Holmes, T.H., Masuda, M.: Life change and illness susceptibility. In Dohrenwend, B.S. and Dohrenwend, B.P. (eds.) Stressful Life Events: Their Nature and Effects. New York: John Wiley and Sons, pp. 45-72, 1974.

Holmes, T.H., Rahe, R.H.: The social readjustment rating scale. J. Psychosom. Res. 11: 213-218, 1967a.

House, J.S.: The relationship of intrinsic and extrinsic work motivations to occupational stress and coronary heart disease risk. Unpublished doctoral dissertation, University of Michigan, 1972.

House, R.J., Filley, A.C.: Leadership style, hierarchial influence, and the satisfaction of subordinate role expectations: a test of Likert's influence proposition. J. App. Psychol. 55: 422-432, 1971.

Hurst, M.W.: Life changes and psychiatric symptom development: Issues of content, scoring and clustering. In Barrett, J. and Rose, R. (eds.): Stress and Mental Disorders. NY: Raven Press, 1979.

Hurst, M.W., Jenkins, C.D., Rose, R.M.: The assessment of life change stress: A comparative and methodological inquiry. Psychosom. Med. 40: 126-141, 1978.

Hurst, M.W., Jenkins, C.D., Rose, R.M.: The relation of psychological stress to the onset of medical illness. Ann. Rev. Med. 27: 301-312, 1976.

Hurst, M.W., Rose, R.M.: Objective job difficulty, behavioral response, and sector characteristics in air route traffic control centers. Ergonomics, 1978a, in press.

Hurst, M., Rose, R.: Objective workload and behavioral response in airport radar control rooms. Ergonomics, 1978b, in press.

Huse, E.F.: Organization Development and Change. New York: West Publishing, 1975.

Israel, J.: Alienation: From Marx to Modern Sociology. New York: McKay, 1971.

Jackson, E.F.: Status consistency and symptoms of stress. Am. Sociol. Rev. 27: 469-480, 1962.

Jenkins, C.D.: Personality and cardiovascular disease: Recent findings and future directions. In Zanchetti, A. (ed.): Neural and Psychological Mechanisms in Cardiovascular Disease. Milan, Italy: Il Ponte, pp. 247-253, 1972.

Jenkins, C.D.: Psychologic and social precursors of coronary disease. N. E. J. Med. 284: 244-255; 307-317, 1971.

Jenkins, C.D.: Recent evidence supporting psychologic and social risk factors for coronary disease. N. E. J. Med. 294: 987-994; 1033-1038, 1976.

Johnson, H.M.: The detection and treatment of accident prone drivers. Psychol. Bull. 43: 489-532, 1946.

Jorgensen, T.G., Gyntelberg, F.: Occurrence of peptic ulcer disease in Copenhagen males age 40-49. Life incidence and one-year incidence correlated to environmental factors, life habits, physical factors and concomitant disease. Dan. Med. Bull. 23: 23-28, 1976.

Julius, S., Schork, M.A.: Borderline hypertension - a critical review. J. Chronic Dis. 23: 723-754, 1971.

Kahn, R.L., Wolfe, D.M., Quinn, R.P., Snoek. J.D., Rosenthal, R.A.: Organizational Stress: Studies in Role Conflict and Ambiguity. New York: Wiley, 1964.

Kaiser, H.F.: The application of electronic computers to factor analysis. Educ. Psycho. Meas. 20: 141-151, 1960.

Kaplan, B.H.: A note on religious beliefs and coronary heart disease. Paper presented at the National Conference on Emotional Stress and Heart Disease, Myrtle Beach, SC, October, 1975.

Karson, S., O'Dell, J.W.: Performance ratings and personality factors in radar controllers. J. Clin. Psychol. 27: 339-342, 1971.

Karson, S., O'Dell, J.W.: Personality make-up of the American air traffic controller. Aero. Med. 45: 1001-1007, 1974.

Kasl, S.V., Cobb, S.: Blood pressure changes in men undergoing job loss: A preliminary report. Psychosom. Med. 32: 19-38, 1970.

Kavanagh, M.J., Halpern, M.: The impact of job level and sex differences on the relationship between life and job satisfaction. Acad. Manag. J. 20: 66-73, 1977.

Kavanagh, M.J., MacKinney, A.C., Wolins, L.: Satisfaction and morale of foremen as a function of middle manager's performance. J. Appl. Psychol. 54: 145-156, 1970.

Kerman, A.K.: "Consideration," "Initiating Structure," and organizational criteria. Personnel Psychol. 18: 349-360, 1966.

Korman, A.K.: The prediction of managerial performance. A review. Personnel Psychol. 21: 295-322, 1968.

Kornhouser, A.: Mental Health of the Industrial Worker. New York: Wiley, 1965.

Kurtz, A.: Selecting salesmen by personal history items: methods and results. Psychol. Bull. 36: 528, 1939.

Laurig, W., Becker-Biskaborn, G.U., Reiche, D.: Software problems in analyzing physiological and work study data. Ergonomics. 14: 625-631, 1971.

Lawrence, D.H.: Biographical surveys. In Bijou, S.W. (ed.) The Psychological Program in AAF Convalescent Hospitals. AAF Aviation Psychology Report No. 15. Washington, DC: U.S. Government Printing Office, 1947.

Luborsky, L.: Assessment of outcome of psychotherapy by independent clinical evaluators: review of the most highly recommended research measures. In Waskow, I.E., Parloff, M.B. (eds.): Psychotherapy Change Measures. DHEW Publication No. (ADM) 74-170. Washington, DC: Superintendent of documents, U.S. Government Printing Office, pp. 233-243, 1972.

Lundberg, U., Therorell, T., Lind, E.: Life changes and myocardial infarction: Individual differences in life change scaling. J. Psychosom. Res. 19: 27-32, 1975.

Magora, A., Taustein, I.: An investigation of the problem of sick-leave in the patient suffering from low back pain. Indus. Med. Surg. 38: 80-90, 1969.

Mason, J.W.: A review of psychoendocrine research on the pituitary adrenal cortical system. Psychosom. Med. 30: 576-607, Part II, 1968.

Masuda, M., Holmes, T.H.: The social readjustment rating scale: A cross-cultural study of Japanese and Americans. J. Psychosom. Res. 11: 227-237, 1967b.

Masuda, M., Holmes, T.H.: Magnitude estimations of social readjustments. J. Psychosom. Res. 11: 219-225, 1967c.

Medalie, J.H., Snyder, M., Groen, J.J., et al.: Agina pectoris among 10,000 men: Five year incidence and univariate analysis. Am. J. Med. 55: 583-594, 1973.

Megargee, E.L.: The California Psychological Inventory Handbook. San Francisco: Jossey-Bass, Inc., 1972.

Mills, C.W.: White Collar. New York: Oxford Univ. Press, 1951.

McNair, D.M., Lorr, M., Droppleman, L.F.: Profile of Mood-States: Manual. San Diego: Educational and Industrial Testing Service, 1971.

Milne, A.M., Colmen, J.G.: Selection of Air Traffic Controllers for Federal Aviation Administration. Washington, DC: Education and Public Affairs, Inc., 1972.

Mirvis, P.H., Lawler, E.E.: Measuring the financial impact of employee attitudes. J. App. Psychol. 62: 1-8, 1977.

Murawski, B.T., Gray, B., Nemetz, S.J., Posin, H.I., Amsterdam, E.A., Chrisrlieb, A.T., Hickler, R.B.: Psycho-physiological responses in patients with essential hypertension. Hypertension. 16: 97, 1968.

Nunnally, J.D.: Psychometric Theory. New York: McGraw-Hill Books Co., 1967.

Ostfeld, A.M.: The Common Headache Syndromes. Springfield, Ill.: C.C. Thomas, 1962.

Owens, W.A., Champagne, J.A.: A Selected Bibliography on Biographical Data. Greensboro, NC: The Creativity Research Institute of the Richardson Foundation, 1965.

Paffenbarger, R.S., Jr., Thorne, M.C., Wing, A.L.: Chronic disease in former college students. VII. Characteristics in youth predisposing to hypertension in later years. Am. J. Epidem. 86: 25-32, 1968.

Palmore, E.: Predicting longevity: A follow-up controlling for age. Gerontology. Winter, 1969.

Paykel, E.S., Prusoff, B.A., Uhlenhuth, E.H.: Scaling of life events. Arch. Gen. Psychiat. 25: 340-347, 1971.

Paykel, E.S., Uhlenhuth, E.H.: Rating the magnitude of life stress. Canad. Psychiat. Assoc. J. 17: ss93-ss100, 1972.

Philipp, U., Reiche, D., Kinhner, J.H.: The use of subjective rating. Ergonomics. 14: 611-616, 1971.

Quinn, R.P., Staines, G.L., McCullough, M.R.: Job Satisfaction: Is There a Trend? Washington, DC: U.S. Department of Labor, Manpower Research Monograph No. 30, 1974.

Rahe, R.H.: Epidemiological studies of life change and illness. Internat. J. of Psychiat. Med. 8: 133-146, 1976.

Rahe, R.H.: Life change measurement as a predictor of illness. Proc. Royal Soc. Med. 61: 1124-1126, 1968.

Rahe, R.H., Meyer, M., Smith, M., Kjaer, G., Holmes, T.H.: Social stress and illness onset. J. Psychosom. Res. 8: 35-44, 1964.

Reinhardt, A.M.: Anomie, socioeconomic status and mental disturbance. Comm. Ment. Health J. 8: 109-119, 1972.

Reimanis, G.: Psychosocial development, anomie and mood. J. Pers. Soc. Psychol. 29: 355-357, 1974.

Reiser, M., Weiner, H., Singer, M.T.: Cardiovascular responses and their psychological correlates: 1. A study in healthy young adults and patients with peptic ulcer and hypertension. Psychosom. Med. 24: 477-498, 1962.

Ridley, C.A.: Exploring the impact of work satisfaction and work involvement on marital interaction when both partners are employed. J. Marr. and Fam. 35: 229-237, 1973.

Riess, W.F., Werdegar, D., Sokolow, M.: Blood pressure responses to daily life events. Trans. Assoc. Life Ins. Med. Dir. America. 51: 116-129, 1968.

Rose, R.M., Poe, R.D. Mason, J.W.: Psychological state and body size as determinants of 17-OHCS excretion. Arch. Int. Med. 121: 406-413, 1968.

Rosenman, R.H., Friedman, M., Strauss, R., et al.: A predictive study of coronary heart disease: The Western Collaborative Group Study. JAMA 189: 15-22, 1964.

Rubin, R.T., Gunderson, E.K., Arthur, R.J.: Life stress and illness patterns in the U.S. Navy, V. Prior life change and illness onset in a battleship's crew. J. Psychosom. Res. 15: 89-96, 1971.

Rubin, R.T., Gunderson, E.K., Arthur, R.J.: Prior life change and illness onset in an attack carrier's crew, III. Arch. Environ. Health. 19: 753-757, 1969.

Russek, H.I.: Role of heredity, diet and emotional stress in coronary heart disease. JAMA 171: 503-508, 1959.

Sales, S.M.: Organizational role as a risk factor in coronary disease. Admin. Sci. Quar. 14: 325-337, 1969.

Sales, S.M., House, J.: Job dissatisfaction as a possible risk factor in coronary heart disease. J. Chronic Dis. 23: 861-873, 1971.

Sandberg, B., Bliding, A.: Problems and symptoms in army basic trainees with stress-induced hypertensive reactions. J. Psychosom. Res. 20: 51-59, 1976.

Schriesheim, C.A., House, R.J., Kerr, S.: Leader initiating structure: A reconciliation of discrepant research results and some empirical tests. Org. Behav. Human Perf. 15: 297-321, 1976.

Schriescheim, C.A., Stogdill, R.M.: Differences in the factor structure across three versions of the Ohio State Leadership Scales. Personnel Psychol. 28: 189-206, 1975.

Seeman, M.: On the meaning of alienation. Am. Soc. Rev. 24: 783-791, 1959.

Singer, R., Rutenfranz, J.: Attitudes of air traffic controllers at Frankfurt Airport towards work and the working environment. Ergonomics. 14: 633-639, 1971.

Smith, P.C., Kendall, L.M., Hulin, C.L.: The Measurement of Satisfaction in Work and Retirement. Chicago: Rand McNally and Co., 1969.

Smith, R.C.: Job attitudes of air traffic controllers: A comparison of three air traffic control specialties. (FAA-AM-73-2). FAA Civil Aeromedical Institute, Oklahoma City, 1973.

Spitzer, R.L., Endicott, J., Cohen, G.M.: Use of Psychiatric Status Schedule Teaching Tapes and Keys. New York: Evaluation Unit, Biometrics Research, New York State Dept. of Mental Hygiene, New York State Psychiatric Institute, 1968a.

Spitzer, R.L., Endicott, J., Cohen, G.M.: Manual of Instructions: Psychiatric Status Schedule. New York: Evaluation Unit, Biometrics Research, New York State Dept. of Mental Hygiene, New York State Psychiatric Institute, 1968b.

Spitzer, R.L., Endicott, J., Fleiss, J.L.: Instruments and recording forms for evaluating psychiatric status and history: Rationale, method of development and description. Comprehen. Psychiat. 8: 321-343, 1967.

Spitzer, R.L., Endicott, J., Fleiss, J.L., Cohen, J.: The Psychiatric Status Schedule. A technique for evaluating psychopathology and impairment in role functioning. Arch. Gen. Psychiat. 23: 41-55, 1970.

Srole, L.: Social integration and certain corollaries. Am. Sociol. Rev. 21: 709-716, 1956.

Stead, W.W., Heymen, A., Thompson, H.K., Hammond, W.E.: Computer-assisted interview of patient's functional headache. Arch. Int. Med. 129: 950-955, 1972.

Stogdill, R.M.: Handbook of Leadership. New York, Free Press, 1974.

Stogdill, R.M.: Manual for the Leader Behavior Description Questionnaire - Form XII. Columbus Ohio State Univ., Bureau of Business Research, 1963.

Stogdill, R.M., Coons, A.E.: Leader Behavior: Its Description and Measurement. Columbus Ohio State Univ., Bureau of Business Research, 1957.

Stokols, D.: On the distinction between density and crowding: Some implications for future research. Psychol. Rev. 79: 275-278, 1972.

Strupp, H.H.: Review of the Psychiatric Status Schedules: Subject Forms, Second Edition. In Buros, O. (ed.): The Seventh Mental Measurements Yearbook, Vol. 1. Highland Park, NJ: The Gryphon Press, 1972, pp. 309-312.

Super, D.E.: The Psychology of Careers. New York: Harper, 1957.

System Development Corporation: Center Controller Performance Rating Package Instruction Booklet and CAB Controller Performance Rating Package Instruction Booklet. Santa Monica, Calif.: System Development Corp., 1972.

Szilagyi, A.D., Keller, R.T.: A comparative investigation of the Supervisory Behavior Description Questionnaire (SBDQ) and the revised Leader Behavior Description Questionnaire (LBDQ-Form XII). Acad. Manag. J. 19: 642-649, 1976.

Thomas, J.M., Bennis, W.G.: Management of Change and Conflict. Baltimore, MD: Penguin, 1972.

Trites, D.K., Kurek, A., Cobb, B.: Personality and achievement of air traffic controllers. Aero. Med. 38: 1145-1150, 1967.

Vroom, V.H.: Work and Motivation. New York: Wiley, 1964.

Walton, G.C.: Personal communication of data compiled by the Office of Management Systems, Air Traffic Service, Federal Aviation Administration, Dept. of Transportation, May 25, 1977.

Wardwell, W.I., Bahnson, C.B.: Behavioral variables and myocardial infarction in the Southeastern Connecticut Heart Study. J. Chronic Dis. 26: 447-461, 1973.

Weiner, H.: Psychobiology and Human Disease. New York: Elsevier, 1977.

Weintraub, J.: The relationship between job satisfaction and perceived states of health: A multivariate investigation. (Doctoral dissertation, Bowling Green State University, 1973). Dissertation Abstracts International 34: 4111B, 1974.

Weissenberg, P., Kavanagh, M.J.: The independence of initiating structure and consideration: A review of the literature. Personnel Psychol. 25: 119-130, 1972.

Weissman, M.W.: The assessment of social adjustment. A review of techniques. Arch. Gen. Psychiat. 32: 357-364, 1975.

Wolf, S.: Psychosocial influences in gastrointestinal function. In L. Levi (ed.), Society, Stress and Disease. London, England: Oxford University Press, 1971.

Zung, W.W.K.: A self-rating depression scale. Arch. Gen. Psychiat. 12: 63-70, 1965.

Zung, W.W.K.: Factors influencing the self-rating depression scale. Arch. Gen. Psychiat. 16: 543, 1967a.

Zung, W.W.K.: Depression in the normal aged. Psychosomatics 8: 287-292, 1967b.

Zung, W.W.K.: A cross-cultural survey of symptoms in depression. Am. J. Psychiat. 126: 154-159, 1969.

Zung, W.W.K.: A rating instrument for anxiety disorders. Psychomatics 12: 371-379, 1971.

Zung, W.W.K.: A rating instrument for anxiety disorders. Psychosom. Med. 12: 371-379, 1971a.

Zung, W.W.K.: The differentiation of anxiety and depressive disorders. A biometric approach. Psychosomatics 12: 380-384, 1971b.

Zyzanski, S., Jenkins, C.D., Ryan, T.J., Flessa, A., Everist, M.: Psychological correlates of coronary angiographic findings. Arch. Int. Med. 136: 1234-1237, 1976.

EXHIBITS

I. Copyrighted and Published Instruments

A. California Psychological Inventory - available from Consulting Psychologists Press, Palo Alto, Calif., 94302.

B. Jenkins Activity Survey - available from Psychological Corporation, attn. Dr. Richard Hanson, 757 Third Ave., N.Y., N.Y., 10017.

C. Sixteen Personality Factor Questionnaire - available from Institute for Personality and Ability Testing, 1602 Coronado Dr., Champaign, Ill., 61820.

D. Zung Self-Rating Depression Scale and Zung Self-Rating Anxiety Inventory - published in

Zung, W.W.K.: A self-rating depression scale. Arch. Gen. Psychiatry, 12: 63-70, 1965.
Zung, W.W.K.: A rating instrument for anxiety disorders. Psychosomatics, 12: 371-379, 1971.

E. Psychiatric Status Schedule - available from Robert Spitzer, M.D., or Jean Endicott, Ph.D., Evaluation Unit, Biometrics Research, New York Dept. of Mental Hygiene, New York State Psychiatric Institute, 722 West 168th St., N.Y., N.Y., 10032.

F. Profile of Mood States - available from Educational and Industrial Testing Service, San Diego, Calif., 92107.

G. Job Description Inventory - in Smith, P.C., Kendall, L.M. and Hulin, C.L.: The Measurement of Satisfaction in Work and Retirement. Chicago, Rand McNally and Co., 1969.

H. Kavanagh Life Attitude Profile - in Kavanagh, M.J., MacKinney, A.C., Wolins, L.: Satisfaction and morale of foremen as a function of middle manager's performance. J. Applied Psychol., 54: 145-156, 1970.

I. Leader Behavior Description Questionnaire - Published as Manual for the Leader Behavior Description Questionnaire Form XII, Columbus, Ohio State University, Bureau of Business Research, 1963.

J. MMPI Subscales (part of Minnesota Multiphasic Personality Inventory) - available from the Psychological Corporation, 757 Third Ave., N.Y., N.Y., 10017.

II. Instruments Devised by ATC HCS

A. Physical examination

B. Medical questionnaire - labelled as "MED 210 - Review of Health History"

C. Health checklist - labelled "Monthly Health Review"

D. Headache questionnaire - labelled "ATC Headache Study"

E. Sleep questionnaire - labelled "Trouble Sleeping?"

F. Biographical questionnaire - labelled "ATC Biographical Questionnaire"

G. ATC questionnaire - labelled :Fifth Round, PSY 102: ATC Questionnaire, Career Attitudes and Behavior"

H. Sociometric questionnaire - labelled "PSY 103 - Sociometric Questionnaire"

I. Review of Life Experiences (ROLE) - labelled "PSY 131, Fifth Round"

J. Satisfaction with FAA Policy Questionnaire - labelled "Satisfaction with FAA Policy Questionnaire"

K. FAA Awards Questionnaire - labelled "FAA Awards Questionnaire"

L. Subjective Difficulty Questionnaire - labelled "ATCS Subjective Difficulty Questionnaire"

APPENDIX I

SUPPLEMENTARY DATA AND TABLES

II. B.5. Specific ATC Variables

ckground: Item selection criteria and factor composition of ATC questionnaire job-specific scales.

The item composition of the ATC questionnaire was analyzed twice to reduce e number and redundancy of questions. The first item reduction analysis was nducted on the results from a pilot study of 55 air traffic controllers at Oakland (Calif.) Air Route Traffic Control Center. The second item reduction lysis was conducted on the results from the first testing of all 416 controllers the present health change study. In both analyses the same criteria for item ntion were used.

Criteria for item retention were devised prior to any analyses to avoid oring criteria to results. Items were retained if they met all of the follow- criteria:

1. At least 85% of the respondents answered a question.
2. Item standard deviations were no less than 0.80 units.
3. Item response distributions were approximately normal with no worse than 80%-20% split between any two of seven response categories.
4. Item-total correlations would exceed 0.30 after excluding the given item from a total score.

basis of these criteria, 147 items were retained in the first item reduction. Items composed the ATC questionnaire that was administered to the partici- f the ATC HCS during their intake examinations.

ter the administration of the questionnaire (147 item version) to all 416 the first round, another item reduction analysis was performed. The analysis allowed us to shorten the questionnaire to 95 items for repeated the Health Change Study.

er the first administration of the ATC questionnaire to all 416 control- became apparent that we had neglected two important constructs -- anxiety iving training on the job and anxiety due to having incidents (violations

of legal separation standards). Two sets of six new items were developed to assess these additional constructs. However, since these two scales were developed and implemented at the second evaluation, they were not included in our other psychometric work on the ATC questionnaire.

The above procedures utilized rational, intuitive, and empirical methods for scale construction. These methods have been found equivalent or superior to other methods such as factor analysis in terms of predictive validity (Haase and Goldberg, 1967). Compared to factor analytic methods, this procedure yields greater content specificity and face validity.

However, since factor analysis was likely to yield fewer scales with tighter psychometric properties, we also conducted a common factors analysis with varimax rotation (Nie, Bent, and Hull, 1970; Harmon, 1960). Harmon's (1960) suggestion of retaining and interpreting only those items with loading greater than .35 was used to determine the items comprising the factor scales. Items which had significant loadings on more than one factor were retained in the factor on which their loading was highest.

The next series of tables (Appendix Tables III.B.5.a.-1-11 display the results of the common factors analysis: the item loadings, item content, factor name, and the percentage of common variance accounted for. Some items introduced in the original scales by a general question, such as "considering an average workday for you, indicate how each of the following...", were separated by the analysis and became items in other scales. For example, a drinking behavior that was originally part of a question asking about methods of coping on bad days may be loaded onto a "drinking to cope" factor while a sports activity under the same original question may have become an item in the "coping by physical activity" factor. The original questions are repeated in the following tables whenever they are necessary to the understanding of the response item.

nally, Appendix Table III.8.5.a.-12 displays the correlations between tor scales and their most nearly related a priori scales. It was t that the factor scales were primarily condensations and minor recombi- of the a priori scales.

Appendix 1-4

Appendix Table III.B.5.a.-1

Factor Name: Psychophysiological Anxiety Reactions

Eigenvalue = 14.3
% variance = 32.3

Scoring: High scores mean a large number and frequent occurrences of anxiety symptoms before, during and after work.

Loading	Item
.37	How long does it take to get back to your peak after changing shifts? (1 = no time at all...7 = over a week)
.41	Even though Air Traffic Control may be a very exciting and rewarding job, to what extent do you feel it has "cost" you personally to be an ATC? (1 = much less than most...7 = much more than most things)
	Before going to work when weather and/or traffic conditions were bad, how often did you have:
.56	a) Difficulty getting to sleep and staying asleep? (1 = never...7 = nearly every time)
.69	b) Uptight, fidgety, and tense feeling (1 = never...7 = nearly every time)
.62	c) Loss of appetite? (1 = never...7 = nearly every time)
.55	d) Upset stomach? (1 = never...7 = nearly every time)
.53	e) Wishes that it was not your shift? (1 = never...7 = nearly every time)
.5	f) Thoughts about calling in sick but not actually doing it? (1 = never...7 = nearly every time)
	While working difficult traffic in the last six months how often have you felt or experienced
	a) A lot of perspiration? (1 = never...7 = nearly every time)
	b) Your muscles tensing up? (1 = never...7 = nearly every time)
	c) Feeling uncomfortably warm? (1 = never...7 = nearly every time)

d) A dry mouth?
(1 = never...7 = nearly every time)

e) Feeling "put on the spot?"
(1 = never...7 = nearly every time)

f) Tense and worried feelings?
(1 = never...7 nearly every time)

g) Getting more irritable with other controllers?
(1 = never...7 = nearly every time)

Now please indicate how often you have felt or experienced the following after you have been relieved from a long period of heavy traffic. How often have you felt or experienced:

a)The realization that your muscles were very tense?
(1 = never...7 = nearly every time)

b) A backache?
(1 = never...7 = nearly every time)

c) Your heart beating very hard or fast?
(1 = never...7 = nearly every time)

d) A headache?
(1 = never...7 = nearly every time)

e) A total lack of appetite?
(1 = never...7 = nearly every time)

f) Feeling exhausted and in need of rest?
(1 = never...7 = nearly every time)

Considering an average work day for you, indicate how accurately each of the following statements describe usual things you do to unwind at the end of the day.

a)I prefer to be alone to recuperate.
(1 = extremely inaccurate...7 = extremely accurate)

When you are having a poor day, such as described above, how often do you use each of the following ways to cope with it at work?

a) Drink more coffee or other stimulants.
(1 = never...7 = nearly always)

Appendix 1-6

Appendix Table III.B.5.a.-2

Eigenvalue = 8.1
% variance = 18.3

Factor Name: Good Controller

Scoring: High scores mean a controller endorses answers of a socially desirable (for controllers) nature.

Loading	Items
.40	How is the quality of your work affected immediately after changing onto your "least" preferred shift? (1 = work quality becomes much worse...7=work quality becomes much better)
.56	Once you come back from a week or more of annual leave, how long does it take you to get up to peak again? (1 = a month or more...7=a day or less)
.40	My own standards of performance are higher than those in the FAA rules. (1 = completely false...7 = completely true)
.35	I am constantly reviewing my performance throughout a shift against my own set of standards. (1 = completely false...7 = completely true)
.40	I try to get assigned to technically challenging sectors so that I won't get bored. (1 = completely false...7 = completely true)
.59	Compared to other controllers, I keep my cool better in very difficult situations. (1 = completely false...7 = completely true)
	People can easily tell from my words and actions how I really feel about them: (1 = completely false...7 = completely true)
	Compared to other controllers, I can easily return to peak performance after a bad time on the boards. (1 = completely false...7 = completely true)
	Considering an average work day for you, indicate how accurately each of the following statements describe usual things you do to unwind at the end of the day. a) I just do whatever's handy. (1 = never...7 = nearly every time)
	Overall, considering only those things which you do to unwind, which you rated above, how helpful are they in assisting you to unwind at the end of a day? (1 = extremely unhelpful...7 = extremely helpful)

.54 Most controllers have days when they feel on top of the world, like they could handle traffic of four sectors at once and master every situation that arises (well, almost). In an average working month of about 20 days how often do you feel really topnotch?
(1 = 0-2 days...7 = 18-20 days)

54 Given those activities which you pursue, how much overall gratification and reward do you get from these activities?
(1 = very ungratifying and quite overextended... 7 = very gratifying and rewarding)

Appendix 1-8

Appendix Table III.8.5.a.-3

Factor Name: Coping by Drinking

nvalue = 3.8
rience = 8.6

ing: High scores mean that an ATC depends on drinking alcoholic beverages for relaxation and coping.

ding	Item
73	I find I have to drink more to get the same rel'ef. (1 = completely false...7 = completely true)
78	If I'm not able to drink, I find it extremely difficult to unwind. (1 = completely false...7 = completely true)
	Considering an average work day for you, indicate how accurately each of the following statements describes usual things you do to unwind at the end of the day. a) I go out with the guys for a drink. (1 = extremely inaccurate...7 = extremely accurate)
	Given the twenty working days in an average month, indicate how many days (out of twenty) you would usually do each of the following: a) I drink alone at home. (1 = 0-2 days...7 = 18-20 days) b) I drink with a few friends. (1 = 0-2 days...7 = 18-20 days) c) I don't drink. (1 = 0-2 days...7 = 18-20 days)
	On the whole, how helpful is drinking in helping to unwind and relax at the end of a working day. (1 = not helpful at all...7 = the best thing)
	People often pursue other interests outside their jobs. We would like to know if you have pursued any of the following activities in the last six months. Use the scale below for indicating how much time, on the average, you give to the following activities. a) Dating, drinking, or partying. (1 = 0-2 hours a week...7 = 18-20 hours a week)

Appendix 1-9

Appendix Table III.B.5.a.-4

Factor Name: Social Coping Resources

nvalue = 3.0
riance = 6.7

ing: High scores mean a high level of social coping resources.

ding	Items
	If you or your family were struck by a crisis or tragedy, how many persons of the following categories could you really count on to help you? For these purposes, count a married couple or a family unit as "1".
1	a) Among relatives. (1 = none...7 = 10 or more)
1	b) Among friends. (1 = none...7 = 10 or more)
6	c) Among people at work. (1 = none...7 = 10 or more)
7	How many people do you consider close friends who live within an hour's drive of your home? (1 = none...7 = 10 or more)

Appendix 1-10

Appendix Table III.B.5.a.-5

Factor Name: Work Avoidance on Bad Days

nvalue = 1.4
riance = 3.2

ing: High scores mean a controller avoids work on difficult days.

ding	Items
	When you are having a poor day, such as described above, how often do you use each of the following ways to cope with it at work?
41	a) Try to get assigned to a sector with a light load (1 = never...7 = nearly always)
72	b) Take longer breaks. (1 = never...7 = nearly always)
9	c) Take more breaks. (1 = never...7 = nearly always)
	d) Find a work partner that understands and can help out. (1 = never...7 = nearly always)
	e) Find a friend or diversion to take your mind off the problem. (1 = never... 7 = nearly always)

Appendix 1-11

Appendix Table III.B.5.a.-6

Factor Name: Subjective Costs

envalue = 1.9
ariance = 4.3

ing: High scores mean a high level of subjective costs.

ding

	Items
	ATC work may affect many other areas in your life. Use the scale below for indicating how each of the following areas have been affected for you.
53	a) Friendships. (7 = ATC work has interfered tremendously in this area... 1 = ATC work has helped tremendously in this area)
	b) Social Life. (7 = ATC work has interfered tremendously in this area... 1 = ATC work has helped tremendously in this area)
	c) Relationships with wife or girlfriend. (7 = ATC work has interfered tremendously in this area... 1 = ATC work has helped tremendously in this area)
	d) Family life and relations with children. (7 = ATC work has interfered tremendously in this area... 1 = ATC work has helped tremendously in this area)
	e) Physical health. (7 = ATC work has interfered tremendously in this area... 1 = ATC work has helped tremendously in this area)
	f) Peace of mind.. (7 = ATC work has interfered tremendously in this area... 1 = ATC work has helped tremendously in this area)

Appendix Table III.B.5.a.-7

Factor Name: Bounceback-Burnout

1.0
2.1

h scores on this factor mean high bounceback. Low scores
this factor mean high burnout and low bounceback

Items
In the past six months it has been becoming more difficult for me to bounce back to peak performance when I've been away from the boards. (7 = completely false... 1 = completely true)
In the last six months, I've been finding it harder to shift between peak and slow periods. (7 = completely false...1 = completely true)
How often do you find yourself worrying about your own "burnout"? (1 = never...7 = constantly)
At the present time, how close to "burnout" do you feel? (7 = extremely close...1 = extremely distant)

Appendix 1-13

Appendix Table III.B.5.a.-8

Factor Name: Investment

Eigenvalue = 1.6
% Variance = 3.6

Scoring: High scores mean a high level of investment in activities characteristic of "Super-Controllers"

Loading	Items
.57	I greatly dislike having to restrict aircraft prior to their entering my sector. (1 = completely false...7 = completely true)
.43	When working a combined sector well, I don't like to have anyone suggest decombining it. (1 = completely false...7 = completely true)
.42	Even when I'm under IFR pressure, I don't feel I'm doing a complete job unless I provide VFR advisories. (1 = completely false...7 = completely true)
.57	It is extremely important to me to try and fill pilot requests even when their requests will cause me extra work. (1 = completely false...7 = completely true)
.56	I try to do something extra in every shift so that I'll end each shift with a sense of accomplishment. (1 = completely false...7 = completely true)
.42	I try to get assigned to technically challenging sectors so that I won't be bored. (1 = completely false...7 = completely true)

Appendix 1-14

Appendix Table III.8.5.a.-9

Factor Name: Tension Discharge Rate

Eigenvalue = 2.3
% Variance = 5.3

Scoring: Each item was scored in reverse such that a high score meant a high tension discharge rate.

Loading	Items
.51	After I have left the boards I continue thinking about all the possible conflicts and work them through again in my mind. (1 = completely false...7 = completely true)
.50	I stay in "high gear" and have trouble relaxing once I leave work. (1 = completely false...7 = completely true)
.36	Over the past few months, I find it is becoming increasingly difficult to unwind at the end of a shift. (1 = completely false...7 = completely true)
.55	When I get home after work, I am so preoccupied with what happened on the job that I can't talk with my wife or friends. (1 = completely false...7 = completely true)
.64	Even when I'm away from Air Traffic Controlling I spend much of my time thinking about ATC work. (1 = completely false...7 = completely true)
.56	In describing me, my friends would say that I eat, drink and think ATC. (1 = completely false...7 = completely true)

Appendix 1-15

Appendix Table III.B.5.a.-10

Factor Name: Physical Activities

genvalue: = 1.3
Variance = 2.9

ring: High scores mean more use of physical activities for coping

oading	Items
	Considering an average work day for you, indicate how accurately each of the following statements describes usual things you do to unwind at the end of the day.
.52	a) I take a walk to relax. (1 = extremely inaccurate...7 = extremely accurate)
.52	b) I do strenous exercise or some physical sport. (1 = extremely inaccurate...7 = extremely accurate)
37	c) I start doing a hobby. (1 = extremely inaccurate...7 = extremely accurate)
	People often pursue other interests outside their jobs. We would like to know if you have pursued any of the following activities in the last six months. Use the scale below for indicating how much time, on the average, you give to the following activities.
38	a) Physical sports, such as baseball, basketball, bowling, hockey, fishing. (1 = 0-2 hours a week...7 = 18-20 hours a week)

Appendix Table III.B.5.a.-11

Factor Name: Marital Coping Resources

Eigenvalue = 1.2
% Variance = 2.6

Scoring: High scores mean high marital resources. Unmarried men received no score.

Loading	Items
.78	How much support do you feel your wife provides you in coping with the pressures of your job? (1 = she criticizes me tremendously...7 = she supports me tremendously)
.62	How often do you talk with your wife about your feelings that are a consequence of your work? (1 = never or extremely rarely...7 = more than once a day)
.63	How do you feel about your wife sharing her trials and tribulations of the day when you arrive home? (1 = I hate it...7 = I really like her to share her problems with me.)
.79	How understanding is your wife of your need to unwind at the end of a day's work? (1 = completely lacks such an understanding...7 = extremely understanding)

Appendix Table III.B.5.a.-12

Correlations Between Factors and the Most Nearly-Related *a priori* Scales

or	Correlation with	Most Nearly-Related a priori Scale(s)
hophysiological iety Reactions	.92 .87 .80	During Work Anxiety Symptoms After Work Anxiety Symptoms Before Work Anxiety Symptoms
Controller	.50 .45 -.38	Investment Bounceback Burnout Concerns
by Drinking	.97	Drinking to Cope
voidance on Bad Days	.96	Tension Discharge Mechanisms on Bad Days
tive Costs	.95	Subjective Costs
back-Burnout	.79 -.77	Bounceback Burnout Concerns
ment	.95	Investment
Discharge Rate	.99	Tension Discharge Rate
by Physical Activities	.88	Coping by Physical Activities
Coping Resources	1.00	Marital Coping Resources
Coping Resources	1.00	Social Coping Resources

III.B.5. Peer Nominations for Competence: Background

General Validity of Sociometric Ratings

Using sociometric (peer) ratings to predict future performance behaviors has been successful in the evaluation of naval officers (Hollander, 1956a, 1965), in the selection of life insurance salesmen (Mayfield, 1970; Weitz, 1958), and in predicting managerial success (Kraut, 1975; Roadman, 1964). In fact, in terms of prediction of managerial performance over time, Korman (1968) concluded his review of the literature by noting that peer ratings are better predictors of performance than psychometric procedures, and better than most tests (p. 319). Two extensive reviews on sociometric nomination studies (Lindzey and Byron, 1969; Lewin and Zwany, 1976) reached the same conclusion as Korman. Thus, the ATC peer nominations could be expected to have a strong relationship to actual ATC job performance.

General Reliability of Sociometric Nomination Ratings

Peer nominations also have demonstrated good internal consistency and test-retest reliabilities across a variety of situations (Lewin and Zwany, 1976). Perhaps more importantly, high reliabilities have been reported after relatively short interaction times with peers. Hollander (1956b, 1957) found uncorrected split-half reliabilities of approximately .90 for peer nominations after only four to five days of interaction. Furthermore, these split-half reliabilities did not change significantly over time, and the reliabilities across sessions (test-retest reliability) were just as high. In his later study, Hollander (1957) suggested that "...by the third week (of interaction) -- and perhaps earlier, had we taken a sounding then -- the nomination score is stabilized... (p. 116)." Thus, previous studies indicated that sociometric nominations are highly reliable and stable.

neral Relationship of Peer Nomination Ratings to Health

Although specific indices, e.g., group cohesiveness and within-group status, e been derived from the nominations, specific empirical evidence of relation-ps of these variables to health change has been somewhat meager. Izard (1959) nd that peer nominations of Naval Air Training Cadets were related to psycho-tic complaints. Trainees who received significantly lower peer evaluations essed significantly more psychosomatic complaints. This study is highly estive and unfortunately is the only study that examined the relationship eer nominations to a health-related criterion. After an extensive review ver, Korman (1968) concluded that peer nominations assess a person's ability nction adequately in a complex, dynamic environment. In this study, we ined this ability in terms of how it predicted, or moderated, health changes en in the air traffic environment.

elationship Between Expected and Observed Choices

e thought that the number of names on lists from which a man could be chosen affect the frequency of being chosen. In fact one can calculate the expected ncy of being chosen if all choices were random. Each crew must be con-d separately since the number of men is different in each crew.

et P1 equal the number of men on crew A who can choose a member of that Let P2 and P3 be the number of men on each of the sister crews that can men on crew A. Let T1, T2, and T3 be the total number of names on the or crew A and the sister crews respectively. Then the probability of a crew A being chosen randomly by men on crew A is P1/T1. Similarly, the lities of a man in each of the sister crews being chosen from his sister ts are P2/T2 and P3/T3. Furthermore, each of these P1, P2, and P3 men votes (3 choices for each of three questions). Thus the total expected

mber of choices of any one man by chance would be 9 (P1/T1 + P2/T2 + P3/T3) oss all three questions.

To test the possible influence of randomly expected scores, we computed all the relevant figures for Logan Tower (N = 35). We found a non-significant elation of .006 between the randomly expected total number of times a man t be chosen and the total number of times a man was actually chosen by his s. In addition a non-significant correlation (r = .07) was found between umber of men who could choose an ATC and the number of times the same ATC hosen. Finally, if we adjusted the raw total number of times a given ATC hosen by the expected number of times he would be chosen at random, the lation between the adjusted number of choices and the actual number of choices 99.

hese results clearly indicated that an adjustment for expected choices was ded. We could use the uncorrected number of times a man was chosen by rs as the variable of interest for each question. However, the question d as to whether or not the above results may have been due to restricted standard deviations, and/or ranges in the variables. Appendix Table III. .-1 shows that this was not the case. The results in the table show a good tion and reasonable variability for these scores.

Appendix Table III.8.5.a.v.-1
Statistics on Sociometric Total Choices at Logan Tower
(N = 35)

	Number of Times Selected by Other ATC	Number Who Could Choose ATC	Expected Number of Choices for An ATC
	9.0	10.5	8.5
eviation	9.26	5.7	0.9
	0.41	7.14	6.5 - 9.8

further check on the validity of using the uncorrected number of choices
ssible. For the Logan Tower ATCs, the number of men who could choose a
ATC was very highly correlated with the number of men from which the given
ld make his choices (r = .91). Thus, we could use the latter as an
e of the actual number who could choose an ATC in order to study all 416

correlation between the estimated number of men who could choose an ATC
number of times that ATC was chosen by those men was .01 across all 416
herefore, we were confident in using the uncorrected number of times an
hosen for each question and for the total score. The theoretically
adjustments for the probability of being chosen were not necessary.
some possible sociometric variables could be based on the number of
r choices of an ATC, the same probability of choice problem could have
e applied the same procedures and statistics to determine if adjustments
eeded for the scores based on choices by team members. We found no
t relationship between the randomly expected number of choices and the
er of choices made by team members and, once again, there was a very
ficant relationship between the theoretically adjusted score and the
umber of team member selections of an ATC (r = .88). Consequently,
pursue any adjustments for these kinds of scores either.

of the SPRQ

l consistency reliabilities are not pertinent to our sociometric
se everyone did not rate everyone else. Consequently these reliabilities
uted. For our SPRQ, test-retest eliability was a more important
ability since it indicates the stability of the measured variable

The three main scores we derived from the SPRQ were ideal team choices, amicability choices, and competence choices of a given ATC by his peers. Appendix Table III.B.5.a.v.-2 displays the test-retest reliability coefficients for these three scores over two separate intervals which averaged nine months between test and re-test.

Appendix Table III.B.5.a.v.-2
Test-Retest Reliability Over
Two Successive Intervals

	Interval 1 - N=377	Interval 2 - N=352
Ideal team choices	.77	.69
Amicability choices	.70	71
Competence choices	76	79

The results shown in the table above indicate that the number of times an ATC was chosen by his peers for three different characteristics was very stable over two successive nine-month intervals.

The eighteen month reliability coefficients (obtained by combining the two nine-month intervals) were .64, .63, and .72 for ideal, amicability and competence choices respectively. Even over this very long period of time, controllers' choices of one another remained relatively stable, further indicating the value of these measures in the study.

Appendix 1-23

Appendix Table III.B.7.-1

Peak Traffic Statistics Used To Obtain Normalized Workload Measures

ty NYARTCC

ean 4.383

.D. 2.647

of Observations 12998

ctor ype / tion	Arrival Departure	Transition High	Enroute Low	Transition Low	Enroute High	Row Summary
and	3.636 2.236 547	4.785 2.527 390	5.114 2.599 185	4.099 2.533 525	5.027 3.010 696	4.472 2.683 2343
d	3.96 2.416 2611	4.686 2.457 1777	4.681 2.690 640	4.15 2.452 1690	4.565 3.283 1470	4.326 2.647 8190
de	3.278 1.602 18	3.091 1.814 11	4.765 2.538 17	*	2.583 1.621 12	3.585 2.053 65
	4.243 2.275 808	4.745 2.675 443	5.177 2.718 220	3.984 2.094 564	5.247 3.499 364	4.513 2.615 2400
	3.982 2.366 3984	4.704 2.504 2621	4.861 2.68 1062	4.107 2.398 2786	4.780 3.251 2542	

pplicable in this facility

ent data -- column summary statistics were used as the best estimates; if mary was not available row summary statistics were used; if both column tatistics could not be calculated the overall facility statistics were used.

ds in the following way: Mean
Standard Deviation
Number of observations

Appendix 1-24

Appendix Table III.B.7.-2

Peak Traffic Statistics Used to Obtain Normalized Workload Measures

lity BOSARTCC

d Mean 2.630

d S.D. 1.836

r of Observations 5333

Sector Type / osition	Arrival Departure	Transition High	Enroute Low	Transition Low	Enroute High	Row Summary
off and nd rol	*	2.502 1.715 305	1.560 1.387 25	2.384 1.793 777	2.799 2.013 273	2.477 1.823 1389
and ol	2.481 1.514 54	2.925 1.793 920	1.912 1.755 91	2.493 1.805 1968	2.533 1.960 530	2.654 1.836 3563
Ride r	*	*	*	*	*	4.188 2.198 16
g	*	3.161 1.876 118	2.900 1.668 30	2.712 1.719 156	3.074 1.989 54	2.921 1.812 365
	2.471 1.511 70	2.850 1.792 1344	2.055 1.729 146	2.479 1.801 2908	2.906 1.982 865	

t applicable in this facility

icient data -- column summary statistics were used as the best estimates; if summary was not available row summary statistics were used; if both column statistics could not be calculated the overall facility statistics were used.

reads in the following way: Mean
Standard Deviation
Number of Observations

Appendix Table III.B.7.-3

Peak Traffic Statistics Used to Obtain Normalized Workload Measures

ty NYCIFR

Mean 3.111

S.D. 1.755

of Observations 2836

ector Type / tion	Arrival Departure	Transition High	Enroute Low	Transition Low	Enroute High	Row Summary
and	3.090 1.720 321	N/A	*	*	*	3.087 1.718 322
d	3.080 1.763 2007	N/A	3.484 2.153 64	3.088 1.324 68	3.176 2.767 17	3.093 1.774 2156
e	*	N/A	*	*	*	*
	3.239 1.675 355	N/A	*	*	*	3.237 1.669 358
	3.102 1.747 2683	N/A	3.462 2.144 65	3.085 1.307 71	3.176 2.767 17	

plicable in this facility

nt data -- colum summary statistics were used as the best estimates; if mary was not available row summary statistics were used; if both column atistics could not be calculated the overall facility statistics were used.

s in the following way: Mean
Standard Deviation
Number of observations

Appendix 1-26

Appendix Table III.B.7.-4

Peak Traffic Statistics Used to Obtain Normalized Workload Measures

acility LOGAN

rand Mean 2.444

rand S.D. 1.757

mber of Observations 1310

Position \ Sector Type	Arrival Departure	Transition High	Enroute Low	Transition Low	Enroute High	Row Summary
ndoff and ound ntrol	2.807 2.142 238	N/A	*	N/A	N/A	2.807 2.142 238
dar and al trol	2.373 1.702 868	N/A	*	N/A	N/A	2.378 1.697 875
k Ride tor	*	N/A	*	N/A	N/A	*
ning	2.299 1.427 197	N/A	*	N/A	N/A	2.299 1.427 197
n ry	2.441 1.761 1303	N/A	*	N/A	N/A	

Not applicable in this facility

fficient data -- column summary statistics were used as the best estimates; if n summary was not available row summary statistics were used; if both column row statistics could not be calculated the overall facility statistics were used.

a reads in the following way: Mean
Standard Deviation
Number of observations

Appendix 1-27
Appendix Table III.B.7.-5

Peak Traffic Statistics Used To Obtain Normalized Workload Measures

Facility BRADLEY

Grand Mean 1.622

Grand S.D. 1.234

Number of Observations 508

Position \ Sector Type	Arrival Departure	Transition High	Enroute Low	Transition Low	Enroute High	Row Summary
Handoff and Ground Control	1.854 1.476 41	N/A	*	N/A	*	1.884 1.451 43
Radar and Local Control	1.600 1.199 402	N/A	*	N/A	*	1.580 1.192 414
Neck Ride Monitor	*	N/A	*	N/A	*	*
Training	1.745 1.354 51	N/A	*	N/A	*	1.745 1.354 51
Column Summary	1.636 1.240 494	N/A	*	N/A	1.273 .905 11	

* = Not applicable in this facility

Insufficient data -- column summary statistics were used as the best estimates; if column summary was not available row summary statistics were used; if both column and row statistics could not be calculated the overall facility statistics were used.

Data reads in the following way: Mean
Standard Deviation
Number of observations

Appendix 1-28

Appendix Table III.8.7.-6

Peak Traffic Statistics Used to Obtain Normalized Workload Measures

Facility QUONSET

Grand Mean 1.782

Grand S.D. 1.382

Number of Observations 377

Position \ Sector Type	Arrival Departure	Transition High	Enroute Low	Transition Low	Enroute High	Row Summary
Handoff and Ground Control	1.919 1.505 146	*	N/A	N/A	*	1.900 1.505 150
adar and ocal ontrol	1.728 1.289 217	*	N/A	N/A	*	1.705 1.292 227
eck Ride nitor	*	*	N/A	N/A	.	*
ining	*	*	N/A	N/A	*	*
umn ary	1.805 1.382 365	*	N/A	N/A	*	

* Not applicable in this facility

ufficient data -- column summary statistics were used as the best estimates; if umn summary was not available row summary statistics were used; if both column row statistics could not be calculated the overall facility statistics were used.

ta reads in the following way: Mean
Standard Deviation
Number of observations

Appendix Table III.B.7.-7

Peak Traffic Statistics Used To Obtain Normalized Workload Measures

ty OTIS

Mean 2.070

S.D. 1.491

of Observations 328

ector Type / tion	Arrival Departure	Transition High	Enroute Low	Transition Low	Enroute High	Row Summary
and	2.054 1.548 111	N/A	N/A	N/A	N/A	2.054 1.548 111
d	2.136 1.479 177	N/A	N/A	N/A	N/A	2.136 1.479 177
de	*	N/A	N/A	N/A	N/A	*
	1.825 1.394 40	N/A	N/A	N/A	N/A	1.825 1.394 40
	2.070 1.491 328	N/A	N/A	N/A	N/A	

pplicable in this facility

nt data -- column summary statistics were used as the best estimates; if mary was not available row summary statistics were used; if both column tatistics could not be calculated the overall facility statistics were used.

ds in the following way: Mean
Standard Deviation
Number of observations

Appendix Table III.B.7.-8

Peak Traffic Statistics Used To Obtain Normalized Workload Measures

Facility PROVIDENCE

Grand Mean 1.175

Grand S.D. 1.171

Number of Observations 63

Position \ Sector Type	Arrival Departure	Transition High	Enroute Low	Transition Low	Enroute High	Row Summary
Handoff and Ground Control	0.778 1.060 18	N/A	N/A	N/A	N/A	0.778 1.060 18
Radar and Local Control	1.333 1.187 45	N/A	N/A	N/A	N/A	1.333 1.187 45
Deck Ride Monitor	*	N/A	N/A	N/A	N/A	*
Training	*	N/A	N/A	N/A	N/A	*
Column Summary	1.175 1.171 65	N/A	N/A	N/A	N/A	

* Not applicable in this facility

Insufficient data -- column summary statistics were used as the best estimates; if column summary was not available row summary statistics were used; if both column and row statistics could not be calculated the overall facility statistics were used.

Data reads in the following way: Mean
Standard Deviation
Number of observations

Appendix Table III.B.7.-9

Conversion of Normalized Workload To Raw Planes For Facility Islip [1]

Normalized Workload Range	N^2	Raw Planes: Sum of Peak Traffic Mean (S.D.)	Raw Planes: Maximum Peak Traffic Mean (S.D.)	Raw Planes: Range in Peak Traffic Mean (S.D.)
363-395	18	17.39 (7.43)	3.44 (1.10)	3.33 (1.24)
407-423	41	23.29 (7.62)	4.29 (.93)	3.88 (1.00)
425-436	58	25.90 (7.24)	4.81 (1.05)	4.10 (1.40)
439-449	72	29.08 (8.37)	5.40 (1.07)	4.74 (1.32)
450-462	117	31.23 (10.05)	5.86 (1.13)	4.83 (1.53)
463-474	111	33.66 (8.86)	6.49 (1.22)	5.30 (1.72)
475-487	139	39.55 (9.63)	6.96 (1.12)	5.45 (1.65)
488-512	215	43.84 (9.92)	7.82 (1.36)	6.20 (1.68)
514-526	103	49.74 (9.13)	8.41 (1.10)	6.33 (1.56)
527-540	81	54.00 (10.48)	9.32 (1.41)	7.14 (1.75)
541-553	66	56.17 (9.35)	9.97 (1.45)	7.77 (1.81)
554-567	67	60.97 (10.92)	10.79 (1.70)	8.21 (2.31)
568-580	48	66.29 (13.90)	11.08 (1.75)	8.15 (2.61)
581-594	29	70.97 (9.89)	11.76 (1.64)	9.28 (2.24)
595-607	25	74.28 (15.06)	12.96 (1.88)	9.76 (2.20)
608-621	21	81.24 (13.02)	13.19 (1.81)	10.43 (2.54)
622-634	14	82.07 (12.78)	12.93 (1.49)	9.64 (1.82)
635-717	18	91.72 (10.75)	15.44 (3.28)	11.72 (3.97)
Total	1243	45.11 (18.33)	7.96 (2.77)	6.28 (2.46)

Normalized workload is the sum of normalized peak traffic, normalized maximum peak traffic, and normalized range in peak traffic. Normalized workload was calculated on 2632 man-days of observation and put on a scale where the mean is 500 and the standard deviation is 50.

Men who were never on a working position are excluded.

Appendix Table III.8.7.-1c

Conversion of Normalized Workload to Raw Planes for Facility Nashua [1]

rmalized rkload nge	N[2]	Raw Planes: Sum of Peak Traffic Mean (S.D.)	Raw Planes: Maximum Peak Traffic Mean (S.D.)	Raw Planes: Range in Peak Traffic Mean (S.D.)
-395	-	--	--	--
-423	8	7.88 (3.60)	2.50 (.54)	2.50 (.54)
-436	18	10.11 (3.48)	2.56 (.78)	2.50 (.86)
-449	37	9.78 (4.82)	2.70 (.84)	2.62 (.95)
462	70	11.64 (5.32)	3.01 (.96)	2.66 (1.21)
474	79	13.95 (6.01)	3.52 (.80)	3.04 (1.17)
87	77	17.14 (6.11)	4.17 (.70)	3.51 (1.13)
12	173	19.06 (6.62)	4.97 (.82)	4.20 (1.32)
26	57	24.61 (6.20)	5.75 (.87)	4.53 (1.34)
0	47	26.70 (6.80)	6.55 (.95)	5.36 (1.85)
3	40	31.20 (5.29)	6.72 (1.06)	5.50 (1.36)
7	22	33.59 (7.67)	7.46 (1.06)	5.91 (1.54)
0	13	36.00 (10.89)	7.85 (1.07)	6.23 (1.48)
	13	38.62 (7.78)	8.46 (1.51)	7.08 (1.38)
	7	45.71 (10.06)	8.57 (.79)	6.29 (1.38)
	4	48.00 (9.31)	8.00 (1.41)	6.00 (1.83)
	4	48.00 (2.94)	10.00 (.82)	8.25 (1.50)
	8	54.25 (7.02)	10.75 (1.16)	8.38 (1.92)
	677	20.52 (11.01)	4.93 (1.93)	4.11 (1.91)

zed workload is the sum of normalized peak traffic, normalized maximum affic, and normalized range in peak traffic. Normalized workload was ed on 2632 man-days of observation and put on a scale where the mean nd the standard deviation is 50.

were never on a working position are excluded.

Appendix 1-33

Appendix Table III.8.7.-II

Conversion of Normalized Workload to Raw Planes for Facility IFR[1]

Normalized Workload Range	N[2]	Raw Planes: Sum of Peak Traffic Mean (S.D.)	Raw Planes: Maximum Peak Traffic Mean (S.D.)	Raw Planes: Range in Peak Traffic Mean (S.D.)
363-395	1	3.00 (**)	1.00 (**)	1.00 (**)
407-423	7	13.71 (5.74)	3.43 (.54)	3.29 (.76)
425-436	11	12.91 (8.25)	2.82 (1.33)	2.64 (1.36)
439-449	11	16.73 (5.53)	3.46 (.69)	3.00 (.89)
450-462	26	16.04 (7.80)	3.50 (.81)	2.96 (1.22)
463-474	31	20.86 (8.26)	4.40 (.80)	3.68 (1.44)
475-487	41	22.20 (7.98)	4.73 (.78)	3.85 (1.41)
488-512	65	27.03 (6.89)	5.38 (.91)	4.25 (1.45)
513-526	37	30.14 (7.42)	6.08 (.68)	4.46 (1.24)
527-540	24	33.83 (6.06)	6.62 (1.01)	5.29 (1.49)
541-553	19	36.63 (7.57)	7.00 (1.11)	5.05 (1.78)
554-567	11	41.00 (8.54)	7.00 (1.18)	5.46 (1.70)
568-580	13	45.15 (6.63)	7.69 (.75)	5.62 (1.32)
581-594	3	38.00 (8.54)	9.00 (1.73)	6.33 (2.31)
595-607	9	47.89 (4.70)	8.56 (.73)	6.67 (1.58)
608-621	1	62.00 (**)	9.00 (**)	6.00 (**)
622-634	--	--	--	--
635-647	2	63.00 (7.07)	9.50 (.71)	6.50 (.71)
	318	27.28 (11.86)	5.40 (1.70)	4.25 (1.67)

[1] Normalized workload is the sum of normalized peak traffic, normalized maximum traffic, and normalized range in peak traffic. Normalized workload was based on 2632 man-days of observation and put on a scale where the mean is 400 and the standard deviation is 50.

[2] Controllers who were never on a working position are excluded.

Appendix 1-34

Appendix Table III.B.7.-12

Conversion of Normalized Workload to Raw Planes for Facility Logan[1]

rmalized rkload nge	N[2]	Raw Planes: Sum of Peak Traffic Mean (S.D.)	Raw Planes: Maximum Peak Traffic Mean (S.D.)	Raw Planes: Range in Peak Traffic Mean (S.D.)
-395	-	--	--	--
-423	1	11.00 (**)	2.00 (**)	2.00 (**)
-436	2	8.50 (3.54)	1.50 (.71)	1.50 (.71)
-449	3	14.33 (8.02)	2.67 (.58)	2.67 (.58)
462	14	12.50 (6.22)	3.21 (1.48)	2.86 (1.70)
474	24	14.12 (5.28)	3.75 (.85)	3.46 (1.18)
487	30	14.70 (5.67)	3.87 (.94)	3.40 (1.30)
512	40	20.18 (6.25)	4.60 (.81)	3.90 (1.30)
526	13	24.08 (6.98)	5.62 (.96)	4.54 (1.45)
40	8	29.62 (6.44)	6.38 (.92)	5.25 (1.28)
53	4	28.50 (4.80)	7.00 (1.41)	6.25 (2.36)
7	6	30.83 (5.60)	7.50 (1.05)	6.67 (1.37)
0	3	40.67 (7.10)	7.00 (1.00)	5.00 (1.00)
4	2	39.00 (8.48)	8.50 (.71)	7.50 (2.12)
7	2	34.50 (3.54)	7.50 (.71)	4.00 (0.00)
	1	41.00 (**)	8.00 (**)	6.00 (**)
	1	39.00 (**)	8.00 (**)	8.00 (**)
	2	59.00 (7.07)	14.00 (4.24)	14.00 (4.24)
	156	20.19 (10.22)	4.76 (1.20)	4.10 (2.06)

ed workload is the sum of normalized peak traffic, normalized peak traffic, and normalized range in peak traffic. Normalized was calculated on 2632 man-days of observation and put on a ere the mean is 500 and the standard deviation is 50.

were never on a working position are excluded.

Appendix Table III.B.7.-13

onversion of Normalized Workload to Raw Planes for The Smaller Facilities[1]

lized oad	N[2]	Raw Planes: Sum of Peak Traffic Mean (S.D.)	Raw Planes: Maximum Peak Traffic Mean (S.D.)	Raw Planes: Range in Peak Traffic Mean (S.D.)
5	1	3.00 (**)	1.00 (**)	1.00 (**)
3	3	5.33 (2.31)	1.33 (.58)	1.33 (.58)
5	4	5.75 (2.22)	1.75 (.96)	1.75 (.96)
9	9	6.11 (3.02)	1.89 (.60)	1.89 (.60)
	19	7.63 (4.07)	2.00 (.74)	2.00 (.74)
	11	8.73 (4.92)	2.36 (.81)	2.18 (.87)
	17	12.06 (4.98)	3.12 (.70)	3.06 (.75)
	47	13.66 (5.01)	3.49 (.72)	3.0. (1.0?)
	13	18.15 (4.78)	4.00 (.82)	3.23 (1.17)
	9	18.11 (3.79)	4.78 (1.09)	4.44 (1.01)
	8	22.12 (5.46)	4.62 (1.06)	3.62 (1.51)
	4	23.50 (7.59)	5.25 (.96)	4.75 (1.50)
	4	23.50 (7.33)	5.00 (1.41)	4.50 (1.29)
	6	29.67 (5.99)	5.83 (1.17)	4.00 (.63)
	3	27.67 (9.71)	6.33 (1.53)	4.67 (2.52)
-		--	--	--
	1	20.00 (**)	8.00 (**)	6.00 (**)
-		--	--	--
	159	14.00 (7.73)	3.43 (1.47)	3.01 (1.31)

orkload is the sum of normalized peak traffic, normalized
traffic, and normalized range in peak traffic. Normalized
calculated on 2632 man-days of observation and put on a
the mean is 500 and the standard deviation is 50.

facilities are Quonset, Otis, and Providence.
re never on a working position are excluded.

Appendix Table III.8.9.-1

ATC

FIELD STUDY

CARDIOVASCULAR MEASURES

Maximum Systolic At Work

ALL SUBJECTS

MAXIMUM SYSTOLIC	MEAN			STD. DEVIATION			MAXIMUM			MINIMUM			N		
	VISIT 1	VISIT 2	VISIT 3	VISIT 1	VISIT 2	VISIT 3	VISIT 1	VISIT 2	VISIT 3	VISIT 1	VISIT 2	VISIT 3	VISIT 1	VISIT 2	VISIT 3
DAILY	151.42	148.35	146.75	17.11	17.08	17.64	200.00	200.00	200.00	113.00	110.00	105.00	382	340	288
ON POSITION	147.44	144.84	144.00	17.07	17.50	17.95	200.00	200.00	200.00	108.00	105.00	103.00	375	338	286
OFF POSITION	143.55	140.55	138.70	17.02	16.63	17.14	200.00	200.00	200.00	109.00	98.00	95.00	376	336	287

EXCLUDING SUBJECTS ON ANTI-HYPERTENSIVE MEDICATIONS

MAXIMUM SYSTOLIC	MEAN			STD. DEVIATION			MAXIMUM			MINIMUM			N		
	VISIT 1	VISIT 2	VISIT 3	VISIT 1	VISIT 2	VISIT 3	VISIT 1	VISIT 2	VISIT 3	VISIT 1	VISIT 2	VISIT 3	VISIT 1	VISIT 2	VISIT 3
DAILY	151.63	148.41	146.99	17.26	17.24	17.82	200.00	200.00	200.00	113.00	110.00	105.00	360	320	269
ON POSITION	147.58	144.76	144.28	17.23	17.69	18.18	200.00	200.00	200.00	108.00	105.00	105.00	353	318	268
OFF POSITION	143.75	140.70	138.78	17.08	16.82	17.17	200.00	200.00	200.00	109.00	98.00	95.00	354	316	268

Appendix Table III.B.9.-2

ATC

FIELD STUDY

CARDIOVASCULAR MEASURES

Maximum Diastolic At Work

ALL SUBJECTS

MAXIMUM DIASTOLIC	MEAN VISIT 1	MEAN VISIT 2	MEAN VISIT 3	STD. DEVIATION VISIT 1	STD. DEVIATION VISIT 2	STD. DEVIATION VISIT 3	MAXIMUM VISIT 1	MAXIMUM VISIT 2	MAXIMUM VISIT 3	MINIMUM VISIT 1	MINIMUM VISIT 2	MINIMUM VISIT 3	N VISIT 1	N VISIT 2	N VISIT 3
DAILY	100.94	100.03	99.43	10.27	9.28	8.93	137.00	131.00	125.00	69.00	75.00	74.00	382	340	288
ON POSITION	98.87	97.83	97.80	10.51	9.91	9.40	130.00	131.00	125.00	69.00	71.00	73.00	375	338	286
OFF POSITION	95.35	94.95	93.29	10.56	10.41	9.87	137.00	122.00	119.00	60.00	69.00	69.00	376	336	287

EXCLUDING SUBJECTS ON ANTI-HYPERTENSIVE MEDICATIONS

MAXIMUM DIASTOLIC	MEAN VISIT 1	MEAN VISIT 2	MEAN VISIT 3	STD. DEVIATION VISIT 1	STD. DEVIATION VISIT 2	STD. DEVIATION VISIT 3	MAXIMUM VISIT 1	MAXIMUM VISIT 2	MAXIMUM VISIT 3	MINIMUM VISIT 1	MINIMUM VISIT 2	MINIMUM VISIT 3	N VISIT 1	N VISIT 2	N VISIT 3
DAILY	100.98	100.81	99.49	10.31	9.40	9.02	137.00	131.00	125.00	69.00	75.00	74.00	360	320	269
ON POSITION	98.94	97.90	97.92	10.45	10.01	9.52	130.00	131.00	125.00	69.00	71.00	73.00	353	318	268
OFF POSITION	95.45	94.86	93.30	10.67	10.41	9.71	137.00	122.00	119.00	60.00	69.00	69.00	354	316	268

Appendix Table III.8.9.-3
ATC

FIELD STUDY

CARDIOVASCULAR MEASURES

Average Heart Rate At Work

ALL SUBJECTS

AVERAGE HEART RATE	MEAN VISIT 1	MEAN VISIT 2	MEAN VISIT 3	STD. DEVIATION VISIT 1	STD. DEVIATION VISIT 2	STD. DEVIATION VISIT 3	MAXIMUM VISIT 1	MAXIMUM VISIT 2	MAXIMUM VISIT 3	MINIMUM VISIT 1	MINIMUM VISIT 2	MINIMUM VISIT 3	N VISIT 1	N VISIT 2	N VISIT 3
DAILY	78.61	77.68	76.37	10.70	9.44	9.66	112.20	105.20	114.86	52.00	53.00	53.14	382	340	288
ON POSITION	78.74	77.51	76.06	11.01	9.70	9.82	112.32	110.40	113.33	52.89	51.00	52.00	375	338	266
OFF POSITION	78.68	78.13	77.24	11.47	9.84	10.40	123.00	106.50	118.00	48.00	48.00	51.00	376	336	287

EXCLUDING SUBJECTS ON ANTI-HYPERTENSIVE MEDICATIONS

AVERAGE HEART RATE	MEAN VISIT 1	MEAN VISIT 2	MEAN VISIT 3	STD. DEVIATION VISIT 1	STD. DEVIATION VISIT 2	STD. DEVIATION VISIT 3	MAXIMUM VISIT 1	MAXIMUM VISIT 2	MAXIMUM VISIT 3	MINIMUM VISIT 1	MINIMUM VISIT 2	MINIMUM VISIT 3	N VISIT 1	N VISIT 2	N VISIT 3
DAILY	78.74	77.62	76.42	10.70	9.51	9.61	112.20	105.20	114.86	52.00	53.00	53.14	360	320	269
ON POSITION	78.84	77.47	76.07	10.95	9.78	9.79	112.01	110.40	113.33	52.89	51.00	52.00	353	318	268
OFF POSITION	79.09	78.02	77.27	11.39	9.31	10.41	123.00	106.50	118.00	50.40	48.00	51.00	354	316	268

Appendix Table III.B.9.-4

ATC

FIELD STUDY

CARDIOVASCULAR MEASURES

Maximum Heart Rate At Work

ALL SUBJECTS

MAXIMUM HEART RATE	MEAN VISIT 1	MEAN VISIT 2	MEAN VISIT 3	STD. DEVIATION VISIT 1	STD. DEVIATION VISIT 2	STD. DEVIATION VISIT 3	MAXIMUM VISIT 1	MAXIMUM VISIT 2	MAXIMUM VISIT 3	MINIMUM VISIT 1	MINIMUM VISIT 2	MINIMUM VISIT 3	N VISIT 1	N VISIT 2	N VISIT 3
DAILY	92.32	90.39	87.48	13.54	13.23	12.10	134.00	146.00	120.00	60.00	60.00	60.00	382	325	288
ON POSITION	89.33	87.30	84.83	13.77	12.77	11.81	132.00	146.00	120.00	60.00	60.00	60.00	375	328	286
OFF POSITION	87.48	86.31	84.05	13.47	12.91	12.43	134.00	137.00	120.00	48.00	48.00	60.00	376	336	287

EXCLUDING SUBJECTS ON ANTI-HYPERTENSIVE MEDICATIONS

MAXIMUM HEART RATE	MEAN VISIT 1	MEAN VISIT 2	MEAN VISIT 3	STD. DEVIATION VISIT 1	STD. DEVIATION VISIT 2	STD. DEVIATION VISIT 3	MAXIMUM VISIT 1	MAXIMUM VISIT 2	MAXIMUM VISIT 3	MINIMUM VISIT 1	MINIMUM VISIT 2	MINIMUM VISIT 3	N VISIT 1	N VISIT 2	N VISIT 3
DAILY	92.51	90.39	87.70	13.60	13.43	11.97	134.00	146.00	120.00	60.00	60.00	60.00	360	305	269
ON POSITION	89.47	87.24	84.99	13.78	12.99	11.66	132.00	146.00	120.00	60.00	60.00	60.00	353	318	268
OFF POSITION	87.71	86.16	84.21	13.00	13.01	12.48	134.00	137.00	120.00	55.00	48.00	60.00	354	316	268

Appendix Table III.B.9.-5

ATC

FIELD STUDY

CARDIOVASCULAR MEASURES

Range Of Heart Rate At Work

ALL SUBJECTS

RANGE - HEART RATE	MEAN VISIT 1	MEAN VISIT 2	MEAN VISIT 3	STD. DEVIATION VISIT 1	STD. DEVIATION VISIT 2	STD. DEVIATION VISIT 3	MAXIMUM VISIT 1	MAXIMUM VISIT 2	MAXIMUM VISIT 3	MINIMUM VISIT 1	MINIMUM VISIT 2	MINIMUM VISIT 3	N VISIT 1	N VISIT 2	N VISIT 3
DAILY	24.58	22.57	19.23	9.15	9.49	8.75	72.00	69.00	54.00	9.00	7.00	0	380	324	288
ON POSITION	19.14	17.82	15.85	9.97	9.83	7.98	72.00	69.00	42.00	0	0	0	375	338	286
OFF POSITION	16.33	15.12	12.65	9.79	10.23	9.41	46.00	53.00	48.00	0	0	0	376	336	287

EXCLUDING SUBJECTS ON ANTI-HYPERTENSIVE MEDICATIONS

RANGE - HEART RATE	MEAN VISIT 1	MEAN VISIT 2	MEAN VISIT 3	STD. DEVIATION VISIT 1	STD. DEVIATION VISIT 2	STD. DEVIATION VISIT 3	MAXIMUM VISIT 1	MAXIMUM VISIT 2	MAXIMUM VISIT 3	MINIMUM VISIT 1	MINIMUM VISIT 2	MINIMUM VISIT 3	N VISIT 1	N VISIT 2	N VISIT 3
DAILY	24.58	22.55	19.40	9.16	9.62	8.77	72.00	69.00	54.00	9.00	7.00	0	358	304	269
ON POSITION	19.22	17.68	15.96	10.00	10.02	7.94	72.00	69.00	42.00	0	0	0	353	318	268
OFF POSITION	16.32	14.97	12.83	9.77	10.27	9.55	46.00	53.00	48.00	0	0	0	354	316	268

Appendix Table III.B.9.-6

Correlations Among On-Position Cardiovascular Measurements of Air Traffic Controllers at Work: First Study

N* = 349 - 353

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1. Average	1.00											
2. Range	.24	1.00										
3. Maximum	.89	.62	1.00									
4. Standard Deviation	.30	.91	.62	1.00								
5. Average	.59	.05	.48	.11	1.00							
6. Range	.12	.42	.27	.28	.06	1.00						
7. Maximum	.56	.23	.55	.23	.88	.47	1.00					
8. Standard Deviation	.19	.30	.27	.30	.13	.90	.49	1.00				
9. Average	.28	.18	.31	.20	.17	.06	.18	.13	1.00			
10. Range	.09	.37	.23	.23	.10	.20	.18	.07	.30	1.00		
11. Maximum	.26	.30	.34	.26	.18	.14	.22	.14	.89	.65	1.00	
12. Standard Deviation	.11	.22	.18	.18	.14	.08	.15	.05	.35	.92	.65	1.00

*Excluded subjects on anti-hypertensive medications. The subjects who were never on-position are also excluded. For some subjects the requisite data-points for calculating a given variable were not available due to measurement difficulties.

Appendix Table III.8.9.-7

Correlations Among On-Position Cardiovascular Measurements of Air Traffic Controllers at Work: Second Study

N* = 306-318

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Sytolic BP	1. Average	1.00											
	2. Range	.42	1.00										
	3. Maximum	.92	.71	1.00									
	4. Standard Deviation	.45	.89	.68	1.00								
	5. Average	.50	.19	.45	.18	1.00							
	6. Range	.24	.37	.33	.19	.12	1.00						
	7. Maximum	.53	.33	.54	.26	.89	.50	1.00					
	8. Standard Deviation	.21	.25	.26	.16	.09	.91	.43	1.00				
	9. Average	.21	.17	.22	.22	.29	-.01	.25	.01	1.00			
	10. Range	.13	.27	.20	.20	.12	.15	.17	.07	.35	1.00		
	11. Maximum	.22	.24	.26	.25	.28	.06	.26	.04	.87	.71	1.00	
	12. Standard Deviation	.07	.17	.10	.18	.09	.01	.10	.00	.38	.91	.69	1.00

*Excluded subjects on anti-hypertensive medications. The subjects who were never on-position are also excluded. For some subjects the requisite datapoints for calculating a given variable were not available due to measurement difficulties.

Appendix 1-43

Appendix Table III.B.9.-8

Correlations Among On-Position Cardiovascular Measurements of Air Traffic Controllers at Work: Third Study

N* = 258-268

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1. Average	1.00											
2. Range	.43	1.00										
3. Maximum	.91	.73	1.00									
4. Standard Deviation	.43	.93	.70	1.00								
5. Average	.52	.18	.47	.18	1.00							
6. Range	.15	.32	.23	.25	.11	1.00						
7. Maximum	.51	.29	.50	.26	.87	.52	1.00					
8. Standard Deviation	.14	.28	.21	.28	.08	.90	.47	1.00				
9. Average	.30	.19	.33	.22	.27	-.10	.16	-.13	1.00			
10. Range	.11	.32	.24	.28	.06	.13	.09	.10	.20	1.00		
11. Maximum	.29	.31	.38	.32	.24	.00	.17	-.05	.88	.57	1.00	
12. Standard Deviation	.08	.25	.18	.27	.09	.05	.07	.06	.23	.88	.54	1.00

*Excluded subjects on anti-hypertensive medications. The subjects who were never on-position are also excluded. For some subjects the requisite data-points for calculating a given variable were not available due to measurement difficulties.

Appendix Table III.8.9.-9

Correlations Among On-Position Cardiovascular Measurements of Air Traffic Controllers at Work: Across Three Studies

N* = 258-311

		Visit 1 vs Visit 2	Visit 1 vs Visit 3	Visit 2 vs Visit 3
Systolic BP	Average	.58	.54	.49
	Range	.08	.23	.14
	Maximum	.48	.49	.40
	Standard Deviation	.00	.20	.11
	Average	.60	.46	.48
	Range	.23	.09	.15
	Maximum	.54	.39	.33
	Standard Deviation	.18	.05	.11
	Average	.53	.44	.47
	Range	.13	.06	.08
	Maximum	.41	.36	.39
	Standard Deviation	.09	.04	.13

*Excluded subjects on anti-hypertensive medications. The subjects who were never on-position are also excluded. For some subjects the requisite data-points for calculating a given variable were not available due to measurement difficulties. In addition, the correlations could only be calculated for subjects having a particular measure for all three studies.

Appendix I-45

Appendix Table III.8.9.-10

Correlations Among Off-Position Cardiovascular

Measurements of Air Traffic Controllers at Work: First Study

N* = 354

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1. Average	1.00											
2. Range	.19	1.00										
3. Maximum	.86	.65	1.00									
** Standard 4. Deviation	-	-	-	-								
5. Average	.51	.02	.40	-	1.00							
6. Range	.12	.46	.31	-	-.01	1.00						
7. Maximum	.50	.26	.51	-	.86	.46	1.00					
** Standard 8. Deviation	-	-	-	-	-	-	-	-				
9. Average	.17	.09	.17	-	.19	-.02	.15	-	1.00			
10. Range	.00	.39	.20	-	.01	.33	.17	-	.18	1.00		
11. Maximum	.14	.23	.22	-	.17	.12	.20	-	.90	.55	1.00	
** Standard 12. Deviation	-	-	-	-	-	-	-	-	-	-	-	-

*Excluding subjects on anti-hypertensive medications. The subjects who were never off-position are also excluded. For some subjects the requisite data-points for calculating a given variable were not available due to measurement difficulties.

**Not calculated.

Appendix Table III.B.9.-12

Correlations Among Off-Position Cardiovascular Measurements of Air Traffic Controllers at Work: Third Study

N* = 264-269

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1. Average	1.00											
2. Range	.35	1.00										
3. Maximum	.91	.68	1.00									
**Standard 4. Deviation	-	-	-	-								
5. Average	.42	.02	.35	-	1.00							
6. Range	.19	.38	.29	-	.07	1.00						
7. Maximum	.43	.19	.43	-	.87	.51	1.00					
** Standard 8. Deviation	-	-	-	-	-	-	-	-				
9. Average	.24	.15	.26	-	.16	.04	.15	-	1.00			
0. Range	.01	.22	.10	-	-.06	.32	.09	-	.19	1.00		
1. Maximum	.18	.22	.24	-	.08	.18	.15	-	.88	.61	1.00	
Standard Deviation	-	-	-	-	-	-	-	-	-	-	-	-

Excluded subjects on anti-hypertensive medications. The subjects who were never off-position are also excluded. For some subjects the requisite data-points for calculating a given variable were not available due to measurement difficulties.

Not calculated.

Appendix Table III.B.9.-13

Correlations Among Off-Position Cardiovascular Measurements of Air Traffic Controllers at Work: Across Three Studies

N* = 264-310

	Visit 1 vs Visit 2	Visit 1 vs Visit 3	Visit 2 vs Visit 3
Average	.48	.48	.43
Range	.02	.04	.02
Maximum	.32	.30	.30
**Standard Deviation	-	-	-
Average	.51	.41	.40
Range	.08	.12	.06
Maximum	.43	.36	.31
**Standard Deviation	-	-	-
Average	.50	.40	.46
Range	.06	.02	.15
Maximum	.37	.29	.43
Standard Deviation	-	-	-

*Excluded subjects on anti-hypertensive medications. The subjects who were never off-position are also excluded. For some subjects the requisite data-points for calculating a given variable were not available due to measurement difficulties. In addition, the correlations could only be calculated for subjects having a particular measure for all three studies.

**Not calculated

Appendix Table III.B.9.-14

Correlations Among Daily Cardiovascular Measurements of Air Traffic Controllers at Work: First Study

N*=358-360

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
rage	1.00											
e	.35	1.00										
mum	.86	.73	1.00									
dard ation	.36	.94	.71	1.00								
ge	.57	.08	.44	.11	1.00							
	.25	.26	.28	.26	.15	1.00						
um	.57	.23	.50	.26	.86	.54	1.00					
rd ion	.27	.26	.28	.28	.13	.93	.49	1.00				
	.25	.22	.26	.22	.18	.06	.17	.08	1.00			
	.07	.26	.19	.26	.13	-.01	.11	-.01	.35	1.00		
	.23	.27	.27	.27	.21	.06	.19	.07	.89	.68	1.00	
d on	.05	.18	.13	.19	.13	.03	.13	.02	.40	.89	.68	1.00

subjects on anti-hypertensive medications; some correlations are based on
ects than others because for some subjects there were too few observations
te a measure. (e.g. There is no range when only one measurement was made).

Appendix Table III.B.9.-15

Correlations Among Daily Cardiovascular Measurements of Air Traffic Controllers at Work: Second Study

N*=304-320

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1. Average	1.00											
2. Range	.43	1.00										
3. Maximum	.91	.73	1.00									
4. Standard Deviation	.47	.95	.73	1.00								
5. Average	.50	.16	.44	.15	1.00							
6. Range	.32	.26	.35	.25	.11	1.00						
7. Maximum	.54	.28	.52	.27	.87	.49	1.00					
8. Standard Deviation	.31	.28	.35	.27	.09	.90	.44	1.00				
9. Average	.25	.15	.24	.18	.32	.12	.31	.08	1.00			
10. Range	.17	.23	.21	.26	.13	-.04	.09	-.05	.45	1.00		
11. Maximum	.25	.20	.27	.24	.29	.05	.26	.02	.86	.77	1.00	
12. Standard Deviation	.11	.19	.16	.21	.13	.00	.13	-.02	.47	.88	.74	1.00

*Excluding subjects on anti-hypertensive medications; some correlations are based on fewer subjects than others because for some subjects there were too few observations to calculate a measure. (e.g.There is no range when only one measurement was made).

Appendix 1-51

Appendix Table III.B.9.-16

Correlations Among Daily Cardiovascular Measurements of Air Traffic Controllers at Work: Third Study

N* = 256-270

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1. Average	1.00											
2. Range	.46	1.00										
3. Maximum	.90	.76	1.00									
4. Standard Deviation	.49	.95	.75	1.00								
5. Average	.51	.13	.43	.14	1.00							
6. Range	.23	.24	.28	.22	.17	1.00						
7. Maximum	.51	.21	.48	.21	.88	.53	1.00					
8. Standard Deviation	.26	.24	.29	.25	.16	.90	.47	1.00				
9. Average	.31	.26	.36	.25	.26	-.05	.16	-.07	1.00			
10. Range	.09	.15	.15	.13	.00	.09	-.01	.10	.19	1.00		
11. Maximum	.28	.28	.36	.27	.20	.02	.12	.00	.84	.62	1.00	
12. Standard Deviation	.04	.13	.11	.12	.01	.06	.00	.07	.21	.86	.56	1.00

*Excluding subjects on anti-hypertensive medications; some correlations are based on fewer subjects than others because for some subjects there were too few observations to calculate a measure. (e.g. There is no reange when only one measurement was made).

Appendix Table III.B.9.-17

Correlations Among Daily Cardiovascular Measurements of Air Traffic Controllers at Work: Across Three Studies

N* = 256-320

		First vs Second Study	First vs Third Study	Second vs Third Study
Systolic BP	Average	.59	.57	.49
	Range	-.02	.14	.24
	Maximum	.41	.44	.39
	Standard Deviation	.03	.20	.25
	Average	.61	.47	.52
	Range	.00	.12	.04
	Maximum	.46	.30	.36
	Standard Deviation	.04	.15	.09
	Average	.54	.47	.51
	Range	.04	.10	.25
	Maximum	.40	.36	.44
	Standard Deviation	.08	.07	.19

*Excluding subjects on anti-hypertensive medications; some correlations are based on fewer subjects than others because for some subjects there were too few observations to calculate a measure. (e.g. There is no range when only one measurement was made). In addition, the correlations could only be calculated for subjects having a particular measure for all three studies.

APPENDIX II

DIAGNOSTIC SUMMARIES SCORING ALGORITHMS

AIR TRAFFIC CONTROLLER STUDY

B.U.M.C.

PHYSICAL EXAMINATION FORM

Label

VITAL SIGNS:

HEIGHT:_____in.

WEIGHT:_____lb.

PULSE:_____per min.

RESP: _____per min.

BLOOD PRESSURE:

		1st observation	2nd observation	3rd observation
RIGHT:	standing	___/___	___/___	___/___
	sitting	___/___	___/___	___/___
	supine	___/___	___/___	___/___
LEFT:	standing	___/___	___/___	___/___
	sitting	___/___	___/___	___/___
	supine	___/___	___/___	___/___

COLOR:

BLACK_____

WHITE_____

OTHER (describe):_____

Place label here (Vitalometer)

FEV_1 (tenths of Liters)_____

FVC (tenths of Liters)_____

EKG reading:

Rate/min_____

Left ventricular hypertrophy _____

Ventricular extrasystoles (number/min.)_____

Supraventricular extrasystoles (number/min.)_____

Other arrhythmia:

Other abnormalities:

HAIR DISTRIBUTION:
EXCESSIVE.....020411 ( )
DECREASED.....020421 ( )
LOCATION 020430:

RASH:
Size 020510: _____cm.
DESCRIPTION:
Macular.....020521 ( )
Papular.....020522 ( )
Vesicular.....020523 ( )
Ulcerative.....020524 ( )
Scaling.....020525 ( )
OTHER 020520:

LOCATION 020530:

SPECIFIC ABNORMALITY:
ACNE.....020611 ( )
Location 020610:

CHERRY ANGIOMA.....020621 ( )
Location 020620:

SPIDER ANGIOMA.....020631 ( )
Location 020630:

SPLINTER HEMORRHAGE.....020641 ( )
Location 020640:

PETECHIAE.....020651 ( )
Location 020650:

ECCHYMOSES.....020661 ( )
Location 020660:

PURPURA.....020671 ( )
Location020670:

PALMAR ERYTHEMA.....020681 Bilat ( )
Rt.....020682 ( ) Lt....020683 ( )
OTHER 020690:

MOLES.....020721 ( )
Location 020720:

WARTS.....020731 ( )
Location 020730:

SCARS.....020741 ( )
Location 020740:

OTHER 020710:

HEAD:
ABNORMALITY 030110:

GENERAL CONDITION:
APPEARANCE:
NUTRITION & HYDRATION:
Obese:
Mildly.....010111 ( )
Moderately.....010112 ( )
Extremely.....010113 ( )
Thin.....010113 ( )
Cachectic.....010114 ( )
Anasarca.....010115 ( )
Dehydrated.....010116 ( )
NOT STATED AGE:.....010117 ( )
Appears older.....010121 ( )
Appears younger.....010122 ( )
ILL:
Acutely.....010131 ( )
Chronically.....010132 ( )
IN DISTRESS:
Mild.....010141 ( )
Moderate.....010142 ( )
Acute.....010143 ( )
OTHER 010150

STATE OF CONSCIOUSNESS:
NOT ALERT:
Drowsy.....010211 ( )
Lethargic.....010212 ( )
Obtunded.....010213 ( )
Unresponsive.....010213 ( )
DISORIENTED:.....010214 ( )
To person.....010221 ( )
To place.....010222 ( )
To time.....010223 ( )
OTHER 010230:

TEMPERAMENT:
DEPRESSED.....010311 ( )
ANXIOUS.....010321 ( )
WITHDRAWN.....010331 ( )
AGGRESSIVE.....010341 ( )
UNCOOPERATIVE.....010351 ( )
PASSIVE AGGRESSIVE.....010361 ( )
OTHER 010370:

OTHER 010410:

SKIN:
TEMPERATURE:
WARM.....020111 ( )
COLD.....020121 ( )
HYDRATION:
DRY.....020211 ( )
MOIST.....020221 ( )
OILY.....020231 ( )
DECREASED TURGOR.....020241 ( )
COLORATION:
PALE.....020311 ( )
RUDDY.....020321 ( )
CYANOTIC.....020331 ( )
ICTERIC.....020341 ( )
HYPERPIGMENTED.....020351 ( )
HYPOPIGMENTED.....020361 ( )
FRECKLED.....020371 ( )
OTHER 020370:

01 GENERAL NE( )NL( )ABN( )
02 SKIN NE( )NL( )ABN( )
03 HEAD NE( )NL( )ABN( )

04 EARS NE( )NL( )ABN( )

05 EYES NE( )NL( )ABN( )

EARS:
AUDITORY TESTING:
DECREASED ACUITY:
Rt.....040111 ( ) Lt.....040112 ( )
Comment..040120:

BONE CONDUCTION > AIR:
Rt.....040131 ( ) Lt.....040132 ( )
WEBER LATERALIZES TO THE:
Rt.....040141 ( ) Lt.....040142 ( )
OTHER 040150:

AURICLE:
ABNORMALITY 040210:

AUDITORY CANAL:
EXCESSIVE CERUMEN.....040313 Both ( )
Rt.....040311 ( ) Lt.....040312 ( )
INFLAMMATION.....040323 Both ( )
Rt.....040321 ( ) Lt.....040322
DISCHARGE.....040333 Both ( )
Rt.....040331 ( ) Lt.....040332 ( )
TYMPANIC MEMBRANES:
NOT VISUALIZED:
Rt.....040411 ( ) Lt.....040412 ( )
INJECTED:
Rt.....040421 ( ) Lt.....040422 ( )
SCARRED:
Rt.....040431 ( ) Lt.....040432 ( )
PERFORATED:
Rt.....040441 ( ) Lt.....040442 ( )
RETRACTED:
Rt.....040451 ( ) Lt.....040452 ( )
BULGING:
Rt.....040461 ( ) Lt.....040462 ( )
OTHER 040470:

OTHER 040510:

EYES:
LIDS:
EXOPHTHALMOS.....050113 Both ( )
Rt.....050111 ( ) Lt.....050112 ( )
XANTHELASMA.....050123 Both ( )
Rt.....050121 ( )Lt.....050122 ( )
PTOSIS.....050133 Both ( )
Rt.....050131 ( )Lt.....050132 ( )
LID LAG.....050143 Both ( )
Rt.....050141 ( )Lt.....050142 ( )
OTHER 050150:

CONJUNCTIVA:
PALE.....050213 Both ( )
Rt.....050211 ( )Lt.....050212 ( )
CONJUNCTIVITIS.....050223 Both ( )
Rt.....050221 ( )Lt.....050222 ( )
OTHER 050230:

SCLERA:
ICTERIC.....050313 Both ( )
Rt.....050311 ( )Lt.....050312 ( )
BODY.....050323 Both ( )
Rt.....050321 ( )Lt.....050322 ( )
THER 050330:

CORNEA:
ARCUS SENILIS.....050413 Both ( )
Rt.....050411 ( ) Lt.....050412 ( )
OPACIFIED.....050423 Both ( )
Rt.....050421 ( ) Lt.....050422 ( )
OTHER 050430:

IRIS:
NEOVASCULARIZATION.....050513 Both ( )
Rt.....050511 ( ) Lt.....050512 ( )
OTHER 050520:

LENS:
OPACIFIED.....050613 Both ( )
Rt.....050611 ( ) Lt.....050612 ( )
REMOVED.....050623 Both ( )
Rt.....050621 ( ) Lt.....050622 ( )
OTHER 050630:

PUPILS:
NOT EQUAL (Note larger one).....050711 Rt ( ) 050712 Lt ( )
NOT ROUND.....050721 Rt ( ) 050722 Lt ( )
NOT REACTIVE TO LIGHT.....050731 Rt ( ) 050732 Lt ( )
NOT ACCOMODATIVE.....050741 Rt ( ) 050742 Lt ( )
OTHER 050750:

FUNDOSCOPIC:
DISC:
Pallor.....050811 Rt ( ) 050812 Lt ( )
Atrophy.....050821 Rt ( ) 050822 Lt ( )
Papilledema.....050831 Rt ( ) 050832 Lt ( )
Pulsation of Retinal Vein.....050841 Rt ( ) 050842 Lt ( )
OTHER 050850.

ARTERIOLES:
Narrowing.....050911 Rt ( ) 050912 Lt ( )
Straightening.....050921 Rt ( ) 050922 Lt ( )
A/V nicking.....050931 Rt ( ) 050932 Lt ( )
Copper wiring.....050941 Rt ( ) 050942 Lt ( )
Tortuosity.....050951 Rt ( ) 050952 Lt ( )
OTHER 050960:

VENULES:
Tortuosity.....051011 Rt ( ) 051012 Lt ( )
Engorgement.....051021 Rt ( ) 051022 Lt ( )
OTHER 051030:

RETINA:
Chorioretinitis.....051111 Rt ( ) 051112 Lt ( )
Hemorrhages:
Flame.....051121 Rt ( ) 051122 Lt ( )
Dot.....051131 Rt ( ) 051132 Lt ( )
Exudates:
Soft.....051141 Rt ( ) 051142 Lt ( )
Hard.....051151 Rt ( ) 051152 Lt ( )
OTHER 051160:

ER 051210:

UAL FIELDS 051310:

R 051410:

---

06 NOSE NE( ) NL( ) ABN( )

07 MOUTH & THROAT NE ( ) NL ( ) ABN ( )

08 NECK NE ( ) NL ( ) ABN ( )

09 THORAX NE ( ) NL ( ) ABN ( )

10 BREASTS NE ( ) NL ( ) ABN ( )

NOSE:
- SEPTUM ASYMMETRICAL.....060111 ( )
- DISCHARGE:
  - Mucus.....060211 Rt( ) 060212 Lt( )
  - Pus.....060221 Rt( ) 060222 Lt( )
  - Blood.....060231 Rt( ) 060232 Lt( )
- OBSTRUCTION...060311 Rt( ) 060312 Lt( )
- OTHER 060410:

MOUTH & THROAT:
- TEETH & GUMS:
  - CARIES.....070111 ( )
  - DENTURES.....070121 ( )
  - EDENTULOUS.....070131 ( )
  - CALCULUS.....070141 ( )
  - GINGIVITIS.....070151 ( )
  - OTHER 070160:
- TONGUE:
  - ABNORMALITY 070210:
- PALATE:
  - INFLAMMATION.....070311 ( )
  - EDEMA.....070321 ( )
  - PETECHIAE.....070331 ( )
  - OTHER 070340:
- PHARYNX:
  - INFLAMED.....070411 ( )
  - EDEMATOUS.....070421 ( )
  - OTHER 070430:
- TONSILS:
  - HYPERTROPHIED.....070511 ( )
  - RED.....070521 ( )
  - EXUDATIVE.....070531 ( )
  - OTHER 070540:
- OTHER 070610:

NECK:
- RIGID.....080111 ( )
- THYROID:
  - ENLARGED.....080211 Rt ( ) 080212 Lt ( )
  - NODULAR.....080221 Rt ( ) 080222 Lt ( )
  - TENDER.....080231 Rt ( ) 080232 Lt ( )
  - BRUIT.....080241 Rt ( ) 080242 Lt ( )
  - OTHER 080250:
- JVP elevated 080310: ____cm at ____degrees
- HEPATO-JUGULAR REFLUX.....080411 ( )
- CAROTID PULSES:
  - NOT PALPABLE.....080511 Rt ( ) 080512 Lt ( )
  - UNEQUAL WITH PREDOMINANCE.080521 Rt ( ) 080522 Lt ( )
  - BRUIT.....080531 Rt ( ) 080532 Lt ( )
  - OTHER 080540:
- OTHER 080610:

THORAX:
INCREASED A-P DIAMETER.....090111 ( )
ASYMMETRY (Describe) 090210:

OTHER 090310:

BREASTS:
MASSES.....
DESCRIPTION 100120:.....100111 Rt ( ) 100112 Lt ( )

RETRACTED NIPPLE.....
ENLARGED.....100211 Rt ( ) 100212 Lt ( )
INCREASED PIGMENTATION.....100311 Rt ( ) 100312 Rt ( )
GLANDULAR HYPERTROPHY.....100411 ( )
LACTATING.....100511 ( )
TENDER.....100611 ( )
OTHER 100810:.....100711 ( )

HEART:

HEART NE( ) NL ( ) ABN ( )

RHYTHM:
- Regular Irregularity.....1101111 ( )
- Irregular Irregularity.....1101211 ( )
- Bigeminy.....1101311 ( )
- Occasional Extrasystoles.....1101411 ( )
- OTHER 1101510:_____

PALPATION:

PMI: localized....1102111 ( ) diffuse....1102112 ( )
- Duration: Sustained....1102121 ( ) Brief....1102122 ( )
- OTHER 1102120:_____
- Amplitude: Tapping....1102131 ( ) Heave....1102132 ( )
- OTHER 1102130:_____
- Location: Epigastric....1102141 ( ) parasternal...1102142 ( )
  1102140:____cm Lt of MSL in the ____ICS
- OTHER IMPULSES 1102210 (Describe):_____

PALPABLE HEART SOUNDS:

S1...1102311 ( ) S2...1102321 ( ) S3...1102331 ( ) S4...1102341 ( )

THRILLS: Systolic...1102411 ( ) Diastolic...1102421 ( )
- Comment 1102430:_____

OTHER 1102510:_____

AUSCULTATION:

HEART SOUNDS & GALLOPS:

S1: Accentuated...1103111 ( ) Distant...1103112 ( ) Split...1103113 ( )
- OTHER 1103110:_____

S2: Accentuated...1103121 ( ) Distant...1103122 ( )
- Split: Paradoxically..1103123 ( ) Fixed...1103124 ( )
- S2A > S2P.....1103125 ( )
- S2A= S2P.....1103126 ( )
- S2A< S2P.....1103127 ( )

S3 gallop.....1103131 ( ) OTHER 1103120:_____
- Comment on location 1103130:_____

S4 gallop.....1103141 ( )
- Comment on location 1103140:_____

OTHER 1103150:_____

MURMURS:

Systolic..110321 Diastolic.....110322

(Plus digit(s) for each of the following categories):

Systolic	Diastolic
Grade:	Grade:
1-2...1 ( )	1-2...1 ( )
3-4...2 ( )	3-4...2 ( )
5-6...3 ( )	5-6...3 ( )
Timing:	Timing:
Early...1 ( )	Early...1( )
Mid.....2 ( )	Mid.....2( )
Late....3 ( )	Late....3( )
Holo....4 ( )	Holo....4( )
Duration:	Duration:
Long....1 ( )	Long....1( )
Short...2 ( )	Short...2( )
Holo....3 ( )	Holo....3( )
Character:	Character:
High pitched...1( )	High pitched...1( )
Low pitched....2( )	Low pitched....2( )
Location:	Location:
Aortic Area....01( )	Aortic Area....01( )
Pulmonic Area..02( )	Pulmonic Area..02( )
3rd & 4th LICS.03( )	3rd & 4th LICS.03( )
Apex.....04( )	Apex.....04( )
Lt Sternal Border05( )	Lt Sternal Border05( )
Rt Sternal Border06( )	Rt Sternal Border06( )
All over pre-cordium.....07( )	All over pre-cordium.....07( )
Radiation:	Radiation:
Neck.....08( )	Neck.....08( )
Lt Sternal Border09( )	Lt Sternal Border.09( )
Apex.....10( )	Apex.....10( )
Axilla.....11( )	Axilla.....11( )
Back.....12( )	Back.....12( )
All over pre-cordium.....13( )	All over pre-cordium.....13( )
OTHER 1103210_____	OTHER 1103220_____

OTHER 1103230:_____

EJECTION SOUND1103310( ) and Location:_____

SYSTOLIC CLICK 1103410( ) and Location:_____

FRICTION Rub 1103510( ) and Location:_____

OTHER 1103610:_____

OTHER 1104110:_____

LUNGS

12 LUNGS NE ( ) NL ( ) ABN ( )

RESPIRATION:
- Cheyne-Stokes.....120111 ( )
- Kussmaul.....120121 ( )
- Labored.....120131 ( )
- Shallow.....120141 ( )
- Prolonged Expiratory Phase.....120151 ( )
- OTHER 120160: _____

PERCUSSION:

DULL:

Right anterior:
- Apex 120211....1( )
- Mid.....2( )
- Base.....3( )
- Hemithorax.....4( )

Right posterior:
- Apex 120212....1( )
- Mid.....2( )
- Base.....3( )
- Hemithorax.....4( )

Left anterior:
- Apex 120213....1( )
- Mid.....2( )
- Base.....3( )
- Hemithorax.....4( )

Left posterior:
- Apex 120214....1( )
- Mid.....2( )
- Base.....3( )
- Hemithorax.....4( )

FLAT:

Right anterior:
- Apex 120221....1( )
- Mid.....2( )
- Base.....3( )
- Hemithorax.....4( )

Right posterior:
- Apex 120222....1( )
- Mid.....2( )
- Base.....3( )
- Hemithorax.....4( )

Left anterior:
- Apex 120223....1( )
- Mid.....2( )
- Base.....3( )
- Hemithorax.....4( )

Left posterior:
- Apex 120224....1( )
- Mid.....2( )
- Base.....3( )
- Hemithorax.....4( )

OTHER 120230: _____

AUSCULTATION:

INCREASED BREATH SOUNDS:

Right anterior:
- Apex 120311....1( )
- Mid.....2( )
- Base.....3( )
- Hemithorax.....4( )

Right posterior:
- Apex 120312....1( )
- Mid.....2( )
- Base.....3( )
- Hemithorax.....4( )

Left anterior:
- Apex 120313....1( )
- Mid.....2( )
- Base.....3( )
- Hemithorax.....4( )

Left posterior:
- Apex 120314....1( )
- Mid.....2( )
- Base.....3( )
- Hemithorax.....4( )

DECREASED BREATH SOUNDS:

Right anterior
- Apex 120321...1( )
- Mid.....2( )
- Base.....3( )
- Hemithorax.....4( )

Right posterior
- Apex 120322....1( )
- Mid.....2( )
- Base.....3( )
- Hemithorax.....4( )

Left anterior:
- Apex 120323....1( )
- Mid.....2( )
- Base.....3( )
- Hemithorax.....4( )

Left posterior:
- Apex 120324....1( )
- Mid.....2( )
- Base.....3( )
- Hemithorax.....4( )

ABSENT BREATH SOUNDS:

Right anterior:
- Apex 120331....1( )
- Mid.....2( )
- Base.....3( )
- Hemithorax.....4( )

Right posterior:
- Apex 120332....1( )
- Mid.....2( )
- Base.....3( )
- Hemithorax.....4( )

Left anterior:
- Apex 120333....1( )
- Mid.....2( )
- Base.....3( )
- Hemithorax.....4( )

Left posterior:
- Apex 120334....1( )
- Mid.....2( )
- Base.....3( )
- Hemithorax.....4( )

RALES

Right anterior:

Apex 120341....1( )
Mid.....2( )
Base.....3( )
Hemithorax.....4( )

Right posterior

Apex 120342... ( )
Mid.....2( )
Base.....3( )
Hemithorax.....4( )

RHONCHI:

Right anterior:

Apex 120351....1( )
Mid.....2( )
Base.....3( )
Hemithorax.....4( )

Right posterior:

Apex 120352...1( )
Mid.....2( )
Base.....3( )
Hemithorax.....4( )

WHEEZES:

Right anterior:

Apex 120361....1( )
Mid.....2( )
Base.....3( )
Hemithorax.....4( )

Right posterior:

Apex 120362....1( )
Mid.....2( )
Base.....3( )
Hemithorax.....4( )

FRICTION RUB:

Right anterior:

Apex 120371....1( )
Mid.....2( )
Base.....3( )
Hemithorax.....4( )

Right posterior:

Apex 120372....1( )
Mid.....2( )
Base.....3( )
Hemithorax.....4( )

left anterior:

Apex 120343...1( )
Mid.....2( )
Base.....3( )
Hemithorax....4( )

Left posterior:

Apex 120344...1( )
Mid.....2( )
Base.....3( )
Hemithorax....4( )

Left anterior:

Apex 120353...1( )
Mid.....2( )
Base.....3( )
Hemithorax....4( )

Left posterior:

Aper 120354...1( )
Mid.....2( )
Base.....3( )
Hemithorax....4( )

Left anterior:

Apex 120363...1( )
Mid.....2( )
Base.....3( )
Hemithorax....4( )

Left posterior:

Apex 120364...1( )
Mid.....2( )
Base.....3( )
Hemithorax....4( )

Left anterior:

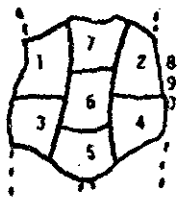
Apex 120373...1( )
Mid.....2( )
Base.....3( )
Hemithorax....4( )

Left posterior:

Apex 120374...1( )
Mid.....2( )
Base.....3( )
Hemithorax....4( )

OTHER 120380: _____

OTHER 120410: _____



8 R CVA
9 L CVA
0 Entire

ABDOMEN NE( )NL( ) ABN( ) 13
BACK NE( ) NL( ) ABN( ) 14
GENITAL NE( ) NL( ) ABN( ) 15
RECTAL NE( ) NL( ) ABN( ) 16
EXTREMITIES NE( ) NL( ) ABN( )17

ABDOMEN:
RETRACTED.....130111 ( )
DISTENDED.....130211 ( )

TENDERNESS:

	1	2	3	4	5	6	7	8	9	0
TO LIGHT PALPATION 130311	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )
COMMENT 130310:										
TO DEEP PALPATION 130321	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )
COMMENT 130320:										
REBOUND.....130411	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )
COMMENT 130410:										
GUARDING.....130511	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )
COMMENT 130510:										
MASS PALPABLE.....130611	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )
COMMENT 130610:										
SCAR.....130711	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )
COMMENT 130710:										

ASCITES.....130811 ( )
ORGANOMEGALY:
LIVER: Palpable...130911 ( ) Other 130910:_____
SPLEEN: Palpable...130921 ( ) Other 130920:_____
OTHER 130930:_____

BOWEL SOUNDS:
HYPERACTIVE.....131011 ( )
INFREQUENT.....131021 ( )
DISTANT.....131031 ( )
OTHER 131040:_____

HERNIA:
UMBILICAL.....131111 ( )
INCISIONAL.....131121 ( )
COMMENT 131120:_____
INGUINAL:
Rt: Reducible....131131 ( ) Nonreducible 131132 ( )
Comment 131130:_____
Lt: Reducible....131141 ( ) Nonreducible 131142 ( )
Comment 131140:_____
Other 131150:_____
OTHER 131210:_____
OTHER 131310:_____

BACK:
LORDOSIS.....140111 ( ) SCOLIOSIS.....140311 ( )
KYPHOSIS.....140211 ( ) OTHER 140410:_____

GENITAL:
PENIS:
PHIMOSIS....150111 ( ) PARAPHIMOSIS....150121 ( ) CIRCUMCISED.....150171 ( )
HYPOSPADIAS.150131 ( ) SMEGMA.....150141 ( ) DISCHARGE.....150151 ( )
OTHER 150160:_____
TESTICLES:
MASS.....150211 Rt ( ) 150212 Lt ( )
OTHER 150220:_____
SCROTUM:
HYDROCELE..150311 Rt ( ) 150312 Lt ( )
VARICOCOELE.150321 Rt ( ) 150322 Lt ( )
OTHER 150330:_____

RECTAL:
DECREASED SPHINCTER TONE.....160111 ( )
TENDERNESS.....160211 ( )
HEMORRHOIDS.....160311 ( )
HEMORRHOIDAL SKIN TAGS.....160411 ( )
PROSTATE:
ENLARGED.....160511 Rt ( ) 160512 Lt ( ) 160513 Diffuse ( )
TENDER.....160521 Rt ( ) 160522 Lt ( ) 160523 Diffuse ( )
NODULAR.....160531 Rt ( ) 160532 Lt ( ) 160533 Diffuse ( )
OTHER 160540:_____

ABNORMAL FECES ON GLOVE:
GUAIAC POSITIVE.....160611 ( )
OTHER 160610:_____
OTHER 160710:_____

EXTREMITIES:
EDEMA:
HAND.....170111 Rt ( ) 170112 Lt ( ) 170113 Both ( )
LEG TO KNEE170121 Rt ( ) 170122 Lt ( ) 170123 Both ( )
ANKLE.....170131 Rt ( ) 170132 Lt ( ) 170133 Both ( )
CLUBBING:
FINGERS....170211 ( )
TOES.....170221 ( )
VARICOSITIES.170310 (Describe site):_____

PULSES: (Carotid -- see NECK)

	NONPALPABLE Rt	NONPALPABLE Lt	WEAK Rt	WEAK Lt	BRUIT Rt	BRUIT Lt
RADIAL 17041.....1	( ) 2( )		3( )	4( )	5( )	6( )
Comment 170410:_____						
BRACHIAL 17042.....1	( ) 2( )		3( )	4( )	5( )	6( )
Comment 170420:_____						
FEMORAL 17043.....1	( ) 2( )		3( )	4( )	5( )	6( )
Comment 170430:_____						
DORSALIS PEDIS 17044....1	( ) 2( )		3( )	4( )	5( )	6( )
Comment 170440:_____						
POSTERIOR TIBIAL 17045..1	( ) 2( )		3( )	4( )	5( )	6( )
Comment 170450:_____						

OTHER 170460:_____

JOINTS:

	SWELLING		REDNESS		PAIN ON MOTION		REDUCED MOTION	
FINGER 17051.....1	( ) 2( )		3( )	4( )	5( )	6( )	7( )	8( )
WRIST 17052.....1	( ) 2( )		3( )	4( )	5( )	6( )	7( )	8( )
ELBOW 17053.....1	( ) 2( )		3( )	4( )	5( )	6( )	7( )	8( )
SHOULDER 17054...1	( ) 2( )		3( )	4( )	5( )	6( )	7( )	8( )
HIP 17055.....1	( ) 2( )		3( )	4( )	5( )	6( )	7( )	8( )
KNEE 17056.....1	( ) 2( )		3( )	4( )	5( )	6( )	7( )	8( )
ANKLE 17057.....1	( ) 2( )		3( )	4( )	5( )	6( )	7( )	8( )
TOES 17058.....1	( ) 2( )		3( )	4( )	5( )	6( )	7( )	8( )

OTHER 170590:_____

OTHER 170610:_____

LYMPH NODES:

18 LYMPH NODES NE( ) NL( ) ABN( )

19 NEUROLOGICAL EXAM NE( ) NL( ) ABN(

ANTERIOR CERVICAL:

	Rt	Lt
TENDER.....180111	( )	180112 ( )
NONTENDER.....180121	( )	180122 ( )
FIXED.....180131	( )	180132 ( )
MOBILE.....180141	( )	180142 ( )

OTHER 180150:_____

POSTERIOR CERVICAL:

	Rt	Lt
TENDER.....180211	( )	180212 ( )
NONTENDER.....180221	( )	180222 ( )
FIXED.....180231	( )	180232 ( )
MOBILE.....180241	( )	180242 ( )

OTHER 180250:_____

SUPRACLAVICULAR:

	Rt	Lt
TENDER.....180311	( )	180312 ( )
NONTENDER.....180321	( )	180322 ( )
FIXED.....180331	( )	180332 ( )
MOBILE.....180341	( )	180342 ( )

OTHER 180350:_____

AXILLARY:

	Rt	Lt
TENDER.....180411	( )	180412 ( )
NONTENDER.....180421	( )	180422 ( )
FIXED.....180431	( )	180432 ( )
MOBILE.....180441	( )	180442 ( )

OTHER 180450:_____

INGUINAL:

	Rt	Lt
TENDER.....180511	( )	180512 ( )
NONTENDER.....180521	( )	180522 ( )
FIXED.....180531	( )	180532 ( )
MOBILE.....180541	( )	180542 ( )

OTHER 180550:_____

OTHER 180610:_____

NEUROLOGICAL EXAMINATION:

MENTAL STATUS (State of Consciousness -- See GENERAL section)

INAPPROPRIATE EXPRESSION.....190111 ( )

Comment 190110:_____

DISTURBED THOUGHT CONTENT....190121 ( )

Comment 190120:_____

INAPPROPRIATE MOOD.....190131 ( )

Comment 190130:_____

IMPAIRED MEMORY.....190141 ( )

Comment 190140:_____

INAPPROPRIATE SPEECH.....190151 ( )

Comment 190150:_____

OTHER 190160:_____

CRANIAL NERVES (Describe Abnormality):

OLEFACTORY (1).....190210 ( )_____

OPTIC (2).....190220 ( )_____

OCULOMOTOR, TROCHLEAR,ABDUCENS (3,4,6).....190230 ( )_____

TRIGEMINAL (5).....190240 ( )_____

FACIAL (7).....190250 ( )_____

AUDITORY (8).....190260 ( )_____

GLOSSOPHARYNGEAL (9,10).....190270 ( )_____

SPINAL ACCESSORY (11).....190280 ( )_____

HYPOGLOSSAL (12).....190290 ( )_____

CEREBELLAR FUNCTION.....190310 ( )_____

MOTOR:

	ARMS Rt	ARMS Lt	LEGS Rt	LEGS Lt
MUSCLE WEAKNESS 19041	1( )	2( )	3( )	4( )
Comment 190410:_____				
HYPERTONIA 19042.....	1( )	2( )	3( )	4( )
Comment 190420:_____				
FLACCID 19043.....	1( )	2( )	3( )	4( )
Comment 190430:_____				
IMPAIRED GAIT 19044.....	1( )	2( )	3( )	4( )
Comment 190440:_____				
LACK OF COORDINATION 19045	1( )	2( )	3( )	4( )
Comment 190450:_____				

OTHER 190460:_____

SENSORY:

	ARMS Rt	ARMS Lt	LEGS Rt	LEGS Lt
DECREASED PAIN SENSE 19051.....	1( )	2( )	3( )	4( )
Comment 190510_____				
DECREASED TEMPERATURE SENSE 19052...	1( )	2( )	3( )	4( )
Comment 190520:_____				
DECREASED VIBRATORY SENSE 19053.....	1( )	2( )	3( )	4( )
Comment 190530:_____				

OTHER 190540:_____

REFLEXES:

	ABSENT Rt	ABSENT Lt	DECREASED Rt	DECREASED Lt	INCREASED Rt	INCREASED Lt
KNEE 19061.....	1( )	2( )	3( )	4( )	5( )	6( )
Other 190610:_____						
ANKLE 19062.....	1( )	2( )	3( )	4( )	5( )	6( )
Other 190620:_____						
BICEPS 19063.....	1( )	2( )	3( )	4( )	5( )	6( )
Other 190630:_____						
TRICEPS 19064.....	1( )	2( )	3( )	4( )	5( )	6( )
Other 190640:_____						
BABINSKI 19065.....	1 Rt ( )	2 Lt ( )				
Comment 190650:_____						

OTHER 190660:_____

OTHER 190710:_____

COMMENT 190810:_____

MED 210: REVIEW OF HEALTH HISTORY
SECOND ROUND

PLEASE INDICATE IF ANY OF YOUR BLOOD RELATIVES HAS DEVELOPED ANY OF THE FOLLOWING HEALTH CONDITIONS SINCE YOUR LAST REGULAR VISIT HERE TO THE ATC STUDY. INCLUDE BOTH NEW EVENTS AND PAST CONDITIONS THAT YOU LEARNED ABOUT SINCE YOUR LAST VISIT HERE.

PLEASE WRITE THE NUMBER OR NUMBERS (SEPARATED BY COMMAS) INDICATING WHICH RELATIVE(S) HAD CONDITION.

WRITE '9' IF YOU DON'T KNOW OR DON'T UNDERSTAND
WRITE '0' IF NO BLOOD RELATIVE DEVELOPED THIS CONDITION (OR YOU DID NOT LEARN ABOUT THE CONDITION) DURING THIS TIME PERIOD.

IN ALL OTHER CASES, USE THE NUMBERS LISTED BELOW:

0. NO RELATIVE HAD THIS CONDITION
1. FATHER
2. MOTHER
3. GRANDPARENT(S), UNCLE(S), OR AUNT(S) IF BLOOD RELATIVE
5. BROTHER(S) OR SISTER(S)
7. SON(S) OR DAUGHTER(S)
9. DON'T KNOW

101 HEART ATTACK OR ANGINA?_____
102 STROKE?_____
103 HIGH BLOOD PRESSURE?_____
104 ASTHMA, HAYFEVER, HIVES, OR ECZEMA?_____
105 DIABETES (SUGAR DISEASE)?_____
106 NERVOUS DISORDER?_____
107 LIVER DISEASE (JAUNDICE)?_____
108 ANEMIA OR BLEEDING DISEASE?_____
109 KIDNEY DISEASE?_____
110 CANCER OR LEUKEMIA?_____
111 SUICIDE?_____
112 PEPTIC ULCER?_____
113 EMPHYSEMA OR OTHER CHRONIC LUNG DISEASE?_____

FOR THE FOLLOWING QUESTIONS, YOU ARE TO MAKE A CHOICE AMONG POSSIBLE ANSWERS OR CONDITIONS.
CIRCLE THE NUMBER CORRESPONDING TO YOUR ANSWER CHOICE:

119 IN WHICH CATEGORY OF "SMOKING HISTORY" DO YOU FIT?

0. I CURRENTLY SMOKE
1. I NEVER SMOKED ON A REGULAR BASIS
2. I HAVE STOPPED SMOKING SINCE MY LAST VISIT (PHYSICAL EXAM) HERE.
3. I STOPPED SMOKING BEFORE MY LAST VISIT HERE.

IF '1, 2 OR 3' SKIP TO QUESTION 130.
IF '0' GO TO QUESTION 125

125 A) PLEASE INDICATE HOW MUCH TOBACCO OF EACH KIND LISTED BELOW YOU USE EACH DAY. MAKE ONE ANSWER FOR EACH KIND OF TOBACCO.

CIGARETTES/DAY

1. NONE
2. UP TO 1/2 PACKS

3. MORE THAN 1/2, UP TO 1 PACK
4. MORE THAN 1, UP TO 2 PACKS
5. MORE THAN 2, UP TO 3 PACKS
6. MORE THAN 3 PACKS

B) CIGARS/DAY

7. NONE
8. 1 TO 3
9. 4 TO 5
10. MORE THAN 5

C) PIPES/DAY

11. NONE
12. 1 TO 3
13. 4 TO 5
14. MORE THAN 5

130 A) HOW OFTEN DO YOU EAT BREAKFAST (I.E., MORE THAN A BEVERAGE) AFTER ARISING FROM YOU MAIN SLEEPING PERIOD, IRRESPECTIVE OF CLOCK TIME?

1. ALMOST EVERY DAY
2. ABOUT HALF THE TIME
3. RARELY OR NEVER

B) ABOUT HOW MANY 'REGULAR MEALS' DO YOU EAT IN AN AVERAGE WEEK? (INCLUDE 'BROWN BAG' LUNCHES)

4. 14 OR LESS
5. 15 TO 19
6. 20 OR 21
7. MORE THAN 21

C) IN ADDITION TO REGULAR MEALS, HOW OFTEN DO YOU EAT BETWEEN MEALS? (INCLUDE ALL SNACKS AT WORK, BUT DON'T COUNT TIMES WHEN YOU HAVE ONLY BEVERAGES)

8. RARELY
9. ABOUT 3 TIMES A WEEK
10. ALMOST EVERY DAY
11. MORE THAN ONCE A DAY

ON THE AVERAGE WORKING DAY, HOW MUCH OF EACH OF THE FOLLOWING DO YOU DRINK? (INCLUDE THE FULL DAY. HOME AND ELSEWHERE -WRITE IN NUMBERS PLEASE)

A) CUPS OF COFFEE CUPS_____

B) BOTTLES OR CANS (12 OZ.) OF COLA DRINKS_____

C) GLASSES OR CARTONS (1/2 PINT) OF MILK AND DAIRY DRINKS_____

IN THE AVERAGE 24 HR. DAY, HOW MANY HOURS OF SLEEP DO YOU GET? PLEASE WRITE THE AVERAGE NUMBER TO THE NEAREST HOUR, FOR EACH SHIFT LISTED BELOW. IF YOU NEVER WORK A CERTAIN SHIFT, WRITE IN '0'.

A) HOW MUCH DO YOU SLEEP WHEN YOU ARE ON DAY SHIFT (7-3)?

B) HOW MUCH DO YOU SLEEP WHEN YOU ARE ON AFTERNOON SHIFT (3-11)?

C) HOW MUCH DO YOU SLEEP WHEN YOU ARE ON MIDS (11-7)?

16C. PLEASE INDICATE HOW OFTEN (ON THE AVERAGE) YOU HAVE TAKEN EACH OF THE FOLLOWING PREPARATIONS OR MEDICINES SINCE YOUR LAST VISIT HERE. USE THIS CODE TO MAKE AN ANSWER TO EACH LINE:

0. NOT AT ALL
1. ONCE A MONTH OR LESS
2. A FEW TIMES A MONTH
3. WEEKLY OR MORE OFTEN
4. DAILY OR MORE OFTEN

A) VITAMINS _____
B) ANTACIDS (SUCH AS TUMS, MAALOX, AMPHOJEL) _____
C) HEADACHE AND PAIN RELIEVERS (SUCH AS ASPIRIN,BUFFERIN,APC,EXCEDRIN)_____
D) ENERGIZERS (TO KEEP YOU AWAKE OR ACTIVE, SUCH AS NO-DOZ)_____
E) TRANQUILLIZERS _____
F) SLEEPING PILLS _____
G) OTHER NON-PRESCRIPTION PREPARATIONS (PILLS,CAPSULES,LIQUIDS)_____
H) OTHER PRESCRIPTION MEDICINES _____

** THROUGHOUT THIS INTERVIEW THE TERM "RECENTLY" APPLIES TO THE PERIOD OF TIME SINCE YOUR LAST REGULAR VISIT HERE TO THE ATC STUDY **

206. INDICATE WHICH OF THE FOLLOWING APPLY (APPLIES) TO YOU:

3) YOU ARE ON WEIGHT REDUCING DIET
4) YOU ARE ON ANOTHER SPECIAL DIET
5) NONE OF THE ABOVE

207. INDICATE WHETHER YOU HAVE HAD ANY OF THE FOLLOWING RECENTLY (I.E., SINCE YOUR LAST VISIT HERE):

1) DOUBLE VISION
2) BLURRING EYESIGHT WHICH LASTED MORE THAN A FEW MINUTES
3) PAIN IN EITHER OR BOTH OF YOUR EYES
4) TEMPORARY BLINDNESS IN EITHER EYE
5) HALOES AROUND LIGHTS
6) TEMPORARY LOSS OF VISION
7) NONE OF THE ABOVE

8. INDICATE WHICH OF THE FOLLOWING APPLY (APPLIES) TO YOU:

1) YOUR TEETH (OR DENTURES) ARE CAUSING YOU SIGNIFICANT TROUBLE, OR THEY ARE IN POOR CONDITION
2) YOUR HEARING HAS DETERIORATED RECENTLY
3) YOUR VOICE HAS CHANGED (BECOME ROUGH, SCRATCHY OR HOARSE) RECENTLY OTHER THAN WHEN YOU HAD A COLD OR A MINOR THROAT INFECTION
4) NONE OF THE ABOVE

CIRCLE ALL OF THE FOLLOWING THAT APPLY TO YOU:

1) YOU USUALLY HAVE A COUGH
2) YOU BRING UP MATERIAL (SUCH AS SPUTUM, PHLEGM OR MUCUS) WHEN COUGHING
3) YOU SOMETIMES COUGH UP BLOOD
4) NONE OF THE ABOVE

210. PLEASE INDICATE WHICH PHRASES DESCRIBE YOUR CURRENT SITUATION (CIRCLE ALL THAT APPLY):

1) YOU DO NOT HAVE SHORTNESS OF BREATH
2) YOU GET SHORTNESS OF BREATH WHEN WALKING ON LEVEL GROUND
3) YOU GET SHORTNESS OF BREATH WHEN CLIMBING A SINGLE FLIGHT OF STAIRS
4) YOU GET SHORTNESS OF BREATH WHEN SHOVELING SNOW
5) YOU GET SHORTNESS OF BREATH WHICH CAUSES YOU TO WAKE FROM SLEEPING
6) YOU GET SHORTNESS OF BREATH WHEN LYING QUIETLY

* * * * * * *

7) YOU GET PERIODS OF WHEEZING OR WHISTLING IN YOUR CHEST

212. INDICATE WHETHER YOU HAD ANY OF THE FOLLOWING CONDITIONS SINCE YOUR LAST VISIT (CIRCLE ALL THAT APPLY):

1) FREQUENT NIGHT SWEATS THAT DRENCH YOUR BED CLOTHES
2) HAY FEVER OR FREQUENT SNEEZING SPELLS
3) PNEUMONIA
4) FREQUENT BRONCHITIS
5) PLEURISY (PAIN IN THE CHEST WHEN BREATHING)
6) BRONCHIAL ASTHMA
7) EMPHYSEMA
8) YOU HAVE BEEN TOLD THAT YOUR CHEST X-RAY WAS ABNORMAL
9) NONE OF THE ABOVE

213. INDICATE WHETHER YOU HAVE HAD ANY OF THE FOLLOWING RECENTLY:

1) TUBERCULOSIS
2) CLOSE CONTACT WITH PEOPLE WHO HAVE HAD TUBERCULOSIS (INCLUDING ANYONE IN YOUR FAMILY)
3) A POSITIVE TUBERCULOSIS SKIN TEST
4) NONE OF THE ABOVE

214. YOU GET PAIN, DISCOMFORT, TIGHTNESS OR PRESSURE IN YOUR CHEST

0) NO
1) YES

IF NO SKIP TO QUESTION 220

215. INDICATE WHICH PHRASES DESCRIBE YOUR PAIN OR DISCOMFORT (CIRCLE ALL THAT APPLY):

1) OCCURS EVERY DAY
2) OCCURS MORE THAN ONCE A WEEK
3) OCCURS EVERY 2 OR 3 WEEKS
4) OCCURS ONCE A MONTH

* * * * * * * * *

5) IS LOCATED ON BOTH SIDES
6) IS LOCATED ON THE LEFT SIDE ONLY
7) IS LOCATED ON THE RIGHT SIDE ONLY
8) IS LOCATED ON THE MIDDLE OF THE CHEST, UNDER THE BREASTBONE

* * * * * * * * *

9) NONE OF THE ABOVE

216. INDICATE WHICH PHRASES DESCRIBE YOUR PAIN OR DISCOMFORT (CIRCLE ALL THAT APPLY IN EACH SECTION)

1) IS MADE WORSE BY BREATHING DEEPLY
2) IS MADE WORSE BY SWALLOWING
* * * * * * * * * *
3) COMES ON AFTER YOU EAT A LARGE MEAL
4) COMES ON AFTER YOU BECOME ANGRY OR EXCITED
5) COMES ON AFTER YOU DO STRENUOUS WORK OR WALK RAPIDLY
6) COMES ON AFTER YOU TURN FROM SIDE TO SIDE, LEAN FORWARD OR LIE DOWN
* * * * * * * * * *
7) IS USUALLY SO PAINFUL THAT YOU ARE IN GREAT DISTRESS
* * * * * * * * * *
8) NONE OF THE ABOVE

217. INDICATE WHICH PHRASES DESCRIBE FACTORS THAT RELIEVE YOUR CHEST PAIN OR DISCOMFORT (CIRCLE ALL THAT APPLY IN EACH SECTION)

1) RESTING RELIEVES IT IMMEDIATELY
2) RESTING RELIEVES IT IN LESS THAN 5 MINUTES
3) RESTING RELIEVES IT IN 5-15 MINUTES
4) RESTING RELIEVES IT IN MORE THAN 15 MINUTES
5) RESTING DOES NOT RELIEVE THE PAIN
* * * * * * * * * * *
6) NITROGLYCERIN RELIEVES IT
7) NITROGLYCERIN DOES NOT RELIEVE THE PAIN
8) I DO NOT TAKE NITROGLYCERIN
* * * * * * * * * *
9) ANTACIDS RELIEVE IT

220. INDICATE WHETHER ANY OF THE FOLLOWING APPLY (APPLIES) TO YOU:

1) YOU GET POUNDING, SKIPPING, THUMPING OR RACING OF YOUR HEART (PALPITATIONS AND/OR FLUTTERING) WHILE YOU ARE AT REST
2) YOU FIND IT NECESSARY TO SLEEP PROPPED UP (WITH EXTRA PILLOWS OR IN A CHAIR) TO HELP YOU BREATHE EASILY
7) NONE OF THE ABOVE

23. INDICATE WHICH OF THE FOLLOWING APPLY (APPLIES) TO YOU IN EACH SECTION (CIRCLE ALL THAT APPLY IN EACH SECTION)

1) YOU GET SWELLING OF YOUR FEET OR ANKLES THAT DOES NOT DISAPPEAR OVERNIGHT
2) YOU GET PAINS CONSISTENTLY IN YOUR CALVES OR LOWER LEGS WHEN YOU WALK ANY DISTANCE
3) THE PAINS IN YOUR CALVES OR LOWER LEGS MAKE YOU STOP WALKING
4) THE PAINS IN YOUR CALVES OR LOWER LEGS GO AWAY AFTER A SHORT REST (5-10 MINUTES)
* * * * * * * * * * * *
5) YOU HAVE BULGING (VARICOSE) VEINS IN YOUR LEGS
6) YOUR FINGERS ARE EXCESSIVELY SENSITIVE TO COLD SO THAT THEY BECOME VERY PAINFUL, COMPLETELY WHITE OR DARK BLUE, WHEN ONLY SLIGHTLY COLD
7) YOU HAD SKIN ULCERS ON YOUR ANKLES THAT TOOK MANY MONTHS TO HEAL
* * * * * * * * * * * *
8) NONE OF THE ABOVE

226. SINCE YOUR LAST VISIT HAVE YOU TAKEN MEDICINE:

1) FOR YOUR HEART
2) FOR HIGH BLOOD PRESSURE
3) TO HELP THIN YOUR BLOOD
4) FOR THE PURPOSE OF LOSING WATER
5) NEVER FOR THE ABOVE REASONS

227. INDICATE WHETHER A DOCTOR HAS RECENTLY TOLD YOU THAT YOU HAD:

1) HEART MURMUR
2) ENLARGED HEART
3) HIGH BLOOD PRESSURE
4) A HEART ATTACK
5) RHEUMATIC FEVER
6) ANGINA OR ANGINA PECTORIS
7) PHLEBITIS, OR THROMBOPHLEBITIS OR "MILK LEG"
8) TROUBLE WITH YOUR CIRCULATION
9) NONE OF THE ABOVE

228. INDICATE WHETHER YOU HAVE HAD ANY OF THE FOLLOWING RECENTLY:

1) A PERSISTENT SORE TONGUE
2) BLEEDING GUMS THAT HAVE BEEN VERY TROUBLESOME
3) A CHOKING FEELING OR A LUMP IN THE THROAT WHEN NOT EATING
4) TROUBLE SWALLOWING FOOD OR LIQUIDS
5) FOOD OR LIQUIDS STICKING IN YOUR THROAT WHILE SWALLOWING
6) NONE OF THE ABOVE

229. YOU GET AN UPSET STOMACH OR ABDOMINAL DISTRESS MORE THAN ONCE A WEEK

0) NO
1) YES

IF NO SKIP TO QUESTION 332

230. INDICATE WHICH PHRASES DESCRIBE YOUR ABDOMINAL PAINS
(CIRCLE ALL THAT APPLY IN EACH SECTION)

1) OCCUR EVERY DAY
2) OCCUR EVERY FEW DAYS
3) OCCUR EVERY WEEK OR TWO
4) OCCUR OCCASIONALLY
* * * * * * * *
5) ARE LOCATED ABOVE THE NAVEL
6) ARE LOCATED BELOW THE NAVEL
7) ARE LOCATED ON THE RIGHT SIDE
8) ARE LOCATED ON THE LEFT SIDE
9) ARE LOCATED THROUGHOUT THE STOMACH
* * * * * * * * *
10) THEY FEEL DULL
11) THEY FEEL SHARP
12) THEY FEEL CRAMPY
13) THEY GIVE OTHER KIND OF FEELING
* * * * * * * * * *
14) DO NOT HAVE PAIN

231. INDICATE WHICH PHRASES DESCRIBE YOUR ABDOMINAL PAINS OR DISTRESS (CIRCLE ALL THAT APPLY IN EACH SECTION)

1) THEY COME ON AT THE TIME OF, OR DIRECTLY AFTER, EATING A MEAL
2) THEY COME ON ONE OR 2 HOURS AFTER EATING
3) THEY COME ON AT NO PARTICULAR TIME
4) THEY KEEP YOU FROM GOING TO SLEEP
5) THEY AWAKE YOU FROM SLEEP
6) THEY COME ON AFTER EATING FRIED OR FATTY FOOD

* * * * * * * * * * *

7) THEY ARE RELIEVED BY TAKING MILK, SODA, TUMS OR MAALOX (ANTACIDS)
8) THEY ARE RELIEVED BY EATING
9) THEY ARE RELIEVED BY BOWEL MOVEMENT

* * * * * * * * * * * * *

10) NONE OF THE ABOVE

332. INDICATE WHETHER ANY OF THE FOLLOWING APPLY (APPLIES) TO YOU:

1) YOU HAVE ATTACKS OF NAUSEA OR VOMITING MORE THAN ONCE A MONTH
2) YOU HAVE VOMITED BLOOD OR MATERIAL THAT LOOKED LIKE COFFEE GROUNDS
3) YOUR SKIN OR EYES HAVE BEEN YELLOW OR YOU HAVE BEEN TOLD BY A DOCTOR THAT YOU HAD JAUNDICE OR HEPATITIS
4) NONE OF THE ABOVE

333. PLEASE INDICATE WHICH OF THE FOLLOWING YOU HAVE MORE THAN ONCE A MONTH:

1) CONSTIPATION
2) DIARRHEA
3) RECTAL PAIN
4) STRAINING ON EXPELLING BOWEL MOVEMENT
5) ANY OTHER ABNORMALITY WITH YOUR BOWEL MOVEMENT
6) NONE OF THE ABOVE

334. INDICATE WHETHER ANY OF THE FOLLOWING HAVE BEEN TRUE FOR YOU RECENTLY:

1) YOU USE A LAXATIVE FREQUENTLY
2) YOU HAVE HAD BOWEL MOVEMENTS THAT WERE AS BLACK AS COAL OR TAR
3) YOU WERE TAKING IRON OR VITAMINS AT THE TIME OF THE BLACK BOWEL MOVEMENTS
4) YOU WERE NOT TAKING IRON OR VITAMINS AT THE TIME OF THE BLACK BOWEL MOVEMENTS
5) YOU HAVE HAD BLOOD IN YOUR BOWEL MOVEMENTS
6) NONE OF THE ABOVE

337. INDICATE WHETHER A DOCTOR HAS RECENTLY TOLD YOU THAT YOU HAD:

1) AN ULCER (STOMACH OR DUODENAL)
2) GALLSTONES OR GALL BLADDER DISEASE
3) CIRRHOSIS, HEPATITIS OR SOME OTHER LIVER DISEASE
4) INFLAMED STOMACH (GASTRITIS)
5) NERVOUS STOMACH
6) PANCREATITIS
7) INTESTINAL DISEASE (INCLUDING COLITIS, ENTERITIS, OR ILEITIS)
8) HEMORRHOIDS OR PILES
9) WORMS OR PARASITES
10) DYSENTERY OR SERIOUS DIARRHEA
11) NONE OF THE ABOVE

440. INDICATE WHETHER YOU RECENTLY HAD ANY OF THE FOLLOWING X-RAYS:

1) STOMACH
2) GALLBLADDER
3) INTESTINES (UPPER GASTROINTESTINAL SERIES, BARIUM ENEMA)
4) NONE OF THE ABOVE

443. INDICATE WHICH OF THE FOLLOWING APPLY TO YOU RECENTLY:

1) YOU BROKE A BONE
2) YOUR JOINTS ARE STIFF WHEN YOU WAKE UP
3) THE DOCTOR TOLD YOU THAT YOU HAVE "ARTHRITIS"
4) NONE OF THE ABOVE

444. DO YOU GET SEVERE BACK PAINS?

0) NO
1) YES

IF NO SKIP TO QUESTION 448

445. HOW OFTEN DO YOU GET THESE BACK PAINS?

1) FREQUENTLY (EVERY DAY)
2) OCCASIONALLY (SOME TIME EACH WEEK)
3) AFTER DOING HEAVY WORK
4) RARELY

446. DO THESE PAINS USUALLY START IN YOUR LOWER SPINE AND PASS DOWN THE BACK OF EITHER OR BOTH LEGS?

0) NO
1) YES

448. INDICATE WHETHER ANY OF THE FOLLOWING APPLY (APPLIES) TO YOU:

1) THE DOCTOR TOLD YOU THAT YOU HAD A GOUT
2) YOU RECENTLY HAD AN OPERATION ON YOUR BONES OR JOINTS
3) YOU RECENTLY HAD RED, TENDER OR SWOLLEN JOINTS
4) NONE OF THE ABOVE

449. DO YOU GET PAINS IN YOUR BONES OR JOINTS?

0) NO
1) YES

IF NO SKIP TO QUESTION 548

450. INDICATE WHICH PHRASES DESCRIBE YOUR PAINS (CIRCLE ALL THAT APPLY)

1) THEY ARE OFTEN SO SEVERE THAT THEY PREVENT YOU FROM MOVING SATISFACTORILY YOUR ARM OR LEG
2) THEY INVOLVE MANY JOINTS
* * * * * * * * * * *
3) WALKING INCREASES THE PAINS
4) WALKING RELIEVES THE PAINS
5) ASPIRIN, BUFFERIN, ANACIN OR OTHER MILD MEDICATION RELIEVE THE PAIN
* * * * * * * * * * *
6) NONE OF THE ABOVE

548. INDICATE WHETHER YOU RECENTLY HAVE HAD

1) BURNING OR PAIN ON URINATION
2) DIFFICULTY IN STARTING OR STOPPING URINATION
3) UNEXPECTED LOSS OF URINE WHEN YOU COUGH, SNEEZE, LAUGH, ETC.
4) BLOOD IN YOUR URINE
5) DARK URINE
6) PUS IN YOUR URINE
7) NONE OF THE ABOVE

549. DO YOU USUALLY GET UP AT NIGHT TO URINATE?

0) NO
1) YES

IF NO SKIP TO QUESTION 551

550. INDICATE WHICH PHRASES DESCRIBE YOUR PROBLEM (LIST ALL THAT APPLY):

1) YOU USUALLY GET UP ONCE PER NIGHT
2) YOU USUALLY GET UP 2 OR MORE TIMES PER NIGHT
* * * * * * * * * *
3) YOU HAVE BEEN GETTING UP FOR LESS THAN 6 MONTHS
4) YOU HAVE BEEN GETTING UP FOR ABOUT 6 MONTHS TO 1 YEAR
5) YOU HAVE BEEN GETTING UP FOR MORE THAN 1 YEAR
* * * * * * * * * *
6) NONE OF THE ABOVE

551. INDICATE WHETHER A DOCTOR RECENTLY TOLD YOU THAT YOU HAD:

1) PROSTATE TROUBLE
2) KIDNEY OR BLADDER INFECTION THAT WAS VERY DIFFICULT TO CLEAR UP OR WHICH RECURRED FREQUENTLY
3) KIDNEY OR BLADDER STONES (GRAVEL)
4) VENEREAL DISEASE ("VD")
5) HERNIA
6) PROTEIN (ALBUMIN) IN THE URINE
7) NONE OF THE ABOVE

553. INDICATE WHETHER ANY OF THE FOLLOWING HAVE HAPPENED TO YOU RECENTLY:

1) YOU HAD A BLADDER OR A KIDNEY OPERATION
2) YOU HAD A KIDNEY X-RAY (INTRAVENOUS PYELOGRAM)
3) SOMETIMES YOU FEEL THAT YOU HAVE TO URINATE BUT FIND THAT YOU CANNOT PASS ANY URINE
4) YOUR URINE OFTEN COMES OUT IN DRIBBLES, RATHER THAN IN A STRONG STREAM
5) NONE OF THE ABOVE

. INDICATE WHICH OF THE FOLLOWING APPLY (APPLIES TO YOU:

1) YOU HAVE BEEN TOLD THAT YOU WERE ANEMIC
2) YOU HAVE BEEN TAKING IRON OR OTHER MEDICATION FOR ANEMIA
* * * * * * * * * *
3) YOU OFTEN GET MANY BLACK OR BLUE SPOTS WITHOUT APPARENT REASON
4) YOU BLEED FOR VERY LONG TIME WITHOUT STOPPING WHEN YOU INJURE YOURSELF OR WHEN YOU HAVE SURGERY OR TOOTH EXTRACTION
* * * * * * * * * *
5) NONE OF THE ABOVE

555. SINCE YOUR LAST VISIT HERE, HAVE YOU EXPERIENCED ENLARGED GLANDS OR LYMPH NODES:

1) IN YOUR NECK?
2) IN YOUR ARMPIT?
3) IN YOUR GROIN?
4) ELSEWHERE IN YOUR BODY?
5) NOT AT ALL

556. HAVE ANY OF THE FOLLOWING HAPPENED RECENTLY?:

1) YOU RECEIVED A BLOOD TRANSFUSION
2) YOU HAD A RASH OR OTHER REACTION TO THE BLOOD TRANSFUSION
3) YOU HAD VITAMIN B-12 INJECTIONS
4) NONE OF THE ABOVE

557. INDICATE ALL THE PHRASES THAT APPLY TO YOU:

1) YOUR SKIN HAS RECENTLY BECOME DARKER (OTHER THAN SUNTAN)
2) YOUR SKIN HAS RECENTLY BECOME LIGHTER OR MORE PALE
3) YOUR SKIN HAS RECENTLY BECOME YELLOW
4) YOUR SKIN HAS SHOWN SOME OTHER TYPE OF CHANGE IN COLOR
5) THE TEXTURE OF YOUR SKIN HAS CHANGED
6) NO CHANGE AT ALL

666. INDICATE WHETHER OR NOT YOUR DOCTOR HAS RECENTLY TOLD YOU THAT YOU HAD:

1) DIABETES (SUGAR DISEASE)
2) OVERACTIVE THYROID
3) LOW METABOLISM OR UNDERACTIVE THYROID
4) GOITER (ENLARGED THYROID)
5) HIGH CHOLESTEROL
6) NONE OF THE ABOVE

668. INDICATE WHETHER ANY OF THE FOLLOWING HAS HAPPENED SINCE YOUR LAST VISIT HERE

1) YOU HAVE EXPERIENCED EXTREME DISCOMFORT IN HOT WEATHER
2) YOU HAVE EXPERIENCED EXTREME DISCOMFORT IN COLD WEATHER
3) YOU HAVE NOTICED THAT YOUR EYES BULGED FORWARD
4) YOU HAVE BEGUN TO DRINK MUCH MORE WATER OR LIQUIDS THAN YOU USED TO
5) YOUR HANDS SOMETIMES TREMBLE OR SHAKE
6) YOU HAVE HAD SUGAR IN YOUR URINE
7) NONE OF THE ABOVE

669. PLEASE INDICATE WHETHER ANY OF THE FOLLOWING OCCURRED TO YOU RECENTLY:

1) ANNOYING SKIN RASHES WHICH LASTED FOR ONE MONTH OR LONGER
2) FREQUENT SKIN INFECTIONS OR BOILS
3) HIVES, WELTS OR SWELLING OF YOUR SKIN
4) A STUFFY NOSE, RASH, HIVES, ECZEMA, OR THROAT SWELLING THAT OCCURS ONLY AT CERTAIN SEASONS OF THE YEAR
5) NONE OF THE ABOVE

72. INDICATE WHETHER YOU HAVE RECENTLY NOTICED:

1) NEW GROWTHS ON YOUR SKIN
2) MOLES WHICH BECAME DARKER OR LARGER
3) SORES THAT WILL NOT HEAL
4) NOTHING AT ALL

73. ARE YOU ALLERGIC TO OR HAVE YOU RECENTLY DEVELOPED A RASH, ECZEMA, WHEEZING OR NASAL BLOCKADE FROM ANY OF THE FOLLOWING:

1) DETERGENTS, SOAPS, SHAMPOOS, OR TOILETRIES
2) SEAFOODS, SPICES OR OTHER FOODS (CAUSING SKIN RASHES)
3) PENICILLIN
4) PHENOBARBITAL OR BARBITURATES
5) CODEINE, MORPHINE, OR DEMEROL
6) ASPIRIN, EMPIRIN, OR BUFFERIN
7) UNKNOWN STIMULUS
8) NO SUCH ALLERGIC REACTION

HAVE YOU RECENTLY WORKED NEAR OR OFTEN BEEN AROUND ANY OF THE FOLLOWING:

1) CHEMICALS, CLEANING FLUIDS OR SOLVENTS
2) INSECT OR PLANT SPRAYS
3) AMMONIA, CHLORINE, OZONE OR NITROUS GASES
4) PLASTIC OR RESIN FUMES
5) LEAD OR METAL FUNES
6) X-RAYS, RADIOACTIVITY OR ULTRAVIOLET RADIATION
7) BERYLLIUM, ASBESTOS OR POLYURETHANES
8) NONE OF THE ABOVE

SINCE YOUR LAST VISIT HERE, HAVE YOU HAD VERY BAD HEADACHES MORE THAN ONCE A WEEK?

0) NO
1) YES

IF NO SKIP TO QUESTION 679

INDICATE WHETHER ANY OF THE FOLLOWING APPLY (APPLIES) TO YOU:

) YOU FEEL THESE HEADACHES HAVE BEEN GETTING WORSE
) YOU HAVE BEEN TOLD THAT YOU HAVE MIGRAINE HEADACHES
) YOU RELATE THE HEADACHES TO TENSION
) THE HEADACHES ARE RELIEVED BY: ASPIRIN, BUFFERIN, ANACIN, EXCEDRIN, DARVON, OR OTHER MILD HEADACHE REMEDIES
) NONE OF THE ABOVE

) YOU OFTEN HAVE DIZZY SPELLS THAT INTERFERE WITH YOUR WORK IN UR NORMAL DAY'S ACTIVITY?

NO
YES

NO SKIP TO QUESTION 685

680. INDICATE WHETHER ANY OF THE FOLLOWING ARE ASSOCIATED WITH YOUR DIZZY SPELLS:

1) LIGHTHEADEDNESS
2) WHIRLING OR SPINNING SENSATIONS
3) OBJECTS ROTATING OR MOVING ABOUT
4) DEAFNESS
5) RINGING IN YOUR EARS, OR NOISES
6) NAUSEA OR VOMITING
7) STAGGERING OR DIFFICULTY WALKING
8) NONE OF THE ABOVE

681. INDICATE ALL THE PHRASES THAT APPLY TO YOU:

1) THE DIZZINESS IS BROUGHT ON BY MOVING YOUR HEAD
2) THE DIZZINESS IS BROUGHT ON BY CHANGING POSITION, FOR EXAMPLE STANDING UP
* * * * * * * * * *
3) THE ATTACKS LAST A COUPLE OF MINUTES OR LESS
4) THE ATTACKS LAST AN HOUR
5) THE ATTACKS LAST A COUPLE OF HOURS OR MORE
* * * * * * * * * *
6) YOU HAD SOMETIMES FALLEN DOWN OR TO THE SIDE BECAUSE OF THE DIZZINESS
7) THE DIZZY SPELLS ARE MADE WORSE BY MOVING YOUR HEAD
8) YOU HAD SOMETIMES EPISODES OF NUMBNESS OR UNUSUAL SENSATIONS (BURINING, TINGLING, ETC.) SOMEWHERE IN YOUR BODY
* * * * * * * * * *
9) NONE OF THE ABOVE

HAVE YOU EVER HAD ANY TEETH EXTRACTIONS

0) NO
1) YES

INDICATE WHETHER YOU HAVE RECENTLY HAD AN OPERATION ON YOUR:

1) STOMACH
2) GALLBLADDER
3) APPENDIX
4) COLON (BOWEL)
5) ANUS/RECTUM
6) OTHER PARTS OF YOUR ABDOMEN
7) NONE OF THE ABOVE

NDICATE WHETHER YOU RECENTLY HAD AN OPERATION ON YOUR:

1) TONSILS/ADENOIDS
2) NECK, HEAD, OR FACE
3) ARMS OR LEGS
4) REPRODUCTIVE SYSTEM INCLUDING VASECTOMY
5) OTHER PARTS OF THE BODY NOT ALREADY MENTIONED
6) NONE OF THE ABOVE

NCE YOUR LAST VISIT HAVE YOU BEEN HOSPITALIZED FOR ANY REASON?

) NO
) YES

II. C-1

BUMC-ATC HEALTH CHANGE STUDY

MONTHLY HEALTH REVIEW

NAME_____ OPEN ID #_____

SUMMARY OF INSTRUCTIONS

A. Check in ILLNESS EPISODES COLUMN

1. All symptoms that occurred together as a single illness. (see definitions over)

2. If more than one illness episode, check symptoms in 2nd & 3rd columns provided.

B. Check in ISOLATED EVENTS COLUMN if symptom occurred by itself infrequently -- and was not just a part of an illness episode.

C. Check in CONTINUING PROBLEMS COLUMN if symptom occurred at least half the days this month -- and was not just part of an illness episode.

D. Check in NOT THIS MONTH COLUMN if symptom didn't occur.

FOR DETAILED INSTRUCTIONS SEE OTHER SIDE OF THIS PAGE.

PLEASE DO NOT DETACH THIS SHEET. WE WILL DESTROY UPON RECEIPT.

This form of the Monthly Health Review has two parts - the first for illness episodes and other symptoms and the second for injuries.

What is an "ILLNESS EPISODE"?

Most "illnesses" that people have are made up of a number of complaints or symptoms that occur in a cluster. For example, a "cold" may start with a sore throat and progress to a fever, cough, and runny nose. The throat may feel better before the nose begins running, but nevertheless we consider all four of these symptoms as the same illness episode. The illness episode is considered over when all the symptoms have been gone for at least a day or two (except for certain types of chronic, recurring conditions). Doctors use the particular combinations of symptoms as well as the length of the illness episode to help diagnose and classify diseases. Our new Monthly Health Review includes vertical columns for you to check off as many as three illness episodes.

In addition, people sometimes have isolated problems or complaints that occur on scattered occasions but are not part of a larger picture of disease. Examples are occasional headache or heartburn. If you have had any of these, check them in the "ISOLATED EVENTS" column.

Finally, those symptoms which are a chronic problem for you, though not occurring as a separate illness, and which were present during at least half the days of the month, check in the "CONTINUING PROBLEMS" column. The typical "cigarette cough" is this kind of symptom.

How to Complete the Review Accurately and Quickly

Before checking off anything:

1) Note the month entered at the top of the Form.
2) Look over the whole Form to see the health problems listed.
3) Recall as accurately as possible what health events have occurred to you in the specified month.

Then enter information:

4) Working vertically by columns, check off symptoms which happened in each "Illness Episode", then those that were "Isolated Events", and finally, "Continuing Problems".
5) If you have had no such symptom, check the column marked "Not This Month".
6) Note that, for each symptom, there should be a check mark in some column. Also, it is possible for a symptom to be checked in more than one column, if the symptom is part of more than one illness, or if it is a continuing problem that flares up as part of an acute "Illness Episode".
7) Be sure to answer questions about getting medical help and to enter numbers for days of disability resulting from each illness or injury.

If you have any questions, ask the ATC Medical Technician when he comes to your cility, or telephone us collect at 617-262-4022.

nks for your continuing interest and cooperation.

UNC - ATC HEALTH CHANGE STUDY LABEL:

HEALTH REVIEW FOR MONTH OF _____

ITEM NO	Please check all symptoms that occurred for each episode	Illness Episodes 1	2	3	Isolated Events	Continuing Problems	Not this Month
1	Temperature of 100° or more						
2	Headache lasting more than 1 hour						
3	Skin rash or hives						
4	Painful, irritated, or burning eyes						
5	Earache or ear infection						
6	Toothache						
7	Sore throat						
8	Sneezing, stuffy or runny nose						
9	Dry cough (more than occasional)						
10	Coughing up substances other than saliva or thin phlegm						
11	Wheezing (from chest)						
12	Unusual shortness of breath						
13	Unplanned loss of weight						
14	Nausea and/or vomiting						
15	Stomach pain or abdominal cramps						
16	Heartburn						
17	Chest pain other than heartburn						
18	Rapid or pounding heartbeat						
19	Diarrhea						
20	Bloody or black stools						
21	Discomfort from hemorrhoids						
22	Urinary problems (unusual frequency, pain or discharge)						
23	Difficulty with sexual function						
24	Trouble getting to sleep or staying asleep						
25	Excess fatigue						
26	Neck pain or stiff neck						
27	Lower back pain spreading to leg						
28	Other pain anywhere in back						
29	Stiffness or swelling or soreness of joints in the absence of injury						
30	Aches or pains in muscles or joints other than back						
	EVERYONE INSERT APPROPRIATE NUMBERS (e.g. 0,1,2,3,...) IN CORRESPONDING COLUMN>				All Combined	All Combined	
31	ALTOGETHER HOW MANY DAYS DID THIS KEEP YOU FEELING BELOW "PAR"? (ENTER NUMBER)						
32	FOR HOW MANY OF THESE DAYS DID THIS CAUSE YOU TO CUT DOWN ON YOUR USUAL ACTIVITIES, INCLUDING TIME LOST FROM WORK? (ENTER NUMBER)						
33	DID YOU GET MEDICAL HELP (DOCTOR OR CLINIC) FOR THIS PROBLEM? (CIRCLE ANSWER)	yes no	yes no	yes no	yes no	yes no	

(CONTINUE ON OTHER SIDE)

INJURIES: Please check all that occurred for each event.

		Injury Events 1	2	3	Not this Month
34	Major cuts, scrapes, or bruises				
35	Injuries to joints, such as sprains, strains, or wrenchings				
36	Broken bones or dislocations				
37	Burns (heat or chemical)				
38	Other injuries to head and face, such as concussion, injured eye, loss of teeth, etc.				

		INSERT APPROPRIATE NUMBER		
39	Altogether how many days did this keep you feeling below "par"? (enter number)			
40	For how many of these days did this cause you to cut down on your usual activities, including time lost from work? (enter number)			
41	Did you get medical help (doctor or clinic) for this problem? (CIRCLE ANSWER)	YES NO	YES NO	YES NO

42 HAVE YOU BEEN HOSPITALIZED DURING THIS MONTH (Circle Answer) YES NO

43 During this month, have you had any illness or health problem NOT covered in this review form? (CIRCLE ANSWER) YES NO

IF YES, what is it?

October 1976

ATC HEADACHE STUDY

Headaches are among the most common health complaints that Air Traffic Controllers report on their Monthly Health Review. In order to get a better understanding of the nature of these headaches, we will be enclosing these added items in several selected months.

A complete description of headaches helps doctors to classify them and to derive ideas regarding their causes. So would you please consider each item below and CHECK whether it Usually, Occasionally, or Never was true for the headaches you had THIS PAST MONTH.

Frequency

How many headaches did you have this last month:

1.) Total number of headaches _____ 1.
2.) How many lasted for more than one hour? _____ 2.
3.) How many were so severe they made you stop what you were doing? _____ 3.

(IF YOU ANSWERED "0" FOR "2" OR "3", YOU ARE FINISHED. PLEASE RETURN THIS PAGE WITH YOUR MONTHLY HEALTH REVIEW. IF YOU ANSWERED A POSITIVE NUMBER FOR "2" or "3", CONTINUE.)

Please answer the questions for only those headaches which EITHER were so severe as to make you stop what you were doing, OR lasted more than one hour (or both).

Check how often EACH item below was true for your headaches this month. Please make 1 check for each numbered statement:

	Usually	Occasionally	Never	
Just before the headache:				
4. Muscles of head or neck are tight	_____	_____	_____	4.
5. Eyes become overly sensitive to light	_____	_____	_____	5.
6. Vision blurs or flickers	_____	_____	_____	6.
7. Other: (write in): _____	_____	_____	_____	7.
8. No symptoms precede the actual headache	_____	_____	_____	8.
Starting location:				
9. Forehead	_____	_____	_____	9.
10. Around or behind the eyes	_____	_____	_____	10.
11. Back of head or neck	_____	_____	_____	11.
12. All over the head	_____	_____	_____	12.
13. Either side of head (not both sides)	_____	_____	_____	13.
Usual time of occurrence:				
14. During periods of intense concentration	_____	_____	_____	14.
15. During or after worry or emotional tension	_____	_____	_____	15.
16. During the "let down" after a period of work	_____	_____	_____	16.
17. During rest or relaxation	_____	_____	_____	17.
18. Starts during sleep and wakes me up	_____	_____	_____	18.
19. Usually only after eating or drinking too much	_____	_____	_____	19.
20. Other (write in): _____	_____	_____	_____	20.

ATC HEADACHE STUDY

Type of Pain	Usually	Occasionally	Never	
21. Steady pressure				21.
22. Dull steady ache or pain				22.
23. Tight band of "head in a vise"				23.
24. Throbbing or pounding				24.
25. Other (write in): _____				25.
During the Headache				
26. Nausea or vomiting				26.
27. "Buzzing" in the ears				27.
28. Feeling faint				28.
29. Redness or watering of one eye				29.
30. Bright light makes it worse				30.
Duration of Headache				
31. Less than 1 hour				31.
32. 1 to 3 hours				32.
33. 4 to 8 hours				33.
34. 9 t 24 hours				34.
35. More than 1 day				35.
Severity				
36. Aching. No real interference with activities				36.
37. Pain. Some interference with most activities				37.
38. Severe pain. Makes me stop whatever I'm doing				38.

What do you use to relieve headaches?	Do not use this.	I use this. It helps much.	I use this. It helps little.	
39. Rest or relaxation (no drugs)				39.
40. Massages of neck or head (no drugs)				40.
41. Aspirin, Anacin				41.
42. Stronger pain reliever (unprescribed)				42.
43. Stronger medicine (prescription)				43.
44. Needs a medicine containing ergot				44.

Medical history items	YES	NO	
45. A parent or close relative has severe headaches of the same type as mine.			45.
46. I first experienced headaches of the type I had this month before age 25 years.			46.
47. As a child I was subject to "motion sickness"			47.

THANK YOU FOR YOUR ASSISTANCE

II. E-1

TROUBLE SLEEPING?

One of the most common problems reported by Air Traffic Controllers in the summer is trouble sleeping. We want to find out more about this problem in a search for possible causes.

If you had no sleep problems this past month, please return this form blank.

If you did have sleep problems, please check the correct description below: Make one check per item.

HOW OFTEN this month DID YOU:

	(0) Not at all	(1) 1-3 days	(2) 4-7 days	(3) 8-14 days	(4) 15-21 days	(5) 22-31 days
1. Have trouble fallin asleep?	☐	☐	☐	☐	☐	☐
2. Have trouble staying asleep? (I.e. if you wake up far too soon and can't get back to sleep.)	☐	☐	☐	☐	☐	☐
3. Wake up several times per night?	☐	☐	☐	☐	☐	☐
4. Wake up after your usual amount of sleep feeling tired and worn out.	☐	☐	☐	☐	☐	☐

AUSES?

Check as many of the following which you feel cause the problems above:

	Yes	No
Things I've eaten or drunk	☐	☐
Having to use the bathroom more than once per night	☐	☐
Too many ideas spinning through my mind	☐	☐
Worries or problems	☐	☐
Changes in sleeping schedule, such as changes in work shifts	☐	☐
Not allowing enough time for sleep	☐	☐
cause not on this list	☐	☐
rite in: _____		
have trouble sleeping, but have no deas about its causes	☐	☐

FERRED TIME OF DAY

me people feel far better--more alert, competent, and happy at one time of day, noticeably below that level at other times. You hear someone saying: "I'm a ing person", and another: "I'm a night owl."

each description, please check the one set of hours which best fits

	7AM-12Noon	12Noon-5PM	5PM-10PM
best time of day for me I feel more energetic, rt, and capable.	☐	☐	☐
most difficult time of day I often feel tired, ay or irritable.	☐	☐	☐
times of day are about the same for me in terms nergy and ability.	☐		

Also check here if your "best time" is just as likely to occur any time ending on other things.

ATC BIOGRAPHICAL QUESTIONNAIRE

The following questions ask about aspects of yourself, your family, and your experiences that have not been covered elsewhere.

Consider each question carefully and select your answer from among those presented. In some cases the question may not fit your situation exactly. For instance, if a question asks about your parents, you may have to interpret it in terms of guardians or step-parents. Please choose the one answer which is most accurate for you, even if it does not fit perfectly, by circling the number in front of your answer choice. Some answers will need to be written.

) While you were growing up, where did you live most of the time:
(1) in a rural area?
(2) in a small town?
(3) in a suburb of a large city?
(4) in a city of less than 500,000 inhabitants?
(5) in a city of over 500,000 inhabitants?

From birth up until you were 13 years old, how many times did your family move? (Do not count moves known at the time to be temporary, e.g. for the summer)
(1) 0
(2) 1
(3) 2 - 3
(4) 4 - 6
(5) 7 or more

ter reaching the age of thirteen, but before moving out on your own, w many times did your family move?
) 0
) 1
) 2 - 3
) 4 - 6
) 7 or more

(4) While you were growing up, was the section of town in which your family lived longest:

1) one of the poorer ones
2) about average
3) good but not the best
4) one of the best
5) not applicable, lived in rural area

(5) What was the economic situation of your family:

1) not able to make ends meet
2) able to have the necessities only
3) able to live comfortably
4) well-to-do

(6) How many brothers and sisters did (do) you have: (Write in the actual number)

_____ older brothers
_____ older sisters
_____ self
_____ younger brothers
_____ younger sisters

(7) How often did you seriously consider quitting high school:

1) never
2) once or twice
3) occasionally
4) frequently

(8) During your last year in high school, what was the average number of evenings a week that you went out socially with persons of the opposite sex:

1) less than 1
2) 1
3) 2
4) 3
5) 4 or more

(9) In high school did you have:
1) fewer friends than most others
2) about the same number of friends as others
3) more friends than most

(10) During your teen years was your rate of physical growth compared to other boys:
1) much slower
2) a little slower
3) about the same
4) a little faster
5) much faster

(11) When did you have your first alcoholic beverage (include beer) outside your home:
1) under age 14
2) 14-16
3) 17-20
4) 21 or older
5) I never drank

(12) During your teens, was your relationship with your parents:
1) much worse than that of others
2) somewhat worse than that of others
3) about average
4) better than that of most
5) much better than that of most

(13) Whether or not you played organized sports, how athletic and fit were you compared to most of your classmates?
1) much less athletic and fit
2) less athletic and fit
3) about average
4) more athletic and fit
5) much more athletic and fit

(14) In which religious tradition did your parents raise you?

1) no religion at all

2) the Roman Catholic Church

3) a Protestant religion

4) the Jewish religion

5) some other religion not listed

6) an atheist or agnostic tradition

(15) Please check for each person listed the highest level of formal schooling he or she was able to obtain. (Place one check in each vertical column. If you have not lived with a wife during this past year, please cross out columns 18, 19, and 20.)

	15	16	17	18	19	20
Amount of School	Myself	My father	My mother	My wife	My wife's father	My wife's mother
Eighth grade or less (1)						
Some high school but did not graduate (2)						
High school graduate (3)						
Formal vocational training after high school (4)						
Some college (5)						
College graduate (6)						
Master's degree or higher (7)						
Not known (9)						

(21) While you were growing up, what was your father's primary occupation? Write in the answer. List more than one, if appropriate. Please indicate the nature of the work, not the employer -- Write "Repaired machines in a cannery." Do not write "Worked for food processor." If a farmer, indicate size of farm and whether owner, renter, or

(21) hired hand. For proprietor, indicate nature of business and number of employees.

_____.

(22) While you were growing up, what was your mother's occupation? Write in the answer. List more than one if appropriate.

_____.

In some families parents are very similar to one another, but in other families the parents are "as different as night and day." Please check how similar your parents were to each other in each of the following respects:

	Very similar	A little different	Sharply different
23) Social background	_____	_____	_____
24) Education	_____	_____	_____
25) Religious emphasis	_____	_____	_____
26) Their goals for you	_____	_____	_____
27) Personality	_____	_____	_____

(28) Up until you were age 17, was either of your natural parents out of your home for more than a year?

0) No, I lived with both natural parents until 18

1) No, my parents were together but I lived elsewhere (e.g. boarding school or in another home).

2) Yes, a separation only occurred

3) Yes, a divorce occurred

4) Yes, father away in military or related service

5) Yes, a parent died

6) Yes, some other reason

(29) If you answered "yes" to question 28, how old were you the first time a parent left your home for a year or more? Enter your age then: _____.

(30) If you answered yes to question 28, which parent left? _____.

NOW WE ARE GOING TO ASK ABOUT YOUR CURRENT LIVING SITUATION:

(31) How many of the following kinds of persons are living in your present household? Write in the number residing with you in each category.

_____ in-laws

_____ relatives on your side

_____ children (include adoptions etc.)

_____ friends

_____ other: (specify) _____

(32) At the present time I live in a section of town which is:

1) one of the poorer ones

2) about average

3) good but not the best

4) one of the best

(33) I currently consider myself a member of:

1) no religion at all

2) the Roman Catholic Church

3) a Protestant religion

4) the Jewish religion

5) some other religion not listed

6) an atheist or agnostic tradition

(34) On the average, I go to church service:

1) never

2) once or twice a year

3) around once a month

4) twice a month or so

5) once a week or more

(35) For how many years have you lived in the county of your present address? Write in the number of years.

_____.

(36) For how many years did you serve in the armed forces? Write in the number of years ("99" if you served for less than ½ year). If you never served, please skip to question 39.

_____.

(37) If you did serve in the armed forces, what was the highest rank you attained:

1) never served

2) private, corporal, seaman, airman, etc.

3) in the ranks of sergeant, petty officer, and so on

4) lieutenant (jg., first, second), captain (AF or Army), lt. commander (Navy)

5) major (AF, Army), commander (Navy) or above

(38) While in the service were you an:

1) ATC

2) pilot

3) navigator

4) other job related to aviation

5) none of these

6) never served

(39) How many times have you been married? Write in the number: _____

(40) At present I am:

1) married (Please continue, starting with Item 41)

2) separated less than one year (Please continue, starting with Item 41)

3) separated one year or more (Please skip to Item 69)

(40) 4) divorced (Please skip to Item 69)

5) widowed (Please skip to Item 69)

6) engaged (Please skip to Item 69)

7) unattached and none of the above (Please skip to Item 69)

(41) While your wife was growing up, what was the primary occupation of HER FATHER? (Write in the answer. List more than one if appropriate. As for Item 21, indicate the nature of the activity, not just the general field.)

_____

(42) While your wife was growing up, what was the primary occupation of HER MOTHER? (Write in the answer. List more than one if appropriate.)

_____

(43) Has your wife in the past or presently pursued any of the following vocations or professions? Please check as many as apply.

1) Business person, such as proprietor or manager, supervisor, personnel director, or the like

2) Professional person such as lawyer, certified accountant, registered engineer, physician, chemist or the like

3) Professional person such as school teacher, social worker, artist, registered nurse, medical technologist (with college degree)

4) Clerical & sales position, such as secretary, bookkeeper, office worker, salesperson.

5) Skilled occupation such as medical technician (without college degree), craftsman, machine operator, factory worker, electrical or similar work

6) Service positions such as hairdresser, waitress, or similar work

7) Some other area: Please specify: _____

8) None of the above

(44) At the present time, does your wife do work other than as a housewife?

1) No

2) Yes, volunteer work outside the home.

3) Yes, part time job

4) Yes, full time job

IF YOU ARE NOT PRESENTLY LIVING WITH YOUR WIFE, PLEASE SKIP TO ITEM 69.

Family Decision Making

In every family somebody has to decide such things as where the family will live and so on. Many couples talk things over first, but the final decision may really be made by one person. For each of the following issues, please indicate whether the decision is made (1) by the husband always, (2) by husband more than wife, (3) by husband and wife exactly the same, (4) by wife more than husband, or (5) by wife always. Please make one check in each horizontal row.

Issue	Final decision is made by: (1) Husb. always	(2) Husb. more than wife	(3) Husb. & wife the same	(4) Wife more than Husb.	(5) Wife always
(45) What job the husband should take	___	___	___	___	___
(46) What car to get	___	___	___	___	___
(47) Whether or not to buy life insurance	___	___	___	___	___
(48) Where to go on vacation	___	___	___	___	___
(49) What house or apartment to take	___	___	___	___	___
(50) Whether or not wife should go to work or quit work	___	___	___	___	___
(51) What doctor to have when someone is sick	___	___	___	___	___
(52) How much money the family can afford to spend on food	___	___	___	___	___
(53) About how the children are to be disciplined	___	___	___	___	___

The following is a list of some possible family goals. Please rank the goals from one to ten in terms of how important you feel each goal should be for a family. Then rank each goal as you think your wife would. The most important goal should be ranked number 1; the least important should be ranked number 10.

A family should provide:	(1-10) Your ranking	(1-10) How you think your wife would rank them
(54) A respected place in the community	_____	_____
(55) The means for healthy and happy children	_____	_____
(56) Companionship for all members so that everyone feels comfortable and gets along	_____	_____
(57) Personality development for children	_____	_____
(58) Satisfaction with the amount of affection shown one another	_____	_____
(59) Economic security	_____	_____
(60) Emotional security	_____	_____
(61) Moral and religious unity	_____	_____
(62) Interesting activities	_____	_____
(63) A house and home where everyone feels they belong and other people cannot interfere	_____	_____

Did you take your children (either with or without your wife) to an eating place, the movies, some entertainment, or recreation, or to visit friends --

(64) In the past week?
- 0 No.
- ____ Yes. Enter the number of times before the "Yes".

(65) In the past month?
- 0 No.
- ____ Yes. Enter the number of times before the "Yes".

(65a) _____ Check here if this is not applicable because you have no children (under age 18) living with or near you.

Did you go out with your wife to an eating place, the movies, to some entertainment or recreation, or to visit friends (You may include events reported above if your wife was present.) --

(66) In the past week? 0 No.

_____ Yes. Enter the number of times before the "Yes."

(67) In the past month? 0 No.

_____ Yes. Enter number of times before the "Yes".

(68) All things considered, how happy and satisfied have you been this year in your relationship with your wife?

1) Very happy and satisfied
2) Fairly happy and satisfied
3) Neutral -- or very mixed feelings
4) Somewhat unhappy and dissatisfied
5) Very unhappy and dissatisfied

The last five items deal with general issues about which everyone has some opinion. Please indicate the degree to which you agree or disagree with each of these statements:

(69) These days a person doesn't really know whom he can count on.

1) Strongly Agree
2) Agree
3) Disagree
4) Strongly Disagree

(70) Nowadays a person has to live pretty much for today and let tomorrow take care of itself.

1) Strongly Agree
2) Agree
3) Disagree
4) Strongly Disagree

(71) Most public officials (people in government offices) are not really interested in the problems of the average man.

1) Strongly Agree
2) Agree

(71) 3) Disagree
4) Strongly Disagree

(72) In spite of what some people say, the condition of the average man is getting worse, not better.

1) Strongly Agree
2) Agree
3) Disagree
4) Strongly Disagree

(73) It is hardly fair to bring children into the world with the way things look for the future.

1) Strongly Agree
2) Agree
3) Disagree
4) Strongly Disagree

THANK YOU FOR YOUR COOPERATION IN COMPLETING ALL THESE ITEMS.

PLEASE TURN IN THIS FORM, WITH YOUR "OPEN ID NUMBER" ON IT, TO THE PSYCHOLOGIST.

II. G-1

FIFTH ROUND

PSY 102: ATC QUESTIONNAIRE

CAREER ATTITUDES AND BEHAVIOR

This questionnaire asks about your ATC work. If you have permanently left Air Traffic Controlling please answer the following questions in terms of your present occupation. Please consider each question carefully before answering. Multiple choice answers are provided immediately above each question.

1	2	3	4	5	6	7
Enjoy very much	Enjoy quite a bit	Enjoy somewhat	Don't care either way	Dislike somewhat	Dislike quite a bit	Dislike very much

1. How do you regard the variety provided by shift changes?

****

1. Work quality becomes much worse
2. Work quality becomes moderately worse
3. Work quality becomes somewhat worse
4. Work quality is not affected
5. Work quality becomes somewhat better
6. Work quality becomes moderately better
7. Work quality becomes much better

2. How is the quality of your work affected immediately after changing onto your 'least" preferred shift?

****

1. No time at all; shift changes don't affect my work quality
2. An hour or two
3. Several hours
4. At least one full shift
5. Two or more shifts
6. Up to a week
7. Over a week

3. How long does it take to get back to your peak after changing shifts?

****

1	2	3	4	5	6	7
A day or less	A couple of days	Up to a week	About a week	Up to two weeks	Up to three weeks	Never get fully relaxed

4. How long does it take you to really unwind or relax once you have started annual leave?

1	2	3	4	5	6	7
A month or more	Up to three weeks	Up to two weeks	About a week	Up to a week	A couple of days	A day or less

5. Once you come back from a week or more of annual leave, how long does it take you to get up to peak again?

****

1. Much less than most
2. Quite a bit less
3. Somewhat less than most things
4. About as much as anything I do
5. Somewhat more than most things
6. Quite a bit more
7. Much more than most things

6. Even though Air Traffic Control may be a very exciting and rewarding job, to what extent do you feel it has "cost" you personally to be an ATC?

****

ATC work may affect many other areas in your life. Use the scale below for indicating how each of the following areas have been affected for you.

1. ATC work has interfered tremendously in this area
2. ATC work has interfered moderately in this area
3. ATC work has interfered slightly in this area
4. ATC work has not affected this area
5. ATC work has helped slightly this area
6. ATC work has helped moderately this area
7. ATC work has helped tremendously this area

7. Friendships
8. Social life
9. Relationships with wife or girlfriend
0. Family life and relations with children
1. Opportunity for advancement
2. Physical health
3. Peace of mind

The next set of questions asks about your perceptions and feelings regarding various aspects of being an ATC. If a question is not exactly appropriate for you respond in terms of the most parallel situation. For instance, some smaller towers do not have sectors but they do have arrival/departure specialists. Use whatever your tower/center has for its controllers. Also, in some questions, safety considerations would influence your answer. Please interpret each question as if safety were assured.

For these questions please use the scale given below for selecting your answer. First decide whether a statement is true of false for you. Then select the number on the scale indicating how true or false the statement is.

1	2	3	4	5	6	7
Completely false	Mostly false	Somewhat false	Neither true nor false	Somewhat true	Mostly true	Completely true

14. I greatly dislike having to restrict aircraft prior to their entering my sector

15. When working a combined sector well, I don't like to have anyone suggest decombining it

16. My own standards of performance are higher than those in the FAA rules

17. I am constantly reviewing my performance throughout a shift against my own set of standards

18. Even when I'm under IFR pressure, I don't feel I'm doing a complete job unless I provide VFR advisories

19. It is extremely important to me to try and fill pilot requests even when their requests will cause me extra work

20. I try to do something extra in every shift so that I'll end each shift with a sense of accomplishment

21. I try to get assigned to technically challenging sectors so that I won't bet bored

22. Compared to other controllers, I keep my cool better in very difficult situations

23. I couldn't be a supervisor of my friends

24. People can easily tell from my words and actions how I really feel about them

25. People who know me well would say I let a lot of things "get to me"

26. If it were not for the FAA required physical I would rarely, if ever, go to a doctor

27. I find I have to drink more to get the same relief

28. If I'm not able to drink, I find it extremely difficult to unwind

29. After I have left the boards I continue thinking about all the possible conflicts and work them through again in my mind

30. I stay in "high gear" and have trouble relaxing once I leave work

31. Over the past few months, I find it is becoming increasingly difficult to unwind at the end of a shift

1 Completely false	2 Mostly false	3 Somewhat false	4 Neither true nor false	5 Somewhat true	6 Mostly true	7 Completely true

32. I get so involved with my work that at the end of a shift I often forget things such as where I parked my car, things to shop for, and so on

33. When I get home after work, I am so preoccupied with what happened on the job that I can't talk with my wife or friends

34. Even when I'm away from Air Traffic Controlling I spend much of my time thinking about ATC work

35. In describing me, my friends would say that I eat, drink and think ATC

36. Compared to other controllers, I can easily return to peak performance after a bad time on the boards

37. In the past six months it has been becoming more difficult for me to bounce back to peak performance when I've been away from the boards

38. In the last six months, I've been finding it harder to shift between peak and slow periods

39. I am relaxed when giving on-the-job training

40. On-the-job training puts an unnecessary strain on me

41. I often take over from trainees too early

42. I really enjoy giving on-job-training

43. I get very irritable with trainees when giving on-the-job training___

44. I am never bothered by thoughts that actions of a trainee of mine will jeopardize my rating.

45. Whenever I have a near-miss, my self confidence is greatly shaken.

46. The last non-collision "pair" I had still bothers me greatly.

47. One of the greatest stresses in ATC work stems from the close-calls I have had.

48. The effect of having an incident wears off me within a week or so.

49. In the last year, how many "incidents" (reportable or otherwise) have you been involved in? Write in the actual number.

50. How many of these incidents still bother you greatly? Write in the actual number

This section of the questionnaire is concerned with your reactions to various situations that arise in Air Traffic Control.

Please indicate how often in the past six months you have felt or experienced any of the following before going to work when you knew the weather and/or traffic conditions were bad. Use the scale given below:

1	2	3	4	5	6	7
Never.	Rarely	Occasionally	More than occasionally but less than often	Fairly often	Very often	Nearly every time

Before going to work when weather and/or traffic conditions were bad, how often did you have:

51. Difficulty getting to sleep and staying asleep?

52. Uptight, fidgety, and tense feelings?

53. Loss of appetite?

54. Upset stomach?

55. Wishes that it was not your shift?

56. Thoughts about calling in sick but not actually doing it?

While working difficult traffic in the last six months how often have you felt or experienced:

57. A lot of perspiration?

58. Your muscles tensing up?

59. Feeling uncomfortably warm?

60. A dry mouth?

61. Feeling "put on the spot"

62. Tense and worried feelings?

63. Getting more irritable with other controllers?

Now please indicate how often you have felt or experienced the following after you have been relieved from a long period of heavy traffic.
How often have you felt or experienced:

64. The realization that your muscles were very tense?

65. A backache

1 Never	2 Rarely	3 Occasionally	4 More than occasionally but less than often	5 Fairly often	6 Very often	7 Nearly every time

66. Your heart beating very hard or fast?

67. A headache?

68. A total lack of appetite?

69. Feeling exhausted and in need of rest?

Considering an average work day for you, indicate how accurately each of the following statements describe usual things you do to unwind at the end of the day. Use this scale:

1. Extremely inaccurate
2. Moderately inaccurate
3. Somewhat inaccurate
4. Neither accurate nor inaccurate
5. Somewhat accurate
6. Moderately accurate
7. Extremely accurate

70. I take a walk to relax

71. I do strenuous exercise or some physical sport

72. I prefer to be alone to recuperate

73. I join a group for social conversation

74. I go for a drive after getting home

75. I start doing a hobby

76. I go out with the guys for a drink

77. I just do whatever's handy

Overall, considering only those things which you do to unwind, which you rated above, how helpful are they in assisting you to unwind at the end of a day?

USE THIS SCALE:

1. Extremely unhelpful
2. Moderately unhelpful
3. Somewhat unhelpful
4. Neither helpful nor unhelpful
5. Somewhat helpful
6. Moderately helpful
7. Extremely helpful

1	2	3	4	5	6	7
Absolutely no	Probably not	Maybe not	Really can't say	Maybe so	Probably so	Definitely yes

79. In your opinion, will all controllers eventually "burn out"?

****

1	2	3	4	5	6	7
Never	Rarely	Occasionally	About as often as Anyone else	Fairly often	Very often	Constantly

80. How often do you find yourself worrying about your own burnout?

****

1	2	3	4	5	6	7
Extremely close	Very close	Somewhat close	Neither close nor distant	Somewhat distant	Very distant	Extremely distant

81. At the present time, how close to "burnout" do you feel?

****

82. Rate yourself on the scale below

1. I am more likely to be level headed and factual about most of life's problems
2.
3.
4. As much one as the other
5.
6.
7. I am more likely to be emotional, fly off the handle, decide on the basis of feelings over facts

****

1	2	3	4	5	6	7
0-2 days	3-5 days	6-8 days	9-11 days	12-14 days	15-17 days	18-20 days

Most controllers have days when they feel on top of the world, like they could handle traffic of four sectors at once and master every situation that arises (well, almost). In an average working month of about 20 days how often do you feel really topnotch?

1	2	3	4	5	6	7
0-2 days	3-5 days	6-8 days	9-11 days	12-14 days	15-17 days	18-20 days

84. There are other days when a person feels he just can't "get it all together", when he really feels below par. You may or may not be sick, you just feel that your controlling skills are really below your own average. Of the average 20 working days in a month, how many are like this for you on the average?

When you are having a poor day, such as described above, how often do you use each of the following ways to cope with it at work? Use the following scale:

1	2	3	4	5	6	7
Never	Rarely	Occasionally	More than occasionally	Fairly often	Very often	Nearly always

85. Try to get assigned to a sector with a light load

86. Take longer breaks

87. Take more breaks

88. Find a work partner that understands and can help out

89. Drink more coffee or other stimulants

90. Find a friend or diversion to take your mind off the problem

Given the twenty working days in an average month, indicate how many days (out of twenty) you would usually do each of the following

Use this scale:

1	2	3	4	5	6	7
0-2 days	3-5 days	6-8 days	9-11 days	12-14 days	15-17 days	18-20 days

91. I drink alone at home

92. I drink with a few friends

93. I don't drink

1	2	3	4	5	6	7
Not helpful at all	A little helpful	Somewhat helpful	Moderately helpful	Quite helpful	Very helpful	The best thing

94. On the whole, how helpful is drinking in helping to unwind and relax at the end of a working day?

People often pursue other interests outside their jobs. We would like to know if you have pursued any of the following activities in the last six months. Use the scale below for indicating how much time, on the average, you give to the following activities.

1	2	3	4	5	6	7
0-2 hours a week	3-5 hours a week	6-8 hours a week	9-11 hours a week	12-14 hours a week	15-17 hours a week	18-20 Hrs a week

5. Another outside job

6. Dating, drinking, or partying

7. Hobbies, such as stamp collecting, carpentry, car repairs

8. Physical sports, such as baseball, basketball, bowling, hockey, fishing

1. Very ungratifying and quite overextended
2. Quite ungratifying and somewhat overextended
3. Somewhat ungratifying and overextended
4. Neither gratifying nor ungratifying
5. Somewhat gratifying and rewarding
6. Quite gratifying and rewarding
7. Very gratifying and rewarding

Given those activities which you pursue, how much overall gratification and reward to you get from these activities?

****

IF YOU ARE NOT MARRIED, SKIP TO QUESTION # 104

****

How much support do you feel your wife provides you in coping with the pressures of your job?

1. She criticizes me tremendously
2. She criticizes me quite a bit
3. She criticizes me somewhat
4. She neither supports me nor criticizes me
5. She supports me somewhat
6. She gives me moderate support
7. She supports me tremendously

101. How often do you talk with you wife about your feelings that are a consequence of your work?

1. Never or extremely rarely
2. Once a month or less
3. A couple of times a month
4. Once a week at most
5. A couple of days a week
6. Once a day at most
7. More than once a day

102. How do you feel about your wife sharing her trials and tribulations of the day when you arrive home?

1. I hate it
2. I dislike it quite a bit
3. I dislike it somewhat
4. I don't feel either way about it
5. I somewhat like her to
6. I most often like her to
7. I really like her to share her problems with me

103. How understanding is your wife of your need to unwind at the end of a day's work?

1. Completely lacks such an understanding
2. Lacks such an understanding quite a bit
3. Somewhat lacks such an understanding
4. Neither understanding nor misunderstanding
5. Somewhat understanding
6. Quite understanding
7. Extremely understanding

****

1	2	3	4	5	6	7
None	1-2	3-4	5-6	7-8	9-10	10 or more

If you or your family were struck by a crisis or tragedy, how many persons of the following categories could you really count on to help you? For these purposes, count a married couple or a family unit as "1".

104. Among relatives

105. Among friends

106. Among people at work

107. How many people do you consider close friends who live within an hour's drive of your home? (use the scale above)

THIS IS THE END OF THIS QUESTIONNAIRE. THANK YOU FOR YOUR COOPERATION

PSY103-Sociometric Questionnaire

This particular questionnaire has only three questions. For each question you will give three answers. The questions ask about your choice or preference among your co-workers when various conditions exist. We are having you write in code numbers rather than names to make it easier to answer. These numbers do not correspond in any way to your confidential code.

Please do not list a person more than once in each question. However, you may list a person in more than one question. Also, do not use yourself as an answer. Use your choice of three other controllers.

You should have been given a list of names and codes with this questionnaire. If you have not, please obtain a list from the receptionist-coordinator. The receptionist-coordinator will indicate which list of names you will use.

The list you will use will include all members of your team and sister teams [illegible] if you are not from Islip or Nashua, your list will include [illegible] team [illegible] sister teams in your facility.

You will find a number to the left of each controller's name. This is the code you are to use on the answer sheet.

THE THREE QUESTIONS AND THE ANSWER SPACES ARE TOGETHER ON THE NEXT PAGE.

FIFTH ROUND

ANSWER SHEET

for

PSY103- Sociometric Questionnaire

QUESTIONS

I. If all assignments were changed to correspond with your preferences, which three ATCS's would you most like to work with? List in order of preference on the answer sheet as indicated.

II. Without considering technical ability, with which three ATCS's do you find it easiest to work? List in order as indicated on the answer sheet.

III. Without considering how easy it is to work with someone, whom do you believe are the three best controllers from a technical standpoint? List in order as indicated on the answer sheet.

ANSWER SPACES

I. A. Top choice: Name code:_____ Is he presently on your team?(1=yes,0=no)_____

B. Second choice: Name code:_____ Is he presently on your team?(1=yes,0=no)_____

C. Third choice: Name code:_____ Is he presently on your team?(1=yes,0=no)_____

II.A. Easiest to work with: Name code:_____
Is he presently on your team?(1=yes,0=no)_____

B. Second easiest to work with: Name code:_____
Is he presently on your team?(1=yes,0=no)_____

C. Third easiest to work with: Name code:_____
Is he presently on your team?(1=yes,0=no)_____

IIIA. Best: Name code:_____ Is he presently on your team?(1=yes,0=no)_____

B. Second best: Name code:_____ Is he presently on your team?(1=yes,0=no)_____

C. Third best: Name code:_____ Is he presently on your team?(1=yes, 0=no)_____

II. I-1

PSY 131

FIFTH ROUND

This questionnaire inquires about things which sometimes happen to people. Their recent occurrence is thought to be related to an increased chance of becoming ill.

This particular inventory is concerned with the actual occurence of various events and the distress which they caused you. The exact details of what happened are of no importance. We are simply concerned with gathering information about the actual number of events which happened to you and the amount of distress which you experienced.

As you may recall, during your previous visits here, this life change questionnaire was quite long and some times tedious if many things had happened to you. We have revised this procedure considerably to eliminate fatigue.

This time, if an event did not occur to you since your last regular exam here, or in the last 8 months if you skipped visit 4 for any reason, please circle "NO" on the answer sheet.

If an event did occur since your last exam here, or in the last 8 months if you skipped visit 4 for any reason, simply report its occurence by writing in a Distress Rating next to the YES on the answer sheet. You can use any number from 01 to 99, depending on how seriously the event troubled you.

Your distress ratings should reflect how much discomfort, upset, or distress each event caused you. The scale below will reappear at the top of each page. It shows that in another study most people gave numerical ratings between 10 and 20, 40 and 55, and 95 and 99 to the events in the following example. Remember, this example is only a rough guide for you. Your own ratings may take any value from 01 to 99 according to the degree of distress which the event caused for you.

DISTRESS SCALE

DISTRESS	MODERATE DISTESS	EXTREME DISTRESS
....10 ... 20.....30.....40..... 50.....60.....70...80....90.....99		
D MARRIED	ADDITIONAL PERSON MOVES INTO HOUSE	CHILD DIED

DISTRESS SCALE

LOW DISTRESS MODERATE DISTRESS EXTREME DISTRESS
01.....10.....20.....30.....40.....50.....60.....70.....80.....90.....99

NO YES:__ 01.) HAVE YOU CHANGED TO A DIFFERENT LINE OF WORK?
NO YES:__ 02.) HAVE YOU CHANGED YOUR PLACE OF WORK (DIFFERENT ADDRESS)?
NO YES:__ 03.) HAS THERE BEEN A CHANGE IN YOUR RESPONSIBILITIES AT WORK (SUCH AS A LATERAL TRANSFER OR SHIFT TO A NEW WORK AREA OR NEW COLLEAGUES, OR A PROMOTION OR DEMOTION?
NO YES:__ 04.) HAVE YOU HAD TO START LEARNING ANY MAJOR NEW EQUIPMENT?
NO YES:__ 05.) HAVE YOU INCREASED THE AVERAGE NUMBER OF HOURS THAT YOU WORK PER DAY?
NO YES:__ 06.) HAVE YOU DECREASED THE AVERAGE NUMBER OF HOURS THAT YOU WORK PER DAY?
NO YES:__ 07.) HAVE YOU HAD ANY TROUBLE WITH ANY OF YOUR SUPERVISORS?
NO YES:__ 08.) HAVE YOU HAD ANY TROUBLES WITH CO-WORKERS, OR PERSONNEL UNDER YOUR SUPERVISION?
NO YES:__ 09.) HAVE YOU RECEIVED ANY DISCIPLINARY ACTION OF RECORD?
NO YES:__ 10.) HAVE YOU BEEN PUT ON MEDICAL WAIVERS?
NO YES:__ 11.) HAVE YOU TAKEN ON A SECOND JOB?
NO YES:__ 12.) HAVE YOU GIVEN UP A SECOND JOB?
NO YES:__ 13.) IF YOU HAVE A SECOND JOB, HAVE YOU HAD PROBLEMS THAT DISCOURAGED YOU?
NO YES:__ 14.) HAVE YOU TAKEN A VACATION?

15.) IN SUMMARY, HOW WELL WOULD YOU SAY YOUR LIFE AT WORK HAS GONE FOR YOU RECENTLY? (CIRCLE ANSWER BELOW)

1.) THE BEST EVER
2.) ESPECIALLY WELL
3.) GOOD
4.) AVERAGE
5.) POOR
6.) REALLY BAD
7.) THE WORST EVER

YES:__ 16.) HAVE YOU STARTED TAKING ANY COURSES TO HELP YOU IN YOUR WORK OR TO PREPARE YOU FOR ANOTHER JOB?
YES:__ 17.) HAVE YOU BEGUN AN ON-THE-JOB TRAINING COURSES?
YES:__ 18.) DID YOU PASS THE EXAMINATION QUALIFYING YOU FOR JOURNEYMAN ATC STATUS?
YES:__ 19.) HAVE YOU MOVED TO A NEW PLACE OF RESIDENCE WITHIN THE SAME CITY OR AREA OF THE STATE?
YES:__ 20.) HAVE YOU MOVED TO A NEW PLACE OF RESIDENCE FROM A DIFFERENT AREA IN THE SAME STATE?
YES:__ 21.) HAVE YOU MOVED TO A NEW PLACE OF RESIDENCE FROM ANOTHER STATE?
YES:__ 22.) HAVE YOU HAD ANY MINOR TROUBLES WITH THE LAW, NOT LEADING TO A COURT APPEARANCE? (FOR EXAMPLE, LESSER TRAFFIC VIOLATIONS, TAX RETURNS, ETC.)
YES:__ 23.) HAVE YOU HAD A VIOLATION LEADING TO A COURT APPEARANCE (INCLUDING LOSING DRIVER'S LICENSE?
YES:__ 24.) HAVE YOU BEEN INVOLVED IN A LAW SUIT?

DISTRESS SCALE

LOW DISTRESS MODERATE DISTRESS EXTREME DISTRESS
01.....10.....20.....30.....40.....50.....60.....70.....80.....90.....99

NO YES:__ 25.) HAVE YOU HAD ANY TROUBLE WITH THE LAW WHICH LED TO YOUR BEING HELD IN JAIL FOR AWHILE? (FOR EXAMPLE, DRINKING TOO MUCH, DISTURBING THE PEACE, AWAITING BAIL)

NO YES:__ 26.) HAVE YOU BEEN THE VICTIM OF A CRIME? (E.G., ROBBERY, ASSAULT, ETC.)

NO YES:__ 27.) HAVE YOU HAD MODERATE FINANCIAL DIFFICULTIES, SUCH AS EXCESSIVE EXPENSES OR TROUBLE FROM BILL COLLECTORS?

NO YES:__ 28.) HAVE YOU BEEN THREATENED WITH LEGAL ACTION (SUCH AS REPOSSESSION) OVER NOT PAYING YOUR MORTGAGE OR INSTALLAMENT PAYMENTS?

NO YES.__ 29.) HAVE YOU BEEN IN AN AUTO ACCIDENT (OR OTHER ACCIDENT) INVOLVING INJURY TO A PERSON OR PROPERTY DAMAGE OF OVER $200?

NO YES:__ 30.) HAVE YOU HAD MAJOR LOSSES IN THE STOCK MARKET OR OTHER SECURITIES TRADING?

NO YES:__ 31.) HAVE YOU HAD MAJOR FINANCIAL DIFFICULTIES RESULTING IN EXTREMELY HEAVY DEBTS OR BANKRUPTCY?

NO YES:__ 32.) HAVE YOU HAD A BUSINESS FAILURE?

NO YES:__ 33.) HAVE YOU BUILT A HOME OR MADE MAJOR IMPROVEMENTS ON YOUR HOME?

NO YES:__ 34.) HAVE YOU TAKEN ON ANY SUBSTANTIAL LOANS OR MADE MAJOR PURCHASES (FOR LESS THAN $10,000? (FOR EXAMPLE, A COLOR TV, CAR, FREEZER, ETC.)

NO YES:__ 35.) HAVE YOU TAKEN ON A PURCHASE FOR MORE THAN $10,000, SUCH AS A HOME OR REAL ESTATE?

NO YES:__ 36.) HAVE YOU HAD A SUBSTANTIAL IMPROVEMENT IN FINANCES, SUCH AS A MAJOR RAISE IN PAY, NEW SOURCES OF INCOME, OR AN INHERITANCE?

37.) ALL IN ALL, HOW WELL WOULD YOU SAY YOUR HOUSING, FINANCIAL AND LEGAL MATTERS HAVE GONE FOR YOU RECENTLY? (CIRCLE ANSWER BELOW)

1.) THE BEST EVER
2.) ESPECIALLY WELL
3.) GOOD
4.) AVERAGE
5.) POOR
6.) REALLY BAD
7.) THE WORST EVER

NO YES:__ 38.) HAVE YOU HAD AN ILLNESS OR INJURY THAT REQUIRED MEDICAL ATTENTION OR THAT KEPT YOU FROM WORKING OR FUNCTIONING NORMALLY?
(IF YOU ANSWER NO, SKIP TO QUESTION 41.)

DISTRESS SCALE

LOW DISTRESS MODERATE DISTRESS EXTREME DISTRESS
01.....10.....20.....30.....40.....50.....60.....70.....80.....90.....99

39.) FOR THE ILLNESS OR INJURY THAT OCCURRED SINCE YOUR LAST VISIT HERE, HOW LONG WERE YOU KEPT FROM WORK OR NORMAL ACTIVITY? (CIRCLE ANSWER BELOW)

0.) NOT AT ALL
1.) LESS THAN THREE DAYS
2.) MORE THAN 3 DAYS BUT LESS THAN A MONTH
3.) A MONTH OR MORE

40.) WERE YOU HOSPITALIZED? (CIRCLE ANSWER BELOW)

0 = NO
1 = YES

NO YES:__ 41.) HAVE YOU CHANGED YOUR EATING HABITS IN TERMS OF WHAT YOU EAT OR HOW MUCH?
NO YES:__ 42.) HAVE YOU CHANGED YOUR SLEEPING HABITS IN TERMS OF SLEEPING A LOT MORE OR A LOT LESS?
NO YES:__ 43.) HAS THERE BEEN A DEFINITE INCREASE IN HOW MUCH TIME YOU DO HEAVY PHYSICAL WORK OR EXERCISE?
NO YES:__ 44.) HAS THERE BEEN A DEFINITE DECREASE IN HOW MUCH TIME YOU DO HEAVY PHYSICAL WORK OR EXERCISE?
NO YES:__ 45.) HAVE YOU FELT ON THE EDGE OF A NERVOUS BREAKDOWN?

HAVE YOU EXPERIENCE THE DEATH OF:
NO YES:__ 46.) A CLOSE FRIEND OR SIGNIFICANT RELATIVE (E.G., FAVORITE AUNT)?
NO YES:__ 47.) AN IMMEDIATE FAMILY MEMBER (E.G., PARENT, SIBLING, FIANCE)?
NO YES:__ 48.) ONE OF YOUR OWN CHILDREN?
NO YES:__ 49.) YOUR SPOUSE?
NO YES:__ 50.) ANY OTHER PERSON CLOSE TO YOU?

NO YES:__ 51.) HAVE YOU EXPERIENCED A SEPARATION FROM A SIGNIFICANT PERSON (E.G., A CLOSE FRIEND MOVES AWAY, A DOCTOR OR COUNSELOR STOPS GIVING SERVICES, SOMEONE YOU DEPENDED ON LEAVES YOU)?
NO YES:__ 52.) HAVE YOU EXPERIENCED THE LOSS OF A PET?
NO YES:__ 53. HAVE YOU EXPERIENCED THE LOSS OR ROBBERY OF SOME PERSONALLY MEANINGFUL OBJECT (E.G., A WEDDING RING, JEWELRY, SENTIMENTAL OBJECT)?
54.) HAVE YOU BEEN UNMARRIED FOR THE ENTIRE TIME SINCE YOU WERE LAST HERE? (CIRCLE ANSWER BELOW)

0 = NO
1 = YES

(IF YES, PLEASE SKIP TO QUESTION 73.)

DISTRESS SCALE

LOW DISTRESS — MODERATE DISTRESS — EXTREME DISTRESS
01.....10.....20.....30.....40.....50.....60.....70.....80.....90.....99

__ 55.) HAVE YOU BECOME MARRIED OR REMARRIED?
__ 56.) HAVE YOU HAD AN INCREASE IN ARGUMENTS WITH YOUR WIFE?
__ 57.) HAVE ANY OF YOUR ARGUMENTS WITH HER BEEN SERIOUS OR VIOLENT?
__ 58.) HAVE YOU HAD TO BE SEPARATED FROM YOUR WIFE BECAUSE OF MARITAL PROBLEMS?
__ 59.) HAVE YOU HAD TO BE SEPARATED FROM YOUR WIFE FOR REASONS OTHER THAN MARITAL PROBLEMS?
__ 60.) ARE YOU SERIOUSLY CONSIDERING DIVORCE?
__ 61.) HAVE YOU FILED FOR DIVORCE OR HAD A DECREE GRANTED?

HAVE YOU FOUND OUT THAT YOUR WIFE IS PREGNANT:
__ 62.) AND THIS IS A WANTED PREGNANCY?
__ 63.) AND THIS IS AN UNWANTED PREGNANCY?
__ 64.) HAS YOUR WIFE HAD A MISCARRIAGE, STILLBIRTH, OR ABORTION?

__ 65.) HAVE YOU BEEN HAVING SEXUAL DIFFICULTIES?
__ 66.) HAVE YOU BEGUN AN EXTRAMARITAL AFFAIR?
__ 67.) HAS YOUR WIFE BEGUN AN EXTRAMARITAL AFFAIR (OR HAVE YOU DISCOVERED REASON TO SUSPECT ONE)?
__ 68.) HAVE YOU HAD A MARKED IMPROVEMENT IN YOUR RELATIONSHIP WITH YOUR WIFE?
__ 69.) HAVE YOU HAD LESS THAN YOUR USUAL NUMBER OF ARGUMENTS WITH YOUR WIFE?
__ 70.) HAVE YOU HAD A MARITAL RECONCILIATION?
__ 71.) HAS YOUR WIFE BEGUN WORK OUTSIDE THE HOME?
__ 72.) HAS YOUR WIFE STOPPED WORK OUTSIDE THE HOME?
__ 73.) HAVE YOU EVER HAD ANY CHILDREN (BY BIRTH OR ADOPTION)? (CIRCLE ANSWER BELOW)

0 = NO
1 = YES

(IF NO, PLEASE SKIP TO QUESTION 81.)

__ 74.) HAVE YOU GAINED A NEW CHILD BY BIRTH OR ADOPTION?
__ 75.) HAVE YOU HAD A CHILD ENLIST OR BE DRAFTED INTO THE ARMED FORCES?
__ 76.) HAVE YOU HAD A CHILD LEAVE HOME FOR OTHER REASONS? (E.G., COLLEGE, OR OTHER INSTITUTION)
__ 77.) HAS ONE OF YOUR CHILDREN HAD A SEVERE PERSONAL PROBLEM (E.G., UNWANTED PREGNANCY, MAJOR ARGUMENT WITH PARENT OR TROUBLE WITH THE LAW)?
__ 78.) HAS A SON OR DAUGHTER BECOME ENGAGED TO BE MARRIED?
__ 79.) HAS A SON OR DAUGHTER MARRIED WITH YOUR APPROVAL?
__ 80.) HAS A SON OR DAUGHTER MARRIED AGAINST YOUR WISHES?

DISTRESS SCALE

LOW DISTRESS MODERATE DISTRESS EXTREME DISTRESS
01.....10.....20.....30.....40.....50.....60.....70.....80.....90.....99

81.) AT ANY TIME IN THE LAST 2 YEARS HAVE YOU BEEN INVOLVED IN A "DATING RELATIONSHIP" (CIRCLE ANSWER BELOW)

0 = NO
1 = YES

(IF NO, PLEASE SKIP TO QUESTION 87)

NO YES:__ 82.) HAVE YOU STOPPED STEADY DATING (OF THREE MONTHS OR MORE) OR ENDED AN ESTABLISHED RELATIONSHIP?
NO YES:__ 83.) HAVE YOU BEGUN A SERIOUS DATING RELATIONSHIP OR BECOME ENGAGED?
NO YES:__ 84.) HAVE YOU HAD AN INCREASE IN ARGUMENTS OR DIFFICULTIES WITH A LONG TERM STEADY DATE, WITH YOUR FIANCE, OR A VERY CLOSE FRIEND?
NO YES:__ 85.) HAVE YOU BROKEN AN ENGAGEMENT?
NO YES:__ 86.) IF YOU HAVE A GIRLFRIEND, HAS SHE RECENTLY BECOME PREGNANT?
NO YES:__ 87.) HAS A NEW PERSON OTHER THAN AN INFANT MOVED INTO YOUR HOUSEHOLD (E.G., AN OLDSTER, RELATIVE, LODGER, OR CHILDREN RETURNING FROM LIVING ELSEWHERE)?
NO YES:__ 88.) HAS A MEMBER OF YOUR HOUSEHOLD (OTHER THAN YOUR SPOUSE OR CHILD) MOVED OUT OF THE HOME?
NO YES:__ 89.) HAVE YOU HAD ANY PROBLEMS WITH YOUR IN-LAWS (WIFE'S PARENTS OR YOUR CHILDREN-IN-LAWS), FRIENDS, OR CLOSE RELATIVES WHO LIVE IN THE HOME?
NO YES:__ 90.) HAVE YOU HAD ANY PROBLEMS WITH SUCH PEOPLE WHO LIVE OUTSIDE YOUR HOME?
NO YES:__ 91.) HAVE YOU BEEN CONCERNED ABOUT THE PHYSICAL OR MENTAL HEALTH OF A MEMBER OF YOUR IMMEDIATE FAMILY (SPOUSE, CHILD, PARENT, SIBLING), A RELATIVE OUTSIDE OF THE IMMEDIATE FAMILY, OR AN INTIMATE FRIEND?
(IF YOUR ANSWER IS "NO", PLEASE SKIP TO QUESTION 95)

WHAT WAS THE INTENSITY OF THE PHYSICAL OR MENTAL HEALTH DIFFICULTY OF:
__ 92.) A MEMBER OF YOUR IMMEDIATE FAMILY (SPOUSE, CHILD, PARENT, SIBLING)?
__ 93.) A RELATIVE OUTSIDE OF THE IMMEDIATE FAMILY?
__ 94.) AN INTIMATE FRIEND?

0.) NO PROBLEM
1.) RELATIVELY MILD
2.) QUITE SERIOUS
3.) LIFE THREATNING

USE THIS ANSWER SCALE FOR QUESTIONS 92, 93, & 94

YES:__ 95.) HAS THERE BEEN A MARKED INCREASE IN HOW FREQUENTLY YOU "GET TOGETHER" WITH RELATIVES OR FRIENDS?
YES:__ 96.) HAS THERE BEEN A MARKED DECREASE IN HOW FREQUENTLY YOU "GET TOGETHER" WITH RELATIVES OR FRIENDS?
YES:__ 97.) HAS THERE BEEN A BREAK UP OF A LOVE RELATIONSHIP OTHER THAN ONE YOU HAVE ALREADY REPORTED IN THIS QUESTIONNAIRE?

DISTRESS SCALE

LOW DISTRESS MODERATE DISTRESS EXTREME DISTRESS
01.....10.....20.....30.....40.....50.....60.....70.....80.....90.....99

YES:__ 98.) HAS THERE BEEN A MARKED IMPROVEMENT IN YOUR RELATIONSHIP WITH SOMEONE CLOSE TO YOU (EXCLUDING YOUR WIFE)?

YES:__ 99.) HAS THERE BEEN A MAJOR CHANGE IN YOUR PERSONAL HABITS? (E.G., YOUR CHOICE OF FRIENDS, STYLE OF DRESS, INTERESTS, ETC.)

YES:__ 100.) HAVE YOU MADE ANY RECENT MAJOR DECISION REGARDING YOUR FUTURE (FOR EXAMPLE, WHEN YOU WILL RETIRE FROM YOUR PRESENT WORK, PLANS TO BUY A NEW HOUSE, MOVE TO ANOTHER PART OF THE COUNTRY, ETC.)?

YES:__ 101.) HAS THERE BEEN A MAJOR CHANGE IN YOUR RELIGIOUS OR POLITICAL CONVICTIONS?

YES:__ 102.) HAVE YOU EXPERIENCED ANY OUTSTANDING PERSONAL ACHIEVEMENT?

103.) ALL IN ALL, HOW WELL WOULD YOU SAY YOUR MARRIAGE, FAMILY, AND/OR PERSONAL LIFE HAS GONE FOR YOU RECENTLY? (CIRCLE ANSWER BELOW)

1.) THE BEST EVER
2.) ESPECIALLY WELL
3.) GOOD
4.) AVERAGE
5.) POOR
6.) REALLY BAD
7.) THE WORST EVER

WE HAVE ASKED YOU MANY QUESTIONS ABOUT THINGS THAT HAVE HAPPENED TO YOU, AND NOW WE HAVE TWO QUESTIONS OF A DIFFERENT SORT.

YES:__ 104.) FIRST, HAS ANYTHING THREATENED TO HAPPEN WHICH COULD HAVE CAUSED SOME CHANGE IN YOUR LIFE BUT WHICH PASSED WITHOUT HAPPENING?

YES:__ 105.) SECOND, HAS ANYTHING FAILED TO HAPPEN WHICH YOU HAD HOPED FOR AND EXPECTED (FOR EXAMPLE, ANTICIPATED PLEASURE, RECOGNITION, OR SUCCESS)?

THIS INTERVIEW IS COMPLETED

THANK YOU FOR YOUR COOPERATION AND CANDID ANSWERS.

Satisfaction With FAA Policy Questionnaire

1. The FAA is more concerned with improving hardware than with helping people do their job.
2. The greatest problems I face in doing my job well are due to FAA policies and not the work itself.
3. The facility's reluctance to use overtime often seriously disrupts my personal life.
4. The facility's reluctance to use overtime often results in dangerous understaffing.
5. The FAA does not reward consistently good performance.
6. Job performance counts very little for promotion.
7. One of the problems of being promoted to supervisor is that you become a "yes-man" for management.
8. You lose the respect of your peers when you are promoted to supervisor.
9. About the only reward for controlling well is the recognition other controllers give you.
10. The only time management responds to the quality of my work is when something goes wrong.
11. Our facility chief would do a lot more for us if it were not for FAA policies handed down from Washington.
12. My facility chief puts the controllers' welfare too low on his list of priorities.
13. The quality of candidates accepted into the training program is too low.
14. In the last couple of years, it has become too easy to become a fully rated journeyman.
15. I don't feel that training developmental controllers with live traffic should be a part of my job.
16. The FAA is more concerned with helping people do their job than improving hardware.

17. The greatest difficulty I have in doing my job well is due to the nature of the work itself rather than FAA policies.

18. The facility's use of overtime does not often disrupt my personal life.

19. The facility's reluctant use of overtime does not often result in dangerous understaffing.

20. Consistently good performance is properly rewarded by the FAA.

21. Our facility chief does more for us because of policies set by the national FAA administration.

22. The welfare of controllers is high on the priorities of my facility chief.

23. I feel that training developmental controllers with live traffic should be a required part of my job.

24. The quality of accepted training candidates is appropriately high.

25. I believe it is just as difficult as ever to become a fully-rated journeyman controller.

26. I believe excellent performance as a controller is an important consideration when promotions are made.

27. An ATC does not lose the respect of fellow controllers when he is promoted.

28. An ATC's attitude toward controllers becomes much worse when he is promoted to supervisor.

29. Exceptional controller performance results in recognition from supervisors that helps in getting promoted.

30. Management give appropriate recognition when things are going well.

FAA Awards Questionnaire

We understand that the FAA has an awards and recognition program. The official names for these awards are:

Outstanding Performance Award
Quality step increase
Point with Pride
Award for Valor
Yearly in-grade
Suggestion Award
Special Act Award (group)
Special Achievement award

Please indicate the number of each of these awards you have received during the three years you have been in this study.

1. Outstanding Performance Award
2. Quality step-increase
3. Point with Pride
4. Award for Valor
5. Yearly in-grade
6. Suggestion Award
7. Special Act Award (group)
8. Special Achievement Award

ATCS SUBJECTIVE DIFFICULTY QUESTIONNAIRE

This short questionnaire inquires about several aspects of your work today. Please respond solely in terms of only your own experience. Select the answer to each question that most accurately reflects your response. Put an "X" in the appropriate box on the answer sheet.

If anything unusual or stressing occurred that is not included on this questionnaire, write it in the space provided at the end of the answer sheet.

1. Overall, how difficult do you feel your assignments have been today?

   1 Very easy
   2 Moderately easy
   3 A little easy
   4 Neither easy nor difficult
   5 A little difficult
   6 Moderately difficult
   7 Very difficult

2. Considering all of the tasks that composed your various assignments , how good a job do you feel you have done today?

   1 Best I've ever done
   2 Quite a bit better
   3 A little better than my average
   4 About my average
   5 A little less good a job
   6 Quite below my average
   7 Worst I've ever done

3. How heavy has been today's traffic in terms of number of aircraft handled?

   1 The highest I can recall
   2 Quite high
   3 Somewhat above average
   4 Average
   5 Somewhat below average
   6 Quite a bit below average
   7 The lightest I've ever had

4. What kind of aircraft mix have you had?

1 Totally commercial
2 Much more than usual proportion of commercial
3 More than usual proportion of commercial
4 About an average mix of commercial and military and general aviation
5 More than usual proportion of military and general aviation
6 Much more than usual proportion of military and general aviation
7 Totally military and general aviation

5. How much did weather affect the ease of working traffic today?

1 Made extremely easier
2 Made quite easier
3 Made somewhat easier
4 Neither made easiernor difficult
5 Made somewhat difficult
6 Made quite difficult
7 Made extremely difficult

6. Compared to other times, what was the quality of help provided by your strip man and handoff man?

1 Terrific
2 Much better than usual
3 Better than usual
4 Average
5 Not quite as good as normal
6 Quite a bit below par
7 The worst they've ever done

7. How many breakdowns or serious impairments of function (quality of return, fruiting, degradation, etc.) did <u>your</u> radar and communications equipment have today?

1 The greatest number of faults ever
2 Many more faults than normal
3 More faults than normal
4 Average number of faults
5 Fewer than average defects
6 Many fewer faults than normal
7 The fewest I've ever experienced

8. How many failures and impairments of function did the communications equipment on the aircraft have today?

1 The greatest number of faults ever
2 Many more faults than normal
3 More faults than normal
4 Average number of faults
5 Fewer than average defects
6 Much fewer than average defects
7 The fewest faults I've ever experienced

9. How did your supervisor contribute to your performance today?

1 Helped tremendously
2 Helped quite a bit
3 Helped somewhat
4 Didn't help or hinder
5 Hindered somewhat
6 Hindered quite a bit
7 Hindered me completely

10. How many interpersonal conflicts occurred for you today? (Such as those arising from FAM flights, administrative policy, and other non-ATC action)

1 The most I've ever had
2 Quite a bit more than usual number
3 More than usual amount
4 About usual amount
5 Fewer than usual number
6 Quite a bit fewer than usual number
7 Fewest I've ever had

11. How many potential traffic conflicts occurred today compared to "normal" times?

1 The most I've ever had
2 Quite a bit more than usual number
3 More than usual number
4 About usual number
5 Fewer than usual number
6 Quite a bit fewer than usual number
7 Fewest I've ever had

12. How many changes from peak to slow controlling conditions occurred today compared to "normal" times?

1 The most I've ever had
2 Quite a bit more than usual number
3 Somewhat more than usual number
4 About usual amount
5 Fewer than usual number
6 Quite a bit fewer than usual number
7 Fewest I've ever had

13. How many times did you feel you were about to "go down the pipe"?

1 The most I've ever had
2 Quite a bit more than usual number
3 More than usual amount
4 About usual amount
5 Fewer than usual number
6 Quite a bit fewer than usual number
7 Fewest I've ever had

14. How much did your general mood prior to coming to work affect the difficulty of your job today?

1 My mood was terrible; made job much more difficult
2 My mood was poor; made job moderately more difficult
3 My mood was not as good as usual; made job a little more difficult
4 Average mood and very little effect on the job
5 Better than average mood; made job a little easier
6 Much better than average mood; made job moderately easier
7 I was in the best mood ever; made job much easier

15. If you gave training (formal or informal) today, how much of a burden was it? Circle box no. 4 if you did not give training today

1 Lightened the job extremely
2 Lightened the job quite a bit
3 Lightened the job somewhat
4 Was neither burdensome nor did it lighten the job
5 Somewhat burdensome
6 Quite burdensome
7 Extremely burdensome

16. How much did the requirements of this study contribute to the difficulty of your job today?

1 Made my job very much easier
2 Made my job quite easy
3 Made my job somewhat easier
4 Neither made easier or difficult
5 Made my job somewhat difficult
6 Made my job quite difficult
7 Made my job very difficult

17. Overall, in your experience as an ATC at this facility, how difficult were your assignments compared to most other assignments that you might have had?

1 Very easy
2 Moderately easy
3 A little easy
4 Average-- neither easy nor difficult
5 A little difficult
6 Moderately difficult
7 Very difficult

APPENDIX II - 1

DIAGNOSTIC SUMMARIES SCORING ALGORITHMS

TEXT	LEVEL of CHAR	ILDA	NONE	1-2	3-6	7-14	15-30	31+	STILL	UNDET
DIARRHEA	1	9.1	0	1	1	2	2	2	*	0
	2		1	1	1	2	2	2	*	1
	3		*	*	*	*	*	*	*	*
GASTROENTERITIS	1	9.2	1	1	1	2	2	2	*	1
	2		1	1	1	2	2	2	*	1
	3		*	*	*	*	*	*	*	*
STREP THROAT	1	34.0	1	1	1	1	1	1	*	1
	2		1	1	1	1	1	1	*	1
	3		1	1	1	1	1	1	*	1
SEPTICEMIA	1	38.9	*	*	*	*	*	*	*	*
	2		*	*	*	*	*	*	*	*
	3		*	2	2	2	2	2	*	*
ASEPTIC MENINGITIS	1	45.0	*	*	*	*	*	*	*	*
	2		*	2	2	2	2	2	*	*
	3		*	2	2	2	2	2	*	*
VARICELLA	1	52.0	*	*	*	*	*	*	*	*
	2		1	1	1	1	1	1	*	1
	3		*	*	*	*	*	*	*	*
HERPES ZOSTER	1	53.9	1	1	1	*	*	*	*	1
	2		1	1	1	2	2	2	*	1
	3		1	1	1	2	2	2	*	1
HERPES SIMPLEX	1	54.0	1	1	1	*	*	*	*	1
	2		1	1	1	2	2	2	*	1
	3		1	1	1	2	2	2	*	1
INFECTIOUS HEPATITIS	1	70.0	*	*	*	*	*	*	*	*
	2		2	2	2	2	2	2	*	2
	3		2	2	2	2	3	3	*	2
VIRAL CONJUNCTIVITIS	1	78.9	*	*	*	*	*	*	*	*
	2		*	1	1	2	2	2	*	*
	3		*	*	*	*	*	*	*	*
VIRAL WARTS	1	79.1	0	1	1	1	1	1	*	0
	2		0	1	1	1	1	1	*	0
	3		*	*	*	*	*	*	*	*

DIAGNOSTIC SUMMARIES SCORING ALGORITHMS

TEXT	LEVEL	ICDA	NONE	1-2	3-6	7-14	15-30	31+	STILL	UNDET
VIRAL INFECTION	1	79.9	1	1	1	2	2	2	*	1
	2		1	1	1	2	2	2	*	1
	3		*	*	*	*	*	*	*	*
VENEREAL WARTS	1	99.9	1	1	1	1	1	1	*	1
	2		1	1	1	1	1	1	*	1
	3									
TINEA-SCALP & BEARD	1	110.0	0	1	1	1	1	1	*	0
	2		0	1	1	1	1	1	*	0
	3		*	2	2	2	2	2	*	*
TINEA PEDIS	1	110.1	0	1	1	1	1	1	*	0
	2		0	1	1	1	1	1	*	0
	3		*	2	2	2	2	2	*	*
TINEA CRURIS ETC.	1	110.9	0	1	1	1	1	1	*	0
	2		0	1	1	1	1	1	*	0
	3		*	2	2	2	2	2	*	*
PITYRIASIS VERSICOLOR	1	111.0	0	1	1	1	1	1	*	0
	2		0	1	1	1	1	1	*	0
	3		*	2	2	2	2	2	*	*
TRICHOMONIASIS	1	131.0	0	1	1	1	.	1	*	0
	2		0	1	1	1	1	1	*	0
	3		*	2	2	2	2	2	*	*
SCABIES	1	133.0	0	1	1	1	1	1	*	0
	2		0	1	1	1	1	1	*	0
	3		*	2	2	2	2	2	*	*
MALIGNANT NEOPLASM	1	162.1	*	*	*	*	*	*	*	*
	2		2	2	2	2	2	2	*	2
	3		2	2	2	2	3	3	*	2
MALIGNANT NEOPLASM-SKIN	1	173.3	*	*	*	*	*	*	*	*
	2		2	2	2	2	2	2	*	2
	3		2	2	2	2	3	3	*	2
BENIGN NEOPLASM-BONE	1	213.9	*	*	*	*	*	*	*	*
	2		2	2	2	2	2	2	*	2
	3		2	2	2	2	3	3	*	2

DIAGNOSTIC SUMMARIES SCORING ALGORITHMS

TEXT	LEVEL	ICDA	NONE	1-2	3-6	7-14	15-30	31+	STILL	UNDET
LIPOMA-SKIN	1	214.0	*	*	*	*	*	*	*	*
	2		2	2	2	2	3	3	*	2
	3		2	2	2	2	3	3	*	2
BENIGN NEOPLASM-BREAST	1	217.0	*	*	*	*	*	*	*	*
	2		2	2	2	2	3	3	*	2
	3		2	2	2	2	3	3	*	2
HASHIMOTO'S THYROIDITIS	1	245.1	*	*	*	*	*	*	*	*
	2		2	2	2	2	2	2	*	2
	3		2	2	2	2	2	2	*	2
DIABETES MELLITUS	1	250.9	*	*	*	*	*	*	*	*
	2		2	3	3	3	3	3	*	2
	3		2	3	3	3	3	3	*	2
HYPERLIPIDEMIA	1	272.0	0	0	0	0	0	0	*	0
	2		0	0	0	0	0	0	*	0
	3		0	0	0	0	0	0	*	0
GOUT	1	274.0	0	1	1	*	*	*	*	0
	2		0	1	1	2	2	2	*	0
	3		*	*	*	2	2	2	*	*
ANEMIA NOS	1	285.9	0	0	0	0	0	0	*	0
	2		0	0	0	0	0	0	*	0
	3		0	0	0	0	0	0	*	0
ANXIETY	1	300.0	0	0	0	0	0	0	*	0
	2		0	0	0	0	0	0	*	0
	3		*	*	*	*	*	*	*	*
DEPRESSIVE NEUROSIS	1	300.4	0	0	0	0	0	0	*	0
	3		*	*	*	*	*	*	*	*
BINGE DRINKING	1	303.0	0	0	0	0	0	0	*	0
	2		0	0	0	0	0	0	*	0
	3		*	*	*	*	*	*	*	*
ALCOHOLISM	1	303.9	0	0	0	0	0	0	*	0
	2		0	0	0	0	0	0	*	0
	3		*	*	*	*	*	*	*	*

DIAGNOSTIC SUMMARIES SCORING ALGORITHMS

TEXT	LEVEL	ICDA	NONE	1-2	3-6	7-14	15-30	31+	STILL	UNDET
FUNCTIONAL BOWEL DISEASE	1	305.5	1	1	1	2	2	2	*	1
	2		1	1	1	2	2	2	*	1
	3		*	*	*	*	*	*	*	*
HEADACHE	1	306.8	0	0	0	0	0	0	*	0
	2		0	0	0	0	0	0	*	0
	3		*	*	*	*	*	*	*	*
SCIATICA	1	353.0	1	1	1	*	*	*	*	1
	2		1	1	1	2	2	2	*	1
	3		*	2	2	2	2	2	*	*
MERALGIA PARESTHETICA	1	355.1	1	1	1	*	*	*	*	1
	2		1	1	1	2	2	2	*	1
	3		*	2	2	2	2	2	*	*
PERIPHERAL NERVE DISEASE	1	357.9	1	1	1	*	*	*	*	1
	2		1	1	1	2	2	2	*	1
	3		*	2	2	2	2	2	*	*
ALLERGIC CONJUNCTIVITIS	1	360.0	1	1	1	*	*	*	*	1
	2		1	1	1	2	2	2	*	1
	3		*	2	2	2	2	2	*	*
BLEPHARITIS	1	361.0	1	1	1	*	*	*	*	1
	2		1	1	1	2	2	2	*	1
	3		*	2	2	2	2	2	*	*
HORDEOLUM	1	362.0	1	1	1	*	*	*	*	1
	2		1	1	1	2	2	2	*	1
	3		*	2	2	2	2	2	*	*
UVEITIS	1	364.0	*	2	2	2	2	2	*	*
	2		*	2	2	2	2	2	*	*
	3		*	2	2	2	2	2	*	*
ORBITAL CELLULITIS	1	369.0	1	1	1	*	*	*	*	1
	2		1	1	1	2	2	2	*	1
	3		*	2	2	2	2	2	*	*
REFRACTIVE ERROR	1	370.9	0	0	0	0	0	0	*	0
	2		0	0	0	0	0	0	*	0
	3		0	0	0	0	0	0	*	0

APPENDIX II - 5

DIAGNOSTIC SUMMARIES SCORING ALGORITHMS

TEXT	LEVEL	ICDA	NONE	1-2	3-6	7-14	15-30	31+	STILL	UNDET
TRAUMATIC CATARACT	1	374.0	*	*	*	*	*	*	*	*
	2		2	2	2	2	2	2	*	2
	3		2	2	2	2	2	2	*	2
GLAUCOMA	1	375.9	*	*	*	*	*	*	*	*
	2		2	2	2	2	2	2	*	2
	3		*	*	*	*	*	*	*	*
CHALAZION	1	378.0	1	1	1	1	1	1	*	1
	2		1	1	1	2	2	2	*	1
	3		*	*	*	*	*	*	*	*
EYELID DISEASE	1	378.2	1	1	1	1	1	1	*	1
	2		1	1	1	2	2	2	*	1
	3		*	*	*	*	*	*	*	*
CONJUNCTIVAL DISEASES	1	378.3	1	1	1	1	1	1	*	1
	2		1	1	1	2	2	2	*	1
	3		*	*	*	*	*	*	*	*
EYE SYMPTOMS NOS	1	378.9	1	1	1	1	1	1	*	1
	2		1	1	1	2	2	2	*	1
	3		*	*	*	*	*	*	*	*
OTITIS EXTERNA	1	380.0	1	1	1	1	1	1	*	1
	2		1	1	1	2	2	2	*	1
	3		*	*	*	*	*	*	*	*
ACUTE OTITIS MEDIA	1	381.0	1	1	1	1	1	1	*	1
	2		1	1	1	2	2	2	*	1
	3		*	*	*	*	*	*	*	*
CHRONIC OTITIS MEDIA	1	381.1	1	1	1	1	1	1	*	1
	2		1	1	1	2	2	2	*	1
	3		*	*	*	*	*	*	*	*
ACUTE MASTOIDITIS	1	383.0	1	1	1	1	1	1	*	1
	2		1	1	1	2	2	2	*	1
	3		*	*	*	*	*	*	*	*
LABYRINTHITIS	1	384.0	1	1	1	1	1	1	*	1
	2		1	1	1	2	2	2	*	1
	3		*	*	*	*	*	*	*	*

DIAGNOSTIC SUMMARIES SCORING ALGORITHMS

TEXT	LEVEL	ICDA	NONE	1-2	3-6	7-14	15-30	31+	STILL	UNDET
EARACHE	1	384.9	0	1	1	1	1	1	*	0
	2		0	1	1	1	1	1	*	0
	3		*	*	*	*	*	*	*	*
CHOLESTEATOMA	1	387.0	*	*	*	*	*	*	*	*
	2		2	2	2	2	2	2	*	2
	3		2	2	2	2	2	2	*	2
WAX IN EAR	1	387.1	0	0	0	0	0	0	*	0
	2		0	0	0	0	0	0	*	0
	3		0	0	0	0	0	0	*	0
EAR DISEASE NOS	1	387.9	1	1	1	1	1	1	*	1
	2		1	1	1	1	2	2	*	1
	3		*	*	*	*	*	*	*	*
HYPERTENSION	1	401.0	3	3	3	3	3	3	*	3
	2		3	3	3	3	3	3	*	3
	3		3	3	3	3	3	3	*	3
ISCHEMIC H.T. DIS. HYPERTENSIVE	1	410.0	3	3	3	3	3	3	*	3
	2		3	3	3	3	3	3	*	3
	3		3	3	3	3	3	3	*	3
ANGINA PECTORIS	1	413.9	3	3	3	3	3	3	*	3
	2		3	3	3	3	3	3	*	3
	3		3	3	3	3	3	3	*	3
ACUTE PERICARDITIS	1	420.0	*	*	*	*	*	*	*	*
	2		2	2	2	2	3	3	*	2
	3		2	2	2	2	3	3	*	2
CHRONIC PERICARDITIS	1	423.0	*	*	*	*	*	*	*	*
	2		2	2	2	2	3	3	*	2
	3		2	2	2	2	3	3	*	2
RAYNAUD'S SYNDROME	1	443.0	1	1	1	1	1	1	*	1
	2		2	2	2	2	2	2	*	2
	3		2	2	2	2	2	2	*	2
PERIPHERAL VASCULAR DISEASE	1	443.9	1	1	1	1	1	1	*	1
	2		2	2	2	2	2	2	*	2
	3		2	2	2	2	2	2	*	2

DIAGNOSTIC SUMMARIES SCORING ALGORITHMS

TEXT	LEVEL	ICDA	NONE	1-2	3-6	7-14	15-30	31+	STILL	UNDET
GANGRENE	1	445.0	1	2	2	2	2	2	*	1
	2		1	1	2	2	2	2	*	1
	3		2	2	2	2	2	2	*	2
PHLEBITIS-OTHER	1	451.9	1	2	2	2	2	2	*	1
	2		1	1	2	2	2	2	*	1
	3		2	2	2	2	2	2	*	2
VARICOSE VEINS-LEGS	1	454.9	0	1	1	1	1	1	*	0
	2		0	1	1	1	1	1	*	0
	3		2	2	2	2	2	2	*	2
HEMORRHOIDS	1	455.0	0	1	1	1	1	1	*	0
	2		0	1	1	1	1	1	*	0
	3		2	2	2	2	2	2	*	2
COMMON COLD	1	460.0	0	1	1	2	2	2	*	0
	2		0	1	1	2	2	2	*	0
	3		*	*	*	*	*	*	*	*
ACUTE MAXILLARY SINUSITIS	1	461.0	1	1	1	1	1	1	*	1
	2		1	1	1	2	2	2	*	1
	3		2	2	2	2	2	2	*	2
ACUTE SINUSITIS	1	461.9	1	1	1	1	1	1	*	1
	2		1	1	1	2	2	2	*	1
	3		2	2	2	2	2	2	*	2
SORE THROAT	1	462.0	0	1	1	1	1	1	*	0
	2		0	1	1	1	1	1	*	0
	3		*	*	*	*	*	*	*	*
ACUTE TONSILLITIS	1	463.0	0	1	1	1	1	1	*	0
	2		0	1	1	1	1	1	*	0
	3		*	*	*	*	*	*	*	*
ACUTE LARYNGITIS	1	464.0	1	1	1	1	1	1	*	1
	2		1	1	1	1	1	1	*	1
	3		*	*	*	*	*	*	*	*
URI	1	465.0	1	1	1	1	1	1	*	1
	2		1	1	1	1	1	1	*	1
	3		*	*	*	*	*	*	*	*

DIAGNOSTIC SUMMARIES SCORING ALGORITHMS

TEXT	LEVEL	ICDA	NONE	1-2	3-6	7-14	15-30	31+	STILL	UNDET
ACUTE BRONCHITIS	1	464.0	1	1	1	1	1	1	*	1
	2		1	1	1	2	2	2	*	1
** NONE SPECIFIED **	3		2	2	2	2	2	2	*	2
	1	468.0	1	1	1	1	1	1	*	1
FLU-LIKE SYNDROME	2		1	1	1	2	2	2	*	1
	3		2	2	2	2	2	2	*	2
	1	470.0	1	1	1	1	1	1	*	1
FLU	2		1	1	1	1	1	1	*	1
	3		*	*	*	*	*	*	*	*
	1	472.0	1	1	1	1	1	1	*	1
BRONCHOPNEUMONIA	2		1	1	1	1	1	1	*	1
	3		*	*	*	*	*	*	*	*
	1	485.0	1	1	1	1	1	1	*	1
PNEUMONIA	2		1	1	1	2	2	2	*	1
	3		2	2	2	2	2	2	*	2
	1	486.0	1	1	1	1	1	1	*	1
BRONCHITIS NOS	2		1	1	1	2	2	2	*	1
	3		2	2	2	2	2	2	*	2
	1	490.0	1	1	1	1	1	1	*	1
CHRONIC BRONCHITIS	2		1	1	1	2	2	2	*	1
	3		2	2	2	2	2	2	*	2
	1	491.0	1	1	1	1	1	1	*	1
ASTHMA	2		1	1	1	1	1	1	*	1
	3		*	*	*	*	*	*	*	*
	1	493.0	1	1	2	2	2	2	*	1
CHRONIC PHARYNGITIS	2		1	1	2	2	2	2	*	1
	3		*	*	*	*	*	*	*	*
	1	502.0	1	1	1	1	1	1	*	1
CHRONIC RHINITIS	2		1	1	1	1	1	1	*	1
	3		*	*	*	*	*	*	*	*
	1	502.1	1	1	1	2	2	2	*	1
	2		1	1	1	2	2	2	*	1
	3		*	*	*	*	*	*	*	*

APPENDIX II - 9

DIAGNOSTIC SUMMARIES SCORING ALGORITHMS

TEXT	LEVEL	ICDA	NONE	1-2	3-6	7-14	15-30	31+	STILL	UNDET
CHRONIC SINUSITIS	1	503.9	1	1	1	2	2	2	*	1
	2		1	1	1	2	2	2	*	1
	3		*	*	*	*	*	*	*	*
HAY FEVER	1	507.0	1	1	1	2	2	2	*	1
	2		1	1	1	2	2	2	*	1
	3		*	*	*	*	*	*	*	*
VOCAL CORD POLYP	1	508.1	*	*	*	*	*	*	*	*
	2		2	2	2	2	2	2	*	2
	3		2	2	2	2	2	2	*	2
ANODONTIA	1	520.0	0	0	0	0	0	0	*	0
	2		0	0	0	0	0	0	*	0
	3		0	0	0	0	0	0	*	0
DISTURBANCE OF TOOTH ERUPTION	1	520.6	0	1	1	1	1	1	*	0
	2		0	1	1	1	1	1	*	0
	3		*	*	*	*	*	*	*	*
DENTAL CARIES	1	521.0	0	0	0	0	0	0	*	0
	2		0	1	1	1	1	1	*	0
	3		*	*	*	*	*	*	*	*
ACUTE APICAL PERIODONTITIS	1	522.4	1	1	1	1	1	1	*	1
	2		1	1	1	1	1	1	*	1
	3		*	*	*	*	*	*	*	*
PERIAPICAL ABSCESS	1	522.5	1	1	1	1	1	1	*	1
	2		1	1	1	1	1	1	*	1
	3		*	*	*	*	*	*	*	*
CHRONIC GINGIVITIS	1	523.1	1	1	1	1	1	1	*	1
	2		1	1	1	1	1	1	*	1
	3		*	*	*	*	*	*	*	*
ACUTE PERIODENTITIS	1	523.3	1	1	1	1	1	1	*	1
	2		1	1	1	1	1	1	*	1
	3		*	*	*	*	*	*	*	*
CHRONIC PERIODONTITIS	1	523.4	1	1	1	1	1	1	*	1
	2		1	1	1	1	1	1	*	1
	3		*	*	*	*	*	*	*	*

APPENDIX II - 10

DIAGNOSTIC SUMMARIES SCORING ALGORITHMS

TEXT	LEVEL	ICDA	NONE	1-2	3-6	7-14	15-30	31+	STILL	UNDET
OTHER GINGIVAL DISEASE	1	523.9	1	1	1	1	1	1	*	1
	2		1	1	1	1	1	1	*	1
	3		*	*	*	*	*	*	*	*
ACQUIRED ABSENCE OF TEETH	1	525.0	0	0	0	0	0	0	*	0
	2		0	0	0	0	0	0	*	0
	3		0	0	0	0	0	0	*	0
DISEASE OF TEETH-OTHER	1	525.7	0	0	1	1	1	1	*	0
	2		0	0	1	1	1	1	*	0
	3		*	*	*	*	*	*	*	*
TOOTHACHE	1	525.9	0	0	1	1	1	1	*	0
	2		0	0	1	1	1	1	*	0
	3		*	*	*	*	*	*	*	*
JAW DISEASE	1	526.9	1	1	1	1	1	1	*	1
	2		1	1	1	1	1	1	*	1
	3		*	*	*	*	*	*	*	*
ORAL APHTHOUS ULCER	1	528.2	1	1	1	1	1	1	*	1
	2		1	1	1	1	1	1	*	1
	3		*	*	*	*	*	*	*	*
ESOPHAGOSPASM	1	530.9	1	1	1	1	1	1	*	1
	2		1	1	1	3	3	3	*	1
	3		*	*	*	*	*	*	*	*
ULCER OF STOMACH	1	531.9	*	2	2	3	3	3	*	*
	2		*	2	2	3	3	3	*	*
	3		3	3	3	3	3	3	*	3
DUODENAL ULCER-BLEEDING	1	532.0	*	2	2	3	2	2	*	*
	2		*	2	2	3	3	3	*	*
	3		3	3	3	3	3	3	*	3
DUODENAL ULCER	1	532.9	*	2	2	3	2	2	*	*
	2		*	2	2	3	3	3	*	*
	3		3	3	3	3	3	3	*	3
PEPTIC ULCER	1	533.9	*	2	2	3	2	2	*	*
	2		*	2	2	3	3	3	*	*
	3		3	3	3	3	3	3	*	3

APPENDIX II - 11

DIAGNOSTIC SUMMARIES SCORING ALGORITHMS

TEXT	LEVEL	ICDA	NONE	1-2	3-6	7-14	15-30	31+	STILL	UNDET
GASTRITIS/DUODENITIS	1	535.0	1	1	1	2	2	2	*	1
	2		1	1	1	2	2	2	*	1
	3		3	3	3	3	3	3	*	3
FUNCTIONAL STOMACH DISEASE	1	536.9	1	1	1	2	2	2	*	1
	2		1	1	1	2	2	2	*	1
	3		*	*	*	*	*	*	*	*
APPENDICITIS	1	540.0	*	*	*	*	*	*	*	*
	2		*	*	*	*	*	*	*	*
	3		*	2	2	2	3	3	*	*
INGUINAL HERNIA	1	541.0	*	*	*	*	*	*	*	*
	2		*	*	*	*	*	*	*	*
	3		*	2	2	2	3	3	*	*
HIATUS HERNIA	1	550.0	1	1	1	2	2	2	*	1
	2		1	1	1	2	2	2	*	1
	3		2	2	2	2	2	2	*	2
GASTROENTERITIS-COLITIS	1	551.3	1	1	1	2	2	2	*	1
	2		1	1	1	2	2	2	*	1
	3		2	2	2	2	2	2	*	2
DIVERTICULOSIS COLI	1	561.0	1	1	1	2	2	2	*	1
	2		1	1	1	2	2	2	*	1
	3		*	*	*	*	*	*	*	*
CHRONIC ENTERITIS	1	562.1	1	1	1	2	2	2	*	1
	2		1	1	1	2	2	2	*	1
	3		*	2	2	2	3	3	*	*
CONSTIPATION	1	563.9	1	1	1	2	2	2	*	1
	2		1	1	1	2	2	2	*	1
	3		2	2	2	2	3	3	*	2
IRRITABLE COLON	1	564.0	0	0	0	0	0	0	*	0
	2		0	0	0	0	0	0	*	0
	3		0	0	0	0	0	0	*	0
	1	564.1	1	1	1	*	*	*	1	1
	2		1	1	1	*	*	*	1	1
	3		*	*	*	*	*	*	1	*

APPENDIX II - 12

DIAGNOSTIC SUMMARIES SCORING ALGORITHMS

TEXT	LEVEL	ICDA	NONE	1-2	3-6	7-14	15-30	31+	STILL	UNDET
OTHER FUNTIONAL DIS.--INTESTINES	1	564.9	1	1	1	*	*	*	*	1
	2		1	1	1	*	*	*	*	1
	3		*	*	*	*	*	*	*	*
ANAL FISSURE	1	565.0	1	1	1	2	2	2	*	1
	2		1	1	1	2	2	2	*	1
	3		*	*	*	*	*	*	*	*
ANAL ABSCESS	1	566.0	1	1	1	2	2	2	*	1
	2		1	1	1	2	2	2	*	1
	3		*	*	*	*	*	*	*	*
INTESTINAL DISEASE-OTHER	1	569.9	1	1	1	2	2	2	*	1
	2		1	1	1	2	2	2	*	1
	3		*	*	*	*	*	*	*	*
ACUTE HEPATITIS	1	570.0	1	1	2	2	2	2	*	1
	2		1	1	2	2	2	2	*	1
	3		3	3	3	3	3	3	*	3
LIVER INFLAMMATION	1	573.0	1	1	2	2	2	2	*	1
	2		1	1	2	2	2	2	*	1
	3		3	3	3	3	3	3	*	3
LIVER INFLAMMATION	1	573.9	1	1	2	2	2	2	*	1
	2		1	1	2	2	2	2	*	1
	3		3	3	3	3	3	3	*	3
ACUTE CHOLECYSTITIS/LITHIASIS	1	574.0	*	2	2	2	2	2	*	*
	2		*	2	2	2	2	2	*	*
	3		*	2	2	2	3	3	*	*
CHRONIC CHOLECYSTITIS	1	574.9	1	1	2	2	2	2	*	1
	2		1	1	2	2	2	2	*	1
	3		3	3	3	3	3	3	*	3
CHOLECYSTITIS/CHOLANGITIS	1	575.0	*	2	2	2	2	2	*	*
	2		*	2	2	2	2	2	*	*
	3		*	2	2	2	3	3	*	*
CALCULUS-KIDNEY/URETER	1	592.0	*	2	2	3	3	3	*	*
	2		*	2	2	3	3	3	*	*
	3		*	2	2	3	3	3	*	*

DIAGNOSTIC SUMMARIES SCORING ALGORITHMS

TEXT	LEVEL	ICDA	NONE	1-2	3-6	7-14	15-30	31+	STILL	UNDET
URINARY CALCULUS	1	594.0	*	2	2	3	3	3	*	*
	2		*	2	2	3	3	3	*	*
	3		*	2	2	3	3	3	*	*
CYSTITIS	1	595.0	1	1	1	2	2	2	*	1
	2		1	1	1	2	2	2	*	1
	3		*	2	2	2	2	2	*	*
BLADDER FISTULA	1	596.0	1	1	1	2	2	2	*	1
	2		1	1	1	2	2	2	*	1
	3		*	2	2	2	2	2	*	*
CONTRACTURE OF BLADDER	1	596.2	1	1	1	2	2	2	*	1
	2		1	1	1	2	2	2	*	1
	3		*	2	2	2	2	2	*	*
BLADDER DISEASE	1	596.9	1	1	1	2	2	2	*	1
	2		1	1	1	2	2	2	*	1
	3		*	2	2	2	2	2	*	*
NONSPECIFIC URETHRITIS	1	597.0	1	1	1	2	2	2	*	1
	2		1	1	1	2	2	2	*	1
	3		*	2	2	2	2	2	*	*
URETHRAL STRICTURE	1	598.0	1	1	1	2	2	2	*	1
	2		1	1	1	2	2	2	*	1
	3		*	2	2	2	2	2	*	*
UTI	1	599.0	1	1	1	2	2	2	*	1
	2		1	1	1	2	2	2	*	1
	3		*	*	*	*	*	*	*	*
PROSTATITIS	1	601.0	1	1	1	2	2	2	*	1
	2		1	1	1	2	2	2	*	1
	3		*	*	*	*	*	*	*	*
ORCHITIS/EPIDIDYMITIS	1	604.0	1	1	1	2	2	2	*	1
	2		1	1	1	2	2	2	*	1
	3		*	*	*	*	*	*	*	*
OLIGOSPERMIA	1	606.0	0	0	0	0	0	0	*	0
	2		0	0	0	0	0	0	*	0
	3		0	0	0	0	0	0	*	0

DIAGNOSTIC SUMMARIES SCORING ALGORITHMS

TEXT	LEVEL	ICDA	NONE	1-2	3-6	7-14	15-30	31+	STILL	UNDET
SPERMATOCELE	1	607.6	0	1	1	*	*	*	*	0
	2		0	1	1	*	*	*	*	0
	3		*	*	*	*	*	*	*	*
BOIL OF FACE	1	680.0	1	1	1	*	*	*	*	1
	2		1	1	1	*	*	*	*	1
	3		*	*	*	*	*	*	*	*
BOIL OF NECK	1	680.1	1	1	1	*	*	*	*	1
	2		1	1	1	*	*	*	*	1
	3		*	*	*	*	*	*	*	*
BOIL OF TRUNK	1	680.2	1	1	1	*	*	*	*	1
	2		1	1	1	*	*	*	*	1
	3		*	*	*	*	*	*	*	*
BOIL OF BUTTOCK	1	680.5	1	1	1	*	*	*	*	1
	2		1	1	1	*	*	*	*	1
	3		*	*	*	*	*	*	*	*
INFECTION-LOWER EXTREMITY	1	680.6	1	1	1	*	*	*	*	1
	2		1	1	1	*	*	*	*	1
	3		*	*	*	*	*	*	*	*
SKIN INFECTION	1	680.8	1	1	1	1	2	2	*	1
	2		1	1	1	1	2	2	*	1
	3		*	2	2	2	*	*	*	*
BOIL	1	680.9	1	1	1	*	*	*	*	1
	2		1	1	1	*	*	*	*	1
	3		*	*	*	*	*	*	*	*
CELLULITIS OF DIGIT	1	681.0	1	1	1	1	2	2	*	1
			1	1	1	1	2	2	*	1
			*	2	2	2	*	*	*	*
CELLULITIS	1	682.1	1	1	1	1	2	2	*	1
	2		1	1	1	1	2	2	*	1
	3		*	2	2	2	*	*	*	*
CELLULITIS OF ARM	1	682.2	1	1	1	1	2	2	*	1
	2		1	1	1	1	2	2	*	1
	3		*	2	2	2	*	*	*	*

APPENDIX II - 15

DIAGNOSTIC SUMMARIES SCORING ALGORITHMS

TEXT	LEVEL	ICDA	NONE	1-2	3-6	7-14	15-30	31+	STILL	UNDET
CELLULITIS OF LEG	1	682.4	1	1	1	1	2	2	*	1
	2		1	1	1	1	2	2	*	1
	3		*	2	2	2	*	*	*	*
CELLULITIS OF FOOT	1	682.5	1	1	1	1	2	2	*	1
	2		1	1	1	1	2	2	*	1
	3		*	2	2	2	*	*	*	*
PILONIDAL CYST	1	685.0	1	1	1	1	2	2	*	1
	2		1	1	1	1	2	2	*	1
	3		*	2	2	2	*	*	*	*
OTHER SKIN INFECTION	1	686.9	1	1	1	1	2	2	*	1
	2		1	1	1	1	2	2	*	1
	3		*	2	2	2	*	*	*	*
SEBORRHEIC DERMATITIS	1	690.0	0	1	1	*	*	*	*	0
	2		0	1	1	*	*	*	*	0
	3		*	*	*	*	*	*	*	*
DERMATITIS DUE TO PLANTS	1	692.6	0	1	1	2	2	2	*	0
	2		0	1	1	2	2	2	*	0
	3		*	*	*	2	2	2	*	*
DERMATITIS DUE TO RADIATION	1	692.7	0	1	1	2	2	2	*	0
	2		0	1	1	2	2	2	*	0
	3		*	*	*	2	2	2	*	*
DERMATITIS DUE TO SUNBURN	1	692.8	0	1	1	2	2	2	*	0
	2		0	1	1	2	2	2	*	0
	3		*	*	*	2	2	2	*	*
DERMATITIS-NONSPECIFIC	1	692.9	0	1	1	2	2	2	*	0
	2		0	1	1	2	2	2	*	0
	3		*	*	*	2	2	2	*	*
PSORIASIS	1	696.1	0	1	1	2	2	2	*	0
	2		0	1	1	2	2	2	*	0
	3		*	*	*	2	2	2	*	*
PITYRIASIS ROSEA	1	696.3	0	1	1	*	*	*	*	0
	2		0	1	1	*	*	*	*	0
	3		*	*	*	*	*	*	*	*

DIAGNOSTIC SUMMARIES SCORING ALGORITHMS

TEXT	LEVEL	ICDA	NONE	1-2	3-6	7-14	15-30	31+	STILL	UNDET
PRURITIS ANI	1	698.0	0	1	1	*	*	*	*	0
	2		0	1	1	*	*	*	*	0
	3		*	*	*	*	*	*	*	*
NEURODERMATITIS	1	698.3	0	1	1	*	*	*	*	0
	2		0	1	1	*	*	*	*	0
	3		*	*	*	*	*	*	*	*
INGROWN NAIL	1	703.0	0	1	1	*	*	*	*	0
	2		0	1	1	*	*	*	*	0
	3		*	*	*	*	*	*	*	*
HAIR DISEASE	1	704.0	0	1	1	*	*	*	*	0
	2		0	1	1	*	*	*	*	0
	3		*	*	*	*	*	*	*	*
DYSHIDROSIS	1	705.9	0	1	1	*	*	*	*	0
	2		0	1	1	*	*	*	*	0
	3		*	*	*	*	*	*	*	*
ACNE	1	706.1	0	1	1	*	*	*	*	0
	2		0	1	1	*	*	*	*	0
	3		*	*	*	*	*	*	*	*
SEBACEOUS CYST	1	706.2	0	1	1	*	*	*	*	0
	2		0	1	1	*	*	*	*	0
	3		*	*	*	*	*	*	*	*
SEBORRHEA	1	706.3		1	1	*	*	*	*	0
	2		0	1	1	*	*	*	*	0
	3		*	*	*	*	*	*	*	*
HIVES	1	708.9	0	1	1	*	*	*	*	0
	2		0	1	1	*	*	*	*	0
	3		*	*	*	*	*	*	*	*
OTHER SKIN DISEASE	1	709.9	0	1	1	*	*	*	*	0
	2		0	1	1	*	*	*	*	0
	3		*	*	*	*	*	*	*	*
OSTEOARTHRITIS	1	713.0	0	1	1	2	2	2	*	0
	2		0	1	1	2	2	2	*	0
	3		*	*	*	*	*	*	*	*

APPENDIX II - 17

DIAGNOSTIC SUMMARIES SCORING ALGORITHMS

TEXT	LEVEL	ICDA	NONE	1-2	3-6	7-14	15-30	31+	STILL	UNDET
SPONDYLITIS OSTEOARTHRITICA	1	713.1	0	1	1	2	2	2	*	0
	2		0	1	1	2	2	2	*	0
ARTHRITIS	3		*	*	*	*	*	*	*	*
	1	715.0	0	1	1	2	2	2	*	0
	2		0	1	1	2	2	2	*	0
LUMBAGO	3		*	*	*	*	*	*	*	*
	1	717.0	0	1	1	2	2	2	*	0
	2		0	1	1	2	2	2	*	0
TORTICOLLIS	3		*	*	*	*	*	*	*	*
	1	717.2	0	1	1	2	2	2	*	0
	2		0	1	1	2	2	2	*	0
MYALGIA	3		*	*	*	*	*	*	*	*
	1	717.9	0	0	0	0	0	0	*	0
	2		0	0	0	0	0	0	*	0
RHEUMATISM	3		*	*	*	*	*	*	*	*
	1	718.0	0	1	1	2	2	2	*	0
	2		0	1	1	2	2	2	*	0
INTERNAL DERANGEMENT OF JOINT	3		*	*	*	*	*	*	*	*
	1	724.0	1	1	1	2	2	3	*	1
	2		1	1	1	2	2	3	*	1
INTERNAL DERANGEMENT OF JOINT	3		1	1	2	2	2	3	*	1
	1	724.5	1	1	1	2	2	3	*	1
	2		1	1	1	2	2	3	*	1
HERNIATED DISC	3		1	1	2	2	2	3	*	1
	1	725.1	1	1	1	2	2	3	*	1
	2		1	1	1	2	2	3	*	1
HERNIATED DISC	3		1	1	2	2	2	3	*	1
	1	725.9	1	1	1	2	2	3	*	1
	2		1	1	1	2	2	3	*	1
ANKYLOSIS	3		1	1	2	2	2	3	*	1
	1	727.8	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	*	*	0
	3		*	1	2	2	2	*	*	*

DIAGNOSTIC SUMMARIES SCORING ALGORITHMS

TEXT	LEVEL	ICDA	NONE	1-2	3-6	7-14	15-30	31+	STILL	UNDET
NECK PAIN	1	728.0	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	*	*	0
	3		*	1	2	2	2	*	*	*
CERVICAL MYELOPATHY	1	728.4	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	*	*	0
	3		*	1	2	2	2	*	*	*
THORACIC RADICULITIS	1	728.5	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	*	*	0
	3		*	1	2	2	2	*	*	*
LOW BACK PAIN	1	728.7	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	*	*	0
	3		*	1	2	2	2	*	*	*
BACK PAIN	1	728.9	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	*	*	0
	3		*	1	2	2	2	*	*	*
[illegible]NT DISEASE	1	729.9	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	*	*	0
	3		*	1	2	2	2	*	*	*
SHOULDER BURSITIS,ETC.	1	731.1	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	*	*	0
	3		*	1	2	2	2	*	*	*
ELBOW BURSITIS	1	731.2	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	*	*	0
	3		*	1	2	2	2	*	*	*
SYNOVITIS,KNEE	1	731.6	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	*	*	0
	3		*	1	2	2	2	*	*	*
[illegible]BURSITIS,ETC.	1	731.9	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	*	*	0
	3		*	1	2	2	2	*	*	*
MYOSITIS	1	732.0	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	*	*	0
	3		*	1	2	2	2	*	*	*

APPENDIX II - 19

DIAGNOSTIC SUMMARIES SCORING ALGORITHMS

TEXT	LEVEL	ICDA	NONE	1-2	3-6	7-14	15-30	31+	STILL	UNDET
DEFORMITY-FINGERS	1	738.3	0	1	1	2	2	*	*	0
	(2)		0	1	1	2	2	*	*	0
	3		*	1	2	2	2	*	*	*
DEFORMITIES,FEET	1	738.7	0	0	0	0	0	0	*	0
	2		0	0	0	0	0	0	*	0
	3		*	*	*	*	*	*	*	*
ESOPHAGEAL WEB,ETC.	1	750.3	0	1	1	1	1	1	*	0
	2		0	1	1	1	1	1	*	0
	3		*	*	*	*	*	*	*	*
PIGMENTED NEVUS	1	757.1	0	1	1	1	1	1	*	0
	2		0	1	1	1	1	1	*	0
	3		*	*	*	*	*	*	*	*
OTHER CONGENITAL ANOMALY	1	758.8	0	1	1	1	1	1	*	0
	2		0	1	1	1	1	1	*	0
	3		*	*	*	*	*	*	*	*
ABNORMAL INVOLUNTARY MVT	1	781.3	0	1	1	2	2	2	*	0
	2		0	1	1	2	2	2	*	0
	3		*	*	*	*	*	*	*	*
VERTIGO	1	780.5	0	1	1	2	2	2	*	0
	2		0	1	1	2	2	2	*	0
	3		*	*	*	*	*	*	*	*
SCOTOMA	1	781.0	0	0	0	0	0	0	*	0
	2		0	0	0	0	0	0	*	0
	3		0	0	0	0	0	0	*	0
TINNITUS	1	781.3	0	0	0	0	0	0	*	0
	2		0	0	0	0	0	0	*	0
	3		0	0	0	0	0	0	*	0
DISTURBANCE OF SENSATION	1	781.6	0	0	0	0	0	0	*	0
	2		0	0	0	0	0	0	*	0
	3		0	0	0	0	0	0	*	0
PALPITATION	1	782.1	0	0	0	0	0	0	*	0
	2		0	0	0	0	0	0	*	0
	3		0	0	0	0	0	0	*	0

DIAGNOSTIC SUMMARIES SCORING ALGORITHMS

TEXT	LEVEL	ICDA	NONE	1-2	3-6	7-14	15-30	31+	STILL	UNDET
SYNCOPE	1	782.5	0	0	0	0	0	0	*	0
	2		0	0	0	0	0	0	*	0
	3		0	0	0	0	0	0	*	0
EPISTAXIS	1	783.0	0	0	0	0	0	0	*	0
	2		0	0	0	0	0	0	*	0
	3		0	0	0	0	0	0	*	0
DYSPNEA	1	783.2	0	0	0	0	0	0	*	0
	2		0	0	0	0	0	0	*	0
	3		0	0	0	0	0	0	*	0
COUGH	1	783.3	0	0	0	0	0	0	*	0
	2		0	0	0	0	0	0	*	0
	3		0	0	0	0	0	0	*	0
CHEST PAIN	1	783.7	0	0	0	0	0	0	*	0
	2		0	0	0	0	0	0	*	0
	3		0	0	0	0	0	0	*	0
NAUSEA	1	784.1	0	0	0	0	0	0	*	0
	2		0	0	0	0	0	0	*	0
	3		0	0	0	0	0	0	*	0
HEARTBURN	1	784.3	0	0	0	0	0	0	*	0
	2		0	0	0	0	0	0	*	0
	3		0	0	0	0	0	0	*	0
JAUNDICE	1	785.2	0	0	0	0	0	0	*	0
	2		0	0	0	0	0	0	*	0
	3		0	0	0	0	0	0	*	0
FLATULENCE	1	785.4	0	0	0	0	0	0	*	0
	2		0	0	0	0	0	0	*	0
	3		0	0	0	0	0	0	*	0
ABDOMINAL PAIN	1	785.5	0	0	0	0	0	0	*	0
	2		0	0	0	0	0	0	*	0
	3		0	0	0	0	0	0	*	0
URINARY PAIN	1	786.0	0	0	0	0	0	0	*	0
	2		0	0	0	0	0	0	*	0
	3		0	0	0	0	0	0	*	0

DIAGNOSTIC SUMMARIES SCORING ALGORITHMS

TEXT	LEVEL	ICDA	NONE	1-2	3-6	7-14	15-30	31+	STILL	UNDET
CLOSED FRACTURE-CLAVICLE	1	810.0	*	*	*	*	*	*	*	*
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
CARPAL FRACTURE	1	814.0	*	*	*	*	*	*	*	*
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
CLOSED METACARPAL FRACTURE	1	815.0	*	*	*	*	*	*	*	*
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
FINGER FRACTURE	1	816.0	*	*	*	*	*	*	*	*
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
OPEN FRACTURE-FINGER	1	816.1	*	*	*	*	*	*	*	*
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
PATELLA FRACTURE	1	822.0	*	*	*	*	*	*	*	*
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
ANKLE FRACTURE	1	824.0	*	*	*	*	*	*	*	*
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
TARSAL/METATARSAL FRACTURE	1	825.0	*	*	*	*	*	*	*	*
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
TOE FRACTURE	1	826.0	*	*	*	*	*	*	*	*
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
FRACTURE	1	829.0	*	*	*	*	*	*	*	*
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
SHOULDER DISLOCATION	1	831.0	1	1	1	2	2	*	*	1
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*

DIAGNOSTIC SUMMARIES SCORING ALGORITHMS

TEXT	LEVEL	ICDA	NONE	1-2	3-6	7-14	15-30	31+	STILL	UNDET
FINGER DISLOCATION	1	834.0	1	1	1	2	2	*	*	1
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
KNEE DISLOCATION	1	836.0	1	1	1	2	2	*	*	1
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
DISLOCATION-FOOT	1	838.0	1	1	1	2	2	*	*	1
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
SPRAIN-SHOULDER/ARM	1	840.0	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	3	*	0
	3		*	1	2	2	2	3	*	*
SPRAIN-ELBOW/FOREARM	1	841.0	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	3	*	0
	3		*	1	2	2	2	3	*	*
SPRAIN-WRIST	1	842.0	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	3	*	0
	3		*	1	2	2	2	3	*	*
SPRAIN-HAND	1	842.1	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	3	*	0
	3		*	1	2	2	2	3	*	*
HIP STRAIN	1	843.0	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	3	*	0
	3		*	1	2	2	2	3	*	*
SPRAIN-KNEE/LEG	1	844.0	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	3	*	0
	3		*	1	2	2	2	3	*	*
SPRAIN-ANKLE	1	845.0	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	3	*	0
	3		*	1	2	2	2	3	*	*
SPRAIN-FOOT	1	845.1	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	3	*	0
	3		*	1	2	2	2	3	*	*

DIAGNOSTIC SUMMARIES SCORING ALGORITHMS

TEXT	LEVEL	ICDA	NONE	1-2	3-6	7-14	15-30	31+	STILL	UNDET
SPRAIN-SACROILIAC	1	846.0	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	3	*	0
	3		*	1	2	2	2	3	*	*
SPRAIN-NECK	1	847.0	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	3	*	0
	3		*	1	2	2	2	3	*	*
SPRAIN-LOW BACK	1	847.8	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	3	*	0
	3		*	1	2	2	2	3	*	*
SPRAIN-BACK	1	847.9	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	3	*	0
	3		*	1	2	2	2	3	*	*
SPRAIN-JOINT	1	848.0	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	3	*	0
	3		*	1	2	2	2	3	*	*
CEREBRAL CONCUSSION	1	850.0	1	1	1	2	2	*	*	1
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
OPEN WOUND-EYE COMPLICATED	1	870.1	*	*	*	*	*	*	*	*
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
SCALP LACERATION	1	873.0	1	1	1	2	2	*	*	1
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
LACERATION OF FACE	1	873.7	1	1	1	2	2	*	*	1
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
OPEN WOUND-HAND	1	882.0	1	1	1	2	2	*	*	1
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
LACERATION OF FINGER	1	883.0	1	1	1	2	2	*	*	1
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*

DIAGNOSTIC SUMMARIES SCORING ALGORITHMS

TEXT	LEVEL	ICDA	NONE	1-2	3-6	7-14	15-30	31+	STILL	UNDET
UPPER LIMB WOUNDS	1	884.0	1	1	1	2	2	*	*	1
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
OPEN WOUND-HIP	1	890.0	1	1	1	2	2	*	*	1
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
OPEN WOUND-LEG	1	891.0	1	1	1	2	2	*	*	1
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
OPEN WOUND-FOOT	1	892.0	1	1	1	2	2	*	*	1
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
MULTIPLE OPEN WOUNDS	1	907.0	1	1	1	2	2	*	*	1
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
SUPERFICIAL INJURY-HEAD	1	910.0	0	1	1	2	2	*	*	0
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
SUPERFICIAL INJURY-TRUNK	1	911.0	0	1	1	2	2	*	*	0
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
SUPERFICIAL INJURY-HAND	1	914.0	0	1	1	2	2	*	*	0
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
FINGER INJURY	1	915.0	0	1	1	2	2	*	*	0
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
SUPERFICIAL INJURY-LEG	1	916.0	0	1	1	2	2	*	*	0
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
SUPERFICIAL INJURY-LEG	1	918.0	0	1	1	2	2	*	*	0
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*

DIAGNOSTIC SUMMARIES SCORING ALGORITHMS

TEXT	LEVEL	ICDA	NONE	1-2	3-6	7-14	15-30	31+	STILL	UNDET
CONTUSION-HEAD	1	920.0	0	1	1	2	2	*	*	0
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
CONTUSION-TRUNK	1	921.0	0	1	1	2	2	*	*	0
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
CONTUSION-EYE	1	922.0	0	1	1	2	2	*	*	0
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
CONTUSION-ARM	1	924.0	0	1	1	2	2	*	*	0
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
CONTUSION-HAND	1	925.0	0	1	1	2	2	*	*	0
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
CONTUSION-FINGER	1	926.0	0	1	1	2	2	*	*	0
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
CONTUSION-LEG	1	927.0	0	1	1	2	2	*	*	0
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
CONTUSION-FOOT	1	928.0	0	1	1	2	2	*	*	0
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
CONTUSION-FOOT	1	929.0	0	1	1	2	2	*	*	0
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
FOREIGN BODY	1	930.0	0	1	1	2	2	*	*	0
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
BURN-HEAD	1	941.0	0	1	1	2	2	*	*	0
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*

DIAGNOSTIC SUMMARIES SCORING ALGORITHMS

TEXT	LEVEL	ICDA	NONE	1-2	3-6	7-14	15-30	31+	STILL	UNDET
BURN-HAND	1	944.0	0	1	1	2	2	*	*	0
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
THIRD DEGREE BURN-LEG	1	945.3	1	1	1	2	2	*	*	1
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
BURN	1	949.0	0	1	1	2	2	*	*	0
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
ADVERSE EFFECT-PENICILLIN	1	960.0	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	3	*	0
	3		*	1	2	2	2	3	*	*
ADVERSE EFFECT-ERYTHROMYCIN	1	960.3	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	3	*	0
	3		*	1	2	2	2	3	*	*
ADVERSE EFFECT-OTHER ANTIBIOTICS	1	960.9	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	3	*	0
	3		*	1	2	2	2	3	*	*
AVERSE EFFECT-COAL TAR DERIV.	1	965.5	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	3	*	0
	3		*	1	2	2	2	3	*	*
ADVERSE EFFECT-SALURITICS	1	975.3	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	3	*	0
	3		*	1	2	2	2	3	*	*
ADVERSE EFFECT-OTHER	1	977.8	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	3	*	0
	3		*	1	2	2	2	3	*	*
ADVERSE EFFECT-GASOLINE	1	981.1	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	3	*	0
	3		*	1	2	2	2	3	*	*
TOXIC EFFECT-GAS FUMES	1	987.1	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	3	*	0
	3		*	1	2	2	2	3	*	*

DIAGNOSTIC SUMMARIES SCORING ALGORITHMS

TEXT	LEVEL	ICDA	NONE	1-2	3-6	7-14	15-30	31+	STILL	UNDET
TOXIC EFFECT-PESTICIDE	1	989.3	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	3	*	0
	3		*	1	2	2	2	3	*	*
TOXIC EFFECT-VENOM	1	989.4	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	3	*	0
	3		*	1	2	2	2	3	*	*
MOTION SICKNESS	1	994.6	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	3	*	0
	3		*	1	2	2	2	3	*	*
INJURY-TRUNK	1	996.1	0	1	1	2	2	*	*	0
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
INJURY-FINGER	1	996.5	0	1	1	2	2	*	*	0
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
INJURY KNEE,LEG ETC.	1	996.7	0	1	1	2	2	*	*	0
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
INJURY-OTHER	1	996.8	0	1	1	2	2	*	*	0
	2		1	1	1	2	2	3	*	1
	3		*	1	2	2	2	3	*	*
POST-OP HEMORRHAGE	1	998.1	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	3	*	0
	3		*	1	2	2	2	3	*	*
SERUM REACTION-OTHER	1	999.5	0	1	1	2	2	*	*	0
	2		0	1	1	2	2	3	*	0
	3		*	1	2	2	2	3	*	*