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AIRCRAFT-PILOT AND OTHER PRE-EMPLOYMENT EXPERIENCE AS FACTORS IN THE SELECTION OF AIR TRAFFIC CONTROLLER TRAINEES

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CONTENTS

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I. Introduction.

Numerous revisions have been made during the last 15 years in the methods and standards with which personnel are selected for training as Air Traffic Control Specialists (ATCSs) with the Federal Aviation Administration. In many respects, however, current screening procedures are remarkably similar to those of the past. One of the most traditional and relatively unchanged policies concerns the evaluation and weighting of previous aviation-related experience (e.g., as an aircraft pilot, navigator, military ATCS, in communications work, air surveillance, etc.) in establishing the eligibility ratings of medically qualified applicants. The present study was undertaken in order to examine the validities of the various types of aviation-oriented experience, separately and in combination, for prediction of success in ATC work—with success defined as retention status within the air traffic control (ATC) system several years after entry into training.

A. *ATCS Selection and Recruiting History.* Eligibility for ATCS training within the FAA has always been restricted to those applicants who, after having met other qualification requirements, satisfactorily pass a rigid medical examination. The current physical fitness standards are much like those of the past and continue to closely parallel those prescribed for a commercial pilot rating (i.e., a Second Class Airman Medical Certificate). However, the procedures relating to medical certification of ATCS personnel were amended in 1966 to include consideration of personality attributes. Since that time, Cattell's Sixteen Personality Factor (P. F.) Questionnaire[2] has been used in the screening of all applicants. Physiologically qualified individuals for whom the P. F. Questionnaire results indicate no significant emotional or mental problems are granted medical certification. Others, who usually represent but a small minority of the applicants, must submit to a psychiatric examination, the results of which may constitute grounds for ineligibility. Moreover, under the standards in effect since April 1973, all applicants of age 31 and older are automatically disqualified for basic training in either En Route or Terminal control procedures. The maximum age limit of 30 does not apply to Flight Service Station (FSS) personnel.

The eligibility ratings prescribed for use by the U.S. Civil Service Commission (CSC) in the competitive selection of candidates have always included (and, prior to 1964, were restricted to) consideration of each applicant's pre-employment experience, his educational background, and the outcomes of an interview with management officials. The methods and standards for evaluation of experience have varied from time to time but all have been predicated, at least in part, on the assumption that almost any type of aviation experience should be positively related to success in ATCS training. Inasmuch as previous experience in air traffic control (usually acquired in military service) has always been considered a prime asset, it has consistently been heavily weighted, directly or indirectly, in the selection process. Other types of aviation experience traditionally regarded as important, but not weighted as heavily as ATC work, include experience as an aircraft pilot (particularly if instrument rated), licensed navigator, certified dispatcher of aircraft, or as a specialist in communications or air surveillance work. Applicants not having aviation-oriented backgrounds have usually been required to have either a (four-year) college degree or at least three years of "general" experience of a progressively responsible nature in administrative, technical, or other work, and/or

We gratefully acknowledge the assistance in data by analyses by Steven Greer and Barbara Rizzuti.

(in recent years) demonstrate their ability to learn ATC work by scoring relatively high on a battery of aptitude tests.

Tests of mental abilities, or aptitudes, were not generally used in the selection of personnel for controller training until 1964. Since that time, however, most applicants have been screened with a battery of six tests, covering ATC-related aptitudes. The battery, often referred to as the "CSC ATC Aptitude Screening Test," and thus frequently alluded to as if a single instrument, was validated by the Civil Aeromedical Institute (CAMI) in experimental studies on trainees recruited during 1962 and 1963.[14]

Examination with the test battery was mandatory for *all* applicants from January 1964 until July 1968, with eligibility for training requiring that those having "qualifying" pre-FAA ATC experience score at least 210; a score of 225 served as the screening standard for those rated as pilots, navigators, dispatchers of aircraft, or in communications or air surveillance, whereas 240 represented the minimal qualifying score for most applicants having little or no aviation experience. The differential aptitude-screening standards involved the use of three score-to-percentile conversion tables, with a minimum-passing percentile score of 70 corresponding to 210 on one, 225 on another, and 240 on the other. In computing the competitive rating of each subject who passed, the percentile score was supplemented by points credited for aviation-related experience. Dependent upon recency and amount, certain types of ATC experience could warrant up to 15 credit points and pilot experience as many as 10. Five additional points were awarded for military service from which honorably discharged and another five if wounded while in service. Former military ATCSs and pilots frequently represented more than half of the applicants; due to the differential screening standards, they tended to experience less difficulty than others in qualifying for training, and they generally constituted the majority of the candidates ultimately certified and listed on the CSC Registers—particularly those having the higher eligibility ratings. Moreover, budgetary limitations severly restricted the FAA's recruitment of personnel for ATC training from January 1964 until the latter part of 1968. Inasmuch as the selection of subjects for the reduced number of training positions available each of those years was accomplished on the basis of competitive ratings, individuals having neither ATC nor pilot experience always represented a small minority of the selectees.

In 1968 a rapid expansion of the air traffic control system was begun. Selection procedures were modified in August 1968 so that applicants having highly specialized ATC experience, particularly in radar control, could be granted waivers of the aptitude-screening phase and also be appointed to training at pay grades (i.e., General Schedules grades) of GS–9 or higher rather than the normally prescribed entry grades of GS–7 and lower. Other applicants, including vast numbers with appreciable experience in ATC work and/or other aviation-related areas, were assessed with the test battery and otherwise screened in accordance with standards very similar to those specified for all trainees during the preceding five years. The "specialized experience" standard remained in effect until April 1973. Throughout that time, however, less than one-fourth of the ATC selectees entered as GS–9's or higher with waivers of the aptitude-screening requirement.

As reported in a previous CAMI study,[5] only 710 (18.9%) of 3,751 subjects who arrived at the Aeronautical Center during November 1968 and the ensuing 17 months for basic ATC training claimed to have entered the FAA as GS–9's or higher on the basis of highly specialized ATC experience. Some 446 of the 710 enrolled in the Academy's basic En Route course, while 264 entered the Terminal course. The study revealed 16% of the 446 En Route trainees of GS–9 level and higher failed to successfully complete the En Route course and that the attrition rate of the 2,526 who enrolled in the same training course as GS–7's or lower was only slightly higher (i.e., 18.2%). Only 14% of the 264 Terminal trainees recruited with disregard of the aptitude-screening requirement failed the Terminal course, whereas a significantly higher ($p < .01$) elimination rate of 21.9% was obtained for the remaining 515 Terminal students. However, a more recent CAMI study[8] (in which December 1, 1971, served as a common date for determination of the attrition-retention status of every student who sucessfully completed either En Route or Terminal basic training at the Academy during 1969) indicated that the trainees selected under the specialized-experience standard had slightly *higher* post-Academy attrition rates than those

appointed to training with pay grades of GS–7 and lower. The difference between the post-Academy (i.e., facility-training) elimination rates of the two differentially selected Terminal subgroups was somewhat greater than that obtained between the En Route subsamples but neither difference was statistically significant. Had the results not been confounded by aging effects, the authors would have concluded that specialized ATC experience was of little or no value to most trainees after Academy graduation. However, almost 23% of the higher-graded trainees of the combined En Route and Terminal options were 35 years of age or older, whereas slightly less than 14% of those appointed as GS–7's or lower were older than 34.

Unpublished research, involving several hundred ATCSs who had successfully completed either En Route or Terminal basic training at the Academy in 1969, revealed highly significant differences between the post-Academy attrition rates (as determined on December 1, 1971) for trainees aged "35 and older" vs. those "34 and younger." For Academy graduates of GS–9 level and higher, the facility-training attrition rates were 42% and 17.5% for the older and younger subgroups, respectively. About 25% of the ATCSs of GS–7 level and lower who were over 35 years old were attrited after returning to their home facilities whereas the post-Academy elimination rate of the younger ATCSs having similar pay grades was only 18%. Moreover, several earlier studies[3 7 11 12] had consistently shown chronological age to be inversely related (at highly significant levels) to scores on numerous aptitude tests, various indices of Academy training progress, and ratings of journeyman-level job performance.

As early as 1965, it was the view of at least some FAA officials that a special early-retirement program was needed for controllers and that the recruitment of ATC trainees should be restricted to those qualified applicants who were relatively young. However, such proposed policies ran counter to the CSC regulations pertaining to all federal service employees except those specifically exempted by Congressional legislation. Research concerning age-related effects upon ATC performance was intensified and, in 1972, the cumulative body of findings prompted Congressional legislation authorizing the FAA and CSC to further develop and implement a proposed ATC "Second-Career Program." The Congressional bill, Public Law 92–297, became effective on January 31, 1973, and the new program became operational in April of the same year. Since that time, ATCSs receive credit for 1.4 years of federal service for each year of active control work; the normally prescribed minimum-age requirement of 55 does not apply to control personnel; early retirement is not mandatory but retention as an ATCS requires maintenance of job proficiency, and they are also offered training for other jobs (i.e., "second-career training"). Moreover, as a means of countering aging and "burnout" effects, the FAA has been permitted to establish a screening standard with respect to age.

B. *Current Selection Standards.* When ATC selection procedures were last revised in April 1973, many of the earlier qualification standards were retained. However, two major changes were made: (1) highly specialized experience no longer warrants waiver of the aptitude-screening phase nor appointment to training at any grade higher than GS–7; (2) the maximum age limit for entry into ATC training is 30, regardless of prior experience. Eligibility for training is restricted to those medically certified candidates no older than 30 who, in addition to other qualifications, have demonstrated their aptitude for training and work as ATCSs by scoring at least 210 on the CSC Test Battery. Each examinee's test performance score is converted to a percentile (e.g., a raw score of 210 corresponds to the 70th percentile) which is supplemented by points credited for experience. Experience as a pilot, navigator, flight dispatcher, and/or in other aviation fields continues to be weighted in the selection process, although not as heavily as prior ATC experience. While such procedures may seem reasonable, previous studies,[10 13 14] in which measures of Academy basic-training performance served as criteria, have failed to demonstrate the validity of any type experience other than prior air traffic control.

C. *The Issue of Using Aircraft-Pilot Experience for Selection Purposes.* Unpublished studies in which biographical data were collected and analyzed for large samples of ATCSs recruited during the past 13 years have generally shown that 40% or more were former military controllers and that 40 to 45% of the remaining selectees held aircraft-pilot ratings. As alluded to earlier, the results of several studies[5 7 13 14] have suggested that various types of pre-FAA ATC experience

were primarily beneficial to the ATCSs during the basic-training phase only, whereas all other experience, including aircraft-pilot experience, appeared to be of questionable value at any stage of the training. Yet, little or no information has been gleaned from prior research to indicate whether the pilot-experience standards should be abolished, drastically revised, or modified only slightly.

The validities of aviation-related experience (pilot, navigator, etc.) and also other kinds of experience for prediction of training progress have never been firmly established. Several CAMI studies, though focusing upon other objectives, have included a comparison of the training attrition rates for groups of non-rated subjects and those having pre-FAA ratings as pilots, ATCSs, or communications specialists. However, *amounts* of each type experience were seldom dealt with. Moreover, the results have generally been difficult to interpret due to the presumed (but unassessed) interaction effects of numerous variables. The subjects established their eligibility for training on the basis of various factors and standards and, inasmuch as chronological age was not considered in the screening process until 1973, those with rated experience tended to be somewhat older than the non-rated subjects. Research[4 5 6 7] has consistently shown age to be inversely related to performance on the CSC ATC Test Battery and to measures of training performance. Yet, no studies have been accomplished to determine the extent to which the validities of the different types and amounts of aviation-related experience might vary as a function of the interaction effects of age and aptitude level and also education.

Most of the CAMI studies referred to above involved comparison of Academy-training-performance criterion measures only for subjects having different *types* of experience. In each such investigation, the trainees who held pre-FAA ATC ratings were found to have significantly higher training-course grade averages and/or graduation rates than all other groups, whereas the mean differences between the pilot-rated trainees and the communications-rated and non-rated personnel were usually rather small and not statistically significant.

Such results, however, do not necessarily warrant the conclusion that pilot experience should be completely disregarded in the screening of ATCS applicants. To the contrary, it is possible that the existing standards are merely too liberal. Under current procedures, a total of five points is credited toward the overall eligibility rating of each pilot-rated applicant having 350 or more hours of logged flight time. A cursory review of biographical-questionnaire response data for several hundred pilot-rated ATCS trainees recruited during 1969 revealed that about half of them possessed no more than a private pilot license and 350 to 500 hours of logged flying time, and that less than 30% had 1,000 hours or more.

In preparing for the present study, the authors contacted a number of Academy instructors and other long-tenured ATCS personnel and solicited their opinions regarding the validity of pilot experience for selection purposes. Each was consulted on an individual basis and granted assurance of anonymity. Few expressed satisfaction with the current standards, several stated that pilot experience should not be considered in the selection process unless the applicant held a commercial license with an instrument rating, and some felt that all pilot experience should be disregarded.

Of all the discussants, those who had entered civilian ATCS training shortly after World War II seemed to have the strongest opinions. Many with military service as Airport Tower Operators said that pilot experience has always received unwarranted emphasis; they felt that the selection standards used for several years after 1945 tended to favor the pilot-rated applicants, and that the military controllers frequently represented a minority of the ATCS-trainee recruits because they generally experienced greater difficulty in establishing highly competitive eligibility ratings. However, most of the long-tenured ATCSs who had served as pilots during the war felt that their candidacy for the military pilot-training programs, and commissioned-officer status upon graduation, had been based on exceptionally high qualification standards (e.g., mental abilities and/or education, etc.). Some alleged that the majority of the pilot-rated ATCSs recruited during those years possessed more than 1,000 hours of flying time, usually with a great deal of navigational training and experience, and that the validity of that experience was mani-

fested in the relatively low attrition rates of the pilots for all phases of the controller-training program. Several claimed that the current issue regarding the use of pilot experience as a selection factor would never have arisen "if the standards had remained sufficiently high to preclude the entry of so many 'leisure-time' or 'Sunday' pilots." Unfortunately, we were unable to locate any factual information concerning the backgrounds and training progress of ATCSs recruited during the immediate post-war years. However, it is commonly acknowledged that military pilots with extensive flying experience and navigational knowledge have represented progressively smaller proportions of the pilot-rated personnel selected each year since about 1955.

Skepticism regarding the validity of pilot experience for selection purposes has continued to mount and particularly since publication of the report of the Air Traffic Controller Career Committee in January 1970.[1] The committee stated that no evidence could be found indicating any type of pre-FAA experience other than ATC work to be useful for prediction of FAA ATCS training progress or subsequent job performance. They recommended "elimination of credit for pilot experience" in the selection process. The same recommendation was made in July 1970 by Education and Public Affairs, Incorporated, in a report entitled "A Review and Evaluation of the Present System for Selection of Controllers."[9] However, neither of the two investigative bodies cited any studies other than those by CAMI as a basis for their conclusions and recommendations concerning pilot experience, and those cited studies do not necessarily imply that all such experience should be completely disregarded. None of the studies focused directly upon the issue of pilot experience; none included determination of the attrition-rate probabilities for ATCSs relative to their flying time or types of ratings held (e.g., private license, commercial license, instrument rating, air transport rating, etc.); and the interaction effects of age, aptitude, and education upon the validities of pilot experience and other types of experience have never been assessed and compared. The present study was undertaken to obtain such information and thereby minimize much of the conjecture which would otherwise arise in the formulation of future standards relating to the evaluation of prior experience in the selection of ATCS trainees.

II. Method.

A. *Subjects.* This report pertains to a longitudinal study of 4,092 former students of the Academy's basic training courses in En Route and Terminal procedures. The focus of the study is upon 2,352 subjects who entered the Academy during the calendar year 1969. For comparative purposes, however, several analyses corresponding to those based on the recruits of 1969 were also accomplished on 1,740 ATCS entrants of the time period September 1960 through August 1963.

B. *Biographical Questionnaires.* The study was facilitated by the availability of pre-employment information and other data which had been collected for the two groups of ATCSs in conjunction with previous studies concerning the validity of various aptitude test measures for prediction of training performance. Inasmuch as the procedures and results relating to the different phases of that research have been discussed in detail in a number of earlier publications,[5 6 7] they will not be elaborated upon in this report. However, it should be emphasized that the biographical questionnaire administered to the pre-1964 trainees was slightly different from the corresponding instrument which the ATCS recruits of 1969 were requested to complete. The former was not as refined as the latter; it contained a number of "open-ended" or ambiguously stated questions and consequently we were, in many cases, unable to determine the exact amounts of specific types of aviation-related experience possessed by an ATCS and/or the rating(s), license(s), or certificate(s) he may have held in aviation fields prior to entry into training. While this was particularly true with respect to pilots, navigators, and others, the former military controllers almost invariably cited the length of their ATC service but frequently failed to indicate the type of ATC rating they held, such as IFR (instrument flight rules), VFR (visual flight rules), etc. Nonetheless, the information concerning most experience normally considered in the selection process was generally sufficient to permit us to reliably categorize the entrants of the earlier time period into experimental groups as was done in some of the analyses conducted on the ATCSs of 1969.

Both questionnaires included items pertaining to age at entry into Academy training and level of education. Moreover, the instrument administered to the 2,352 trainees of 1969 resulted in the elicitation of detailed information regarding the types and amounts of aviation experience and also the *ratings* held in aviation-related fields.

C. *Criteria for Validation of Pre-FAA Experience.* Each subject's attrition-retention status for the Academy basic-training phase had been determined in the earlier studies. The second major criterion variable was "post-Academy attrition-retention status" as of January 1, 1973. The latter was determined by collating the names and Social Security numbers of the subjects with those set forth in magnetic tape records of all personnel within the FAA who, at the beginning of 1973, possessed an occupational code of 2152 (denoting the ATCS specialty). Each subject still within the air traffic control system at that time was designated as a "post-Academy retention." The listing of all remaining and attrited cases of the CAMI samples was then compared with the listing of Academy eliminees and each subject who was found to have attrited subsequent to Academy graduation was designated as a "post-Academy attrition."

It was against these criteria that the different types and amounts of experience and also the pre-FAA ratings of the ATCSs of 1969 were validated. As explained earlier, however, most of the analyses concerning the trainees of the earlier time period dealt with types, or categories, of experience and none involved consideration of pre-FAA ratings, licenses, or certificates.

Procedures were also employed to assess the interaction effects of age, aptitude, and education upon the validities of the different types of experience, separately and in combination, for prediction of success in the FAA ATC profession—with success defined as retention within the air traffic control system as of January 1, 1973.

III. Results and Discussion.

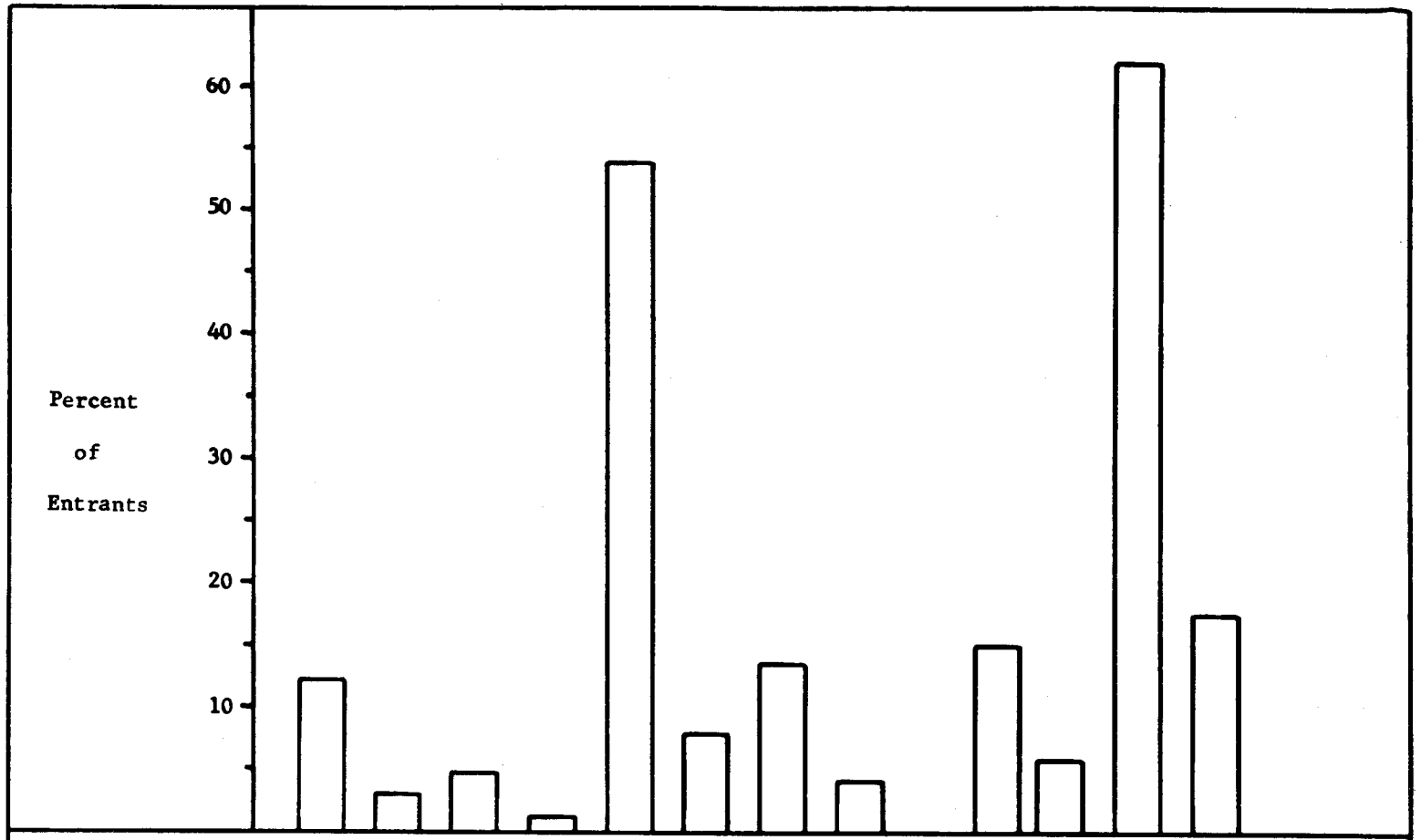
Comparison of ATCS Trainees of 1960–1963 With Those Recruited During 1969

A. *Experience Backgrounds of Pre-1964 Group.* Each of the 1,740 ATCSs of the earlier time period either completed or partially completed a copy of the biographical questionnaire. A large proportion of the group failed to provide information regarding the ratings, licenses, or certificates held prior to entry into FAA ATC training and several subjects (none of whom had previous experience in ATC work) further neglected to indicate the amounts of specific types of prior experience they possessed.

An examination of the response data revealed that all but 70 (4.0%) of the 1,740 claimed prior experience of three months or more as military controllers, civilian or military pilots, or as specialists in communications. (For research purposes, experience of less than three months was disregarded.) Some 24 of the 70 failed to answer those items relating to aviation experience or their replies indicated that they had none or less than three months; only eight of the 24 (33.3%) were still in FAA ATC work on January 1, 1973. Thirty-four of the 70 claimed GCI (Ground Control Intercept) experience and their post-Academy retention rate was 23.5%. The remaining 12, having either navigator or navigator-bombardier experience, included eight who failed basic training and three who attrited after Academy graduation. The 70 had an overall attrition rate of 75.7% for all phases of training and service up to the beginning of 1973. For purposes of the present study, the 70 were therefore treated as a single subgroup, whereas all others were categorized according to the specific area or combination of areas in which they obtained their aviation-related experience (i.e., pilot, ATC, and/or communications).

Figure 1 shows the number of subjects in each of eight mutually exclusive experience categories and also the percentages of the entire sample of 1,740 represented by the various subgroups. As may be noted, 12.0% (N=208) entered with "Pilot Experience Only," 53.7% (N=934) had "ATC Experience Only," and 13.4% (N=234) possessed "Communications Experience Only." The four subgroups, "Pilot With Communications," "Pilot With ATC," "Pilot With Both ATC and Communications," and "ATC With Communications" accounted for percentages of 3.0, 4.8, 1.1, and 8.0, respectively.

Inasmuch as the issue concerning the validity of pilot experience was the prime reason for undertaking the present study, we felt that the most appropriate manner in which the subgroups could be combined was as shown in the right-hand portion of Figure 1. As may be noted, 260



Experience Category	Pilot Exp. Only	Pilot With Comm.	Pilot With ATC	Pilot, ATC & Comm.	ATC Exp. Only	ATC With Comm.	Comm. Exp. Only	No Exp. As ATC, Pilot or In Comm.	Tot. Non-ATC Pilot	Tot. ATC With Pilot	Tot. Non-Pilot ATC	Total All Others	Total Sample
N per Category	208	52	84	19	934	139	234	70	260	103	1073	304	1740
Percent of Total	12.0	3.0	4.8	1.1	53.7	8.0	13.4	4.0	14.9	5.9	61.7	17.5	100.0

FIGURE 1. Percentages of 1,740 entrants into the Academy's En Route and Terminal basic training courses during September 1960 through August 1963 who claimed to possess pre-FAA experience of three months or more as aircraft pilots, in ATC work, and/or in communications and related areas.

(14.9%) of the subjects entered ATCS training as "Non-ATC Pilots," an additional 103 (5.9%) were pilots who also had ATC experience, and 1,073 (61.7%) were categorized as "Non-Pilot ATC." The remaining 304 (17.5%) included the 234 having communications experience only and the 70 who possessed little (i.e., less than three months) or no experience in air traffic control, communications work, or as pilots.

B. *Experience Backgrounds of ATCSs of 1969.* The biographical questionnaire administered to the 2,352 trainees recruited during 1969 was considerably more lengthy, better structured, and more refined than that which the trainees of 1960–1963 were asked to complete. Due to the improved questionnaire and greater care employed in its administration, the information elicited from the ATCSs of 1969 was more easily coded and processed and generally deemed more reliable than that collected on the earlier group.

Only three of the 2,352 ATCS recruits of 1969 failed to complete those items of the questionnaire relating to pre-FAA experience. All but 706 of the 2,349 respondents indicated they held, or had held, *ratings*, *licenses*, or *certificates* as military controllers, civilian or military pilots, and/or as specialists in communications. (See Figure 2.) The remaining 706 represented 30.0% of the 1969 sample. As may be recalled, only 4.0% (N=70) of the 1,740 trainees of September 1960-August 1963 were categorized as having little or no ATC, pilot, or communications experience. The disparity between the two percentages is probably due to a combination of factors and circumstances. As discussed earlier, ATC-aptitude-test-screening procedures were first implemented in July 1962 but, until January 1964, applied to only those applicants unable to qualify on the basis of experience in aviation fields. However, the vast majority of the subjects who successfully established their candidacy on the basis of test scores during the 18-month interim were never selected for training because their competitive (i.e., eligibility) ratings were generally lower than those who qualified on the basis of aviation experience. Screening procedures were progressively modified during the ensuing years, with aviation experience being less heavily weighted in the selection process than during the pre-1964 period. Moreover, a program was well underway in 1969 to rapidly expand the air traffic control system; the recruitment of trainees was accelerated and, although high qualification standards were maintained, competition for the training positions declined. Consequently, increasingly greater numbers of candidates with moderate-to-low eligibility ratings were selected, including many with backgrounds unrelated to aviation.

1. Backgrounds and retention rates of 706 non-rated trainees of 1969. Records of the 706 ATCS trainees of 1969 who held no ratings in ATC, pilot, or communications work were re-examined in order to determine whether any other types of aviation-related experience were sufficiently valid for predictive purposes to warrant establishment of additional categories for inclusion in the numerous analyses scheduled for subsequent phases of the study. As shown in Appendix A, 230 of the 706 had backgrounds *unrelated* to *aviation;* 47.0% of the 230 were still in the air traffic control system as of January 1, 1973.

Also, 237 of the 706 possessed experience in aviation other than in ATC, pilot, and communications fields. Many of the 237 claimed ratings, licenses, or certificates in their respective fields. However, their backgrounds were quite varied. In fact, the 237 were initially sorted into 29 subgroups, the largest of which contained only 30 cases. The 30 claimed prior service as Flight Data Aids; 56.7% (N=17) of the 30 were still in the FAA as ATCSs at the beginning of 1973. An additional 20 of the 237 were reliably categorized as "Navigators or Navigators With Bombardier Experience." Their retention rate was 40.0%. Subgroups having backgrounds in either GCI (ground controlled intercept) or allied fields such as AC&W (aircraft control and warning), etc. were eventually merged. The latter consisted of 108 subjects, 59.3% of whom were "retentions." The remaining 79 of the 237 were categorized as having "Miscellaneous or Other Experience" (e.g., air operations, radar flight following, dispatch work, etc.). Their retention rate was 53.2%.

Some 239 of the 706 claimed limited experience, but no ratings, in ATC, pilot, or communications fields. One hundred ninety-eight of the 239 had backgrounds which seemed to warrant categorization under "Communications." Their retention rate of 52.5% was only one-tenth of one point lower than that obtained for 19 "Non-Rated Pilots," whereas 68.2% of the 22 subjects having non-rated ATC experience were "retentions." However, a comparison of all categories

with respect to retention rates yielded only one statistically significant ($p<.05$) difference; it pertained to the 230 subjects with backgrounds unrelated to aviation and the 108 whom researchers had somewhat reservedly classified under the singular heading "GCI." On the basis of such findings, it was decided that all analyses relating to the ATCS recruits of 1969 should focus upon the 1,643 who entered training with ATC, pilot, and/or communications ratings, and that the 706 should be treated as a single subgroup.

2. Distribution of ratings for ATCSs of 1969. Figure 2 shows the number and proportion of the ATCSs of 1969 classified under each of eight mutually exclusive categories. Three percent (N=71) possessed pilot ratings only, 36.1% (N=849) had ATC ratings only, and 4.0% (N=94) entered with communications ratings only.

Some 458 (19.5%) claimed both pilot and communications ratings, 11 (0.5%) possessed both pilot and ATC ratings, and 81 (3.4%) were pilots who also held both ATC and communications ratings. Seventy-nine non-pilots with both ATC and communications ratings represented 3.4% of the sample. The remaining 709, including three for whom experience was unknown and the 706 non-rated subjects represented 30.1% of the total group.

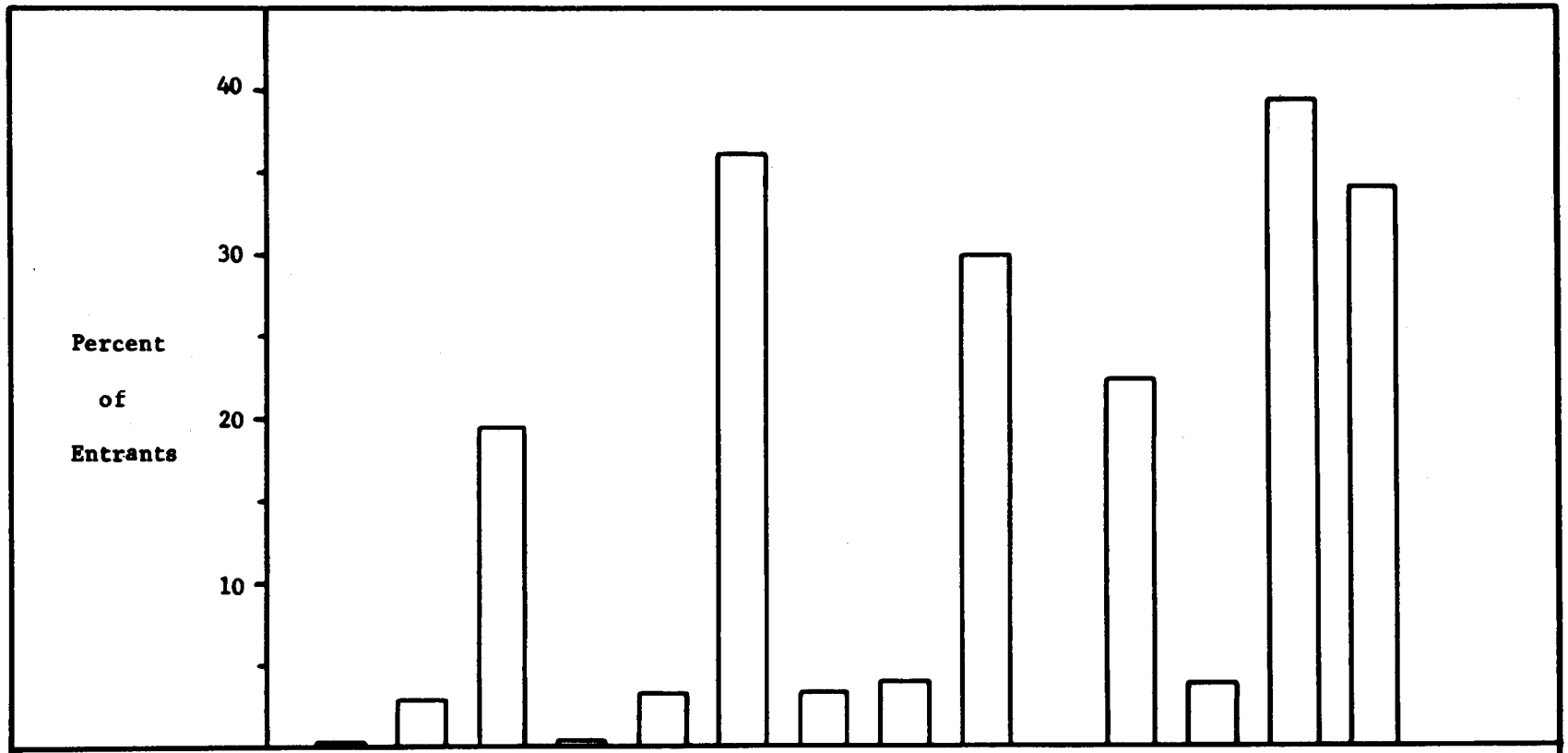
By combining appropriate subgroups, it was determined that 22.5% (N=529) entered as "Non-ATC Pilots" and that 3.9% (N=92) were pilots who possessed ATC ratings—with or without communications ratings. The "Non-Pilot ATC-Rated" subjects, regardless of whether rated in communications, numbered 928 and represented 39.5% of the total group, whereas the remaining 803 having neither pilot nor ATC ratings represented 34.1%.

Difficulties arise in attempting to compare these data with those depicted in Figure 1 for the recruits of 1960–1963. The ATCSs of the earlier time period were categorized according to the areas in which they attained three months or more experience, regardless of whether rated or non-rated. In contrast, the 2,352 ATCSs of 1969 were classified according to the specific *ratings* they held. While 803 of the 2,352 possessed neither pilot nor ATC ratings, the 803 included only 19 non-rated pilots, none of whom claimed any prior ATC experience, and 22 subjects with non-rated control experience but no flying experience. Yet, a review of the data shown in Figures 1 and 2 will clearly reveal that a significantly ($p<.01$) smaller proportion of the recruits of 1969 possessed prior ATC experience than did those of 1960–1963. Compared to the sample of the earlier time period, the 1969 group also included a slightly higher percentage of pilots (rated or non-rated) and, as pointed out earlier, a far greater proportion having no aviation-related experience of any type.

C. *Attrition and Retention Rates by Experience Category for ATCSs of 1960–1963.* Figure 3 shows the number and proportion of ATCSs in each experience category who failed to successfully complete the Academy basic-training phase, those who passed Academy training but left the air traffic control system before January 1, 1973, and those still working in the ATCS specialty at the beginning of 1973.

Looking first at the Academy elimination rates, it should be noted that the highest, which was 60.0%, pertained to the 70 subjects who had no ATC, pilot, or communications experience. Next highest was 51.9% obtained for the 52 ATCSs who claimed both pilot and communications experience, whereas the corresponding rates for the 208 categorized under "Pilot Experience Only" and the 234 designated as "Communications Only" were 48.1 and 48.3%, respectively. None of the differences between these four highest-ranked rates was statistically significant.

Appreciably lower Academy attrition rates were obtained for the four remaining subgroups, each of which was comprised of subjects having prior control experience, either solely or in combination with pilot and/or communications experience. Rates for three of the four differed significantly ($p<.05$) from those of the four subgroups devoid of ATC experience. The exception pertained to the 19 pilots who also claimed both ATC and communications experience; six of the 19, or 31.6%, failed to complete their basic training course. The 139 subjects designated as having "ATC With Communications Experience" and the 84 classified as "Pilots With ATC Experience" had Academy elimination rates of 27.3% and 19.0%, respectively. The largest of the eight subgroups, which was comprised of 934 subjects who possessed ATC experience only, had the distinction of having an exceptionally low attrition rate of only 14.2%. These results infer that all types of experience other than ATC work were of little value to the ATCSs during the basic-training phase.



Experience Category	Experi. Unknown	Pilot Lic. Only	Pilot With Comm.	Pilot With ATC	Pilot, ATC & Comm.	ATC Rtg. Only	ATC With Comm.	Comm. Rtg. Only	No Rtg. As ATC, Pilot or In Comm.	Tot. Non-ATC Pilot	Tot. ATC With Pilot	Tot. Non-Pilot ATC	Total All Others	Total Sample
N per Category	3	71	458	11	81	849	79	94	706	529	92	928	803	2352
Percent of Total	0.1	3.0	19.5	0.5	3.4	36.1	3.4	4.0	30.0	22.5	3.9	39.5	34.1	100.0

FIGURE 2. Percentages of 2,352 entrants into the Academy's ATCS basic training courses during 1969 who, upon entry, claimed to hold certificates or ratings as aircraft pilots, in ATC work, and/or in communications and related areas.

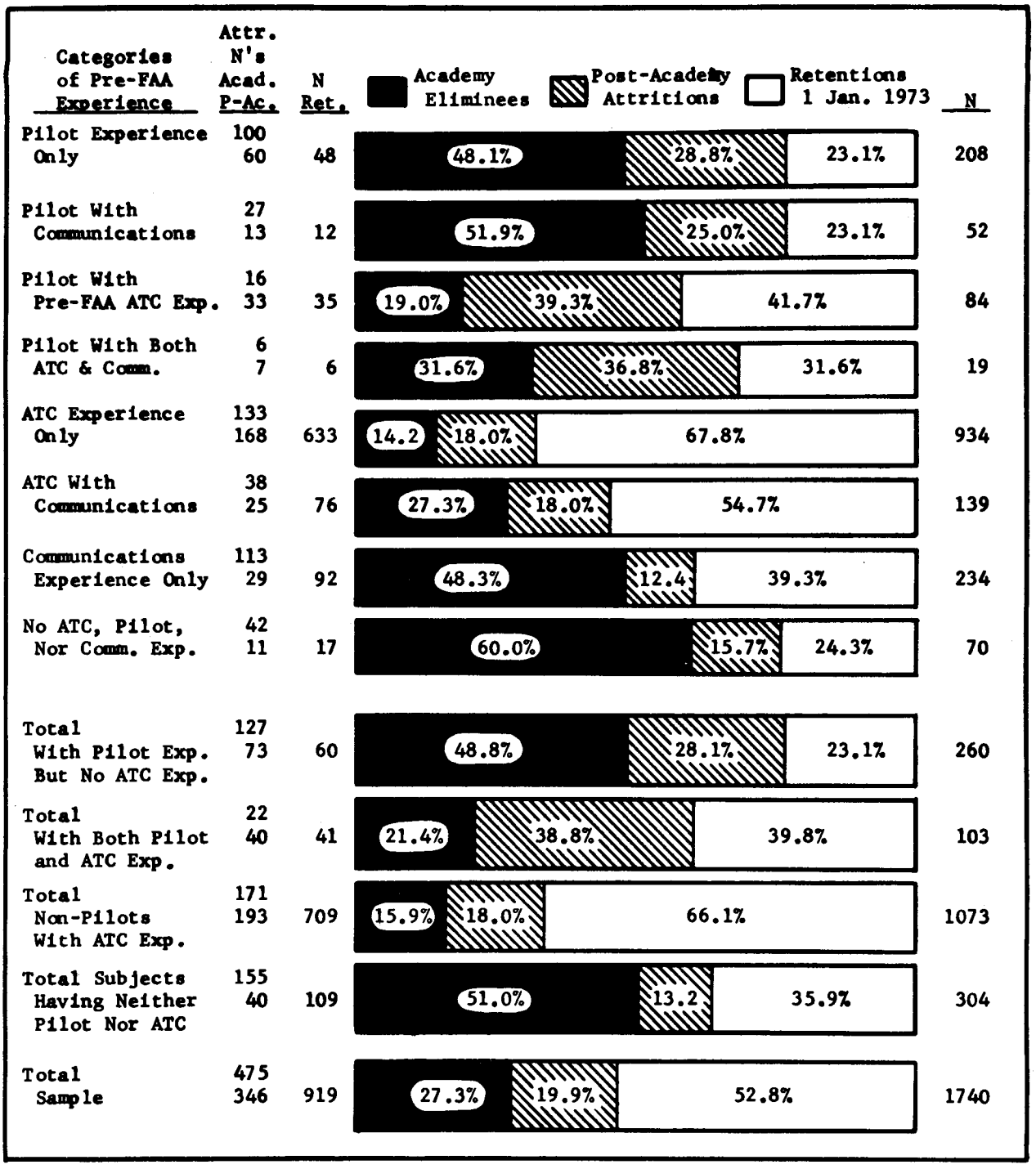


FIGURE 3. Attrition and retention rates by pre-FAA experience category for 1,740 entrants into the Academy's En Route and Terminal basic training courses during September 1960 through August 1963.

Nonetheless, in order to more clearly resolve the issue concerning the pilot-experience selection standards, the differentially experienced subgroups were combined (in the same manner as previously described in connection with Figure 1) to permit comparison of the attrition rates for pilot and non-pilot personnel having no ATC experience vs. those having three months or more. Results of the summary analysis, in which communications experience was entirely disregarded, appear in the lower portion of Figure 3. Two hundred sixty of the 1,740 (14.9%) possessed pilot experience but no ATC experience; their Academy attrition rate was 48.8%, not significantly different from the 51.0% pertaining to the 304 subjects who had neither pilot nor ATC experience. However, significantly lower ($p<.01$) Academy elimination rates were obtained for the two remaining subgroups. Only 21.4% of the 103 trainees having both ATC and pilot experience failed to graduate from the Academy's basic-training phase and the non-graduates represented only 15.9% of the 1,073 who were "Non-Pilots With ATC Experience."

It should be emphasized that the post-Academy attrition and retention rates appearing throughout this report were invariably computed on the basis of *entrants* into Academy training. Analyses were also accomplished which involved comparison of the subgroups relative to the post-Academy attrition and retention rates of the *Academy graduates only*. However, results stemming from the latter and also those of many other analyses conducted during the course of the investigation are not presented here in order to limit the length of this report. For the same reason, we have omitted discussion of differences between the subgroups with respect to the (presented) post-Academy attrition rates based on numbers entering training. Instead, most of the analyses selected for discussion concern the Academy elimination rates and/or post-Academy retention rates of the entrants. (Inasmuch as the post-Academy retention rate of each subgroup was complementary to the combined Academy-elimination and post-Academy attrition rates, there was no need to compare the subgroups with respect to all three rates.)

As shown in Figure 3, the post-Academy retention rates of the differentially experienced subgroups of the 1960–1963 sample ranged from 23.1% to 67.8%. The rate of 23.1% for the 208 subjects having pilot experience only was identical to that established for the 52 pilots who also claimed communications experience of three or more months. A highly comparable retention rate of 24.3% was obtained for the 70 non-pilots who had neither ATC nor communications experience. Four of the five remaining subgroups had significantly higher ($p<.05$) retention rates. The exception pertained to the relatively small number of subjects ($N=19$) who indicated they possessed pilot experience in combination with both ATC and communications; their retention rate was 31.6%. Appreciably higher than the latter were the rates of 39.3 and 41.7% obtained for the 234 having communications experience only and the 84 categorized as "Pilots With Pre-FAA ATC Experience." Significantly different ($p<.05$) from the 39.3%, but not the 41.7, was the retention rate of 54.7% for the 139 who claimed both ATC and communications experience. However, some 67.8% of the 934 who indicated they had ATC experience only were still in the ATC system at the beginning of 1973; all differences between their retention rate and those of other subgroups proved statistically significant at the .01 level of probability.

When communications experience was disregarded, it was determined that 260 of the 1,740 recruits of 1960–1963 were non-ATC pilots. (Data relating to these and other combined subgroups appear in the lower portion of Figure 3.) The retention rate for the 260 was 23.1%, significantly below the rate of 35.9% established for the 304 who had neither pilot nor ATC experience. (As may be recalled, 234 of the 304 possessed communications experience only.) The next highest rate, though not significantly different from the 35.9%, was 39.8%; it pertained to the 103 ATCSs who claimed both pilot and ATC experience. In contrast, 66.1% of the 1,073 non-pilot subjects who indicated they had three or more months of ATC experience were still in the FAA control system on January 1, 1973. The significantly higher ($p<.01$) retention rate of the latter suggests that the ATCS selection process should continue to include consideration of each applicant's prior ATC experience. However, there is no evidence to support the traditional belief that pilot experience is valid for prediction of success in the profession.

D. *Attrition and Retention Rates by Experience Category for 2,352 ATCSs of 1969.* Figure 4, the format of which corresponds to that of Figure 3, presents attrition and retention data for the entrants into ATCS training during 1969. However, it should be re-emphasized that we were unable to employ the same criteria in dividing the two samples into experience subgroups. Unlike the subjects comprising the earlier sample, those of 1969 were categorized on the basis of *ratings* or *licenses* they held at time of entry into FAA training as aircraft pilots and/or in ATC work or communications. A meaningful comparison of the results depicted by the two figures is also thwarted by implications arising from differences between the screening-and-selection standards in effect during the widely separated time periods. For example, the screening of medically qualified applicants for ATCS training prior to 1964 focused upon assessments of ATC-related experience, whereas the majority of the ATCSs of 1969 were selected from candidates who, aside from experience qualifications, had been screened with the CSC ATC Aptitude Test Battery. Moreover, it is doubtful that such a time lapse failed to be accompanied by changes in either the training-performance evaluation criteria or the post-Academy retention standards.

In examining the Academy attrition rates shown in Figure 4 for the ATCSs of 1969, it should be noted that, exclusive of the rate pertaining to the three subjects from whom no background information was collected, the highest rate was 29.6% for the 71 who entered with pilot ratings only. Highly comparable rates of 28.7 and 28.2%, respectively, were obtained for the 94 having communications ratings only and the 706 non-rated subjects. (As may be recalled, 239 of the 706 claimed limited experience, but no ratings, in the ATC, pilot, and communications fields; and, the 239 included only 19 non-rated pilots and only 22 having non-rated ATC experience.) Some 23.8% of the 458 having both pilot and communications ratings failed to complete the basic training phase. All differences between the rates of the four subgroups just mentioned were statistically insignificant.

Inasmuch as there were only 11 pilots who also claimed ATC ratings, their Academy attrition rate of 18.2% could not be reliably compared with that of any other subgroup. However, the elimination rates of the three remaining subgroups, comprised of subjects having ATC ratings only or in combination with pilot and/or communications ratings, were even lower and, in every instance, proved to be significantly ($p<.05$) different from each of the four highest-ranked rates cited above. Of 849 subjects who entered with ATC ratings only, 13.6% failed to graduate from basic training and the same was true with respect to 12.7% of the 79 who possessed both ATC and communications ratings. Although not significantly different from either of the latter, the Academy attrition rate for the 81 subjects rated in all three of the basic aviation-related areas was only 8.6%.

The lower portion of Figure 4 presents the results of the summary analysis in which the 1969 sample was divided into only four experience subgroups: "Rated Pilots With No ATC Ratings," "Rated Pilots With ATC Ratings," "Non-Pilots With ATC Ratings," and "Subjects With No ATC Or Pilot Rating." (As explained earlier, communications experience was purposely disregarded.) The Academy elimination rate for the 529 pilots who had no ATC ratings was 24.6%, only slightly (insignificantly) lower than the percentage of 28.4 pertaining to the 803 subjects devoid of both pilot and ATC ratings. However, contrastingly lower ($p<.01$) Academy attrition rates were obtained for the two remaining subgroups. Of the 928 non-pilot subjects who held ATC ratings, 13.5% failed to successfully complete basic training and the corresponding attrition rate for the 92 having both pilot and ATC ratings was only 9.8%.

The Academy attrition rates of the differentially experienced subgroups of 1969 follow a pattern highly similar to that reflected in Figure 3 for the ATCSs of 1960–1963. The results suggest that all types of experience other than ATC work were of little value to the subjects during basic training. Although not shown in any table or figure of this report, an Academy attrition rate of 13.1% was obtained for the 1,020 ATCSs of 1969 who held ATC ratings solely or in combination with pilot and/or communications ratings. The corresponding rate for all remaining (1,332) ATCSs of 1969 was 26.9%, *more than twice that of the 1,020.* When the 1960–1963 sample was dichotomized on the same basis, it was determined that 16.4% of the 1,176 having ATC experience

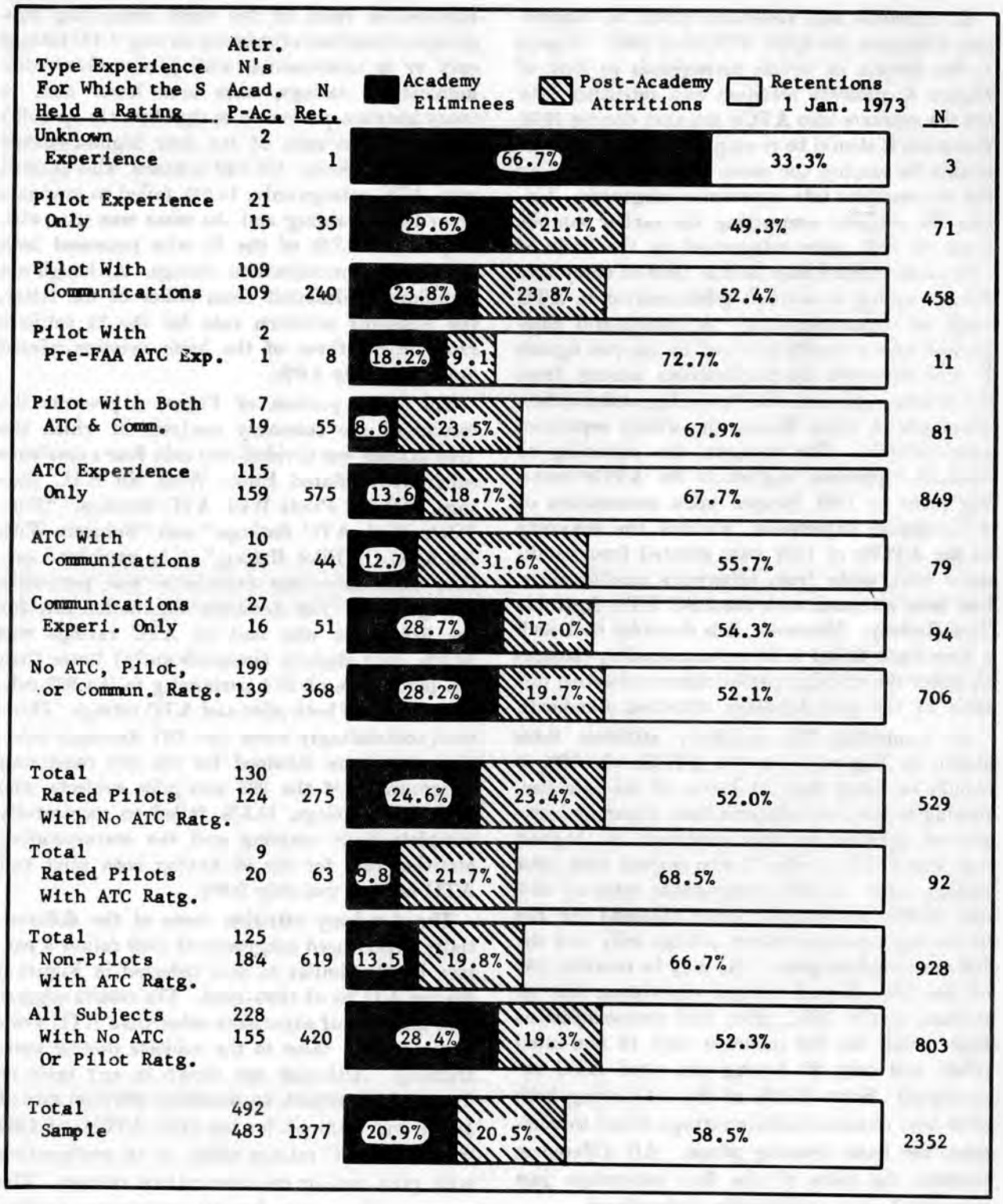


FIGURE 4. Attrition and retention rates by pre-FAA experience category for 2,352 entrants into the Academy's En Route and Terminal basic training courses during 1969.

failed to graduate, whereas the Academy attrition rate for the 564 having no such experience was 50.0%—*over three times that of the former.*

In comparing the post-Academy *retention* rates of the ATCSs of 1969 by rated-experience category (see Figure 4), all differences between the four subgroups having no ATC ratings were found to be relatively small and nonsignificant. The retention rates of the four subgroups ranged from 49.3% (for the 71 rated as pilots only) to 54.3% (for the 94 rated in communications only). Although comparable with each of the latter, the rate of 55.7% for the 79 who held both ATC and communications ratings differed significantly from the retention rate of 67.7% obtained for the 849 who held ATC ratings only. Moreover, 67.9% of the 81 ATCSs who entered training with ratings in all three of the basic aviation-related areas were still in the ATC system at the beginning of 1973 and the same was true with respect to 72.7% of the relatively small number of ATCSs (N=11) having both pilot and ATC ratings.

When the two subgroups of pilots having no ATC ratings were merged, it was determined that only 52.0% of the 529 were still in ATC work on January 1, 1973. Their retention rate was lower, though negligibly lower, than the 52.3% obtained for the combined subgroups of ATCSs (N=803) having neither pilot nor ATC ratings. However, the 928 "Non-Pilots With ATC Ratings" and the 92 "Pilots With ATC Ratings" had significantly higher retention rates of 66.7 and 68.5%, respectively.

On the basis of the entire body of results depicted in Figures 3 and 4 (and Appendix A), for analyses involving a total of over 4,000 subjects, there seems to be little doubt that prior ATC work is the only type of pre-FAA aviation-related experience having validity for prediction of success in the ATCS profession. The subjects having pilot experience, solely or in combination with communications experience, and also those with communications experience only, tended to have relatively low retention rates, frequently lower and seldom appreciably higher than those having no aviation-related experience or ratings. Certain findings admittedly infer a modicum of validity for pilot and/or communications experience, but only for those ATCSs who also possessed ATC experience.

However, all analyses discussed thus far pertained to types, rather than amounts, of prior aviation-related experience. While the obtained results clearly demonstrate that the selection process should continue to include consideration of an applicant's prior ATC experience, they do not necessarily attest to the appropriateness of past policies under which specified credit points (i.e., eligibility points) have been awarded for the first six months of ATC experience, additional points for the next six months, and so forth, up to and including three years, and sometimes three and one-half years, of experience. Additional analyses were therefore undertaken to determine the relevancy of amounts of ATC experience to probabilities of attrition or retention in the ATCS profession.

E. *Amounts of ATC Experience, Age, and Attrition-Retention Rates of Non-Pilots.* Previous CAMI studies[3 5 11 12] have consistently shown chronological age at time of entry to be inversely related (at highly significant levels) to various indices of ATC training performance and ratings of journeyman-level job performance. In view of the previous findings and the concomitancy of aging in the attainment of pre-entry ATC experience, it was decided that the attrition-retention rates of the subjects involved in the present study should be examined relative to entry age as well as level of prior experience.

Figure 5 shows the attrition and retention rates by age and level of experience for the 1,073 non-pilot ATCSs of 1960–1963 who claimed three or more months of pre-FAA ATC work. Even the most cursory review of the Academy elimination rates will reveal that those of the subjects in the age categories "36–40" and "41 and older" (i.e., rates of 59.1% and 41.7%, respectively) are about three times greater than obtained for either of the two younger subgroups. Also, the post-Academy attrition rates of the older subjects exceeded that of the youngest subgroup. (Such results are in general agreement with the findings of the earlier studies on aging effects.[5 10 11 12 14]) However, the vast majority of the 1,073 ATCSs were younger than 36. Sixty-nine were 31 to 35 years old and 934 (87%) were 30 or younger. The data for the 934 warrant special attention because eligibility for ATCS training has been restricted, since April of 1973, to qualified appli-

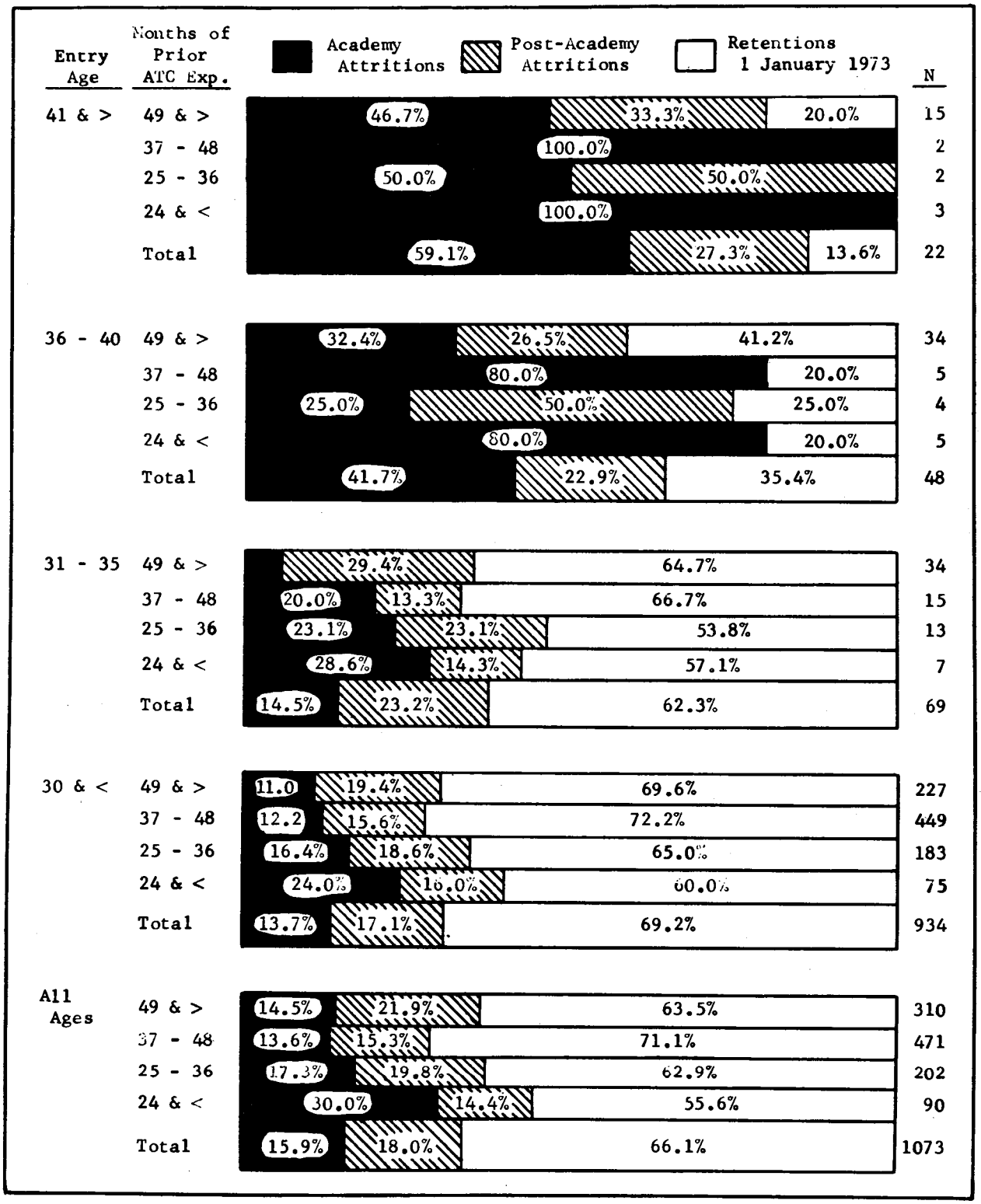


FIGURE 5. Attrition and retention rates by age and months of prior ATC experience for 1,073 personnel who entered FAA ATCS training during September 1960 through August 1963 with pre-FAA experience in ATC work but not licensed as aircraft pilots.

cants no older than 30. Although not specifically indicated, the 934 include 128, or over 75%, of the 171 among the 1,073 who failed to successfully complete Academy basic training. Yet, the 128 represented only 13.7% of the 934; their failure rate was slightly lower than the 14.5% rate obtained for the 69 subjects with ages ranging from 31 to 35.

Academy attrition rates were also inversely related to level, or amount, of pre-entry ATC experience but to a much lesser extent than chronological age. Moreover, the data suggest that the benefits associative with increasingly greater amounts of experience tended to be overridden by adverse aging effects, beginning at about age 36. For the ATCSs of age 30 and younger, the Academy attrition rates ranged progressively upward from 11.0% for the 227 having ATC experience of 49 months or more to 24.0% for the 75 claiming 24 months or less. Corresponding rates for the 69 ATCSs aged 31 to 35 followed a similar pattern, ranging from 5.9% to 28.6%. For the remaining and older subgroups, the Academy elimination rates are contrastingly higher and reflect no relationship to level of ATC experience.

The post-Academy *retention* rates shown in Figure 5 for the 1,073 ATC-experienced recruits of 1960–1963 provide little insight regarding the possible influence of age or prior ATC experience upon success in the profession (with success defined as retention) because the rates were computed on the basis of Academy *entrants*, rather than graduates. Although not shown, retention rates were also calculated for the Academy *graduates* only. The resulting percentages, proceeding from the oldest to the youngest of the subgroups, were 33.3, 60.7, 72.9, and 80.1. While these data attest to aging effects beyond the basic training phase, and particularly for subjects over 40 years old, such effects are not nearly as pronounced as those which occurred during basic training.

Moreover, there appeared to be no trend or pattern in the retention rates of the differentially aged Academy *graduates* with respect to level of prior ATC experience. For example, the retention rates of personnel of age 30 and younger who successfully completed basic training were: 78.9% for those having previous ATC experience of 24 months or less; 77.8 for those with 25 to 36 months; 82.2 for the next most experienced subgroup; and 78.2% for those claiming more than 48 months. The rates of corresponding subgroups of other age categories fluctuated in much the same manner, providing *no evidence of any relationship whatsoever between level of prior ATC experience and success beyond Academy basic training.* Even the most highly experienced of the older subjects had unusually high Academy-attrition rates.

Figure 6 presents the attrition and retention rates by age and level of ATC experience for the 928 non-pilot ATCSs of 1969 who held ATC ratings at time of entry into training. The results comprise a body of findings similar in many respects to those obtained in the corresponding analysis (discussed immediately above) for the 1,073 non-pilot ATC-experienced personnel recruited during 1960–1963. However, the age effects pertaining to the ATCSs of the more recent time period are even more pronounced than those obtained for the former. In examining the Academy attrition rates of these subjects by age category, and irrespective of experience level, it should be noted that the lowest of the rates pertained to the 715 of age 30 and younger. Progressively higher rates of 21.5, 27.6, and 43.2% were obtained for the subjects of the age categories 31–35, 36–40, and 41 and older. The disparity between the attrition rates of the 715 youngest ATCSs and those 31 to 35 years old (i.e., 9.1% vs. 21.5%) was unexpected in view of the previous finding of highly comparable rates of 13.7 and 14.5% for the two youngest subgroups of the 1960–1963 sample. The subgroup of 715 ATCSs of age 30 and younger represented 77% of the 928 non-pilot ATC-rated personnel recruited during 1969 and included 65 (52%) of the 125 Academy attritions among the 928. Yet, the 65 represented only 9.1% of the 715, whereas the Academy attrition rate (not shown) for the remaining 213 subjects of age 31 and older was 28.2%. *These data impressively support the FAA's current policy of selecting all ATCS trainees from qualified applicants no older than 30.*

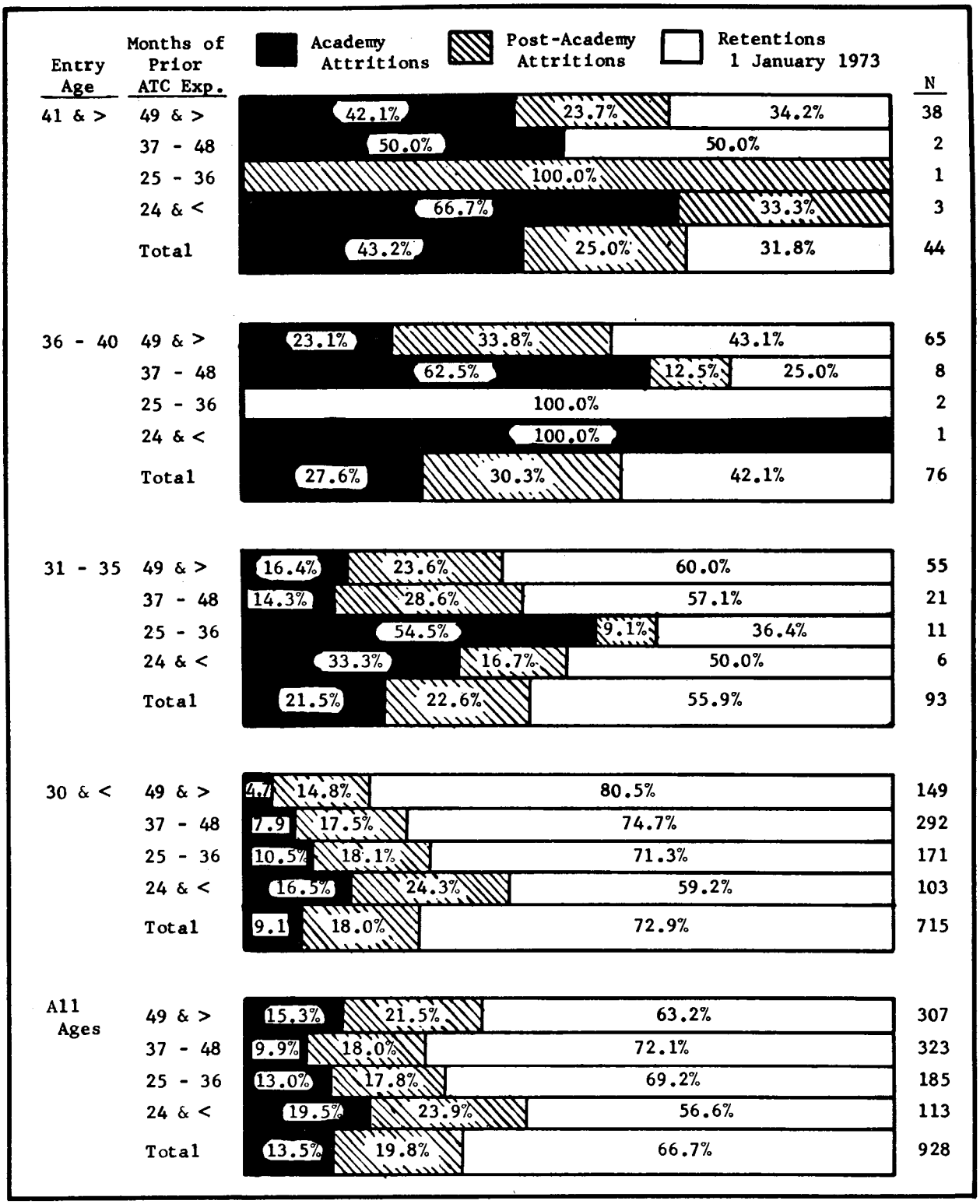


FIGURE 6. Attrition and retention rates by age and months of prior ATC experience for 928 personnel who entered FAA ATCS training during 1969 with pre-FAA rating(s) in ATC work but not licensed as aircraft pilots.

Figure 6 reflects little or no relationship between the Academy elimination rates and amounts of prior experience claimed by the ATC-rated subjects of ages 41 and older, 36 to 40, or 31 to 35. However, the rates of the 715 youngest ATCSs of 1969 follow a pattern similar to that obtained for the youngest and comparably experienced subgroup of the 1960–1963 sample. Only 103 of the 715 indicated they had ATC experience of 24 months or less; 16.5% of the 103 failed to successfully complete their basic training. Progressively lower rates of 10.5, 7.9, and 4.7% were obtained for the subjects claiming 25 to 36, 37 to 48, and 49 months of more of prior control experience. Inasmuch as relatively few of the ATCSs of age 31 to 35 possessed ATC experience of less than 25 months or 25 to 36 months, their Academy attrition rates of 33.3% and 54.5% cannot be considered reliable, nor can they be meaningfully compared with the rates of 14.3 and 16.4% for ATCSs of the same age category having experience of 37 to 48 months and 49 months and more. Consequently, the data preclude confirmation of the hypothesis, based on findings with the input of 1960–1963, that the value of prior ATC experience to the ATCSs during basic training tends to be overriden by aging effects beginning at about age 36. There seems to be little doubt, however, that such experience is of value to the younger ATCSs, at least those no older than 30, during basic training.

The post-Academy *retention* rates shown in Figure 6 for the 928 ATC-experienced recruits of 1969 pertain to Academy *entrants*. Although not shown, the retention rates for the Academy *graduates*, irrespective of experience level, were: 80.2% for the youngest and largest subgroup, 71.2% for the age subgroup 31–35, 58.2% for those 36 to 40, and 56.0% for the ATCSs aged 41 and older. As may be recalled, corresponding rates for the ATC-experienced graduates of 1960–1963, proceeding from the youngest to the oldest subgroup, were 80.1, 72.9, 60.7, and 33.3%. Both sets of *data attest to aging effects beyond the basic-training phase.* For one sample, the rates suggest that the onset of greatest difficulty in the post-Academy phase occurs at about age 36, whereas those based on the other sample infer that aging effects are apt to be rather minimal for all ATCSs under 30. Such an issue, however, is of little importance because: (1) the ATC-experienced subjects of age 30 and younger in the two samples had almost identical post-Academy retention rates (80.2% and 80.1%) and (2) candidacy for ATCS training has, since April 1973, been restricted to personnel no older than 30.

With the exception of the subjects of age 30 and younger, there appeared to be no relationship between amount of prior ATC experience and probability of retention. This was true with respect to the retention rates based on Academy graduates as well as those depicted in Figure 6 for entrants. Some 650 (90.9%) of the 715 youngest ATC-rated subjects of 1969 successfully completed basic training; 80.2% (N=512) of the 650 Academy graduates were still in FAA control work at the beginning of 1973 but their retention rates varied in accordance with amount of prior ATC experience. The retention rate for 86 with only 25 months of experience was 70.9%, compared to 79.7, 81.0, and 84.5%, respectively, for those having 25–36 (N=153), 37–48 (N=269), and 49 or more months (N=142). The retention rates for the differentially experienced ATC-rated Academy graduates of the other age categories were generally much lower and appeared to vary randomly with respect to ATC experience level, as did those of all age subgroups in the 1960–1963 sample.

The major findings stemming from all of the previously discussed analyses for the non-pilot ATC-rated subjects of both the 1960–1963 and 1969 samples were: (1) the attrition-retention rates for both the basic-training and post-Academy phases were in no way associated with the amount of prior ATC experience for the subgroups 36 and older, (2) questionable, or negligible, relationships between the Academy pass-fail criterion and experience for the subjects of age 31 to 35, and (3) the experience claimed by ATCSs no older than 30 was significantly related to Academy graduation rates and, for the input of the more recent time period only, was also slightly related to post-Academy retention probability. The older subjects within comparably experienced subgroups almost invariably had higher attrition rates than their younger colleagues, illustrating the dominant influence of age. Nonetheless, inasmuch as eligibility standards have been revised to preclude the candidacy of personnel over 30 years of age, the findings discussed above attest to the appropriateness of selecting as many ATCS trainees as possible from

among the aptitude-screened and medically-qualified applicants having the greater amounts of prior ATC experience, particularly those having more than two years.

F. *Amounts of ATC Experience, Age, and Attrition-Retention Rates of Pilots.* As may be recalled from Figures 3 and 4, the pilot and non-pilot subgroups having ATC experience were generally somewhat similar with respect to their attrition-retention rates, whereas the rates of those having pilot experience only were contrastingly different from each of the former, and more comparable with those having neither pilot nor ATC experience. Moreover, the subsequent analyses (Figures 5 and 6) relating to the non-pilot ATC-experienced subjects (only) revealed that the probabilities of training success for the younger subjects, and particularly those under 31 years of age, tended to progressively increase in accordance with level of prior ATC experience. We therefore expected to find similar relationships between the criteria and amounts of ATC experience claimed by the pilot-rated ATCSs recruited during either of the two time periods. That hypothesis is supported by the results shown in Figure 7 for the 103 ATC-experienced pilots of the 1960–1963 sample and to a much lesser extent by those depicted in Figure 8 for the 92 ATCSs of 1969 who held both pilot and ATC ratings.

The subgroup of 103 recruited during 1960–1963 included 48 subjects of age 30 and younger, 31 of whom possessed ATC experience in excess of three years. None of the 31 were attrited during basic training, whereas the Academy elimination rates were 27.3% and 16.7%, respectively, for the 11 claimants of ATC experience ranging from 25 to 36 months and the six who indicated they had 24 months or less. Only eight of the 103 were 31 to 35 years old; only one of the eight failed to successfully complete Academy training, but that failing subject was one of the four who claimed less than 25 months of pre-FAA control work. Fifty-seven of the 103 pilots were over 35 years old *and/or* possessed no more than two years ATC experience. Although not specifically shown in the figure, 33.3% (N=19) of the 57 were attrited at the Academy and 50.0% (N=19) of the 38 who passed basic training were still in FAA ATC work at the beginning of 1973. In contrast, only 6.5% (N=3) of the 46 pilot-rated ATCSs of age 35 and younger having more than two years of prior ATC experience were Academy attritions and 55.8% of the 43 who graduated were "retentions" as of January 1, 1973.

Sixty-four of the 92 ATCSs of 1969 who claimed both pilot and ATC ratings entered training when no older than 30 and the ages of an additional ten ranged from 31 to 35. Only nine of the 92 were attrited during Academy training; just four of the nine were among the 64 youngest ATCSs and none were among those aged 31 to 35. The small number of non-graduates precludes a meaningful comparison of the Academy elimination rates of the subjects by age level. Much the same is true with respect to the post-Academy attrition and retention rates, regardless of whether based on Academy entrants or graduates. Twenty (21.7%) of the 92 were post-Academy attritions. Two of the seven *retentions* among the 13 graduates of age 36 and older entered with ATC experience of 24 months or less and one claimed experience in excess of four years. Although not reflected in Figure 8, the overall retention rate for the 70 Academy graduates of age 35 and younger was 80.0%; their retention rates by experience level, proceeding from the lower to higher experience categories, were 76.5, 64.3, 87.0, and 87.5%.

These findings, others which may be ferreted from the data presented in Figure 8, and the results discussed above for the 103 ATC-experienced pilots recruited during 1960–1963 illustrate that the probabilities of success in the ATCS profession for pilot-rated personnel are far more related to entry age than level of prior ATC experience. Beginning at about age 36, aging effects (negative in nature) tend to grossly outweigh the benefits of previous control work. The retention rates of the younger pilots tend to vary in accordance with level of ATC experience in much the same manner as those previously discussed for the non-pilot subjects. In other words, the obtained results provide little or no support for the theory that the beneficial effects of ATC experience are generally greater for pilot-rated ATCSs than non-pilot personnel. However, inasmuch as the study did not include the collection of job performance ratings, we may only speculate as to whether such a theory has substance insofar as it applies to level of controller proficiency.

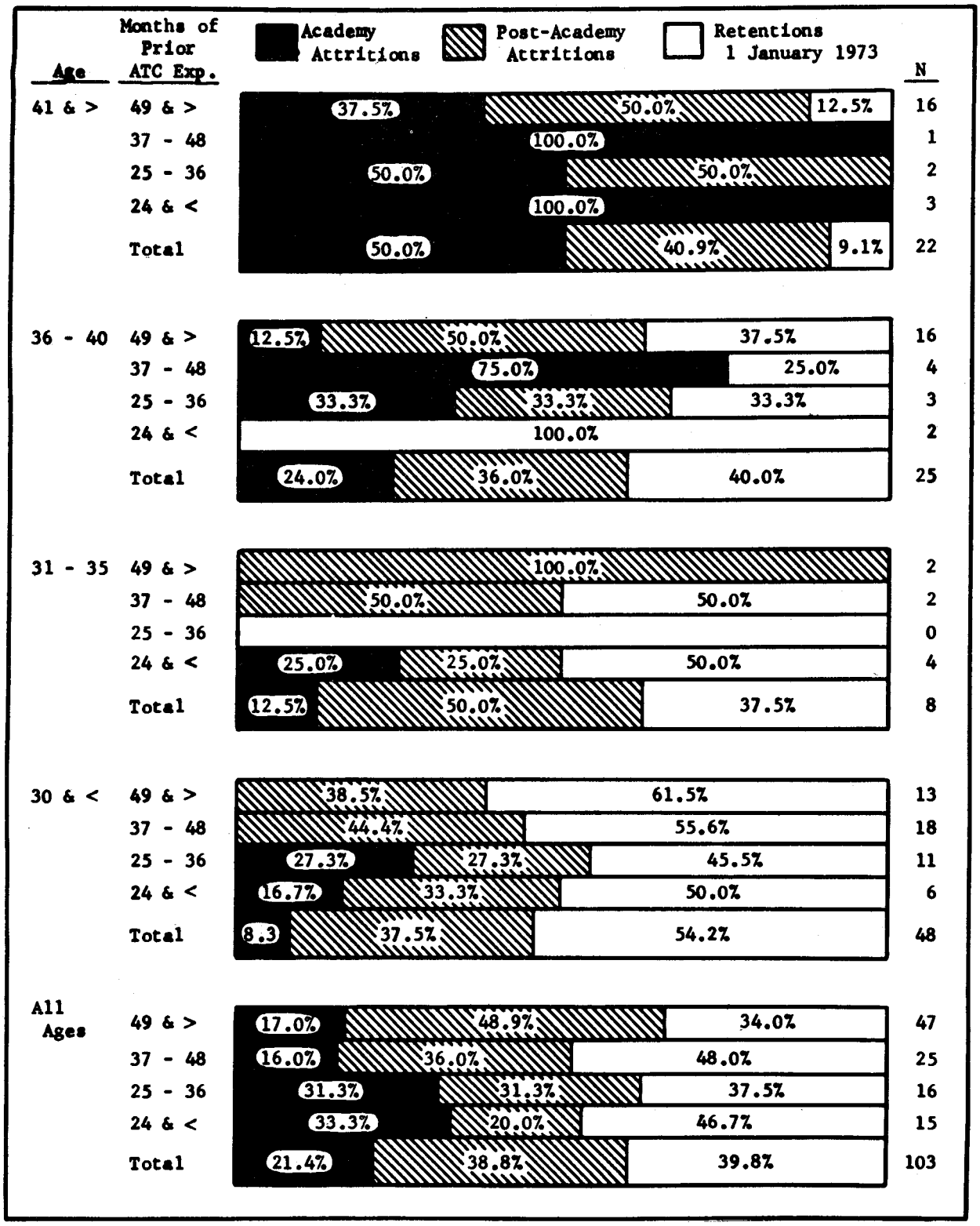


FIGURE 7. Attrition and retention rates by age and months of prior ATC experience for 103 personnel who entered FAA ATCS training during September 1960 through August 1963 with pre-FAA experience in ATC work and as licensed aircraft pilots.

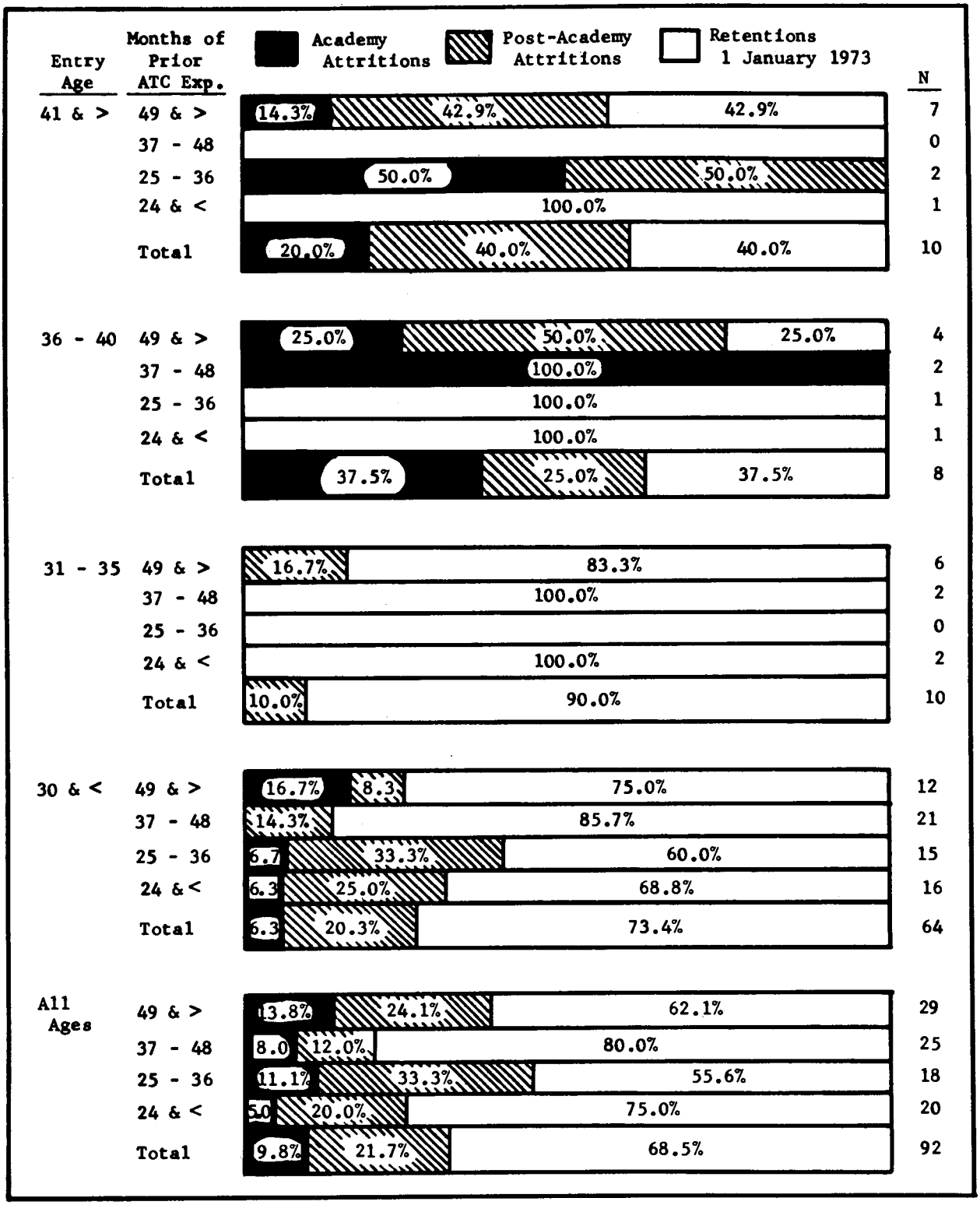


FIGURE 8. Attrition and retention rates by age and months of prior ATC experience for 92 personnel who entered FAA ATCS training during 1969 as licensed aircraft pilots also holding pre-FAA rating(s) in ATC work.

Other Findings Relating to the ATCSs Recruited During 1969

A number of other analyses were conducted on the 1969 sample in order to obtain additional information bearing upon the possible improvement of selection procedures. Many of the current (1974) selection standards are much the same as those in effect during 1969 but appreciably different from those in operational use prior to 1964. For that reason primarily, none of the analyses discussed in subsequent sections of this report were replicated with the 1960–1963 sample. Moreover, data of the type which would have been needed for some of the analyses were simply not available for the ATCSs of the earlier time period.

A. *Level of Pilot Experience and ATCS Attrition-Retention Probability.* As mentioned in the introductory section of this report, several pilot-rated instructors of the Academy's basic ATC training courses and also long-tenured ATCSs with pilot licenses expressed the view that the issue concerning the validity of pilot experience had resulted from "liberal" evaluation standards. They were generally unapproving of policies under which the applicants with a private pilot license and only 350 hours of logged flying time have been awarded credit points (toward the overall eligibility rating) for that experience and/or, at various times in the past, been declared qualified on the ATC Aptitude Test Screening Battery with scores lower than prescribed as minimally passing for applicants having no aviation-related experience. Many of the discussants suggested that the pilot-experience evaluation procedures should be revised to include greater consideration of type, or level, of pilot rating and also amount of logged flying time in excess of 500 hours. The cogency of their arguments prompted us to undertake several additional analyses, the first of which is depicted in Figure 9.

In this analysis, the 529 pilot-rated subjects who entered training with no prior ATC experience were initially categorized on the basis of types of pilot licenses they held. The lowest of the five categories was "Private Pilot License With No Instrument Rating"; the highest was "Air Transport Rating." Next, Secondary categories were established indicating logged flying time of "349 hours or less," "350 to 999," and "1,000 hours or more."

The highest of the Academy attrition rates for the subjects of any major category, irrespective of flying time, was 31.9%. It pertained to the 141 subjects holding Private Licenses but no instrument ratings. However, 13 ATR pilots had a comparable overall Academy elimination rate of 30.8%, whereas the corresponding rates for the three remaining and intermediate-ranked categories ranged from 11.1 to 28.6%. In other words, the basic-training attrition rates reflected no relationship to level (i.e., type) of pilot rating. Also, with the exception of the 141 lowest-rated pilots, there was no pattern or trend in the Academy attrition rates with respect to logged flying time. Moreover, the *findings relating to the 141 reflected a positive, or undesirable, relationship between Academy attrition probability and flying time.* Some 112 of the 141 possessed flying time of 349 hours or less; their Academy attrition rate was 25.9%, considerably below the rate of 47.8% for the 23 claiming 350 to 999 hours and contrastingly different from the 83.3% rate established for the six having 1,000 hours or more. Although not shown, the post-Academy retention rates of the Academy graduates (N=339) among the 529 appeared to vary independently of both level of pilot rating and flying time.

Other analyses pertaining to the group of 529 pilots yielded findings of incidental interest. For example, it was determined that while the relatively few pilots over 35 years of age tended to have greater amounts of flying time than their younger colleagues, there was no consistent relationship between the subjects' logged hours of flying and their attrition-retention rates—regardless of entry age. (See Appendix B.) Moreover, an analysis, the results of which appear in the left-hand portion of Appendix C, further demonstrated there was *no point* on the pilot-experience continuum which could be adjudged "appropriate" for screening purposes. In brief, all *findings* relating to the 529 pilots having no prior ATC experience either *failed to support, or ran counter to, the theory that higher, more rigid, standards in the evaluation of pilot experience should enhance its validity as a selection factor.* This was also true with respect to the results (not shown) which were obtained in corresponding analyses of data for the 92 pilot-rated ATCSs of 1969 who claimed pre-FAA ATC ratings.

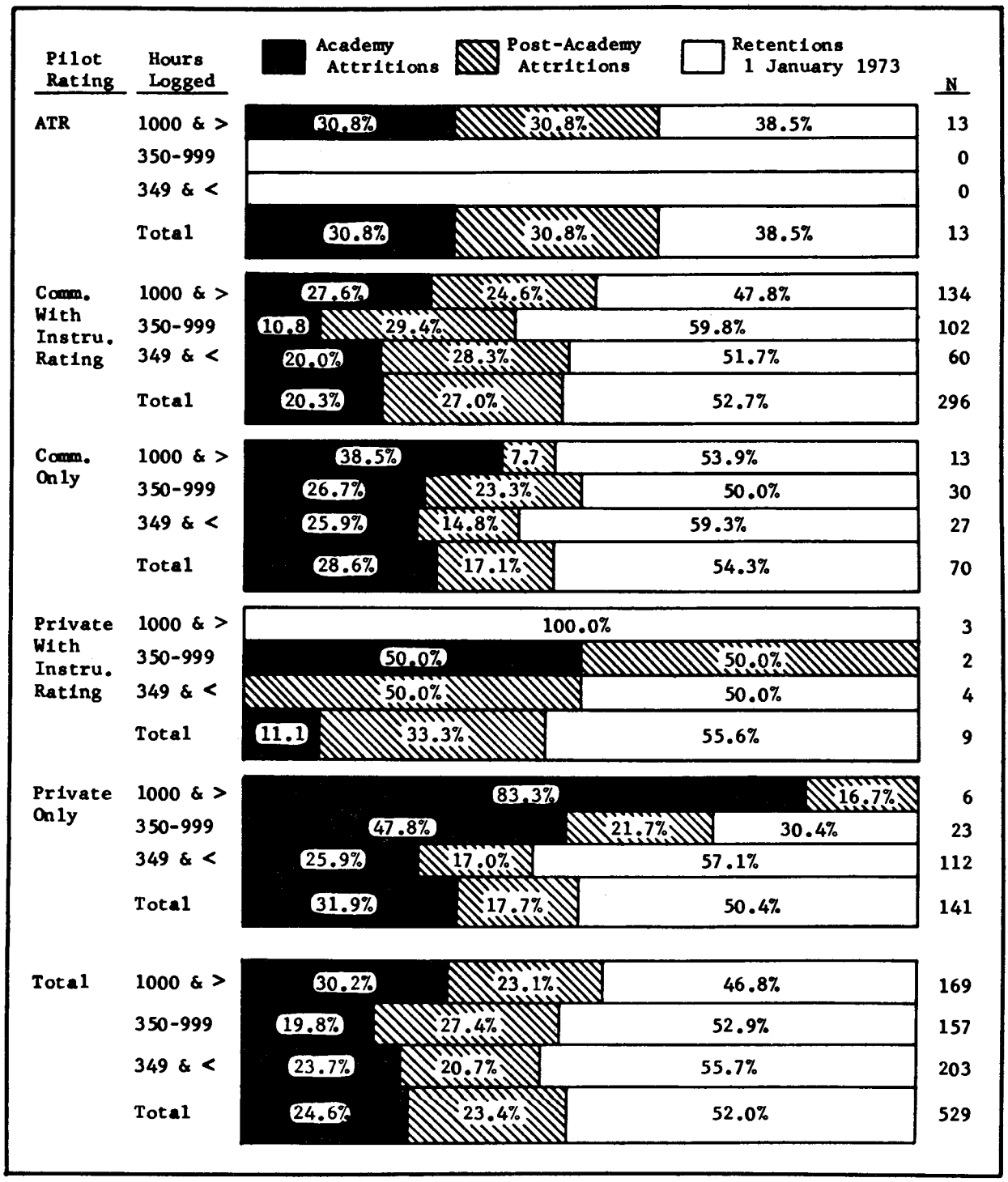


FIGURE 9. Attrition and retention rates by type of pilot rating and hours of logged flying time for 529 entrants into ATCS basic training in 1969 who held aircraft pilot licenses but no pre-FAA rating(s) in ATC work.

B. *Level and Type of Pre-FAA ATC Experience and ATCS Attrition-Retention Probability.* Another analysis, the results of which appear in the right-hand portion of Appendix C, was conducted on the 928 subjects having ATC ratings only, in order to obtain additional information bearing upon the establishment of an optimal "screening cut" with respect to level, or amount, of prior ATC experience. Some 19.5% of the 113 ATCSs having 24 months or less of pre-FAA control experience were attrited during the basic-training phase whereas the subgroup having 25–36, 37–48, and 49–60 months had successively lower elimination rates of 13.0, 9.9, and 5.3%, respectively. A reversal in the trend then occurred; 9.8% of the 133 claiming 61 to 120 months were training-course attritions, whereas the 117 with experience of 121 months or more had an Academy elimination rate of 26.5%. There appeared to be no definite pattern or trend in the post-Academy attrition and retention rates, regardless of whether based on entrants into training or Academy graduates only. As may be recalled, however, an earlier analysis (discussed in connection with Figure 6), in which these same subjects were grouped more coarsely with respect to amount of ATC experience, revealed that: (1) the *retention* rates of the Academy graduates of age 30 and younger varied in accordance with level of experience, with the highest of the retention rates pertaining to those having experience of 49 months or more, whereas (2) the retention rates of the graduates of the age groups 31 to 35, 36 to 40, and 41 and older were progressively lower, illustrating an inverse relationship with entry age but no relationship to experience level.

Although not shown, the (product-moment) correlation between entry age and level of pre-FAA ATC experience for the entire group of 928 ATC-rated subjects was .76. With age effects theoretically partialled out, or statistically nullified, the experience variable correlated .14 ($p<.01$) with attrition-retention status covering both the Academy and post-Academy phases.

In the past, the FAA has almost always awarded eligibility points to applicants for pre-FAA ATC experience extending through 12 months; it has generally done so for experience up to 36 months and sometimes as many as 48 months. Inasmuch as recruiting is currently restricted to personnel no older than 30, the findings depicted in Appendix C, when considered in combination with those previously shown in Figure 6, suggest that the selection process might be further improved by awarding credit points for ATC experience extending up to 60 months.

An analysis of the response data for the biographical questionnaire revealed that the vast majority of the 1,020 ATC-rated subjects (928 of whom were non-pilots and 92 of whom held both pilot and ATC ratings) were former military controllers. Some 367 of the 1,020 claimed experience in VFR operations only, while the remaining 653 indicated they had engaged in IFR operations. Although most of the 653 had worked with various kinds of radar equipment, very few claimed experience which would have warranted classification other than as former military Terminal controllers. This being so, an analysis was undertaken to determine whether IFR or VFR experience was differentially valid for prediction of success in the FAA's En Route and Terminal training options. The analysis was extended to include determination of the attrition and retention rates of the 1,329 subjects who claimed no ratings in prior ATC work and, inasmuch as current standards preclude the recruitment of ATCS trainees beyond the age of 30, attrition-retention data were also obtained for comparison of the subjects aged "31 and older" vs. those "30 and younger" within each of the three major subgroups. Results of this analysis are summarized in Figure 10.

Although both the En Route and Terminal personnel of age 31 and older had significantly lower ($p<.01$) retention rates than their younger colleagues having similar experience backgrounds, the retention rate data attested to the *superior validity of IFR experience* over both VFR experience and non-ATC work for prediction of success of the older, and also the younger, ATCSs in either of the two training options. The VFR-experienced Terminal subjects of each age category had slightly higher retention rates than those who entered Terminal training with no pre-FAA ATC ratings.

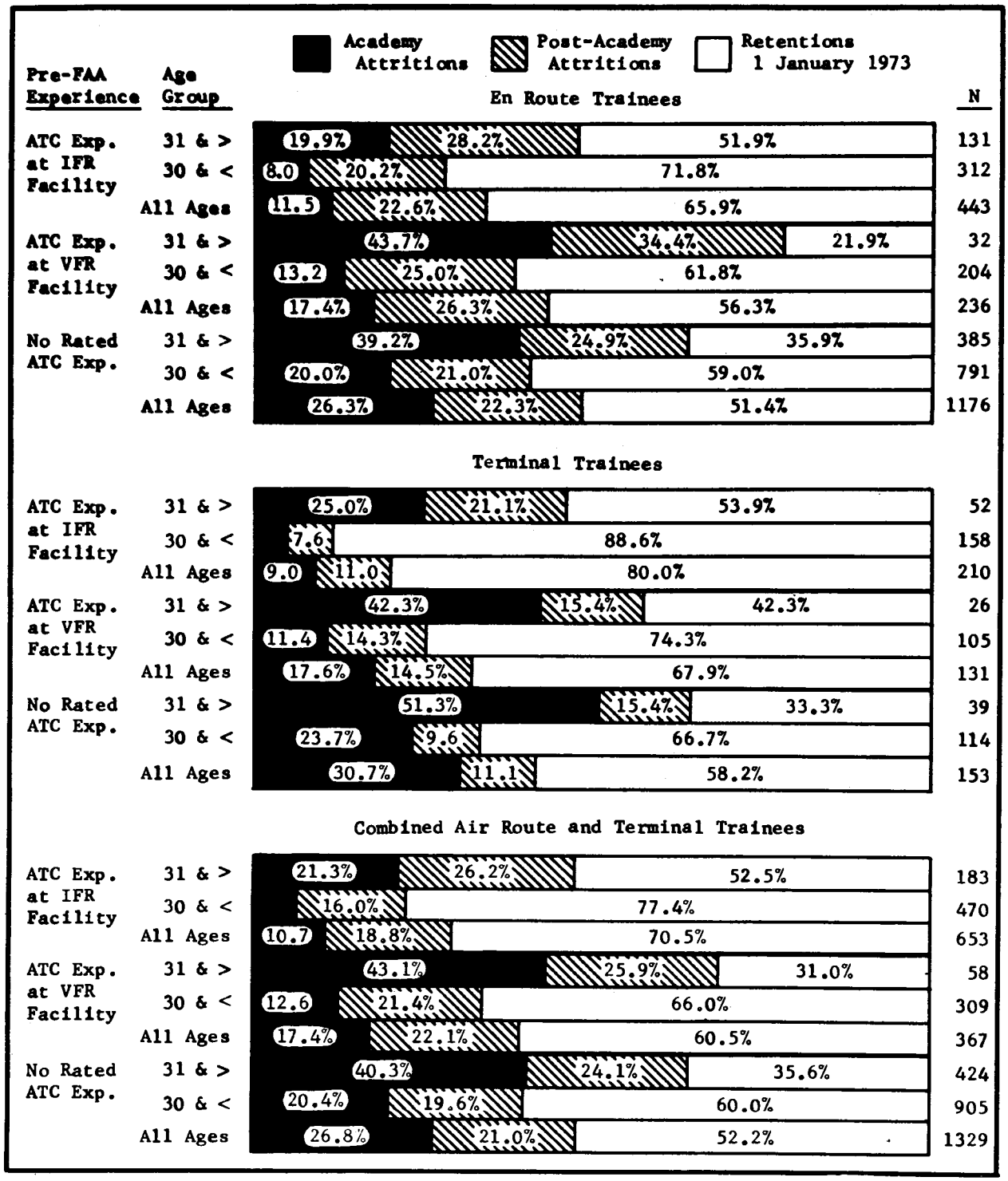


FIGURE 10. Attrition and retention rates by training option, type of pre-FAA ATC experience, and age for 2,349 entrants into the Academy's basic training courses in 1969.

However, little or no evidence was obtained to support the long-standing hypothesis that VFR experience is relevant to success in FAA En Route work. Only 21.9% of the 32 VFR-experienced En Route subjects of age 31 and older were still in the air traffic system at the beginning of 1973; their retention rate was lower than obtained for any other subgroup and differed substantially, though not significantly, from the rate of 35.9% established by the 385 En Route entrants of age 31 and older who possessed no ATC ratings. Moreover, the En Route recruits of age 30 and younger who had no ATC ratings fared almost as well as the VFR-experienced En Route personnel of the same age bracket; their retention rates were 59.0 and 61.8%, respectively.

In their report of 1970, the Air Traffic Controller Career Committee[1] questioned the appropriateness of selecting former military controllers with Terminal experience only for training in En Route work. As alluded to earlier, the analysis depicted in Figure 10 indicates that pre-entry IFR experience is only slightly less valid for prediction of En Route success than Terminal success—for ATCSs of age 30 and younger. The data also infer that the benefits associated with IFR experience exceed those of VFR experience, regardless of training option. In our opinion, it would be desirable, if possible, to select *all* En Route *and* Terminal trainees from aptitude-screened candidates having pre-FAA IFR control experience. However, inasmuch as such candidates will undoubtedly be limited in number, we would consider it inadvisable to assign them all to Terminal training as previously recommended in a report by Education and Public Affairs, Incorporated.[9]

C. *Questioned Worthiness of Communications Experience for Selection Purposes.* Attrition-retention data for the 94 ATCSs of 1969 who claimed communications ratings only are shown in Figure 11. Twenty-seven (28.7%) of the 94 were attrited during basic training, 16 (17%) were post-Academy attritions, and 51 were still in FAA control work on January 1, 1973. When categorized on the basis of specific types of communications experience, the subgroups were so small as to render the results unreliable. However, the retention rate of 54.3% for the entire group of 94 was highly comparable with the rate of 52.1% for the 706 subjects who entered with no ATC, pilot, or communications ratings. Thus, there is little likelihood that any future research will reveal methods of assessing and weighting various types of communications experience so as to substantially improve the overall ATCS selection program.

D. *Potential of Screening on Age, Aptitude, Experience, and Education.* As mentioned earlier, all but three of the 2,352 ATCSs of 1969 completed the biographical questionnaire. Approximately 90% of the 2,349 respondents indicated they had been administered the operational CSC ATC Aptitude Test Battery when establishing their candidacy for appointment; and, about 15% of those purportedly examined claimed that their test scores were disregarded because of their experience qualifications. However, test performance scores were forwarded to CAMI for only 1,485 of the 2,349 and the 1,485 were not representative of the total group presumably examined. Due to existing workloads, regional officials frequently found it necessary to have their staffs postpone the task of examining records for CSC test data until several months after entry of the ATCS groups into Academy training. Unfortunately, scores were no longer available for many of the ATCSs after such a time lapse. This was particularly true with regard to many of the attrited personnel. For example, although 490 (20.9%) of the 2,349 ATCSs were attrited during this Academy training stage alone, the group of 1,485 for whom CSC test scores were forwarded included only 171, or 34.9%, of the 490 Academy attritions and 1,314, or almost 71%, of the 1,859 graduates. It should also be emphasized that the CSC battery was designed to screen, or preclude from entry, those individuals not having aptitudes or abilities of sufficient level to pass basic training. Thus, if the battery is indeed fulfilling that purpose, then research on aptitude-screened groups should be expected to yield little evidence of that validity. It is only with this perspective that the results of the summary analysis appearing in Table 1 can be meaningfully interpreted.

All data shown in Table 1 except those relating to aptitude level are the same as extracted from one or more of the previous analyses and therefore will not again be discussed in great detail. However, in looking at the data for the

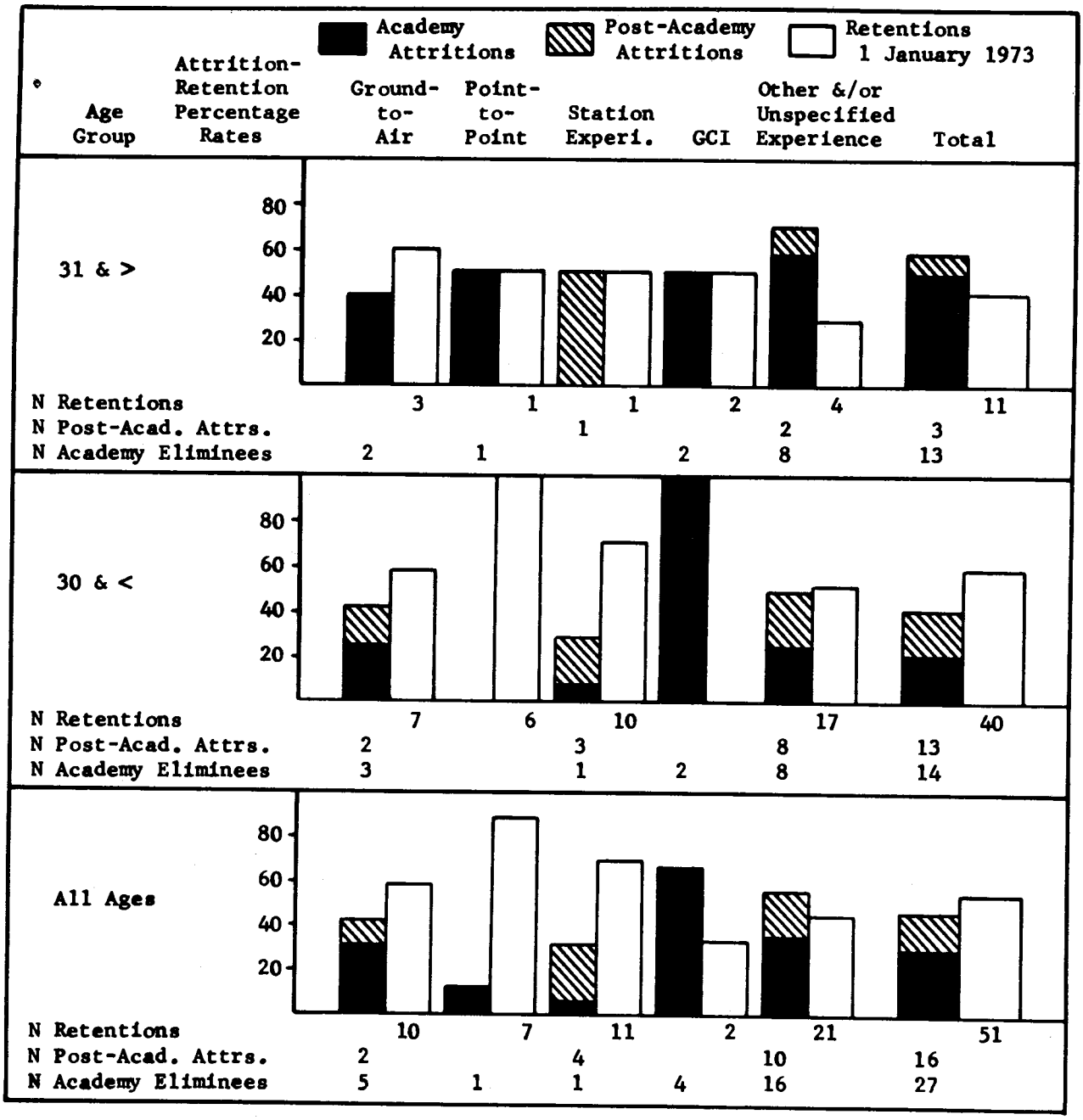


FIGURE 11. Attrition and retention rates by age and type of pre-FAA experience for 94 entrants into Academy ATCS training during 1969 who claimed to possess ratings in communications work only. (Although each of the 94 claimed a communication rating, 41 failed to specify the type of rating or experience, three claimed to have been former Flight Data Aids, one responded that he had non-rated ATC experience, another indicated he had worked in Base Operations, and one claimed air-to-ground communications experience.)

TABLE 1. Comparison of attrition and retention rates by CSC-ATC-Aptitude-Test performance level, type of rated pre-FAA experience, and dichotomized age grouping for 2,349 En Route and Terminal ATCSs who entered the Academy during 1969.

		CSC-ATC Aptitude Test Score															
		Unknown				209 & <				210 & >				All Aptitude Levels			
Age	Pre-FAA Experience Category	N Tot	Acad Attr Rate %	P-A Attr Rate %	Ret Jan 1973 %	N Tot	Acad Attr Rate %	P-A Attr Rate %	Ret Jan 1973 %	N Tot	Acad Attr Rate %	P-A Attr Rate %	Ret Jan 1973 %	N Tot	Acad Attr Rate %	P-A Attr Rate %	Ret Jan 1973 %
31 & >	Non-ATC Pilot	71	57.7	21.1	21.1	1	100.0			115	27.8	33.0	39.1	187	39.6	28.3	32.1
	ATC & Pilot	16	25.0	18.8	56.3	3	33.3	66.7		9		22.2	77.8	28	17.9	25.0	57.1
	Non-Pilot ATC	125	35.2	26.4	38.4	40	27.5	25.0	47.5	48	10.4	25.0	64.6	213	28.2	25.8	46.0
	Other	84	64.3	10.7	25.0	5	60.0	20.0	20.0	148	27.0	26.4	46.6	237	40.9	20.7	38.4
	Total	296	48.3	20.3	31.4	49	32.7	26.5	40.8	320	24.1	28.4	47.5	665	35.5	24.7	39.8
30 & <	Non-ATC Pilot	97	35.1	21.7	43.3					245	9.0	20.4	70.6	342	16.4	20.8	62.9
	ATC & Pilot	29	13.8	20.7	65.5	11			100.0	24		29.2	70.8	64	6.3	20.3	73.4
	Non-Pilot ATC	277	17.3	15.5	67.1	88	6.8	20.5	72.7	350	3.1	19.4	77.4	715	9.1	18.0	72.9
	Other	165	54.6	15.8	29.7	3			100.0	395	9.9	20.3	69.9	563	22.9	18.8	58.3
	Total	568	31.0	16.9	52.1	102	5.9	17.7	76.5	1014	7.1	20.2	72.7	1684	15.1	18.9	66.0
All Ages	Non-ATC Pilot	168	44.6	21.4	33.9	1	100.0			360	15.0	24.4	60.6	529	24.6	23.4	52.0
	ATC & Pilot	45	17.8	20.0	62.2	14	7.1	14.3	78.6	33		27.3	72.7	92	9.8	21.7	68.5
	Non-Pilot ATC	402	22.9	18.9	58.2	128	13.3	21.9	64.8	398	4.0	20.1	75.9	928	13.5	19.8	66.7
	Other	249	57.8	14.1	28.1	8	37.5	12.5	50.0	543	14.5	21.9	63.5	800	28.3	19.4	52.4
	Total	864	36.9	18.1	45.0	151	14.6	20.5	64.9	1334	11.2	22.2	66.6	2349	20.9	20.6	58.6

1,485 ATCSs for whom CSC test measures were forwarded, it should first be noted that all but nine of the 151 who failed to attain passing scores of 210 or higher were ATC-rated. Although the records forwarded to the Civil Aeromedical Institute seldom reflected the exact manner in which an ATCS qualified for appointment to training, we presume that the 151 (and also many of the 864 with unreported test data) were granted waivers of the aptitude-screening requirement on the basis of experience and/or education. The subgroup of 151 had a retention rate of 64.9%, highly comparable with that of 66.6% for the 1,334 having CSC scores of 210 and higher. In contrast, the 864 for whom no scores were forwarded had a significantly lower ($p<.01$) retention rate of 45.0%.

Three hundred twenty of the 1,334 aptitude-screened ATCSs were over 30 years old; their retention rates, by experience-rating subgroup, ranged from 39.1%, for the 115 non-ATC pilot-rated subjects, to 77.8% for the nine who held both ATC and pilot ratings. Thirty-one (64.6%) of the 48 non-pilot ATC-rated subjects were still in FAA control work on January 1, 1973, as were only 46.6% of the remaining 148 who were 31 or older. The overall retention rate for the 320 was 47.5%, whereas that of the 1,014 younger aptitude-screened ATCSs was 72.7%. Some 395 of the 1,014 who entered before age 31 possessed neither pilot nor ATC ratings and their retention rate of 69.9% was highly comparable to the rates of 70.6 and 70.8%, respectively, for the 245 non-ATC pilots and the 24 who held both pilot and ATC ratings. However, the 350 non-pilot ATC-rated subjects of the same age category (i.e., under age 31) tended to experience even less difficulty; all but 3.1% successfully completed Academy training, only 19.4% were post-Academy attritions, and 77.4% were still in FAA ATC work at the beginning of 1973.

The majority of the 151 ATCSs having CSC scores of 209 and lower were non-pilot ATC-rated personnel, precluding a meaningful comparison of the retention rates of the differentially experienced subgroups within each age category. With experience disregarded, however, the 49 older subjects had an overall retention rate of 40.8%, significantly below the rate of 76.5% obtained for the 102 of age 30 and younger.

The group of 864 subjects for whom no CSC test data were forwarded included 296 of age 31 and older and 568 of age 30 and younger. Although the retention rates of the differentially experienced subgroups were variable, favoring the ATC-rated subjects, there was no experience subgroup in which the younger subjects failed to have a higher retention rate than their older colleagues. The overall retention rate of the 296 was 31.4%, compared to 52.1% for the 568 of age 30 and younger.

Moreover, the final analysis conducted in the study (and partially summarized in Appendix D) revealed an inverse relationship between educational level, as defined by years of education, and retention status. The mean educational level for the ATCS recruits of 1969 was slightly less than one-half year of college; only 7.7% held (four-year) college degrees, 46% had "some college," and each of the others held only a high school diploma or its equivalent. The retention rates of the ATCSs within the various experience-rating categories who held college degrees, and particularly those no older than 30, were generally substantially lower than those of the college non-graduates, whereas the rates of the latter were usually comparable with, or slightly lower than, those pertaining to personnel having no college credits.

IV. Conclusions.

The results of the numerous analyses conducted in this study of 1,740 ATCS recruits of 1960–1963 and 2,352 recruits of 1969 clearly infer that success (defined as retention status) in FAA ATC work is far more contingent upon age at entry into FAA training than type of rated aviation-related experience, level of aptitude, or education. When considered as a body, the findings, in our opinion, suggest that ATCS applicants who meet the existing age and aptitude screening standards *should not be awarded credit points toward their eligibility ratings for any type experience other than ATC work* and that the latter should be rather conservatively assessed and weighted in the selection process. If such a procedural change is followed, an indirect result is likely to be a relative improvement in the competitive ranking of female and minority candidates who, for various socioeconomic reasons, probably do not obtain the types of pre-FAA

experience for which credit is currently given in selecting ATC candidates.

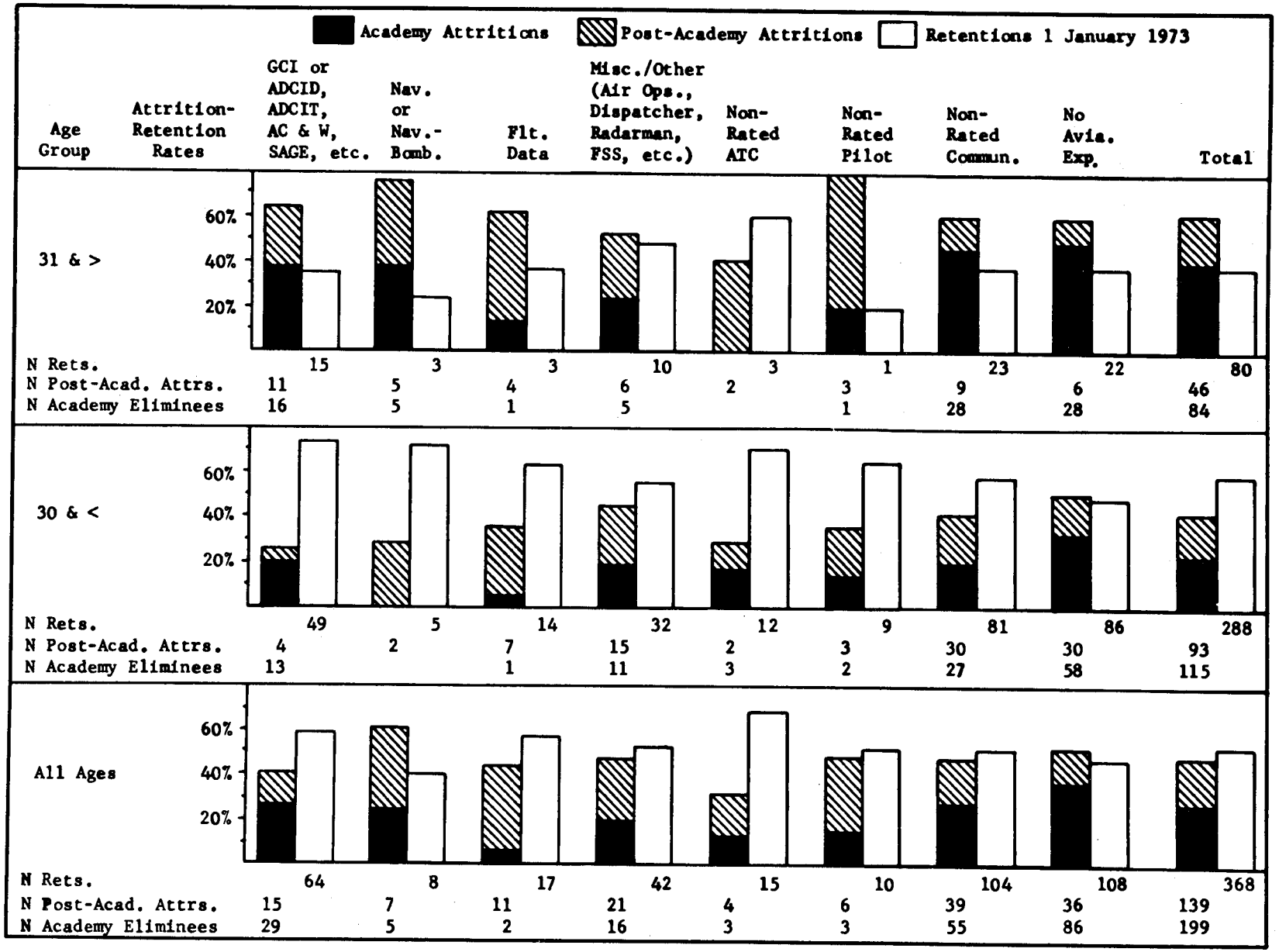
Personnel having only pilot experience when they entered ATCS training during either of the two widely separated time periods had unusually low retention rates, even lower than those of groups having no aviation-related experience of any type. Speculation that many of the pilot-rated subjects may have volitionally attrited in order to take jobs of higher pay or jobs more compatible with their flying interests, prompted a search of ADP records of all FAA employees; only 14 of the 254 attrited pilot-rated ATCSs of 1969 were still in the FAA (in non-ATC jobs) at the beginning of 1973. Six of the 14 were aviation safety officers, five of whom were GS–12's; one was a GS–12 in an educational training program, and the other seven were in various jobs (e.g., electronics technicians, flight data aids, wage board employees, clerks, etc.) with lower pay grades. Unfortunately, data were unavailable for a similar follow-up study of the remaining 240 attrited pilots who had left the FAA.

Although ATC experience involving VFR operations only proved to be considerably less valid than ATC-IFR experience for prediction of success in either En Route or Terminal options, experience of each respective type appeared to be almost equally valid for the two options. It would therefore seem desirable, when possible, to *select all En Route and Terminal trainees from among the best qualified of the aptitude-screened candidates younger than 31 who possess pre-FAA IFR control experience.*

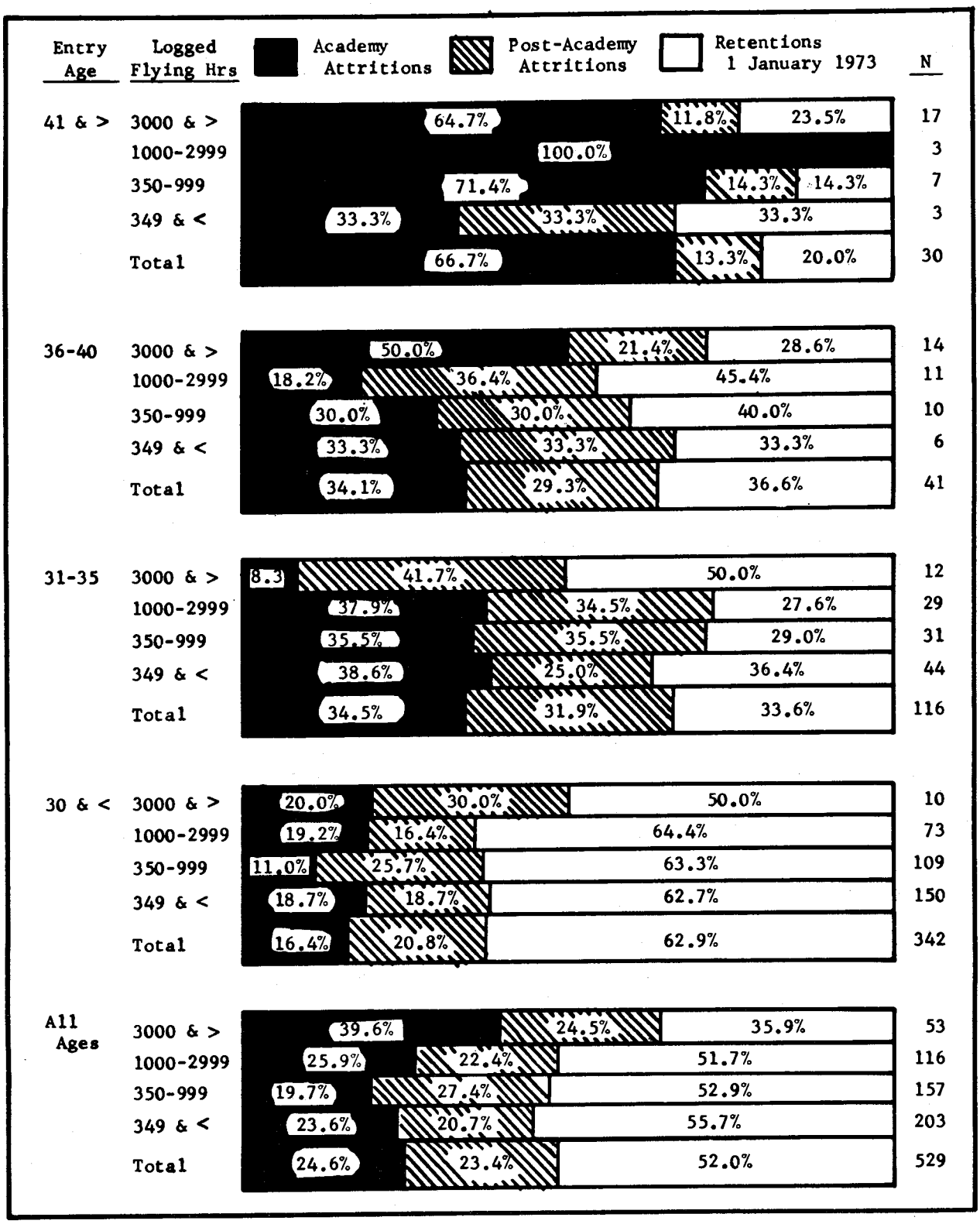
References

1. Air Traffic Controller Career Committee Report: The Career of the Air Traffic Controller—A Course of Action. Executive Summary of the Report of the Air Traffic Controller Career Committee. FAA, Washington, D.C., January 1970.
2. Cattell, R. B., and H. W. Eber: *The Sixteen Personality Factor Questionnaire.* Champaign, Illinois: Institute for Personality and Ability Testing, 1962.
3. Cobb, B. B.: The Relationships Between Chronological Age, Length of Experience, and Job Performance Ratings of Air Route Traffic Control Specialists. FAA Office of Aviation Medicine Report No. AM–67–1, 1967.
4. Cobb, B. B.: Air Traffic Aptitude Test Measures of Military and FAA Controller Trainees. FAA Office of Aviation Medicine Report No. AM–71–40, 1971.
5. Cobb, B. B., C. D. Lay, and N. M. Bourdet: The Relationship Between Chronological Age and Aptitude Test Measures of Advanced-Level Air Traffic Control Trainees. FAA Office of Aviation Medicine Report No. AM–71–36, 1971.
6. Cobb, B. B., and J. J. Mathews: A Proposed New Test for Aptitude Screening of Air Traffic Controller Applicants. FAA Office of Aviation Medicine Report No. AM–72–18, 1972.
7. Cobb, B. B., J. J. Mathews, and C. D. Lay: A Comparative Study of Female and Male Air Traffic Controller Trainees. FAA Office of Aviation Medicine Report No. AM–72–22, 1972.
8. Cobb, B. B., J. J. Mathews, and Peter L. Nelson; Attrition-Retention Rates of Air Traffic Control Trainees Recruited During 1960–1963 and 1968–1970. FAA Office of Aviation Medicine Report No. AM–72–33, 1972.
9. Education and Public Affairs, Inc. Report: Review and Evaluation of Present System for Selection of Air Traffic Controllers. Summary of Research on Phase I, Task I of Contract DOT–FA70WA–2371. FAA, Washington, D. C., July 1970.
10. Trites, D. K.: Problems in Air Traffic Management: I. Longitudinal Prediction of Effectiveness of Air Traffic Controllers. FAA Civil Aeromedical Research Institute Report No. 61–1, 1961.
11. Trites, D. K.: Problems in Air Traffic Management: VI. Interaction of Training-Entry Age With Intellectual and Personality Characteristics of Air Traffic Control Specialists. FAA Office of Aviation Medicine Report No. AM–65–21, 1965.
12. Trites, D. K., and B. B. Cobb: Problems in Air Traffic Management: III. Implications of Age for Training and Job Performance of Air Traffic Controllers. FAA Civil Aeromedical Research Institute Report No. 62–3, 1962.
13. Trites, D. K., and B. B. Cobb: Problems in Air Traffic Management: IV. Comparisons of Pre-Employment, Job-Related Experience With Aptitude Tests as Predictors of Training and Job Performance of Air Traffic Control Specialists. FAA Civil Aeromedical Research Institute Report No. 63–31, 1963.
14. Trites, D. K., and B. B. Cobb: CARI Research on Air Traffic Control Specialists: Age, Aptitude, and Experience as Predictors of Performance. FAA Civil Aeromedical Research Institute, unnumbered report, 1964.

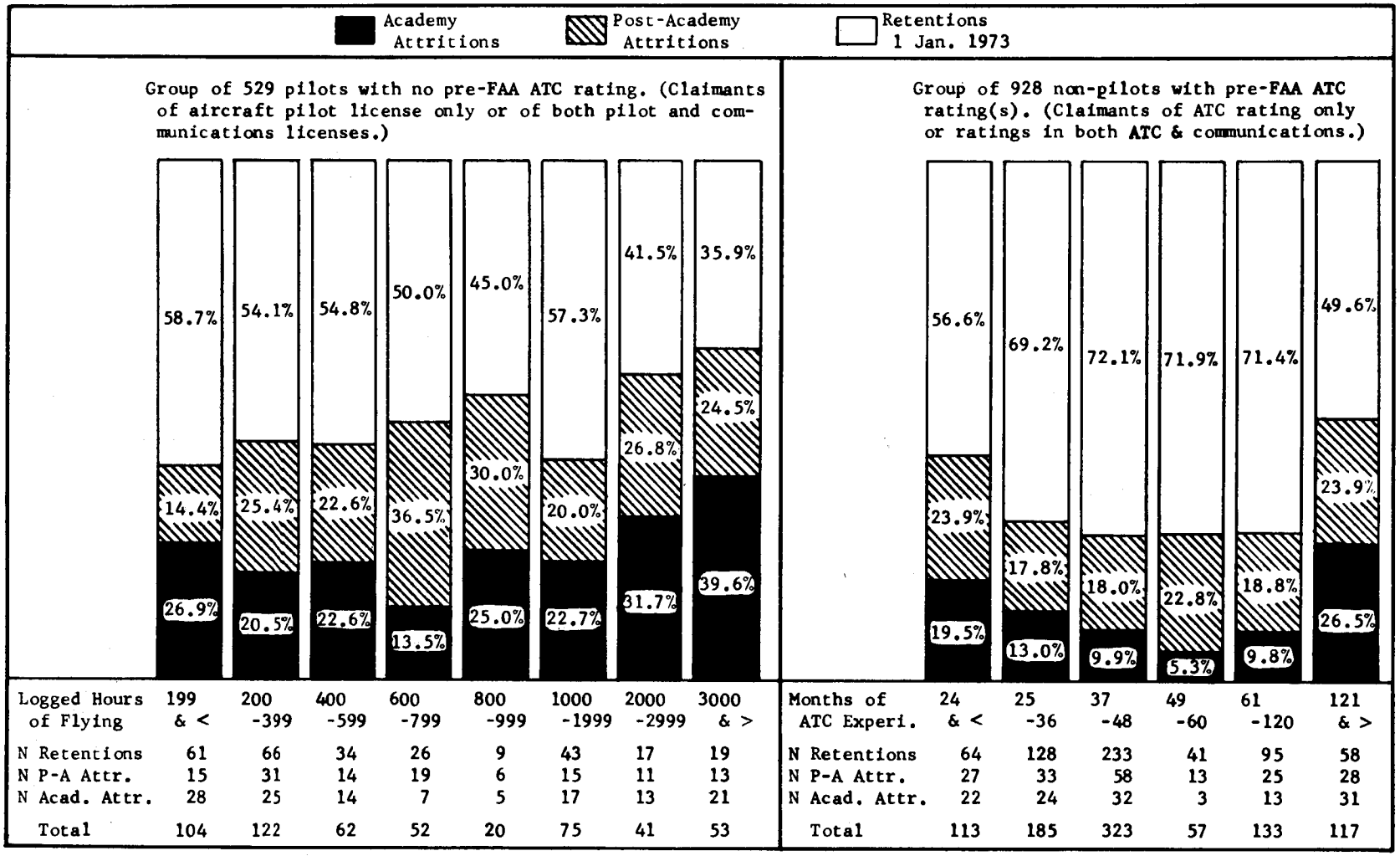
Appendix A. Attrition and retention rates by age and type of pre-FAA experience for 706 ATCSs who claimed no ratings as pilots and/or in ATC or communications work upon entry into controller training in 1969.



Appendix B. Attrition and retention rates by age and hours of logged flying time for 529 personnel who entered FAA ATCS training during 1969 as licensed aircraft pilots but not having pre-FAA rating(s) in ATC work.



Appendix C. Attrition and retention rates for ATCS trainees relative to amounts of pre-FAA pilot experience or prior ATC experience.



Logged Hours of Flying	199 & <	200 -399	400 -599	600 -799	800 -999	1000 -1999	2000 -2999	3000 & >
N Retentions	61	66	34	26	9	43	17	19
N P-A Attr.	15	31	14	19	6	15	11	13
N Acad. Attr.	28	25	14	7	5	17	13	21
Total	104	122	62	52	20	75	41	53

Months of ATC Experi.	24 & <	25 -36	37 -48	49 -60	61 -120	121 & >
N Retentions	64	128	233	41	95	58
N P-A Attr.	27	33	58	13	25	28
N Acad. Attr.	22	24	32	3	13	31
Total	113	185	323	57	133	117

Appendix D. Comparison of attrition and retention rates by educational level, type of rated pre-FAA experience, and dichotomized age grouping for 2,349 entrants into the Academy's En Route and Terminal basic training courses during 1969.

		Level of Education															
		High School or Less				Some College				College Degree				All Educational Levels			
Age	Pre-FAA Experience Category	N Tot	Acad Attr Rate %	P-A Attr Rate %	Ret Jan 1973 %	N Tot	Acad Attr Rate %	P-A Attr Rate %	Ret Jan 1973 %	N Tot	Acad Attr Rate %	P-A Attr Rate %	Ret Jan 1973 %	N Tot	Acad Attr Rate %	P-A Attr Rate %	Ret Jan 1973 %
31 & >	Non-ATC Pilot	61	34.4	32.8	32.8	100	41.0	25.0	34.0	26	46.2	30.8	23.1	187	39.6	28.3	32.1
	ATC & Pilot	17	11.8	29.4	58.8	10	20.0	20.0	60.0	1	100.0			28	17.9	25.0	57.1
	Non-Pilot ATC	145	30.3	25.5	44.1	67	23.9	25.4	50.7	1		100.0		213	28.2	25.8	46.0
	Other	111	38.7	22.5	38.7	104	44.2	15.4	40.4	22	36.4	36.4	27.3	237	40.9	20.7	38.4
	Total	334	32.9	26.0	41.0	281	37.4	21.4	41.3	50	42.0	34.0	24.0	665	35.5	24.7	39.8
30 & <	Non-ATC Pilot	84	20.2	17.9	61.9	218	12.8	21.6	65.6	40	27.5	22.5	50.0	342	16.4	20.8	62.9
	ATC & Pilot	25	8.0	12.0	80.0	36	5.6	25.0	69.4	3		33.3	66.7	64	6.3	20.3	73.4
	Non-Pilot ATC	432	7.6	17.4	75.0	271	10.7	18.8	70.5	12	25.0	25.0	50.0	715	9.1	18.0	72.9
	Other	211	22.3	16.6	61.1	275	21.8	19.3	58.9	77	28.6	23.4	48.1	563	22.9	18.8	58.3
	Total	752	13.2	17.0	69.8	800	14.9	20.0	65.1	132	27.3	23.5	49.2	1684	15.1	18.9	66.0
All Ages	Non-ATC Pilot	145	26.2	24.1	49.7	318	21.7	22.6	55.7	66	34.9	25.8	39.4	529	24.6	23.4	52.0
	ATC & Pilot	42	9.5	19.1	71.4	46	8.7	23.9	67.4	4	25.0	25.0	50.0	92	9.8	21.7	68.5
	Non-Pilot ATC	577	13.3	19.4	67.2	338	13.3	20.1	66.6	13	23.1	30.8	46.2	928	13.5	19.8	66.7
	Other	322	28.0	18.6	53.4	379	28.0	18.2	53.8	99	30.3	26.3	43.4	800	28.3	19.4	52.4
	Total	1086	19.2	19.8	61.0	1081	20.7	20.4	58.9	182	31.3	26.4	42.3	2349	20.9	20.6	58.6