ORDER

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

7032.9

9/28/88

SUBJ: TRAFFIC MANAGEMENT SYSTEM (TMS) AIR TRAFFIC OPERATIONAL REQUIREMENTS

1. PURPOSE. This order establishes air traffic operational requirements for the TMS. These requirements extend from the original baselined TMS Phase II, through the Advanced Automation System (AAS) timeframe, and include the Enhanced Traffic Management System (ETMS) and TMS Phase III. The TMS includes the Central Flow Control Facility (CFCF), Traffic Management Units (TMU), and designated terminal facility Traffic Management Coordinators (TMC). The facilities included are the Air Traffic Control System Command Center (ATCSCC), all CONUS Air Route Traffic Control Centers (ARTCC), designated Terminal Radar Approach Controls (TRACON), Radar Approach Controls (RAPCON), Air Traffic Control Towers (ATCT), and military air traffic control facilities, and Anchorage ARTCC, Honolulu ARTCC, and San Juan Combined Center/Radar Approach Control (CERAP), and interfaces with designated domestic and foreign air traffic control facilities.

2. DISTRIBUTION. This order is distributed to the branch level in the Air Traffic, Program Engineering and Systems Engineering Services, Airport Capacity Program Office and Automation Service in Washington, Technical Center, Mike Monroney Aeronautical Center, and all regional air traffic and airway facilities offices.

3. AUTHORITY. The Air Traffic Plans and Requirements Service, ATR-1, is authorized to issue changes to this order.

4. APPLICATION. This order applies to all air traffic personnel and is for the guidance of all other organizational units.

5. ASSUMPTIONS.

a. The TMS operational requirements are based on the assumption that the CFCF will be contained within the ATCSCC, and will be located in the headquarters building (i.e. FOB-10A). If this facility is to be located away from the headquarters building, an "operational room" needs to be created at headquarters.

b. These operational requirements are based on the assumption that the field traffic management workstations will utilize the AAS initial sector suite systems when available. These initial sector suites must present the capabilities in this order, or new field workstations will be required.

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c. On occasion, due to high demand and unforeseeable closely related circumstances, some flight components (centers, terminal areas, airports, fixes, en route segments, sectors) of the nation's air traffic control system could become saturated. It is anticipated that as demand for the system increases, the system could be pushed to its limit. Airline hubbing, new aircraft designs, which allow aircraft of widely different capabilities to utilize the same airspace, and changes in the military's mission are just a few of the contributing factors to the problem. This extensive demand on the system will occur in spite of extensive equipment modernization and automation efforts which are intended to increase the level of traffic that air traffic controllers can handle.

6. MISSION NEED. The TMS mission is the balancing of air traffic demand with system capacity to ensure maximum efficiency in utilization of the total national system, thereby producing a safe, orderly, and expeditious flow of traffic while minimizing delays. The TMS supports the primary air traffic control mission of separation by providing a more disciplined flow of traffic, whereby aircraft are spaced properly and peaking is reduced. This allows the controller to handle more aircraft with less need for delays.

7. SYSTEM DESCRIPTION. The ATCSCC has the overall responsibility for management of the NAS. The CFCF, TMU's and TMC's have the responsibility for traffic management of the facility airspace within their jurisdictions. To provide the safest and most efficient flow management of air traffic, TMS will require the capability to assign delays, change proposed altitudes and/or reroute for any NAS identified flight plan (en route and terminal). These actions will be in response to actual or anticipated capacity limitations of centers, terminal areas, fixes, en route segments, sectors, and designated airports. Delays will be minimized without overloading any flight component. Every NAS tracked and untracked flight (en route and terminal) will be monitored and accounted for on a near real-time basis. Modern workstations will be required. Large screen display equipment capable of simultaneously displaying all CONUS, plus a 300-mile perimeter, airborne NAS tracked and untracked flights (en route and terminal) and their flight call signs will also be required. The terminal area displays shall have a range of 150 miles. The ATCSCC facility will integrate existing and planned functions of CFCF, Central Altitude Reservation Function (CARF), Operational Network (OPSNET), Oceanic Display and Planning System (ODAPS), Automatic Dependent Surveillance (ADS), National Airspace Management Facility (NAMFAC), and Airport Reservation Function (ARF). It will interface with the traffic management units (TMU) in each ARTCC/Area Control Facility (ACF), designated air traffic terminal facilities, Flight Service Data Processing Systems (FSDPS), foreign ATC/TMS facilities, Military Base Operations (MBO), Airline Dispatch Offices (ADO), and other qualified users.

8. OPERATIONAL REQUIREMENTS.

a. General Requirements

(1) All operational requirements contained in this order shall be developed, procured, and implemented as quickly as possible.

(2) The ATCSCC shall be a self-supported, stand alone facility. This facility will contain the Enhanced TMS (ETMS) and/or the replacement Traffic Management Processor (TMP) hardware and associated support equipment. The facility shall contain space for offices, Central Flow Control Function (CFCF), Central Altitude Reservations Function (CARF), Central Flow Weather Service Unit (CFWSU), ATCSCC training laboratory, training classrooms, conference rooms, R&D equipment, and necessary support equipment.

(3) All existing and planned TMS capabilities shall be retained.

(4) The ETMS computer shall be housed in the same location as the ATCSCC. This is required for the Air Traffic Operations Service to adequately supervise software development and maintenance.

(5) Because of the long lead time for development and implementation of requirements, provisions must be made for satisfying new operational and training TMS requirements identified during this period of time.

(6) Both the Air Traffic Plans and Requirements Service and the Air Traffic Operations Service must be explicitly involved in the system development, design, and resolution of all technical and operational issues as they arise during the development, procurement, and implementation phases.

(7) The operational suitability of the TMS shall be evaluated by both the Air Traffic Plans and Requirements Service and the Air Traffic Operations Service. These efforts shall include design approval, operational testing and evaluation, as well as testing during the development phase.

NOTE: Items 8 through 10 are pre-1995 operational requirements. The total Traffic Management System Statement of Work (SOW) June 17, 1987, contains the specific requirements for Item 8.

(8) The system shall provide all TMU's and designated terminal facilities the capability for the phased implementation of the ETMS.

(a) The system shall provide the capability for near real time display of position and track history of all NAS tracked and untracked aircraft operating in the NAS airspace, terminal and en route. The system shall provide multiple methods to highlight and display designated sets of specific aircraft. The system shall provide the capability of traffic replay for post analysis purposes.

(b) Monitor Alert Capability - This shall provide a continuous capability to monitor demand versus system capacity. Track positions will be projected to determine if the aircraft demand at a designated moment exceeds the capacity of any flight component (See paragraph 8.c.(1)(a)1. Whenever demand exceeds capacity, the system will automatically generate an alert to all appropriate specialists and CFCF supervisors, and disseminate a hardcopy to a designated printer. Alerts will be based on thresholds for centers, terminal areas, sectors, en route segments, fixes, and airports, as determined by the specialists.

(c) Automated Demand Resolution - This shall provide the capability to automatically analyze traffic demand conditions and provide the specialist with a listing of alternate strategies that will resolve the excess demand situation. The capability will be provided to model reroutes or delays to assure that system generated recommendations do not cause other system alerts.

(d) Alternative Selection/Strategy Evaluation - This shall provide the capability to rank other alternative resolutions based on the overall delay produced by each so that the most effective strategy can be selected. The rank order lists will be displayed to the specialist for selection.

(e) Directive Distribution Function - This element shall consider the selected strategy, determine the individual facilities involved, calculate aircraft specific adjustments within those facilities to implement the strategy, generate the flow directive, and automatically distribute the directives to the affected facilities.

(9) The Arrival Sequencing Program (ASP), Departure Sequencing Program (DSP), and En Route Sequencing Program (ESP) shall be integrated at all domestic ARTCCs, designated terminal facilities, and CFCF/ETMS. ASP and ESP programs are being developed by the DTFA 01-82-C-10029 contract. DSP is being developed by NAS MD 982 and applicable air traffic packaging definitions contained in case file AT 410-CPF-008 (CCD 9138).

(10) Additional equipment, software, and associated equipment to establish TMU's/TMC's at designated facilities shall be provided.

(a) There shall be a total of 250 DSP terminal locations.

(b) Display devices in 300 designated facilities for the display of metering list information will be required. These displays shall be of high resolution. The quality of the presentation shall be constant throughout

the display area, clear of clutter, flicker free and of uniform brightness. The presentation shall provide sufficient contrast and brightness so that all displayed items can be easily read under all ambient light conditions (i.e. in a tower cab with direct sunlight, to in an air traffic control room with very dim lighting) and must be free of glare. The display background color shall be the most pleasing and optimum for use in air traffic control tower cabs and ARTCC's. Reflectance and susceptibility of the display face to smudging shall be kept to the lowest level within the existing state-of-the-art.

(c) The future ETMS shall provide the regional air traffic division offices with the required hardware for a continuous traffic management monitoring capability.

b. Data Base. A flight plan data base is required to support the traffic management functions described in paragraph c; in particular, to support the estimation of demand for all flight components. This data base must include flight data for all scheduled and unscheduled NAS identified flights (en route and terminal), including oceanic and international overflight traffic when a flight is projected to impact a flight component defined in paragraph 8.c.(1)(a)1 in this order. Flight data must be available for all flight components of each aircraft's flight, from departure to arrival (i.e., runway-to-runway). The flight plan data base shall receive and make updates to airborne (including flight plan amendments, cancellations, and near real time radar position reports) and proposed flights (including airfiles). All traffic management specialists shall have access to (capability to edit and delete) this data base from any workstation. Air carrier operators shall have the capability to edit and delete only their own inactive flight plans from this data base and shall be reflected throughout the system.

c. Functions. The following functions are required to support the safest and most efficient system operation of air traffic.

(1) System Saturation Detection and Resolution

(a) Capacity

1 Each of the following flight components (i.e. paragraphs (aa) through (jj) will require stored capacities (count of aircraft per unit of time). All centers and sectors shall be included. Specific terminal areas, airports, en route fixes, and en route segments shall be designated based on level of activity and/or complexity. Arrival and departure fixes shall be designated to coincide with the designated airports. The CFCF specialists shall have the capability to easily and dynamically add additional temporary (timed in and out) and permanent flight components. All specialists (from this point on throughout this order "all specialists" means all affected CFCF, TMU and TMC specialists) shall have the capability to easily and dynamically add additional flight components for trial runs for testing a scenario and/or analysis work).

(aa) Center - Capacity for each individual center.

(bb) Terminal Areas - Capacities for designated airspaces defined as terminal areas.

(cc) Departure Airports - Departure capacity for every runway configuration at designated airports.

(dd) Departure Fixes - Capacities for designated terminal airspace departure fixes/departure gates.

(ee) Terminal Sectors - Capacities for designated terminal area sectors.

(ff) En Route Fixes - Capacities for designated points/intersections, broken down by altitude.

(gg) En Route Segments - Capacities for designated segments of airways/routes, broken down by altitude.

(hh) En Route Sectors - Capacities for geographic volumes of the en route airspace.

(ii) Arrival Fixes - Capacities for designated terminal airspace arrival fixes/arrival gates.

(jj) Arrival Airports - Arrival capacities for every runway configuration at designated airports. These capacity values must be balanced with the departure airport capacity values for the same airport, for the same time intervals and runway configurations. The combination of the variable arrival and departure capacities, based on the arrival/departure demand, shall determine the total airport capacity.

NOTE: Specific terminal areas, airports, fixes, and en route segments shall be designated by Air Traffic.

2 All flight component capacity values shall be broken down by weather conditions (e.g., VFR, IFR, runway conditions, visibility, weather cells/fronts). The system shall automatically make available to all specialists new flight component capacity values based on predicted and actual weather condition changes.

3 All specialists shall have the capability to display and make trial and temporary changes to flight components and capacity values. The capability to make permanent changes to flight components and capacity values shall also be available, but only to the CFCF specialists. Temporary changes may be used to reflect changes in weather, Military Operation Areas (MOA), and other military areas (i.e. restricted, warning, prohibited and alert, etc.), Air Traffic Control Assigned Airspace (ATCAA), Special Use Airspace (SUA), navigational and radar equipment outages, and runway closures,

for example. Temporary changes shall include the time interval for which the change shall be in effect, after which time the original capacity value or flight component shall be automatically reinserted and the specialist informed. For permanent changes, the change shall include when the change is to go into effect.

(b) Demand

1 All flight components shall have corresponding estimated demand values. Among the considerations in calculating these demand values shall be winds aloft, category of aircraft, aircraft speed and climb rate, flight position data (proposed or active), and position time updates for airborne flights.

2 All specialists shall have the capability to display any or all demand values, or set of demand values, with corresponding capacity values for up to 24 hours in advance in increments of 5 minutes for all flight components (longer look ahead times and special events will be addressed in subsequent sections). The CFCF specialists shall have the capability to change demand intervals for any or set of flight components to be from 5 minutes to 1 hour. Upon request, all the specialists shall have the capability to display the following additional demand data for a flight component: ACID/call sign, airline, aircraft type departure/arrival airport, proposed time of departure and estimated time of arrival, estimated time en route, estimated time of sector entry/exit, estimated fix times, and user class (e.g. military, general aviation, commuters, air carrier, foreign air carriers, etc.).

NOTE: A set of demand values refers to the demand for a specified time interval for all flight components along a route (including preferred routes) between an origin and destination, including both airport demand values (e.g., demand values for 8 a.m. to 9 a.m. for designated flight components).

(c) Demand/Capacity Comparisons, Alerts, and Resolutions

1 Comparisons - Every 5 minutes the system shall compare demand and capacity for all flight components to identify saturation (i.e., demand exceeds capacity) or near saturation (i.e., demand within 10 percent of capacity). These comparisons shall be for every 5-minute interval (e.g., 1200-1204, 1205-1209), for 8 hours (changeable from present time up to 24 hours) into the future. The CFCF specialist shall have the capability to change the comparison interval for any flight components to be from 5 minutes up to 1 hour, in increments of 5 minutes.

2 Alerts - If saturation or near saturation is predicted, the following information shall be automatically displayed to the specialist: any flight component where saturation or near saturation was identified, the time interval(s) for which it was predicted, the demand and capacity values for each interval, and upon request, a list of ACID's and flight data (e.g., departure/arrival airports, departure/ arrival/en route times, route,

requested or assigned altitudes). All specialists shall have the capability to inhibit designated displays of any or all of this information. Saturation and near saturation alerts shall be color coded to readily distinguish between the two and CFCF supervisors shall be provided an alert, with a hardcopy to designated printers.

NOTE: The alert inhibit capability shall be adjustable in 5 minute increments and shall default at 30 minutes.

3 Resolutions

(aa) Every 5 minutes the system shall automatically generate resolutions (i.e., delays and reroutes) to predicted saturation problems up to 4 hours in advance. These resolutions shall be for every 5-minute interval (e.g., 1200-1204, 1205-1209) and the system shall prompt the specialist that they are available. The system shall generate three resolutions for each predicted saturation problem. The resolutions shall solve the saturation problem without creating other saturation problems.

(bb) All specialists shall be able to select, for a trial run, one of three system-generated resolutions (displayed in the system recommended order) as is, modify the resolution, enter a new resolution, request another set of three resolutions from the system, rerun the trial simulation based on specialist-entered changes, such as new capacity or demand values, or take no action. All specialists shall have the capability to inhibit individual resolutions for a specified time interval. If any specialist modifies a system-generated resolution or enters a new one, the system shall automatically check to see whether it solves the predicted problem without creating any other saturation problems. Only the CFCF supervisor shall have the capability to disseminate a resolution which create a saturation problem. All disseminated resolutions shall be reflected in subsequent system calculations.

(cc) In generating resolutions to predicted saturation problems for airport flight components, the system shall only consider delays. In generating resolutions to predicted saturation problems at all other flight components, the system shall consider ground delays, proposed altitude changes, reroutes and aircraft capabilities. The system shall select reroutes from stored alternate preferred routes (which must be approved by Air Traffic). Proposed resolutions may consist of a combination of ground delays, altitude changes, and reroutes, with reroutes kept to a minimum. Resolutions shall not be generated such that they include delays of less than 5 minutes (CFCF specialists shall have the capability to change this number per flight component).

(dd) The appropriate CFCF specialist shall be alerted when another specialist is either modifying or generating a new resolution, or when a resolution is disseminated.

(ee) The appropriate CFCF specialist shall have the capability to amend or cancel current or anticipated delays and reroutes within their area of responsibility.

(2) Trial Reroutes

(a) All specialists shall have the capability to select a system stored alternate route, or change on a trial basis any elements of a proposed flight plan, or construct a new flight plan to consider a reroute.

(b) The system shall automatically check to see whether the trial reroute creates saturation problems for all appropriate flight components for up to 24 hours in advance.

(c) If the trial reroute is predicted to create a saturation problem, the following data will be displayed to the appropriate specialist: each flight component predicted to be saturated, corresponding time increments, and capacity and demand values with and without the trial reroute.

(d) All specialists shall have the capability to reroute, on a trial basis, all flights or designated flights, on or proposed to fly a particular route (e.g., because of weather).

(e) The CFCF specialist shall have the capability to adopt a trial reroute, and automatically disseminate it to the appropriate ARTCC's/ACF's, appropriate terminal facilities, and designated users for implementation.

(f) The system shall be capable of simultaneously handling the construction of a different trial reroute problem at every operational workstation.

(g) All specialists shall have the capability to display stored alternate preferred routes for areas which are typically impacted by either special use airspace or weather. All specialists shall have the capability to use these alternate preferred routes on a trial basis.

(3) Special Events and Training Capabilities

(a) All specialists shall have the capability to display previous real traffic situations (e.g., Mardi Gras, Indianapolis 500, or any past traffic situation). All specialists shall be able to amend trial traffic situation parameters (e.g., number of aircraft departing from a specified airport) and rerun the scenarios.

(b) All specialists shall have the capability to develop real traffic scenarios for certain airports/airspace for training purposes, testing procedures (e.g., proposed hubbing), and handling projected high demand activities. All specialists shall be able to store, amend routes, change scenario parameters, and rerun the scenarios.

(c) All special event and training capabilities shall not affect the live TMS activities.

(d) Capability to display all NAS-tracked and untracked flights, and have the same displayable characteristics and capabilities as the operational system shall be available.

(4) Traffic Management Performance Analysis and Evaluation

(a) Real-Time Analysis. All specialists shall have the capability to display current or future traffic situations, tables and lists, and shall have the capability to perform impact analysis and comparisons in considering resolutions to problems.

1 Situation Display. The specialist shall have the following situation display capabilities:

(aa) Display a traffic situation for a geographic area of concern, defined by a display center location or a flight component, with a range of 5 miles to large enough to simultaneously include all the CONUS, plus a 300-mile perimeter, in 10 mile graduations (selectable by the specialist) about that location or flight component. The terminal area displays shall have a range of 150 miles.

(bb) Display aircraft track positions and direction of flight along with limited data blocks to include ACID, type aircraft, departure airport, specified time en route from any designated point, to a destination or designated point, departure airport, destination, speed, and altitude. Data block offset capability shall be provided.

(cc) Display the following background mapping, as designated by the specialist: geographic U.S. boundaries, state boundaries, oceanic ARTCC boundaries, Alaskan and adjacent foreign boundaries, ARTCC/ACF/TRACON/RAPCON boundaries, en route and terminal area sector boundaries (selectable for any stratum), sector shelving, all airways (numbered), NAVAIDS, airports, fixes, standard instrument approach procedures (SIAP), standard instrument departures (SID), preferential arrival routes (PAR), preferential departure routes (PDR), preferential departure and arrival routes (PDAR), and special use airspace.

(dd) Range rings around multiple points.

(ee) Filter and color code targets by the following criteria: flight component, arrival ARTCC/ACF/TRACON/RAPCON, departure ARTCC/ACF/TRACON/RAPCON, overflight ARTCC/ACF/TRACON/RAPCON, type of aircraft, transponder code, class of users (i.e. airline, general aviation, commuter or military) and altitude.

(ff) Fully variable (range and location) zoom for viewing the situation display.

(gg) Fast-forward or immediately display a picture of the predicted future traffic situation (including projected weather) for up to 24 hours into the future. The specialist shall also have the capability to fast-forward the situation display based on trial resolutions.

(hh) Distinguish between airborne aircraft versus proposed flights projected.

(ii) All graphic weather capabilities listed in paragraph 6 of this section; Weather Display Capabilities.

2 Traffic Situation Lists. The specialist shall have the following capabilities:

(aa) Display and/or receive in hard copy, statistics and lists describing current and predicted future traffic.

(bb) Display demand counts, capacity values, and lists of individual aircraft by call sign or flight, total number of aircraft and for any flight component broken down by aircraft operations (i.e., selected air carriers, selected military, general aviation, and commuter), and/or flight types (i.e., departures, arrivals, and overflights), and/or ATC service (IFR or VFR).

(cc) Display delay and reroute data (e.g., list of proposed aircraft delays, delay times, estimated delay by airport, by aircraft operation, and/or flight types).

(dd) Display current sector configuration data and current runway configuration data for certain airports (designated by Air Traffic).

(ee) Display historical weather trends based on ceiling (i.e. CAT 3/2/1, etc.), and number of bad weather days per month each year for previous 5-year periods. Compare year-to-year weather in concert with actual delays at airports, ARTCC's/ACF's/TRACON's/RAPCON's.

3 Impact Analysis. All specialists shall have the capability to determine the impact of a resolution (e.g., number of aircraft rerouted and/or delayed, average delay). All specialists shall also have the capability to display a comparison between a specialist-entered resolution and a system-generated resolution in solving an identified saturation problem. The traffic impact analysis and comparison shall include the following data for all flight components: total and average delay, number of delayed aircraft, number of reroutes broken down by aircraft operations, flight type, and ATC service. The system will determine the number of aircraft with less than 10 minutes delay and what impact each delay would have had if the delay had not been issued to the flight (delays of less than 30 minutes (by minute) shall be determined by the specialist).

(b) After-The-Fact Analysis. For the purpose of reviewing and evaluating TMS programs, and testing hypothetical resolutions, all specialists shall have the capability to display the following actual traffic count data, statistics, scenarios, and synopsis for the past 54 weeks, except for special events which will be kept for 3 years:

1 Actual Traffic Count Data. All specialists shall have the capability to display actual traffic counts by minute, hour, day, or month for any flight component. These counts shall be displayable by aircraft categories (i.e. selected groups of airlines, general aviation, commuters, and military).

2 Traffic Statistics. All specialists shall have the capability to display the following statistics:

(aa) Actual Delay Data. Data on delays to include 5 minute discounted delays, time of delay, amount of delay for individual aircraft, proposed and actual departure times, ACID, origin and destination airports, cause of delay (e.g., ATC, non-ATC), and average delay by aircraft operation and/or flight type over a given time period.

(bb) Reroute Data. Data on reroutes to include original route, reroute, ACID, origin and destination airports, time, and cause of reroute.

(cc) Runway and Sector Configuration Data. The configuration, time, and the respective airport or sector.

3 Scenarios. All specialists shall have the capability to display any previous real traffic situation.

4 Traffic Synopsis. All specialists shall have the capability to create, store, and display customized synopses to include predicted demands, actual and hypothetical traffic counts, capacity estimates, and in free text a description of the system or specialist generated resolutions, or suggested alternatives. All specialists shall have the capability to receive, on request, appropriate traffic synopses that match specified characteristics (e.g., all stored synopses (selected by Air Traffic) involving shutdown of a major airport due to weather).

(5) Large Screen Display Capabilities. The CFCF specialist shall have the capability to simultaneously display, on up to eight separate large-screen displays, all CONUS, plus 300 miles perimeter; and all TMU specialists shall have the capability to simultaneously display, on up to three separate large-screen displays, all CONUS and plus U. S. oceanic sectors, all airborne NAS-tracked and untracked flights. These screens shall display data blocks which include: ACID, type aircraft, departure and destination airports, ground speed, altitude, and calculated time en route from any designated point to a destination or designated point. Limited data blocks (i.e., position symbol, leaderline, and aircraft identification only) shall be readable from a distance of up to 2 feet. If the screen is located such that a 5th percentile female in height cannot physically move to within 2 feet of all areas of the display, the data blocks must have sufficient size, resolution, and clarity such that she can read the characters as if she were 2 feet away. Some data block overlap in congested areas is tolerable. The data block character size shall be adjustable. The large screen displays shall be viewable from all workstations. Upon selection, the following overlays shall be available: background mapping to include geographic U.S./state boundaries, Oceanic center boundaries, Canada, Alaska, and adjacent foreign facility boundaries, ARTCC/ACF/TRACON/RAPCON boundaries, en route and terminal sector boundaries, sector shelving, airways, NAVAIDS, airports, fixes, special use airspace, ATC assigned airspace (includes MOA's, warning and restricted areas), and six levels of weather information. All capabilities available for the situation displays shall also be available for the large-screen displays. The large-screen displays shall be controllable from any TMS operational or ATCSCC supervisory workstation (with over-ride capability) and from a data entry device located close to the large screens. Only one workstation/data entry device shall have control of a large screen at a time, but, control shall be changeable from one data entry device to another. The large-screen displays shall display across the top (after an alarm) any traffic management system updates, alerts, and delay programs. This capability shall be on a timed basis. Small screen displays capable of displaying any system update, alerts, and delay programs shall be available at designated facilities.

(6) Weather Display Capabilities. All specialists shall have the capability to display current and forecasted weather information. This information shall include data on surface and upper air weather conditions by altitude.

(a) Current Surface Weather Conditions. Shall include information on cloud cover and ceiling, surface and runway visibility, obstructions to vision, precipitation (i.e. liquid, freezing, and frozen), and icing conditions, taxiway/runway conditions (e.g., braking action, snow accumulation), and surface wind speed and direction, altimeter, pressure settings, temperature, and dew point.

(b) Current Upper Air Weather Conditions. Shall include information on cloud layers (i.e., tops, bases, and layers), precipitation, winds aloft (speed and direction), icing, turbulence, pressure centers and fronts, and other significant weather conditions (e.g., hail, thunderstorms, IFR areas, and MVFR).

(c) Forecast Weather Conditions. Forecasts of surface and upper air weather conditions listed above.

(d) Video Graphic Looping. Graphically displayed weather products from 12 hours in the past to 12 hours into the future.

(e) Graphically Displayed

1 6 levels of weather intensity by altitude stratums

2 cloud cover, tops, bases, and layers

3 precipitation

4 winds aloft, including jet stream flows

5 areas of icing reported and forecasted

6 significant weather conditions

7 pressure centers and fronts

(7) Static Display Capabilities. All specialists shall have the capability to display the following data:

(a) airport layout maps

(b) approach charts

(c) preferential arrival and departure routes, standard instrument departures, and standard instrument arrival routes.

(d) ARTCC/ACF/ATCCC backup plans

(8) Special Use and ATC Assigned Airspace Status Display Capabilities. All specialists shall have the capability to automatically receive and display real-time data and the status of military special use and ATC assigned airspace. This capability shall include current status, schedules for use, cancellations, and appropriate times. When these areas are in use, or projected to be in use during a time interval of interest, they shall be outlined in color.

(9) National Airspace Management Facility (NAMFAC)

(a) The system shall accept altitude reservation (ALTRV) requests input by all specialists and/or military units. All ALTRV requests shall be received and transmitted directly into the system and shall contain the required format.

(b) All specialists shall have the capability to process any unclassified ALTRV request for conflicts with other ALTRV's, but, only the ATCSCC specialist shall have the capability to approve the ALTRV. Appropriate specialist's shall be alerted if the processed ALTRV will enter any predicted saturated flight component(s). Upon request, the specialist shall have the capability to receive demand and capacity data for the saturated flight component(s).

NOTE: These ALTRV's are not to be incorporated into the flight component capacity and demand projections, but shall be identified when demand lists are requested. When an ALTRV aircraft (or flight of aircraft) actually departs an airport, it shall be incorporated into the appropriate flight component demand projections.

(c) The ATCSCC specialists shall have the capability to transmit any unclassified ALTRV request to the appropriate ARTCC's/ACF's/ATCCC and foreign facilities. Foreign facility ALTRV approvals and amendments shall be received directly at the CARF workstation.

(d) All specialists shall have the capability to display (and extract in hard copy) the flight paths for a processed ALTRV request, and the related color-coded conflict information, including conflicting missions, altitudes, locations, and times.

(e) The system shall automatically generate a list of possible resolutions if ALTRV to ALTRV conflicts are identified, and display this list to the specialist. At a minimum, the following resolutions shall be provided: (1) change in altitude; (2) change in estimated time of departure, one earlier and one later; and (3) change in routing. These resolutions shall resolve the conflict without creating any new conflicts.

(f) All specialists shall have the capability to make trial changes to an ALTRV request, display (or extract a hard copy of) the modified ALTRV request and transmit them to the ATCSCC NAMFAC specialist for approval.

(g) Only the ATCSCC NAMFAC specialists shall have the capability to cancel, amend, or approve ALTRV requests, and to transmit these messages to the originating military units and appropriate ARTCC's/ACF's/ATCSCC and appropriate foreign facilities and users.

(h) All specialists shall have the capability to receive and generate statistics on requested and approved ALTRV's, including summaries of ALTRV's by time, ARTCC/ACF, or military source.

(i) All specialists shall also have the following analysis capabilities:

1 Collect and analyze altitude reservation requests and special military operations.

2 The types of data and requests required are altitude reservation requests, special use airspace flight requests, large-scale military exercises, flight plan filing procedures, system workload, and en route and terminal sector loading factors.

3 An established data base to track all military training flights, altitude reservations, and special military flights along en route airways.

4 Post-analysis will be performed to gauge if the airspace levels were efficiently utilized.

5 Develop military training flight demand and capacity scenarios.

6 Based upon flight plan intelligence, proposed military training schedules, pinpointing of chronic en route congestion will be performed so that appropriate military commands can be advised of more efficient routes for training flights.

7 A statistical data base must exist and consists of:

(aa) Proposed aircraft departure.

(bb) Proposed aircraft arrival.

(cc) Actual aircraft departure.

(dd) Estimated time en route (ETE).

(ee) Actual time en route (ATE).

(ff) Number of aircraft in mission/training flight that departed.

(gg) Number of aircraft in mission/training flight that failed to depart.

(hh) Number/types of changes to the original ALTRV.

8 The system shall produce graphics/charts.

(10) Airport Reservations

(a) All specialists shall have the capability to make, cancel, change, and confirm reservations at up to 500 designated airports and automatically transmit this information to the control tower/controlling facility of the departing aircraft. The system shall also process, cancel, change, approve and confirm reservations made directly by users.

(b) The system shall notify the specialist (or user) when a requested slot is full and shall automatically provide the nearest available slot to the specialist and the user - one before and one after the requested slot.

(c) For any of the designated airports, all specialists shall have the capability to display a list showing, for a specified time interval, the total number of slots, the reservations made to date (i.e., time slot, ACID, arrival, or departure), and the remaining number of available slots.

(d) All specialists shall have the capability to display (and receive in hard copy) airport reservation statistics (e.g., number of reserved slots, number of requested slots broken down by arrivals, departures, airport, and time period, comparison of individual arrival/departure requested times with actual times).

(e) The CFCF specialist shall have the capability to adjust, up or down, the total number of slots for any of the designated airports in any time interval.

(11) Operations Network (OPSNET)

(a) All specialists and analysis branch specialists shall have the capability to access the following performance information and format it into standard or specialized performance reports: air traffic activity (by ARTCC's/ACF's/TRACON's/RAPCON's and airports), delay information (e.g., number of delays, causes), Engineering Performance Standard measurement data, and equipment outages/status (e.g., airport lighting, NAVAIDS, computer systems, radar). All specialists shall also have the capability to display past terminal weather reports.

(b) The system shall have the capability to simultaneously receive performance information from ARTCC's/ACF's/TRACON's, towers, regional offices, FAATC, qualified users, and shall store this information for 5 years.

(c) The system shall allow designated users (e.g., ATS-1, ATR-1, ATO-1, and regional Air Traffic divisions), access to the system, in addition to specialists.

(d) All specialists shall have the capability to simultaneously transmit reports to ARTCC's/ACF's, TRACON's, towers, ATCSCC, regional air traffic divisions, FAATC, and qualified users.

(e) All specialists shall have the capability to display, in graphic format, analysis of all data received at OPSNET.

(12) Emergency Operations Function (EOF). The EOF shall be a separate function used for backup of the ATCSCC. The EOF shall have the same workstations and the same number of workstations as the ATCSCC. This function shall provide all the capabilities specified for the TMS at the ATCSCC including, CARF, ARF, NAMFAC and large-screen displays. The EOF shall be housed in a separate location from the ATCSCC and shall run completely independent of the ATCSCC and contain its own ETMS/TMP computer.

(13) NOTAM Processing. All specialists shall have the capability to receive and display all NOTAM's affecting the traffic management operations (e.g., equipment outages, special events). All ATCSCC specialists shall have the capability to transmit information to the NOTAM office.

(14) ACF Backup Support.

(a) The system shall monitor ARTCC/ACF/ATCSCC status and notify the appropriate specialists when an ARTCC/ACF/ATCSCC fails.

(b) All specialists shall have the capability to display ARTCC/ACF/ATCCC backup plans.

d. ATCSCC Workstations

(1) Operational ATCSCC Workstations (OATCSCCWS). At initial implementation there shall be 22 OATCSCCWS's. To provide for projected growth, provisions shall be made to provide up to 2 additional OATCSCCWS. Each OATCSCCWS shall be capable of providing all functions specified in this order. The specialist shall have the capability to inhibit and reactivate any function (e.g., saturation detection and alert).

(a) Configuration. The OATCSCCWS shall be completely independent of each other. They shall be configurable by keyboard entry for any position requirements (e.g., geographic or functional breakdown of specialist responsibilities such as CARF, NAMFAC, airport reservations, OPSNET, or flight components to one OATCSCCWS, or any combination of OATCSCCWS), and shall be reconfigurable from any OATCSCCWS. The current OATCSCCWS configuration shall be displayed at each OATCSCCWS. The ATCSCC voice switch shall be an integral part of the OATCSCCWS and be easily accessible to the specialist.

(b) Display Characteristics

1 Each OATCSCCWS shall be capable of displaying all of the display data required in this order. Each OATCSCCWS shall, at a minimum, be capable of simultaneously displaying the following information:

(aa) A traffic scenario with the following characteristics and available data:

((1)) All NAS-tracked and untracked (en route and terminal) aircraft in volume of airspace.

((2)) Aircraft data blocks to include aircraft ID and leader line.

((3)) Up to the CONUS, plus a 300-mile perimeter.

((4)) Graphic weather overlayed.

((5)) Labeled airway information, preferred routes and VFR corridors.

((6)) Airport and NAVAID information.

(bb) A traffic scenario in the projection mode with the same characteristics and available data as listed above.

(cc) Static display information (i.e., either a terminal area or an airport map).

(dd) A trial reroute

(ee) Alphanumeric weather data

(ff) Capacity lists (some scrolling permitted)

(gg) Demand lists (some scrolling permitted)

(hh) Capacity/demand resolutions

(ii) Alert area

(jj) Data entry/preview area

(kk) Output area

(ll) Special use and ATC assigned airspace status information

(mm) NOTAMS

(nn) Description of specialist flight component responsibilities

(oo) Current OATCSCCWS configuration information

(pp) Time

(qq) Free text/scratch pad area

2 Capability to select/inhibit any item listed in paragraph 8.d.(1)(b)1, above.

3 OATCSCCWS's shall be capable of generating symbols and graphics. Symbol sizes, spacing, line width, and font shall be designed to provide for easy viewing by the specialist. Symbols shall be free of baseline variation. Lines, circles, and arcs shall be free of distortion and positioning error and shall clearly appear as the appropriate geometrics. The generation of symbols and graphics contained in this paragraph shall conform to MIL-STD-1472.

4 The system shall be capable of permitting the specialist to perform free handwriting (i.e., electronically) on the display presentation.

5 Data will be arranged on the screen so that the observation of similarities, differences, trends, and relationships is facilitated for the most common uses. Data will be arranged in logical groups: sequentially (i.e., by time), functionally (e.g., flight component saturation resolution data separated from CARF resolution data), and geographically. The specialist shall have the capability to rearrange any displayable data. When the amount of information will not fit on a single screen, the information will be partitioned such that the user can scroll or page through the data, a message will be provided to indicate that the list is not complete. For paged or scrolled data, an indication of current position will be presented to the user at all times.

6 The specialist shall have the capability to dynamically designate any logical display (i.e., set of information displayed as a single entry) or a portion of the situation display which is of interest at a given time (i.e., a window), and have that window displayed upon a designated portion of one of the available display surfaces. The specialist shall be able to scroll within a window.

7 The specialist shall have the capability to zoom to the system range limits, and the relative position of the data shall remain true.

8 The OATCSCCWS's shall be capable of providing brightness modulation, colors (at least 16 easily distinguishable colors), and color shading.

9 Each OATCSCCWS shall constantly display current time in coordinated universal time.

(c) Data Entry and Output Devices

1 Keyboards shall be provided with QWERTY layout, and shall accommodate right and left hand operations. Dedicated keys shall be provided.

2 A cursor position device shall be provided with sufficient resolution to identify every addressable point on the display. This device shall accommodate right- and left-hand operations.

3 Simultaneous multiple inputs shall produce no more than one output message.

4 Visual feedback capability shall be provided to verify message entered.

5 If other input devices are included, these shall provide the same level of performance in supporting the national TMS functional requirements. Input devices shall function independently such that different devices are concurrently operable. The physical and operating characteristics of these and other input devices shall conform to applicable sections of MIL-STD-1472.

(d) Physical Characteristics. The number and size of displays per OATCSCCWS shall be based on the simultaneous display requirements specified in paragraph VII.D.1.b., above (display characteristics), and the human engineering requirements specified below:

1 OATCSCCWS's shall be designed and located for ease of maintenance access (without affecting specialist operations), ease of temporary or permanent relocation, and configurability. OATCSCCWS design shall also reflect applicable system and personnel health and safety factors specified in MIL-STD-1472.

2 The OATCSCCWS work surface shall be large enough to accommodate a writing surface area, a coffee holder, and an ashtray.

3 The OATCSCCWS shall be desigred to provide anthropometric accommodations for 5th percentile females through 95th percentile males.

4 Ambient noise contributed solely by OATCSCCWS's shall not exceed the limits specified in FAA-G-2100.

(e) Man-Machine Interface (MMI) Characteristics. OATCSCCWS's shall be designed to use the best modern MMI practices to provide a data entry function that is easy to use and learn, and has inherent entry error prevention.

1 Menus shall be logically organized (i.e., dependent or logically related options grouped together). An audit trail shall be provided to tell the specialist where the specialist is in the menu structure. A control option shall always be present to allow the specialist to return to previous levels of a menu structure.

2 Command languages shall be concise. The specialist shall have the capability to enter commands by a function key command, or by composing the command.

3 When necessary, form filling capabilities shall be provided.

4 Computer inquiry capabilities shall be provided, including user prompts and implied functions.

5 Defaults shall be provided for any form-filling or many selection types of data.

6 Immediate feedback shall be provided after all input actions (e.g., echo the designated character on the display, see movement of the displayed cursor).

7 Error checking feedback shall be provided which can easily determine what was received by the system as input, what was sent by the system, what fields or data items were detected as being erroneous, and what error checking criteria were violated.

8 The specialist shall have the capability to terminate, suspend, and/or suppress display of the results of a process or transaction underway. The specialist shall have the capability to easily resume an interrupted process via a single command.

(2) Supervisory ATCSCC Workstations (SATCSCCWS). There shall be two SATCSCCWS's which provide the same capabilities as OATCSCCWS's, plus the following additional capabilities:

(a) Globally inhibit/activate any system function (i.e., for all OATCSCCWS's).

(b) Display anything currently being displayed on any OATCSCCWS and monitor any associated communications.

(c) Display system status information (e.g., list of hardware elements and operational status).

(d) All OATCSCCWS's shall be viewable from the SATCSCCWS's.

(3) NAMFAC ATCSCC Workstations (NFATCSCCWS). There shall be 10 SAATCSCCWS's which provide the same capabilities as the OATCSCCWS's.

(4) Support ATCSCC Workstations (STATCSCCWS). There shall be 10 STATCSCCWS's which provide the same capabilities as the OATCSCCWSs. The 10 STATCSCCWS's shall be designated to the following positions:

(a) Data Systems

(b) Analysis

(c) Software Maintenance

(d) Development Lab - two workstations

(e) Training - four workstations

(f) FAATC

(5) Operations Network (OPSNET) Workstation (OPSNETWS). The OPSNET shall provide only the OPSNET capabilities specified in the OPSNET section (paragraph 8.c.(11) above).

(6) Printers. Color printers shall have the capability to print in hard copy anything that appears on the displays. One printer shall be available at each of the workstations. These printers shall have the capability of producing view graphs, 35 mm slides and accepting output from personal computers.

(7) Plotters

(a) Color plotters shall be available at the following positions:

1 Operational floor (2 plotters)

2 Analysis

3 Training

4 CARF

(b) The specialist shall have the capability to vary the scale so that plotted transparencies can be overlayed with matching scales on en route high and low altitude charts, to the same scale.

(c) These plotters shall have the capability of producing view graphs, 35 mm slides, and accepting output from personal computers.

e. Interface Capabilities

(1) The system shall receive and process the following data:

(a) Flight data (flight plans, amendments, cancellations)

(b) Flight track position updates

(c) ARTCC/ACF boundary crossing messages

(d) Unusual capacity data (i.e., conditions such as marginal weather which do not cause automatic updates to the CFCF capacity parameters, but which do reduce capacity).

(e) Airspace status data (e.g., restricted airspace status)

(f) Runway configuration data/changes/status

(g) Sector configuration data/changes

(h) ARTCC/ACF backup status data

(i) Terminal area status data

(j) Equipment status data

(k) General information messages (e.g., coordination data, free text)

(l) Weather information

(m) Airport reservation data

(n) Processed NOTAM's

(o) ALTRV request data

(p) Delay data (e.g. actual delays)

(q) Air Traffic Operations Management System (ATOMS)

(r) Operations Network (OPSNET)

(s) Oceanic Display and Planning probe System (ODAPS)

(t) Automatic Dependent Surveillance (ADS)

(u) National Airspace Management Facility (NAMFAC)

(v) Military Airspace Management System (MANS)

(2) The system shall receive and transmit the following data to and from the CFCF, ARTCC's/ACF's, designated terminal facilities and the System Support Computer Complex (SSCC):

(a) Delay data

(b) Reroute data

(c) Capacity data

(d) Demand data

(e) ALTRV requests, approvals, amendments, cancellations

(f) Traffic statistics, traffic scenarios

(g) Airport reservation data

(h) General information messages

(i) Central flow advisories

(j) Traffic management alerts (sent automatically)

(k) ARTCC/ACF and ATCSCC backup plans and data

(l) All lists and simulations and graphic data

(m) ODAPS

(n) ADS

(o) NAMFAC

(p) MANS

(3) The national TMS shall allow all specialists to request TMS data.

(4) All flight component demand counts shall be automatically sent to the respective ARTCC's/ACF's and designated terminal facilities. When the demand for any flight component exceeds its respective capacity value, an alert and system generated resolutions will be automatically sent to the respective ARTCC's/ACF's and terminals.

(5) The CFCF shall have the capability to send resolutions to appropriate users.

(6) The system shall transmit and receive airport reservation data to/from Flight Service Automation Stations (FSAS), appropriate specialists, and other users.

(7) The system shall transmit ALTRV data (approvals, amendments, conflict resolution data, cancellations) to military units, foreign facilities, and all appropriate specialists.

(8) The CFCF shall transmit designated advisories and/or messages (e.g., delay summaries, free text) to all appropriate users.

(9) Interface with the Emergency Operation Function.

(10) Capability for CFCF training lab to interface with all TMU and TMC designated training positions.

(11) Provide the interface between ATCSCC/ETMS data and the Air Traffic Operation Management System (ATOMS). ATOMS will provide analytical information to headquarters, regional, and field personnel on information contained in the ETMS (e.g. OAG information, lists of arrival or departures from selectable airports, sector usage, etc).

(12) All ATCSCCWS's shall have a total and complete interface with all other ATCSCCWS's such that all information can be transmitted and received between ATCSCCWS's.

(13) The CFCF shall interface with designated foreign air traffic control facilities (e.g. Canada, Mexico, Europe, and military facilities: Europe CARF, Pacific Military Altitude Reservation Facility, etc.

(14) The TMU workstations shall interface with the appropriate en route sectors and ATCSCC workstations, with all data automatically directed to the appropriate TMU, TMC, or ATCSCC workstations.

(15) The system shall interface with ODAPS and capture oceanic traffic.

(16) The system shall interface with ADS.

(17) The system shall interface with NAMFAC.

(18) The system shall interface with MANS.

(19) An office and building intercom system interface with the control room speakers and the staff officers/offices shall be provided, and shall also be capable of interfacing with the building emergency intercom with independent speakers (e.g. ceiling type) having access to it.

f. Voice Communications. The ATCSCC shall provide voice connectivity.

(1) Direct Access. The ATCSCC voice switch (ATCSCCVS) shall provide for direct access to initiate an outgoing call or to answer an incoming call with ARTCC's/ACF's/ TRACON's/RAPCON's/ATCT's, and military facilities. The system shall also provide capability of answering and placing calls, using CENTREX, FTS, AUTOVON, automatic ring (point-to-point signaling) system and to special locations such as regional offices or international TMS air traffic facilities, into a conference. This capability is required even though some flight components may lie in more than one ARTCC/ACF and some ARTCC's/ACF's may have operational responsibility; for flight components under different ATCSCCWS responsibility, incoming calls shall be automatically directed to the appropriate ATCSCCWS with operational responsibility for that flight component. Visual indication representing call status shall be provided.

(2) Single Action Indirect Access

(a) The capability of "programming" individual designated phone numbers with burst-dialing capability shall be provided to those users listed in paragraph VII.F.1, above, and administrative offices, AFSS's, airport authority, airlines, military, and other users.

(b) The capability of bridging (lines simultaneously) for conferences shall be provided.

(c) Facilities/users of the system shall be permitted to be called into a conference automatically, simultaneously, and instantaneously.

(d) The capability of identifying conferees on a particular conference in progress shall be provided. Visual identification of each participant in a conference shall be provided to enable the specialist to respond to identified participant's questions (i.e. whoever is speaking is automatically and visually identified). The specialist requires the capability of knowing when any conferee becomes disconnected.

(e) The capability of combining any combination of CENTREX, AUTOVON, FTS, or "point-to-point" lines into a conference, either individually or simultaneously, shall be provided.

(3) Feature Access. The ATCSCCVS shall provide the special features listed below via single selector operation (e.g., call hold).

(a) Conference Calls. The capability to initiate and participate in conference calls. Three types of conference capabilities shall be provided: progressive conferencing, meet-me conferencing, and preset conferencing. Indirect access and direct access to conference calls shall be provided. Visual indication of participation in any conference call shall be provided for the duration of the conference call. The conference limit for the ATCSCCVS shall be large enough to include designated ARTCC's/ACF's, TRACON's, RAPCON's, ATCT's, all specialists, ADO's, regional air traffic divisions, Management Information System (MIS), and designated commercial lines.

1 Progressive Conferencing. All answered direct and indirect access calls initiated at the position after the conference function is enabled shall become participants in the conference call up to the conference limit.

2 Meet-Me Conferencing. To establish a meet-me conference bridge where designated parties call a specific conference number at a predetermined time. Once established, each position accessing the bridge, up to the conference limit of the ATCSCCVS, will become a party to any conference on the bridge.

3 Preset Conferences. Preset conference originators and conferees are set in ATCSCCVS adaptation. Preset conferences will be originated from authorized positions by direct access. Ringdown to each preset conferee will be provided. Each called party, up to the conference limit, shall be able to join the conference by answering the call.

4 Conference Suspend. The capability shall be provided to suspend any conference call. Resumption of the conference call shall be provided by a single touch action.

5 Release From Conference. Release from a conference call by any participant shall not affect the continued participation in the conference by any other participant.

(b) Override Capability. The capability of "override" to or from any operational or supervisory workstation shall be provided. This should be locking buttons when depressed. When the override button is depressed, the designated workstation is alerted to whom is overriding that workstation. This should allow any workstation to override/monitor any other workstation by depressing that workstation's button. There shall also be a capability to release the override. This override feature shall accommodate all workstations, individually or simultaneously, on one conversation.

(c) Release Pushbutton. A release pushbutton (or equivalent) function shall be provided to permit the disconnect of any communication, with the exception of calls in HOLD status.

(d) Workstation Speakers. Each workstation shall have an integrated speaker with an on, off, and volume control capability. Also, an option to route communications through additional external speakers (e.g. ceiling type) that are independent of that console shall be available. It may require that these external speakers have their own button appearance or dial up capability at each workstation to be able to add or subtract the communication (with volume control) at anytime and against any console.

(e) Call Forwarding. When the call forwarding feature is enabled, all incoming calls shall be redirected to a designated destination. A message shall be provided indicating that call forwarding to the receiving position is in effect. Call forwarding shall be controllable by the forwarding position.

(f) Call Transfer. To transfer any call to any other position.

(g) Common Answer (CA) Queue. The ATCSCCVS shall allow for a maximum of four common answer calls (i.e., calls to same workstation) to be held in queue. The call in progress shall be included in this number. All subsequent calls shall be provided with a busy signal.

(h) Call HOLD. To place any call, including participation in conference calls, in a HOLD status with a single touch action. The capability to resume a call on HOLD by a single touch action shall be provided. A continuous visual indication that a call is in a HOLD status shall be provided for the duration of time that a call is on HOLD. A CA queue call placed on HOLD will retain its sequence in the CA queue.

(i) Back-up Power. Shall be capable of back-up power for at least 72 hours.

g. Performance Characteristics

(1) Data Base Accuracy

(a) The departure time/wheels-up (i.e., when the aircraft actually departs) accuracy shall be measured as the number of flights in the data base that depart within 8 minutes of their proposed departure times (i.e., proposed departure time plus projected times until wheels-up time). Departure times shall be 97 percent accurate for a look-ahead time of 2 hours, 92 percent accurate for 4 hours, 90 percent accurate for 8 hours, 85 percent accurate for 24 hours, 80 percent accurate for 4 weeks.

(b) The en route time accuracy shall be measured as the number of flights in the data base with actual en route times within 9 minutes of their proposed en route times for flights 2 hours long, or less, and within 10 minutes for flights longer than 2 hours. En route times shall be 97 percent accurate for a look-ahead time of 2 hours, 92 percent accurate for 4 hours, 90 percent accurate for 8 hours, 85 percent accurate for 24 hours, 80 percent accurate for 4 weeks.

(c) The route of flight accuracy shall be measured as the number of flights in the data base that actually depart and fly their proposed routes of flight. Routes of flight shall be 99 percent accurate for a look-ahead time of 2 hours, 98 percent accurate for 4 hours, 90 percent accurate for 8 hours, 88 percent accurate for 24 hours, 85 percent accurate for 4 weeks.

(d) The specific flight accuracy shall be measured as the number of proposed flights stored in the data base that actually fly. The number of flights shall be 98 percent accurate for a look-ahead time of 2 hours, 93 percent accurate for 4 hours, 91 percent accurate for 8 hours, 86 percent accurate for 24 hours, 81 percent accurate for 4 weeks.

(2) Functional Accuracy. The TMS functions shall have the following numerical accuracies:

(a) The estimated demand counts for any flight component for any prediction time interval shall be within 95 percent of the actual demand during that interval for predictions made 2 hours in advance. For predictions made 2 to 4 hours in advance, estimated demand shall be within 91 percent of actual demand, and within 89 percent for 4 to 8 hours.

NOTE: Every part of a flight and the peculiarities about the different airports and airspace encountered by a particular flight must be considered in calculating times used to project flight component demand estimates. The proposed times of departure used on flight plans are airline/user proposed gate departure times and cannot alone provide sufficient accuracy to meet our TMS mission. The following are examples of areas that, at a minimum, should be considered between the time an aircraft departs the gate and the actual departure time (wheels up) in calculating these estimates:

1 Taxi times in general, from gate to runway.

2 Different taxi times for different airports.

3 Different taxi times from different airline gates or user ramps to runways.

4 Different taxi times for different runway configurations.

5 Hold short time at end of runway times waiting for takeoff clearance.

6 Rolling time after clearance for takeoff until wheels up.

NOTE: Many of these times will be the same, but they all should be considered and added into the time estimates used for calculating flight component demands. Other parts of the flights will have other areas that should be considered for calculating other flight component demands. We consider the high accuracy of the estimates absolutely essential in the successful implementation and operation of the TMS system.

(b) When delays are calculated and implemented to resolve an airport saturation problem, the actual number of arrivals (departures) shall be within 97 percent of the predicted number of arrivals (departures) in the predicted interval.

(c) Any system-generated resolution (delays and reroutes) for any predicted saturated flight component, other than airports as in paragraph b. above, shall result in actual aircraft counts for each flight component that are within 95 percent of each flight components predicted aircraft count in the predicted interval.

(d) System proposed alternate routes, when implemented, shall result in traffic loads that meet the performance requirements specified above for system resolutions.

(e) Near real time display of airborne aircraft positions shall always be accurate to within 8 nm of their actual position. This accuracy requirement shall take into account all system inaccuracies (i.e., radar systems, displays, throughput times, etc). A combination of radar updates and integrated tracker updates may be used to satisfy this requirement. All displayed data/aircraft positions shall be refreshed simultaneously (within 2 seconds).

(f) The predicted aircraft position of an airborne aircraft shall be displayed within 15 nm of their actual position when the proposed route of flight is flown for predictions up to 2 hours in advance, and within 18 nm for predictions greater than 2 hours in advance.

(g) The CARF will process ALTRV requests such that the predicted position shall be accurate to within 15 nm of the future actual position. Error, such as the uncertainty in the winds aloft, data available, should be accounted for in this performance accuracy.

NOTE: We acknowledge that the accuracy of the outputs of TMS functions are in many cases limited by the accuracy of the input data available at the time the function is invoked. However, the quality of the TMS data base will to a great extent determine the accuracy of most results of TMS functions.

(3) Operational Availability. The system operational availability for full service (i.e., provide all capabilities) shall not be less than:

(a) 0.9995 for functionality of the computer and software (i.e., will be in full service all of the time, except for up to 4.38 hours/year).

(b) 0.9995 for any one workstation (i.e., will be in full service all of the time, except for up to 4.38 hours/year).

(4) Response Time. The system shall have a maximum response time requirement (from time of request to time of display) of 10 seconds for all displayable data at any workstation.

(5) Sizing. The system shall be sized to account for FAA projected growth in arrivals, departures, en route, tower en route air travel, and an increased number of flight components over the life of the system.

h. Recording and Playback. The system shall record all specialist inputs and displayed data information and shall store this data for 54 weeks, except for special events which will be kept for 3 years. All recorded voice and data shall be time/date stamped and all recorded input data shall include specialist identification. All specialists shall have the capability to auto

search and playback synchronized recorded voice and data at any ATCSCCWS in the normal or fast-forward mode, without affecting the recording of current voice and data or the normal operation of other TMS duties at that ATCSCCWS. The system shall provide for on-line playback of all data and voice up to 15 days. The system shall provide a fail safe capability in order to guarantee there will not be any erasure of data.

i. Training. This section establishes TMS training requirements for national, regional, and traffic management specialists, traffic management contractors, automation specialists, air traffic control specialists and their respective area supervisors, area managers, and facility managers.

(1) Transition Training

(a) Transition training shall be provided to traffic management specialists, supervisors, and managers to facilitate a smooth transition from existing operational functions, capabilities, and equipment to full use of all operational functions, capabilities, and equipment defined by this order which impact traffic management.

(b) Transition training shall be provided to automation specialists to ensure a smooth transition from supporting current TMS software to providing support for all operational functions, equipment, and capabilities defined by this order.

(2) Operational Functions, Capabilities, and Equipment Training.

(a) Traffic management specialists, supervisors, and managers shall be trained to effectively perform all operational functions and capabilities defined by this order which impact traffic management operational functions, equipment, and procedures.

(b) Air traffic control specialists, supervisors, and managers shall be trained to perform all operational functions and capabilities defined by this order that interface with their operational functions, equipment, and procedures.

(c) Automation specialists shall be trained to provide software support for maintaining all operational functional, equipment, and capabilities defined by this order.

William H. Pollard
Associate Administrator
for Air Traffic

APPENDIX 1. TITLE INDEX

(Concluded)