ORDER

6850.35

HIGH INTENSITY APPROACH LIGHTING SYSTEM
WITH SEQUENCED FLASHING LIGHTS (ALSF-2)
PROJECT IMPLEMENTATION PLAN

March 30, 1993

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

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RECORD OF CHANGES

DIRECTIVE NO. 6850.35

CHANGE TO BASIC	SUPPLEMENT			OPTIONAL	CHANGE TO BASIC	SUPPLEMENTS			OPTIONAL

FOREWORD

This order transmits the project implementation plan (PIP) which provides management direction for the implementation of National Airspace System High Intensity Approach Lighting Systems with Sequenced Flashing Lights (ALSF-2) and with remote maintenance monitoring capability. The PIP defines the major functional responsibility levels, management direction, and overall program guidance to all responsible levels within the Federal Aviation Administration for the procurement and implementation of the ALSF-2 systems.

Gary Skillicorn
Program Manager for Landing

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CHAPTER 1. GENERAL

1. **PURPOSE.** This order establishes a project implementation plan (PIP) for the High Intensity Approach Lighting System with Sequenced Flashing Lights (ALSF-2), and with Remote Maintenance Monitoring (RMM). Its primary purpose is to define management roles and procedures and supporting organization's responsibilities for implementation and integration of the ALSF-2 into the National Airspace System (NAS).

2. **DISTRIBUTION.** This order is distributed to branch level in the office of the Program Directors for Communications and Aircraft Acquisition, Navigation and Landing, Weather and Flight Service Systems; NAS Transition and Implementation and Operational Support Services; to division level in the NAS System Engineering and Systems Maintenance Services, Office of the Associate Administrator for Contracting and Quality Assurance, Offices of Airport Safety and Standards, Aviation System Standards, and Air Traffic Plans and Requirements Service; to branch level in the regional Airway Facilities, Logistics, Airports, Air Traffic, and Flight Standards divisions; to division level in the Engineering, Test and Evaluation Service at the FAA Technical Center; to branch level in the FAA Logistics Center, and FAA Academy at the Mike Monroney Aeronautical Center; limited distribution to the Airway Facilities General National Airspace System sectors, sector field offices, sector field units, and sector field office units.

3. **DEFINITIONS.** The following acronyms and abbreviations are used in this order:

ACT	FAA Technical Center
AF	Airway Facilities
ALS	Approach Lighting System
ALSF-2	High Intensity Approach Lighting System with Sequenced Flashing Lights
APML	Associate Program Manager for Logistics
APMC	Associate Program Manager for Contracting
APMQ	Associate Program Manager for Quality
APMT	Associate Program Manager for Test
ATCT	Airport Traffic Control Tower
BIT	Built-in-test
CAI	Contractor Acceptance Inspection
CCB	Configuration Control Board
CCD	Configuration Control Document
CM	Configuration Management
CO	Contracting Officer
dB	Decibel
DRR	Deployment Readiness Review
FAA	Federal Aviation Administration

FRDF	Facility Reference Data File
GBL	Government Bill of Lading
GFM	Government Furnished Materials
ILS	Instrument Landing System
ILSP	Integrated Logistics Support Plan
IMCS	Interim Monitor and Control Software
IRD	Interface Requirements Document
JAI	Joint Acceptance Inspection
LRU	Line Replaceable Unit
MDT	Maintenance Data Terminal
MPS	Maintenance Processor Subsystem
MTBF	Mean Time Between Failure
MTTR	Mean Time To Repair
NAILS	NAS Integrated Logistics Support
NAILSMT	NAS Integrated Logistics Support Management Team
NAS	National Airspace System
NCP	NAS Change Proposal
NOTAM	Notice to Airmen
ORD	Operational Readiness Demonstration
OT&E	Operational Test and Evaluation
PIP	Project Implementation Plan
PDSR	Program Director Status Review
QRO	Quality Reliability Officer
RMM	Remote Maintenance Monitoring
RMS	Remote Monitoring Subsystem
SSALR	Simplified Short Approach Lighting System with Runway Alignment Indicator Lights
T&E	Test and Evaluation
TCCC	Tower Control Computer Complex

4. **AUTHORITY TO CHANGE THIS ORDER.** The Program Manager for Landing, ANN-200, shall approve all changes to this order.

5.-19. **RESERVED.**

CHAPTER 2. PROJECT OVERVIEW

20. SYNOPSIS. The ALSF-2 project consists of the procurement of ALSF-2 equipment as defined in specification FAA-E-2689a, Notices 1 and 2, Dual Mode High Intensity Approach Lighting Systems. The systems will be installed at airports in accordance with FAA standards. Approximately 20 systems will be installed throughout the country. The procurement will be a firm fixed-price contract with two options. If exercised, both options may provide a maximum of 15 additional ALSF-2 systems each.

21. PURPOSE. This project is to procure and install ALSF-2 equipment at selected sites.

22. HISTORY.

a. The present ALSF-2 population is comprised of several generations of equipment, that do not have RMM capability. The present ALSF-2 systems are controlled locally only from the substation, and remotely only from the air traffic control tower (ATCT). Alarms and caution conditions are indicated, at both substation and ATCT, by means of audible electronic signals and blinking indicator lights or by extinguishment of indicator lights.

b. The ALSF-2 systems being procured will be equipped with a remote monitoring subsystem (RMS). The RMS will enable maintenance specialists to monitor and control the ALSF-2 system, from a centralized location, through the maintenance processor subsystem (MPS). Also, the RMS will allow local monitoring and control of the system through a maintenance data terminal (MDT).

c. The last contract for the procurement of ALSF-2 systems was awarded to Airflo Instrument Co. in 1985.

23.-29. RESERVED.

CHAPTER 3. PROJECT DESCRIPTION

30. **FUNCTIONAL DESCRIPTION.** The ALSF-2 system is a high intensity approach lighting system with sequenced flashing lights, used to present approach lighting patterns to landing aircraft on selected category II/III runways. The steady burning lights patterns consist of a group of light bars installed symmetrically about the extended runway centerline, starting at the runway approach threshold and extending a distance of 2,400 feet and up to 3,000 feet (i.e., when the approach slope is less than 2.75) outward into the approach zone. The flashing light section of the ALSF-2 system will consist of a maximum of 21 flashers. The ALSF-2 system operates in two modes: 1) the ALSF-2 mode and 2) the simplified short approach lighting system with runway alignment indicator lights (SSALR) mode (see figures 3-1, 3-2, and 3-3). The ALSF-2 system consists of the equipment cited in subparagraphs 30a - 30q (see figure 3-4).

a. High voltage input cabinet. The high voltage input cabinet receives the 2,400/4,160 volts, alternating current (V ac), three-phase, four-wire, 60 Hertz (Hz), 150 KW primary input power to the substation shelter. The high voltage input cabinet provides 2,400 V ac, one-phase, two-wire, 60 Hertz (Hz) power to each of the constant current regulators in the substation and accommodates main power switching, fusing, metering takeoff, and system input lightning protection. It provides lightning protection for the primary input power and the input power monitoring circuits. The high voltage input cabinet provides oil-filled circuit breakers for primary power distribution to the regulators, the flasher system, and the substation utility distribution system. It contains 20:1 potential and 25:5 current transformers, as required to monitor the input voltage and power consumption at the control and monitor system.

b. Constant current regulator. The three constant current regulators each receive 2,400 V ac, one-phase, two-wire, 60 Hertz (Hz) power from the high voltage input cabinet and distribute 50 KW constant current power to the high voltage output cabinet.

c. High voltage output cabinet. The high voltage output cabinet receives constant current regulated power from the 50 KW constant current regulators in the substation and distributes it to three output lighting loops in the ALS light field. It provides switching relays to perform the high voltage output switching function required to change operational modes from ALSF-2 to SSALR. It provides 20:1 potential transformers as required to monitor output voltage level and contains shorting disconnects for isolation of the light field during servicing and maintenance.

(1) 300, 500, and 1500 watt series isolation transformers. Isolation transformers isolate PAR-56 lamps from the high voltage

constant current loop coming from the high voltage output cabinet and maintain loop integrity in the event of lamp failure. Transformers used will be in accordance with Advisory Circular (AC) 150/5345-47, Isolation Transformer for Airport Lighting Systems, type L830-9 and L830-13. The 1500 watt transformers will be in accordance with FAA-E-2690, Isolation Transformer for Approach Lighting System (1500 watt).

d. PAR-56 lamp holders. PAR-56 lampholders receive power from the three output lighting loops in the ALS light field. The PAR-56 steady burning lamps are white, green filtered, or red filtered and are aimed into the approach to the runway and away from the runway threshold.

e. Control and monitor subsystem. The control and monitor subsystem consists of the substation control and monitor assembly, the remote electronic chassis, and the remote control panel. The following functions are accomplished by these units.

(1) Substation control and monitor assembly. This assembly receives 120 V ac, 60 Hz input power from the high voltage input cabinet. It monitors the Approach Lighting System (ALS) input voltage and power, and the output voltage of the three constant current regulators. It provides power for the operation of control and monitor electronic circuits and local panel indicator lamps, and lightning protection for the input power and data transmission link to the remote electronic chassis. It also contains the substation control panel (figure 3-5) and electronics for controlling the operation of the system, and electronics for distributing status and alarm signals upon detection of lamp failures and for RMM and control. The substation control and monitor assembly also interfaces the ALSF-2/SSALR to the Tower Control Computer Complex (TCCC) where applicable.

(2) Remote electronic chassis. The remote electronic chassis provides an interface function between the remote control panel and the substation control and monitor assembly. Its purpose is to perform those electronic functions required by the ATCT and the communications link.

(3) Remote control panel. The remote control panel (figure 3-6) provides control functions and status information to the ATCT.

f. Flasher subsystem transformer. The flasher subsystem transformer converts 2,400 V, 60 Hz, one-phase power from the high voltage input cabinet to provide 120/240 V, 60 hertz, three-wire, single-phase power to the flasher master controller.

FIGURE 3-1. ALSF-2 LIGHTING PATTERN

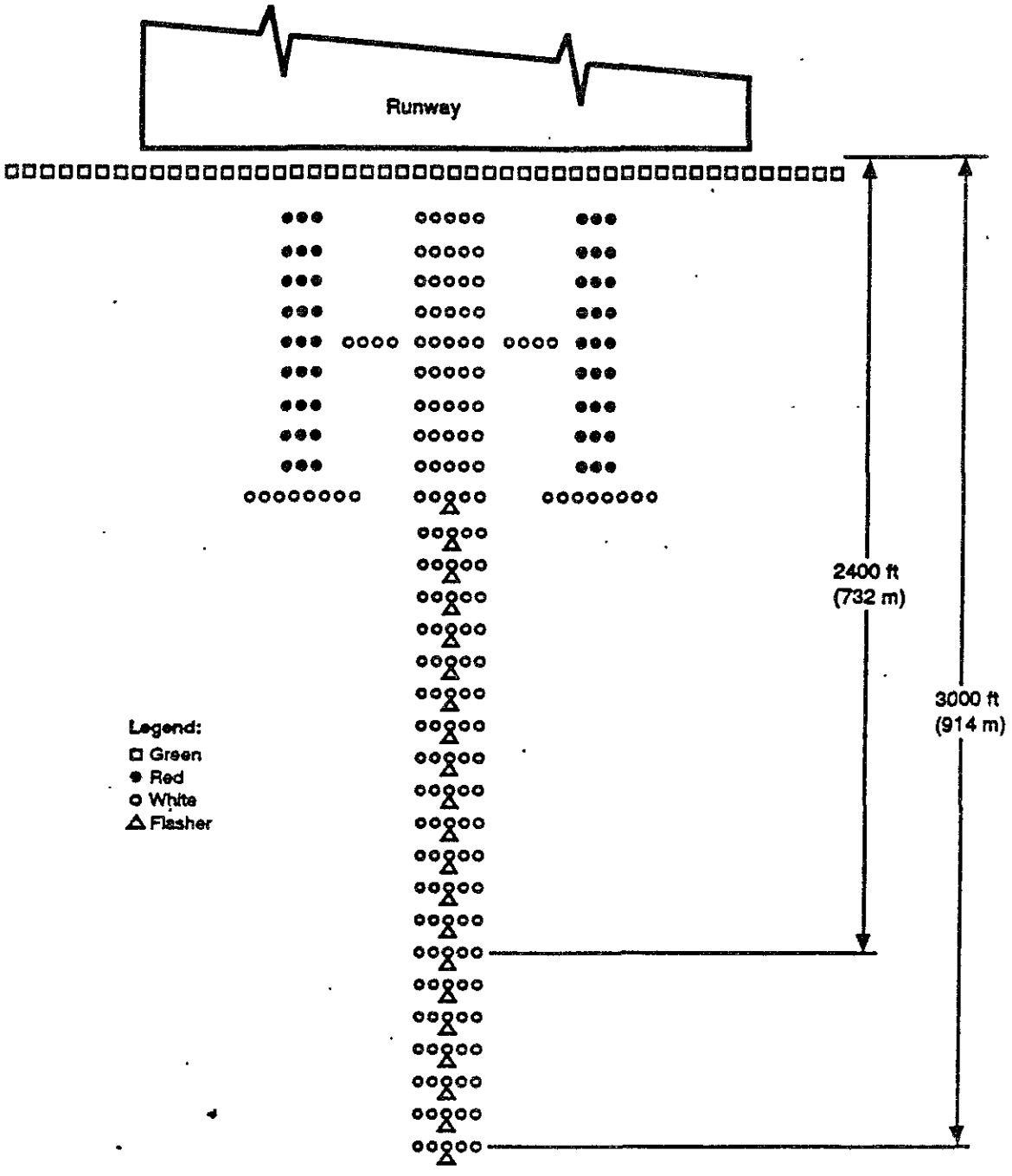


FIGURE 3-2. SSALR LIGHTING PATTERN

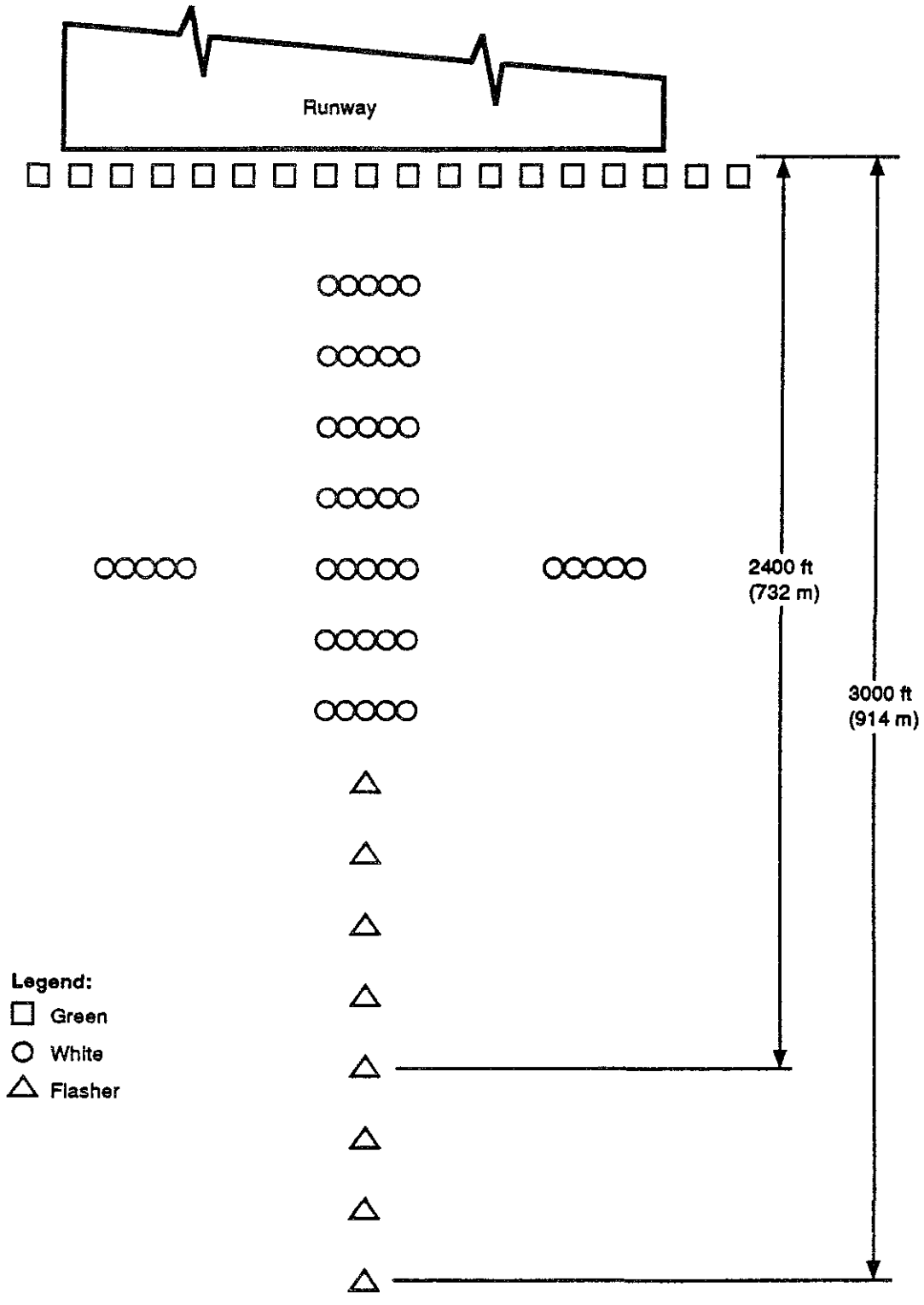


FIGURE 3-3. ALSF-2/SSALR MODE SWITCHING SIMPLIFIED SCHEMATIC

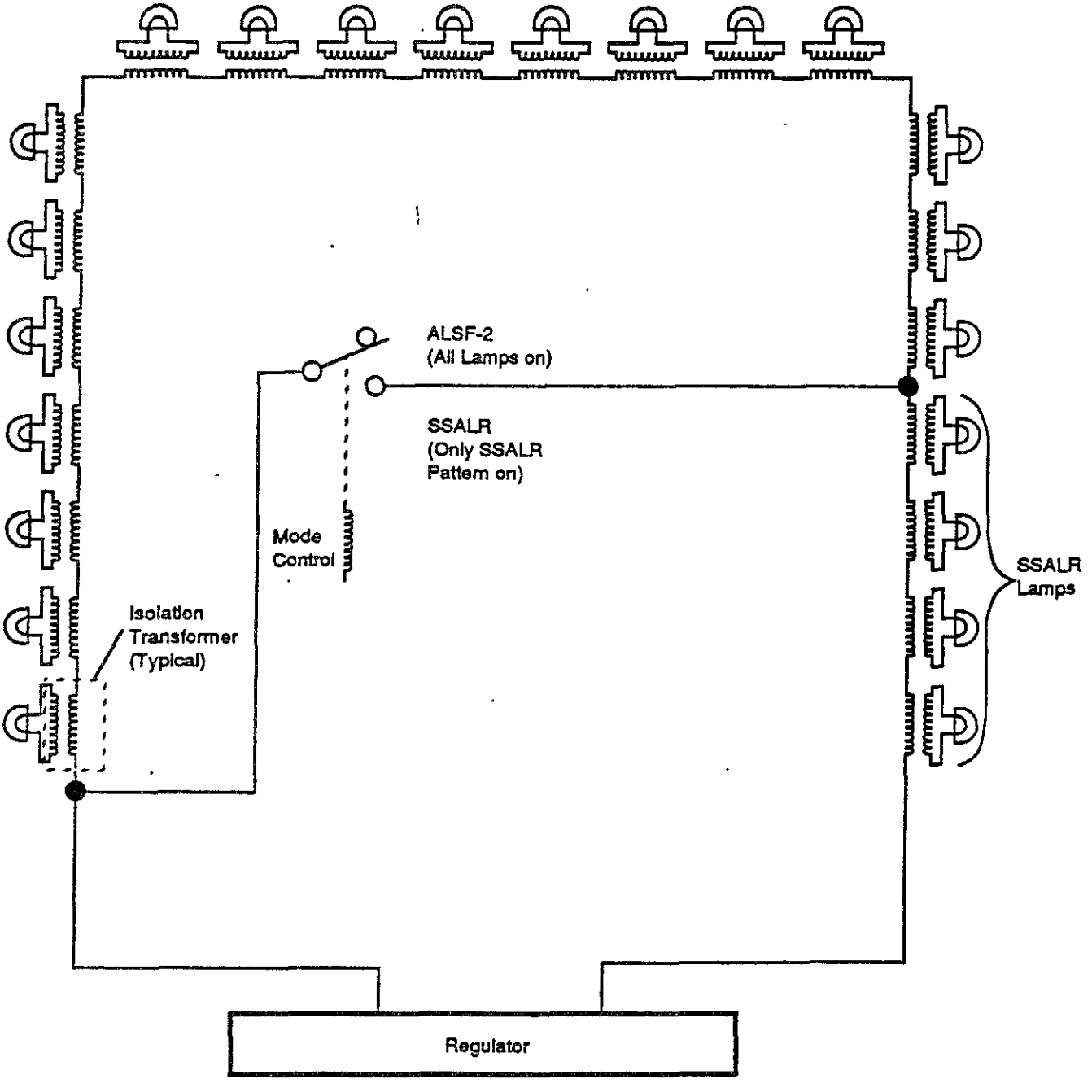


FIGURE 3-4. FUNCTIONAL BLOCK DIAGRAM

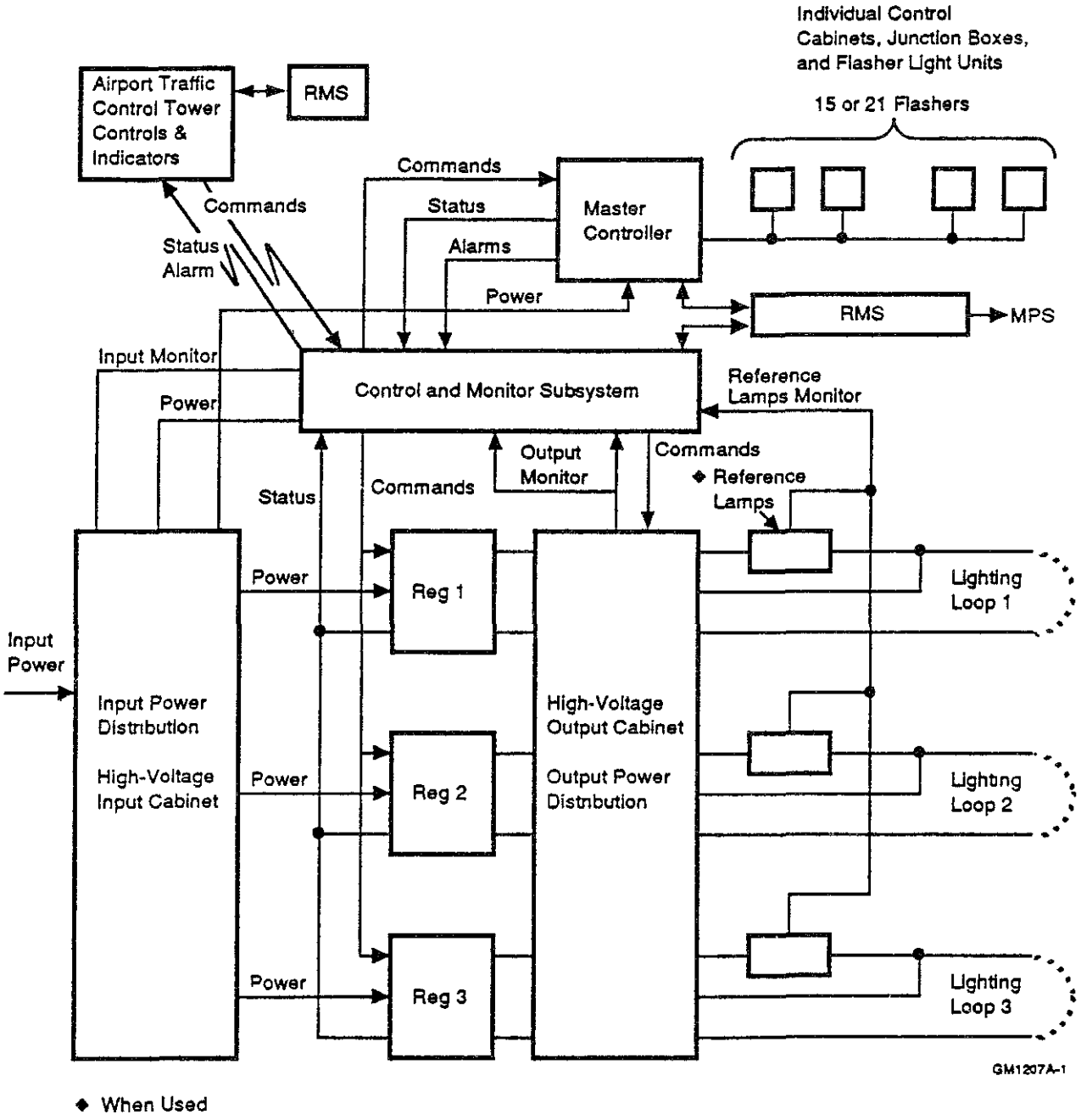


FIGURE 3-5. SUBSTATION CONTROL PANEL

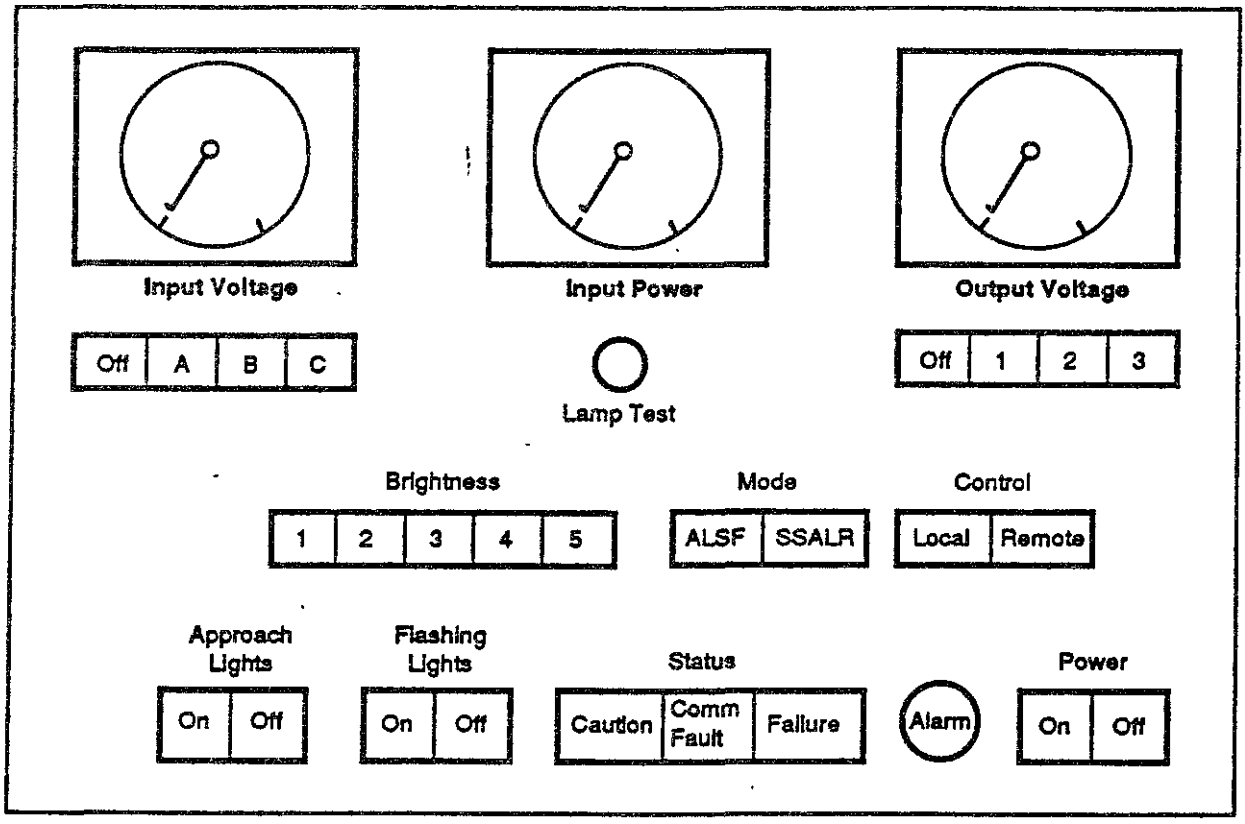
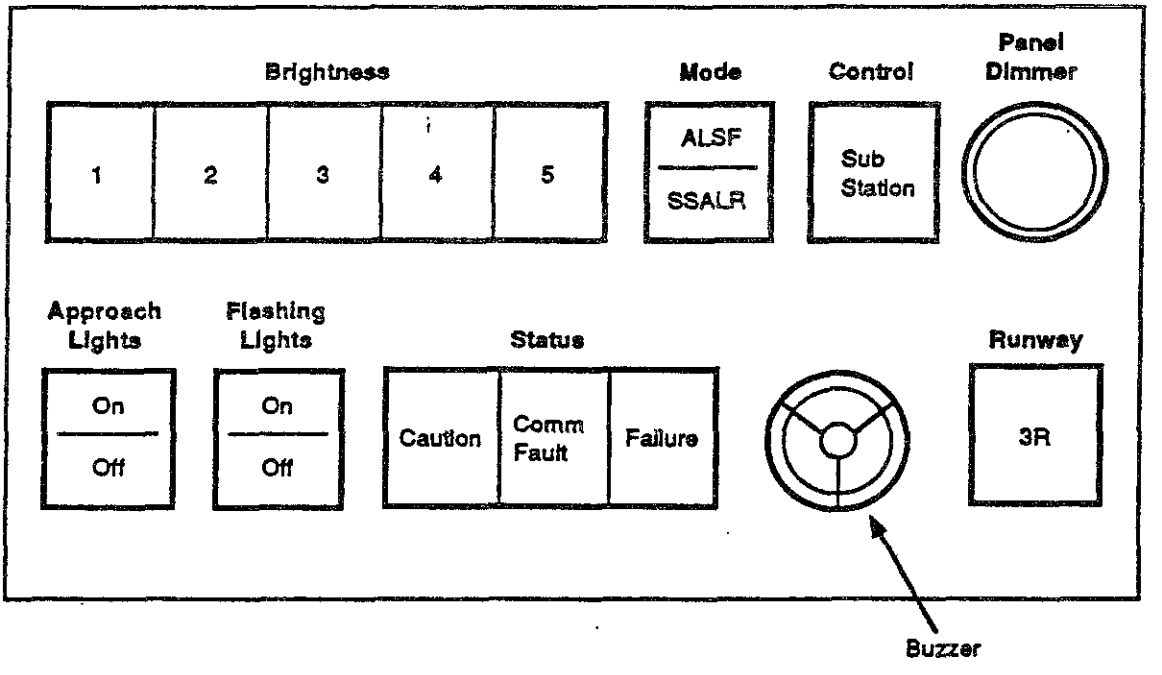


FIGURE 3-6. REMOTE CONTROL PANEL



g. Flasher master controller. The flasher master controller (figure 3-7) receives control signals and conditioned 120/240 V ac, 60 Hz, three-wire, single-phase power from the high voltage input cabinet via the flasher subsystem transformer and provides 120/240 V ac, 60 Hz, ungrounded power to the flasher assemblies via junction boxes. It monitors flasher operation, controls flasher intensity, and conveys status signals to the remote control panel in the ATCT via the control and monitor subsystem. It also provides lightning protection for output circuits and provides for switching between ALSF-2 and SSALR modes.

h. Junction boxes. The junction boxes (figure 3-7) serve as convenient distribution points to interconnect cables from the flasher master controller to the flasher assembly individual control cabinets.

i. Flasher assemblies. The flasher assemblies, consisting of an individual control cabinet and either an elevated or semiflush flasher assembly will function as described in the subparagraphs 30i(1) - 30i(2).

(1) Individual control cabinet. The individual control cabinet (figure 3-7) receives control signals and conditioned 240 V ac, 60 Hz, one-phase, ungrounded power from the flasher master controller. It provides power and control signals to the flasher light unit for distances up to 200 feet. An uninterruptible power supply will be provided to ensure proper operation when the system is switched from commercial power to engine generator.

(2) Flasher light unit. The flasher light units (figure 3-7) are aimed into the approach to the runway and away from the runway threshold. Each flasher light unit emits a bluish-white flash in sequence toward the threshold at a rate of twice per second. The flasher light unit is provided with a means for continuous vertical adjustment of the light beam axis from horizontal to 25 degrees above horizontal with an aiming device. The horizontal beam axis will be perpendicular to the lamp cover glass or window.

j. Flasher tester. The flasher tester will test the individual control cabinet and its associated flasher light unit. The flasher tester will isolate failures to the LRU level. The flasher tester will measure certified, key performance parameters and other critical electrical values and flag any that are out of tolerance.

k. Aiming device for the flasher light unit and PAR-56 lamp. The aiming device will be designed for use with the flasher light unit and the PAR-56 lampholder. The aiming device will fit onto the PAR-56 lampholder and flasher light unit without disassembly of the lampholder or removal of the lamp. The aiming device will permit

field aiming of the lamp axis perpendicular to the plane of the cover glass to any angle from 0 to +25 degrees above the horizontal. The device will be capable of remotely measuring the alignment of the light unit when mounted on low impact resistance structures that conform to FAA-E-2604 or FAA-E-2702. The aiming device will also be capable of aiming a PAR-56 lamp or a flasher light unit mounted on a frangible coupling (FAA Drawing C-6046).

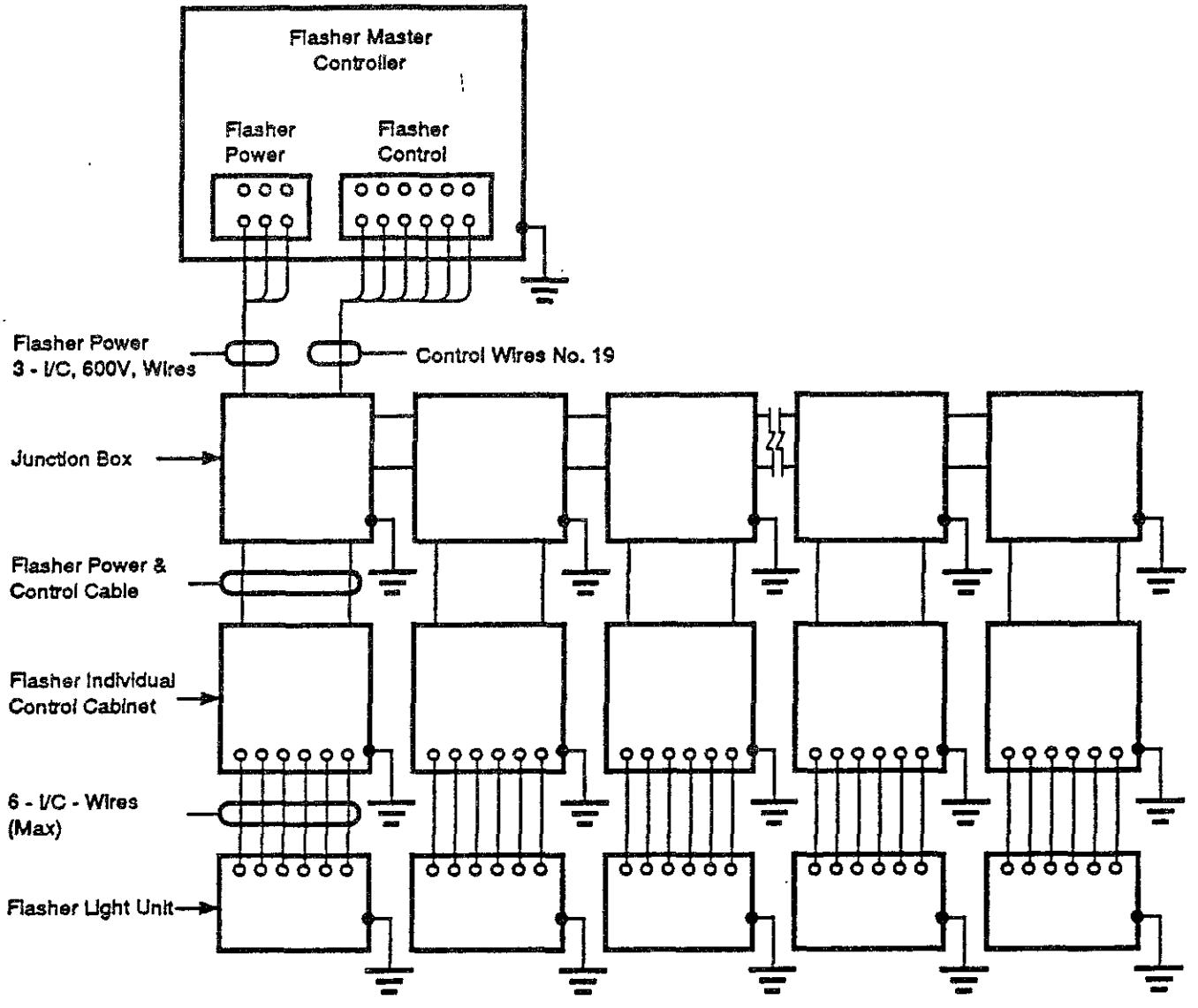
1. Remote monitoring subsystems (RMS). The ALSF-2 subsystem RMS's, with the exception of the environmental sensors, are an integral part of the equipment at each of the ALSF-2 subsystem sites. The RMS's consist of the various embedded sensors required for sampling signals from the ALSF-2 equipment units, an interface unit (if required) to buffer or preprocess the sampled signals and a data acquisition system for digitizing, formatting, and transmitting the processed signals to the MPS on a periodic basis or upon request. Each ALSF-2 subsystem RMS will incorporate a terminal interface. When a MDT is connected to the terminal interface at the subsystem RMS, a qualified, authorized operator will have the capability to monitor the ALSF-2 subsystem, record of site data, perform fault isolation and diagnostic tests, and control and adjust subsystem equipment parameters. Operational requirements for the RMS are given in NAS-MD-792, Operational Requirements for the Remote Maintenance Monitoring System, and NAS-SS-1000, NAS System Specification, Volume V. Functional requirements for the RMS are given in NAS-MD-793, Remote Maintenance Monitoring System Functional Requirements for Remote Monitoring Subsystem, and NAS-SS-1000 Volume V.

31. PHYSICAL DESCRIPTION.

a. High voltage input cabinet. The high voltage input cabinet is a NEMA Type 12 enclosure, 72 inches (1,829 mm) high by 36 inches (914 mm) wide by 24 inches (610 mm) deep. The steel enclosure is equipped with a lockable door and with 1/4-inch plexiglass enclosure, or equal, guarding all exposed high voltage terminals.

b. Constant current regulators. Each 50 kilowatt (kW) current regulators is contained in a steel enclosure not to exceed 70 inches high by 40 inches wide by 47 inches deep. The unit, mounted on a steel base plate with feet or channels, has a rectangular footprint of 30 inch (762 mm) centers. Lifting eyes are provided on all four upper corners. Reactors, capacitors, and indoor transformers are provided with a steel enclosure. The steel tank has a steel control cabinet permanently attached for housing the control electronic circuitries. High voltage input terminals are enclosed with steel.

FIGURE 3-7. FUNCTIONAL RELATIONSHIP OF FLASHING LIGHT SUBSYSTEM



c. High voltage output cabinet. The high voltage output cabinet is a NEMA 12 enclosure, 72 inches (1,829 mm) high by 36 inches (914 mm) wide by 24 inches (610 mm) deep. The steel enclosure will be equipped with a lockable door and with 1/4-inch plexiglass enclosures, or equal, guarding all exposed voltage terminals. The plexiglass will be clear so maintenance personnel can visually inspect behind it without removal. The control wiring terminal board is located in the front of the cabinet so that it will not be necessary to enter the high voltage areas to make measurements on the control wiring.

(1) 300, 500, and 1500 watt series isolation transformers. The 300 and 500 watt transformers used will be in accordance with AC 150/5345-47, type L830-9 and L830-13, respectively. The 1500 watt transformers will be in accordance with FAA-E-2690.

d. Elevated PAR-56 lampholders. Elevated PAR-56 lampholders hold PAR-56 lamps and allow for angular adjustment. They interface mechanically to a supporting structure and electrically to the isolation transformers.

e. Semiflush fixtures. Semiflush fixtures used for the inpavement ALS lights are in accordance with FAA-E-2491, Approach Light, Semiflush, Steady Burning.

f. Control and monitor subsystem. The control and monitor subsystem consists of the three elements described in subparagraphs 31f(1) - 31f(3).

(1) Substation control and monitor assembly. The substation control and monitor assembly will be a NEMA Type 12 steel enclosure that is 40 inches (1,016 mm) high by 24 inches (610 mm) wide by 12 inches (304.8 mm) deep. The cabinet will have a split door with the upper portion being 14 inches (356 mm) high and the lower portion being 22 inches (559 mm) high. The upper door will serve as the local control panel and the lower door will provide access to the control and monitor electronic assemblies and interface wiring. Gasketing will be provided for both doors such that the upper edge of the lower door will seal against the contoured lower edge of the upper door. Opening of the upper door will not be possible without first opening the lower door, and locking provisions will be provided on the lower door. The cabinet doors will open from the right side and a door stop will be provided to lock the door in a 120 degree open position. The monitor card cage assembly will also contain the test/adjustment panel.

(2) Remote electronic chassis. The remote electronic chassis has a NEMA Type 12 steel enclosure, 20 inches (508 mm) high by 16 inches (406.4 mm) wide by 10 inches (254 mm) deep. The unit is

constructed such that it can be either wall mounted (up to 200 feet (61 m) from the tower control console) or placed on the floor directly below the console. The unit has a gasketed, lockable door, with right-hand opening. The chassis interfaces with the remote control panel via a multiconductor cable and with the substation control and monitor assembly via a pair of telephone wires.

(3) Remote control panel. The remote control panel has a metal enclosure with the following dimensions: 9.5 inches (241 mm) wide by 5.25 inches (133 mm) high by 5 inches (127 mm) deep. It is supported in the tower console by a lip around the perimeter of the front panel. This lip will not be less than 0.25 inches (6.3 mm) from the panel edge at any point. Power supplies or electronic circuits will not be mounted in or on the control panel. Interface to the electronic control chassis will be with connectors conforming to MIL-C-26482, Connectors, Electronic, Circular, Miniature, Quick Disconnect and a multiconductor cable.

g. Flasher subsystem transformer. The transformer converts 2,400 V, 60 Hz, one phase power from the high voltage input cabinet to provide 120/240 V, ± 10 percent, 60 Hz power. The transformer will have the following characteristics: 25 kilovoltamperes (kVA), one phase, 2,400-120/240 V, dry type with taps.

h. Flasher master controller cabinet. The flasher master controller cabinet will be a NEMA Type 12 enclosure. The cabinet will have the following maximum dimensions: 30 inches (762 mm) high by 36 inches (914 mm) wide by 12 inches (304.8 mm) deep. It will have mounting means external to the cabinet cavity, and provision for locking. Space is provided in the cabinet for all external cable connections.

i. External resistor cabinet. The resistor cabinet, if required, will be made of stainless steel or anodized aluminum and will have the following dimensions: 40 inches (101 cm) by 20 inches (50 cm) by 13 inches (33 cm) (maximum) and located on the outside of the ALSF-2 substation.

j. Junction boxes. Junction boxes are in accordance with FAA Drawing D-5140-2. However, the terminal block indicated in Drawing D-5140-2 is of the type specified in FAA-G-2100e, Electronic Equipment, General Requirements, paragraph 3.5.5.15.5, and the box will be made of stainless steel or anodized aluminum. The junction boxes will be a NEMA Type 4X. Two 2-inch (5.08 cm) conduit hubs are provided at the bottom of the box. The centerlines of the hubs are 8 inches (20.32 cm) apart. To separate incoming control cables from outgoing cables from junction boxes, four two-inch hubs will be installed in the bottom of the junction boxes. The junction boxes

will contain weep holes with stainless steel screened vents, to allow moisture to dissipate, located at the bottom of the boxes.

k. Elevated flasher assembly (Type I). The elevated flasher assembly consists of two parts, the individual control cabinet and the flasher light unit. The flasher light unit may be installed next to the individual control cabinet on frangible couplings or on 2-inch (5.08 cm) electrical metallic tubing (emt), or on top of low impact resistant structures with a maximum vertical separation of 128 feet (39 meters) between the flasher light unit and the individual control cabinet. The individual control cabinet will contain weep holes with stainless steel screened vents to allow moisture to dissipate.

(1) Individual control cabinet. The cabinet is an outdoor, waterproof, dusttight, nonventilated NEMA Type 4X enclosure made of stainless steel or anodized aluminum. It has sufficient size to accommodate all of the necessary components and wiring and allow for easy field installation and maintenance. Two 2-inch threaded fittings are provided on the bottom of the cabinet to allow for the mounting of the cabinet. Mounting lugs or bolts are provided on the back of the cabinet to enhance the stability of the cabinet by using an additional mounting attachment when necessary. A third fitting on the bottom of the cabinet is provided to accommodate a 3/4-inch (1.9 cm) flexible conduit. The 3/4 inch fitting is provided with a 3/4 inch plug.

(2) Flasher light unit. The flasher light unit is a single raintight assembly consisting of all items not mounted on or in the individual control cabinet. The lamp housing is constructed of stainless steel or aluminum or of a nonferrous material which is comparable in service life with that of a stainless steel or anodized aluminum housing and does not require painting. All components in the lamp housing are accessible through a door or cover for maintenance purposes. The maximum weight of the flasher light unit, including the mounting attachments, is 5 pounds (2.26 kilograms).

l. Flasher tester. The flasher tester is a single portable unit and will weigh not more than 20 pounds (9 kg). The tester will be equipped with a plug that will be connected to a socket in the individual control cabinet.

m. Aiming device for flasher light unit and PAR-56 lamp. The aiming device will be designed for use with the flasher light unit and the PAR-56 lampholder. The aiming device will fit onto the PAR-56 lampholder and flasher light unit without disassembly of the lampholder or removal of the lamp. The aiming device will permit field aiming of the lamp axis perpendicular to the plane of the cover glass at any angle from 0 to +25 degrees above the horizontal. The aiming device will be constructed of a light weight non-corrosive

metal and weigh no more than three pounds. The device will have no loose parts, i.e., no pins. The device should have an enclosed dial and stop break to hold the reading. The aiming device will retain its reading when the tower is lowered. With the support structure in the elevated position, the aiming device will permit an individual to accurately aim the light unit from the ground after lowering the structure a maximum of two times regardless of the tilting direction of the structure. The aiming angle will be indicated in 1 degree intervals and will be accurate to within ± 1/2 degree of the actual aiming angle with the aiming device attached. If a digital display is used the indication will be in degrees and in tenths of a degree of angle. The final aimed angle of the light unit with the aiming device unattached will be accurate within 1 degree of the actual angle. The aiming device shall be designed to operate in any ambient temperatures between -55 degrees Centigrade (C) (-67 degrees Fahrenheit (F) and +70 degrees C (158 degrees F)).

n. Utility transformer. The transformer converts 2,400 V, 60 Hz, one-phase power from the high voltage input cabinet to provide 120/240 V, ± 10 percent, 60 Hz power. The transformer will have the following characteristics: 25 kVA, one phase, 2,400-120/240 V, dry type.

o. Low impact resistance structures. Low impact resistance (LIR) structures will be used to support the approach lighting system lighting fixtures. Low impact resistance structure will be in accordance with FAA-E-2702.

p. Substation shelter. The substation shelter provides environmental protection, workshop space, and storage for tools and spare parts. A typical shelter is shown on FAA Drawings D-6238-17 and D-6238-18.

q. Remote monitoring subsystem (RMS). The RMS enclosure is a NEMA Type 12 aluminum cabinet of appropriate size to house all RMS assemblies and accommodate specified expansion requirements. The enclosure is constructed such that it can be either wall or floor mounted. The enclosure will have a gasketed, lockable door, with right-hand opening.

32. SYSTEM REQUIREMENTS.

a. Power. The ALSF-2 operates from 2,400/4,160 V ac, three-phase, four-wire, 60 Hz, 150 KW primary input power to the substation shelter.

b. Siting. The ALSF-2 is installed in accordance with Order 6850.2A, Visual Guidance Lighting Systems.

c. Interchangeability. Due to the high degree of functional commonality between stations, various assemblies of the ALSF-2 are designed to maximize module interchangeability.

d. Maintainability. The ALSF-2 equipment meets the maintainability requirements depicted in Figure 3-8, ALSF-2 Maintainability Requirements.

FIGURE 3-8. ALSF-2 MAINTAINABILITY REQUIREMENTS

EQUIPMENT	MTTR	MAXIMUM REPAIR TIME
High voltage input cabinet	None specified	None specified
High voltage output cabinet	None specified	None specified
Constant current regulators	0.5 hours	8 hours
Control and monitor system	0.5 hours	8 hours
Flasher lights	0.5 hours	4 hours
Remote monitoring subsystem	0.5 hours	4 hours

e. Reliability. The ALSF-2 equipment meets the reliability requirements depicted in Figure 3-9, ALSF-2 Reliability Requirements.

FIGURE 3-9. ALSF-2 RELIABILITY REQUIREMENTS

EQUIPMENT	SPECIFIED MTBF
High voltage input cabinet	None specified
High voltage output cabinet	None specified
Constant current regulators	12,000 hours
Control and monitor system	2,800 hours
Flashing lights subsystem	2,500 hours
Remote monitoring subsystem	30,000 hours

f. Control and monitor subsystem data link. The remote electronic chassis and the substation control and monitor assembly is connected together via a two-wire, half duplex, phase coherent, frequency shift keyed (fsk) data link. The ATCT to substation

communication link (downlink) transmits 1270 Hz and 1070 Hz respectively for mark and space. The substation to tower link (up-link) transmits 2225 Hz and 2025 Hz for mark and space. The transmission is asynchronous, serial binary, has the characteristics required in Figure 3-10, Data Link Transmission Characteristics. The transmission link is required to operate with at least an 8 dB signal-to-noise ratio over a distance of 10 miles (10.6 km) or more without intermediate boosters or line amplifiers. The two-wire transmission lines terminates in the remote electronic chassis and the substation control and monitor assembly at input circuitry that eliminates line noise from the transmitted and received signals.

FIGURE 3-10. DATA LINK TRANSMISSION CHARACTERISTICS

PARAMETER	TOLERANCE/CHARACTERISTIC
Frequency tolerance	0.5% max.
Impedance	600 ohms
Transmitter output level	-12 dBm to 0 dBm
Bit error rate (8 dB S/N)	1×10^{-5} max.
Peak-to-peak jitter	5% max.

33. INTERFACES.

a. Maintenance Processor Subsystem Interface. The ALSF-2 will interface with the MPS in accordance with NAS-MD-790, Remote Maintenance Monitoring System Interface Control Document.

b. Maintenance Data Terminal (MDT) Interface. The ALSF-2 will interface with the MDT through an EIA RS-232 interface in accordance with the RMS Interface Requirements Document (IRD).

c. TCCC Interface. The ALSF-2 will interface with the Tower Control Computer Complex (TCCC) in accordance with the TCCC/ALS IRD.

34.-39. RESERVED.

CHAPTER 4. PROJECT SCHEDULE AND STATUS

40. PROJECT SCHEDULES AND GENERAL STATUS. The procurement of the ALSF-2 with RMS is divided by fiscal year. A design/production contract for 20 systems with two options for 15 more ALSF-2's in each option is scheduled to be awarded in December 1992.

41. MILESTONE SUMMARY SCHEDULE.

FIGURE 4-1. MILESTONE SUMMARY SCHEDULE

EVENT	DATE
Contract Award	September 1993
Preliminary Design Review	April 1994
Critical Design Review	September 1994
First system delivered to Government at the T & E sites	July 1995
First production system delivered to operational site	1 Months after Government gives Production Approval (Note 1)
Last system delivered to operational site	18 Months After Government gives Production Approval (Initial buy) (Note 1) Options TBD
Note 1: Government approval is expected approximately 6 months after delivery to Government at the T&E sites.	

42. INTERDEPENDENCIES AND SEQUENCE. The following projects were identified as having interdependencies with the ALSF-2 project. Because of the broad variation in site requirements, discussion of specific effects of each program on a site-by-site basis is beyond the scope of this order.

a. The Airport Cable Loop Program. The Airport Cable Loop Program establishes reliable and flexible signal and power distribution systems at Levels III, IV, and V airports. The ALSF-2 projects may precede the Airport Cable Loop Program at some locations. The ALSF-2 control and monitor subsystem modem will require a single two-wire voice grade line to interface with the

remote status and control unit located in ATCT equipment room. Fiber optic interfaces have not been well enough defined to include as part of the specification for equipment purchased for this project.

b. Airport Traffic Control Tower (ATCT) System Intraconnectivity Program. The Airport Traffic Control Tower System Intraconnectivity Program, Capital Improvement Program 42-20, integrates all projects which interface with the ATCT. This effort includes integration of existing tower cab display systems into a consolidated display to allow tower cab space for new systems and tower equipment room system integration design and implementation. Temporary shelters, power, heating and cooling as well as other factors commonly encountered for facility renovation may effect the installation of the ALSF-2 equipment.

c. Remote Maintenance Monitoring Program. Equipment purchased for this program will include RMM capability. Operational use of the remote monitoring capability for facility performance and maintenance of the ALSF-2 will occur after the ALSF RMS to MPS connectivity is provided by ASM-300.

43.-49. RESERVED.

CHAPTER 5. PROJECT MANAGEMENT

50. **PROJECT MANAGEMENT, GENERAL.** This chapter describes the organizations within the Program Director of Navigation and Landing that are directly responsible for ALSF-2 project management.

a. Program Director for Navigation and Landing (ANN-1). The Program Director for Navigation and Landing manages, directs, and executes the FAA's engineering and management activities related to facilities design, air navigation, and landing aids to ensure that the NAS is efficient, economical, and responsive to operational needs.

b. Navigation and Landing Engineering Division (ANN-100). The division is responsible for the engineering, acquisition, and implementation of navigation and landing systems.

c. Associate Program Manager for Engineering (APME), Visual Aids Program (ANN-140). The APME is the principal element of the division responsible for design, development, and implementation responsibilities for ALSF-2's. Duties include preparation of technical installation instructions, management of in-transit material for construction and installation, and maintaining currency of material systems and control over equipment inventory.

d. ALSF-2 Technical Officer (ANN-140). The ALSF-2 technical officer is the principal element of the division responsible for providing engineering advice and consultation to the contracting officer during procurement, approving factory acceptance test procedures, serving as Contracting Officer's Technical Representative, and reviewing contractor requests, contractor documentation, and progress payments.

e. Program Manager for Landing (ANN-200). The Program Manager for Landing has overall responsibility for the program and reports to ANN-1. The ALSF-2 Program Manager (ANN-200) is supported by a technical staff and is responsible for the ALSF-2. These responsibilities include:

(1) Management. Planning, scheduling, and managing the program from design through commissioning, logistics support, training, and program completion. Responsible for systems engineering, system design, man-machine interface, component design and related functional, technical, and performance characteristics. Acts as co-chair of the National Airspace Integrated Logistics Support Management Team.

(2) Equipment and Spares Provisioning. Provides, in conjunction with the Associate Program Manager for Logistics and Systems Maintenance Service, technical guidance to define logistics support for proper provisioning of equipment.

(3) Modernization Input. Developing service input for the modernization or in-service improvement of equipment.

(4) Cost Data. Developing and providing cost data, controlling assigned funds, and adjusting program schedules and objectives as necessary.

(5) Maintenance Instructions. Preparing maintenance instructions, identifying training, provisioning and test requirements, and directing the preparation of maintenance technical handbooks.

(6) Testing. Reviews and approves manufacturers' equipment test procedures. Establishes requirements and approves plans for test and evaluation (T&E) of engineering activities of the FAA Technical Center.

(7) Installation. Management of installation activities for current and future systems to assure a high level of system performance.

(8) Acceptance. Providing engineering, development, design, and systems analyses associated with acquisition and acceptance of hardware and software.

f. Associate Program Manager for Testing (APMT) (ACD-110). The APMT, ACD-110, will assume all testing responsibilities as contained in Order 1810.4B, FAA NAS Test and Evaluation Policy. These responsibilities include preparing test plans, procedures and reports; coordinating with Air Traffic, Airway Facilities, the program office, and other users to develop Operation Test and Evaluation (OT&E) test requirements; preparing and coordinating test related program directives; directing the conduct of OT&E/integration; and supporting acceptance testing at the first field site.

g. Associate Program Manager for Logistics (APML) (ANS-420). The APML is responsible for ensuring all applicable NAS Integrated Logistics Support (NAILS) element requirements are managed and integrated into all new NAS subsystems and equipments and facilities in a manner which provides for total life cycle supportability.

h. Associate Program Manager for Contracting (APMC) (ASU-310). The APMC is a Contracting Officer with the authority to enter into, administer, or terminate contracts and make related determinations and findings to the program manager.

i. Associate Program Manager for Quality (APMQ) (ASU-400). The APMQ will provide support to the program office, and is the central point of contact for the Industrial Division on all Quality Assurance (QA) matters.

51. **PROJECT CONTACTS**. This paragraph lists ALSF-2 project contacts and their addresses.

a. Program Director. Rod Gill, ANN-1, Federal Aviation Administration, 800 Independence Avenue, S.W., Washington, D.C., 20591, FTS (202) 267-6593.

b. Navigation and Landing Engineering Division Manager. Robert J. Bernard, ANN-100, Federal Aviation Administration, 800 Independence Avenue, S.W., Washington, D.C., 20591, FTS (202) 267-6594.

c. Program Manager for Landing. Gary Skillicorn, ANN-200, Federal Aviation Administration, 800 Independence Avenue, S.W., Washington, D.C., 20591, FTS (202) 267-6675.

d. Acting Associate Program Manager for Engineering, Visual Aids Program. Clesson McDonald , ANN-140, Federal Aviation Administration, 800 Independence Avenue, S.W., Washington, D.C., 20591, FTS (202) 267-6580.

e. Project Engineers.

(1) Lansine Toure , ANN-140, Federal Aviation Administration, 800 Independence Avenue, S.W., Washington, D.C., 20591, FTS (202) 267-6577.

(2) Calvin Miles, ANN-140, Federal Aviation Administration, 800 Independence Avenue, S.W., Washington, D.C., 20591, FTS (202) 267-6038.

f. Associate Program Manager for Logistics. Linda Litchfield, ANS-420, Federal Aviation Administration, 800 Independence Ave, S.W., Washington, D.C., 20591, FTS (202) 267-3756.

g. Associate Program Manager for Contracting. Matthew Asai, ASU-310, Federal Aviation Administration, 800 Independence Ave, S.W., Washington, D.C., 20591, FTS (202) 267-7542.

h. Associate Program Manager for Testing. Satish Agrawal, ACD-110, Federal Aviation Administration Technical Center, Atlantic City International Airport, New Jersey 08405, FTS (609)484-6686.

i. Associate Program Manager for Quality. Ken Beers, ASU-420, Federal Aviation Administration Central Region, 601 East 12th Street, Federal Building, Kansas City, Missouri 64106, FTS (816) 374-6583.

j. Associate Program Manager for Requirements. Andrew Oltmanns, ATR-122, Federal Aviation Administration, 800 Independence Ave, S.W., Washington, D.C., 20591, FTS (202) 267-9172.

k. Associate Program Manager for Procedures. Robert Pierce, ATP-121, Federal Aviation Administration, 800 Independence Ave, S.W., Washington, D.C., 20591, FTS (202) 267-8460.

l. Associate Program Manager for Systems Engineering. Tom Laginja, ASE-300, Federal Aviation Administration, Portals Building, 1250 Maryland Ave, S.W., Washington, D.C., 20024, FTS (202) 287-8635.

m. Associate Program Manager for Legal. Linda Lewis, AGC-510, Federal Aviation Administration, 800 Independence Ave, S.W., Washington, D.C., 20591, FTS (202) 267-3151.

52. **PROJECT COORDINATION.** The ALSF-2 project requires coordination with other services within the FAA and with regional representatives. Coordination by and with the following organizations is essential for them to accomplish their functions.

a. Maintenance Engineering Division (ASM-100). ASM-100 reviews procurement specifications to ensure the design meets the reliability and maintainability requirements and supports the general maintenance philosophy. ASM-100 provides test equipment for new establishment projects with funding from the program office in accordance with Order 6200.4E, Test Equipment Management Handbook.

b. Maintenance Operations Division (ASM-200). ASM-200 participates in the development and review of maintenance plans and develops the equipment maintenance requirements. In addition, ASM-200 develops national Airway Facility sector staffing standards for the ALSF-2 program and validates maintenance staffing requirements, and personnel certification. ASM-200 also ensures the project is in conformance with staffing, training, certification policies, guidelines and requirements and submits training proposals to the Airway Facilities Training Program Division, AHT-400.

c. Telecommunications Management & Operations Division (ASM-300). ASM-300 provides the connectivity for the RMM data between the installed sites and their designated MPS. The Program

Manager for Landing, ANN-200, shall coordinate and work with ASM-300 to provide this connectivity in a timely manner.

d. Spectrum Engineering Division (ASM-500). ASM-500 obtains frequency authorizations necessary to satisfy the requirements of the NAS. This division also provides engineering support to regional and field facilities in the resolution of and prevention of radio-frequency interference to NAS facilities.

e. National Airway Systems Engineering Division (AOS-200). AOS-200 provides support in the development of test plans and procedures for site-specific requirements. AOS-200 will conduct shakedown testing, analyze the results of the tests, and recommend actions needed to correct deficiencies. During the operational phase, AOS-200 is responsible for providing software and hardware maintenance engineering support, developing needed software and hardware modifications and maintaining instruction books.

f. NAS Support Division (ASM-700). ASM-700 develops, recommends, and issues agency systems, procedures, standards, and policies for material, supply, property management, and disposal in support of the NAILS process.

g. Contracts Division (ASU-300). ASU-300 performs cost/price analyses of contractor's proposals and participates as a member of the Source Evaluation Board on ALSF-2 procurement. In addition, ASU-300 provides procurement support for the ALSF-2 programs and plans, and places and administers contracts for the ALSF-2 equipment. ASU-300 also designates the APMC who is responsible for all contractual matters. The APMC is the only individual authorized to approve contract changes affecting price, delivery, or schedule.

h. Industrial Division (ASU-400). ASU-400 is responsible for the performance of factory inspection of the ALSF-2, and will assign an APMQ, and a Quality Reliability Officer (QRO), at the time the contract is awarded. The APMQ will provide support to the program office, and is the central point of contact for QA matters between the Program Office and ASU-400. The QRO is the FAA's representative at the contractor's facility, and is responsible for verifying the acceptability of the contractor's QA system, performing inspections and test witnessing, and accepting or rejecting items submitted by the contractor in accordance with the terms and conditions of the contract.

i. Grants-in-Aid Division (APP-500). APP-500 directs the airport grant program and is included in the coordination process to avoid conflicts that may arise because of pending airport projects, including those where the airport may be purchasing its own ALSF-2 under the grant program.

j. FAA Logistics Center (AML-1). AML-1 manages the distribution of equipment for the ALSF-2 sites at the region's request. The FAA Logistics Center provides repair of unserviceable repairable items that require specialized repair procedures, test equipment/tools, diagnostic hardware/software, and major shop facilities. It also provides all other FAA Logistics Center functions as set forth in the NAILS Master Plan.

k. FAA Academy (AMA-1). AMA-1 evaluates and monitors the development and conduction of contractor training and provides maintenance training after completion of contractor training. AMA-1 will participate in workshops and meetings related to program implementation, NAILS and the Deployment Readiness Review (DRR) process.

l. Airway Facilities Training Program Division (AHT-400). AHT-400 analyzes training proposals prepared by ASM-200 and initiates action to meet training requirements.

m. Associate Program Manager for Engineering, Maintenance Automation Program (ANA-120). ANA-120 develops the MPS Interim Monitor and Control Software (IMCS) which is used to decode data received from the ALSF-2 RMS. The Program Manager for Landing, ANN-200, will provide implementation schedule, information and assistance to the Maintenance Automation Program, ANA-120, to assure timely development and delivery of the IMCS for the ALSF-2.

n. Airport Technology Branch (ACD-110). ACD-110 provides an APMT who provides test support in accordance with Order 1810.4B. ACD-110 writes test procedures for and performs NAS integration testing. The ATC Sustaining Engineering Division, Maintenance Automation Program (ACN-100D) assists ACD-110 with these activities for Remote Maintenance Monitoring System (RMMS) testing.

o. Office of Aviation System Standards, Flight Procedures & Inspection Division (AVN-200). AVN-200 is responsible for providing the coordination to accomplish the following functions:

(1) Provides the support necessary for accomplishing the preliminary (preparatory) and commissioning flight inspections.

(2) Determines if the operational status of a facility or system is in accordance with the established tolerances.

(3) Certifies the facility or system for operational use in the NAS when all operational requirements have been met.

(4) When applicable, ensures that required Notices to Airmen (NOTAM) will be issued for any facility or system restriction.

p. Flight Standards Service Planning and Program Management Branch, AFS-12. AFS-12 manages the prioritization and validation of facilities and equipment requirements for ALSF-2 and reviews all NAS Change Proposals (NCP) related to ALSF-2 equipment requirements.

q. NAILS Implementation Branch, ANS-420. Responsible for the management of the Integrated Logistics Support elements: maintenance planning, direct-work maintenance staffing, maintenance support facilities, supply support, packaging, handling, storage, and transportation, support equipment, technical data, and training, training support, and personnel skills; organizes, schedules, and chairs all NAILS Management Team Meetings (NAILSMT); develops, publishes, and updates the Integrated Logistics Support Plan (ILSP).

r. FAA Regional Offices. The FAA regional offices through established administrative structures coordinate with all responsible parties to assure adequate funding, establish system commissioning/service availability dates, assign project field representatives and determine utility availability for the ALSF-2. The regions also provide field engineering as required to support preparations for the installation of the ALSF-2 system. The regional offices order Government Furnished Materials (GFM), provides tools, any necessary telecommunications circuits and test equipment to support installation and acceptance; tailor installation drawings to be site specific; initiate work orders and travel authorization; and assign field personnel. The regional offices will purchase equipment shelters. The regional offices will be responsible for planning the shutdown of existing systems and the transfer of operations to other runways, removal and disposition (in conjunction with the FAA Logistics Center and the program office) of old equipment where necessary, restoral of service, and commissioning. The following regional offices are responsible for the coordination required to accomplish the specific functions listed in subparagraphs 52r(1) - 52r(4).

(1) Regional Airway Facilities Division (AXX-400).

(a) Installing facilities systems and equipment in accordance with established standards, specifications, and instructions. The ALSF-2 contractor will provide installation drawings under the contract. These will be reviewed by the program office and delivered to the regions in sufficient time to produce or procure site specific plans.

(b) Notifying the appropriate sector that a project has been funded and issuing a projected implementation schedule.

(c) Providing the sector an opportunity to review and participate in project plans during the engineering phase and for

furnishing the sector a copy of the engineering plans and contract documents.

(d) Providing the sector a copy of the project work order at least 10 days before the start of project work.

(e) Providing the appropriate facility reference data file (FRDF) information to the sector for inclusion in the FRDF.

(f) Providing the essential facility, system, and equipment technical reference and performance parameters as part of the project transmittal when maintenance technical handbook parameters are not available.

(g) Ensuring that modifications, configuration control documents (CCD), manufacturer's field changes and factory changes are current and documented for equipment received from sources outside the AF sector.

(h) Notifying the joint acceptance board chairman of when the facility will be ready for Joint Acceptance Inspection (JAI), providing the sector all data necessary to prepare warranty failure reports on items failing prior to JAI, and providing regional Airway Facilities Division representatives for participation in the JAI.

(i) Establishing and maintaining a follow-up file for monitoring and clearing all JAI report exceptions, reviewing all JAI reports and follow-up reports for correctness, completeness and proper distribution, taking appropriate and timely actions to clear JAI report exceptions, and identifying additional sources of funds or initiating budgetary action, as necessary, to clear exceptions.

(j) Establish in conjunction with flight standard procedures personnel, a realistic commissioning chart date, flight inspection and any corresponding NOTAM.

(k) Notifying the regional Airports divisions of the intent to establish an ALSF-2 at an airport and to coordinate with the division to avoid any conflict with actual or proposed airport development at that airport.

(l) Updating the project materiel list for site specific requirements.

(2) Airway Facilities Sector.

(a) Reviewing contract documents and engineering plans during the engineering phase and providing comments to the regional AF divisions.

(b) Providing personnel as required at appropriate times throughout the project to witness and/or participate in construction, installation, tune-up, tests, and collection of technical reference data.

(c) Coordinating the release of equipment currently in use to regional AF divisions establishment personnel for use in the project.

(d) Maintaining those components of an existing facility properly that are unaffected by an improvement project.

(e) Ensuring that modifications/CCD's and documentation are current on installed equipment for the purpose for which the equipment was being used prior to the project.

(f) Providing a representative to serve as the joint acceptance board chairperson and other qualified personnel for participation in the JAI, preparing and distributing the JAI report, and assuming maintenance responsibilities and custodianship for facilities, systems, or equipment at the conclusion of JAI.

(g) Coordinating and following-up on exceptions after the JAI to include exceptions assigned to other organizations or to a contractor for clearance, clearing exceptions that have been assigned to the sector, reporting the clearance of exceptions, and reviewing all waived exceptions to determine if actions will impact sector operations or other organizations.

(h) Maintaining all equipment warranty information and reporting equipment failing under warranty.

(i) Receiving, storing, and shipping project materials and disposing of excess equipment and materials.

(j) Participating in all phases of commissioning and initiate the official notification of commissioning.

(k) Coordinating with logistics for regionally processed site preparation contracts as needed.

(l) Providing necessary tools and test equipment to site maintenance personnel.

(3) Regional Logistics Division (AXX-50). Perform normal functional roles of material management, contracting, and real estate management as they relate to project implementation at the regional level. Provide representatives to participate in specific projects that the regional AF division has identified as having major logistical problems and has requested the participation by the regional Logistics division.

(4) Regional Flight Standards Division (AXX-200). Provide technical expertise to the regional AF, as required, for accomplishing JAI's and the commissioning of facilities and systems.

s. Facility Programs and Transition Division (ANS-200). ANS-200 will provide facility and environmental expertise for the removal of old equipment in compliance with all Federal, State and local regulations.

t. Office of Environment and Energy (AEE-1). AEE-1 provides analysis and removal of older equipment for hazardous materials identification and content.

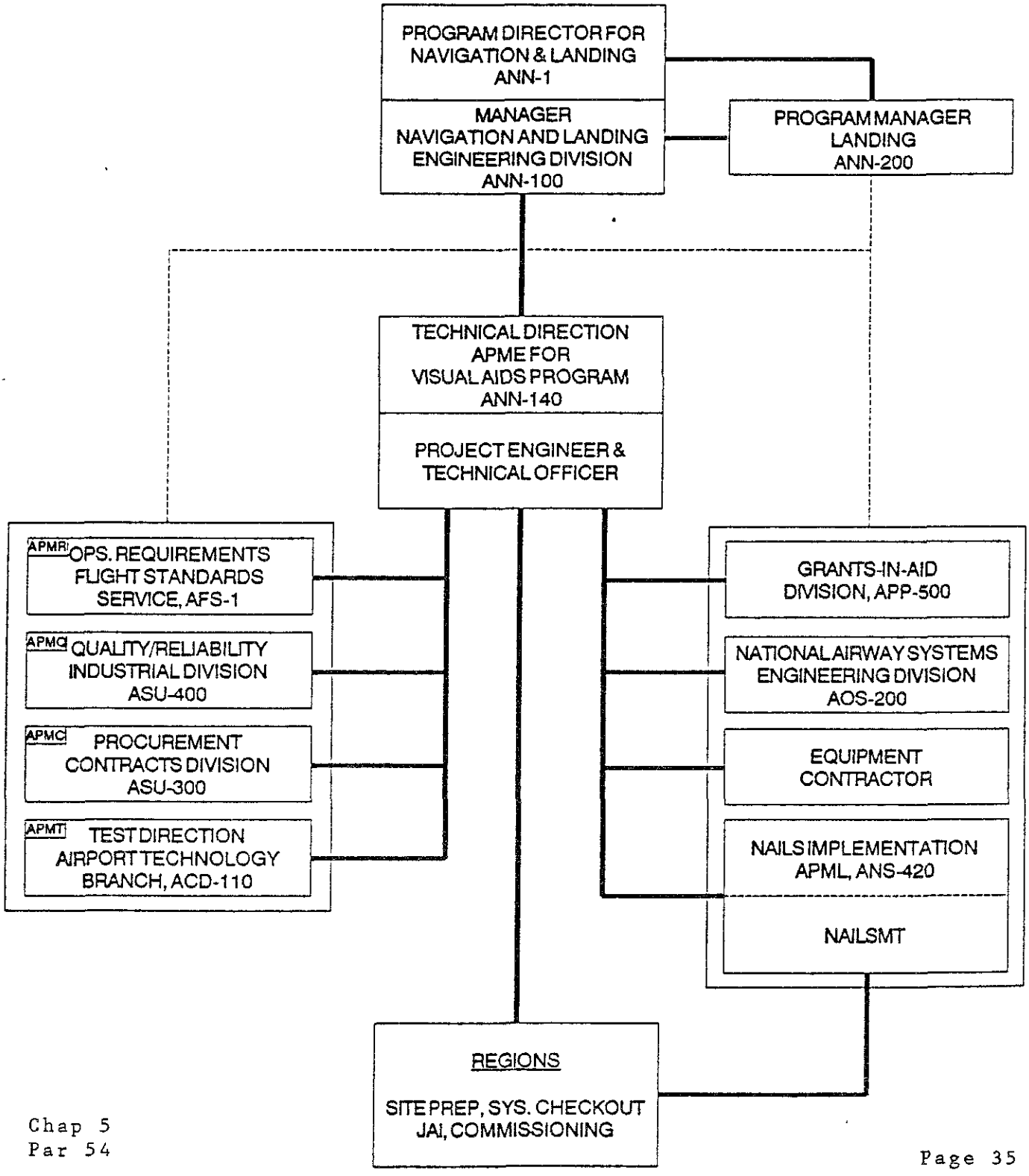
u. Hardware Contractor. The contractor, when requested by ANN-140, provides engineering support services for onsite advice, including technical supervision to FAA technicians and the installation contractor concerning proper installation or operation of the ALSF-2.

53. **PROJECT RESPONSIBILITY MATRIX**. Figure 5-1 illustrates the FAA organizations responsible for the implementation of each significant function of the ALSF-2 project.

54. **PROJECT MANAGERIAL COMMUNICATIONS**. The ALSF-2 program manager (ANN-200) is the focal point for all internal project communication. Organizations supporting the project designate a representative to maintain close communication with the ALSF-2 program office. Supporting organizations maintain communications within the FAA but never directly with the contractor without the contracting officer's permission. The meetings listed in subparagraphs 54a and 54b are the regularly scheduled project meetings or conferences.

a. The National Airspace Integrated Logistics Support Management Team (NAILSMT) Meetings. NAILSMT's are held to ensure there is an interrelated, unified, and iterative approach to the managerial and technical activities that support the NAS. During these meetings issues affecting logistics management, maintenance planning, supply support, test and support equipment, manpower and training support, support facilities, technical data, and packing, handling, storage and transportation are discussed and resolved. These meetings are held as required, but not less frequently than

FIGURE 5-1. PROJECT RESPONSIBILITY



annually, and may meet at the FAA headquarters, the FAA Logistics Center, or the contractor's facility. Additional guidance is contained in the NAILS Master Plan and Order 4560.1B, Policies and Procedures Covering the Provisioning Process During the Acquisition of FAA Material, and Order 1800.58, NAILS Policy.

b. Program Director Status Review (PDSR). PDSR meetings are held bimonthly at the FAA headquarters to discuss project status and to resolve problems and issues affecting all phases of the project from the time the requirements are established until system deployment has been completed.

55. **IMPLEMENTATION STAFFING**. There are no personnel requirements peculiar to the implementation phase of the project.

56. **PLANNING AND REPORTS**. The following plans and reports are referenced or required by this order.

a. Project Master Test Plan. The ALSF-2 project master test plan will be furnished by the program office and the APMT.

b. OT&E/Integration Test Plan, Procedures and Reports. These documents will be developed by ACD-110.

c. OT&E/Shakedown Test Plan, Procedures and Reports. These documents will be developed by AOS-200. The OT&E/Shakedown Test Procedure document will be furnished by AOS-200 to the regional associate program managers.

d. Field Shakedown Test Plan and Procedures. These documents, for each site, will be developed by the responsible region. The procedure document may be developed from the OT&E/Shakedown Test Procedure furnished by AOS-200.

e. JAI Report. This document will be prepared by the JAI board.

57. **APPLICABLE DOCUMENTS**. Within this order the following documents are applicable.

a. FAA-D-2494/b, Technical Instruction Book Manuscript: Electronic, Electrical, and Mechanical Equipment, Requirements for Preparation of Manuscript and Production Books, March 14, 1984.

b. FAA-E-2689a, Specification, Dual Mode High Intensity Approach Lighting System (ALSF-2/SSALR), September 13, 1983 (Two Notices).

c. FAA-G-2100e, Electronic Equipment, General Requirements, March 11, 1987.

d. Order 1800.8F, NAS Configuration Management, May 20, 1991.

e. Order 1800.63, NAS Deployment Readiness Review (DRR) Program, July 10, 1990.

f. Order 1810.4B, FAA NAS Test and Evaluation Policy, October 22, 1992.

g. Order 3400.3E, Airway Facilities Maintenance Certification Program, August 4, 1978.

h. Order 4560.1B, Policies and Procedures Covering the Provisioning Process During the Acquisition of FAA Material, March 10, 1989.

i. Order 4800.2B, Utilization and Disposal of Excess and Surplus Personal Property, October 11, 1991.

j. Order 6000.15A, General Maintenance Handbook for Airway Facilities, October 26, 1988.

k. Order 6000.26A, Reliability and Maintainability Policy, May 14, 1982.

l. Order 6000.30A, Policy for Maintenance of the National Airspace System.

m. Order 6030.45, Facility Reference Data File, March 28, 1974.

n. Order 6850.2A, Visual Guidance Lighting Systems, December 17, 1981.

o. Order 6850.5B, Maintenance of Lighted Navigational Aids, August 26, 1991.

p. Order 6950.2C, Electrical Power Policy Implementation National Airspace System Facilities, November 1987.

q. FAA-STD-028a, Contract Training Programs.

r. FAA-STD-019a, Lightning Protection Grounding, Bonding, and Shielding Requirements for Facilities.

s. NAS-DD-1000D, Level I Design Document, June 1989.

t. NAS-MD-110, Test and Evaluation (T&E) Terms and Definitions for the National Airspace System, March 27, 1987.

u. NAS-MD-790A, Remote Maintenance Monitoring Interface Control Document, June 30, 1992.

v. NAS-MD-792, Operational Requirements for the Remote Maintenance Monitoring System, June 1984.

w. NAS-MD-793, Remote Maintenance Monitoring System Functional Requirements for Remote Monitoring Subsystem, February 28, 1986.

x. National Airspace Integrated Logistic Support (NAILS) Master Plan, March 1987.

y. NAS-SS-1000, NAS System Specification, Vol. I-App. III, Vol. III and Vol. V, February 26, 1993.

z. OA P 8200.1, United States Standard Flight Inspection Manual, January 18, 1991.

aa. Order 1800.58, National Airspace Integrated Logistics Support Policy, July 2, 1987.

58.-59. RESERVED.

CHAPTER 6. PROJECT FUNDING

60. PROJECT FUNDING STATUS, GENERAL. Funding for this project is supplied under Capital Investment Plan. The Navigation and Landing Engineering Division will procure the systems and provide funding to the regions for installation. Fiscal year budget allocations are by nature dynamic and as such are not included in this order. The program manager, ANN-200, can supply current information if required.

61.-69. RESERVED.

CHAPTER 7. DEPLOYMENT

70. GENERAL DEPLOYMENT ASPECTS. Deployment of ALSF-2's is administered by the Program Manager for Landing and staff. The first system will be shipped to Knoxville, Tennessee, the T&E site, for operational testing. After completion of integration/shakedown testing and a successful DRR and DRR Excom meeting, systems will be tested at the contractor's plant and shipped at FAA expense to a designated site or to the FAA Logistics Center by Government Bill of Lading (GBL). The GBL will include provisions for unloading, and the region should make preparations to provide storage (where necessary). The ALSF-2 will be shipped as an entire system to the site or storage facility where it will await installation. Installation of the equipment is the responsibility of the region. Figure 7-1 depicts the DRR schedule. The DRR process milestones and DRR checklist table of contents are done in accordance with Order 1800.63, appendix 1 and appendix 2 respectively.

FIGURE 7-1. ALSF-2 DRR SCHEDULE

EVENT	DATE
Contract Award	Sep 1993
Delivery to Government at T&E Sites	May 1995
Shakedown Testing Complete	Jul 1995
Final Report to Associate Administrator	Aug 1995
Excom Meeting and Production Approval	Aug 1995

71. SITE PREPARATION. The regions are responsible for preparing the sites where ALSF-2 equipment will be installed. Site preparation includes planning for installation and integration with other inter-related subsystems. Considerations for site preparation include removal of existing equipment, where required, weather conditions and concurrent construction activities including the project interdependencies cited in chapter 4.

72. DELIVERY. The projected delivery schedule for the ALSF-2 is located in chapter 4. Additional delivery details are found in appendix 1.

73. INSTALLATION PLAN. The FAA regions will coordinate the receipt, installation, and evaluation of all equipment required to form the ALSF-2. The ALSF-2 will be installed in accordance with site installation drawings prepared by the regions using Washington

standard drawings. The regional office will coordinate the complete installation, alignment, and operational tests on all identified ALSF-2 interfaces to assure full compliance with FAA specifications and performance. If required, the contractor will be available to provide engineering support services for onsite advice, including technical supervision to FAA technicians and the installation contractors.

74. **CONFIGURATION MANAGEMENT PLAN**. Configuration management (CM) is the process used to identify and document the functional and physical characteristics of a configuration item, control changes to those characteristics, and record and report change processing and implementation status. The CM discipline will be applied to all configuration items included in the ALSF-2 baseline to ensure compatibility between elements within the ALSF-2. All additions and changes to the ALSF-2 baseline will be proposed in a case file, and will be reviewed for recommended approval or disapproval by a Configuration Control Board (CCB). All changes to the NAS site design baseline must be processed and approved by the Navigation and Landing (ANN-100) CCB.

a. Acquisition Phase Configuration Management.

(1) The Navigation and Landing CCB controls the establishment of and changes to the ALSF-2 hardware baseline during the acquisition phase through Operational Readiness Demonstration (ORD) of the final system. For ALSF-2 matters, the CCB will include members from ANN-120, AOS-200, ASM-500, ASM-200, ASM-100, ASE-300, ASE-600, ACN-100, ACD-110, AVN-500, ANS-100, AML-1, AAS-100, AFS-400, ASU-300, ASU-400, ANC-1, AOV-100, ATR-100, the SEI contractor, and the Configuration Management Division, ASE-620. The CCB is responsible for ensuring that the functional, performance, and interface requirements allocated to the ALSF-2 hardware subsystems are reflected in the baseline, and in any changes to those baselined, until product acceptance. The CCB is also responsible for ensuring that baseline documentation is accurate and reflects ALSF-2 operational requirements. Baseline documentation includes specifications and interface control documents (ICD). The ANN CCB retains this CM responsibility until the hardware installation is commissioned at each site. Transition of CM responsibilities between the acquisition and operational phase is detailed in a memorandum of understanding between the Navigation and Landing Program Office; the Communications/Navigation/Surveillance Division, FAA Technical Center; the National Airway Field Support Sector; the FAA Logistics Center, Mike Monroney Aeronautical Center; and all receiving regions for ALSF-2 systems.

(2) The baselining of ALSF-2 hardware products occurs upon successful completion of the functional and physical configuration

audits (FCA/PCA). Hardware product acceptance is based on successful ORD of the complete ALSF-2 system.

(3) At contract completion, the change control functions and CCB records associated with hardware products that affect Level III drawings and instruction books transition from the Navigation and Landing CCB to the Maintenance Engineering (ASM-100) CCB.

b. Operational Support Phase Configuration Management.

(1) During the operational support phase, and for the entire life-cycle of the implemented hardware enhancements, CM functions will consist of maintenance and change control management of site as well as product baseline (Level III Design).

(2) The ASM-100 CCB assumes baseline and change control management of all ALSF-2 installations as they are commissioned for operational service and of related NAS site design baseline (including logistics and training). The ASM-100 CCB is responsible for change control management of the ALSF-2 hardware product baseline. Hardware product baselines are maintained by National Engineering Field Support Division (AOS-200) personnel for the field. The contractor will provide all engineering changes to AOS-200 when the changes are released and prior to implementation in the field. AOS-200 will evaluate the changes and approve the change for field implementation via the NCP process. The CM functions assigned to the ASM-100 CCB are described in the ASM-100 CCB charter.

75.-79. RESERVED.

CHAPTER 8. VERIFICATION

80. **FACTORY VERIFICATION.** The ALSF-2 contractor will perform design qualification, type tests and production tests using a complete ALSF-2 to validate and demonstrate that the requirements of specification FAA-E-2689a, the ICD's, and the contract are met. These tests will verify that all hardware, software, and performance requirements are met before the FAA accepts a system from the contractor. On completion of design qualification testing (DQT), and prior to further contractor/Government tests, an FCA/PCA will be conducted on the first article.

81. **CHECKOUT.** After installation of equipment by the regions, FAA personnel will conduct checkout tests in accordance with the procedure contained in the contractor developed equipment instruction books. The procedures followed will include testing of electrical, mechanical hardware, and RMS interfaces, verifying system and remote maintenance monitoring performance, testing of interfaces with diagnostics and verifying on site and remote maintenance capability using the MDT and the RMMS, and the adequacy of support hardware and onsite and RMM software.

82. **CONTRACTOR INTEGRATION TESTING.** Not applicable.

83. **CONTRACTOR ACCEPTANCE INSPECTION (CAI).** Not applicable.

84. **FAA INTEGRATION TESTING.** These tests, conducted by ACD-110 and ACN-100D verify that the ALSF-2 system has been integrated as specified and that it can interface with the specified external systems. Testing will be conducted with the participation of user organizations. At the completion of integration testing the ALSF-2 should be adapted to parameters of the operational equipment with which it must interface. Included are tests that verify the operation of multiple interfaces and integration with other systems in the operational environment, such as:

a. System and RMS testing will be performed at the ALSF-2 T&E sites and at the first operational site to determine that is all ready for full operation as part of the NAS and RMMS. System and RMS shakedown permits facility and General NAS Maintenance Control Center (GMCC) personnel to become familiar with the ALSF-2 and remote monitoring subsystem, learn their limitations, and to become proficient in diagnosing problems and making repairs. The National Engineering Field Support Division, AOS-200, is responsible for all ALSF-2 shakedown testing. The National Automation Support Division, AOS-300, is responsible for all ALSF-2 remote monitoring shakedown testing. After final ALSF-2 system and ALSF-2 RMM shakedown testing

at the first operational site, AOS-200 and AOS-300 will respectively recommend for or against additioanl ALSF-2 and ALSF-2 RMM deployment. JAI activities will be performed at the field sites.

b. Integration testing between the existing NAS system and the new subsystem, while reverifying top-level functional requirements, while also establishing baseline operational performance values.

c. The operational effectiveness and suitability of the new subsystem in the NAS environment.

d. Testing of the interface between the system RMS and the remainder of the RMMS network, especially the RMS/MPS interface.

85. **SHAKEDOWN AND CHANGEOVER.**

a. System shakedown testing will be performed at the ALSF-2 T&E sites and at the first operational site to determine that it is ready for full operation as part of the NAS. System shakedown permits facility personnel to become familiar with the system, learn its limitations, and to become proficient in diagnosing problems and making repairs. AOS-200 is responsible for all shakedown testing. After the initial system shakedown testing at the test sites, AOS-200 will recommend to the DRR Board whether or not to commence production. After final shakedown testing at the first operational site, AOS-200 will recommend for or against additional deployment. JAI activities can be performed at field sites.

b. ALSF-2 and ALSF-2 RMM system shakedown activities include accomplishment of the following activities:

(1) Operational and maintenance proficiency and remote monitoring and hands-on training.

(2) Evaluations to determine the adequacy of onsite and RMM ALSF-2 system failure detection and recovery procedures.

(3) Live testing of operational functions, including specific adaptation data, and system configuration, with and without the RMM capability.

(4) Evaluations to determine the suitability of displayed operational data, and establish any additional display requirements, with and without RMM capability.

86. JOINT ACCEPTANCE INSPECTION.

a. A JAI is conducted in accordance with Order 6030.45, Facility Reference Data File, to gain the consensus of involved offices that the ALSF-2 project has been completed in accordance with applicable standards and specifications and that the facilities are capable of providing the services required within established standards and tolerances. After the successful completion of JAI, equipment certification, flight inspections, and commissioning, the local AF technical representative assumes responsibility.

b. The JAI ensures compliance with requirements in the following areas:

(1) Facility construction and equipment/RMM installation.

(2) Facility/system/equipment/RMM performance.

(3) Facility and RMM technical performance documentation and maintenance reference data.

(4) Trained technicians.

(5) Facility and RMM logistics support.

(6) Final acceptance and commissioning of ALSF-2 and RMM capability.

87.-89. RESERVED.

CHAPTER 9. INTEGRATED LOGISTICS SUPPORT

90. MAINTENANCE CONCEPT. The FAA is responsible for onsite and depot level maintenance of ALSF-2 equipment procured by this project.

a. Site Maintenance. Site maintenance technicians will perform periodic maintenance, replace ALSF-2 components down to the line replaceable units (LRU) and may perform limited repair/corrective maintenance functions onsite.

b. FAA Logistics Center Maintenance. The FAA Logistics Center maintenance will consist of receipt and repair/replacement of failed LRU's. For repair and testing of these units a "hot" test-bed will be required by either the FAA and/or a commercial contractor.

c. Maintenance Plan. The maintenance plan for ALSF-2 will be contained in the ILSP that will be published in accordance with Order 1800.58A, NAILS Policy. The ILSP is a NAILS document.

d. Remote Maintenance. The RMS embedded in the ALSF-2 system will monitor all environmental and system parameters and provide alarms to the MDT and the MPS if those parameters are beyond defined limits. Security procedures are built-in to prevent unauthorized access to controls and data. The technician and GMCC will access and use the monitored parameter values and alarm information from the MPS, and use them for performing RMM and control of the ALSF-2. The technician will remotely access the MPS and/or access the ALSF-2 while onsite during ALSF-2 maintenance activities.

91. TRAINING. The training program for the ALSF-2 is contained in the ALSF-2 Subsystem Training Plan. Assignment of training quotas for the regions will be made by ASM-260 for AF personnel. The projected training requirements by individual work centers/facilities and principal training milestones will be included in the training plan. The maintenance training program for the ALSF-2 will be developed in accordance with FAA-STD-028A. Training course graduates will be able to configure the ALSF-2 system for normal operation and system testing using manufacturer's instructions and FAA Handbook Specifications. The FAA Logistics Center technician will be trained to troubleshoot and repair LRU to the component level.

92. SUPPORT TOOLS AND TEST EQUIPMENT. All supply support and spare parts-peculiar will be stored at the FAA Logistics Center. Test equipment is supported at the AF sector office having responsibility for the ALSF-2 facility. All special tools and test equipment (determined by the FAA) required for maintenance will be made available prior to installation and integration of the ALSF-2.

a. The contractor will provide a list of the common tools, test/support equipment, interface devices, and connectors required for maintaining ALSF-2 equipment at all levels of maintenance. Procurement of common equipment not currently available to the site will be according to standard procedures.

b. The contractor will identify special tools, test/support equipment, and special interface devices required to support the ALSF-2. The FAA will determine whether it is necessary to purchase any of the identified items. Those items identified will be provided by the contractor at system delivery.

93. SUPPLY SUPPORT. The FAA Logistics Center is responsible for providing supply support to the ALSF-2 in the area of procurement and storage and transportation of component parts (both common and LRU's). This responsibility also encompasses maintaining inventory records including the Master FAA Catalog, and interfacing with the Federal Cataloging System.

94. VENDOR DATA AND TECHNICAL MANUALS. The contractor will prepare the instruction books in accordance with FAA-D-2494/b for the ALSF-2. The FAA will review, approve, and print the books for distribution. Two complete sets of instruction books will be provided with each ALS. Other technical data to be provided by the contractor includes: reliability and maintainability documentation, test procedures, provisioning technical documentation, engineering/reprocurement drawings, and software documentation prepared according to DOD-STD-2167.

95. EQUIPMENT REMOVAL. Equipment being removed for replacement will be disposed of in compliance with Order 4800.2B, Utilization and Disposal of Excess and Surplus Personal Property.

96. FACILITIES. Not applicable.

97. EQUIPMENT NOT FURNISHED. The following list includes equipment that is required for an ALS but that is not furnished by the contractor. These items are briefly described herein with detailed requirements being contained at the page or in the individual equipment specifications referenced in subparagraphs 97a - 97f.

a. Isolation transformers (pages 5 and 16). Isolation transformers will be provided by the program office.

(1) 300 watt, 20 ampere (A) primary, 20 A secondary (AC 150/5345-47).

(2) 500 watt, 20 A primary, 20 A secondary (AC 150/5345-47).

(3) 1500 watt, 20 A primary, 20 A secondary (FAA-E-2690).

b. PAR-56 lamps (FAA-E-2408). PAR-56 lamps will be provided by the program office.

(1) 300 watt.

(2) 500 watt.

c. Flasher subsystem transformer (pages 6 and 17). Flasher subsystem transformers will be procured by the region responsible for installation of each ALSF-2.

d. Utility transformer (page 19). Utility transformers will be procured by the region responsible for installation of each ALSF-2.

e. Low impact resistant structures (page 19). Low impact resistant structures will be provided by the program office.

f. Substation shelter (page 19). Substation shelters will be procured by the region responsible for installation of each ALSF-2.

g. Semiflush fixtures (FAA-E-2491 and page 16). Semiflush fixtures will be provided by the program office.

98. PERSONNEL CERTIFICATION. Personnel maintaining this equipment will require certification in accordance with Order 3400.3E, Airway Facilities Maintenance Certification Program.

99. EQUIPMENT CERTIFICATION. Equipment certification for the ALSF-2 system will be in accordance with Order 6850.5B, Maintenance of Lighted Navigational Aids, and Order 6000.15A, General Maintenance Handbook for Airway Facilities. Flight checks will be performed in accordance with 0 AP 8200.1, United States Standard Flight Inspection Manual.

APPENDIX 1. SYSTEM DELIVERY

1.	Nantucket, MA	RW 24
2.	Orlando, FL	RW 36R
3.	San Antonio, TX	RW 12
4.	Colorado Springs, CO	RW 35
5.	Nashville, TN	RW 02L
6.	Klamath Falls, OR	RW 03
7.	Covington, KY	RW 18L
8.	Greer, SC	RW 03
9.	Windsor Locks, CT	RW 06
10.	Boston, MA	RW 04R
11.	St. Louis, MO	RW 12L
12.	Miami, FL	RW 09L
13.	Knoxville, TN	RW 23R
14.	Atlanta, GA	RW 08R
15.	Chattanooga, TN	RW 20
16.	Denver, DIA	RW 35R
17.	Denver, DIA	RW 35L
18.	Denver, DIA	RW 34R
19.	Denver, DIA	RW 34L
20.	Minneapolis, MN	RW 29L
21.	Atlanta, GA	RW 09R
22.	Jacksonville, FL	RW 07
23.	Tampa, FL	RW 36L