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16. Abstract

This volume presents a description of the services a generic Advanced Air Traffic Management System (AATMS) should provide to the users of the system to facilitate the safe, efficient flow of traffic. It provides a definition of the functions which the system must perform to provide these services and relates them to the various phases or segments of flight encountered in a general flight profile. This document also presents a series of detailed operational logic flow diagrams which specify individual tasks or activities which must be accomplished to complete each function. These flow diagrams were generated as an aid in the development of a digital simulation of an AATMS. They are required as a basis for subsystem mechanization and for the analysis of system implementations.

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GLOSSARY

AATMS	Advanced Air Traffic Management System
ACC	Airport Control Center
ADF	Automatic Direction Finder
ADIZ	Air Defense Identification Zone
AGL	Above Ground Level
AMF	Analog Matched Filter
AOPA	Aircraft Owners and Pilots Association
ARINC	Aeronautical Radio, Inc.
ARTCC	Air Route Traffic Control Center
ARTS	Automated Radar Terminal System
ATC	Air Traffic Control
ATCAC	Air Traffic Control Advisory Committee
ATCRBS	Air Traffic Control Radar Beacon System
ATCS	Air Traffic Control System
ATM	Air Traffic Management
CA	California
CARD	Civil Aviation Research and Development
CAS	Collision Avoidance System
CCC	Continental Control Center
CNI	Communication Navigation Identification
CNMAC	Critical Near Midair Collisions
COMM	Communications
CONUS	Continental United States
CP	Central Processor
CST	Central Standard Time
CW	Continuous Wave

GLOSSARY (continued)

DABS	Discrete Address Beacon System
DOD	Department of Defense
DOT	Department of Transportation
DME	Distance Measuring Equipment
DNSDP	Defense Navigation Satellite Development Program
DNSS	Defense Navigation Satellite System
ERP	Effective Radiated Power
ESRO	European Satellite Reserach Organization
EST	Eastern Standard Time
ETA	Estimated Time of Arrival
FAA	Federal Aviation Administration
F&E	Facilities and Equipment
FL	Florida
FM	Frequency Modulation
FSS	Flight Service Station
GA	General Aviation
GAATMS	Ground-Based Advanced Air Traffic Management System
GDOP	Geometric Dilution of Precision
GFE	Government Furnished Equipment
IAC	Instantaneous Airborne Count
ICAO	International Civil Aviation Organization
ID	Identification
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions

GLOSSARY (continued)

I/O	Input/Output
IOP	Input Output Processor
IPC	Intermittent Positive Control
IPS	Instructions Per Second
IR	Infrared
JFK	Kennedy International Airport
LA	Los Angeles
LAT	Latitude
LAX	Los Angeles International Airport
LORAN	Long Range Navigation
LOS	Line-of-sight
LRR	Long Range Radar
MIPS	Million Instructions Per Second
MLS	Microwave Landing System
MODEM	Modulator-Demodulator
MSL	Mean Sea Level
MTBF	Mean Time Between Failures
NAFEC	National Aviation Facilities Experimental Center
NAD	North American Datum
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
NAV	Navigation
NDB	Non-Directional Radio Beacon
NEF	Noise Exposure Factor
NFCC	National Flow Control Center

GLOSSARY (continued)

NMAC	Near Midair Collisions
NOTAM	Notice to Airmen
NOZ	Normal Operating Zone
NWS	National Weather Service
O&M	Operations and Maintenance
PCA	Positively Controlled Airspace
PIREPS	Pilot Reports
PN	Pseudo-Noise
PPM	Pulse Position Modulation
PWI	Pilot Warning Indicator
RAM	Random Access Memory
RCAG	Remote Control Air-to-Ground Facility (Present System)
RCAGT	Remote Communication Air-Ground Terminal
RCC	Regional Control Center
R&D	Research and Development
RDT&E	Research, Development, Test, and Evaluation
RF	Radio Frequency
RNAV	Area Navigation
ROM	Read-Only Memory
SAATMS	Satellite-Based Advanced Air Traffic Management System
SAMUS	State Space Analysis of Multisensor System
SID	Standard Instrument Departure
S/N	Signal-to-Noise
SNC	Surveillance, Navigation, Communication
STAR	Standard Arrival Routes
STC	Satellite Tracking Center
STOL	Short Takeoff and Landing

GLOSSARY (continued)

TACAN	Tactical Air Navigation
T&E	Test and Evaluation
TCA	Terminal Controlled Airspace
TOA	Time of Arrival
TRACAB	Terminal Radar Approach/Tower Cab
TRACON	Terminal Radar Approach Control
TRSA	Terminal Radar Service Areas
TRW	Thompson Ramo Wooldridge
TSC	Transportation Systems Center
TX	Texas
VFR	Visual Flight Rules
VHF	Very High Frequency
VMC	Visual Meteorological Conditions
VOR	Very High Frequency Omni-Directional Range
VORTAC	Very High Frequency Omni-Range TACAN
VVOR	Virtual VOR
2D	Two Dimensional
3D	Three Dimensional
4D	Four Dimensional

1. INTRODUCTION

The large number of variables involved in an air traffic management system requires a systematic method for establishing the relationships between those variables. A functional analysis was conducted to establish the relationships between the goals and objectives of a generic Advanced Air Traffic Management System (AATMS), the needs of the system users, and the data gathering and processing subsystems (Ref. 1). The functional analysis of the air traffic management process was performed on two primary elements: (1) the operational variables oriented toward control of aircraft in conjunction with other traffic using an origin-to-destination flight profile and (2) the scenario elements which define the physical constraints under which the traffic must operate.

The AATMS operational variables are derived from the services which must be provided by an AATMS to insure continuous and long-term operation in support of all users. An air traffic management system provides services to its users through performance of specific functions. The services to be provided by an air traffic management system are generic in that many different system configurations are capable of providing the same set of services; the efficiency with which each configuration provides its services, however, is a measure of system performance. The responsibility for providing the services and performing the required functions (i.e., air or ground) is defined by the management concept.

This volume presents a series of operational logic flow diagrams which describe and define the functions that must be performed by a generic AATMS to provide the required services. These logic flow diagrams can be used in the analysis of any specific management concept and can be utilized in the analysis of specific system and subsystem mechanizations.

The following sections present a definition of the services that should be provided by a generic AATMS, the functions that must be performed by the system to provide these services, the segments of an origin-to-destination flight profile in which these functions must be performed, and the operational logic flow diagrams which define the activities of the system that must be accomplished to complete the performance of a function.

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2. SYSTEM SERVICES AND FLIGHT SEGMENT DEFINITION

This section presents a definition of the services that should be provided by a generic AATMS and the generalized segments encountered during a complete flight operation.

2.1 System Services

(1) Airport/Airspace Use Planning

(a) Planning - This service is concerned with the construction and maintenance of a master flow plan. The flow plan contains data concerning user intent and results in a master schedule designed to facilitate traffic flow into and out of airports. This service is also concerned with assisting a user in selecting the shortest time of flight and the most economical route. It is also concerned with assisting the user in preparation of flight plans and providing facilities for checking, revising, approving, disseminating, and modifying the flight plans.

(b) Airspace Structure - This service involves the development and operation of an airspace structure designed to separate aircraft of differing performance capabilities and needs. The airspace structure planning service involves establishing standard arrival and departure routes; enroute regions of controlled and uncontrolled airspace; navigation routes; special areas for holding patterns, training and practice areas, areas for military operations, and special restricted areas.

(2) Flight Plan Conformance

Traffic Control - This service is concerned with controlling the flow of traffic efficiently. It involves providing the necessary personnel and the algorithms, sensors, and data processing to control the movement of traffic with minimum delay and maximum safety.

(3) Separation Assurance

Spacing Control - This service involves the generation of intervention commands to all or a specific set of users of designated regions of the airspace structure. The purpose of these intervention commands is to prevent aircraft from conflicting with other aircraft by controlling their relative separation or spacing.

(4) Operational Regulations

Rules and Procedures - This service involves establishing
a set of rules and procedures that defines the minimum
requirements for operating within the system, the require-
ments for admission to various airspace categories, traffic
regulations, legal responsibilities, jurisdictional
boundaries, and operating procedures during contingency
modes of operation.

(5) Airborne, Landing, and Ground Navigation

(a) Ground Control and Guidance - This service concerns the
provision of traffic and spacing control intervention on
commands for aircraft on the primary airport runways, taxi-
ways, and ramps.

(b) All Weather Landing - This service involves the provision
of equipment and facilities which will enable all users to
safely approach and land during Instrument Meteorological
Conditions (IMC).

(6) Flight Advisory

General Information - This service concerns the compilation
and maintenance of current traffic information and notices
to airmen for dissemination as needed. This service also
involves providing pilot briefings designed to familiarize
pilots with traffic patterns, obstructions, and peculiarities
at destination airports, along with weather advisories in
terminal and enroute regions, enroute waypoints, and special
procedures.

(7) Information

Weather - This service involves the gathering, processing,
and dissemination of weather data as preflight or in-flight
advisories.

(8) Records

Statistics - This service is concerned with collecting,
storing, and analyzing data required to evaluate system
performance, to plan for system growth and improvements,
and to assist the user in planning future flights.

(9) Ancillary

Facilities Operation and Maintenance - This service involves
the operation and maintenance of all facilities and includes
the monitoring of system performance and status, testing,
and maintaining all equipment, training the system staff, and
general housekeeping operations.

(10) Emergency

Emergency Assistance - This service is concerned with the
assistance of all users during emergencies. It involves
directing the search and rescue activities, routing and
navigation assistance to lost pilots, and development of
special emergency procedures.

2.2 Flight Segments

A typical flight profile consists of 12 phases or flight segments; in the
event of a missed approach, three additional contingency segments are required.
These flight segments are shown in Fig. 2.2-1; each flight segment is defined as
follows:

(1) Preflight

This segment is concerned with the planning and scheduling
activities required to establish a flight plan. It con-
siders the present system status, user capabilities, rules
and procedures, projected traffic, and operational conditions.
The segment ends with the filing of an approved flight plan.

(2) Departure Taxi

This segment starts with the pilot contacting the local
control authority and the activation of any required
avionics (e.g., Identification Transponder). Tasks involve
taxiway negotiation and issuance/receipt of required flight
data. Aircraft, airport, and AATMS status is checked for
current conditions. Separation from adjacent ground traffic
is maintained and the segment terminates when the aircraft
arrives at a holding area prior to entry onto the active
runway.

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                    ┌──────────────────────────┐
                    │   Preflight    1.0        │
                    └──────────────────────────┘
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                    ┌──────────────────────────┐
                    │  Departure Taxi  2.0      │
                    └──────────────────────────┘
                                 │
                                 ▼
                    ┌──────────────────────────┐
                    │    Takeoff       3.0      │
                    └──────────────────────────┘
                                 │
                                 ▼
                    ┌──────────────────────────┐◄─────────────────────┐
                    │   Departure      4.0      │                      │
                    └──────────────────────────┘                      │
                                 │                                     │
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                    ┌──────────────────────────┐                      │
                    │   Departure               │                      │
                    │   Transition    5.0       │                      │
                    └──────────────────────────┘                      │
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                    │   Enroute        6.0      │                      │
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                    │   Arrival                 │                      │
                    │   Transition    7.0       │                      │
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                    │    Arrival       8.0      │               │      │
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                    ┌──────────────────────────┐               │      │
                    │    Approach      9.0      │               │      │
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    ┌──────────────────┐              ┌──────────────────────┐ │      │
    │           11.0   │              │      Missed          │ │      │
    │  Landing         │              │      Approach  10.0  │ │      │
    └──────────────────┘              └──────────────────────┘ │      │
              │                             │                   │      │
              ▼                    ┌────────┴────────┐          │      │
    ┌──────────────────┐          ▼                 ▼          │      │
    │  Arrival  14.0   │  ┌──────────────────┐  ┌──────────────────┐  │
    │  Taxi            │  │ Transition to    │  │   Return to      │  │
    └──────────────────┘  │ Alternate        │  │   Airport        │  │
              │           │ Airport   13.0   │  │          12.0    │  │
              ▼           └──────────────────┘  └──────────────────┘  │
    ┌──────────────────┐          │                   │               │
    │  Postflight      │          │                   └──────────►────┤
    │          15.0    │          └──────────────────────────────────┘
    └──────────────────┘
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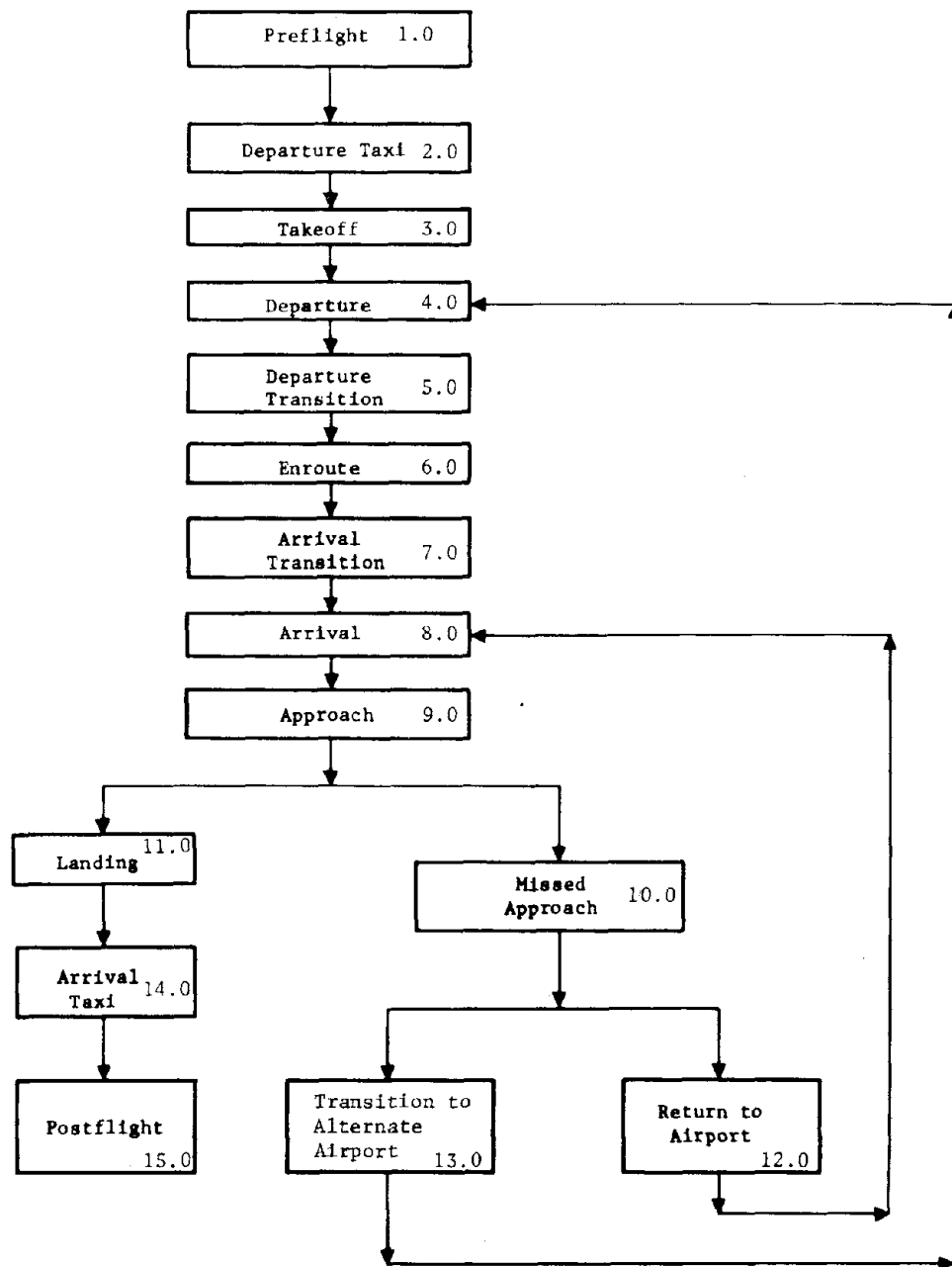
Figure 2.2-1. Flight Segments

(3) Takeoff

This segment begins when the aircraft is cleared onto the runway for takeoff roll. Separation from arriving and departing aircraft and intersecting ground traffic are important control functions. Effects of wake turbulence, airport visibility, and surface wind conditions are primary considerations for aircraft dynamic control through lift-off. This segment ends when the aircraft has reached the airport boundary.

(4) Departure

The activities involved in this flight segment are concerned with compliance to an assigned route after leaving the airport control boundary. It is constrained by definition to the local area, and controlled aircraft would commonly fall under the jurisdiction of an approach control type of facility. One of two flight options will follow this segment: either flight within the local area will continue or the aircraft will transition into another control sector.

(5) Departure Transition

This sgment concerns aircraft exiting the local area to enroute airspace. Changes in jurisdictional authority are probable. Standard departure routes will be followed in most high density traffic situations with close time and checkpoint tolerance requirements. Merging with other outbound traffic and spacing between adjacent aircraft are principal functions to be accomplished. Aircraft transitioning into enroute airspace will be given altitude assignments consistent with aircraft capabilities and the enroute plan.

(6) Enroute

This segment is characterized by flight between major traffic centers with relaxed separation standards. Surveillance monitoring is carried on in this segment. Traffic density is usually not heavy and aircraft classes tend to be separated by their natural flight capabilities. Airspace structure is highly influenced by altitude profiles defining control level requirements. Rules and procedures, avionics requirements, and services provided by the system will be somewhat variable between these altitude segments. Spacing, merging, sequencing, and route conformance are the primary functions being performed.

(7) Arrival Transition

The enroute traffic is transitioned into the higher density hub areas during this phase for dispersion to the appropriate airports. Control requirements will become more stringent due to the increased traffic. Published feeder routes may be established in areas where an operational advantage can be gained; these may include standard arrival routes to selected regional approach fixes. The initial merging and sequencing of aircraft will be conducted during this segment. It concludes with the aircraft arrival over the Arrival Fix.

(8) Arrival

This segment commences at the Arrival Fix. The aircraft are maneuvering during this segment to establish alignment and order for the approach. Holding pattern descents, procedure turns, and merging paths are involved. The aircraft dynamic state is adjusted during this phase to the proper flight configuration (flaps, speed, positioning) for entry into the approach segment. Descent gradients are restricted to avoid excessive dynamic transients.

(9) Approach

Final alignment and descent for landing are accomplished during this segment. It is initiated at the approach fix (within the airport control boundary) and terminates at the runway threshold or missed approached point. Final power and aircraft configuration settings are made during this flight portion and primary maneuvering is restricted to glideslope and path adjustments. Control is concerned with maintaining separation between arriving and departing aircraft.

(10) Missed Approach

The missed approach is initiated at the decision height. It involves an aircraft configuration change and course guidance to the designated missed approach fix. Traffic separation and ordering is required in addition to obstacle clearance. This segment is terminated at the missed approach fix (for this definition, within the local area control) where a return to the airport is authorized or a clearance to an alternate destination is provided.

(11) Landing

This segment is an extension of the approach where the
decision was made to continue through to touchdown. It
involves flare, touchdown, runway guidance, and exit.
Under Category IIIC conditions, this could be a completely
automatic mode. Expeditious exiting of the runway with
consideration of following traffic and taxiway paths is
required.

(12) Return to Airport

This flight segment is oriented to return aircraft to
the field after having executed a missed approach or where
the requirement exists following a takeoff. The flight
path may involve a circling approach by entering the air
craft into the local visual traffic pattern or may require
return to the final approach fix. In the latter case all
functions and control actions normally associated with
the Initial Approach segment will be appropriate.

(13) Transition to Alternate Airport

When conditions following a missed approach require
transition to an alternate airport, several options may
exist dependent on the relative location of the destina-
tion airport. This segment assumes the alternative is
in the near vicinity and can be routed into an arrival
segment at that airport. In order to do this, the air-
craft must go to the departure phase from the airport
whose approach was missed. Consequently, the functions
involved will be similar to those of Departure, Departure
Transition, Enroute, and Arrival Transition.

(14) Arrival Taxi

This segment begins when the landing aircraft exits the
runway. Functions involve taxiway negotiation, main-
taining proper separation from other ground traffic, and
following procedural rules or control instructions at
intersection merge points. Aircraft parking, engine shut-
down, and deactivation of avionics at the gate terminates
this segment.

(5) Post Flight

The formal closing of a flight plan is involved in this
segment if the aircraft is terminating. If the flight
has completed only a leg of a continuing flight, planning
data will be held in intermediate storage for later
activation. Processing of data for statistical or
historical records completes this phase.

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3. OPERATIONAL LOGIC FLOWS

A generic definition of the operation of an AATMS and its associated system interfaces is formally presented in a series of operational logic flow diagrams. The diagrams are multidimensional in that they consider all segments within a complete flight profile, cover succeedingly increased levels of detail (ultimately to specific task accomplishments and mechanization approaches), embody different operational/control philosophies, and are amenable to all user categories.

Development of the logic flow diagrams has been limited to those primary functions involved in the traffic flow planning and control services. The definition of other services, such as General Advisories and Facilities Operation and Maintenance, was not considered in this study.

3.1 Organizational Approach

Three levels of detail have been derived for presentation of the definition of a generic AATMS operation. A fourth level is provided as an example of detailed task identification and a fifth level is discussed briefly with regard to mechanization applications. The following paragraphs describe the information content of each level.

Level I - Presents the major events associated with a complete flight profile and identifies the primary functions involved.

Level II - Establishes the interface organization and identity of each planning/control function within a flight segment.

Level III - Details each function definition with corresponding situation qualifiers. Identifies decision blocks and alternative control paths, and provides the basis for control concept application.

Level IV - Shows the detailed task sequences required to perform each function and identifies the factors associated with task conduct. Provides initial identification of operational boundary conditions.

Level V - Provides mechanization detail of fourth level tasks. Control algorithms are stated and gross subsystem parameters are identifiable.

The presentation format of the logic flow diagrams employs a numbering organization together with definitive symbols to insure traceability and to promote clarity. Each flight segment was assigned an identifying number code from Fig. 2.2-1 and all functions, processes, and tasks associated with that segment carry that code. Additionally, with succeeding levels of detail, an increasing decimal scheme is employed. Hence, the code number 4.2.1 relates to the first task/process block of the second function within the fourth flight segment. The symbology is representative of that used in standard computer flow diagrams. Figure 3.1-1 presents the symbols employed together with a brief definition.

3.2 Major Operational Logic Levels

Figure 3.2-1 presents a top or first level diagram of the major sequence of events associated with a complete flight profile. Additionally, a matrix of the primary functions involved in traffic flow planning and control is presented in conjunction with the appropriate flight segments. The matrix was developed with consideration of the primary events which may occur within each flight segment and is not intended to be all inclusive. That is, for a selected scenario, some functions listed may not be appropriate to a specific flight segment or they may occur in a segment where they are not presently shown. The validity of the matrix as a guide and as an operational tool is not compromised. Commonality of the functional definitions exist between flight segments and little if any logic variation is required. The primary influences will be in secondary effects relating to control options available and decision criteria for selection of alternatives. The flight segments are arranged in a temporal sequence with segment flow options at the key decision points of missed approach/ landing and return to airport/transition to the alternate airport. Feedback logic flow is presented where required to complete the total flight profile.

The second and third level logic flow diagrams for each of the flight segments follow the flow diagrams. In addition, the fourth level diagrams for the arrival phase are presented.

The ultimate use of the operational logic flow diagrams is to provide a basis for the operational implementation of the system functions and for the development of computer algorithms in an automated system. The intent during the Subsystem Requirements Study was to provide enough detail to guide the development of the digital simulation used to represent a generic Advanced Air Traffic Management System. At this time in the study, the operational logic flow diagrams have been developed to the third level for all of the functions involved in the direct control of traffic flow. The level of detail is such that each of these functions can reflect different control concepts and will permit investigation into the relative performance of systems employing different operational
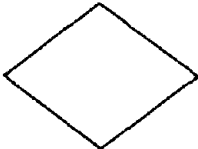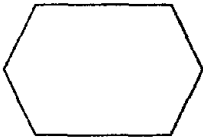
An action block indicating a function, process or task to be performed.

A decision block with two exits, yes or no. Only *yes/no* questions are permitted.

Represents an influence factor or qualifies a situation associated with adjacent action blocks. Not detailed in successive flow charts.

Interface block indicating information flow to interrelated logic diagrams.

Interface block indicating information flow (usually feedback) within a logic flow diagram.

Branch point indicating information flow along any, all or a combination of the branch paths.

Branch point indicating information flow along only one of the branch paths.

Fig. 3.1-1. Flow Diagrams Symbol Legend

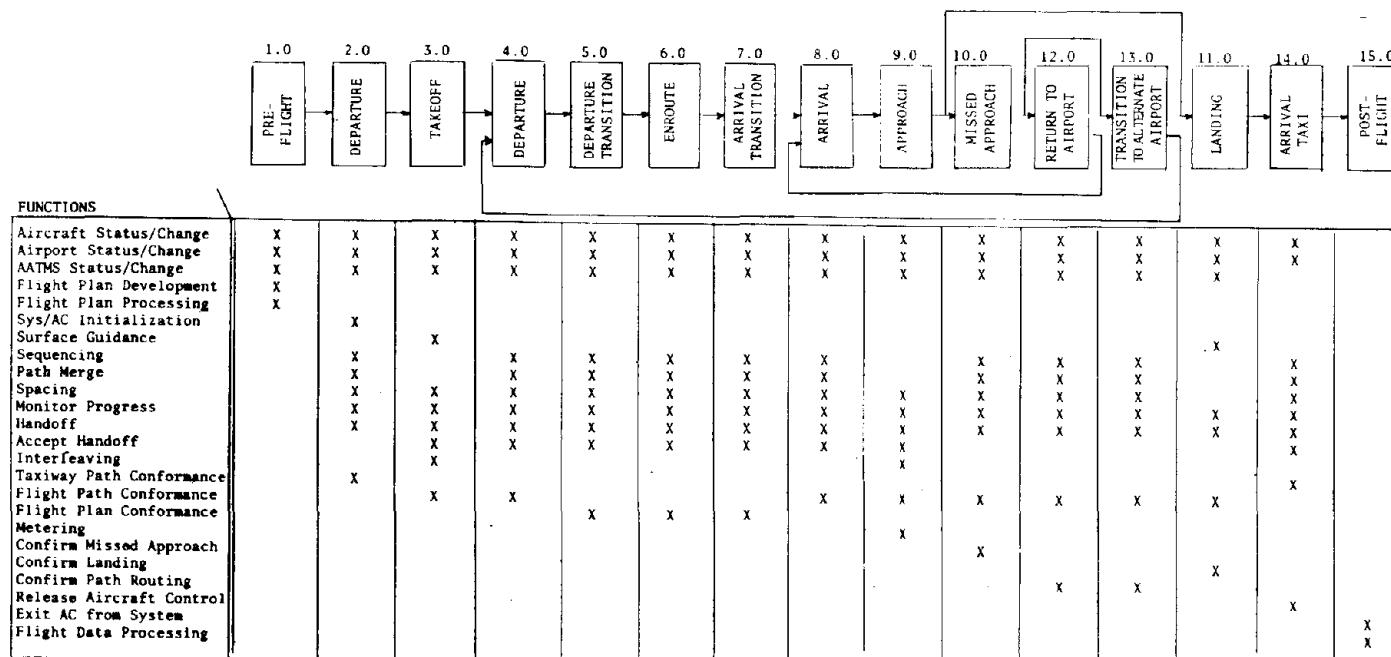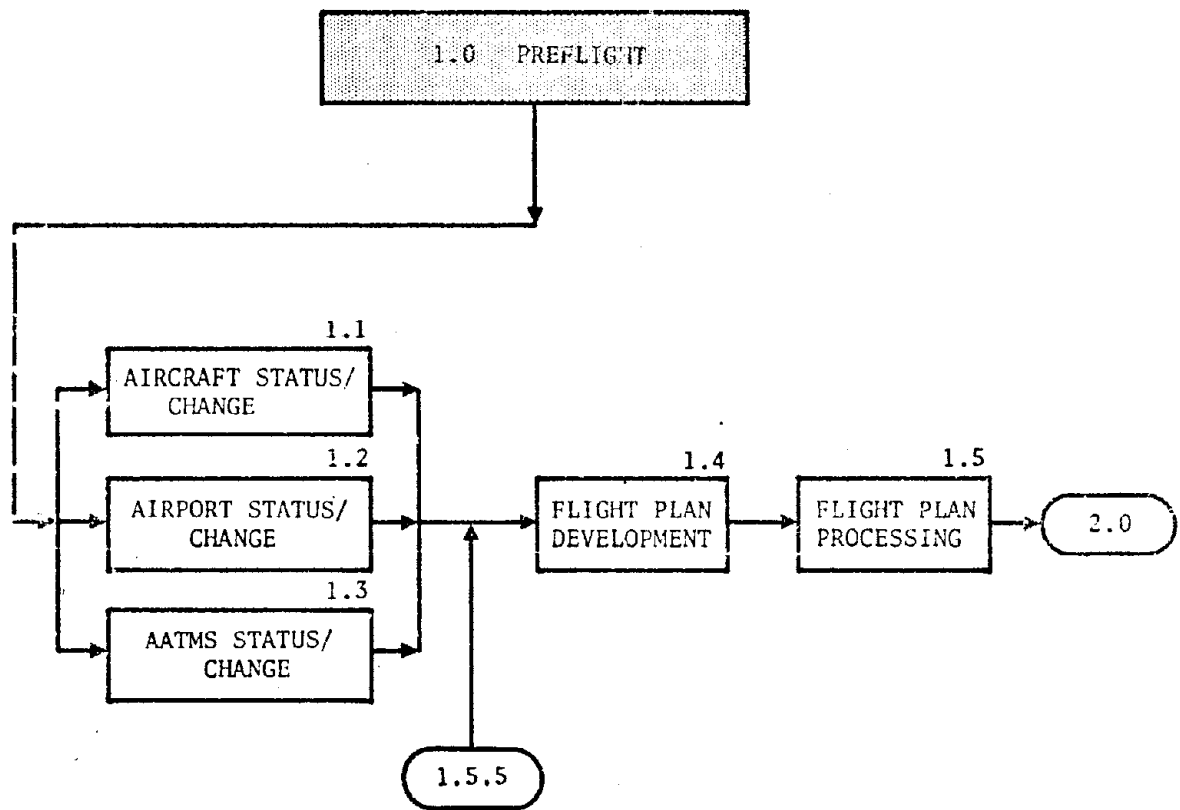| FUNCTIONS	1.0 PRE-FLIGHT	2.0 DEPARTURE	3.0 TAKEOFF	4.0 DEPARTURE	5.0 DEPARTURE TRANSITION	6.0 ENROUTE	7.0 ARRIVAL TRANSITION	8.0 ARRIVAL	9.0 APPROACH	10.0 MISSED APPROACH	12.0 RETURN TO AIRPORT	13.0 TRANSITION TO ALTERNATE AIRPORT	11.0 LANDING	14.0 ARRIVAL TAXI	15.0 POST-FLIGHT
Aircraft Status/Change	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Airport Status/Change	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
AATMS Status/Change	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Flight Plan Development	X														
Flight Plan Processing	X														
Sys/AC Initialization		X													
Surface Guidance			X										X		
Sequencing		X		X	X	X	X	X		X	X	X		X	
Path Merge		X		X	X	X	X	X		X	X	X		X	
Spacing		X	X	X	X	X	X	X	X	X	X	X		X	
Monitor Progress		X	X	X	X	X	X	X	X	X	X	X		X	
Handoff		X	X	X	X	X	X	X	X	X	X	X	X	X	
Accept Handoff			X	X	X	X	X	X	X					X	
Interleaving			X						X						
Taxiway Path Conformance		X													
Flight Path Conformance			X	X				X	X	X	X	X	X	X	
Flight Plan Conformance					X	X	X								
Metering									X						
Confirm Missed Approach										X					
Confirm Landing													X		
Confirm Path Routing											X	X			
Release Aircraft Control													X		
Exit AC from System														X	
Flight Data Processing															X

Figure 3.2-1. Major Flight Events/Functions Matrix

concepts in a given scenario. The arrival segment of flight was considered to be the most critical to system performance and was analyzed to the fourth level of detail to provide insight into the complexity of developing control algorithms to the detail required to increase the fidelity of system simulation; and, as with all flight phases, each function associated with the arrival flight segment, 8.0, is ordered and coded. The entry and exit interface blocks depict areas with associated information. The flow diagram is pseudo-temporal in that some functions are essentially continuous (e.g., Monitor Progress function) during the flight segment, while others are specifically time oriented within the segment (e.g., Handoff/Accept and Handoff). The primary functions associated with the arrival segment are Flight Path Conformance, Sequencing, Merging, Spacing, and System Status Monitoring. The decision block functions reflect the possibility of the occurrence of an improper situation which would require a control action for resolution. The details required to rectify the situation are provided in the more detailed logic flow diagrams.

Each of these functions applied to a particular scenario can reflect different control or operational concepts. As an example, under an air managed control concept, the pilot of an aircraft would be responsible for maintaining the proper spacing relative to adjacent aircraft and for monitoring the progress of his aircraft relative to an established flight profile. Under a ground managed control concept the ground based system would perform these functions through surveillance of the aircraft state and communication of the proper resolution commands to the affected aircraft. A third level diagram for the Flight Path Conformance function, 8.2, indicates that if an aircraft is not conforming to its flight profile, a position and/or time error could be involved. Using an extrapolation of the aircraft state data available (i.e., surveillance position, velocity, acceleration) with an appropriate time increment, the consequence of those errors, such as a mid-air conflict or an adverse impact on traffic flow, can be determined. This assessment of the situation will determine if a corrective action is required and will aid in the selection of the most appropriate control maneuver. This maneuver may involve several alternate control paths. The subfunctions involved in Flight Path Conformance are presented in the fourth level diagrams. These diagrams reflect the detailed task identification and the temporal sequences required to derive a solution to a specific situation. Specific conduct of these tasks would be shown in fifth level logic flow diagrams and would be dependent upon specific implementations or control algorithms.

These operational logic flow diagrams have been used as the basis for an Air Traffic Management System simulation. They will also be used to develop more detailed control concept algorithms for incorporation in the simulation to increase its validity and to permit a more detailed investigation into the sensitivity of system performance to the subsystem data which forms the basis of the system operation.
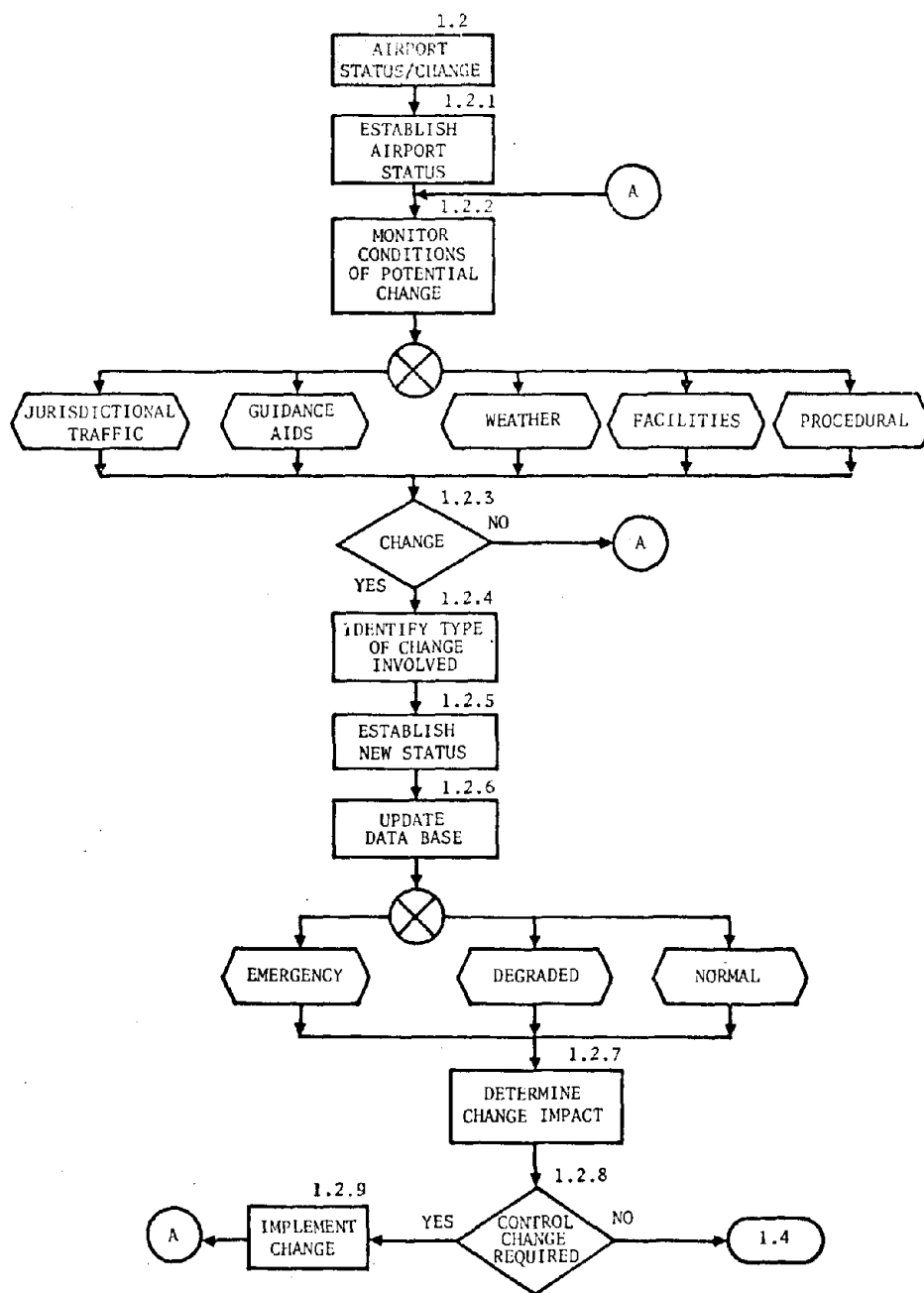
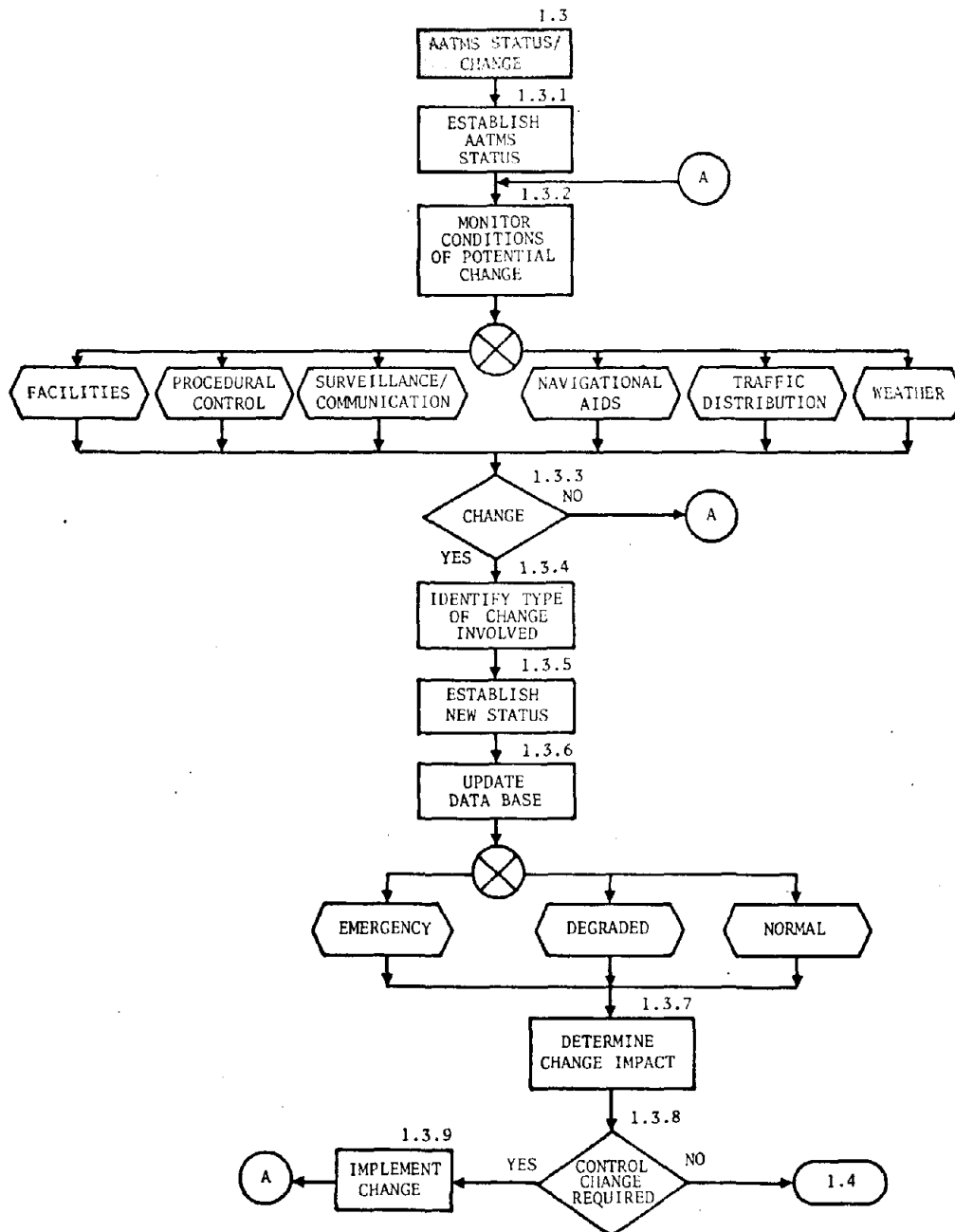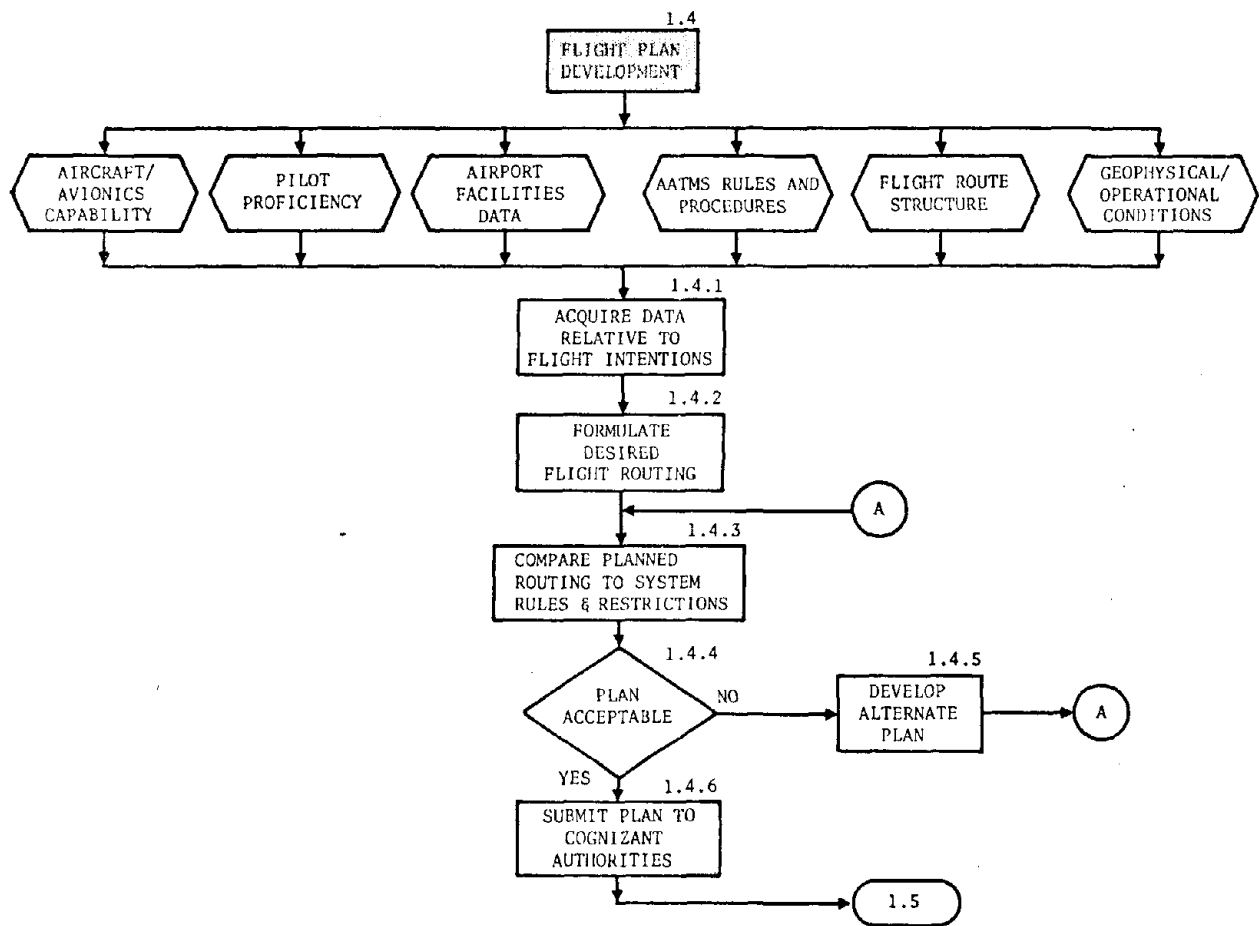Preflight Logic Flow Diagram, Level II

```
                                    1.1
                            ┌──────────────────┐
                            │    AIRCRAFT      │
                            │  STATUS/CHANGE   │
                            └──────────────────┘
                                    │  1.1.1
                                    ▼
                            ┌──────────────────┐
                            │   ESTABLISH      │
                            │   AIRCRAFT       │            ╭───╮
                            │   STATUS         │◄───────────┤ A │
                            └──────────────────┘            ╰───╯
                                    │  1.1.2
                                    ▼
                            ┌──────────────────┐
                            │    MONITOR       │
                            │   CONDITIONS     │
                            │  OF POTENTIAL    │
                            │    CHANGE        │
                            └──────────────────┘
                                    │
                                    ⊗
        ┌──────────────┬───────────┴───────────┬──────────────┐
        ▼              ▼                        ▼              ▼
  ⬡ MECHANICAL ⬡  ⬡ WEATHER ⬡          ⬡ ADJACENT ⬡    ⬡ PROCEDURAL ⬡
    SYSTEMS                                TRAFFIC
        └──────────────┴───────────┬───────────┴──────────────┘
                                    │  1.1.3
                                    ▼                    NO
                                ◇ CHANGE ◇ ─────────────────────►  ╭───╮
                                                                   │ A │
                                    │ YES                          ╰───╯
                                    │  1.1.4
                                    ▼
                            ┌──────────────────┐
                            │  IDENTIFY TYPE   │
                            │  OF CHANGE       │
                            │  INVOLVED        │
                            └──────────────────┘
                                    │  1.1.5
                                    ▼
                            ┌──────────────────┐
                            │   ESTABLISH      │
                            │   NEW STATUS     │
                            └──────────────────┘
                                    │  1.1.6
                                    ▼
                            ┌──────────────────┐
                            │    UPDATE        │
                            │   DATA BASE      │
                            └──────────────────┘
                                    │
                                    ⊗
            ┌───────────────┬───────┴───────┬───────────────┐
            ▼               ▼               ▼
      ⬡ EMERGENCY ⬡   ⬡ DEGRADED ⬡    ⬡ NORMAL ⬡
            └───────────────┴───────┬───────┴───────────────┘
                                    │  1.1.7
                                    ▼
                            ┌──────────────────┐
                            │   DETERMINE      │
                            │   CHANGE         │
                            │   IMPACT         │
                            └──────────────────┘
                                    │  1.1.8
      1.1.9                         ▼
 ╭───╮   ┌───────────┐   YES    ◇ CONTROL ◇   NO      ⬭ 1.4 ⬭
 │ A │◄──┤ IMPLEMENT │◄─────────  CHANGE    ────────►
 ╰───╯   │  CHANGE   │            REQUIRED
         └───────────┘
```

Preflight-Aircraft Status/
Change Diagram Level III

-17-

Preflight-Airprot Status/
Change Diagram Level III
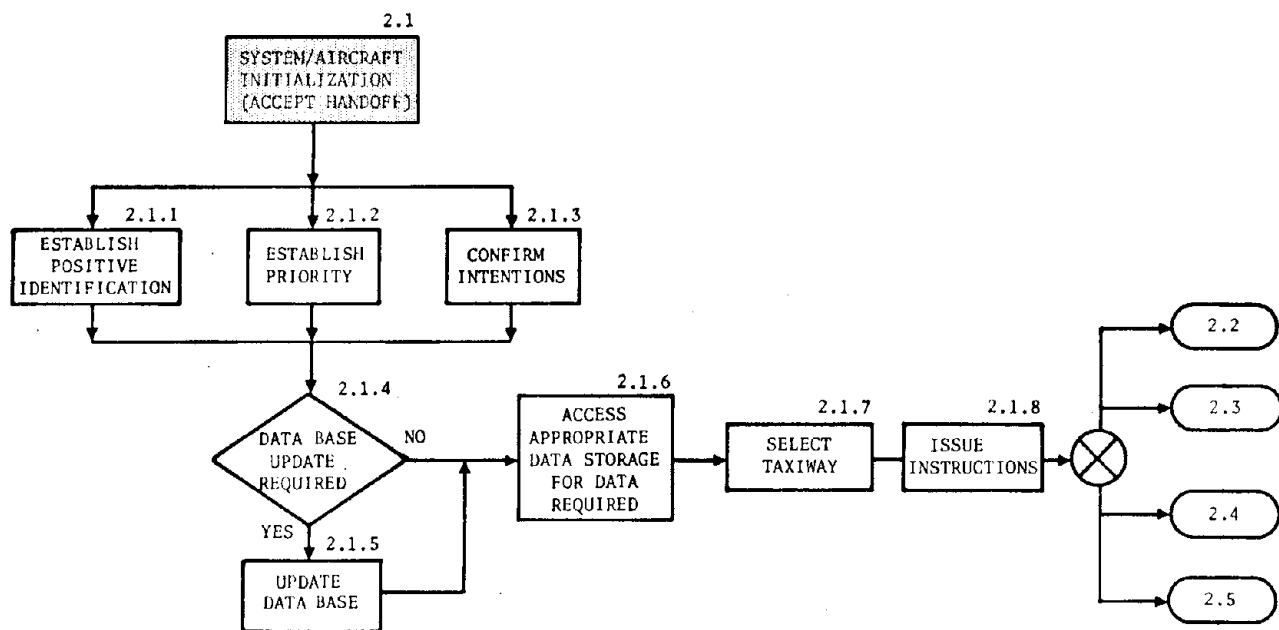
Preflight—AATMS Status/
Change Diagram Level III

```
                                    1.4
                              ┌─────────────┐
                              │ FLIGHT PLAN │
                              │ DEVELOPMENT │
                              └──────┬──────┘
                                     │
    ┌────────┬─────────┬──────────┬─┴────────┬──────────┬──────────┐
    ▼        ▼         ▼          ▼          ▼          ▼          ▼
┌────────┐ ┌────────┐ ┌────────┐ ┌────────┐ ┌────────┐ ┌────────────┐
│AIRCRAFT/│ │ PILOT  │ │AIRPORT │ │AATMS RULES AND│ │FLIGHT ROUTE│ │GEOPHYSICAL/│
│AVIONICS │ │PROFICI-│ │FACILI- │ │  PROCEDURES   │ │ STRUCTURE  │ │OPERATIONAL │
│CAPABILITY│ │ENCY    │ │TIES    │ │               │ │            │ │CONDITIONS  │
└────────┘ └────────┘ │DATA    │ └────────┘ └────────┘ └────────────┘
                       └────────┘
                                          1.4.1
                              ┌───────────────────┐
                              │   ACQUIRE DATA    │
                              │   RELATIVE TO     │
                              │ FLIGHT INTENTIONS │
                              └─────────┬─────────┘
                                        │           1.4.2
                              ┌───────────────────┐
                              │    FORMULATE      │
                              │    DESIRED        │
                              │ FLIGHT ROUTING    │
                              └─────────┬─────────┘        ⃝ A
                                        │◄──────────────────
                                        │           1.4.3
                              ┌───────────────────┐
                              │ COMPARE PLANNED   │
                              │ ROUTING TO SYSTEM │
                              │RULES & RESTRICTIONS│
                              └─────────┬─────────┘
                                        │        1.4.4              1.4.5
                                       ╱ ╲                      ┌──────────┐
                                      ╱   ╲      NO             │ DEVELOP  │
                                     ╱ PLAN ╲───────────────────►│ALTERNATE │──► ⃝ A
                                     ╲ACCEPT-╱                   │  PLAN    │
                                      ╲ABLE ╱                    └──────────┘
                                       ╲ ╱
                                        │ YES     1.4.6
                              ┌───────────────────┐
                              │  SUBMIT PLAN TO   │
                              │    COGNIZANT      │
                              │  AUTHORITIES      │
                              └─────────┬─────────┘
                                        │
                                        └──────────────►( 1.5 )
```
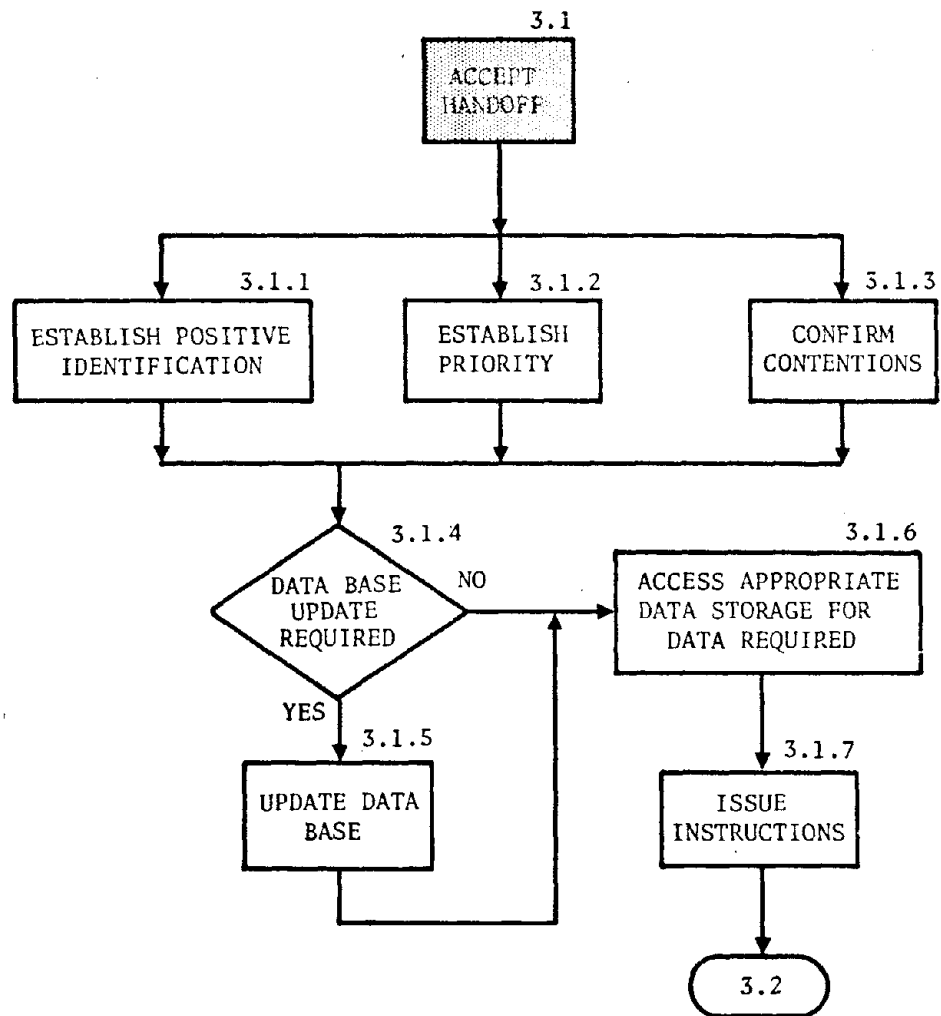
Preflight-Flight Plan
Development Diagram, Level III

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1.5

FLIGHT PLAN
PROCESSING

| AATMS SERVICE BOUNDARIES | LOCALIZED/ CENTRALIZED FLOW PLANNING | FLIGHT PLAN FILING STATIONS DISTRIBUTION | DATA FORMATS AND INFORMATION TRANSFER LINKS |

1.5.1

ACQUISITION OF USER
FLIGHT PLAN REQUESTS

| TRAFFIC REQUESTS GEOGRAPHICAL AND TIME DISTRIBUTION | PROJECTED TRAFFIC DENSITY | AATMS STRUCTURE AND CAPABILITIES | USER MIX AND CAPABILITIES | GEOPHYSICAL/ OPERATIONAL CONDITIONS |

1.5.2

FLIGHT PLAN
ANALYSIS

1.5.3

PLAN
APPROVED
AS FILED

NO   YES

1.5.4

FORMULATED
ALTERNATE
FLIGHT PLAN

1.5.6

UPDATE DATA
BASE

1.5.5

SUBMIT TO
USER

1.5.7

DISSEMINATE DATA TO
CONCERNED AGENTS

1.4.4

2.0

Preflight-Flight Plan Processing
Diagram, Level III
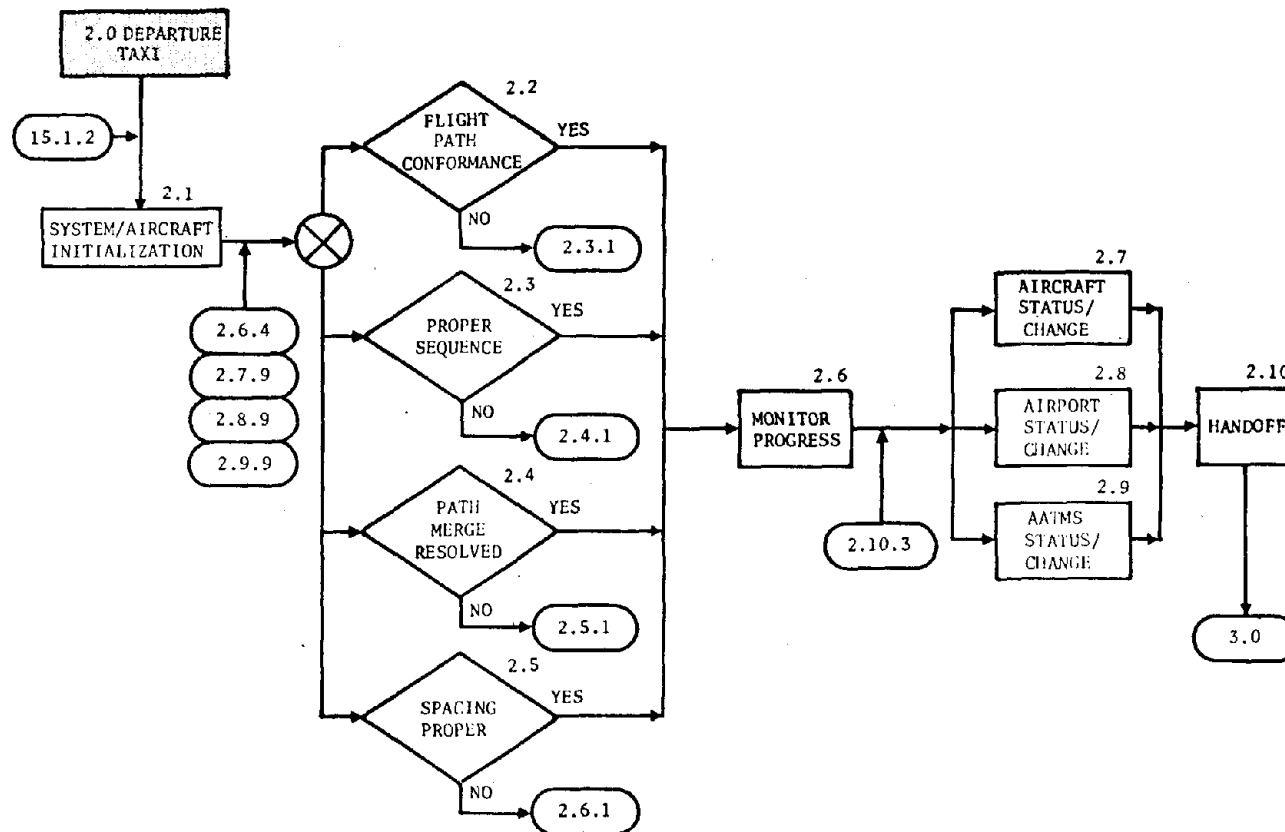
Departure Taxi Logic
Flow Diagram, Level II

```
                              2.1
                    ┌──────────────────────┐
                    │ SYSTEM/AIRCRAFT      │
                    │ INITIALIZATION       │
                    │ (ACCEPT HANDOFF)     │
                    └──────────────────────┘
```

Departure Taxi-System/Aircraft
Initialization Diagram, Level III
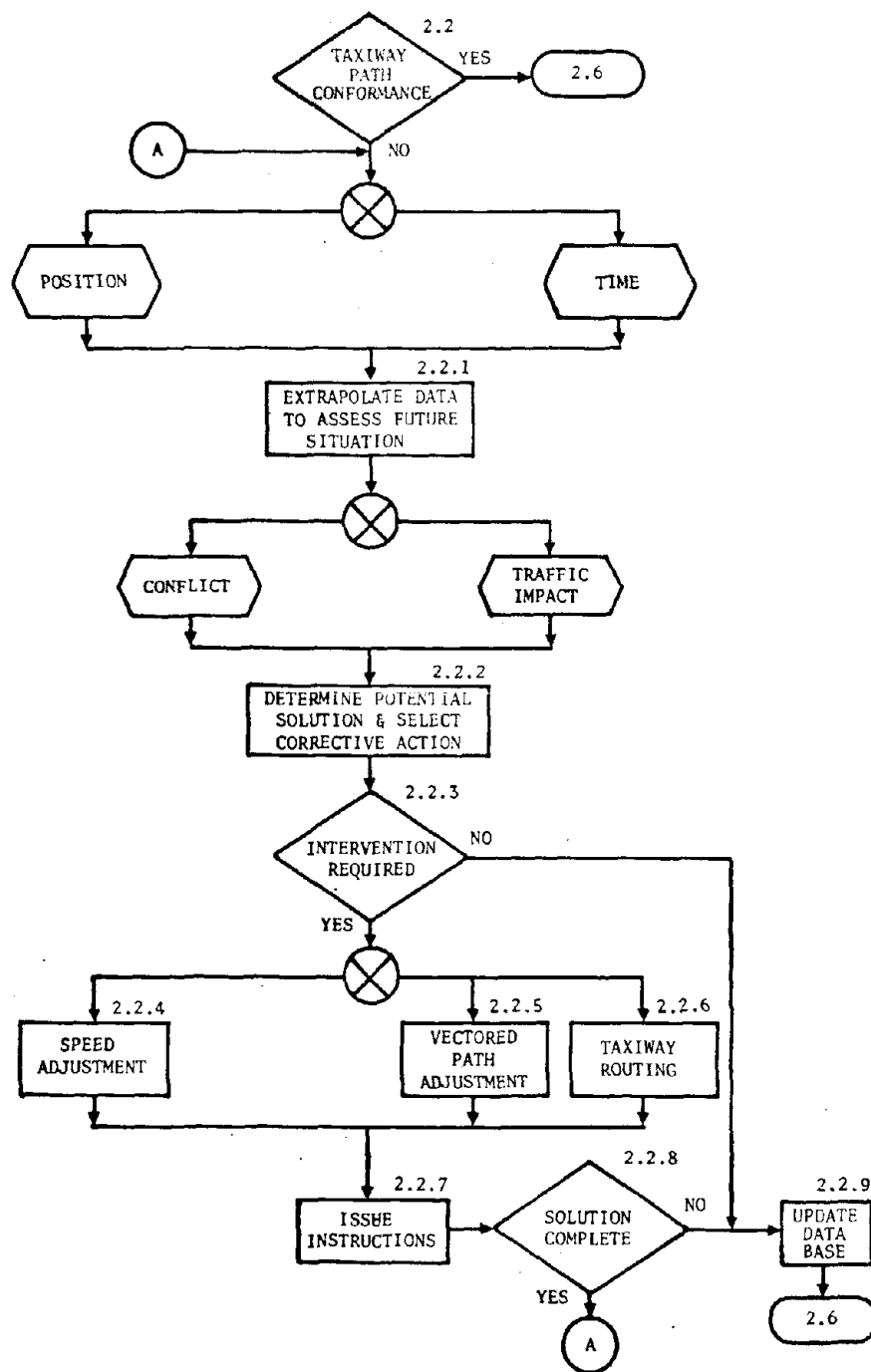
Departure Taxi-Taxiway Path
Conformance Diagram, Level III
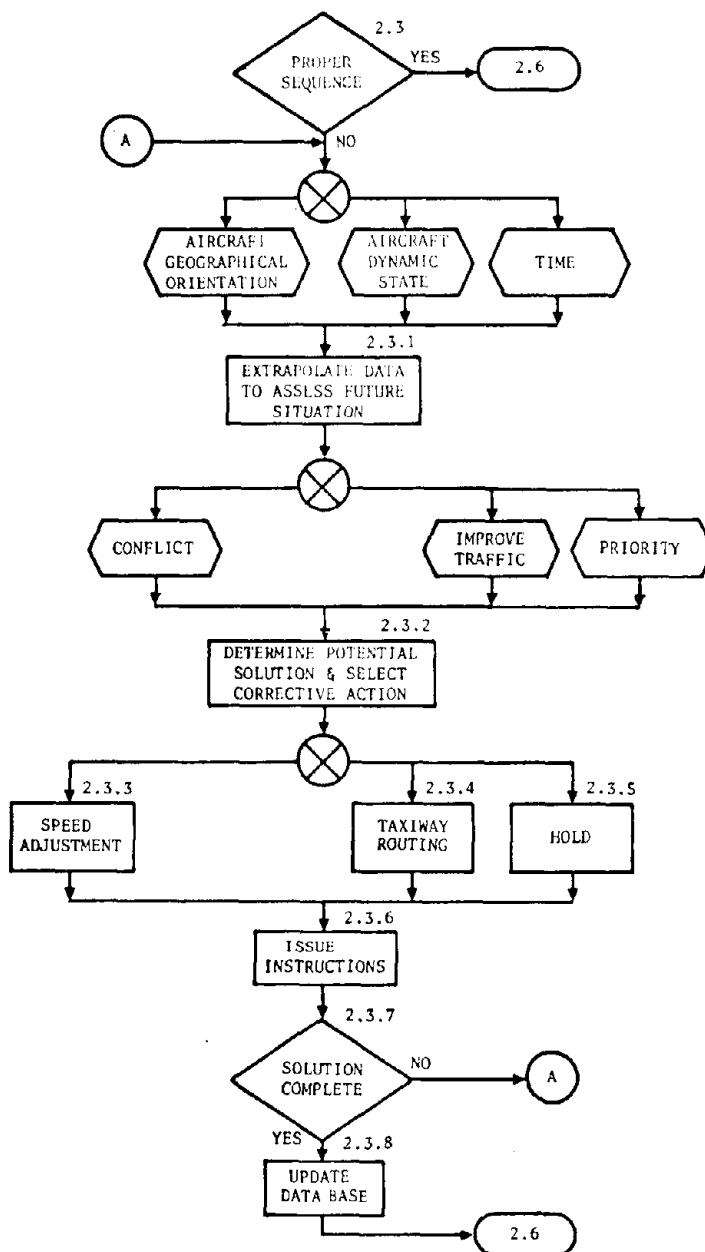
Departure Taxi-Proper
Sequence Diagram, Level III
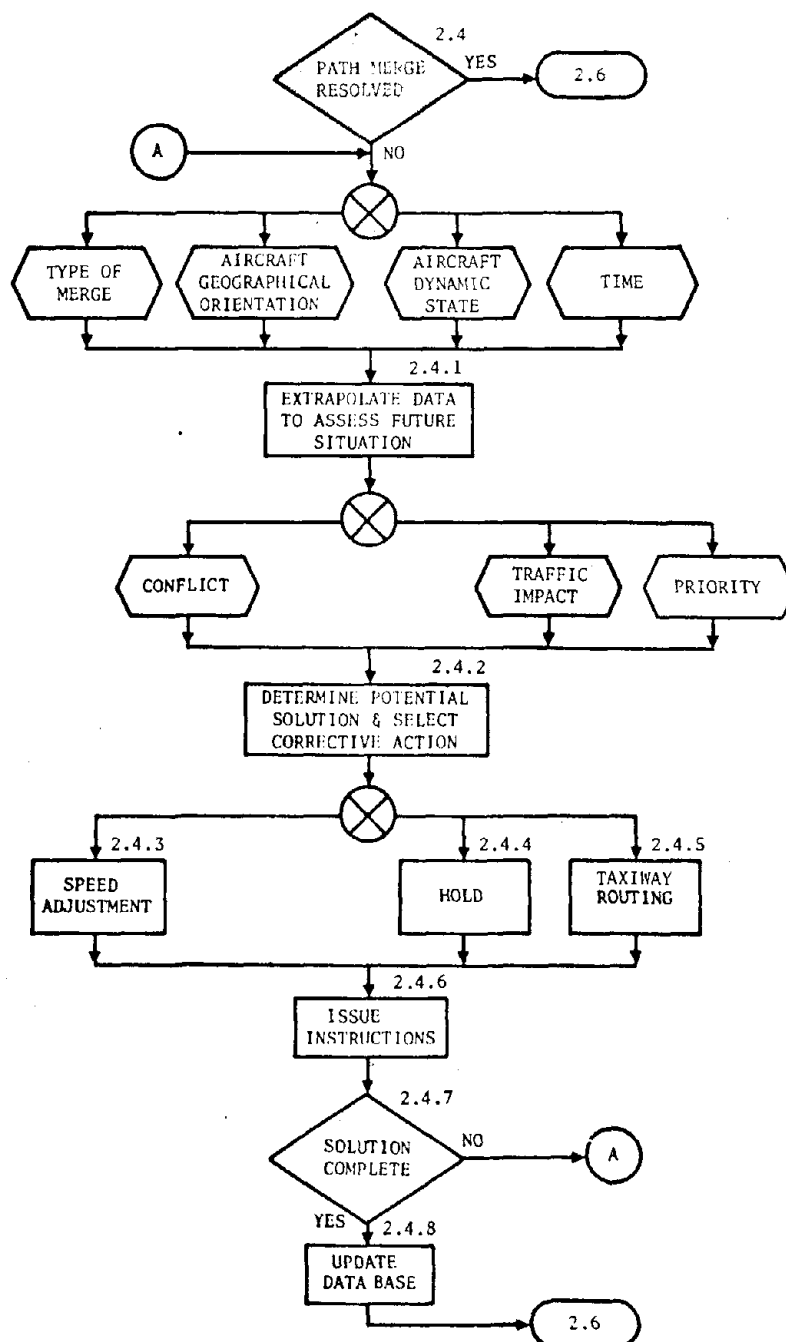
Departure Taxi-Path Merge Resolved
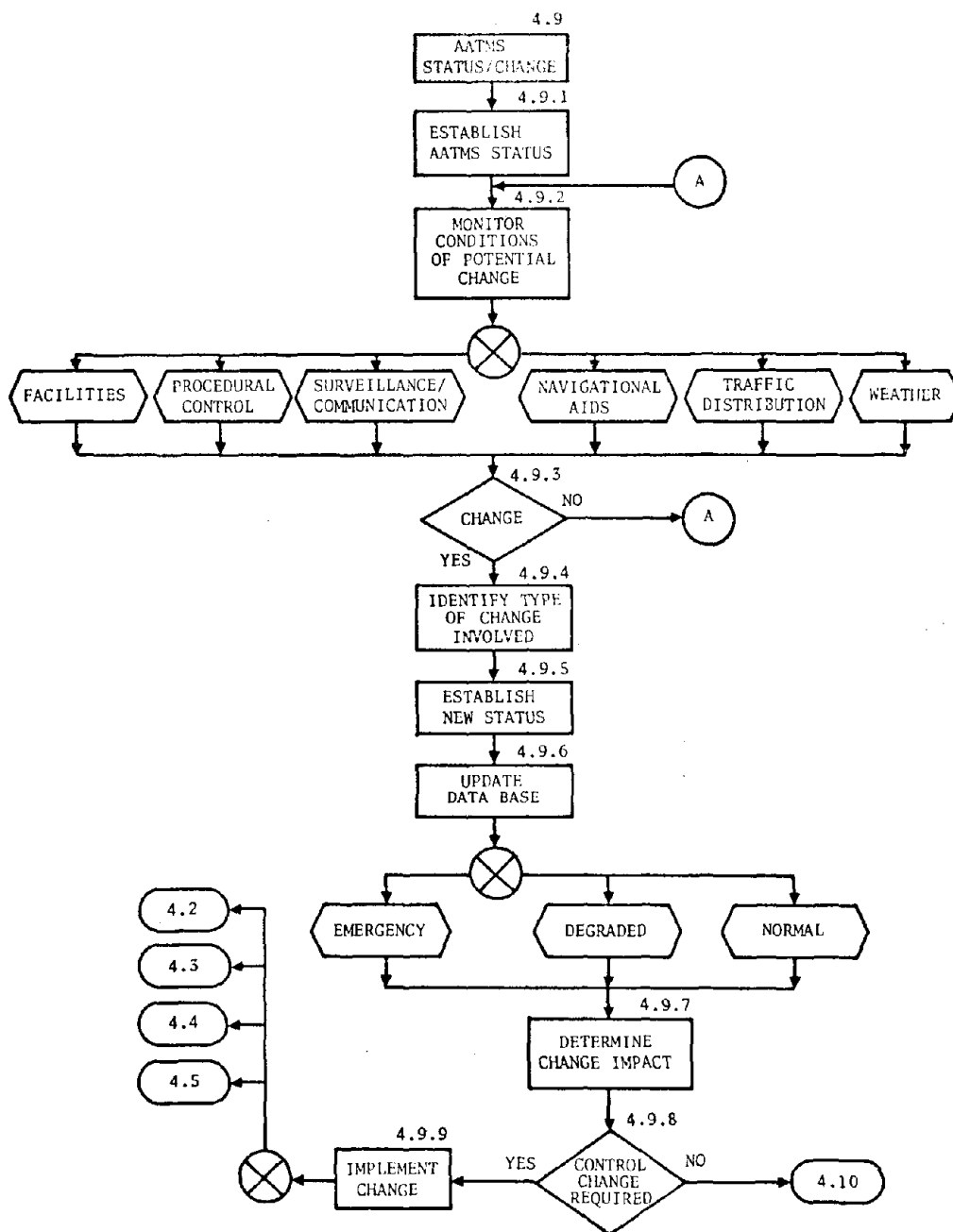Diagram, Level III
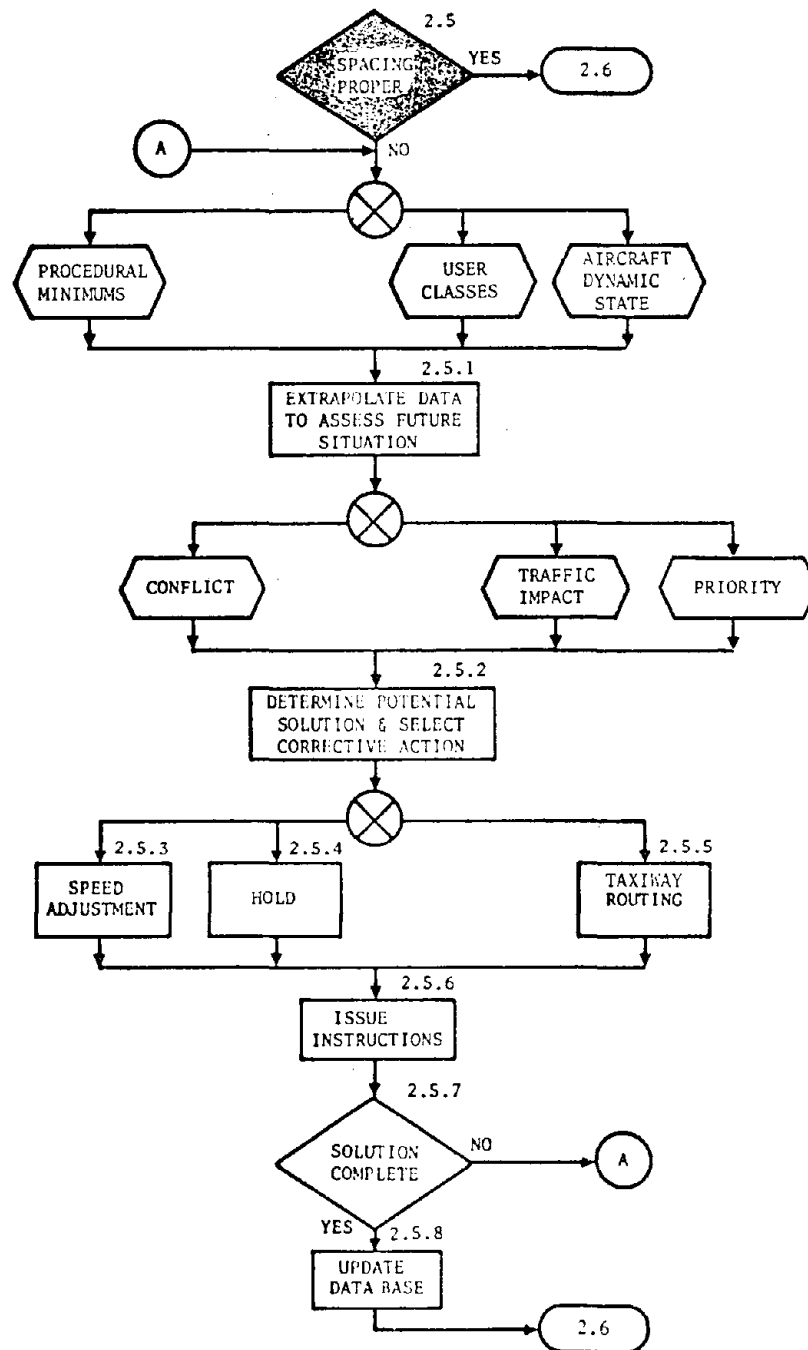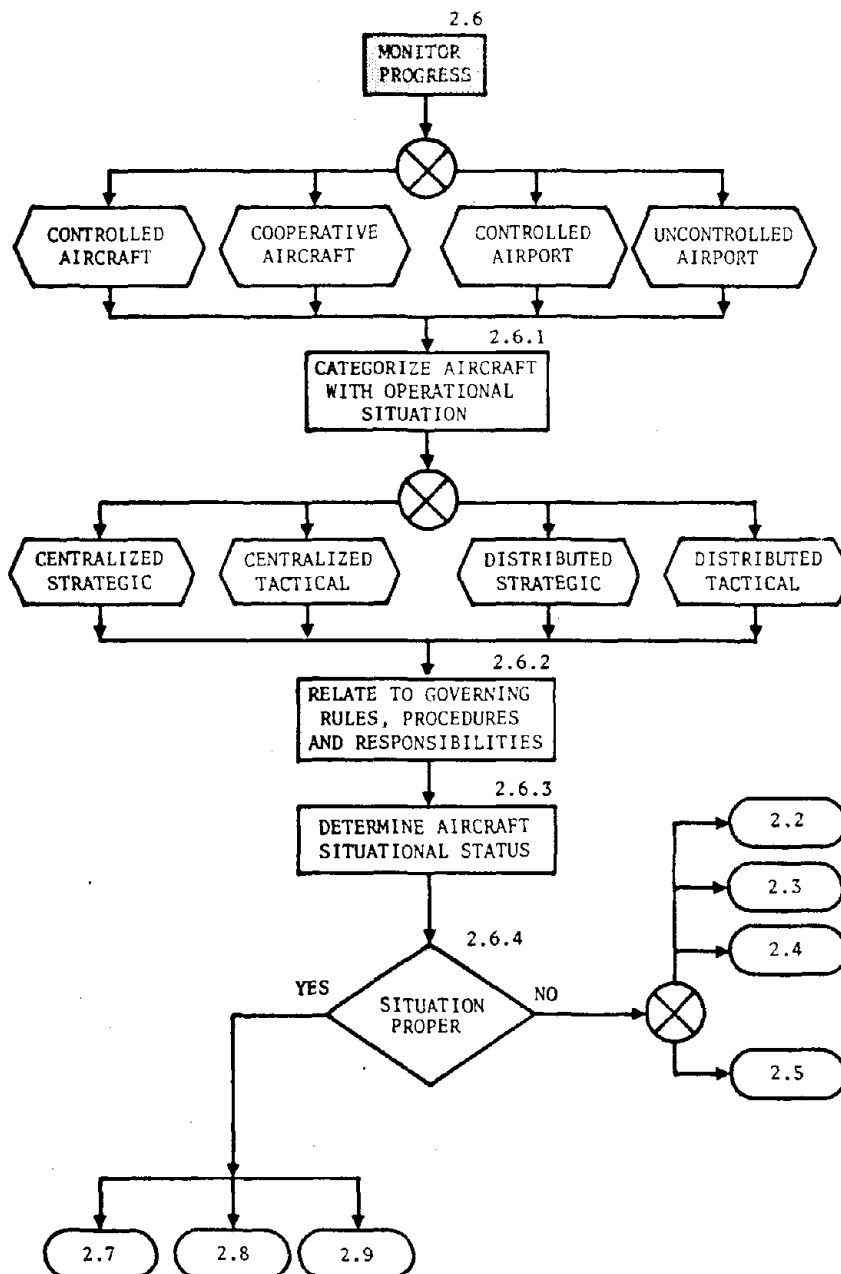
Departure Taxi-Monitor
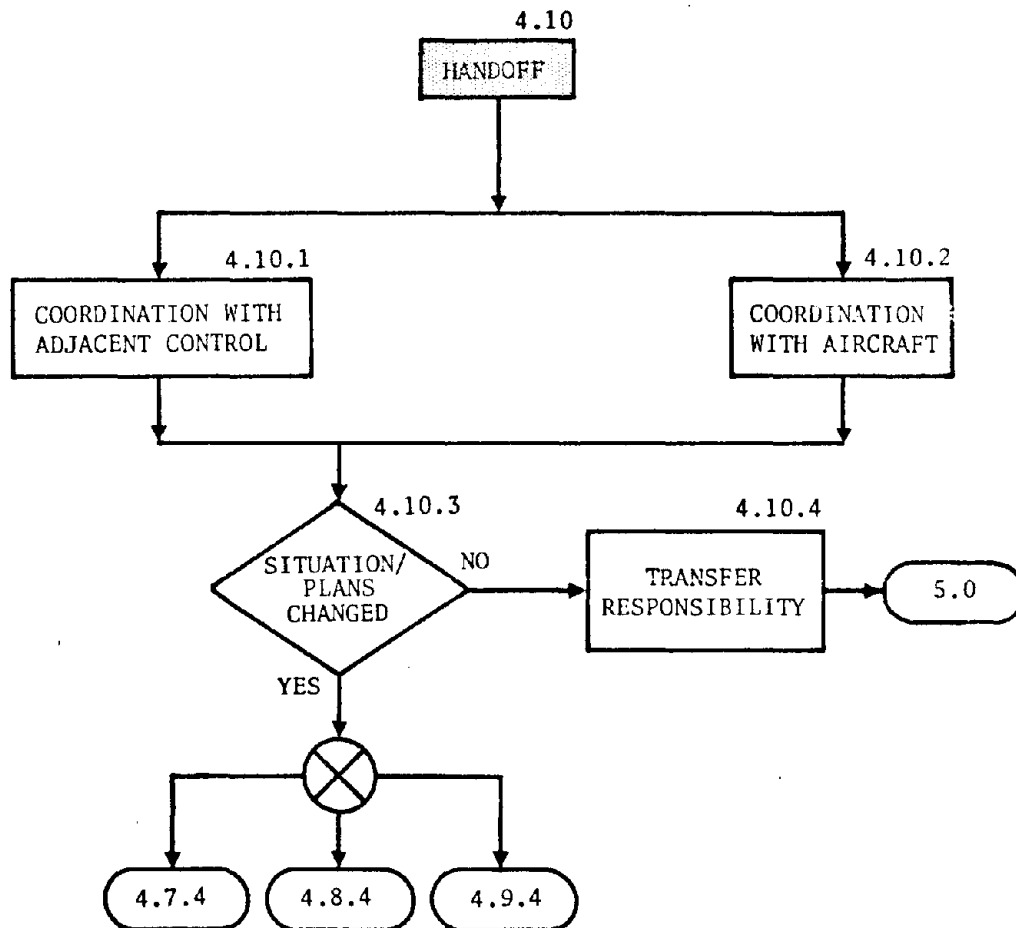Progress Diagram, Level III
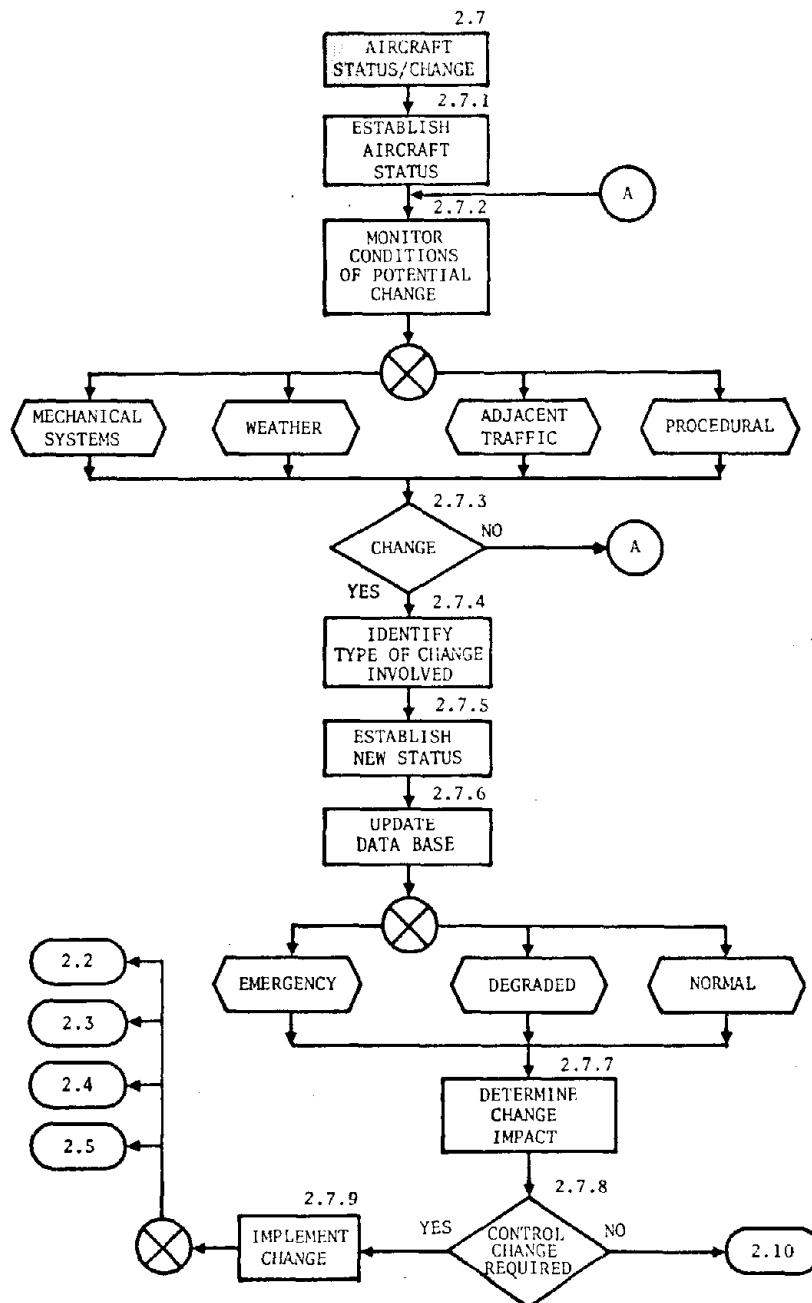
Departure Taxi Aircraft
Status/Change Diagram, Level III
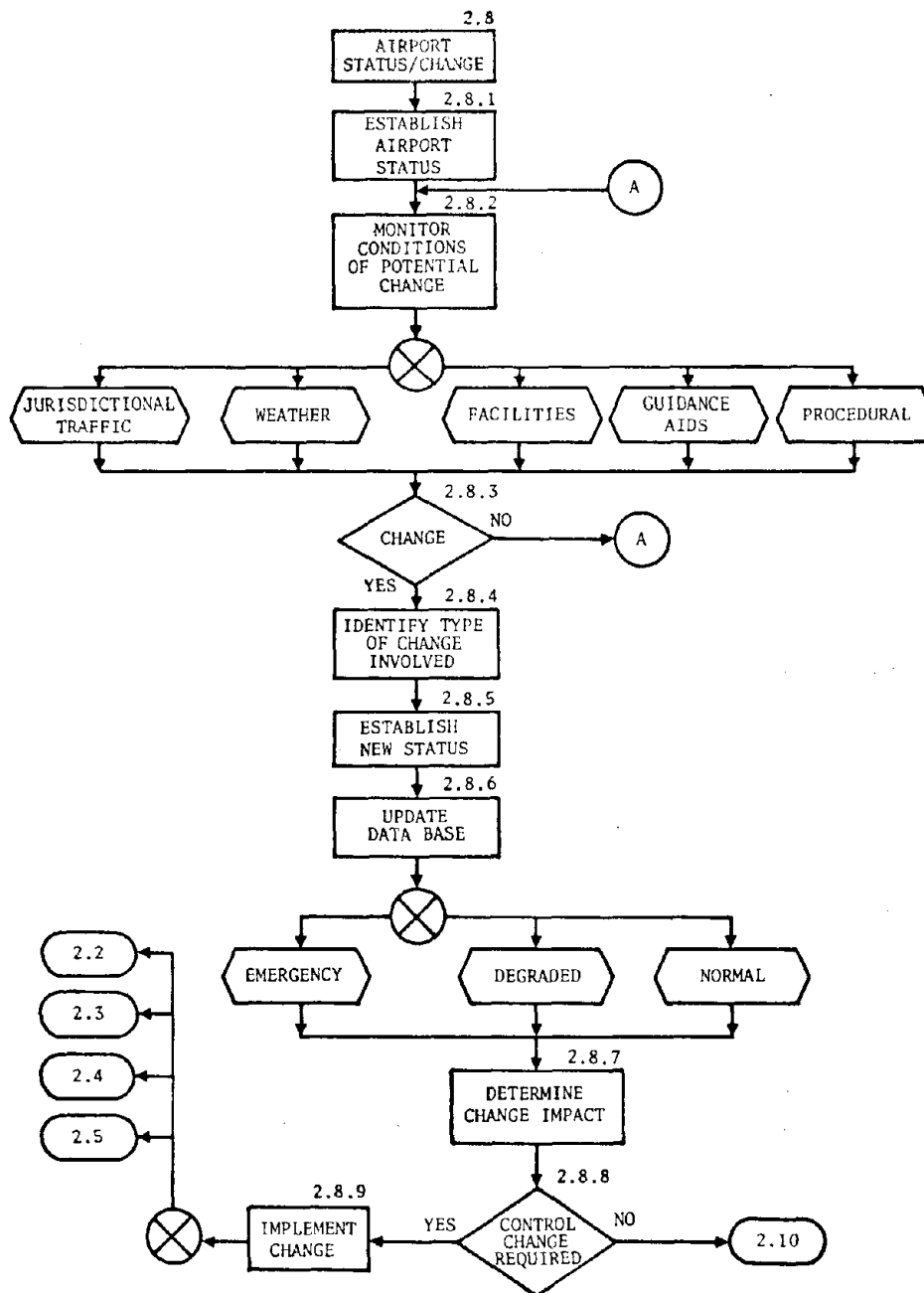
Departure Taxi-Airport Status/
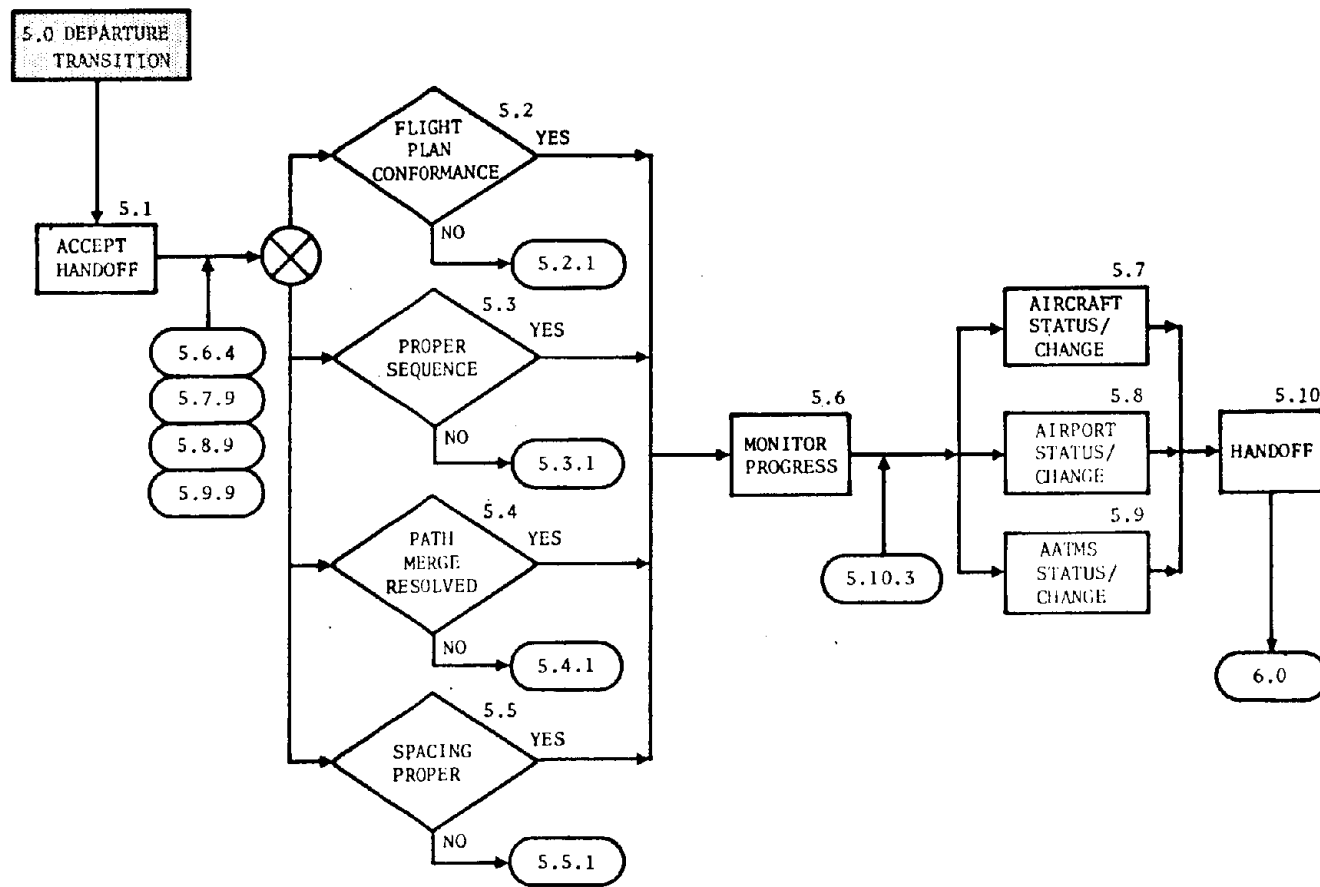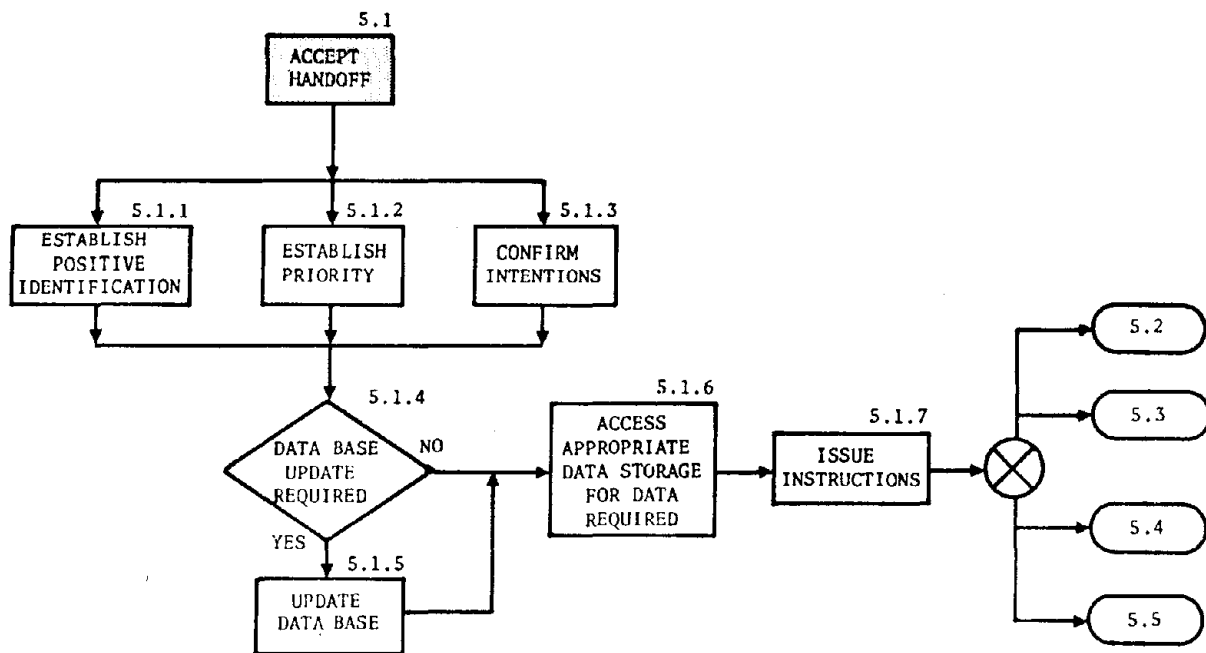Change Diagram, Level III
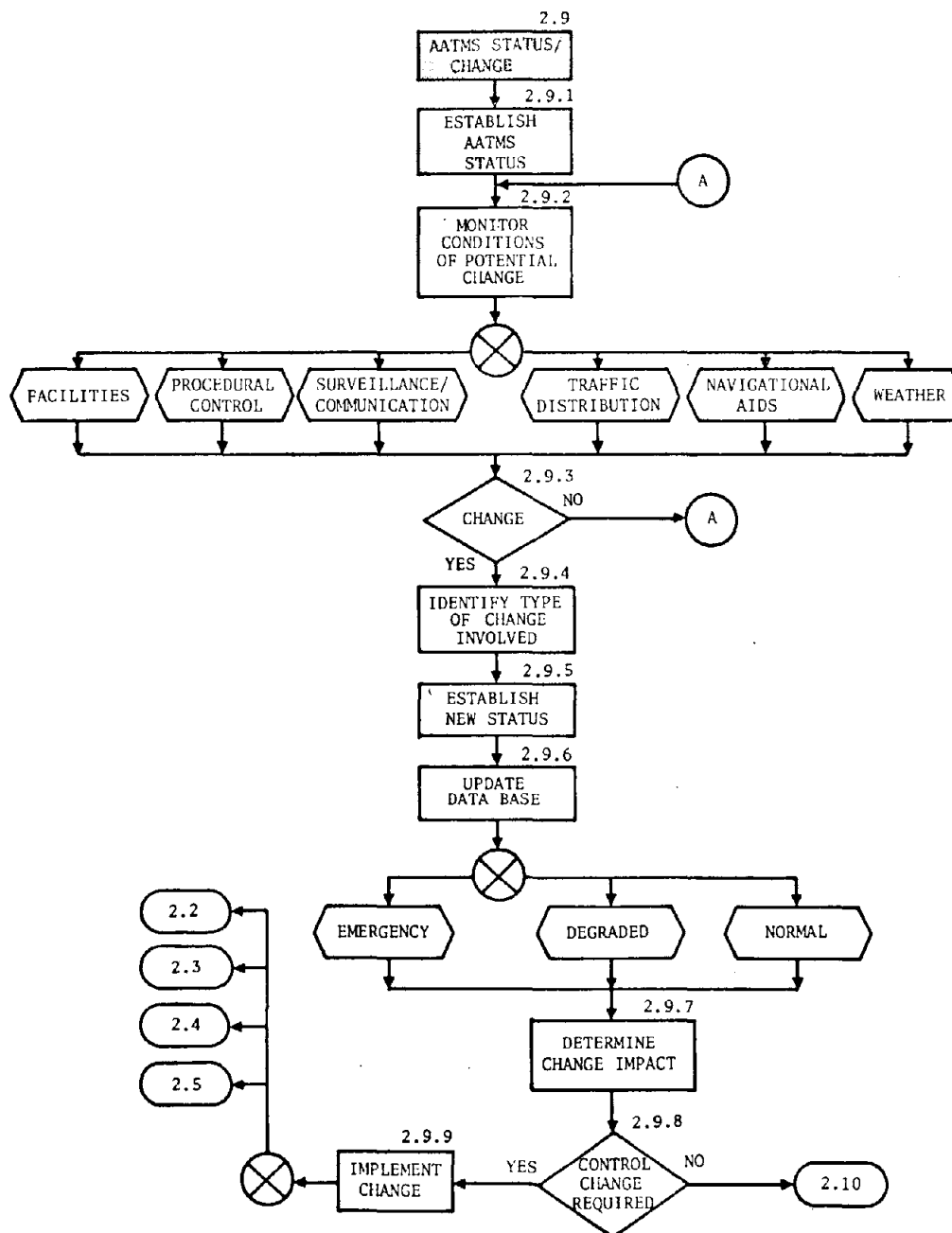
Departure Taxi-AATMS Status/
Change Diagram, Level III

Departure Taxi - Handoff Diagram, Level III

2.10

HANDOFF

2.10.1

COORDINATION
WITH ADJACENT
CONTROL

2.10.2

COORDINATION
WITH
AIRCRAFT

2.10.3

SITUATION/
PLANS
CHANGED

NO

2.10.4

TRANSFER
RESPONSIBILITY

3.0

YES

⊗

2.7.4

2.8.4

2.9.4
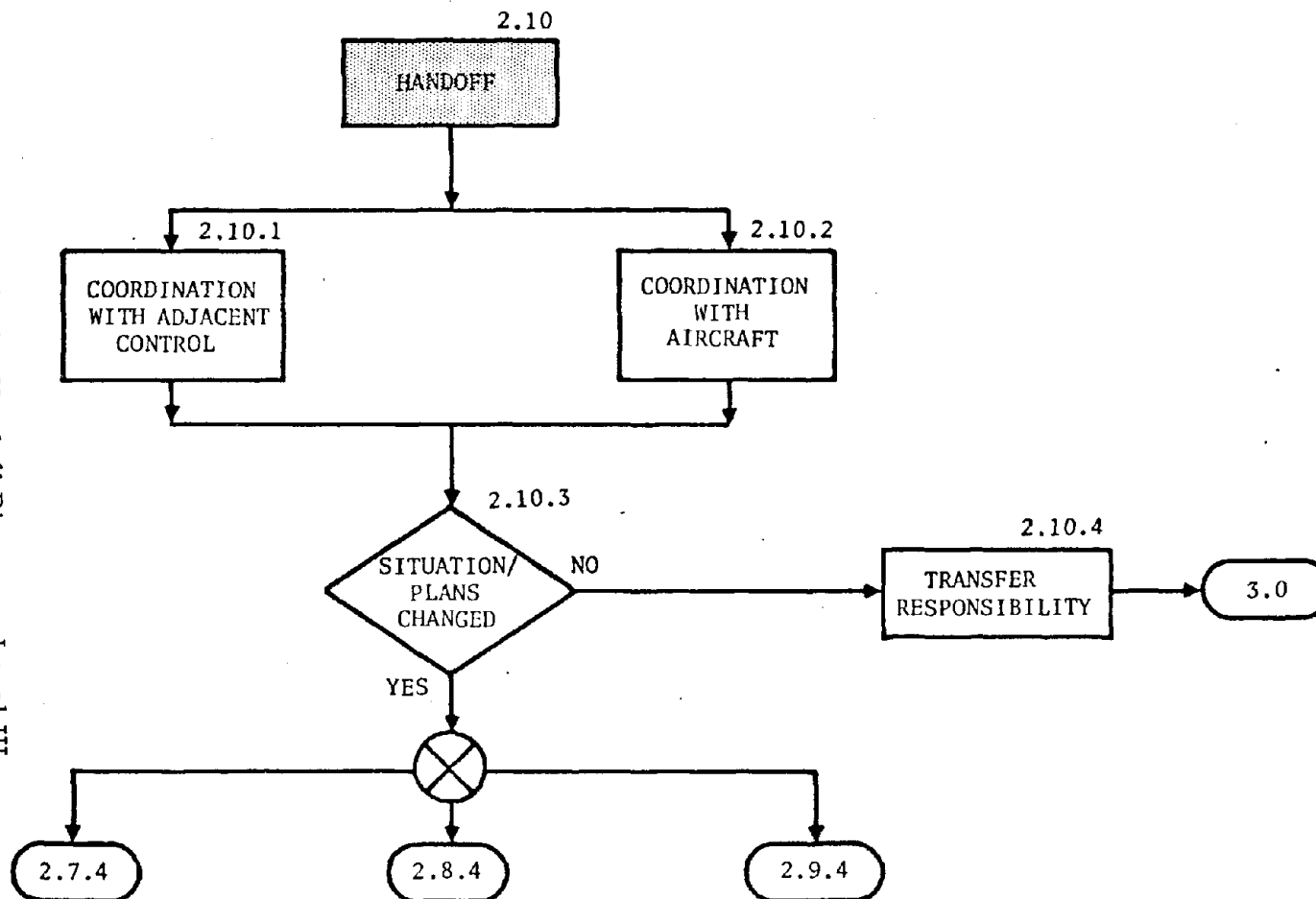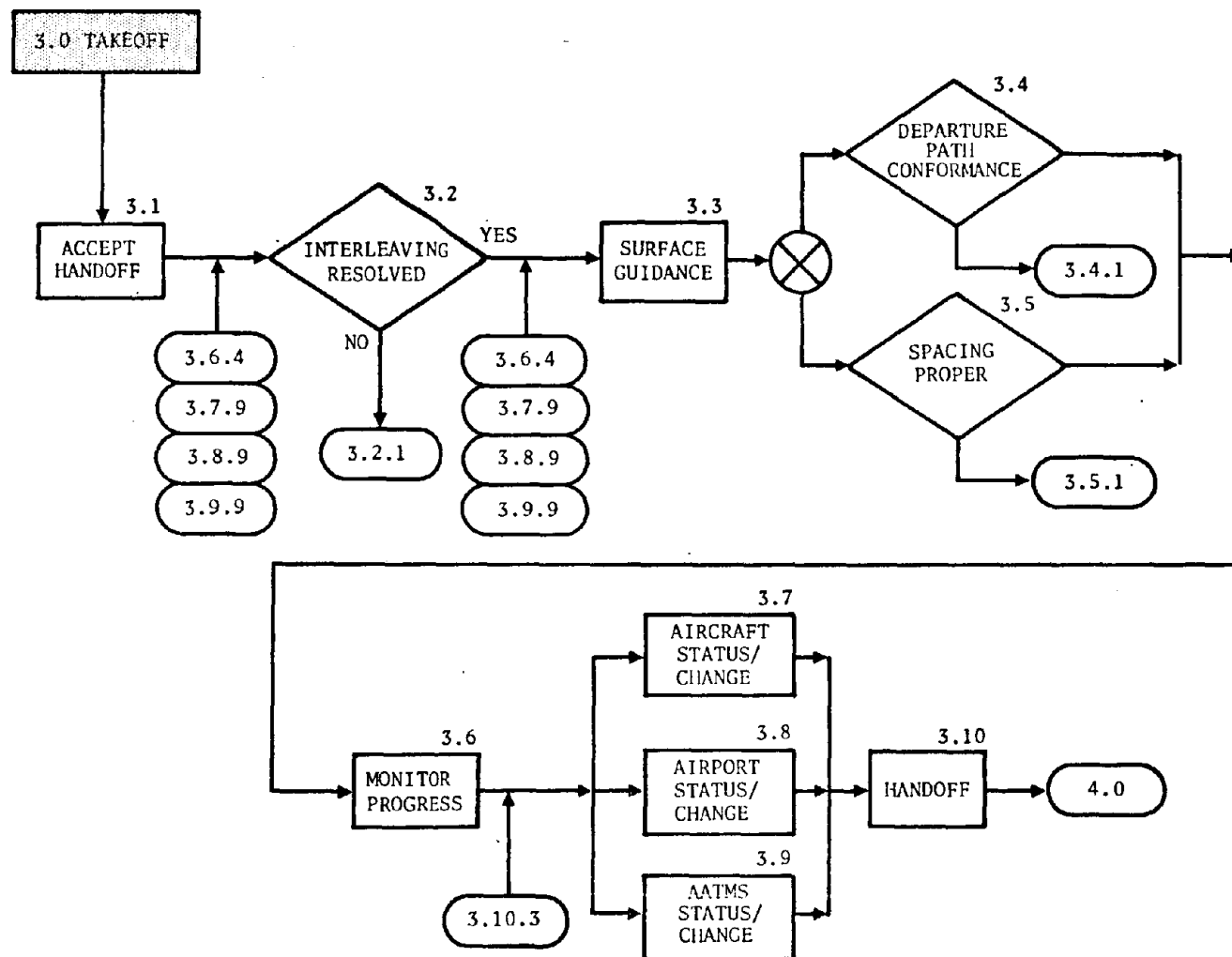
Takeoff Logic Flow
Diagram, Level II

Takeoff - Accept Handoff Diagram, Level III
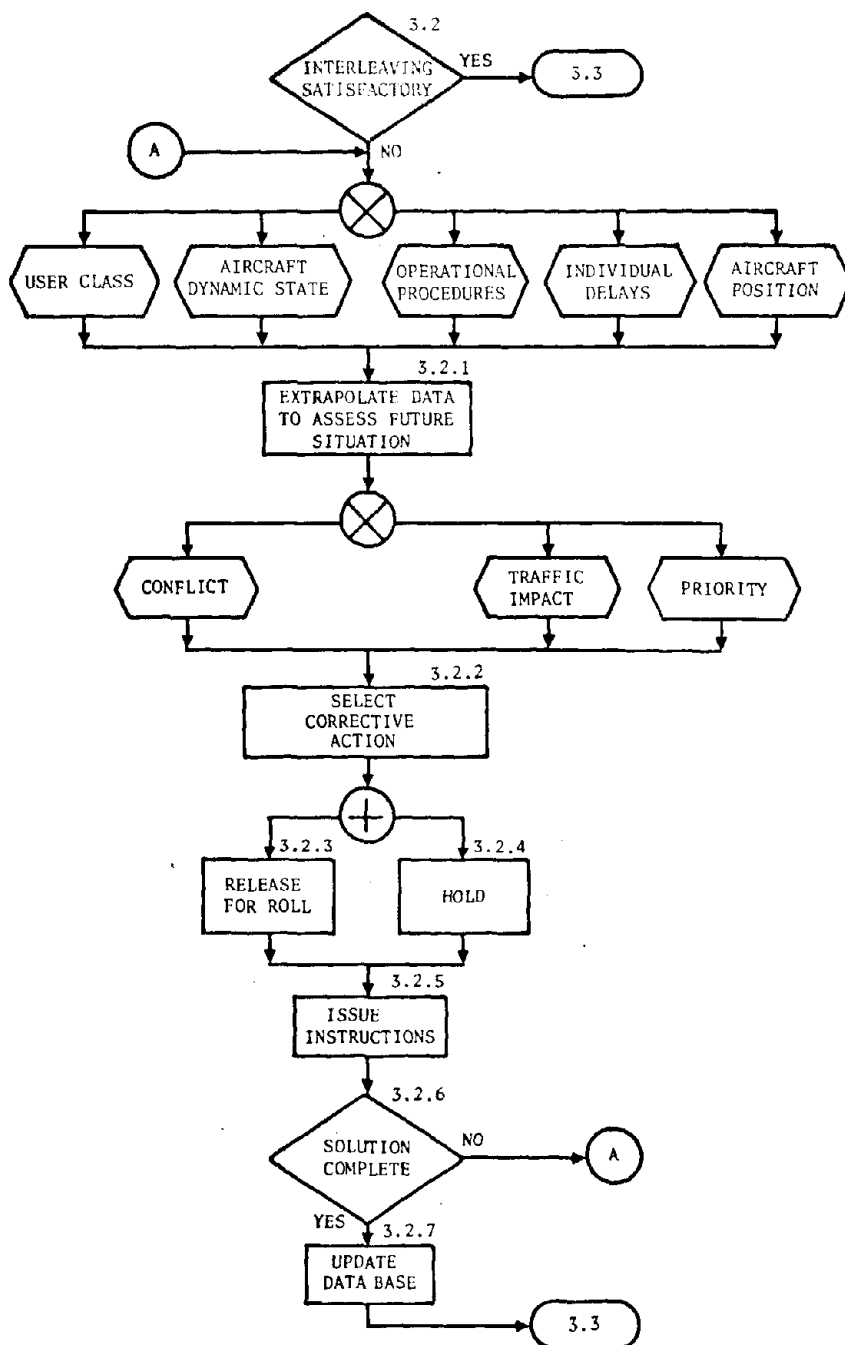
Takeoff-Interleaving
Satisfactory Diagram, Level III
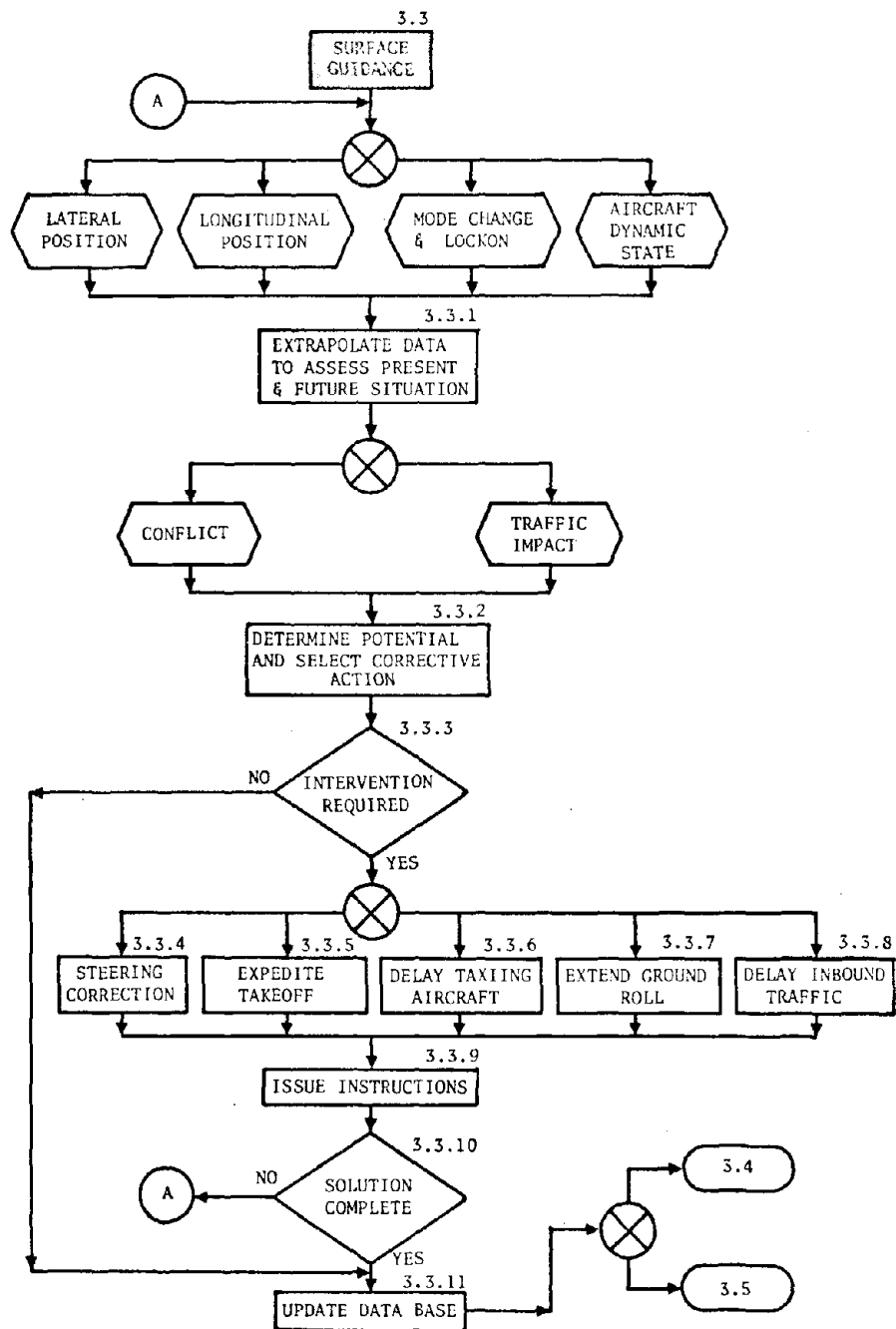
Takeoff-Surface Guidance
Diagram, Level III

Takeoff Flight Path
Conformance Diagram, Level
III
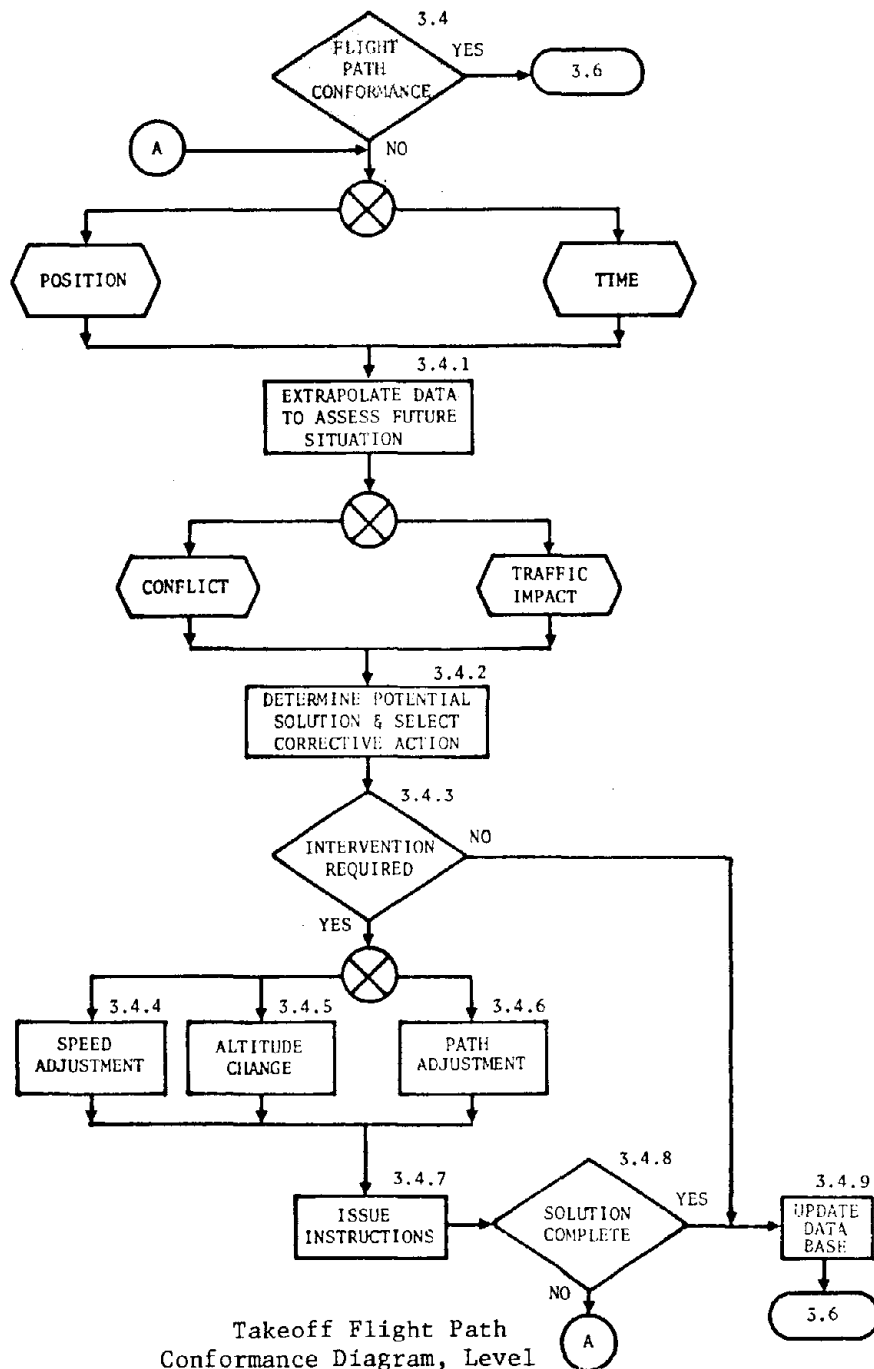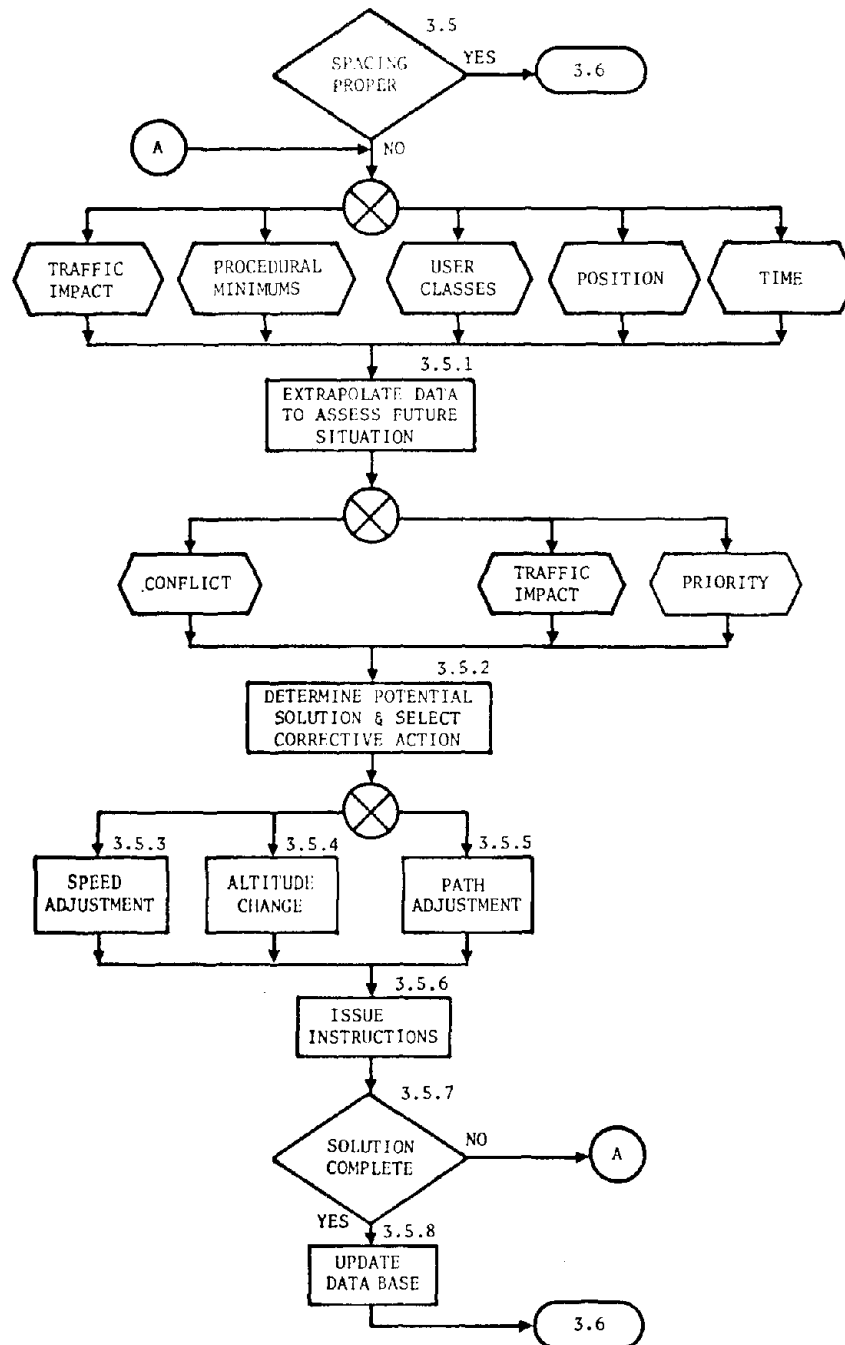
Takeoff-Spacing Proper Diagram
Level III

3.6

MONITOR
PROGRESS

⊗

| CONTROLLED AIRCRAFT | COOPERATIVE AIRCRAFT | CONTROLLED AIRPORT | UNCONTROLLED AIRPORT |

3.6.1

CATEGORIZE AIRCRAFT
WITH OPERATIONAL
SITUATION

⊗

| CENTRALIZED STRATEGIC | CENTRALIZED TACTICAL | DISTRIBUTED STRATEGIC | DISTRIBUTED TACTICAL |

3.6.2

RELATE TO GOVERNING
RULES, PROCEDURES
AND RESPONSIBILITIES

3.6.3

DETERMINE AIRCRAFT
SITUATIONAL STATUS

3.6.4

SITUATION
PROPER

YES   NO

⊕

3.2

3.3

3.7   3.8   3.9

Takeoff-Monitor Progress
Diagram Level III

-39-
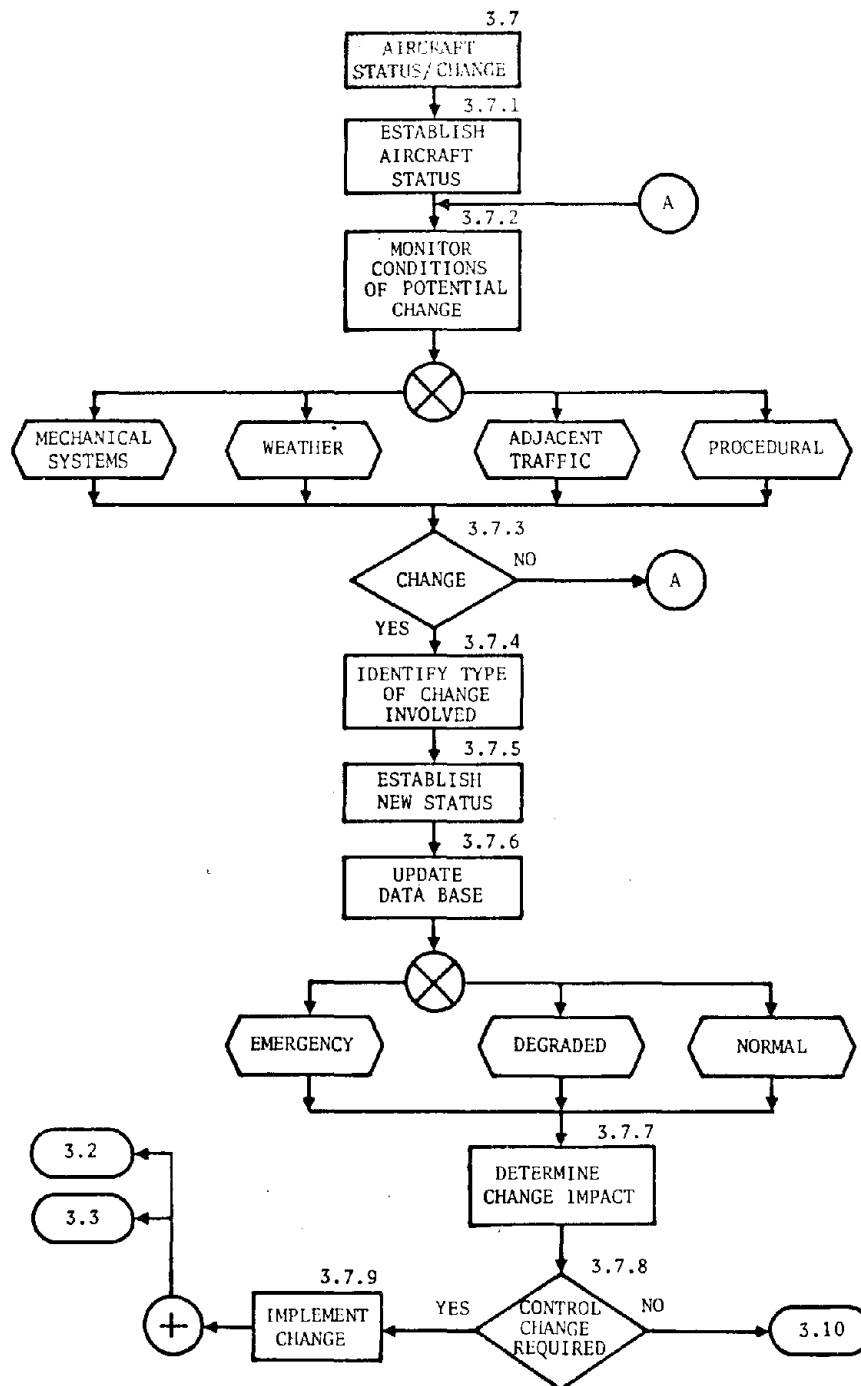
Takeoff-Aircraft Status/Change
Diagram, Level III
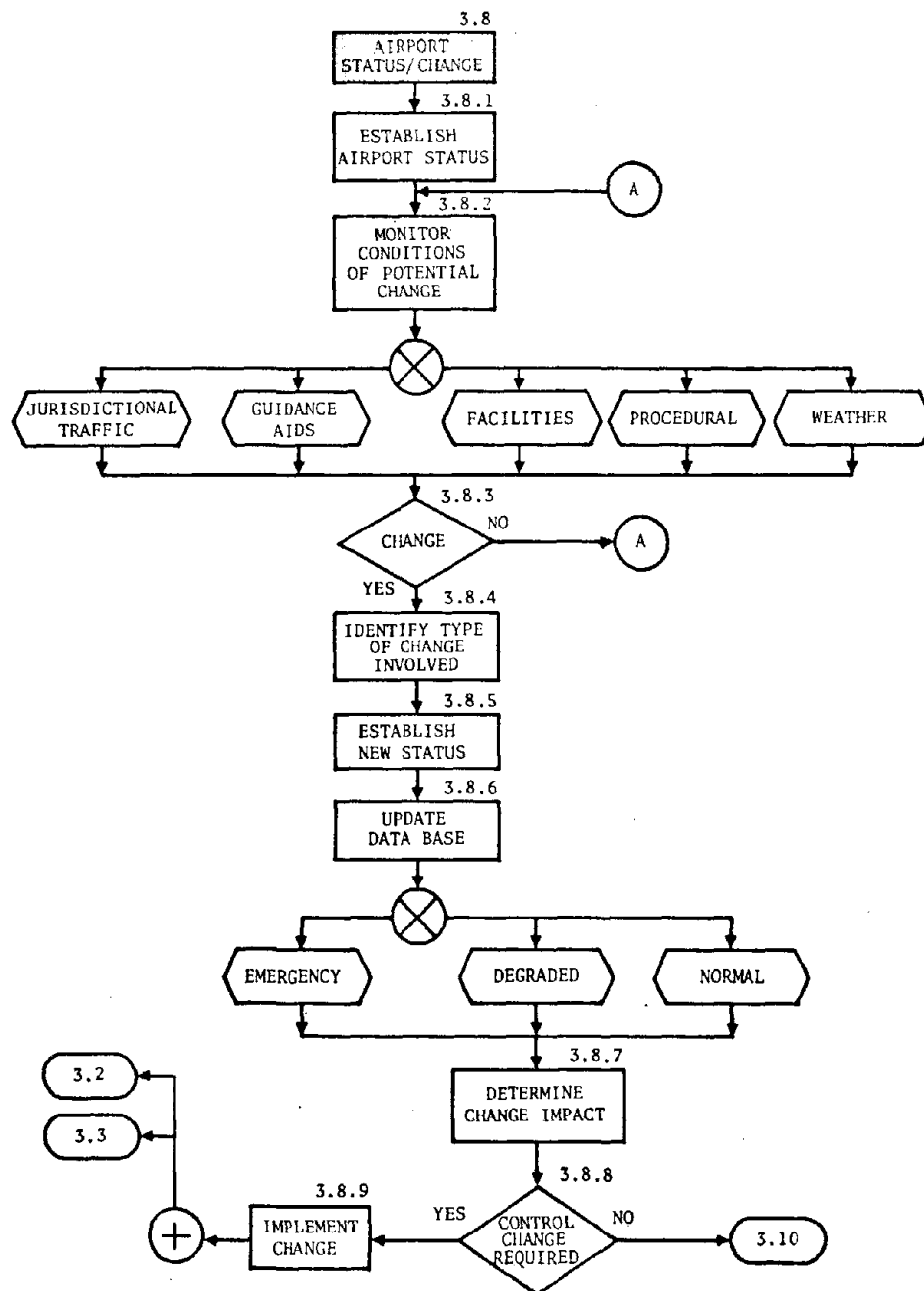
Takeoff-Airport Status/
Change Diagram, Level III
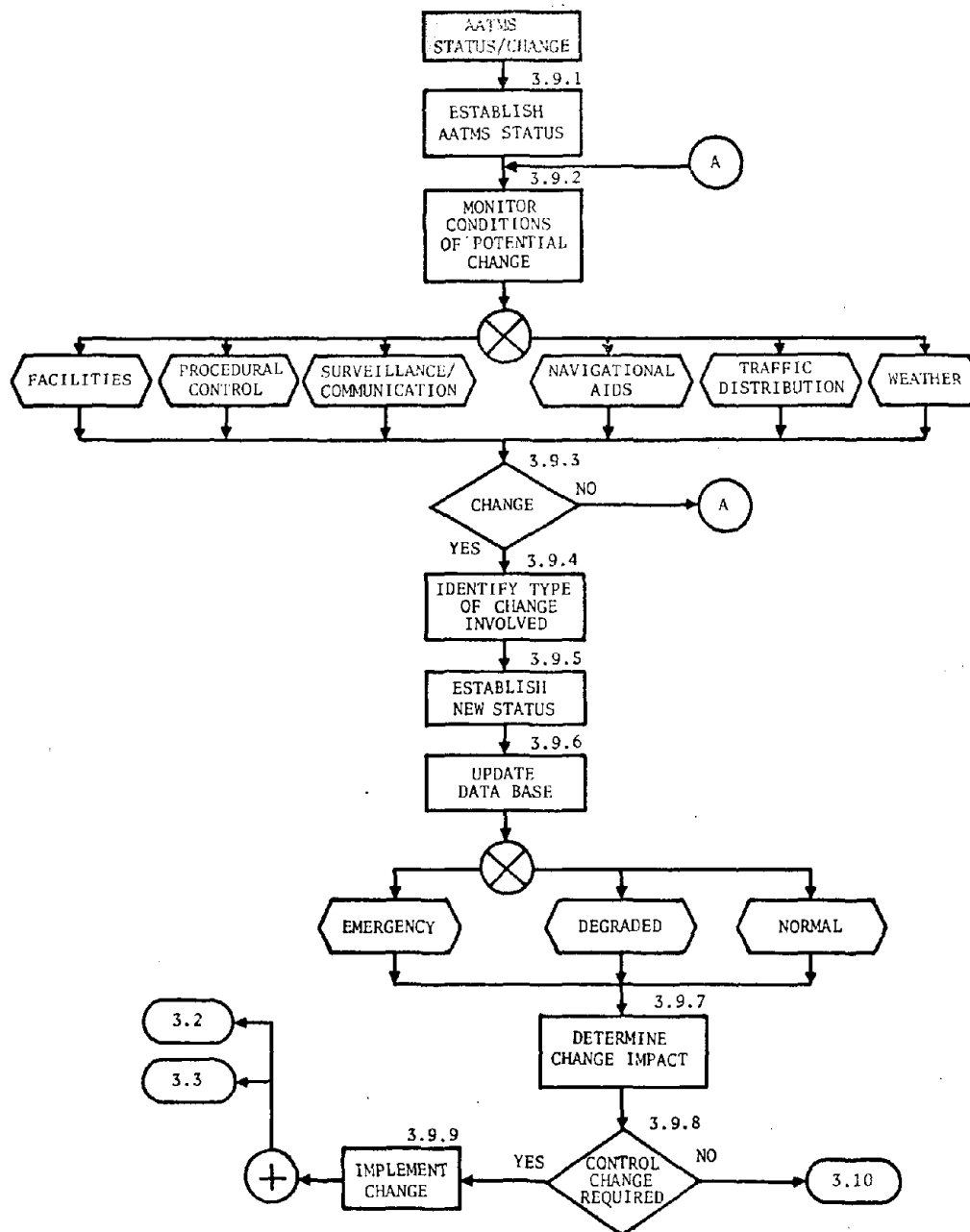
Takeoff-AATMS Status/Change
Diagram, Level III

Takeoff - Handoff Diagram, Level III
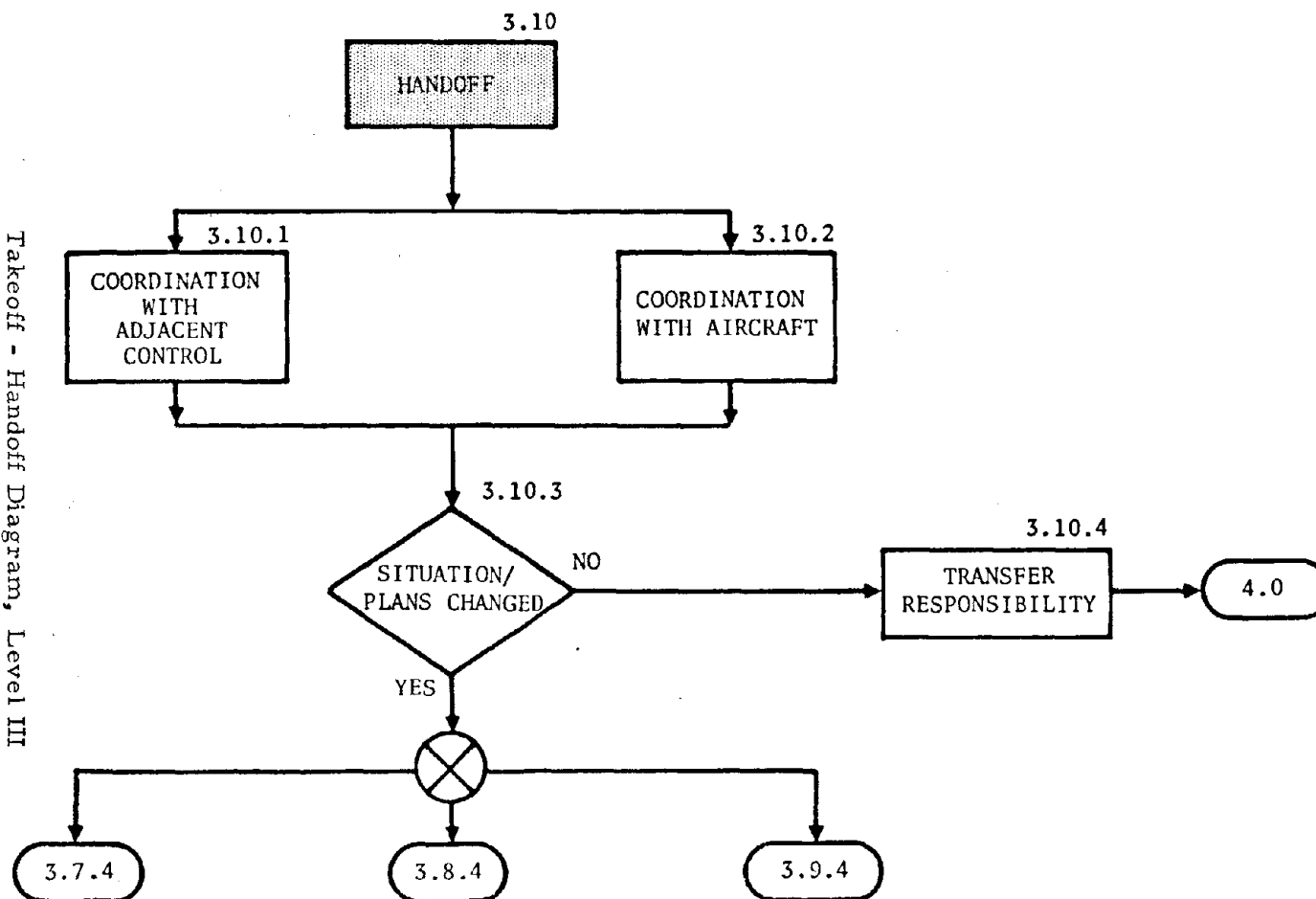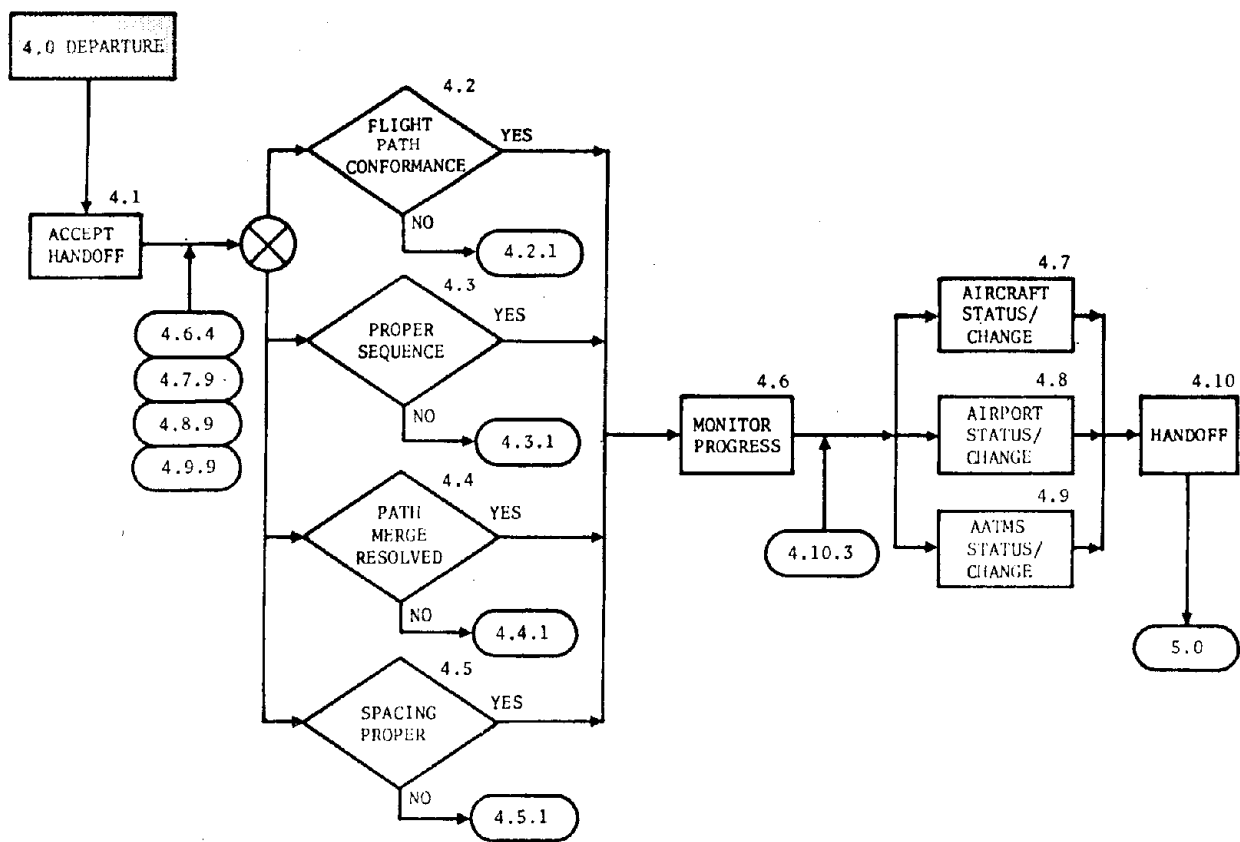
Departure Logic Flow
Diagram, Level II
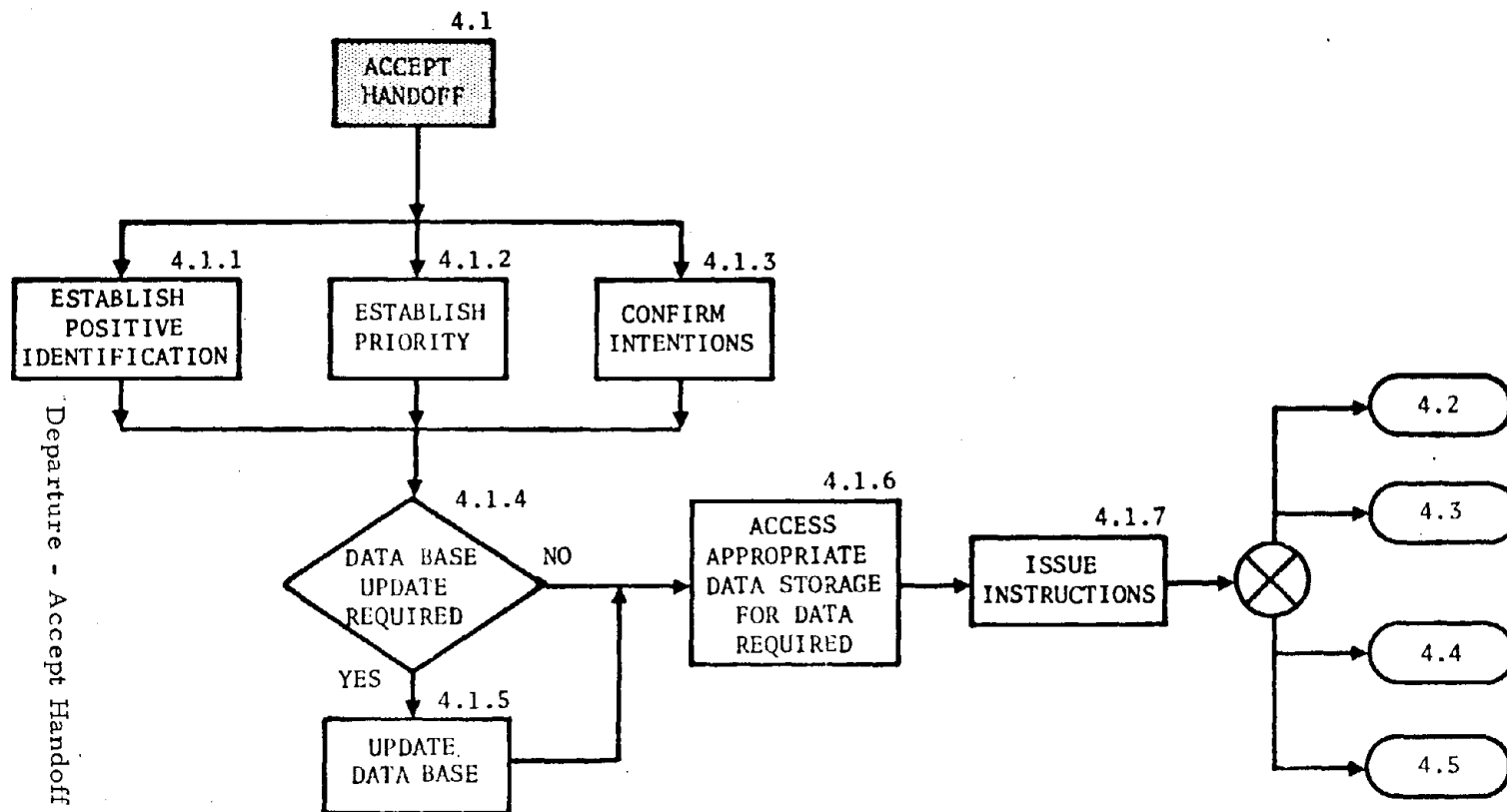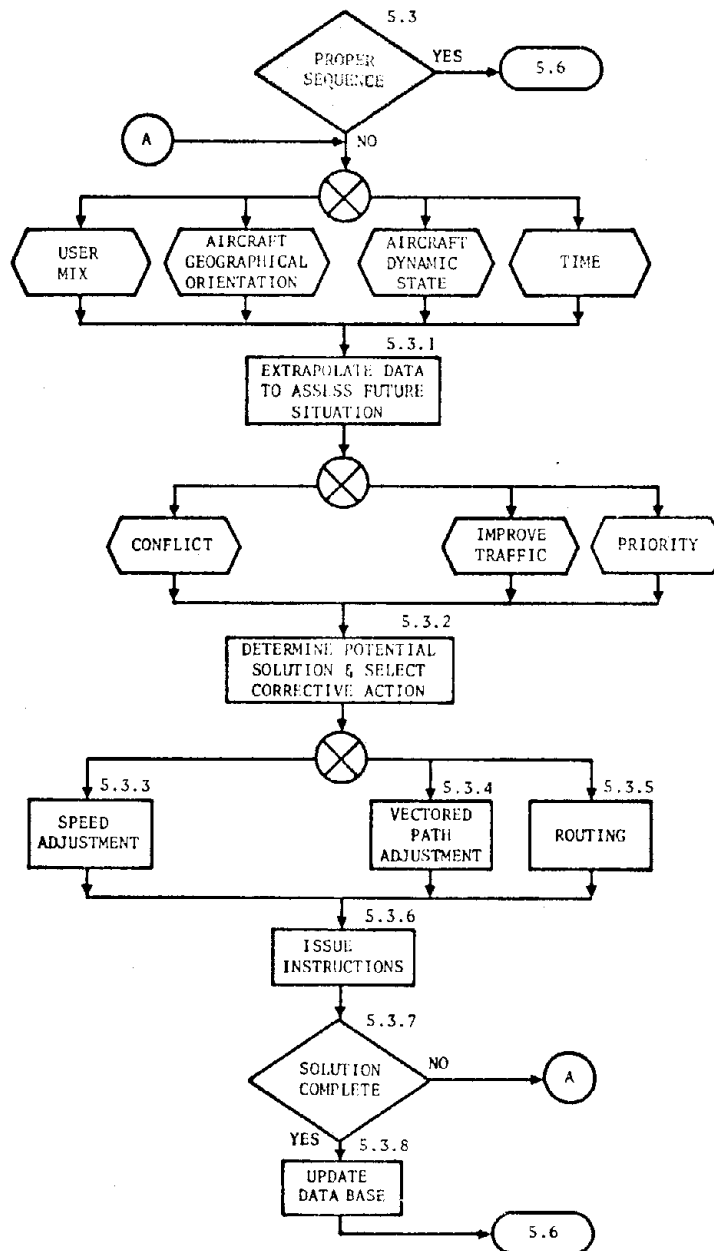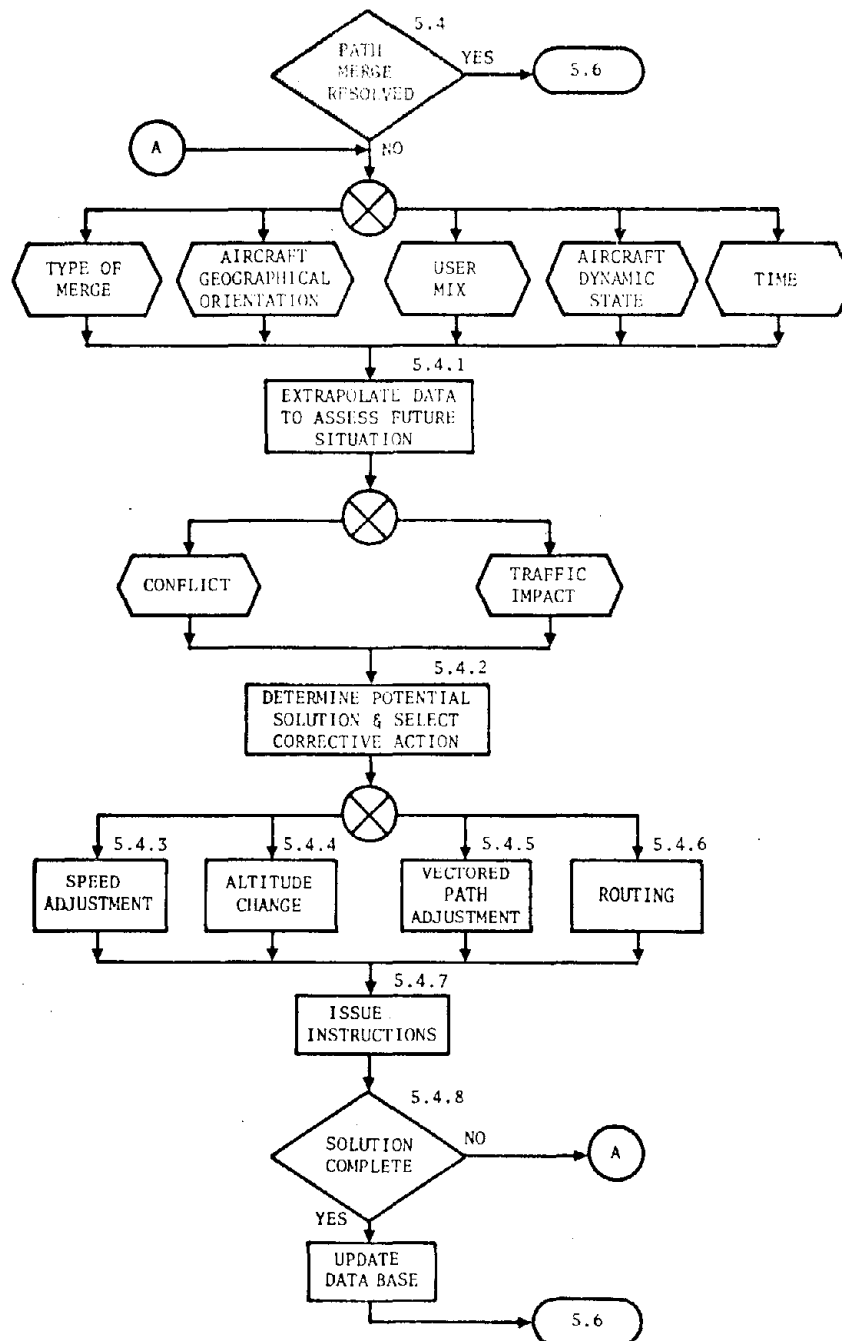
Departure - Accept Handoff Diagram, Level III
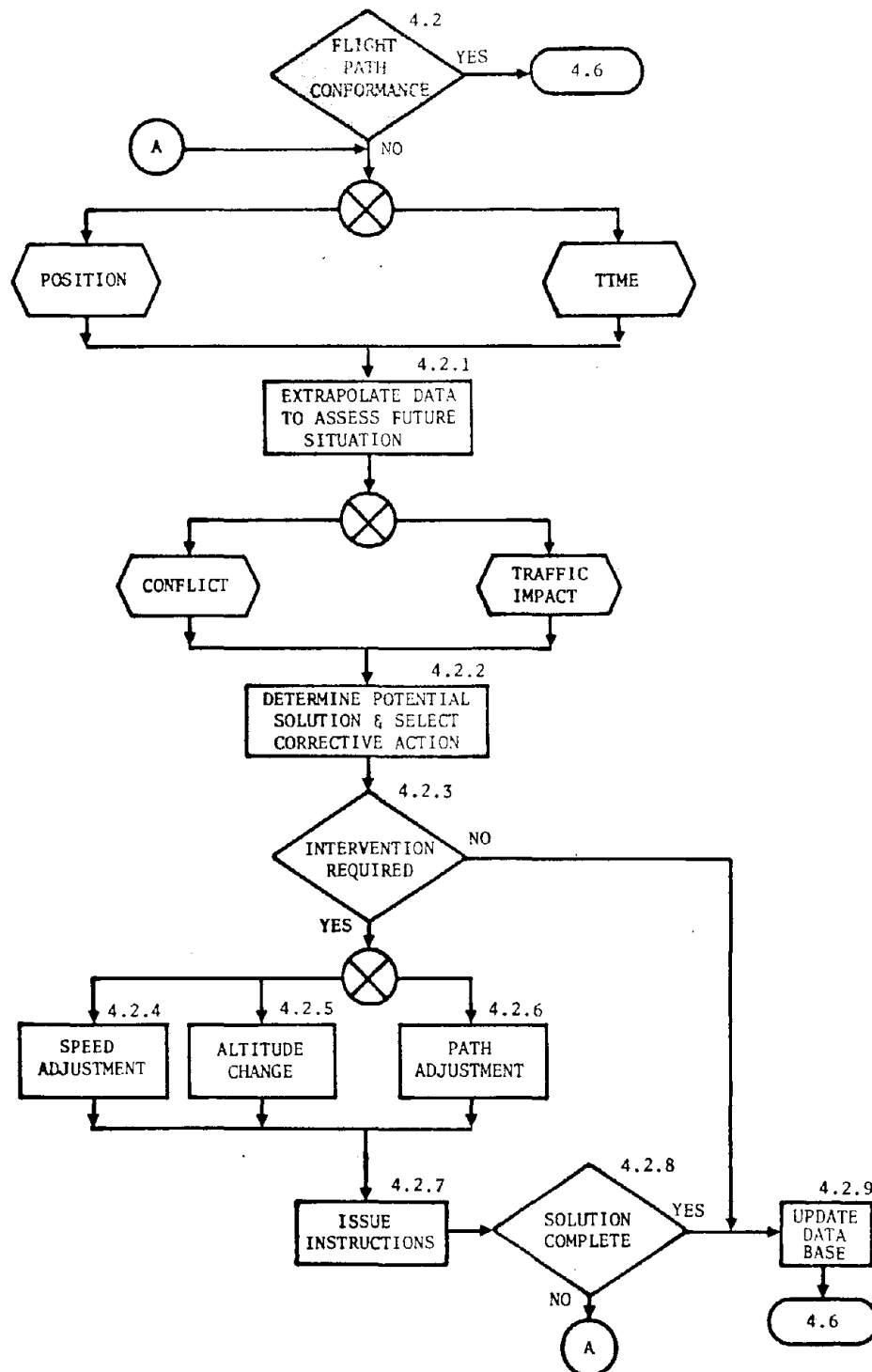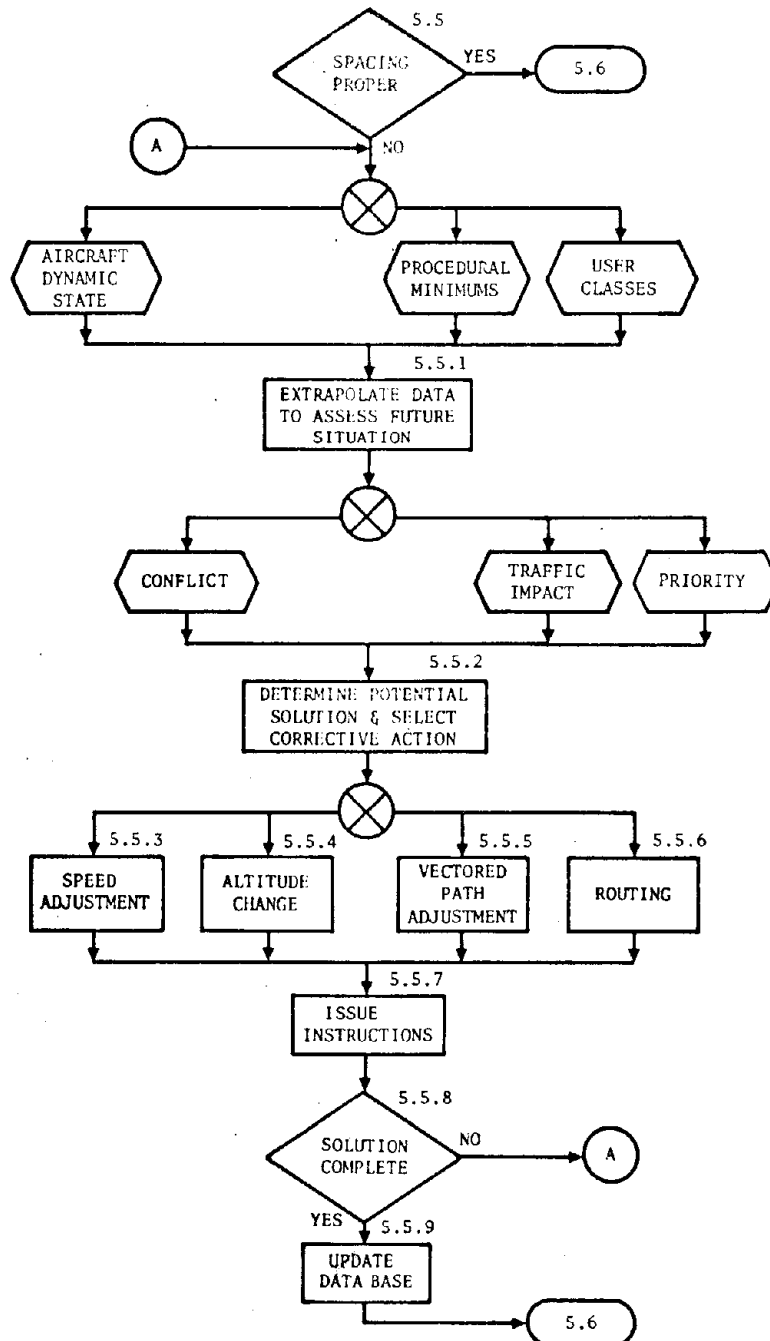
Departure-Flight Path Conformance
Diagram, Level III
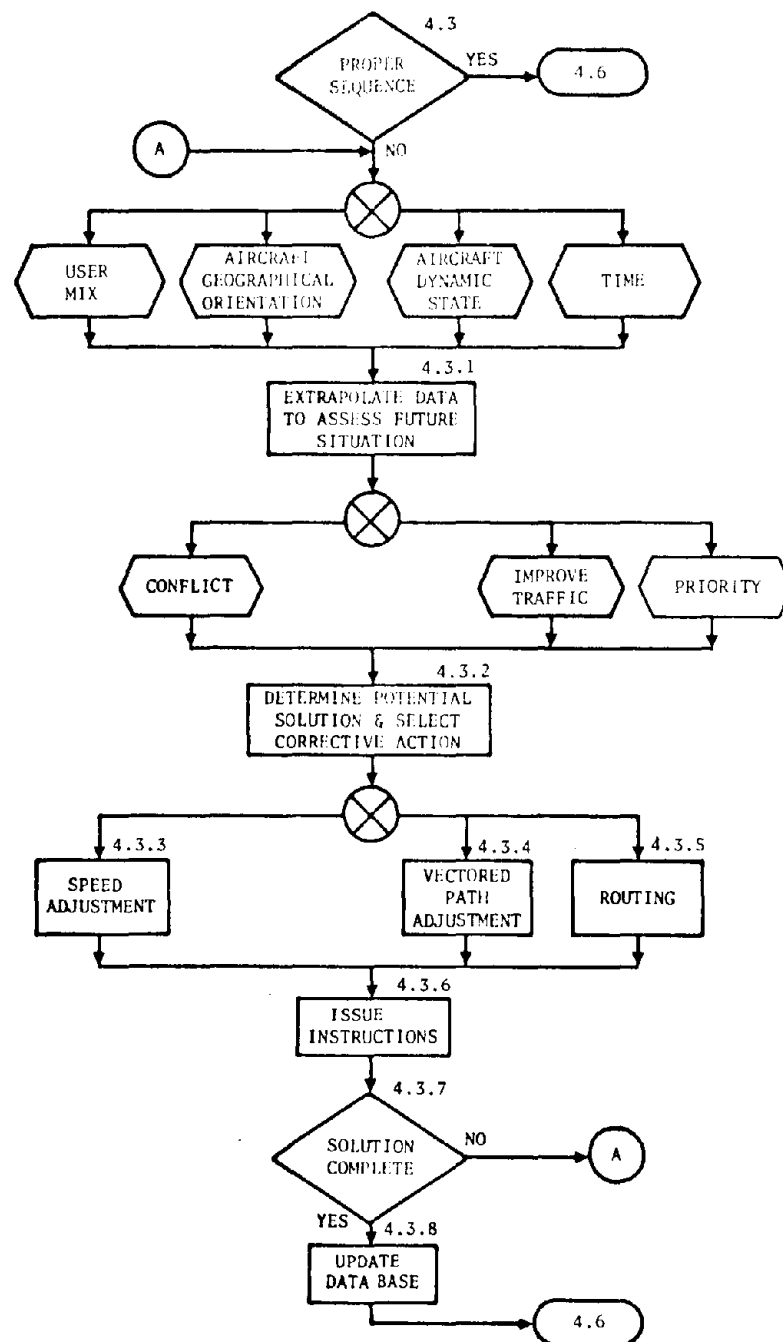
Departure-Proper Sequence
Diagram, Level III
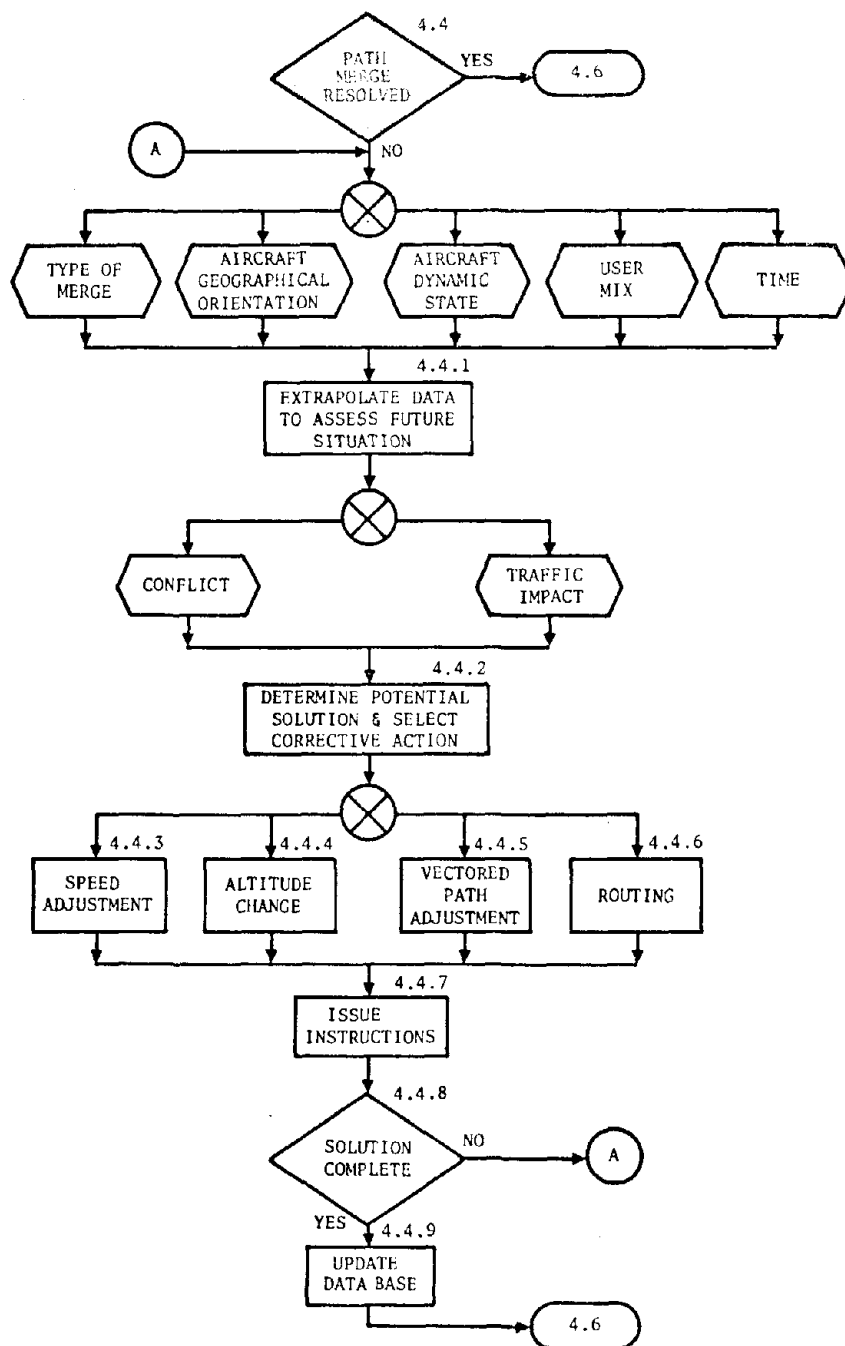
Departure-Path Merge Resolved
Diagram, Level III
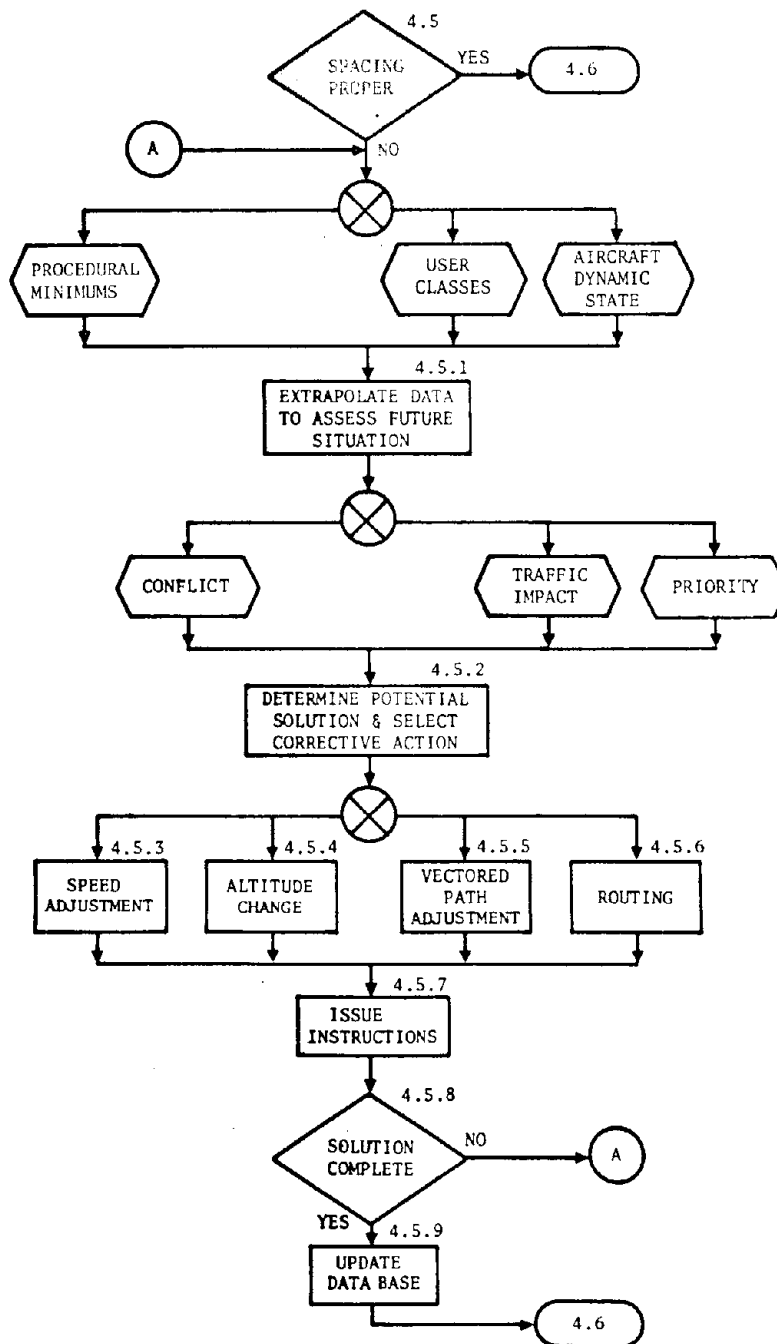
Departure-Spacing Proper
Diagram, Level III
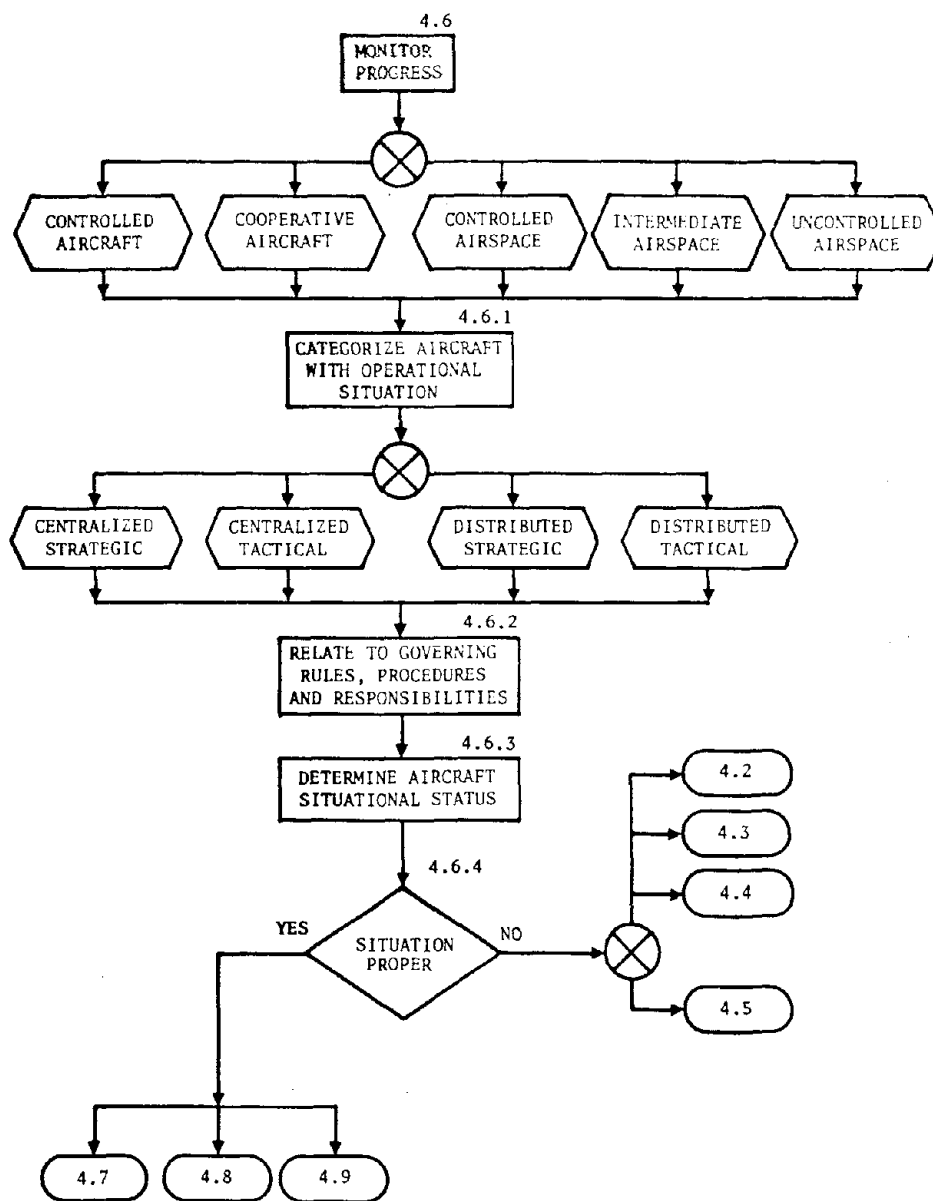
Departure-Monitor Progress
Diagram, Level III
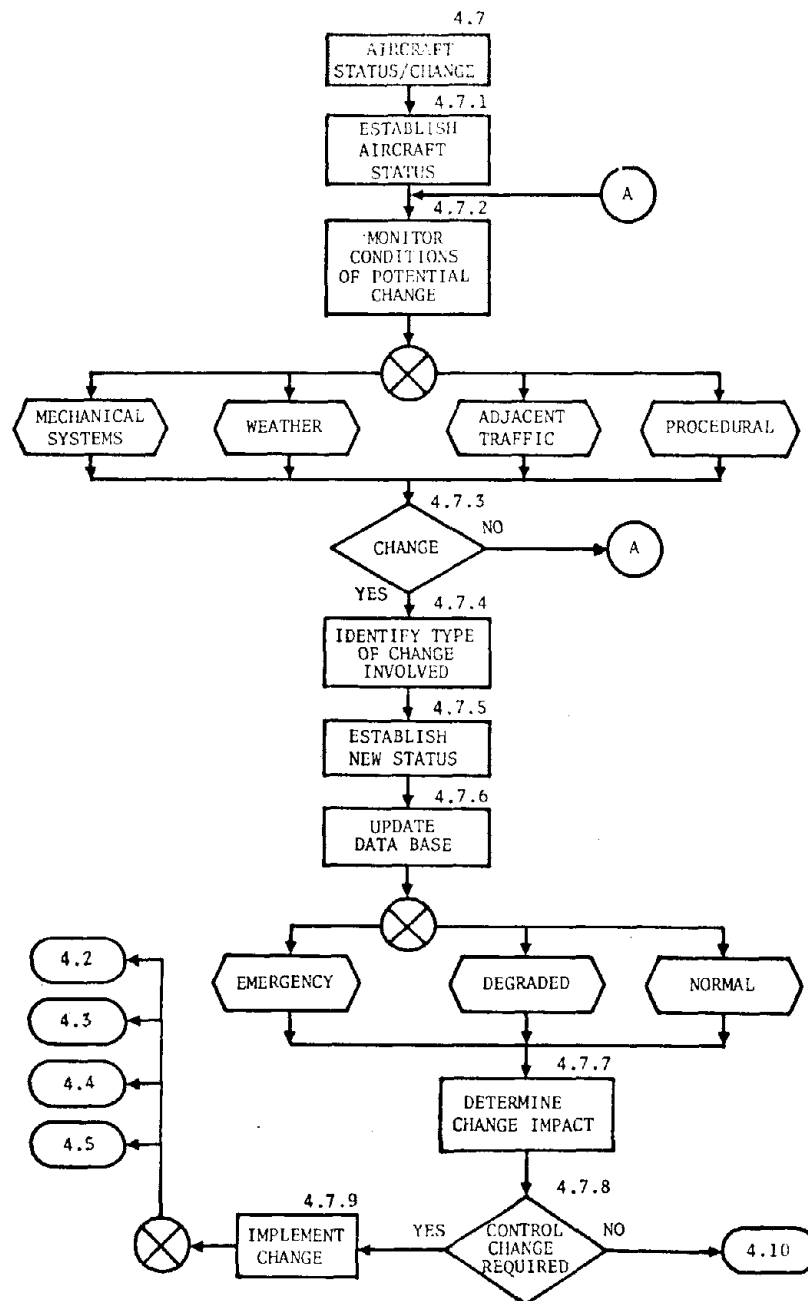
Departure-Aircraft Status/
Change Diagram, Level III
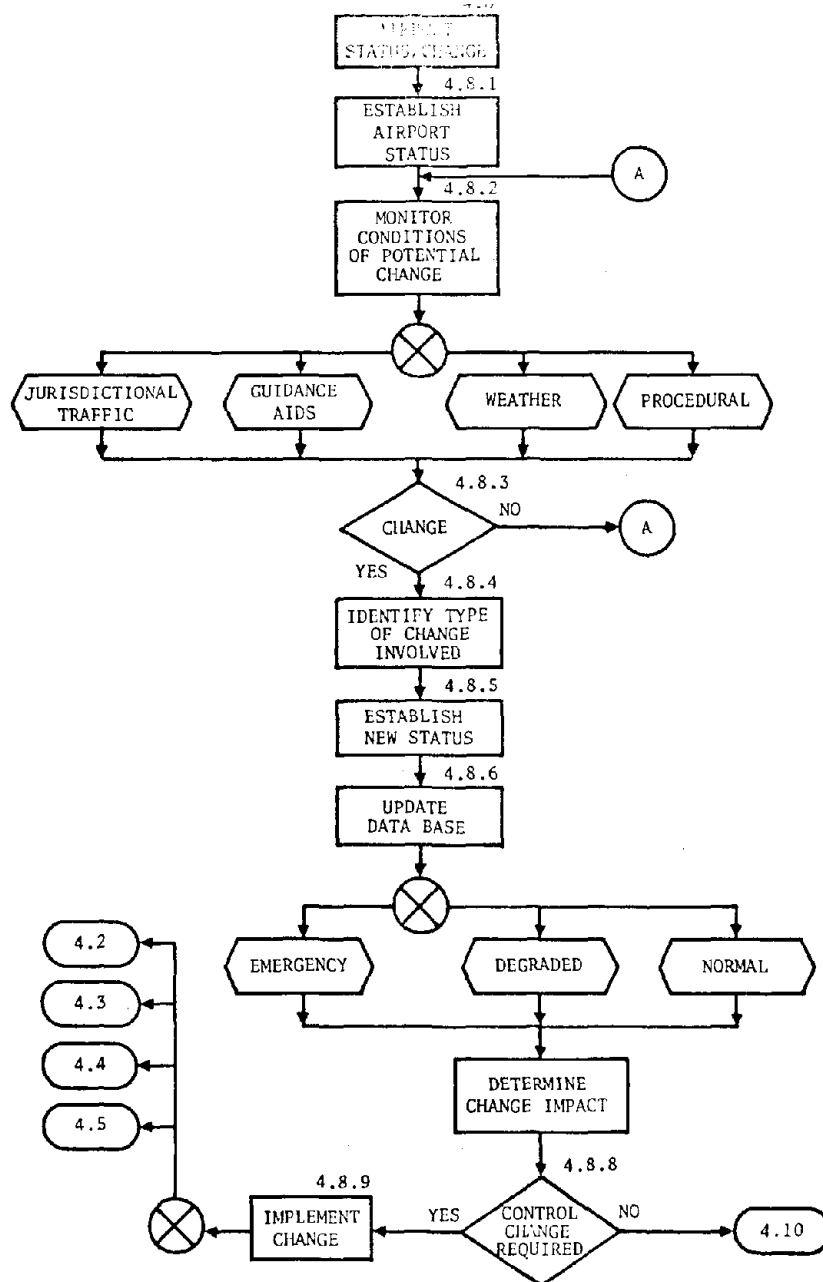
Departure-Airport Status/Change
Diagram, Level III

Departure-AATMS Status/
Change Diagram, Level III

Departure - Handoff Diagram, Level III

Departure Transition Logic
Flow Diagram, Level III

-55-

Departure Transition Accept
Handoff Diagram, Level III
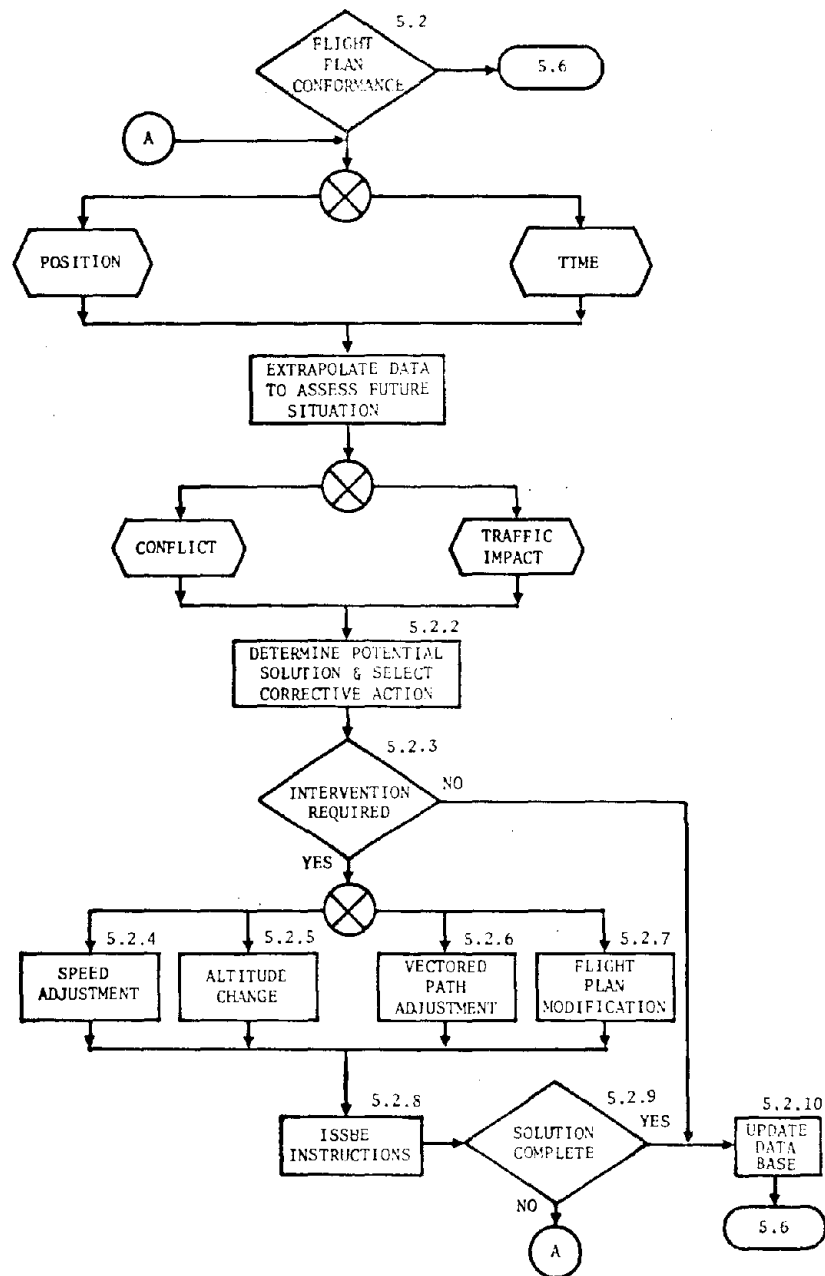
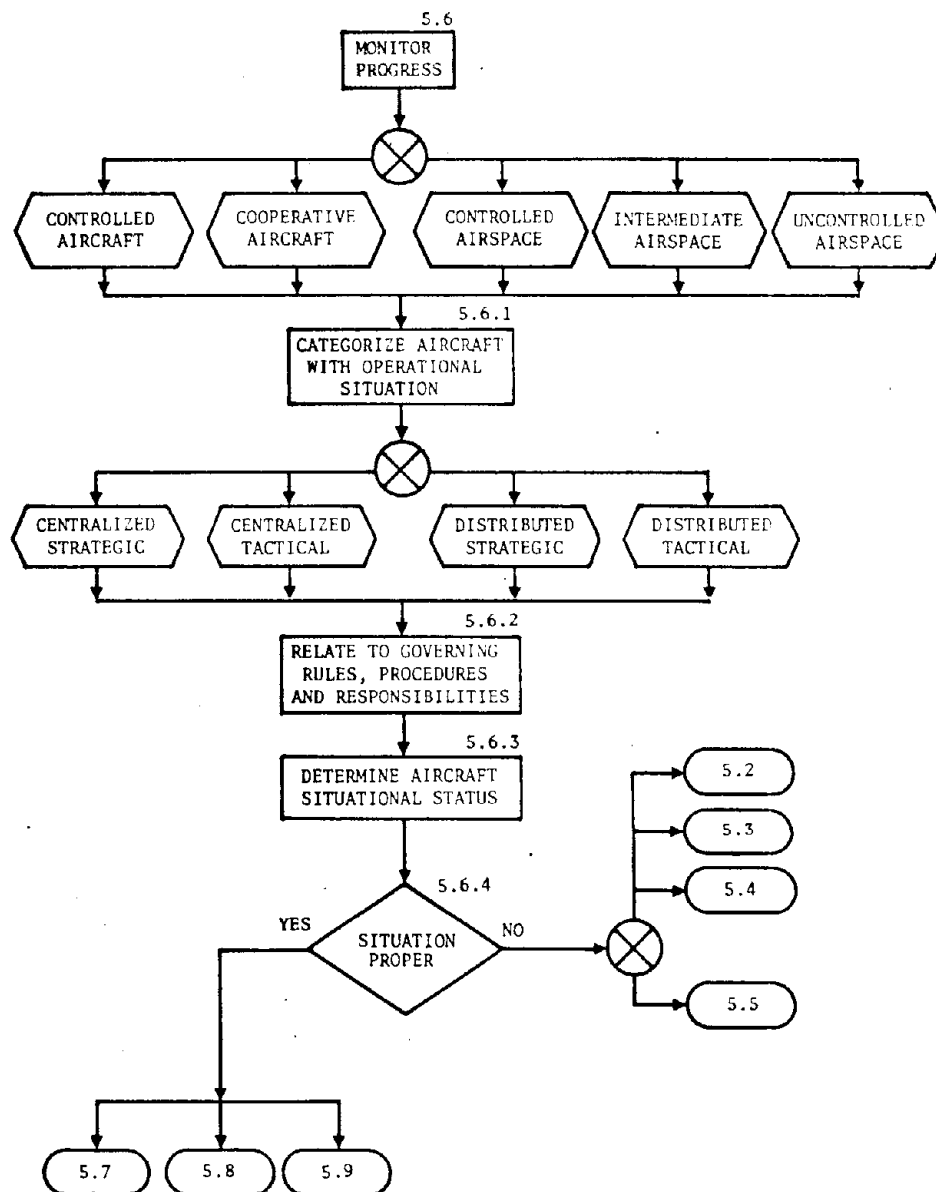Departure Transition-FLight Plan
Conformance Diagram, Level
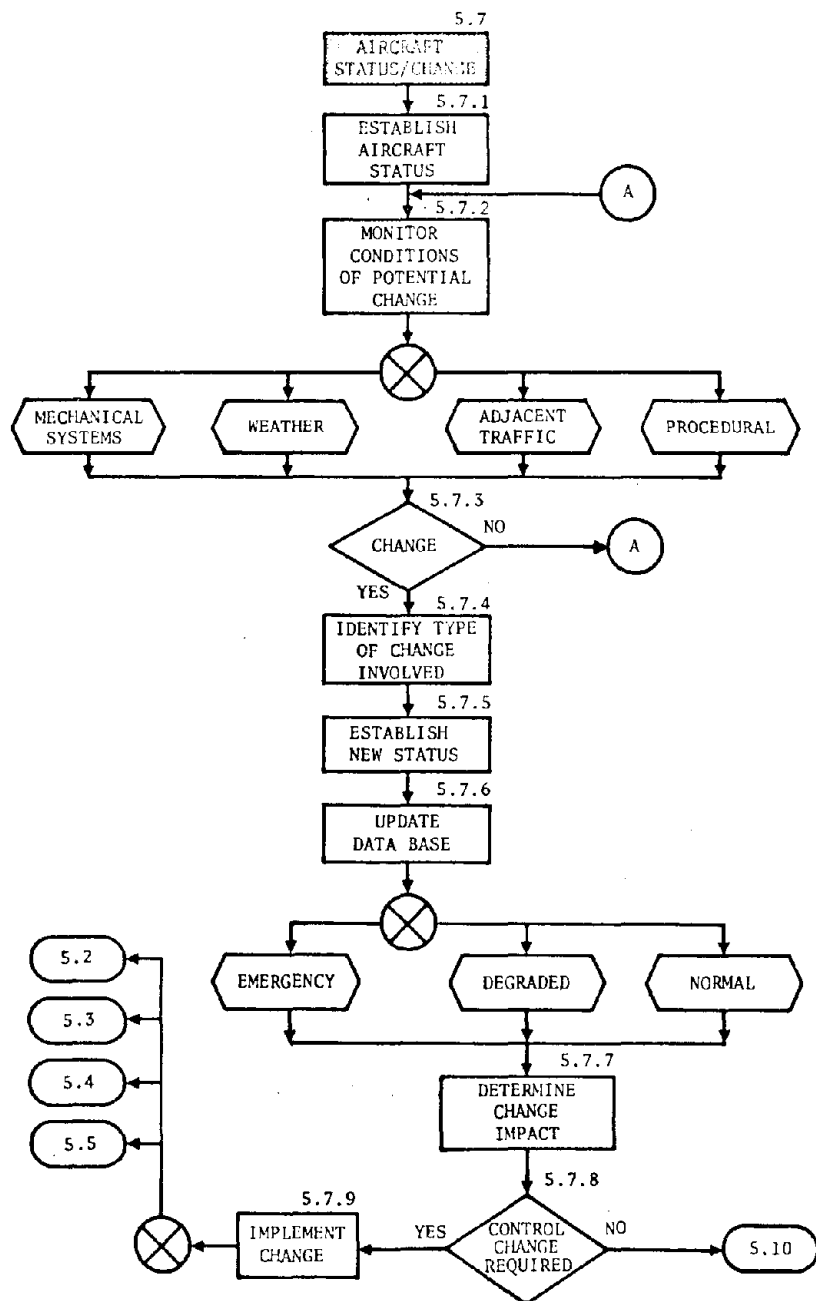III

Departure Transition-Proper Sequence
Diagram, Level III

Departure Transition-Path Merge
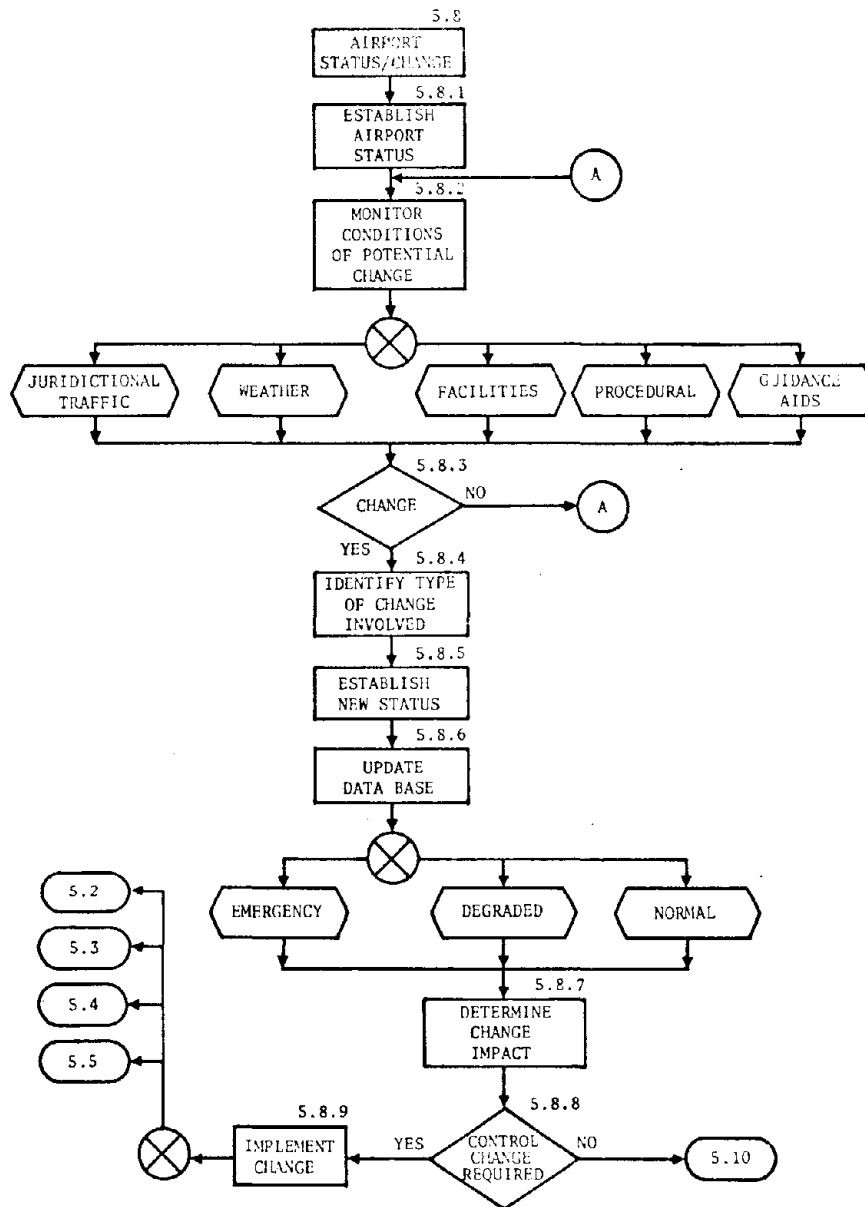Resolved Diagram, Level III

Departure Transition-Spacing
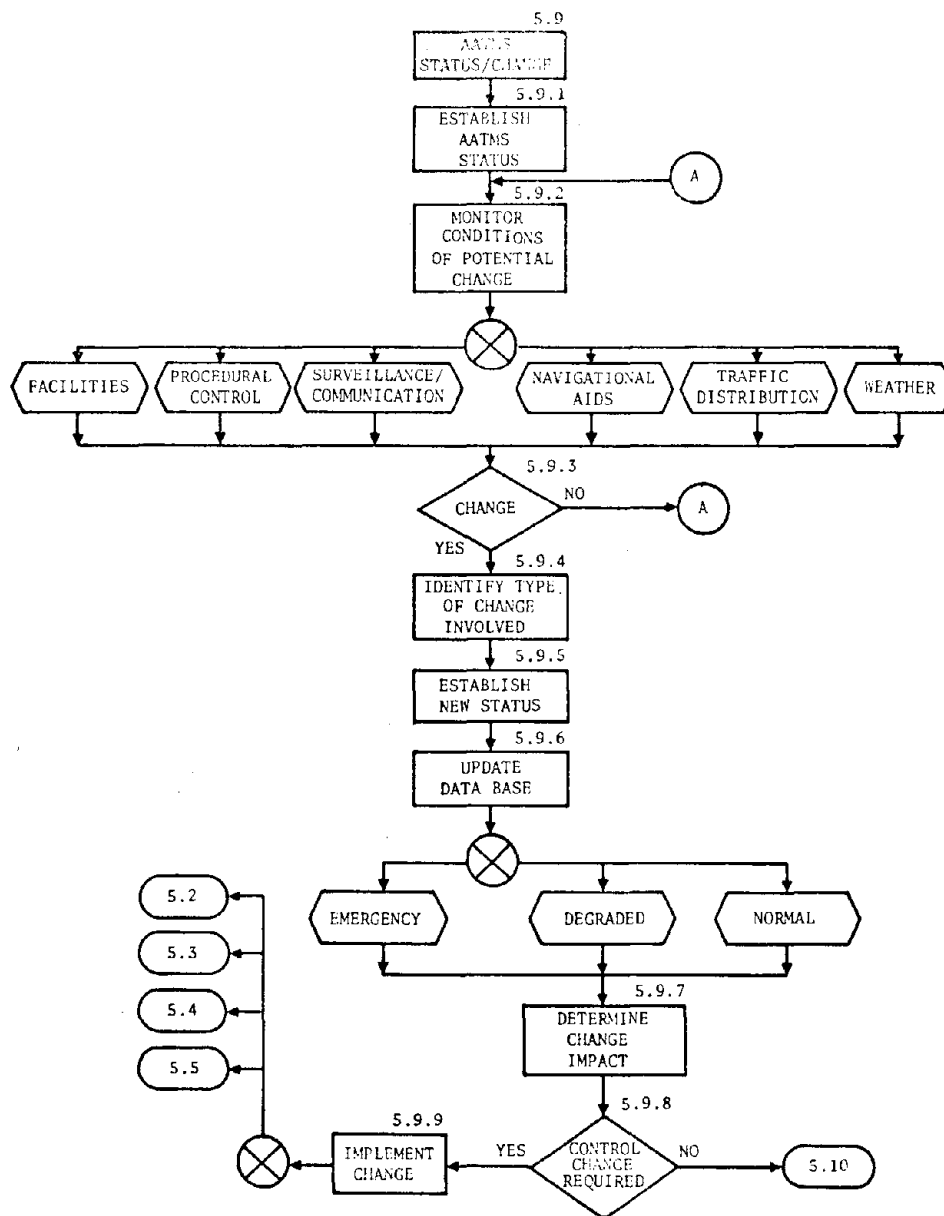Proper Diagram, Level III

5.6

MONITOR PROGRESS

CONTROLLED AIRCRAFT

COOPERATIVE AIRCRAFT

CONTROLLED AIRSPACE

INTERMEDIATE AIRSPACE

UNCONTROLLED AIRSPACE

5.6.1

CATEGORIZE AIRCRAFT WITH OPERATIONAL SITUATION

CENTRALIZED STRATEGIC

CENTRALIZED TACTICAL

DISTRIBUTED STRATEGIC

DISTRIBUTED TACTICAL

5.6.2

RELATE TO GOVERNING RULES, PROCEDURES AND RESPONSIBILITIES

5.6.3

DETERMINE AIRCRAFT SITUATIONAL STATUS

5.6.4

SITUATION PROPER

YES

NO

5.2

5.3

5.4

5.5

5.7

5.8

5.9

Departure Transition-Monitor Progress Diagram, Level III

-61-

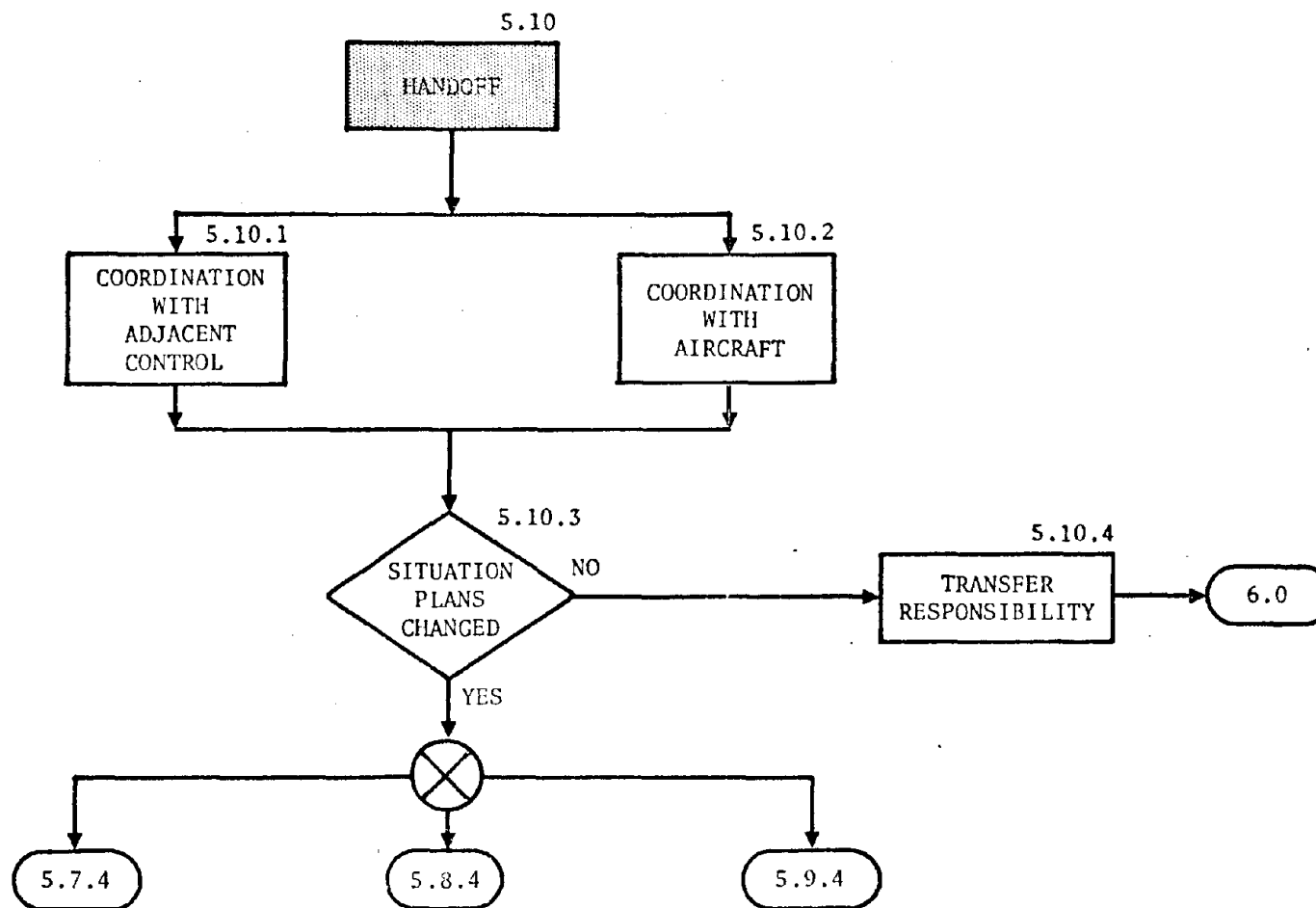Departure Transition-Aircraft Status/Change
Diagram, Level III

Departure Transition-Airport Status/
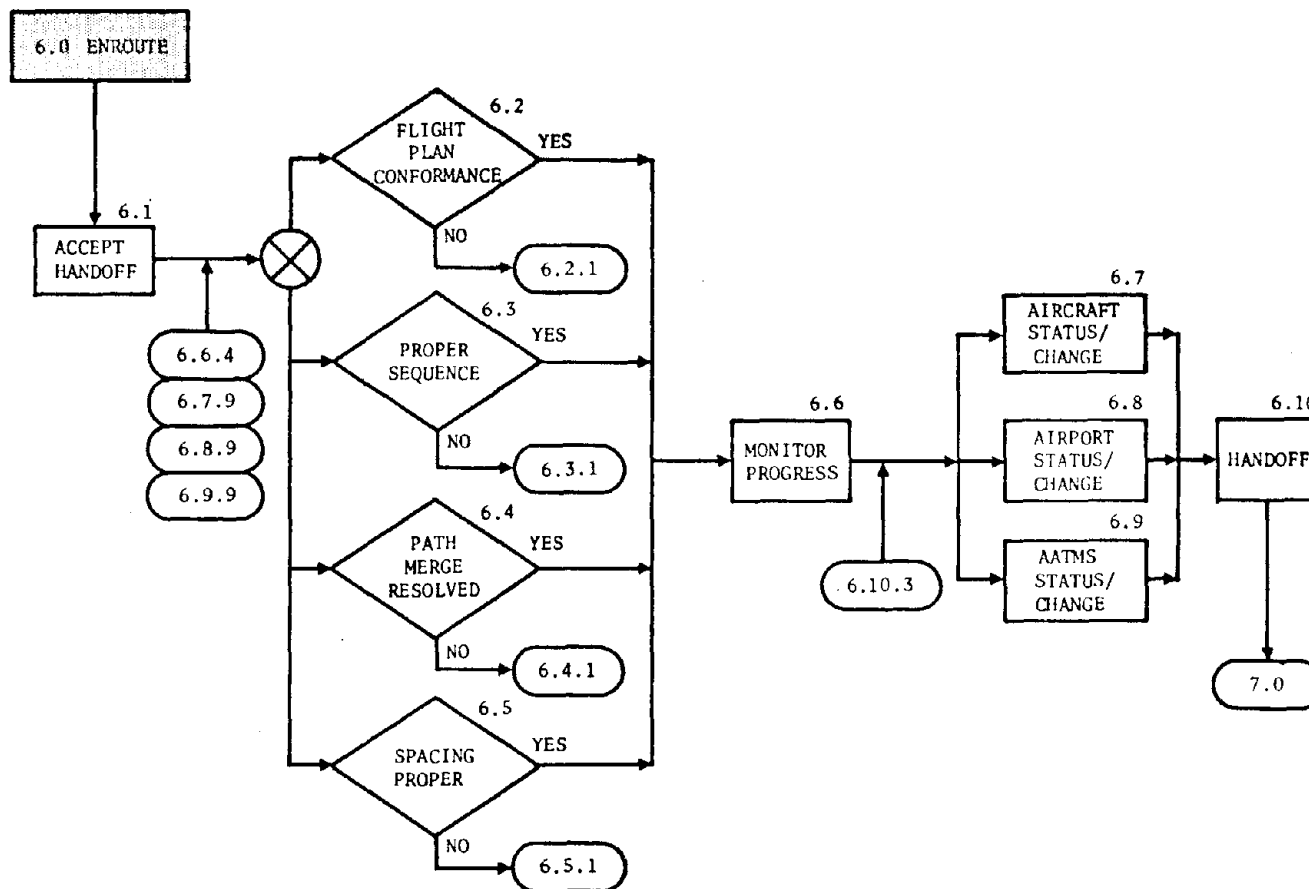Change Diagram, Level III

Departure Transition-AATMS
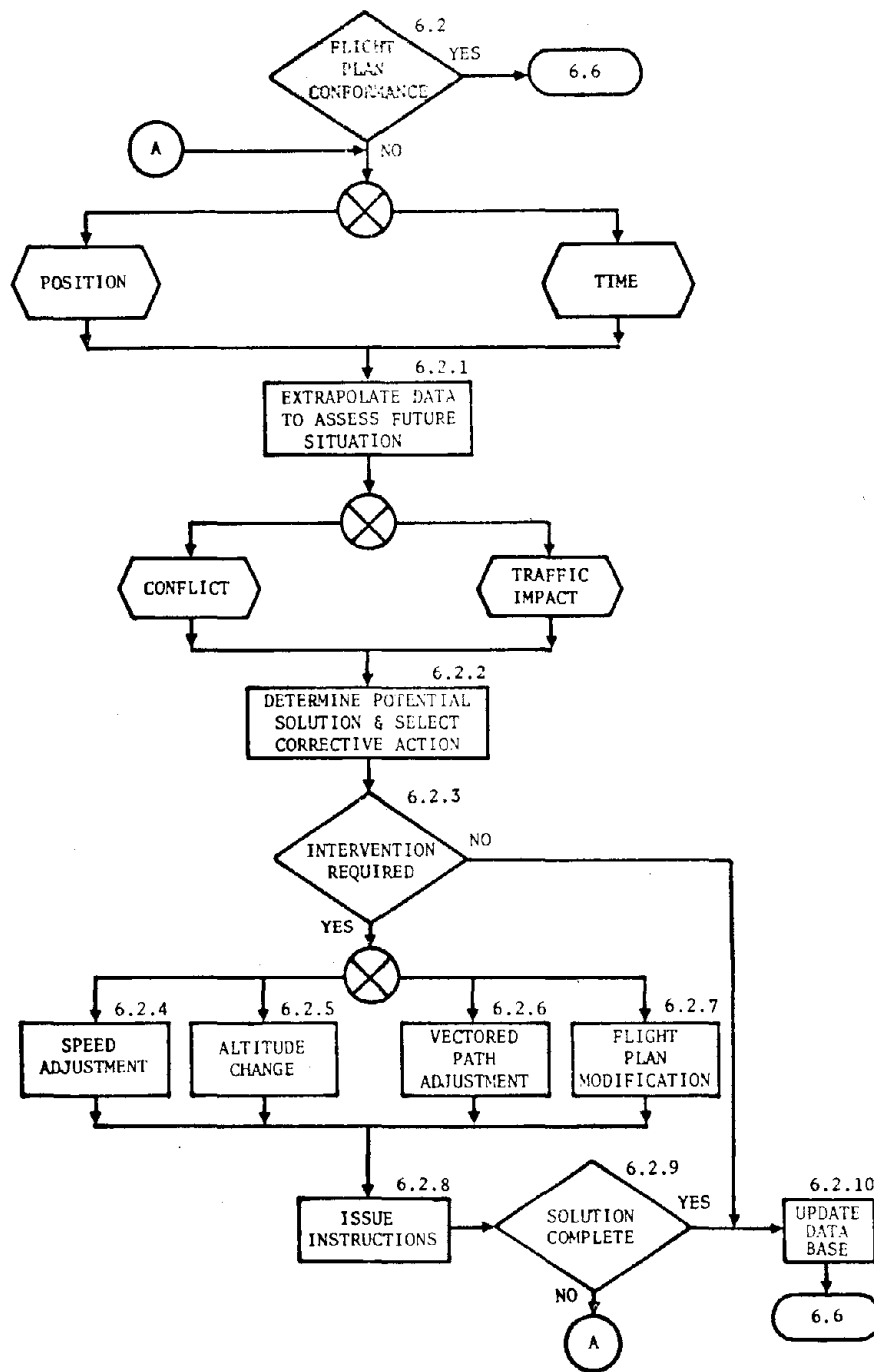Status/Change Diagram, Level III

5.10

HANDOFF

5.10.1

COORDINATION
WITH
ADJACENT
CONTROL

5.10.2

COORDINATION
WITH
AIRCRAFT

5.10.3

SITUATION
PLANS
CHANGED

NO

5.10.4

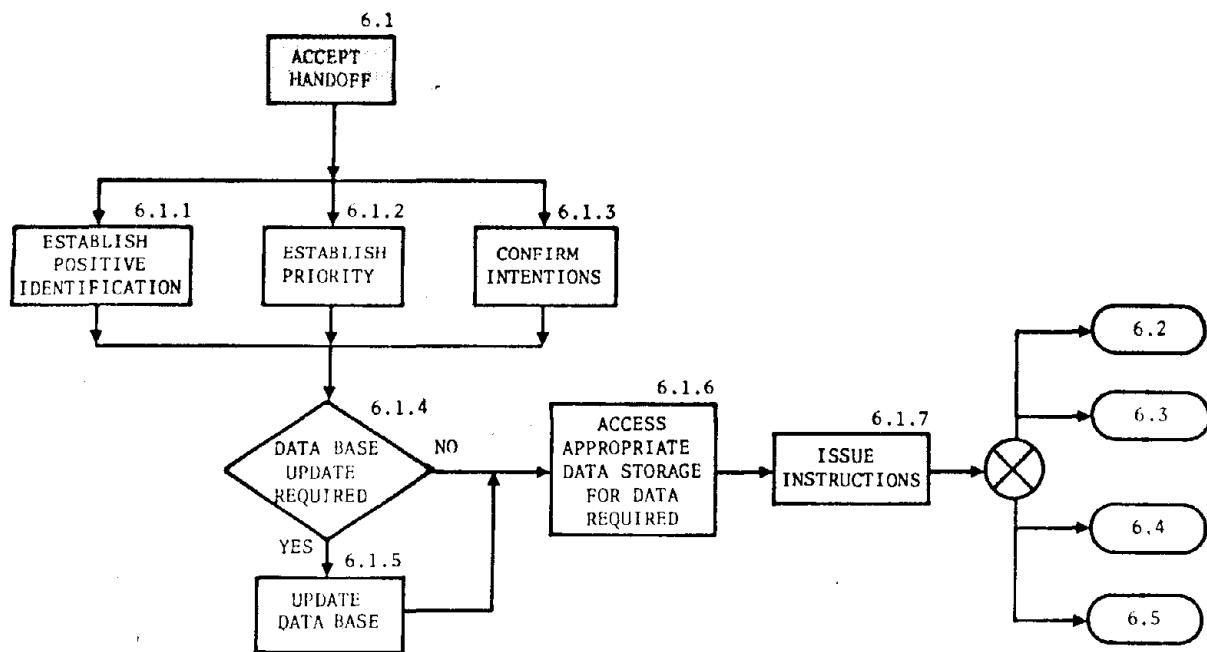TRANSFER
RESPONSIBILITY

6.0

YES

5.7.4

5.8.4

5.9.4

Departure Transition-Handoff Diagram, Level III

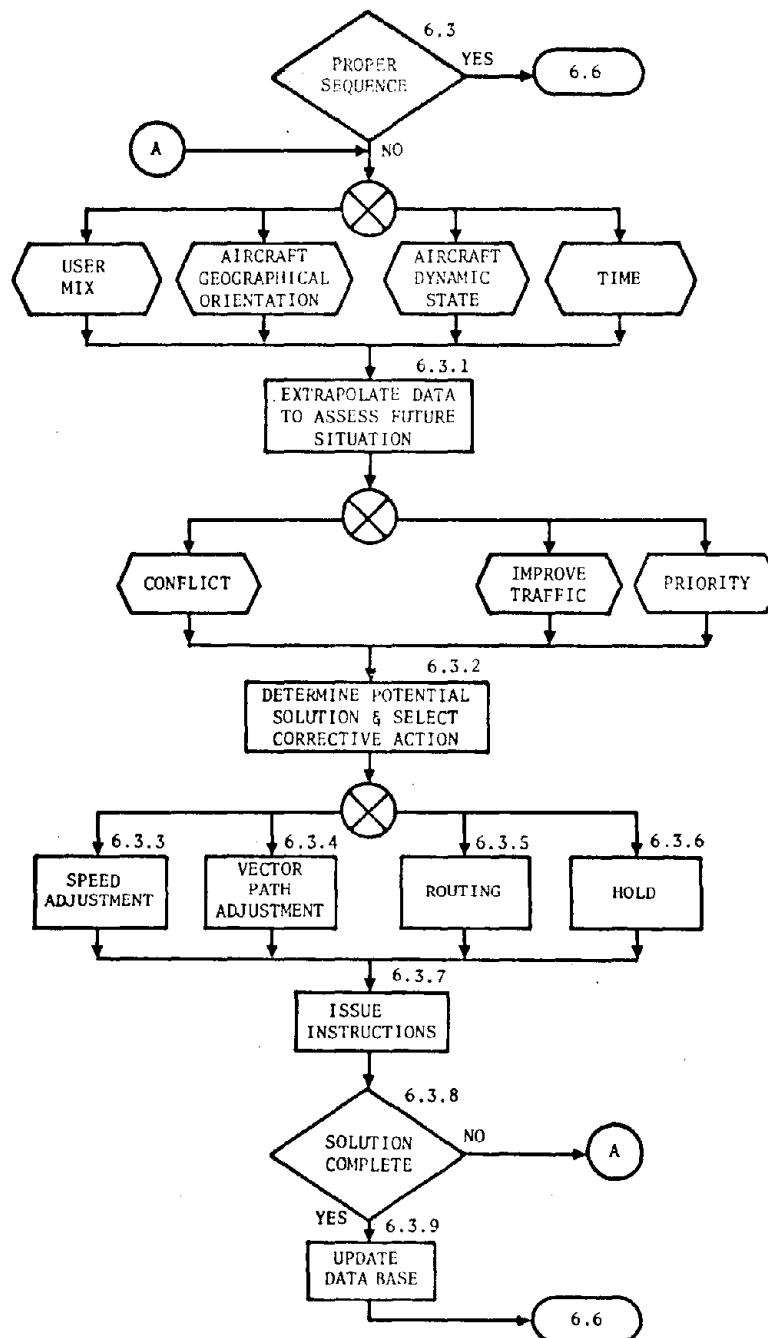Enroute Logic Flow Diagram, Level II

Enroute—Flight Plan Conformance
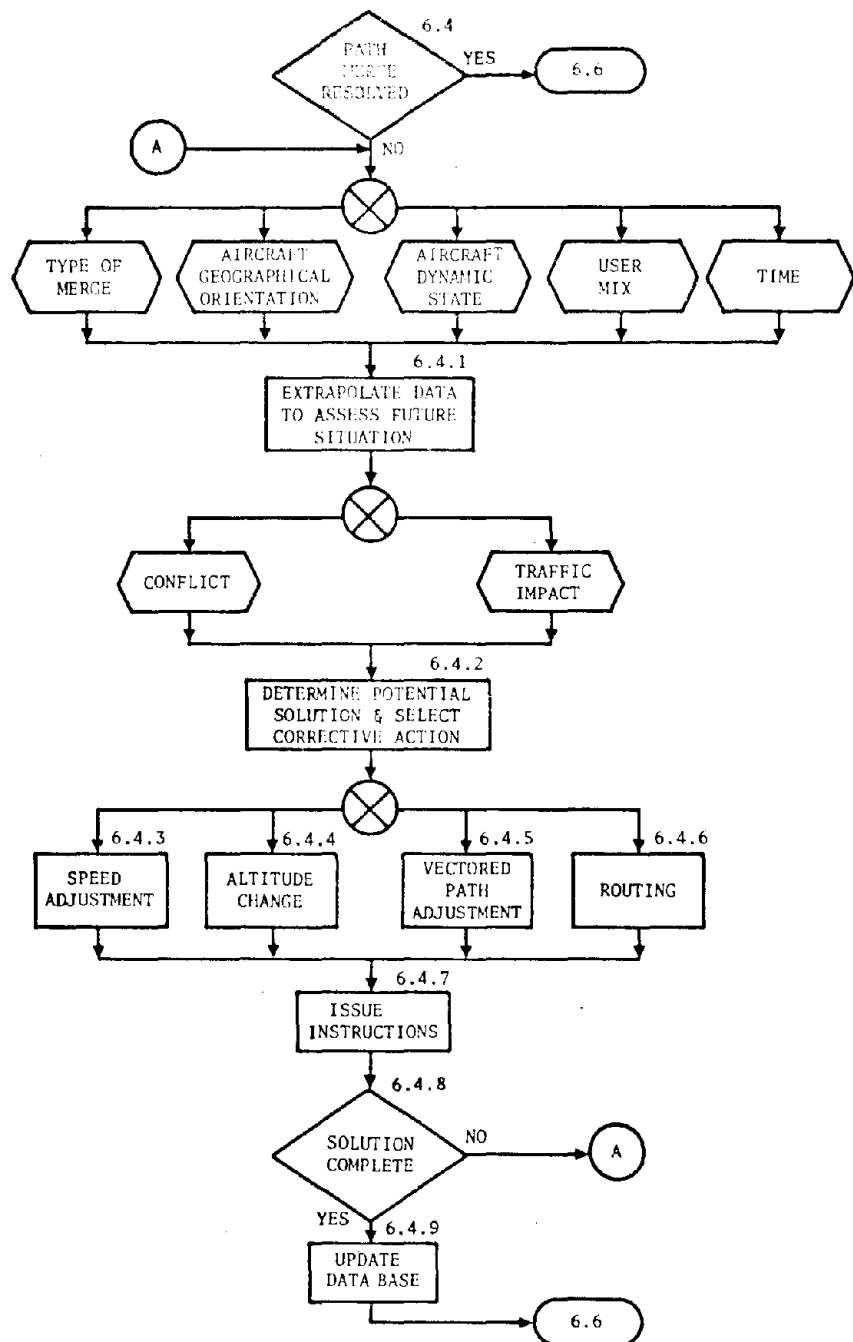Diagram, Level III

Enroute-Accept Handoff
Diagram, Level III

Enroute Proper Sequence
Diagram, Level III

Enroute-Path Merge Resolved
Diagram, Level III
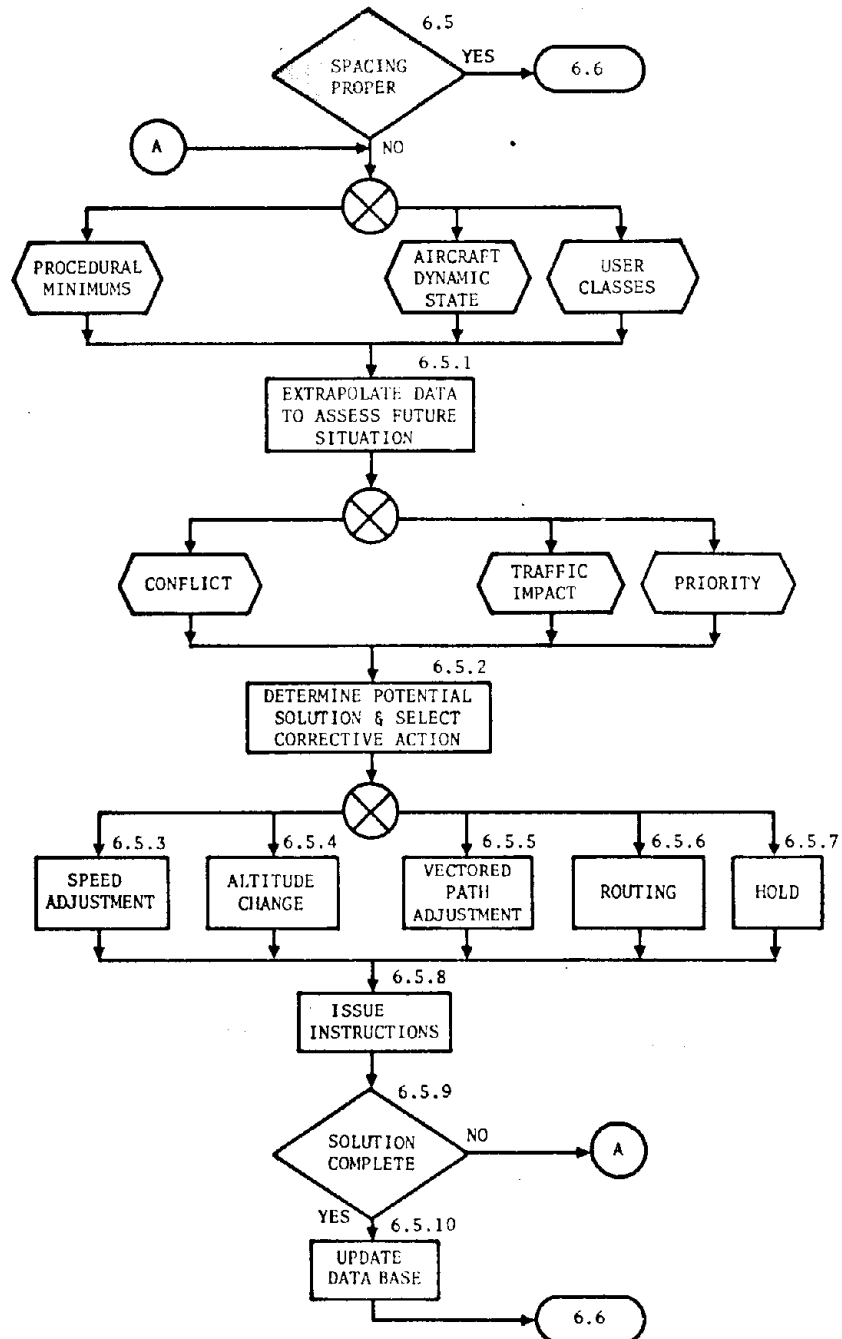
Enroute-Spacing Proper Diagram,
Level III
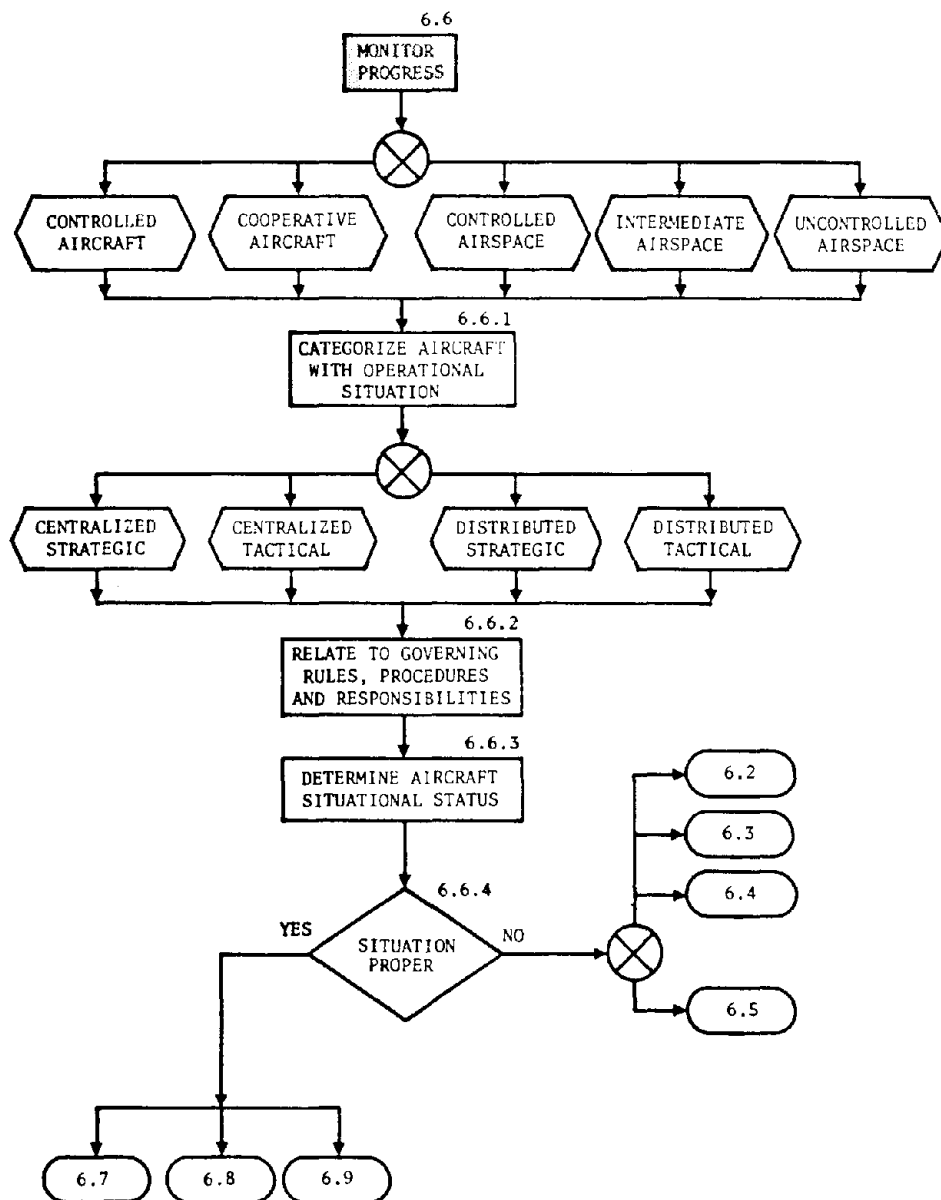
Enroute-Monitor Progress Diagram,
Level III
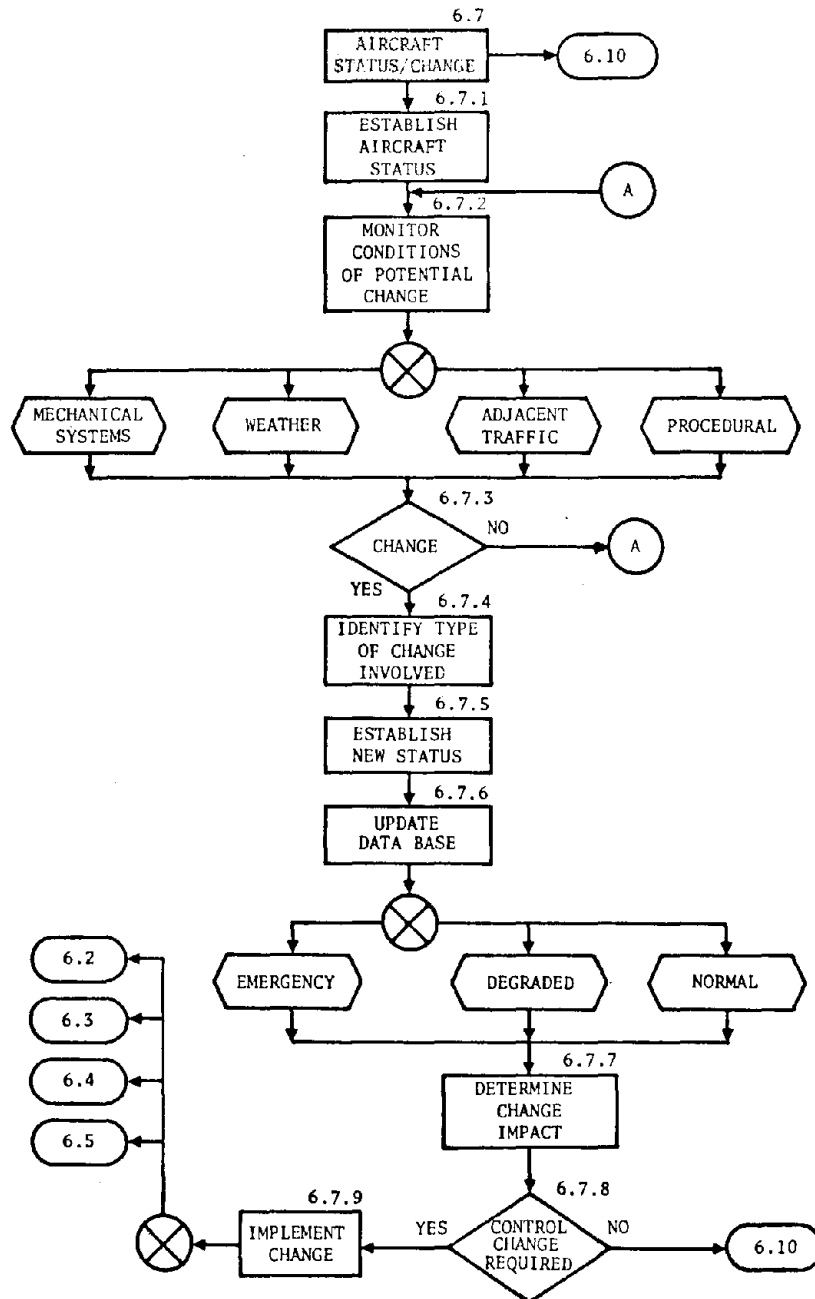
Enroute-Aircraft Status/
Change Diagram, Level III
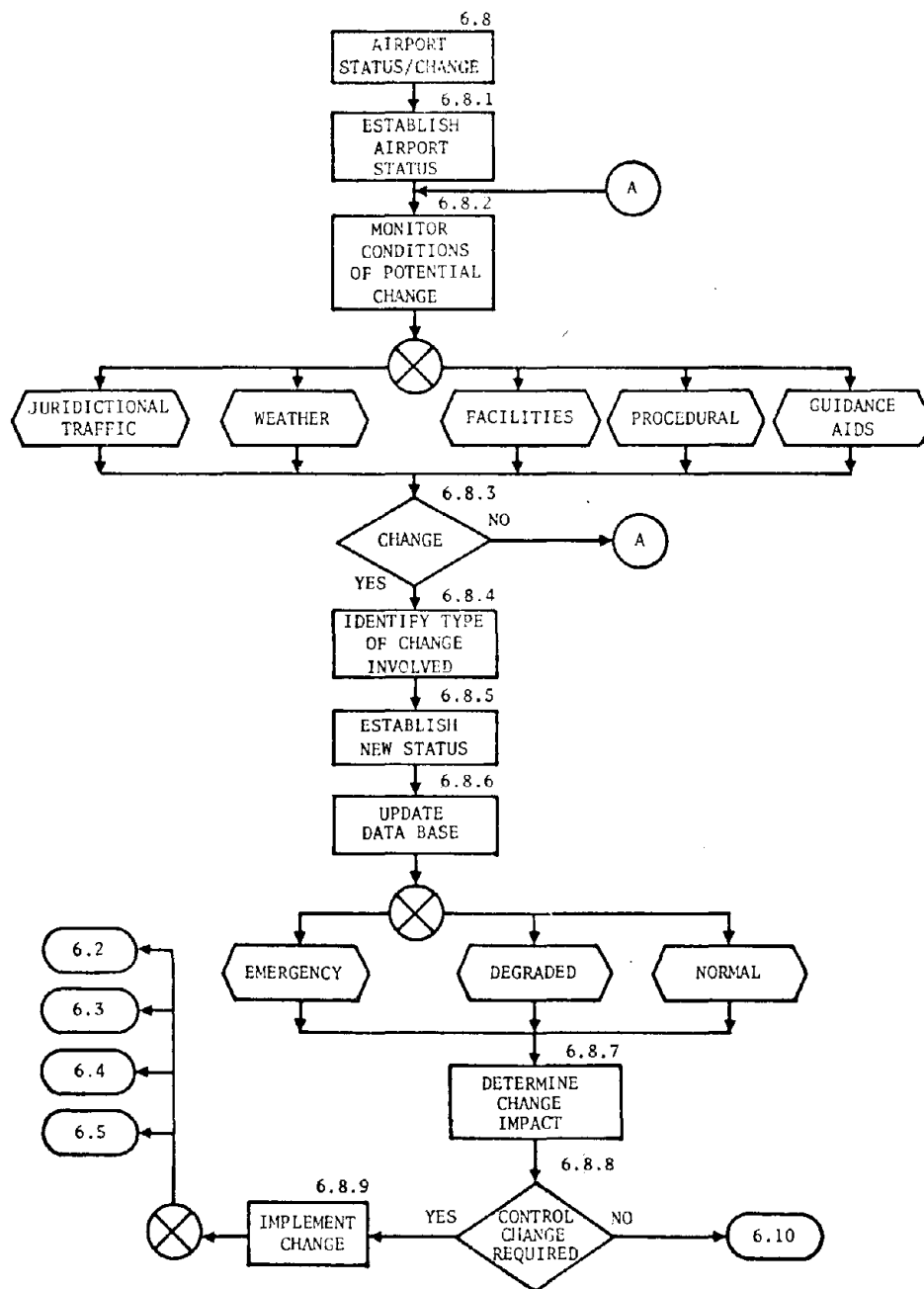
Enroute-Airport Status/Change
Diagram, Level III
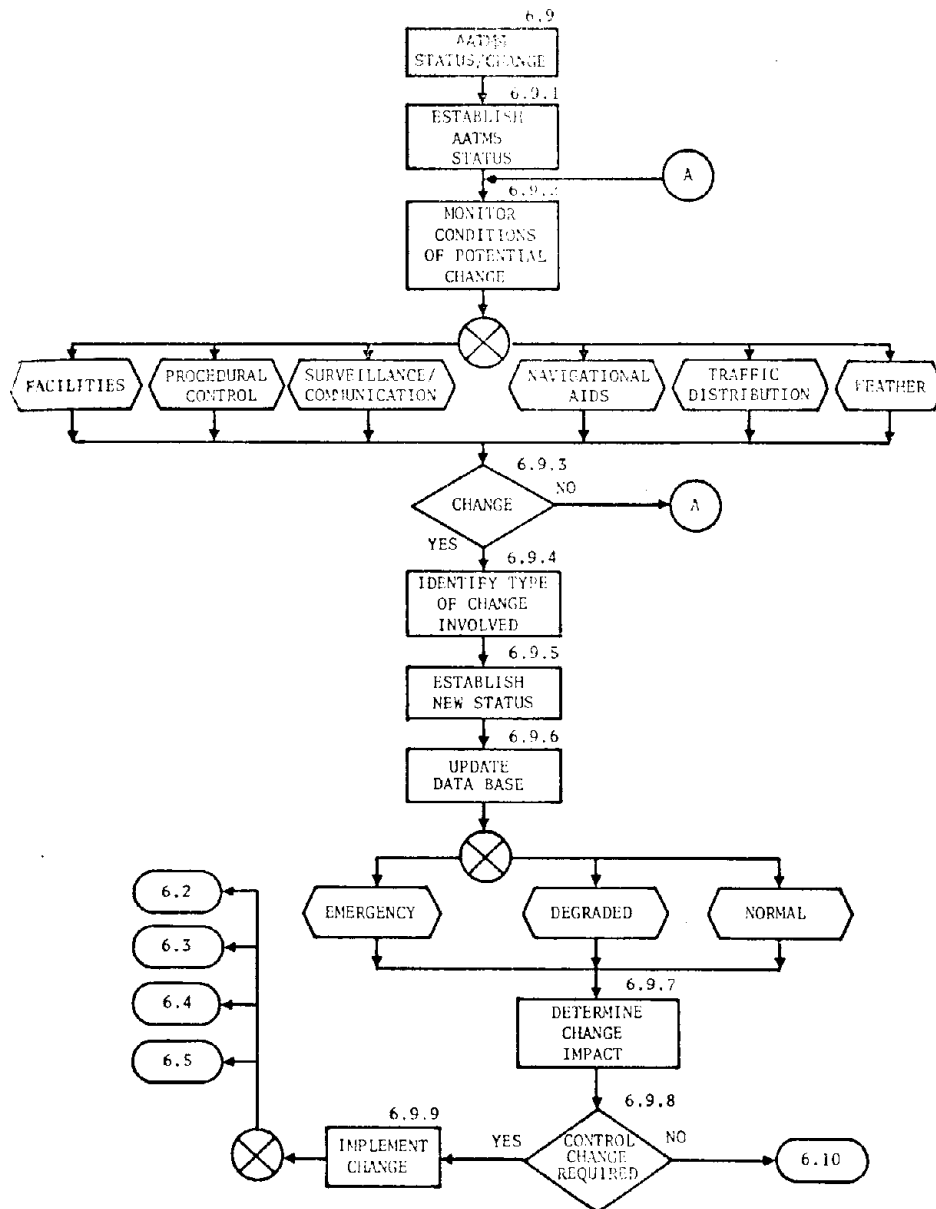
Enroute-AATMS Status/Change
Diagram, Level III

6.10

HANDOFF

6.10.1
COORDINATION
WITH
ADJACENT
CONTROL

6.10.2
COORDINATION
WITH
AIRCRAFT

6.10.3
SITUATION/
PLANS
CHANGED

NO

6.10.4
TRANSFER
RESPONSIBILITY

7.0

YES

6.7.4   6.8.4   6.9.4

Arrival Transition Logic
Flow Diagram, Level II

-77-

7.1

```
┌─────────────┐
│   ACCEPT    │
│   HANDOFF   │
└─────────────┘
```

┌──────────────────┐   ┌──────────────┐   ┌──────────────┐
│ 7.1.1   │   │ 7.1.2   │   │ 7.1.3   │
│ ESTABLISH   │   │ ESTABLISH   │   │ CONFIRM   │
│ POSITIVE   │   │ PRIORITY   │   │ INTENTIONS │
│ IDENTIFICATION │   │   │   │   │
└──────────────────┘   └──────────────┘   └──────────────┘

7.1.4

```
      DATA BASE      NO
      UPDATE      ──────►
      REQUIRED

      YES
```

7.1.5
```
┌──────────────┐
│   UPDATE     │
│   DATA BASE  │
└──────────────┘
```

7.1.6
```
┌──────────────┐
│   ACCESS     │
│ APPROPRIATE  │
│ DATA STORAGE │
│  FOR DATA    │
│  REQUIRED    │
└──────────────┘
```

7.1.7
```
┌──────────────┐
│   ISSUE      │
│ INSTRUCTIONS │
└──────────────┘
```

⊗

(7.2)

(7.3)

(7.4)

(7.5)
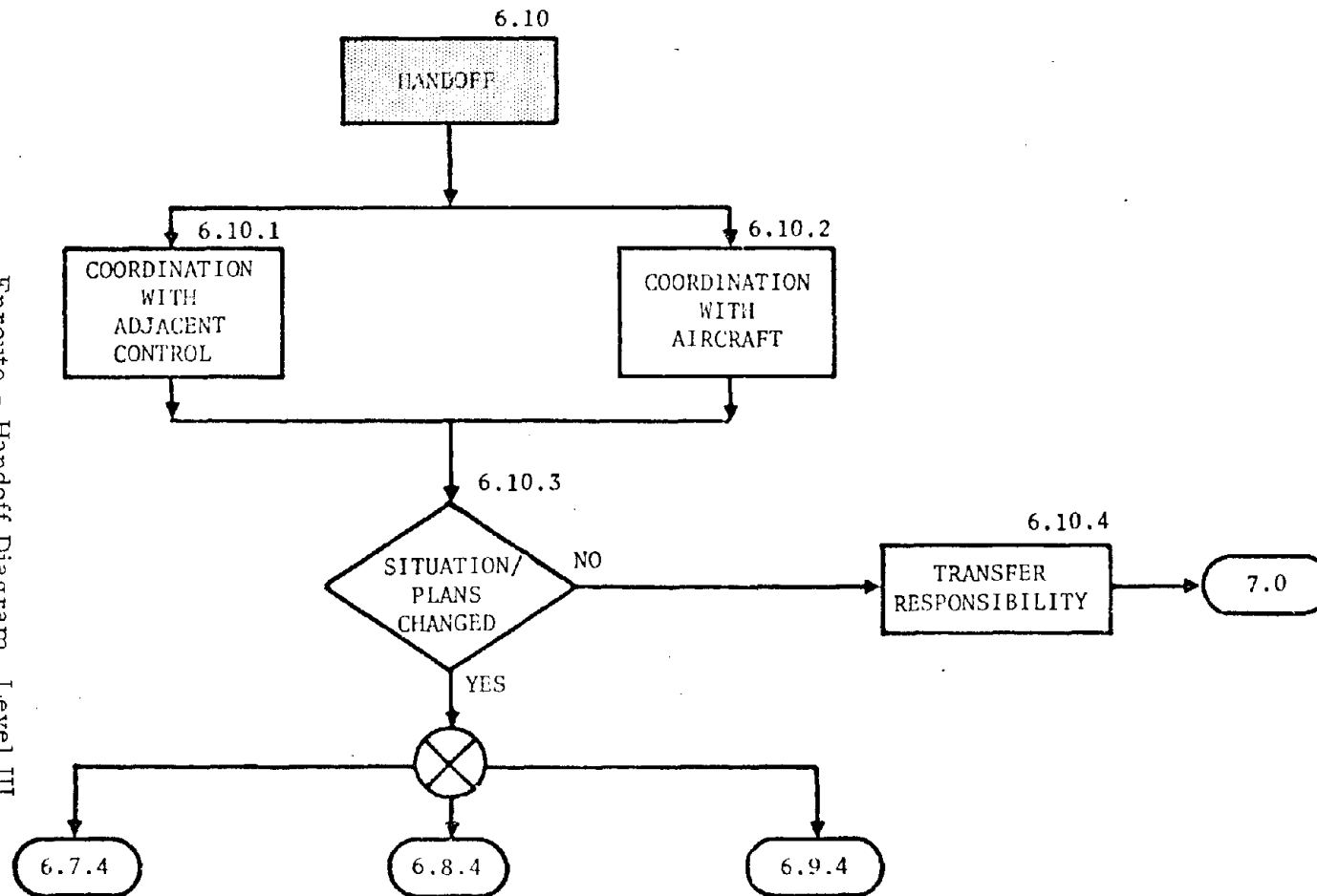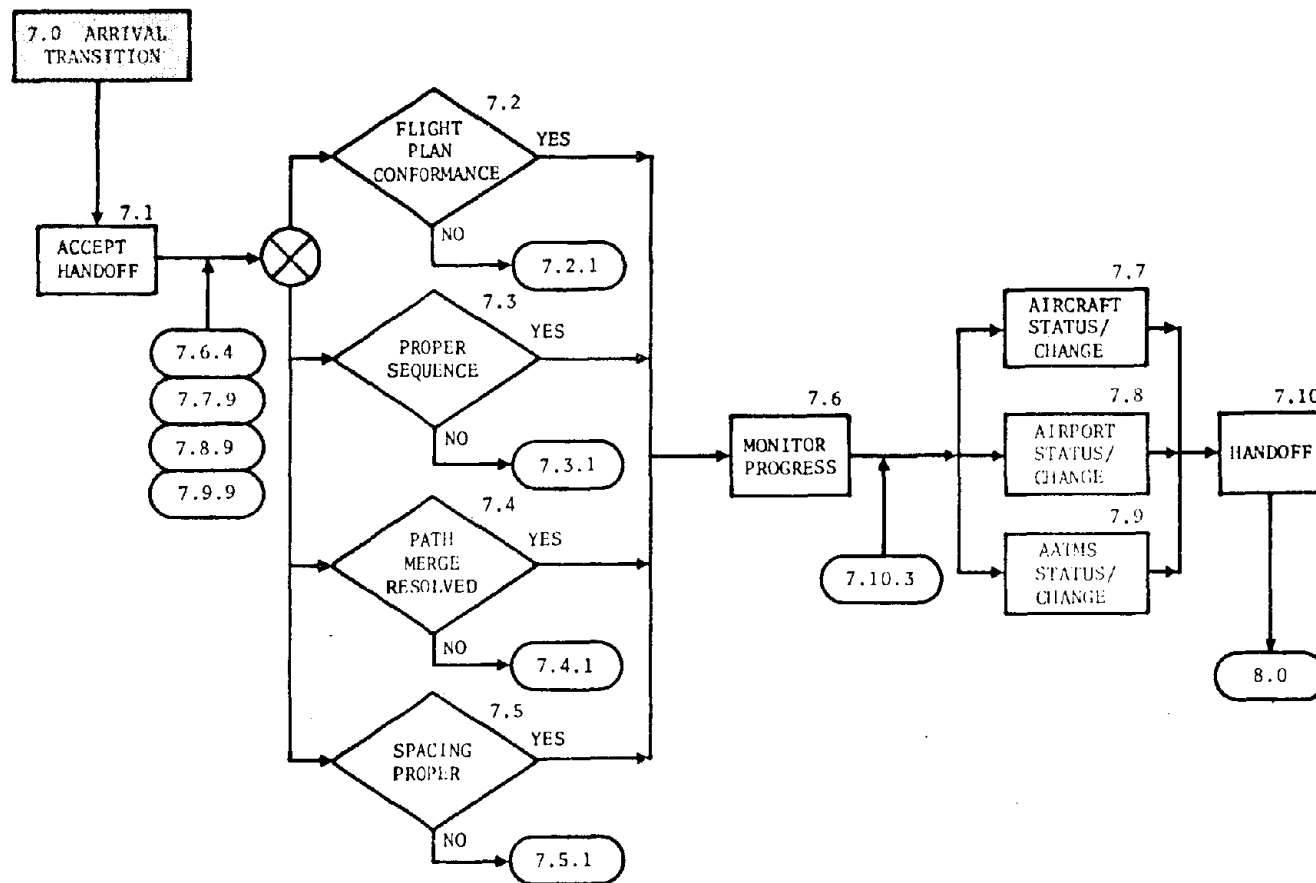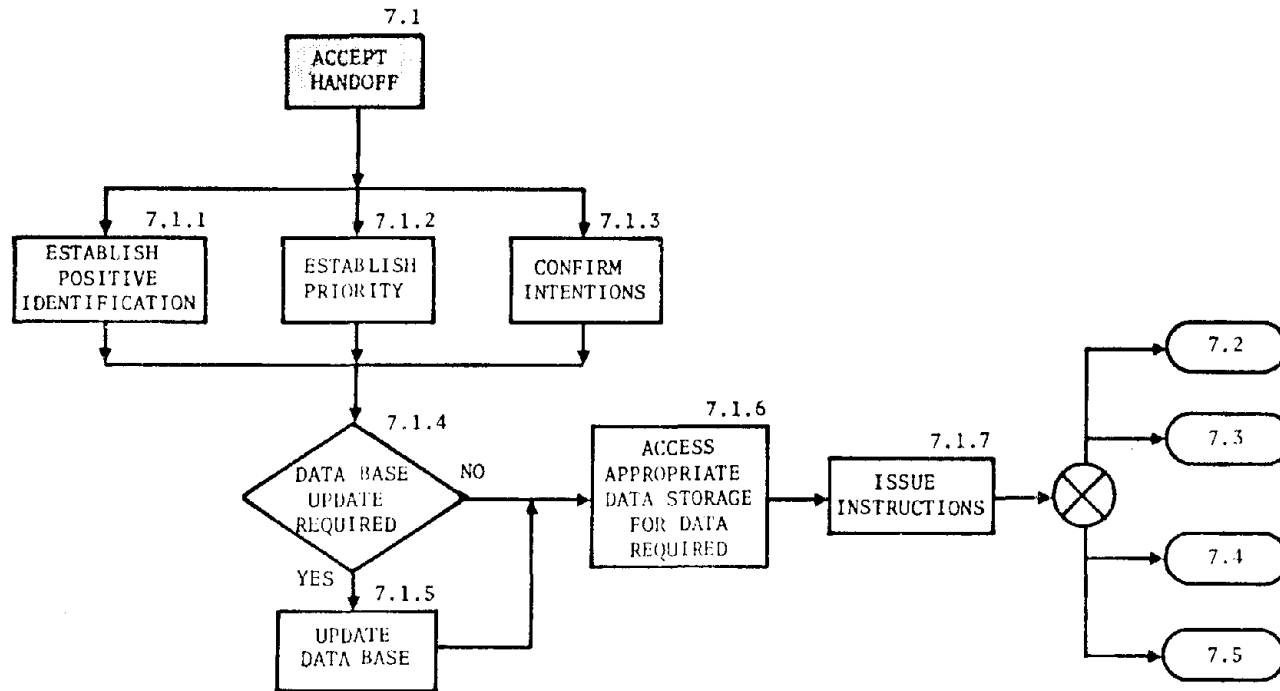
Arrival Transition Accept Handoff
Diagram, Level III
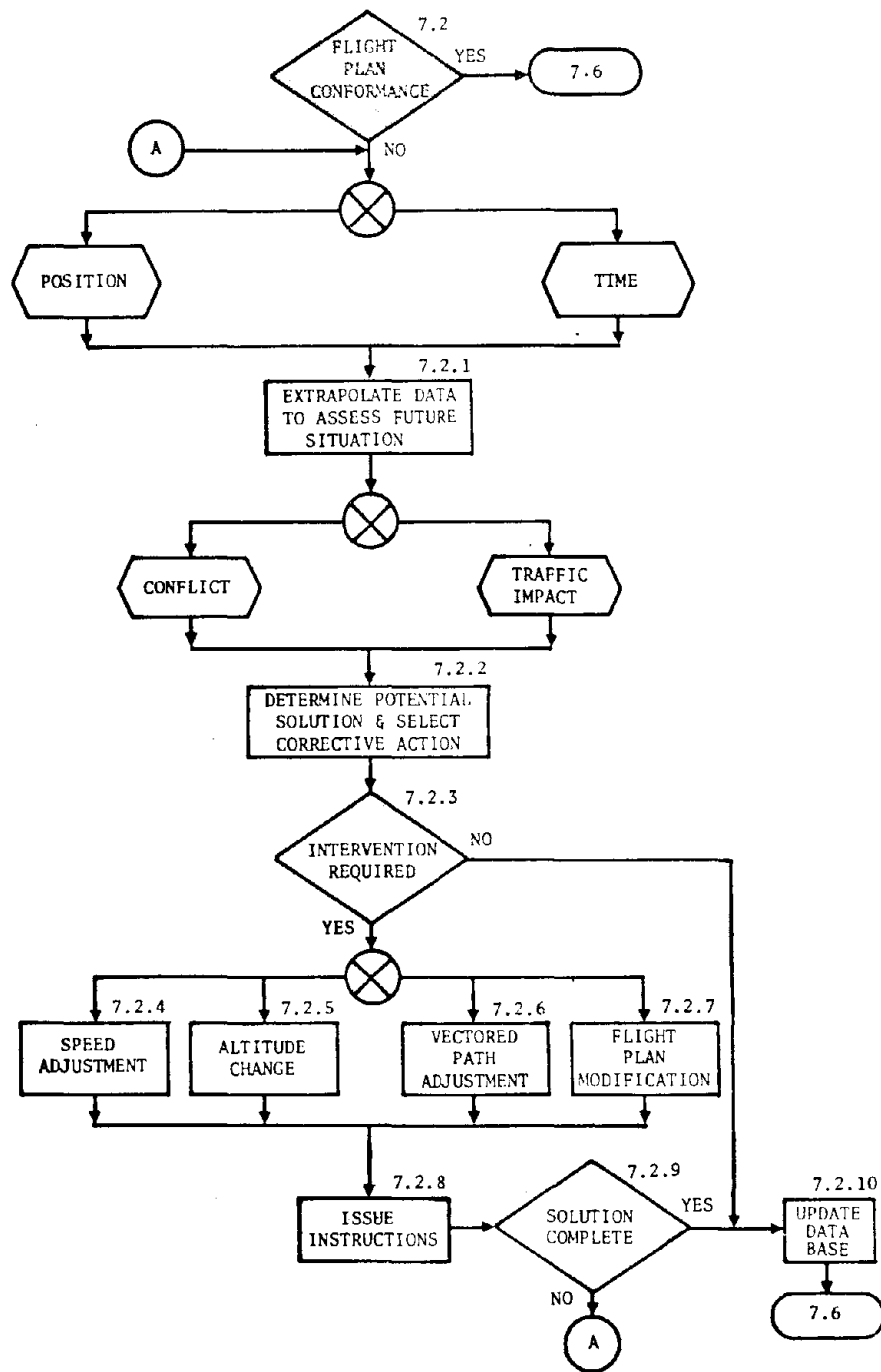
Arrival Transition-Flight
Plan Conformance Diagram, Level III

Arrival Transition-Proper
Sequence Diagram, Level III

Arrival Transition-Path
Merge Resolved Diagram, Level III

Arrival Transition-Spacing Proper Diagram, Level III

7.6

MONITOR
PROGRESS

⊗

| CONTROLLED AIRCRAFT | COOPERATIVE AIRCRAFT | CONTROLLED AIRSPACE | INTERMEDIATE AIRSPACE | UNCONTROLLED AIRSPACE |

7.6.1

CATEGORIZE AIRCRAFT
WITH OPERATIONAL
SITUATION

⊗

| CENTRALIZED STRATEGIC | CENTRALIZED TACTICAL | DISTRIBUTED STRATEGIC | DISTRIBUTED TACTICAL |

7.6.2

RELATE TO GOVERNING
RULES, PROCEDURES
AND RESPONSIBILITIES

7.6.3

DETERMINE AIRCRAFT
SITUATIONAL STATUS

7.6.4

SITUATION
PROPER

YES   NO

7.2

7.3

7.4

⊗

7.5

7.7   7.8   7.9

Arrival Transition-Monitor Progress
Diagram, Level III

-83-
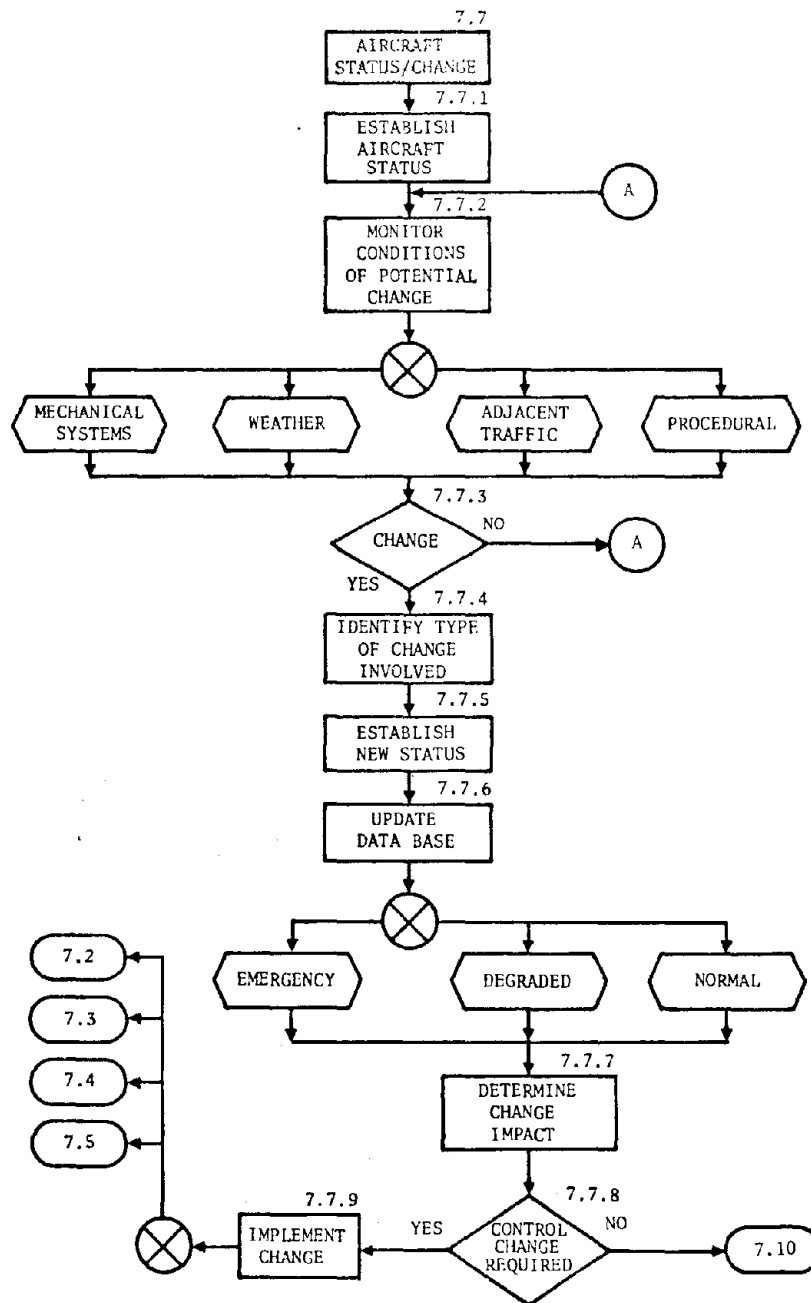
Arrival Transition-Aircraft
Status/Change Diagram, Level III
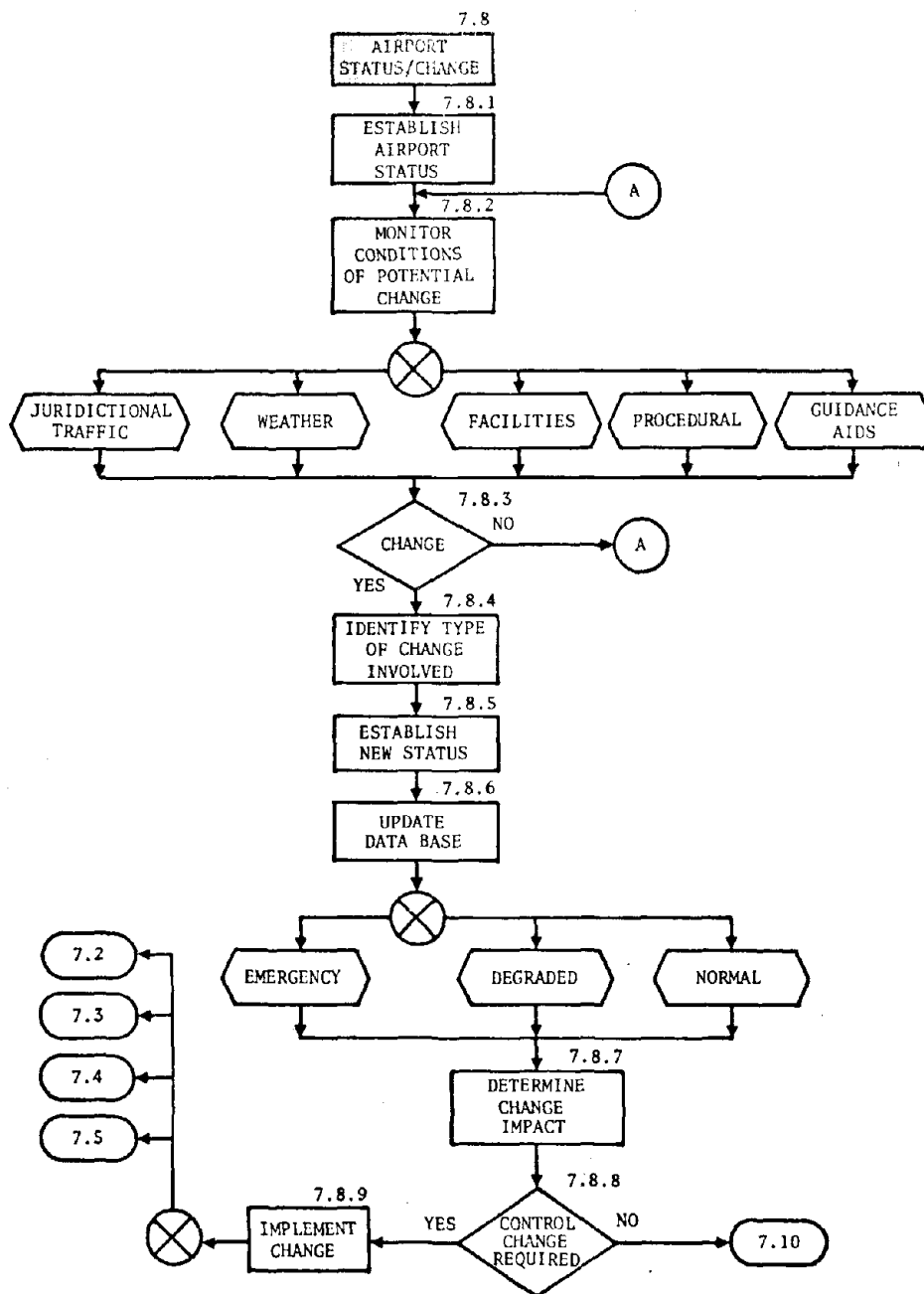
Arrival, Transition-Airport
Status/Change Diagram, Level III

Arrival Transition-AATMS
Status/Change Diagram, Level III

Arrival Transition - Handoff Diagram, Level III

7.10

HANDOFF

7.10.1

COORDINATION
WITH ADJACENT
CONTROL

7.10.2

COORDINATION
WITH
AIRCRAFT

7.10.3

SITUATION/
PLANS
CHANGED

NO

7.10.4

TRANSFER
RESPONSIBILITY

8.0

YES

⊗

7.7.4

7.8.4

7.9.4

8.0 ARRIVAL

8.1 ACCEPT HANDOFF

8.6.4
8.7.9
8.8.9
8.9.9

8.2 FLIGHT PATH CONFORMANCE — YES / NO → 8.2.1

8.3 PROPER SEQUENCE — YES / NO → 8.3.1

8.4 PATH MERGE RESOLVED — YES / NO → 8.4.1

8.5 SPACING PROPER — YES / NO → 8.5.1

8.6 MONITOR PROGRESS

8.10.3

8.7 AIRCRAFT STATUS/CHANGE

8.8 AIRPORT STATUS/CHANGE

8.9 AATMS STATUS/CHANGE

8.10 HANDOFF

9.0

Arrival Logic Flow Diagram, Level II

-88-
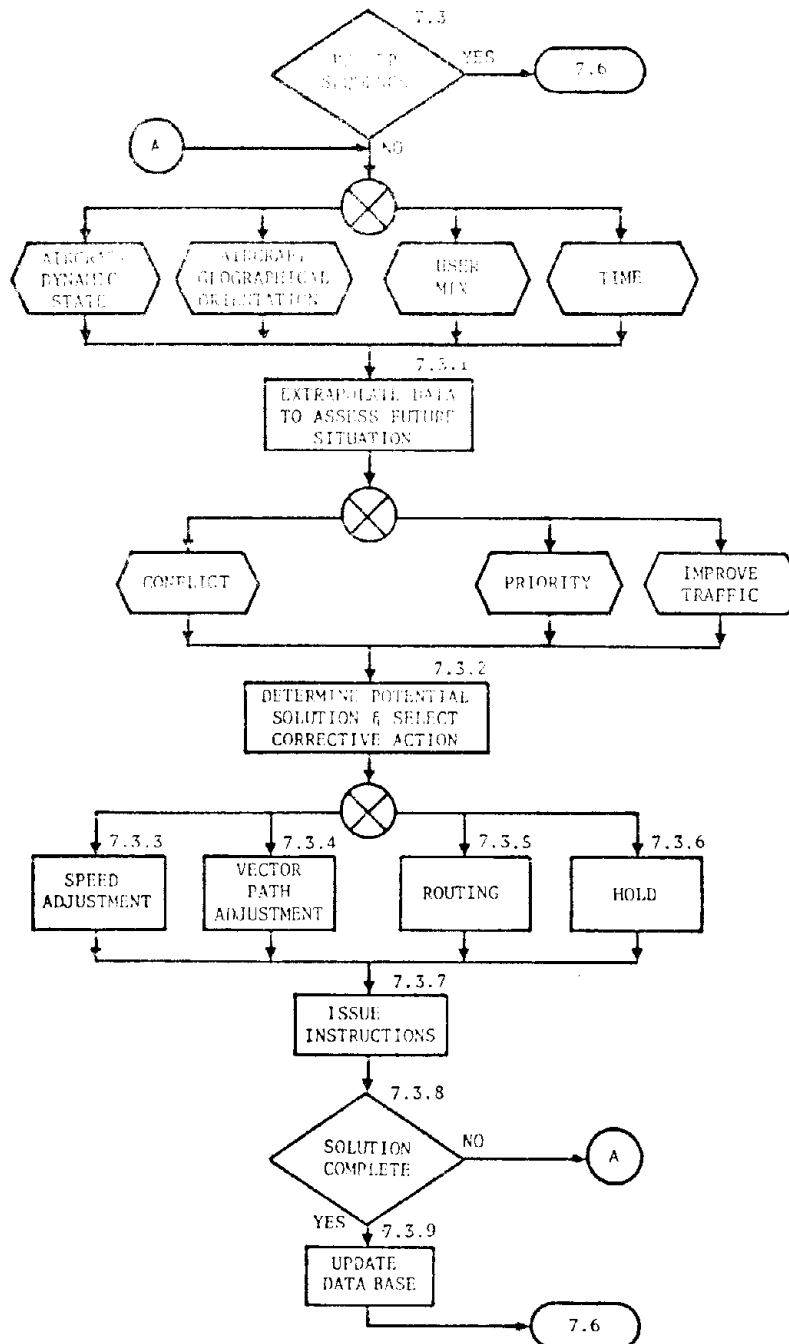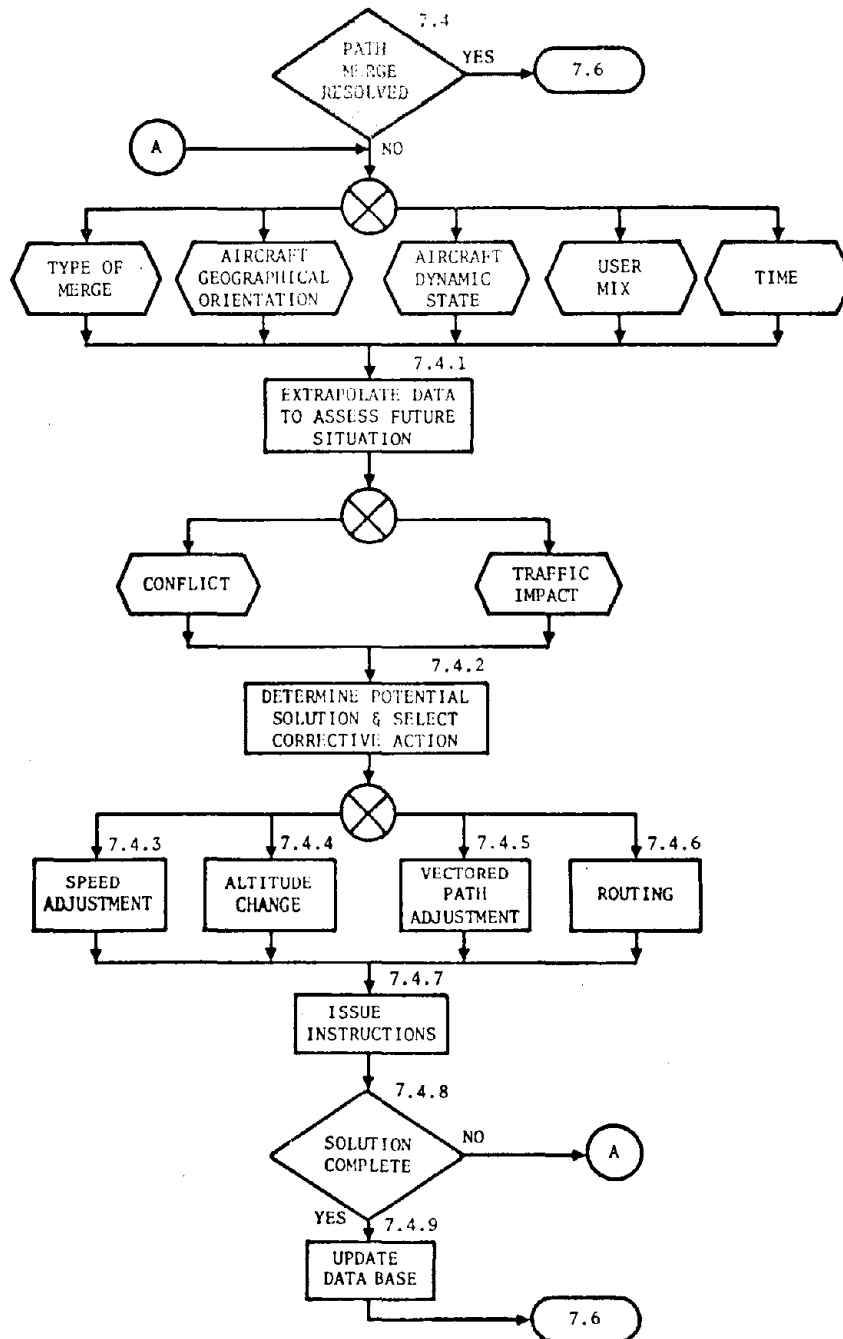
Arrival-Accept Handoff
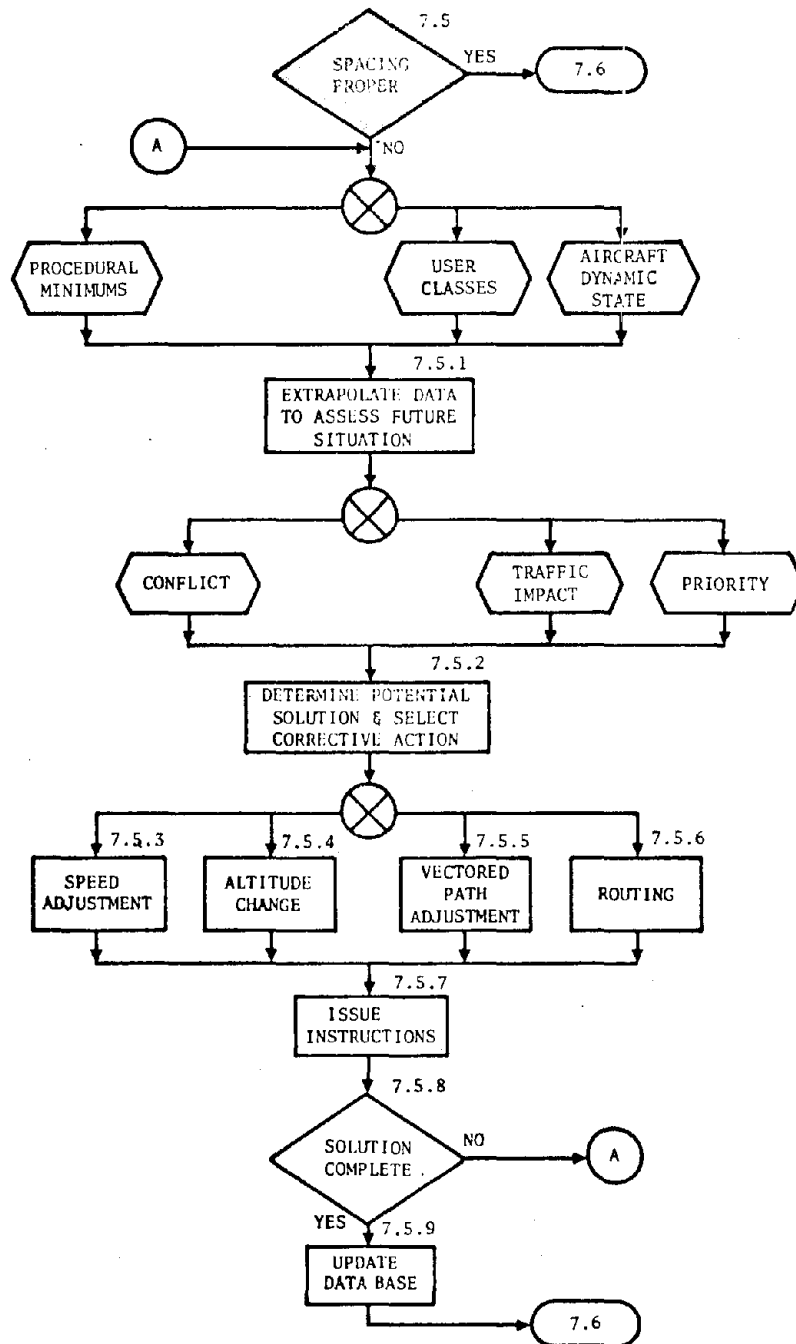Diagram, Level III
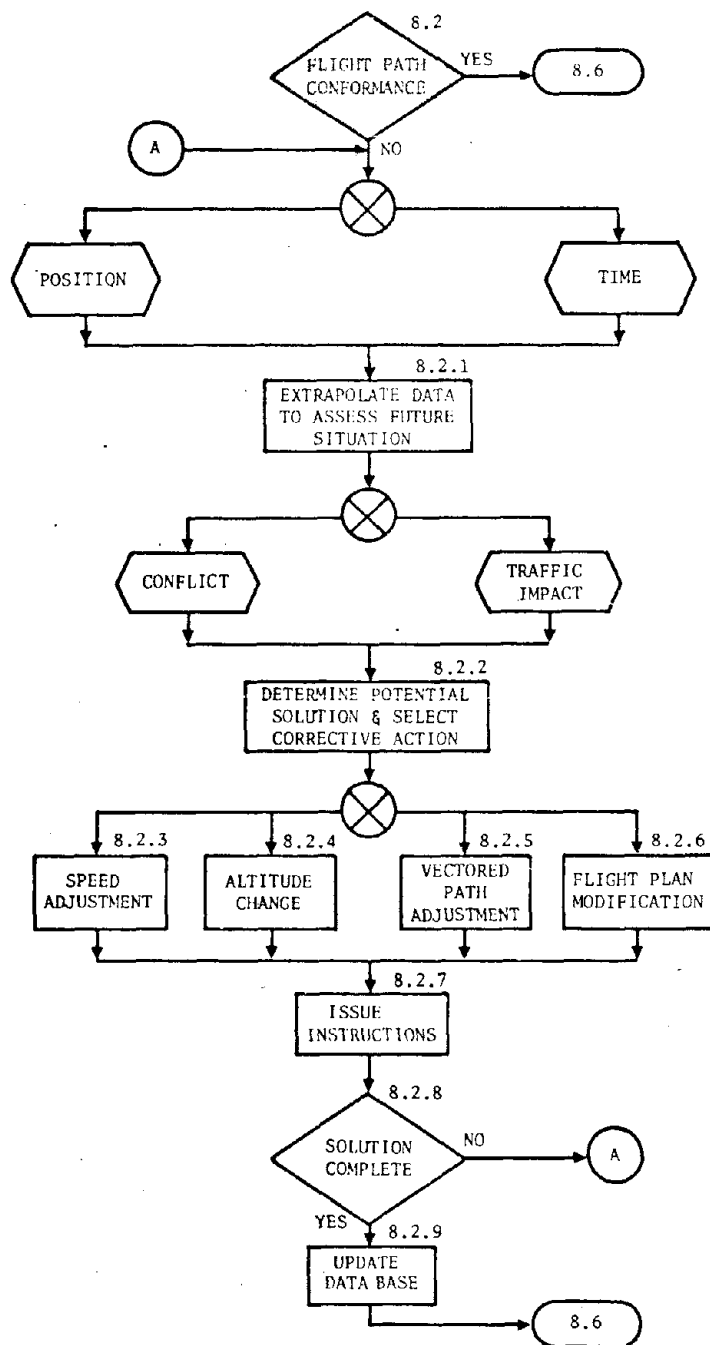
Arrival-Flight Path
Conformance Diagram, Level III
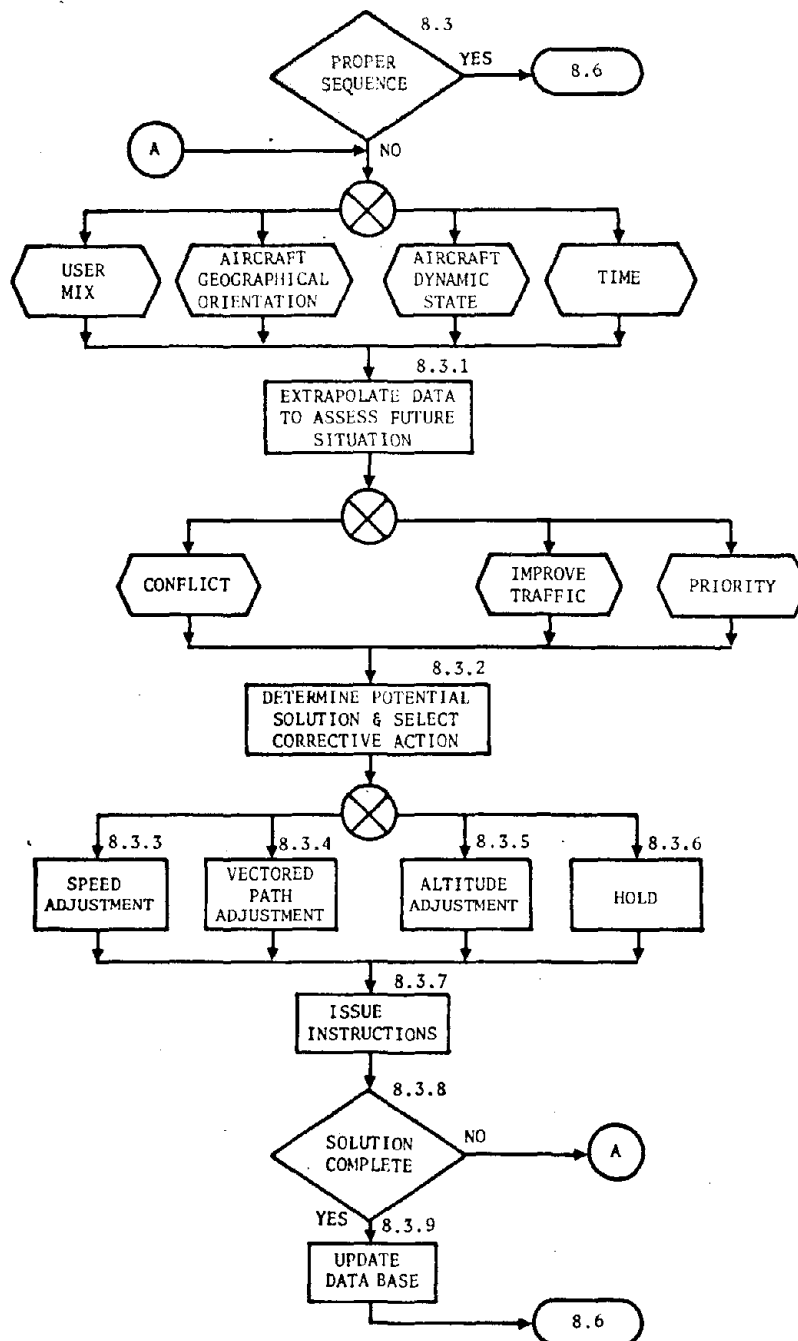
Arrival-Proper Sequence
Diagram, Level III
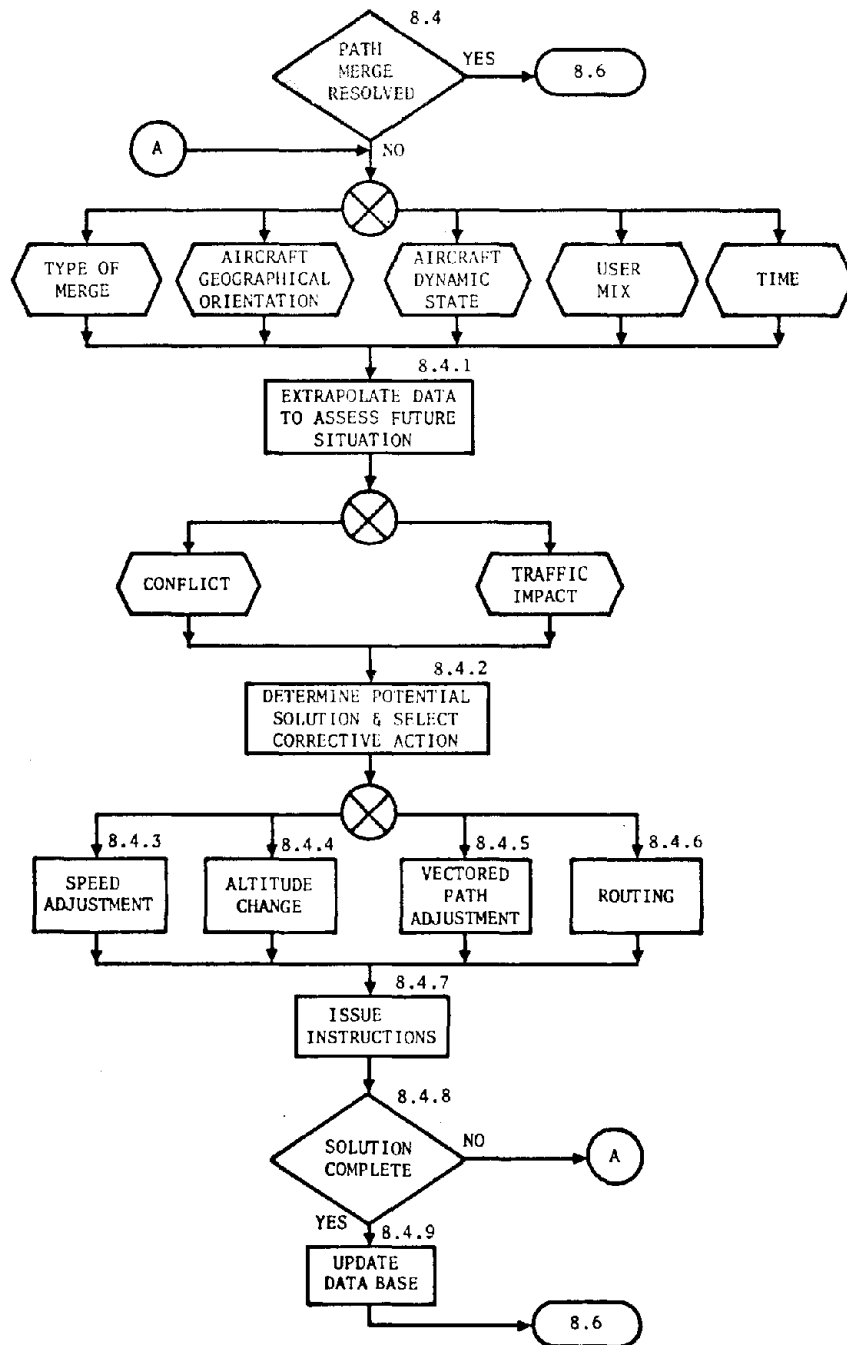
Arrival-Path Merge
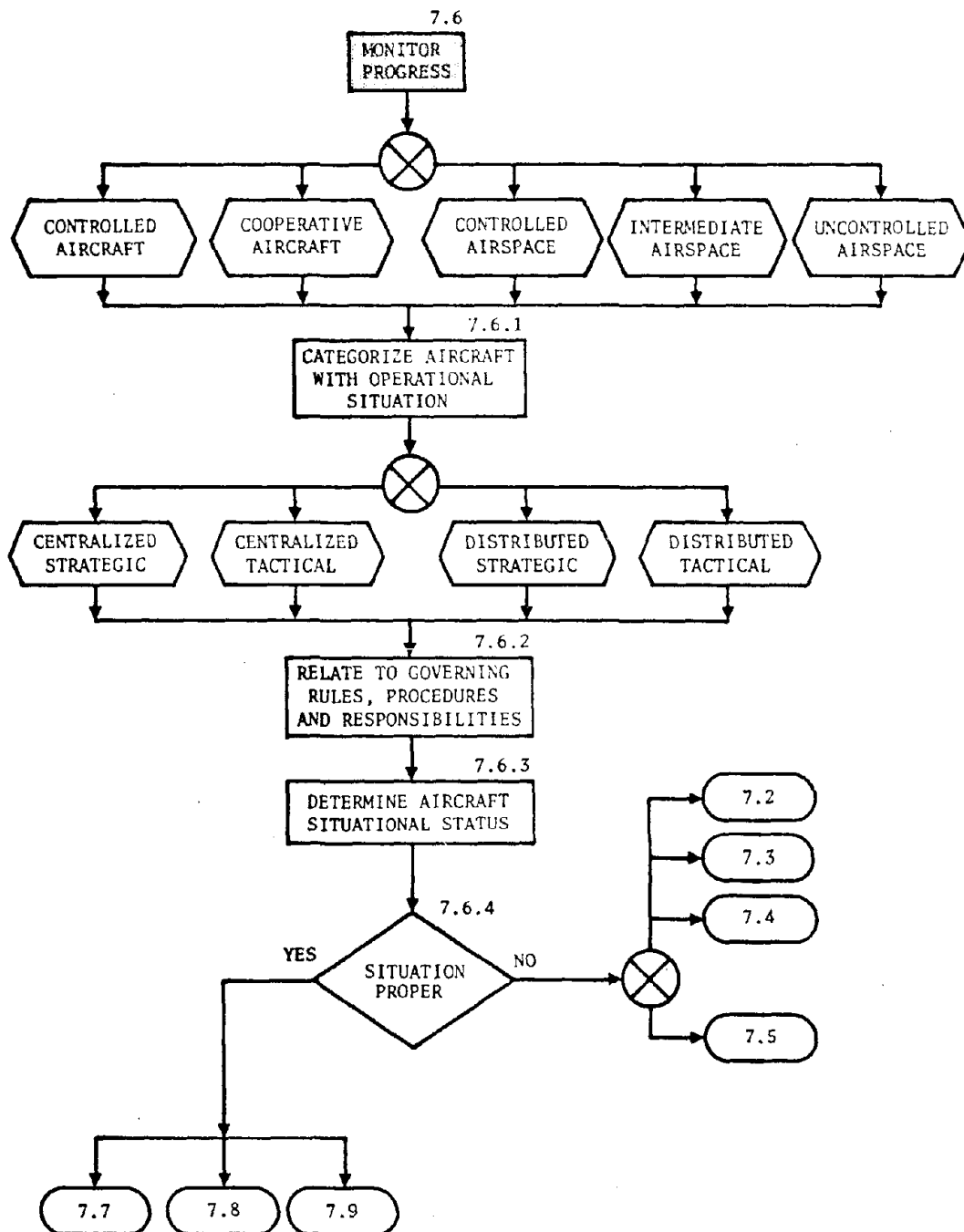Resolved Diagram, Level III
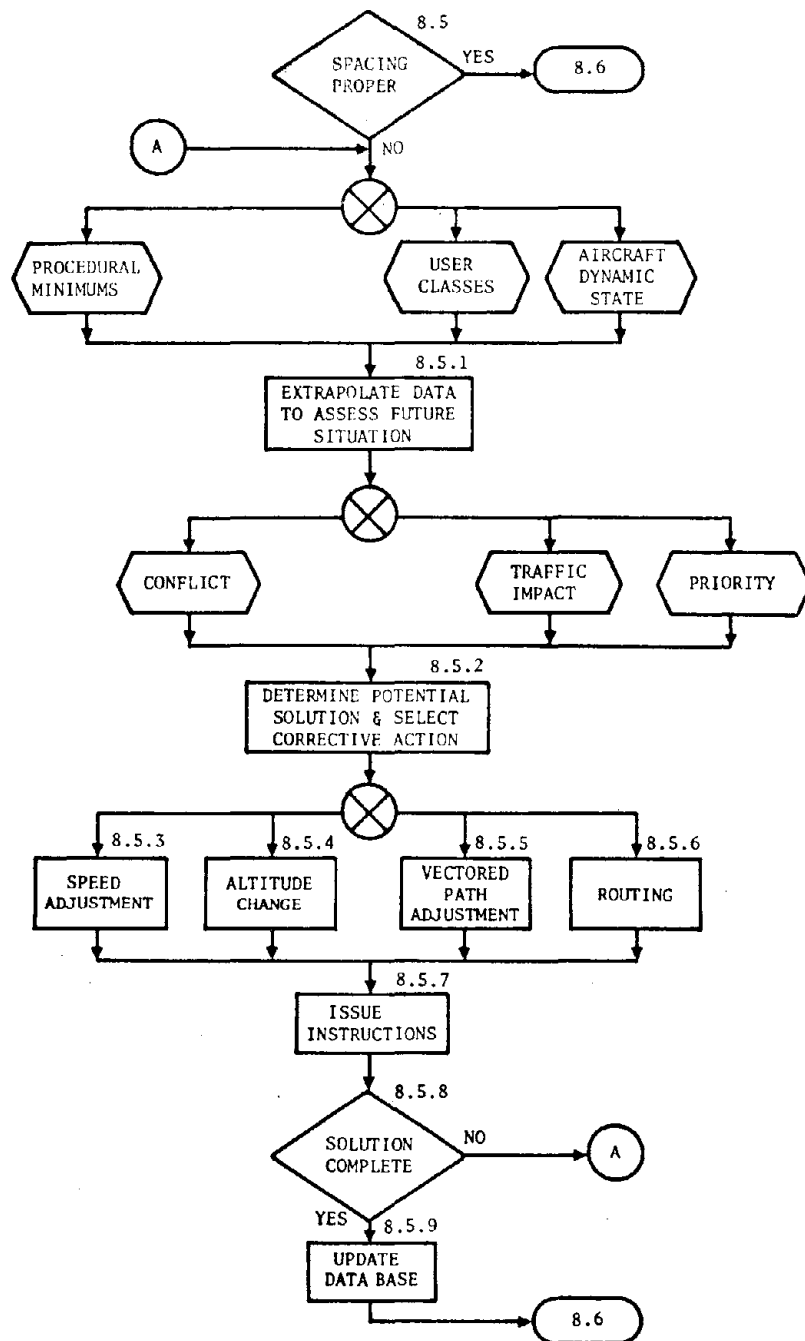
Arrival-Spacing Proper
Diagram, Level III

8.6

```
┌──────────┐
│ MONITOR  │
│ PROGRESS │
└──────────┘
```



```
┌──────────┐  ┌──────────┐  ┌──────────┐  ┌──────────┐  ┌──────────┐
│CONTROLLED│  │COOPERATIVE│ │CONTROLLED│  │INTERMEDIATE│ │UNCONTROLLED│
│ AIRCRAFT │  │ AIRCRAFT │  │ AIRSPACE │  │  AIRSPACE  │ │  AIRSPACE  │
└──────────┘  └──────────┘  └──────────┘  └──────────┘  └──────────┘
```

8.6.1

```
┌─────────────────┐
│CATEGORIZE AIRCRAFT│
│ WITH OPERATIONAL │
│    SITUATION     │
└─────────────────┘
```

```
┌───────────┐  ┌───────────┐  ┌───────────┐  ┌───────────┐
│CENTRALIZED│  │CENTRALIZED│  │DISTRIBUTED│  │DISTRIBUTED│
│ STRATEGIC │  │ TACTICAL  │  │ STRATEGIC │  │ TACTICAL  │
└───────────┘  └───────────┘  └───────────┘  └───────────┘
```

8.6.2

```
┌──────────────────┐
│RELATE TO GOVERNING│
│ RULES, PROCEDURES │
│AND RESPONSIBILITIES│
└──────────────────┘
```

8.6.3

```
┌──────────────────┐
│DETERMINE AIRCRAFT │
│SITUATIONAL STATUS │
└──────────────────┘
```

8.6.4

```
        YES  ◇ SITUATION ◇  NO
             ◇  PROPER   ◇
```
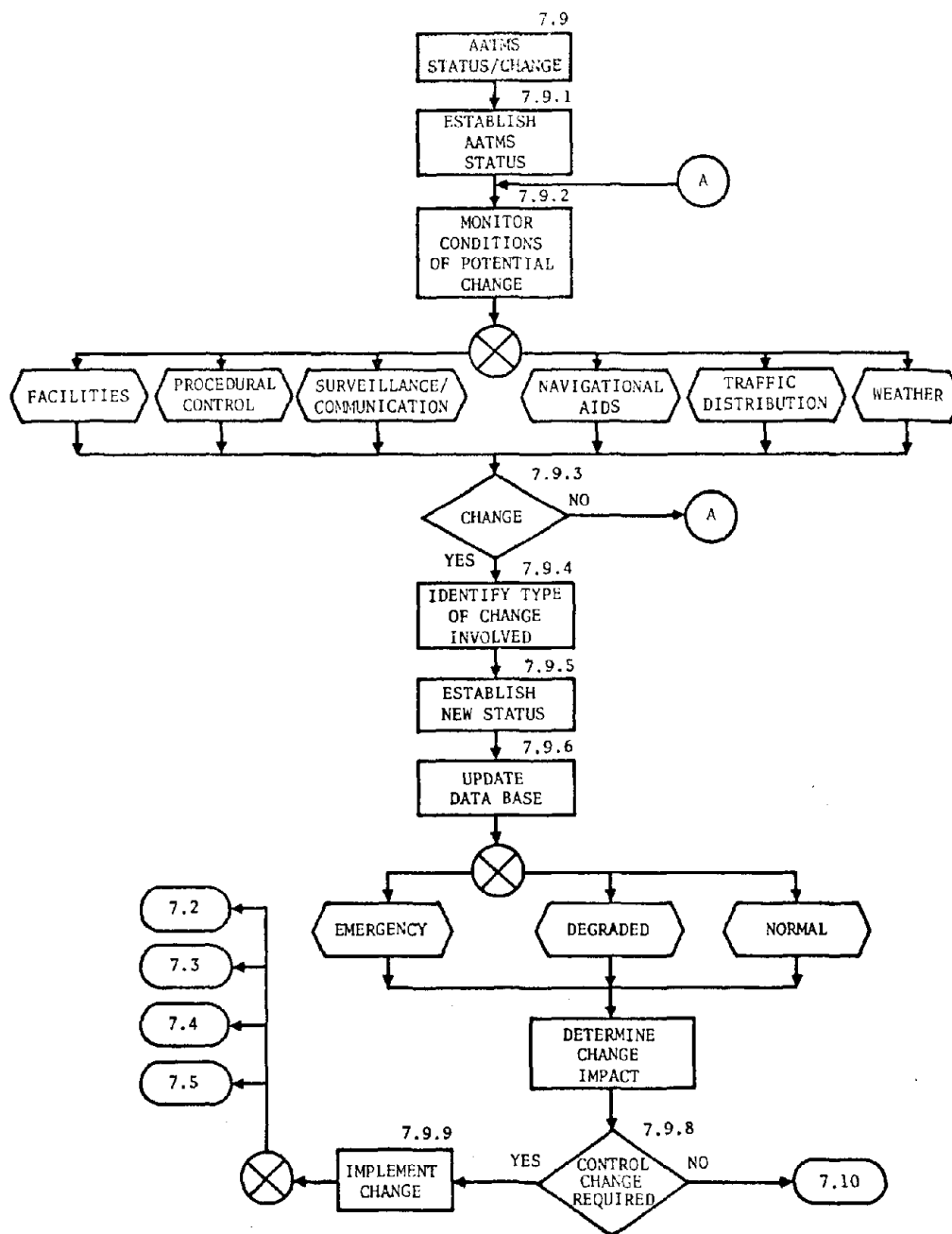
8.2

8.3

8.4

8.5

8.7   8.8   8.9

Arrival—Monitor Progress
Diagram, Level III
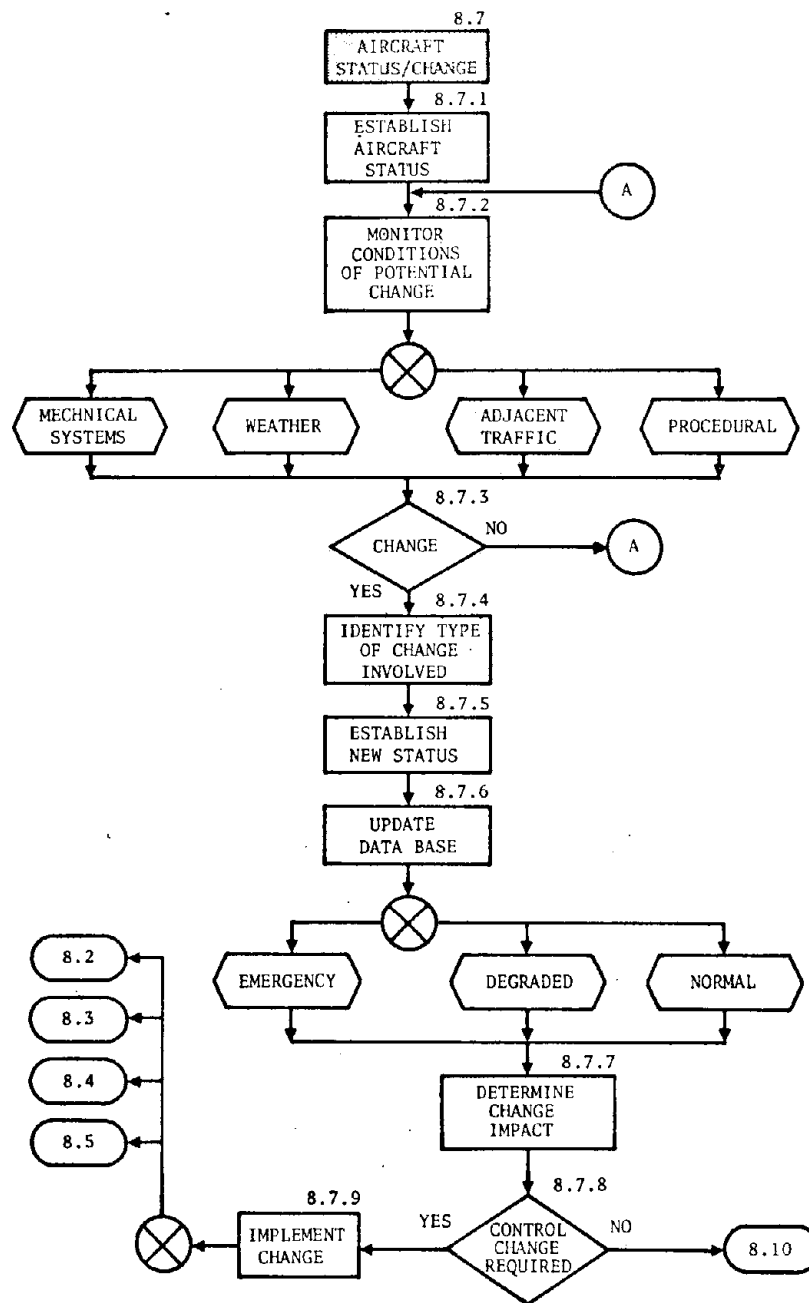
Arrival-Aircraft Status/
Change Diagram, Level III
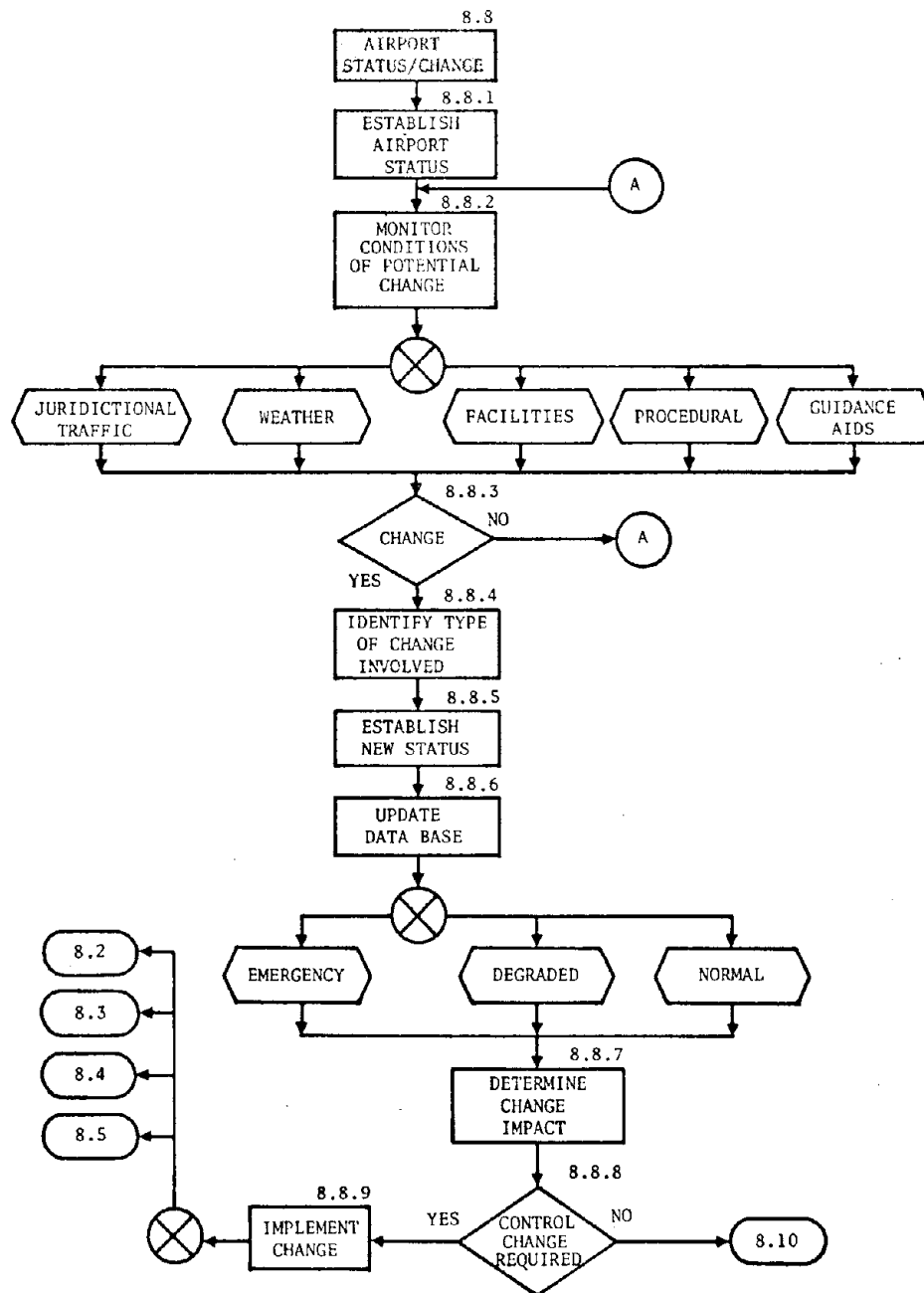
Arrival-Airport Status/Change
Diagram, Level III

8.9
AATMS
STATUS/CHANGE
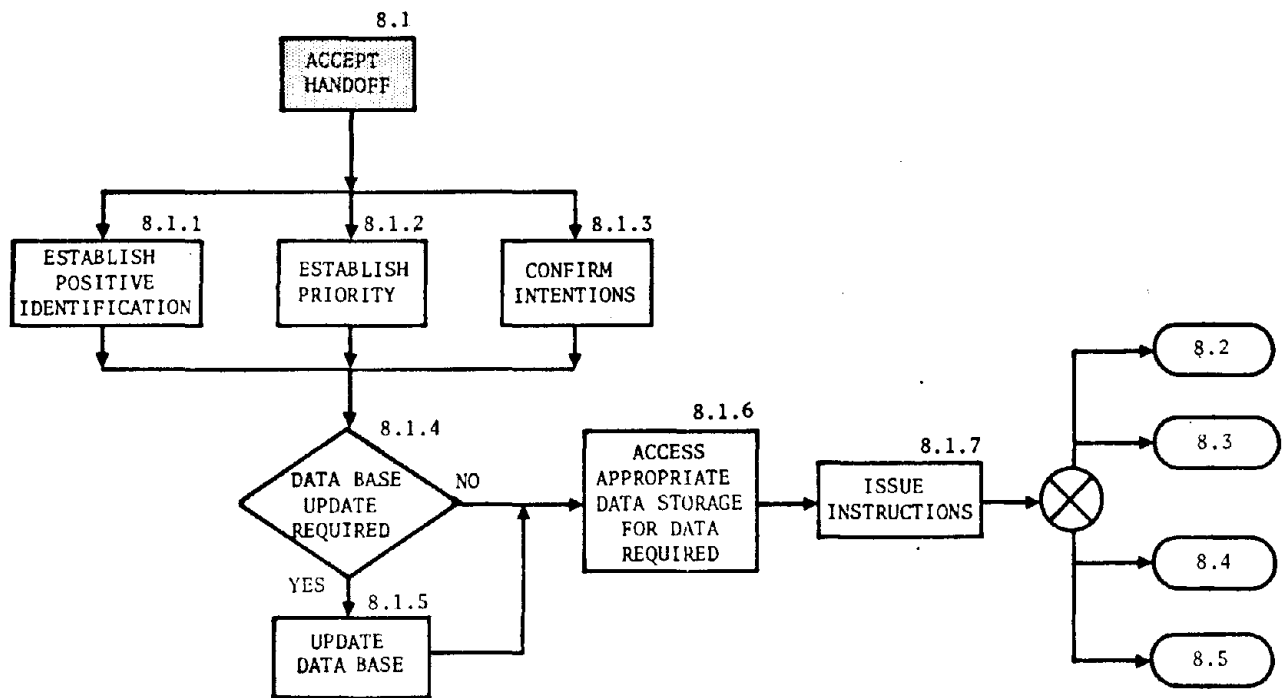
8.9.1
ESTABLISH
AATMS STATUS

A

8.9.2
MONITOR
CONDITIONS
OF POTENTIAL
CHANGE

⊗

FACILITIES   PROCEDURAL   SURVEILLANCE/   NAVIGATIONAL   TRAFFIC   WEATHER
               CONTROL   COMMUNICATION   AIDS   DISTRIBUTION

8.9.3
CHANGE   NO   A
YES

8.9.4
IDENTIFY TYPE
OF CHANGE
INVOLVED

8.9.5
ESTABLISH
NEW STATUS

8.9.6
UPDATE
DATA BASE

⊗

8.2
8.3
8.4
8.5

EMERGENCY   DEGRADED   NORMAL

8.9.7
DETERMINE
CHANGE
IMPACT

8.9.9   8.9.8
IMPLEMENT   YES   CONTROL   NO   8.10
CHANGE   CHANGE
⊗   REQUIRED

Arrival-AATMS Status/
Change Diagram, Level III

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8.10

HANDOFF

8.10.1
COORDINATION
WITH ADJACENT
CONTROL

8.10.2
COORDINATION
WITH
AIRCRAFT

8.10.3
SITUATION/
PLANS
CHANGED

NO

8.10.4
TRANSFER
RESPONSIBILITY

9.0

YES

8.7.4

8.8.4

8.9.4

Arrival - Handoff Diagram, Level III
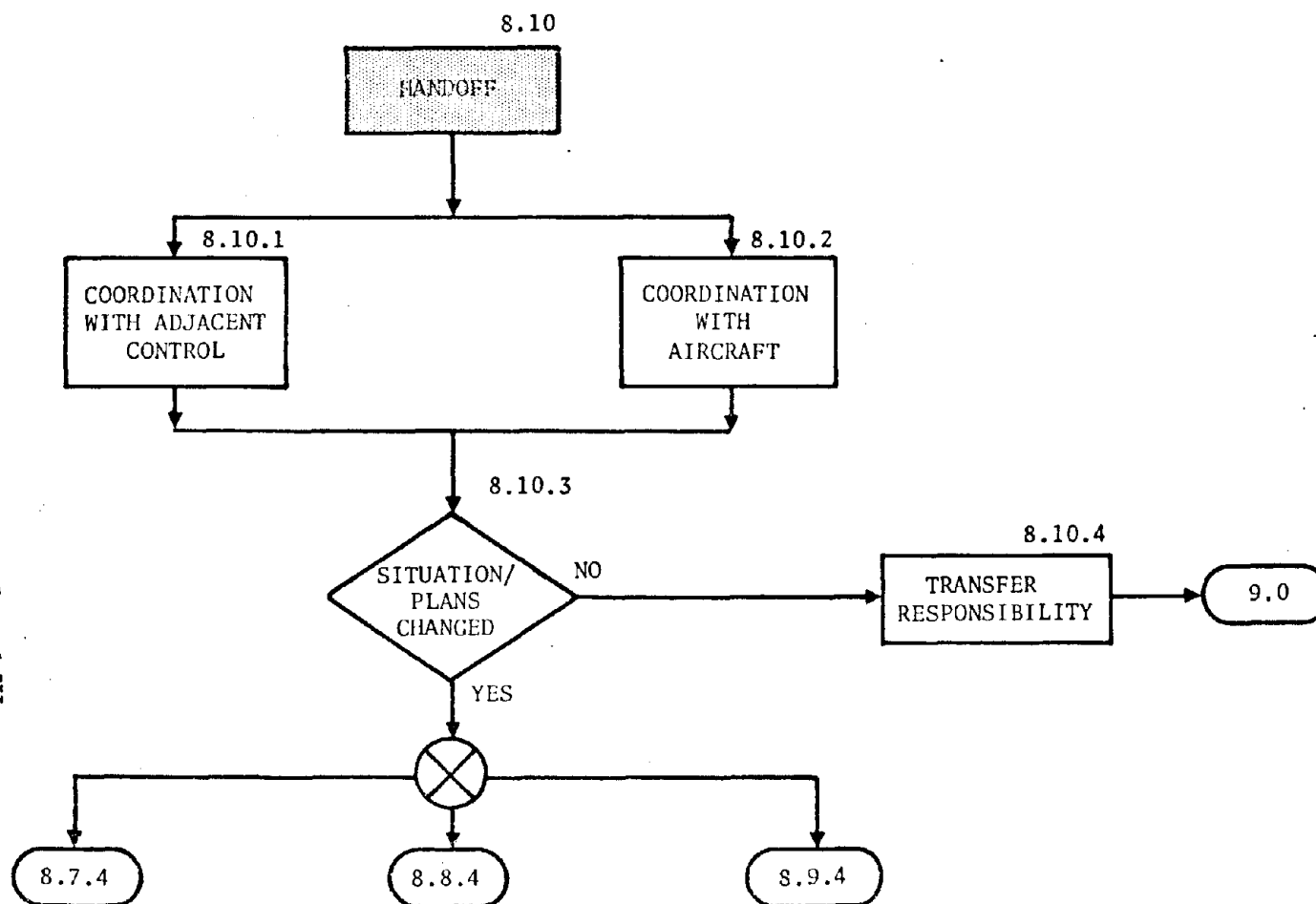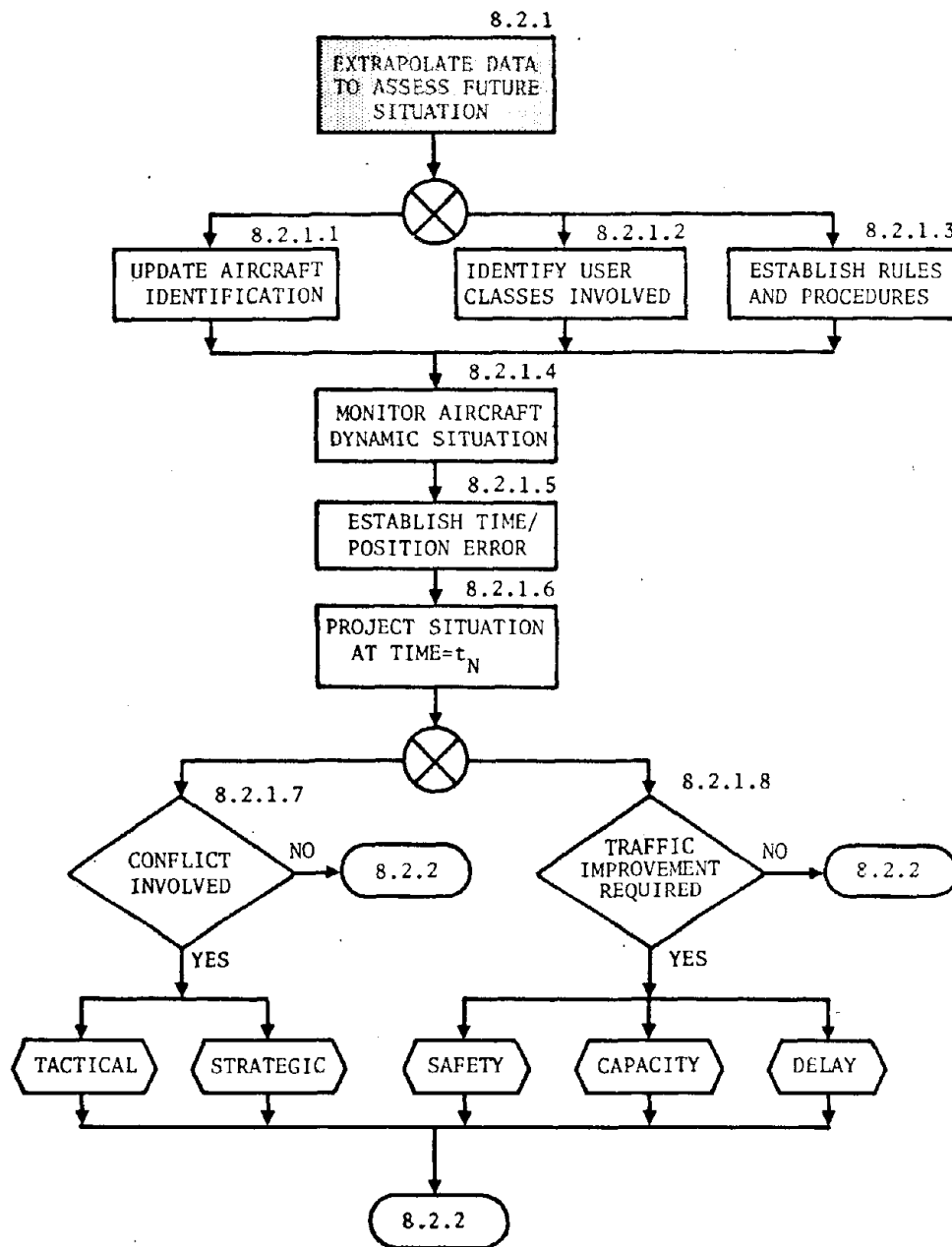
Extrapolate Data to Assess Future Situation for Flight Path Conformance
Function, Level IV

8.2.2
```
DETERMINE POTENTIAL
SOLUTION & SELECT
CORRECTIVE ACTION
```

8.2.2.1
```
SELECT MANEUVER
OPTIONS
```

8.2.2.2
```
AIRCRAFT
CAPABLE
```
NO

YES

8.2.2.3
```
SELECT MANEUVER
OPTIONS FOR
ADJACENT AIRCRAFT
```

8.2.2.4
```
PROJECT RESULTANT TRACKS
TO TIME EQUAL $t_N$
```

8.2.2.5
```
COMPARE RESULTANT
SITUATIONS
```

MINIMUM SEPARATION
DISTANCE

MINIMIZE TRAFFIC
IMPACT

FACILITATE PILOT
COMPLIANCE

8.2.2.6
```
SELECT CONTROL
MANEUVER
```

8.2.3   8.2.4   8.2.5   8.2.6
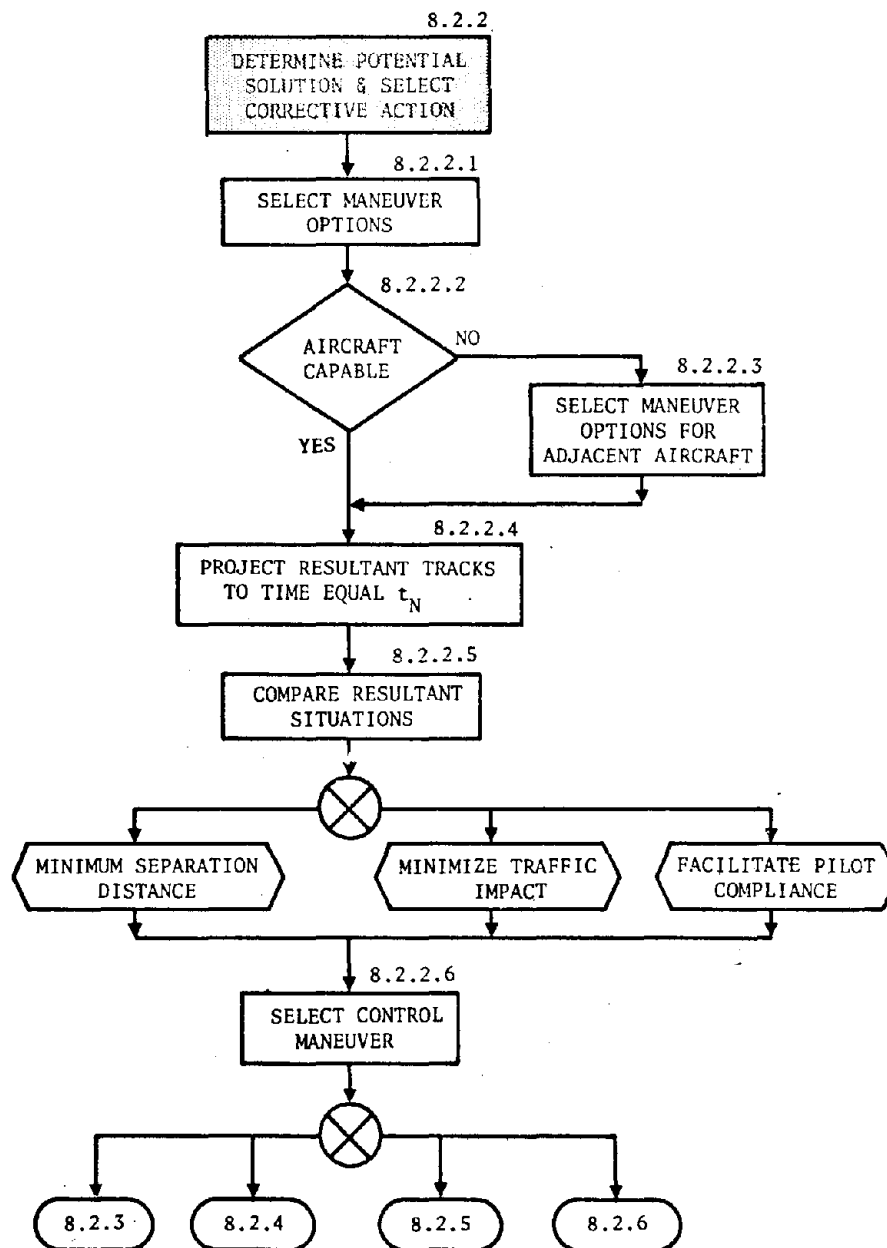
Determine Potential Solution and Select Corrective Action for
Flight Path Conformance Function, Level IV

Speed Adjustment for Flight Path Conformance
Function, Level IV

8.2.4

```
┌─────────────────┐
│   ALTITUDE      │
│    CHANGE       │
└─────────────────┘
         │
         ▼                    8.2.4.1
┌─────────────────────────┐
│ RELATE ALTITUDE CHANGE  │
│ AT TIME/POSITION ERROR  │
└─────────────────────────┘
         │                              8.2.4.2        ◄────────( A )
         ▼
┌─────────────────────────┐
│ ESTABLISH ALTITUDE      │
│ PROFILE REQUIRED        │
└─────────────────────────┘
         │
```

⟨ RATE OF CLIMB/ DESCENT ⟩   ⟨ WIND SHEAR ⟩   ⟨ TIME INITIATED ⟩   ⟨ DURATION ⟩

8.2.4.3

┌─────────────────────────┐
│ COMPARE PROJECTED TIME/ │
│ POSITION TO REQUIRED   │
│ CONFORMANCE PATH   │
└─────────────────────────┘

8.2.4.4

PROJECTED ERROR AT t_N WITHIN TOLERANCE ── NO ──▶ (A)

YES

(8.2.7)
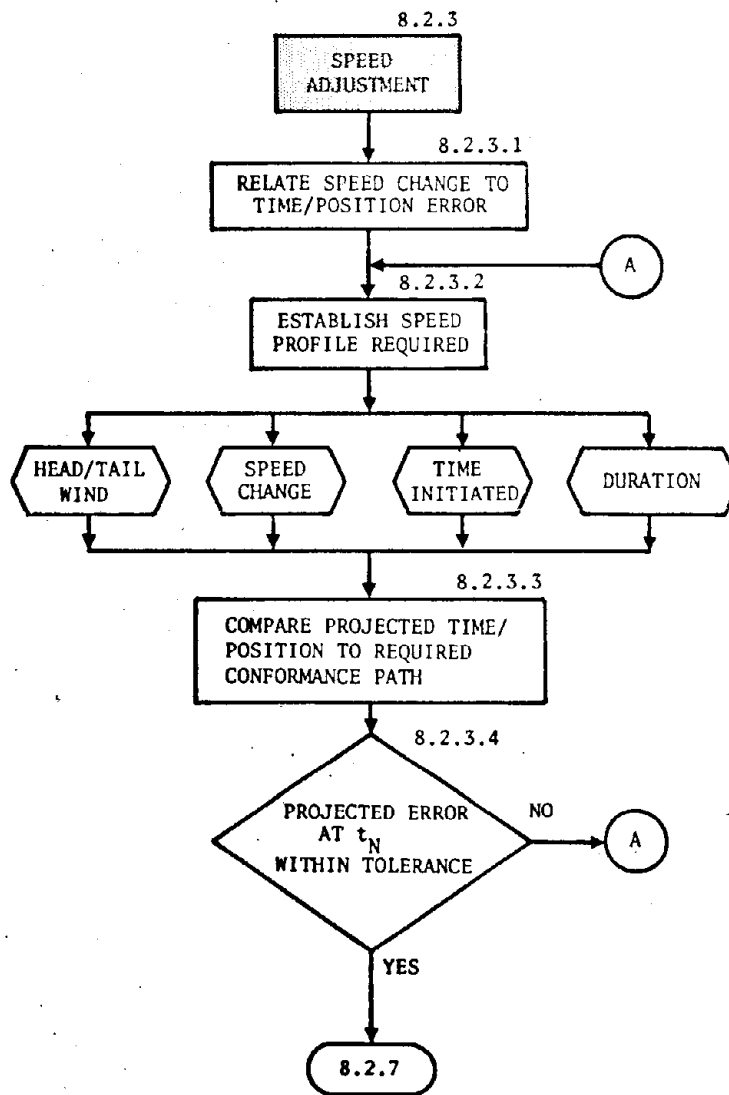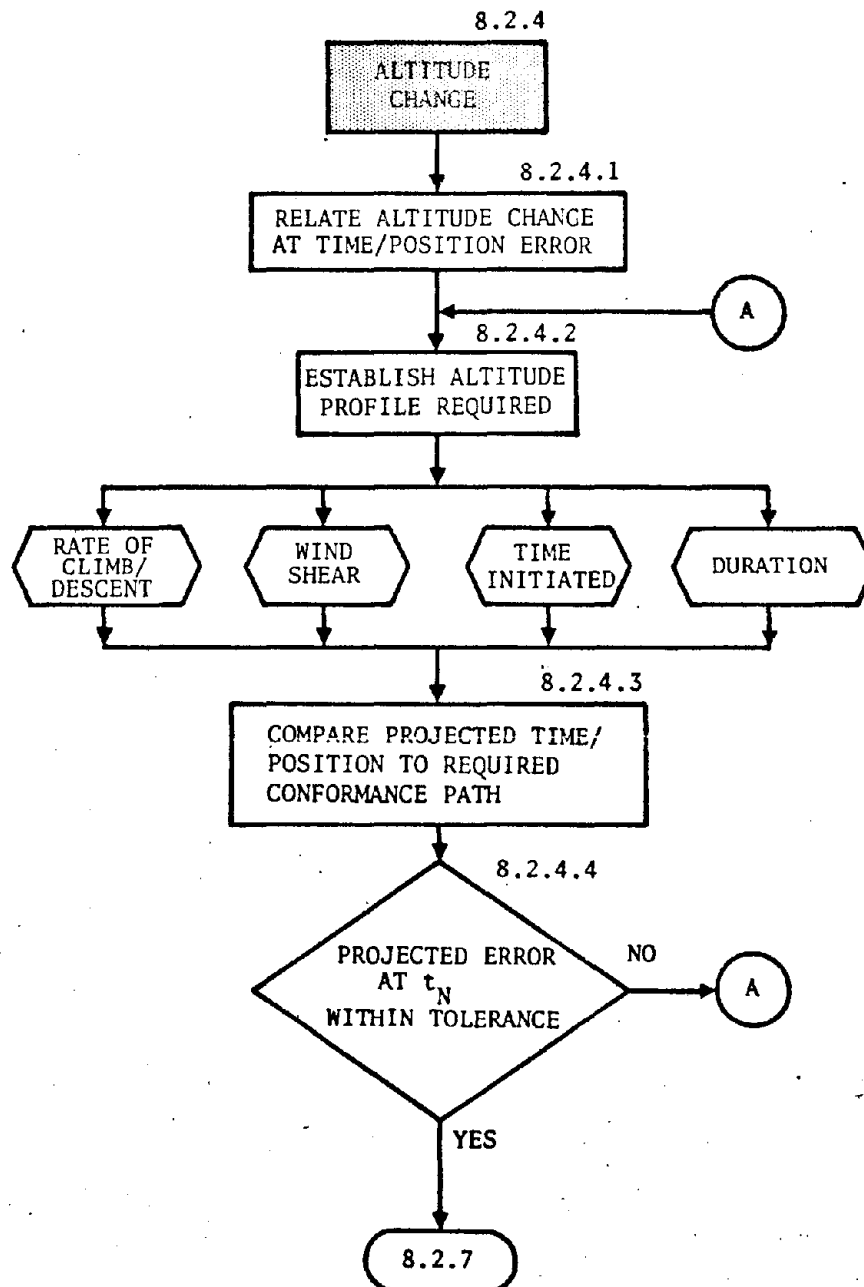
Altitude Change for Flight Path Conformance Function, Level IV

-102-
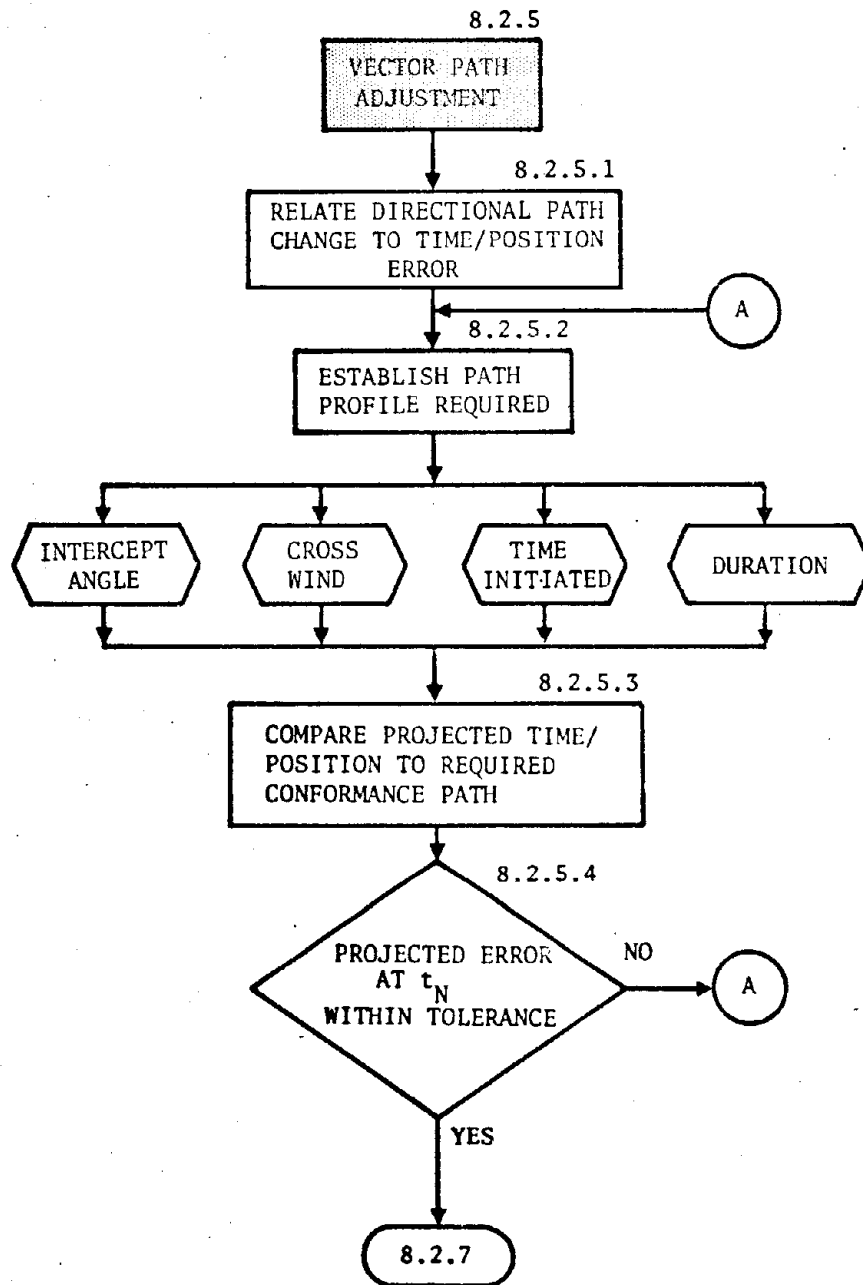
Vector Path Adjustment for Flight Path Conformance Function, Level IV

```
                                         8.2.6
                              ┌─────────────────────┐
                              │   MODIFY FLIGHT      │
                              │        PLAN          │
                              └─────────────────────┘
                                         │        8.2.6.1
                                         ▼
                              ┌─────────────────────┐
                              │  PROJECT FLIGHT      │
                              │  PLAN PROFILE TO     │
                              │    DESTINATION       │
                              └─────────────────────┘
                                         │
                                         ▼
   ┌───────────────┬──────────────┬──────────────┬──────────────┐
   ▼               ▼              ▼              ▼
 ⬡ FLIGHT        ⬡ ALTITUDE     ⬡ CHECK POINT   ⬡ SPECIAL
   PATH                            ETA'S           REQUIREMENTS
   │               │              │              │
   └───────────────┴──────────────┴──────────────┴──────────────┘
                                         │        8.2.6.2
                                         ▼
                              ┌─────────────────────┐
                              │  CONFIRM NEW FLIGHT  │
                              │    PLAN WITH ALL     │
                              │ COGNIZANT AUTHORITIES│
                              └─────────────────────┘
                                         │
                          ┌──────────────┴──────────────┐
                          ▼                              ▼
                      ⬡ HUB FLOW                  ⬡ DESTINATION AIRPORT
                        PLAN                        ARRIVAL TIME ACCEPTANCE
                          │                              │
                          └──────────────┬──────────────┘
                                         ▼
                                     ( 8.2.7 )
```
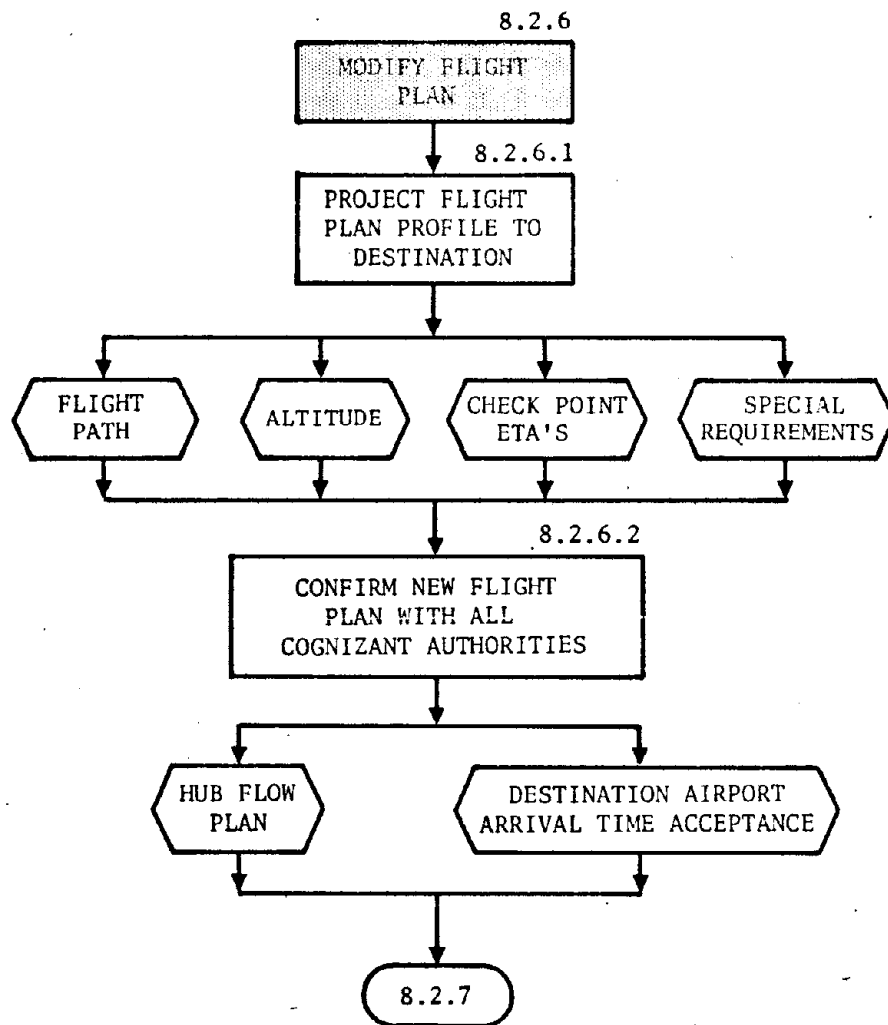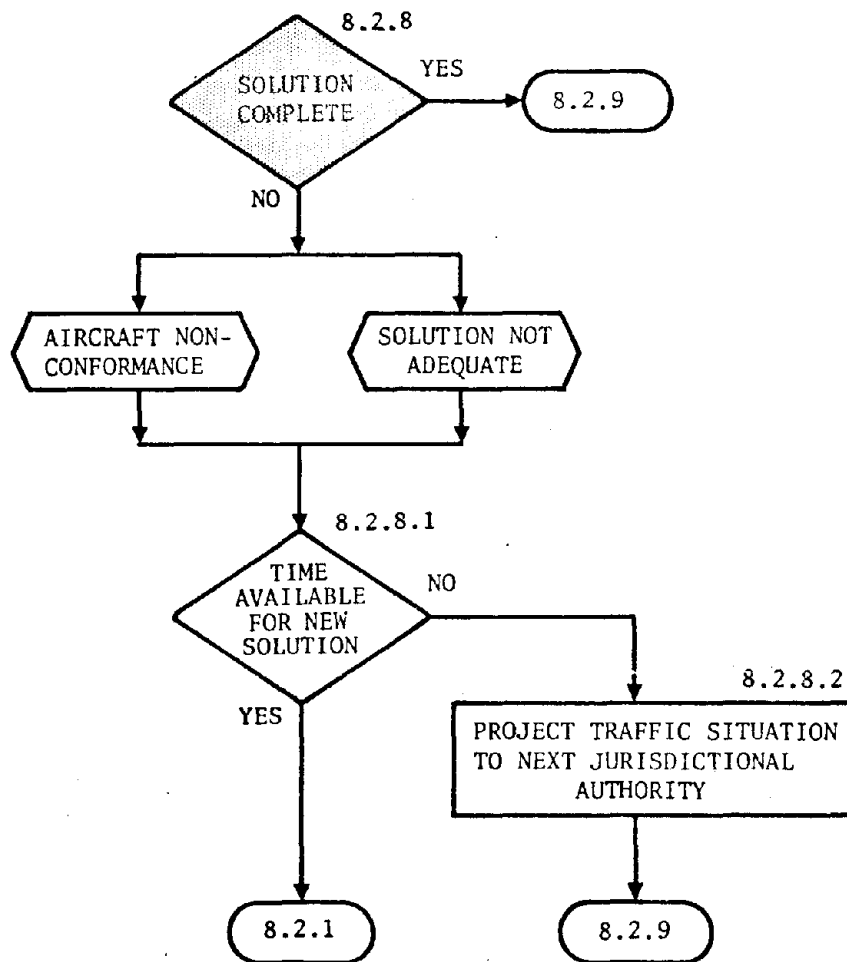
Modify Flight Plan for Flight Path Conformance Function, Level IV

```
                        8.2.7
              ┌───────────────────────┐
              │      ISSUE             │
              │   INSTRUCTIONS         │
              └───────────────────────┘
                         │
                         ▼   8.2.7.1
              ┌───────────────────────┐
              │   FORMULATE           │
              │   COMMANDS            │
              └───────────────────────┘
                         │
                         ▼            8.2.7.2
          ┌───────────────────────────────┐
          │  ESTABLISH COMMUNICATIONS      │
          │  WITH AFFECTED AIRCRAFT        │
          └───────────────────────────────┘
                         │
                         ▼      8.2.7.3
          ┌───────────────────────────────┐
          │   TRANSMITTAL AND              │
          │   CONFIRMATION OF              │
          │   INSTRUCTIONS                 │
          └───────────────────────────────┘
                         │
                         ▼
                  ╭───────────╮
                  │   8.2.8   │
                  ╰───────────╯
```
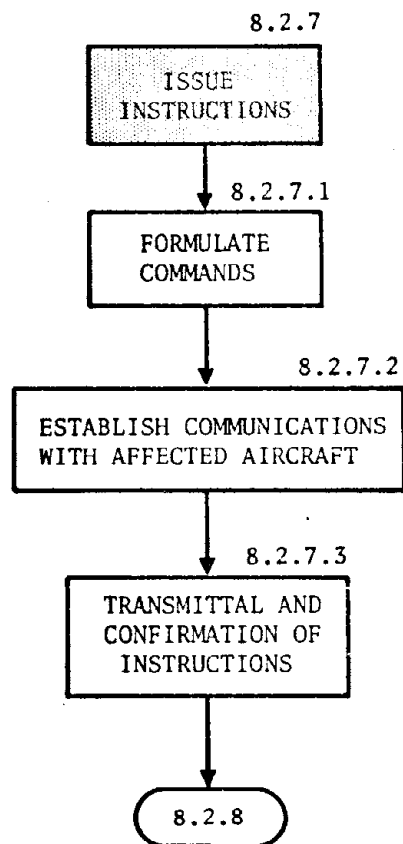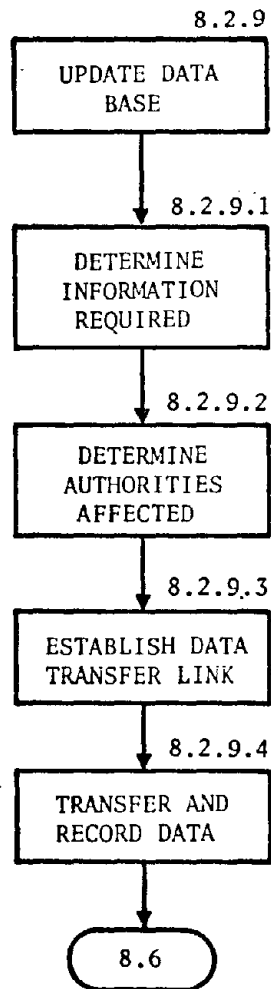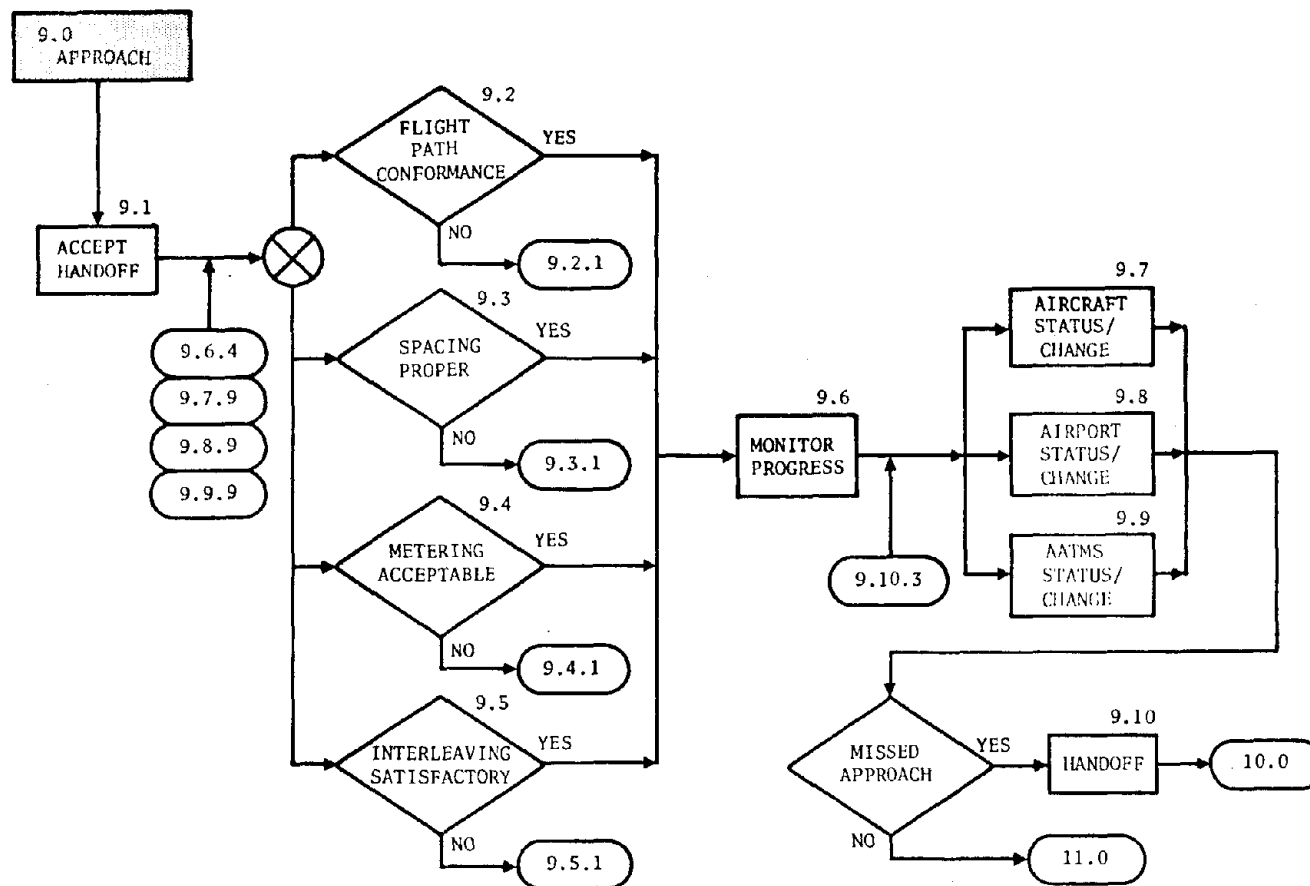
Issue Instructions for Flight Path Conformance Function, Level IV

Solution Complete for Flight Path Conformance Function, Level IV

```
                              8.2.9
                    ┌──────────────────┐
                    │  UPDATE  DATA    │
                    │     BASE         │
                    └──────────────────┘
                             │
                             │      8.2.9.1
                             ▼
                    ┌──────────────────┐
                    │   DETERMINE      │
                    │  INFORMATION     │
                    │   REQUIRED       │
                    └──────────────────┘
                             │
                             │      8.2.9.2
                             ▼
                    ┌──────────────────┐
                    │   DETERMINE      │
                    │  AUTHORITIES     │
                    │   AFFECTED       │
                    └──────────────────┘
                             │
                             │      8.2.9.3
                             ▼
                    ┌──────────────────┐
                    │  ESTABLISH DATA  │
                    │  TRANSFER LINK   │
                    └──────────────────┘
                             │
                             │      8.2.9.4
                             ▼
                    ┌──────────────────┐
                    │  TRANSFER AND    │
                    │  RECORD DATA     │
                    └──────────────────┘
                             │
                             ▼
                     ╭──────────────╮
                     │     8.6      │
                     ╰──────────────╯
```
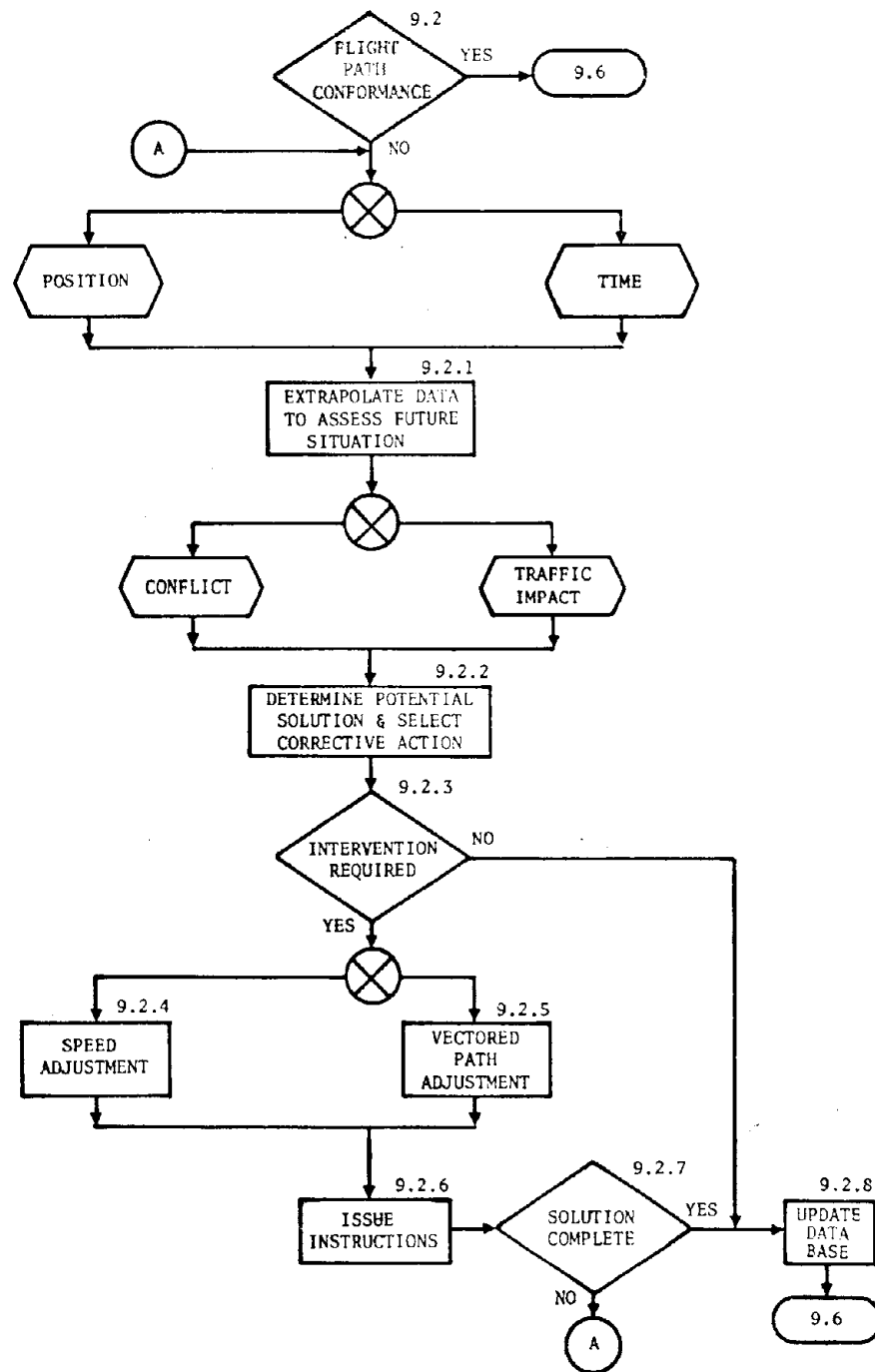
Update Data Base for Flight Path Conformance Function, Level IV

Approach Logic Flow Diagram, Level III

9.1

ACCEPT
HANDOFF

9.1.1
ESTABLISH
POSITIVE
IDENTIFICATION

9.1.2
ESTABLISH
PRIORITY

9.1.3
CONFIRM
INTENTIONS

9.1.4
DATA BASE
UPDATE
REQUIRED

NO

YES

9.1.5
UPDATE
DATA BASE

9.1.6
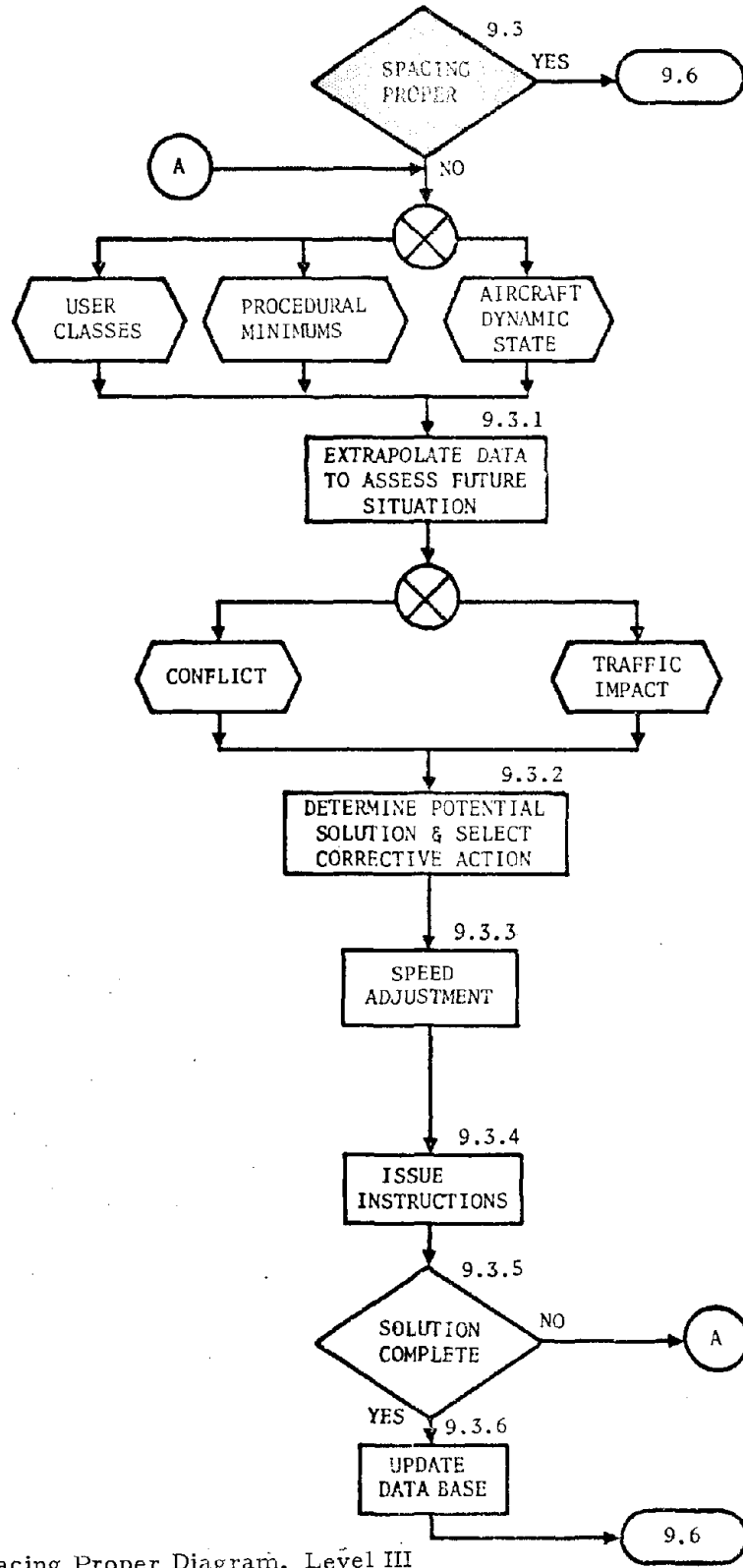ACCESS
APPROPRIATE
DATA STORAGE
FOR DATA
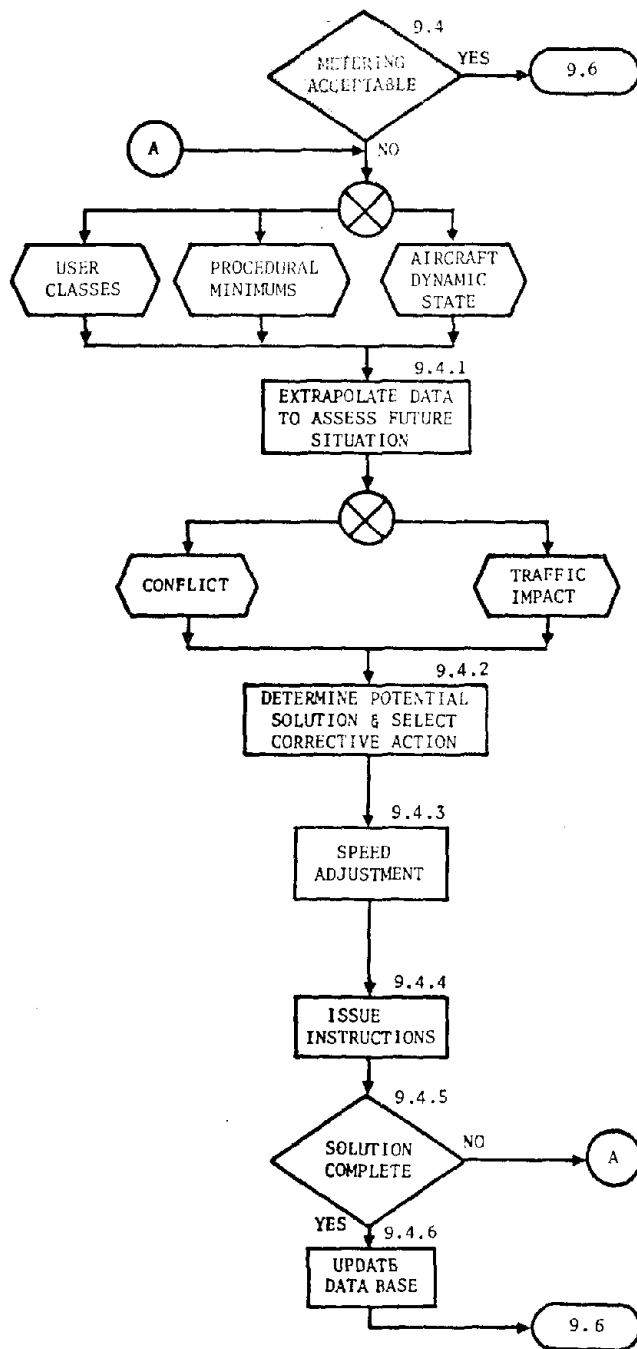REQUIRED

9.1.7
ISSUE
INSTRUCTIONS

9.2

9.3

9.4

9.5
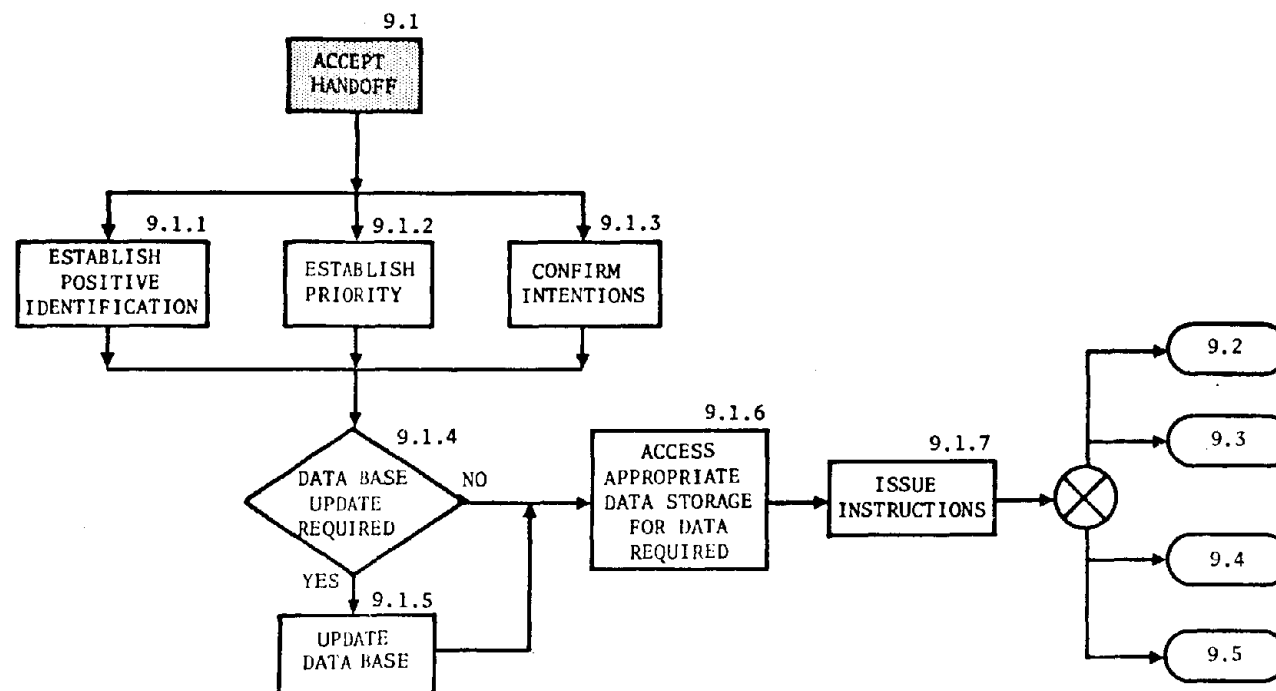
Approach-Accept Handoff Diagram, Level III

Approach-Flight Path Conformance Diagram, Level III
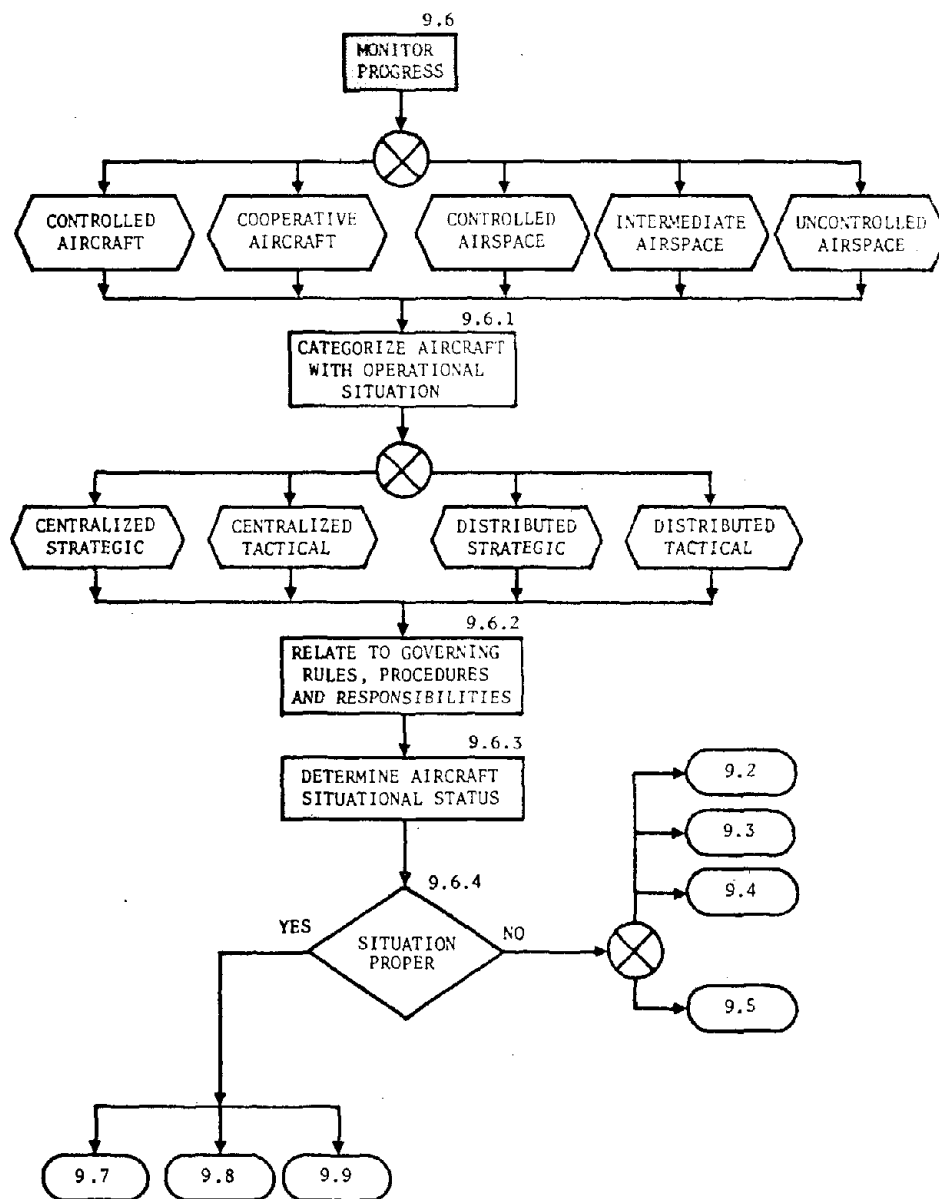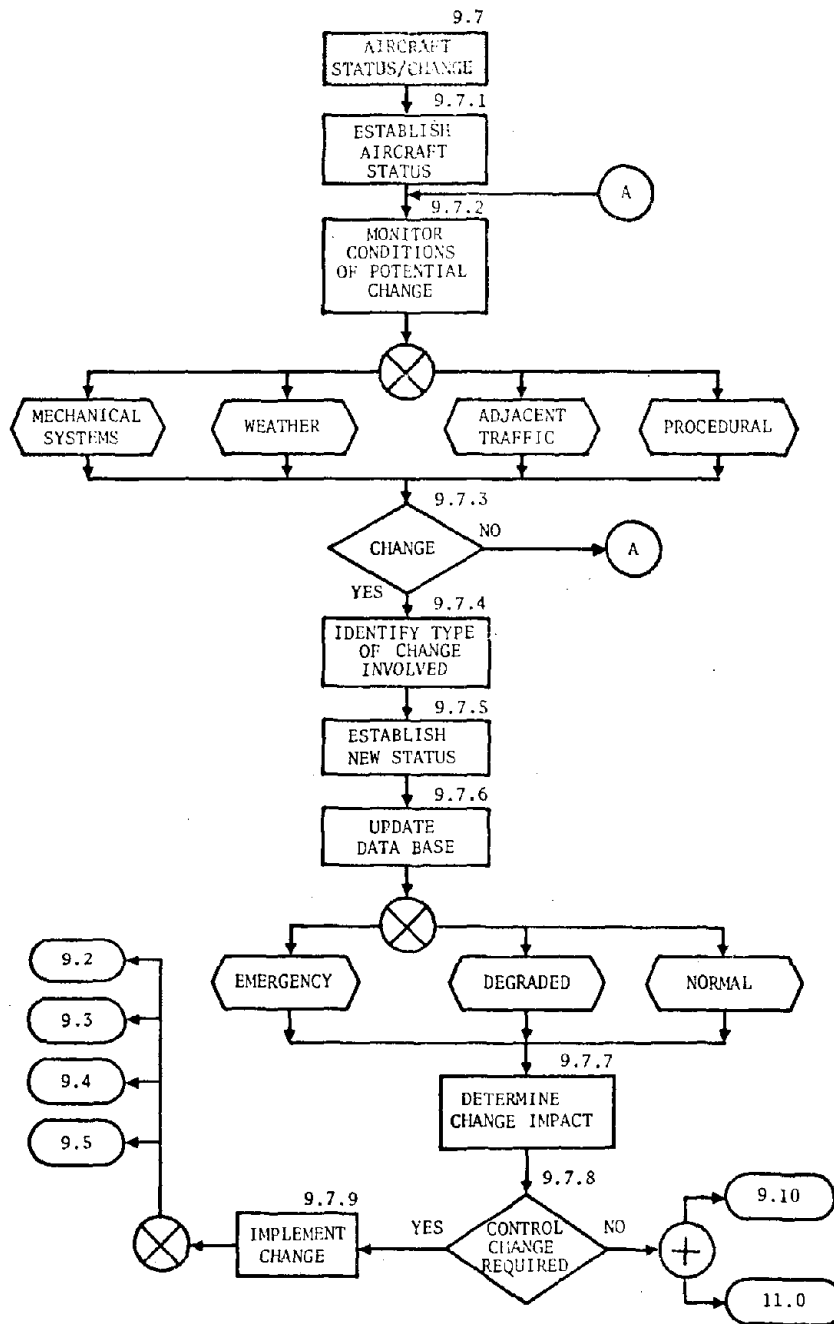
Approach - Spacing Proper Diagram, Level III

Approach-Metering Acceptable Diagram, Level III
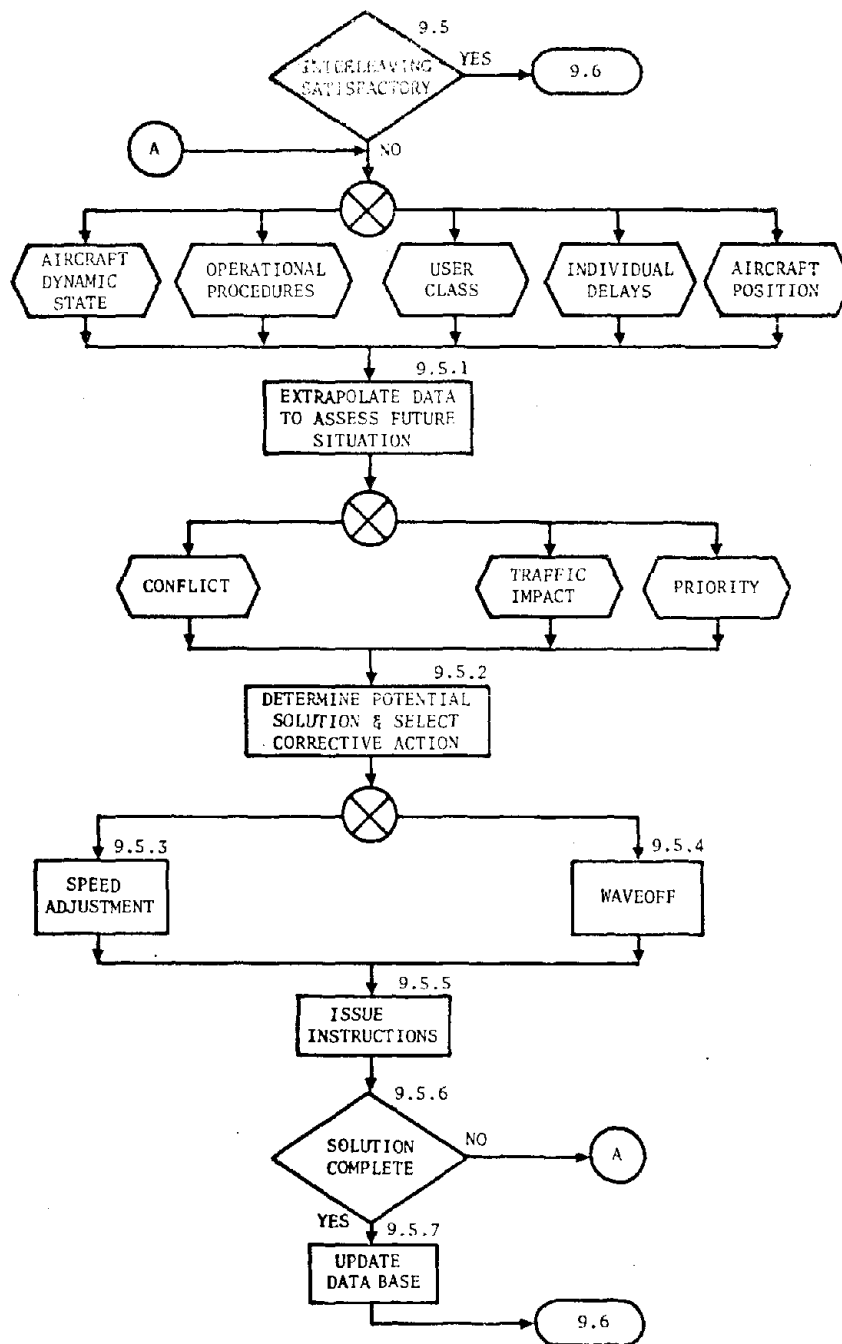
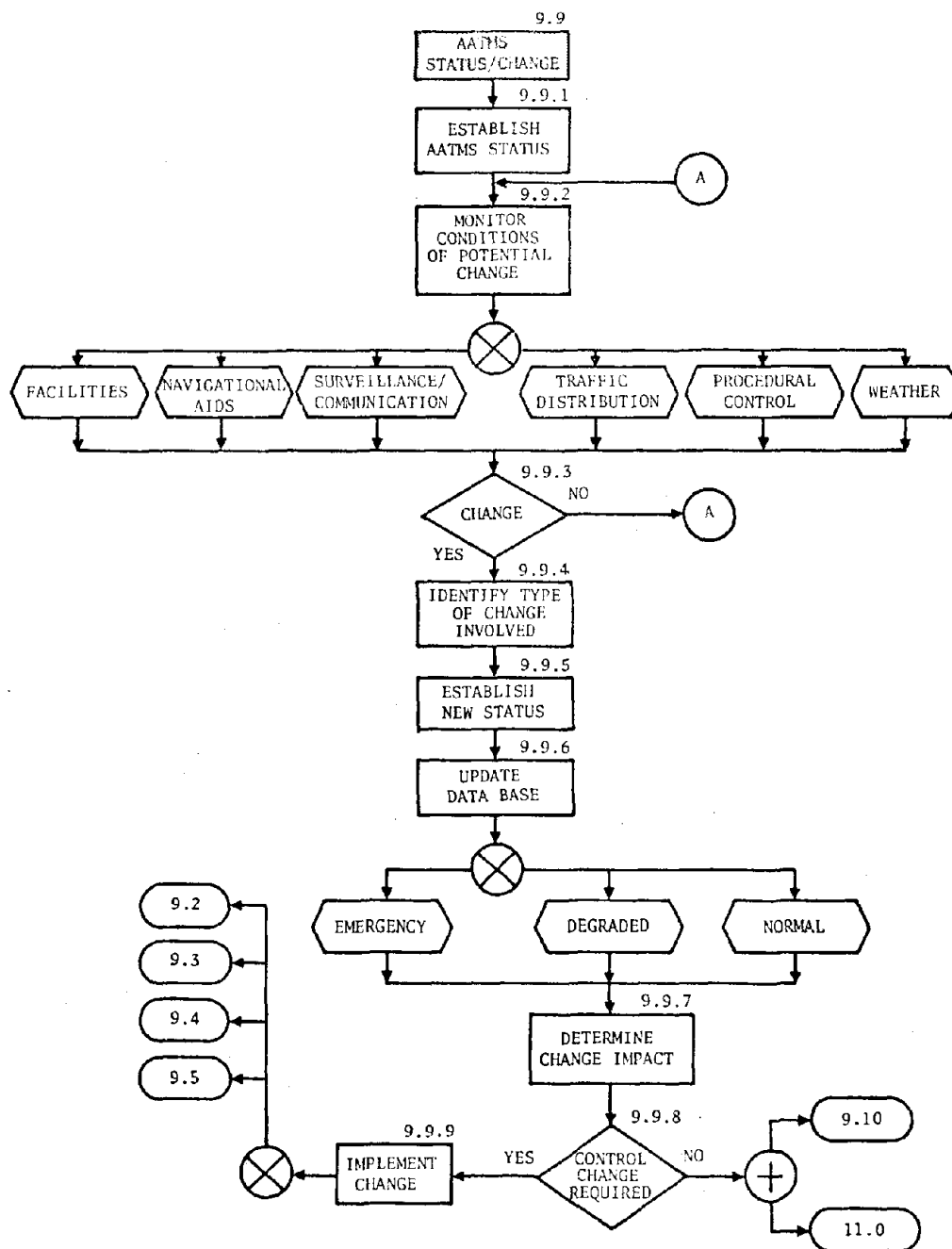Approach-Interleaving Satisfactory Diagram, Level III

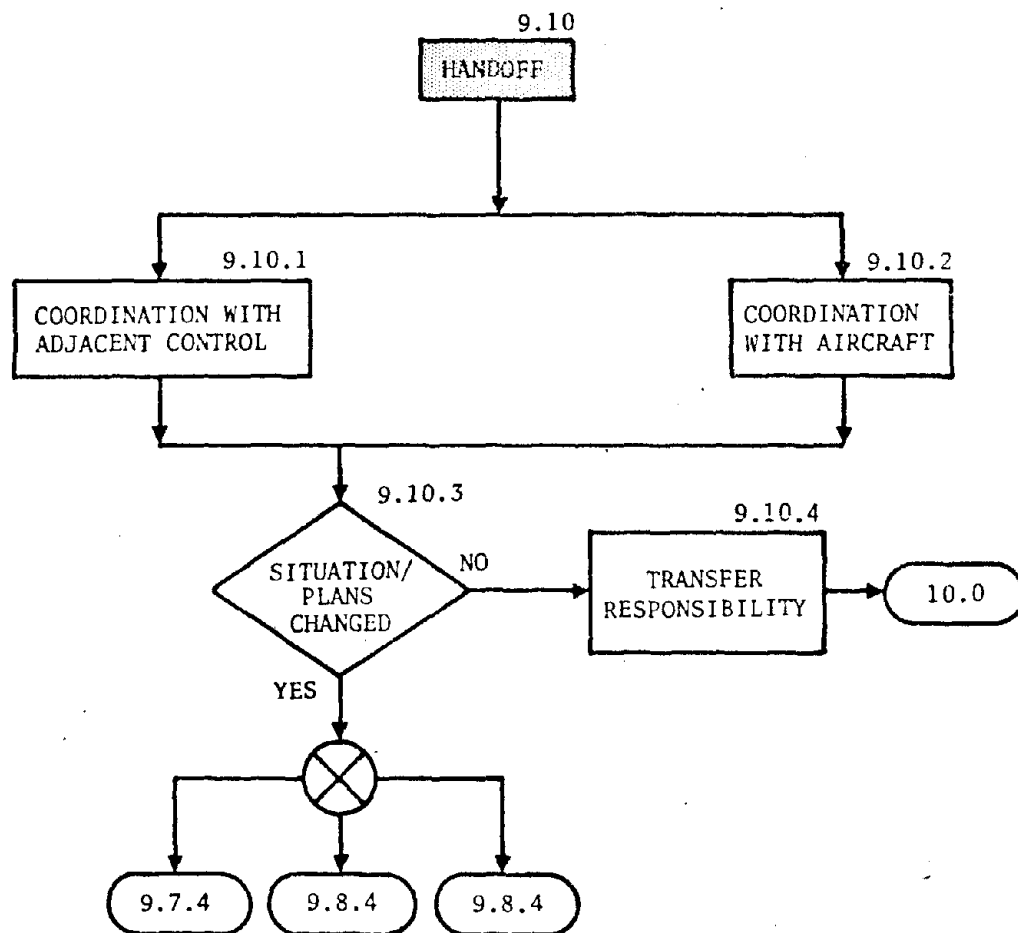Approach-Monitor Progress Diagram, Level III

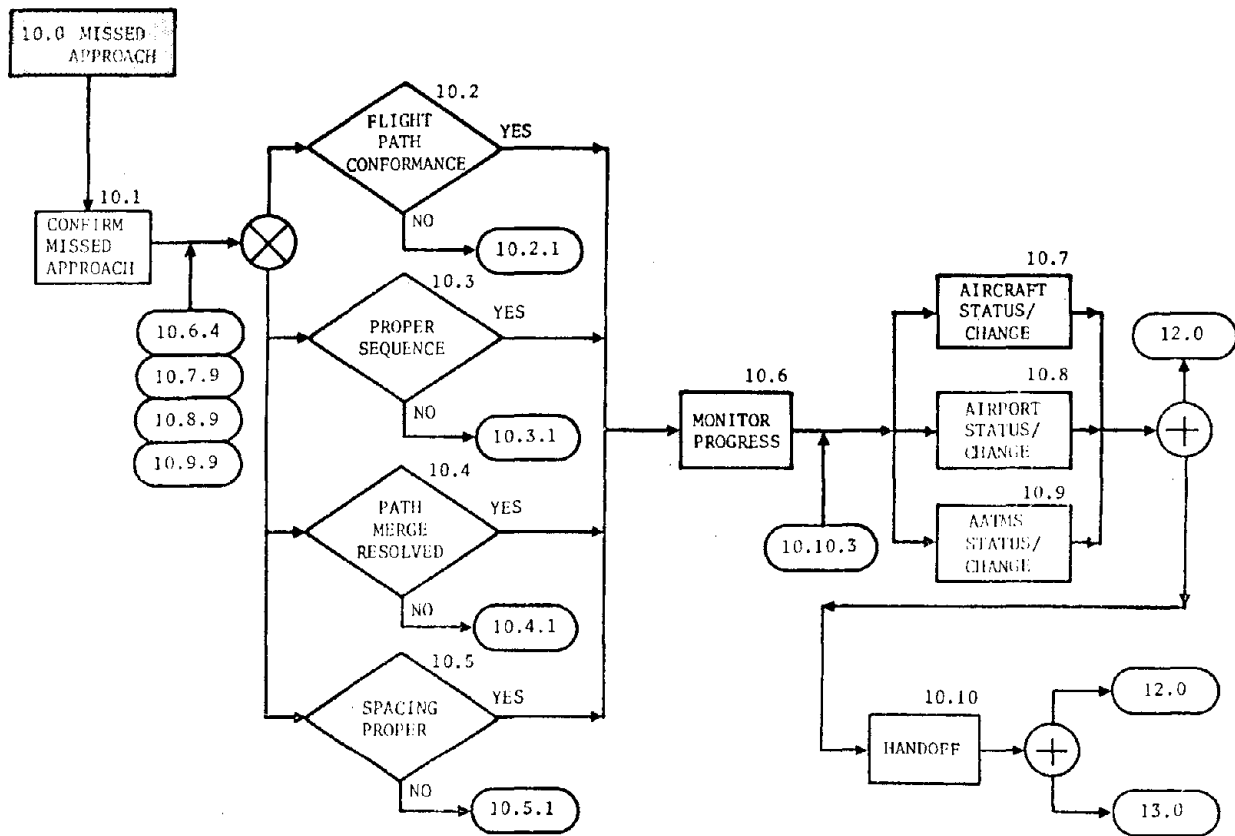Approach-Aircraft Status/Change Diagram, Level III
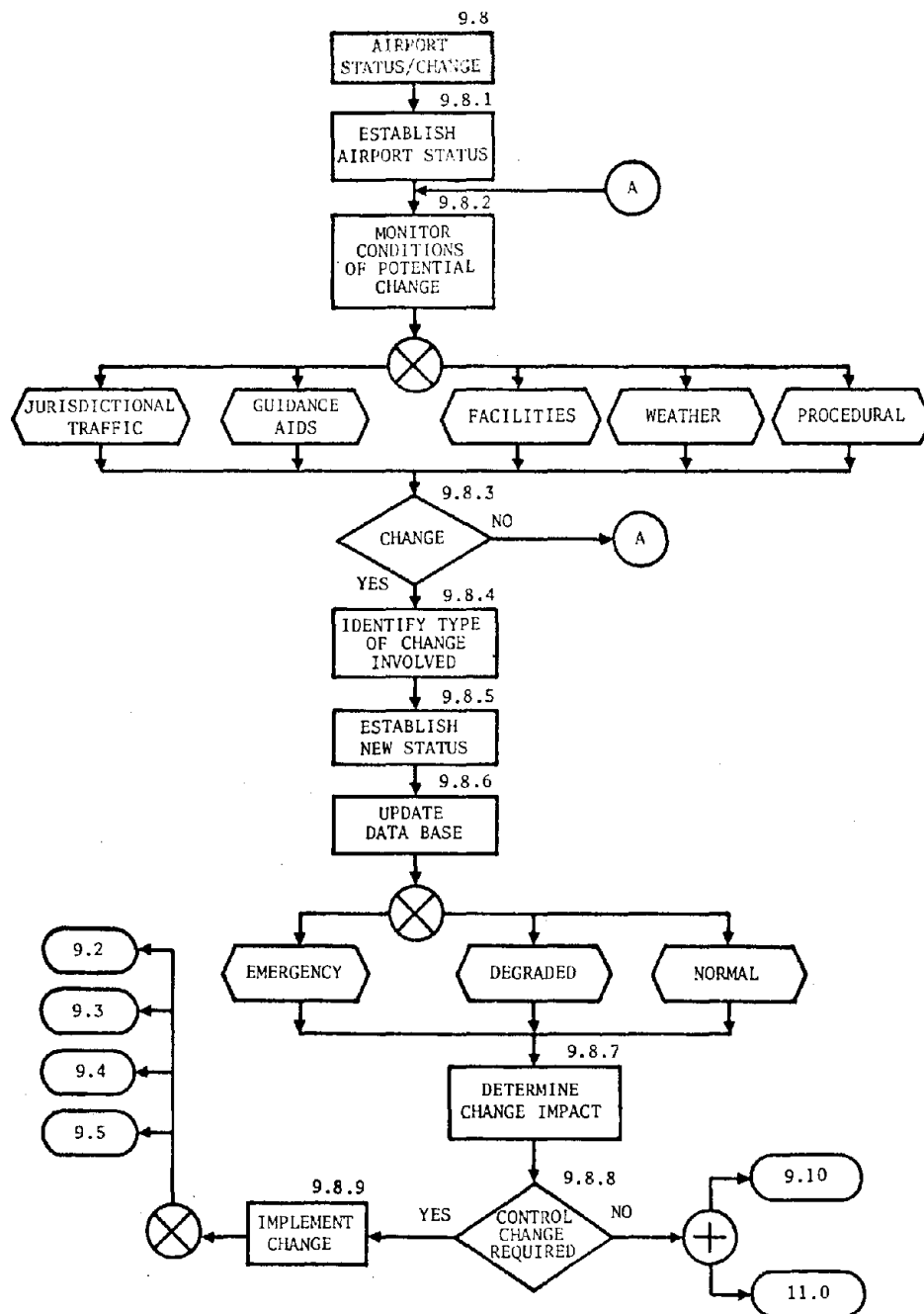
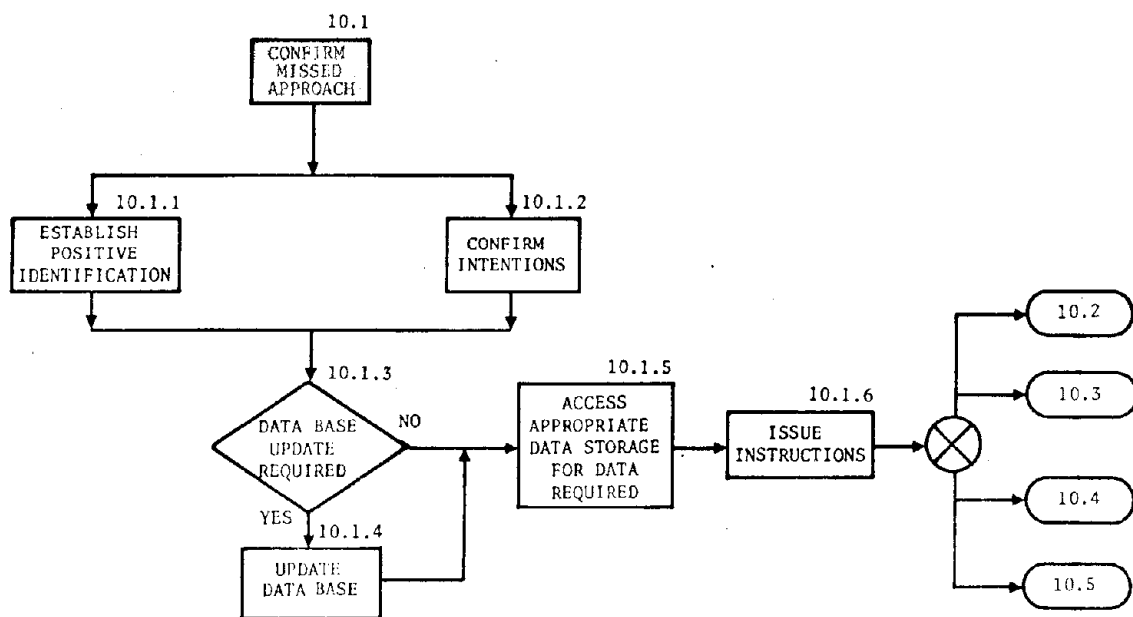Approach-Airport Status/Change Diagram, Level III

Approach-AATMS Status/Change Diagram, Level III

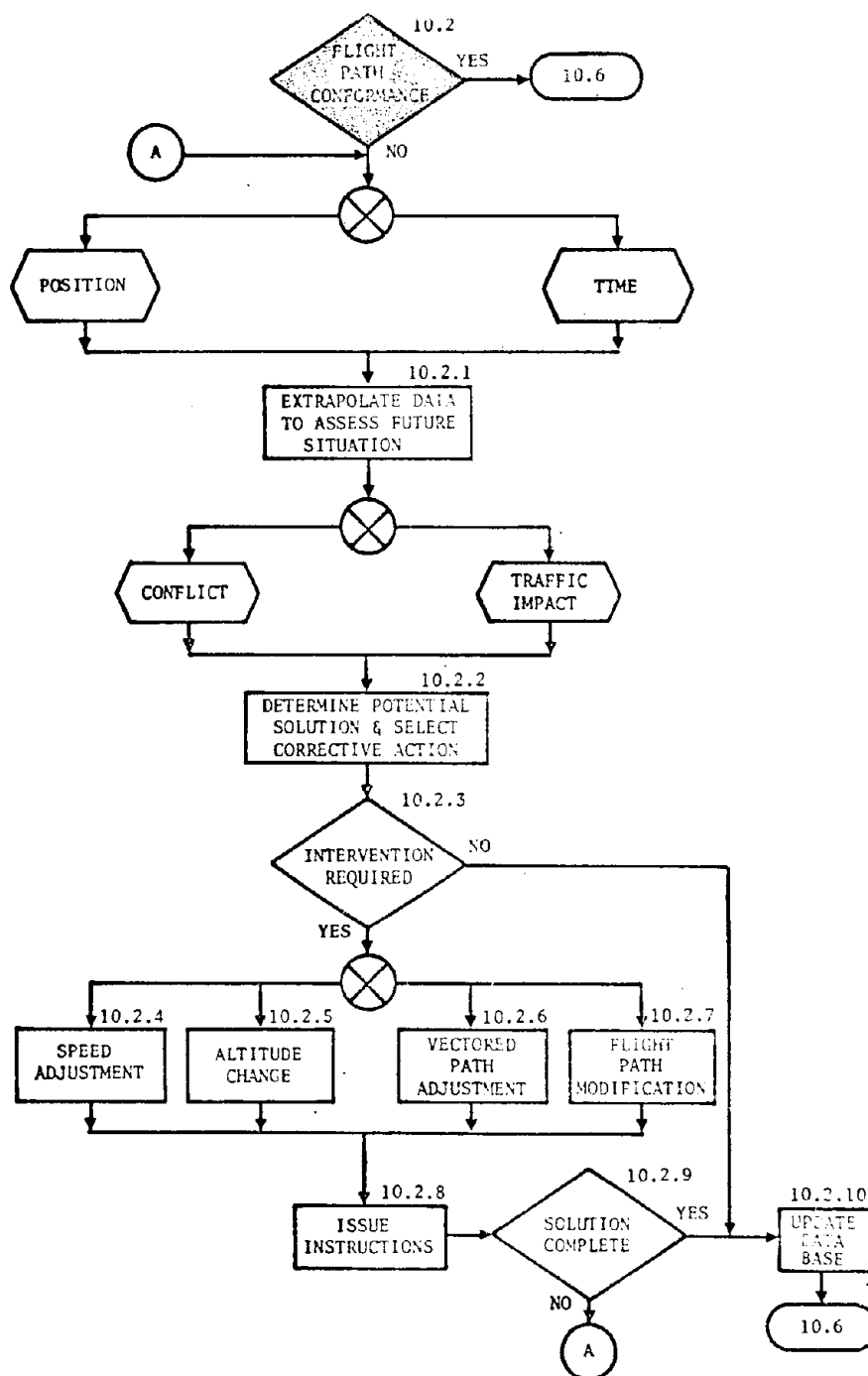Approach - Handoff Diagram, Level III

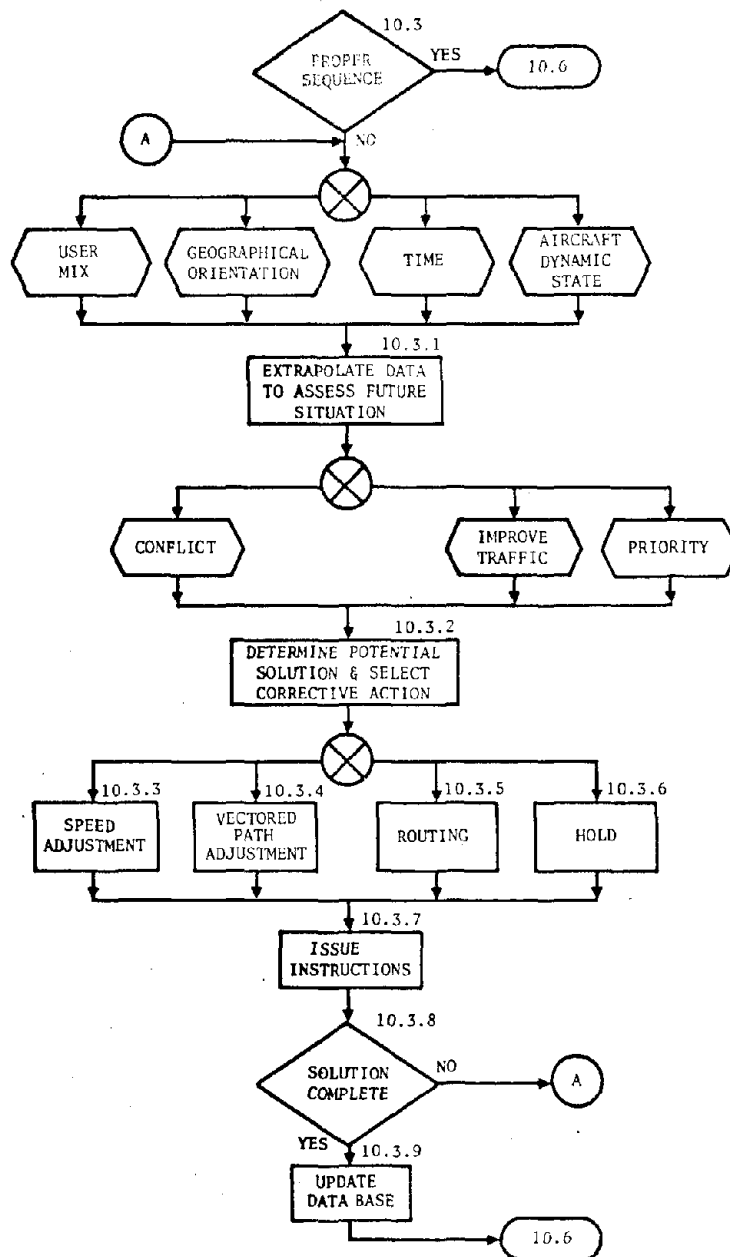Missed Approach Logic Flow Diagram, Level II

Missed Approach-Confirm Missed Approach Diagram, Level III
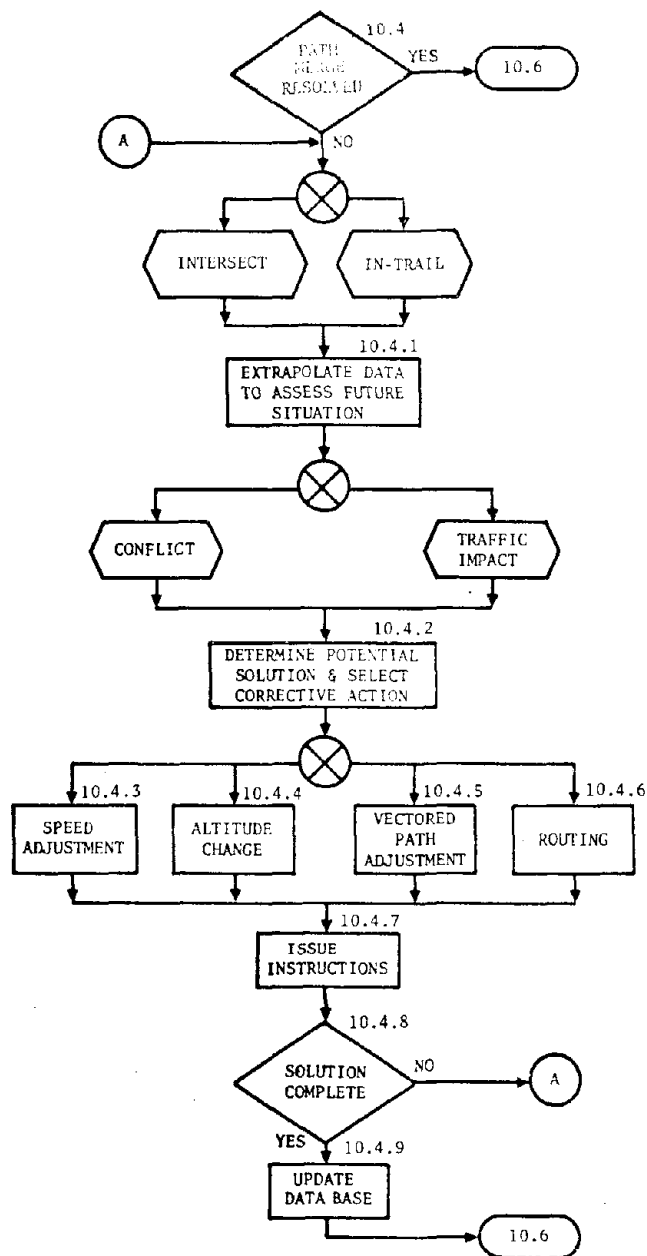
Missed Approach-Flight Path Conformanace Design, Level III

Missed Approach-Proper Sequence Diagram, Level III

Missed Approach-Path Merge Resolved Diagram, Level III
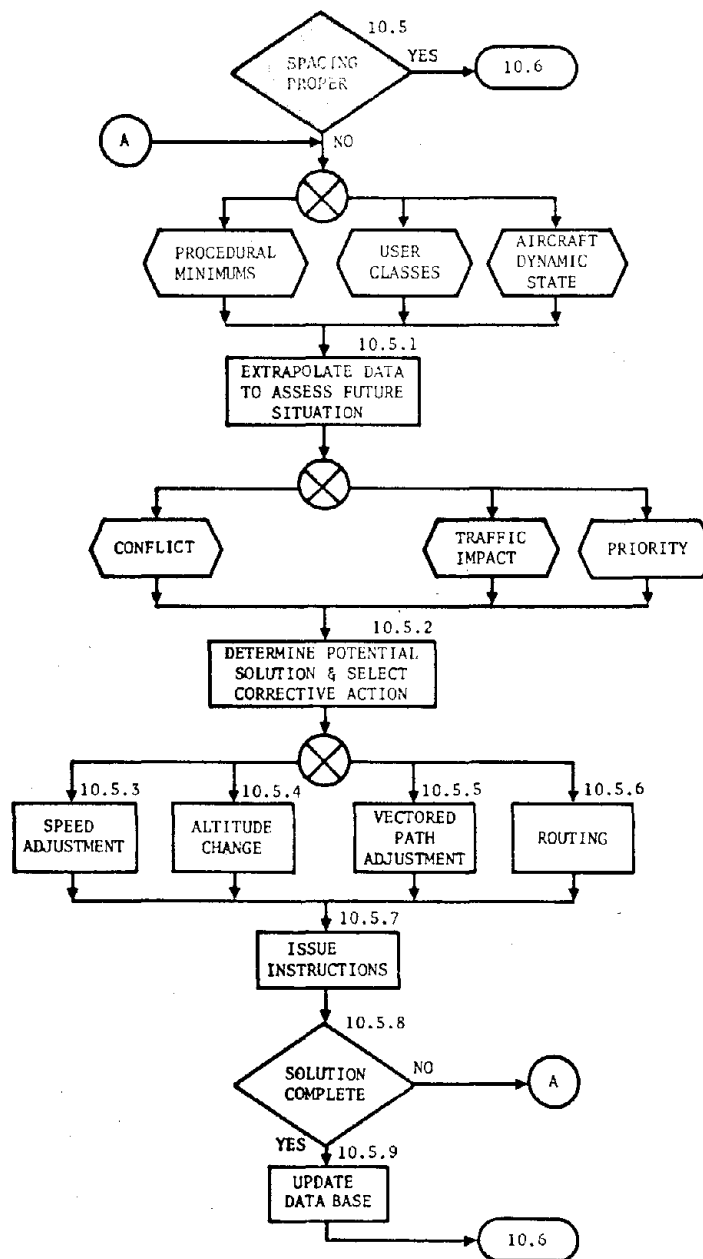
Missed Approach-Spacing Proper Diagram, Level III

-124-
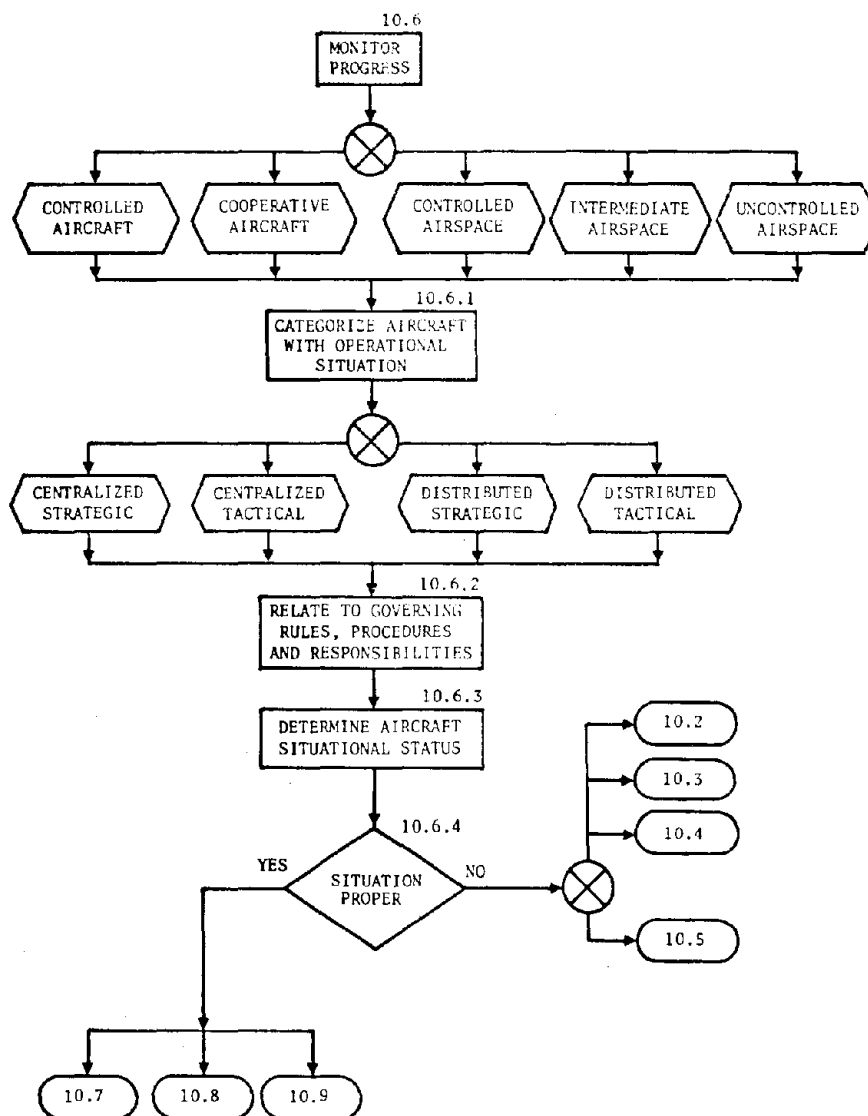
Missed Approach—Monitor Progress Diagram, Level III

10.7
AIRCRAFT
STATUS/CHANGE

10.7.1
ESTABLISH
AIRCRAFT
STATUS

A

10.7.2
MONITOR
CONDITIONS
OF POTENTIAL
CHANGE

⊗

MECHANICAL SYSTEMS   WEATHER   ADJACENT TRAFFIC   PROCEDURAL

10.7.3
CHANGE   NO   A
YES

10.7.4
IDENTIFY TYPE
OF CHANGE
INVOLVED

10.7.5
ESTABLISH
NEW STATUS

10.7.6
UPDATE
DATA BASE

⊗

EMERGENCY   DEGRADED   NORMAL

10.2
10.3
10.4
10.5

10.7.7
DETERMINE
CHANGE IMPACT

10.7.8
10.7.9
IMPLEMENT
CHANGE   YES   CONTROL CHANGE REQUIRED   NO   ⊕   10.10

12.0

⊗

Missed Approach-Aircraft Status/Change Diagram, Level III

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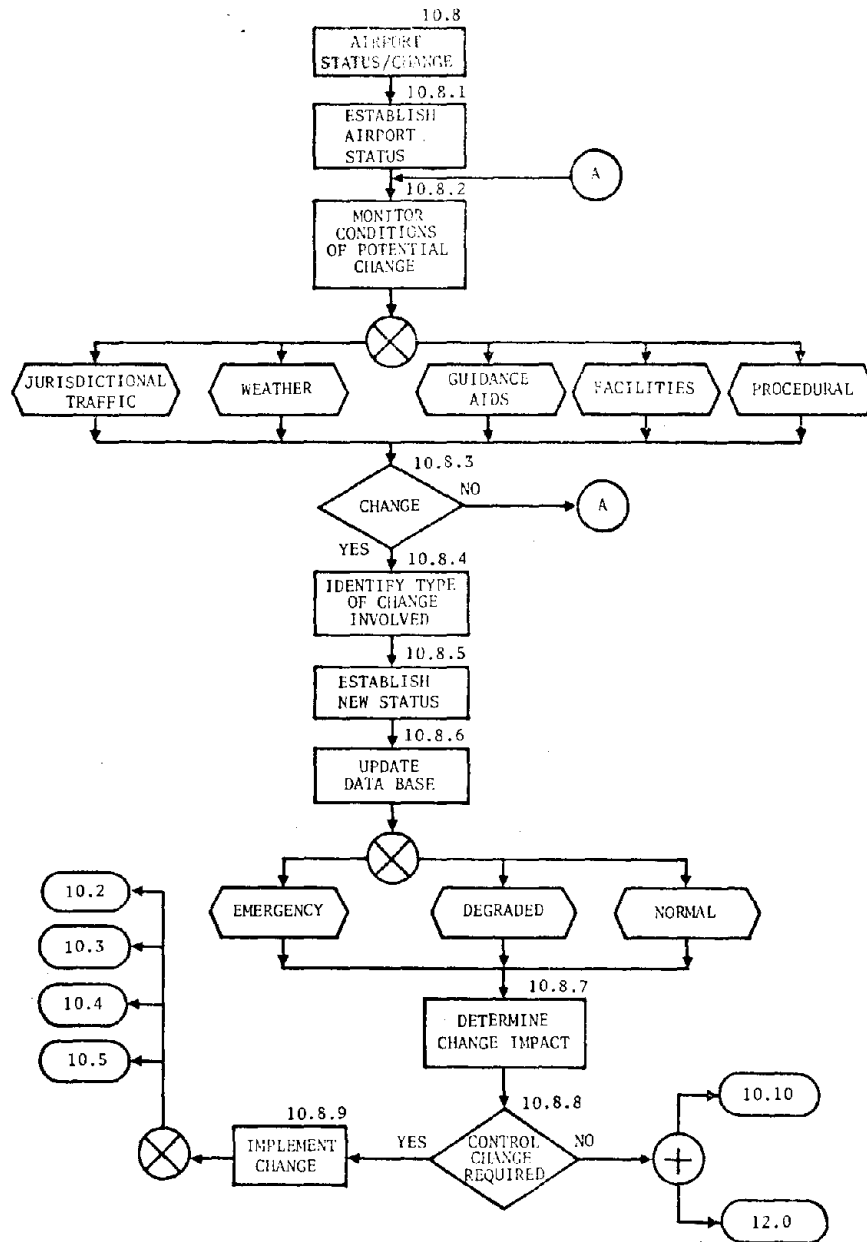
Missed Approach-Airport Status/Change Diagram, Level III
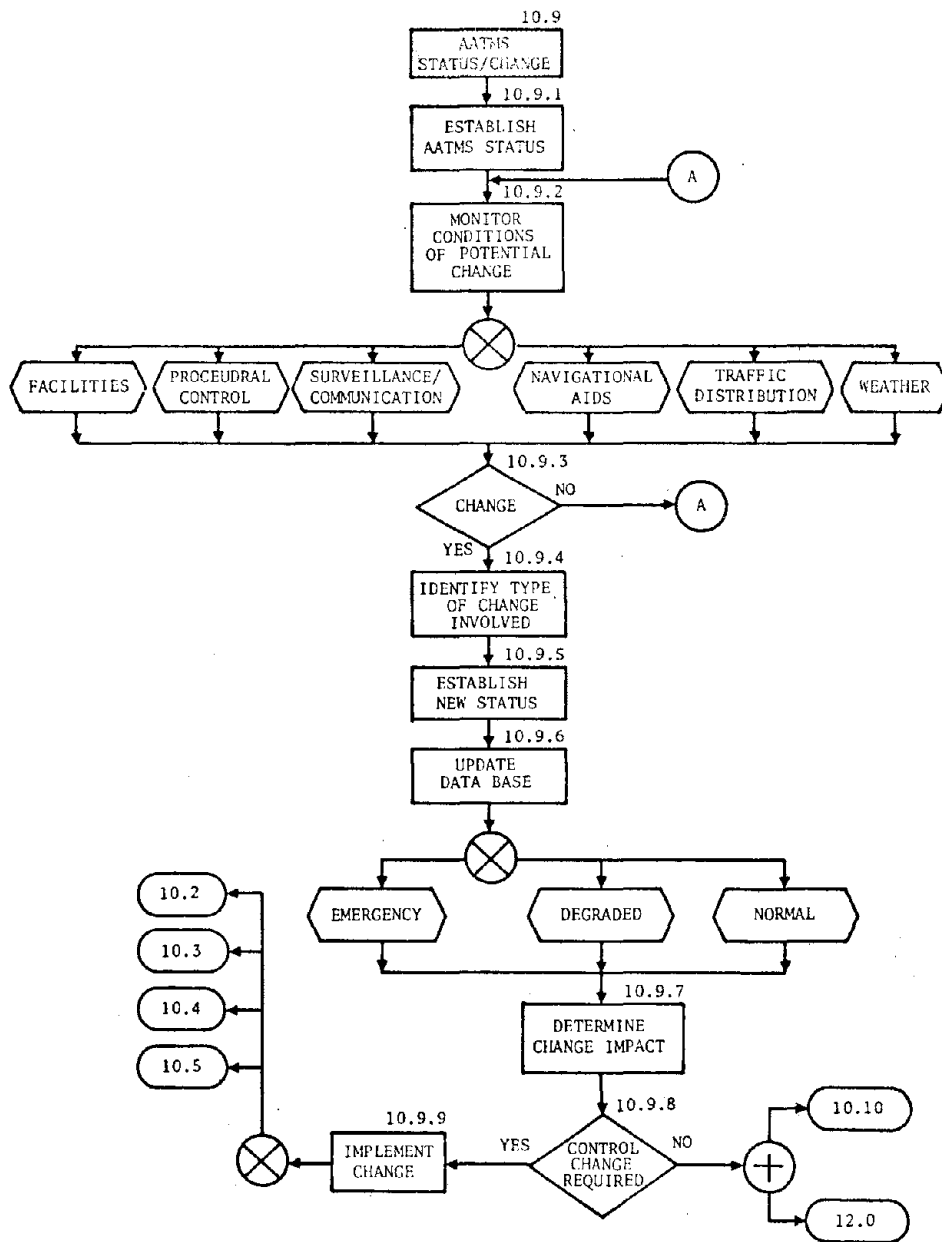
Missed Approach-AATMS Status/Change Diagram, Level III
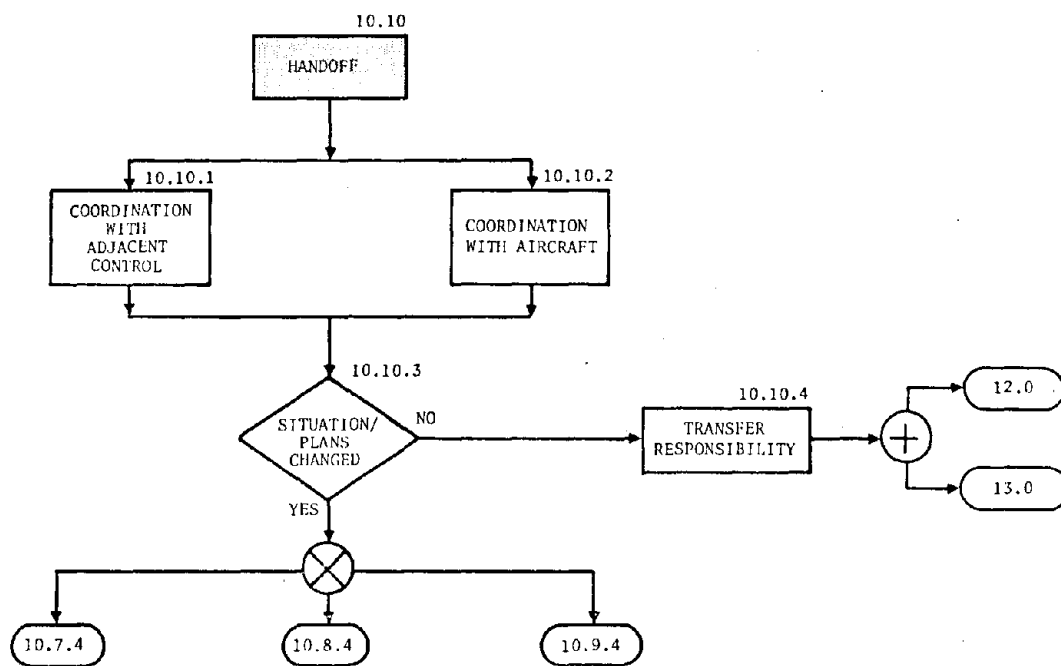
Missed Approach-Handoff Diagram, Level III
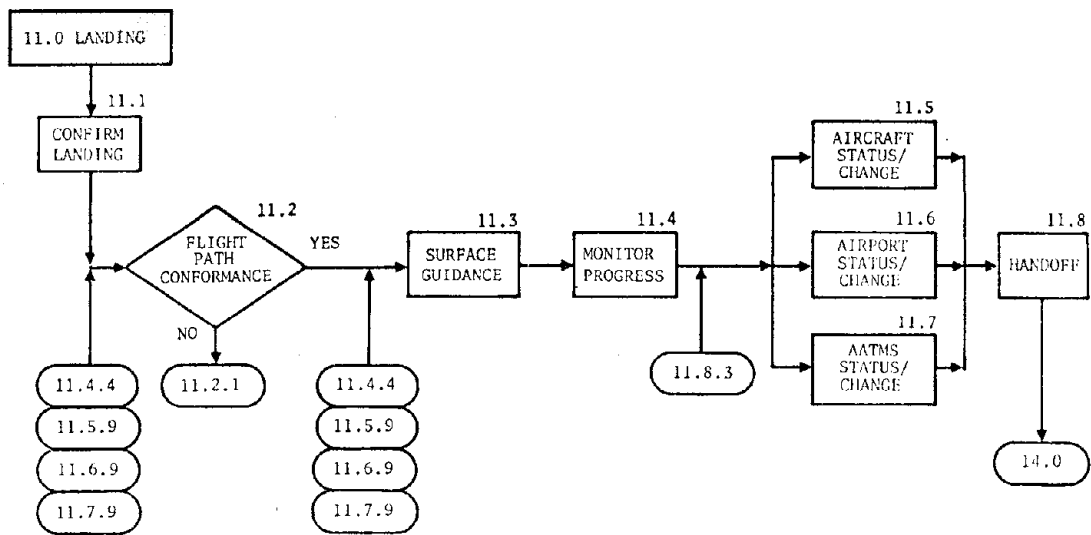
Landing Logic Flow Diagram, Level II

11.1

CONFIRM
LANDING

11.1.1

ESTABLISH
POSITIVE
IDENTIFICATION

11.1.2

CONFIRM
INTENTIONS

11.1.3

DATA BASE
UPDATE
REQUIRED

NO

11.1.5

ACCESS
APPROPRIATE
DATA STORAGE
FOR DATA
REQUIRED

11.1.6

ISSUE
INSTRUCTIONS

11.2

YES

11.1.4

UPDATE
DATA BASE
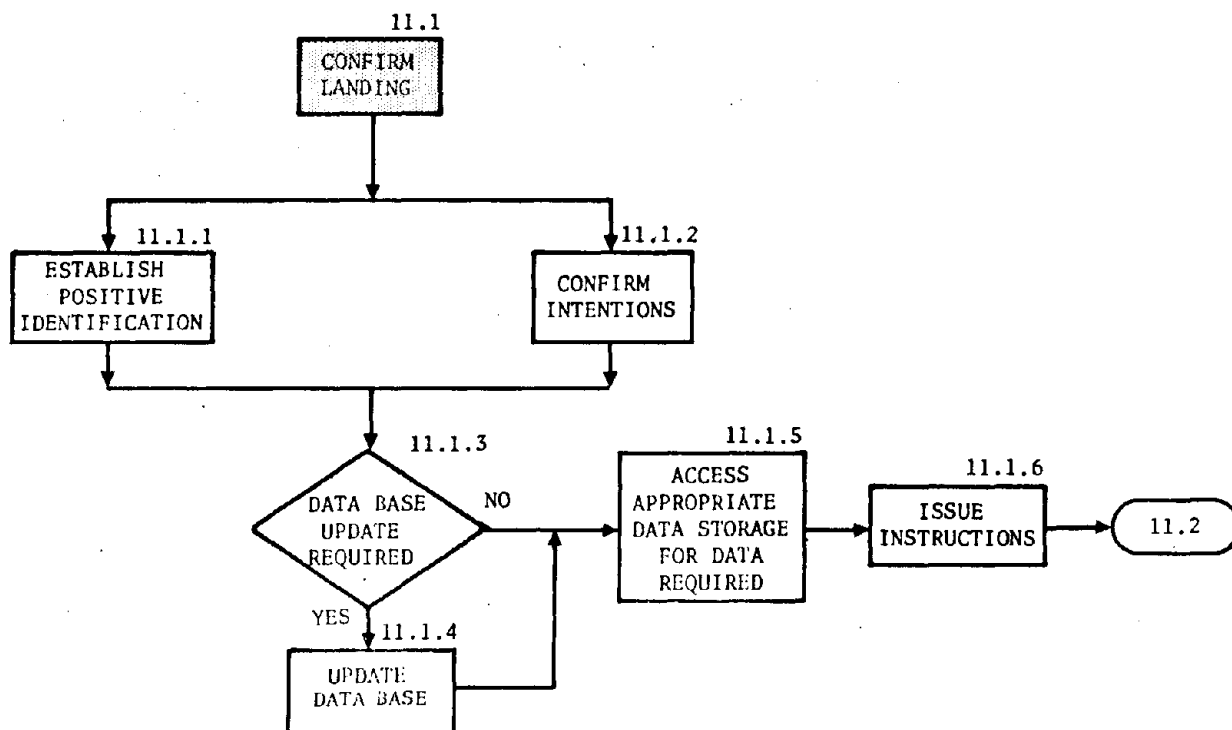
Landing-Confirm Landing Diagram, Level III
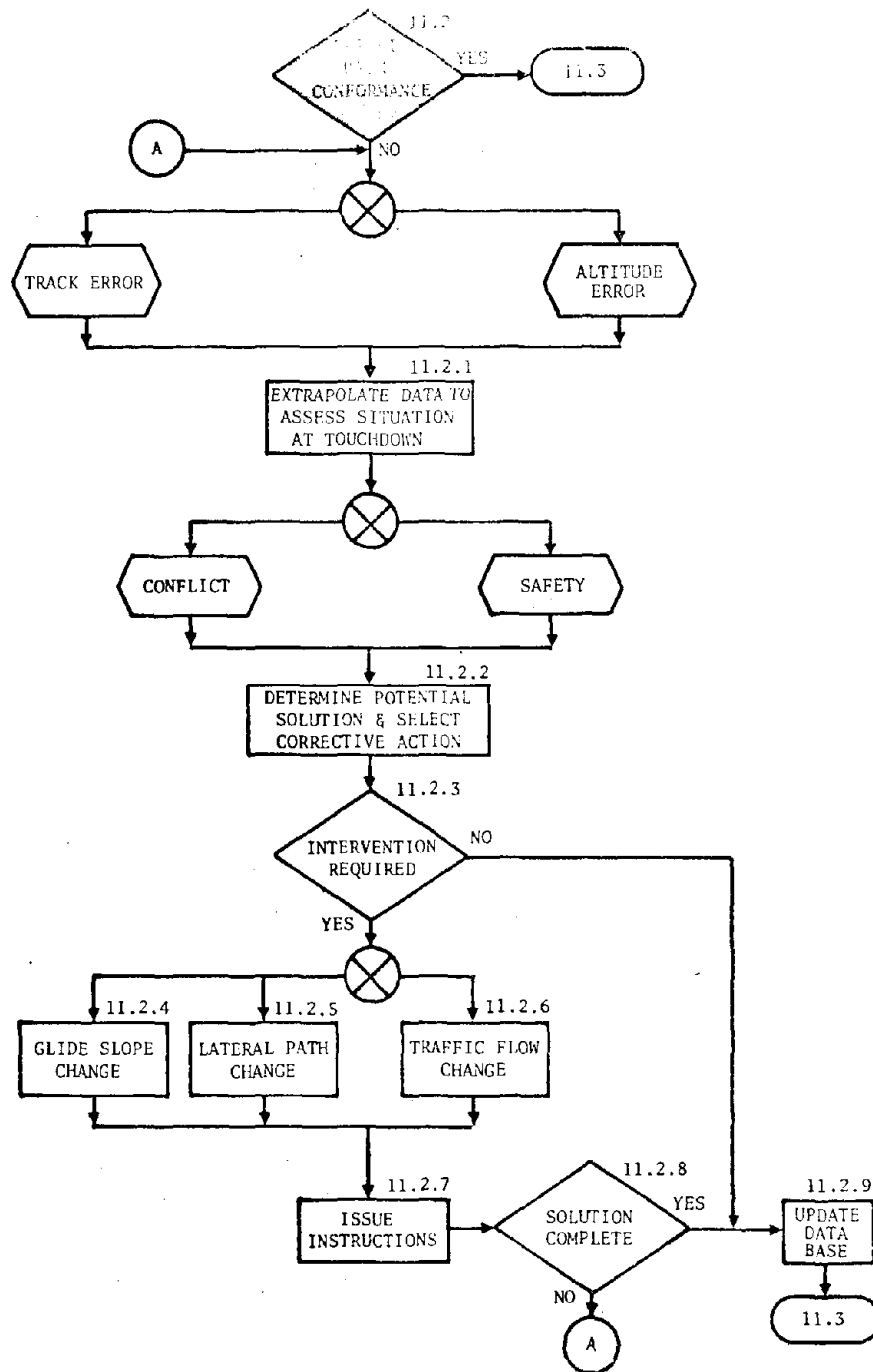
Landing-Flight Path Conformance Diagram, Level III
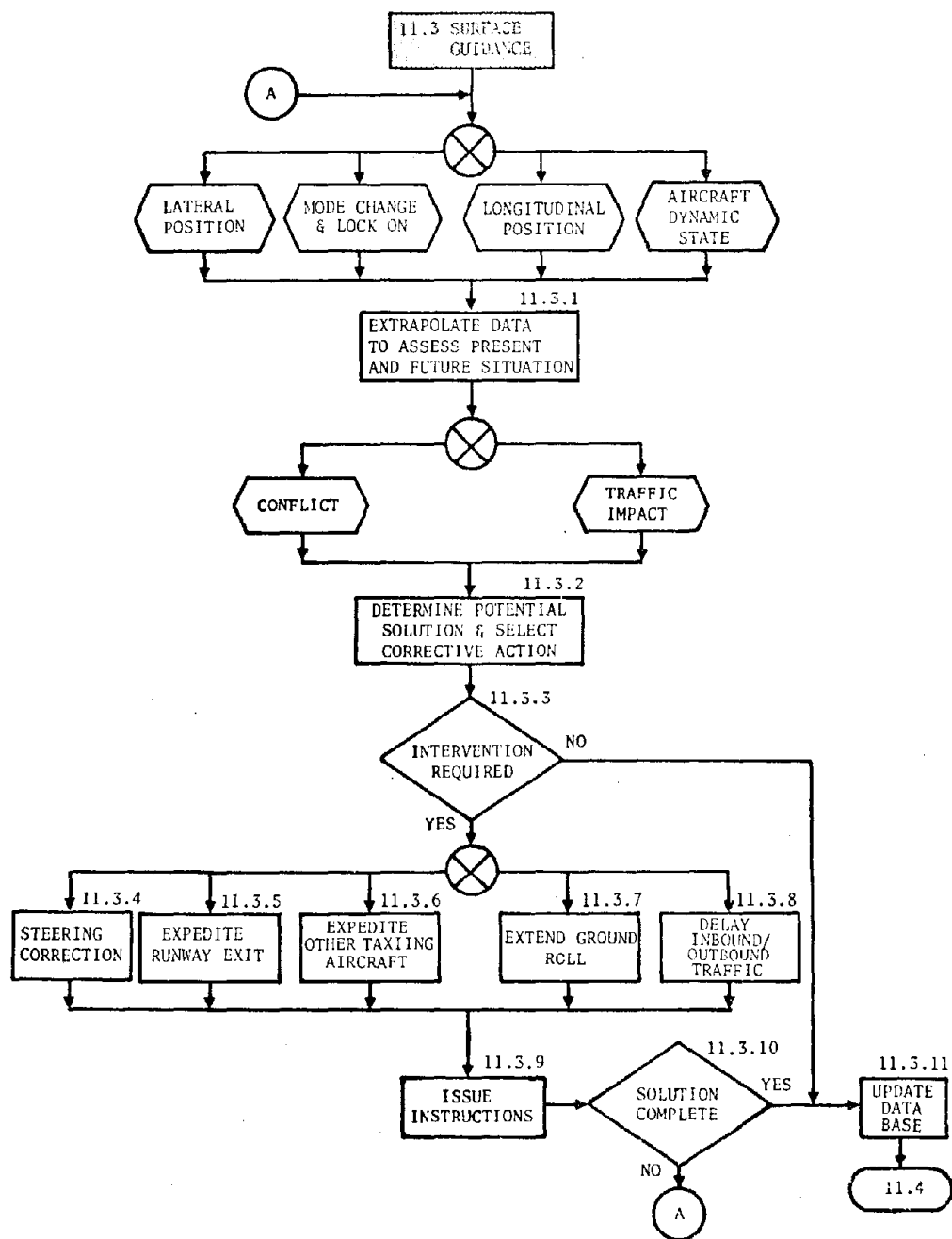
Landing - Surface Guidance, Level III

-133-
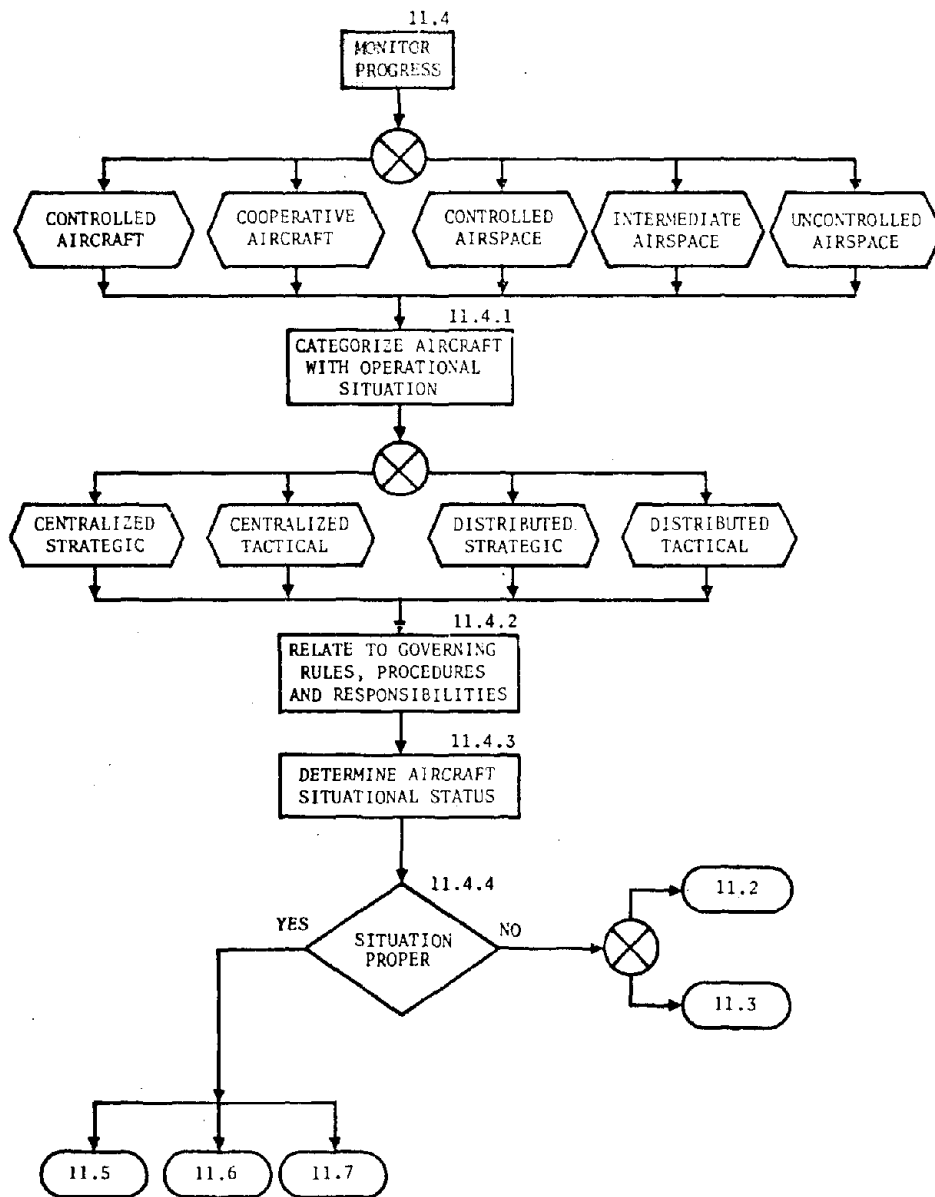
Landing-Monitor Progress Diagram, Level III
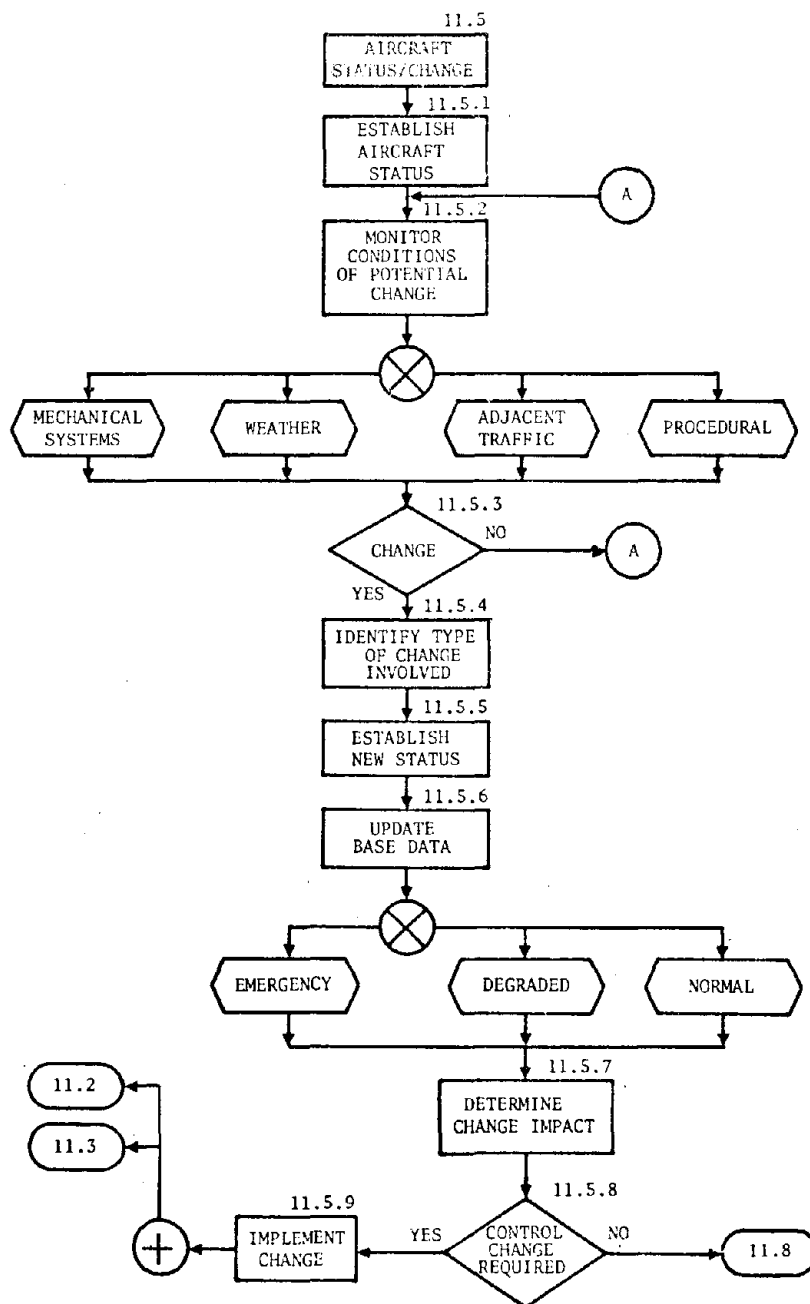
Landing-Aircraft Status/Change Diagram, Level III
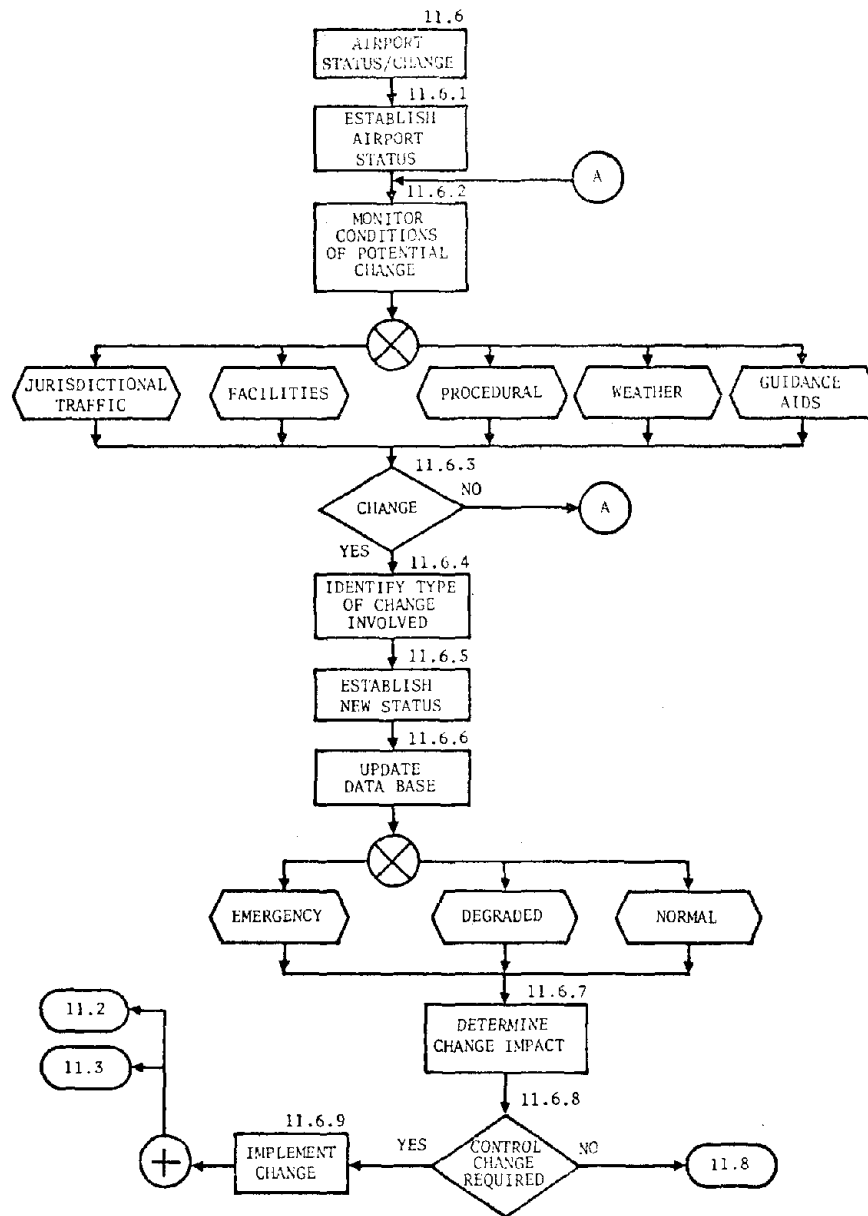
Landing-Airport Status/Change Diagram Level III
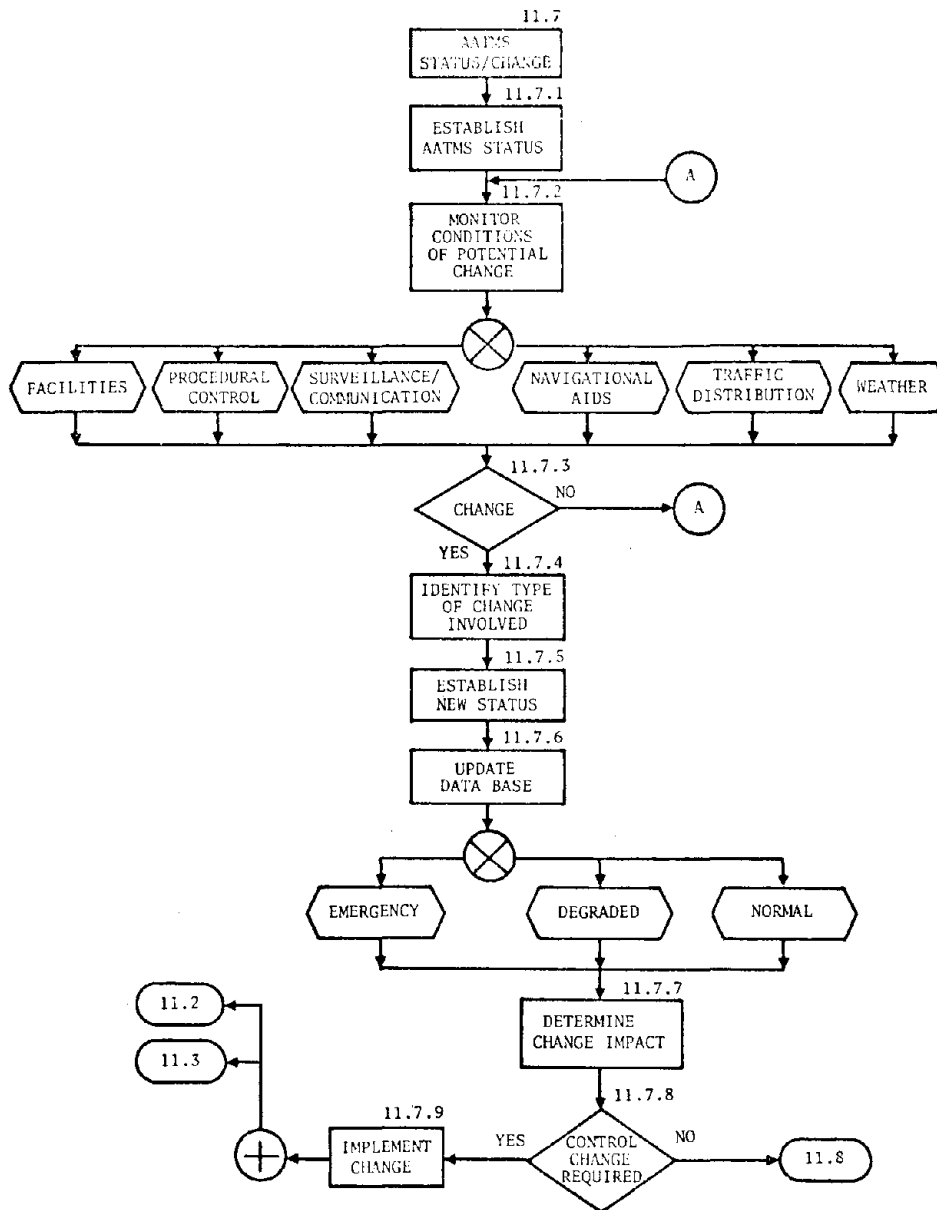
Landing-AATMS Status/Change Diagram, Level III
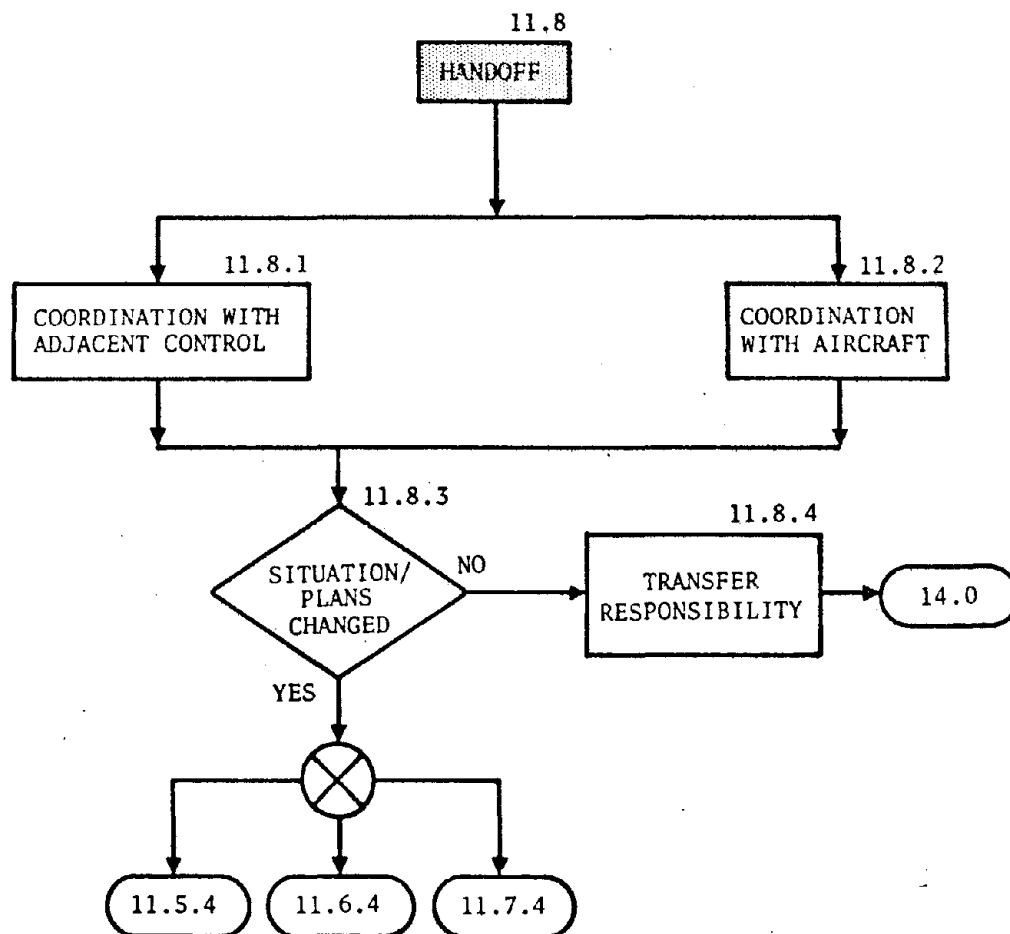
Landing - Handoff Diagram, Level III
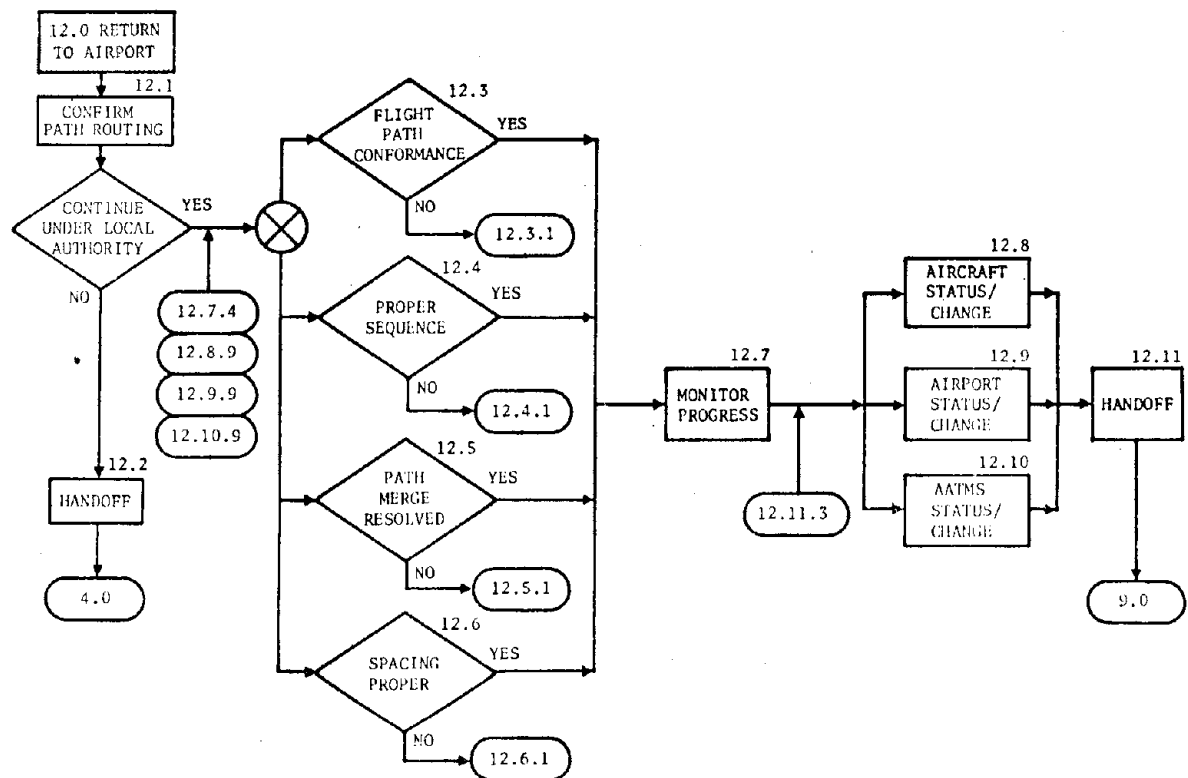
Return to Airport Logic Flow Diagram, Level II

12.1

CONFIRM
PATH
ROUTING

12.1.1
ESTABLISH
POSITIVE
IDENTIFICATION

12.1.2
CONFIRM
INTENTIONS

⊗

PILOT/AIRCRAFT
CAPABILITIES

LOCAL TRAFFIC
PROCEDURES

NAVIGATIONAL
AIDS

AIRPORT
MINIMUMS

TRAFFIC
DENSITY

12.1.3
EXTRAPOLATE DATA
TO ASSESS FUTURE
SITUATION

⊗

VECTORED
PATH

STANDARD
LOCAL ROUTING

DEPARTURE
ROUTING

12.1.4
ASSESS OPTIONS
AND SELECT
PATH ROUTING

12.1.5
ISSUE
INSTRUCTIONS

⊕

⊗

12.3

12.4

12.5

12.6

12.2

Return to Airport—Confirm Path Routing Diagram, Level III

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```
                              12.2
                        ┌───────────┐
                        │  HANDOFF  │
                        └───────────┘
                              │
                              ▼
    ┌─────────────────────────────────────────────────────┐
    │                                                       │
    ▼                                                       ▼
  12.2.1                                                 12.2.2
┌──────────────────────┐                          ┌──────────────────────┐
│ COORDINATION WITH     │                          │ COORDINATION          │
│ ADJACENT CONTROL      │                          │ WITH AIRCRAFT         │
└──────────────────────┘                          └──────────────────────┘
    │                                                       │
    ▼                                                       ▼
    └───────────────────────────────┐                      │
                                     │                      │
                                  12.2.3                    │
                          ┌──────────────────────┐   ┌──────────┐
                          │ TRANSFER              │──▶│   4.0    │
                          │ RESPONSIBILITY        │   └──────────┘
                          └──────────────────────┘
```
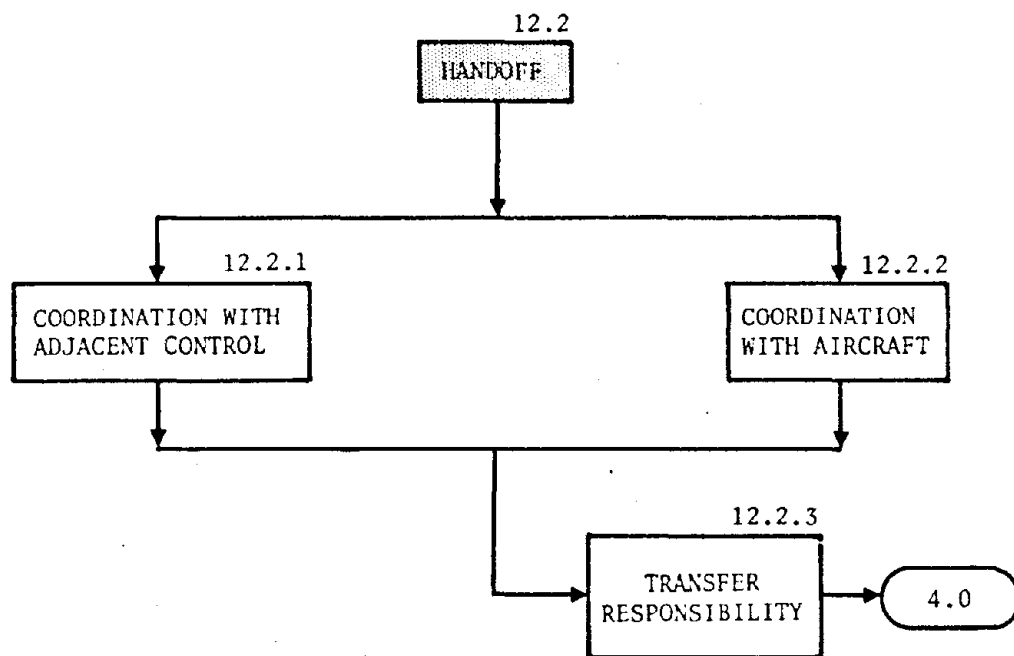
Return to Airport - Handoff Diagram, Level III
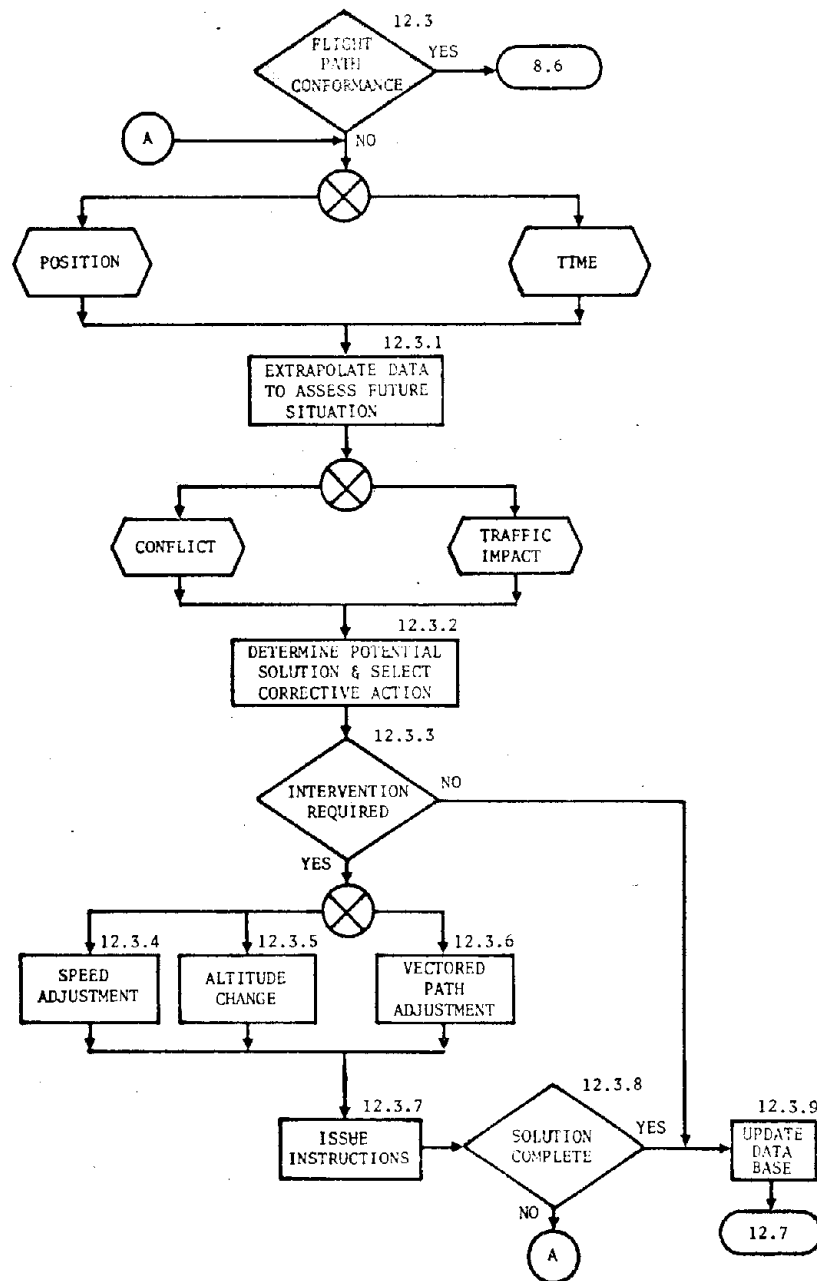
Return to Airport-Flight Path Conformance Diagram, Level III
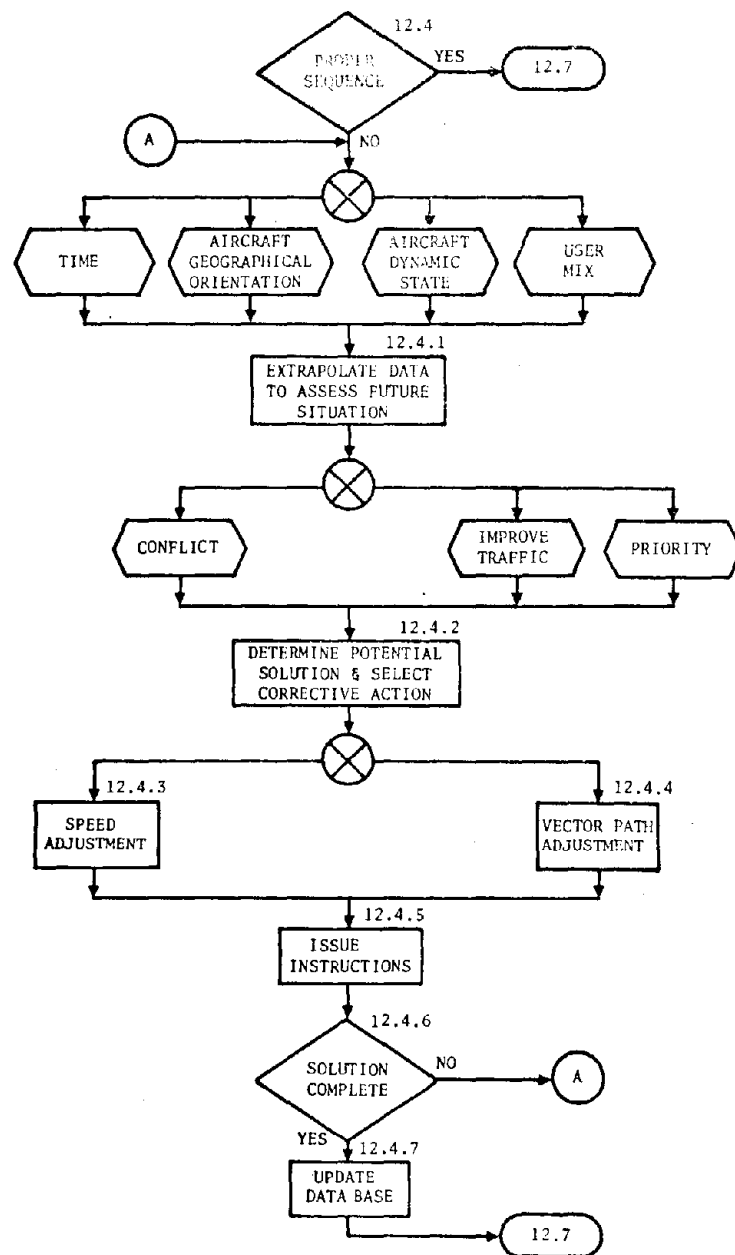
Return to Airport—Proper Sequence Diagram, Level III
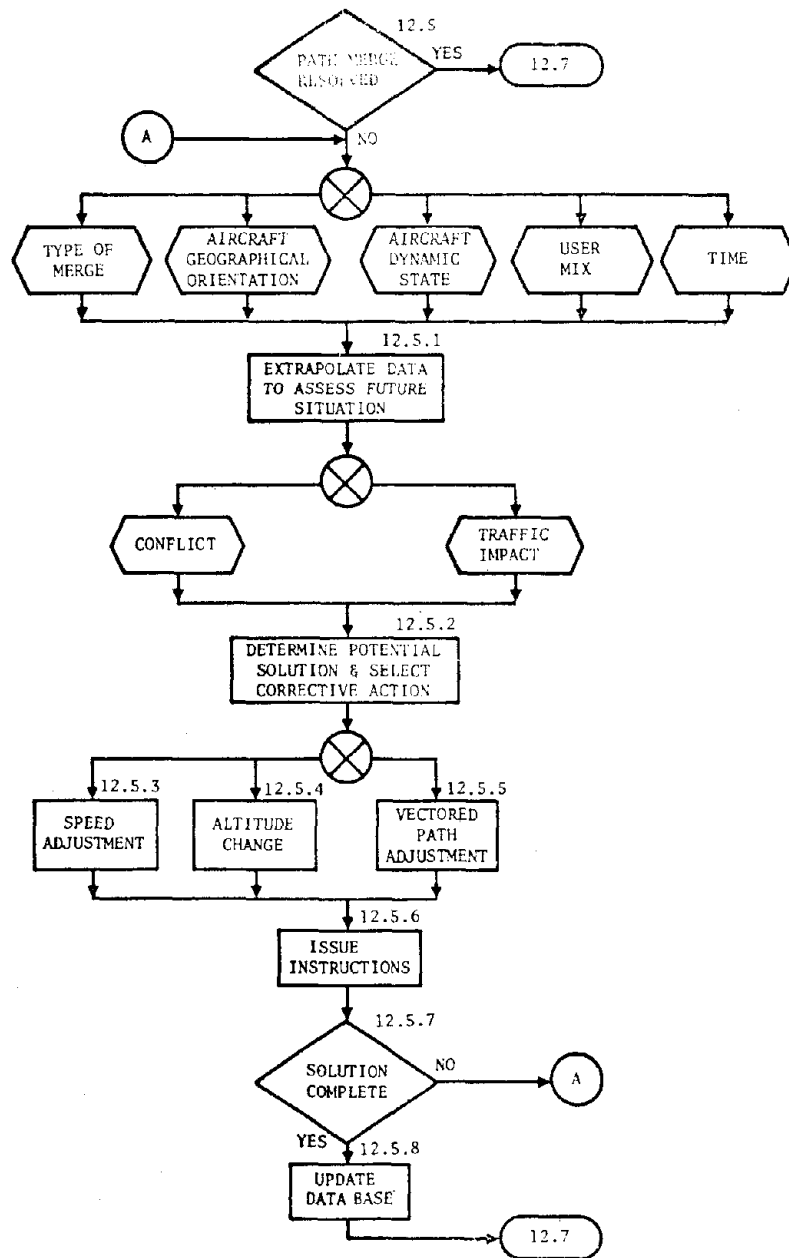
Return to Airport-Path Merge Resolved Diagram, Level III
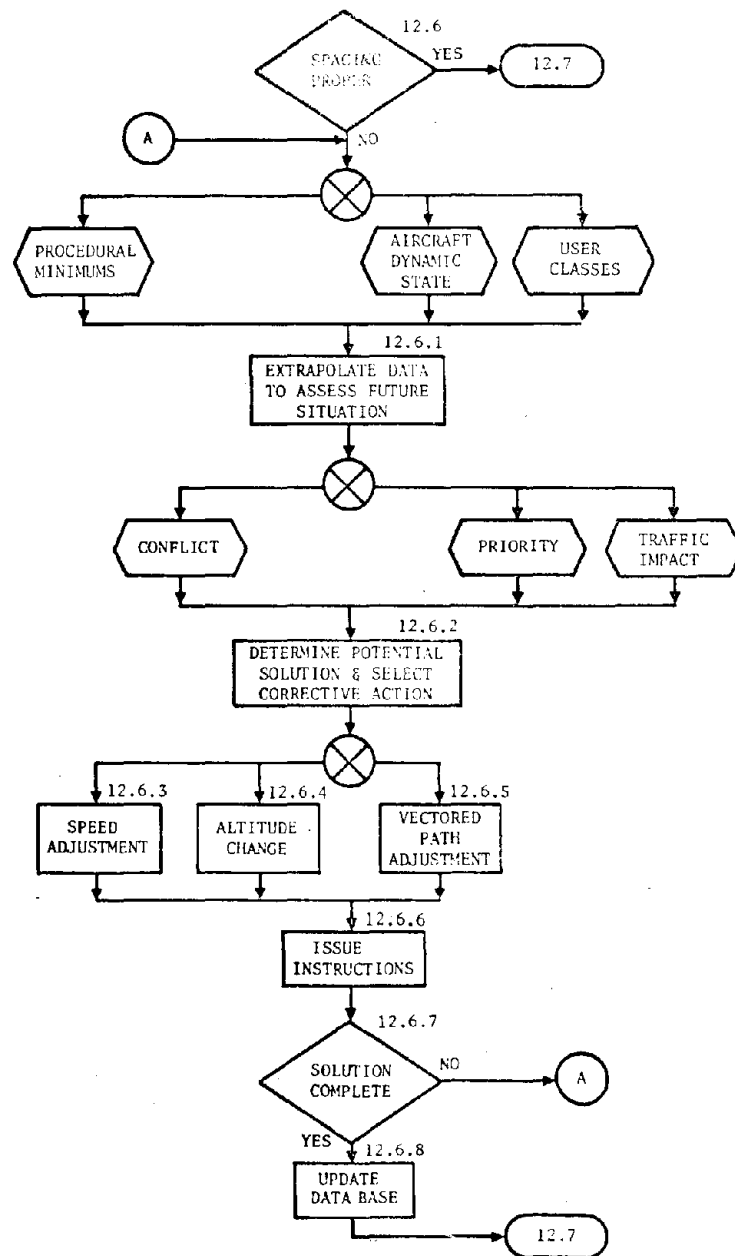
Return to Airport-Spacing Proper Diagram, Level III

12.7
MONITOR
PROGRESS

CONTROLLED
AIRCRAFT

COOPERATIVE
AIRCRAFT

CONTROLLED
AIRSPACE

INTERMEDIATE
AIRSPACE

UNCONTROLLED
AIRSPACE

12.7.1
CATEGORIZE AIRCRAFT
WITH OPERATIONAL
SITUATION

CENTRALIZED
STRATEGIC

CENTRALIZED
TACTICAL

DISTRIBUTED
STRATEGIC

DISTRIBUTED
TACTICAL

12.7.2
RELATE TO GOVERNING
RULES, PROCEDURES
AND RESPONSIBILITIES

12.7.3
DETERMINE AIRCRAFT
SITUATIONAL STATUS

12.3
12.4
12.5
12.6

12.7.4
YES
SITUATION
PROPER
NO

12.8   12.9   12.10

Return to Airport-Monitor Progress Diagram, Level III

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Return to Airport-Aircraft Status/Change Diagram, Level III

```
                          12.9
                    ┌─────────────────┐
                    │ AIRPORT          │
                    │ STATUS/CHANGE    │
                    └────────┬─────────┘
                             │  12.9.1
                    ┌────────┴─────────┐
                    │ ESTABLISH        │
                    │ AIRPORT          │              ⎛   ⎞
                    │ STATUS           │──────────────⎜ A ⎟
                    └────────┬─────────┘              ⎝   ⎠
                             │  12.9.2
                    ┌────────┴─────────┐
                    │ MONITOR          │
                    │ CONDITIONS       │
                    │ OF POTENTIAL     │
                    │ CHANGE           │
                    └────────┬─────────┘
                             ⊗
```

JURISDICTIONAL TRAFFIC   WEATHER   GUIDANCE AIDS   FACILITIES   PROCEDURAL

```
                                        12.9.3
                         ◇ CHANGE ◇──── NO ────⎛ A ⎞
                             │ YES              ⎝   ⎠
                             │  12.9.4
                    ┌────────┴─────────┐
                    │ IDENTIFY TYPE    │
                    │ OF CHANGE        │
                    │ INVOLVED         │
                    └────────┬─────────┘
                             │  12.9.5
                    ┌────────┴─────────┐
                    │ ESTABLISH        │
                    │ NEW STATUS       │
                    └────────┬─────────┘
                             │  12.9.6
                    ┌────────┴─────────┐
                    │ UPDATE           │
                    │ DATA BASE        │
                    └────────┬─────────┘
                             ⊗
```

  12.3   EMERGENCY   DEGRADED   NORMAL
  12.4
  12.5
  12.6

```
                                        │  12.9.7
                               ┌────────┴─────────┐
                               │ DETERMINE        │
                               │ CHANGE IMPACT    │
                               └────────┬─────────┘
                                        │  12.9.8
        12.9.9                  ◇ CONTROL ◇
    ┌───────────┐    YES        ◇ CHANGE   ◇── NO ──( 12.11 )
    │ IMPLEMENT │◄──────────────◇ REQUIRED ◇
    │ CHANGE    │
    └───────────┘
```

Return to Airport-Airport Status/Change Diagram, Level III

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12.10
AATMS
STATUS/CHANGE

12.10.1
ESTABLISH
AATMS STATUS

A

12.10.2
MONITOR
CONDITIONS
OF POTENTIAL
CHANGE

FACILITIES PROCEDURAL CONTROL SURVEILLANCE/ COMMUNICATION NAVIGATIONAL AIDS TRAFFIC DISTRIBUTION WEATHER

12.10.3
CHANGE — NO → A
YES

12.10.4
IDENTIFY TYPE
OF CHANGE
INVOLVED

ESTABLISH
NEW STATUS

12.10.6
UPDATE
DATA BASE

EMERGENCY DEGRADED NORMAL

12.3
12.4
12.5
12.6

12.10.7
DETERMINE
CHANGE IMPACT

12.10.9
IMPLEMENT
CHANGE ← YES — 12.10.8 CONTROL CHANGE REQUIRED — NO → 12.11

Return to Airport-AATMS Status/Change Diagram, Level III

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```
                            12.11
                        ┌──────────┐
                        │ HANDOFF  │
                        └──────────┘
                              │
        ┌─────────────────────┴─────────────────────┐
        │                                            │
        ▼                                            ▼
     12.11.1                                      12.11.2
┌──────────────────┐                       ┌──────────────────┐
│ COORDINATION WITH │                       │  COORDINATION    │
│ ADJACENT CONTROL  │                       │  WITH AIRCRAFT   │
└──────────────────┘                       └──────────────────┘
        │                                            │
        └─────────────────────┬─────────────────────┘
                              │
                              ▼   12.11.3           12.11.4
                          ╱────────╲     NO   ┌──────────────────┐
                         ╱ SITUATION/ ╲──────▶│    TRANSFER      │──────▶ ( 9.0 )
                         ╲   PLANS    ╱       │ RESPONSIBILITY   │
                          ╲ CHANGED  ╱        └──────────────────┘
                           ╲────────╱
                              │
                             YES
                              │
                              ▼
                             ⊗
        ┌─────────────────────┼─────────────────────┐
        ▼                     ▼                     ▼
   ( 12.8.4 )            ( 12.9.4 )            ( 12.10.4 )
```
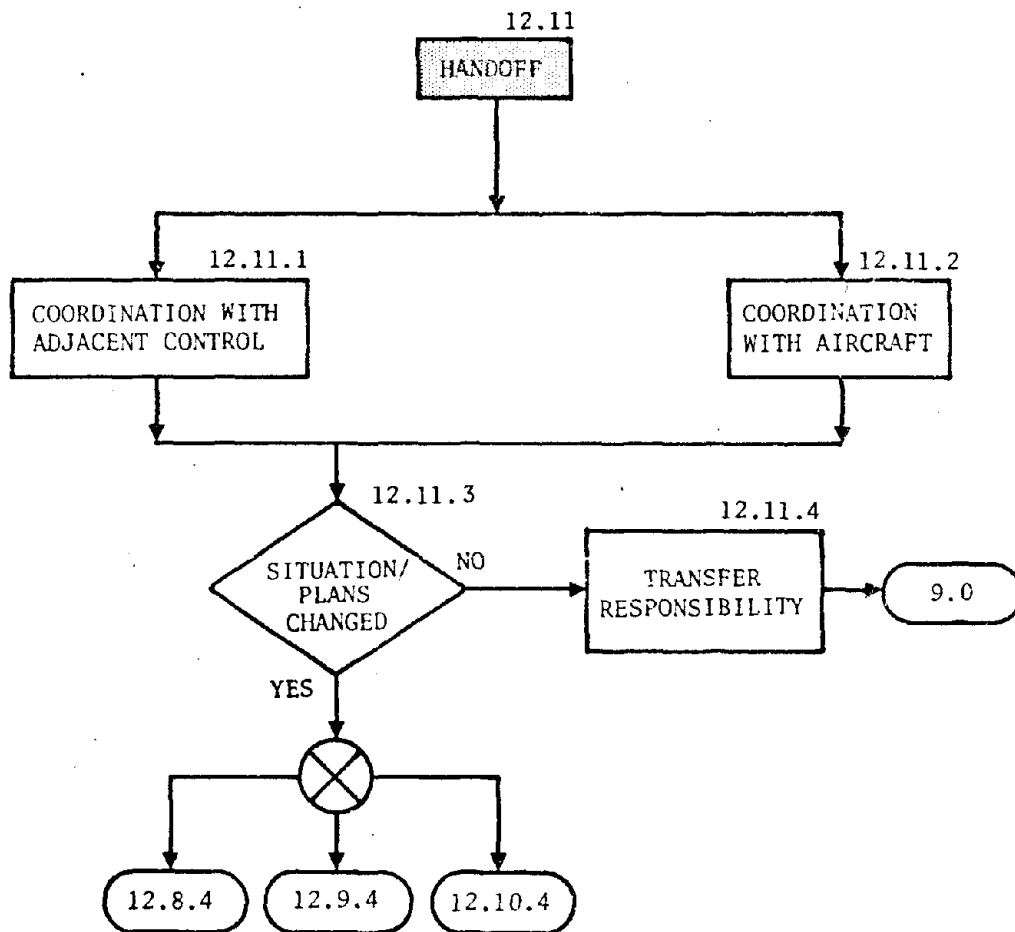
Return to Airport - Handoff Diagram, Level III
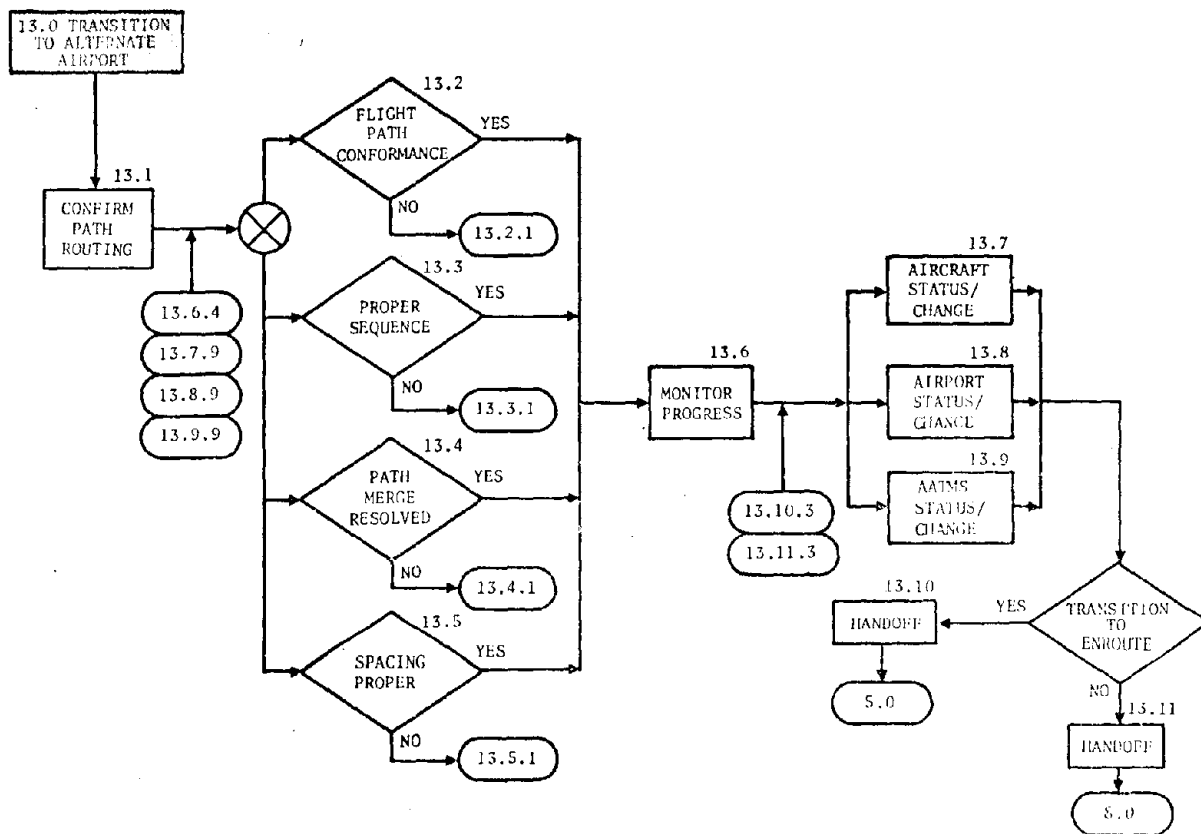
Transition to Alternate Airport Logic Flow Diagram, Level II
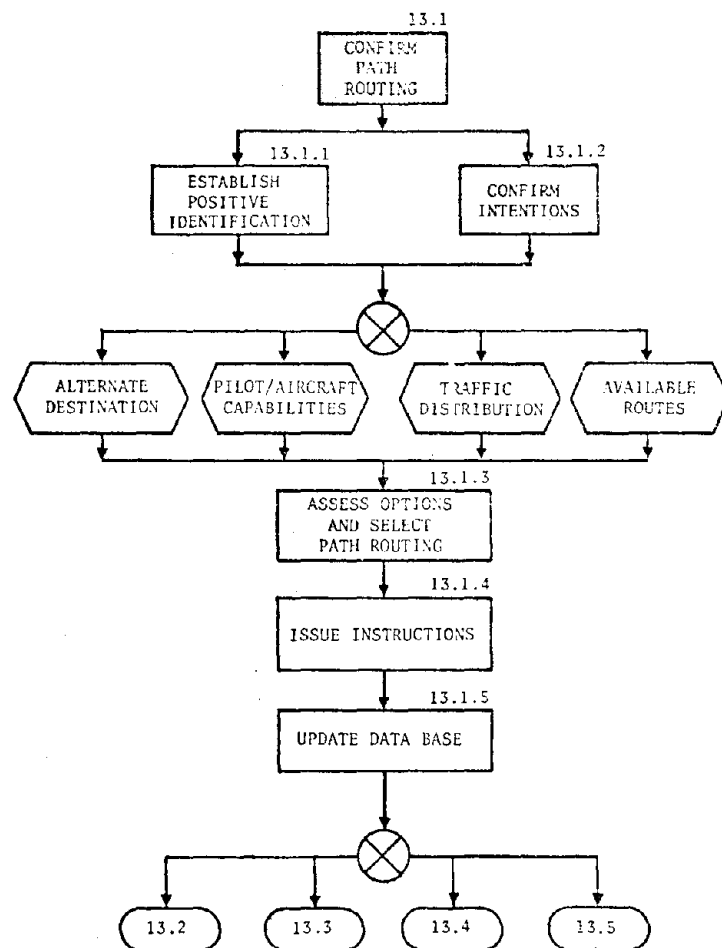
Alternate Airport-Confirm Path Routing Diagram, Level III

Alternate Airport-Flight Path Conformance Diagram, Level III

Alternate Airport-Proper Sequence Diagram, Level III

Alternate Airport-Path Merge Resolved Diagram, Level III
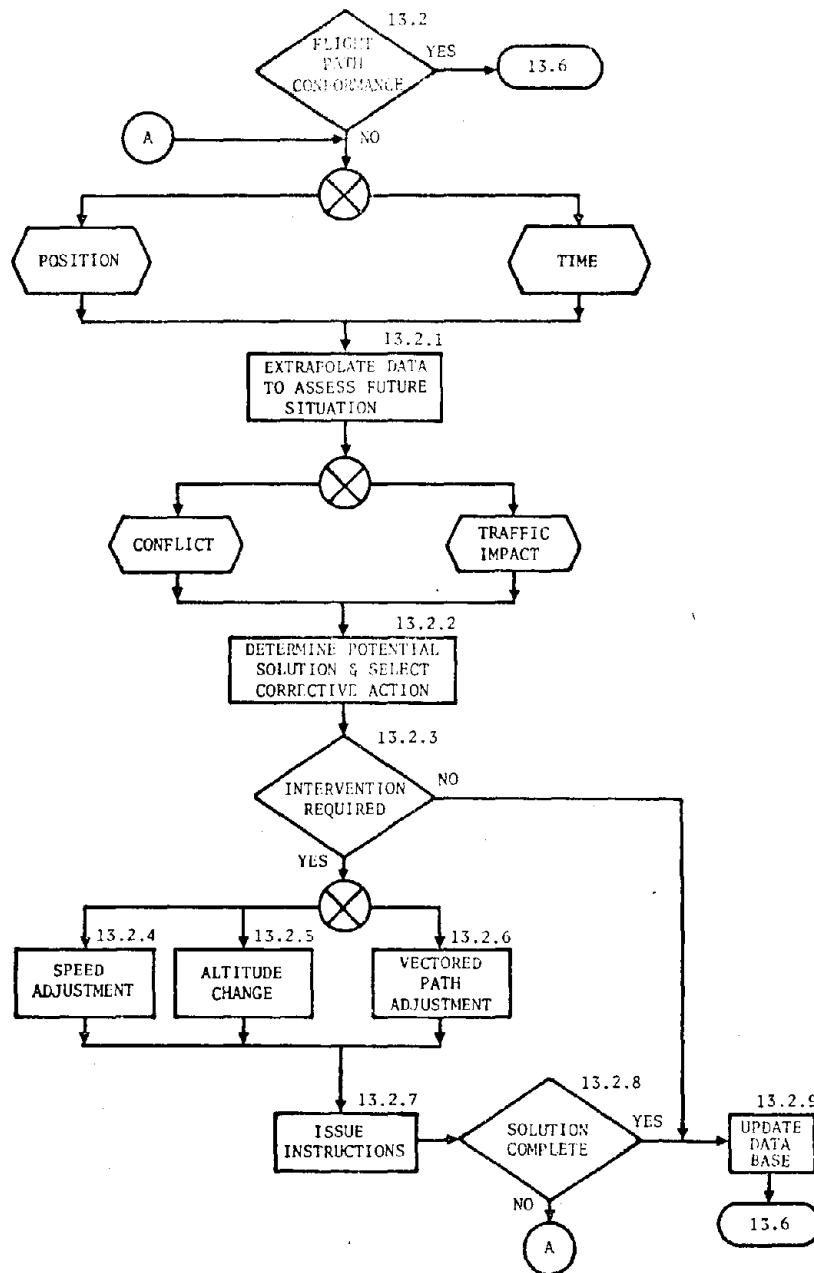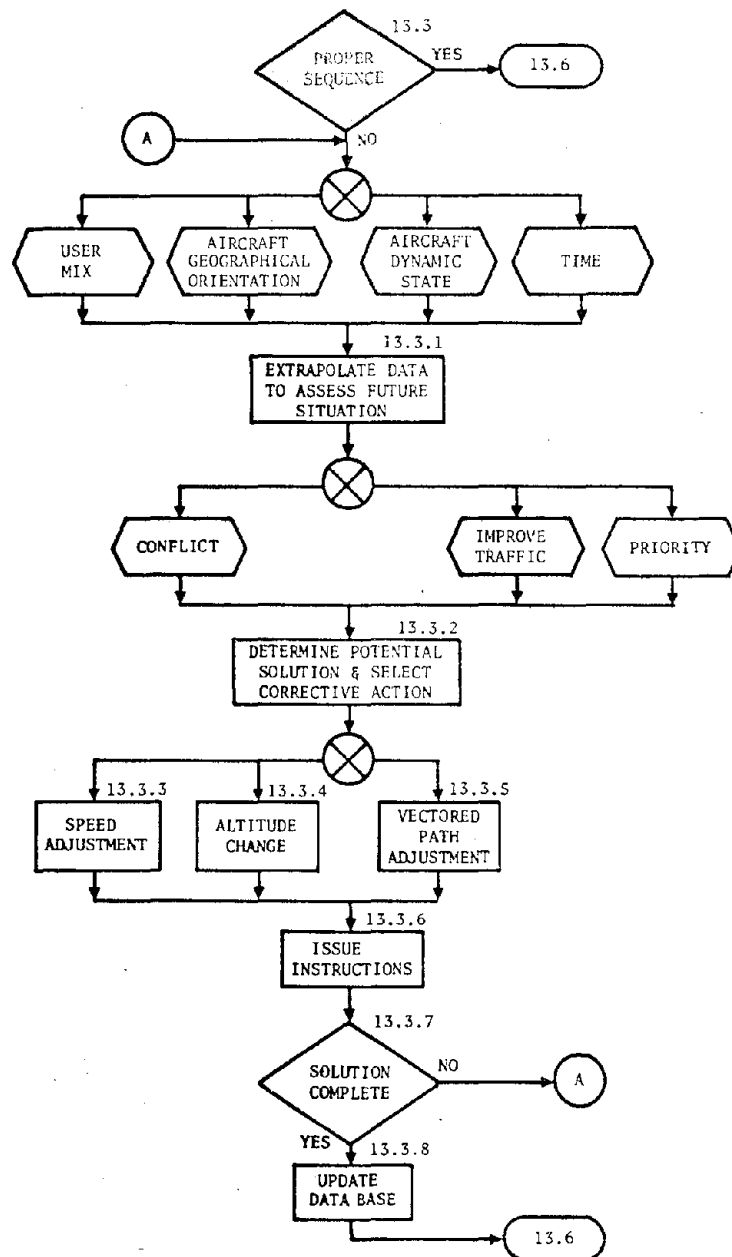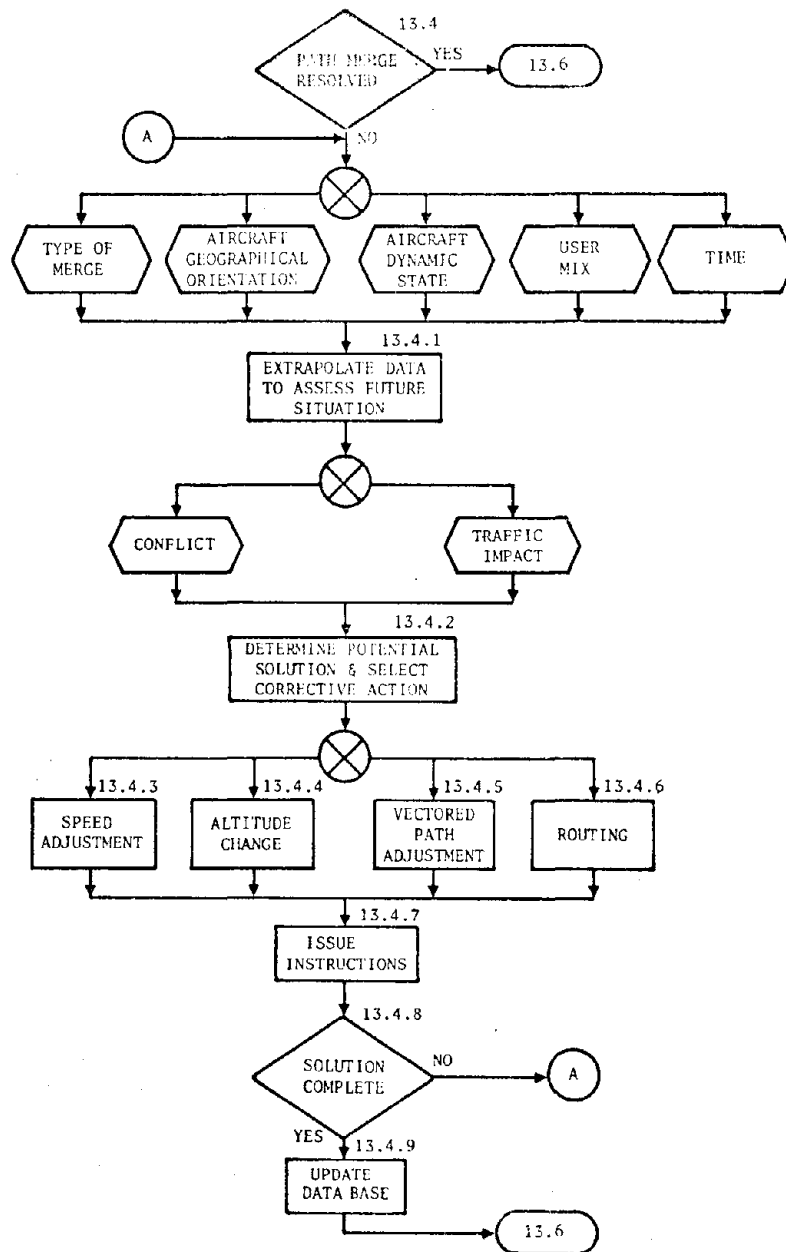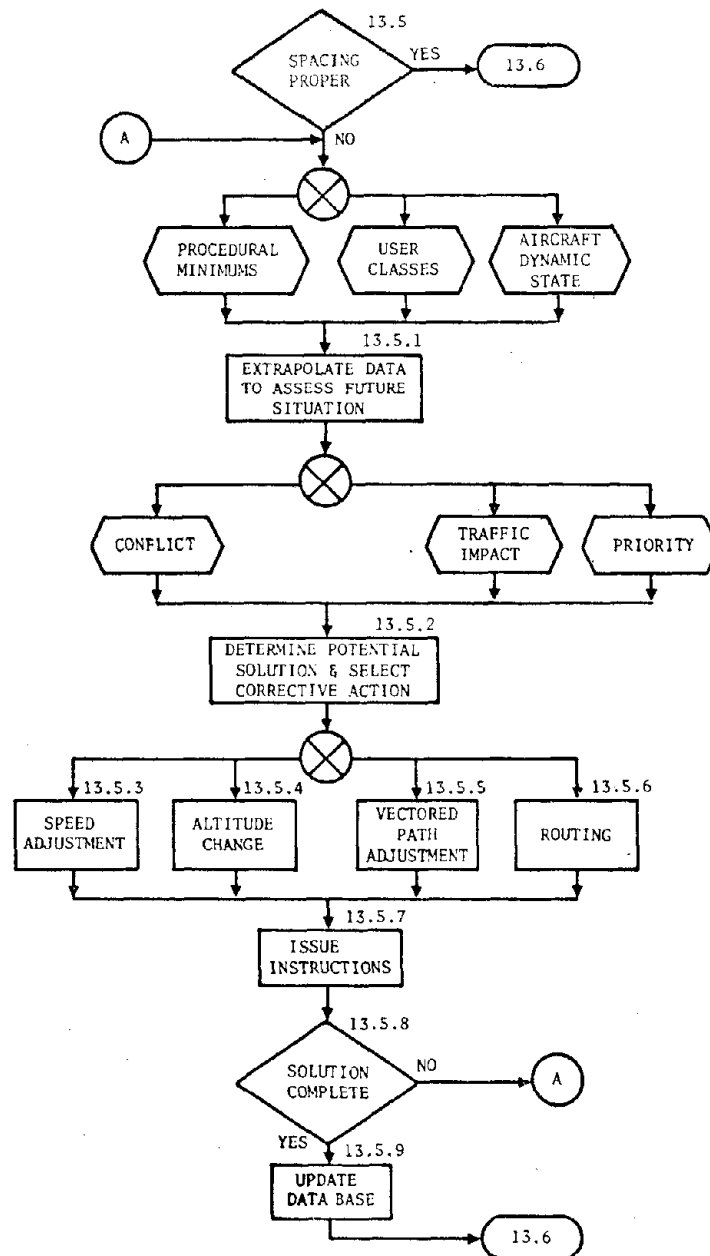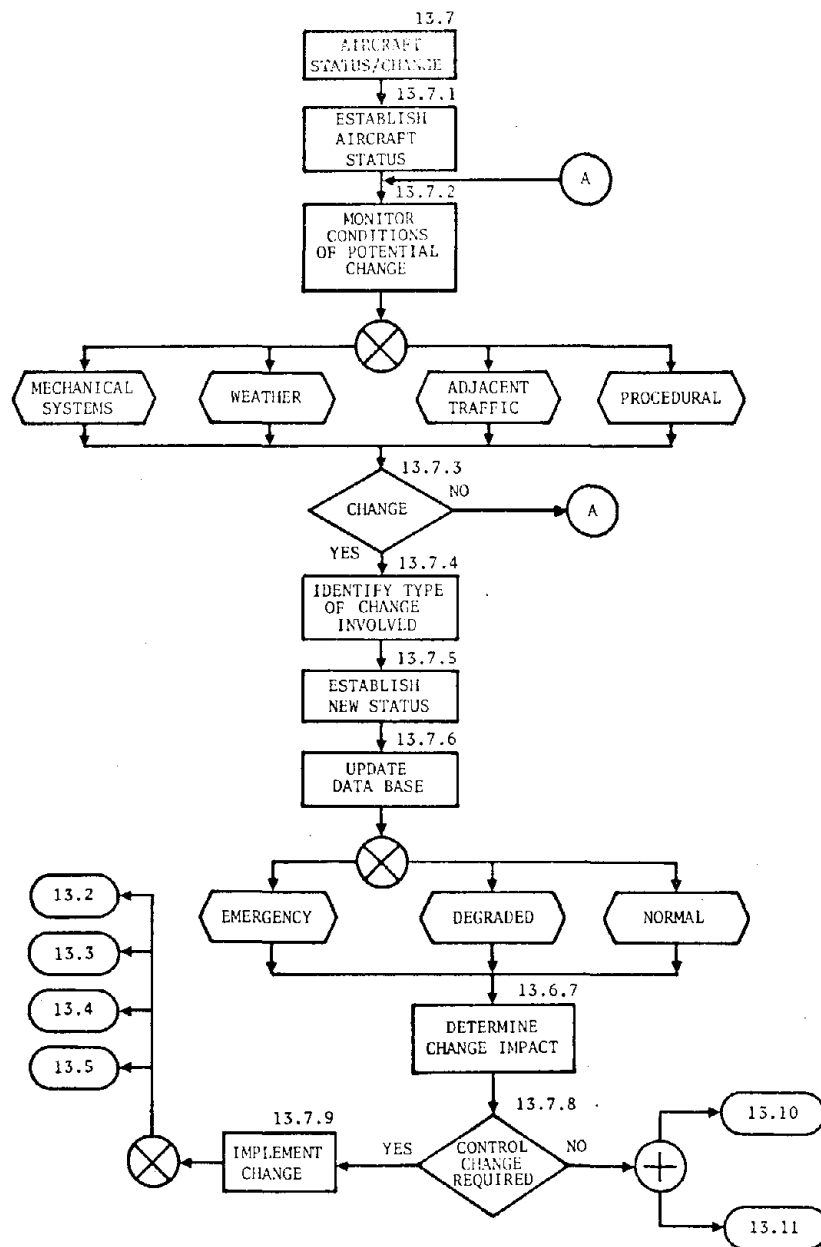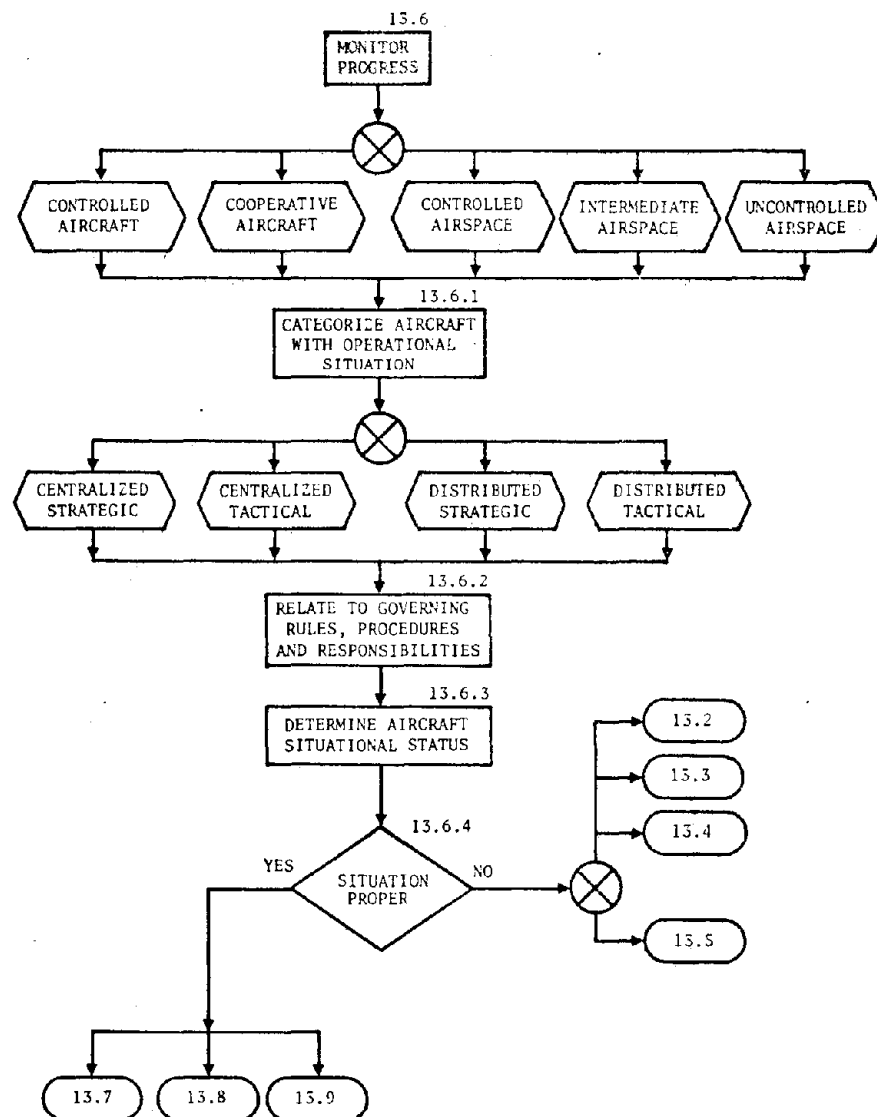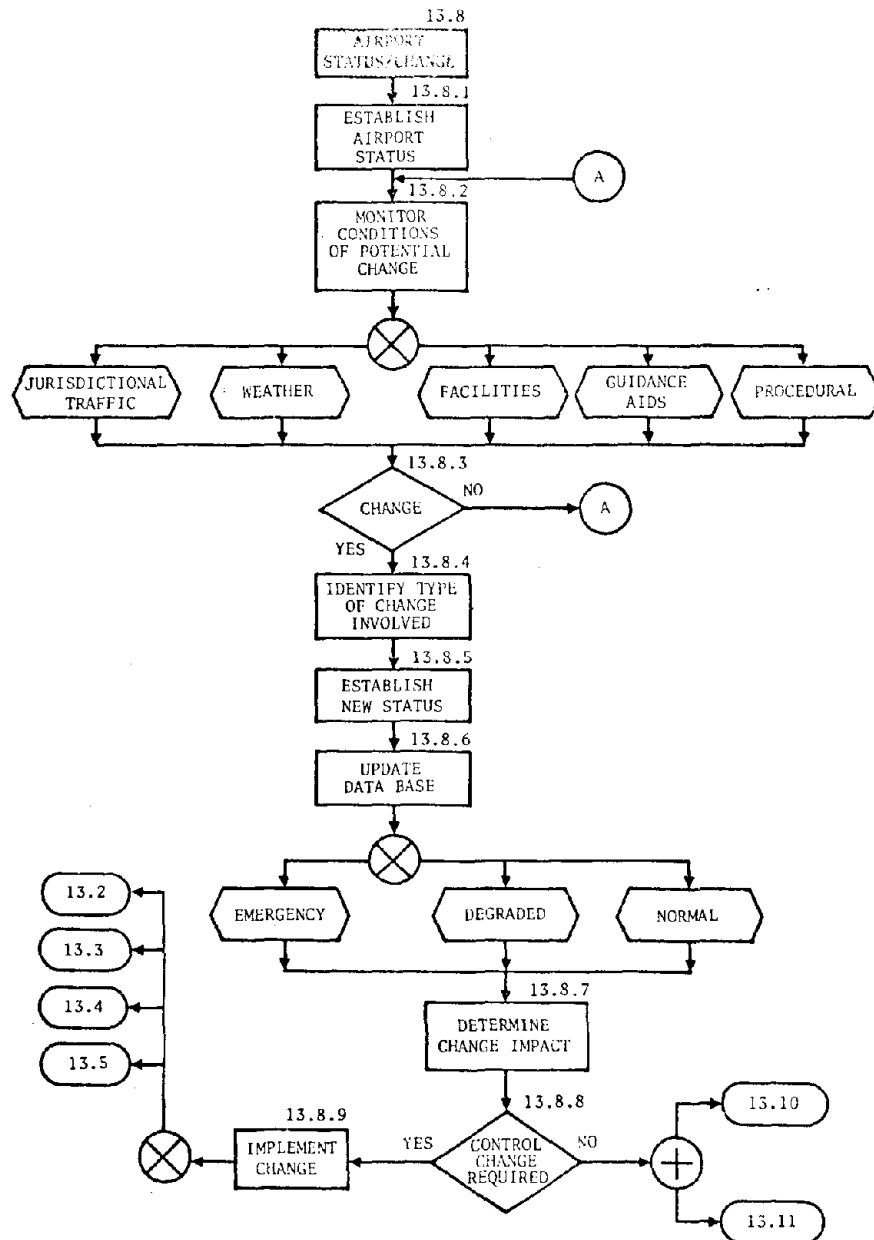
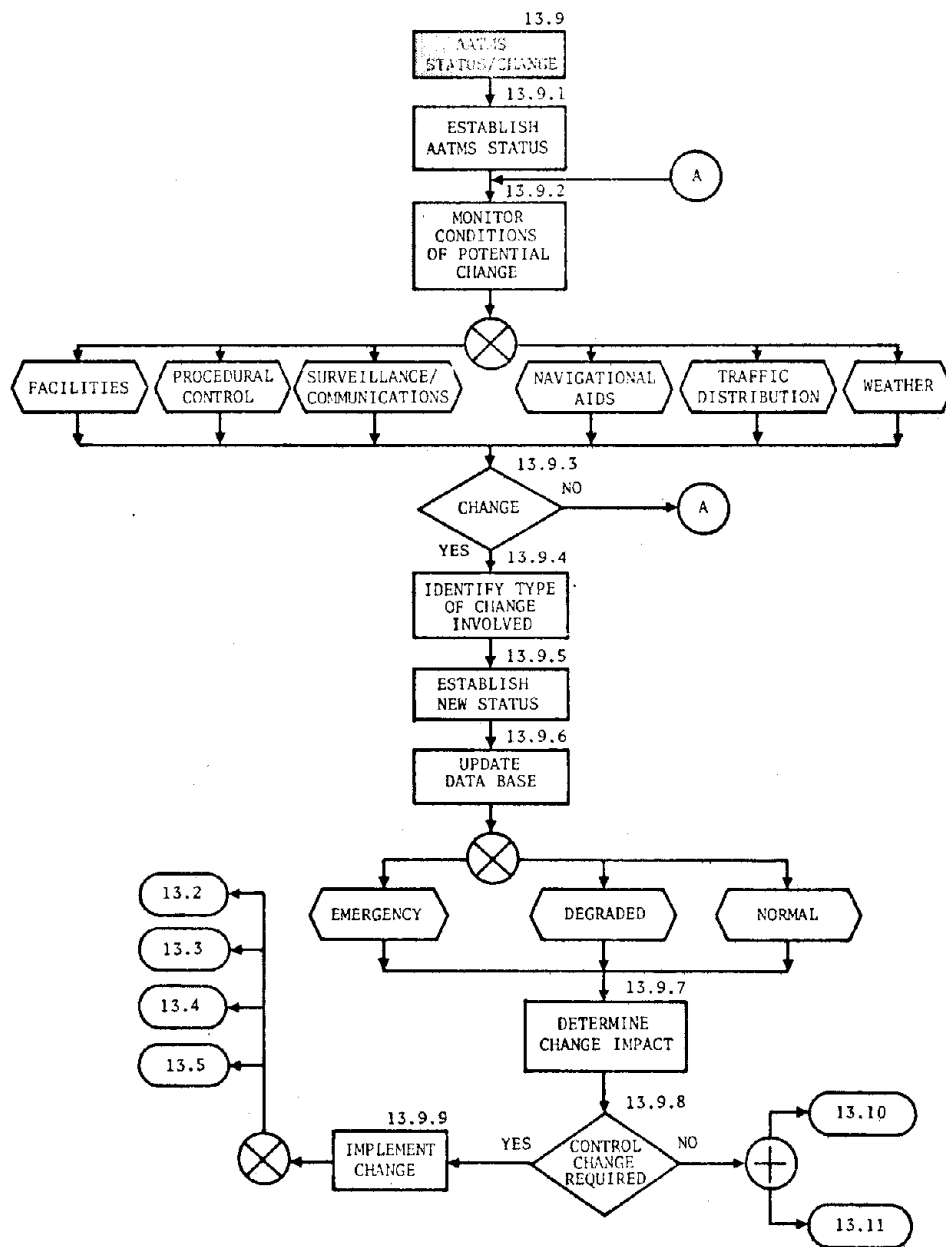Alternate Airport-Spacing Proper Diagram, Level III

```
                           13.7
                        ┌─────────────┐
                        │  AIRCRAFT   │
                        │STATUS/CHANGE│
                        └──────┬──────┘
                               │ 13.7.1
                        ┌──────▼──────┐
                        │ ESTABLISH   │
                        │  AIRCRAFT   │─────────────────( A )
                        │   STATUS    │
                        └──────┬──────┘
                               │ 13.7.2
                        ┌──────▼──────┐
                        │  MONITOR    │
                        │ CONDITIONS  │
                        │OF POTENTIAL │
                        │   CHANGE    │
                        └──────┬──────┘
                               │
                              ⊗
        ┌──────────────┬───────┴───────┬──────────────┐
   ┌────▽─────┐   ┌────▽─────┐    ┌────▽─────┐   ┌────▽─────┐
   │MECHANICAL│   │ WEATHER  │    │ ADJACENT │   │PROCEDURAL│
   │ SYSTEMS  │   │          │    │ TRAFFIC  │   │          │
   └────┬─────┘   └────┬─────┘    └────┬─────┘   └────┬─────┘
        └──────────────┴───────┬───────┴──────────────┘
                               │ 13.7.3
                            ╱──▼──╲       NO
                           ╱ CHANGE ╲──────────────( A )
                           ╲       ╱
                            ╲─────╱
                          YES │ 13.7.4
                        ┌──────▼──────┐
                        │IDENTIFY TYPE│
                        │ OF CHANGE   │
                        │  INVOLVED   │
                        └──────┬──────┘
                               │ 13.7.5
                        ┌──────▼──────┐
                        │ ESTABLISH   │
                        │ NEW STATUS  │
                        └──────┬──────┘
                               │ 13.7.6
                        ┌──────▼──────┐
                        │   UPDATE    │
                        │  DATA BASE  │
                        └──────┬──────┘
                               │
                              ⊗
                    ┌──────────┼──────────┐
              ┌─────▽────┐┌────▽─────┐┌───▽──────┐
  ( 13.2 )   │EMERGENCY ││ DEGRADED ││  NORMAL  │
             └─────┬────┘└────┬─────┘└───┬──────┘
  ( 13.3 )         └──────────┼──────────┘
                              │ 13.6.7
  ( 13.4 )              ┌─────▼──────┐
                        │ DETERMINE  │
  ( 13.5 )              │CHANGE IMPACT│
                        └─────┬──────┘
                              │ 13.7.8
        13.7.9              ╱─▼─╲              ( 13.10 )
   ┌──────────┐   YES     ╱CONTROL╲   NO
  ⊗◄─│IMPLEMENT │◄────────╱ CHANGE ╲────────⊕
     │  CHANGE  │         ╲REQUIRED╱
     └──────────┘          ╲─────╱          ( 13.11 )
```

Alternate Airport-Aircraft Status/Change Diagram, Level III

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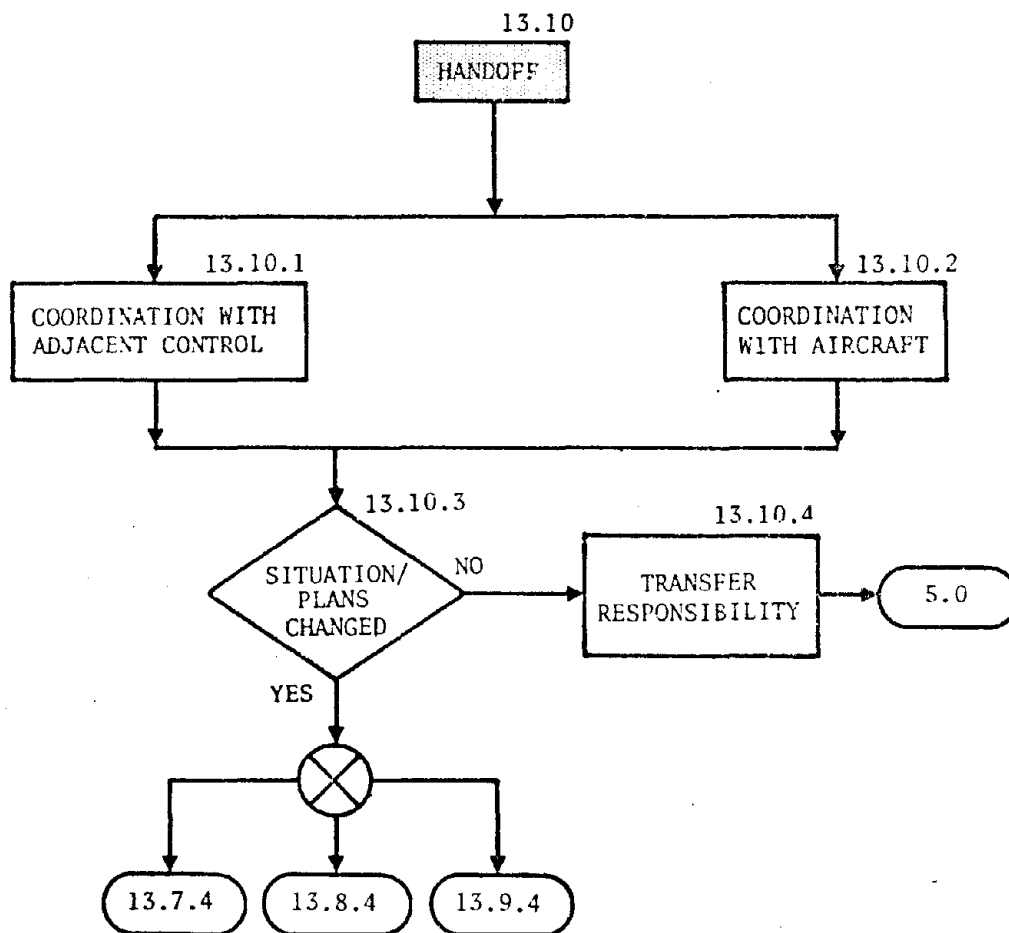Alternate Airport-Monitor Progress Diagram, Level III

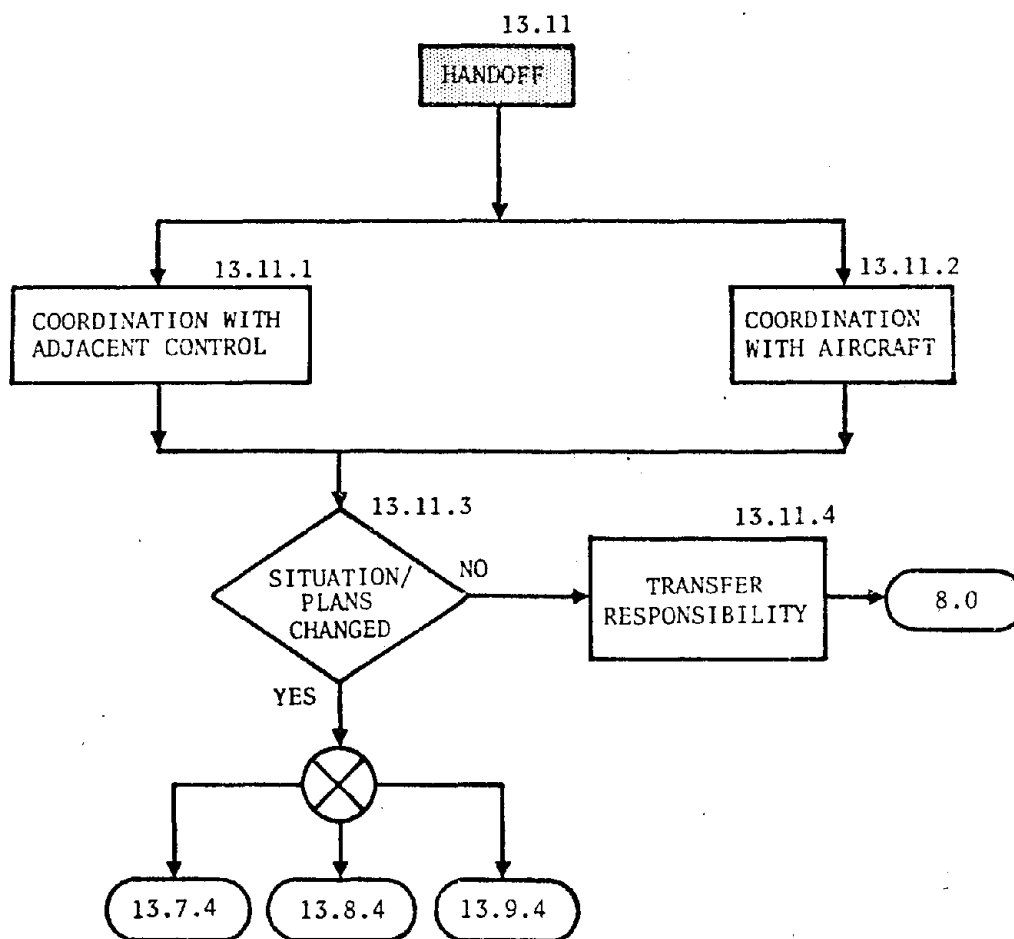Alternate Airport-Airport Status/Change Diagram, Level III

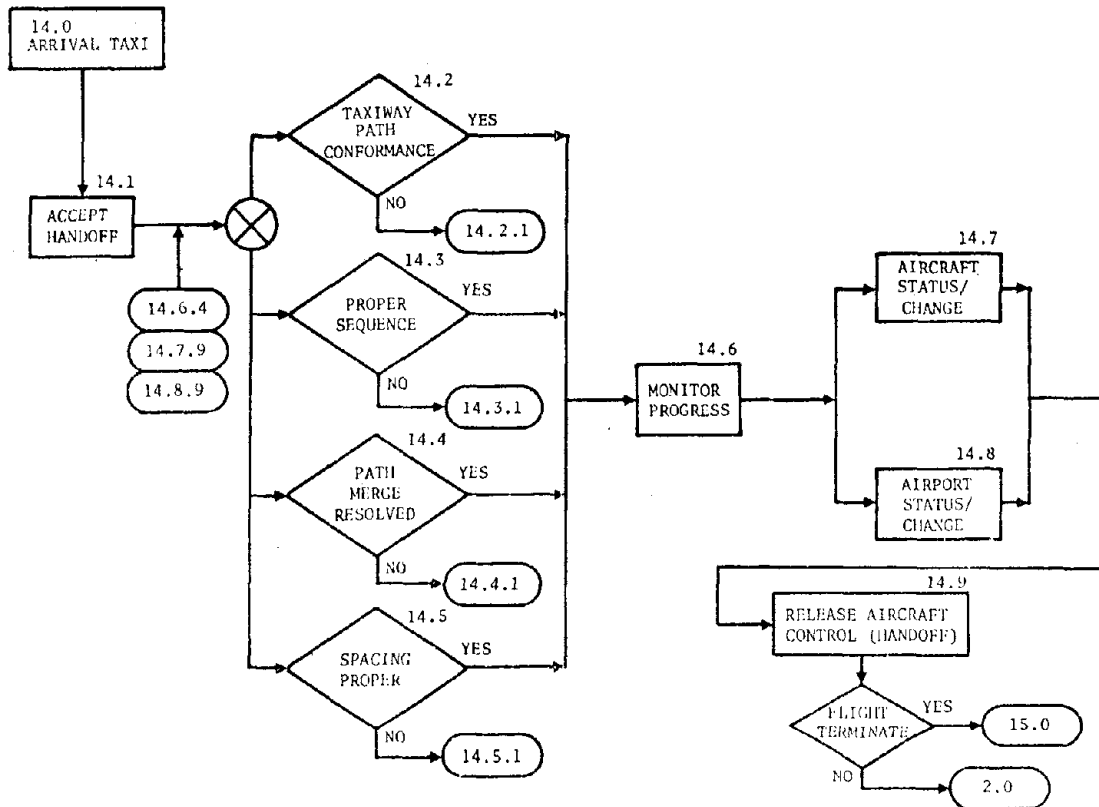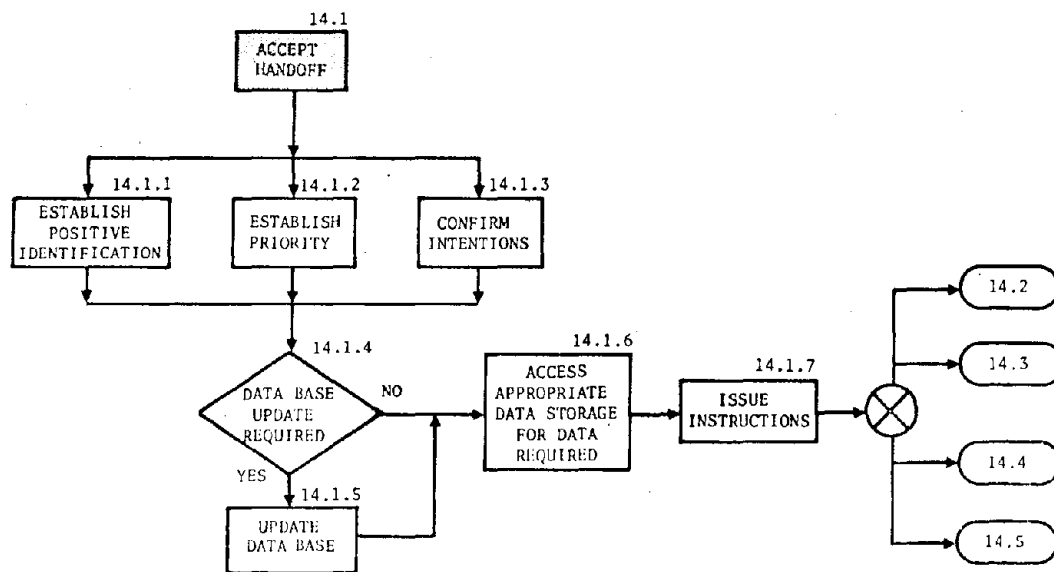Alternate Airport—AATMS Status/Change Diagram, Level III

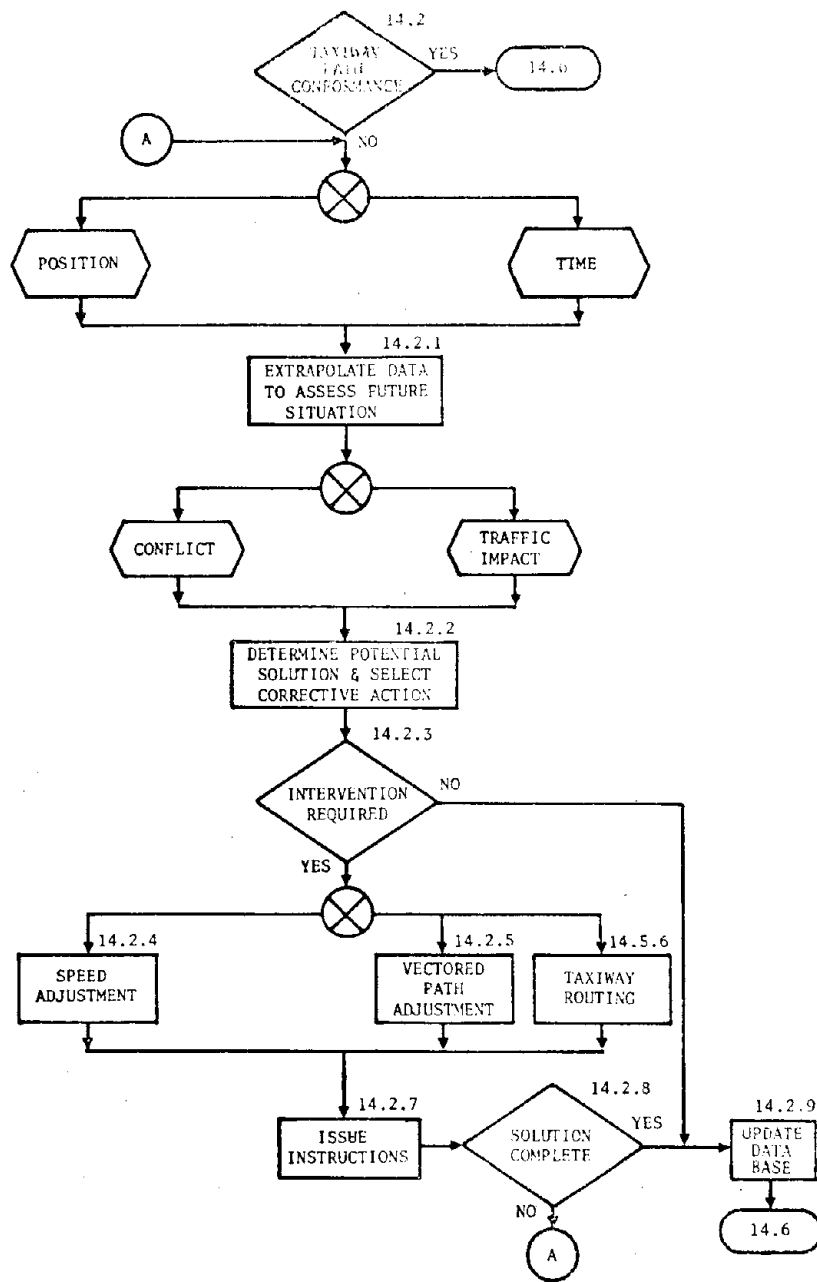Alternate Airport - Handoff to Enroute Diagram, Level III

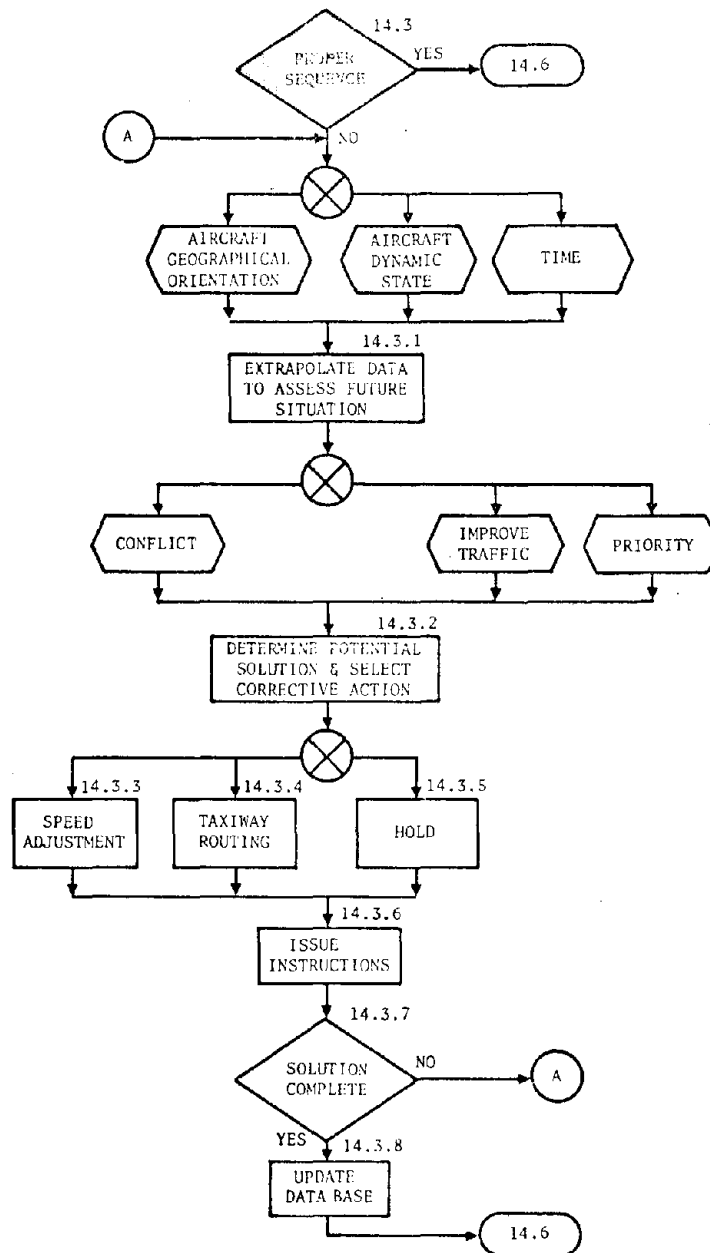Alternate Airport - Handoff Diagram, Level III
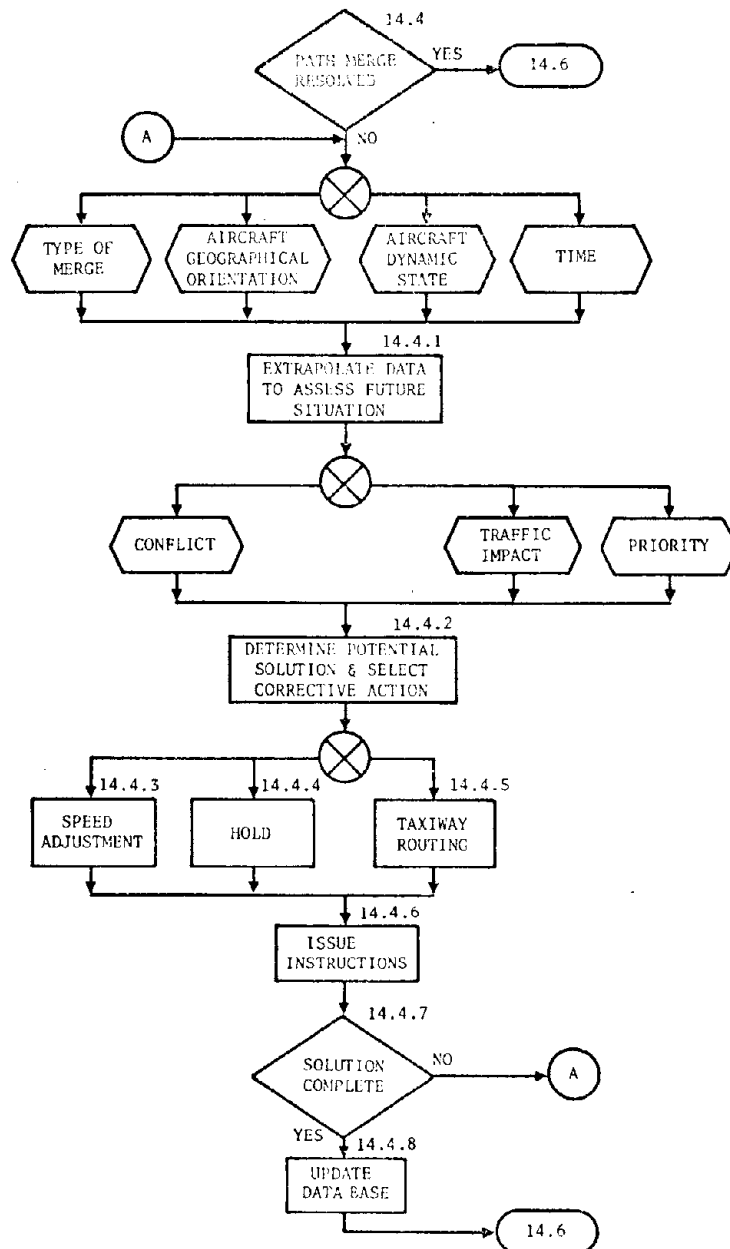
Arrival Taxi Logic Flow Diagram Level II
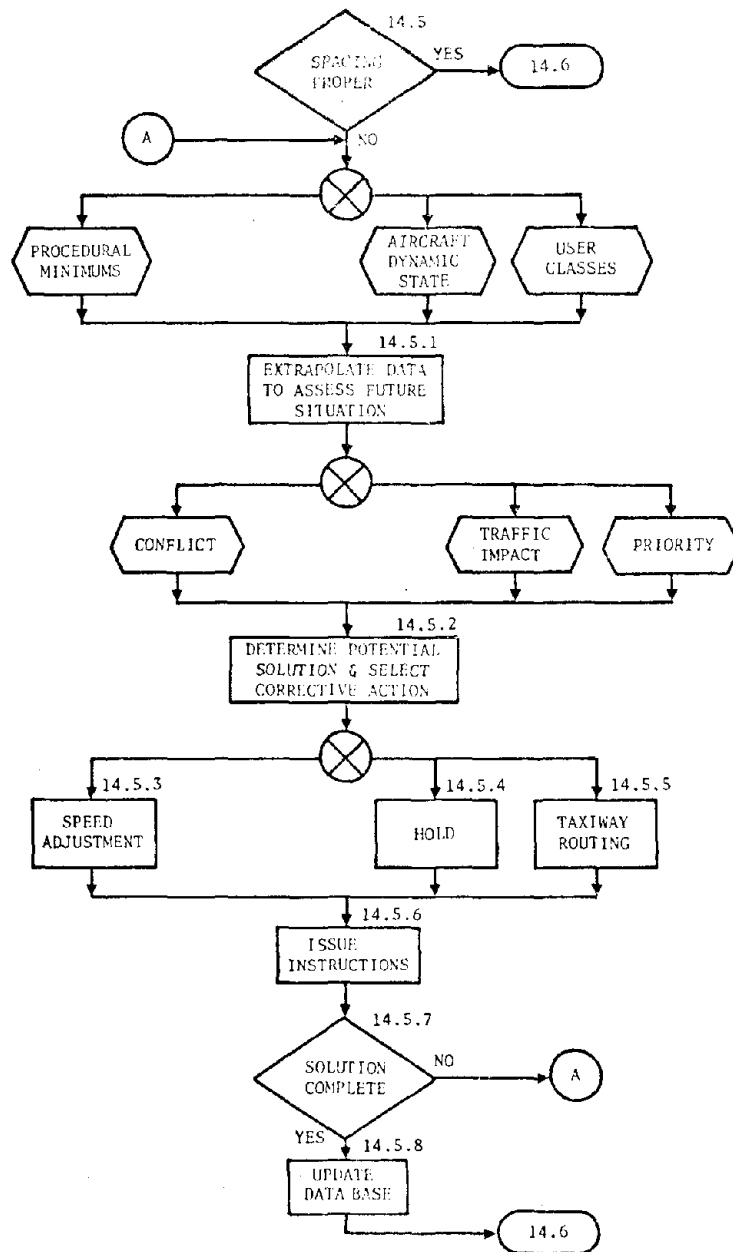
Arrival Taxi-Accept Handoff-Diagram, Level III

Arrival Taxi-Taxiway Path Conformance Diagram, Level III
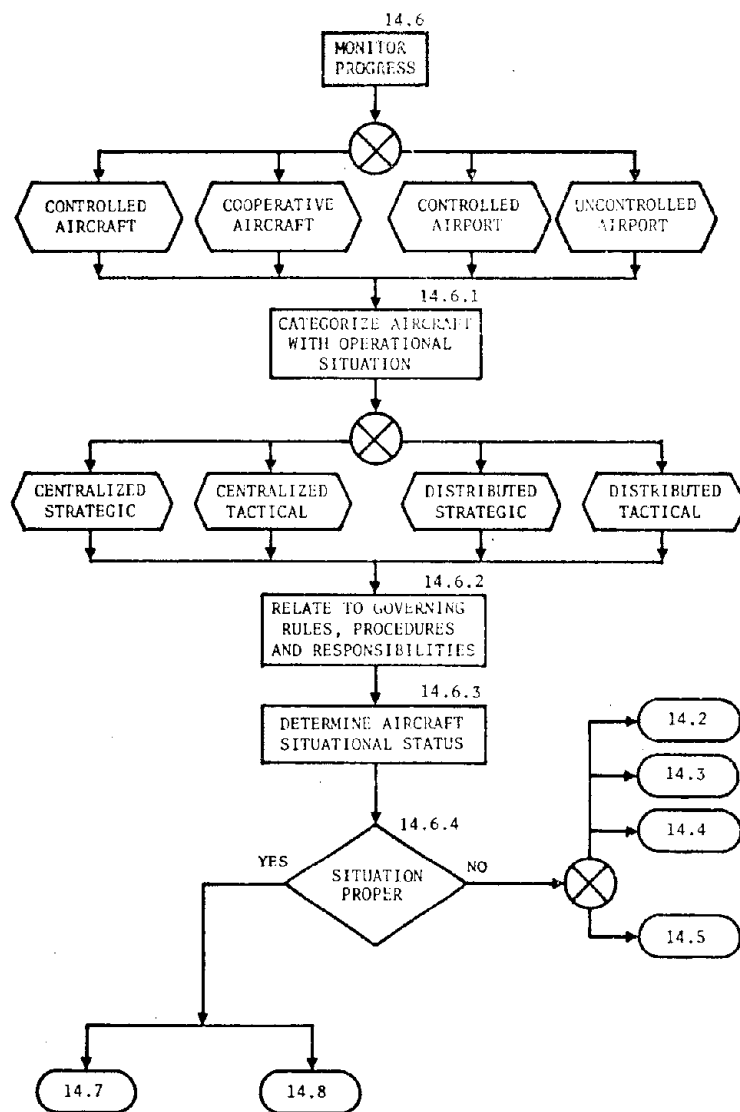
Arrival Taxi-Proper Sequence Diagram, Level III

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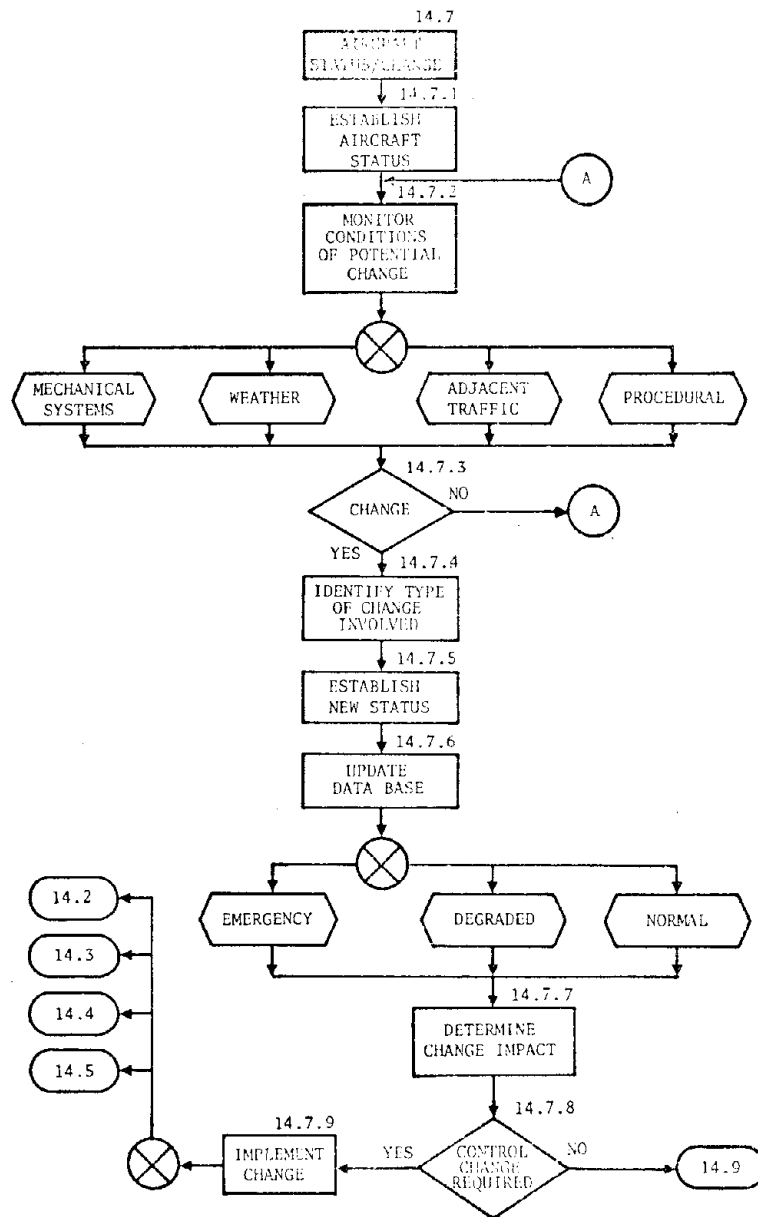Arrival Taxi-Path Merge Resolved Diagram, Level III
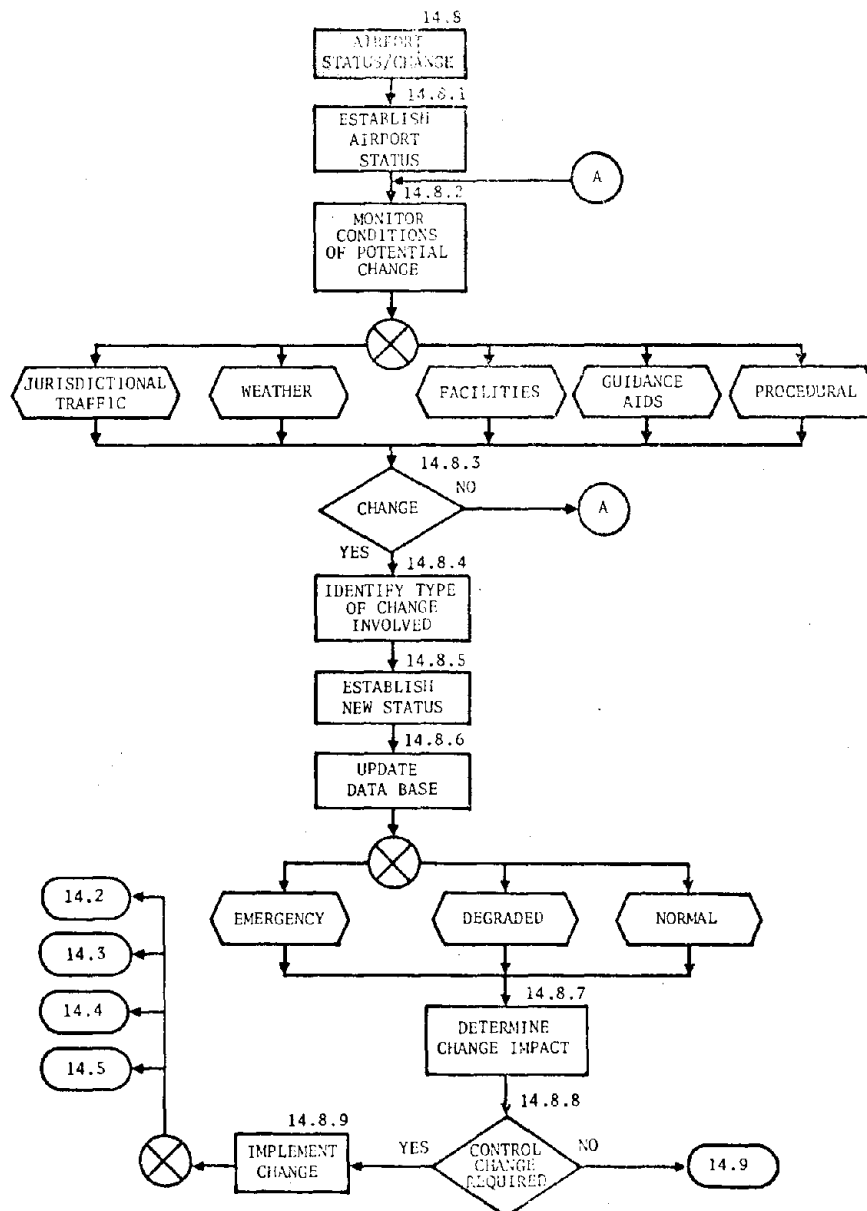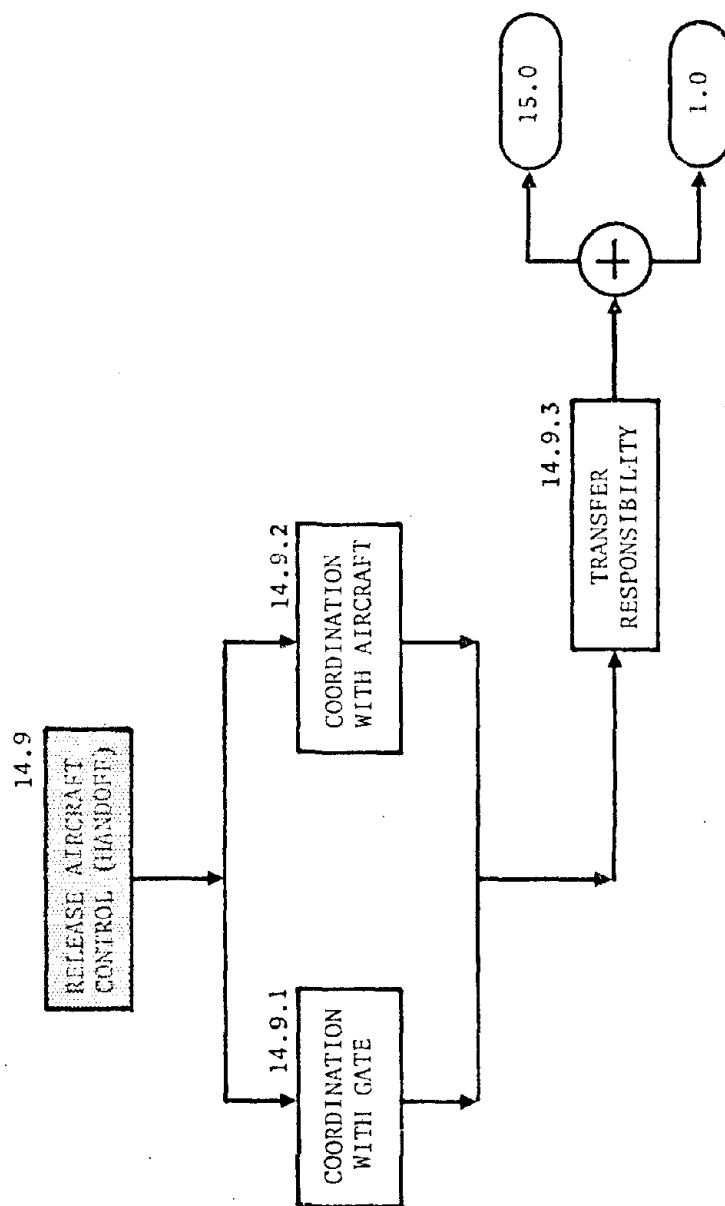
Arrival Taxi-Spacing Proper Diagram, Level III

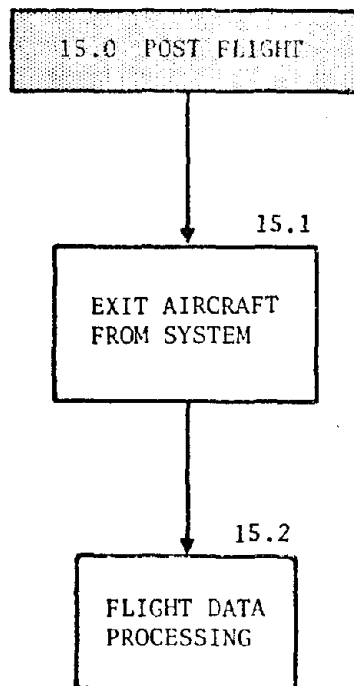Arrival Taxi-Monitor Progress Diagram, Level III

Arrival Taxi-Aircraft Status/Change Diagram, Level III

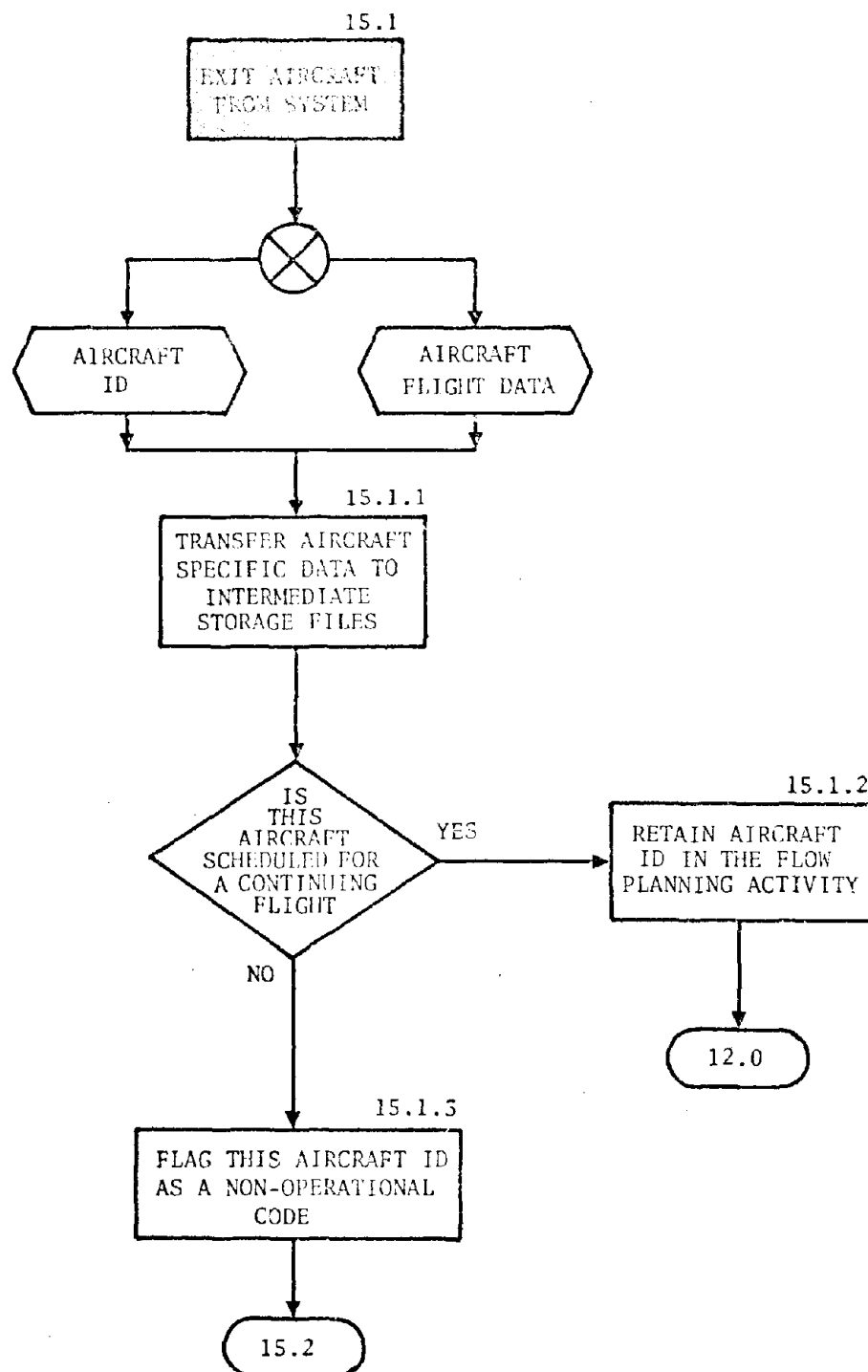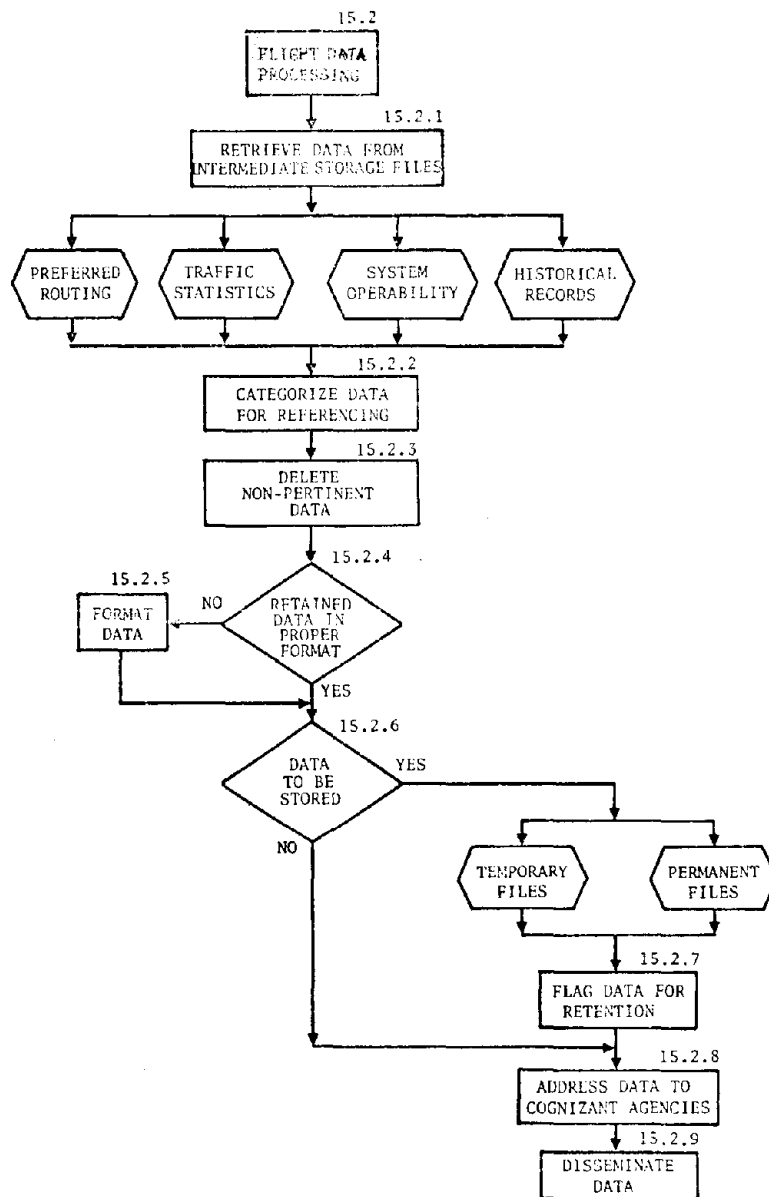Arrival Taxi-Airport Status/Change Diagram, Level III

Arrival Taxi - Release Aircraft Control Diagram, Level III

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        ┌─────────────────────────────┐
        │ 15.0  POST FLIGHT           │
        └─────────────────────────────┘
                       │
                       │           15.1
                       ▼
        ┌─────────────────────────────┐
        │                             │
        │   EXIT AIRCRAFT             │
        │   FROM SYSTEM               │
        │                             │
        └─────────────────────────────┘
                       │
                       │           15.2
                       ▼
        ┌─────────────────────────────┐
        │                             │
        │   FLIGHT DATA               │
        │   PROCESSING                │
        │                             │
        └─────────────────────────────┘
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Post Flight Logic Flow Diagram, Level II

Post Flight - Exit Aircraft from System Diagram, Level III

Post Flight-Flight Data Processing Diagram, Level III