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AUTOMATION APPLICATIONS IN AN ADVANCED AIR TRAFFIC MANAGEMENT SYSTEM
Volume IIB: Functional Analysis of Air Traffic Management (Cont'd)

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AUGUST 1974

FINAL REPORT

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16 Abstract

The Advanced Air Traffic Management System (AATMS) program is a long-range investigation of new concepts and techniques for controlling air traffic and providing services to the growing number of commercial, military, and general aviation users of the national airspace. This study of the applications of automation was undertaken as part of the AATMS program. The purposes were to specify and describe the desirable extent of automation in AATMS, to estimate the requirements for man and machine resources associated with such a degree of automation, and to examine the prospective employment of humans and automata as air traffic management is converted from a labor-intensive to a machine-intensive activity.

Volume II contains the analysis and description of air traffic management activities at three levels of detail - functions, sub-functions, and tasks. A total of 265 tasks are identified and described, and the flow of information inputs and outputs among the tasks is specified.

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PREFACE

This is the second of four books which together contain a detailed function analysis of air traffic management. The four books represent Volume II of a five-volume report describing work performed during Phase B of the Automation Applications Study for an Advanced Air Traffic Management System sponsored by the Transportation Systems Center of the Department of Transportation.

The first book describes the methodology employed and contains a description of the 17 generic air traffic management functions. It contains also, detailed descriptions of the subfunctions and tasks of Functions 1-4. The second book contains detailed descriptions of the subfunctions and tasks of Functions 5-8. The third book contains similar material for Functions 9-13 and the final book contains similar material for Functions 12-17.

Preface and reference material for the entire Volume can be found in the front of Volume IIA. The Table of Contents, List of Figures and List of Tables for this book follows.

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LIST OF TABLES - VOL. IIB

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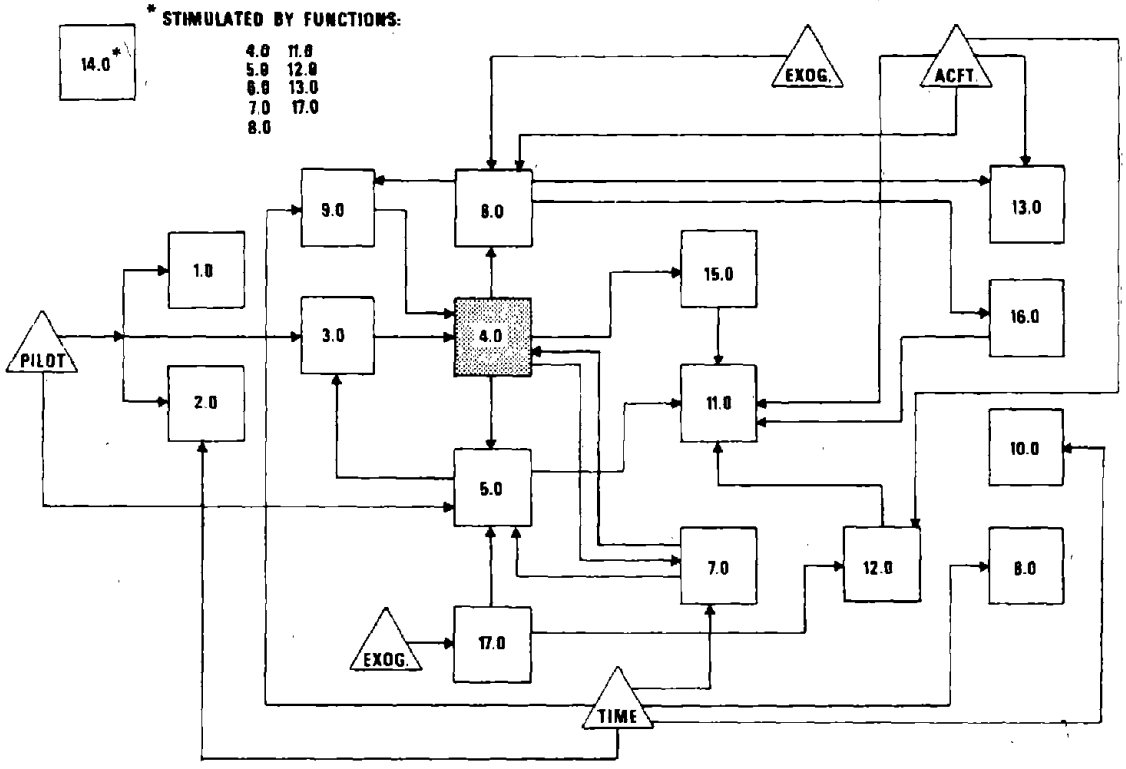
FUNCTION 4.0· PROCESS FLIGHT PLAN



1.0: PROVIDE FLIGHT PLANNING INFORMATION
2.0: CONTROL TRAFFIC FLOW
3.0: PREPARE FLIGHT PLAN
4.0: PROCESS FLIGHT PLAN
5.0: ISSUE CLEARANCES AND CLEARANCE CHANGES
6.0: MONITOR AIRCRAFT PROGRESS
7.0: MAINTAIN CONFORMANCE WITH FLIGHT PLAN
8.0: ASSURE SEPARATION OF AIRCRAFT
9.0: CONTROL SPACING OF AIRCRAFT
10.0: PROVIDE AIRBORNE, LANDING AND GROUND NAVIGATION CAPABILITY
11.0: PROVIDE AIRCRAFT GUIDANCE
12.0: ISSUE FLIGHT ADVISORIES AND INSTRUCTIONS
13.0: HANDOFF
14.0: MAINTAIN SYSTEM RECORDS
15.0: PROVIDE ANCILLARY AND SPECIAL SERVICES
16.0: PROVIDE EMERGENCY SERVICES
17.0: MAINTAIN SYSTEM CAPABILITY AND STATUS INFORMATION

4.0 PROCESS FLIGHT PLAN

- 4.1 Develop Time Position Profile
  - 4.1.1 Determine points for which ETOV's are to be computed
  - 4.1.2 Compute ETOV's/ETA
- 4.2 Review Flight Plan
  - 4.2.1 Compare flight plan with aircraft capability and status
  - 4.2.2 Compare flight plan with operational and environmental conditions
  - 4.2.3 Probe for conflicts among flight plans
  - 4.2.4 Compare flight plan with flow control directives and guidelines
  - 4.2.5 Compare flight plan with rules and procedures
  - 4.2.6 Compare flight plan with flight progress
  - 4.2.7 Compare flight plan with user class/pilot qualifications
  - 4.2.8 Compile list of discrepancies
  - 4.2.9 Determine flight plan priority
  - 4.2.10 Determine acceptability of flight plan
  - 4.2.11 Identify flight plans that must be modified as a result of this approval
  - 4.2.12 Inform pilot of flight plan approval
  - 4.2.13 Determine special services required
- 4.3 Propose Modified Flight Plan
  - 4.3.1 Determine changes required to make flight plan acceptable
  - 4.3.2 Determine responsibility to modify the flight plan
  - 4.3.3 Inform pilot of unacceptable flight plan
  - 4.3.4 Compile modified flight plan
- 4.4 Determine Responsibility for Control and Communication
  - 4.4.1 Receive and enter pilot's response
  - 4.4.2 Cancel flight plan
  - 4.4.3 Designate responsible jurisdictions
  - 4.4.4 Designate communication links between ATM and aircraft

SUBFUNCTION DESCRIPTION

FILE: 4.1
SUBFUNCTION: Develop Intended Time-Position Profile
FUNCTION: Process Flight Plan

OUTPUTS: Intended time-position profile (ETOV's/ETA)

DESCRIPTION:

Purpose: To develop an intended time-position profile for the proposed flight plan

Stimulus: Event-stimulated by receipt of a submitted flight plan or of a proposed revision of modification

Tasks:

(1) Determine points for which ETOV's are to be computed

(2) Compute ETOV's/ETA

Critical Performance Parameters:

(1) Timeliness

(2) Accuracy

Allocation Sensitivities:

INPUTS:

(1) From Subfunction 3.3, Compile and Submit Flight Plan:

- Submitted flight plan

(2) From Subfunction 4.3, Propose Modified Flight Plan:

- Modified flight plan

(3) From Subfunction 7.4, Determine Appropriate Resolution of Deviations:

- Proposed flight plan revision

(4) From Subfunction 17.1, Determine Current and Forecast Weather:

- Stored weather sequences
- Stored weather forecasts

(5) From Subfunction 9.5, Initiate Implementation of Sequence/Schedule Change:

- Proposed revised flight plan

(6) From Subfunction 17.1, Detect Long Term Conflicts Among Flight Plans:

- Proposed flight plan revision

TASK DESCRIPTION

FILE: 4.1.1
TASK: Determine Points for Which ETOV's are to be Computed
SUBFUNCTION: Develop Intended Time-Position Profile
FUNCTION: Process Flight Plan

OUTPUTS: Points for which ETOV's are to be computed

DESCRIPTION:

Purpose: To determine those points along the intended routes for which ETOV's are to be computed

Stimulus: Event-stimulated by receipt of a submitted flight plan or of proposed revisions or modifications

Decisions and Actions:

(1) Determine if it is a standard route, and:

- For standard routes, use predetermined points
- For non-standard routes, use predetermined times to separate points

Phase of Flight:

All phases except postflight

Critical Performance Parameters:

Timeliness

Performance Capabilities Required:

(1) Decision making:

- Comparison with standard
- Selection/choice

(2) Storing and receiving information:

- Selective retrieval/recall

(3) Information processing:

- Calculation

(4) Interpreting:

- Classification

Allocation Sensitivities:

External Constraints:

INPUTS:

(1) From Task 3.3.3, Compile and Submit Flight Plan:

- Submitted flight plan

(2) From Task 4.3.4, Compile Modified Flight Plan:

- Modified flight plan

(3) From Task 7.4.4, Develop Flight Plan Revisions to Correct Out-of-Tolerance Deviations:

- Proposed flight plan revision

(4) From Task 7.1.5, Propose Revised Flight Plan to Correct Long-Term Conflicts Among Flight Plans:

- Proposed flight plans

(5) From Task 9.5.7, Submit Revised Flight Plan for Approval:

- Proposed revised flight plan

TASK DESCRIPTION

FILE: 4.1.2
TASK: Compute ETOV's/ETA
SUBFUNCTION: Develop Intended Time-Position Profile
FUNCTION: Process Flight Plan

OUTPUTS: Intended time-position profile (ETOV's/ETA)

DESCRIPTION:

Purpose: To compute the estimated time over (ETOV's) and ETA for points along the intended route and at destination. This is the development of the intended time-position profile

Stimulus: Event-stimulated by receipt of the points for which ETOV's and an ETA are to be computed

Decisions and Actions:

(1) Determine distance between points

(2) Determine SOA

(3) Compute time over points and at destination

Phase of Flight:

All phases except postflight

Critical Performance Parameters:

(1) Timeliness

(2) Accuracy

Performance Capabilities Required:

(1) Storing and retrieving information:

- Selective retrieval/recall

(2) Information processing:

- Calculation

Allocation Sensitivities:

External Constraints:

INPUTS:

(1) From Task 4.1.1, Determine Points for which ETOV's are to be Computed:

- Points for which ETOV's are to be computed

(2) From Task 3.3.3, Compile and Submit Flight Plan:

- Submitted flight plan

(3) From Task 17.1.8, Store Weather Information:

- Stored weather sequences
- Stored weather forecasts

(4) From Task 4.3.4, Compile Modified Flight Plan:

- Modified flight plan

(5) From Task 7.1.5, Propose Revised Flight Plan to Correct Long-Term Conflicts Among Flight Plan:

- Proposed flight plan revision

(6) From Task 9.5.7, Submit Revised Flight Plan for Approval:

- Proposed revised flight plan

(7) From Task 7.4.4, Develop Flight Plan Revisions to Correct Out-of-Tolerance Deviations:

- Proposed flight plan revision

SUBFUNCTION DESCRIPTION

FILE: 4.2
SUBFUNCTION: Review Flight Plan
FUNCTION: Process Flight Plan

OUTPUTS:

(1) List of discrepancies between flight plan and:

- Aircraft capability and status
- Operational and environmental conditions
- Other approved flight plans
- Flow control directives and guidelines
- Rules and procedures
- Present flight progress
- User class/pilot qualifications

(2) Unacceptable flight plan

(3) Information to pilot of flight plan approval

(4) Special services required

(5) No special services required

(6) Priority of the flight plan

(7) Other flight plans that must be modified (as a result of approving this flight plan)

(8) Conflicts to be resolved

(9) No other flight plans must be modified

DESCRIPTION:

Purpose: To determine any inconsistencies in the submitted or modified flight plan, to determine the acceptability of the flight plan based on the inconsistencies, to inform the pilot when the submitted or a modified flight plan has been approved, and to determine any special services required by the flight plan

Stimulus: Event-stimulated by receipt of a submitted flight plan or of proposed revisions or modifications

Tasks:

(1) Compare flight plan with aircraft capability and status

(2) Compare flight plan with operational and environmental conditions

(3) Probe for conflicts among flight plans

(4) Compare flight plan with flow control directives and guidelines

(5) Compare flight plan with rules and procedures

(6) Compare flight plan with flight progress

(7) Compare flight plan with user class/pilot qualifications

(8) Compile list of discrepancies

(9) Determine acceptability of flight plan

(10) Inform pilot of flight plan approval

(11) Determine flight plan priority

(12) Identify flight plans that must be modified because of this approval

(13) Determine special services required

Critical Performance Parameters:

(1) Timeliness

(2) Accuracy

(3) Validity

(4) Completeness

Allocation Sensitivities:

INPUTS:

(1) From Subfunction 3.3, Compile and Submit Flight Plan:

- Submitted flight plan

(2) From Subfunction 2.3, Determine and Resolve Capacity Overload Situations:

- Terminal release quotas
- Enroute jurisdictional release quotas

(3) From Subfunction 6.1, Determine Present Position:

- Correlated position and identification

(4) From Subfunction 6.3, Predict Future Positions/ ETA's of the Aircraft:

- Predicted long-range time-position profile

(5) From exogenous source:

- Approval criteria
- Prioritizing criteria

(6) From Subfunction 17.1, Determine Current and Forecast Weather:

- Stored weather forecasts
- Stored weather sequences

(7) From Subfunction 17.2, Update Rules and Procedures Information:

- Stored data base items (rules and procedures)

(8) From Subfunction 17.7, Determine Capability and Status of COMM-NAV System:

- Stored data base items (COMM-NAV system)

(9) From Subfunction 17.8, Determine Capability and Status of Ground Facilities:

- Stored data base items (ground facilities)

(10) From Subfunction 17.9, Maintain User Class Information:

- Stored user class data base items

(11) From Subfunction 4.3, Propose Modified Flight Plan:

- Modified flight plan

(12) From Subfunction 17.3, Update Airspace Structure and Jurisdictional Boundary Information:

- Stored data base items (airspace structure and jurisdictional boundary information)

(13) From Subfunction 17.6, Update Hazards to Flight Information:

- Stored data base items (hazards to flight)

(14) From Subfunction 17.4, Update Route Information:

- Stored data base items (routes information)

(15) From Subfunction 4.1, Develop Intended Time-Position Profile:

- Intended time-position profiles

(16) From Subfunction 17.5, Update Airspace Restrictions Information:

- Stored data base items (airspace restriction information)

(17) From Subfunction 15.1, Determine Nature of Service Required:

- Special service no longer required

(18) From Subfunction 15.2, Initiate Action to Provide Service:

- New flight plan priority

TASK DESCRIPTION

FILE: 4.2.1
TASK: Compare Flight Plan with Aircraft Capability and Status
SUBFUNCTION: Review Flight Plan
FUNCTION: Process Flight Plan

OUTPUTS: Discrepancies between flight plan and aircraft capability and status

DESCRIPTION:

Purpose: To determine any inconsistencies between the proposed flight and the capability and status of the aircraft

Stimulus: Event-stimulated by receipt of a submitted flight plan or proposed revisions or modifications

Decisions and Actions:

(1) Extract aircraft status from flight plan

(2) Compare capability data with flight plan data

(3) Compare status data with flight plan data

Phase of Flight:

All phases except postflight

Critical Performance Parameters:

(1) Timeliness

(2) Accuracy

(3) Validity

Performance Capabilities Required:

(1) Decision making:

- Comparison with a standard
- Selection/choice

(2) Storing and retrieving information:

- Selective retrieval/recall

(3) Information processing:

- Sorting
- Filtering

(4) Interpreting:

- Association

Allocation Sensitivities:

External Constraints:

INPUTS:

(1) From Task 3.3.3, Compile and Submit Flight Plan:

- Submitted flight plan

(2) From Task 4.3.4, Compile Modified Flight Plan:

- Modified flight plan

(3) From Task 17.9.6, Store User Class Data Base Items:

- Stored user class data base items

(4) From Task 7.1.5, Propose Revised Flight Plan to Correct Long-Term Conflicts Among Flight Plans:

- Proposed flight plan revision

(5) From Task 9.5.7, Submit Revised Flight Plan for Approval:

- Revised flight plan

(6) From Task 7.4.4, Develop Flight Plan Revisions to Correct Out-of-Tolerance Deviations:

- Proposed flight plan revision

TASK DESCRIPTION

FILE: 4.2.2
TASK: Compare Flight Plan with Operational and Environmental Conditions
SUBFUNCTION: Review Flight Plan
FUNCTION: Process Flight Plan

OUTPUTS: Discrepancies between flight plan and operational and environmental conditions

DESCRIPTION:

Purpose: To determine any inconsistencies between the proposed flight plan and the operational and environmental conditions

Stimulus: Event-stimulated by receipt of the submitted flight plan or of proposed revisions or modifications

Decisions and Actions:

(1) Extract flight area from flight plan

(2) Determine environmental conditions for flight area

(3) Determine operational conditions for flight area

(4) Compare operational conditions with flight plan

(5) Compare environmental conditions with flight plan

Phase of Flight:

All phases except postflight

Critical Performance Parameters:

(1) Timeliness

(2) Validity

Performance Capabilities Required:

(1) Decision making:

- Comparison with a standard

(2) Storing and retrieving information:

- Selective retrieval/recall

(3) Interpreting:

- Association

(4) Information processing:

- Analysis

Allocation Sensitivities:

External Constraints:

INPUTS:

(1) From Subfunction 3.3, Compile and Submit Flight Plan:

- Submitted flight plan

(2) From Task 4.3.4, Compile Modified Flight Plan:

- Modified flight plan

(3) From Task 17.1.8, Store Weather Information:

- Stored weather sequences
- Stored weather forecasts

(4) From Task 17.7.5, Store Data Base Items:

- Stored data base items (Comm-Nav system)

(5) From Task 17.8.5, Store Data Base Items:

- Stored data base items (ground facilities)

(6) From Task 17.4.6, Store Data Base Items:

- Stored data base items (route information)

(7) From Task 17.6.6, Store Data Base Items:

- Stored data base items (flight hazard information)

(8) From Task 17.5.6, Store Data Base Items:

- Store data base items (airspace restrictions)

(9) From Task 17.3.6, Store Data Base Items:

- Stored data base items (airspace structure and jurisdictional boundary information)

(10) From Task 7.1.5, Propose Revised Flight Plan to Correct Long-Term Conflicts:

- Proposed flight plan revision

(11) From Task 9.5.7, Submit Revised Flight Plan for Approval:

- Revised flight plan

(12) From Task 7.4.4, Develop Flight Plan Revisions to Correct Out-of-Tolerance Deviations:

- Proposed flight plan revision

TASK DESCRIPTION

FILE: 4.2.3
TASK: Probe for Conflicts Among Flight Plans
SUBFUNCTION: Review Flight Plan
FUNCTION: Process Flight Plan

OUTPUTS: Conflicts with other flight plans

DESCRIPTION:

Purpose: To determine any conflicts between the proposed flight plan and the other approved flight plans

Stimulus: Event-stimulated by the receipt of the submitted flight plan or of proposed revisions or modifications

Decisions and Actions:

(1) Determine other flight plans which might have conflicts with proposed flight plan

(2) Compare flight plan with other flight plans for conflicts

Phase of Flight:

All phases except postflight

Critical Performance Parameters:

(1) Timeliness

(2) Accuracy

(3) Validity

Performance Capabilities Required:

(1) Decision making:

- Comparison with a standard
- Selection/choice

(2) Storing and retrieving information:

- Selective retrieval/recall

(3) Interpreting:

- Association

(4) Information processing:

- Analysis

Allocation Sensitivities:

External Constraints:

INPUTS:

(1) From Task 3.3.3, Compile and Submit Flight Plan:

- Submitted flight plan

(2) From Task 4.3.4, Compile Modified Flight Plan:

- Modified flight plan

(3) From Task 4.2.10, Determine Acceptability of Flight Plan:

- Approved flight plan

(4) From Task 7.1.5, Propose Revised Flight Plan to Correct Long-Term Conflicts:

- Proposed flight plan revision

(5) From Task 9.5.7, Submit Revised Flight Plan for Approval:

- Revised flight plan

(6) From Task 7.4.4, Develop Flight Plan Revisions to Correct Out-of-Tolerance Deviations:

- Proposed flight plan revision

TASK DESCRIPTION

FILE: 4.2.4
TASK: Compare Flight Plan with Flow Control Directives and Guidelines
SUBFUNCTION: Review Flight Plan
FUNCTION: Process Flight Plan

OUTPUTS: Discrepancies between flight plan and flow control directives and guidelines

DESCRIPTION:

Purpose: To determine any inconsistencies between the proposed flight plan and the flow control directives and guidelines

Stimulus: Event-stimulated by the receipt of the submitted flight plan or of proposed revisions or modifications

Decisions and Actions:

(1) Determine applicable flow control directives

(2) Determine guidelines in effect

(3) Compare flight plan with flow control directives

(4) Compare flight plan with guidelines

Phase of Flight:

All phases except postflight

Critical Performance Parameters:

(1) Timeliness

(2) Validity

Performance Capabilities Required:

(1) Decision making:

- Comparison with a standard
- Selection/choice

(2) Storing and retrieving information:

- Selective retrieval/recall

(3) Interpreting:

- Association

Allocation Sensitivities:

External Constraints:

INPUTS:

(1) From Task 3.3.3, Compile and Submit Flight Plan:

- Submitted flight plan

(2) From Task 4.3.4, Compile Modified Flight Plan:

- Modified flight plan

(3) From Task 2.3.5, Formulate Flow Control Directives:

- Terminal release quotas
- Enroute jurisdictional release quotas

(4) From Task 7.1.5, Propose Revised Flight Plan to Correct Long-Term Conflicts:

- Proposed flight plan revision

(5) From Task 9.5.7, Submit Revised Flight Plan for Approval:

- Revised flight plan

(6) From Task 7.4.4, Develop Flight Plan Revisions to Correct Out-of-Tolerance Deviations:

- Proposed flight plan revision

TASK DESCRIPTION

FILE: 4.2.5
TASK: Compare Flight Plan with Rules and Procedures
SUBFUNCTION: Review Flight Plan
FUNCTION: Process Flight Plan

OUTPUTS: Discrepancies between flight plan and rules and procedures

DESCRIPTION:

Purpose: To determine any inconsistencies between the proposed flight plan and the rules and procedures

Stimulus: Event-stimulated by the receipt of the submitted flight plan or of proposed revisions or modifications

Decisions and Actions:

(1) Determine applicable rules and procedures

(2) Compare flight plan with rules and procedures

Phase of Flight:

All phases except postflight

Critical Performance Parameters:

(1) Timeliness

(2) Validity

Performance Capabilities Required:

(1) Decision making:

- Comparison with a standard
- Selection/choice

(2) Storing and retrieving information:

- Selective retrieval/recall

(3) Interpreting:

- Association

(4) Information processing:

- Analysis

Allocation Sensitivities:

External Constraints:

INPUTS:

(1) From Task 3.3.3, Compile and Submit Flight Plan:

- Submitted flight plan

(2) From Task 4.3.4, Compile Modified Flight Plan:

- Modified flight plan

(3) From Task 17.2.6, Store Data Base Items:

- Stored data base items (rules and procedures)

(4) From Task 7.1.5, Propose Revised Flight Plan to Correct Long-Term Conflicts:

- Proposed flight plan revision

(5) From Task 9.5.7, Submit Revised Flight Plan for Approval:

- Revised flight plan

(6) From Task 7.4.4, Develop Flight Plan Revisions to Correct Out-of-Tolerance Deviations:

- Proposed flight plan revision

TASK DESCRIPTION

FILE: 4.2.6
TASK: Compare Flight Plan with Flight Progress
SUBFUNCTION: Review Flight Plan
FUNCTION: Process Flight Plan

OUTPUTS: Discrepancies between present flight progress and proposed flight plan

DESCRIPTION:

Purpose: To determine any inconsistencies between present flight progress and proposed flight progress. This assures that if the flight plan is an airfile, the aircraft can be at the beginning point of the flight plan at the specified time

Stimulus: Event-stimulated by the intended time-position profile (Task 4.1.2)

Decisions and Actions:

(1) Determine present flight progress

(2) Compare present flight progress with intended flight plan

Phase of Flight:

All phases except preflight and postflight

Critical Performance Parameters:

(1) Timeliness

(2) Accuracy

(3) Validity

Performance Capability Required:

(1) Decision making:

- Comparison with standard

(2) Storing and retrieving information:

- Selective retrieval/recall

(3) Interpreting:

- Association

(4) Information processing:

- Analysis

Allocation Sensitivities:

External Constraints:

INPUTS:

(1) From Task 6.1.2, Receive/Enter Position:

- Correlated position and identification

(2) From Task 6.3.3, Compute Long-Range Extrapolations:

- Long-range predicted time-position profile (x, y, h and t) for the aircraft

(3) From Task 4.1.2, Compute ETOV's/ETA:

- Intended time-position profile

TASK DESCRIPTION

FILE: 4.2.7
TASK: Compare Flight Plan with User Class/Pilot Qualifications
SUBFUNCTION: Review Flight Plan
FUNCTION: Process Flight Plan

OUTPUTS: Discrepancies between flight plan and user class/pilot qualifications

DESCRIPTION:

Purpose: To determine any inconsistencies between the proposed flight plan and the qualifications of the pilot and the user class (If pilot qualifications and user class are determined from the flight plan, this becomes a check for internal consistency)

Stimulus: Event-stimulated by receipt of a submitted flight plan or of proposed revisions or modifications

Decisions and Actions:

(1) Determine pilot qualifications

(2) Compare pilot qualifications with flight plan

(3) Determine user class

(4) Compare user class with flight plan

Phase of Flight:

All phases except postflight

Critical Performance Parameters:

(1) Timeliness

(2) Validity

Performance Capabilities Required:

(1) Decision making:

- Comparison with standard
- Selection/choice

(2) Storing and retrieving information:

- Selective retrieval/recall

(3) Interpreting:

- Association

(4) Information processing:

- Analysis

Allocation Sensitivities:

External Constraints:

INPUTS:

(1) From Task 3.3.3, Compile and Submit Flight Plan:

- Submitted flight plan

(2) From Task 4.3.4, Compile Modified Flight Plan:

- Modified flight plan

(3) From Task 7.1.5, Propose Revised Flight Plan to Correct Long-Term Conflicts:

- Proposed flight plan revision

(4) From Task 9.5.7, Submit Revised Flight Plan for Approval

- Revised flight plan

(5) From Task 7.4.4, Develop Flight Plan Revisions to Correct Out-of-Tolerance Deviations

- Proposed flight plan revision

TASK DESCRIPTION

FILE: 4.2.8
TASK: Compile List of Discrepancies
SUBFUNCTION: Review Flight Plan
FUNCTION: Process Flight Plan

OUTPUTS: List of discrepancies

DESCRIPTION:

Purpose: To compile a list of the discrepancies between flight plan entries and regulatory, operational, and environmental factors

Stimulus: Event-stimulated by the compilation of Tasks 4.2.1 thru 4.2.7

Decisions and Actions:

Compile list of discrepancies

Phase of Flight:

All phases except postflight

Critical Performance Parameters:

(1) Timeliness

(2) Completeness

Performance Capabilities Required:

Information processing:

- Merging

Allocation Sensitivities:

External Constraints:

INPUTS:

(1) From Task 4.2.1, Compare Flight Plan with Aircraft Capability and Status:

- Discrepancies between flight plan and aircraft capability and status

(2) From Task 4.2.2, Compare Flight Plan with Operational and Environmental Conditions:

- Discrepancies between flight plan and operational and environmental conditions

(3) From Task 4.2.3, Probe for Conflicts:

- Conflicts with other flight plans

(4) From Task 4.2.4, Compare Flight Plan with Flow Control Directives and Guidelines:

- Discrepancies between flight plan and flow control directives and guidelines

(5) From Task 4.2.5, Compare Flight Plan with Rules and Procedures:

- Discrepancies between flight plan and rules and procedures

(6) From Task 4.2.6, Compare Flight Plan with Flight Progress:

- Discrepancies between present flight progress and proposed flight plan

(7) From Task 4.2.7, Compare Flight Plan with User Class/ Pilot Qualifications:

- Discrepancies between flight plan and user class/ pilot qualifications

TASK DESCRIPTION

FILE: 4.2.9
TASK: Determine Flight Plan Priority
SUBFUNCTION: Review Flight Plan
FUNCTION: Process Flight Plan

OUTPUTS: Priority of the proposed flight plan

Purpose: To determine the priority of the flight plan in relationship to other flight plans

Stimulus: Event-stimulated by receipt of a flight plan or by an output of special service no longer required from Task15.1.2, or by an output of a new flight plan priority required from Task 15.2.1

Decisions and Actions:

(1) Determine aircraft identity

(2) Determine aircraft mission

(3) Establish priority

Phase of Flight:

All phases except postflight

Critical Performance Parameters:

(1) Timeliness

(2) Validity

Performance Capabilities Required:

(1) Interpreting:

- Classification

(2) Storing and retrieving information:

- Selective retrieval/recall

(3) Decision making:

- Comparison with standard
- Induction/inference/deduction

Allocation Sensitivities:

External Constraints:

INPUTS:

(1) From Task 3.3.3, Compile and Submit Flight Plan:

- Submitted flight plan

(2) From Task 4.3.4, Compile Modified Flight Plan:

- Modified flight plan

(3) From exogenous source:

- Prioritizing criteria

(4) From Task 17.2.6, Store Data Base Items:

- Stored data base items (rules and procedures)

(5) From Task 4.2.10, Determine Acceptability of Flight Plan:

- Approved flight plan

(6) From Task 7.1.5, Propose Revised Flight Plan to Correct Long-Term Conflicts:

- Proposed flight plan revision

(7) From Task 9.5.7, Submit Revised Flight Plan for Approval:

- Revised flight plan

(8) From Task 7.4.4, Develop Flight Plan Revisions to Correct Out-of-Tolerance Deviations:

- Proposed flight plan revision

TASK DESCRIPTION

FILE: 4.2.10
TASK: Determine Acceptability of Flight Plan
SUBFUNCTION: Review Flight Plan
FUNCTION: Process Flight Plan

OUTPUTS: (1) Approved flight plan

(2) Unacceptable flight plan

DESCRIPTION:

Purpose: To approve or disapprove the proposed flight plan

Stimulus: Event-stimulated by the list of discrepancies (may be zero list) from Task 4.2.8

Decisions and Actions:

(1) Comparison of discrepancies with acceptance criteria

(2) Approve or disapprove decision

Phase of Flight:

All phases except postflight

Critical Performance Parameters:

(1) Timeliness

(2) Validity

Performance Capabilities Required:

(1) Decision making:

- Comparison with a standard
- Selection/choice

(2) Interpreting:

- Association

(3) Storing and retrieving information:

- Selective retrieval/recall

Allocation Sensitivities:

External Constraints:

INPUTS:

(1) From Task 3.3.3, Compile and Submit Flight Plan:

- Submitted flight plan

(2) From Task 4.3.4, Compile Modified Flight Plan:

- Modified flight plan

(3) From Task 4.2.8, Compile List of Discrepancies:

- List of discrepancies

(4) From exogenous source:

- Approval criteria

(5) From Task 4.2.9, Determine Flight Plan Priority:

- Priority of the proposed flight plan

(6) From Task 7.1.5, Propose Revised Flight Plan to Correct Long-Term Conflicts:

- Proposed flight plan revision

(7) From Task 9.5.7, Submit Revised Flight Plan for Approval:

- Revised flight plan

(8) From Task 7.4.4, Develop Flight Plan Revisions to Correct Out-of-Tolerance Deviations:

- Proposed flight plan revision

TASK DESCRIPTION

FILE: 4.2.11
TASK: Identify Flight Plans that Must be Modified as a Result of this Approval
SUBFUNCTION: Review Flight Plan
FUNCTION: Process Flight Plan

OUTPUTS:

(1) Flight plans which must be modified

(2) Conflicts to be resolved in each flight plan

(3) There are flight plans which must be modified

DESCRIPTION:

Purpose: To identify any previously approved flight plans which must now be modified as a result of the approval of this flight plan

Stimulus: Event-stimulated by the receipt of an approved flight plan

Decisions and Actions:

(1) Compare intended time-position profile of this flight plan with intended time-position profiles of other approved flight plans

(2) Identify conflicts

(3) List flight plans to be modified with time and position of conflicts that necessitate the modification

Phase of Flight:

All phases except postflight

Critical Performance Parameters:

(1) Timeliness

(2) Accuracy

(3) Validity

Performance Capabilities Required:

(1) Decision making:

- Comparison with a standard

- Selection/choice

(2) Information processing:

- Filtering

(3) Interpreting:

- Association

(4) Storing and retrieving information:

- Selective retrieval/recall

Allocation Sensitivities:

External Constraints:

INPUTS:

(1) From Task 4.1.2, Compute ETOV's/ETA:

- Intended time-position profiles

(2) From Task 4.2.10, Determine Acceptability of Flight Plan:

- Approved flight plans

(3) From Task 4.2.3, Probe for Conflicts:

- Conflicts with other aircraft

TASK DESCRIPTION

FILE: 4.2.12
TASK: Inform Pilot of Flight Plan Approval
SUBFUNCTION: Propose Modified Flight Plan
FUNCTION: Process Flight Plan

OUTPUTS: Information to pilot of flight plan approval

DESCRIPTION:

Purpose: To inform the pilot that his flight plan has been approved as submitted or has been modified and approved

Stimulus: Event-stimulated by receipt of an approved flight plan

Decisions and Actions:

(1) Determine content of message

(2) Establish communications

(3) Transmit message

(4) Receive acknowledgement

Phase of Flight:

All phases except postflight

Critical Performance Parameters:

(1) Timeliness

(2) Validity

Performance Capabilities Required:

(1) Responding:

- Communication/data transmission

(2) Information processing:

- Encoding/decoding

Allocation Sensitivities:

External Constraints:

INPUTS: (1) From Task 4.2.10, Determine Acceptability of Flight Plan:

- Approved flight plan

TASK DESCRIPTION

FILE: 4.2.13
TASK: Determine Special Services Required
SUBFUNCTION: Review Flight Plan
FUNCTION: Process Flight Plan

OUTPUTS: (1) Special services required

(2) No special services required

DESCRIPTION:

Purpose: To determine the special services which are required for the flight

Stimulus: Event-stimulated by receipt of an approved flight plan

Decisions and Actions:

(1) Extract information from flight plan

(2) Determine special services required

Phase of Flight:

All phases except postflight

Critical Performance Parameters:

(1) Information processing:

- Encoding/decoding

(2) Decision making:

- Induction/inference/deduction

(3) Interpreting:

- Classification

(4) Storing and retrieving information:

- Selective retrieval/recall

Allocation Sensitivities:

External Constraints:

INPUTS:

(1) From Task 4.2.10, Determine Acceptability of Flight Plan:

- Approved flight plan

(2) From Task 17.2.6, Store Data Base Items:

- Stored data base items (rules and procedures)

SUBFUNCTION DESCRIPTION

FILE: 4.3
SUBFUNCTION: Propose Modified Flight Plan
FUNCTION: Process Flight Plan

OUTPUTS:

(1) Information to pilot that flight plan is unacceptable, and changes to make it acceptable to ATM

(2) Modified flight plan

DESCRIPTION:

Purpose: To determine the changes to the flight plan which will make it acceptable and determine the responsibility for modification of the flight plan; to inform the pilot that the flight plan is unacceptable and the changes which will make it acceptable to ATM if it has been determined that modification of the flight plan is the responsibility of the pilot; to modify the flight plan when it has been determined that it is the responsibility of ATM to do so

Stimulus: Event-stimulated by receipt of an unacceptable flight plan

Tasks:

(1) Determine changes required to make flight plan acceptable

(2) Determine responsibility to modify the flight plan

(3) Inform pilot of unacceptable flight plan

(4) Compile modified flight plan

Critical Performance Parameters:

(1) Timeliness

(2) Utility

(3) Flexibility

(4) Validity

(5) Completeness

Allocation Sensitivities:

INPUTS:

(1) From Subfunction 4.2, Review Flight Plan:

- Unacceptable flight plan
- List of discrepancies
- Other flight plans that must be modified
- Conflicts to be resolved

(2) From Subfunction 17.1, Determine Current and Forecast Weather:

- Stored weather sequences
- Stored weather forecasts
- Stored severe weather phenomena
- Stored route summaries
- Stored weather charts

(3) From Subfunction 17.2, Update Rules and Procedures:

- Stored data base items (rules and procedures)

(4) From Subfunction 17.3, Maintain Airspace Structure and Jurisdictional Boundary Information:

- Stored data base items (airspace structure and jurisdictional boundary information

(5) From Subfunction 17.7, Determine Capability and Status of COMM-NAV System:

- Stored data base item (COMM-NAV system status)

(6) From Subfunction 17.8, Determine Capability and Status of Ground Facilities:

- Stored data base item (ground facility status)

(7) From Subfunction 17.9, Maintain User Class Information:

- Stored user class data base item

(8) From Subfunction 17.6, Update Hazards to Flight Information:

- Stored data base items (hazards to flight)

(9) From Subfunction 17.5, Update Airspace Restrictions Information:

- Stored data base items (airspace restrictions)

(10) From Subfunction 17.4, Update Route Information:

- Stored data base items (route information)

(11) From Subfunction 17.10, Compile Traffic Data:

- Stored traffic data

TASK DESCRIPTION

FILE: 4.3.1
TASK: Determine Changes Required to Make Flight Plan Acceptable
SUBFUNCTION: Propose Modified Flight Plan
FUNCTION: Process Flight Plan

OUTPUTS: Changes to the flight plan which will make it acceptable to ATM

DESCRIPTION:

Purpose: To determine the changes to an unacceptable flight plan which will correct the discrepancies

Stimulus: Event-stimulated by an unacceptable flight plan

Decisions and Actions:

(1) Determine reasonable corrections for each discrepancy

(2) Check corrections for internal consistency

(3) Select proposed changes to correct discrepancies

Phase of Flight:

All phases except postflight

Critical Performance Parameters:

(1) Timeliness

(2) Utility

(3) Flexibility

(4) Validity

Performance Capabilities Required:

(1) Decision making:

- Hypothesis formulation
- Identification of alternatives
- Comparison of alternatives
- Selection/choice

(2) Information processing:

- Analysis

(3) Interpreting:

- Classification

(4) Storing and retrieving information:

- Selective retrieval/recall

Allocation Sensitivities :

External Constraints:

INPUTS:

(1) From Task 4.2.10, Determine Acceptability of Flight Plan:

- Unacceptable flight plan

(2) From Task 4.2.8, Compile List of Discrepancies:

- List of discrepancies

(3) From Task 17.1.8, Store Weather Information:

- Stored weather sequences
- Stored severe weather phenomena data
- Stored weather forecasts
- Stored route summaries
- Stored weather charts

(4) From Task 17.10.3, Store Traffic Data:

- Stored traffic data

(5) From Task 17.2.6, Store Data Base Items:

- Stored data base items (rules and procedures)

(6) From Task 17.3.6, Store Data Base Items:

- Stored data base items (airspace structure and jurisdictional boundary information)

(7) From Task 17.5.6, Store Data Base Items:

- Stored data base items (airspace restrictions)

(8) From Task 17.6.6, Store Data Base Items:

- Stored data base items (flight hazards information)

(9) From Task 17.7.5, Store Data Base Items:

- Stored data base items (Comm-Nav system)

(10) From Task 17.8.5, Store Data Base Items:

- Stored data base items (ground facilities status)

(11) From Task 17.9.6, Store User Class Data Base Items:

- Stored user class data base items

(12) From Task 17.4.6, Store Data Base Items:

- Stored data base items (route information)

TASK DESCRIPTION

FILE: 4.3.2
TASK: Determine Responsibility to Modify the Flight Plan
SUBFUNCTION: Propose Modified Flight Plan
FUNCTION: Process Flight Plan

OUTPUTS:

(1) ATM is responsible for modification of flight plan

(2) Pilot is responsible for modification of flight plan

DESCRIPTION:

Purpose: To determine the responsibility for modifying a flight plan

Stimulus: Event-stimulated by the receipt of required modifications

Decisions and Actions:

(1) Evaluate proposed changes for consistency with:

- Pilot intent as indicated in the flight plan
- SOP for type, numbers, and magnitude of modifications ATM may propose.

(2) Decide to/not to propose a modified flight plan

Phase of Flight:

All phases except postflight

Critical Performance Parameters:

(1) Timeliness

(2) Validity

Performance Capabilities Required:

(1) Interpreting:

- Extrapolation

(2) Decision making:

- Comparison with a standard
- Selection/choice

(3) Storing and retrieving information:

- Selective retrieval/recall

Allocation Sensitivities:

External Constraints:

INPUTS:

(1) From Task 4.3.1, Determine Changes Required to Make Flight Plan Acceptable:

- Changes to the flight plan which will make it acceptable

(2) From Task 17.2.6, Store Data Base Items:

- Stored data base items (rules and procedures)

(3) From Task 4.2.10, Determine Acceptability of Flight Plan:

- Unacceptable flight plan

TASK DESCRIPTION

FILE: 4.3.3
TASK: Inform Pilot of Unacceptable Flight Plan
SUBFUNCTION: Propose Modified Flight Plan
FUNCTION: Process Flight Plan

OUTPUTS: Information to pilot that flight plan is unacceptable and changes to make it acceptable to ATM

DESCRIPTIONS:

Purpose: To advise pilot that a flight plan is unacceptable and present information about the changes that would make it acceptable

Stimulus: Event-stimulated by the decision that modification of the flight plan is the pilot's responsibility

Decisions and Actions:

(1) Determine message content

(2) Establish communications

(3) Transmit messages

Phase of Flight:

All phases except postflight

Critical Performance Parameters:

Timeliness

Performance Capabilities Required:

(1) Information processing:

- Encoding

(2) Responding:

- Communications

Allocation Sensitivities:

External Constraints:

INPUTS:

(1) From Task 4.3.2, Determine ATM's Responsibility to Modify the Flight Plan:

- Pilot is responsible for modification of flight plan

(2) From Task 4.3.1, Determine Changes Required to Make Flight Plan Acceptable:

- Changes to the flight plan which will make it acceptable

TASK DESCRIPTION

FILE: 4.3.4
TASK: Compile Modified Flight Plan
SUBFUNCTION: Propose Modified Flight Plan
FUNCTION: Process Flight Plan

OUTPUTS: Modified flight plan

DESCRIPTION:

Purpose: To modify the flight plan by incorporating the changes to make it acceptable to ATM

Stimulus: Event-stimulated by a decision that ATM is responsible for modifying a flight plan

Decisions and Actions:

(1) Collect flight plan changes

(2) Record changes in required format

Phase of Flight:

All phases except postflight

Critical Performance Parameters:

(1) Timeliness

(2) Completeness

Performance Capabilities Required:

(1) Storing and retrieving information:

- Short-term memory

(2) Responding:

- Operation of controls/data transmission

(3) Information processing:

- Encoding/decoding

Allocation Sensitivities:

External Constraints:

INPUTS:

(1) From Task 4.2.10, Determine Acceptability of Flight Plan:

- Unacceptable flight plan

(2) From Task 4.3.1, Determine Changes Required to Make Flight Plan Acceptable:

- Changes to the flight plan which will make it acceptable

(3) From Task 4.3.2, Determine Responsibility to Modify the Flight Plan:

- ATM is responsible for modification of flight plan

SUBFUNCTION DESCRIPTION

FILE: 4.4
SUBFUNCTION: Determine Responsibility for Control and Communications
FUNCTION: Process Flight Plan

OUTPUTS:

(1) Cancellation of the flight plan

(2) Comm links between ATM system and aircraft

(3) Accepted flight plan

DESCRIPTION:

Purpose: To receive and enter the acceptance or rejection of the flight plan by the pilot; to cancel the flight plan when requested by the pilot; to designate the responsible ATM jurisdictions and facilities to be responsible for controlling and monitoring the flight; and to designate the communications links between the aircraft and the ATM system

Stimulus: Event-stimulated by receipt of the pilot response to notification that flight plan (or modified flight plan) is approved

Tasks:

(1) Receive and enter pilot's response

(2) Cancel flight plan

(3) Designate responsible ATM jurisdictions

(4) Designate communications links between aircraft and ATM system

Critical Performance Parameters:

(1) Timeliness

(2) Validity

(3) Flexibility

(4) Availability

(5) Utility

(6) Capacity

(7) Completeness

Allocation Sensitivities:

INPUTS:

(1) From pilot:

- Pilot's response

(2) From Subfunction 17.3, Update Airspace Structure and Jurisdictional boundary Information:

- Stored data base items (airspace structure and jurisdictional boundaries)

(3) From Subfunction 17.7, Determine Capability and Status of COMM-NAV System:

- Stored data base item (COMM-NAV system status)

(4) From Subfunction 17.8, Determine Capability and Status of Ground Facilities:

- Stored data base item (ground facilities status)

(5) From Subfunction 4.1, Develop Intended Time-Position Profile:

- Intended time-position profile

TASK DESCRIPTION

FILE: 4.4.1
TASK: Receive and Enter Pilot's Response
SUBFUNCTION: Determine Responsibility for Control and Communication
FUNCTION: Process Flight Plan

OUTPUTS: (1) Accepted flight plan

(2) Rejected flight plan

DESCRIPTION:

Purpose: To receive and enter the pilot's acceptance or rejection of the approved flight plan and its modifications (if any)

Stimulus: Event-stimulated by response from pilot

Decisions and Actions:

(1) Receive response from pilot

(2) Enter response from pilot

Phase of Flight:

All phases except postflight

Critical Performance Parameters:

Timeliness

Performance Capabilities Required:

(1) Monitoring:

- Watck keeping

(2) Responding:

- Communication or data transmission

(3) Sensing:

- Signal recognition

(4) Interpreting:

- Pattern recognition

Allocation Sensitivities:

External Constraints:

INPUTS: From exogenous source:

- Pilot's response

TASK DESCRIPTION

FILE: 4.4.2
TASK: Cancel Flight Plan
SUBFUNCTION: Determine Responsibility for Control and Communication
FUNCTION: Process Flight Plan

OUTPUTS: Cancellation of the flight plan

DESCRIPTION:

Purpose: To cancel the flight plan on request of the pilot

Stimulus: Event-stimulated by pilot's rejection of an approved flight plan

Decisions and Actions:

Cancel the flight plan

Phase of Flight:

All phases except postflight

Critical Performance Parameters:

(1) Timeliness

(2) Validity

Performance Capabilities Required:

Responding:

- Communication or data transmission

Allocation Sensitivities:

External Constraints:

INPUTS: From Task 4.4.1, Receive and Enter Pilot's Response:

- Rejected flight plan

TASK DESCRIPTION

FILE: 4.4.3
TASK: Designate Responsible ATM Jurisdictions
SUBFUNCTION: Determine Responsibility for Control and Communications
FUNCTION: Process Flight Plan

OUTPUTS: Responsible ATM jurisdictions

DESCRIPTION:

Purpose: To determine the ATM jurisdictions and facilities which will be responsible for controlling and monitoring the flight

Stimulus: Event-stimulated by an acceptable flight plan

Decisions and Actions:

(1) Determine jurisdictions and facilities which will be transversed

(2) Make the designations

Phase of Flight:

All phases except postflight

Critical Performance Parameters:

(1) Timeliness

(2) Validity

Performance Capabilities Required:

(1) Decision making:

- Comparison with standard

(2) Interpreting:

- Association

(3) Storing and retrieving information:

- Selective retrieval/recall

Allocation Sensitivities:

External Constraints:

INPUTS:

(1) From Task 17.3.6, Store Data Base Items:

- Stored data base items (airspace structure and jurisdictional boundary information)

(2) From Task 17.8.5, Store Data Base Items:

- Stored data base items (ground facilities information)

(3) From Task 4.1.2, Compute ETOV's/ETA:

- Intended time-position profile

(4) From Task 4.4.1, Receive and Enter Pilot's Response:

- Accepted flight plan

TASK DESCRIPTION

FILE: 4.4.4
TASK: Designate Communication Links Between ATM and Aircraft
SUBFUNCTION: Determine Responsibility for Control and Communication
FUNCTION: Process Flight Plan

OUTPUTS: Communications links to be used between aircraft and ATM system

DESCRIPTION:

Purpose: To designate communication links to be used between ATM facilities and aircraft

Stimulus: Event-stimulated by the designation of responsible ATM jurisdictions in Task 4.4.3

Decisions and Actions:

(1) Review status of appropriate available links

(2) Make designation of communications links

Phase of Flight:

All phases except postflight

Critical Performance Parameters:

(1) Timeliness

(2) Flexibility

(3) Validity

Performance Capability Required:

(1) Decision making:

- Identification of alternatives
- Comparison of alternatives
- Selection/choice

(2) Interpreting:

- Association

(3) Storing and retrieving information:

- Selective retrieval/recall

Allocation Sensitivities:

External Constraints:

INPUTS:

(1) From Task 17.7.5, Store Data Base Items:

- Stored data base items (Comm-Nav system status)

(2) From Task 4.1.2, Compute ETOV's/ETA:

- Intended time-position profile

(3) From Task 4.4.3, Designate Responsible ATM Jurisdictions:

- Responsible ATM jurisdictions

(4) From Task 17.3.6, Store Data Base Items:

- Stored data base items (airspace structure and jurisdictional boundary information)

Table 4.4-I. Flow of Information

Function 4.0: Process Flight Plan

TASK	INPUTS		OUTPUTS	
	IDENTIFICATION	SOURCE	IDENTIFICATION	DESTIN.
4.1.1	*Proposed revised flt. plan	9.5.7	Points for which ETOVs are to be computed	4.1.2
	*Proposed revisions to flight plan	7.1.5		
	*Submitted flight plan	3.3.3		
	*Modified flight plan	4.3.4		
	*Proposed revision to flight plan	7.4.4		
4.1.2	*Points for which ETOVs are to be computed	4.1.1	Intended time-position profile	4.2.11 4.4.3
	Submitted flight plan	3.3.3		4.4.4 4.2.6
	Modified flight plan	4.3.4		6.2.1
	Stored weather sequences	17.1.8		6.3.3 6.1.3
	Stored weather forecasts	17.1.8		
	*Proposed flight plan revision	7.1.5		
	*Proposed revised flt. plan	9.5.7		
	*Proposed flight plan revision	7.4.4		
4.2.1	*Proposed flight plan revision	7.1.5	Discrepancies between flight plan and aircraft capability and status	4.2.8
	*Proposed flight plan revision	7.4.4		
	*Proposed revised flt. plan	9.5.7		
	*Submitted flight plan	3.3.3		
	*Modified flight plan	4.3.4		
	Stored user class data	17.9.6		

* Task stimulus

Table 4.4-I. Flow of Information

Function 4.0: Process Flight Plan (Cont'd.)

TASK	INPUTS		OUTPUTS	
	IDENTIFICATION	SOURCE	IDENTIFICATION	DESTIN.
4.2.2	*Submitted flight plan	3.3.3	Discrepancies between flight plan and operational and environmental conditions	4.2.8
	*Modified flight plan	4.3.4		
	Stored weather sequences	17.1.8		
	Stored weather forecasts	17.1.8		
	Ground facilities status	17.8.5		
	COMM-NAV system status	17.7.5		
	Flight hazards information	17.6.6		
	Route information	17.4.6		
	Airspace restriction information	17.5.6		
	Airspace structure and jurisdictional boundary Information	17.3.6		
4.2.3	*Submitted flight plan	3.3.3	Conflicts with other flight plans	4.2.11 4.2.8
	*Modified flight plan	4.3.4		
	*Approved flight plan	4.2.10		
	*Proposed revision to flight plan	7.4.4		
	*Proposed revised flt. plan	9.5.7		
	*Proposed revision to flight plan	7.1.5		
4.2.4	*Submitted flight plan	3.3.3	Discrepancies between flight plan and flow control directives and guidelines	4.2.8
	*Modified flight plan	4.3.4		
	*Proposed flight plan revision	7.1.5		
	*Proposed revised flt. plan	9.5.7		
	*Proposed flight plan revision	7.4.4		
	Terminal release quotas	2.3.5		
	Enroute jurisdiction release quotas	2.3.5		

Table 4.4-I. Flow of Information

Function 4.0: Process Flight Plan (Cont'd.)

TASK	INPUTS		OUTPUTS	
	IDENTIFICATION	SOURCE	IDENTIFICATION	DESTIN.
4.2.5	*Submitted flight plan	3.3.3	Discrepancies between flight plan and rules and procedures	4.2.8
	*Modified flight plan	4.3.4		
	*Proposed revision to flight plan	7.4.4		
	*Proposed revised flt. plan	9.5.7		
	*Proposed revision to flight plan	7.1.5		
	Rules and procedures	17.2.6		
4.2.6	*Intended time-position profile	4.1.2	Discrepancies between present flight progress and proposed flight plan	4.2.8
	Correlated position and identification	6.1.1 6.1.3 6.1.5		
	Predicted long-range time-position profile	6.3.3		
	Present aircraft position	6.1.2		
4.2.7	*Submitted flight plan	3.3.3	Discrepancies between flight plan and user class/pilot qualification	4.2.8
	*Modified flight plan	4.3.4		
	*Proposed revision to flight plan	7.4.4		
	*Proposed revised flt. plan	9.5.7		
	*Proposed revision to flight plan	7.1.5		
	Rules and procedures	17.2.6		
4.2.8	*Discrepancies between flight plan and:		List of discrepancies	4.2.10 4.3.1
	• aircraft capability and status	4.2.1		
	• operational and environmental conditions	4.2.2		
	• traffic and other approved flight plans	4.2.3		
	• flow control directives and guidelines	4.2.4		

Table 4.4-I. Flow of Information

Function 4.0: Process Flight Plan (Cont'd.)

TASK	INPUTS		OUTPUTS	
	IDENTIFICATION	SOURCE	IDENTIFICATION	DESTIN.
4.2.8 (cont'd)	• rules and procedures • present flight progress • user class/pilot qualifications	4.2.5 4.2.6 4.2.7		
4.2.9	*New flight plan priority required	15.2.1	Priority of proposed flight plan	4.2.10 7.1.5 15.2.1
	*Special service no longer required	15.1.2		
	*Rules and procedures	17.1.8		
	*Submitted flight plan	3.3.3		
	*Modified flight plan	4.3.4		
	*Proposed revised flt. plan	9.5.7		
	*Proposed flight plan revision	7.1.5		
	*Proposed flight plan revision	7.4.4		
	Approved flight plans	4.2.10		
	Prioritizing criteria	Exog.		
4.2.10	*Submitted flight plan	3.3.3	Unacceptable flight plan	4.3.1 4.3.2 4.3.4
	Priority of proposed flight plan	4.2.9		
	*Modified flight plan	4.3.4	Approved flight plan	4.2.11 4.2.12 4.2.3 4.2.9 4.2.13
	List of discrepancies	4.2.8		
	Approval criteria	Exog.		
	*Proposed flight plan revisions	7.4.4		
	*Proposed revised flt. plan	9.5.7		
	*Proposed flight plan revision	7.1.5		

Table 4.4-I. Flow of Information

Function 4.0: Process Flight Plan (Cont'd.)

TASK	INPUTS		OUTPUTS	
	IDENTIFICATION	SOURCE	IDENTIFICATION	DESTIN.
4.2.11	Intended time-position profile	4.1.2	No flight plans that must be modified	End
	Conflicts with other flight plans	4.2.3	Flight plans to be modified	4.3.1
	*Approved flight plans	4.2.10	Conflicts to be resolved	4.3.1
4.2.12	*Approved flight plan	4.2.10	Approval information to pilot	Pilot
4.2.13	*Approved flight plan	4.2.10	Special services required	15.1.1
	Rules and procedures	17.2.6	No special services required	End
4.3.1	*Unacceptable flight plan	4.2.10	Changes in flight plan to make it acceptable	4.3.2 4.3.3 4.3.4
	List of discrepancies	4.2.8		
	Stored weather sequences	17.1.8		
	Stored severe weather phenomenon	17.1.8		
	Stored weather forecasts	17.1.8		
	Stored route summaries	17.1.8		
	Stored weather charts	17.1.8		
	Stored traffic data	17.10.3		
	Airspace structure and jurisdictional boundary information	17.3.6		
	Route information	17.4.6		
	COMM-NAV system status	17.7.5		
	Ground facilities system status	17.8.5		
	User class data base item	17.9.6		
	Flight hazards information	17.6.6		
	Airspace restrictions	17.5.6		
	Rules and procedures	17.2.6		

Table 4.4-I. Flow of Information

Function 4.0: Process Flight Plan (Cont'd.)

TASK	INPUTS		OUTPUTS	
	IDENTIFICATION	SOURCE	IDENTIFICATION	DESTIN.
4.3.2	*Changes in flight plan to make it acceptable	4.3.1	Pilot responsible for modification of flight plan	4.3.3
	Unacceptable flight plan	4.2.10		
	Rules and procedures	17.2.6	ATM responsible for modification of flight plan	4.3.4
4.3.3	*Pilot responsible for modification of flight plan	11.3.2	Changes to make flight plan acceptable	3.2.3
	Changes to the flight plan that will make it acceptable	4.3.1		
4.3.4	Unacceptable flight plan	4.2.10	Modified flight plan	4.1.1 4.1.2 4.2.1 4.2.2 4.2.3 4.2.4 4.2.5 4.2.7 4.2.9 4.2.10
	Changes to make flight plan acceptable	4.3.1		
	*ATM responsible for modification of flight plan	4.3.2		
4.4.1	Pilot's response (to 4.2.12)	Pilot	Rejected flight plan	4.4.2
			Accepted flight plan	4.4.3 5.1.1 5.2.2 5.2.3 6.4.3 6.3.3 6.4.5 6.4.7 7.1.2 7.2.1 7.3.1 7.4.4 9.1.2 9.5.6 12.2.4 13.1.3 13.1.2 13.2.1 14.2.1 16.2.6 17.10.1 17.10.2

Table 4.4-I. Flow of Information

Function 4.0: Process Flight Plan (Cont'd.)

TASK	INPUTS		OUTPUTS	
	IDENTIFICATION	SOURCE	IDENTIFICATION	DESTIN.
4.4.2	*Rejected flight plan	4.4.1	Cancellation of the flight plan	End 14.2.1
4.4.3	Airspace structure and jurisdictional boundary information	17.3.6	Responsible ATM jurisdiction	4.4.4
	Ground facilities status	17.8.5		
	Intended time-position profile	4.1.2		
	*Accepted flight plan	4.4.1		
4.4.4	*Responsible ATM jurisdiction	4.4.3	Communication links between ATM and aircraft	16.2.7 14.2.1 7.4.2
	Airspace structure and jurisdictional boundary information	17.3.6		
	COMM-NAV system status	17.7.5		
	Intended time-position profile	4.1.2		

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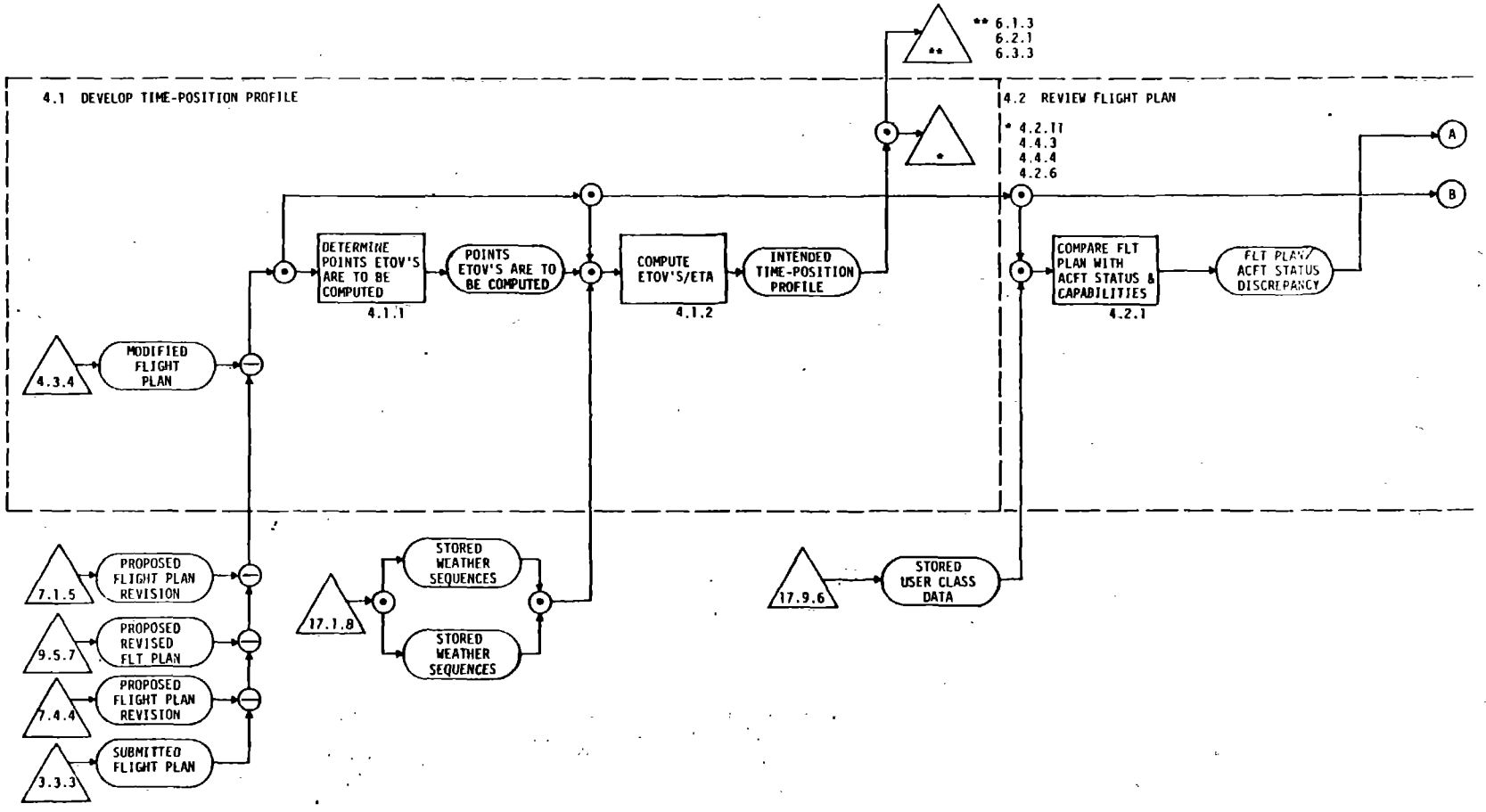


FIGURE 4.4-1. FUNCTION 4.0: PROCESS FLIGHT PLAN
(SHEET 1 OF 6)

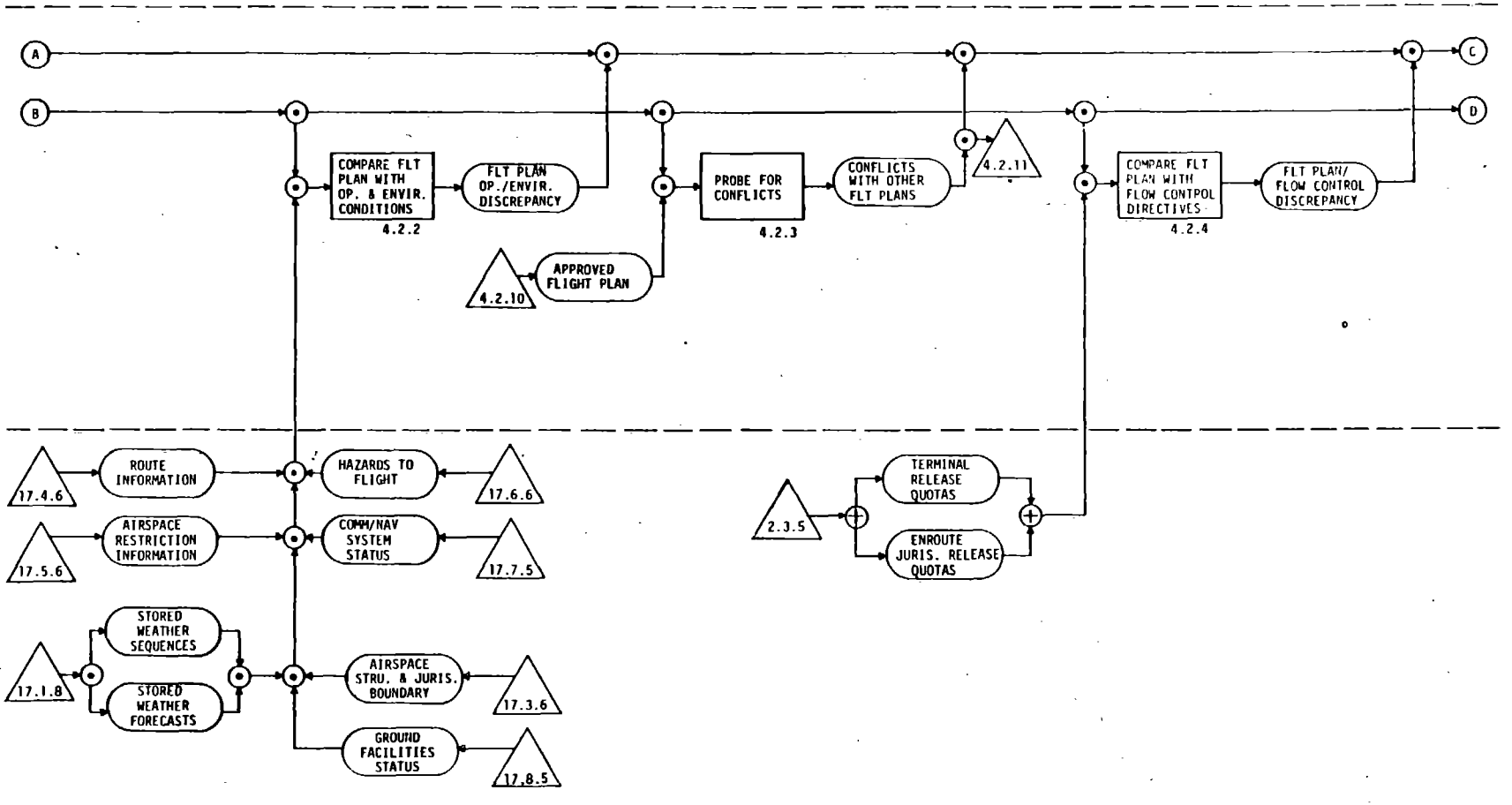


FIGURE 4.4-1. FUNCTION 4.0: PROCESS FLIGHT PLAN
(SHEET 2 OF 6)

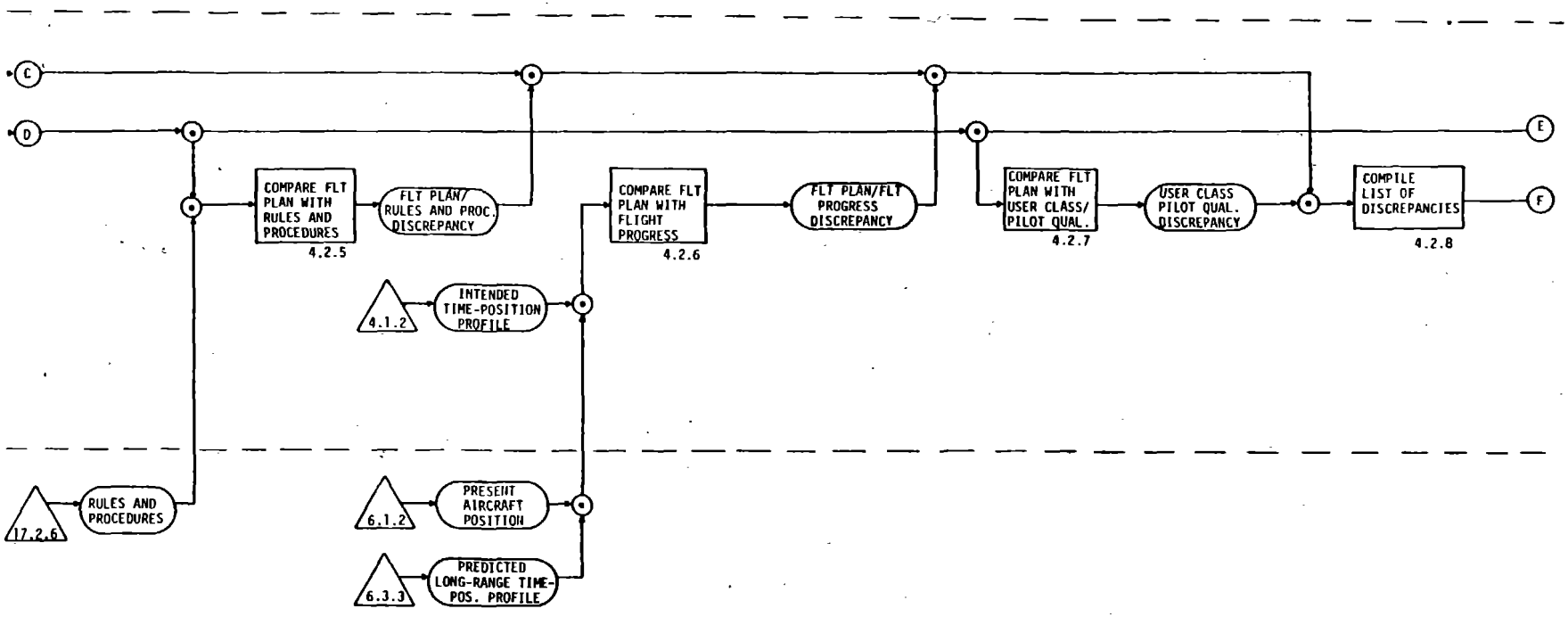


FIGURE 4.4-1. FUNCTION 4.0: PROCESS FLIGHT PLAN
(SHEET 3 OF 6)

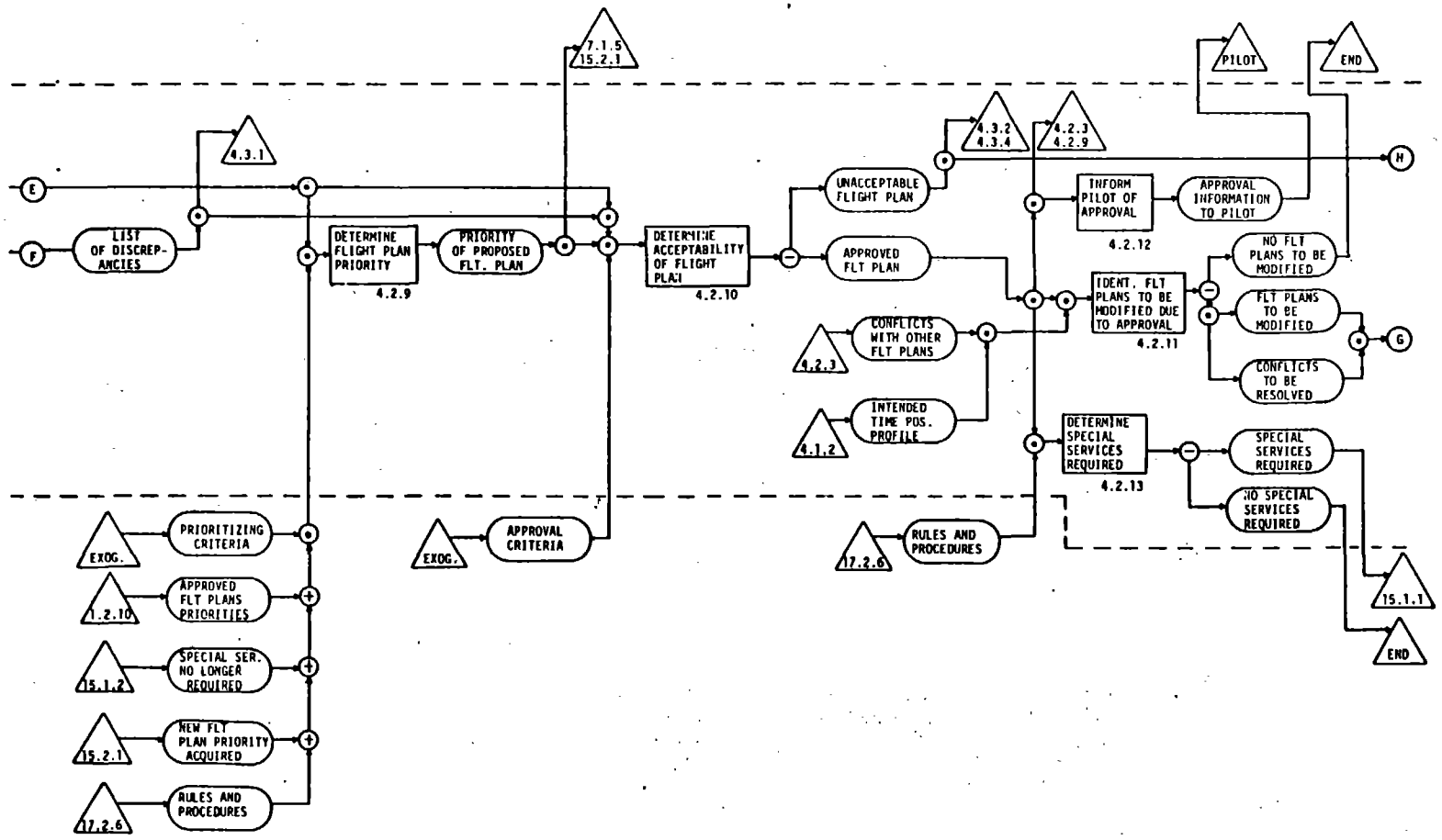
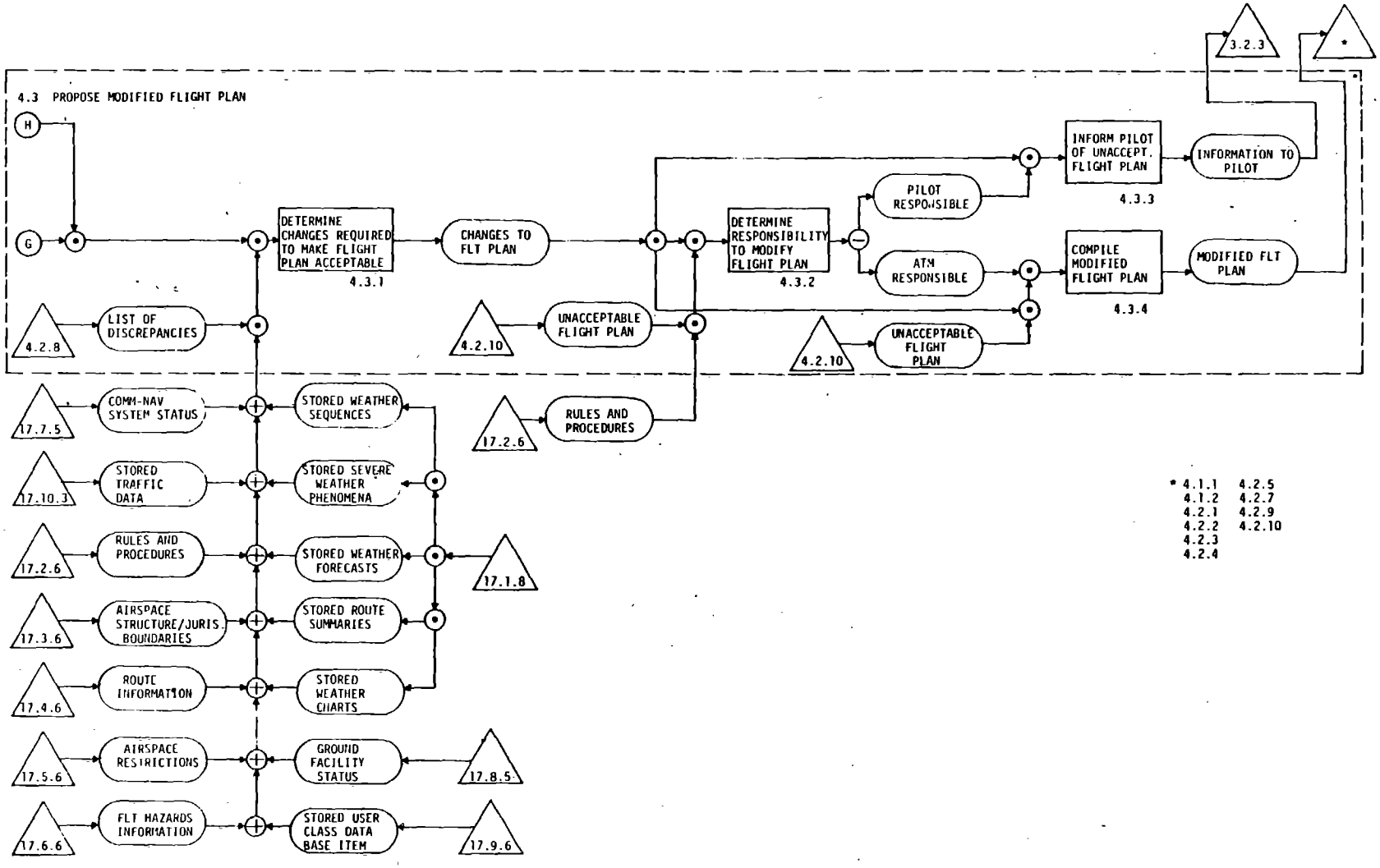


FIGURE 4.4-1. FUNCTION 4.0: PROCESS FLIGHT PLAN
(SHEET 4 OF 6)



* 4.1.1 4.2.5
4.1.2 4.2.7
4.2.1 4.2.9
4.2.2 4.2.10
4.2.3
4.2.4

FIGURE 4.4-1. FUNCTION 4.0: PROCESS FLIGHT PLAN
(SHEET 5 OF 6)

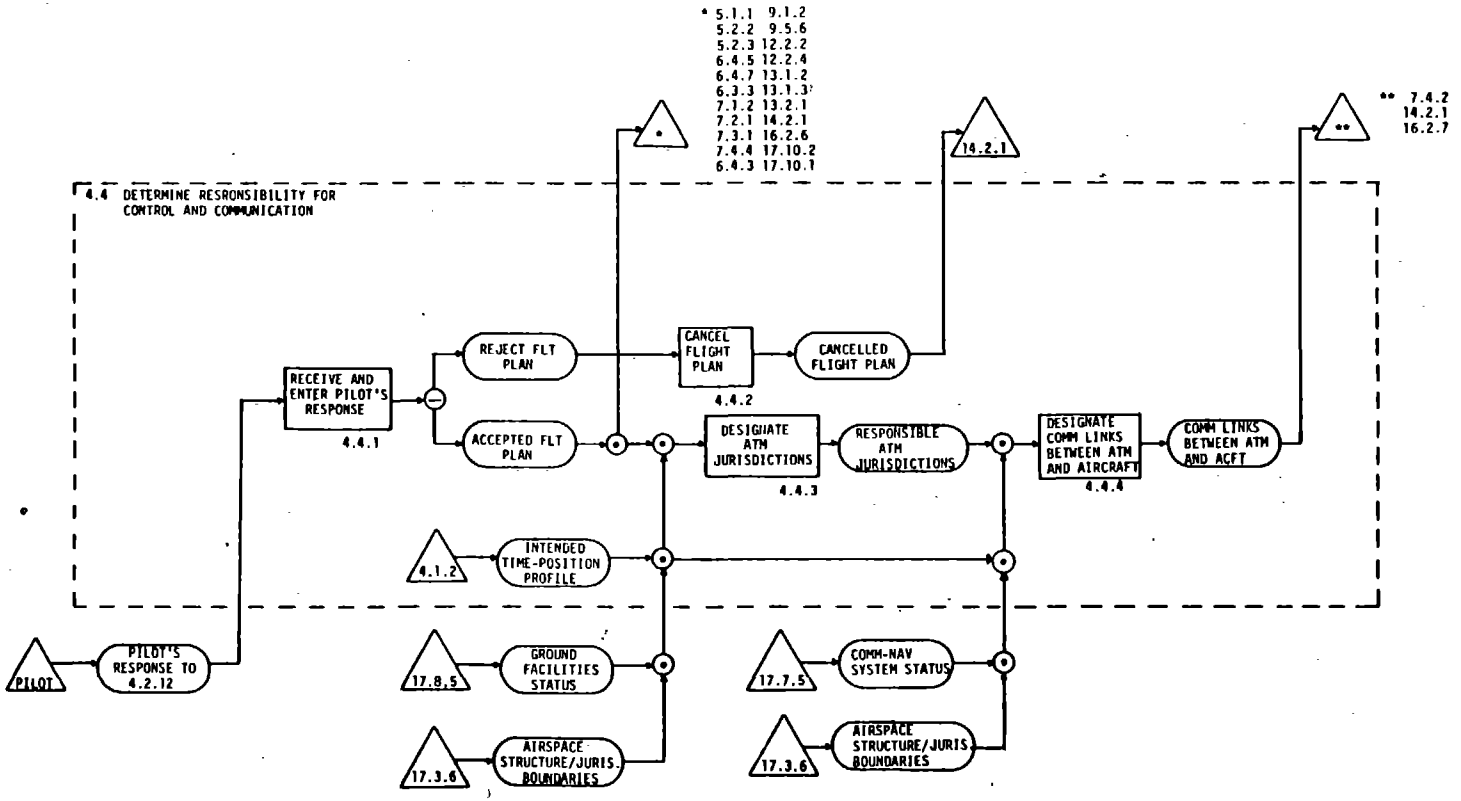
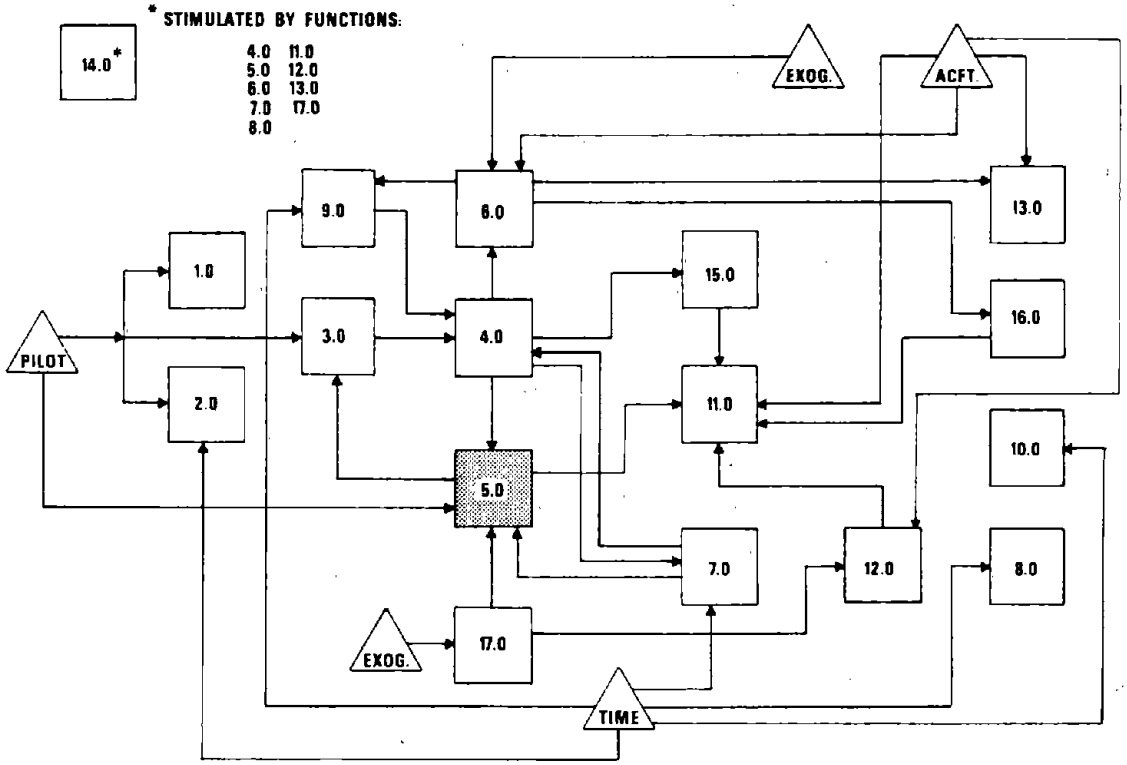


FIGURE 4.4-1. FUNCTION 4.0: PROCESS FLIGHT PLAN
(SHEET 6 OF 6)

FUNCTION 5.0: ISSUE CLEARANCES AND CLEARANCE CHANGES



1.0: PROVIDE FLIGHT PLANNING INFORMATION
2.0: CONTROL TRAFFIC FLOW
3.0: PREPARE FLIGHT PLAN
4.0: PROCESS FLIGHT PLAN
5.0: ISSUE CLEARANCES AND CLEARANCE CHANGES
6.0: MONITOR AIRCRAFT PROGRESS
7.0: MAINTAIN CONFORMANCE WITH FLIGHT PLAN
8.0: ASSURE SEPARATION OF AIRCRAFT
9.0: CONTROL SPACING OF AIRCRAFT
10.0: PROVIDE AIRBORNE, LANDING AND GROUND NAVIGATION CAPABILITY
11.0: PROVIDE AIRCRAFT GUIDANCE
12.0: ISSUE FLIGHT ADVISORIES AND INSTRUCTIONS
13.0: HANDOFF
14.0: MAINTAIN SYSTEM RECORDS
15.0: PROVIDE ANCILLARY AND SPECIAL SERVICES
16.0: PROVIDE EMERGENCY SERVICES
17.0: MAINTAIN SYSTEM CAPABILITY AND STATUS INFORMATION

5.0 ISSUE CLEARANCES AND CLEARANCE CHANGES

5.1 Check Clearance Status

5.1.1 Determine if identification code assignment is required

5.1.2 Compare flight progress with clearance limit and EFC time

5.1.3 Determine pilot's intentions following missed approach

5.2 Determine Clearance to be Issued

5.2.1 Assign identification code

5.2.2 Determine clearance tolerances

5.2.3 Determine clearance limit

5.2.4 Determine required clearance instructions

5.3 Compile and Issue Clearance

5.3.1 Compile clearance to be issued

5.3.2 Transmit clearance message

5.3.3 Receive acknowledgement of clearance

SUBFUNCTION DESCRIPTION

FILE: 5.1
SUBFUNCTION: Check Clearance Status
FUNCTION: Issue Clearance and Clearance Changes

OUTPUTS:

(1) Identification code assignment required

(2) Identification code assignment not required

(3) Request approach

(4) Proceeding to alternate

(5) Missed approach

(6) Approaching clearance limit or EFC time

DESCRIPTION:

Purpose:

(1) To determine if an aircraft covered by a flight plan has been assigned an identification code (This will be the case if a clearance has been issued previously and the new, approved flight plan is a revised flight plan.)

(2) To determine pilot's intention subsequent to his execution of a missed approach

Stimulus: Event-stimulated by an accepted flight plan from Task 4.4.1 and by execution of a missed approach

Tasks:

(1) Determine if identification code assignment is required

(2) Compare flight progress with clearance limit and EFC time

(3) Determine pilot intentions following missed approach

Critical Performance Parameter:

Timeliness

Allocation Sensitivities:

To the speed and timeliness with which the outputs of the task are required for further clearance operations

INPUTS:

(1) From Subfunction 4.4, Determine Responsibility for Control and Communication, Receive and Enter Pilot's Response:

- Accepted flight plan

(2) From exogenous source:

- Identification code usage procedures
- Time stimulus

(3) From aircraft:

- Pilot's intentions

(4) From Subfunction 6.3, Predict Future Positions/ETAS of aircraft:

- Long-range predicted time-position profile

(5) From Subfunction 6.1, Determine Present Position:

- Correlated position and identification

(6) From Subfunction 5.2, Determine Clearance Limit:

- Clearance limit

(7) From Subfunction 5.2, Determine Clearance to Be Issued:

- Holding instructions
- Expect further clearance time

(8) From Subfunction 5.3, Compile and Issue Clearance:

- Issued clearance

TASK DESCRIPTION

FILE: 5.1.1
TASK: Determine if Identification Code Assignment is Required
SUBFUNCTION: Check Clearance Status
FUNCTION: Issue Clearance and Clearance Changes

OUTPUTS: (1) Identification code assignment required

(2) Identification code assignment not required

DESCRIPTION:

Purpose: To determine if the aircraft covered by the flight plan has already been assigned an identification code. (This will be the case if a clearance has been issued previously and the new, approved flight plan is a revised flight plan.)

Stimulus: Event-stimulated by an accepted flight plan from Task 4.4.1

Decisions and Actions:

(1) Determine if an identification code has already been assigned to this flight (in granting the existing clearance)

(2) Determine if the present code assignment is appropriate for the revised flight plan

Phase of Flight:

All phases except postflight

Critical Performance Parameters:

Timeliness

Performance Capability Required:

(1) Decision making:

- Induction/inference/deduction

(2) Interpreting:

- Association

(3) Storing and retrieving information:

- Selective retrieval/recall

Allocation Sensitivities:

External Constraints:

INPUTS:

(1) From Task 4.4.1, Receive and Enter Pilot's Response:

- Accepted flight plan

(2) From Task 5.3.3, Issue Clearance:

- Issued clearance

(3) From exogenous source:

- Identification code usage procedures

TASK DESCRIPTION

FILE: 5.1.2
TASK: Compare Flight Progress with Clearance Limit and EFC* Time
SUBFUNCTION: Check Clearance Status
FUNCTION: Issue Clearance and Clearance Changes

OUTPUTS:
(1) Approaching clearance limit or EFC time

(2) Not approaching clearance limit or EFC time

(3) Missed approach

DESCRIPTION:

Purpose: To determine if the aircraft is approaching the limits of its clearance

Stimulus: Initially event-stimulated by the establishment of a clearance limit, then performance is repeated periodically as long as the output remains "not approaching clearance limit of EFC time"

Decisions and Actions:

(1) Determine (from long-range predicted time-position profile) ETA at clearance limits

(2) Compare present position/time with ETA at clearance limit

(3) Compare present time with EFC time

(4) Compare present position with touchdown point (to recognize missed approach)

Phase of Flight:

All phases except postflight

Critical Performance Parameters:

Timeliness

Performance Capabilities Required:

(1) Information processing:

- Comparison

*EFC - expected further clearance

(2) Monitoring:

- Vigilance

(3) Storing and retrieving information:

- Selective and retrieval/recall

(4) Decision making:

- Comparison with criterion reference

Allocation Sensitivities:

To the speed and timeliness with which the outputs of the task are required for further clearance operations

External Constraints:

To the accuracy of the long-range predicted time-position profile

INPUTS:

(1) From Task 5.2.3, Determine Clearance Limit:

- Clearance limit (x, y, h, t)

(2) From Task 5.2.4, Determine Required Clearance Instructions:

- Expect further clearance (EFC) time
- Holding instructions

(3) From Task 5.1.2, Compare Flight Progress with Clearance Limit and EFC Time:

- Not approaching clearance limit or EFC time (previous performance of this task)

(4) From Task 6.3.3, Compute Long-Range Extrapolations:

- Long-range predicted time-position profile for the aircraft

(5) From Task 6.1.1, Receive/Enter Correlated Position and Identification (or Task 6.1.3 or 6.1.5):

- Correlated position and identification

(6) From exogenous source:

- Time stimulus

TASK DESCRIPTION

FILE: 5.1.3
TASK: Determine Pilot's Intentions Following Missed Approach
SUBFUNCTION: Check Clearance Status
FUNCTION: Issue Clearance and Clearance Changes

OUTPUTS: (1) Request approach

(2) Proceeding to alternate

DESCRIPTION:

Purpose: To determine pilot's intentions (if necessary) following execution of a missed approach

Stimulus: Event-stimulated by execution of missed approach

Decisions and Actions:

(1) Request the pilot's intentions (if necessary)

(2) Receive the pilot's statement of his intentions

Phase of Flight:

Missed approach

Critical Performance Parameters:

Timeliness

Performance Capability Required:

(1) Responding:

- Communication

(2) Monitoring:

- Watch keeping

(3) Sensing:

- Signal recognition

(4) Information processing:

- Encoding/decoding

Allocation Sensitivities:

External Constraints:

INPUTS:

(1) From aircraft:

- Pilot's intentions

(2) From Task 5.1.2, Compare Flight Progress with Clearance Limit and EFC Time:

- Missed approach

SUBFUNCTION DESCRIPTION

FILE: 5.2
SUBFUNCTION: Determine Clearance To Be Issued
FUNCTION: Issue Clearance and Clearance Changes

OUTPUTS:

(1) Assigned code

(2) Flight plan tolerances

(3) Clearance limit (x, y, h & t)

(4) No instructions required

(5) Holding instructions

(6) Expect further clearance (EFC) time

(7) Tolerances instructions

(8) Proceed to the next phase of flight

(9) Contact next controlling jurisdiction

(10) Vectoring requirement

DESCRIPTION:

Purpose:

(1) To assign a unique identity code to each aircraft within the ATM system

(2) To determine which tolerances are to be applied to a flight plan

(3) To specify the conflict free portion of an intended time-position profile

(4) To determine the instructions needed to amplify or explain the clearance action being taken

Stimulus: Event-stimulated by:

(1) Requirement or termination of an identity code Assignment

(2) Accepted flight plan

(3) Sequencing performance changes

(4) Present out-of-tolerance deviations

(5) Status of nav-aids directly affecting the flight

(6) Request for deviation from clearance

Tasks: (1) Assign identity code

(2) Determine clearance tolerances

(3) Determine clearance limit (x, y, h & t)

(4) Determine required clearance instructions

Critical Performance Parameters:

(1) Timeliness

(2) Completeness

(3) Flexibility

(4) Validity

(5) Accuracy

Allocation Sensitivities:

To the work loads of the ATC clearance process and the speed with which the tasks have to be completed

INPUTS: (1) From exogenous source:

- Identity code paradigm
- Terminated code assignments

(2) From Subfunction 4.4, Determine Responsibility for Control and Communications:

- Accepted flight plan

(3) From Subfunction 7.4, Determine Appropriate Resolution of Deviations:

- Pilot's preference to return to flight plan
- Pilot's preference for a revised flight plan
- Present out-of-tolerance deviations from flight plan

(4) From Subfunction 6.1, Determine Present Position:

- Correlated position and identification

(5) From aircraft:

- Request for deviation from clearance

(6) From Subfunction 9.5, Initiate Implementation of Sequence/Schedule:

- Performance necessary to implement sequence change

(7) From Subfunction 5.1, Check Clearance Status:

- Approaching clearance limit or EFC time
- Missed approach
- Identification code assignment required
- Identification code assignment not required

(8) From Subfunction 17.2, Update Rules and Procedures Information:

- Stored data base item (rules and procedures)

(9) From Subfunction 16.1, Describe Emergency Situation:

- Emergency ended

(10) From Subfunction 17.7, Determine Capability and Status of COMM-NAV System:

- Stored data base item (COMM-NAV system status)

(11) From Subfunction 17.1, Determine Current and Forecast Weather:

- Stored weather sequences
- Stored weather forecasts

(12) From Subfunction 16.2, Determine Required Response to Emergency:

- Emergency flight plans
- Revised emergency flight plans

(13) From Subfunction 13.1, Determine Handoff Responsibility Requirements:

- Handoff not acceptable

(14) From Subfunction 5.3, Compile and Issue Clearance:

- Unable to issue clearance

(15) From Subfunction 7.1, Detect Long Term Conflicts Among Flight Plans:

- Flight plan is conflict free until ___
- Conflict identified by location, time, and aircraft involved

(16) From Subfunction 2.3, Determine and Resolve Capacity Overload Situations:

- Terminal release quotas
- Enroute jurisdiction release quotas

(17) From Subfunction 17.4, Update Route Information:

- Stored data base item (route information)

(18) From Subfunction 17.9, Maintain User Class Information:

- Stored user class data base item

(19) From Subfunction 6.4, Determine Aircraft Capability and Status:

- Readiness of aircraft

(20) From Subfunction 13.3, Effect Transfer of Responsibility:

- Responsible facility
- Functions transferred
- Communication channel

TASK DESCRIPTION

FILE: 5.2.1
TASK: Assign Identification Code
SUBFUNCTION: Determine Clearance To Be Issued
FUNCTION: Issue Clearance and Clearance Changes

OUTPUTS: (1) Assigned code

(2) Remaining unassigned codes

DESCRIPTION:

Purpose: To assign a unique identification code to each aircraft within the ATM system

Stimulus: Event-stimulated by the finding in Task 5.1.1, that a code assignment is required, or by the termination of an identity code assignment

Decisions and Actions:

(1) Select and assign an identification code

(2) Remove the assigned code from the list of unassigned codes

(3) Add a code whose assignment has been terminated to the list of unassigned codes

Phase of Flight:

Code assignment would usually occur during the preflight planning phase, and updating, during the postflight phase, but either could occur during any phase.

Critical Performance Parameters:

Accuracy

Performance Capability Required:

(1) Storing and retrieving information:

- Selective retrieval/recall

(2) Information processing:

- Merging

Allocation Sensitivities:

External Constraints:

INPUTS:

(1) From Task 5.2.1, Assign Identification Code:

- Remaining unassigned codes

(2) From exogenous source:

- Identification code assignment paradigm

(3) From Task 5.1.1, Determine if Identification Code Assignment is Required:

- Identification code required

(4) From exogenous source:

- Terminated code assignments

TASK DESCRIPTION

FILE: 5.2.2
TASK: Determine Clearance Tolerances
SUBFUNCTION: Determine Clearance To Be Issued
FUNCTION: Issue Clearance and Clearance Changes

OUTPUTS: Flight plan tolerances

DESCRIPTION:

Purpose: To determine whether standard tolerances can be applied to the flight plan and if not, specify what tolerances are to be applied

Stimulus: Event-stimualted by:

(1) Identification code assignment not required (Task 5.1.1)

(2) Assignment of identification code (Task 5.2.1)

(3) Performance necessary to implement sequence change (Task 9.5.5)

(4) Present deviations out of tolerance (Task 7.4.1)

(5) Data base item (COMM-NAV system status change), (Task 17.7.5)

(6) Request for deviation from clearance (aircraft)

(7) Emergency flight plan or revised emergency flight plan (Task 16.2.6)

(8) Emergency ended (Task 16.1.3)

Decisions and Actions:

(1) Determine applicability of standard tolerances

(2) Determine applicability of requested tolerances

(3) Determine tolerance required by special situation (return to flight plan, implement sequence change, etc.)

(4) Determine tolerances required by emergency situation

(5) Assign appropriate tolerances

Phase of Flight:

All phases except postflight

Critical Performance Parameters:

(1) Timeliness

(2) Completeness

(3) Flexibility

(4) Validity

Performance Capability Required:

(1) Interpreting:

- Association

(2) Decision making:

- Comparison with standard
- Comparison of alternatives
- Selection/choice

(3) Storing and retrieving information:

- Selective retrieval/recall

Allocation Sensitivities:

To the work loads of the ATC clearance process and the speed with which the task has to be completed

External Constraints:

INPUTS:

(1) From Task 5.2.1, Assign Identification Code:

- Assigned code

(2) From Task 4.4.1, Receive and Enter Pilot's Response:

- Accepted flight plan

(3) From Task 17.2.6, Store Data Base Items:

- Stored data base items (rules and procedures)

(4) From Task 7.4.1, Compare Deviations with Tolerances:

- Present out-of-tolerance deviations from flight plan

(5) From Task 7.4.3, Receive Pilot's Response Concerning Resolution of Out-of-Tolerance Present and/or Long-Range Deviation:

- Pilot's preference to return to flight plan
- Pilot's preference for a revised flight plan

(6) From Task 6.1.1, Receive/Enter Correlated Position and Identification (or Task 6.1.3 or 6.1.5):

- Correlated position and identification

(7) From the aircraft:

- Request for deviation from clearance

(8) From Task 9.5.5, Submit Performance Changes within Existing Flight Plan to Clearance Function:

- Performance necessary to implement sequence change

(9) From Task 17.1.8, Store Weather Information:

- Stored weather sequences
- Stored weather forecasts

(10) From Task 5.1.2, Compare Flight Progress with Clearance Limit and EFC time:

- Missed approach

(11) From Task 5.1.1, Determine if Identification Code Assignment is required:

- Code assignment not required

(12) From Task 16.2.6, Develop Emergency Flight Plan:

- Emergency flight plan
- Revised emergency flight plan

(13) From Task 16.1.3, Compile/Update Description of Emergency:

- Emergency ended

(14) From Task 17.7.5, Store Data Base Items:

- Stored data base items (COMM-NAV systems status)

TASK DESCRIPTION

FILE: 5.2.3
TASK: Determine Clearance Limit
SUBFUNCTION: Determine Clearance To Be Issued
FUNCTION: Issue Clearance and Clearance Changes

OUTPUTS: Clearance limit (x, y, h, and t)

DESCRIPTION:

Purpose: To specify that portion of the intended time-position profile which, in the normal mode of operation, the aircraft will be authorized to execute without further clearance. Generally speaking, this will be that portion in which there are no conflicts with other intended time-position profiles. (When an aircraft is authorized to takeoff there may be unresolved problems which must be resolved as the flight progresses.)

Stimulus: Event-stimulated by:

(1) Flight plan is conflict free until ___ Task 7.1.4)

(2) Time-position of (first) long-term conflict (Task 7.1.4)

(3) Unable to issue clearance (Task 5.3.3)

(4) Terminal release quotas (Task 2.3.5)

(5) Enroute jurisdiction release quotas (Task 2.3.5)

Decisions and Actions:

(1) Note the point to which the intended time-position profile has been determined to be conflict free

(2) Identify the holding points along the conflict free portion of the time-position profile

(3) Select the last acceptable point at which the aircraft can hold within the conflict-free portion of the intended time-position profile

Phase of Flight:

All phases except postflight

Critical Performance Parameters:

(1) Timeliness

(2) Validity

Performance Capabilities Required:

(1) Storing and retrieving information:

- Selective retrieval

(2) Decision making:

- Comparison of alternatives
- Selection/choice

(3) Interpreting:

- Pattern recognition

External Constraints:

Allocation Sensitivities:

To the work loads of the ATC clearance process and the speed with which the task has to be completed

INPUTS:

(1) From Task 5.3.3, Issue Clearance:

- Unable to issue clearance

(2) From Task 7.1.4, Compare Time-Position Profiles for Intersection in x, y, h and t:

- Flight plan is conflict free until ____
- Conflicts identified by location, time, and aircraft involved

(3) From Task 4.4.1, Receive and Enter Pilot's Response:

- Accepted flight plan

(4) From Task 17.4.6, Store Data Base Items:

- Stored data base items (route information)

(5) From Task 2.3.5, Formulate Flow Control Directives:

- Terminal release quotas
- Enroute jurisdiction release quotas

(6) From Task 13.1.5, Determine Acceptability to Jurisdiction Involved:

- Handoff not acceptable

(7) From Task 17.9.6, Store User Class Data Base Items:

- Stored user class data base items

TASK DESCRIPTION

FILE: 5.2.4
TASK: Determine Required Clearance Instructions
SUBFUNCTION: Determine Clearance To Be Issued
FUNCTION: Issue Clearance and Clearance Changes

OUTPUTS:

(1) No instructions required

(2) Holding instructions

(3) Expect further clearance (EFC) time

(4) Tolerances instructions

(5) Proceed to next phase of flight (e.g., cleared to takeoff, cleared to land, etc.)

(6) Contact next controlling jurisdiction

(7) Vectoring requirements

DESCRIPTION:

Purpose: To determine the instructions needed to amplify or explain the clearance action being taken

Stimulus: Event-stimulated by the determination of a clearance limit; by an aircraft approaching (within specified tolerances) a clearance limit or an EFC time, or by a transfer of responsibility

Decisions and Actions

(1) Note the clearance action to be taken

(2) Assess the requirement for instructions

(3) Formulate any instructions required

Phase of Flight:

All phases except postflight

Critical Performance Parameters:

(1) Timeliness

(2) Completeness

(3) Flexibility

(4) Validity

Performance Capability Required:

(1) Storing and retrieving information:

- Short-term memory

(2) Information processing:

- Sorting

(3) Interpreting:

- Association

(4) Decision making:

- Identification of alternatives
- Comparison of alternatives
- Selection/choice

External Constraints:

Allocation Sensitivities:

INPUTS:

(1) From Task 5.2.1, Assign Identification Code:

- Assigned code

(2) From Task 5.2.2, Determine Clearance Tolerances:

- Flight plan tolerances

(3) From Task 5.2.3, Determine Clearance Limit:

- Clearance limit

(4) From Task 6.4.1, Determine Aircraft Readiness:

- Readiness of the aircraft

(5) From Task 5.1.2, Compare Flight Progress with Clearance Limit and EFC Time:

- Approaching clearance limit or EFC time

(6) From Task 5.3.3, Receive Acknowledgement of Clearance:

- Unable to issue clearance

(7) From Task 13.3.2, Compile Required Information for Clearance Function:

- Responsible facility
- Functions transferred
- Communication channel

SUBFUNCTION DESCRIPTION

FILE: 5.3
SUBFUNCTION: Compile and Issue Clearance
FUNCTION: Issue Clearance and Clearance Changes

OUTPUTS:
(1) Transmitted clearance
(2) Unable to issue clearance
(3) Clearance issued

DESCRIPTION:

Purpose: To transmit clearance message to the aircraft and assure that it is received and accepted

Stimulus: Event-stimulated by receipt of instructions from Subfunction 5.2, and by receipt of pilot's response to the transmitted clearance

Tasks:
(1) Compile clearance to be issued
(2) Transmit clearance message
(3) Receive acknowledgment of clearance

Critical Performance Parameters:
(1) Completeness
(2) Timeliness
(3) Accuracy
(4) Availability
(5) Validity

Allocation Sensitivities:

INPUTS:
(1) From Subfunction 5.2, Determine Clearance to be Issued:
- Holding instructions
- Expect further clearance (EFC) time
- Tolerances instructions
- Proceed to next phase of flight

- Contact next controlling jurisdiction
- No instructions required
- Clearance limit
- Flight plan tolerances
- Assignment code

(2) From exogenous source:

- Clearance format

(3) From aircraft:

- Pilot's response
- No response

TASK DESCRIPTION

FILE: 5.3.1
TASK: Compile Clearance To Be Issued
SUBFUNCTION: Compile and Issue Clearance
FUNCTION: Issue Clearance and Clearance Changes

OUTPUTS: Clearance message content and format

DESCRIPTION:

Purpose: To bring together all elements of the clearance into a proper arrangement for issuance to the pilot

Stimulus: Event-stimulated by the receipt of the instructions to be issued, from Task 5.2.4

Decisions and Actions:

Compile clearance data according to pre-established format

Phase of Flight:

All phases except postflight

Critical Performance Parameters:

(1) Completeness

(2) Timeliness

Performance Capability Required:

(1) Information processing:

- Compiling

(2) Storing and retrieving information:

- Selective retrieval/recall

Allocation Sensitivities:

External Constraints:

INPUTS:

(1) From Task 5.2.4, Determine Required Clearance Instructions:

- Holding instructions
- Expect further clearance (EFC) time
- Tolerances instructions
- Proceed to next phase of flight
- Contact next controlling jurisdiction
- No instructions required
- Vectoring requirement

(2) From Task 5.2.3, Determine Clearance Limit:

- Clearance limit

(3) From Task 5.2.2, Determine Clearance Tolerances:

- Flight plan tolerances

(4) From Task 5.2.1, Assign Identification Code:

- Assigned code

(5) From exogenous source:

- Clearance format

TASK DESCRIPTION

FILE: 5.3.2
TASK: Transmit Clearance Message
SUBFUNCTION: Compile and Issue Clearance
FUNCTION: Issue Clearance and Clearance Changes

OUTPUTS: Transmitted clearance

DESCRIPTION:

Purpose: To transmit clearance message to pilot

Stimulus: Event-stimulated by receipt of clearance message content and format from Task 5.3.1

Decisions and Actions:

Transmit the clearance to the pilot

Phase of Flight:

All phases except postflight

Critical Performance Parameters:

(1) Speed

(2) Accuracy

Performance Capabilities Required:

(1) Responding:

- Data transmission

(2) Information processing:

- Encoding/decoding

External Constraints:

Allocation Sensitivities:

INPUTS: (1) From Task 5.3.1, Compile Clearance To Be Issued:

- Clearance message content and format

TASK DESCRIPTION

FILE: 5.3.3
TASK: Receive Acknowledgement of Clearance
SUBFUNCTION: Compile and Issue Clearance
FUNCTION: Issue Clearance and Clearance Changes

OUTPUTS: (1) Unable to issue clearance

(2) Clearance issued

DESCRIPTION:

Purpose: To assure that the clearance is received and accepted by the pilot

Stimulus: Event-stimulated by receipt of pilot's response to the transmitted clearance

Decisions and Actions:

(1) Receive pilot's response

(2) Interpret meaning of the response

Phase of Flight:

All phases except postflight

Critical Performance Parameters:

(1) Availability

(2) Validity

Performance Capabilities Required:

(1) Sensing:

- Discrimination

(2) Interpreting:

- Classification

(3) Monitoring:

- Watch-keeping

(4) Information processing:

- Analysis

Allocation Sensitivities:

External Constraints:

INPUTS: (1) From Task 5.3.2, Transmit Clearance Messages:

- Transmitted clearance

(2) From aircraft:

- Pilot's response
- No response

Table 4.5-I. Flow of Information

Function 5.0: Issue Clearance and Clearance Changes

TASK	INPUTS		OUTPUTS	
	IDENTIFICATION	SOURCE	IDENTIFICATION	DESTIN.
5.1.1	*Accepted flight plan	4.4.1	Identification code assignment required	5.2.1
	Issued clearance	5.3.3	Identification code assignment not required	5.2.2
	Identification code usage procedures	Exog.		
5.1.2	*Clearance Limit (x, y, h, t)	5.2.3	Approaching clearance limit or EFC	5.2.4
	*Time	Exog.		
	Expect further clearance time	5.2.4	Missed approach	5.2.2 5.1.3
	Not approaching clearance limit or EFC time	5.1.2	Not approaching clearance limit or EFC time	5.1.2
	Long-range predicted time-position profile	6.3.3		
	Correlated position	6.1.1 6.1.3 6.1.5		
	Holding instructions	5.1.2		
5.1.3	Pilot intentions	Pilot	Request approach	9.1.1
	*Missed approach	5.1.2	Proceeding to alternate	3.1.1 3.1.3
5.2.1	Remaining unassigned codes	5.2.1	Assigned code	5.3.1 5.2.4 5.2.2
	Code assignment paradigm	Exog.	Remaining unassigned codes	5.2.1
	*Code assignment required	5.1.1		
	*Terminated code assignments	Exog.		
5.2.2	*Code assignment not required	5.1.1	Flight plan tolerances	5.2.4 7.1.4 9.5.4 9.5.6 5.3.1 7.1.3 7.4.1
	*Assigned code	5.2.1		

*Task stimulus

Table 4.5-I. Flow of Information

Function 5.0: Issue Clearance and Clearance Changes (Cont'd.)

TASK	INPUTS		OUTPUTS	
	IDENTIFICATION	SOURCE	IDENTIFICATION	DESTIN.
5.2.2 (cont'd)	Accepted flight plan	4.4.1		
	Rules and procedures	17.2.6		
	*Present out-of-tolerance deviations	7.4.1		
	Pilot preference to return to flight plan	7.4.3		
	Pilot preference for a revised flight plan	7.4.3		
	Correlated position & identification	6.1.1 6.1.3 6.1.5		
	*Emergency flight plan	16.2.6		
	*Revised emergency flight plan	16.2.6		
	*Emergency ended	16.1.3		
	*Request for deviation from clearance	Acft		
	*COMM-NAV system status	17.7.5		
	Stored weather sequences	17.1.8		
	Stored weather forecasts	17.1.8		
	*Performance necessary for sequence change	9.5.5		
5.2.3	Unable to issue clearance	5.3.3	Clearance Limit	5.2.4 5.1.2 5.3.1
	Route information	17.4.6		
	User class data	17.9.6		
	Terminal release quotas	2.3.5		
	En route jurisdiction release quotas	2.3.5		
	Hand-off not acceptable	13.1.5		
	Flight plan is conflict free until_____	7.1.4		
	Conflicts by location, time, and aircraft	7.1.4		

Table 4.5-I. Flow of Information
Function 5.0: Issue Clearance and Clearance Changes (Cont'd.)

TASK	INPUTS		OUTPUTS	
	IDENTIFICATION	SOURCE	IDENTIFICATION	DESTIN.
5.2.4	Assigned code	5.2.1	No instructions required	5.3.1
	Flight plan tolerance	5.2.2	Holding instructions	5.3.1 5.1.2
	*Clearance Limit	5.2.3	Expect further clearance time	5.1.2 5.3.1
	Readiness of the aircraft	6.4.1	Tolerances instructions	5.3.1
			Proceed to next phase of flight	5.3.1
	*Approaching clearance limit	5.1.2	Contact next controlling jurisdiction	5.3.1
			Vectoring requirement	11.1.1 5.3.1
	Unable to issue clearance	5.3.3		
	Functions transferred	13.3.2		
	Responsible facility	13.3.2		
	Communications channel	13.3.2		
5.3.1	*Holding instructions	5.2.4	Clearance message	5.3.2
	*EFC time	5.2.4		
	*Tolerances instructions	5.2.4		
	*Proceed to next phase of flight	5.2.4		
	*Contact next controlling jurisdiction	5.2.4		
	No instructions required	5.2.4		
	*Vectoring requirement	5.2.4		
	*Clearance limit	5.2.3		
	*Flight plan tolerances	5.2.2		
	Assigned code	5.2.1		
	Clearance format	Exog.		
5.3.2	*Clearance message	5.3.1	Transmitted clearance	Pilot 5.3.3 14.1.1 14,2,1

Table 4.5-I. Flow of Information
Function 5.0: Issue Clearance and Clearance Changes (Cont'd.)

TASK	INPUTS		OUTPUTS	
	IDENTIFICATION	SOURCE	IDENTIFICATION	DESTIN.
5.3.3	*Transmitted clearance	5.3.2	Unable to issue clearance	16.1.3 5.2.3 5.2.4
	*Pilot response	Pilot	Clearance issued	5.1.1
	No response	Pilot		8.1.2

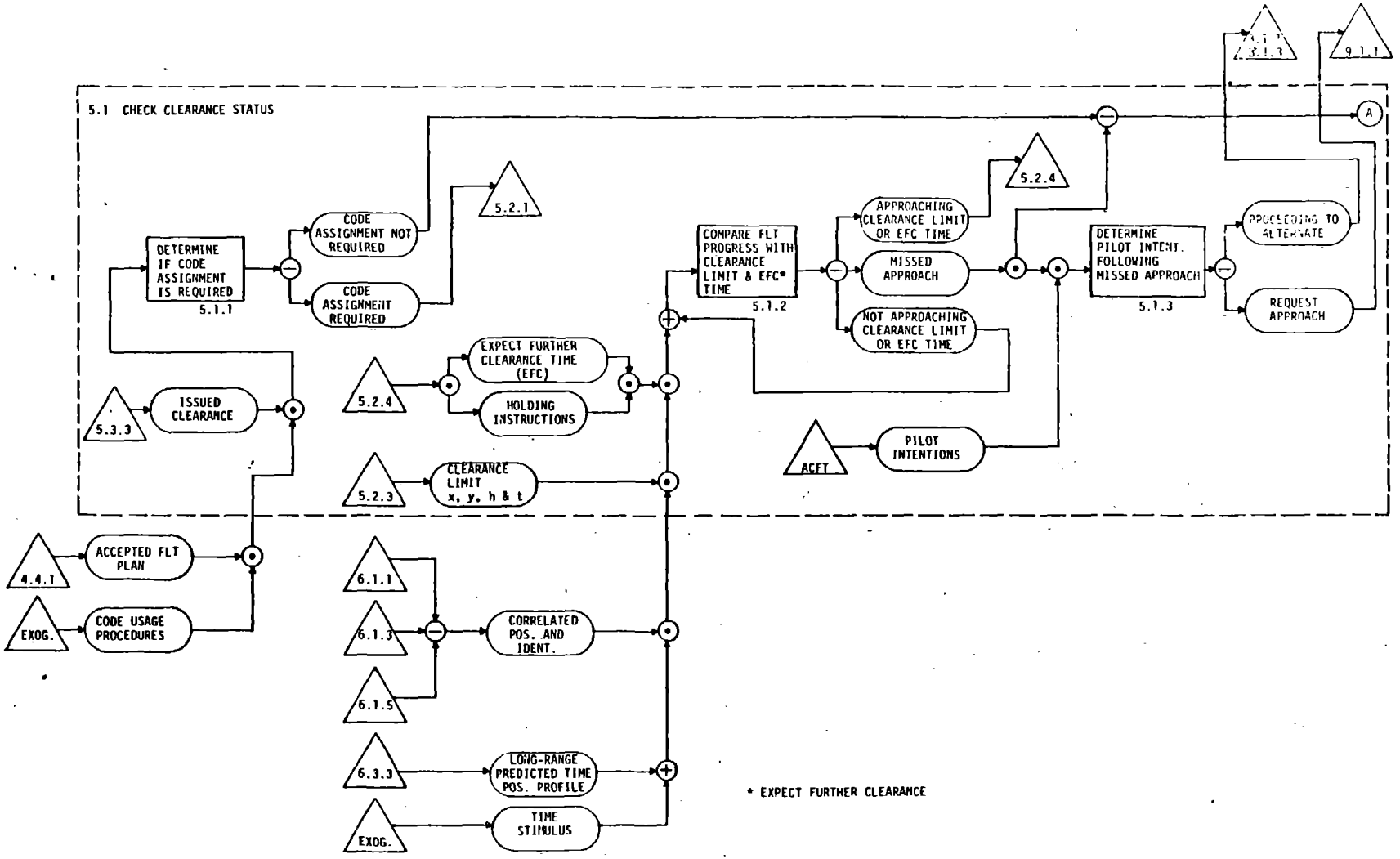


FIGURE 4.5-1. FUNCTION 5.0: ISSUE CLEARANCE AND CLEARANCE CHANGES (SHEET 1 OF 3)

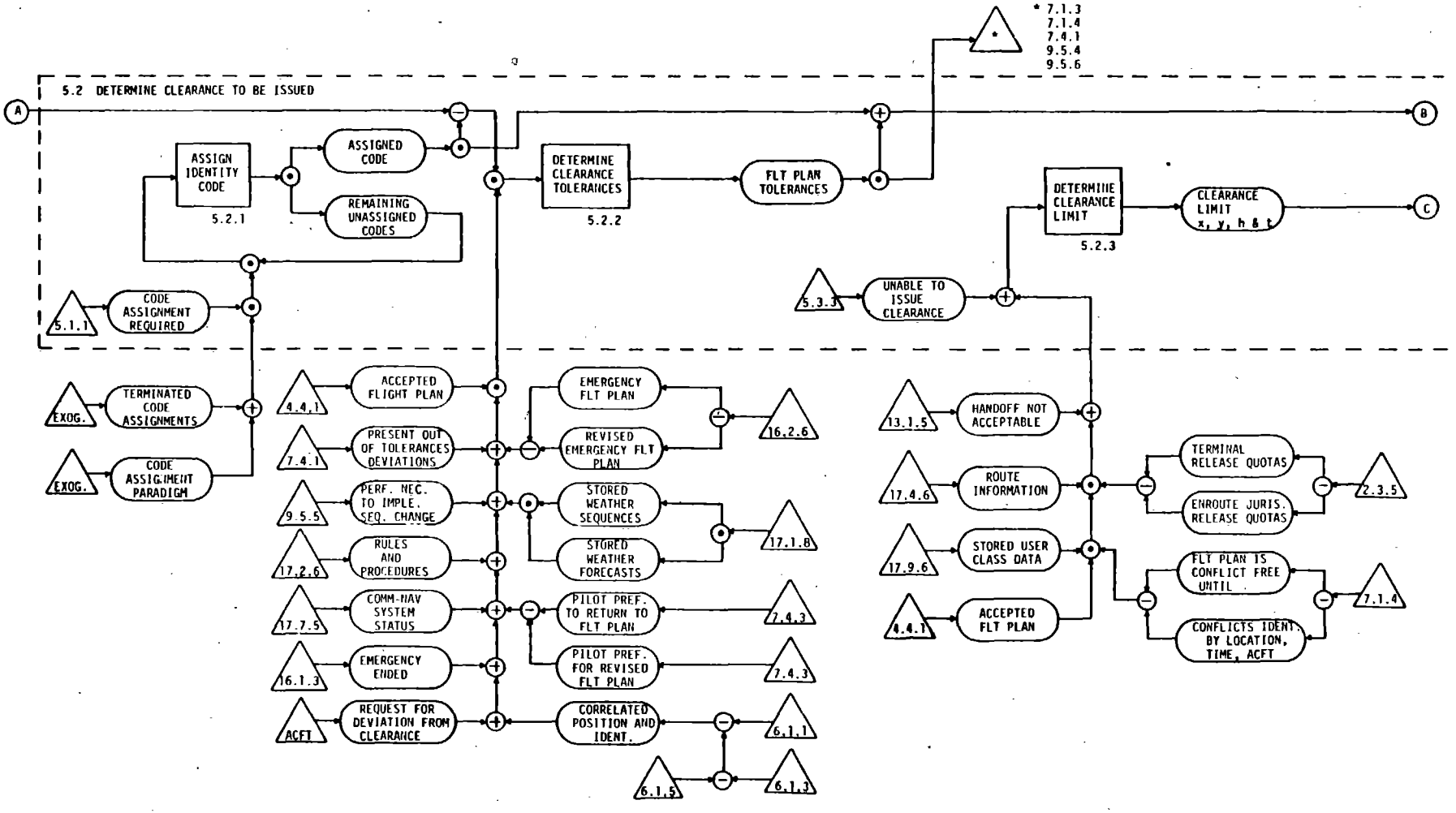


FIGURE 4.5-1. FUNCTION 5.0: ISSUE CLEAPANCE AND CLEARANCE CHANGES
(SHEET 2 OF 3)

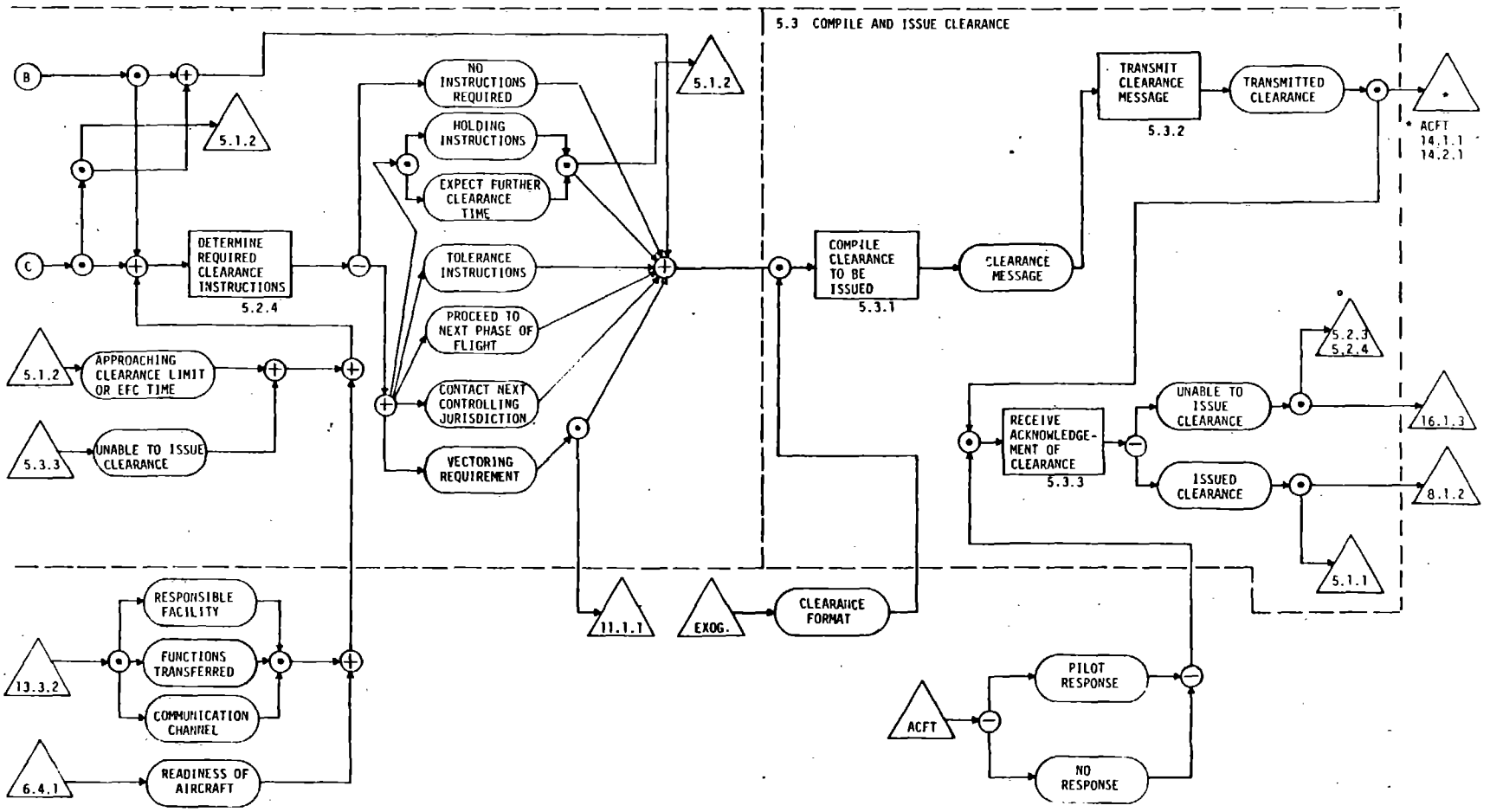
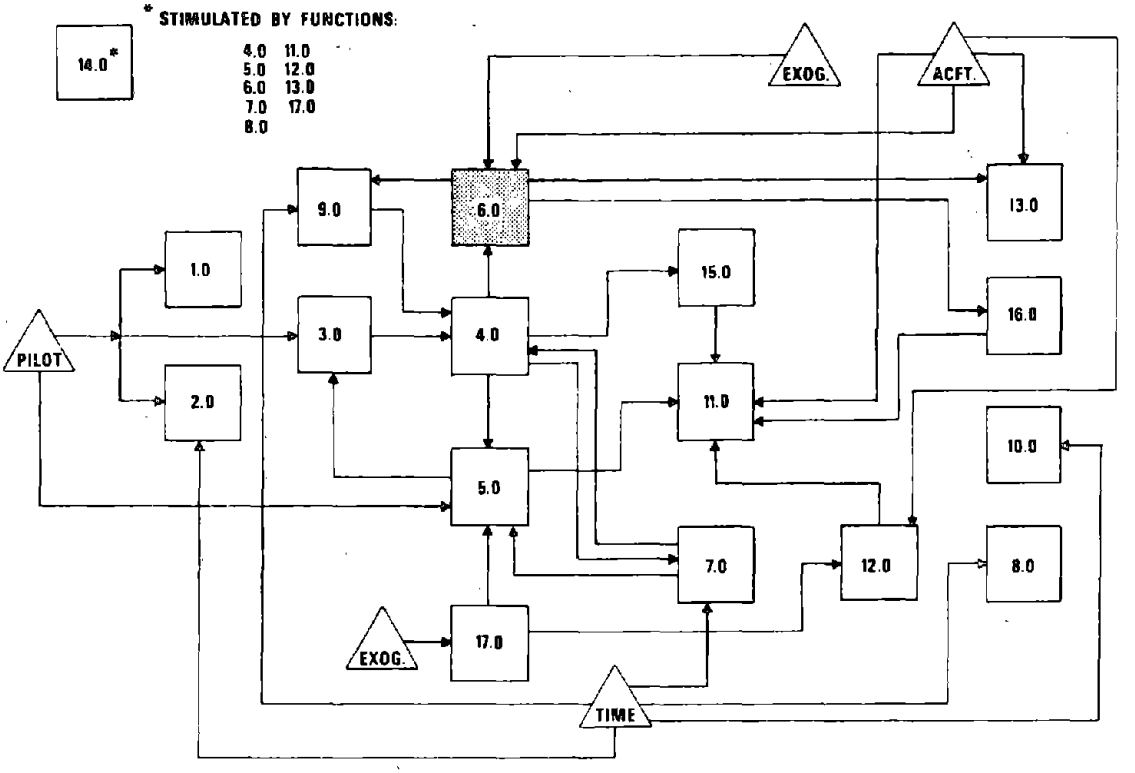


FIGURE 4.5-1. FUNCTION 5.0: ISSUE CLEARANCE AND CLEARANCE CHANGES (SHEET 3 OF 3)

FUNCTION 6.0: MONITOR AIRCRAFT PROGRESS



1.0: PROVIDE FLIGHT PLANNING INFORMATION
2.0: CONTROL TRAFFIC FLOW
3.0: PREPARE FLIGHT PLAN
4.0: PROCESS FLIGHT PLAN
5.0: ISSUE CLEARANCES AND CLEARANCE CHANGES
6.0: MONITOR AIRCRAFT PROGRESS
7.0: MAINTAIN CONFORMANCE WITH FLIGHT PLAN
8.0: ASSURE SEPARATION OF AIRCRAFT
9.0: CONTROL SPACING OF AIRCRAFT
10.0: PROVIDE AIRBORNE, LANDING AND GROUND NAVIGATION CAPABILITY
11.0: PROVIDE AIRCRAFT GUIDANCE
12.0: ISSUE FLIGHT ADVISORIES AND INSTRUCTIONS
13.0: HANDOFF
14.0: MAINTAIN SYSTEM RECORDS
15.0: PROVIDE ANCILLARY AND SPECIAL SERVICES
16.0: PROVIDE EMERGENCY SERVICES
17.0: MAINTAIN SYSTEM CAPABILITY AND STATUS INFORMATION

6.0 MONITOR AIRCRAFT PROGRESS

- 6.1 Determine Present Position
  - 6.1.1 Receive/enter correlated position and identification
  - 6.1.2 Receive/enter position
  - 6.1.3 Correlate position and identification
  - 6.1.4 Request aircraft identity
  - 6.1.5 Assign arbitrary aircraft identification
- 6.2 Compile Aircraft Time-Position Profile
  - 6.2.1 Initiate aircraft actual time-position profile
  - 6.2.2 Update aircraft actual time-position profile
- 6.3 Predict Future Positions/ETA's of the Aircraft
  - 6.3.1 Derive rate of change of position
  - 6.3.2 Compute short-range extrapolations
  - 6.3.3 Compute long-range extrapolations
- 6.4 Determine Aircraft Capability and Status
  - 6.4.1 Determine aircraft readiness
  - 6.4.2 Detect aircraft emergencies
  - 6.4.3 Determine nature of emergency
  - 6.4.4 Receive and enter aircraft status changes
  - 6.4.5 Update aircraft status
  - 6.4.6 Receive and enter reports of aircraft capability changes
  - 6.4.7 Update aircraft capability

SUBFUNCTION DESCRIPTION

FILE: 6.1
SUBFUNCTION: Determine Present Position
FUNCTION: Monitor Aircraft Progress

OUTPUTS:
(1) Correlated position* and identification

(2) Identity request

DESCRIPTION:

Purpose: To produce and maintain aircraft identity and present position correlated with identity

Stimulus: Event-stimulated by receipt of identification and/or position data

Tasks:
(1) Receive/enter correlated position and identification

(2) Receive/enter position

(3) Correlate position and identification

(4) Request aircraft identity

(5) Assign arbitrary aircraft identification

Critical Performance Parameters:

(1) Speed

(2) Accuracy

(3) Capacity

(4) Timeliness

Allocation Sensitivities:

To the nature (electronic or voice) of the incoming position and identification reports

INPUTS:
(1) From the aircraft or surveillance equipment:

- Electronic position and identification reports
- Electronic position reports

* Position consists of x, y, h and t.

(2) From Subfunction 4.1, Develop Intended Time-Position Profile:

- Intended time-position profile

(3) From exogenous source:

- Request message format

(4) From Subfunction 6.3, Predict Future Position/ETA's of the Aircraft:

- Short-range predicted time-position profile

(5) From the aircraft:

- Voice position and identification reports
- No response (to identification request)

(6) From exogenous source:

- Aircraft position

TASK DESCRIPTION

FILE: 6.1.1
TASK: Receive/Enter Correlated Position and Identification
SUBFUNCTION: Determine Present Position
FUNCTION: Monitor Aircraft Progress

OUTPUTS: Correlated position* and identification

DESCRIPTION:

Purpose: To receive and enter the current position and identification of each aircraft within the system

Stimulus: Event-stimulated by receipt of identification and position data, (if the data are reported electronically the frequency will be much greater than if reported by voice.)

Decisions and Actions:

(1) Monitor for incoming position and identification report

(2) Detect incoming position and identification report

(3) Receive (accept) incoming position and identification report

(4) Translate voice report into ATM system language

(5) Enter (transmit) position and identification report into ATM system

Phase of Flight:

All phases except preflight and postflight

Critical Performance Parameters:

(1) Speed

(2) Accuracy

(3) Capacity

Performance Capability Required:

(1) Monitoring:

- Surveillance

* Position consists of x, y, h and t

(2) Sensing:

- Signal detection
- Discrimination

(3) Information processing:

- Encoding

(4) Responding:

- Data transmission

External Constraints:

Allocation Sensitivities:

To the nature (electronic or voice) of the incoming position and identification reports

INPUTS: (1) From the aircraft or exogenous surveillance equipment:

- Electronic position and identification reports

(2) From the aircraft:

- Voice position and identification reports

TASK DESCRIPTION

FILE: 6.1.2
TASK: Receive/Enter Position
SUBFUNCTION: Determine Present Position
FUNCTION: Monitor Aircraft Progress

OUTPUTS: Present aircraft position (x, y, h and t)

DESCRIPTION:

Purpose: To receive and enter the position of those aircraft in the system for which only position (as opposed to correlated position and identity) is reported

Stimulus: Event-stimulated by receipt of position data

Decisions and Actions:

(1) Monitor for incoming position signal

(2) Detect incoming position signal

(3) Receive (accept) incoming position signal

(4) Enter (transmit) position signal into ATM system

Phase of Flight:

All phases except preflight and postflight

Critical Performance Parameters:

(1) Speed

(2) Accuracy

(3) Capacity

Performance Capability Required:

(1) Monitoring:

- Surveillance

(2) Sensing:

- Signal detection
- Descrimination

(3) Information processing:

- Encoding

(4) Responding:

- Data transmission

External Constraints:

Allocation Sensitivities:

INPUTS: (1) From exogenous source:

- Present aircraft position (x, y, h and t)

TASK DESCRIPTION

FILE: 6.1.3
TASK: Correlate Position and Identification
SUBFUNCTION: Determine Present Position
FUNCTION: Monitor Aircraft Progress

OUTPUTS:

(1) Correlated position and identification

(2) No correlation

DESCRIPTION:

Purpose: To correlate present aircraft position with identity information

Stimulus: Event-stimulated by entry of uncorrelated position data into the system

Decisions and Actions:

(1) Select position data to be correlated

(2) Obtain predicted time-position profile data

(3) Compare position signal with predicted time-position profile data

Phase of Flight:

All phases except preflight and postflight

Critical Performance Parameters:

(1) Speed

(2) Validity

Performance Capability Required:

(1) Information processing:

- Sorting

(2) Decision making:

- Comparison with a standard

(3) Interpreting:

- Association

(4) Storing and retrieving information:

- Selective retrieval/recall

External Constraints:

Allocation Sensitivities:

INPUTS:

(1) From Task 6.1.2, Receive/Enter Position:

- Present aircraft position (x, y, h and t)

(2) From Task 6.3.2, Compute Short-Range Extrapolation:

- Short-range predicted time-position profile for the aircraft

(3) From Task 4.1.2, Compute ETOV's/ETA's:

- Intended time-position profile

TASK DESCRIPTION

FILE: 6.1.4
TASK: Request Aircraft Identity
SUBFUNCTION: Determine Present Position
FUNCTION: Monitor Aircraft Progress

OUTPUTS: Identity request associated with an unidentified aircraft position

DESCRIPTION:

Purpose: To request identification information from an unidentified aircraft

Stimulus: Event-stimulated by unsuccessful attempt to correlate position data with an aircraft identity (Task 6.1.3)

Decisions and Actions:

(1) Compose the request

(2) Transmit the request

Phase of Flight:

All phases except preflight and postflight

Critical Performance Parameters:

(1) Flexibility

(2) Timeliness

Performance Capability Required:

(1) Information processing:

- Encoding

(2) Responding:

- Communication

External Constraints:

Allocation Sensitivities:

INPUTS:

(1) From Task 6.1.2, Receive/Enter Reported Position:

- Present aircraft position (x, y, h and t)

(2) From Task 6.1.3, Correlate Position and Identification:

- No correlation

(3) From exogenous source:

- Request message format

TASK DESCRIPTION

FILE: 6.1.5
TASK: Assign Arbitrary Aircraft Identification
SUBFUNCTION: Determine Aircraft Position
FUNCTION: Monitor Aircraft Progress

OUTPUTS: Correlated position and identification

DESCRIPTION:

Purpose: To select and assign an arbitrary identification to an aircraft whose identity cannot be determined. (This is required for the system to handle the aircraft.)

Stimulus: Event-stimulated by repeated failure of an aircraft to respond to an identification request (Task 6.1.4)

Decisions and Actions:

(1) Recognize absence of a response

(2) Select appropriate arbitrary identification number to be assigned

(3) Make assignment

Phase of Flight:

All phases except preflight and postflight

Critical Performance Parameters:

(1) Timeliness

(2) Validity

Performance Capability Required:

(1) Monitoring:

- Watch-keeping

(2) Storing and retrieving information:

- Short-term memory

(3) Decision making:

- Selection/choice

(4) Information processing:

- Encoding

External Constraints:

Allocation Sensitivities:

INPUTS:

(1) From Task 6.1.2, Receive/Enter Position:

- Present aircraft position (x, y, h and t)

(2) From Task 6.1.3, Correlate Position and Identification:

- No correlation

(3) From the aircraft:

- No response to identification request

SUBFUNCTION DESCRIPTION

FILE: 6.2
SUBFUNCTION: Compile Aircraft Time-Position Profile
FUNCTION: Monitor Aircraft Progress

OUTPUTS: Updated actual time-position profile

DESCRIPTION:

Purpose: To establish and maintain a time-position profile* for each aircraft that enter the system

Stimulus: Event-stimulated by entry of aircraft into system, and correlated identification and position information

Tasks: (1) Initiate aircraft actual time-position profile

(2) Update aircraft actual time-position profile

Critical Performance Parameters:

(1) Timeliness

(2) Completeness

(3) Validity

Allocation Sensitivities:

INPUTS: (1) From Subfunction 6.1, Determine Present Position:

- Correlated position and identification
- Correlated position and arbitrary identification

(2) From Subfunction 4.1, Develop Intended Time-Position Profile:

- Intended time-position profile

* Series of successive x, y, h and t entries

TASK DESCRIPTION

FILE: 6.2.1
TASK: Initiate Aircraft Actual Time-Position Profile
SUBFUNCTION: Compile Aircraft Time-Position Profile
FUNCTION: Monitor Aircraft Progress

OUTPUTS: Initial entry in actual time-position profile

DESCRIPTION:

Purpose: To establish a time-position profile for each aircraft that enters the system

Stimulus: Event-stimulated by entry of an aircraft into the system (usually by filing a flight plan)

Decisions and Actions:

(1) Recognize that a new aircraft is entering the system

(2) Write initial entries to the record

Phase of Flight:

Usually performed during preflight planning but may occur during any phase with the possible exception of postflight

Critical Performance Parameters:

(1) Timeliness

(2) Completeness

Performance Capability Required:

(1) Storing and retrieving information:

- Short-term memory

(2) Information processing:

- Encoding/decoding

(3) Sensing:

- Signal detection

(4) Decision making:

- Induction/inference/deduction

Allocation Sensitivities:

External Constraints:

INPUTS:

(1) From Task 4.1.2, Develop Intended Time-Position Profile:

- Intended time-position profile

(2) From Task 6.1.1, Receive/Enter Correlated Position and Identification (or Task 6.1.3):

- Correlated position and identification

(3) From Task 6.1.5, Assign Arbitrary Identification:

- Correlated position and arbitrary identification

TASK DESCRIPTION

FILE: 6.2.2
TASK: Update Aircraft Actual Time-Position Profile
SUBFUNCTION: Compile Aircraft Actual Time-Position Profile
FUNCTION: Monitor Aircraft Progress

OUTPUTS: Updated actual time-position profile

DESCRIPTION:

Purpose: To continually update aircraft time-position profile

Stimulus: Event-stimulated by each "new" correlated identification and position for the aircraft (from Task 6.1.1, 6.1.3 or 6.1.5)

Decisions and Actions:

(1) Accept input (correlated position and identity)

(2) Determine time-position profile to which input should be added

(3) Add input to the appropriate time-position profile

Phase of Flight:

All phases except preflight and postflight

Critical Performance Parameters:

(1) Completeness

(2) Timeliness

(3) Validity

Performance Capability Required:

(1) Decision making:

- Selection/choice

(2) Storing and retrieving information:

- Short-term memory

(3) Information processing:

- Merging

(4) Interpreting:

- Association

Allocation Sensitivities:

External Constraints:

INPUTS:

(1) From Task 6.1.1, Receive and Enter Correlated Position and Identification (or Task 6.1.3):

- Correlated position and identification

(2) From Task 6.1.5, Assign Arbitrary Identification Number:

- Correlated position and arbitrary identification

(3) From Task 6.2.1, Initiate Aircraft Actual Time-Position Profile:

- Initial entry in actual time-position profile

(4) From previous performance of Task 6.2.2, Update Aircraft Actual Time-Position Profile:

- Updated actual time-position profile

SUBFUNCTION DESCRIPTION

FILE: 6.3
SUBFUNCTION: Predict Future Positions/ETA's of the Aircraft
FUNCTION: Monitor Aircraft Position

OUTPUTS:

(1) Predicted long-range time-position profile for the aircraft

(2) Predicted short-range time-position profile for the aircraft

DESCRIPTION:

Purpose: To provide short- and long-range predicted time-position profiles for the aircraft based on current and recently observed performance

Stimulus: Event-stimulated by the addition of a new position to the actual time-position profile

Tasks:

(1) Derive rate of change of position

(2) Compute short-range extrapolations

(3) Compute long-range extrapolations

Critical Performance Parameters:

(1) Validity

(2) Capacity

(3) Utility

(4) Timeliness

Allocation Sensitivities:

INPUTS:

(1) From Subfunction 6.2, Compile Aircraft Time-Position Profile:

- Updated actual time-position profile

(2) From Subfunction 6.1, Determine Present Position:

- Correlated position and identification

(3) From Subfunction 4.1, Develop Intended Time-Position Profile:

- Intended time-position profile

(4) From Subfunction 4.4, Determine Responsibility for Control and Communication:

- Accepted flight plan

(5) From Subfunction 17.1, Determine Current and Forecast Weather:

- Stored weather sequences
- Stored weather forecasts

TASK DESCRIPTION

FILE: 6.3.1
TASK: Derive Rate of Change of Position
SUBFUNCTION: Predict Future Positions/ETA's of the Aircraft
FUNCTION: Monitor Aircraft Position

OUTPUTS: Rate and direction of change of position (ground speed, track, vertical speed)

DESCRIPTION:

Purpose: To determine aircraft rate of change of position

Stimulus: Event-stimulated by the addition of a new position to the actual time-position profile (Task 6.2.2)

Decisions and Actions:

(1) Select input data for computations

(2) Compute rates of change of position

Phase of Flight:

All phases except preflight and postflight

Critical Performance Parameters:

(1) Speed

(2) Accuracy

(3) Capacity

Performance Capability Required:

(1) Storing and retrieving information:

- Short-term memory

(2) Information processing:

- Calculation

External Constraints:

Accuracy of data of time-position profile

Allocation Sensitivities:

INPUTS: (1) From Task 6.2.2, Update Aircraft Time-Position Profile:

- Updated actual time-position profile

TASK DESCRIPTION

FILE: 6.3.2
TASK: Compute Short-Range Extrapolations
SUBFUNCTION: Predict Future Positions/ETA's of the Aircraft
FUNCTION: Monitor Aircraft Progress

OUTPUTS: Predicted short-range time-position profile for the aircraft

DESCRIPTION:

Purpose: To provide a short-range predicted time-position profile for the aircraft based on observed current and recent performance

Stimulus: Event-stimulated by each calculation of the rate of change of position

Decisions and Actions:

(1) Determine length of extrapolation required (e.g., 3 min.)

(2) Determine required frequency of position predictions (e.g., each minute)

(3) Compute predicted positions for each time determined in (2)

Phase of Flight:

All phases except preflight and postflight

Critical Performance Parameters:

(1) Validity

(2) Capacity

(3) Utility

(4) Timeliness

Performance Capability Required:

(1) Information processing:

- Calculation

(2) Decision making:

- Selection/choice

External Constraints:

Allocation Sensitivities:

INPUTS:

(1) From Task 6.3.1, Derive Rate of Change of Position:

- Rate and direction of change of position

(2) From Task 6.1.1, Receive and Enter Correlated Position and Identification (or from Task 6.1.3 or 6.1.5)

- Correlated position and identification

TASK DESCRIPTION

FILE: 6.3.3
TASK: Compute Long-Range Extrapolations
SUBFUNCTION: Predict Future Positions/ETA's of the Aircraft
FUNCTION: Monitor Aircraft Progress

OUTPUTS: Predicted long-range time-position profile for the aircraft

DESCRIPTION:

Purpose: To compute long-range predicted time-position profiles based on the intended time-position profile and the observed speed of advance

Stimulus: Event-stimulated by an accepted flight plan or a change in speed of advance greater than x

Decisions and Actions:

(1) Determine if a new extrapolation is required

(2) Compute airspeed

(3) Determine the points for which ETA's are to be computed

(4) Compute the ETA's

Phase of Flight:

All phases except preflight and postflight

Critical Performance Parameters:

(1) Validity

(2) Utility

(3) Timeliness

Performance Capability Required:

(1) Information processing:

- Calculation

(2) Decision making:

- Comparison with standard
- Selection/choice

(3) Storing and retrieving information:

- Short-term memory

External Constraints:

Allocation Sensitivities:

INPUTS:

(1) From Task 6.3.1, Derive Rate of Change of Position:

- Rate of change of position (ground speed)

  (NOTE: It may be more desirable to use actual true airspeed and wind speed and direction, rather than ground speed, in the long-range extrapolation)

(2) From Task 6.1.1, Receive and Enter Correlated Position and Identification (or from Task 6.1.3 or 6.1.5):

- Correlated position and identification

(3) From Task 17.1.8, Store Weather Information:

- Stored weather sequences
- Stored weather forecasts

(4) From Task 4.1.2, Compute ETOV's/ETA's:

- Intended time-position profile

(5) From Task 4.4.1, Receive and Enter Pilot's Response:

- Accepted flight plan

SUBFUNCTION DESCRIPTION

FILE: 6.4
SUBFUNCTION: Determine Aircraft Capability and Status
FUNCTION: Monitor Aircraft Progress

OUTPUTS:

(1) Aircraft readiness

(2) Emergency description

(3) Aircraft current status

(4) Current aircraft capability

(5) Emergency ended

DESCRIPTION:

Purpose: To determine aircraft readiness, status and capabilities

Stimulus: Event-stimulated by receipt of pilot or sensor reports, alerts and capability and/or status changes

Tasks:

(1) Determine aircraft readiness

(2) Detect aircraft emergencies

(3) Determine nature of emergency

(4) Receive and enter aircraft status changes

(5) Update aircraft status

(6) Receive and enter reports of aircraft capability changes

(7) Update aircraft capability

Critical Performance Parameters:

(1) Timeliness

(2) Speed

(3) Validity

Allocation Sensitivities:

To the manner (e.g., electronic signal, voice, etc.) in which the information is received

INPUTS:

(1) From the aircraft:

- Report of changes in aircraft or equipment status, readiness or capability, and emergency situations

(2) From Subfunction 4.4, Determine Responsibility for Control and Communication:

- Approved flight plan

(3) From Subfunction 17.1, Determine Current and Forecast Weather:

- Stored weather sequences
- Stored weather forecasts

(4) From Subfunction 6.2, Compile Aircraft's Actual Time-Position Profile:

- Actual time-position profile

(5) From Subfunction 17.9, Maintain User Class Information:

- Stored user class data base item

TASK DESCRIPTION

FILE: 6.4.1
TASK: Determine Aircraft Readiness
SUBFUNCTION: Determine Aircraft Capability and Status
FUNCTION: Monitor Aircraft Progress

OUTPUTS: Readiness of the aircraft

DESCRIPTION:

Purpose: To determine the readiness of the aircraft for the next phase of flight, maneuver or procedure

Stimulus: Event-stimulated by receipt of a readiness report from the aircraft

Decisions and Actions:

(1) Monitor for signal (or report)

(2) Detect signal

(3) Interpret signal - decode or transform as required

Phase of Flight:

All phases except postflight

Critical Performance Parameters:

Timeliness

Performance Capability Required:

(1) Monitoring:

- Watch keeping

(2) Information processing:

- Decoding

(3) Sensing:

- Signal detection

(4) Interpreting:

- Classification

Allocation Sensitivities:

To the manner (e.g., electronic signal, voice, etc.) in which the information is reported

External Constraints:

INPUTS: (1) From the aircraft:

- Report of readiness

TASK DESCRIPTION

FILE: 6.4.2
TASK: Detect Aircraft Emergencies
SUBFUNCTION: Determine Aircraft Capability and Status
FUNCTION: Monitor Aircraft Progress

OUTPUTS:

(1) Emergency alert

(2) Emergency ended

DESCRIPTION:

Purpose: To detect aircraft emergencies

Stimulus: Event-stimulated by pilot report or sensor signal from an aircraft in the system or by degradation of aircraft capabilities to a specified level

Decisions and Actions:

(1) Monitor for signal (or report)

(2) Detect signal

(3) Interpret signal

Phase of Flight:

All phases except preflight and postflight

Critical Performance Parameters:

(1) Speed

(2) Validity

Performance Capabilities Required:

(1) Monitoring:

- Watch keeping

(2) Sensing:

- Signal detection
- Signal recognition

(3) Information processing:

- Decoding

(4) Interpreting:

- Classification

Allocation Sensitivities:

To the kind of signal (voice or electronic) to be sensed

External Constraints:

INPUTS:

(1) From the aircraft or exogenous:

- Report of emergency situation

(2) From Task 6.4.6, Determine Aircraft Capability Changes:

- Change in capability

(3) From Task 6.4.7, Update Aircraft Capability:

- Current aircraft capability

TASK DESCRIPTION

FILE: 6.4.3
TASK: Determine Nature of Emergency
SUBFUNCTION: Determine Aircraft Capability and Status
FUNCTION: Monitor Aircraft Progress

OUTPUTS: Description of emergency situation

DESCRIPTION:

Purpose: To determine the details of the emergency situation which exists

Stimulus: Event-stimulated by an emergency alert

Decisions and Actions:

(1) Gather information concerning aircraft, pilot and current situation

(2) Compile a description of the emergency situation (include any earlier emergency not yet resolved)

Phase of Flight:

All phases except preflight and postflight

Critical Performance Parameters:

(1) Speed

(2) Validity

Performance Capability Required:

(1) Decision making:

- Hypothesis formulation
- Identification of alternatives
- Selection/choice

(2) Responding:

- Communication

(3) Sensing:

- Signal recognition
- Recognition of dynamic change
- Recognition of discrete change

(4) Interpreting:

- Classification

(5) Storing and retrieving information:

- Selective retrieval/recall

Allocation Sensitivities:

External Constraints:

INPUTS:

(1) From Task 6.4.2, Detect Aircraft Emergencies:

- Emergency alert

(2) From Task 4.4.1, Receive and Enter Pilot's Response:

- Accepted flight plan

(3) From Task 17.1.8, Store Weather Information:

- Stored weather sequences
- Stored weather forecasts

(4) From previous performance of Task 6.4.3, Determine Nature of Emergency:

- Description of (any previous unresolved) emergency situation

(5) From Task 6.4.6, Determine Aircraft Capability Changes:

- Change in capability

(6) From Task 6.1.1, Receive and Enter Correlated Position and Identification (or from Task 6.1.3 or 6.1.5):

- Correlated position and identification

(7) From Task 6.4.7, Update Aircraft Capability:

- Current aircraft capability

TASK DESCRIPTION

FILE: 6.4.4
TASK: Receive and Enter Aircraft Status Changes
SUBFUNCTION: Determine Aircraft Capability and Status
FUNCTION: Monitor Aircraft Progress

OUTPUTS: Changes in status of the aircraft (malfunctions or repairs)

DESCRIPTION:

Purpose: To determine changes in the operational status of the aircraft and airborne equipment

Stimulus: Event-stimulated by reports from the aircraft

Decisions and Actions:

(1) Monitor for signal (or report)

(2) Detect signal

(3) Interpret signal - recognize changes in status

Phase of Flight:

All phases except preflight and postflight

Critical Performance Parameters:

(1) Timeliness

(2) Completeness

Performance Capability Required:

(1) Monitoring:

- Surveillance

(2) Sensing:

- Signal detection
- Recognition of dynamic change
- Recognition of discrete change

(3) Information processing:

- Decoding

(4) Storing and retrieving information:

- Selective retrieval/recall

(5) Interpreting:

- Classification

Allocation Sensitivities:

To the nature of the signals; voice reports would probably require manual handling

External Constraints:

INPUTS: (1) From the aircraft:

- Report of change in aircraft or equipment status

TASK DESCRIPTION

FILE: 6.4.5
TASK: Update Aircraft Status
SUBFUNCTION: Determine Aircraft Capability and Status
FUNCTION: Monitor Aircraft Progress

OUTPUTS: Current aircraft status (includes airborne equipment status)

DESCRIPTION:

Purpose: To update aircraft and airborne equipment status record

Stimulus: Event-stimulated by changes in aircraft and/or airborne equipment status received from Task 6.4.4

Decisions and Actions:

(1) Degrade status to reflect malfunctions

(2) Upgrade status to reflect repairs

Phase of Flight:

All phases except preflight and postflight

Critical Performance Parameters:

(1) Timeliness

(2) Validity

(3) Completeness

Performance Capability Required:

(1) Information processing:

- Analysis
- Merging

(2) Storing and retrieving information:

- Short-term memory

External Constraints:

Allocation Sensitivities:

INPUTS:

(1) From Task 6.4.4, Determine Changes in Aircraft Status:

- Changes in status of the aircraft (manfunctions or repairs)

(2) From (previous performance of) Task 6.4.5, Update Aircraft Status Record:

- Current aircraft status (prior to receipt of change)

(3) From Task 4.4.1, Receive and Enter Pilot's Response:

- Accepted flight plan (initial source of on-board equipment status information)

TASK DESCRIPTION

FILE: 6.4.6
TASK: Receive and Enter Reports of Aircraft Capability Changes
SUBFUNCTION: Determine Aircraft Capability and Status
FUNCTION: Monitor Aircraft Progress

OUTPUTS: Change in the performance capability of the aircraft

DESCRIPTION:

Purpose: To determine changes in the capability of the aircraft

Stimulus: Event-stimulated by report of aircraft capability change

Decisions and Actions:

(1) Monitor for signal (or report)

(2) Detect signal

(3) Interpret signal

Phase of Flight:

All phases except preflight and postflight

Critical Performance Parameters:

(1) Completeness

(2) Timeliness

Performance Capability Required:

(1) Monitoring:

- Watch keeping

(2) Sensing:

- Signal recognition

(3) Information processing:

- Decoding

(4) Interpreting:

- Classification

(5) Storing and retrieving information:

- Selective retrieval/recall

Allocation Sensitivities:

To the nature of the report to be sensed (voice or electronic signal)

External Constraints:

INPUTS: (1) From the aircraft:

- Report of change in aircraft capability

TASK DESCRIPTION

FILE: 6.4.7
TASK: Update Aircraft Capability
SUBFUNCTION: Determine Aircraft Capability and Status
FUNCTION: Monitor Aircraft Progress

OUTPUTS: Current aircraft capability (includes performance capability and user class)

DESCRIPTION:

Purpose: To update aircraft capability record

Stimulus: Event-stimulated by change in performance capability in Task 6.4.6 or by updating of the aircraft status record in Task 6.4.5

Decisions and Actions:

(1) Determine elapsed time in the air

(2) Update performance capabilities to reflect elapsed time in the air

(3) Update performance capabilities to reflect reports of capability change

(4) Update performance capabilities to reflect current status

(5) Update user class

Phase of Flight:

All phases except preflight

Critical Performance Parameters:

(1) Validity

(2) Timeliness

(3) Completeness

(4) Accuracy

Performance Capability Required:

(1) Information processing:

- Analysis
- Calculation
- Merging

(2) Storing and retrieving information:

- Short-term memory

(3) Decision making:

- Deduction

(4) Interpreting:

- Association

Allocation Sensitivities:

External Constraints:

INPUTS:

(1) From (previous performance of) Task 6.4.7, Update Aircraft Capability Record:

- Current aircraft capability (includes performance capability and user class)

(2) From Task 6.4.6, Receive and Enter Aircraft Capability Changes:

- Change in capability

(3) From Task 6.4.5, Update Aircraft Status Record:

- Current status

(4) From Task 6.2.2, Update Aircraft Actual Time-Position Profile:

- Actual time-position profile

(5) From Task 4.4.1, Receive and Enter Pilot's Response:

- Accepted flight plan (status of on-board equipment)

(6) From Task 17.9.6, Store User Class Data Base Item:

- Store user class data base item

Table 4.6-I. Flow of Information

Function 6.0: Monitor Aircraft Progress

TASK	INPUTS		OUTPUTS	
	IDENTIFICATION	SOURCE	IDENTIFICATION	DESTIN.
6.1.1	*Electronic-reported correlated position and identification	Exog.	Correlated position and identification	4.2.6 5.1.2 5.2.2 6.2.1 6.2.2 6.3.2 6.3.3 6.4.3 7.2.1 7.2.2 7.3.1 11.1.2 11.2.1 11.2.2 11.2.4 12.2.7 13.1.1 13.1.3 16.2.3 17.1.3
	*Voice-reported correlated position and identification	Acft		
6.1.2	*Aircraft position data	Exog.	Aircraft position	6.1.3 6.1.4 6.1.5
6.1.3	Predicted time-position profile (short-range)	6.3.2	Correlated position and identification	4.2.6 5.1.2 5.2.2 6.2.1 6.2.2 6.3.2 6.3.3 6.4.3 7.2.1 7.2.2 7.3.1 11.1.2 11.2.1 11.2.2 11.2.4 12.2.7 13.1.1 13.1.3 16.2.3 17.1.3
	Intended time-position	4.1.2		
	*Present aircraft position	6.1.2		
			No correlation	6.1.4 6.1.5

*Task stimulus

Table 4.6-I. Flow of Information

Function 6.0: Monitor Aircraft Progress (Cont'd.)

TASK	INPUTS		OUTPUTS	
	IDENTIFICATION	SOURCE	IDENTIFICATION	DESTIN.
6.1.4	Aircraft position	6.1.2	Identity request	Acft
	*No correlation	6.1.3		
	Request message format	Exog.		
6.1.5	No correlation	6.1.3	Correlated position and identification	4.2.6 5.1.2 5.2.2 6.2.1 6.2.2 6.3.2 6.3.3 6.4.3 7.2.1 7.2.2 7.3.1 11.1.2 11.2.1 11.2.2 11.2.4 12.2.7 13.1.1 13.1.3 16.2.3 17.1.3
	Aircraft position	6.1.2		
	*No response to identification request	Acft		
6.2.1	Correlated position and identification	6.1.1 6.1.3 6.1.5	Initial entry in actual time-position profile	6.2.2
	*Intended time-position profile	4.1.2		
6.2.2	*Correlated position and identification	6.1.1 6.1.3 6.1.5	Updated actual time-position profile	6.2.2 6.3.1 6.4.7 7.4.4 14.1.1 14.2.1
	Initial entry in actual time-position profile	6.2.1		
	Updated actual time-position profile	6.2.2		
6.3.1	*Updated actual time-position profile	6.2.2	Rate and direction of change of position	6.3.2 6.3.3

Table 4.6-I. Flow of Information

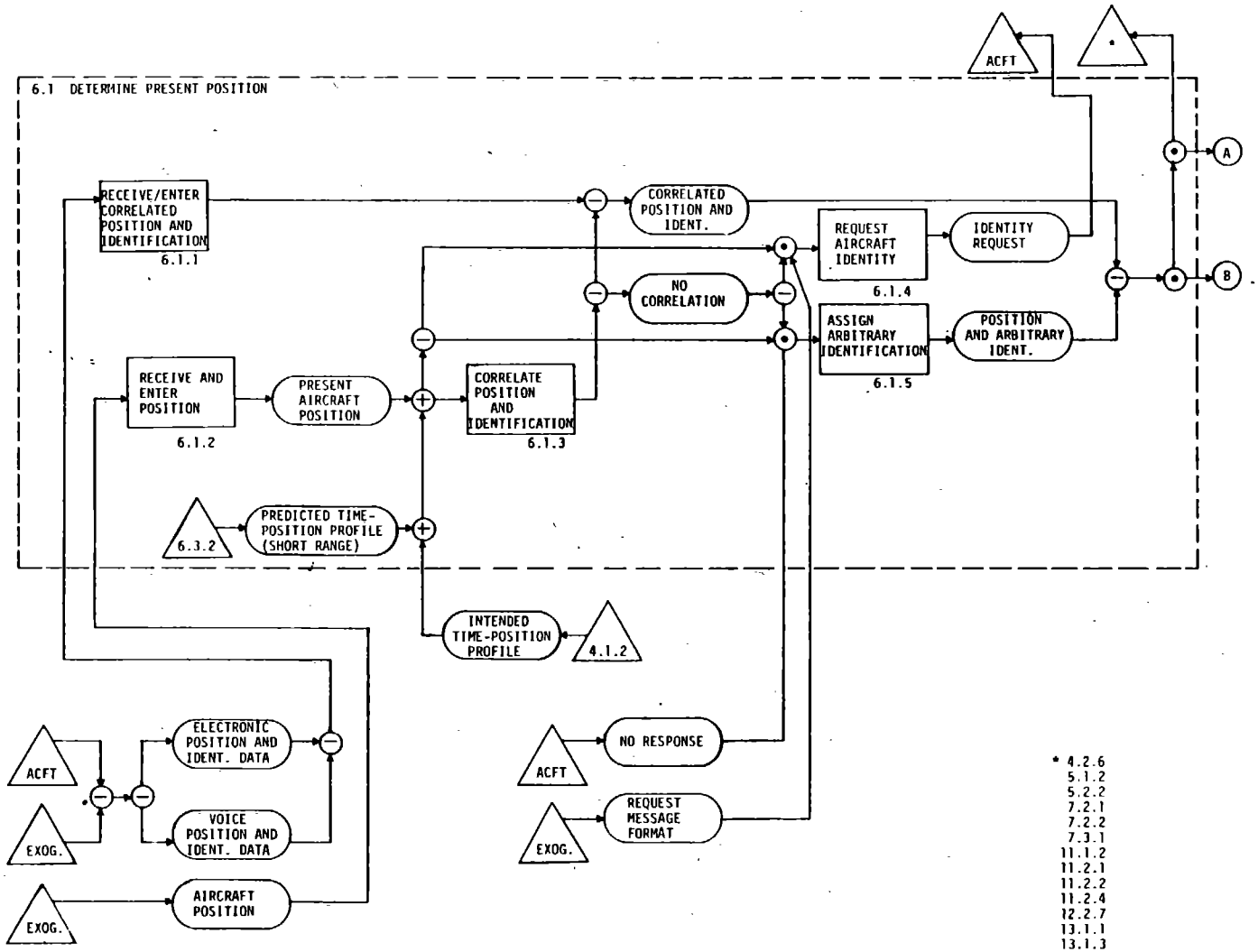
Function 6.0: Monitor Aircraft Progress (Cont'd.)

TASK	INPUTS		OUTPUTS	
	IDENTIFICATION	SOURCE	IDENTIFICATION	DESTIN.
6.3.2	*Rate and direction of change of position	6.3.1	Short-range predicted time-position profile	6.1.3 7.3.1 7.3.2 7.4.4 8.1.2 8.1.8 8.2.5 9.5.3 12.3.1
	Correlated position and identification	6.1.1 6.1.3 6.1.5		
6.3.3	*Accepted flight plan	4.4.1	Long-range predicted time-position profile	4.2.6 5.1.2 7.3.1 7.3.3 7.4.4 8.1.2 9.1.1 9.5.3
	Stored weather sequences	17.1.8		
	Stored weather forecasts	17.1.8		
	Intended time-position profile	4.1.2		
	*Rate and direction of change of position	6.3.1		
	Correlated position and identification	6.1.1 6.1.3 6.1.5		
6.4.1	*Report of readiness	Acft	Readiness of aircraft	5.2.4
6.4.2	*Report of emergency situation	Acft Exog.	Emergency alert	6.4.3
			Emergency ended	16.1.3
	Change in capability	6.4.6		
	Current aircraft capability	6.4.7		
6.4.3	*Emergency alert	6.4.2	Description of emergency	16.1.1 16.1.2 16.1.3
	Accepted flight plan	4.4.1		
	Stored weather sequences	17.1.8		
	Stored weather forecasts	17.1.8		
	Prior description of emergency situation	6.4.3		
	Change in capability	6.4.6		
	Current aircraft capability	6.4.7		
6.4.4	*Report of change of status	Acft	Change in status	6.4.5

Table 4.6-I. Flow of Information

Function 6.0: Monitor Aircraft Progress (Cont'd.)

TASK	INPUTS		OUTPUTS	
	IDENTIFICATION	SOURCE	IDENTIFICATION	DESTIN.
6.4.5	*Change in status	6.4.4	Current status of aircraft and equipment	6.4.5 6.4.7 14.1.1 14.2.1
	Accepted flight plan (status of aircraft and equipment)	4.4.1		
	Current status	6.4.5		
6.4.6	*Report of change in capability	Acft	Change in capability	6.4.7 6.4.2 6.4.3
6.4.7	*Change in capability	6.4.6	Current aircraft capability	6.4.2 6.4.3 8.1.2 9.5.4 9.5.6 14.2.1 16.2.3
	*Current status	6.4.5		
	Accepted flight plan (initial aircraft capability)	4.4.1		
	Actual time-position profile	6.2.2		
	User class data	17.9.6		
	Current aircraft capability (from previous performance of this task)	6.4.7		



* 4.2.6
5.1.2
5.2.2
7.2.1
7.2.2
7.3.1
11.1.2
11.2.1
11.2.2
11.2.4
12.2.7
13.1.1
13.1.3
16.2.3
17.1.3

FIGURE 4.6-1. FUNCTION 6.0: MONITOR AIRCRAFT PROGRESS (SHEET 1 OF 3)

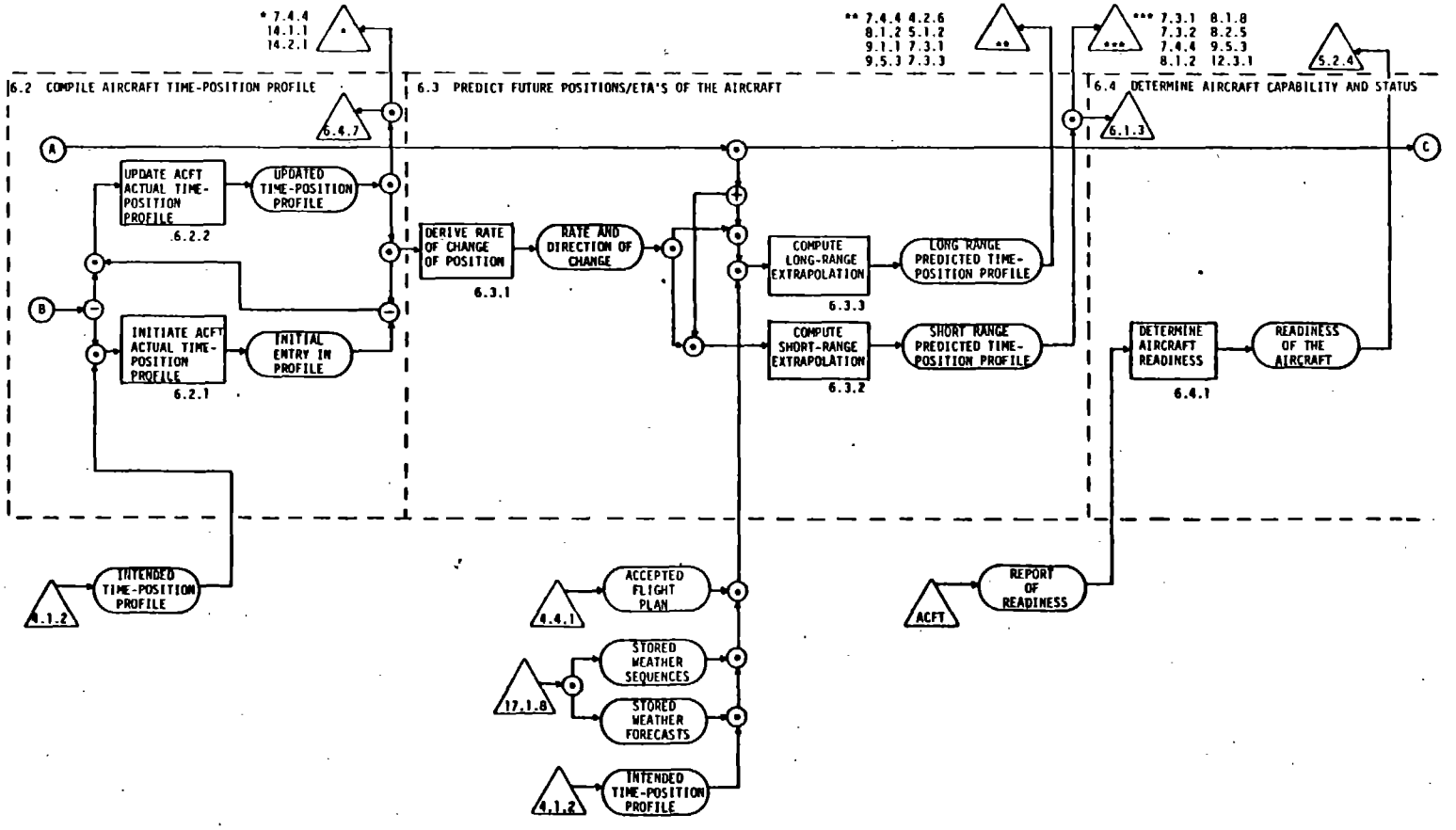


FIGURE 4.6-1. FUNCTION 6.0: MONITOR AIRCRAFT PROGRESS
(SHEET 2 OF 3)

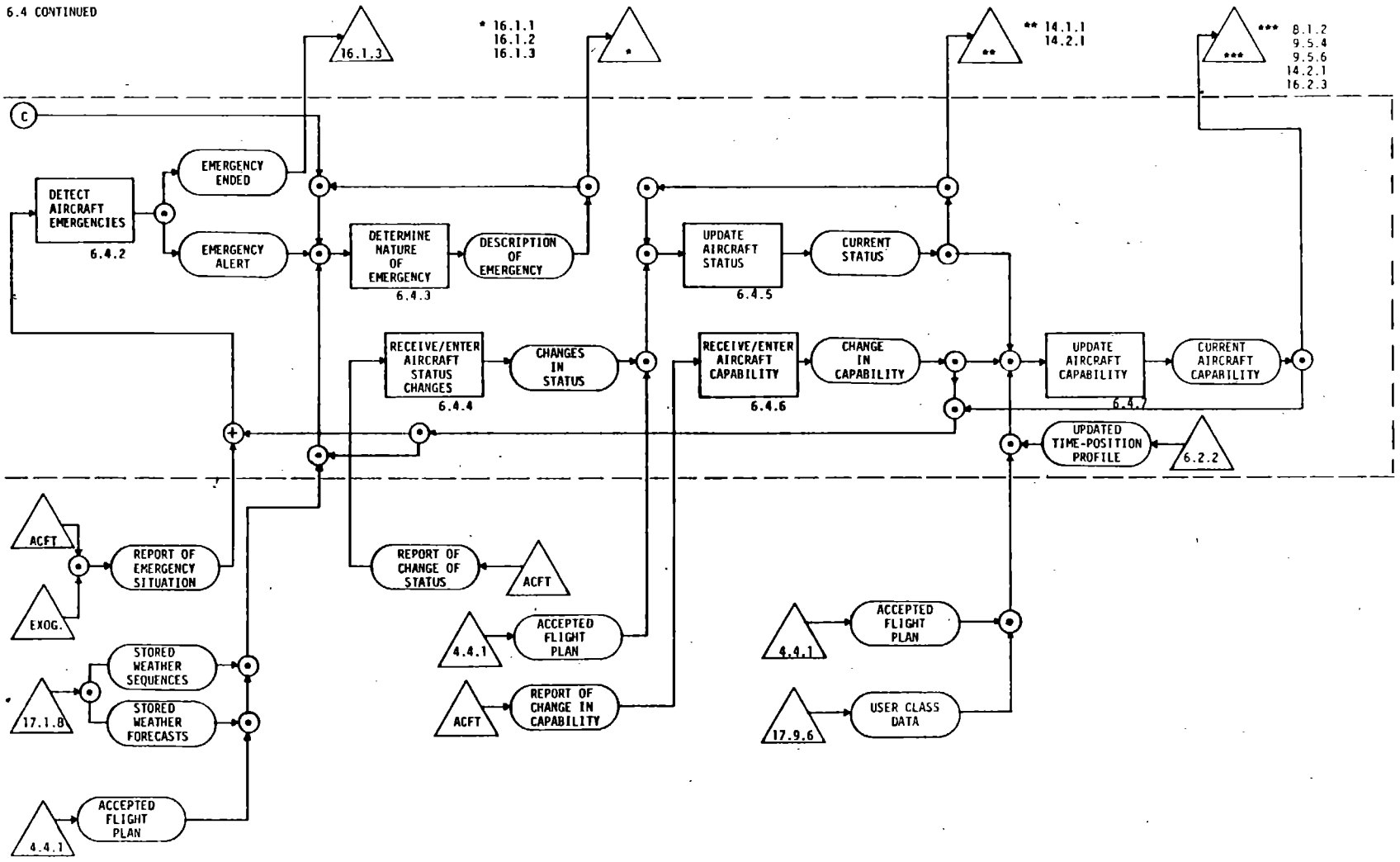
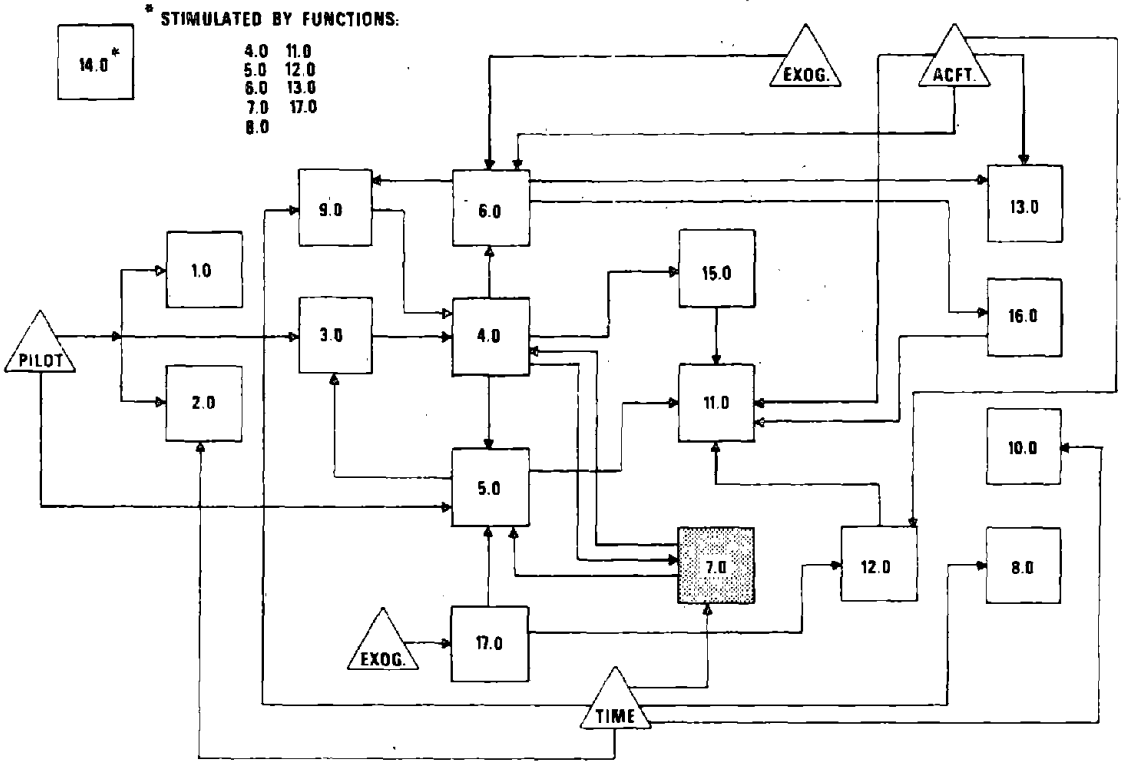


FIGURE 4.6-1. FUNCTION 6.0: MONITOR AIRCRAFT PROGRESS
(SHEET 3 OF 3)

FUNCTION 7.0: MAINTAIN CONFORMANCE WITH FLIGHT PLAN



1.0: PROVIDE FLIGHT PLANNING INFORMATION
2.0: CONTROL TRAFFIC FLOW
3.0: PREPARE FLIGHT PLAN
4.0: PROCESS FLIGHT PLAN
5.0: ISSUE CLEARANCES AND CLEARANCE CHANGES
6.0: MONITOR AIRCRAFT PROGRESS
7.0: MAINTAIN CONFORMANCE WITH FLIGHT PLAN
8.0: ASSURE SEPARATION OF AIRCRAFT
9.0: CONTROL SPACING OF AIRCRAFT
10.0: PROVIDE AIRBORNE, LANDING AND GROUND NAVIGATION CAPABILITY
11.0: PROVIDE AIRCRAFT GUIDANCE
12.0: ISSUE FLIGHT ADVISORIES AND INSTRUCTIONS
13.0: HANDOFF
14.0: MAINTAIN SYSTEM RECORDS
15.0: PROVIDE ANCILLARY AND SPECIAL SERVICES
16.0: PROVIDE EMERGENCY SERVICES
17.0: MAINTAIN SYSTEM CAPABILITY AND STATUS INFORMATION

7.0 MAINTAIN CONFORMANCE WITH FLIGHT PLAN

7.1 Detect Long-Term Conflicts Among Flight Plans

7.1.1 Specify time period to be checked

7.1.2 Construct pairs of flight plans to be compared

7.1.3 Select relevant portion of each pair member's intended time-position profile

7.1.4 Compare intended time-position profiles for intersections in x, y, h and t

7.1.5 Propose revised flight plan to correct long-term conflicts among flight plans

7.2 Determine Current Deviations From Flight Plan

7.2.1 Determine aircraft's intended present position

7.2.2 Compute deviations between aircraft's intended and actual present position

7.3 Predict Deviations From Flight Plan

7.3.1 Specify aircraft's intended future positions

7.3.2 Compute short-range deviations (in x, y, and h) from flight plan

7.3.3 Compute long-range deviations (in t) from flight plan

7.4 Determine Appropriate Resolution of Deviations

7.4.1 Compare deviations with tolerances

7.4.2 Inform pilot of out-of-tolerance deviations

7.4.3 Receive pilot's response concerning resolution of out-of-tolerance present and/or long-range deviations

7.4.4 Develop flight plan revisions to correct out-of-tolerance deviations

SUBFUNCTION DESCRIPTION

FILE: 7.1
SUBFUNCTION: Detect Long-Term Conflicts Among Flight Plans
FUNCTION: Maintain Conformance With Flight Plan

OUTPUTS:

(1) Flight plan is conflict free until _____

(2) Conflicts identified by location, time, and aircraft involved

(3) Proposed flight plan revision

DESCRIPTION:

Purpose: To check flight plans against each other to detect any "long-term" conflicts

Stimulus: Event-stimulated by the receipt of a flight plan processed through 4.2.10 and time-stimulated by elapse of a specified time since a flight plan was checked *

Tasks:

(1) Specify time period to be checked

(2) Construct pairs of flight plans to be compared

(3) Select relevant portion of each pair member's time-position profile

(4) Compare time-position profile for intersection in x, y, h and t

(5) Propose revised flight to correct long-term conflicts among flight plans

Critical Performance Parameters:

(1) Timeliness

(2) Accuracy

(3) Capacity

(4) Validity

* Since a check does not necessarily cover the entire period of the flight, additional checks of subsequent portions of the flight plan will be required as the flight progresses.

Allocation Sensitivities:

INPUTS:

(1) From Subfunction 4.4, Determine Responsibility for Control and Communication:

- Accepted flight plans

(2) From Subfunction 4.2, Review Flight Plan:

- Flight plan priority

(3) From Subfunction 17.10, Compile Traffic Summaries:

- Active flight plans count

(4) From exogenous source:

- System capacity to perform Subfunction 7.1 (number of flight plans that can be processed vs. length of time period to be checked)

(5) From Subfunction 5.2, Determine Clearance To Be Issued:

- Flight plan tolerances

(6) From exogenous source:

- Time stimulus

(7) From Subfunction 7.2, Determine Current Deviations From Flight Plan:

- Closed flight plans

(8) From Subfunction 16.2, Determine Required Response To Emergency:

- Emergency flight plan
- Revised emergency flight plan

(9) From Subfunction 16.1, Describe Emergency Situations:

- Emergency ended

TASK DESCRIPTION

FILE: 7.1.1
TASK: Specify Time Period To Be Checked
SUBFUNCTION: Detect Long Term Conflicts Among Flight Plans
FUNCTION: Maintain Conformance With Flight Plan

OUTPUTS: Time period to be checked

DESCRIPTION:

Purpose: To determine the period of inflight time which is to be examined for conflicts among the flight plans

Stimulus: Event-stimulated by receipt of active flight plan counts from Task 17.10.1

Decisions and Actions:

(1) Compare number of plans to system capacity to perform Subfunction 7.1

(2) Select time period to be checked

Phase of Flight:

All phases except approach, landing, arrival taxi, and postflight

Critical Performance Parameters:

(1) Flexibility

(2) Validity

Performance Capabilities Required:

(1) Information processing:

- Calculation

(2) Intepreting:

- Association

(3) Decision making:

- Selection/choice

External Constraints:

The length of the time period to be checked will be a function not only of operational consideration, but also of the amount of time available to perform all of Subfunction 7.1. Increasing the time period to be checked increases the number of repetitive calculations involved in Subfunction 7.1, thus increasing the time and/or resources required to perform it.

Allocation Sensitivities:

INPUTS:

(1) From exogenous source:

- System capacity to perform Subfunction 7.1 (number of flight plans that can be processed vs. length of time period to be checked)

(2) From Task 17.10.1; Maintain Tallies Of Active Flight Plans:

- Active flight plan counts

TASK DESCRIPTION

FILE: 7.1.2
TASK: Construct Pairs of Flight Plans To Be Compared
SUBFUNCTION: Detect Long Term Conflicts Among Flight Plans
FUNCTION: Maintain Conformance With Flight Plan

OUTPUTS: Pairs of flight plans to be compared

DESCRIPTION:

Purpose: To identify the pairs of flight plans to be compared for possible conflicts

Stimulus: Event-stimulated by the accepted flight plan or by the closing of a flight plan (entry or exit of an aircraft to or from the system) or by receipt of emergency flight plan or revised emergency flight plan

Decisions and Actions:

(1) Select newly-approved flight plan

(2) Identify all other flight plans for aircraft active during time period specified in 7.1.1

(3) Pair newly approved flight plan with each of the other flight plans

Phase of Flight:

All phases except approach, landing, arrival taxi, and postflight

Critical Performance Parameters:

(1) Completeness

(2) Timeliness

Performance Capabilities Required:

(1) Storing and retrieving information:

- Selective retrieval/recall
- Short-term memory

(2) Information processing:

- Merging
- Sorting

External Constraints:

Allocation Sensitivities:

INPUTS:

(1) From Task 7.1.1, Specify Time Period To Be Checked:

- Time period to be checked

(2) From Tasks 4.4.1, Receive and Enter Pilot's Response:

- Accepted flight plans

(3) From Task 16.2.6, Develop Emergency Flight Plan:

- Emergency flight plan
- Revised emergency flight plan

(4) From Task 16.1.3, Compile/Update Description of Emergency:

- Emergency ended

(5) From Task 7.2.2, Compute Deviations Between Aircraft's Intended and Actual Present Positions:

- Closed flight plan

TASK DESCRIPTION

FILE: 7.1.3
TASK: Select Relevant Portion of Each Pair Member's Intended Time-Position Profile
SUBFUNCTION: Detect Long Term Conflicts Among Flight Plans
FUNCTION: Maintain Conformance With Flight Plan

OUTPUTS: Relevant section of pair-member's intended time-position profile

DESCRIPTION:

Purpose: To determine correct section of time-position profiles to be compared for conflicts

Stimulus: Event-stimulated by receipt of pairs of flight plans to be checked, from 7.1.2; or receipt of changed tolerance limits, from 5.2.2; or time-stimulated

Decisions and Actions:

Select section of time-position profile (for each member of all pairs) which corresponds to time period determined in Task 7.1.1

Phase of Flight:

All phases except approach, landing, arrival taxi, and postflight

Critical Performance Parameters:

Validity

Performance Capabilities Required:

(1) Decision making:

- Comparison with standard
- Selection/choice

(2) Storing and retrieving information:

- Short-term memory

(3) Information processing:

- Analysis

(4) Interpreting:

- Association

External Constraints:

Allocation Sensitivities:

INPUTS:

(1) From Task 7.1.2, Construct Pairs of Flight Plans To Be Compared:

- Pairs of flight plans (intended time-position profiles) to be compared

(2) From Task 7.1.1, Specify Time Period To Be Checked:

- Time period to be checked

(3) From Task 5.2.2, Determine Clearance Tolerances:

- Flight plan tolerances

(4) From exogenous source:

- Time stimulus

TASK DESCRIPTION

FILE: 7.1.4
TASK: Compare Intended Time-Position Profiles For Intersection in x, y, h and t
SUBFUNCTION: Detect Long-Term Conflicts Among Flight Plans
FUNCTION: Maintain Conformance With Flight Plan

OUTPUTS:

(1) Conflicts identified by location, time, and aircraft involved

(2) Flight plan is conflict free until _____ (specify farthest time position of check)

DESCRIPTION:

Purpose: To identify long-term conflicts in x, y, h and t

Stimulus: Event-stimulated by selection of the relevant portion of each pair member's time-position profile (Task 7.1.3)

Decisions and Actions:

(1) For each pair of time-position profiles (expanded by flight plan tolerance limits), identify any intersections in x

(2) For each intersection in x, determine if there is also a concurrent intersection in y

(3) For each intersection in x and y, determine if there is also a concurrent intersection in h

(4) For each intersection in x, y and h, determine if there is also a concurrent intersection in t

(5) List all conflicts identified by aircraft involved, position, and time of occurrence

Phase of Flight:

All phases except approach, landing, arrival taxi and postflight

Critical Performance Parameters:

(1) Accuracy

(2) Validity

(3) Timeliness

(4) Capacity

Performance Capabilities Required:

(1) Information processing:

- Analysis

(2) Interpreting:

- Association

External Constraints:

Allocation Sensitivities:

INPUTS:

(1) From Task 7.1.3, Select Relevant Portion of Each Pair Member's Intended Time-Position Profile:

- Relevant section of pair members intended time-position profile

(2) From Task 5.2.2, Determine Clearance Tolerances:

- Flight plan tolerances

TASK DESCRIPTION

FILE: 7.1.5
TASK: Propose Revised Flight Plan To Correct Long Term Conflicts Among Flight Plans
SUBFUNCTION: Detect Long Term Conflicts Among Flight Plans
FUNCTION: Maintain Conformance With Flight Plan

OUTPUTS: Proposed flight plan revision

DESCRIPTION:

Purpose: The purpose of this task is to develop a revised flight plan which will eliminate the conflicts determined in Task 7.1.4

Stimulus: Event-stimulated by the receipt of conflicts identified by location, time, and aircraft involved from Task 7.1.4

Decisions and Actions:

(1) Determine whether one or both of the aircraft involved in the conflict will require a flight plan modification

(2) Determine the flight plan modifications necessary to eliminate the conflict

(3) Prepare a flight plan revisions based on (2)

(4) Submit revisions for processing and approval

Phase of Flight:

All phases except approach, landing, arrival taxi, and postflight

Critical Performance Parameters:

(1) Accuracy

(2) Timeliness

Performance Capability Required:

(1) Decision making:

- Selection/choice
- Comparison of alternatives

(2) Information processing:

- Analysis

(3) Interpreting:

- Association

External Constraints:

Allocation Sensitivities:

INPUTS:

(1) From Task 7.1.4, Compare Time-Position Profiles For Intersection in x, y, h and t:

- Conflicts identified by location, time, and aircraft involved

(2) From Task 4.2.9, Determine Flight Plan Priority:

- Flight plan priority

SUBFUNCTION DESCRIPTION

FILE: 7.2
SUBFUNCTION: Determine Current Deviations From Flight Plan
FUNCTION: Maintain Conformance With Flight Plan

OUTPUTS:

(1) Deviations between intended position at the present time and actual present position

(2) Closed flight plan

DESCRIPTION:

Purpose: To check aircraft actual present position against intended present position in order to detect current deviations, if any, from flight plan

Stimulus: Time-stimulated by passage of a specified amount of time since last performance. (Performed only for those aircraft for which no long-term conflicts exist.)

Tasks:

(1) Determine aircraft intended present position

(2) Compute deviations between intended and actual present positions

Critical Performance Parameters:

(1) Accuracy

(2) Timeliness

(3) Capacity

Allocation Sensitivities:

INPUTS:

(1) From Subfunction 4.4, Determine Responsibility For Control and Communications:

- Accepted flight plan

(2) From Subfunction 6.1, Determine Present Position:

- Correlated position and identifiction

(3) From Subfunction 7.1, Detect Long-Term Conflicts Among Flight Plans:

- Flight plan is conflict free until _____

(4) From Subfunction 16.1, Describe Emergency Situation:

- Emergency ended

(5) From Subfunction 16.2, Determine Required Response To Emergency:

- Emergency flight plan
- Revised emergency flight plan

(6) From exogenous source:

- Time stimulus

TASK DESCRIPTION

FILE: 7.2.1
TASK: Determine Aircraft's Intended Present Position
SUBFUNCTION: Determine Current Deviations From Flight Plan
FUNCTION: Maintain Conformance With Clearance

OUTPUTS: Aircraft intended present position

DESCRIPTION:

Purpose: To determine the intended position of the aircraft at the present time

Stimulus: Time-stimulated (performed only for those aircraft for which no long-term conflicts exist)

Decisions and Actions:

(1) Determine time associated with latest report of aircraft position

(2) Determine aircraft's intended position at time in (1) above

Phase of Flight:

All phases except preflight planning

Critical Performance Parameters:

(1) Timeliness

(2) Accuracy

Performance Capabilities Required:

(1) Storing and retrieving information:

- Short-term memory

(2) Information processing:

- Analysis

(3) Interpreting:

- Association

External Constraints:

Allocation Sensitivities:

INPUTS:

(1) From Task 6.1.1, Receive And Enter Correlated Position And Identification (or Task 6.1.3 or 6.1.5):

- Correlated position and identification

(2) From Task 4.4.1, Receive and Enter Pilot's Response:

- Accepted flight plan (intended time-position profile)

(3) From Task 7.1.4, Compare Time-Position Profiles For Intersections in x, y, h and t:

- Flight plan is conflict free until _____

(4) From Task 16.2.6, Develop Emergency Flight Plan:

- Emergency flight plan
- Revised emergency flight plan

(5) From Task 16.1.3, Compile/Update Description Of Emergency:

- Emergency ended

(6) From exogenous source:

- Time stimulus

TASK DESCRIPTIONS

FILE: 7.2.2
TASK: Compute Deviations Between Aircraft's Intended And Actual Present Positions
SUBFUNCTION: Determine Current Deviations From Flight Plan
FUNCTION: Maintain Conformance With Flight Plan

OUTPUTS:
(1) Deviations between intended and actual present positions

(2) Closed flight plan

DESCRIPTION:

Purpose: To determine deviations between intended and actual present positions as a step in resolving conformance

Stimulus: Event-stimulated, by determination of the intended present position (Task 7.2.1)

Decisions and Actions:

(1) Compare intended present position with actual present position

(2) Promulgate closed flight plan if actual present position is at final point of intended time position profile

(3) Compute extent and direction of any differences

Phase of Flight:

All phases except preflight

Critical Performance Parameters:

(1) Accuracy

(2) Capacity

(3) Timeliness

Performance Capabilities Required:

(1) Information processing:

- Calculation

External Constraints:

Allocation Sensitivities:

INPUTS:

(1) From Task 7.2.1, Determine Aircraft Intended Present Position:

- Aircraft intended present position

(2) From Task 6.1.1, Receive and Enter Correlated Position and Identification (or from Task 6.1.3 or 6.1.5):

- Correlated position and identification

SUBFUNCTION DESCRIPTION

FILE: 7.3
SUBFUNCTION: Predict Deviations From Flight Plan
FUNCTION: Maintain Conformance With Flight Plan

OUTPUTS:

(1) Long-range deviations in t

(2) Short-range deviations in x, y and h

DESCRIPTION:

Purpose: To predict future deviations from flight plan as a step in maintaining conformance with flight plan

Stimulus: Time-stimulated by passage of a specified amount of time since last performance (performed only for those aircraft for which no long-term conflicts exist.)

Tasks:

(1) Specify aircraft intended future position

(2) Compute short-range deviations (in x, y and h) from flight plan

(3) Compute long-range deviations (in t) from flight plan

Critical Performance Parameters:

(1) Timeliness

(2) Capacity

(3) Accuracy

Allocation Sensitivities:

INPUTS:

(1) From Subfunction 4.4, Determine Responsibility For Control And Communication:

- Accepted flight plan

(2) From Subfunction 6.3, Predict Future Positions/ETA's of the Aircraft:

- Short-range predicted time-position profile
- Long-range predicted time-position profile

(3) From Subfunction 7.1, Detect Long-Term Conflicts Among Flight Plans:

- Flight plan is conflict free until _____

(4) From Subfunction 16.1, Describe Emergency Situation:

- Emergency ended

(5) From Subfunction 16.2, Determine Required Response to Emergency:

- Emergency flight plan
- Revised emergency flight plan

(6) From exogenous source:

- Time stimulus

TASK DESCRIPTION

FILE: 7.3.1
TASK: Specify Aircraft's Intended Future Positions
SUBFUNCTION: Predict Deviations From Flight Plan
FUNCTION: Maintain Conformance With Flight Plan

OUTPUTS:

(1) Aircraft's intended short-range future positions in x, y, h and t

(2) Aircraft's intended long-range future positions in x, y, h and t

DESCRIPTION:

Purpose: To provide the pertinent reference data concerning the aircraft's intended future positions for comparison with predicted future positions

Stimulus: Time-stimulated (Performed only for those aircraft for which no long-term conflicts exist)

Decisions and Actions:

(1) Select the portions of the intended time-position profile corresponding in time and length of time to the short and long-range predictions from Tasks 6.3.2 and 6.3.3, respectively

(2) Select/interpolate future time-position data points from these portions of the time-position profile corresponding to the time-position data points in the predictions

Phase of Flight:

All phases except preflight

Critical Performance Parameters:

(1) Accuracy

(2) Timeliness

Performance Capabilities Required:

(1) Information processing:

- Calculation

(2) Interpreting:

- Interpolation

(3) Storing and retrieving information:

- Selective retrieval/recall

External Constraints:

Allocation Sensitivities:

INPUTS:

(1) From Task 4.4.1, Receive and Enter Pilot's Response:

- Accepted flight plan (intended time-position profile)

(2) From Task 6.3.2, Compute Short-Range Extrapolations:

- Short-range predicted time-position profile for the aircraft

(3) From Task 6.3.3, Compute Long-Range Extrapolations:

- Long-range predicted time-position profile for the aircraft

(4) From Task 7.1.4, Compare Time-Position Profiles for Intersections in x, y, h and t:

- Flight plan is conflict free until _____

(5) From Task 16.2.6, Develop Emergency Flight Plan:

- Emergency flight plan
- Revised emergency flight plan

(6) From Task 16.1.3, Compile/Update Description of Emergency:

- Emergency ended

TASK DESCRIPTION

FILE: 7.3.2
TASK: Compute Short-Range Deviations (in x, y, and h) from Flight Plan
SUBFUNCTION: Predict Deviations from Flight Plan
FUNCTION: Maintain Conformance with Flight Plan

OUTPUTS: Short-range deviations in x, y, and h

DESCRIPTION:

Purpose: To determine the difference between the aircraft's short-range intended future positions and short-range predicted future positions in x, y, and h

Stimulus: Event-stimulated by the receipt of short-range intended future positions from Task 7.3.1

Decisions and Actions:

(1) For each t data point, compare predicted positions with intended positions

(2) Compile list of differences between predicted positions and intended positions in x, y, and h

Phase of Flight:

All phases except preflight

Critical Performance Parameters:

(1) Accuracy

(2) Timeliness

(3) Capacity

Performance Capability Required:

(1) Information processing:

- Calculation

(2) Storing and retrieving information:

- Selective retrieval/recall

External Constraints:

Allocation Sensitivities:

If the task is to be manual, the computation of differences between discrete position points, rather than the derivation of difference as a continuous function of time, would be desirable from a speed of task performance viewpoint. If the task is automated, the difference in time required to perform the two types of difference computations would be negligible. The greater precision available from a functional relationship of position differences versus time may be desired if this task is to be automated.

INPUTS:

(1) From Task 6.3.2, Compute Short-Range Extrapolations:

- Short-range predicted time-position profile for the aircraft

(2) From Task 7.3.1, Specify Aircraft's Intended Future Positions:

- Short-range intended future positions

TASK DESCRIPTION

FILE: 7.3.3
TASK: Compute Long-Range Deviations (in t) from Flight Plan
SUBFUNCTION: Predict Deviations from Flight Plan
FUNCTION: Maintain Conformance with Flight Plan

OUTPUTS: Long-range deviations in t

DESCRIPTION:

Purpose: To determine the difference (in t) between the intended ETA/ETOVs and the predicted ETA/ETOVs at selected x, y, and h data points (comparison of intended time-position profile with long-range predicted time-position profile)

Stimulus: Event-stimulated by the receipt of long-range intended future positions from Task 7.3.1

Decisions and Actions:

(1) Compare predicted positions with intended positions

(2) Compile list of differences between predicted positions and intended positions in t

Phase of Flight:

All phases except preflight

Critical Performance Parameters:

(1) Accuracy

(2) Timeliness

(3) Capacity

Performance Capability Required:

(1) Information processing:

- Calculation

(2) Storing and retrieving information:

- Selective retrieval/recall

External Constraints:

Allocation Sensitivities:

If the task is to be manual, the computation of differences between discrete position points, rather than the derivation of difference as a continuous function of time, would be desirable from a speed of task performance viewpoint. If the task is automated, the difference in time required to perform the two types of difference computations would be negligible. The greater precision available from a functional relationship of position differences versus time may be desired if this task is to be automated.

INPUTS:

(1) From Task 6.3.3, Compute Long-Range Extrapolations:

- Long-range predicted time-position profile for the aircraft

(2) From Task 7.3.1, Specify Aircraft's Intended Future Positions:

- Long-range intended future positions

SUBFUNCTION DESCRIPTION

FILE: 7.4
SUBFUNCTION: Determine Appropriate Resolution of Deviations
FUNCTION: Maintain Conformance with Flight Plan

OUTPUTS:

(1) All deviations are within tolerance

(2) Short-range predicted deviations (x, y and h) which exceed tolerance

(3) Present deviations in x, y, h and t which exceed tolerance

(4) Long-range predicted deviations (in t) which exceed tolerances

(5) Proposed revisions to emergency flight plan

(6) Message to pilot containing:

- Enumeration of out-of-tolerance present and/or short-range and/or long-range deviations from flight plan
- Request for pilot's preference for resolution of present and/or long-range deviations

(7) Pilot's preference to return to flight plan (to resolve deviations)

(8) Pilot's preference for a revised flight plan

(9) Proposed flight plan revision

DESCRIPTION:

Purpose: To identify out-of-tolerance deviations from flight plans and to determine the appropriate resolutions of those deviations

Stimulus: Event-stimulated by determination of deviations from flight plan

Tasks:

(1) Compare deviations with tolerances

(2) Inform pilot of out-of-tolerance situation

(3) Receive pilot's response concerning resolution of out-of-tolerance present and/or long-range deviations

(4) Develop flight plan revisions to correct out-of-tolerance deviations

Critical Performance Parameters:

(1) Validity

(2) Accuracy

(3) Flexibility

(4) Completeness

(5) Timeliness

Allocation Sensitivities:

INPUTS:

(1) From Subfunction 4.4, Determine Responsibility for Control and Communications:

- Accepted flight plan
- Communication links between ATM and aircraft

(2) From Subfunction 5.2, Determine Clearance to be Issued:

- Flight plan tolerance limits

(3) From Subfunction 6.2, Compile Aircraft Time-Position Profile:

- Actual time-position profile

(4) From Subfunction 6.3, Predict Future Positions/ETA's of the Aircraft:

- Long-range predicted time-position profile

(5) From Subfunction 7.2, Determine Current Deviations from Flight Plan:

- Deviations between intended and actual present position

(6) From Subfunction 7.3, Predict Deviations from Flight Plan:

- Long-range deviation (in t)
- Short-range deviations (in x, y, and h)

(7) From the aircraft:

- Statement of preference for correction back to flight plan
- Statement of preference for revision to flight plan

(8) From Subfunction 16.1, Describe Emergency Situation:

- Emergency ended

(9) From Subfunction 16.2, Determine Required Response to Emergency:

- Emergency flight plan
- Revised emergency flight plan

TASK DESCRIPTION

FILE: 7.4.1
TASK: Compare Deviations with Tolerances
SUBFUNCTION: Determine Appropriate Resolution of Deviations
FUNCTION: Maintain Conformance with Flight Plan

OUTPUTS:

(1) Present out-of-tolerance deviations from flight plan

(2) Predicted short-range out-of-tolerance deviations from flight plan in x, y, and h

(3) Predicted long-range out-of-tolerance deviations from flight plan in t

(4) Deviations are within tolerances

DESCRIPTION:

Purpose: To determine which deviations from the flight plan are out-of-tolerance

Stimulus: Event-stimulated by determination of present or predicted deviations from flight plan (Tasks 7.2.2 or 7.3.2)

Decisions and Actions:

(1) Compare present deviation from flight plan with flight plan tolerance limits

(2) Compare short-range predicted deviations from flight plan with flight plan tolerance limits

(3) Compare long-range predicted deviations from flight plan with flight plan tolerance limits

(4) Compile lists of out-of-tolerance deviations from flight plan

Phase of Flight:

All phases except preflight

Critical Performance Parameters:

Accuracy

Performance Capabilities Required:

(1) Decision making:

- Comparison with standard

(2) Information processing:

- Analysis
- Merging

(3) Interpreting:

- Association

(4) Storing and retrieving information:

- Selective retrieval/recall

External Constraints:

Allocation Sensitivities:

INPUTS:

(1) From Task 5.2.2, Determine Flight Plan Tolerance Limits:

- Flight plan tolerance limits

(2) From Task 7.2.2, Compute Deviations Between Intended and Actual Present Positions:

- Deviations between intended and actual present positions

(3) From Task 7.3.2, Compute Short-Range Deviations (in x, y and h) from Flight Plan:

- Short-range deviations in x, y and h

(4) From Task 7.3.3, Compute Long-Range Deviations (in t) from Flight Plan:

- Long-range deviations in t

TASK DESCRIPTION

FILE: 7.4.2
TASK: Inform Pilot of Out-Of-Tolerance Deviations
SUBFUNCTION: Determine Appropriate Resolution of Deviations
FUNCTION: Maintain Conformance with Flight Plan

OUTPUTS:

(1) Enumeration of out-of-tolerance present and/or predicted short-range and/or predicted long-range deviations from flight plan

(2) Request for pilot's preference for resolution of present and predicted long-range deviations

DESCRIPTION:

Purpose: To make the pilot aware that he has or will deviate from the flight plan

Stimulus: Event-stimulated by predicted or present out-of-tolerance deviations (Task 7.4.1)

Decisions and Actions:

(1) Transmit list of out-of-tolerance deviations to pilot

(2) Request from pilot, his preference for resolving deviations, i.e., either corrections to return to and/or maintain original flight plan, or revised flight plan

Phase of Flight:

All phases except preflight

Critical Performance Parameters:

Completeness

Performance Capabilities Required:

Responding:

- Data transmission

External Constraints:

Allocation Sensitivities:

To method of communication with pilot (voice or data link)

INPUTS:

(1) From Task 7.4.1, Compare Deviations with Tolerances:

- Present out-of-tolerance deviations from flight plan in x, y, h and t
- Predicted short-range out-of-tolerance deviations from flight plan in x, y and h
- Predicted long-range out-of-tolerance deviations from flight plan in t

(2) From Task 4.4.4, Designate Communication Links Between ATM and Aircraft:

- Communication links to be used between aircraft and ATM system

TASK DESCRIPTION

FILE: 7.4.3
TASK: Receive Pilot's Response Concerning Resolution of Out-Of-Tolerance Present and/or Long-Range Deviations
SUBFUNCTION: Determine Appropriate Resolution of Deviations
FUNCTION: Maintain Conformance with Flight Plan

OUTPUTS:

(1) Pilot's preference to return to flight plan

(2) Pilot's preference for a revised flight plan

DESCRIPTION:

Purpose: To determine the pilot's preferences regarding resolution of out-of-tolerance present or predicted long-range deviations (predicted short-range deviations require no pilot response)

Stimulus: Event-stimulated by receipt of pilot's response

Decisions and Actions:

(1) Receive pilot's statement of preferences

(2) Initiate action on pilot's stated preference

Phase of Flight:

All phases except preflight

Critical Performance Parameters:

Completeness

Performance Capabilities Required:

(1) Responding:

- Communication/data transmission

(2) Monitoring:

- Vigilance

(3) Sensing:

- Signal recognition

(4) Interpreting:

- Classification

(5) Information processing:

- Encoding/decoding

External Constraints:

Allocation Sensitivities:

To method of communication with pilot (voice or data link)

INPUTS: From the aircraft:

- Statement of preference for correction back to flight plan
- Statement of preference for revision of flight plan

TASK DESCRIPTION

FILE: 7.4.4
TASK: Develop Flight Plan Revisions to Correct Out-Of-Tolerance Deviations
SUBFUNCTION: Determine Appropriate Resolution of Deviations
FUNCTION: Maintain Conformance with Flight Plan

OUTPUTS:

(1) Proposed flight plan revision

(2) Proposed revision to emergency flight plan

DESCRIPTION:

Purpose: To develop proposed flight plan revisions which will resolve out-of-tolerance conditions determined in Tasks 7.4.1

Stimulus: Event-stimulated by pilot's stated preference for flight plan change to correct out-of-tolerance condition(s)

Decisions and Actions:

(1) Compute parameters of current performance (e.g., true airspeed, ETA's, etc.) needed to propose a revised flight plan (derived from actual time-position profile)

(2) Prepare a proposed revision to flight plan by modifying existing flight plan to reflect current performance

(3) Submit proposed revised flight plan for processing and approval

Phase of Flight:

All phases except preflight

Critical Performance Parameters:

(1) Timeliness

(2) Completeness

(3) Accuracy

Performance Capability Required:

(1) Storing and retrieving information:

- Short-term memory

(2) Information processing:

- Merging
- Calculation

(3) Interpreting:

- Association

(4) Decision making:

- Induction/inference/deduction

External Constraints:

Allocation Sensitivities:

INPUTS:

(1) From Task 7.4.1, Compare Deviations with Tolerances:

- Present out-of-tolerance deviations from flight plan in x, y, h and t
- Long-range predicted out-of-tolerance deviations from flight plan in t

(2) From Task 4.4.1, Relieve and Enter Pilot's Response:

- Accepted flight plan

(3) From Task 6.2.2, Update Aircraft Actual Time-Position Profile:

- Actual time-position profile

(4) From Task 6.3.3, Compute Long-Range Extrapolations:

- Long-range predicted time-position profile for the aircraft

(5) From Task 16.2.6, Develop Emergency Flight Plan:

- Emergency flight plan
- Revised emergency flight plan

(6) From Task 16.1.3, Compile/Update Description of Emergency:

- Emergency ended

(7) From Task 6.3.2, Compute Short-Range Extrapolations:

- Short-range predicted time-position profile for the aircraft

(8) From Task 7.4.3, Receive Pilot's Response Concerning Resolution of Out-Of-Tolerance Present and/or Long-Range Deviations:

- Pilot's preference for a revised flight plan

Table 4.7-I. Flow of Information

Function 7.0: Maintain Conformance with Flight Plan

TASK	INPUTS		OUTPUTS	
	IDENTIFICATION	SOURCE	IDENTIFICATION	DESTIN.
7.1.1	*Active flight plan count	17.10.1	Time period to be checked	7.1.2 7.1.3
	System capacity to perform	Exog.		
7.1.2	*Accepted flight plan	4.4.1	Pairs of flight plans to be compared	7.1.3
	*Closed flight plan	7.2.2		
	*Emergency flight plan	16.2.6		
	*Revised emergency flight plan	16.2.6		
	Emergency ended	16.1.3		
7.1.3	*Pairs of flight plans to be compared	7.1.2	Relevant section of pair member's time-position profile	7.1.4
	*Flight plan tolerances	5.2.2		
	Time period to be checked	7.1.1		
	*Time stimulus	Exog.		
7.1.4	*Section of intended time-position profiles to be checked for conflicts	7.1.3	Conflicts identified by location, time, & aircraft involved	7.2.1 7.1.5 7.3.1 5.2.3 14.2.1
	Flight plan tolerance limits	5.2.2		
			Flight plan is conflict free until____	5.2.3 7.2.1 7.3.1
7.1.5	*Conflicts identified by location, time and acft involved	7.1.4	Proposed flight plan revision	4.1.1 4.1.2 4.2.1 4.2.2 4.2.3 4.2.4 4.2.5 4.2.7 4.2.9 4.2.10
	Flight plan priority	4.2.9		

Table 4.7-I. Flow of Information

Function 7.0: Maintain Conformance with Flight Plan (Cont'd.)

TASK	INPUTS		OUTPUTS	
	IDENTIFICATION	SOURCE	IDENTIFICATION	DESTIN.
7.2.1	*Time stimulus	Exog.	Aircraft's intended present position	7.2.2
	Accepted flight plans (intended time-position profile)	4.4.1		
	Correlated position and identification	6.1.1 6.1.3 6.1.5		
	Flight plan is conflict free until _____	7.1.4		
	Emergency flight plan	16.2.6		
	Revised emergency flight plan	16.2.6		
	Emergency ended	16.1.3		
7.2.2	*Aircraft intended present position	7.2.1	Deviations between intended and actual present position	7.4.1
	Correlated position and identification	6.1.1 6.1.3 6.1.5	Closed flight plan	7.1.2 14.2.1 17.10.1
7.3.1	*Time stimulus	Exog.	Short-range intended future position	7.3.2
	Accepted flight plan	4.4.1		
	Short-range predicted time-position profile	6.3.2	Long-range intended future position	7.3.3
	Long-range predicted time-position profile	6.3.3		
	Flight plan is conflict free until _____	7.1.4		
	Emergency flight plan	16.2.6		
	Revised emergency flight plan	16.2.6		
	Emergency ended	16.1.3		
7.3.2	Short-range predicted time-position profile	6.3.2	Short-range deviations in x, y, and h	7.4.1
	*Short-range intended future position	7.3.1		

Table 4.7-I. Flow of Information

Function 7.0: Maintain Conformance with Flight Plan (Cont'd.)

TASK	INPUTS		OUTPUTS	
	IDENTIFICATION	SOURCE	IDENTIFICATION	DESTIN.
7.3.3	Long-range predicted time-position profile	6.3.3	Long-range deviations in "t"	7.4.1
	*Long-range intended future position	7.3.1		
7.4.1	Flight plan tolerance limits	5.2.2	Present deviations out-of-tolerance	7.4.2 7.4.4 14.1.1 14.2.1 5.2.2
	*Deviations between intended and actual present positions	7.2.2		
	*Short-range deviations from flight plan	7.3.2	Short-range predicted deviations out-of-tolerance	7.4.2 14.2.1
	*Long-range deviations from flight plan	7.3.3	Long-range predicted deviations out-of-tolerance	7.4.2 7.4.4 14.2.1
			Deviations are within tolerances	End
7.4.2	*Present out-of-tolerance deviations from flight plan	7.4.1	Message to aircraft: • Out-of-tolerance deviations • Request for pilots preference for resolution of present and long-range deviations	Acft
	*Short-range predicted out-of-tolerance deviations	7.4.1		
	*Long-range predicted out-of-tolerance deviations	7.4.1		
	Comm. links in use between aircraft and ATM	4.4.4		
7.4.3	*Statement of preference for return to flight plan	Acft	Preference for return to flight plan	5.2.2 14.2.1
	*Statement of preference for revised flight plan	Acft	Preference for revised flight plan	7.4.4 14.2.1

Table 4.7-I. Flow of Information

Function 7.0: Maintain Conformance with Flight Plan (Cont'd.)

TASK	INPUTS		OUTPUTS	
	IDENTIFICATION	SOURCE	IDENTIFICATION	DESTIN.
7.4.4	*Preference for revised flight plan	7.4.3	Proposed flight plan revision	4.1.1
	Present deviations out-of-tolerance	7.4.1	Proposed revisions to emergency flight plan	16.2.6
	Long-range predicted deviations out-of-tolerance	7.4.1		
	Accepted flight plan	4.4.1		
	Actual time-position profile	6.2.2		
	Long-range predicted time-position profile	6.3.3		
	Short-range predicted time-position profile	6.3.2		
	Emergency flight plan	16.2.6		
	Revised emergency flight plan	16.2.6		
	Emergency ended	16.1.3		

Table 4.7-I. Flow of Information

Function 7.0: Maintain Conformance with Flight Plan (Cont'd.)

TASK	INPUTS		OUTPUTS	
	IDENTIFICATION	SOURCE	IDENTIFICATION	DESTIN.
7.4.4	*Preference for revised flight plan	7.4.3	Proposed flight plan revision	4.1.1
	Present deviations out-of-tolerance	7.4.1	Proposed revisions to emergency flight plan	16.2.6
	Long-range predicted deviations out-of-tolerance	7.4.1		
	Accepted flight plan	4.4.1		
	Actual time-position profile	6.2.2		
	Long-range predicted time-position profile	6.3.3		
	Short-range predicted time-position profile	6.3.2		
	Emergency flight plan	16.2.6		
	Revised emergency flight plan	16.2.6		
	Emergency ended	16.1.3		

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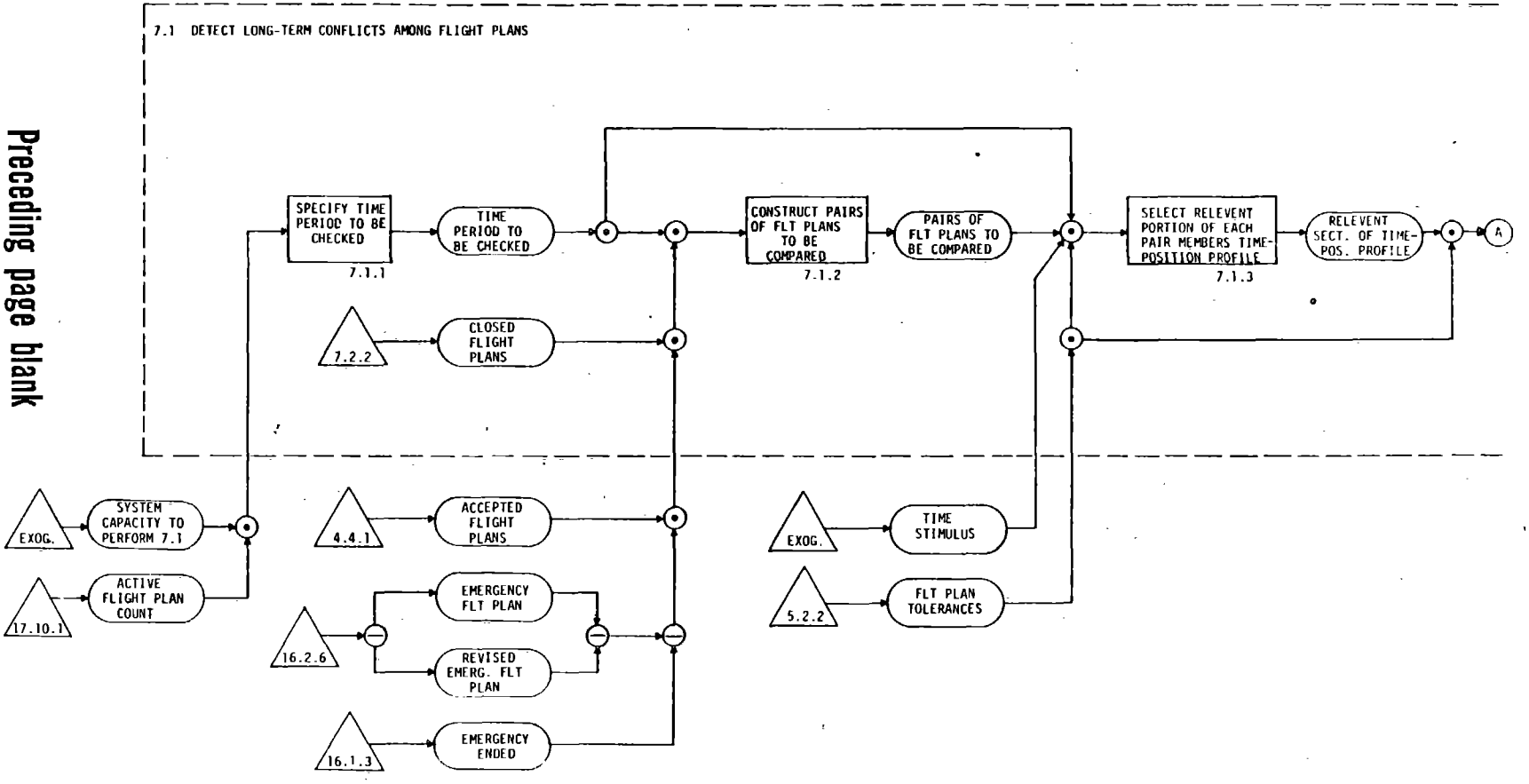


FIGURE 4.7-1. FUNCTION 7.0: MAINTAIN CONFORMANCE WITH FLIGHT PLAN (SHEET 1 OF 5)

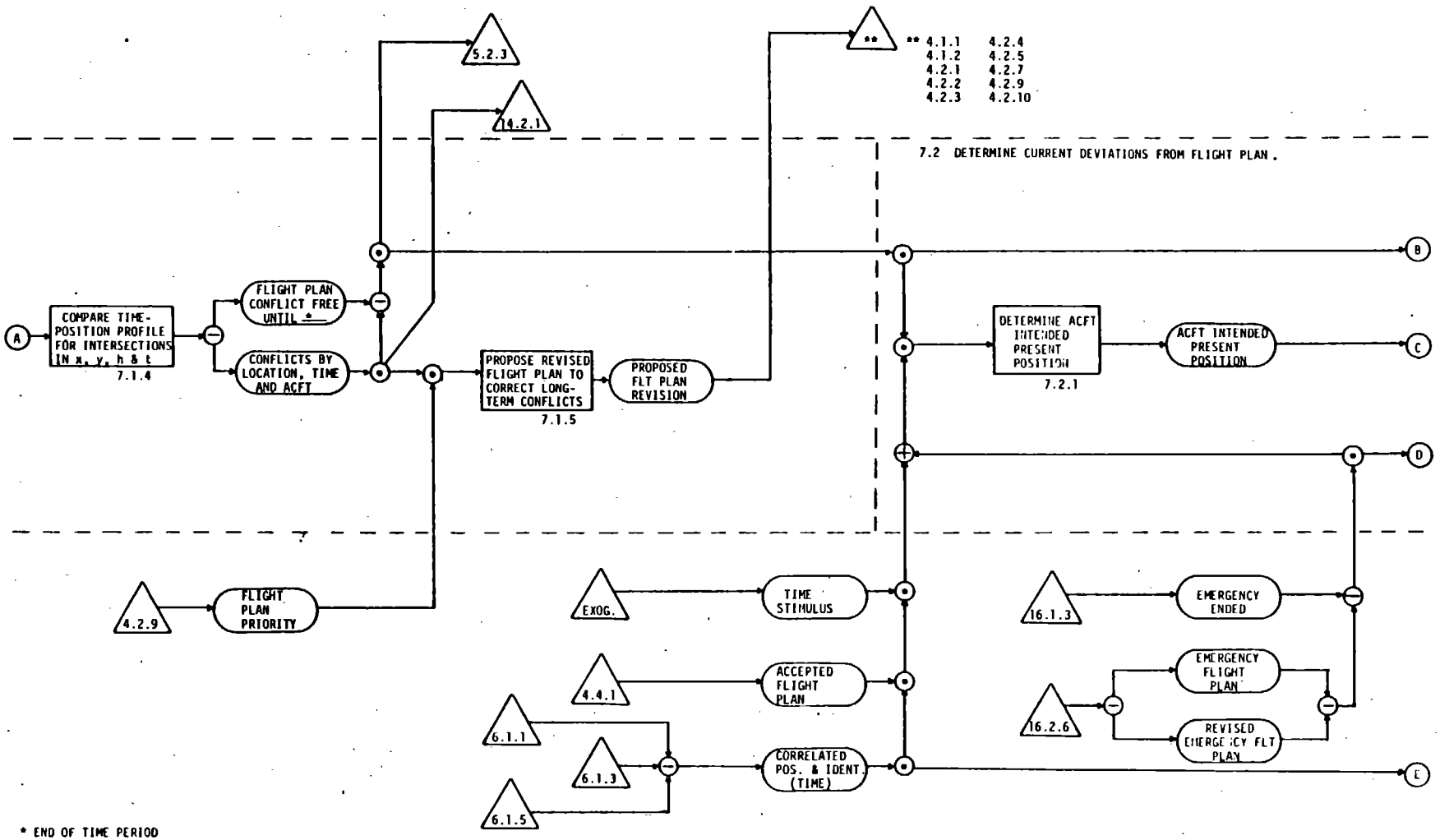


FIGURE 4.7-1. FUNCTION 7.0: MAINTAIN CONFORMANCE WITH FLIGHT PLAN (SHEET 2 OF 5)

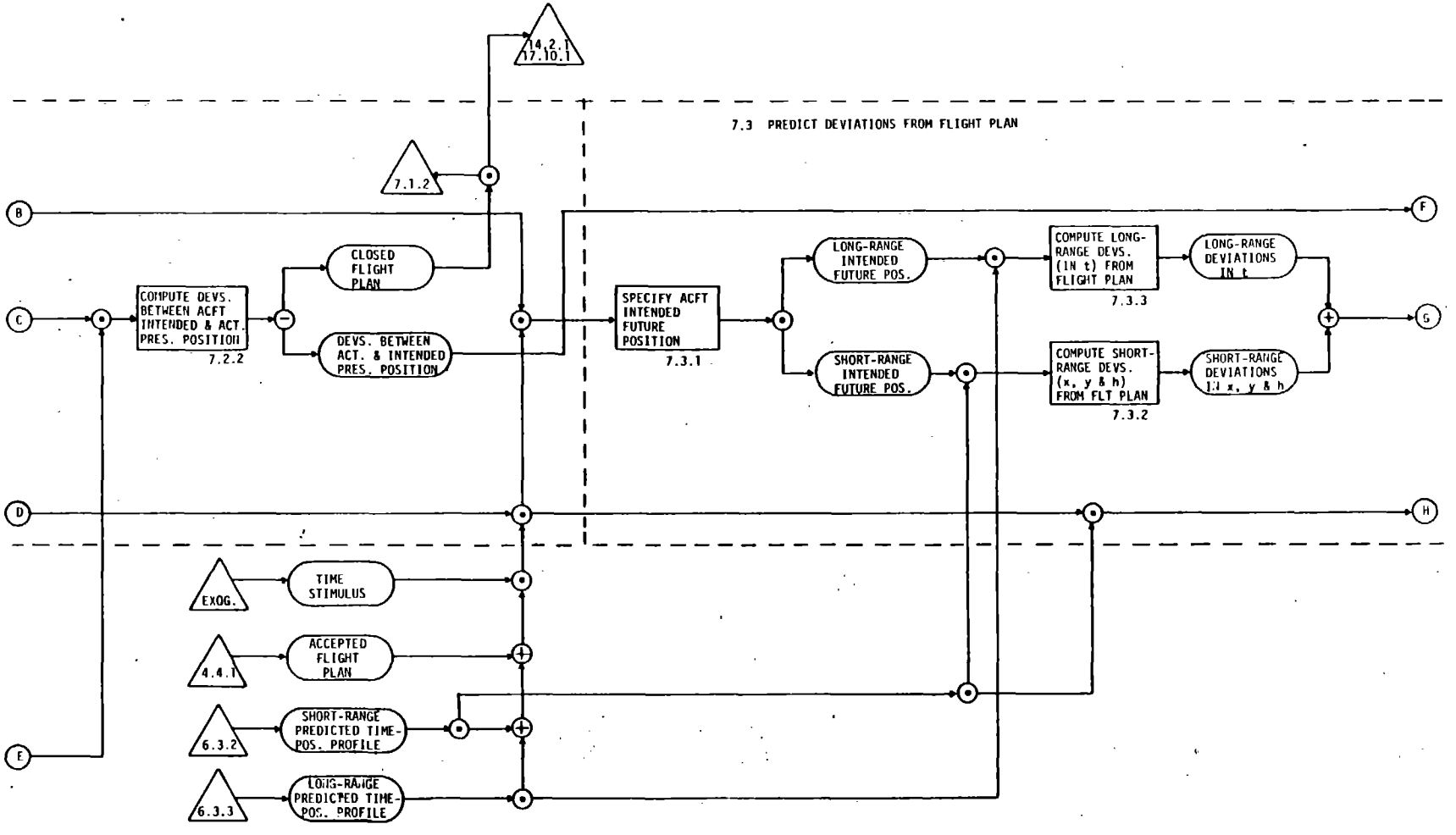


FIGURE 4.7-1. FUNCTION 7.0: MAINTAIN CONFORMANCE WITH FLIGHT PLAN
(SHEET 3 OF 5)

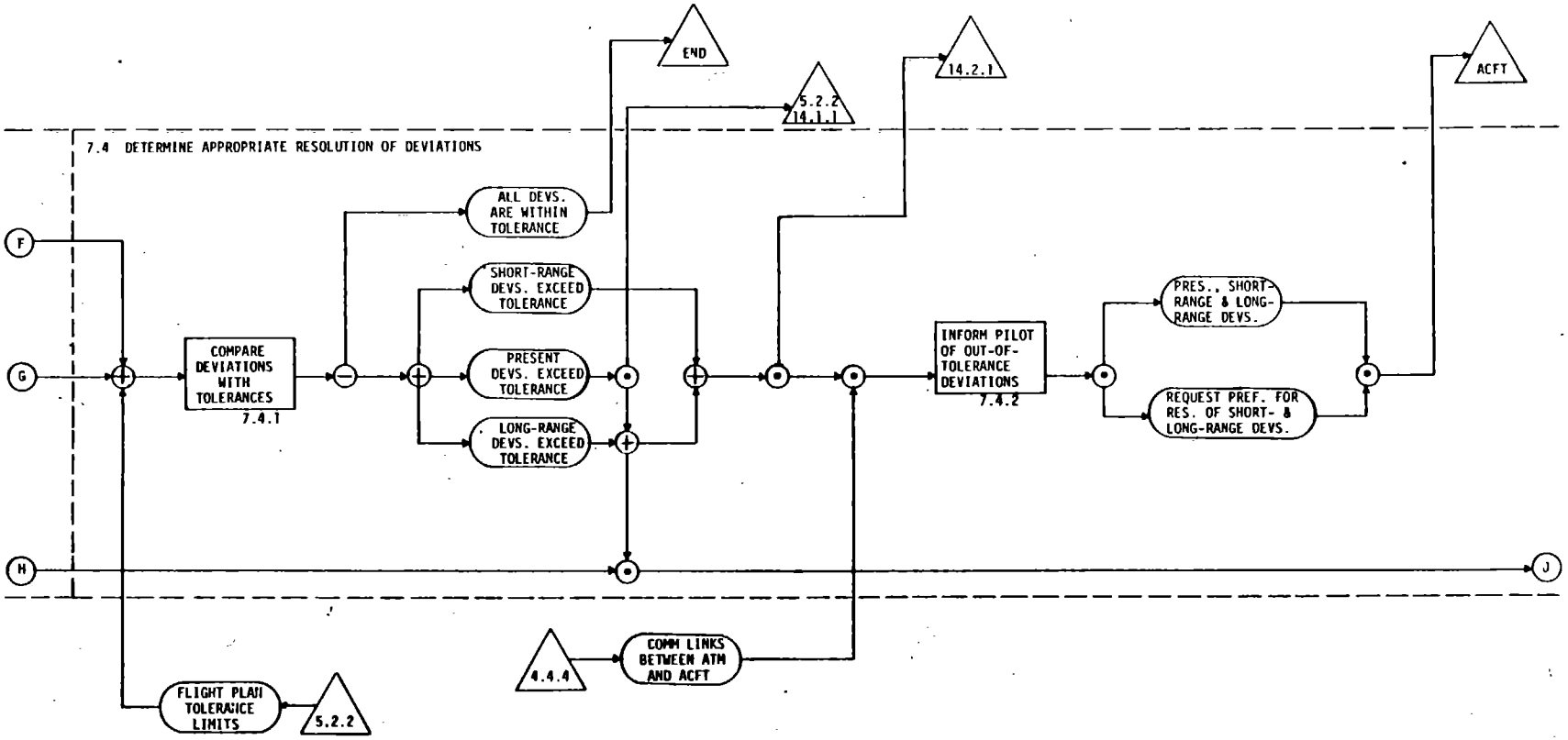


FIGURE 4.7-1. FUNCTION 7.0: MAINTAIN CONFORMANCE WITH FLIGHT PLAN
(SHEET 4 OF 5)

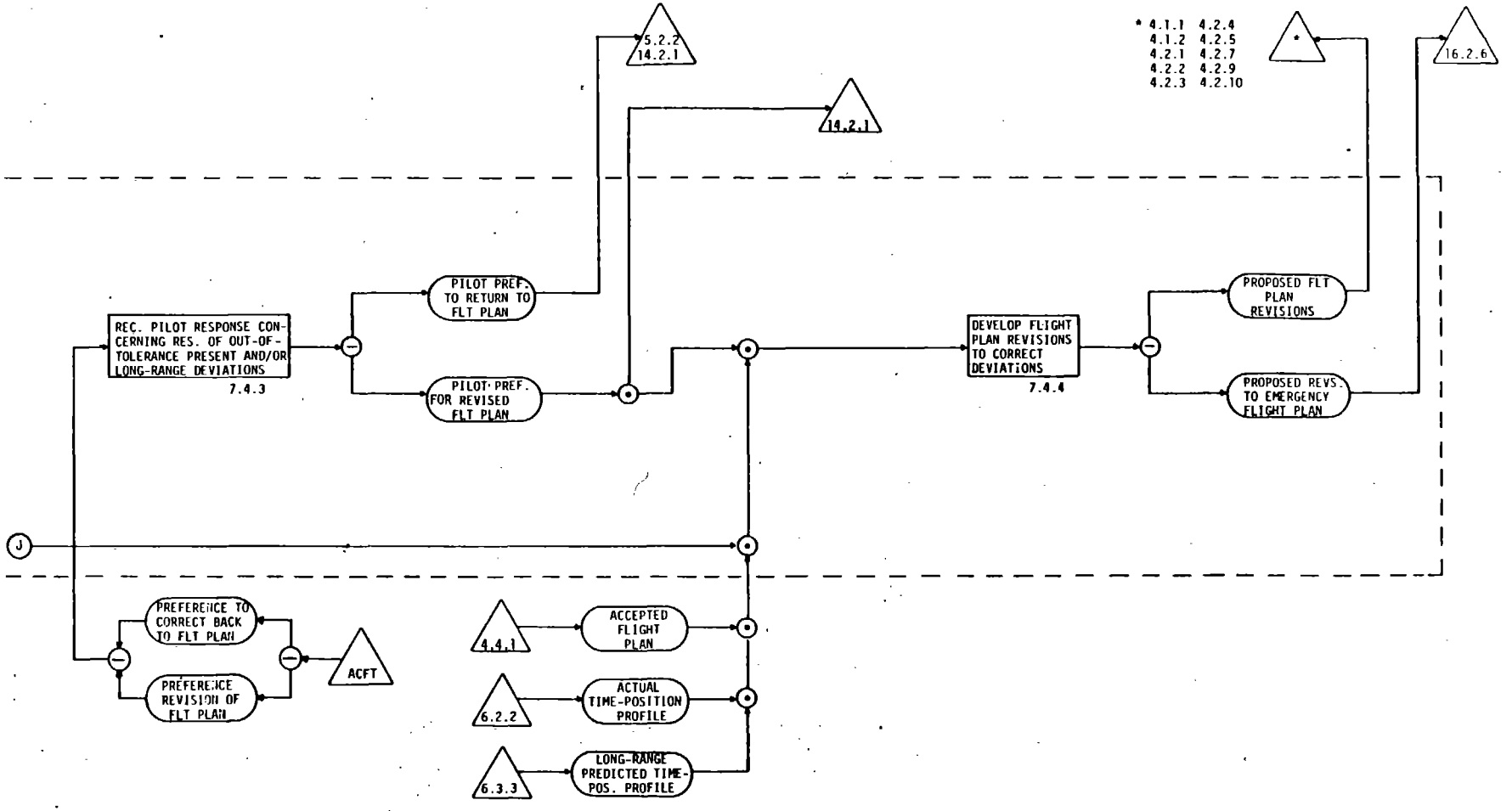
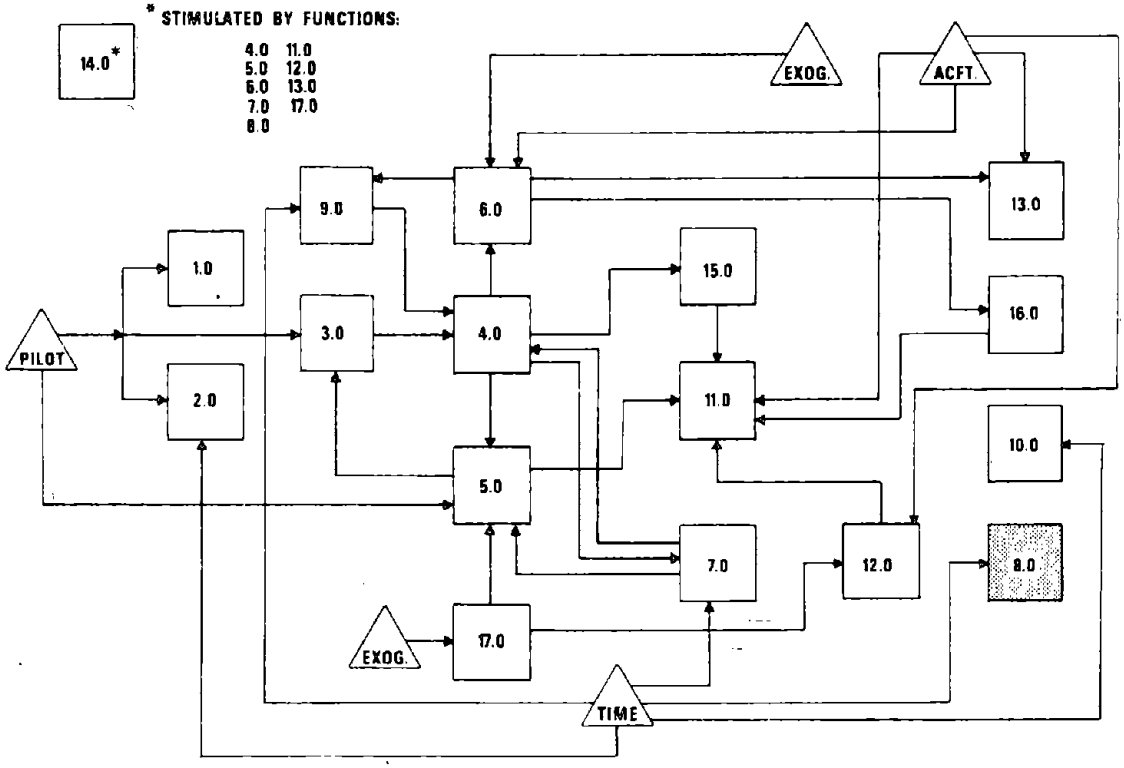


FIGURE 4.7-1. FUNCTION 7.0: MAINTAIN CONFORMANCE WITH FLIGHT PLAN
(SHEET 5 OF 5)

FUNCTION 8.0: ASSURE SEPARATION OF AIRCRAFT



1.0: PROVIDE FLIGHT PLANNING INFORMATION
2.0: CONTROL TRAFFIC FLOW
3.0: PREPARE FLIGHT PLAN
4.0: PROCESS FLIGHT PLAN
5.0: ISSUE CLEARANCES AND CLEARANCE CHANGES
6.0: MONITOR AIRCRAFT PROGRESS
7.0: MAINTAIN CONFORMANCE WITH FLIGHT PLAN
8.0: ASSURE SEPARATION OF AIRCRAFT
9.0: CONTROL SPACING OF AIRCRAFT
10.0: PROVIDE AIRBORNE, LANDING AND GROUND NAVIGATION CAPABILITY
11.0: PROVIDE AIRCRAFT GUIDANCE
12.0: ISSUE FLIGHT ADVISORIES AND INSTRUCTIONS
13.0: HANDOFF
14.0: MAINTAIN SYSTEM RECORDS
15.0: PROVIDE ANCILLARY AND SPECIAL SERVICES
16.0: PROVIDE EMERGENCY SERVICES
17.0: MAINTAIN SYSTEM CAPABILITY AND STATUS INFORMATION

8.0 ASSURE SEPARATION OF AIRCRAFT

8.1 Predict Conflicts

8.1.1 Select airspace volume and time frame

8.1.2 Predict aircraft paths

8.1.3 Identify path prediction profiles for the airspace and time frame

8.1.4 Pair path prediction profiles for conflict comparison

8.1.5 Determine conflict probability for each pair

8.1.6 Determine conflict imminence for each pair

8.1.7 Determine action required

8.1.8 Monitor for unexpected deviations

8.1.9 Determine if action classification has been updated

8.2 Resolve Conflicts

8.2.1 Hypothesize performance changes

8.2.2 Analyze performance change for conflicts

8.2.3 Format performance change message

8.2.4 Transmit performance change message to pilot

8.2.5 Determine performance change status

SUBFUNCTION DESCRIPTION

FILE: 8.1
SUBFUNCTION: Predict Conflicts
FUNCTION: Assure Separation of Aircraft

OUTPUTS:

(1) Set of selected path prediction profiles

(2) High imminence conflict pairs

(3) No action required

(4) Careful monitoring required

(5) Unsafe deviations

(6) Performance correction required

(7) Action classification updated

DESCRIPTION:

Purpose: To identify the pairs of aircraft that require conflict resolution

Stimulus: Time-stimulated

Tasks:

(1) Select airspace volume and time frame

(2) Predict aircraft paths

(3) Identify path prediction profiles for the airspace and time frame

(4) Pair path prediction profiles for conflict comparison

(5) Determine conflict probability for each pair

(6) Determine conflict imminence for each pair

(7) Determine action required

(8) Monitor for unexpected deviations

(9) Determine if action classification has been updated

Critical Performance Parameters:

(1) Speed

(2) Accuracy

(3) Capacity

(4) Timeliness

(5) Validity

Allocation Sensitivities:

INPUTS: (1) From exogenous source:

- Time stimulus
- Designations of airspace volumes for conflict detection
- Designations of time intervals for conflict detection
- Path probability paradigm
- Update cycle time

(2) From Subfunction 6.3, Predict Future Positions/ETAs of the aircraft:

- Predicted short-range time-position profile for the aircraft
- Predicted long-range time-position profile for the aircraft

(3) From Subfunction 6.4, Determine Aircraft Capability and Status:

- Current aircraft capability (include performance capability and user class)

(4) From Subfunction 5.3, Compile and Issue Clearance:

- Clearance issued

(5) From Subfunction 8.2, Resolve Conflicts:

- Acceptable performance change

(6) From Subfunction 15.2, Initiate Action to Provide Service:

- Definition of special separation minima

(7) From Subfunction 15.1, Determine Nature of Service Required:

- Special service no longer required

(9) From Subfunction 17.2, Update Rules and Procedures Information:

- Stored data base item (rules and procedures - minimum separation standards)

TASK DESCRIPTION

FILE: 8.1.1
TASK: Select Airspace Volume and Time Frame
SUBFUNCTION: Predict Conflicts
FUNCTION: Assure Separation of Aircraft

OUTPUTS: Airspace volume and time frame

DESCRIPTION:

Purpose: To determine the four-dimensional volume ($x-x_1$, $y-y_1$, $h-h_1$, $t-t_1$) of interest

Stimulus: Time-stimulated

Decisions and Actions:

(1) Select the airspace volume

(2) Select the time interval

(3) Specify the four-dimensional volume

Phase of Flight:

All phases except preflight and postflight

Critical Performance Parameters:

(1) Capacity

(2) Timeliness

(3) Speed

Performance Capability Required:

Decision making:

- Comparison with standard

External Constraints:

Allocation Sensitivities:

INPUTS: (1) From exogenous source:

- Designations of airspace volumes for conflict detection
- Designations of time intervals for conflict detection
- Time stimulus

TASK DESCRIPTION

FILE: 8.1.2
TASK: Predict Aircraft Paths
SUBFUNCTION: Predict Conflicts
FUNCTION: Assure Separation of Aircraft

OUTPUTS: Path prediction profile for each aircraft

DESCRIPTION:

Purpose: To predict the path of the aircraft in terms of the probability that the aircraft will be located in a given area at a given time

Stimulus: Time-stimulated

Decisions and Actions:

(1) Determine intent for the aircraft from:

- Long-range extrapolation
- Clearance issued
- User class
- Any previously directed performance change for the aircraft

(2) Compare intent with the short-range extrapolation to predict the path of the aircraft

(3) Use intent and aircraft performance capability to determine the probability that the aircraft will deviate from the predicted path by any given amount

(4) Construct a profile of probabilities for each area and time that the aircraft may occupy

Phase of Flight:

All phases except preflight and postflight

Critical Performance Parameters:

(1) Accuracy

(2) Capacity

(3) Speed

(4) Validity

Performance Capability Required:

(1) Storing and retrieving information:

- o Short-term memory

(2) Interpreting:

- o Prediction

(3) Information processing:

- o Calculation

External Constraints:

Allocation Sensitivities:

INPUTS:

(1) From Task 6.3.2, Compute Short-Range Extrapolations:

- Short-range predicted time-position profile for the aircraft

(2) From Task 6.3.3, Compute Long-Range Extrapolations:

- Long-range predicted time-position profile for the aircraft

(3) From Task 5.3.3, Receive Acknowledgement of Clearance:

- Clearance issued

(4) From Task 6.4.7, Update Aircraft Capability:

- Current aircraft capability

(5) From exogenous source:

- Path probability paradigm
- Time stimulus

(6) From Task 8.2.2, Analyze Performance Change for Conflicts:

- Acceptable performance change

TASK DESCRIPTION

FILE: 8.1.3
TASK: Identify Path Prediction Profiles for the Airspace and Time Frame
SUBFUNCTION: Predict Conflicts
FUNCTION: Assure Separation of Aircraft

OUTPUTS: Set of selected path prediction profiles

DESCRIPTION:

Purpose: To identify path prediction profiles in the selected airspace and time frame

Stimulus: Time-stimulated

Decisions and Actions:

(1) Examine the path prediction profiles within a specified distance of the selected airspace volume

(2) Select path prediction profiles common to the selected airspace volume and time frame

Phase of Flight:

All phases except preflight and postflight

Critical Performance Parameters:

(1) Capacity

(2) Speed

(3) Validity

Performance Capability Required:

(1) Monitoring:

- Surveillance

(2) Interpreting:

- Association

(3) Storing and retrieving information:

- Short-term memory

External Constraints:

Allocation Sensitivities:

INPUTS:

(1) From Task 8.1.1, Select Airspace Volume and Time Frame:

- Airspace volume and time frame

(2) From Task 8.1.2, Predict Aircraft Paths:

- Path prediction profile for each aircraft

(3) From exogenous source:

- Time stimulus

TASK DESCRIPTION

FILE: 8.1.4
TASK: Pair Path Prediction Profiles for Conflict Comparison
SUBFUNCTION: Predict Conflicts
FUNCTION: Assure Separation of Aircraft

OUTPUTS: Pairs of path prediction profiles

DESCRIPTION:

Purpose: To pair each path prediction profile with every other path prediction profile common to the specified airspace during the same time interval

Stimulus: Event-stimulated by the receipt of a set of path prediction profiles for conflict comparison from Task 8.1.3

Decisions and Actions:

(1) Pair each path prediction profile in the set with each other path prediction profile in the set

Phase of Flight:

All phases except preflight and postflight

Critical Performance Parameters:

(1) Speed

(2) Capacity

Performance Capability Required:

Information processing:

- Sorting
- Ordering

External Constraints:

Allocation Sensitivities:

INPUTS: (1) From Task 8.1.3, Identify Path Prediction Profiles for the Airspace and Time Frame:

- Set of selected path prediction profiles

TASK DESCRIPTION

FILE: 8.1.5
TASK: Determine Conflict Probability for Each Pair
SUBFUNCTION: Predict Conflicts
FUNCTION: Assure Separation of Aircraft

OUTPUTS:

(1) High probability conflict pairs

(2) Low probability conflict pairs

DESCRIPTION:

Purpose: To determine the probability of a conflict between the two members of each pair

Stimulus: Event-stimulated by the receipt of pairs of path prediction profiles from Task 8.1.4

Decisions and Actions:

(1) Compare the path prediction profiles for each pair

(2) Determine the probability of a conflict

(3) Compare the probability of a conflict with minimum separation standards*

(4) Separate pairs into ordered groups based on conflict probability compared to minimum separation standards

Phase of Flight:

All phases except preflight and postflight

Critical Performance Parameters:

(1) Speed

(2) Capacity

(3) Validity

Performance Capability Required:

(1) Storing and retrieving:

- Short-term memory

*Although minimum separation standards are not presently stated in terms of probability and imminence of conflict, it seems reasonable to do so.

(2) Decision making:

- Probability (contingency estimation)
- Comparison with standard

(3) Information processing:

- Sorting
- Ordering

External Constraints:

Allocation Sensitivities:

INPUTS:

(1) From Task 15.2.4, Determine Special Separation Minima:

- Definition of special separation minima

(2) From Task 15.1.2, Monitor Progress of Service:

- Special service no longer required

(3) From Task 17.2.6, Store Data Base Item:

- Stored data base item (rules and procedures - minimum separation standards)

(4) From Task 8.1.4, Pair Path Prediction Profiles for Conflict Comparison:

- Pairs of path prediction profiles

TASK DESCRIPTION

FILE: 8.1.6
TASK: Determine Conflict Imminence for Each Pair
SUBFUNCTION: Predict Conflicts
FUNCTION: Assure Separation of Aircraft

OUTPUTS:

(1) High imminence conflict pairs

(2) Low imminence conflict pairs

DESCRIPTION:

Purpose: To determine the imminence of a conflict for each pair (how long until the predicted conflict will occur, if it occurs)

Stimulus: Event-stimulated by the receipt of pairs of path prediction profiles from Task 8.1.4

Decisions and Actions:

(1) Compare the path prediction profiles for each pair

(2) Determine the imminence of a conflict

(3) Compare the imminence of a conflict with minimum separation standards

(4) Separate pairs into ordered groups based on conflict imminence compared to minimum separation standards

Phase of Flight:

All phases except preflight and postflight

Critical Performance Parameters:

(1) Speed

(2) Capacity

(3) Validity

Performance Capability Required:

(1) Storing and retrieving:

- Short-term memory

(2) Decision making:

- Probability/contingency estimation
- Comparison with standard

(3) Information processing:

- Sorting
- Ordering

External Constraints:

Allocation Sensitivities:

INPUTS:

(1) From Task 15.2.4, Determine Special Separation Minima:

- Definition of special separation minima

(2) From Task 15.1.2, Monitor Progress of Service:

- Special service no longer required

(3) From Task 17.2.6, Store Data Base Item:

- Stored data base item (rules and procedures - minimum separation standards)

(4) From Task 8.1.4, Pair Path Prediction Profiles for Conflict Comparison:

- Pairs of path prediction profiles

TASK DESCRIPTION

FILE: 8.1.7
TASK: Determine Action Required
SUBFUNCTION: Predict Conflicts
FUNCTION: Assure Separation of Aircraft

OUTPUTS:

(1) Performance correction required (high probability, high imminence pairs and high probability, low imminence pairs)

(2) Careful monitoring required (low probability, high imminence pairs)*

(3) No action required (low probability, low imminence pairs)

DESCRIPTION:

Purpose: To sort pairs by the action required

Stimulus: Event-stimulated by determination of conflict probability and imminence (Tasks 8.1.5 and 8.1.6)

Decisions and Actions:

(1) Compile the probability and imminence for each pair

(2) Sort pairs by the compiled probability and imminence to determine action required

Phase of Flight:

All phases except preflight and postflight

Critical Performance Parameters:

(1) Speed

(2) Capacity

(3) Validity

Performance Capability Required:

Information processing:

- Sorting
- Ordering

* An example of low probability and high imminence would be aircraft on parallel approaches.

External Constraints:

Allocation Sensitivities:

INPUTS:

(1) From Task 8.1.5, Determine Conflict Probability for Each Pair:

- High probability conflict pairs
- Low probability conflict pairs

(2) From Task 8.1.6, Determine Conflict Imminence for Each Pair:

- High imminence conflict pairs
- Low imminence conflict pairs

TASK DESCRIPTION

FILE: 8.1.8
TASK: Monitor for Unexpected Deviations
SUBFUNCTION: Predict Conflicts
FUNCTION: Assure Separation of Aircraft

OUTPUTS:

(1) Unsafe deviations (high probability, high imminence)

(2) Deviations within tolerance

DESCRIPTION:

Purpose: To carefully monitor low probability, high imminence pairs for unexpected deviations which will change their conflict probability to high*

Stimulus: Initially event-stimulated by receipt of low probability, high imminence pairs from Task 8.1.7, subsequently time-stimulated

Decisions and Actions:

(1) Monitor each low probability high imminence pair from receipt until the action classification in Task 8.1.7 has been updated

(If the updated classification is again low probability, high imminence, it will be monitored again.)

(2) Determine deviation which will change conflict probability from low to high

(3) Evaluate deviation each time one is sensed

(4) Predict high conflict probability for those aircraft with out-of-tolerance deviations

Phase of Flight:

All phases except preflight and postflight

Critical Performance Parameters:

(1) Speed

(2) Capacity

* This monitoring provides a more frequent check of these high imminence pairs than is provided by the basic determination performed in Tasks 8.1.5 and 8.1.6.

(3) Validity

Performance Capability Required:

(1) Information processing:

- Sorting

(2) Interpreting:

- Interpolation

(3) Monitoring:

- Vigilance

(4) Storing and retrieving information:

- Short-term memory

(5) Sensing:

- Recognition of dynamic change

External Constraints:

Allocation Sensitivities:

INPUTS:

(1) From Task 8.1.7, Determine Action Required:

- Careful monitoring required (low probability, high imminence pairs)

(2) From Task 8.1.9, Determine if Action Classification has been Updated:

- Action classification not updated

(3) From Task 6.3.2, Compute Short-Range Extrapolations:

- Short-range predicted time-position profile for the aircraft

(4) From Task 8.1.3, Identify Path Prediction Profiles for the Airspace and Time Frame:

- Set of selected path prediction profiles

(5) From exogenous source:

o Time stimulus

TASK DESCRIPTION

FILE: 8.1.9
TASK: Determine If Action Classification has been Updated
SUBFUNCTION: Predict Conflicts
FUNCTION: Assure Separation of Aircraft

OUTPUTS:

(1) Action classification updated

(2) Action classification not updated

DESCRIPTION:

Purpose: To determine if computations for probability and imminence of conflict have been updated

Stimulus: Time-stimulated

Decisions and Actions:

Determine if conflict computations have been updated

Phase of Flight:

All phases except preflight and postflight

Critical Performance Parameters:

(1) Speed

(2) Validity

Performance Capability Required:

Sensing:

- Signal detection

External Constraints:

Allocation Sensitivities:

INPUTS:

(1) From exogenous source:

- Time stimulus (update cycle time)

(2) From Task 8.1.8, Monitor for Unexpected Deviations:

- Deviations within tolerance

SUBFUNCTION DESCRIPTION

FILE: 8.2
SUBFUNCTION: Resolve Conflicts
FUNCTION: Assure Separation of Aircraft

OUTPUTS:
(1) Transmitted performance change message
(2) Revision not required
(3) Revision required
(4) Transmission required

DESCRIPTION:

Purpose: To resolve each conflict

Stimulus: Event-stimulated by the receipt of performance correction is required or receipt of unsafe deviations from Subfunction 8.1

Tasks:
(1) Hypothesize performance changes
(2) Analyze performance change for conflicts
(3) Format performance change message
(4) Transmit performance change message to pilot
(5) Determine performance change status

Critical Performance Parameters:
(1) Speed
(2) Accuracy
(3) Capacity
(4) Timeliness
(5) Completeness
(6) Utility
(7) Validity

Allocation Sensitivities:

INPUTS:

(1) From exogenous souce:

- Path probability paradigm
- Performance change message format

(2) From Subfunction 8.1, Predict Conflicts:

- Performance correction required (high probability, high imminence pairs and high probability, low imminence pairs)

(3) From Subfunction 6.3, Predict Future Positions/ETA's of the Aircraft:

- Predicted short-range time-position profile for the aircraft

(4) From the aircraft:

- Acknowledgement (of performance change message)

(5) From Subfunction 17.2, Update Rules and Procedures Information:

- Stored data base item (rules and procedures - minimum separation standards)

TASK DESCRIPTION

FILE: 8.2.1
TASK: Hypothesize Performance Changes
SUBFUNCTION: Resolve Conflicts
FUNCTION: Assure Separation of Aircraft

OUTPUTS:
(1) Performance change for first aircraft

(2) Performance change for second aircraft (when required)

DESCRIPTION:

Purpose: To determine path or paths to resolve separation conflicts

Stimulus: Event-stimulated by an output of performance correction required (Task 8.1.7), or of unsafe deviations (Task 8.1.8), or of unacceptable performance change (Task 8.2.2), or of revision required (Task 8.2.5)

Decisions and Actions:

(1) Determine if a performance change has been hypothesized

(2) If no - order the pairs requiring performance changes by imminence of conflict and,

(3) Determine optimum path for the first aircraft consistent with the probability of conflict, capability and intent of the aircraft and minimum separation standards

(4) Determine optimum path for the second aircraft consistent with the probability of conflict, capability and intent of the aircraft and minimum separation standards

(5) If yes - wait for report of status

(6) If revision is not required, performance change is complete

(7) If revision is required, implement in accordance with the reason for the revision

Phase of Flight:

All phases except preflight and postflight

Critical Performance Parameters:

(1) Accuracy

(2) Speed

(3) Utility

(4) Validity

Performance Capability Required:

(1) Storing and retrieving information:

- Short-term memory

(2) Interpreting:

- Prediction

(3) Information processing:

- Calculation
- Sorting

(4) Decision making:

- Identification of alternatives
- Comparison of alternatives
- Selection/choice

External Constraints:

Allocation Sensitivities:

INPUTS:

(1) From Task 8.1.7, Determine Action Required:

- Performance correction required (high probability, high imminence pairs and high probability, low imminence pairs)

(2) From Task 8.1.8, Monitor for Unexpected Deviations:

- Unsafe deviations (high probability, high imminence pairs)

(3) From Task 8.2.5, Determine Performance Change Status:

- Performance change revision required

(4) From Task 8.2.2, Analyze Performance Change for Conflicts:

- Unacceptable performance change with the specified conflict(s)

(5) From Task 8.1.3, Identify Path Prediction Profiles for Airspace and Time Frame:

- Set of selected path prediction profiles

TASK DESCRIPTION

FILE: 8.2.2
TASK: Analyze Performance Change for Conflicts
SUBFUNCTION: Resolve Conflicts
FUNCTION: Assure Separation of Aircraft

OUTPUTS:

(1) Acceptable performance change

(2) Unacceptable performance change with the induced conflict(s) identified

DESCRIPTION:

Purpose: To determine if performance change has an acceptable conflict level (will not generate unacceptable conflicts with other aircraft)

Stimulus: Event-stimulated by the receipt of performance change from Task 8.2.1

Decisions and Actions:

(1) Modify path prediction profile to reflect the performance change

(2) Compare modified path prediction profile with path prediction profiles for other aircraft in the set

(3) Classify performance change as acceptable/unacceptable

Phase of Flight:

All phases except preflight and postflight

Critical Performance Parameters:

(1) Accuracy

(2) Speed

(3) Capacity

(4) Validity

Performance Capability Required:

(1) Storing and retrieving information:

- Short-term memory

(2) Decision making:

- Probability/contingency estimation
- Comparison with standard

(3) Information processing:

- Sorting
- Ordering

External Constraints:

Allocation Sensitivities:

INPUTS:

(1) From Task 8.2.1, Hypothesize Performance Changes:

- Performance change for first aircraft
- Performance change for second aircraft (when required)

(2) From exogenous source:

- Path probability paradigm

(3) From Task 17.2.6, Store Data Base Item:

- Stored data base item (rules and procedures - minimum separation standards

(4) From Task 8.1.3, Identify Path Prediction Profiles for the Airspace and Time Frame:

- Set of selected path prediction profiles

TASK DESCRIPTION

FILE: 8.2.3
TASK: Format Performance Change Message
SUBFUNCTION: Resolve Conflicts
FUNCTION: Assure Separation of Aircraft

OUTPUTS: Performance change message

DESCRIPTION:

Purpose: To format performance change in a manner compatible with aircraft communications

Stimulus: Event-stimulated by the receipt of an acceptable performance change from Task 8.2.2

Decisions and Actions:

Format the performance change in language understandable to the aircraft

Phase of Flight:

All phases except preflight and postflight

Critical Performance Parameters:

(1) Completeness

(2) Timeliness

Performance Capability Required:

Information processing:

- Compiling

External Constraints:

Allocation Sensitivities:

INPUTS:

(1) From Task 8.2.2, Analyze Performance Change for Conflicts:

- Acceptable performance change

(2) From exogenous source:

- Performance change message format

TASK DESCRIPTION

FILE: 8.2.4
TASK: Transmit Performance Change Message to Pilot
SUBFUNCTION: Resolve Conflicts
FUNCTION: Assure Separation of Aircraft

OUTPUTS: Transmitted performance change message

DESCRIPTION:

Purpose: To transmit performance change to pilot

Stimulus: Event-stimulated, by the receipt of a performance change message from Task 8.2.3, or by receipt of transmission required from Task 8.2.5

Decisions and Actions:

Transmit the performance change to the pilot

Phase of Flight:

All phases except preflight and postflight

Critical Performance Parameters:

(1) Speed

(2) Accuracy

Performance Capability Required:

(1) Responding:

- Communication
- Data transmission

(2) Storing and retrieving:

- Short-term memory

External Constraints:

Allocation Sensitivities:

INPUTS:

(1) From Task 8.2.3, Format Performance Change Message:

- Performance change message

(2) From Task 8.2.5, Determine Performance Change Status:

- Transmission required

TASK DESCRIPTION

FILE: 8.2.5
TASK: Determine Performance Change Status
SUBFUNCTION: Resolve Conflicts
FUNCTION: Assure Separation of Aircraft

OUTPUTS:

(1) Performance change revision required

(2) Performance change revision not required

(3) Transmission required

DESCRIPTION:

Purpose: To determine if the performance change is progressing as planned

Stimulus: Event-stimulated by the receipt of an acceptable performance change from Task 8.2.2

Decisions and Actions:

(1) Check to see if the performance change message has been acknowledged

(2) Check to see if the performance change is being carried out

(3) Determine if further action is required

Phase of Flight:

All phases except preflight and postflight

Critical Performance Parameters:

(1) Capacity

(2) Speed

(3) Validity

Performance Capability Required:

(1) Storing and retrieving information:

- Short-term memory

(2) Interpreting:

- Prediction

(3) Information processing:

- Calculation

External Constraints:

Allocation Sensitivities:

INPUTS:

(1) From Task 8.2.2, Analyze Performance Change for Conflicts:

- Acceptable performance change

(2) From the aircraft:

- Acknowledgement (of performance change message)

(3) From 6.3.2, Compute Short-Range Extrapolations:

- Short-range predicted time-position profile for the aircraft

(4) From Task 8.2.4, Transmit Performance Change Message to Pilot:

- Transmitted performance change message

Table 4.8-I. Flow of Information

Function 8.0: Assure Separation of Aircraft

TASK	INPUTS		OUTPUTS	
	IDENTIFICATION	SOURCE	IDENTIFICATION	DESTIN.
8.1.1	*Time stimulus	Exog.	Airspace volume and time frame	8.1.3
	Designation of airspace volumes for conflict detection	Exog.		
	Designation of time intervals for conflict detection	Exog.		
8.1.2	Short-range predicted time-position profile	6.3.2	Path prediction profile for each aircraft	8.1.3
	*Time stimulus	Exog.		
	Long-range predicted time-position profile	6.3.3		
	Clearance issued	5.3.3		
	Current aircraft capability	6.4.7		
	Path probability paradigm	Exog.		
	Acceptable performance change	8.2.2		
8.1.3	Airspace volume and time frame	8.1.1	Set of selected path prediction profiles	8.1.4 8.1.8 8.2.1 8.2.2
	*Time stimulus	Exog.		
	Path prediction profile for each aircraft	8.1.2		
8.1.4	*Set of selected path prediction profiles	8.1.3	Pairs of path prediction profiles	8.1.5 8.1.6
8.1.5	Definition of special separation minima	15.2.4	High probability conflict pairs	8.1.7
	Special service no longer required	15.1.2	Low probability conflict pairs	8.1.7
	Minimum separation standards	17.2.6		
	*Pairs of path prediction profiles	8.1.4		

* Task stimulus

Table 4.8-I. Flow of Information

Function 8.0: Assure Separation of Aircraft (Cont'd.)

TASK	INPUTS		OUTPUTS	
	IDENTIFICATION	SOURCE	IDENTIFICATION	DESTIN.
8.1.6	Definition of special separation minima	15.2.4	High imminence conflict pairs	8.1.7
	Special service no longer required	15.1.2	Low imminence conflict pairs	8.1.7 14.1.1
	Minimum separation standards	17.2.6		
	*Pairs of path prediction profiles	8.1.4		
8.1.7	*High probability conflict pairs	8.1.5	Performance correction required (high probability, high imminence pairs and high probability, low imminence pairs)	8.2.1 14.2.1
	*Low probability conflict pairs	8.1.5		
	*High imminence conflict pairs	8.1.6		
	*Low imminence conflict pairs	8.1.6	Careful monitoring required (low probability high imminence pairs)	8.1.8 14.2.1
			No action required (low probability, low imminence pairs)	End
8.1.8	*Careful monitoring required	8.1.7	Unsafe deviations	8.2.1
	*Time stimulus	Exog.	Deviations within tolerance	8.1.9
	Action classification not updated	8.1.9		
	Short-range predicted time-position profile for the aircraft	6.3.2		
	Set of selected path prediction profiles	8.1.3		
8.1.9	*Time stimulus (update cycle time)	Exog.	Action classification updated	End
	Deviations within tolerance	8.1.8	Action classification not updated	8.1.8

Table 4.8-I. Flow of Information

Function 8.0: Assure Separation of Aircraft (Cont'd.)

TASK	INPUTS		OUTPUTS	
	IDENTIFICATION	SOURCE	IDENTIFICATION	DESTIN.
8.2.1	*Performance correction required	8.1.7	Performance change for first aircraft	8.2.2
	*Unsafe deviations	8.1.8	Performance change for second aircraft	8.2.2
	*Performance change revision required	8.2.5		
	*Unacceptable performance change with the specified conflicts	8.2.2		
	Set of selected path prediction profiles	8.1.3		
8.2.2	*Performance change for first aircraft	8.2.1	Acceptable performance change	8.2.3 8.2.5 8.1.2
	*Performance change for second aircraft (when required)	8.2.1	Unacceptable performance change with the specified conflict(s)	8.2.1
	Path probability paradigm	Exog.		
	Minimum separation standards	17.2.6		
	Set of selected path prediction profiles	8.1.3		
8.2.3	*Acceptable performance change	8.2.2	Performance change message	8.2.4
	Message format	Exog.		
8.2.4	*Performance change message	8.2.3	Transmitted performance change message	Acft 8.2.5 14.2.1
	*Transmission required	8.2.5		
8.2.5	*Acceptable performance change	8.2.2	Performance change revision required	8.2.1 14.2.1
	Transmitted performance change message	Acft	Performance change revision not required	End
	Acknowledgement (of performance change message)	Acft	Transmission required	8.2.4 14.2.1
	Short-range predicted time-position profile	6.3.2		

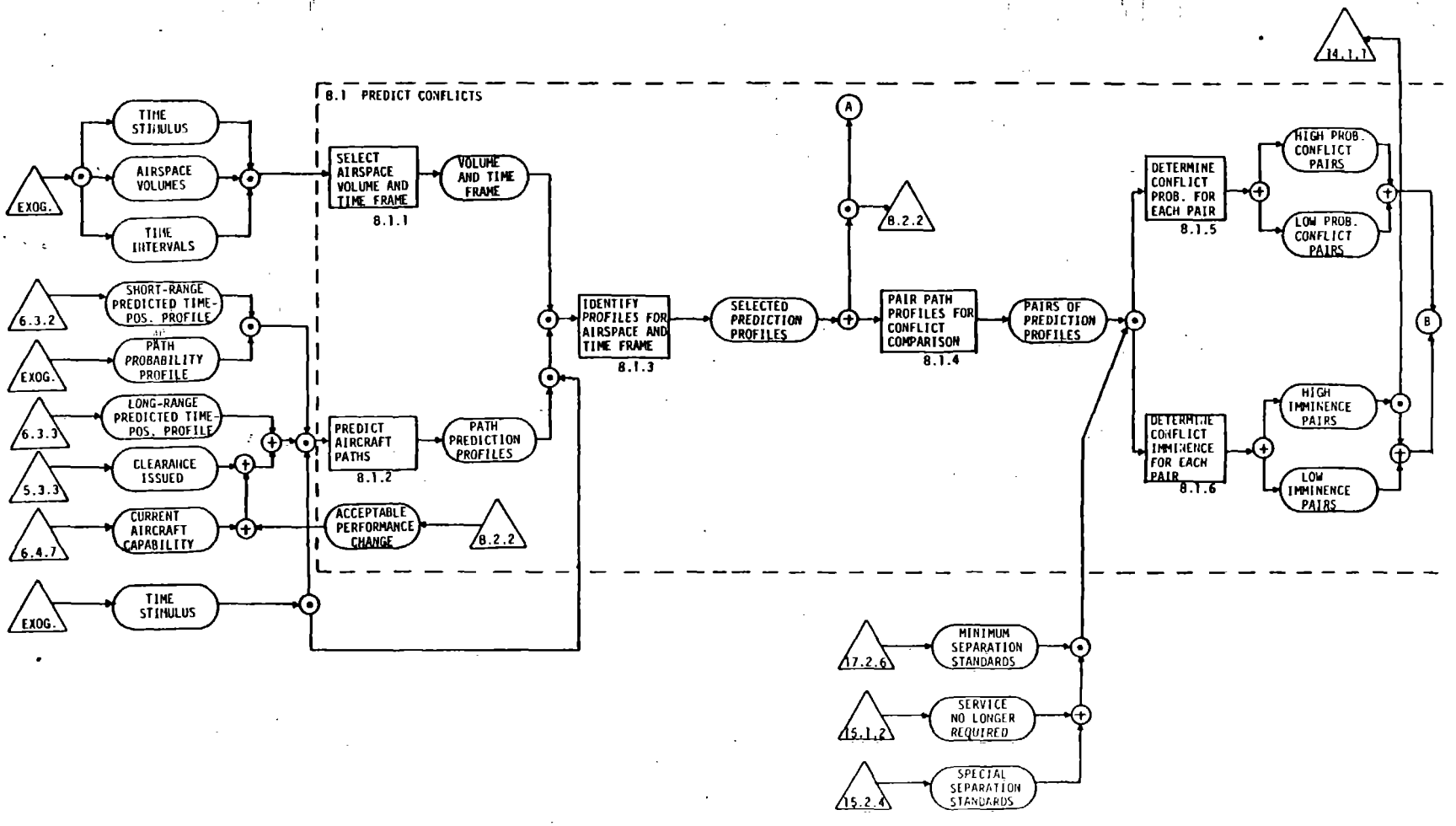


FIGURE 4.8-1. FUNCTION 8.0: ASSURE SEPARATION OF AIRCRAFT
(SHEET 1 OF 3)

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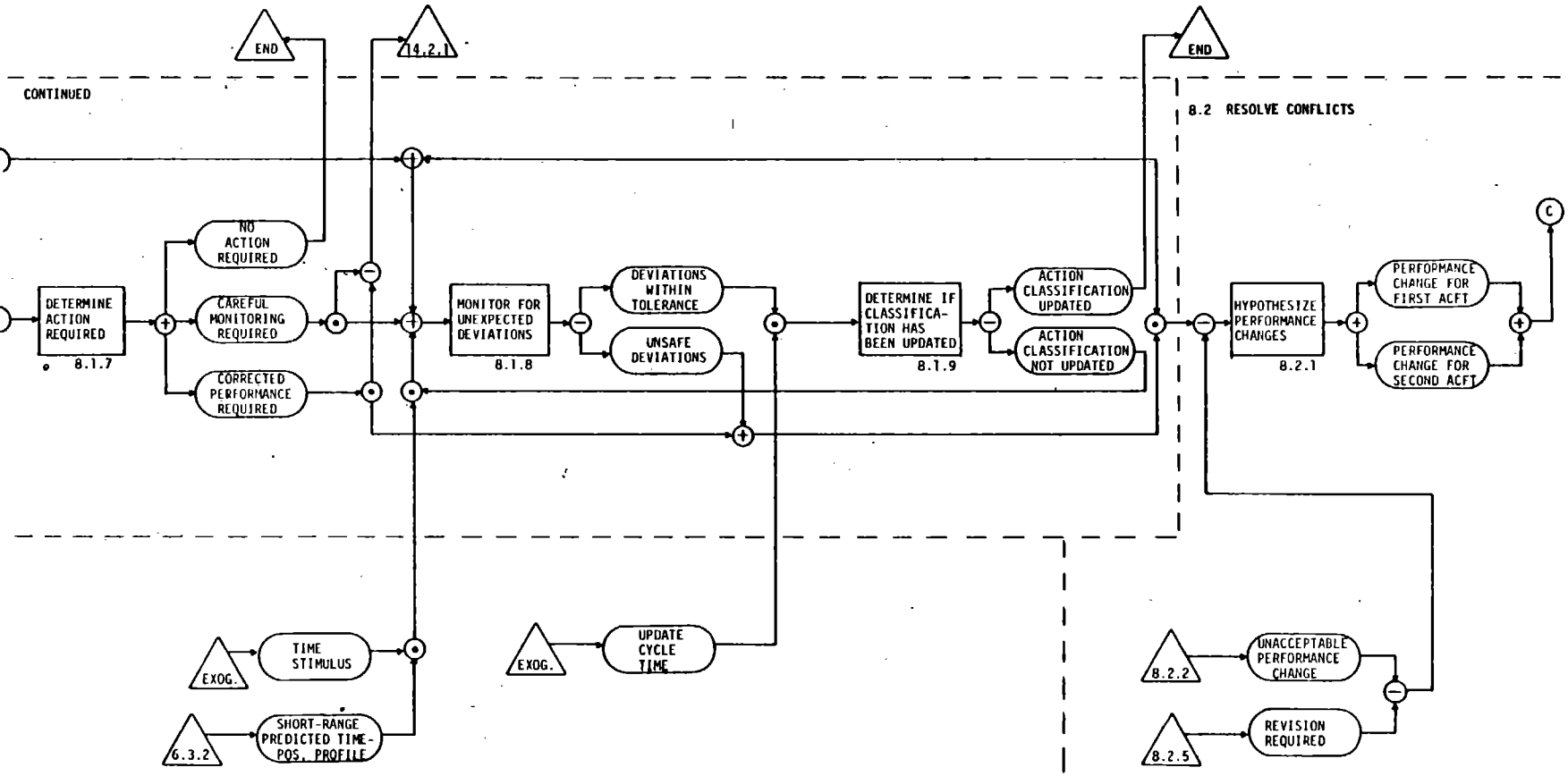

FIGURE 4.8-1. FUNCTION 8.0: ASSURE SEPARATION OF AIRCRAFT
(SHEET 2 OF 3)

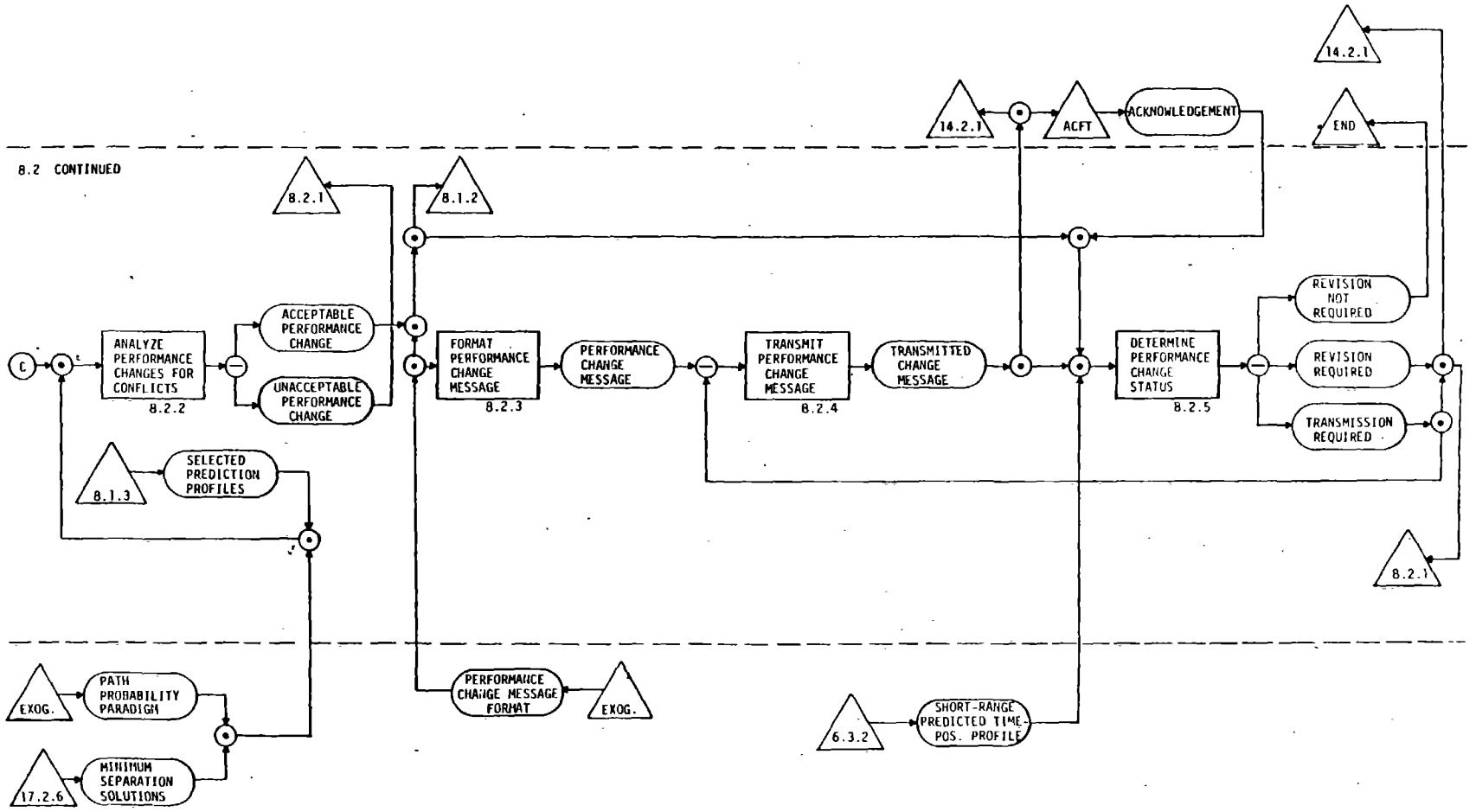

FIGURE 4.8-1. FUNCTION 8.0: ASSURE SEPARATION OF AIRCRAFT
(SHEET 3 OF 3)