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TECHNICAL REPORT

MODEL OF THE CURRENT REPORTING AND INFORMATION RETRIEVAL SYSTEM FOR AIR FORCE PROGRAM ELEMENT MONITORS

1032-1

CDRL Item A0001

December 17, 1976

Submitted to

USAF/RDPV
Avionics Department
Directorate of Acquisition and Development
Pentagon
Washington, D. C.

Under Contract Number
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Sponsored by

Aeronautical Systems Division
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Wright-Patterson AFB, Ohio 45433

Prepared by

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Waltham, MA 02154

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PREFACE

This report describes current operations necessary to monitor an RD program element. It is written from the viewpoint of a Program Element Monitor (PEM). It includes activities performed by a PEM and .iformation exchanged with a PEM during the lifetime of any program element or project.

This report results from the orientation phase of a project conducted jointly by SofTech, Inc., and USAF/RDPV. It documents SofTech's understanding of current PEM operations. The purpose of this project is to develop a prototype management information system (MIS). This MIS is intended to aid a PEM in preparing the program status reports identified in this document.

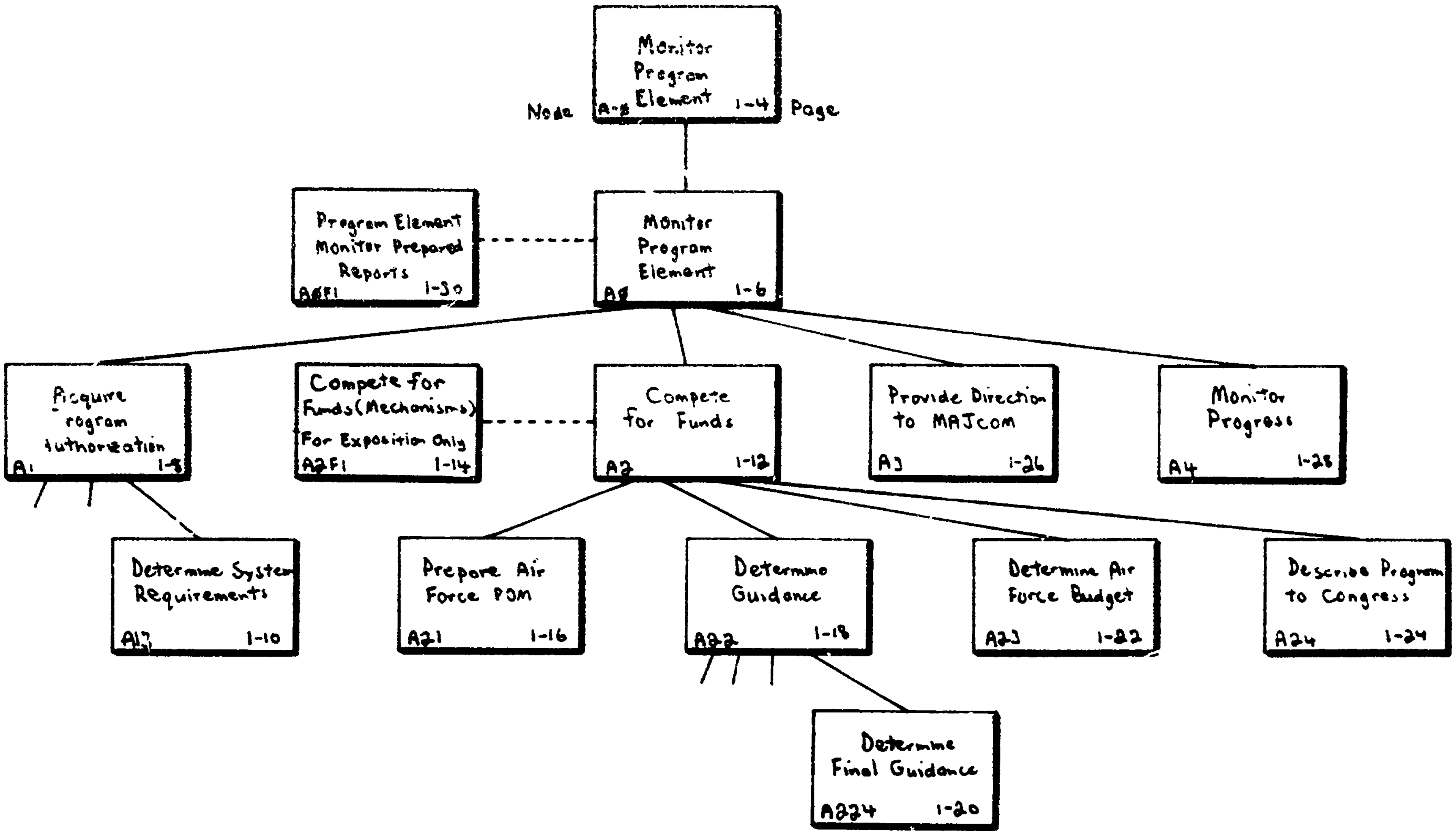
This report has been written using the diagram conventions and structured text of SofTech's SADT. An appendix that describes SADT is attached to this report. Readers who are unfamiliar with SADT are urged to study the appendix before reading the report.

This page provides a Table of Contents for the diagrams in this model. In addition, a short description of diagram conventions is attached as an appendix.

A number of the lower level diagrams are provided for two reasons: to simplify diagrams at a higher level and to detail areas of particular interest.

Glossary of Abbreviations

AF	-	Air Force
AFLC	-	Air Force Logistics Command
AFSC	-	Air Force Systems Command
APDM	-	Amended Program Decision Memorandum
BCI	-	Budgetary Cost Information
BES	-	Budget Estimate Submission
CAR	-	Command Assessment Review
DCP	-	Decision Coordinating Paper
DCS/R+D	-	Deputy Chief of Staff for Research & Development
FYDP	-	Five Year Defense Program
MAJCOM	-	Major Command
MPA	-	Modification Proposal and Analysis
ODDR+E	-	Office of the Deputy Director of Research & Engineering
OMB	-	Office of Management and Budget
OSD	-	Office of the Secretary of Defense
PAR	-	Program Assessment Review
PBD	-	Program Budget Decision
PDM	-	Program Decision Memorandum
PEM	-	Program Element Monitor
PMD	-	Program Management Directive
POD	-	Program Objective Directive
POM	-	Program Objective Memorandum
PPBS	-	Planning, Programming and Budgeting System
PPGM	-	Planning - Programming Guidance Memorandum
ROC	-	Required Operational Capability
RRG	-	Requirements Review Group
SPR	-	Secretarial Program Review
SECDEF	-	Secretary of Defense
TPDM	-	Tentative Program Decision Memorandum



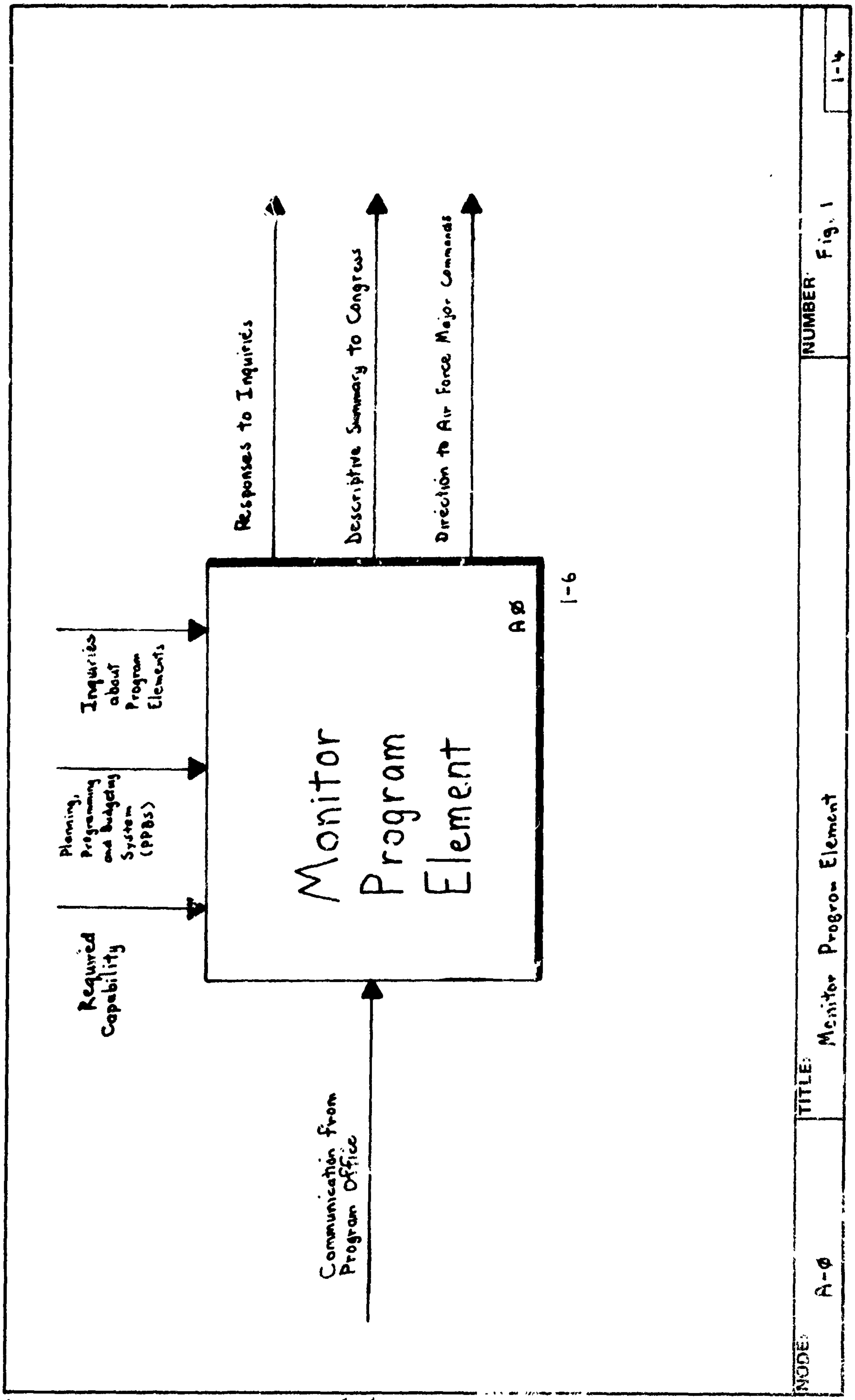
NODE: Index	TITLE: List of Diagrams	NUMBER: — 1-2

A-0. Monitor Program Element

This model describes the activities performed by or affecting an Air Force Program Element Monitor (PEM) during the lifetime of a particular program element or project. A program element is the description of a mission identifying the resources needed to perform the assigned mission. The PEM is responsible for monitoring a program element. The activities are initiated by three controlling factors: the identification of a required capability may initiate a program element or project; the Planning. Programming and Budgeting System (PPBS) defines exercises and reports to be prepared, and the time cycle in which to perform them; and, inquiries will require responses to be prepared. In addition, the PEM must provide direction to the major commands involved in the program and describe it to Congress These activities are supported by various reports and briefings from the implementing program office.

The viewpoint of this model is all activities either performed by a PEM or seen by the PEM in performing his duties.

This work may be performed by people not called PEMs. It is often done by an Action Officer, and in directorates other than Research and Development (AF/RD), that person may have a different title.



Monitor Program Element
AØ
1-6
Required Capability
Planning, Programming and Budgeting System (PPBS)
Inquiries about Program Elements
Communication from Program Office
Responses to Inquiries
Descriptive Summary to Congress
Direction to Air Force Major Commands
NODE: A-Ø
TITLE: Monitor Program Element
NUMBER: Fig. 1
1-4

A0. Monitor Program Element

This diagram shows the monitoring activities occurring during the lifetime of a program element. The PEM and other Air Force and DoD personnel perform these activities simultaneously for several programs in different stages of development.

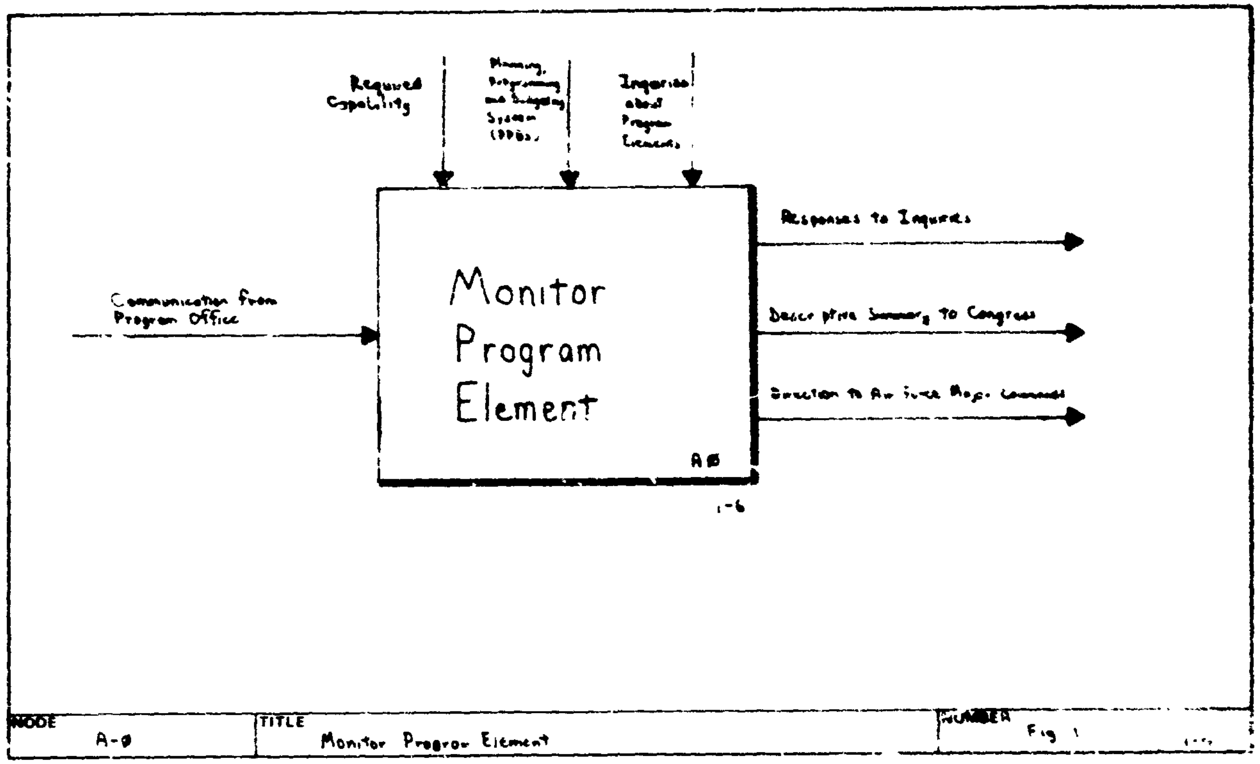
The process is initiated by the identification of a required capability (box 1 control 1). This can be in the form of a Required Operational Capability (ROC) received by the PEM (in most cases from the major command), or from any agency/individual perceiving a required operational capability. If program authorization is received the system requirements are identified (box 1 output 1). However no funds are yet appropriated. This will not occur until the next budget cycle, unless the need warrants reprioritization of other programs and their approved funding.

The PEM must then compete for funds for each program (box 2). The primary result of this competition is funding guidance given to each PEM in December (box 2 output 3). Along with this guidance, a Descriptive Summary must be prepared for Congress in January (box 2 output 2). Funds are committed for a five-year period beginning in October.

Once funding guidance is received (box 3 control 1), the PEM can provide direction to each Major (Implementing) Command for the coming year (box 3). This is provided in a Program Management Directive (PMD) (box 3 output 1).

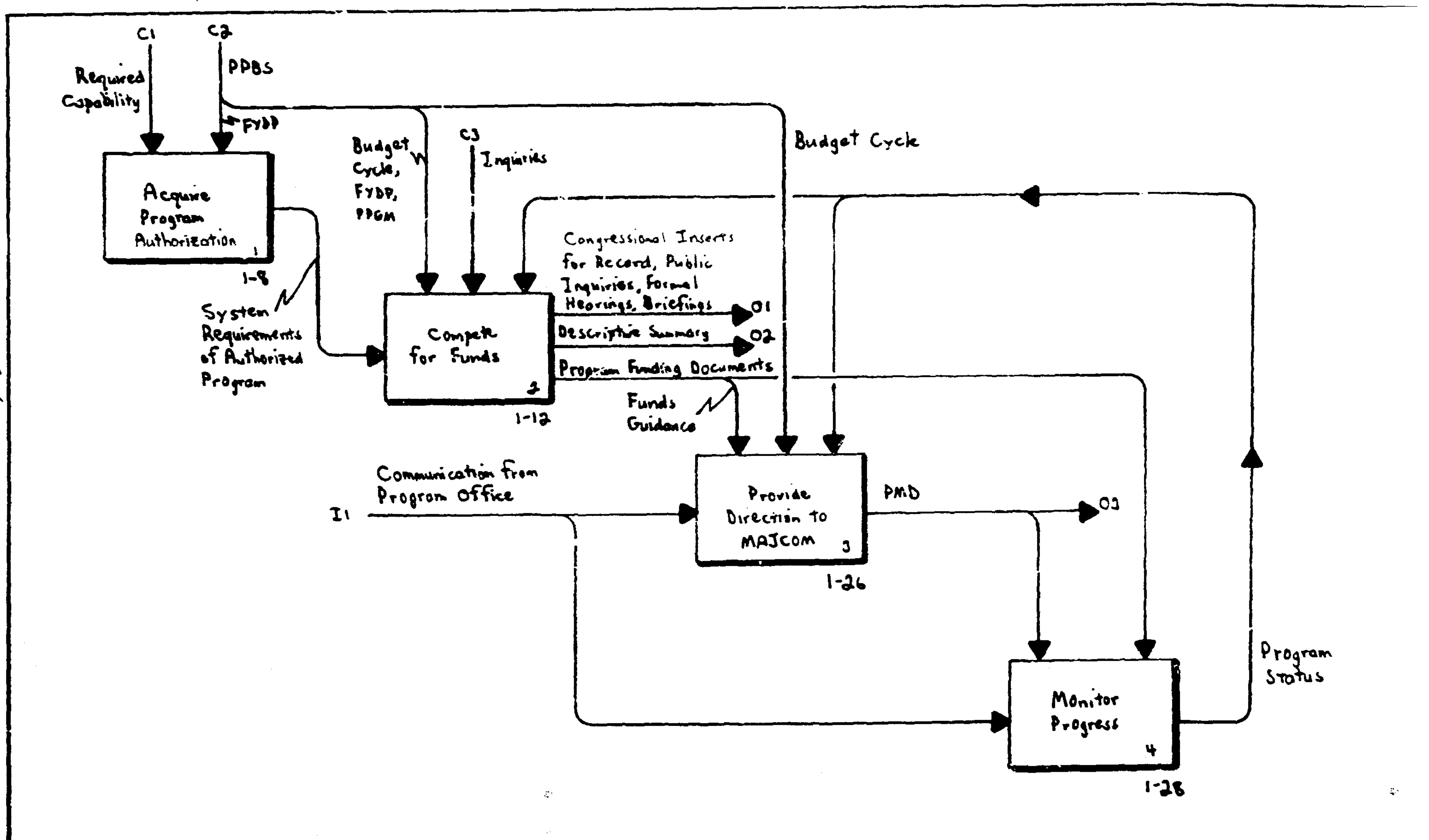
Once a program is operational, the PEM must monitor its progress during the current year (box 4). The status of the program (box 4 output 1) then becomes a factor in the future funding and direction of the program.

One important constraint in this process is the Planning, Programming and Budgeting System (PPBS). This specifies activities, reports and timing affecting the PEM. The Five Year Defense Program (FYDP) specifies the approved Air Force plans and programs, and the Planning-Programming Guidance Memorandum (PPGM) provides Secretary of Defense (SECDEF) guidance for financial constraints and support programs.



In summary, it is important to note that the PEM is working in three time frames on each program:

1) Current year
2) Next year
3) Five year period following next year



NODE: AØ | TITLE: Monitor Program Element | NUMBER: Fig. 2 | 1-6

A1. Acquire Program Authorization

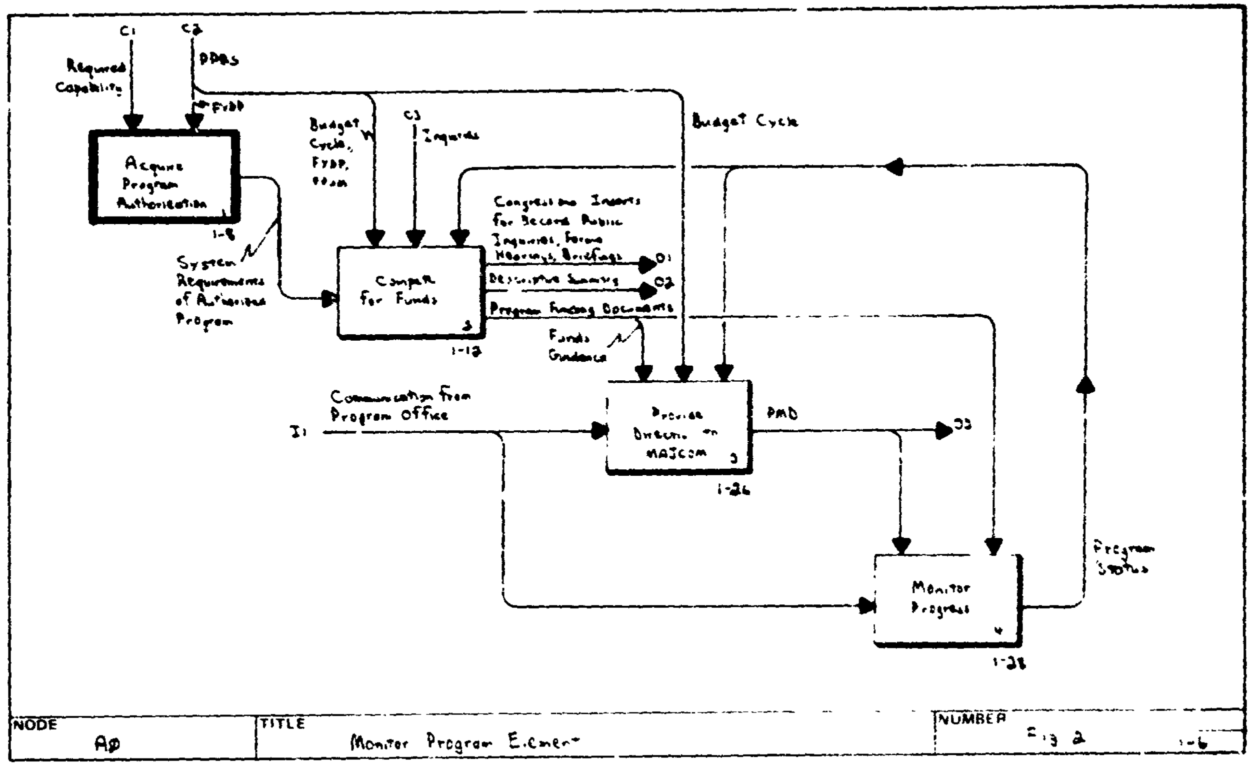
A required capability can be received by the Directorate of Operational Requirements (AF/RDQ) as a ROC, or generated through the initiative of a member of the Air Staff. A division within AF/RD is designated as the focal point, with an action officer or PEM responsible for preparing a recommendation for or against validation. The recommendation is coordinated with Air Staff directorates and major commands (box 1 mechanisms 1 and 3). The recommendation (box 1 output 2) includes Budgetary Cost Information (BCI) provided by the Air Force Systems Command (AFSC) and the Air Force Logistics Command (AFLC) to support the recommendation.

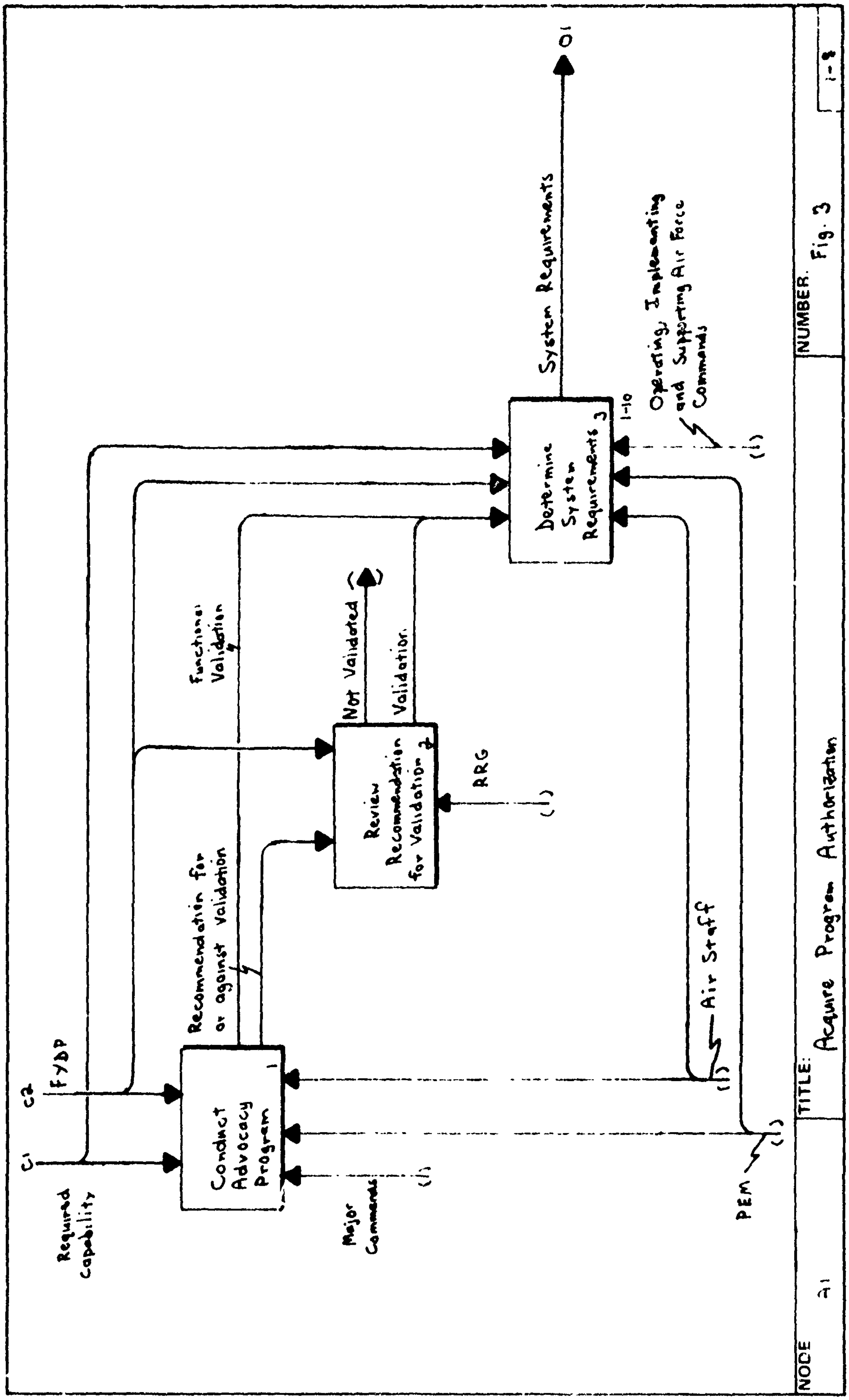
The recommendation is then presented to the Requirements Review Group (RRG), which includes the following members:

AF/RDQ	Director of Operational Requirements, Chairman
AF/RDP	Director of Development and Acquisition
AF/RDR	Director of Reconnaissance and Electronic Warfare
AF/XOO	Director of Operations
AF/XOX	Director of Plans
AF/LGY	Director of Maintenance and Engineering
AF/PRP	Director of Programs

The RRG reviews the recommendation (box 2) and determines whether to validate it or not. It may not be validated for a number of reasons: the requirement may not be cost effective, or the requirement is unsubstantiated. If the program is validated the requirements of the system must be obtained. This requires the cooperation of the Air Staff PEM, operating, developing and supporting commands.

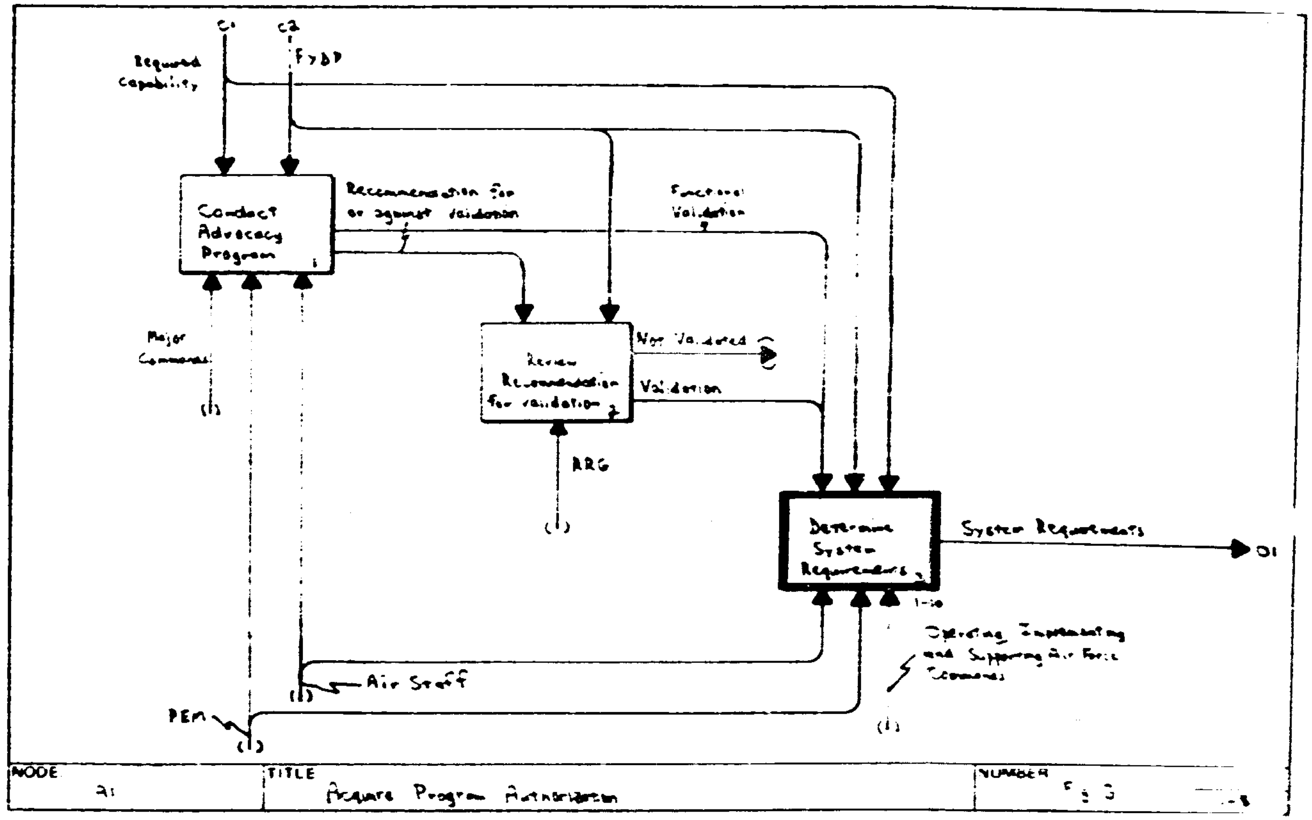
If the program is small enough or has high level interest, then it may bypass validation by the RRG. In this case, it is said to have functional validation (box 1 output 1).

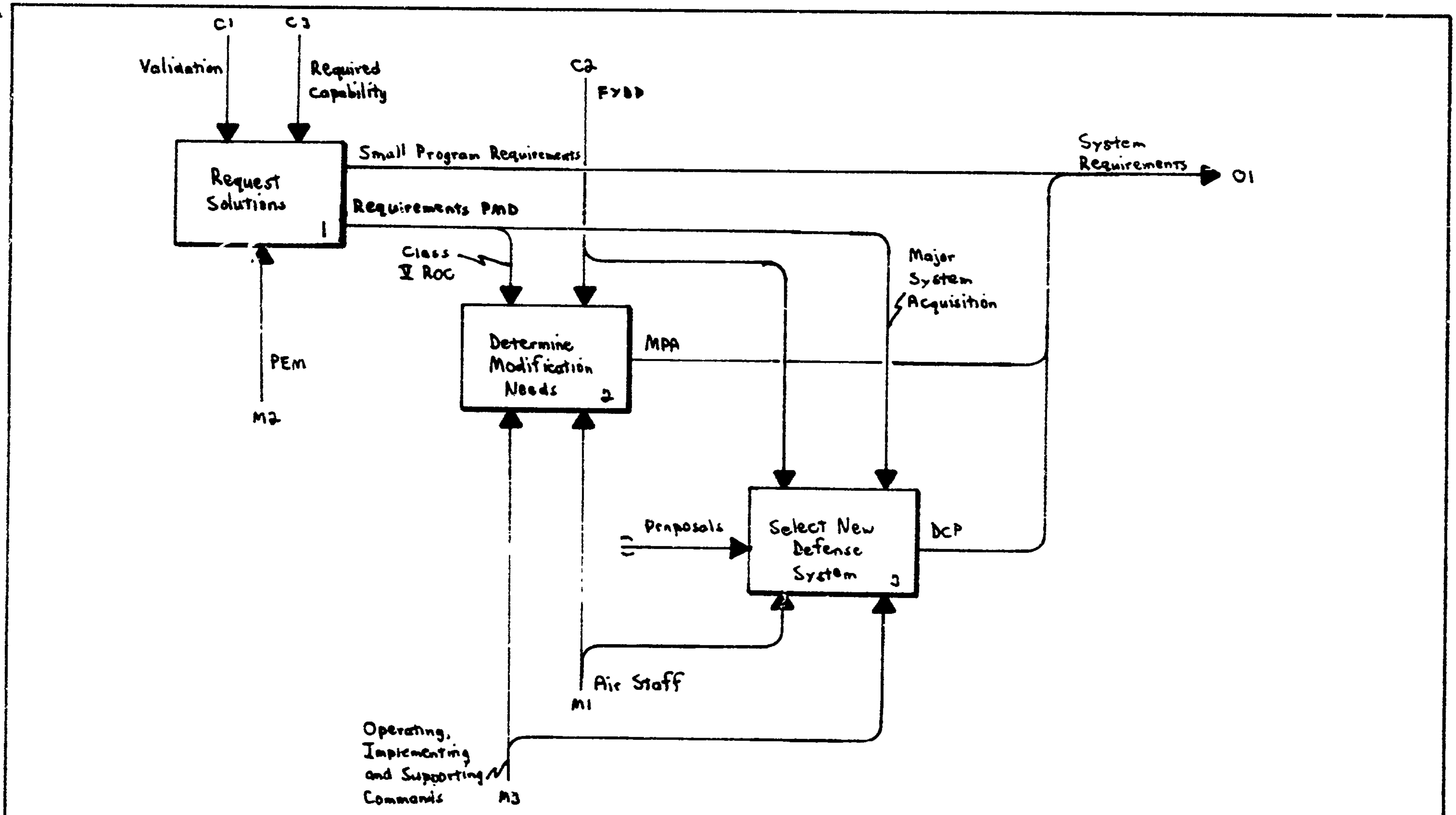



Required capability
C1
C2
FYDP
Conduct Advocacy Program
1
Major Commands
PEM
Air Staff
Recommendation for or against validation
Review Recommendation for Validation
2
RRG
Not Validated
Validation
Functional Validation
Determine System Requirements
3
I-10
System Requirements
O1
Operating, Implementing and Supporting Air Force Commands
NODE
A1
TITLE:
Acquire Program Authorization
NUMBER:
Fig. 3
i-8

A13. Determine System Requirements

Once the program is validated, the PEM or action officer prepares a PMD specifying the requirements of the system (box 1). This PMD is sent to the implementing command for further action (box 1 output 1). In the case of a small system, no action is required. For a Class V modification, the implementing command is directed to prepare cost and feasibility information in the form of a modification proposal and analysis (MPA). This is coordinated through the various affected commands and Air Staff. The procedure for the acquisition of a major system involves the selection of a proposal (box 3 input 1) for the new defense system and the preparation of a Decision Coordinating Paper (DCP). The DCP provides summary management information and program rationale.





NODE:	TITLE:	NUMBER:
A13	Determine System Requirements	Fig. 4

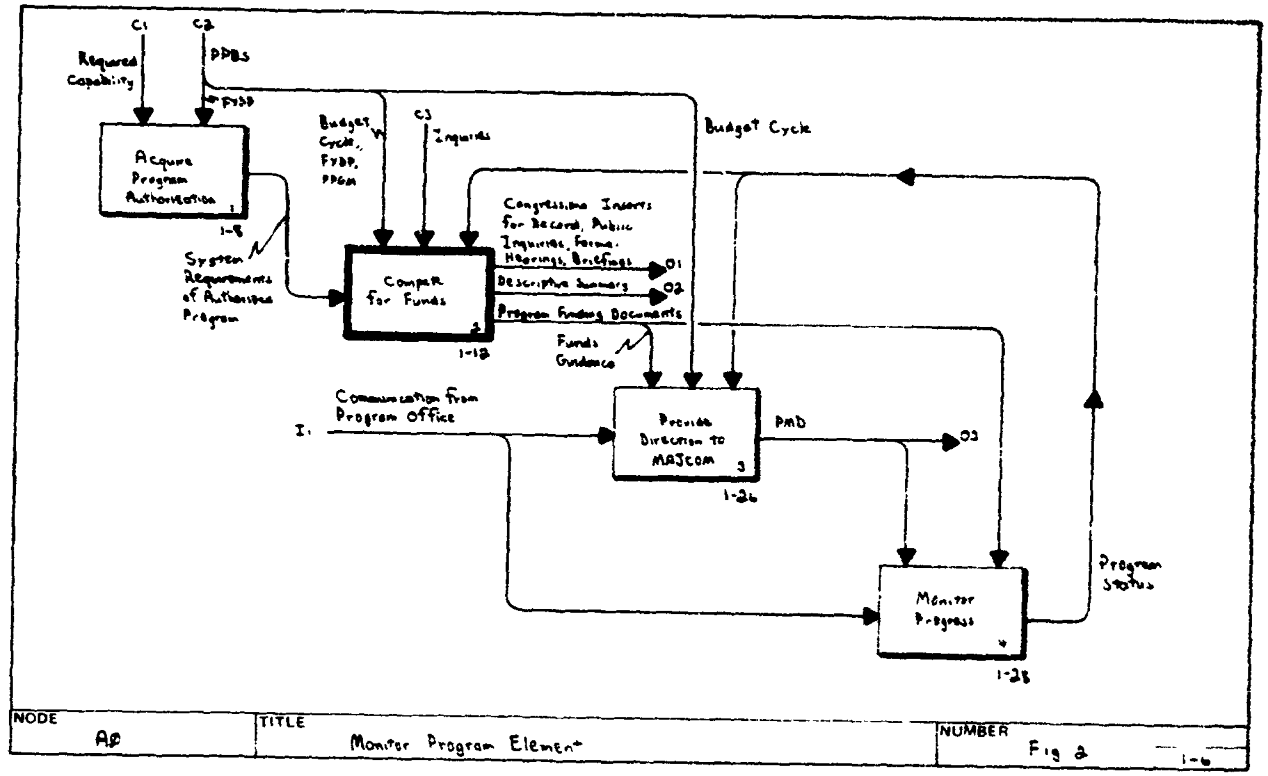
1-10

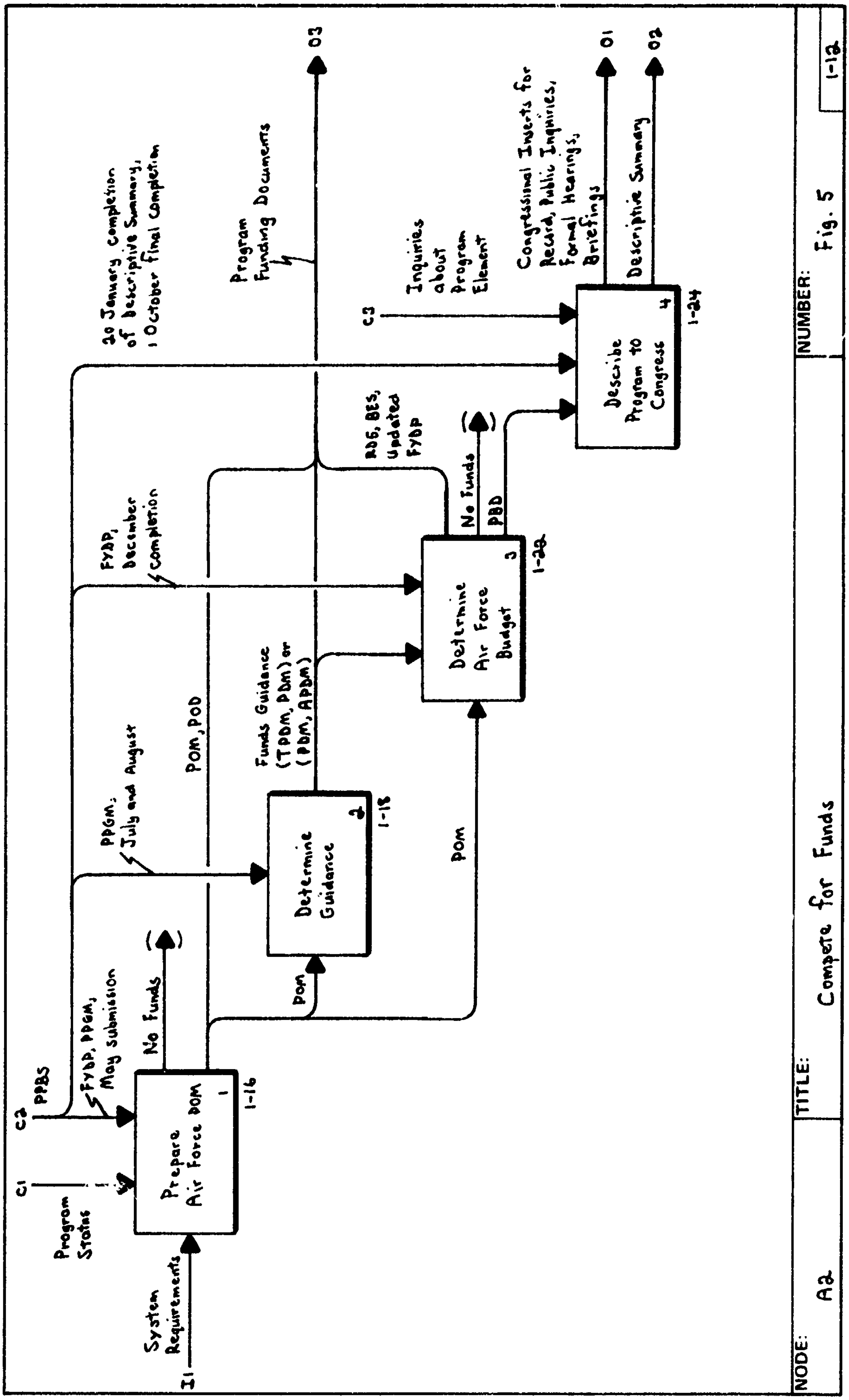
A2. Compete for Funds

The first phase of the funds competition occurs between November and May when the Air Force budget is developed in the form of a Program Objective Memorandum (POM). Through interactions between the Air Force directors and PEMs an Air Force budget is determined (box 1). Programs may be denied funding at this point (box 1 output 1). The POM is submitted to the Office of the Secretary of Defense (OSD) where it is further reviewed and budget guidance issued (box 2 output 1). The agencies and individuals involved in these activities are detailed on the next diagram.

The Air Force Budget for submission to Congress is prepared based on the POM and guidance in the form of a Tentative Program Decision Memorandum (TPDM), Program Decision Memorandum (PDM) pair or a PDM, Amended Program Decision Memorandum (APDM) pair. It may be either one depending on whether a TPDM or PDM is issued first. A program may be denied funds at this point in the process (box 3 output 2). The funding decision will be received in the form of a Program Budget Decision (PBD) (box 4 control 1). In addition, the Five Year Defense Program (FYDP) is updated at this point (box 3 output 1) and other funding documents are received.

Finally, the program must be described to Congress during their examination of the budget (box 4). This is done by providing Congressional Inserts for Records and Public Inquiries as responses to inquiries, a Descriptive Summary for an overall program description, formal hearings and briefings to members of Congress.

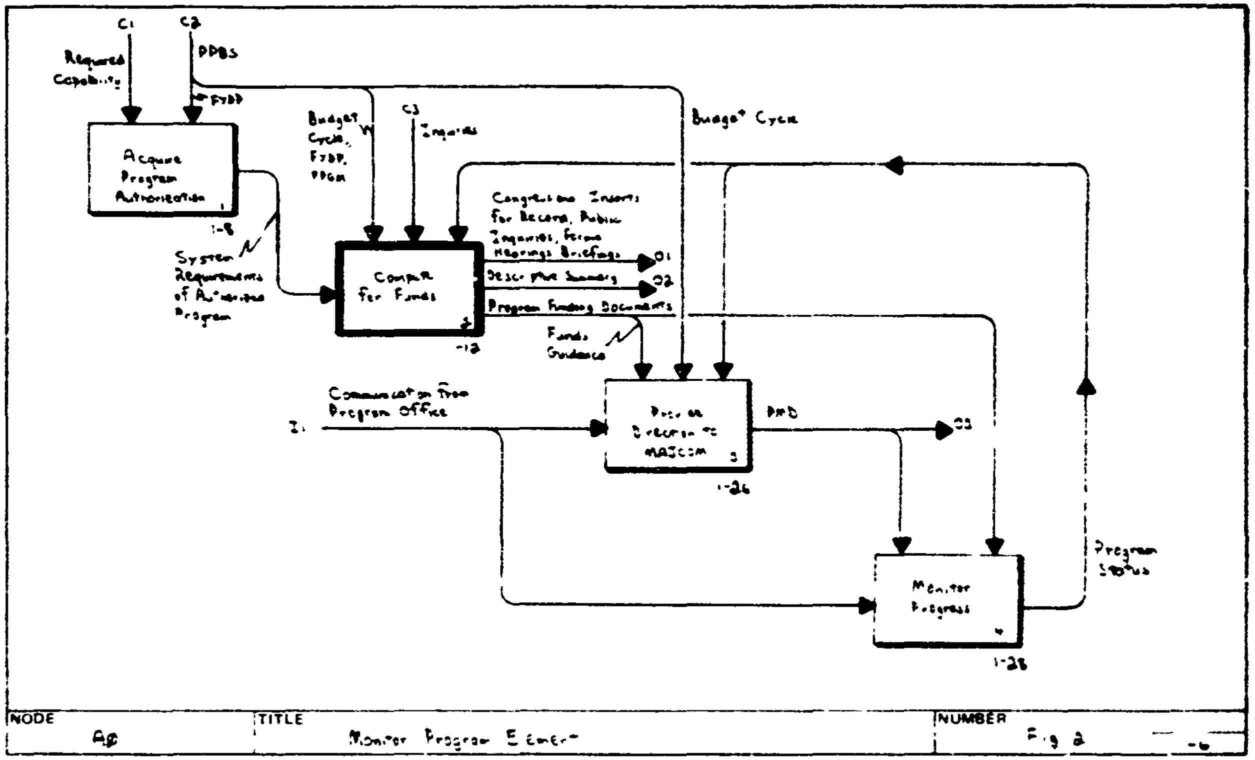


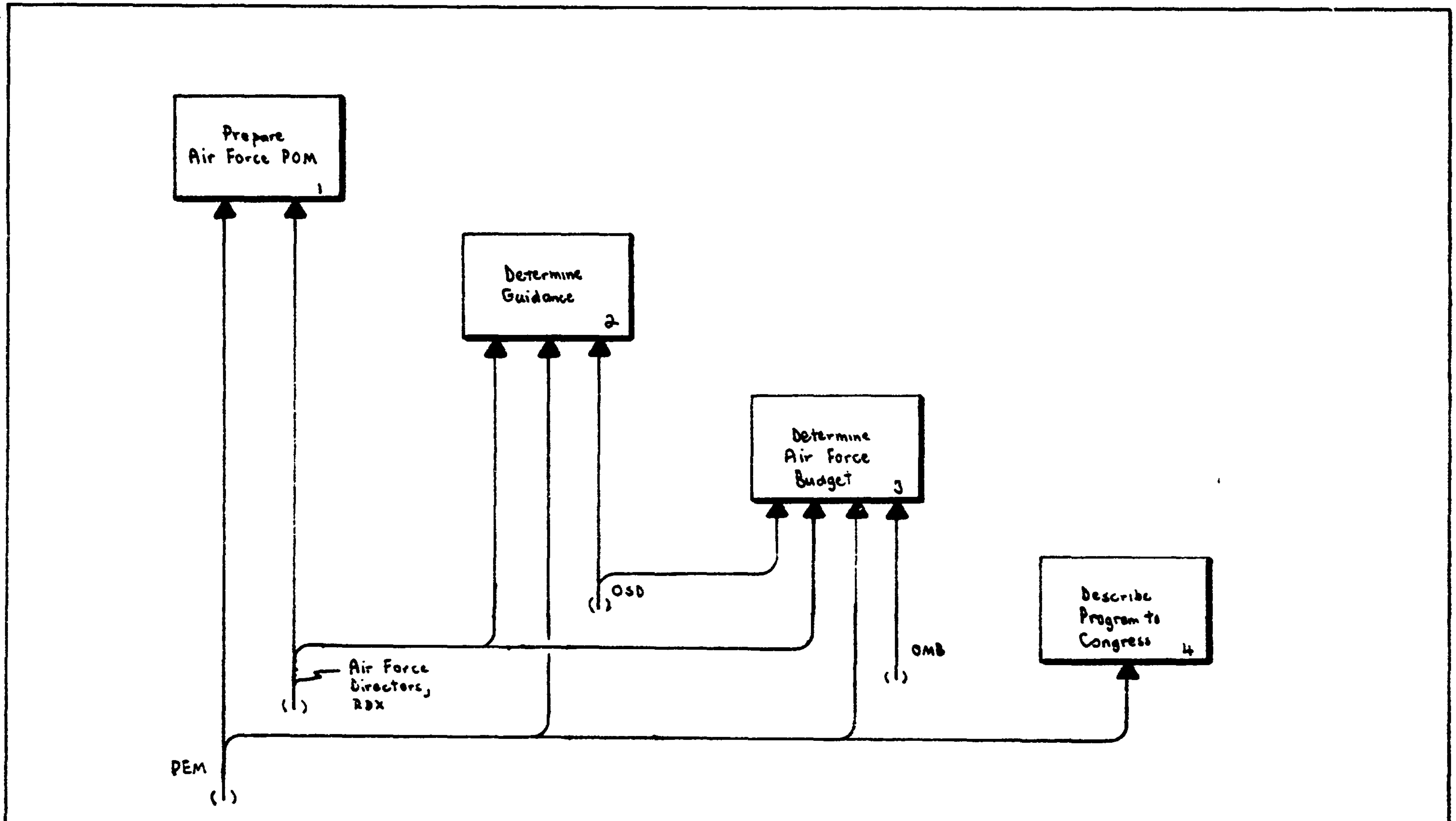


Prepare Air Force POM
1
1-16
Determine Guidance
2
1-18
Determine Air Force Budget
3
1-22
Describe Program to Congress
4
1-24
I1
System Requirements
C1
Program Status
C2
PPBS
FYDP, PPGM, May submission
PPGM, July and August
FYDP, December completion
20 January completion of descriptive Summary, 1 October final completion
C3
Inquiries about Program Element
No Funds
( )
POM
POM, POD
Funds Guidance (TPDM, PDM) or (PDM, APDM)
Program Funding Documents
RDS, BES, Updated FYDP
No Funds
PBD
Congressional Inserts for Record, Public Inquiries, Formal Hearings, Briefings
Descriptive Summary
O1
O2
O3
NODE: A2
TITLE: Compete for Funds
NUMBER: Fig. 5
1-12

A2F1. Compete for Funds (Mechanism)
For Exposition Only

This diagram shows the people and organizations that perform the activities with funds competition described in diagram A2.

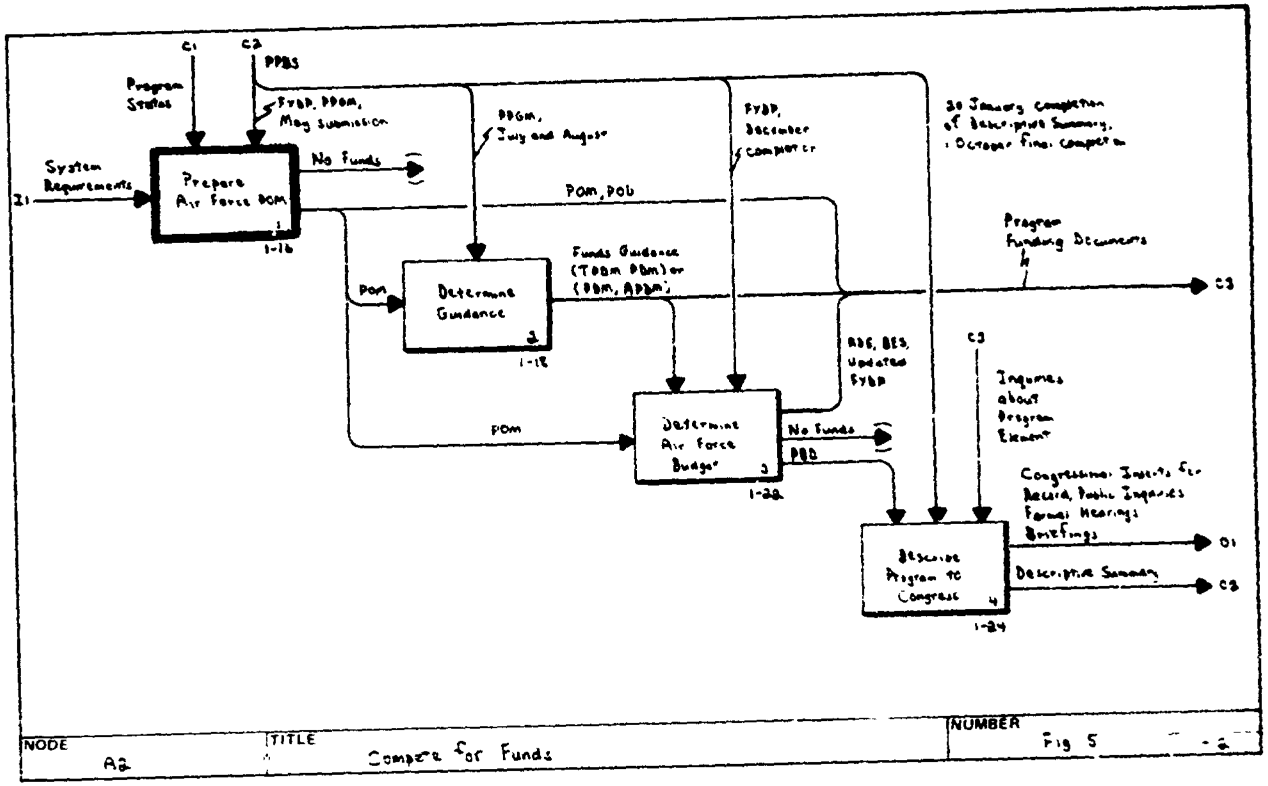


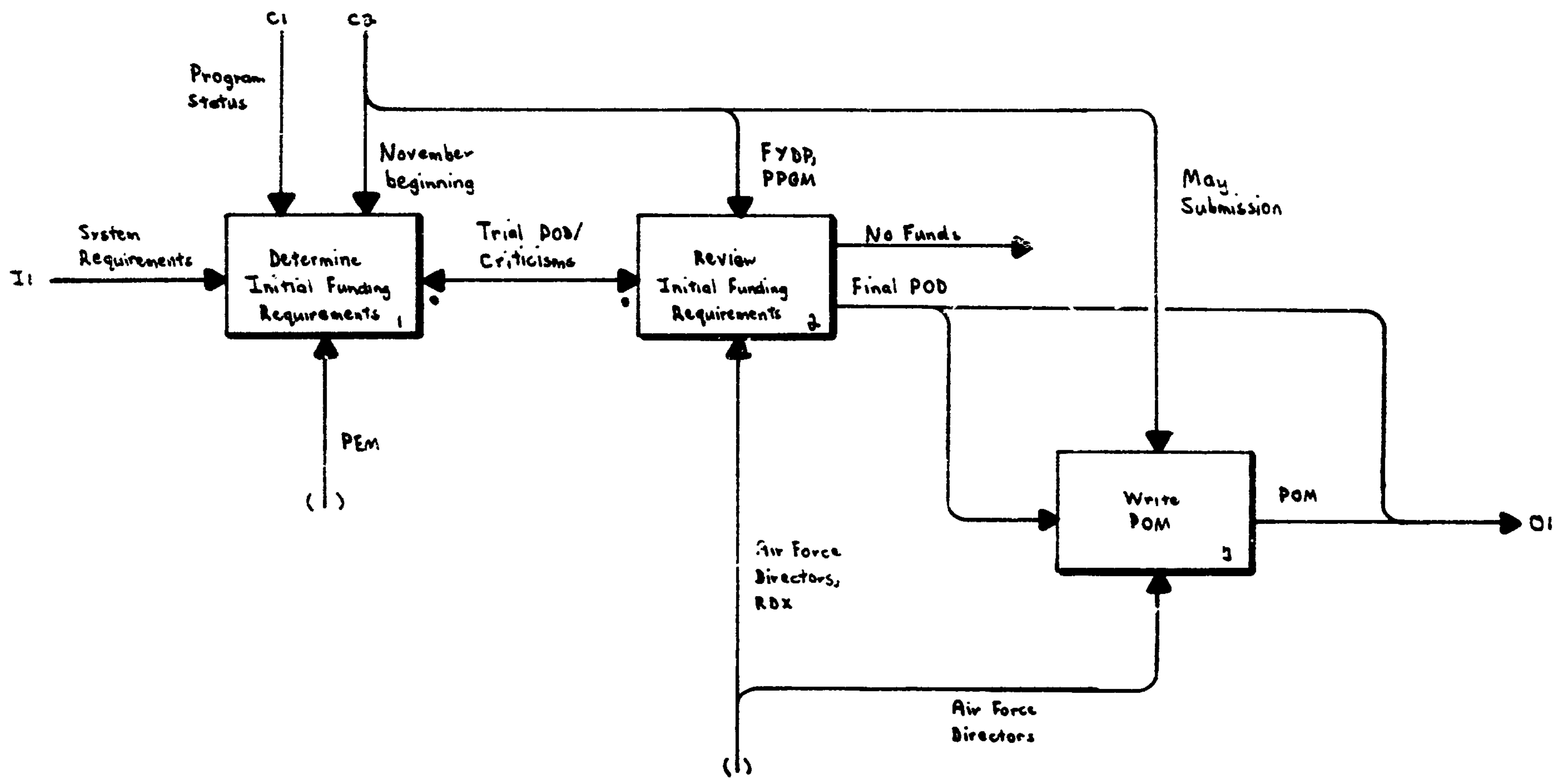


NODE: A2F1 | TITLE: Compete for Funds (Mechanisms) For Exposition Only | NUMBER: Fig. 6 | 1-14

A21. Prepare Air Force Program Objective Memorandum (POM)

In November (box 1 control 2), the PEM begins preparation of the Program Objective Directive (POD) to support the Air Force directors in preparing the initial version of the budget. The POD is reviewed by the Air Force directors and the Directorate of Planning, Programming and Analysis (AF/RDX) (box 2) until it meets their satisfaction. Then either the program element is denied funds (box 2 output 1) or the POD is used (box 3 input 1) to help prepare the Program Objective Memorandum (box 3). The POM specifies resource requirements within fiscal guidelines.

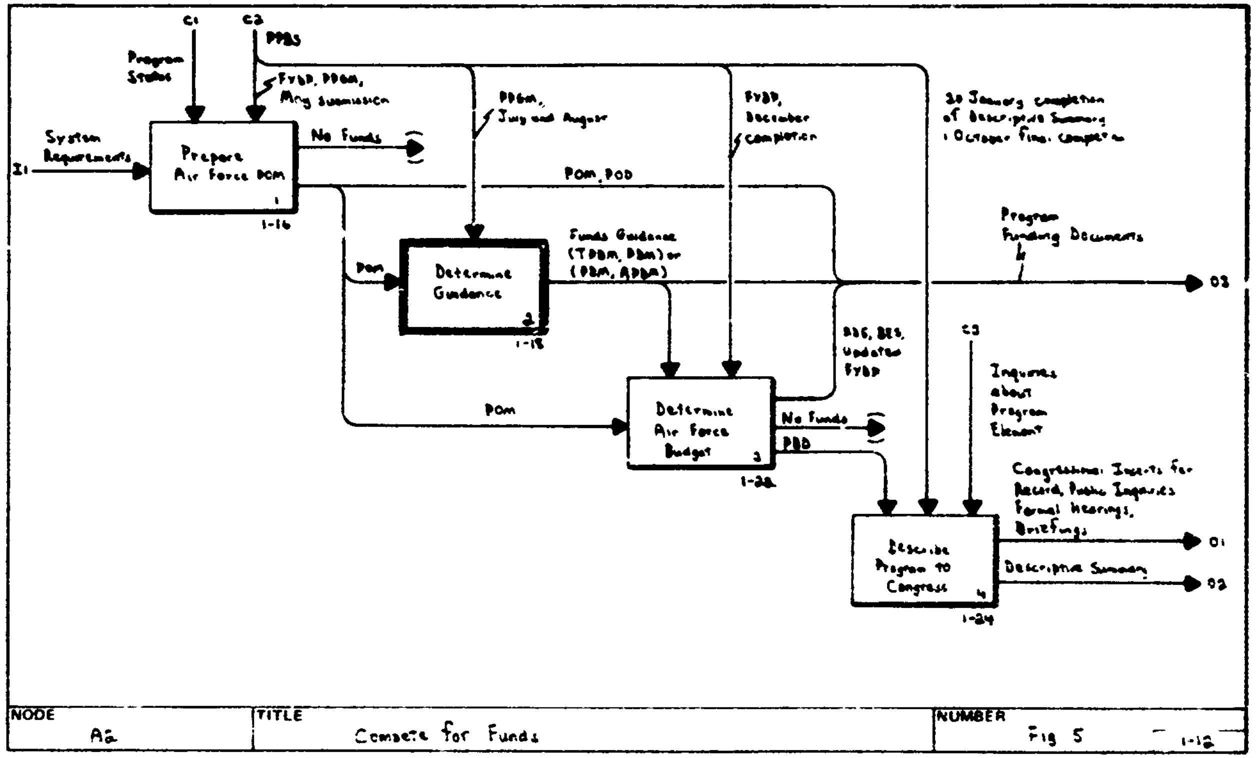


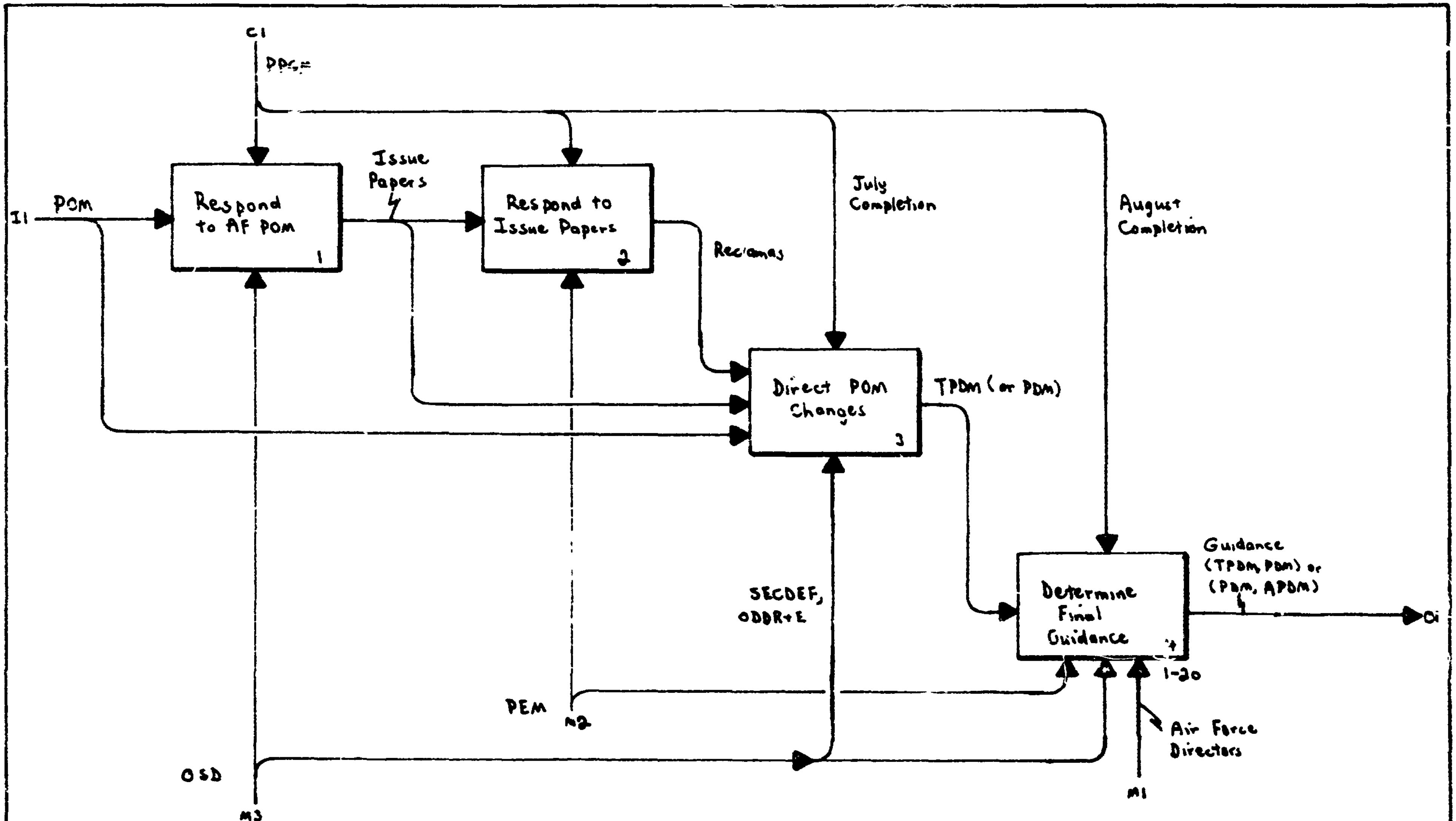


NODE: A21	TITLE: Prepare Air Force Program Objective Memorandum (POM)	NUMBER: Fig. 7 1-16

A22. Determine Guidance

Once the Program Objective Memorandum (POM) is prepared by the Air Force OSD reviews it under the constraints imposed by the Planning-Programming Guidance Memorandum (PPGM). OSD prepares issue papers analyzing the POM and these are submitted to the Air Force where the PEM responds through reclamas. The POM, issue papers and reclamas are reviewed by the Secretary of Defense (SECDEF) and initial modifications to the POM are issued in a series of Tentative Program Decision Memoranda (TPDM). Then final guidance is determined through resolution of issues between the Air Force, supported by PEMs and OSD. Guidance is reported in a PDM, or if the original report was a PDM, an Amended Program Decision Memorandum (APDM) is prepared.

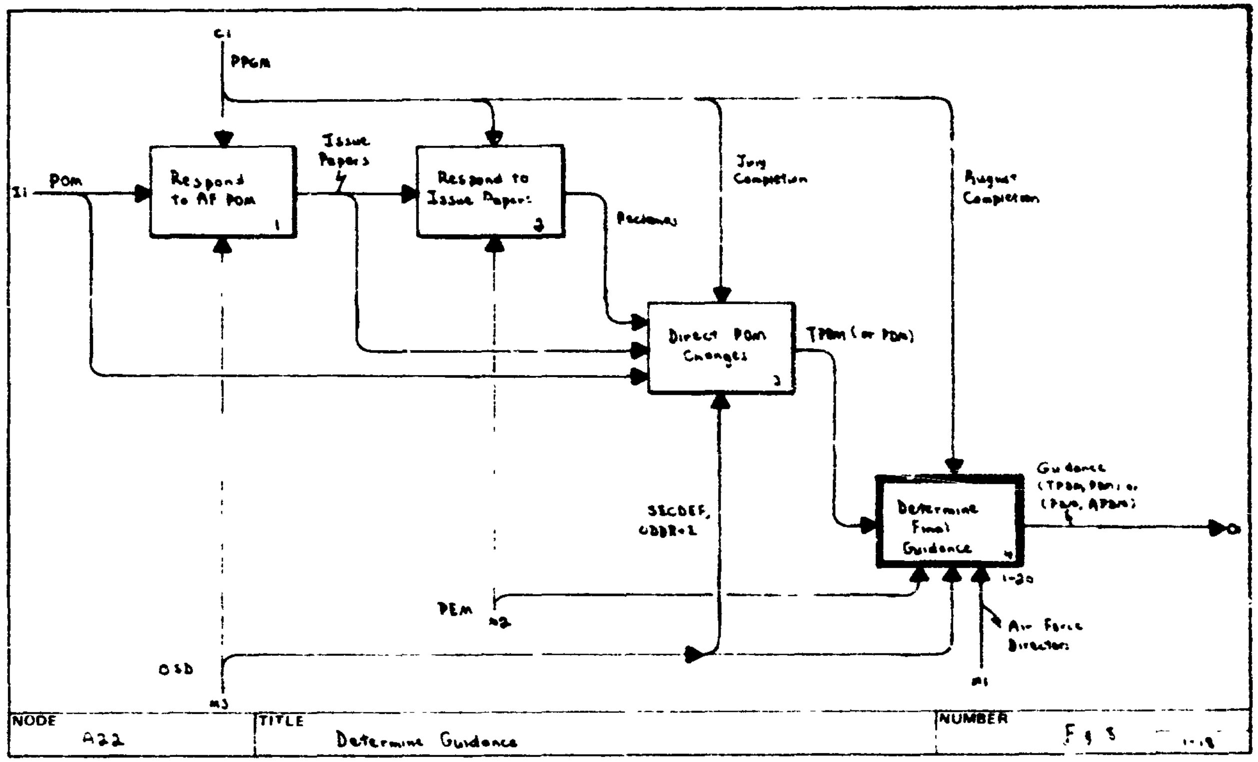


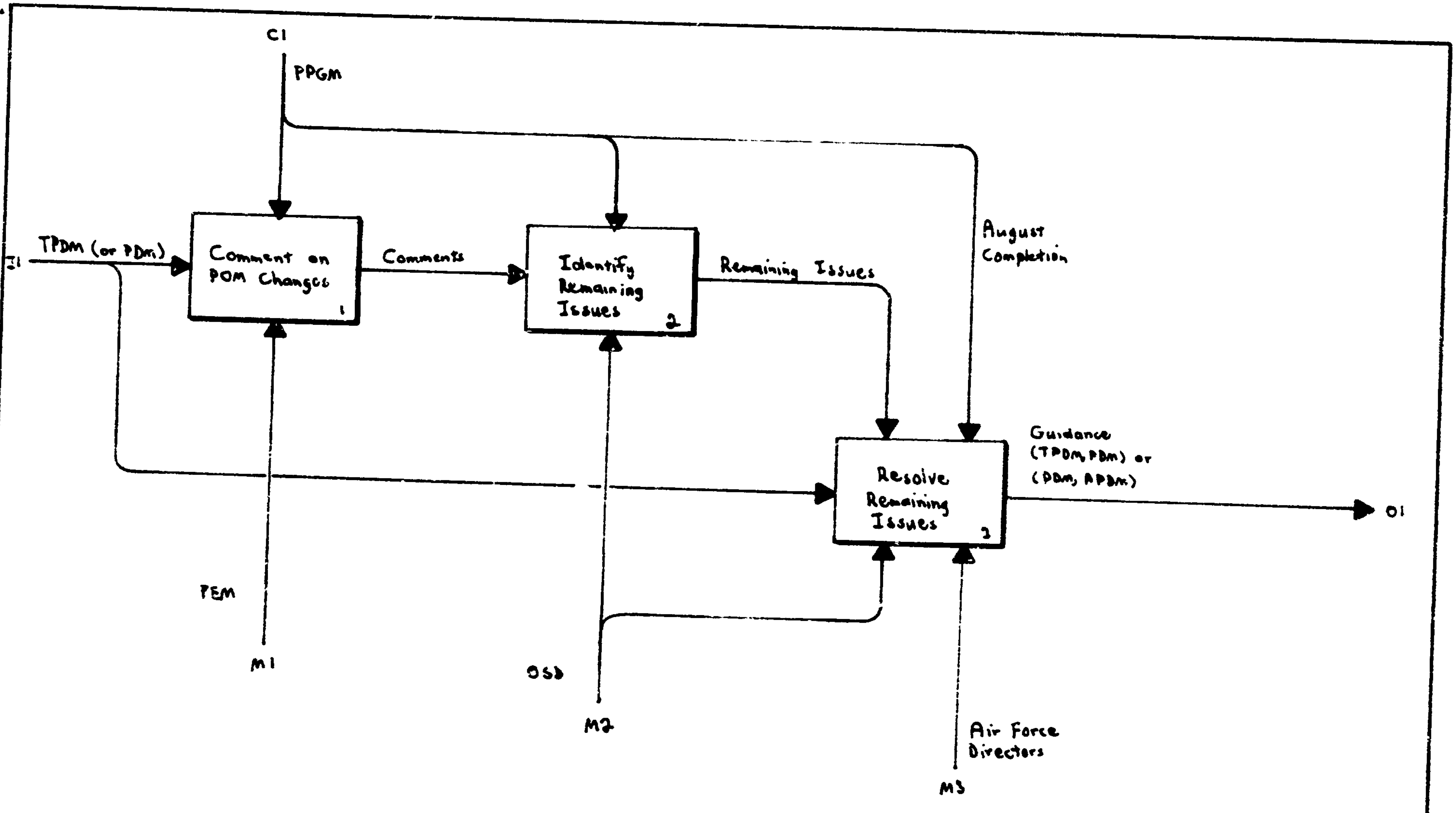


NODE: A22 | TITLE: Determine Guidance | NUMBER: Fig. 8 | 1-19

A224. Determine Final Guidance

The PEM reviews the TPDM and comments on the changes to the POM. OSD then identifies remaining issues yet to be resolved. These issues are resolved by the end of August in meetings held between OSD and Air Force directors. Then the PDMs (or APDMs if a PDM was originally written) are written to provide guidance and establish program decisions.





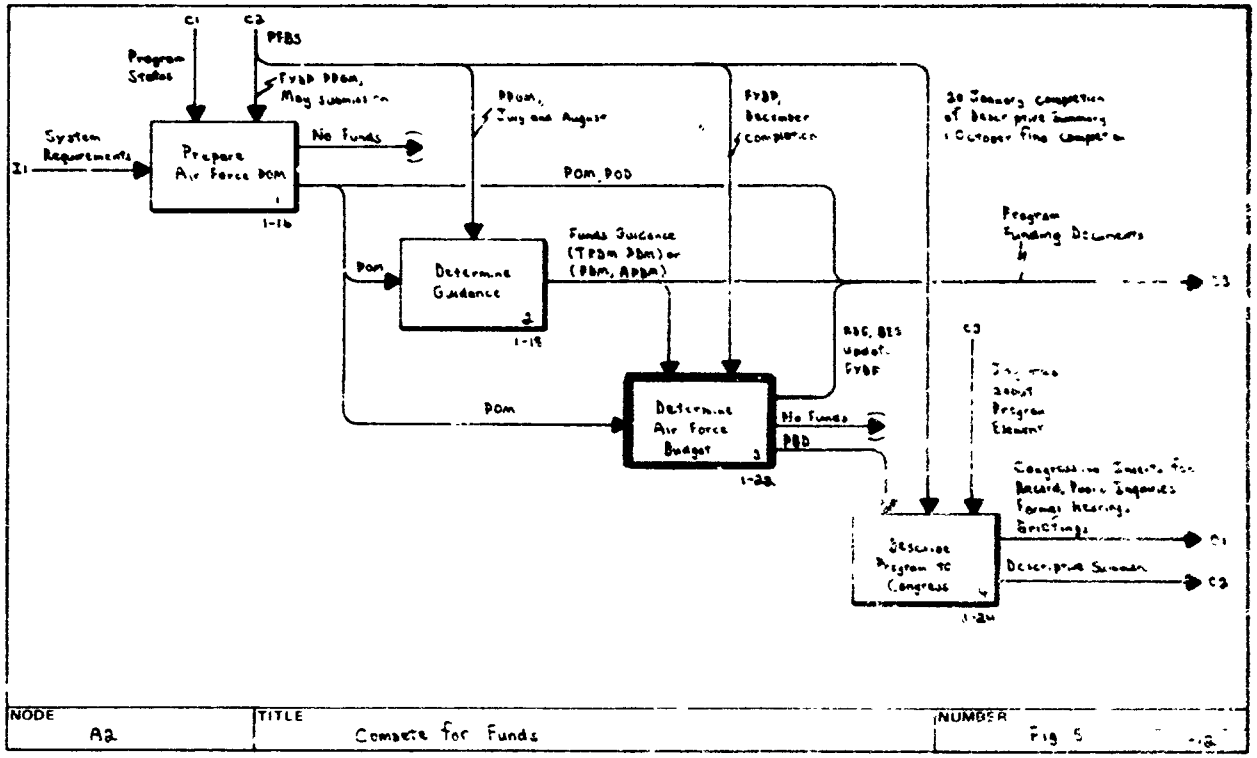
NODE: A224
TITLE: Determine Final Guidance
NUMBER: Fig. 9

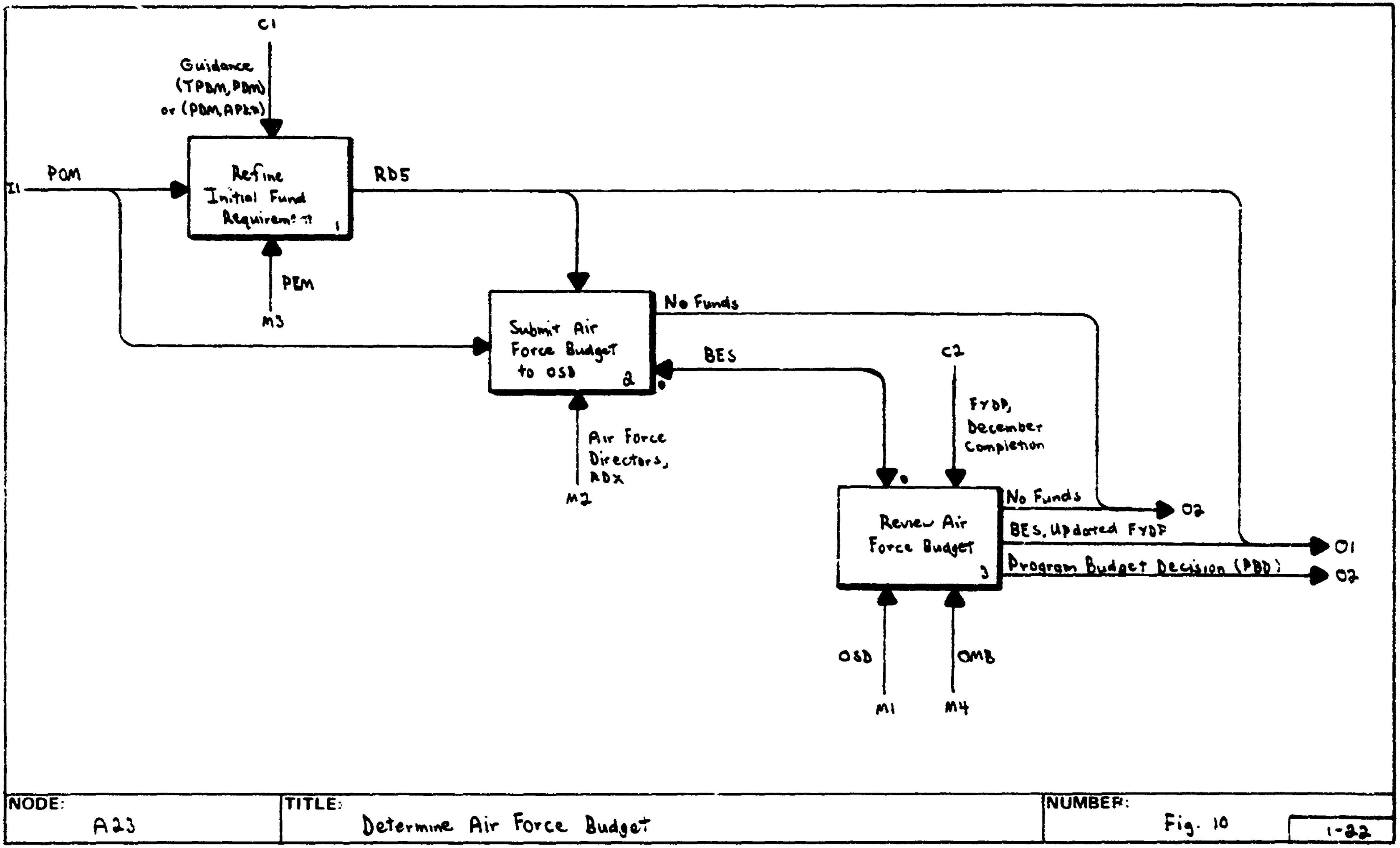
1-20

A23. Determine Air Force Budget

The final Air Force budget submitted to the Office of the Secretary of Defense (OSD) is the Budget Estimate Submission (BES) (box 2 output 1). It is based on an RDS report that is prepared by the PEM (box 1). The RDS report contains budget information for five years with significant detail for the first two years (box 1 output 1).

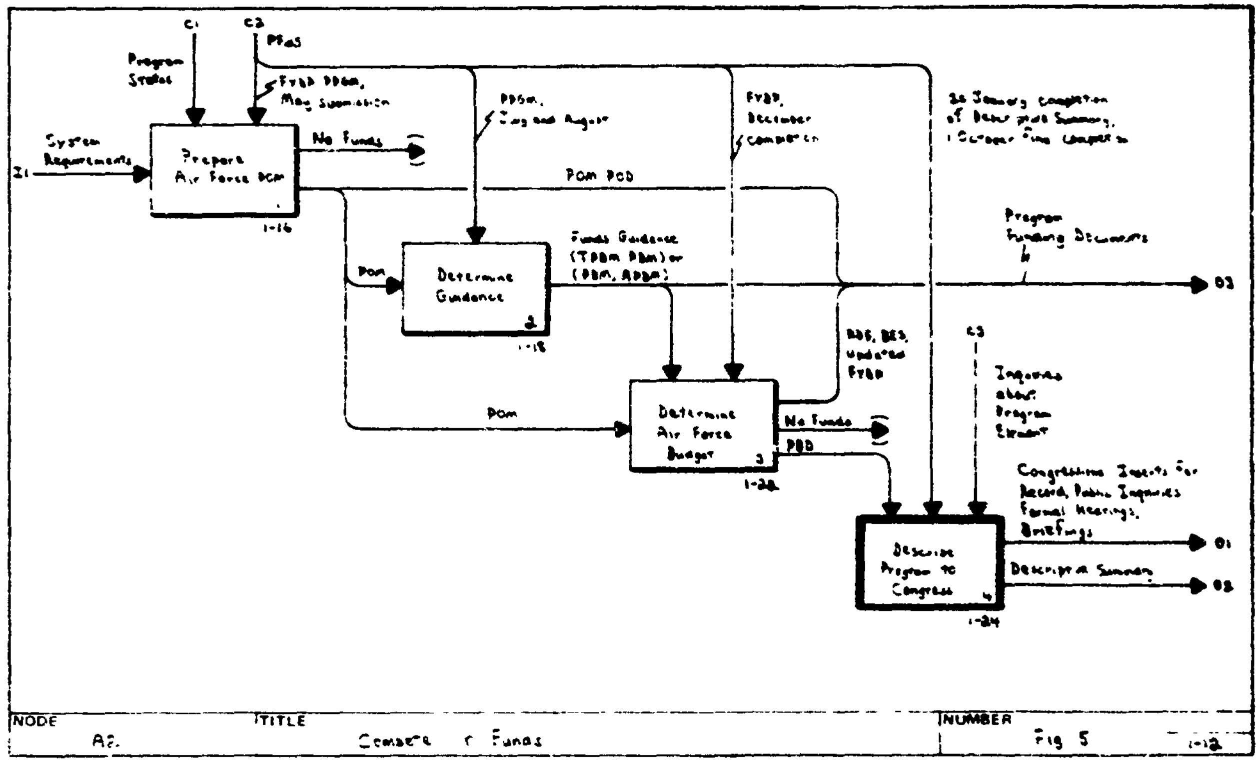
The budget is reviewed (box 3) by OSD and the Office of Management and Budget (OMB) and the final budget is completed in December for inclusion in the President's budget. The FYDP is updated in the process (box 3 output 2). Changes to the budget are specified in a series of documents called Program Budget Decisions (PBDs) (box 3 output 3).

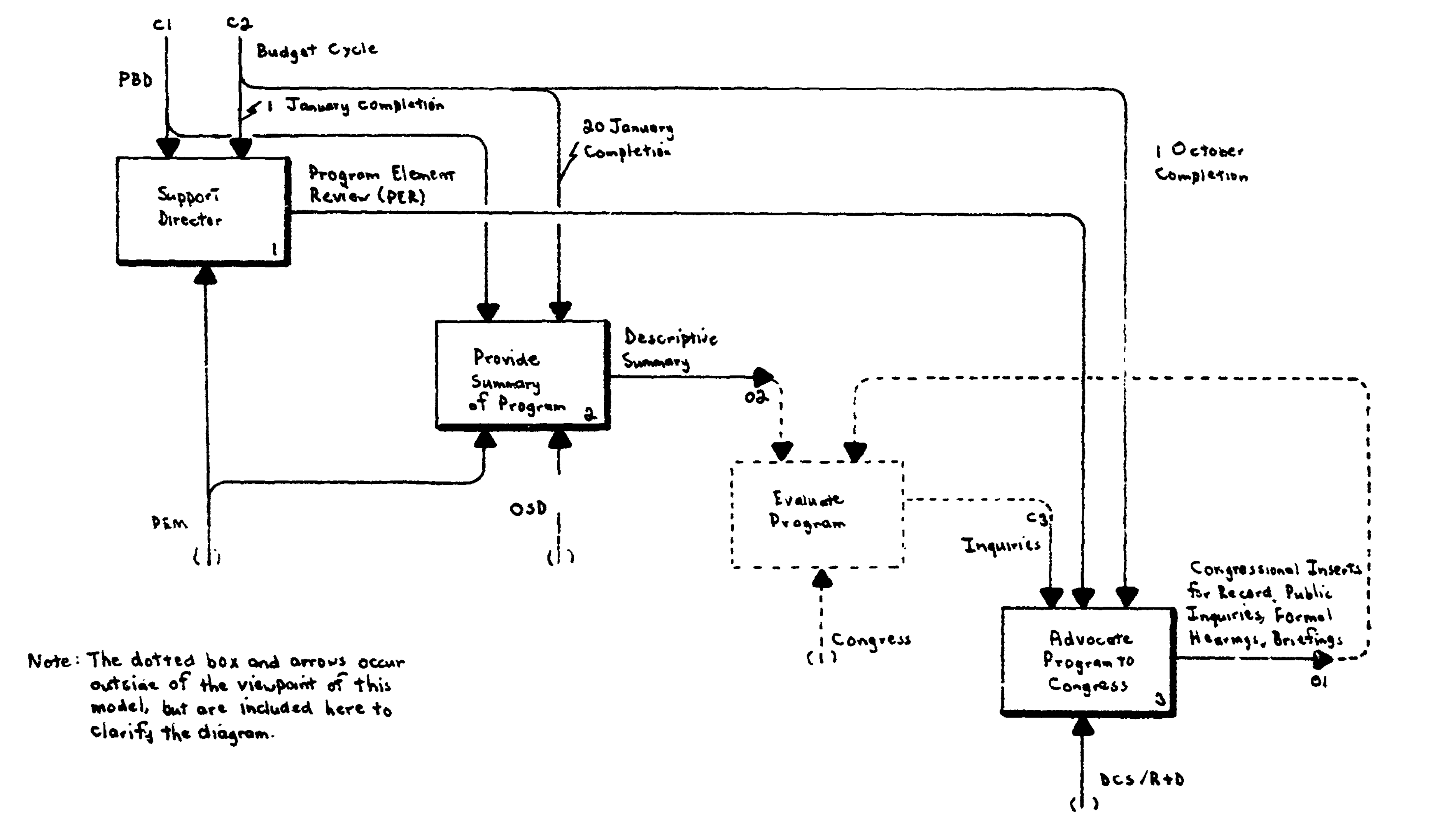



C1
Guidance (TPDM, PDM) or (PDM, APEs)
I1
POM
Refine Initial Fund Requirem'ts
1
RDS
PEM
M3
No Funds
Submit Air Force Budget to OSD
2
BES
Air Force Directors, ADx
M2
C2
FYDP, December Completion
Review Air Force Budget
3
No Funds
O2
BES, Updated FYDP
O1
Program Budget Decision (PBD)
O2
OSD
M1
OMB
M4
NODE: A23
TITLE: Determine Air Force Budget
NUMBER: Fig. 10
1-22

A24. Describe Program to Congress

It is the responsibility of the Deputy Chief of Staff for Research and Development (DCS/R&D) to advocate the program to Congress (box 3). Support is provided by the PEM (box 1 mechanism 1) who prepares a Program Element Review (PER) (box 1 output 1). He also writes a Descriptive Summary (box 2 output 1) which provides a description of the program to Congress. The Descriptive Summary, along with other information received (box 3 output 1), provoke inquiries (box control 1) from Congress about the program element.





Note: The dotted box and arrows occur outside of the viewpoint of this model, but are included here to clarify the diagram.

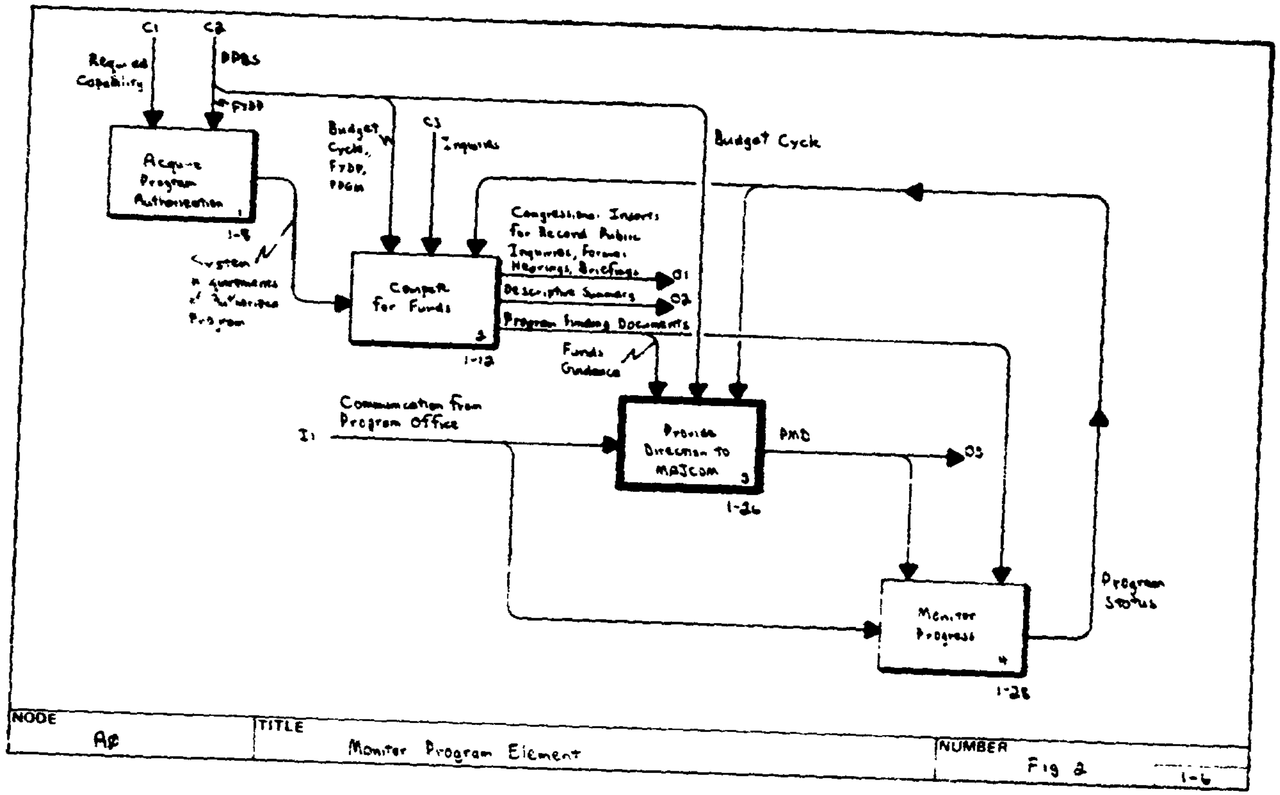
NODE:	TITLE:	NUMBER:
A24	Describe Program to Congress	Fig. 11

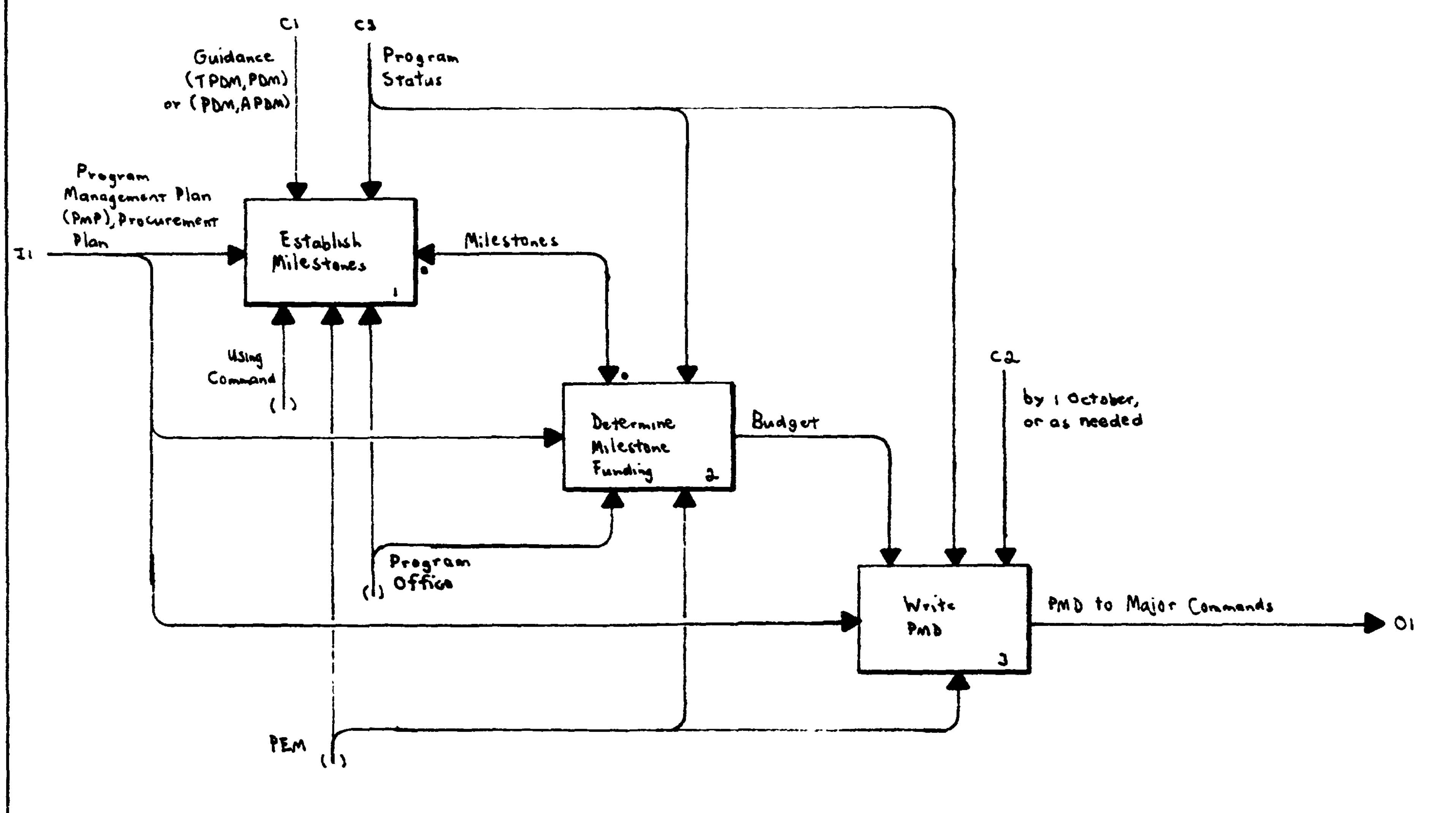
1-24

A3. Provide Direction to Major Command

The Program Management Directive (PMD) is a primary document prepared by the PEM (box 3). It provides direction to the major commands involved with the program. The direction provides funding guidelines and broad technical guidance. It is usually prepared each year by the first of October, but can be written whenever a change occurs that requires new direction (box 3 control 3).

To prepare the PMD, milestones and funding to achieve them are determined first (boxes 1 and 2). This is an iterative process requiring cooperation from the using command, program office and PEM. Information from the program office, such as the Program Management Plan and Procurement Plan, respond to the PMD and provide input for subsequent activities.



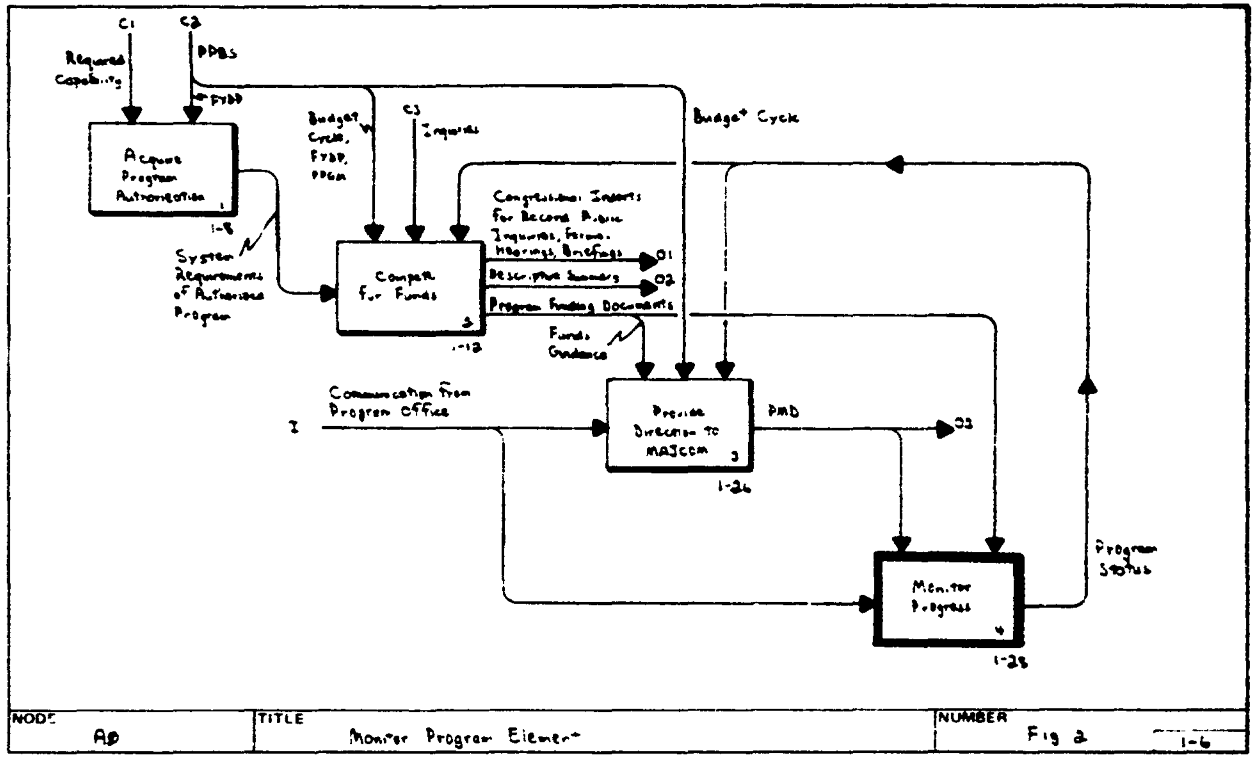


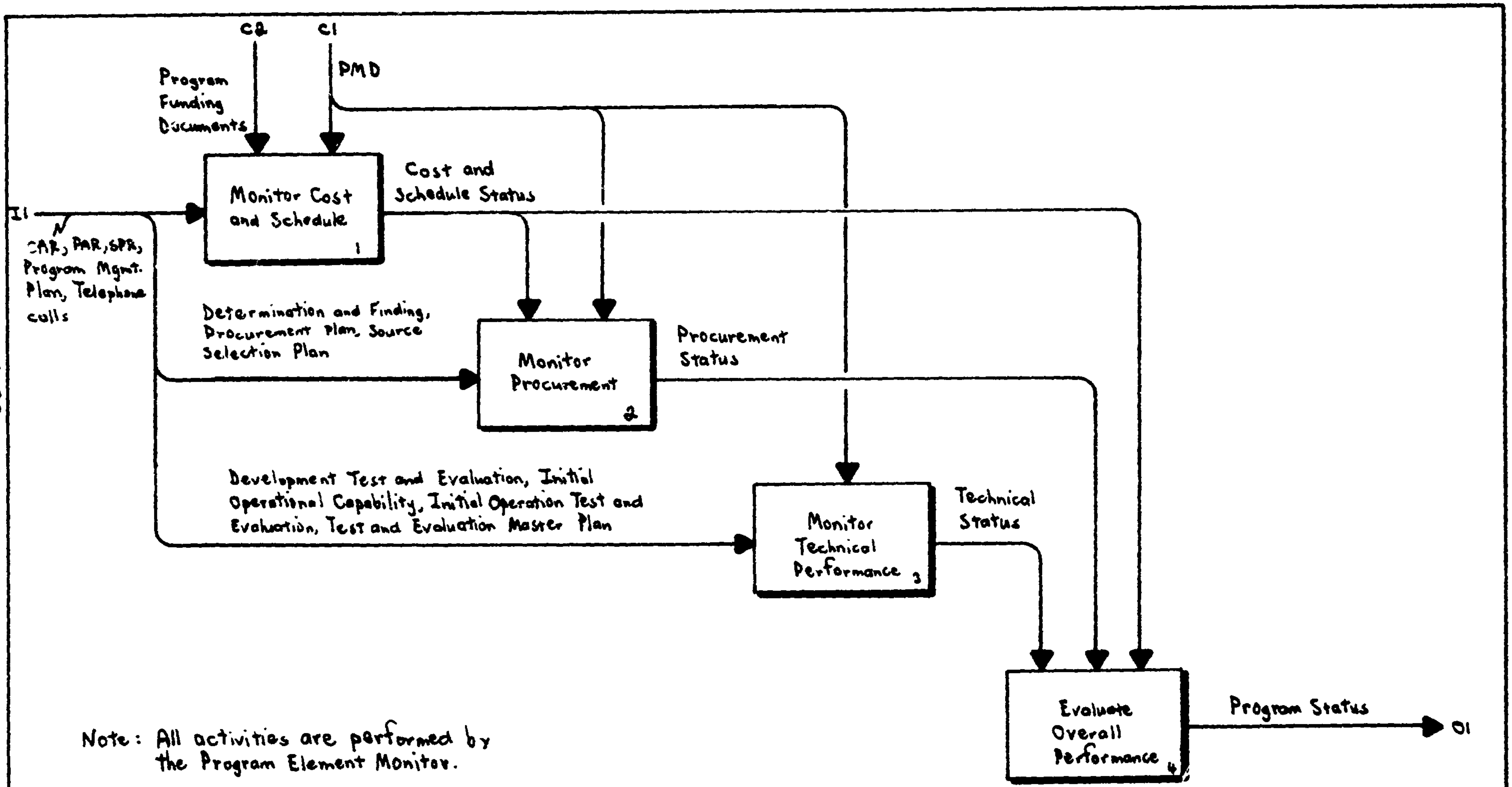
NODE:	TITLE:	NUMBER:
A3	Provide Direction to Major Command	Fig. 12

1-26

A4. Monitor Progress

The program will be in one of two states at all times. The procurement phase (box 2) occurs before a contract is let to perform the work. The funding, schedule PMD requirements, D-F, Procurement Plan and Source Selection Plan are all required to monitor the procurement. Once the procurement is let the program is in the contract phase (box 3). The program status can be determined by evaluating the cost, schedule and technical performance progress to date (box 4). These activities are supported by a variety of reports and briefings prepared by the program office. These will be prepared as often as the PEM desires.



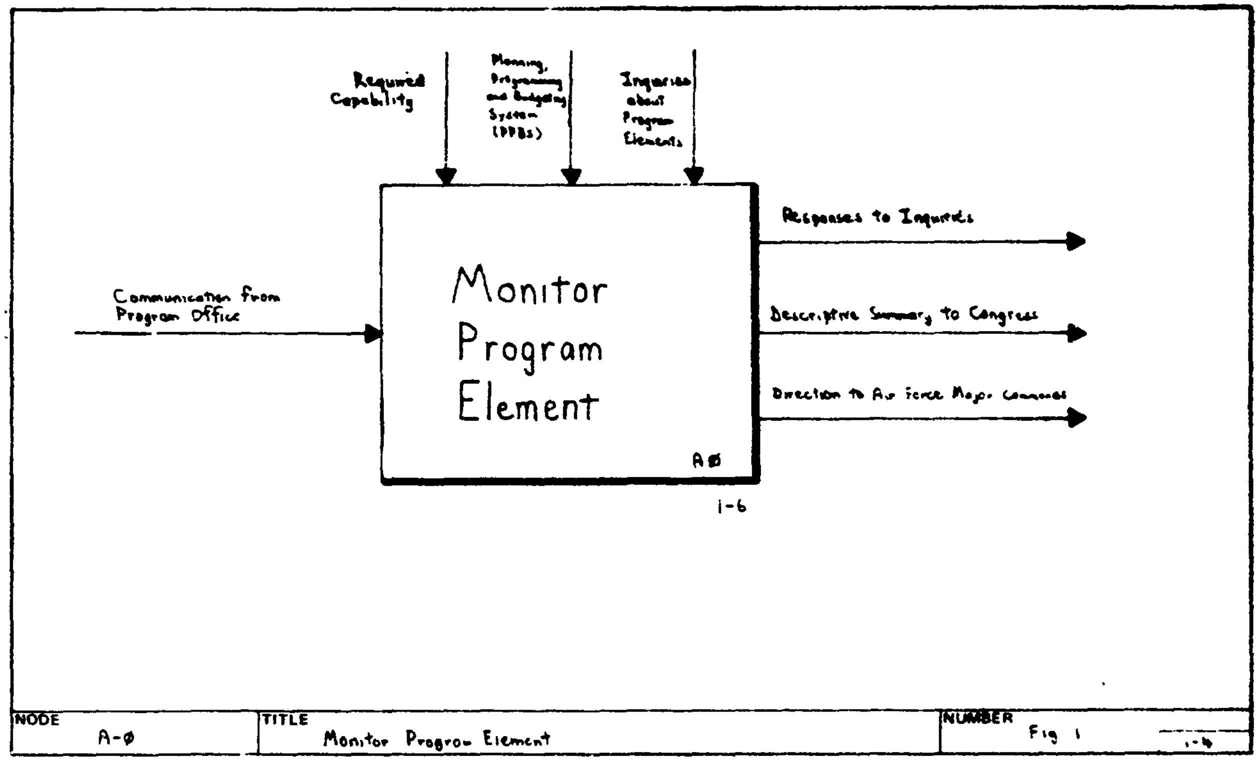


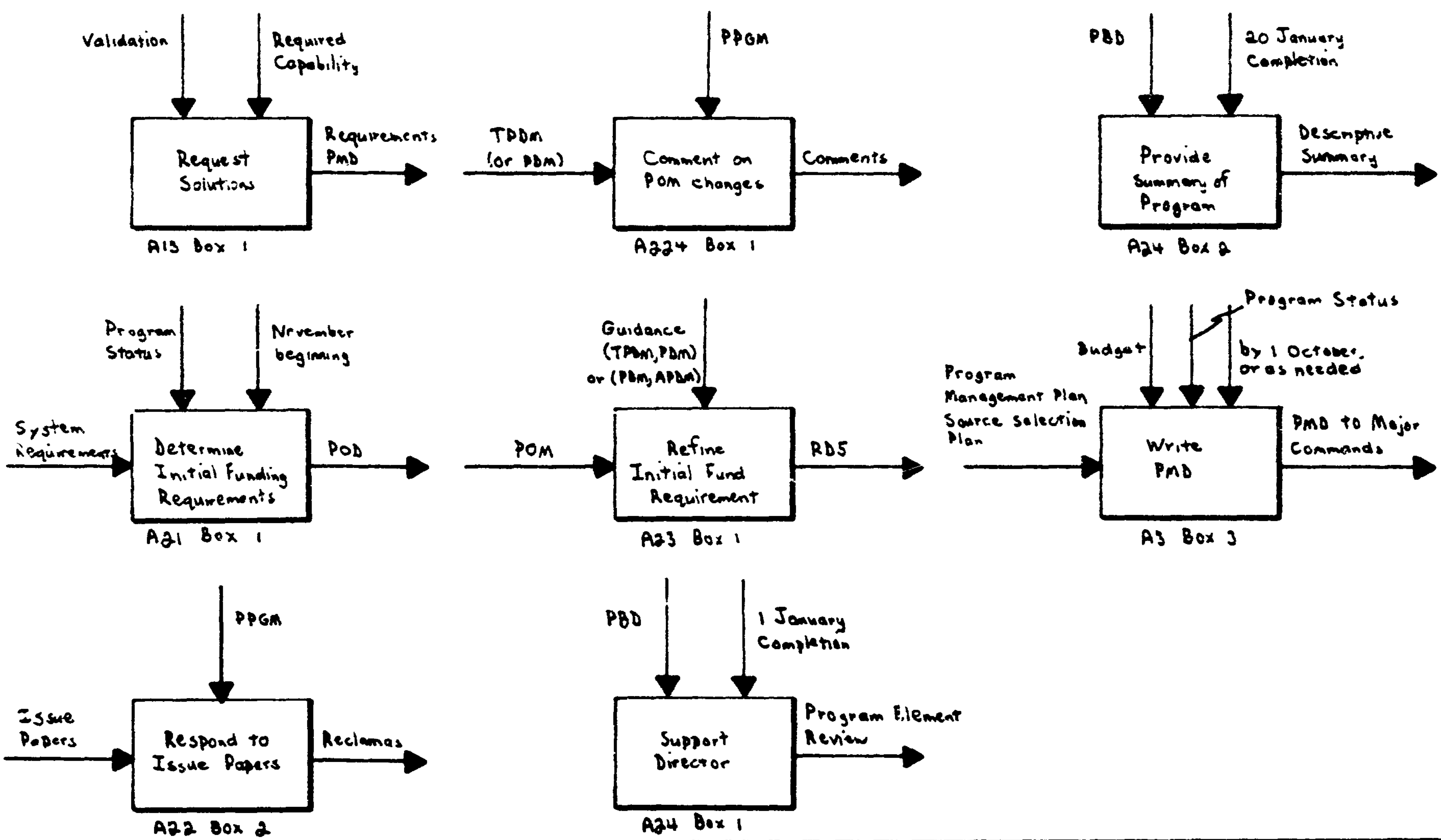
Note: All activities are performed by the Program Element Monitor.

NODE:	TITLE:	NUMBER:	
A4	Monitor Progress	Fig 13	1-28

A0F1. Program Element Monitor Prepared Reports

All of the activities shown in this diagram are performed by a PEM and produce a report. This does not intend to demonstrate a relationship between reports, the information flow between reports is shown in the entire model. Note, however, that common data elements are not maintained. Reports are filed, and retrieved, if possible, when information on the report is needed.





NODE:	TITLE:	NUMBER:	
AØF1	Program Element Monitor Prepared Reports	Fig 14	1-30

Section 2

CONCLUSION

This report has shown the involvement of a PEM in the various aspects of a program element, from advocating its necessity to monitoring its progress. It is clear that the PEM is the focal point for a program element within the Air Staff.

The next step in this project will be to define functions and performance requirements for a prototype management information system. That task will be based on this model, which identifies reports the PEM must produce, the timing and purpose of the reports, and their relationship to the Air Force management process.

READING SADT®

ACTIVITY DIAGRAMS

This section reviews some of the graphic conventions of SofTech's "Structured Analysis and Design Technique" (SADT). These graphics have been used to construct the figures which appear in this document.

This section does not entirely describe SADT. SADT is a complete methodology for planning, analysis, or design of complex systems. Additional information on SADT is available on request from SofTech.

SADT is a Trademark of SofTech, Inc.

SADT is for understanding systems

A system may be any combination of machinery (hardware) and/or computer software and/or people, working together to perform a useful function. The system may be a new one, yet to be built, or it may be an existing system. SADT is a technique that enables people to understand complex systems in a complete and precise manner, and enables them to communicate their understanding. The result of applying SADT is a "model". Each model describes a carefully-chosen topic to meet a specific need such as:

- Describing what functions a system must perform
- Specifying how it is to be designed and constructed
- Explaining how it is to be used and/or maintained.

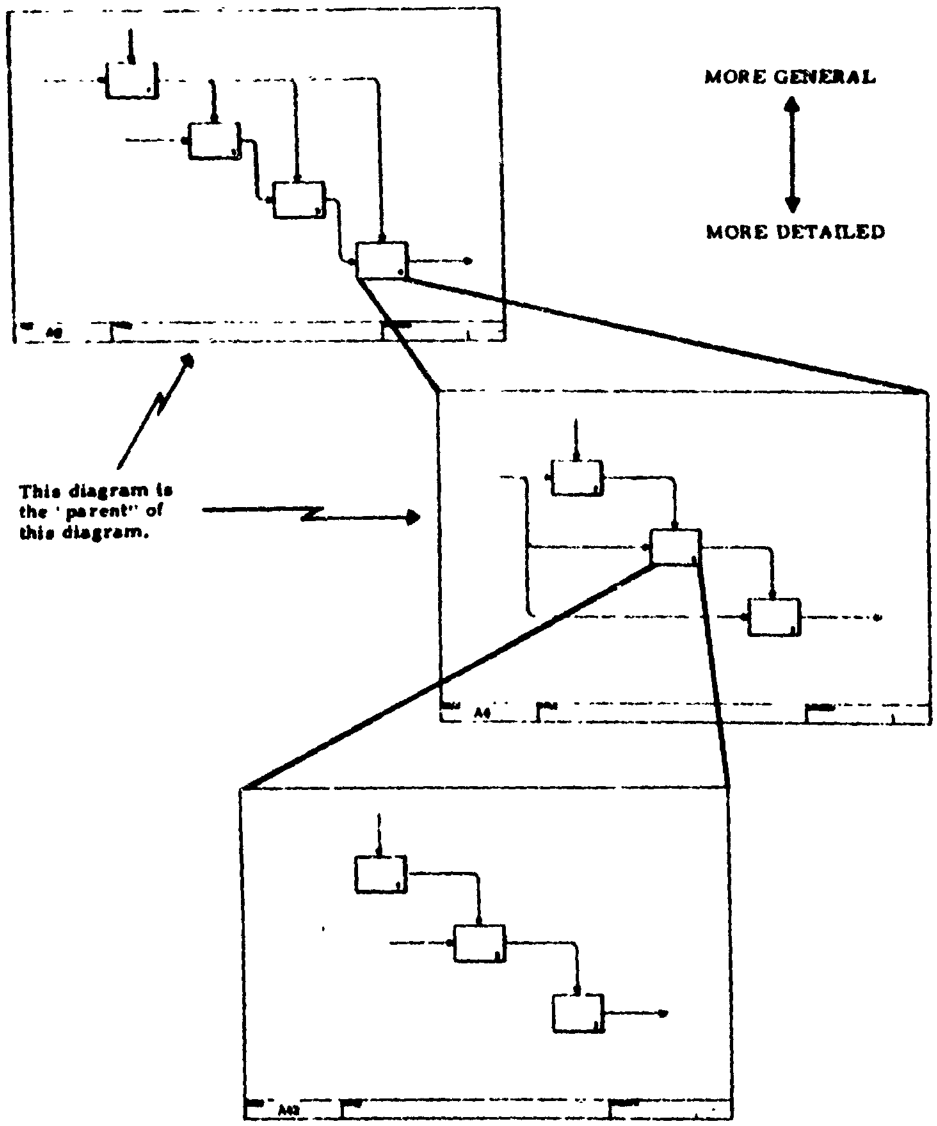
A model is a series of diagrams that break a complex subject into its component parts. The initial diagram is the most general or abstract description of the whole system. This diagram shows each major component as a box. The details of each component (that is, the "insides" of each box) are shown on another diagram. This diagram also shows components as boxes. These boxes can be broken down into still more diagrams, until the system is described to any desired level of detail.

Each detailed diagram, then, is the decomposition of a box on a more abstract diagram. At each step, the abstract diagram is said to be the "parent" of the detailed diagram. A detailed diagram is best thought of as fitting "inside" a parent box. (See figure opposite.)

Diagrams consist of "activities" and "data"

SADT diagrams show both the things (objects or data) and the happenings (functions or activities) in a system. These aspects are always shown together. When describing system functions, boxes represent component activities performed by the system. Arrows show data interfaces, that is, the things that interrelate activities.

Activity diagrams have the property of abstraction. High-level diagrams encompass a wide range of detail and the boxes and arrows have abstract labels that describe general concepts. Successive diagrams at lower levels reveal this detail, with more specific labels, one step at a time.



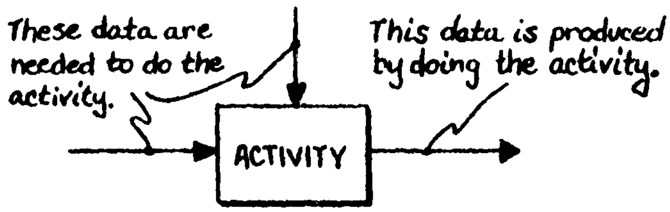
EVERY COMPONENT MAY BE DECOMPOSED IN ANOTHER DIAGRAM.

EVERY DIAGRAM SHOWS THE "INSIDE" OF A BOX ON A HIGHER DIAGRAM.

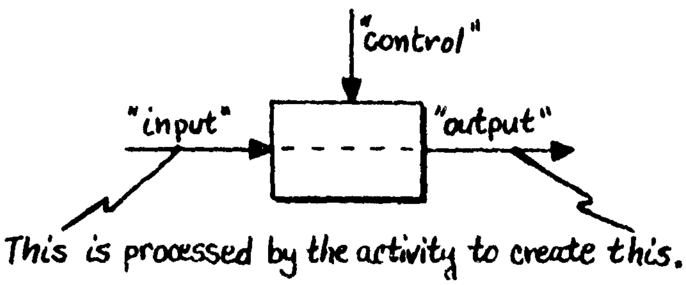
Diagrams have both boxes and arrows

If a box represents an activity, it will be described by an active phrase, written inside. The arrows that connect to the box represent real data (not flows), and will be labelled by nouns, written beside the arrows. "Data" may be information, objects, or anything that can be named with a noun.

Incoming arrows (left and top of box) show the information needed to perform the activity. Outgoing arrows (right of box) show the data produced when the activity is performed.

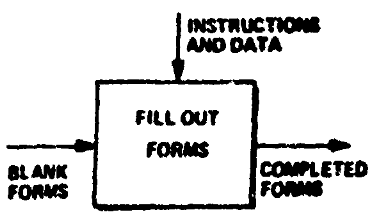


From left to right (called "input" and "output"), an activity transforms data. Activities are done under conditions shown by the top arrows (called "control").



Boxes are named by active verbs. Input, control, and output arrows, which represent real things, are labeled with nouns.

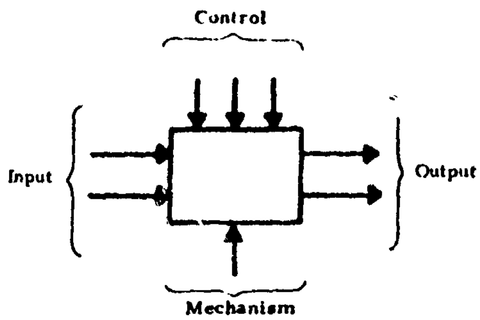
If it is unclear whether a particular word is a noun (data) or a verb (activity), an "(n)" or "(v)" may be appended to the label. For example, the label "Record" could mean a record, or the action of recording. "Record(n)" is used for the former case, and "Record(v)" is used for the latter.



ARROWS CLARIFY AND BOUND THE MEANING OF EACH BOX

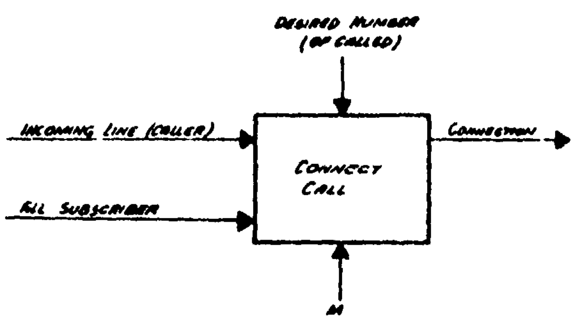
Function first

If a box represents an activity, then input data (on the left) are transformed into output data (on the right). Controls (on the top) govern the way the transformation is done.



Mechanisms (on the bottom) indicate the means by which the activity is performed. A "mechanism" might be a person or a committee or a machine or a process. The box itself, with its inputs, controls, and outputs, indicates WHAT the system does. The mechanism shows HOW that activity is accomplished. Diagrams drawn without mechanisms show what functions a system must perform. Selecting specific mechanisms later will allow those functions to be implemented.

PART OF A TELEPHONE EXCHANGE



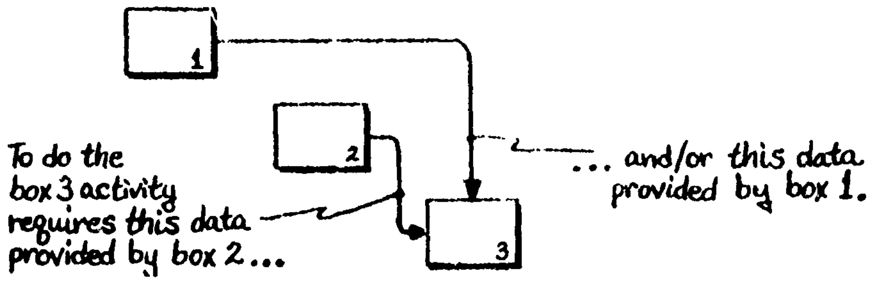
M1 AN OPERATOR WHO ASKS "NUMBER, PLEASE" AND CONNECTS PLUGS INTO A SWITCHBOARD

M2 A ELECTROMECHANICAL DIAL SYSTEM THAT COLLECTS THE DIGITS AND CONNECTS THE LINES

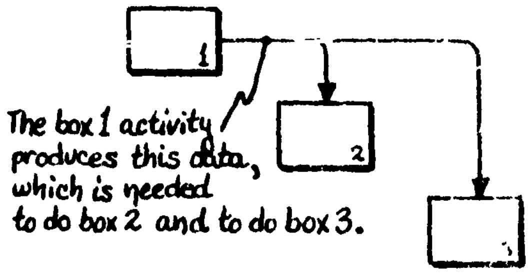
M3 A COMPUTERIZED PUSH-BUTTON SYSTEM THAT CONVERTS NUMBERS THROUGH TABLES AND SIGNALS MINIMAL HARDWARE TO MAKE CONNECTIONS.

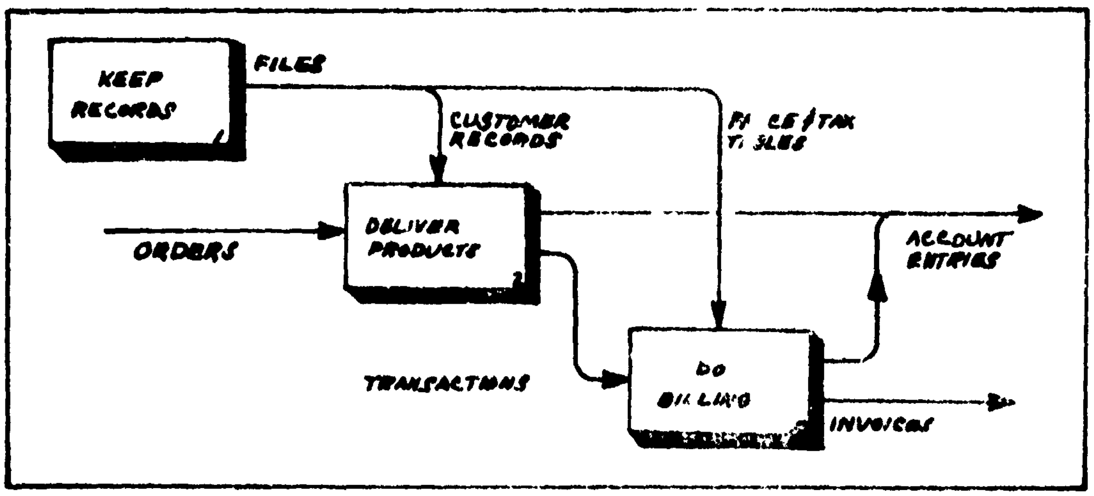
Arrows are interfaces between boxes

The arrows on an activity diagram represent data constraints. They do not represent flow or sequence. The arrows entering a box show all the data that is needed for the activity to be performed. Several activities could be performed simultaneously, if the needed constraints have been satisfied. Arrows connect boxes, thus showing the logical relationship of each component to the whole system.



Data produced by one activity may be required by several other activities. So arrows may branch or be joined. The branches may each represent the same thing, or different things of the same general type. The arrow labels will make clear what the arrows are.



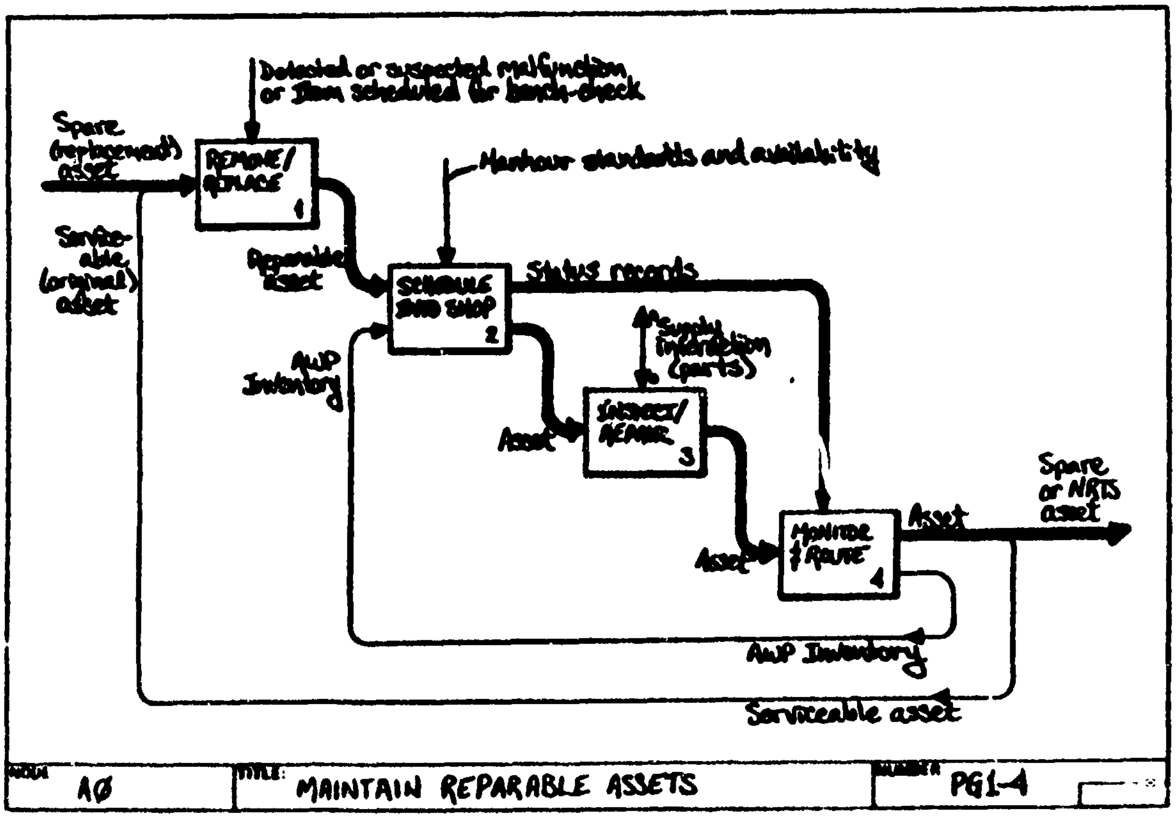


ACTIVITY DIAGRAMS HAVE DATA ARROWS

Diagram interfaces form a main path

SADT diagrams are used to describe systems. Each diagram, in essence, tells a "story" about a well-defined portion of the system. As in other descriptions, each diagram has a central theme, running from the most important "unconnected" incoming arrow to the most important "unconnected" outgoing arrow. This main path through the boxes and arrows outlines the primary function of the diagram. Other parts of the diagram represent qualifying or alternative conditions which are secondary to the main path.

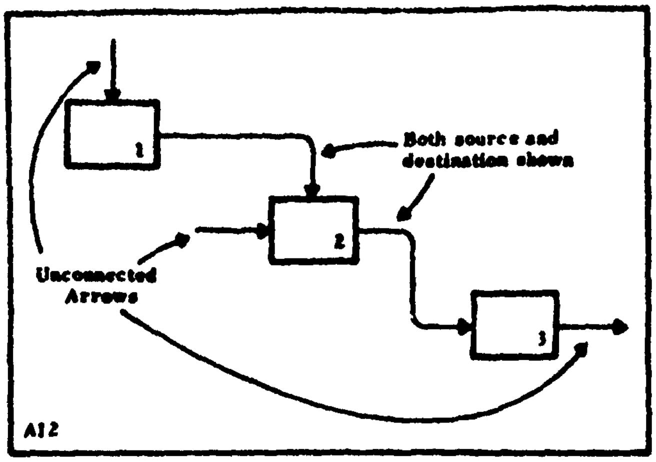
In reading a diagram, it is helpful to remember that there is a main path and that the diagram describes a working system. One can mentally envision the system's operation, as described in the diagram, by pursuing imagined events through the interface arrows. This mental "simulation" or walk-through may cover both the main path and other situations, such as specific kinds of data input, the handling of errors, and possible alternative outputs.



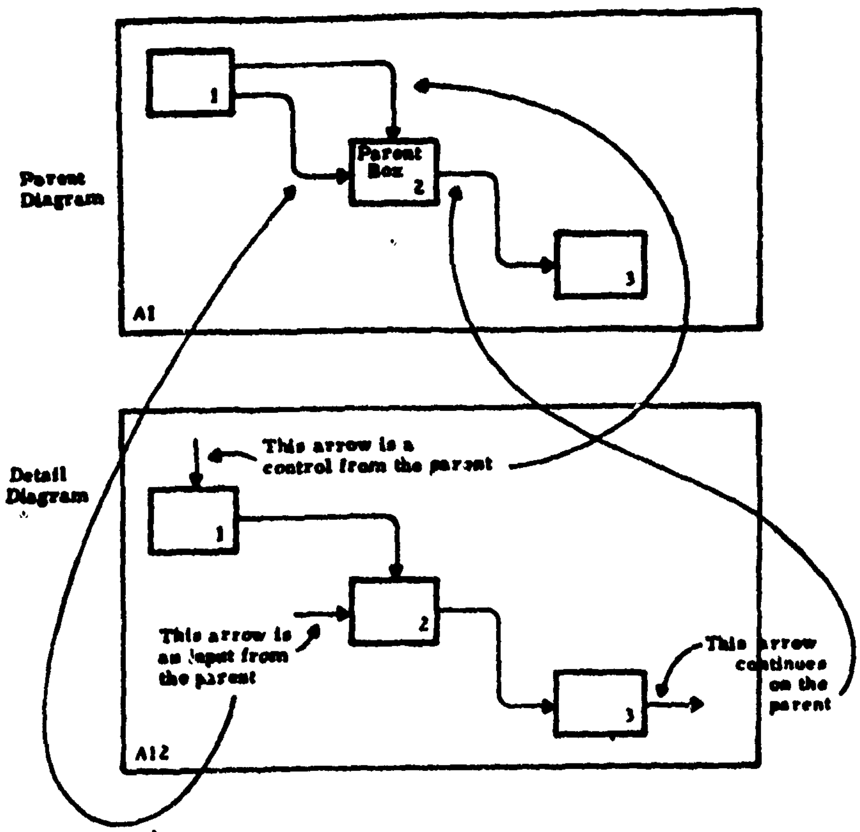
MAIN PATH INDICATED BY "PARENT" ARROWS

Some interfaces connect to the "parent" context

Some arrows are connected at both ends to boxes on the same diagram. Other arrows have one end unconnected. The unconnected arrows represent inputs, controls, or outputs of the parent box. To find the source or destination of these unconnected arrows, the reader must locate the matching arrows on the parent diagram. All such unconnected arrows must continue on the parent, to make the diagrams complete and consistent.



"UNCONNECTED" ARROWS ARE DERIVED FROM THE "PARENT"

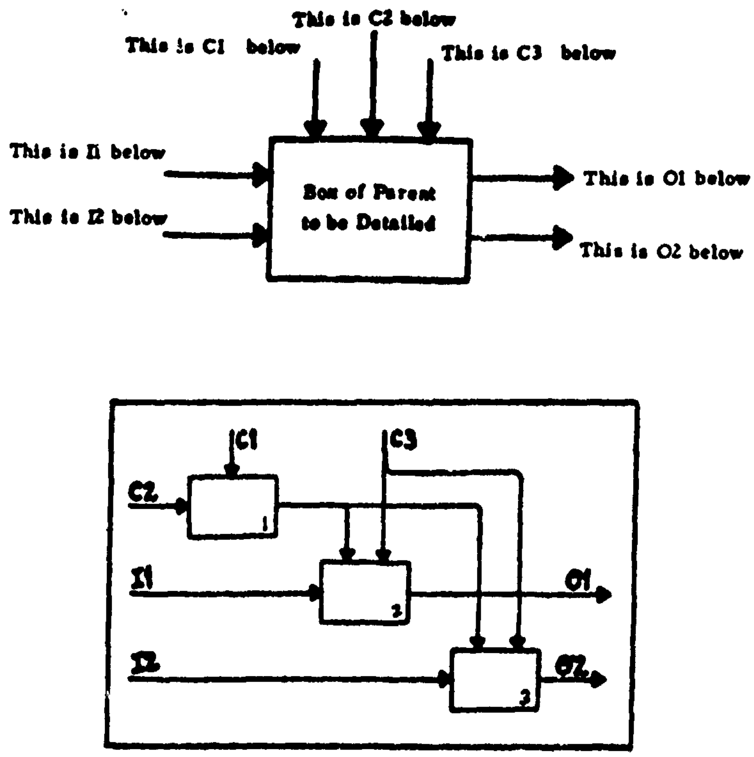


THE MATCH MUST BE COMPLETE AND CONSISTENT

"Unconnected" arrows are coded

Although arrow continuations from parent boxes to detail diagrams may be obvious from the labels, a special notation confirms the match. The letter I, C, O, or M is written near the unconnected end of the arrow on the detail diagram, to identify that the arrow is shown as an Input, Control, Output, or Mechanism on the parent box. This letter is followed by a number giving the relative position at which the arrow is shown entering or leaving the parent box, numbering left to right and top to bottom. For example, "C3" written on an arrow in the detail diagram indicates that this arrow corresponds to the third control arrow entering the parent box.

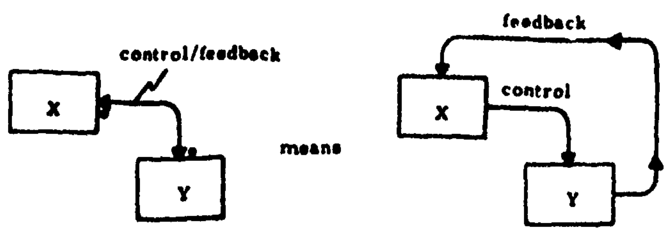
Using this letter/number matching scheme, an arrow shown as control or as input on a parent diagram is not limited to the same role on a detail diagram (for example, C2 on the parent box appears as an input to box 1 on its detail diagram in the example below).



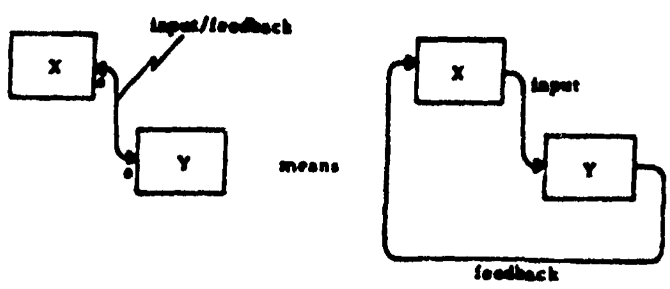
CODES ARE WRITTEN ON THE DETAIL DIAGRAM

Some interfaces are cooperative

A two-way arrow (with an arrowhead and a dot at each end) represents a cooperative relationship between boxes. It is a short-hand way of indicating feedback. A double label, separated by a "/" identifies what is passed forward and backward along the arrow. If a single arrow label is used with no "/", data about a common subject is passed in both arrow directions.



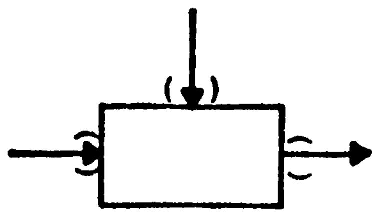
FEEDBACK MAY BE OUTPUT AND CONTROL



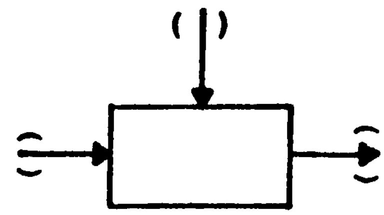
FEEDBACK MAY BE OUTPUT AND INPUT

Special cases

Occasionally, an unconnected arrow on a detail diagram has no matching arrow on its parent, or vice versa. In this case, the arrow head or tail is shown enclosed in parentheses. Parentheses are used only when an arrow is of no further use in understanding the system being described. Seldom, if ever, does more than one parenthesized arrow appear on a single box or diagram.



No match shown on detail diagram for this box.



No match shown on parent diagram.

Read each diagram systematically

The precise information about a system is in the diagrams themselves, not in what the author says about them in the text. So, the following reading sequence is recommended:

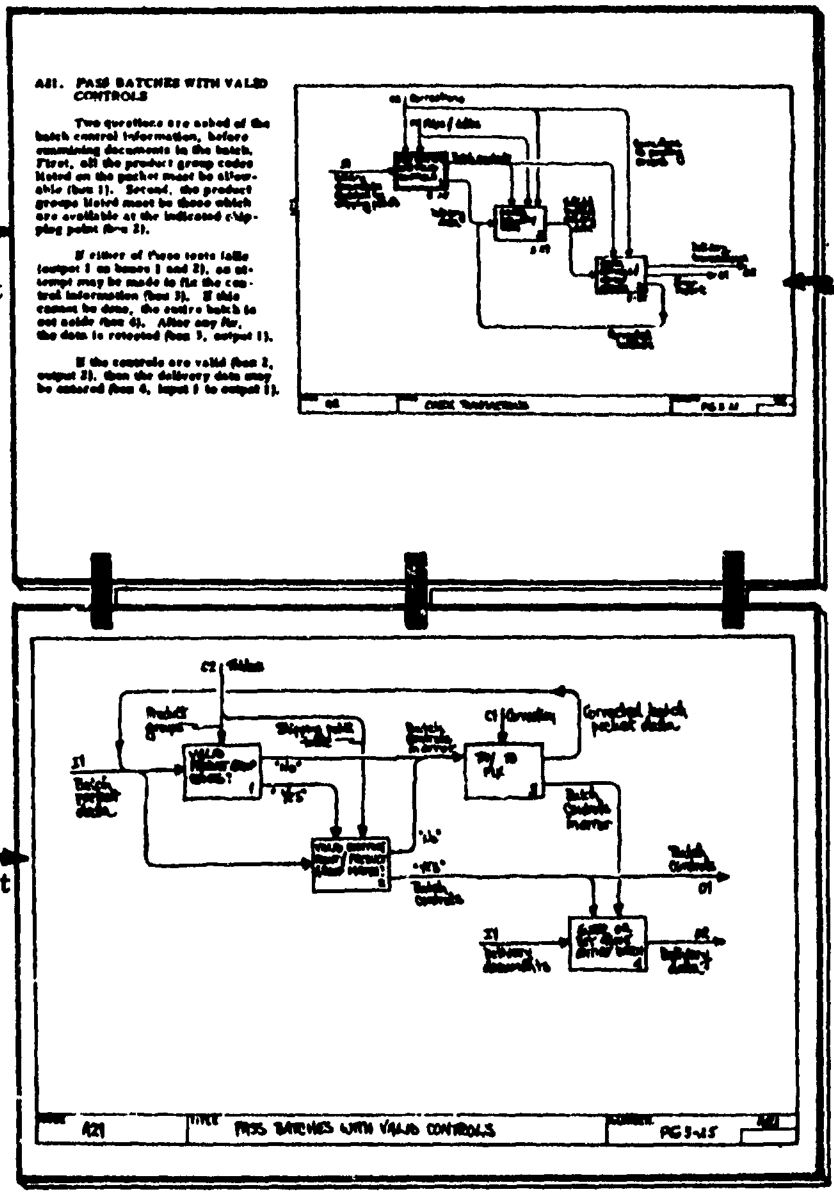
1. Scan only the boxes of the current diagram to gain a first impression of what is being described.
2. Refer back to the parent diagram and note how the arrows connecting to the appropriate box reappear in the current diagram. Try to identify a "most important" input or control and a "most important" output.
3. Then, consider the arrows of the current diagram. Try to determine if there is a main path linking the "most important" input or control and the "most important" output.
4. Mentally walk through the diagram, from upper left to lower right, using the main path as a guide. Note how other arrows interact with each box. Determine if there are secondary paths. Check the story being told by the diagram, by considering how familiar situations are handled.
5. Finally, read the text to complete your understanding.

This sequence becomes quite natural and ensures that the major features of each diagram receive attention. The reader should find that, with a little concentration, the diagrams are not difficult to read. The text will call attention to anything that the author wishes to emphasize.

Occasionally, an author may include a "For Exposition Only" or "FEO" diagram. Such a diagram highlights a particularly interesting or subtle aspect of the model. It is not part of the "top-down" decomposition of the model. The FEO diagram's title describes its purpose. Before reading any diagram, check to see if related FEO's exist.

Helpful text discussing the current diagram.

This smaller diagram is the parent for the current diagram.



This is the current diagram.

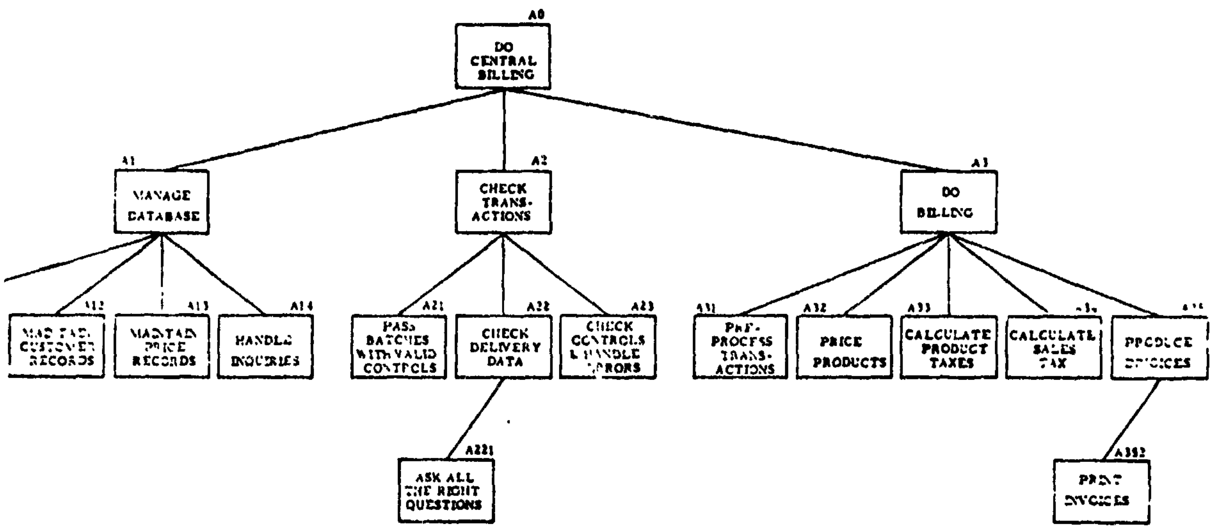
EACH DIAGRAM IS PUBLISHED
ON A PAIR OF FACING PAGES.

Diagrams are indexed by node numbers

In an SADT diagram, the component parts are shown as numbered boxes. Each box is detailed in one diagram at the next lower level, until a sufficient level of detail is reached.

If one were to spread out all of the diagrams as they are arranged in a model, a structure like that shown below would result. The uppermost diagram is the most abstract diagram in the model. It is composed of three boxes; each box is decomposed on another diagram. The boxes on each of these diagrams are then decomposed in another set of diagrams. The figure below shows the arrangement of the diagrams.

The place of each diagram in a model is indicated by a "node number", derived from the numbering of boxes. For example, A21 is the diagram which details box 1 on the A2 diagram. Similarly, A2 details box 2 on the A0 diagram, which is the top diagram of the model. This hierarchy may be shown in an index of diagram names and their node numbers called a "node chart". The figure shown below is a typical node chart. The node chart merely serves as a table of contents for a model. Each box in this node chart represents a whole diagram.

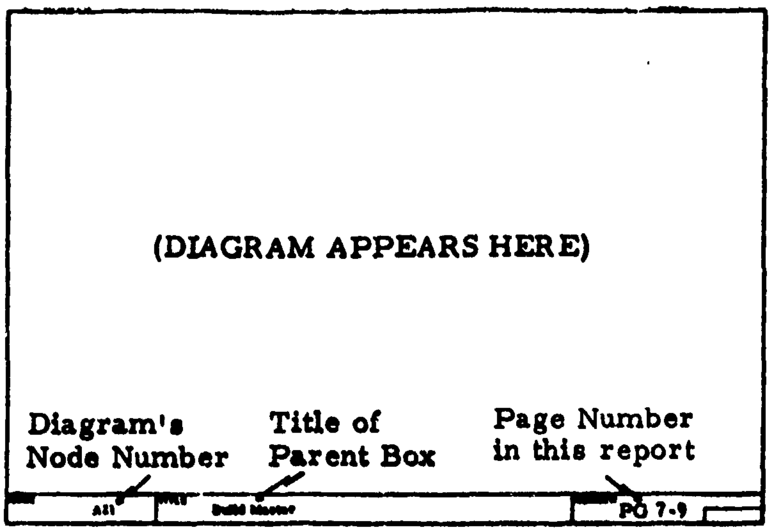


NODE NUMBERS REFLECT THE DECOMPOSITION

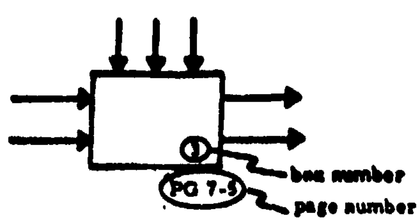
How to find details of a box

A diagram's node number is written in the lower-left corner of the standard SADT diagram sheet. The number that appears in the lower right corner is the page number or figure number.

On the diagram, the box number appears in the lower-right corner of each box, and a page number appears just outside the box and below the box number. The page number identifies the page which contains the detail diagram for the box. If it is omitted, no further detail exists.



PUBLISHED VERSION OF DIAGRAM SHEET



PAGE NUMBER OF DETAIL DIAGRAM MAY APPEAR BELOW BOX