SECTION 2
IUE GROUND SYSTEM ORGANIZATION

SECTION 2. IUE GROUND SYSTEM ORGANIZATION

2.1 GENERAL

This section describes the personnel, functional description of key positions, and limits of authority within the IUE ground system organization.

2.2 DIRECT OPERATIONS STAFF

This section discusses the operations staff positions that are directly involved with the routine operation of the IUE observatory. Figure 2-1 is an organization chart representing the communications and interaction relationships among the operational staff without regard to the line organizations to which the individuals are assigned. The top structure is shown in simplified form for reference only. The following discussion will address the functions and responsibilities of staff positions starting at the Mission Operations Manager (MOM) level.

2.2.1 MISSION OPERATIONS MANAGER

The MOM has overall responsibility for ground system implementation, development of all necessary procedures and software, and for ensuring the safety of the flight spacecraft and scientific instrument from launch throughout the IUE mission lifetime. As senior project representative in the ground system area, the MOM possesses final authority in granting approval to perform hazardous operations with the spacecraft, resolving spacecraft scheduling conflicts, directing emergency operations, and approving ground system hardware and software modifications. The MOM may delegate certain decision authority to the Project Operations Director (POD) and to the ESA Operations Engineer.

2.2.2 PROJECT OPERATIONS DIRECTOR

The POD resides in the IUE Control Center and acts for the MOM in his absence. The POD receives guidance from the MOM in the form of general policy and objectives, and exercises decision-making authority as delegated. The POD has primary responsibility for scheduling weekly spacecraft operations and operational shift periods; performing routine coordination with the ESA Operations Engineer; and granting approval for critical command transmissions, maneuver constraint overrides, and other non-routine spacecraft operations. The POD interfaces directly with Resident Astronomers (RA) to coordinate scheduling and resolve problems.

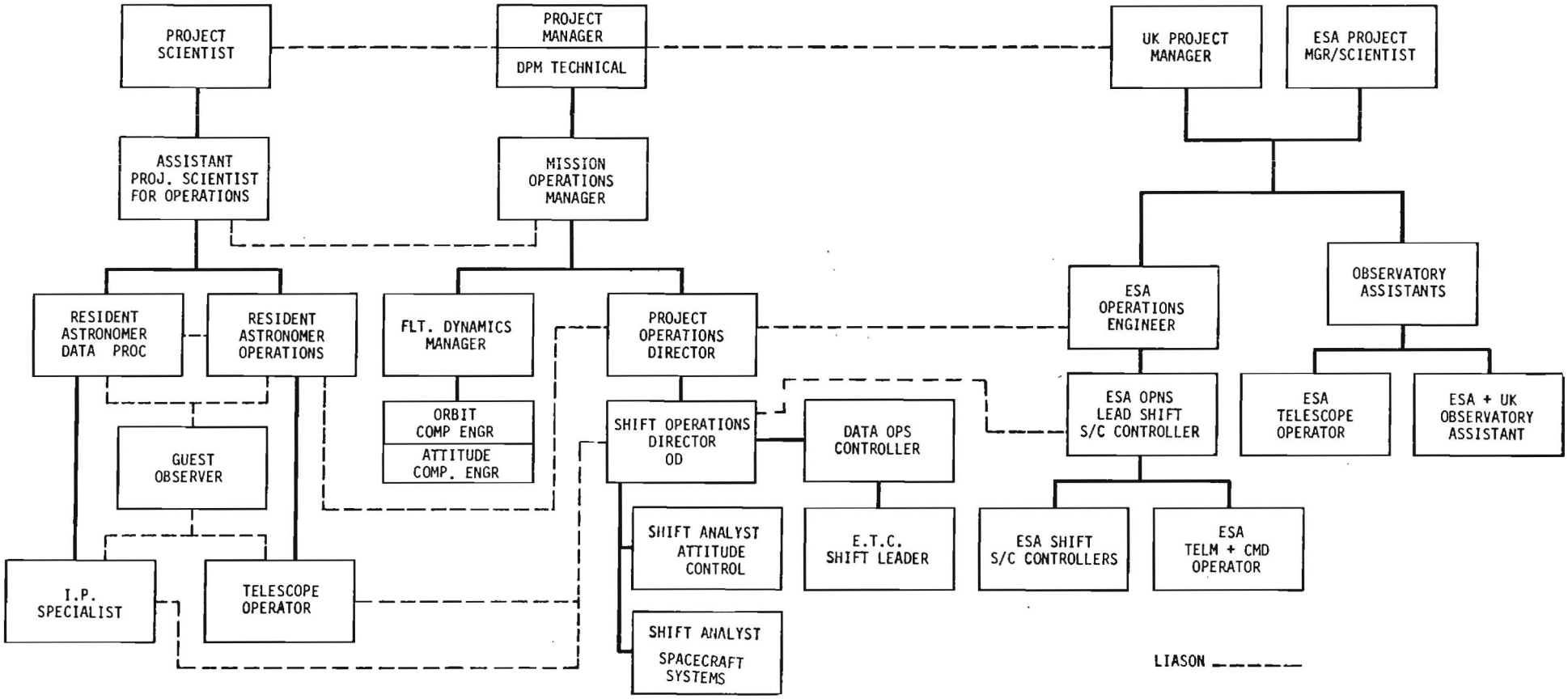

Figure 2-1. IUE Flight Operations Organization Chart

2.2.3 SHIFT OPERATIONS DIRECTOR

A team of three Spacecraft Analysts (one of which is designated Operations Director [OD]) is required to be on duty at all times in the Mission Operations Room (MOR) to ensure the safety and well-being of the spacecraft and to perform required engineering operations.

The OD is the leader of the shift spacecraft operations team. He is responsible for the coordination of all spacecraft operations with IUE ground system elements. The OD and his team members are directly responsible for the safety of the IUE spacecraft and for maximizing the time available for scientific observations. Spacecraft safety considerations have priority over scientific operations in the event of conflict. The OD is responsible for working out with the Telescope Operator (TO) optimum times to perform ranging measurements, wheel unloads, and spacecraft equipment configuration changes. He monitors the scientific instrument for proper engineering performance during scientific observations.

At most times, the OD will function as command controller. As such, he will perform all housekeeping commanding, assign commanding authority, and approve all critical commands. He will monitor all outgoing commands and will coordinate verification of same. Upon the advice of the Attitude Control System (ACS) Analyst, he will approve the uplink of all SOC-initiated maneuver commands.

The OD receives direction from the POD or the MOM pertaining to spacecraft operations to be performed. This direction is in the form of written schedules and approved spacecraft operations requests. Under no circumstances is the OD to accept verbal instructions to send commands or alter the spacecraft in any way from anyone other than the MOM or POD. Routine scientific operations do not require written spacecraft operations requests, provided that no constrained maneuvers are to be performed. Minor spacecraft equipment changes (such as turning on a heater, ranging, etc.) may be made at the discretion of the OD, but must be entered into the operations log. Emergency recovery procedures may likewise be executed at OD discretion in the event of clear evidence of need. MOM/POD approved spacecraft operations requests are specifically required for the following (or similar)cases:

a. Any engineering test or operation.

b. Change of ACS mode to anything other than HOLD/SLEW.

c. Turn-on redundant hardware: (power supplies, transmitters, OBC, etc.)

d. Station-keeping maneuvers.

e. Slews which violate established dynamic or static pointing constraints.

f. Patches to OBC flight software.

In the event of clear and present hazard to the IUE spacecraft (i.e., declared spacecraft emergency), verbal instruction to alter or deviate from prepared recovery procedures will be accepted from the following GSFC personnel (listed in descending order of authority):

a. Spacecraft

(1) H. Freeman
(2) J. Moore
(3) J. Kelly

b. OBC

(1) T. Taylor
(2) M. Tong
(3) V. Kalb
(4) B. Scott

The OD is expected to exercise sound judgement in the absence of both the MOM and POD in carrying out spacecraft operations. If in the single opinion of the OD, any upcoming operation is not adequately prepared, not fully understood by all, is being pursued in a hasty or careless manner, or is potentially dangerous; he has standing authority to suspend or cancel the operation until the MOM or POD can be consulted by telephone.

The OD will report on all anomalies and departures from normal spacecraft operations and will undertake, with the assistance of team members, the detailed analysis of these anomalies when required. The OD will inform the SOC whenever spacecraft or ground system anomalies require suspension of operations. He will advise the SOC as soon as normal operations may be resumed.

The OD will log significant items in the spacecraft operations log and will ensure that the ACS log is properly kept. He will monitor and disseminate incoming TTY traffic and other instruction/information material. He will ensure that needed reference documents are available in the MOR.

He submits his recommendations on administrative matters concerning his team.

As the leader of the shift spacecraft operating crew, the OD is expected to take positive action to optimize the performance of his team and to encourage initiative and promote professional attitudes.

The OD position is normally filled by the Lead Analyst. However, this role may, on occasion, be assumed by the Spacecraft Analyst Supervisor, by one of the Staff Analysts, or by another Shift Analyst. Whenever OD responsibility is passed from one person to another, this change will be made in a clear-cut manner and will be announced to all OCC participants.

2.2.4 ATTITUDE CONTROL SYSTEM ANALYST

The ACS Analyst is responsible for knowing at all times the state and performance of the ACS including the on-board computer hardware, software, hydrazine propulsion system, digital sun sensor, and the fine error sensor. He advises the OD when wheel unloading and equipment configuration changes are required.

The ACS Analyst reviews and approves proposed maneuvers prior to execution by the TO. He reports the start and completion of each maneuver leg to the OD. He approves the use of the FES as an input to the OBC HOLD/SLEW program before such configuration is implemented by the TO. He monitors and approves all changes of OBC mode select bits. He will advise the OD of concurrence prior to the uplinking of all maneuver commands.

He is responsible for determining that the use of the ACS is compatible with the current observational situation, and will advise the TO whenever undesirable control modes are being attempted. In the event of loss of stabilization or other malfunction, the ACS Analyst is responsible for specifying the proper recovery procedure to be used. Early detection and prompt corrective action of in-flight malfunction are the goals to be strived for.

The ACS Analyst will log all significant items in the ACS log and will annotate significant ACS events on the stripchart recorder.

The ACS Analyst will participate as required in special assignments such as anomaly analysis, long-term trend analysis, special subsystem engineering tests, etc.

2.2.5 SPACECRAFT SYSTEMS ANALYST (SYSTEMS)

The Systems Analyst is responsible for cognizance of the electrical power, thermal, data, command, and RF systems. He ensures that the electrical power balance is at all times positive and that all temperatures are within limits. He recommends to the OD corrective actions necessary to maintain or correct various spacecraft and SI temperatures. He is also responsible for estimating the state of charge of the batteries. The Systems Analyst annotates the stripchart recorder at 1-hour intervals and at events which produce noticeable changes in the spacecraft bus current. Additionally, he monitors the spacecraft received signal strength (during commanding) and advises when levels are marginal or a polarization change is needed.

He is responsible for monitoring data quality at all times. He will determine and advise when S-band antenna switches are advisable and when data quality is sufficient for image readout.

The Systems Analyst will monitor data flow and systems related OBC parameters and functions such as telemetry format, decoder being used, OBC diagnostic flags, etc.

2.2.6 TELESCOPE OPERATOR (U.S. and ESA)

The TO is responsible for conducting scientific operations from the telescope operations console in the SOC. The TO assists the guest observer in executing the observing program and performs all keyboard entries to the Sigma 5 via the Experiment Data System (EDS) to perform maneuvers, map star fields, perform target acquisition, execute camera procedures, and perform quick-look data analysis. The TO communicates with the Lead Spacecraft Analyst when restricted operations need to be performed such as a request to override maneuver constraints, momentum wheel unloading, or reconfiguration of spacecraft equipment or guidance mode. The TO verifies the proper configuration and operation of the scientific instrument. The TO assisted by the RA's are responsible for detecting and working around subtle performance changes in the FES and cameras. Similarly, the TO may be the first to observe guidance system anomalies and should advise the RA and OD in such cases.

The ESA TO has similar responsibilities and relationship to the ESA Lead Spacecraft Controller although the relationship with the UK and ESA resident astronomers may differ somewhat.

2.2.7 DATA OPERATIONS CONTROLLER

The Data Operations Controller (DOC) is responsible for the equipment configuration within IUEOCC and maintenance of data communications with the

spacecraft and VILSPA (when needed). The DOC interfaces directly with the Spacecraft Analyst, the ETC Shift Leader and the ESA Lead Spacecraft Controller in performing his functions. The counterpart to the GSFC DOC within the VILSPA control center is the ESA Telemetry and Command Operator. Coordination with the DOC is available through the ESA Lead Spacecraft Controller.

2.2.8 ETC SHIFT LEADER

The ETC Shift Leader is the point of contact at ETC for coordination with IUEOCC and for resolving problems associated with ground antennas, receivers, and transmitters, and the hardwire communications between ETC and IUEOCC.

2.2.9 FLIGHT DYNAMICS MANAGER

The Flight Dynamics Manager (FDM) has primary responsibility during transfer orbit for orbit and attitude determination, orbit and attitude maneuvers, ABM firing, station acquisition, and initial mission phase attitude determination. After these have been achieved, the FDM's responsibilities consist of routine production of antenna steering tapes, ephemeris update, orbit determination, and station maintenance through periodic orbit adjustment maneuvers as required. The FDM interfaces with the MOM or POD for spacecraft operations. There is no ESA counterpart to the FDM since ESA has no responsibilities in this area. The FDM is assisted by an Orbit Computation Engineer and an Attitude Computation Engineer.

2.2.10 RESIDENT ASTRONOMERS

The RA's perform an advisory function with the guest observers and generally run the ground observatory. The RA's ensure that observations are performed in a consistent manner with policy established by the joint project scientists, including access rights to archive data. The RA for data processing is responsible for the production of processed data products, advising guest observers in cases where special processing is indicated, and regulating the commitment of production volume and turnaround time to be consistent with the ground system capabilities and equitably made available to all observers. The RA for operations is responsible for production and readiness of pre-observation data tapes which contain target lists, finder fields, and other preplanned information. The guest observer's interface with IUE is primarily with the RA, TO, and Image Processing Specialist (IPS).

2.2.11 IMAGE PROCESSING SPECIALIST

The IPS operates the IUE Spectral Image Processing Center within the SOC. This equipment is connected to the Sigma 9 in IUEOCC. The IPS examines the daily queue of images places on the shared disk by the Sigma 5 and plans the day's activities accordingly. The RA for data processing advises the IPS on priorities, observer-specified processing objectives, and desired output products. The IPS communicates principally with the Sigma 9 computer operators and the RA for data processing. However, the IPS is contacted by the POD or Lead Spacecraft Analyst to coordinate the shutdown of image processing when it is necessary to transfer spacecraft operations to the Sigma 9 in case of Sigma 5 computer failure.

2.2.12 STAFF ANALYSTS

Not shown on this organization chart are three non-shift Spacecraft Staff Analysts who perform a detailed examination of spacecraft subsystem performance and prepare subsystem performance reports. In addition, these Staff Analysts undertake spacecraft troubleshooting when required and develop suitable operational solutions in cases of flight hardware failure and anomalous operation. A parallel function does not exist within the VILSPA Control Center; therefore, the VILSPA capability to perform troubleshooting (beyond first action to save the spacecraft and scientific instrument) is limited. In such cases, the U.S. control center is notified immediately for problem diagnosis and possible spacecraft takeover for troubleshooting operations.