

SECTION 1  
INTRODUCTION

## SECTION 1. INTRODUCTION

### 1.1 PURPOSE AND SCOPE

The purpose of this manual is to provide an authoritative single-reference definition for the operation of the IUE satellite, both in the launch and mission phases. It provides guidelines for routine operations, policy guidance for emergencies or abnormal situations, and a description of the ground system organization and how it is intended to function. This manual applies to ESA/U.K.-controlled operations from the ESA Ground System in Madrid (VILSPA) as well as to those conducted from the U.S. ground system at GSFC.

### 1.2 DEFINITION OF LAUNCH AND MISSION PHASES

This manual will use the term launch phase in an enlarged sense to include the launch and powered flight sequence as well as transfer-orbit operations through Apogee Boost Motor (ABM) firing, despin, deployment, and sun acquisition. All operations subsequent to the initial sun acquisition will be referred to as the mission phase even though orbital commissioning, which includes the initial flight use of the scientific instrument, will take place in this phase prior to the start of routine operations.

### 1.3 OPERATIONS PHILOSOPHY, MISSION OBJECTIVES

The IUE scientific mission is to obtain high resolution ultraviolet spectra of stars, planets, and other targets of interest. The spectra are acquired in the form of digital television readouts of charge patterns accumulated on the charge-integrating target of a SEC vidicon. Operationally, the spacecraft and the ground system are to function as an integral system functionally resembling ground-based observatories. A synchronous orbit was chosen such that continuous contact with dedicated ground antennas would result, thereby enabling guest observers to interact with the flight instrument to maximize the scientific yield of their observations. In contrast to the OAO spacecraft, IUE observations are not preprogrammed, but are controlled on line and in real time by guest observers with the assistance of a telescope operator. A fundamental design concept of the IUE observatory is the capability of producing processed data products within 24 hours of a typical observing session.

The IUE ground system was implemented to offer the most direct control of the spacecraft possible to the scientific operations personnel without

burdening the observer with the requirement for detailed knowledge of spacecraft subsystems and commands. This is accomplished by the provision of a set of software procedures which are executed by the ground system computer to perform a number of elementary functions. An observation then consists of a sequence of elementary operations in which the target is acquired, and the cameras are prepared, exposed, and read out. The guest observer, assisted by the Telescope operator, specifies a sequence of procedures to accomplish an observation and evaluates their performance as they are executed. Many procedures have optional arguments whereby an observer may specify variations in execution such as the duration of an exposure. The procedures in turn send all necessary commands to the spacecraft and incorporate suitable safety checks to prevent the possibility of doing anything harmful to the spacecraft.

Operations procedures are written in a specially designed language for IUE known as the Procedural Control Language (PCL) in the Ground System for Integration and Test, and as the Control Center Interactive Language (CCIL) in the ground system for flight operations. The language resembles FORTRAN, and is executed by an interpreter program in the ground computer. Therefore, procedures are similar to, but not the same as, computer programs.

#### 1.4 DESCRIPTION OF GROUND SYSTEM ELEMENTS

The U.S. ground system consists of three major sites:

- a. ETC: Ground Receiving and Transmitting.
- b. Bldg 14: IUEOCC, computers and Mission Operations Room (MOR).
- c. Bldg 21: Scientific Operations Center (SOC).

The three sites are interconnected by dedicated cables and communications circuits, and hence operate as a system.

The MOR in the IUEOCC is used by spacecraft analysts to monitor the status of the spacecraft at all times. The SOC is used by guest observers, resident astronomers, and operators to conduct scientific operations and scientific data processing. When controlling the spacecraft from the SOC, no individual commands may be specified by the telescope operator. Only the execution of a number of procedures which are stored within the Sigma 5 in the IUEOCC may be specified. The telescope operator's interface to the ground system is the Experiment Display System (EDS) which is connected to the Sigma 5. The ESA ground system consists of functionally identical elements located at the ESA satellite tracking station (known as VILSPA) near Madrid, Spain. Both scientific and spacecraft operations are conducted in the IUE-dedicated control room at VILSPA.

For a more detailed discussion of the ground system design, the reader is referred to the "IUE System Design Report," Volume 3, December 1974.

## 1.5 ORGANIZATION, CONTROL, AND DISTRIBUTION OF THIS MANUAL

This revised IUE Flight Operations Manual is comprised of 10 sections, organized as follows:

- Section 1 - Introduction
- Section 2 - Ground System Organization
- Section 3 - Operations Policies and Guidelines
- Section 4 - Operations Directives
- Section 5 - Procedure (PROC) Descriptions
- Section 6 - Telemetry and Command List
- Section 7 - CRT Display Pages
- Section 8 - CCIL Language Manual
- Section 9 - Orbit Data
- Section 10 - Subsystem Information

This document is a joint U.S., U.K., ESA product and is intended for issue to the operations staff of the U.S. and ESA IUE ground systems. Individual copies of this document bear unique numbers and are recorded as being assigned to their recipients. Updated sections will be mailed to registered holders of manuals on a periodic basis.

This document is controlled with the initial release. Change recommendations should be sent to:

IUE Mission Operations Manager  
Code 410, NASA/GSFC  
Greenbelt, MD 20771

## 1.6 RELATED DOCUMENTS

The following documents are related to the design and operation of the IUE ground system, and are included in this manual by reference only.

- a. IUE Project Plan
- b. IUE System Design Report, IUE 401-76-099
  - Volume 1, Scientific Instrument, August, 1976
  - Volume 2, Spacecraft, June 1976
  - Volume 3, Ground System, December, 1974
- c. IUE Support Instrumentation Requirements Document (SIRD), Rev. 1, March, 1977
- d. IUE Network Support Plan  
STDN No. 601/IUE, May, 1977

- e. IUE Network Operations Support Plan
- f. IUE Geometric Support Analysis  
STDN No. 717/IUE, December, 1977
- g. IUE Ground Station Reference Data  
S-861-75-073
- h. IUE Mission Operations Plan  
December, 1977
- i. IUE Telemetry and Command List  
IUE-733-76-101, December, 1977
- j. IUE On Board Computer Software  
Specification
- k. IUE Image Header Format  
513-77-106
- l. IUE Satellite Mission Analysis (ORBIT)  
Update 1, IUE 581-75-078, June, 1977
- m. IUE Operations Control Center Software  
System Development Plan, CSC/SD-77/6029, April, 1977
- n. IUE Control Center Software Operations Manual  
CSC/SD-76/6055 (4.9), November, 1977
- o. IUE Control Center Interactive Language (CCIL) Reference Manual  
Rev. 1, January, 1978
- p. IUE Experiment Display Users Manual  
March, 1977
- q. IUE Spectral Image Processing System Users Guide
- r. IUE Camera Operations Manual, AL IUE TN 30, October 1977.