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EOSDIS Core System Project

Instrument Support Toolkit Prototype Usability Test Plan for the ECS Project

February 1995

Hughes Applied Information Systems
Landover, Maryland

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Preface

This document is submitted as required by the ECS Statement of Work (August 1994), Section 3.3.3.3, and does not require Government approval. After this prototype has been completed, a final report will be documented in the Prototyping and Studies Final Report (DID 331/DV3).

For additional technical information pertaining to the Instrument Support Toolkit prototype, contact Jim Creegan at (301) 925-0621 or via e-mail at jcreegan@eos.hitc.com.

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Abstract

This test plan defines an approach for testing the usability of the Instrument Support Toolkit (IST) prototype. This plan identifies the required personnel, facilities, basic testing strategies, and metrics. Testing will be performed on the IST prototype. The objective of this testing is to examine the effectiveness of preliminary design concepts and improve usability as the design process evolves. This test plan was primarily based upon the paper "Usability Testing On a Budget, A Usability Test Case Study", written by Martha Szczur, and on heritage usability test plans.

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1. Introduction

1.1 Purpose

The purpose of this test plan is to define an approach for testing the Instrument Support Toolkit (IST) prototype usability. The IST is a user interface tool providing access to EOC functions. The EOC is responsible for the high-level monitoring and control of all U.S. Spacecraft and all instruments on-board the U.S. EOS spacecraft. It will maintain spacecraft and instrument health and safety, monitor spacecraft performance, perform spacecraft engineering analysis and perform high-level monitoring of the mission performance of the instruments. The IST will be delivered to the Principal Investigator/Team Leader (PI/TL) sites for U.S. EOS instruments. This enables PIs and TIs who are not physically located at the EOC to participate in the planning, scheduling, commanding, monitoring, and analysis of their instruments. The IST prototype design is based on the level 3 FOS requirements defined in the ECS Requirements Specification for monitoring and controlling the spacecraft and instruments.

In the early phase of prototype development, the IST development team held discussions with typical end users. These discussions were highly successful in understanding the needs of the user. The feedback from the discussions, surveys and questionnaires was incorporated into the prototype. During the current phase of development, usability testing will provide empirical data to supplement the subjective feedback received.

1.2 Scope

The testing described in this plan highlights the major features and functionality of the IST. The tasks described in the test plan exercise these functions and how the user interacts with the IST, providing for an evaluation of the usability of the toolkit.

1.3 Objectives

The objectives of this usability test effort are to:

- define usability tests and scoring criteria to evaluate the usability of the IST prototype
- conduct preliminary usability tests with the user community to collect empirical data to supplement feedback, and
- improve the usability of the prototype, and feed the knowledge gained into the design process.

1.4 Applicable Documents

DSTL-93-024 NCC/ROSE GUI Usability Test Plan, GSFC 1993

DSTL-94-002 Usability Testing Handbook, GSFC 1994

DSTL -92-007 Human Computer Interface Guidelines - Checklists, GSFC 1993

Szczur, Martha, "Usability Testing On a Budget, A Usability Test Case Study", GSFC

Rubin, Jeffrey, "Handbook of Usability Testing", WILEY 1994

2. Resources

2.1 Personnel

2.1.1 Test Participant

One test participant will be used for each test session. There will be a total of five test sessions over a two day test period. Two tests will be performed on the first day and 3 tests will be performed on the second day, including one re-take. Each test session will be video-recorded to augment the debriefing process. One hour for the testing session and one hour for the debriefing session will be provided.

The test tasks will be provided during the testing session. These tasks are summarized in section 3.4 of this document. The actual test tasks and other test material can be accessed from the contact person identified in the preface of this document.

All the test participants will be Loral employees external to the ECS project. An ECS FOS User Interface charge number will be provided for each test participant.

The test participants will be typical end users that will not be familiar with the prototype. The test participant will be encouraged to think aloud as they perform test tasks in order to facilitate recording of their observations. The test participant will receive a brief demonstration of the prototype to get acquainted with the desktop environment. The test participant will be the same type of end user of the IST (i.e., instrument operator, instrument engineer). The computer system experience among the test participants will vary to provide representative sampling of end users.

2.1.2 Observers

There will be at least two observers for each test session. Observers will be personnel who are IST developers, or experienced users of the system. Observers will monitor and document ongoing test activities. They will not speak during the testing. Observers will record their observations on the form provided for each test. Observers are looking for usability problems (e.g., "Where did the testers get misled?" ...).

2.1.3 Facilitator

One facilitator will be used during the testing session. The facilitator is a neutral observer of the testing and plays the role of host to the other participants. The facilitator will keep the test session moving and on schedule. The facilitator refrains from helping or guiding the testers unless they reach an impasse. When this occurs, the problem is documented and the facilitator will explain how to proceed. The facilitator, at the sign of participant frustration, will encourage the participant to continue to avoid ending the task too quickly. It is important to observe difficulties experienced by participants to help indicate design flaws. The facilitator will record time, errors, and comments on the form provided.

2.1.4 Debriefing

The debriefer will review the videotape recording with the tester. Actions, viewpoints, and comments will be discussed. The debriefing session should be comfortable. The debriefer will begin by letting the test participant say whatever is on his or her mind. The first topic in which the test participant chooses to speak may be the most prominent topic. The debriefer should begin questions on a general level focusing on interface presentation and design. More specific issues will be addressed while reviewing the videotape. The debriefer will not react to the test participant's answers to avoid implicating that one answer is better than another.

2.2 Test Site

The testing will be conducted in a conference room at the ECS Landover Facility. The room will accommodate the IST prototype hardware and software, a desktop workspace, a video camera and the test personnel. Another conference room will be used to replay the recorded test session to the test participant along with the debriefer to gather feedback. In the essence of time, testing will continue as a briefing takes place in the other conference room.

3. Usability Test Sessions

The tasks to be evaluated during this testing include those that are performed frequently, those that are more complex, and those that are basic tasks that have been included to relieve tester tension during the course of the test session.

3.1 Test Administration

The testers will be given a general orientation of the IST workstation environment and flow of the system functionality. Test participant will be given one task at a time with no indication of how many tasks are remaining.

The observers will be provided with a copy of a form on which to enter data for the task about to be tested.

The test participant reads the task instructions and may ask any questions to clarify directions. When the test participant is ready to begin, the facilitator clocks the actual time to perform each task. During performance of the task, the facilitator and observers record behavior and events performed by the test participant.

There will be five test sessions. Two of the same test participants will be retested to indicate the learning curve factor.

At the completion of the test session, the test participant and an observer will evaluate the video recording of the test session. This is where an evaluation form will be completed.

3.2 Pre-Test Training

Pre-Test training includes the minimum amount of background information to enable the tester to accomplish the tasks. The pre-test training will be defined in the test procedure.

During the pre-test briefing, the facilitator will emphasize to the testers that the purpose of the test is to evaluate the usability of the prototype and not the competence of the tester.

3.3 General Conduct of Test Sessions

3.3.1 Release Forms

The purpose of the release form is to explain to the testers that they will be asked to perform some tasks with the prototype and to share their experiences. The release form is to inform the tester that he/she has the right to stop participating in the test at any time.

3.3.2 Video Recording

The purpose of the video recording is to capture the test session on tape so that it can later be evaluated.

3.3.3 Questionnaire

The questionnaire is used to gather feedback and usability metrics.

3.3.4 Test Time

The test sessions will be kept as consistent as practicable and will last no more than one hour.

3.3.5 Post-Test

At the conclusion of the test session, testers will observe the video replay of the testing session. This is to solicit feedback on the testing experience.

3.4 Task Selection for Testing

Tasks to be included in test sessions include simple window management tasks, complex analysis and commanding tasks. Tasks to be tested are:

- **Monitor telemetry data-** This task consists of monitoring telemetry using telemetry windows in a graph, spreadsheet and alphanumeric display.
- **Monitor real-time events-** This task consists of monitoring and filtering events using the event window.
- **Perform real-time analysis-** This task consists of opening the quick analysis window from a telemetry room and selecting mnemonics and output views to observe telemetry data in real time.
- **Perform offline analysis-** This task consists of selecting the offline analysis tool and selecting mnemonics, sample rate, time, frequency, filters and format options using the Analysis Request Builder window. Upon processing the requests, the status of the request is to be monitored using the Analysis Status window. When the status is complete, the product selector window is to be invoked and the analysis results are to be displayed.
- **Edit procedures-** This task consists of selecting the Procedure Builder tool and editing a command procedure. The syntax check and procedure validation utilities are to be executed. Both valid and invalid edits are to be introduced to observe successful and unsuccessful status indicators. Upon observing a successful status message, the procedure is to be saved.
- **Control command execution-** This task consists of opening a command control display and suspending and resuming command execution. Directives are to be enabled/disabled and other functions are to be performed including find, jump, and clear.
- **Analyzing event history -** This task consists of opening the event analyzer window and zooming in on a group of events. Events are to be filtered using the event filter option.
- **Opening a room-** This task consists of opening a room using the <ROOM NAME> button, ROOM button, and specifying directives using the command prompt (from the control window).

- **Opening a window-** This task consists of opening a window using the WINDOW button.
- **Tiling a room-** This task consists of selecting the tile option in a room.
- **Changing mnemonics to descriptors-** This task consists of selecting mnemonic values from a telemetry window and selecting the menu option to change to descriptor.
- **Changing numerical values -** This task consists of selecting mnemonic values from a telemetry window and selecting the menu option to change the numerical value to a EU, RAW, Decimal or HEX value.

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4. Data Collection and Analysis

4.1 Test Participant Data

Test participants will complete a background questionnaire to reveal their experience and computer systems background. This information will help to understand the behavior and attitudes during the test.

The facilitator and observers will collect data during the test. They will complete a form containing checklists and simple coding schemes to expedite the collection of data. Generally the data collected will be based on objective measures of behavior and subjective data. Objective data is based on recorded time and events and subjective data is based on the participants opinions and attitudes.

The debriefer will collect data after the test. The information gathered will focus on ease of use and ease of learning. The debriefer will be able to use the timer on the videotape to record specific timing events. User satisfaction will be measured by attitude scales (e.g., like, dislike) and comments (e.g., friendly, unfriendly).

4.2 Test Data Metrics

The test data metrics to be collected consists of target and actual values of efficiency, effectiveness and user satisfaction. Also qualitative observations will be collected.

The metric measurements will be defined on the questionnaire forms distributed prior to the testing. Each metric is described in the following:

- **Effectiveness**- Measures of effectiveness will relate the target goals of the task to the actual accuracy and completeness achieved. The number of errors occurred is a factor used for this metric.
- **Efficiency**-Measures of efficiency relate the target level effort of the task to the actual effort required. The actual amount of time taken to achieve the task is a factor used for this metric.
- **Satisfaction** - Measures the comfort and overall acceptability of the task. This metric must be subjectively determined by the tester. The attitude of the tester (e.g., negative or positive) is a factor used for this metric.

4.3 Test Data Compilation and Analysis

The data for each metric will be collected and formatted for ease of analysis. Analysis will be based on the metrics compiled, the notes and comments from the observers and general comments from the testers. The results of this analysis will be used to improve the usability of the prototype.

4.4 At-Site Feedback Comparison

An additional mechanism for obtaining feedback on usability is "At-Site" testing. This provides an informal way of gathering feedback from potential users. The prototype software has been packaged onto a tape and distributed to various instrument sites. The users at these sites will independently test the software for one month. The users will complete the questionnaire provided. This questionnaire will include the same satisfaction metrics used for the usability test so that the results can be directly compared. This process may determine the best method to obtain usability feedback in the future.

5. Schedule

- August 22, 1994** **Prototype Distribution to instrument sites-** The prototype will be sent to JPL and others for "at-site" testing.
- August 31, 1994** **Test Procedure Development -** The test procedures and questionnaire metrics will be completed.
- Sept 12, 1994** **Test Plan Review -** The test plan including test procedures will be reviewed by Jim Creegan, Elizabeth Buie, Bob Dutilly and Nelson Pingitore.
- Sept 14, 1994** **Dry Run Test -** An internal test will be performed to validate the test procedures.
- Sept 20,21, 1994** **Usability Testing -** The formal usability testing will take place at Loral Aeorsys in the Landover facility.
- Sept 23, 1994** **Gather results-** Obtain the results from "at-site" and formal usability tests.
- Sept 30, 1994** **Compile Results -**The test results will be compiled and formatted.
- Oct 14, 1994** **Usability Test Results -** The final results of the usability testing will be completed and summarized.