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Telerobotics/EVA Joint Analysis System (TEJAS)

Version 1.0 User's Guide

M. L. Drews

(NASA-CR-197323) TELEROBOTICS/EVA JOINT ANALYSIS SYSTEM (TEJAS) VERSION 1.0 USER'S GUIDE (JPL) 332 p

N95-70724

Unclas

Z9/63 0040664

March 30, 1990

National Aeronautics and
Space Administration

Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California

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The research described in this report was carried out by the Jet Propulsion Laboratory, California Institute of Technology, under contract with the National Aeronautics and Space Administration. The TEJAS software concept, stacks, cards, card backgrounds, fields, pictures, icons, and HyperTalk scripts were developed as part of this project.

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The PopUpMenu resource (XCMD #4479) and all messages calling it in TEJAS Version 1.0 is from *101 Scripts & Buttons for HyperCard™*, published by Individual Software and created by Craig Ragland of INTERACTIVE DESIGN. This XCMD resource is used in this stack with permission since the developer of this stack is a legitimate owner of this product. The XCMD is not in public domain but is used in the TEJAS stack system under license by the copyright holder, Individual Software. Others may not extract or use this XCMD in other stacks unless they are also owners of *101 Scripts & Buttons for HyperCard™*. For further information about XCMD #4479, contact Individual Software, 125 Shoreway #3000, San Carlos, CA 94070 800-331-3313 (USA) or 415-595-8855 (in CA)

Abstract

This report contains detailed instructions, including examples, that explain how to use the Telerobotics/EVA Joint Analysis System (TEJAS) Version 1.0 software multimedia stack (file) system. This software tool demonstrates the effectiveness of hypermedia (reactive multimedia) for reference, communication, planning, and analysis of space telerobot and crew extravehicular activity (EVA) tasks and for planning the development of necessary telerobotics technologies. TEJAS Version 1.0 is a system containing twenty HyperCard stacks that use a visual, customizable interface of icon buttons, pop-up menus, and relational commands to store, link, and standardize related information about the primitives, technologies, tasks, assumptions, and open issues involved in space telerobot or crew EVA tasks. TEJAS runs on any Apple Macintosh personal computer with at least one megabyte of random access memory, a hard disk drive, and HyperCard version 1.2.1, or later version.

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CONTENTS

INTRODUCTION 1

1 PROBLEM DEFINITION 7

1.1 Telerobotics Technologies Development Planning 11
1.2 Telerobotics/EVA Relationship Problem 12

2 METHOD OF SOLUTION 13

2.1 TEJAS Objectives 14
2.2 What Is TEJAS? 14
2.3 TEJAS Basic Approach 15
2.4 Elemental Components of Research 15
2.5 Hypermedia Rationale 16
2.6 HyperCard Selection Rationale 17

3 BEFORE YOU BEGIN 19

3.1 What You Should Know About HyperCard 20
3.2 What TEJAS Assumes 20
3.3 What You Need to Run TEJAS: Hardware 21
3.4 What You Need to Run TEJAS: Software 22
3.5 How to Install TEJAS 23
3.6 How to Use TEJAS Help 24
3.7 The TEJAS User's Guide 26
3.8 TEJAS Version 1.0 Participants 26

4 OVERVIEW OF TEJAS VERSION 1.0 27

4.1 Contents (Stack List) 28
4.2 What It Does 29
4.3 Reference Stacks Overview 30
4.4 Analysis Stacks Overview 31
4.5 Transporting TEJAS Data 32
4.6 Communicating with Hypermedia 33
4.7 Modifying Existing Cards 33
4.8 Adding Cards 34
4.9 Deleting Cards 34
4.10 Updates and Later Versions 35
4.11 The User's Role 35

PRECEDING PAGE BLANK NOT FILMED

vi

CONTENTS (Continued)

5 INPUT AND OUTPUT 37

5.1 Importing From Text Files 38
5.2 Importing From Spreadsheets and Databases 38
5.3 Printing TEJAS Stacks and Cards 39
5.4 Printing TEJAS Reports 40
5.5 Exporting to Text Files 40
5.6 Exporting to Databases and Spreadsheets 41

6 USER INSTRUCTIONS: TEJAS COMMON HELP 43

6.1 Common Navigation and Action Commands 44
6.2 Common Navigation and Action Buttons 46
6.3 Information vs. Comment vs. Configuration Fields 53
6.4 Common Configuration Fields 53
6.5 Common User Notes Field 54
6.6 TEJAS Information Fields 54

7 USER INSTRUCTIONS: REFERENCE STACKS 55

7.1 User Instructions: TEJASHome Stack 57
7.1.1 General Information 59
7.1.2 The User's Role 59
7.1.3 Changing the Standard 60
7.1.4 Adding Cards 60
7.1.5 Deleting Cards 61
7.1.6 Card Backgrounds 61
7.1.7 Information Fields 62
7.1.8 Buttons 62
7.1.9 Stackware Bibliography Card 63

7.2 User Instructions: Glossary Stack 65
7.2.1 General Information 67
7.2.2 The User's Role 67
7.2.3 Changing the Standard 68
7.2.4 Adding Cards 69
7.2.5 Deleting Cards 69
7.2.6 Card Backgrounds 70
7.2.7 Information Fields 70
7.2.8 Buttons 72
7.2.9 Contributions Card 74

7.3 User Instructions: Acronym Stack 75
7.3.1 General Information 77

CONTENTS (Continued)

7.3.2 The User's Role 77
7.3.3 Changing the Standard 78
7.3.4 Adding Cards 79
7.3.5 Deleting Cards 79
7.3.6 Card Backgrounds 80
7.3.7 Information Fields 80
7.3.8 Buttons 81
7.3.9 Contributions Card 82

7.4 User Instructions: EVAPrimitives Stack 83
7.4.1 General Information 85
7.4.2 The User's Role 85
7.4.3 Changing the Standard 86
7.4.4 Adding Cards 86
7.4.5 Deleting Cards 87
7.4.6 Task Primitives – Definition 87
7.4.7 Task Primitives – Development 88
7.4.8 Task Primitives – Conclusions 90
7.4.9 Building Specific From Generic Primitives 92
7.4.10 Card Backgrounds 93
7.4.11 Information Fields 94
7.4.12 Buttons 96
7.4.13 Relating EVA and Telerobot Primitives 98
7.4.14 Parsing Scheme Card 100
7.4.15 Menu Builder Card 101
7.4.16 Contributions Card 102

7.5 User Instructions: TelePrimitives Stack 103
7.5.1 General Information 105
7.5.2 The User's Role 105
7.5.3 Changing the Standard 106
7.5.4 Adding Cards 106
7.5.5 Deleting Cards 107
7.5.6 Task Primitives – Definition 107
7.5.7 Task Primitives – Development 108
7.5.8 Task Primitives – Conclusions 110
7.5.9 Building Specific From Generic Primitives 112
7.5.10 Card Backgrounds 113
7.5.11 Information Fields 114
7.5.12 Buttons 116
7.5.13 Relating EVA and Telerobot Primitives 118
7.5.14 Parsing Scheme Card 120
7.5.15 Menu Builder Card 121
7.5.16 Contributions Card 122

CONTENTS (Continued)

7.6 User Instructions: TeleSystems Stack (Not Available in Version 1.0 Help Stacks) 123

7.7 User Instructions: TeleTechnologies Stack 125
7.7.1 General Information 126
7.7.2 The User's Role 127
7.7.3 Changing the Standard 127
7.7.4 Adding Cards 128
7.7.5 Deleting Cards 128
7.7.6 Technology Requirement and Criticality 129
7.7.7 Specifying Technology Requirements 131
7.7.8 Card Backgrounds 132
7.7.9 Information Fields 132
7.7.10 Buttons 135
7.7.11 Forecast Histograms 137
7.7.12 TeleTech Menus Card 138
7.7.13 Contributions Card 138

8 USER INSTRUCTIONS: ANALYSIS STACKS 139

8.1 User Instructions: EVATasks Stack 141
8.1.1 General Information 142
8.1.2 The User's Role 143
8.1.3 Changing the Standard 143
8.1.4 Adding Cards 144
8.1.5 Deleting Cards 144
8.1.6 Task Analysis in TEJAS 145
8.1.7 Relating Tasks, Assumptions, and Open Issues 148
8.1.8 Task Baseline Cards vs. Specific Tasks Stack 148
8.1.9 Card Backgrounds 149
8.1.10 Information Fields 149
8.1.11 Buttons 150
8.1.12 Building a Specific Task 151
8.1.13 EVATasks Menu 153

8.2 User Instructions: EVAAssume Stack 155
8.2.1 General Information 156
8.2.2 The User's Role 157
8.2.3 Changing the Standard 158
8.2.4 Adding Cards 158
8.2.5 Deleting Cards 159
8.2.6 Relating Tasks, Assumptions, and Open Issues 160
8.2.7 Card Backgrounds 160
8.2.8 Information Fields 161

CONTENTS (Continued)

8.2.9 Buttons 161
8.2.10 Assumptions Menu 162

8.3 User Instructions: EVAIssues Stacks 163
8.3.1 General Information 164
8.3.2 The User's Role 165
8.3.3 Changing the Standard 165
8.3.4 Adding Cards 166
8.3.5 Deleting Cards 166
8.3.6 Relating Tasks, Assumptions, and Open Issues 167
8.3.7 Card Backgrounds 167
8.3.8 Information Fields 168
8.3.9 Buttons 168
8.3.10 Open Issues Menu 169

8.4 TeleTasks 171
8.4.1 General Information 172
8.4.2 The User's Role 173
8.4.3 Changing the standard 173
8.4.4 Adding Cards 174
8.4.5 Deleting Cards 174
8.4.6 Task Analysis in TEJAS 175
8.4.7 Relating Tasks, Assumptions, and Open Issues 178
8.4.8 Task Baseline Cards vs. Specific Tasks Stack 178
8.4.9 Card Backgrounds 179
8.4.10 Information Fields 179
8.4.11 Buttons 180
8.4.12 Building a Specific Task 181
8.4.13 TeleTasks Menu 183

8.5 User Instructions: TeleAssume Stack 185
8.5.1 General Information 186
8.5.2 The User's Role 187
8.5.3 Changing the Standard 187
8.5.4 Adding Cards 188
8.5.5 Deleting Cards 189
8.5.6 Relating Tasks, Assumptions, and Open Issues 190
8.5.7 Card Backgrounds 190
8.5.8 Information Fields 191
8.5.9 Buttons 191
8.5.10 Assumptions Menu 192

8.6 User Instructions: TeleIssues Stack 193
8.6.1 General Information 194
8.6.2 The User's Role 195
8.6.3 Changing the Standard 195

CONTENTS (Continued)

8.6.4 Adding Cards 196
8.6.5 Deleting Cards 196
8.6.6 Relating Tasks, Assumptions, and Open Issues 197
8.6.7 Card Backgrounds 197
8.6.8 Information Fields 198
8.6.9 Buttons 198
8.6.10 Open Issues Menu 199

9 USER INSTRUCTIONS: ANALYSIS STACKS 201

9.1 EVASpecPrim Tools 203
9.1.1 General Information 205
9.1.2 The User's Role 206
9.1.3 Changing the Standard 206
9.1.4 Adding Cards 207
9.1.5 Deleting Cards 207
9.1.6 Stack Organization 208
9.1.7 EVASpecPrims List 209
9.1.8 EVASpecPrim Builder 210
9.1.9 EVASpecPrim Arg Menus 212
9.1.10 Card Backgrounds 214
9.1.11 Common Fields 214
9.1.12 Common Buttons 215
9.1.13 Analysis Fields 215
9.1.14 Analysis Buttons 218
9.1.15 Analysis Menus 227

9.2 User Instructions: EVASpecPrim Archives Stack 231
9.2.1 General Information 233
9.2.2 The User's Role 234
9.2.3 Changing the Standard 234
9.2.4 Adding Cards 235
9.2.5 Deleting Cards 235
9.2.6 Carrying Back Specific Primitives 236
9.2.7 Card Backgrounds 236
9.2.8 Information Fields 237
9.2.8 Buttons 238
9.2.10 Menu Builder Card 240

9. 3 User Instructions: EVATask.5058 Example Stack 241
9.3.1 General Information 243
9.3.2 Before You Create SpecPrims 243
9.3.3 Stack Organization 244
9.3.4 Specific Primitive Record Cards 245
9.3.5 Configuring Argument Menus 246

CONTENTS (Continued)

9.3.6 Building a Derivative Task 250
9.3.7 Building Specific Primitives 252
9.3.8 Using the Append Button 256
9.3.9 Using the Insert Button 257
9.3.10 Using the Modify Button 259
9.3.11 Using the Copy Button 261
9.3.12 Using the Delete Button 262
9.3.13 Maintaining the Frequency 263
9.3.14 Archiving Specific Primitives 264
9.3.15 Retrieving Specific SpecPrims 264
9.3.16 After You Create Specprims 266

9.4 User Instructions: TeleSpecPrim Tools 267
9.4.1 General Information 269
9.4.2 The User's Role 270
9.4.3 Changing the Standard 270
9.4.4 Adding Cards 271
9.4.5 Deleting Cards 271
9.4.6 Stack Organization 272
9.4.7 TeleSpecPrims List 273
9.4.8 TeleSpecPrim Builder 274
9.4.9 TeleSpecPrim Arg Menus 276
9.4.10 Card Backgrounds 277
9.4.11 Common Fields 278
9.4.12 Common Buttons 279
9.4.13 Analysis Fields 279
9.4.14 Analysis Buttons 282
9.4.15 Analysis Menus 291

9.5 User Instructions: TeleSpecPrim Archives Stack 295
9.5.1 General Information 297
9.5.2 The User's Role 298
9.5.3 Changing the Standard 298
9.5.4 Adding Cards 299
9.5.5 Deleting Cards 299
9.5.6 Carrying Back Specific Primitives 300
9.5.7 Card Backgrounds 300
9.5.8 Information Fields 301
9.5.9 Buttons 302
9.5.10 Menu Builder Card 304

9.6 User Instructions: TeleTask.4877 Example Stack 305
9.6.1 General Information 307
9.6.2 Before You Create SpecPrims 307
9.6.3 Stack Organization 308
9.6.4 Specific Primitive Record Cards 309

CONTENTS (Continued)

9.6.5 Configuring Argument Menus 310
9.6.6 Building a Derivative Task 314
9.6.7 Building Specific Primitives 316
9.6.8 Using the Append Button 320
9.6.9 Using the Insert Button 321
9.6.10 Using the Modify Button 323
9.6.11 Using the Copy Button 325
9.6.12 Using the Delete Button 326
9.6.13 Maintaining the Frequency 327
9.6.14 Archiving Specific Primitives 328
9.6.15 Retrieving Archived SpecPrims 329
9.6.16 After You Create SpecPrims 330

Index 331

Introduction

The primary objective of space telerobotics as a research discipline is the augmentation and/or support of extravehicular activity (EVA) with telerobotic activities; this allows increased emplacement of on-orbit assets while providing for their *in situ* maintenance. Development of the requisite telerobot work systems requires a well-understood correspondence between EVA and telerobotics that to date has been only partially established.

The Telerobotics/EVA Joint Analysis System (TEJAS) hypermedia information system uses object-oriented programming to bridge the gap between crew-EVA and telerobotics activities. The Version 1.0 integrated stack system of twenty HyperCard stacks contains approximately 3 megabytes of data and utilities to aid referencing, discussion, communication, and analysis within the EVA and telerobotics communities. Any or all of these stacks can be completely incorporated within other hypermedia applications, or they can be referenced as is, without requiring data to be transferred into any other database.

The TEJAS Version 1.0 Overview (Figure 1) is a "road map" showing the organization of the stack system. Analysis stacks (designated by diamond "work sign" icons) draw on information in the Reference stacks (designated by cube and octagon icons) as part of a rapid point-and-click utility for building scripts of specific task primitives (the shadowed cube icons) or for any EVA or telerobotics task. **It is in each task's specific primitives list that the correlation between EVA and telerobotics activities must be drawn.** As a prerequisite to achieving this correlation, the TEJAS reference stacks, EVAPrimitives and TelePrimitives, standardize the list of generic EVA and telerobot primitives.

TEJAS is simple to use—no formal training is required. Some users will want to begin immediately exploring the TEJAS Version 1.0 stack system; others may want to refer to a printed manual as they try out the stack system. To meet the needs of various users, the TEJAS User's Guide is available both online and in hard copy form. The information included in the User's Guide is detailed and designed for reference only; **you do not have to read the User's Guide before using TEJAS.** However, it is recommended that you read Help section 3.0, "Before You Begin."

The TEJAS Help sections printed within this User's Guide explain how to use the stack system and individual stacks. **All Help cards printed in the TEJAS User's Guide are part of the TEJAS Help stack (except sections 9.3 and 9.6) and are available to you online, from a pop-up menu, any time you are using TEJAS.** The TEJAS User's Guide is a printed copy of the TEJAS Help stack and includes both Help cards and example cards from the stacks. When accessing TEJAS Help from within any TEJAS stack, the Help cards will appear on your screen.

The TEJAS Stack System

These stacks are meant to be interactive and can be used with any database system running on a Macintosh, including spreadsheets, relational databases, word-processed documents, and hypermedia utilities. Used either individually or in any combination, these hypermedia files constitute an analysis tool for the EVA and telerobotics communities. The software provides a means for managing volumes of data and for communicating complex ideas, relationships, and processes inherent to task planning.

Reference stacks – The TEJAS reference stacks establish a forum for the EVA and Telerobotics communities. The generic primitives stacks (EVAPrimitives and TelePrimitives) are a result of an initial compilation of task primitives taken from a variety of sources. This initial compilation was followed by further discussion, written commentary, and analysis to create a second integration. The telerobotics technology stack (TeleTechnologies) is an initial attempt to deal with technologies as individual objects that can be defined, forecasted, related and altered dynamically. It is released as Version 0.9, to be revised following the same cycle of discussion, written commentary, and analysis that developed the primitives stacks. The Glossary and Acronyms stacks form an online, expandible reference with the unique ability to compare existing, sometimes conflicting definitions that can hinder communication in today's crew-EVA and telerobotics communities. They can grow indefinitely to support new terminology and new definitions, acting as a hypermedia-based standardization tool.

With this initial release it is hoped that the revision cycle for the above reference stacks (and any new ones) can be substantially shortened and improved for the next update by using the stacks as a means to communicate with other analysts and with the TEJAS Editor. To make this productivity leap, follow these four simple rules: 1) use the stacks internally to your organization, 2) make comments and/or changes within the stacks, 3) send the changed stacks (NOT a printout) to the TEJAS Editor and your colleagues, and 4) identify other potential users to the TEJAS Editor.

Analysis stacks – The six baseline analysis stacks (EVATasks, EVAAssume, EVAIssues, TeleTasks, TeleAssume, TeleIssues) work interactively to manage and relate basic information that you enter about the crew-EVA and telerobot tasks so it can be analyzed in depth. The EVATasks and TeleTasks stacks can create on demand a *specific task stack* that carries the analysis one step further. This new stack (called EVATask.#### or TeleTask.####; the numbers are assigned automatically) contains all the information from the baseline stacks, plus powerful new tools (involving the EVASpecPrim Tools, EVASpec Prim Archives, TeleSpecPrim Tools, TeleSpecPrim Archives stacks) that allow you to quickly build, analyze, and output a list of specific task primitives that completely scripts that task.

To illustrate a specific task stack, the example stacks EVATask.5058 and TeleTask.4877 are provided. Step-by-step instructions in Help sections 9.3 and 9.6 (found only in the printed TEJAS User's Guide, not in the TEJAS Help stack) help you practice using them.

Specific task stacks created in TEJAS can be exchanged among groups, divisions, companies, or centers for complete communication of fundamental information that forms the basis for further analyses.

How to Install the Stacks

Installing TEJAS Version 1.0 involves only copying the stacks onto your hard disk, personalizing your TEJASHome stack (optional), and adding a button to your HyperCard Home card for navigating to the TEJASHome card. The first step is a familar Macintosh procedure; the last two steps are automated for your convenience. Altogether, installation will only take a few minutes. Follow the "How to Install TEJAS" instructions in this TEJAS User's Guide, Help section 3.5.

How to Use the Stacks

TEJAS stacks provide a visual interface designed for continuous, daily use without elaborate setup routines. The stacks have varied applications. No knowledge of programming is required to use them as integrated in TEJAS.

After installing the stacks onto your hard disk drive, open any TEJAS stack in one of the following ways: a) directly from the Macintosh desktop by double-clicking on its icon, b) from the TEJASHome stack or c) from any other hypermedia stack. Page through the cards in any TEJAS stack using the Previous and Next buttons (the left and right arrows at the bottom center of all cards). Try the other buttons and menus (all explained in the TEJAS Help stack/TEJAS User's Guide).

Detailed explanation for all stacks are in the stack-specific User Instructions (Help sections 7–9) of the TEJAS User's Guide. If you need help understanding the buttons, fields, background, the purpose of the stack, or your role in using it, the information in those sections is invaluable.

How to Change the Stacks

The content of any information fields can be changed; these fields are not locked. There are certain rules to follow for changing stack content or standards. Read the specific instructions for any stack in the "Changing the Standard," "Adding Cards," and "Deleting Cards" Help sections for that stack.

The TEJAS stacks are *supposed* to be changed, customized, and expanded by you. Don't hesitate to do so, following the guidelines in the Help sections listed above.

TEJAS allows you to communicate with a coworker or the TEJAS Editor. All comments, questions, or notes should be entered into the User Notes field. This field can be

opened by pressing the notepad button marked "User.." found at the bottom right of each card (see "TEJAS Common User Notes Field," Help section 6.5). You can enter comments in the User Notes field at any time when using the stacks.

Important: Do NOT change the names of any stacks, backgrounds, or cards. (This warning is repeated throughout the TEJAS Help cards.)

You can transfer information into and out of TEJAS in various ways. For further details read the "Input and Output" Help section 5.

How to Communicate Your Changes

When you have compiled a set of comments or changes in any reference stack, simply copy the stacks onto a floppy diskette and send the diskette to the TEJAS Editor. Each comment and change will be reviewed and compiled. If you have made changes to the cards themselves or added cards, those changes will also be reviewed.

These stacks can grow without limitations. New features, such as 2-D video "clips" to demonstrate the verbs, better navigation aids, and any number of hierarchical categorization systems can be added if so desired. Please identify for the TEJAS Editor any operational or spelling errors and comment on how the stacks work, look, or are organized. Suggestions for improvements are welcome.

Feedback on TEJAS's content, organization, and interface is essential in order to evolve a dynamic resource that will reflect the task analysis community's needs. Wide application of this resource will result in a clearer understanding and communication between crew-EVA and telerobot operations.

Obtaining Copies of TEJAS Version 1.0

TEJAS Version 1.0 is distributed under the NASA Computer Software Management and Information Center (COSMIC), operated under contract by the University of Georgia.

Who to Contact for Help With TEJAS Version 1.0

Please contact the TEJAS Editor with any questions, comments and suggestions not covered by the TEJAS User's Guide. For FY 1990, the TEJAS Editor is

Michael L. Drews
Jet Propulsion Laboratory
Mail Stop 303-308
4800 Oak Grove Drive
Pasadena, CA 91109
(818) 354-0205

TEJAS Version 1.0 Stack System

Navigation Stacks:

TEJASHome
TEJAS Help
Open Me First!!

Reference Stacks:

Glossary
Acronym

EVAPrimitives
TelePrimitives
TeleTechnologies

Analysis Stacks:

EVATasks
EVAAssume
EVAIssues

TeleTasks
TeleAssume
TeleIssues

EVASpecPrim Tools
EVASpecPrim Archives
EVATask.5058 (Example Specific Task Stack)

TeleSpecPrim Tools
TeleSpecPrim Archives
TeleTask.4877 (Example Specific Task Stack)

Section 1

Problem Definition

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TEJAS Help Menu

○ Skip this Menu Menu 1 of 5

1.0 Problem Definition:

- ☐ 1.1 TeleTechnologies Development Planning
- ☐ 1.2 Telerobotics/EVA Relationship Problem

2.0 Method of Solution:

- ☐ 2.1 TEJAS Objectives
- ☐ 2.2 What is TEJAS?
- ☐ 2.3 TEJAS Basic Approach
- ☐ 2.4 Elemental Components of Research
- ☐ 2.5 Hypermedia Rationale
- ☐ 2.6 HyperCard Selection Rationale

3.0 Before You Begin:

- ☐ 3.1 What You Should Know About HyperCard...
- ☐ 3.2 What TEJAS Assumes...
- What You Need to Run TEJAS
- ☐ 3.3 Hardware
- ☐ 3.4 Software
- ☐ 3.5 How to Install TEJAS
- ☐ 3.6 How to Use TEJAS Help
- ☐ 3.7 The TEJAS User's Guide
- ☐ 3.8 TEJAS Version 1.0 Participants

INSTRUCTIONS:
Click ☐ box to access section;
Click arrows to page through Help stack;
Click 'T-flag' to return to point of origin.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

TEJAS Help Menu

○ Skip this Menu Menu 2 of 5

4.0 Getting Acquainted with TEJAS Version 1.0 –

Overview:

- ☐ 4.1 Contents (Stack List)
- ☐ 4.2 What It Does
- ☐ 4.3 Reference Stacks
- ☐ 4.4 Analysis Stacks

Common Concepts:

- ☐ 4.5 Transporting TEJAS Data
- ☐ 4.6 Communicating with Hypermedia
- ☐ 4.7 Modifying Existing Cards
- ☐ 4.8 Adding Cards
- ☐ 4.9 Deleting Cards
- ☐ 4.10 Updates and Later Versions
- ☐ 4.11 The User's Role

INSTRUCTIONS:
Click ☐ box to access section;
Click arrows to page through Help stack;
Click 'T-flag' to return to point of origin.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

TEJAS Help Menu

○ Skip this Menu Menu 3 of 5

5.0 Input and Output:

- ☐ 5.1 Importing Text Files
- ☐ 5.2 Importing Spreadsheets & Databases
- ☐ 5.3 Printing TEJAS Stacks and/or Cards
- ☐ 5.4 Printing TEJAS Reports
- ☐ 5.5 Exporting to Text Files
- ☐ 5.6 Exporting to Databases & Spreadsheets

6.0 User Instructions – Common Help:

- ☐ 6.1 Navigation and Action Commands
- ☐ 6.2 Navigation and Action Buttons
- ☐ 6.3 Information vs. Comment vs. Configuration Fields
- ☐ 6.4 Configuration Fields
- ☐ 6.5 User Notes Field
- ☐ 6.6 Information Fields

INSTRUCTIONS:
Click ☐ box to access section;
Click arrows to page through Help stack;
Click 'T-flag' to return to point of origin.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER...

TEJAS Help Menu

Menu 4 of 5

7.0 User Instructions – Reference Stacks Help Menus:

- ☐ 7.1 TEJASHome
- ☐ 7.2 Glossary
- ☐ 7.3 Acronym
- ☐ 7.4 EVAPrimitives
- ☐ 7.5 TelePrimitives
- ☒ 7.6 TeleSystems
- ☐ 7.7 TeleTechnologies

8.0 User Instructions - Analysis Stacks Help Menus:

- ☐ 8.1 EVATasks
- ☐ 8.2 EVAAssume
- ☐ 8.3 EVAIssues
- ☐ 8.4 TeleTasks
- ☐ 8.5 TeleAssume
- ☐ 8.6 TeleIssues

☒= Not Available in Version 1.0 Help Stacks

INSTRUCTIONS:
Click ☐ box to access section;
Click arrows to page through Help stack;
Click 'T-flag' to return to point of origin.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER...

9.0 User Instructions –
Analysis Stacks Help Menus:

- ☐ 9.1 EVASpecPrim Tools
- ☐ 9.2 EVASpecPrim Archives
- ⧅ 9.3 EVATask.5058 (Example Specific Task Stack)

- ☐ 9.4 TeleSpecPrim Tools
- ☐ 9.5 TeleSpecPrim Archives
- ⧅ 9.6 TeleTask.4877 (Example Specific Task Stack)

⧅= Not Available in Version 1.0 Help Stacks

INSTRUCTIONS:
Click ☐ box to access section;
Click arrows to page through Help stack;
Click 'T-flag' to return to point of origin.

Telerobotics Technologies Development Planning 1.1 1 of 2

The Telerobotics/EVA Joint Analysis System (TEJAS) project was initiated by the NASA Office of Space Station (Code ST) in response to an urgent perceived need for a high-level mechanism to plan the development of telerobotics technologies based on a realistic understanding of

- technologies required to perform on-orbit tasks,
- planned telerobotic systems' use of those technologies, and
- the forecast for each technology in terms of time and money, versus the need date for on-orbit test or deployment.

With this information available, a set of relational rules could be constructed that would define the critical path of technological development, and help to prioritize the expenditure of time and money. However, the information was not available, nor was any repeatable, logical method or tool in place to assimilate, access, or derive this data.

Telerobotics Technologies Development Planning 1.1 2 of 2

As a further dimension to the problem, the relationships between telerobotics and EVA were not well established, although they are causally implicit: Telerobotics technology requirements derive from a need to support crew-EVA with telerobots that help to perform an on-orbit task under specific circumstances. Crew-EVA involves humans using tested and proven equipment and checklists, based on an established, evolving, and integrated set of technologies and proven task analysis and scripting techniques. Telerobot work systems will be composed of hardware and software resulting from technology development in related fields. These fields are not yet integrated, nor is the task scripting fully evolved. The working premise was that relationally linking EVA and telerobotics at various levels would help to solve both of these interrelated shortcomings.

Keeping track of this data requires an extensive database of technologies, telerobot work systems, task primitives, tools, etc. that exists separately in paper and electronic documents. The first step of TEJAS was to compile it.

Telerobotics/EVA Relationship Problem

- Clear, consistent, repetitive, interactive and exchangeable method of relating EVA and telerobotics is needed on various levels:
  - Activity: Task, Subtask, Primitives
  - Environment
    - On-orbit astrophysical medium
    - Worksites and taskboards
  - External resources
    - Tools and services, jigs etc.
  - Work Systems
    - FTS, JEMS-RMS, JEMS-SFA, RMS, SPDM, SSRMS
  - Technologies
    - Sensing/Perception
    - Planning/Reasoning
    - Control/Execution
    - Operator Interface
    - System Architecture

    } FY 1989 Emphasis

Section 2

Method of Solution

TEJAS Objectives

- Create a multimedia technology development planning tool for telerobotics that gives definitive direction for the technology push NASA will have to make to get space telerobots working. Make that tool
  - Powerful, fast, and complete
  - Compatible with the widest range of centers and corporations
  - User-friendly; almost no training required
  - Flexible; WORKS the way the user THINKS, not vice versa
  - Adaptable; can change with changing requirements or can use different methodologies, depending on the user's wants
  - Expansible; easily accommodates revisions and additions
  - Self-referencing; provides complete traceability to sources

- Use that tool to
  - Determine technology requirements for any specific task
  - Show how six telerobot work systems match those requirements
  - Build a concrete relationship between crew-EVA and telerobotics

What Is TEJAS?

TEJAS is...

- an information system of related multimedia data

- a task analysis tool for EVA and Telerobotics that can form relational links between the two fields for any task through their task primitives

- a technology development planning tool for Telerobotics that can give definitive direction for the needed technology push

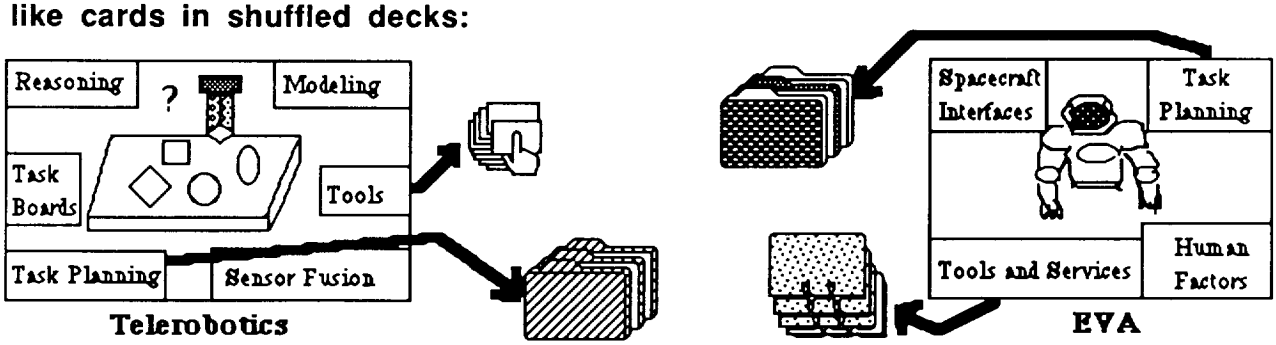
- a software-based reference for EVA and Telerobotics

- a set of hypermedia stacks that can be used individually, collectively, or card-by-card in many other applications

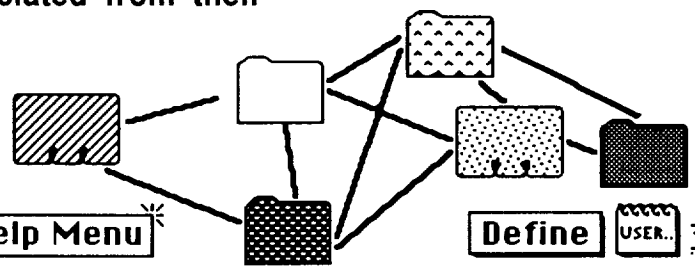
...built within an object-oriented programming environment that comes FREE with and runs on any Macintosh personal computer (≥1 Mbyte RAM)

TEJAS Basic Approach

TEJAS is an object-oriented programming environment, in which elemental research components such as task primitives and technologies, are treated like cards in shuffled decks:



The cards can be disassociated from their traditional groupings and related freely using the TEJAS scripts.



Elemental Components of Research

Every area of research breaks down eventually into some set of elemental components. Many lists of components, arranged in multiple categorization schemes, have been generated by people at different research centers as databases, spreadsheets, CAD files, and especially written documents.

If you could deal effectively not just with lists but also with individual components, you could create a 'master list' of cards of different forms, each a self-contained, multimedia database element containing one telerobotics component that every researcher could use or not use as they saw fit. You could combine and link these cards in many different ways: computationally, conceptually, chronologically, causally, etc. This would allow researchers to exchange (a) basic knowledge, such as terms, descriptions of tools etc., and (b) their ideas, represented by linked stacks of cards showing the reasons for the links.

The search for a software tool that could do all this led to hypermedia.

Hypermedia Rationale

For hypermedia to perform complex, multidisciplinary telerobotics/EVA relationships and technology development planning, it must be

- Multifaceted - including
  - Database functions: store, retrieve, copy, delete, update, link, search, and sort (by various criteria) in MULTIPLE MEDIA, including numbers, text, formulae, charts and graphs, drawings, even scanned documents
  - Spreadsheet functions: do calculations, macros, charts and graphs
  - Expert system functions (limited): have built-in ability to document and show thought processes leading to specific conclusions, without the use of a dedicated Artificial Intelligence software shell or microprocessor

- Fast - run on every applicable system without long delays
- Expandable - unlimited file size, with no change in speed
- Customizable - able to retain core data and functions and still be adaptable to a particular user's needs

More--->

TEJAS V1.0 3/30/90 Help Menu Define USER..

Hypermedia Rationale cont'd

Hypermedia must also be

- System-friendly - work interactively with existing database tools without modification or rehosting

- User-friendly - accessible via several layers of expertise:
  - Novice: no programming/user skills; intuitive (no training, no manuals required) viewing of information, analysis methods, and underlying thoughts through a GRAPHICAL, menu-driven interface
  - User: able to operate tool fully without modification
  - Superuser: able to modify certain steps and create new processes without deleting or distorting the source code
  - Programmer: able to access and customize source code

- Accessible – Inexpensive and available to every researcher wishing to exchange information with others in the telerobotics and EVA fields

TEJAS V1.0 3/30/90 Help Menu Define USER..

HyperCard Selection Rationale

• HyperCard is a user-customizable programming utility with which you can create tools that work the way you think. Half multimedia database and half programming tool, it incorporates most of the multimedia functions required for research and analysis in EVA and telerobotics.

• HyperCard files – called 'stacks' – and individual items in each stack – called 'cards' – can be linked together for calculation, thought association, graphing, searching, sorting, etc. in almost unlimited ways. The infinitely customizable stack format is always compatible with any other card or stack, regardless of origin.

• Traditional uses of HyperCard include demonstration and training stacks for software programs, archival stacks for museums and graphics artists, and office information tools for business. TEJAS is one of the more advanced scientific applications in HyperCard.

Section 3

Before You Begin

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What You Should Know About HyperCard...

TEJAS has been designed for users with minimal knowledge of HyperCard. The TEJAS Help stack (printed with examples as the TEJAS User's Guide) tells you how to use TEJAS. But it helps to know a little of the HyperCard terminology and basic concepts.

Apple Computer, Inc. provides two resources with HyperCard to help you:
1. The "HyperCard User's Guide" – the printed manual
2. The 'Help', 'Help Index', and 'Help Samples' stacks for HyperCard, accessed jointly through the 'Help' item from the 'Go' menu visible at the topmost menubar anytime any stack is open. The HyperCard Help stacks are brief explanations of every term, command, and button in HyperCard, while the manual is much more in-depth in both explanation and examples.

For optimum first use of TEJAS, read the Preface and Chapters 1 and 2 of the "HyperCard User's Guide." Using the stack-based Intro in the Help stack will introduce you to basic concepts. Try it!

What TEJAS Assumes...

TEJAS assumes that

- You are using an Apple Macintosh computer with a hard disk drive (for RAM and drive size requirements, see Help section 3.3).

- You are familiar with basic Macintosh terminology (e.g., mouse, clicking, dragging, selecting, highlighting, files, folders, windows, etc.).

- You have installed HyperCard and its attendant stacks on your Macintosh.

- You own or have access to the documentation that came with the HyperCard application (see 'What You Should Know About HyperCard,' Help section 3.1).

When appropriate, these TEJAS Help stack cards will refer you to the "HyperCard User's Guide" for further explanations.

What You Need to Run TEJAS: Hardware

TEJAS will run on any Apple Macintosh personal computer with AT LEAST:

- 1 megabyte (Mbyte) of RAM (2-4 is preferred)
- An 800K floppy disk drive (input) and 2-3 megabytes of hard disk space

HyperCard stacks and HyperTalk scripts have no size limitations. As with any program, it is still up to the designer to make efficient use of RAM. However, stacks up to 3 Mbytes have been built that run on a Macintosh SE with no added delays. As long as the ROM drive is large enough to hold the stack, it will run.

TEJAS will NOT run on DOS-based machines because the system that makes HyperCard's operation possible is incompatible with DOS. However, TEJAS stacks can work with DOS-based files, using a DOS interface board or PC-emulating software in your Macintosh.

More -->

What You Need to Run TEJAS: Hardware cont'd

TEJAS was developed to run quickly and efficiently on a Macintosh SE (Motorola 68000 processor), with 2 megabytes of RAM and a 20 megabyte internal hard disk.

The faster the hard disk drive (ROM drive) on which the TEJAS stacks are stored, the faster the stack system will run. Tested drives' seek times were from 52 milliseconds (relatively slow) to 28 milliseconds (moderately fast).

With 3 Mbytes of RAM, TEJAS runs noticeably faster on any processor.

With 4 Mbytes of RAM, TEJAS can run under Multifinder with other large applications simultaneously (or without other applications with 2 Mbytes).

Macintosh accelerator boards (third-party upgrades) that are compatible with HyperCard will have no problems running TEJAS.

More -->

What You Need to Run TEJAS: Hardware cont'd

TEJAS Version 1.0 has been tested on five Macintoshes:

a. Macintosh SE 030 (68030 processor, 4 Mbytes RAM): beta test site; faster than any other Mac tested. No noticeable delays in any operation.

b. Macintosh II (68020 processor, 4 Mbytes RAM): primary development; exhibited minor delays in some pop-up menus.

c. Macintosh SE (68000 processor, 2 Mbytes RAM): alpha test site; slower than the Mac II because of the Mac II 68020 processor's greater speed.

d. Macintosh Plus (68000 processor, 1 Mbytes RAM): beta test site; runs TEJAS without bombing, but MUCH slower than either the Mac SE or Mac II.

e. Macintosh Portable (68000 static processor, 2 Mbytes static RAM): beta test site; runs TEJAS at approximately the same speed as the Macintosh II.

What You Need to Run TEJAS: Software

TEJAS Version 1.0 was created using HyperCard Version 1.2.1 (5/88) and 1.2.2 (11/88). Either HyperCard version (and all later versions) will run TEJAS Version 1.0 without problems.

HyperCard Version 1.1 will NOT run TEJAS (nor most stacks developed with later HyperCard versions) because many commands and resources required for TEJAS and common to later HyperCard versions are not supported in HyperCard Version 1.1.

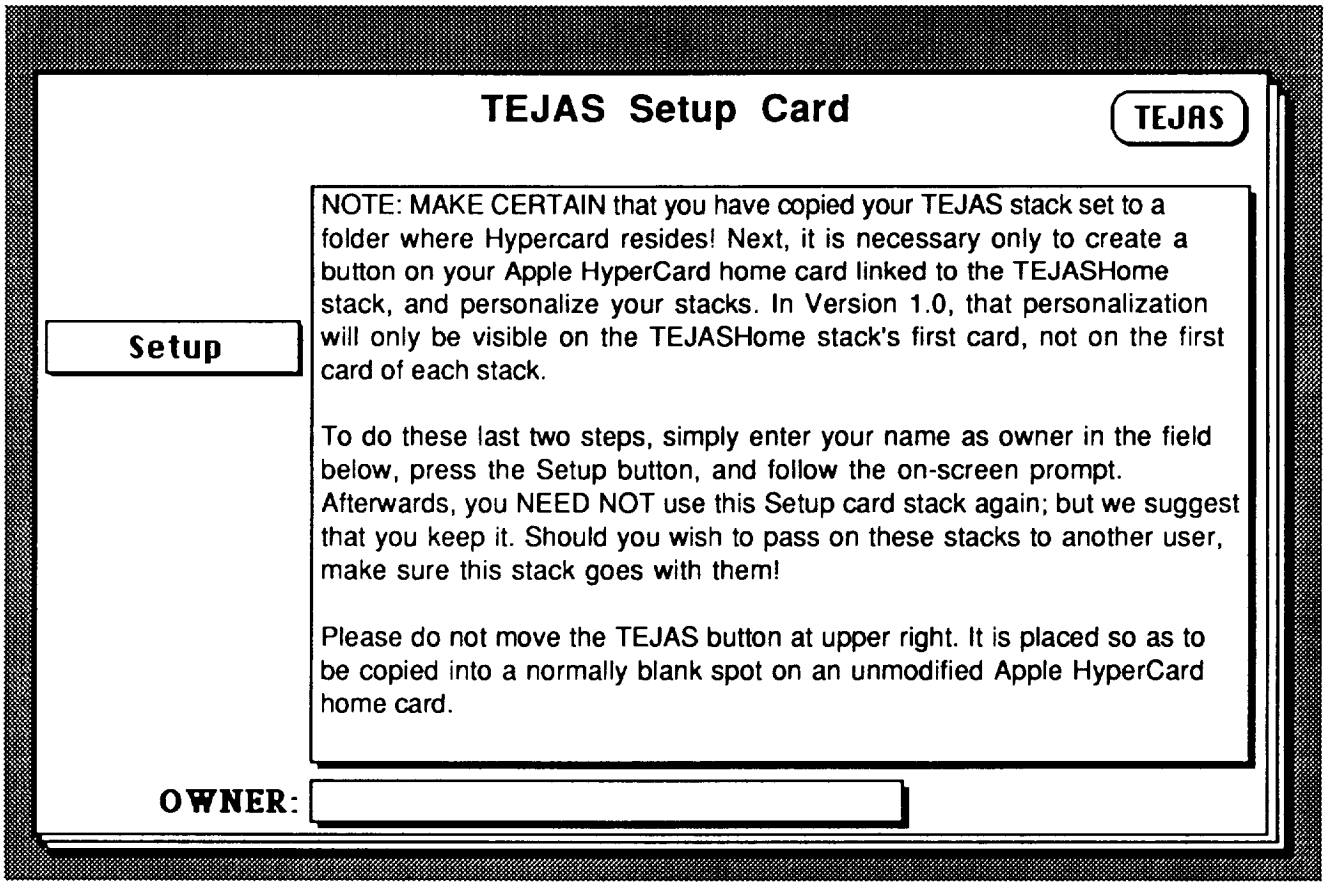
HyperCard has been bundled (offered together free) with EVERY Macintosh system sold since August 1987. Apple supports HyperCard and issues upgrades, and it is not write-protected. Therefore, every new Macintosh system owner automatically has HyperCard (although it is the owner's responsibility to install it), and every stack written with HyperCard will run on any of these machines.

TEJAS Version 1.0 installation has been somewhat automated but still must begin with three simple manual steps:

STEP 1: Make sure that HyperCard is installed on your hard disk. Review "Installing HyperCard on a hard disk" in the "HyperCard User's Guide" that came with your Macintosh. You might wish to put HyperCard and all the folders of other Apple stacks in a folder called 'Hyperfold'.

STEP 2: In the folder where the HyperCard application resides ('Hyperfold' if you followed the suggestion above), create a new folder called 'TEJAS Stacks', and copy all the TEJAS stacks into it.

STEP 3: Open the new 'TEJAS Stacks' folder. Double-click on the stack 'Open Me First!!' to open it, then follow the instructions on the TEJAS Setup Card that appears.



How to Use TEJAS Help

TEJAS Help is an extensive stack that will guide you in using the TEJAS stack system. There are background cards, common user instructions, and a specific section for every TEJAS stack ('stack-specific' help). The cards explain what is there, how to use it, how to change it, and what not to do.

Enter TEJAS Help directly from the desktop, from the TEJASHome card via the TEJAS Help button (Help section 7.1.8), or from ANY TEJAS stack via the pop-up menu attached to the TEJAS boot button (Help section 6.2).

Once at a Help menu, follow the directions in the outlined box to navigate directly to the section you want. Read ALL the cards in a section.

If you entered the Help stack from any other TEJAS stack, you can immediately return to your point of origin (the card you left in pursuit of Help) by clicking on the T-flag button on any Help card (see Help section 6.2). This will work regardless of how much you navigated within Help.

How to Use TEJAS Help

TEJAS Help is so extensive that several aids are provided to speed navigation within the stack.

The Help section is shown in the upper right corner of each Help card, between the Next and previous arrows. Below that number is the Card sequence, showing where you are within a section's cards.

Menu cards are built-in to speed navigating in Help. There are instructions on each menu for its use. Printed, they act as tables of contents.

To make it easy to get to the Help menus, there are two buttons unique to the TEJAS Help stack: Help Menu and Skip this Menu. Read the next card to understand how to use them to your advantage.

More --->

Help Menu – this button, found at the bottom right of every card in the TEJAS Help stack, works as follows: Click and hold down on it. You will see a pop-up menu with three items (shown). Drag the mouse up and select an item.

TEJAS Help Menu
Next Help Menu
This Section Menu
Help Menu

'TEJAS Help Menu' takes you to the first TEJAS Help Menu – the first card in the TEJAS Help stack.

'Next Help Menu' takes you to the next menu in the Help stack (e.g., if you are in section 7.4.3, this selection will take you to the TelePrimitives Help Menu, section 7.5).

NOTE:
If you do not select any item, you will remain in place.

'This Section Menu' will take you to the menu card for any stack-specific help (e.g., if you are in section 7.4.3, this selection will return you to the EVAPrimitives Help Menu for section 7.4), where you can quickly access more help for that stack.

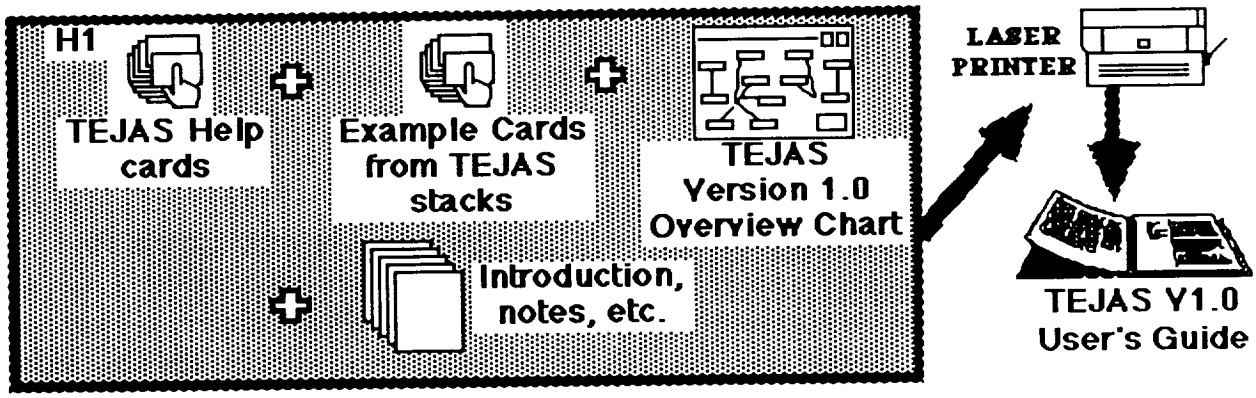
Once you are familiar with TEJAS, you can shorten your search for help by highlighting the ○ Skip this Menu radio button found on the first four TEJAS Help menus. To highlight the button, click on it. It will change to appear dark --> ◉ Skip this Menu (highlight).

If the ◉ Skip this Menu button is highlighted on a TEJAS Help menu card, you will automatically skip that card when you select 'TEJAS Help' from the 'TEJAS boot' button in any stack (see Help section 6.2). Instead, you will go directly to the first Help menu without this button highlighted, skipping menus for general information and common Help, to get right to the menu you want.

The ◉ Skip this Menu button is an extra feature. Use it if you wish.

The TEJAS User's Guide

The TEJAS User's Guide is a printed version of the TEJAS Help stack, with example cards interspersed among the Help cards, and a word-processed Introduction, Index, and Bibliography. The example cards provide reference in the printed Guide; you will not need them in Help when using that stack while TEJAS is up and running on a Macintosh.



TEJAS Version 1.0 Participants

Drews, Michael: tool specification; system and detailed stack design, development and scripting; User's Guide/Help author; project management; TEJAS Editor for Version 1.0

Fiorini, Paolo: TeleTechnologies definitions and forecasting; beta test/review of all stacks; Version 1.0 demo stack development

Hansen, Dr. Bertel: project management (JPL Code ST Projects)

McAffee, Douglas: TeleSystems stack preliminary design

Schenker, Dr. Paul: TeleTechnologies definitions and forecasting

Smith, Jeff H. and group: interactive definition and compilation of Telerobot and EVA task primitives; beta test/review of Primitives stacks

Zimmerman, Wayne: tool specification; system design; project management

Section 4

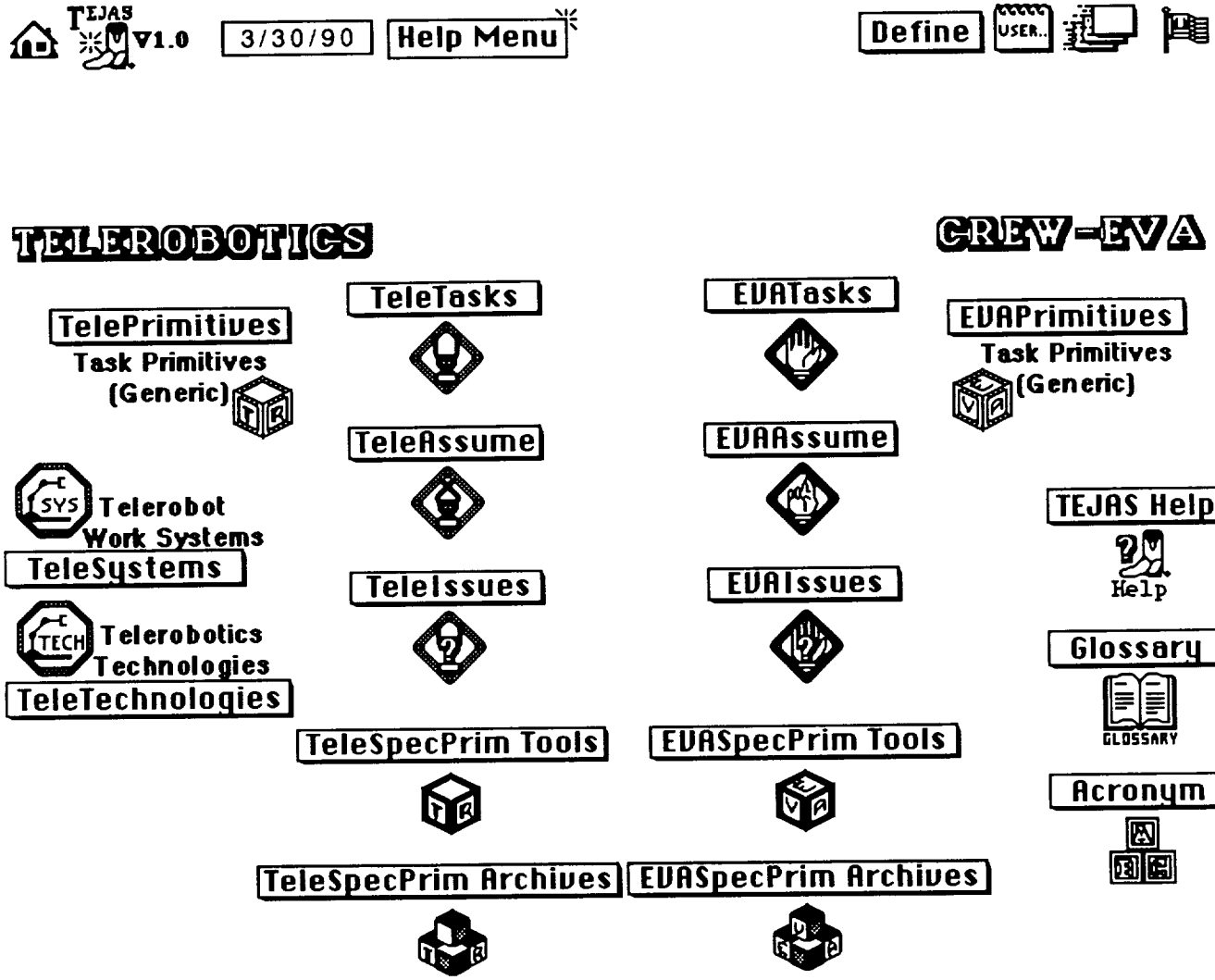
Overview of TEJAS Version 1.0

TEJAS Version 1.0 Contents (Stack List)

Please check that your copy of the TEJAS Version 1.0 release contains the following stacks:

TEJASHome	EVATasks	EVASpecPrim Tools
TEJAS Help	EVAAssume	EVASpecPrim Archives
Open Me First!!	EVAIssues	EVATask.5058 Example
Glossary	TeleTasks	TeleSpecPrim Tools
Acronym	TeleAssume	TeleSpecPrim Archives
EVAPrimitives	TeleIssues	TeleTask.4877 Example
TelePrimitives		
TeleTechnologies		

The TEJASHome card and the pop-up stack navigation menus also list the 'TeleSystems' stack, now scheduled for release in mid-1990.



TEJAS Version 1.0 - What It Does

• Relates EVA and Telerobotics through their specific task primitives. Clearly defines the primitive Verb, details generic Syntax and the primitive's History, and retains the deleted (unincorporated) verbs for future discussion (see Help sections 7.4 and 7.5).

• Interrelates EVA and Telerobot primitives through use of Antonym and Like Verb fields (see Help sections 7.4.11 and 7.5.11).

• Interrelates the Description and Outline, Assumptions, and Open Issues for any EVA or Telerobotic task (Help sections 8.1.7 and 8.4.7), then aids in building a specific task (and any number of derivatives to it) with each of the above (Help sections 8.1.12 and 8.4.12), plus a specific primitives list to approximate the Outline (Help sections 7.4.9 and 7.5.9).

• Provides detailed definition and forecasting on an eight-level readiness system for all telerobotics technologies listed (see Help section 7.7.9).

TEJAS Version 1.0 - What It Does cont'd

TEJAS demonstrates that linked hypermedia stacks can serve as a

- User/researcher-compiled standard reference
- Standard analysis tool
- Communications medium between disciplines, projects, and centers that is compatible with their common in-house equipment
- Thought tool – a way to link, compare, and contrast data across project or technology boundaries, so that any user can follow WHO the originator was, HOW they were thinking, and WHY they reached a particular conclusion.

TEJAS Version 1.0 Reference Stacks Overview

EVA and Telerobot Primitives (EVAPrimitives, TelePrimitives)
- Contains first-ever compilation of verb-oriented task primitives from major crew-EVA and telerobotics Task Analysis Methodologies (TAMs) nationwide
- Includes Verb, Definition, generic Syntax, Like Verbs (related terms, NOT synonyms), Antonym, and History fields
- Helps standardize TAM primitives, relate methodologies, and eliminate redundancies. Contains more telerobot primitives than EVA, more exact. (see Help sections 7.4 and 7.5)

Telerobotics Technologies (TeleTechnologies)
- Contains one card per space telerobotics technology, for ALL technologies (not just some arbitrary list of 'critical' technologies)
- Includes Definitions and Forecasts (with histograms), via an 8-level technology readiness system
- Includes NASREM (NASA/NBS Standard Reference Model) classification for each technology (see Help section 7.7)

TEJAS Version 1.0 Reference Stacks Overview

Telerobotics and EVA Glossary of Terms (Glossary)
- Contains over 1100 commonly used (and misused) terms, one per card
- Includes up to three definitions (each with a source)

(see Help section 7.2)

Acronyms and Abbreviations Dictionary (Acronym)
- Contains over 800 commonly used (and misused) acronyms and abbreviations, one per card
- Includes up to five definitions (each with a source) from NASA and industry documents

(see Help section 7.3)

TEJAS Version 1.0 Analysis Stacks Overview

Task Summaries (EVATasks, TeleTasks)
- Contains card summaries (one per task) of any EVA or Telerobotics task
- Includes Task Name, Description, Outline fields

(see Help sections 8.1 and 8.4)

Assumptions (EVAAssume, TeleAssume)
- Contains cards for listing assumptions about workplace, task flow, tools, ORU's, etc.; one assumptions card per task
- Aids in technology requirements analysis

(see Help sections 8.2 and 8.5)

Open Issues (EVAIssues, TeleIssues)
- Contains cards for listing what is NOT resolved about a task you are analyzing; one open issues card per task

(see Help section 8.3 and 8.6)

TEJAS Version 1.0 Analysis Stacks Overview

Specific Primitives Tools (EVASpecPrim Tools, TeleSpecPrim Tools)
- Contains three cards only (SpecPrims List, SpecPrim Builder, SpecPrim Args Menu) that work interactively with other cards in a specific task stack
- Aids in building specific primitives in a Specific Task stack (see below)

(see Help sections 9.1 and 9.4)

Example Specific Task Stacks (EVATask.5058, TeleTask.4877)
- Created from Task Summaries; each stack contains Task Summary, Assumptions, and Open Issues cards for one task, three cards that build specific primitives (above), and a card that provides primitive verb menus
- Used to specify the specific primitives for any task
- Allows creation of derivatives of any specific task at any point in the analysis (see 'Building a Specific Task,' Help sections 8.1.12 and 8.4.12)

NOTE: EVATask.5058 and TeleTask.4877 are EXAMPLE STACKS only. You can create an unlimited number of these stacks using TEJAS (see Help sections 9.3 and 9.6).

TEJAS Version 1.0 Analysis Stacks Overview

Specific Primitives Archives
(EVASpecPrim Archives, TeleSpecPrim Archives)

- Contains separate cards for each primitive verb, arranged alphabetically by verb (similar to EVAPrimitives and TelePrimitives stacks, but excluding the deleted verbs), with a single scrolling field that archives all specific primitives using that verb. To appear here, these specific primitives must first be built by the user within a specific task stack (on the SpecPrim Builder card, see Help sections 9.1.8 and 9.4.8), then archived with the Archive List button (on the SpecPrims List card, see Help sections 9.1.7 and 9.4.7).
- Aids in reusing specific primitives already built within a specific task stack (see Help sections 9.2 and 9.5). Provided as a convenience for internal use (e.g., group, section, division etc.), NOT as an attempt at standardization of SPECIFIC primitives for the entire community.
(see Help sections 9.2 and 9.5)

Transporting TEJAS Data

TEJAS is NOT meant to replace, but to augment existing microcomputer software tools. Although TEJAS data is stored in HyperCard stacks, this data can, if desired, be exported to or imported from another program in many ways (see Help sections 5.1 to 5.6). Therefore, your analysis needn't hinge on HyperCard, nor on a particular stack's design. By transporting TEJAS data into your existing applications, you can take full advantage of your specialized macros and formulae.

In a future application, HyperCard could act as a user-customizable front-end for any database, spreadsheet, or word-processed file (where you see only a HyperCard card). For example, complicated HyperTalk scripts could call on a number-crunching application to calculate and graph data, solve equations, create and store files, print, etc. The TEJAS Version 1.0 scripts don't do this, however. If they did, using TEJAS would then require owning, installing, and configuring those other applications, lessening the total Macintosh compatibility HyperCard automatically gives you.

Communicating with Hypermedia

The data in the TEJAS Version 1.0 stacks is useful for a variety of applications but is best transported as stackware. Here's why:

Stackware is software, but it is hypermedia (reactive media) too. Stacks can do more than list text and numbers, or show static two-dimensional graphics (like the histograms in the TeleTechnologies stack). With hypermedia comes audio, video, and file manipulation capability.

Therefore, the TEJAS stacks are intended as a communications medium, too. When you check a stack that someone sends you against your copy of it, you can see RELATIONSHIPS between terms, systems, primitives, technologies, etc. – something not possible on paper. Using the Find... command, you can quickly read what you need and ignore the rest.

In short, the stacks are best left as stacks. SAVE TIME: don't print stacks, exchange stackware! You will quickly find other uses for hypermedia.

Modifying Existing Cards

You can modify cards by adding and deleting text fields and buttons, changing the background and card pictures, or entering or deleting text in existing fields (see the "HyperCard User's Guide" for details).

WARNING: If you wish to add NEW background fields and buttons, you can. But you therefore assume responsibility for explaining each button or field's use, filling in new fields on EVERY card in the stack, justifying each change, and so on. This is a considerable job – don't leave it half done.

Please avoid adding card fields or buttons, or changing the card picture. These changes are time-consuming and expensive to reconcile.

The TEJAS Help stack cards are protected by a HyperTalk script to prevent you from deleting them. Please do not change the Help cards in ANY way. If you do and you transfer these stacks, the next user will not get the original Version 1.0 stack. Suggest changes in the User Notes field instead.

Adding Cards

New cards may be added to any stack at any time. These may include primitive verbs, terms and acronyms, technologies, etc. The TEJAS Editor welcomes and encourages such additions, especially to the reference stacks. Each added card will be identified, read, and compiled in any updates or later TEJAS versions.

Each TEJAS stack has specific Help cards (see Help sections 7.1 to 9.6). Before adding cards, please refer to the 'Adding Cards' Help card for the stack you're in and read the rules for that stack.

Deleting Cards

NEVER DELETE ANY CARDS FROM ANY REFERENCE STACK, OR FROM THE TEJASHome OR TEJAS Help STACKS!!

Deleting cards is, in general, a very poor idea. Without exception in TEJAS, all cards serve a purpose. Sometimes they control the way a stack works. Most often, they provide information.

ONLY in the TEJAS analysis stacks should cards EVER be deleted. When released, these stacks contain only example data; they exist to store whatever you enter. You can delete your data if you want. But even in the analysis stacks, there are cards you should NEVER delete.

Each TEJAS stack has specific Help cards (see Help sections 7.1 to 9.6). Before deleting cards, please refer to the 'Deleting Cards' Help card for the stack you are in, and read the rules for that stack.

TEJAS Updates and Later Versions

Compiling suggested changes, additional information, and comments must be directed by an impartial group. Until that group is identified, the TEJAS Editor will continue maintaining, updating, and augmenting the stack system (through FY 1990).

Additional TEJAS stacks (such as the TeleSystems stack due out in early 1990) will bear release numbers of 1.1 to 1.9. When enough comments and changes have been received, tested, debated, and compiled, a new version of the entire TEJAS stack system (2.0) may be released.

For each release, an interactive installation routine (much more complex than the one for Version 1.0) will give you a choice: update the existing stacks or replace them with new versions. Updating will carefully modify the reference stacks, preserving items you specify (such as User Notes, additional definitions, etc.), but changing the standardized reference information (clearly identified) so that no information is lost.

The User's Role

Hypermedia communications works best if the flow of ideas is TWO-WAY. The TEJAS Editor needs your inputs to help the entire commmunity.

USE the stacks. Modify the information if it is wrong, and send the modified stacks back. Add your other comments in the User Notes field. We will use scripts to identify and flag all changes, then compile them for the next version. This can continue as long as it helps the community.

Detailed instructions are on 'The User's Role' cards in the stack-specific Help (sections 7.1 to 9.6).

Section 5

Input and Output

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PAGE 36

Input: Importing From Text Files

Reference documents – such as acronym lists and glossaries (of terms) – are often compiled as text files. Considerable information may be (and has been) transferred from them into the TEJAS reference stacks. There are three basic methods of importing text into TEJAS information fields:

1. Manually cut and paste specific items from spreadsheet to stack cards. With enough RAM, MultiFinder will run both HyperCard and a text application simultaneously (see Help section 3.3 about RAM limits).

2. Type the text onto cards. This can be the fastest way, if the amount of data is not too great and you have insufficient RAM to try method 1.

3. Build a macro or HyperTalk script to automate the process. For this, you need detailed knowledge of both the originating file and the HyperCard stack. The TEJAS Help cards give details on all TEJAS information fields; it is up to you to write the code (or request it from the TEJAS Editor).

Input: Importing From Spreadsheets & Databases

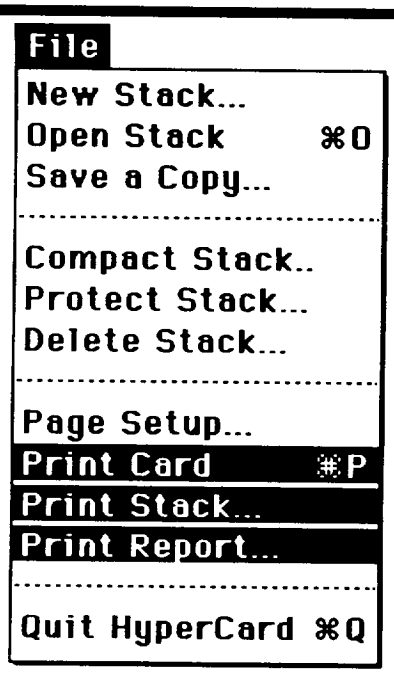
HyperCard's main utility is as an information manager that collects, sorts, stores, and finds data. It is not a spreadsheet program, nor a number-cruncher. But people often use spreadsheets and databases. If input from these is desired for one of the TEJAS stacks, it can happen in three ways:

1. Manually cut and paste specific items from spreadsheet to stack cards. With enough RAM, MultiFinder will run both HyperCard and a text application simultaneously (see Help section 3.3 about RAM limits).

2. Type the information onto cards. This can be the fastest way, if the data amount is not too great, and you have insufficient RAM to try method 1.

3. Build a macro or HyperTalk script to automate the process. For this, you need detailed knowledge of both the originating file and the HyperCard stack. The TEJAS Help cards give details on all TEJAS information fields; it is up to you to write the code (or request it from the TEJAS Editor).

Output: Printing TEJAS Stacks and Cards



The following commands let you print an exact record of what you see on the screen:

To print TEJAS cards individually, one to a page, use the 'Print Card' command.

To print the entire stack of cards, use the 'Print Stack...' command.

Use the 'Print Report...' command for text not visible on scrolled fields (Help section 5.4).

See the "HyperCard User's Guide" for a full explanation of these commands.

More --->

Output: Printing TEJAS Stacks and Cards

A few tips about printing in HyperCard:

HyperCard printing is quite slow; this will doubtless be improved with the next release of the application. The more RAM you have in both computer and printer, the faster it will print. Printing 'text-only' reports is much faster, but for card or background pictures (such as the histograms in the TeleTechnologies stack), you MUST print either the card or the entire stack if you need hard copy.

Caution: extensive TEJAS data is best used in stack form. AVOID PRINTING ANYTHING – cards, stacks, or reports – when possible. TEJAS Verson 1.0 is very large. Remember that even text reports may be up to 200 pages!

Output: Printing TEJAS Reports

The 'Print Report...' command from the 'Edit' menu allows you to print text-only reports from the background and card fields of any TEJAS stack. You may choose any combination of fields to print, in several styles, by using the dialog box that appears when you select 'Print Report...'

HyperCard versions 1.2.1, 1.2.2, and 1.2.5 do not provide a way to print a text-only report from particular cards. You must print the entire stack. See the "HyperCard User's Guide" for a full details.

For some printouts, the TEJAS project used the "Reports" program by Activision, Inc. This program allows greater flexibility with reporting style for HyperCard stacks and is somewhat faster.

Caution: extensive TEJAS data is best used in stack form. AVOID PRINTING ANYTHING – cards, stacks, or reports – when possible. TEJAS Verson 1.0 is very large. Remember that even text reports may be up to 200 pages!

Output: Exporting to Text Files

Because of HyperCard's limited text processing and printing capability, it is sometimes best to export text fields to word-processing programs. There are various commercial DA's (Desk Accessories), stand-alone programs, and even some HyperCard stacks that export text fields. But TEJAS deliberately avoids providing a quick-and-easy way to save an entire stack as text, because such a handy utility would quickly lead to two problems:

- breakdown in configuration control
- duplication of known data as printed media

It is simple to create a short HyperTalk script that will transfer all text from a stack into a document. A number of books are available that explain how. Several of them are listed as references in the TEJASHome stack.

Remember, you can always use the mouse to cut and paste discrete text from any TEJAS stack to any word-processed document.

TEJAS Version 1.0 analysis is limited. But different Task Analysis Methodology (TAM) efforts nationwide have created extensive, useful databases and spreadsheets, with built-in formulae and macros. These TAMs generally deal with specific task primitives. You can create these specific primitives in TEJAS, then export them to a spreadsheet for analysis.

In TEJAS, specific primitives are found only in specific task stacks (e.g., EVATask.5139, TeleTask 4722, etc.) that are created from the EVATasks and TeleTasks stacks (see Help sections 8.1.12 and 8.4.12). Built into the SpecPrims List card (Help sections 9.1.7 and 9.4.7) in every specific task stack is the only automated data exporting function in TEJAS Version 1.0. This routine dumps the list of specific primitives to the text-only files "Transfer spreadsheet" and/or "Transfer document".

For a full explanation of TEJAS task analysis capabilities, see Help sections 8.1.6, 8.4.6, and 9.1 to 9.6.

Section 6

User Instructions: TEJAS Common Help

TEJAS Common Navigation and Action Commands

Please see the "HyperCard User's Guide" (c) Apple Computer, Inc., Cupertino, CA, 1988, or the built-in HyperCard Help stack for a complete explanation of the following commands from the 'Go' menu:

Go		
Back	⌘~	the last card seen; choose repeatedly to trace steps
Home	⌘H	the Home card (the first card in the HyperCard Home stack)
Help	⌘?	the first card in the HyperCard Help stack
Recent	⌘R	the 42 most recent cards; cards you've seen more than once are shown just once
First	⌘1	the first, previous, next, or last card in the current stack
Prev	⌘2	
Next	⌘3	
Last	⌘4	
Find...	⌘F	text searching command
Message	⌘M	input box in which to type any command such as "Go to Address"

TEJAS Common Navigation and Action Commands

A few important words about the 'Find...' command:

To find a word, phrase, or number (any character string) in any stack, select 'Find...' from the 'Go' menu (or type ⌘F). The message box will appear (if it's not already visible) with the Find command in it. Type the character string inside the quotation marks. Hit the Return key to activate the search, and the card containing the first occurrence of that string will appear, with the string outlined (e.g., string).

If that occurrence of the string is not what you wanted, hit the Return key again (before you do anything else). Keep hitting the Return key until you find the string you want. Find will check ALL fields, locked or unlocked. Use the Return-Find sparingly at first; it can be confusing, and for searching out common strings (such as 'telerobot'), quite wearisome.

For a better way to search text within TEJAS, see the next card -->

TEJAS Common Navigation and Action Commands

A tip about searching in TEJAS:

Wherever practical, TEJAS provides a HyperTalk script (software code) to shorten the search for a particular word or phrase. Usually these script utilities search only the fields that identify the card's subject such as a primitive verb or technology name.

These HyperTalk scripts are attached to buttons and locked text fields, and may use a pop-up menu (all explained further in the following cards). There may be several utilities in the same stack, deliberately inserted to give you greater flexibility and speed in text searches. You will usually save a lot of time if you use them instead of executing the 'Find...' command.

Be certain to check the Help cards for the stack in which you're searching for these built-in TEJAS utilities. If a particular search routine would be useful but isn't incorporated, please let the TEJAS Editor know.

TEJAS Common Navigation and Action Commands

A few words about the 'Compact Stack' command (in the File menu):

This is a vitally important comand to know (and use wisely) in order to keep your stacks manageable, both in operating speed and storage.

HyperCard stacks are much larger than commonly encountered files. The application reserves disk space in 8 kilobyte increments for a growing stack. Initially, all that space is used. But free space is introduced into a stack each time you delete a card, background, field, or button; the more free space in a stack, the slower and larger the stacks. You can monitor the free space by selecting 'Stack Info...' from the Objects menu.

The 'Compact Stack' command rearranges the current stack on your hard disk, deleting any free space. The larger the stack and the more free space, the longer this command takes to execute. But it's worth the wait. You should use 'Compact Stack' at the end of each session with a TEJAS stack.

TEJAS Common Navigation and Action Buttons

HyperCard allows you to create an unlimited set of programmable on-screen buttons. TEJAS takes full advantage of buttons, either to navigate within and between the various stacks or to provoke an action such as hiding or showing fields or pictures.

Buttons work because subroutines of HyperTalk code, called scripts, are attached to them (see 'Button Info...' in the "HyperCard User's Guide"). In TEJAS, these scripts are optimized to operate within the stack system. They can offer many different ways to find or use a particular piece of information, thereby building flexibility into the interface with you. Don't be afraid to try them.

If anything about a button seems contrary, too subtle, or not intuitive – the icon, the speed, the action – please make a note in the User Notes field (see Help section 6.5).

TEJAS Common Navigation and Action Buttons

TEJAS buttons are of most of the seven standard HyperCard types – transparent, opaque, rectangle, shadow, round rect, check box, and radio button (see the "HyperCard User's Guide").

Icon buttons have been used wherever possible in TEJAS, to save screen space, build an intuitive interface, and give uniformity within and between stacks. Over two dozen icon buttons were created especially for TEJAS. Some examples:

These are explained in the TEJAS Help cards for each stack.

NOTE: Any button with a 'pop' symbol (⁂) on it supports a pop-up menu! TEJAS has quite a few of these menus, again to save space. Look for the ⁂!

The next cards explain buttons that are common to ALL TEJAS stacks.

TEJAS Common Navigation and Action Buttons

Home - always takes you back to the HyperCard Home card, however your Home card is configured. This same icon is found at the bottom left corner on every card in every TEJAS stack.

Next - advances you through the cards in any stack. Found at the bottom center of every card in every TEJAS stack (except TEJAS Help).

Previous - takes you back one card at a time within a stack. Found at the bottom center of every card in every TEJAS stack (except TEJAS Help).

T-flag - will return you from a pursuing a definition or some help from the TEJAS Help stack to the card you left, even if you have moved within the Glossary, Acronym, or TEJAS Help stacks, or used the Define button again. Think of T-flag as a 'bookmark' that keeps your place. Use it to save time finding your point of origin. Found at the upper right corner of every card in every TEJAS stack (except TEJAS Help - see it?).

TEJAS Common Navigation and Action Buttons

Show - this button quickly displays all the cards in any stack, so fast that you'll barely be able to scan them. When you see the card you want, or wish to stop the search, just click the mouse (anywhere). The display will stop, probably a few cards past the card you want. Click on the Previous button (left arrow) until you get back to the card you want.

Sort - this button works differently in different stacks. Usually Sort functions alphabetically in the fields that list the card subject, such as the primitives Verb field. See the TEJAS Help cards for a particular stack. In some stacks, a warning will appear with an option to cancel the command.

BEWARE! If you use Show or Sort in any large stack (such as the Glossary and Acronym stacks, each approximately a thousand cards), you may be in for a long wait. These commands are RAM-intensive, and completion times vary by stack size, RAM cache size, and your processor. Do not use either button trivially in large stacks, and read the Help cards for each stack.

TEJAS Common Navigation and Action Buttons

6.2 5 of 14

EVAPrimitives
TelePrimitives
TeleSystems
TeleTechnologies

EVATasks
EVAAssume
EVAIssues

TeleTasks
TeleAssume
TeleIssues

Glossary of Terms
Acronyms & Abbrev.

TEJAS Help
This Stack Help

TEJAS boot - found at the bottom left (next to the HOME button) on every card in every TEJAS stack; speeds navigating between stacks.

Click and hold down the mouse button on the boot to reveal a pop-up menu (at left), which works like any other Macintosh menu. Select a TEJAS stack from the menu by holding down the mouse button, dragging the cursor until a stack name illuminates, then releasing. The script takes you immediately to the first card of that stack.

IMPORTANT: If you fail to select an item (i.e., drag the cursor off the menu and release the mouse button, or click once quickly on this button), you will go directly to the TEJASHome card. More -->

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

TEJAS Common Navigation and Action Buttons

6.2 6 of 14

EVAPrimitives
TelePrimitives
TeleSystems
TeleTechnologies

EVATasks
EVAAssume
EVAIssues

TeleTasks
TeleAssume
TeleIssues

Glossary of Terms
Acronyms & Abbrev.

TEJAS Help
This Stack Help

TEJAS boot (cont'd) - the last two menu items are important. Use them to get Help, then return to your point of origin by clicking on the .

'TEJAS Help' takes you back to the first TEJAS Help Menu at the beginning of this Help stack.

'This Stack Help' takes you to the Help menu for whatever stack you are in, bypassing the TEJAS Help stack's introductory and Common Help cards. It's a more direct route to Stack-Specific Help.

The TEJAS boot button is one of the fastest ways around the stack system, saving you time by bypassing the TEJASHome card, finding Help, or getting you back to TEJASHome. Lost? Click on it!

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

TEJAS Common Navigation and Action Buttons

Define - found at the bottom right on almost all cards in TEJAS, this button lets you access cards in the Glossary of Terms and Acronyms and Abbreviations Dictionary at any time during your work in TEJAS.

This utility is provided because EVA and Telerobotics are extremely complex areas of research, requiring constant reference. With a plethora of terms and multiple definitions, a suitable 'dictionary' that covered both areas simultaneously did not exist. The Glossary and Acronym stacks were created to fill this need (see Help sections 7.2 and 7.3), and the Define button was created to use them as hypermedia.

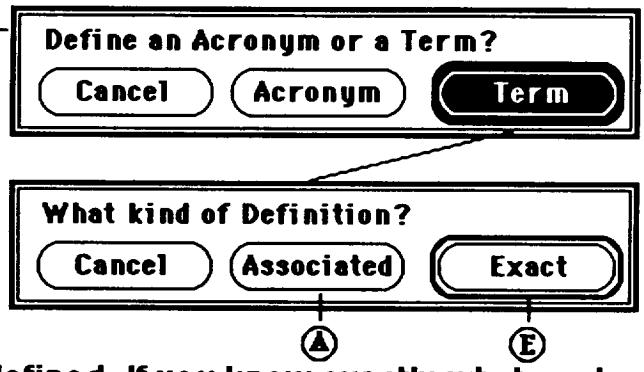
When you use Define in any stack except Glossary, Acronym, or TEJAS Help (this stack), the button 'saves your place.' If you want to search for other terms or acronyms in those two stacks, just use Define again, or the Next, Previous, or Show buttons. After you have the information you need, click on , and you will return to where you started the search.

TEJAS Common Navigation and Action Buttons

Define - Define works via a complicated HyperTalk script to help you search and navigate through the Glossary and Acronym stacks. It is useful to know exactly how the Define search works.

Define

When the Define button is clicked, it highlights, and shows the first dialog box.

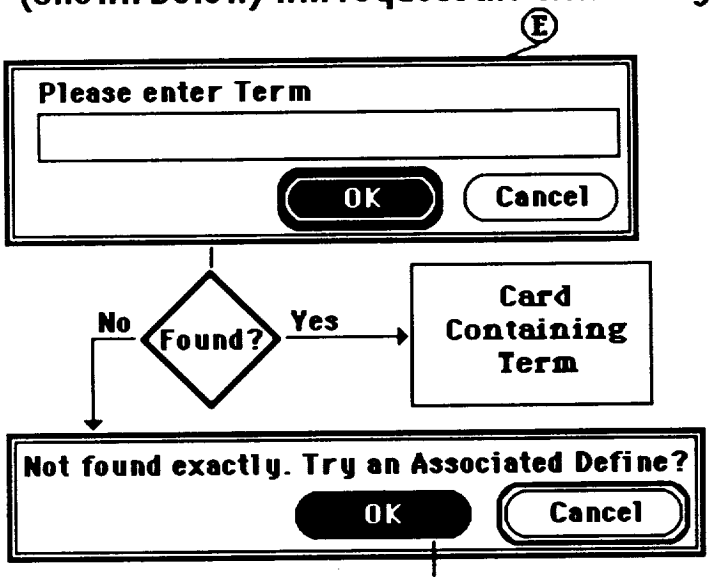


NOTE: You can Cancel the search at any time

If 'Term' is selected, TEJAS next wants to know if you wish an Associated or Exact term defined. If you know exactly what you're looking for (e.g., 'gripper'), choose Exact. If you're not certain how your term may be listed (e.g., 'shared control' or 'control mode: shared' etc.), choose 'Associated.'

More -->

Define - If you selected an Exact term definition, the input dialog box (shown below) will request the term and give you another chance to Cancel.



If you click 'OK,' the script will start the search. If it finds an EXACT MATCH for your term, you will go to that card in the Glossary.

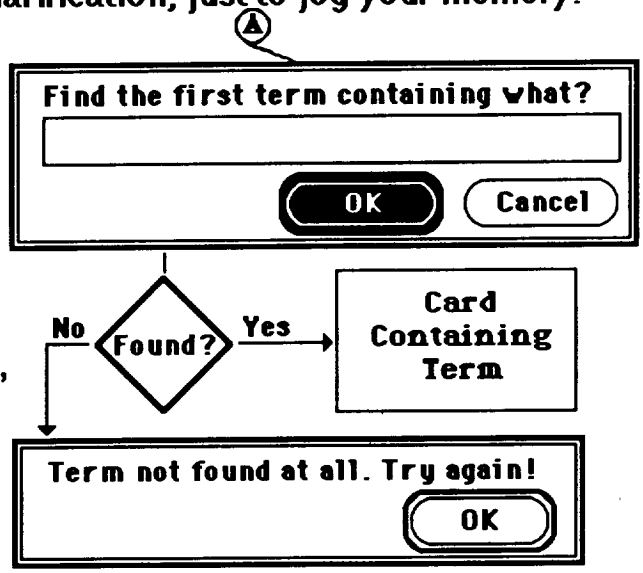
If Define does not find an EXACT MATCH for what you typed, it is still possible that your word or phrase is in the Glossary, perhaps rearranged a bit or contained within an associated term. The script will ask to try an Associated Define.

More -->

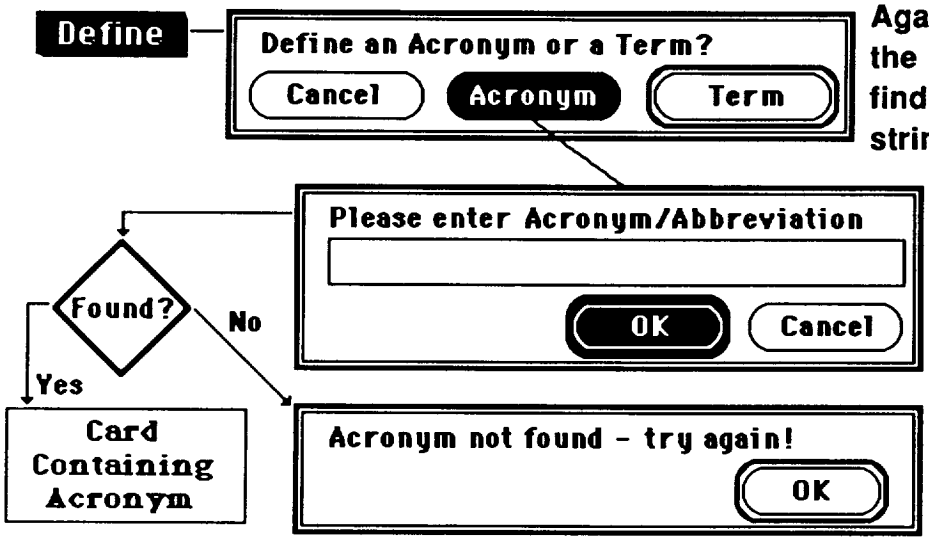
Define - If you selected an Associated term definition, the input dialog box will request the term with a little clarification, just to jog your memory:

The request means just that: the script will alphabetically search the Glossary, until it finds the first term that CONTAINS your word or phrase.

EXAMPLE: If you select an associated definition of "telerobot," Define will yield (in TEJAS Version 1.0) "Primitive, Telerobot (Generic)"; this is certainly an associated term, but hardly what you wanted. You will have to Define again. That's why you should always start term searches with Define Exact.



Define - Defining acronyms and abbreviations is somewhat simpler. The sequence is as shown: select 'Acronym' in the first dialog box; this leads to another input box. Enter the character string you want and click 'OK.'



Again, you can cancel the search. If the script finds a match for your string, it will take you to that card in the Acronym stack. If not, you will get the message below.

Compound acronyms (e.g., JEM-RMS) can lengthen the search. Be persistent.

Some tips for using Define with TERMS:

• With Exact Defines, single words will be found much faster than phrases or multiword terms.

• For multiword terms (such as "shared control"), enter them as such, NOT as a hierarchical list separated by commas (e.g., "control, shared").

• If a search fails, try breaking down the term into key words and finding all the associated terms. For example, an Exact Define of "degree-of-freedom" finds no match. An Associated Define yields "Limited-degree-of-freedom Robot." But the key words are "degree" and "freedom"; either of these finds "Degrees of Freedom." This example also illustrates how to overcome hyphenation in a term, whether expected or not – do a key word search.

See Help section 7.2 on the Glossary stack for more insights.

TEJAS Common Navigation and Action Buttons

Some tips for using Define with ACRONYMS and ABBREVIATIONS:

- Searching for acronyms and abbreviations is much faster than searching for terms because nearly all entries are single word terms.

- Hyphenation can still cause multiple 'successful' searches that don't give you the acronym or abbreviation you want. Just repeat the Define. There are not many hyphenated acronyms in the stack.

- See Help section 7.3 on the Acronym stack for more insights.

TEJAS Common Navigation and Action Buttons

USER.. User Notes - found at the lower right on almost all TEJAS cards in the reference stacks (including Help), this button gives you access to a scrolling text field called 'User Notes,' where you can type in whatever comments you may have. If something is missing or you disagree with a definition, a forecast, a numerical value, an icon, the way something works or is explained – ANYTHING – note it on this 'scratch pad.' Then you can either print this field for all the cards in a stack, or return a copy of the stack to the TEJAS Editor, who will review and respond to these suggestions.

Information vs. Comment vs. Configuration Fields

There are three types of TEJAS fields:

INFORMATION fields are used for data input on each information card. Specific instructions for each field are found in the 'Information Fields' Help cards for each TEJAS stack.

COMMENT fields, found on every card of any stack, are provided as a personal notepad. In this field you can communicate your ideas, critiques, even justifications for changes to another user, or between any user and the TEJAS Editor. TEJAS Version 1.0 contains only one comment field, described in the 'TEJAS Common User Notes Field' card (Help section 6.5).

CONFIGURATION fields, found on every card of any stack, are locked. Their function is described in the 'Configuration Fields' card (Help section 6.4).

TEJAS Common Configuration Fields

Date: locked, unlabeled rectangle field at bottom left (see arrow 1). Shows date the card was last modified; changes automatically to current date with a change in any field's contents. Used for configuration control for the TEJAS user and Editor; can be used to search for latest changes in an evolving stack.

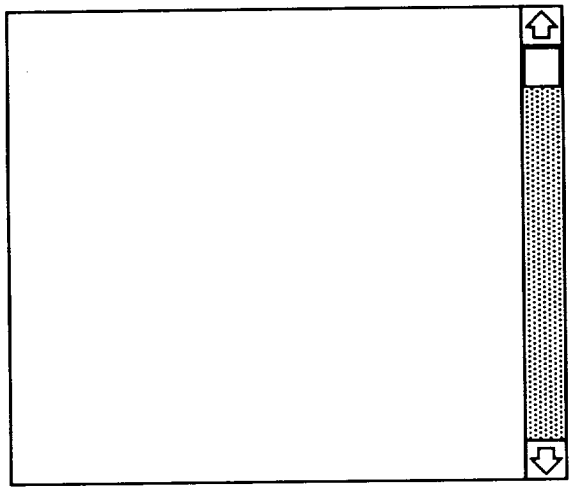
TEJAS Version: locked, unlabeled transparent field to the right of the TEJAS boot at lower left (see arrow 2). Contains "VX.X" (original version number, e.g., V1.1); changes automatically to "VX.X+" with a change in any information field's contents (but NOT with changes or additions to the User Notes field). Used for configuration control, for the user and originators.

NOTE: any "VX.X+" cards have been modified before you received them; they are NOT an original release!

TEJAS Common User Notes Field

User Notes: unlocked, unlabeled, hidden scrolling field appearing at card center when the 'User Notes' button is pressed. Use as a 'notepad,' to transfer thoughts, comments, complaints, or notes.

'User Notes' field shown as it appears on-screen --->



NOTE: When this field appears, the card picture will be hidden. This may change the appearance of the card; It will be restored when the 'User Notes' is pressed again, hiding this field.

TEJAS Information Fields

Information fields are the text fields that store both text and numbers in TEJAS. They are different in purpose from Comment and Configuration fields (see help section 6.3.). There are five possible types of fields: transparent, opaque, rectangle, shadow, and scrolling. In addition, fields can be either hidden (i.e., invisible unless shown by pressing a button or otherwise executing a "show field" command) or visible. Please see the "HyperCard User's Guide" (c) Apple Computer, Inc., Cupertino, CA, 1988, or the built-in HyperCard Help stack for a complete explanation of fields and their properties.

There are no information fields common to all TEJAS Version 1.0 stacks.

Specifications for and use of information fields for each TEJAS stack are described in the 'Information Fields' section of that stack's TEJAS Help cards. See the Help menus for the individual TEJAS stacks to find the appropriate section number.

Section 7

User Instructions: Reference Stacks

Section 7.1

User Instructions: TEJASHome Stack

PAGE 56 INTENTIONALLY BLANK

TEJASHome Help Menu

Menu 1 of 1

7.1 User Instructions

Background:

- ☐ 7.1.1 General Information
- ☐ 7.1.2 The User's Role
- ☐ 7.1.3 Changing the Standard
- ☐ 7.1.4 Adding Cards
- ☐ 7.1.5 Deleting Cards

Unique!

Stack-Specific Help:

- ☐ 7.1.6 Card Backgrounds
- ☐ 7.1.7 Information Fields
- ☐ 7.1.8 Buttons

Unique!

- ☐ 7.1.9 Stackware Bibliography Card

INSTRUCTIONS:
Click ☐ box to access section;
Click arrows to page through Help stack;
Click 'T-flag' to return to point of origin.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

TELEROBOTICS/EVA JOINT ANALYSIS SYSTEM (TEJAS) HOME CARD

Telerobotics

- TelePrimitives
- TeleTasks
- TeleAssume
- TeleIssues
- TeleTechnologies
- TeleSystems

Extravehicular Activity (EVA)

- EVAPrimitives
- EVATasks
- EVAAssume
- EVAIssues

Help

Acronyms & Abbreviations

Glossary of Terms

Owner:

TEJAS V1.0 | 3/30/90 | Define | USER..

TEJASHome Stack - General Information

TEJASHome is 'home base' (i.e., the 'root directory') for the TEJAS stack system. Most of the time, you will never need to visit here. But if you ever do get lost in the stacks, clicking once on the 'TEJAS boot' button (see Help section 6.2) in the lower left-hand corner of EVERY card in EVERY stack will take you to TEJASHome. From the TEJASHome card, you can enter any stack in the TEJAS stack system

You SHOULD include this stack with any smaller subset of TEJAS that you use or distribute because there are scripts in each stack that refer to it.

As an example, TEJASHome comes with the TelePrimitives, EVAPrimitives and TEJAS Help stacks released on a single disk with the document, "Generic Extra-Vehicular Activity (EVA) and Telerobot Task Primitives for Analysis, Design, and Integration, Version 1.0: Reference Compilation," JPL Publication 90-10.

TEJASHome Stack - The User's Role

TEJASHome is a reference stack provided to aid navigation within TEJAS. There is nothing to change in this stack, since all text fields are locked. Please DON'T TAMPER with any objects - field, button, picture, script, etc. Don't even move them.

The text field "My Copy" (located at the bottom, with the label "OWNER" in front of it) is automatically filled with the owner's name when installing TEJAS, if you followed the directions on the 'How to Install TEJAS' card (Help section 3.5). Whenever this stack is reinstalled using the 'Open Me First!!' stack, this field may change. That is the ONLY thing that may change in TEJASHome.

TEJASHome Stack - Changing the Standard

This is an important stack for navigation, for introducing the TEJAS symbology, and for documenting software and references used in TEJAS' creation. If you think that changes should be made to either card in this stack, please suggest them in the User Notes field (see Help section 6.5). Otherwise, this stack – especially the first card – is a standard only to TEJAS. No other mechanism is needed for changing the standard.

TEJASHome Stack - Adding Cards

DO NOT ADD ANY CARDS TO THIS STACK!!

TEJASHome is not a place to store things, but a place for navigating to other places where things are already stored, or should be. This is the only stack to which cards should NEVER be added.

TEJASHome Stack - Deleting Cards

DO NOT DELETE ANY CARDS FROM THIS STACK!

There are only two cards in this stack: the TEJASHome card and the TEJAS Stackware Bibliography card.

The TEJASHome card provides your navigation 'home base.'
The TEJAS Stackware Bibliography card lists, for traceability and accreditation, the software and documents used to write this stack system.

Both cards are important to TEJAS' overall working and are protected by a HyperTalk script. This script will intercept the 'Delete Card' and 'Cut Card' menu commands if issued, and will give you the message "Cannot delete or cut TEJASHome cards!" with a warning tone.

Moral: Don't mess with TEJASHome!

TEJASHome Stack - Card Backgrounds

There are two different backgrounds in these stacks. By specific name:

TEJASHome.bg: background for the TEJASHome card. Different cards for each technology. No primary information fields; thirteen visible card buttons of different types, one visible shadow card field labeled "Owner."

Bibliography.bg: specialized, for the Bibliography Card only. Updated only by the TEJAS Editor; lists software and references (handbooks, documents, 'how to' books, etc.) used in compiling the TEJAS stacks.

TEJASHome Stack - Information Fields

THERE ARE NO INFORMATION FIELDS IN THIS STACK.

This is the only stack within TEJAS for which this is true because it is the only stack whose purpose is purely navigation and acknowledgement, not data transfer, analysis, or reference compilation.

TEJASHome Stack - Buttons

Labeled icon buttons on the TEJASHome card represent each stack in TEJAS. These same icon buttons are also found in the upper left corner of every card in the stack they represent (see 'NOTE', below). They therefore help you to instantly identify a stack that you may have just entered.

The buttons use different icons to make them instantly recognizable: diamonds for analysis stacks, cubes for primitives, etc. They are separated into two sides of the card: Telerobotics on the left, EVA on the right. This is an arbitrary arrangement.

The buttons have different functions within their stacks, but here they serve only one purpose: to take you instantly to the first card of that stack.

NOTE: the TEJAS Help button Help is found ONLY on this TEJASHome card, nowhere else in TEJAS. TEJAS Help is accessed from the stacks via the 'TEJAS boot' button's pop-up menu (see Help section 6.2).

TEJAS Stackware Bibliography Card

NOTES TO THE READER: This particular card is a bibliography of the software and references (handbooks and documents) used in compiling the TEJAS stacks. Disclaimers still appear in the "About TEJAS" card field on the TEJAS home card, in the TEJAS User's Guide, and in other places where appropriate. But this card is the main point of reference; if it's not listed here, we did not make use of it in creating these stacks.

REFERENCES

1. "HyperCard User's Guide", (c) Apple Computer, Inc., Cupertino, CA, 1988; used as an introductory learning tool and reference

2. "HyperTalk Programmer's Quick Reference" , by Lon Poole, Microsoft Press, Redmond, WA, (c) 1988; used as an extensive reference, especially with script commands; includes updates to HyperTalk until HyperCard Version 1.2.2

3. "Apple HyperCard Script Language Guide: The HyperTalk Language", Addison-Wesley Publishing Company, Inc., Menlo Park, CA, (c)

SOFTWARE

1. 'HyperCard' Version 1.2.2', (c) Apple Computer, Inc.; software used to construct TEJAS stack system

2. '101 Scripts and Buttons for HyperCard' Version 1.0, (c) 1988 Macropac International; software used to provide certain visual effects, choice fields, popup menus, and certain animated buttons

3. 'Stack Cleaner Utilities for HyperCard' , Version1.0, (c) 1988 by Softworks, Inc.; used to clean up (shorten)

TEJAS V1.0 | 3/30/90 | Define | USER..

TEJASHome Stack - Stackware Bibliography Card

7.1.9 1 of 1

The second (and last) card of the TEJASHome stack lists the software (programs) and references (books, articles, etc.) used in the creation of TEJAS Version 1.0. They are provided here for accountability. Their appearance here should not be considered an endorsement; and this software is not distributed for profit. By using the same software and documents, you can create equally powerful HyperCard applications.

HyperCard itself (up to Version 1.2.5) has certain limitations that the TEJAS Editor opted to accept in order benefit from HyperCard's wide compatibility and availability. Among the limitations are a lack of color, a single non-resizable window, a complete lack of pop-up menus, etc. Many of these limitations have been surpassed by commercial HyperTalk scriptwriters in programs such as the ones listed. TEJAS used certain HyperTalk scripts and resources from these programs to 'push the envelope' of HyperCard enough to get the job done. There are hundreds of HyperTalk applications available that can provide such enhancements.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

Section 7.2

User Instructions: Glossary Stack

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Glossary of Terms Help Menu

Menu 1 of 1

7.2 User Instructions

Background:

- ☐ 7.2.1 General Information
- ☐ 7.2.2 The User's Role
- ☐ 7.2.3 Changing the Standard
- ☐ 7.2.4 Adding Cards
- ☐ 7.2.5 Deleting Cards

Unique!

Stack-Specific Help:

- ☐ 7.2.6 Card Backgrounds
- ☐ 7.2.7 Information Fields
- ☐ 7.2.8 Buttons

Unique!

- ☐ 7.2.9 Contributions Card

INSTRUCTIONS:
Click ☐ box to access section;
Click arrows to page through Help stack;
Click 'T-flag' to return to point of origin.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

Telerobotics/EVA Glossary of Terms

EXPLANATION CARD - First card in the stack

Definition: **Source:** SOURCE GOES HERE!

SOURCES can be: dictionary, text, paper, or report title; NASA (ARC, GSFC, HQ, JPL, JSC, KSC, LaRC, MSFC, etc.) Internal; (other organization) Internal; name.

Definition: **Source:**

WHY FOUR DEFINITIONS?

Differing definitions exist between departments, centers, & engineers that need to be compared. This stack, free to the entire telerobotics community, is the vehicle. If a single definition can be agreed upon, it will come out eventually.

Definition: **Source:**

REMEMBER: STRIVE TO EXCHANGE MEANINGS, BUT USE A SINGLE SOURCE!
IF A TERM OR DEFINITION ISN'T IN THE GLOSSARY, ADD IT!
JUST UNDERSTAND ONE ANOTHER - THAT'S WHAT COUNTS

Definition: **Source:**

TEJAS V1.0 | 3/30/90 | Associates | Define | USER..

Glossary - General Information

An early TEJAS goal was to include a quick reference to help resolve often confilicting telerobotics and EVA terminology. There are undefined terms and terms with multiple definitions, even between similar-series 'standard' documents (e.g. JSC-30000). This stack makes that conclusion very clear.

The TEJAS Version 1.0 Glossary of Terms incorporates nearly 1200 terms relating to EVA, telerobotics, Space Station Freedom, the STS etc. These form a glossary of our very large, multidisciplined environment. Common terms – subtask, primitive, macro – are the most important. Communication must be clear, without contant redefining. This stack helps that process.

This Glossary allows four definitions for each term, because differing definitions exist between departments, centers, etc. that must be compared. In this stack, they can be. If a single definition can be agreed upon by the EVA and telerobotics communities, it will be eventually. If it can't, then at least you will know what another Source meant by that term.

Glossary Stack - The User's Role

This stack is meant to provide a standardized reference for many analyses. You can help to make this stack complete and accurate, by performing three very important operations:

1. EXAMINE the Contributions Card (Help section 7.2.9) for key documents. Glossaries have been compiled from the document listed. Other glossaries from documents not listed should be added (see Help section 7.2.3). BE CERTAIN to keep the original V1.0 Glossary stack as backup.

2. CHECK for missing terms by using the Define, Show, or Previous and Next buttons (see Help section 7.2.8). If the exact term OR an associated one is NOT there, add it (see Help section 7.2.4). Otherwise, just add the Definition and your Source. Evolution is a reference's greatest asset. It will take many compilations of the Glossary stack to get a 'complete' terms list.

3. ADD comments or suggestions in the User Notes field for any term.

Glossary Stack - Changing the Standard

This stack is really online reference. Definitions from published documents should be compiled here. If you are unsure as to a document's suitability to inclusion in THIS Glossary, contact the TEJAS Editor.

You can add text in any empty stack information field, since none of the fields are locked, but DO NOT make ANY changes to existing information, nor use filled fields to store new definitions and sources. If you wish to add a definition and all four Definition and Source fields are full, add a new card for that term after the original card (see Help section 7.2.4).

TEJAS will track all changes by updating the Date field and setting the TEJAS Version field to "V1.0+". Send your updated stack to the TEJAS Editor. All new definitions, sources, and comments will be automatically retrieved, reviewed, and compiled into the next Glossary version. No definition will be added without a source. New sources MUST be listed on the Contributions Card (Help section 7.2.9) if their glossaries are compiled.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

Telerobotics/EVA Glossary of Terms — GLOSSARY

World Model

Definition: **Source:** Telerobotics Project Plan, pp. xvii-xix

A robot or telerobot's model (in computer memory) of the taskspace and task environment. Created in the MCM and updated for most subsystems.

Definition: **Source:** Handbook of Industrial Robotics, Nof et al

A model of the robot's environment containing: geometric and physical descriptions of objects; kinematic descriptions of linkages; descriptions of the robot system characteristics; and explicit specification of the amount of uncertainty there is in model parameters. This is useful in task-level programming.

Definition: **Source:** FTS Task Analysis Methodology 4/14/89 GSFC MUT

The robotic system's best estimate and evaluation of the history, current state, and possible future states of the world, including the states of the system being controlled. The world model also includes a knowledge base stored in global memory where state variables, maps, lists of objects and events, and attributes of objects and events are maintained.

Definition: **Source:**

TEJAS V1.0 | 2/4/90 | Associates | Define | USER..

Glossary Stack - Adding Cards

Before adding a new card, ensure a CLEAR NEED, i.e., check existing terms to verify the term is NOT in the Glossary (perhaps listed differently). Try using an associated define (see Help Section 6.2). To add a new term:

1. Go to any term card (background Glossary.bg).
2. Select 'New Card' from the Edit menu. A blank card will appear.
3. Fill out the Term, Definition and Source fields, with comments in the User Notes field to explain why the term was suggested.
4. Either cut and paste the new card alphabetically by Term, or sort. Sorting a stack this large can take some time (see comments on the 'Sort' button, Help section 6.2), so cutting and pasting is faster in the Glossary.

The Glossary's overall objective is to create as complete a list of telerobotics and EVA terms as possible, in all areas. All glossaries and definitions from all applicable documents are welcome. Many terms and definitions may be missing in this Version 1.0 release. PLEASE add them, and make comments on the terms you see.

Glossary Stack - Deleting Cards

DO NOT DELETE ANY CARDS FROM THIS STACK!

TEJAS will prevent you from deleting cards by intercepting the 'Delete Card' message and giving you a "Cannot delete Glossary stack cards!" message. But it won't stop you from cutting cards; if you forget to paste them back in, they will be lost. So be careful when cutting and pasting.

The Glossary stack allows you to compare definitions, up to four at a time. Look at the source of a particular definition. Publications were the primary sources for technical terms, but everyday terms (common parlance) such as primitive, procedure, macro, etc. are still evolving; most of their definitions came from individuals. If you find a definition to be inaccurate, simply note it in the User Notes field (see Help section 6.5), or contribute a definition of your own in an empty definition field and list yourself as the source.

Glossary Stack - Card Backgrounds

There are two different backgrounds in this stack. By specific name:

Glossary.bg – main background for the stack. Different cards for each term. Incorporates primary information fields: one visible shadow field, four visible scrolling background information fields, four corresponding visible transparent background information fields, and one hidden shadow field (User Notes).

Contributions.bg – specialized, for the Contributions Card only. Unlocked.

Glossary Stack - Information Fields

There are ten information fields common to the 'Glossary.bg' background: Term, Definition1-4, Source1-4, and 1stTerm. The empty field Associated Terms is used for searches. Field specifications are on the following cards.

If at any time, you disagree with the contents of a field, DO NOT change it. LEAVE ALL FIELDS, both locked and unlocked, ALONE. Make general comments in the User Notes hidden field, especially when you add new terms on new cards. The TEJAS Version and Date fields will help you remember where you've added definitions or left notes (Help section 7.2.3).

If you want your changes to be considered for compilation, please follow the simple conventions (e.g., Terms capitalized, Sources with date, etc.).

All stacks returned to the TEJAS Editor will be compiled via scripts, after each change has been reviewed. PLEASE use the User Notes: SAVE the TEJAS Editor TIME by explaining why you added terms or definitions!

Glossary Stack - Information Fields

Field specifications:

Term: unlocked, unlabeled shadow field at top right. Enter the term EXACTLY as written in the source; capitalize all nouns and verbs.

Definition1–Definition4: unlocked, labeled identical scrolling fields found in center of card. Enter the term's definition(s), word for word as given in the source(s). If you are compiling an entire glossary into the stack, be certain all terms referenced in the definitions are compiled as well.

Source 1–Source 3: unlocked, unlabeled transparent fields at top right of each Definition field. Enter the source, with document numbers (e.g., JSC-30000) and date of publication. Do not allow source to exceed field limits; abbreviate as necessary. For fully compiled sources, enter full reference and your name and date of entry on the Contributions Card (see Help section 7.2.9).

Glossary Stack - Information Fields

Field specifications cont'd:

1stTerm: locked, hidden transparent field located at bottom right within the Term field. Used by the Glossary stack to store all single-word terms as they are entered, for faster defining later using the Define button (see Help section 6.2). Not to be shown, unlocked or altered.

Associated Terms: locked, hidden scrolling field located over the left half of each card when visible. Used by the 'Associates' button (Help section 7.2.8) as a choice field (locked, touch-sensitive field where items clicked are selected) displaying all terms that contain a term you specify (the associated terms). Always hidden unless your search is successful.

Telerobotics/EVA Glossary of Terms

Telerobot

Definition: **Source:** Telerobotics Project Plan, pp. xvii-xix

The robotic effector mechanism of a telerobotic system.

Definition: **Source:** OAST CSTI Telerobotics Program Plan - 4/89

A remote manipulator which can function either as a teleoperator or as a robot, and which can smoothly transition between the two modes. Necessarily a telerobot must be more complex than either a teleoperator or a robot. The goal is that the extra cost and complexity of a telerobot will be more than offset by increased robustness, capability, reliability, and safety.

Definition: **Source:** Space-Based Multifunctional End Effector Systems

A telerobot combines elements of teleoperators and robots. In a telerobotic system. a human operatpor controls some, or most, activities, but at least some operations are controlled autonomously, as in a robotics system. As the sophistication of robotics technology increases, telerobot systems are expected to evolve greater and greater autonomy.

Definition: **Source:**

TEJAS V1.0 | 2/4/90 | Associates | Define | USER..

Glossary Stack - Buttons

7.2.8 1 of 3

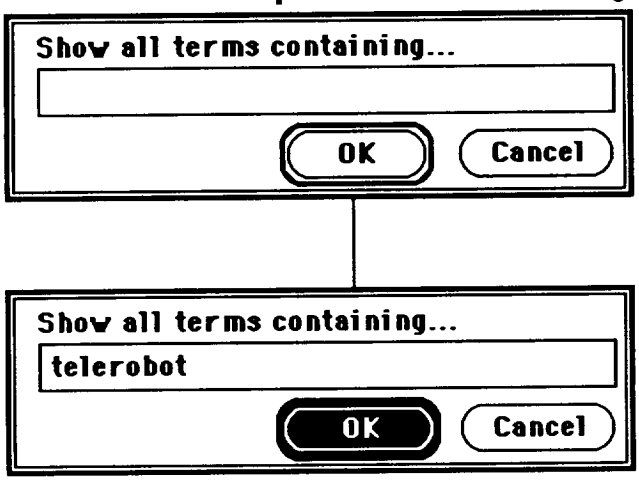
The Define button is the optimum search tool for this stack. Since it is common to all cards in all TEJAS stacks, its function and explicit instructions for its use are explained in the Common Help cards (Help section 6.2).

There are two buttons in the 'Glossary.bg' background that help access terms in the Glossary stack and is NOT explained in Common Help:

– The 'ABC tabs' button at the top right allows you to skip through the Glossary letter by letter. This is particularly useful when searching for a word or phrase letter by letter. To use it, position the cursor over it, click and hold down. A pop-up menu will appear. Pull down the mouse to the letter at which you wish to start searching and release. There is one card for each letter of the alphabet, placed in this stack to use with this button. On searches of this kind, using the 'ABC tabs' button is faster than scanning cards one at a time with the Next, Previous, or Show buttons.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

Associates - This button, located just left of the Define button, extends your capability to search for associated terms beyond the Define script's function. Clicking on it produces an input box:

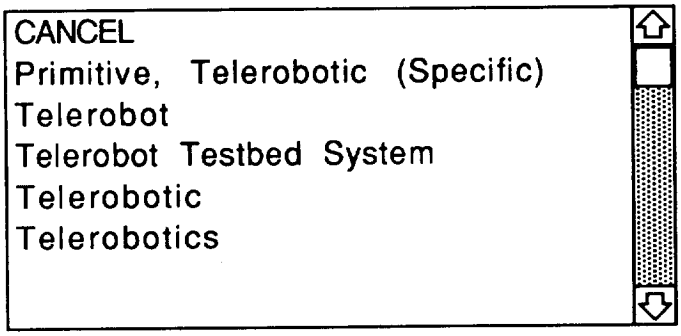


To find associated terms, type in the root term and press the 'OK' button...

More-->

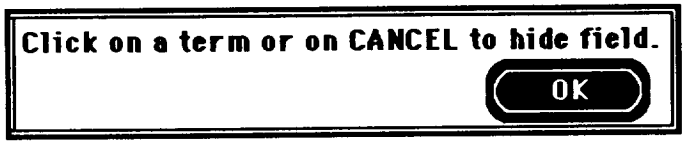
If you click on Cancel or on OK with an empty input box, the input box disappears and you are left on the same card. If you enter a term, the cursor changes into the busy symbol , and the search begins for all terms containing your requested term. The search takes a few seconds.

BEWARE: These RAM-intensive searches can be SLOW for common terms.



If the search is successful in finding terms containing your search term, a hidden field called 'Associated Terms' will appear (see Help section 7.2.7). For the search term "telerobot," the entries in this locked choice field are shown at left. Field is not to scale.

At the same time, the following message appears and directs your next action. Clear the message with OK, then click on the term you wish to find in the Associated Terms field. You will go immediately to that card in the Glossary. To quit the search, click on the word CANCEL in the field. Either way, the Associated Terms field will clear and hide again.



Glossary of Terms Contributions

NOTES TO THE READER: If you contribute a term or definition to this Glossary and list its source, that's great. Thank you. But if you contribute ALL the terms in an existing glossary, or cross-correlate that source, that's even better, and needs to be noted here, so we know at a glance what this glossary includes. Enter the source name & date with appropriate notes on a numbered line at left below, and your name & date of entry on the corresponding line, please.

COMPLETE SOURCES CHECKED/COMPILED	CONTRIBUTOR & DATE
1. "Telerobotics Project Plan", JPL D-5692, Rev. A 9/30/88; all terms/defs compiled	1. M. Drews Jan 89
2. "Task Ranking for the Telerobot Demonstration", SRI Project # 3528 7/88; all terms/defs compiled	2. M. Drews Jan 89
3. "Handbook of Industrial Robotics", edited by Nof et al, J. Wiley & Sons, Inc. 1985; all terms/defs compiled	3. M. Drews Feb 89
4. "Technology Assessment for a Robotic Satellite Servicer System", JSC-22970, NASA New Initiatives Office, May 1988; all terms/defs compiled	4. M. Drews Mar 89
5. "Draft Final - Summary Report, Space Station Ops Task	5. M. Drews Mar 89
	6. M. Drews Apr 89
	7. M. Drews Apr 89

TEJAS V1.0 | 2/4/90 | ZZEnd | Define | USER..

Glossary Stack - Contributions Card

7.2.9
1 of 1

The LAST card of every reference stack is like this one. When compiled, these cards form a bibliography of the TEJAS effort. The 'References' scrolling field gives a detailed list of documents, notes, or other sources that are also identified by abbreviations in the Source fields on the stack's information cards. Each reference also contains a short note about how the source was used. The corresponding numbered lines in the 'Contributor' scrolling field list who contributed the information and when. This data contributes to the TEJAS goal of "total traceability."

Please provide references for every source. The Glossary and Acronym stacks can help standardize terminology, but only if sources for conflicting, multiple definitions are traceable. Furthermore, with so many documents in circulation, many so-called 'standards' coexist. It is important to rigorously note when you have compiled a reference's glossary. Please read and follow the card's instructions If there is a reference that you think is missing but that you will NOT be compiling, let the TEJAS Editor know.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

Section 7.3

User Instructions: Acronym Stack

Acronym Stack Help Menu

Menu 1 of 1

7.3 User Instructions

Background:

- ☐ 7.3.1 General Information
- ☐ 7.3.2 The User's Role
- ☐ 7.3.3 Changing the Standard
- ☐ 7.3.4 Adding Cards
- ☐ 7.3.5 Deleting Cards

Unique!

Stack-Specific Help:

- ☐ 7.3.6 Card Backgrounds
- ☐ 7.3.7 Information Fields
- ☐ 7.3.8 Buttons

Unique!

- ☐ 7.3.9 Contributions Card

INSTRUCTIONS:
Click ☐ box to access section;
Click arrows to page through Help stack;
Click 'T-flag' to return to point of origin.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

Telerobotics/EVA Acronyms and Abbreviations

Acronym: EXAMPLE

Definition: Source:

Definition: Source:

Definition: Source:

Definition: Source:

Definition: Source:

SOURCES CAN BE: dictionary, text, paper, or report title; NASA (ARC, GSFC, HQ, JPL, JSC, KSC, LaRC, MSFC, etc.) Internal; (other organization) Internal; name.

WHY FIVE SLOTS FOR POSSIBLE DEFINITIONS?
Differing definitions exist within NASA and the EVA and telerobotics community, and the list is growing all the time. This stack, free to the entire telerobotics community, is the vehicle to find the definition that helps YOU understand something you're reading. In scanning this stack, there will sometimes be up to five different definitions for an acronym from a single source. It is important to see them side by side.

TEJAS V1.0 | 2/4/90 | Define | USER..

Acronym Stack - General Information

The Acronyms and Abbreviations Dictionary incorporates over 800 cards compiled from many different NASA, university, and industry sources involved in EVA and telerobotics operations and research. These are listed on the last card in the stack, the Contributions card.

Many acronyms and abbreviations are still missing in the Version 1.0 stack. As with the Glossary, you can add new acronyms on another card or new definitions on an existing card, then send the TEJAS Editor a copy of the stack in order to have your changes compiled with others. Be sure to include a source when you do.

There are five definitions here because acronyms are often used for quite different things (look up MMU if you don't believe it). The Acronyms and Glossary stacks form an "armchair reference" for any other HyperCard stacks in telerobotics. The fastest way to access definitions is by using the Define button (see Help section 6.2).

Acronym Stack - The User's Role

This stack is meant to provide a standardized reference for many analyses. You can help to make this stack complete and accurate, by performing three very important operations:

1. EXAMINE the Contributions Card (Help section 7.3.9) for key documents. Acronym lists have been compiled from the document listed. Other acronyms from documents not listed should be added (see Help section 7.3.3). BE CERTAIN to keep the original V1.0 Glossary stack as backup.

2. CHECK for compiled acronyms using the Define, Show, or Previous and Next buttons (Help section 6.2). If the exact acronym is NOT there, add it (see 'Adding Cards', section 7.3.4). Otherwise, just add your new Definition and your Source. Evolution is a reference's greatest asset. It will take many compilations of the Acronym stack to get a 'complete' list.

3. ADD comments or suggestions in the User Notes field for any term.

Acronym Stack - Changing the Standard

This stack is really an online reference. Definitions from published documents should be compiled here. If you are unsure whether a document is suitable for inclusion in THIS Acronym list, contact the TEJAS Editor.

Changes in any stack information field are possible, since none of the fields are locked, but DO NOT make ANY changes to existing information, nor use filled fields to store new definitions and sources. If you wish to add a definition, and all five Definition and Source fields are full for an acronym, add a new card for that acronym or abbreviation after the original one.

TEJAS will track all changes by updating the Date field, and setting the TEJAS Version field to "V1.0+". Send the updated stack to the TEJAS Editor. All new definitions, sources and comments will be automatically retrieved, read, and compiled into the next Acronym version. No definition will be added without a source. New sources MUST be listed on the Contributions Card (Help section 7.3.9) if their acronym lists are compiled.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

Telerobotics/EVA Acronyms and Abbreviations

Acronym: PMC

Definition: Permanently Manned Capability
Source: Space Station

Definition: Permanently Manned Capability
Source: SSP 30000 Sec. 3, Rev. G/Sec. 5, Rev. C

Definition: Power Management Controller
Source: SSP 30263, Rev. B

Definition: Permanently Manned Configuration
Source: FTS Design Criteria Doc, MMI #87900000005 9/26/89

Definition:
Source:

TEJAS V1.0 | 2/4/90 | Define | USER..

Acronym Stack - Adding Cards

Before adding a new card, ensure a CLEAR NEED, i.e., check existing terms to verify that the acronym/abbreviation is NOT in the Dictionary stack. To add a new acronym/abbreviation:

1. Go to any acronym card (background Acronym.bg).
2. Select 'New Card' from the Edit menu. A blank card will appear.
3. Fill out the Acronym, Definition and Source fields, with comments in the User Notes field to explain why the term was suggested.
4. Either cut and paste the new card alphabetically by Acronym, or sort. Sorting this large a stack can take some time (see comments on the 'Sort' button, Help section 6.2), so cutting and pasting is faster in this Dictionary.

The Acronym stack's overall objective is to create as complete a list of telerobotics and EVA acronyms as possible, in all areas. All acronym and abbreviations lists from all applicable documents are welcome. Many acronyms may be missing in this Version 1.0 release. PLEASE add them, and make comments on the acronyms you see.

Acronym Stack - Deleting Cards

DO NOT DELETE ANY CARDS FROM THIS STACK!

TEJAS will prevent you from deleting cards by intercepting the 'Delete Card' message and giving you a "Cannot delete Acronym stack cards!" message. But it won't stop you from cutting cards; if you forget to paste them back in, they will be lost. So be careful when cutting and pasting.

The Acronym stack allows you to compare definitions for the same acronym or abbreviation, up to five at a time. Look at the source of a particular definition. Publications were the primary sources in almost all cases, but new acronyms (e.g. TEJAS) and locally known acronyms are still evolving; most of their definitions came from individuals. If you find a definition to be inaccurate, simply note it in the User Notes field (see Help section 6.5), or contribute a definition of your own in an empty definition field, and list yourself as the source.

Acronym Stack - Card Backgrounds

There are two different backgrounds in this stack. By specific name:

Acronym.bg – main background for the stack. Different cards for each acronym or abbreviation. Incorporates primary information fields: one visible shadow field, five visible rectangle background information fields, five corresponding visible rectangle background information fields, and one hidden shadow field (User Notes).

Contributions.bg – specialized, for the Contributions Card only. Unlocked.

Acronym Stack - Information Fields

There are eleven information fields common to the 'Acronym.bg' background: Acronym, Definition1-5, and Source1-5. Field specifications are on the following cards.

If at any time, you disagree with the contents of a field, DO NOT change it. LEAVE ALL FIELDS, both locked and unlocked, ALONE. Make general comments in the User Notes hidden field, especially when you add new acronyms on new cards. The TEJAS Version and Date fields will help you remember where you've added definitions or left notes (Help section 7.3.3).

If you want your changes to be considered for compilation, please follow the simple conventions (e.g., acronyms capitalized, sources with date, etc.).

All stacks returned to the TEJAS Editor will be compiled via scripts, after each change has been reviewed. PLEASE use the User Notes: SAVE the TEJAS Editor TIME by explaining why you added acronyms or definitions!

Acronym Stack - Information Fields

Field specifications:

Acronym: unlocked, unlabeled shadow field at top right. Enter the acronym or abbreviation EXACTLY as written in the source.

Definition1–Definition5: unlocked, labeled identical scrolling fields at center, one above the other. Enter the acronym's definition, word for word as given in the source. If you are compiling a complete acronyms list into this stack, be certain all compounded acronyms are compiled as well.

Source 1–Source3: unlocked, unlabeled rectangle fields at top right of each Definition field. Enter the source, with document numbers (e.g., JSC-30000) and date of publication. Don't let the source exceed field limits; abbreviate as necessary. For fully compiled sources, enter full reference and your name and date of entry on the Contributions card (see Help section 7.3.9).

Acronym Stack - Buttons

All buttons in the 'Acronym.bg' background are common buttons. There are no stack-specific buttons.

The Define button is the optimum search tool for this stack. Since it is common to all cards in all TEJAS stacks, its function and explicit instructions for its use are explained in the Common Help cards (Help section 6.2).

Acronyms/Abbreviations Contributions

NOTES TO THE READER: If you contribute a term or definition to this Dictionary and list its source, that's great. Thank you. But if you contribute ALL of the terms in an existing acronym list, or cross-correlate that source, that's even better, and needs to be noted here, so we know at a glance what this dictionary includes. Enter the source name & date with appropriate notes on a numbered line at left below, and your name & date of entry on the corresponding line, please.

COMPLETE SOURCES CHECKED/COMPILED	CONTRIBUTOR & DATE
1. "Telerobotics Project Plan", JPL D-5692, Rev. A 9/30/88; all acronyms/abbreviations compiled	1. M. Drews Jan 89
2. "Task Ranking for the Telerobot Demonstration", SRI Project # 3528 7/88; all acronyms/abbreviations compiled	2. M. Drews Jan 89
3. "Handbook of Industrial Robotics", edited by Nof et al, J. Wiley & Sons, Inc. 1985; all acronyms/defs compiled	3. M. Drews Feb 89
4."Technology Assessment for a Robotic Satellite Servicer System", JSC-22970, NASA New Initiatives Office, May 1988; all acronyms/abbreviations compiled	4. M. Drews Mar 89
5. "Draft Final - Summary Report, Space Station Ops Task	5. M. Drews Mar 89
	6. M. Drews Mar 89
	7. M. Drews Apr 89

TEJAS V1.0 | 2/4/90 | ZZEnd | Define | USER..

Acronym Stack - Contributions Card

7.3.9
1 of 1

The LAST card of every reference stack is like this one. When compiled, these cards form a bibliography of the TEJAS effort. The 'References' scrolling field gives a detailed list of documents, notes, or other sources that are also identified by abbreviations in the Source fields on the stack's information cards. Each reference also contains a short note about how the source was used. The corresponding numbered lines in the 'Contributor' scrolling field list who contributed the information and when. This data contibutes to the TEJAS goal of "total traceability."

Please provide references for every source. The Glossary and Acronym stacks can help standardize terminology, but only if sources for conflicting, multiple definitions are traceable. Furthermore, with so many documents in circulation, many so-called 'standards' coexist. It is important to rigorously note when you have compiled a reference's glossary. Please read and follow the card's instructions. If there is a reference that you think should be added but that you will NOT be compiling, let the TEJAS Editor know.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

Section 7.4

User Instructions: EVAPrimitives Stack

EVAPrimitives Help Menu

Menu 1 of 1

7.4 User Instructions

Background:

- ☐ 7.4.1 General Information
- ☐ 7.4.2 The User's Role
- ☐ 7.4.3 Changing the Standard
- ☐ 7.4.4 Adding Cards
- ☐ 7.4.5 Deleting Cards

Unique!

Generic Task Primitives:

- ☐ 7.4.6 Definition
- ☐ 7.4.7 Development
- ☐ 7.4.8 Conclusions
- ☐ 7.4.9 Building Specific from Generic Primitives

Stack-Specific Help:

- ☐ 7.4.10 Card Backgrounds
- ☐ 7.4.11 Information Fields
- ☐ 7.4.12 Buttons

Unique!

- ☐ 7.4.13 Relating EVA and Telerobot Primitives
- ☐ 7.4.14 Parsing Scheme Card
- ☐ 7.4.15 Menu Builder Card
- ☐ 7.4.16 Contributions Card

INSTRUCTIONS:
Click ☐ box to access section;
Click arrows to page through Help stack;
Click 'T-flag' to return to point of origin.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

EVA Primitives — Explanation Card

Syntax | **Source**

Definition, Notes etc. | **History**

This field is available to the researcher to write the final definition of the primitive as they understand it. The interim definition (and any comments received on it) should go in the History field, accessible by pressing the 'History' button above.

Like Verbs:

Antonym

This space is left blank to allow display of other, related information stored in hidden fields, e.g. graphics, text, etc. The History field is one such. Data on specific tools, objects (such as connectors, bolts etc.) and specifications (torques, temps, pressures etc.) can be displayed by means of a new button if desired.

TEJAS V1.0 | 3/30/90 | Find Verb | Define | USER..

EVAPrimitives Stack - General Information

The EVAPrimitives stack serves as repositories for a final set of generic task primitives for crew extravehicular activity. Each card has one primitive verb, a definition, a syntax, like (similar) verbs (NOT synonyms; see Help section 7.4.11), an antonym, and a field showing that primitive's evolution.

With relational hypermedia, you can add new or improved fields, or graphics, animation, and sound, if necessary, to completely convey the idea. Any card copied into any other stack would automatically include these functions.

The EVAPrimitives and TelePrimitives stacks are intended as master lists of GENERIC primitives for the nationwide EVA and telerobotics task analysis communities. TEJAS also accesses them during task analysis via a menu (see 'Task Analysis in TEJAS,' Help section 8.1.6). From these generic primitive 'roots,' SPECIFIC primitives evolve by specifying the arguments according to that specific task, leaving the master lists intact.

EVAPrimitives Stack - The User's Role

This stack is meant to provide a standardized reference for many analyses. There are dozens of primitives involved in EVA and telerobotic activities. Scripting on-orbit tasks requires specific primitives derived from these lists (see Help section 7.4.9). Relating telerobotics to crew-EVA is possible through the use of these primitives stacks, but it requires VALID reference data. All users benefit from a standardized set. Please help make this stack complete and accurate by performing three very important operations:

1. CHECK for missing primitives (especially EVA verbs already in use), then add them (see 'Adding Cards,' Help section 7.4.4). Version 1.0 of this stack will not be a complete list.
2. EXAMINE all the information fields. Make changes if necessary (see 'Changing the Standard,' Help section 7.4.3), but BE CERTAIN to keep the original Version 1.0 as a backup.
3. ADD comments or suggestions in the User Notes field for each primitive already in the stack.

EVAPrimitives Stack - Changing the Standard

You can make changes in any stack information field, since none of the fields are locked. There are different mechanisms for entering data (see the 'Information Fields' Help cards in this section).

Make changes if you do not agree with the data on a particular primitive, but BE CERTAIN to justify those changes in the User Notes field AND to update the Source field for traceability.

TEJAS will track all changes by updating the Date field, and setting the TEJAS Version field to "V1.0+". When you feel you have compiled sufficient changes, send the updated stack to the TEJAS Editor. All changes and comments will be automatically retrieved and reviewed for incorporation into the next version of this stack. Remember that any time you change this reference stack data, it is no longer the Version 1.0 release but a modification of it (hence the "+"). Keep your original Version 1.0 stacks safely archived.

EVAPrimitives Stack - Adding Cards

Before adding a new card, ensure a CLEAR NEED, i.e., check that the concept is not already covered by an existing primitive in the stack.

To add the new verb primitive:

1. Go to the Explanation card (first card in the stack).
2. Select 'New Card' from the Edit menu. A blank card will appear.
3. Fill out ALL the information fields, with comments in the User Notes field to explain why the primitive was suggested.
4. Select 'Card Info...' from the Objects menu. Type the verb as the card name. This ensures that the new verb will appear on the primitives menu.
5. Either cut and paste the new card alphabetically by verb, or sort.

NOTE: New verbs will not appear in the EVAPrimitives verb menus until the Menu Builder card's 'Rebuild' button has been activated (see explanation of the Menu Builder Card, Help section 7.4.15).

EVAPrimitives Stack - Deleting Cards

DO NOT DELETE ANY CARDS FROM THIS STACK!

Any primitive you find objectionable may not be so to others; compromise was necessary to reach the current stack and will continue to be necessary to evolve a truly complete, integrated primitives set for the EVA community.

Primitives that are defined as "deleted" are in fact still archived on cards in the stacks. They have only been omitted from the integrated set of EVAPrimitives; their History fields reflect why (see Help section 7.4.11). TEJAS will prevent you from deleting any primitives. Instead, state your reasons for deletion in the User Notes, along with any other comments.

Remember that the primitives lists are like a spiderweb; everything is connected to something else. THINK IT THROUGH. What would deleting this verb do to the complete set? Could the definition just be changed? How does this affect relating EVAPrimitives to TelePrimitives?

Task Primitives - Definition

Two kinds of primitives exist: generic and specific. Their definitions are:

Primitive, Generic: The smallest descriptive task component for a crewmember or telerobot work system performing work, involving a subject (crew, system, or subsystem), an action VERB, and undefined arguments in a consistent syntax. Example Verbs: GRASP, TRANSLATE, ATTACH, VERIFY, etc.

Primitive, Specific: The smallest descriptive task component for a crewmember or telerobot work system performing work, involving a subject (EV1, EV2, or a telerobot work system or subsystem), an action VERB, the object of that action, and external factors, all defined as specific arguments connected by prepositions, and evolved (in the TEJAS stack system) from generic primitives. Examples: FTS GRASP wrench; EV2 TRANSLATE to MMU; EV1 ATTACH tether to slidewire; IV1 VERIFY RMS clear of obstructions, etc.

Task Primitives - Development

The steps in the development of this Version 1.0 release are illustrated on the next card and detailed below. Follow the process bars (and) to see the development. Development steps were:

- Generic task primitives included in this EVAPrimitives stack first compiled from an initial set of published documents (first boxed list)

- Review release of EVAPrimitives and TelePrimitives stacks to members of the EVA and Telerobotics communities (first and cubes)

- Comments received from the primitives reviewers (feedback loop)

- Review and resolution of all comments to the review stacks. Primitives cards modified; all comments and final notes archived in History field.

- TEJAS Version 1.0 primitives stacks released (second and cubes)

Task Primitives - Development

- "Task Ranking for the Telerobot Demonstration", JPL/SRI Report 1988: preliminary telerobot primitives (Teleprimitives) & EVA primitives lists

- "Advanced Robotics for In-Space Vehicle Processing" (Interim), J.H. Smith et al JPL, 5/89: expanded teleprimitives & EVAprimitives lists

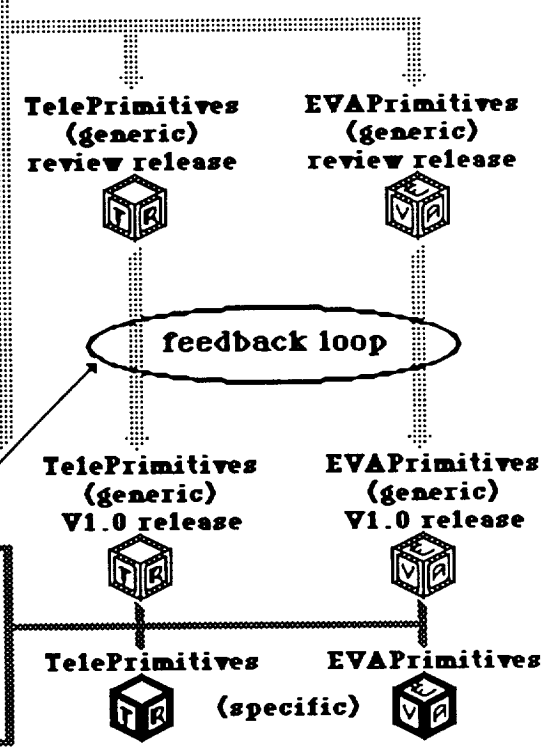
- "Flight Telerobotic Servicer Task Analysis Methodology", GSFC MUT 4/89: expanded teleprimitives list

- "Telerobotic Application to EVA Activities", MDAC 10/88: teleprimitives, EVAprimitives, written links

- Comments from EVA and telerobotics communities on TelePrimitives & EVAPrimitives review lists

- J.H. Smith "ARISVP": specific teleprimitives derived from TEJAS pre-release list

- "Vehicle Processing Operations Data Collection Set (VPOD) " CTA Inc. & LaRC 1989: specific teleprimitives derived from TEJAS pre-release list



EVA Primitives Task:

MATE

% TOTAL EVA | FREQ. | EVA MINS.

Definition, Notes etc.

To join or fit associated parts (object A to object B); e.g., attach Velcro interface, plug in power umbilical. Condition 1: type of connection or mating (e.g., quick connect, captive pin, threaded interface etc.); condition 2: one-handed, two-

Source

Adv. Robotics for Veh. Proc. (Interim) JPL 5/89

Copy of primitive card 'MATE' as released for review with original definition.

Syntax

(crew) MATE (condition 1) (condition 2) (object A) [object B]

Find Verb

TEJAS 6/20/89 Define

EVA Primitives MATE

Syntax

(crew) MATE (condition) (object_A) to (object_B)

Source Adv. Robotics for Veh. Proc. (Interim) JPL 5/89

Definition, Notes etc.

To join or fit complimentary parts (object A to object B); e.g., 'MATE power umbilical'. Condition: type of connection or mating (e.g., quick connect, captive pin, threaded interface, etc.).

History

ORIGINAL DEFINITION (from Source): To join or fit associated parts (object A to object B); e.g., attach Velcro interface, plug in power umbilical. Condition 1: type of connection or mating (e.g., quick connect, captive pin, threaded interface, etc.); condition 2: one-handed, two-

Like Verbs:

INSTALL
SECURE

Antonym

DEMATE

Copy of primitive card 'MATE' from Version 1.0 release with original definition archived in the History field (shown).

TEJAS V1.0 3/30/90 Find Verb Define USER...

Task Primitives - Conclusions

- The basic steps of task analysis methodologies (TAMs) are similar between EVA and Telerobotics, up to the outline (see below):

1. Name the task.
2. Divide the task into subtasks; this can take several iterations. In TEJAS, all subtasks are considered to be 'tasks.'
3. Write a prose description of the task.
4. State the assumptions of the task: about task sequencing, lighting, environment, geometry, objects to be handled, tools used, etc.
5. State the open issues – things not decided or known.
6. Develop an outline (no set format) of the steps in the task.
7. Build the detailed task script of specific primitives.
8. Perform detailed analysis on this task script and attendant data.

At step 8, the approaches appear to diverge. The number and name of hierarchical levels in their detailed analysis varies by TAM.

Task Primitives - Conclusions

- Generic primitives have generic arguments. Specific primitives are derived from generic primitives by specifying their generic arguments (see Help section 7.4.9). Generic primitives are therefore a finite set of roots; specific primitives change according to each task and are a potentially unlimited set. -->

- Verb-based syntaxes for standardizing and relating generic primitives must be part of any compilation, to help automate the generic-to-specific step. Generic syntaxes will evolve into a standard form only through actual use in task analyses.

- Primitives are universal objects of task analysis, with their level set in each particular methodology. Primitives should be standardized, not the TAMs. With standardized generic primitives, all TAMs may be reconciled on an equal basis.

Task Primitives - Conclusions

- Generic EVA primitives are far more complex, but less numerous, than telerobot primitives, because a human can sense and identify, move etc. To accomplish a single EVA step, a telerobot must execute a greater number of preliminary steps, either sequentially or in parallel (depending on the microprocessor technology used). As an example, consider:

EV1 HANDOFF portable foot restraint to EV2 — This specific EVA primitive...

FTS ACQUIRE EV2
FTS LOCATE EV2
FTS MOVE portable foot restraint to EV2
FTS VERIFY EV2 has grasped portable foot restraint
FTS UNGRASP portable foot restraint

...may equate to this set of specific telerobot primitives.

- Relationships between EVA and telerobotics are through specific primitives, not generic primitives. These links are therefore task-dependent.

TEJAS V1.0 | 3/30/90 | Help Menu | Define

EVA Primitives | MONITOR

Syntax — **Source** "Telerobotic Application to EVA" MDAC 10/88

(crew) MONITOR (object_A/activity)

Definition, Notes etc.

To attentatively watch a dynamic system or process in order to detect a change in state or condition, either appropriate or unexpected.

History

ORIGINAL DEFINITION (from Source): To detect a change in state or condition of a system (syn: observe, watch, check status)

JPL: Drop synonyms! This primitive and OBSERVE are very close but not exactly

Like Verbs:

INSPECT

Antonym

none

The EVAPrimitives and TelePrimitives stacks are two powerful, community-compiled references.

TEJAS V1.0 | 3/30/90 | Find Verb | Define

Building Specific From Generic Primitives

Specific primitives are built by specifying the generic arguments of a generic primitive syntax to fit the circumstances of a particular task. The specific primitives list approximates the outline for that task (see 'Task Analysis in TEJAS,' Help section 8.1.6).

EVA Task Summary

For a specific step in the task outline...

- Prepare workstation for hydrazine refueling
- Verify that the OMV is stabilized and ready for refueling
- Couple hydrazine filler line to OMV hydrazine interface panel

EVA Task Primitives (Generic)

...retrieve the generic primitive for that action...

(crew) COUPLE (object_A) to (object_B) [with (tool)]

Building Specific From Generic Primitives

tool

(crew) COUPLE (object_A) to (object_B) [with (tool)]

- hydrazine multipurpose tool
- hydrazine right angle clipper
- hydrazine safety wire clipper
- hydrazine spanner wrench
- hydrazine tool support brace

- Add Item
- Delete Item

...then specify each generic argument using items from a reconfigurable menu (or by hand)...

(crew) COUPLE (object_A) to (object_B) with hydrazine spanner wrench

...and after limited repetition...

EV1 COUPLE filler line to OMV hydrazine port with hydrazine spanner wrench

EVA Task Primitives (Specific)

...a specific primitive, built precisely for that task from the generic syntax, may be archived.

EVAPrimitives Stack - Card Backgrounds

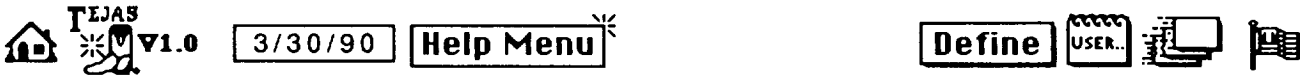
There are four different backgrounds in this stack. By specific name:

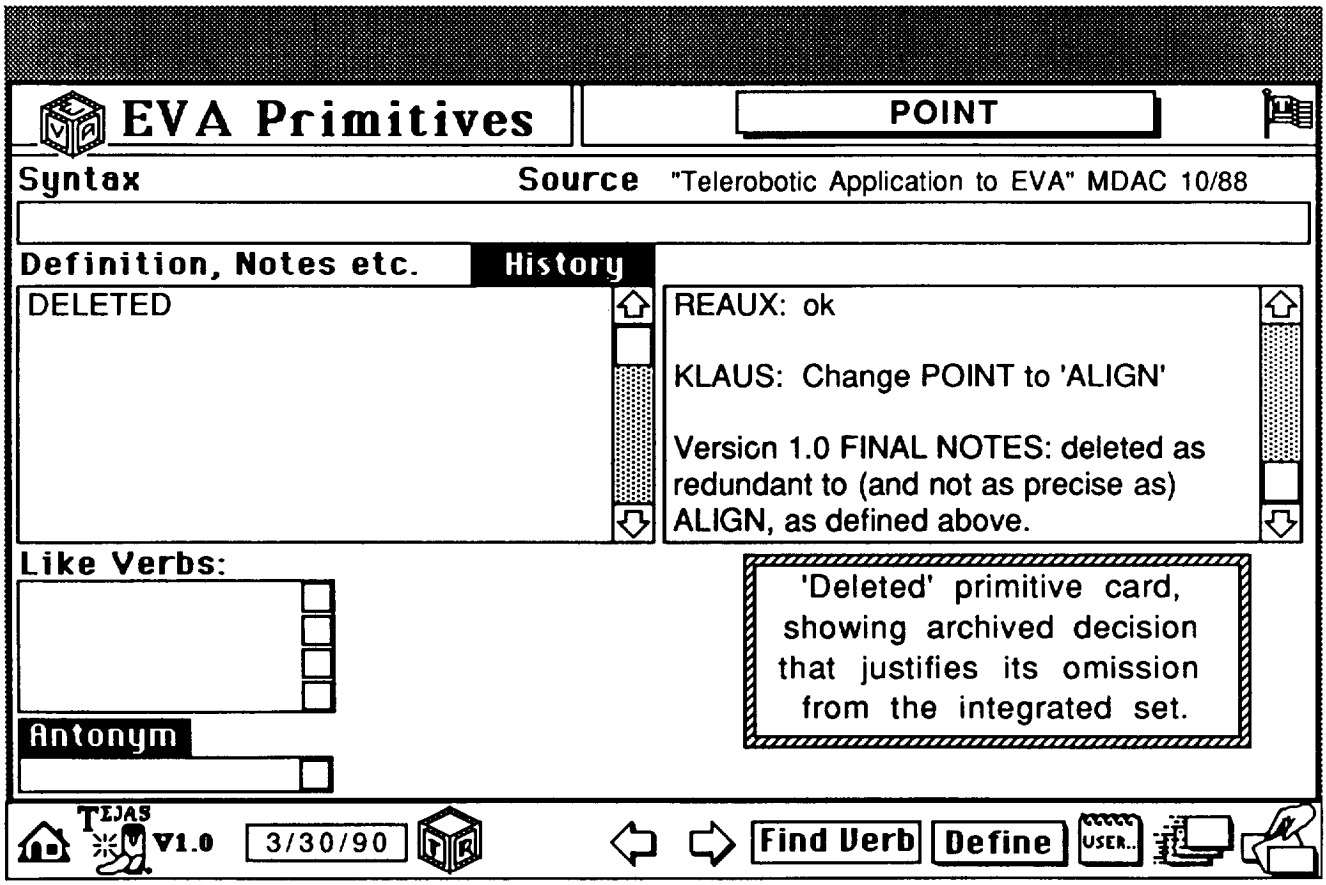
EVAPrimitives.bg – main background for this stack. Different cards for each verb primitive. Incorporates primary information fields: eight visible background fields of different types, two hidden scrolling fields.

EVAPrimsParsing.bg – specialized, for the Syntax Parsing card only. Unlocked, but a reference for all information cards in the stack. Changes are best made via the User Notes comments field (Help section 6.5).

EVAPrimsMenu.bg – specialized, for the Menu Builder Card only. Unlocked, but a reference for all information cards in the stack. Changes are best made via the User Notes comments field (Help section 6.5).

Contributions.bg – specialized, for the Contributions Card only. Unlocked.





EVAPrimitives Stack - Information Fields

There are seven information fields common to the 'EVAPrimitives.bg' background: Verb, Def/Notes, Syntax, Like Verbs, Antonym, Source, History. Field specifications are on the following cards.

If at any time, you disagree with the contents of an unlocked field, you may change it. You can change the Definition, generic Syntax, Like Verbs and Antonym if you wish, but remember that the like verbs and antonym form a kind of thesaurus; do not change them without careful consideration.

Leave locked fields and the History field alone. Make general comments in the User Notes field, either as a reminder to yourself or to communicate with the TEJAS Editor.

If you want your changes to be considered for compilation, please follow the simple conventions (e.g., verbs capitalized, generic syntax arguments in parentheses, etc.) detailed in the field specifications cards that follow.

EVAPrimitives Stack - Information Fields

Field specifications:

Verb: unlocked, unlabeled shadow field at top right. Contains one- or two-word primitive verb. One-word verbs are desirable; two-word verbs (verb plus adverb or article) are used only to differentiate between different primitives with identical verbs. First word of verb is all capital letters.

Def/Notes: unlocked, labeled scrolling field at middle left. Contains definition and notes about the verb primitive, as compiled from the original definition and changes made during the review process.

Syntax: unlocked, labeled rectangle field across top of card. Contains the suggested generic syntax for the primitive with generic arguments (in parentheses) connected by prepositions (see 'Parsing Scheme Card,' Help section 7.4.14). Both format and content can be changed; submit suggested changes to the TEJAS Editor.

Field specifications cont'd:

Like Verbs: unlocked, labeled rectangle field at lower left. Contains list of verbs with similar connotations to the present verb. Like Verbs ARE NOT SYNONYMS! Synonymous verbs would be redundant; however, Like Verbs are distinct, in definition and use (example: INSPECT has like verbs MONITOR, TEST and VERIFY). Pressing on the square button opposite a like verb takes you to that card.

Antonym: unlocked, labeled rectangle field beneath the Like Verbs field. Logically, only one antonym may (and should) exist, since there are no synonyms, only like verbs. Pressing on the square button opposite the verb antonym takes you to that card. If none of the primitive verbs in the stack applies as an antonym, the field will be blank. If there logically is no antonym, the field will say 'none'.

Field specifications cont'd:

Source: unlocked, labeled transparent field at upper right. Contains an abbreviated reference to the document or notes where the verb first came to the attention of the TEJAS project. For more definitive titles, see the Contributions Card (last card in the stack).

History: unlocked, labeled, hidden scrolling field at middle right, alongside Def/Notes. Contains "ORIGINAL DEFINITION (from Source):" for the verb primitive, notes, redlines, etc. received (with sender's name or initials) during the review process, and "Version 1.0 FINAL NOTES:" that tell how final definition evolved. Used for traceability; normally not printed. Visibility of this field is set via the History button (see Help section 7.4.12).

EVAPrimitives Stack - Buttons

There are four buttons in the 'EVAPrimitives.bg' background that access information about each verb primitive, or a related one. They are

☐ - the square buttons are used to access Like Verbs and the Antonym for each verb. Click on these to navigate to the verb closest to each button.

History - the History field is hidden, to provide a space on the right side of each card for other information (graphic, video, or other text fields, for instance). Clicking on this button highlights it and shows the field; clicking again hides the field and turns the highlighting off.

Find Verb - to find a particular verb primitive, click here. A dialog box will ask "Find what Verb?". Type it in (capitalization not required) and click OK (or press return). If not found, a message will tell you so. Try again - you may have misspelled it. Using this button is faster than scanning cards one at a time with the Next, Previous, or Show buttons.

EVAPrimitives Stack - Buttons

- the 'EVAPrimitives block' button at the upper left corner of the EVAPrimitives cards is part of a customized, powerful script that creates a set of selectable menus of the verb primitives for quick navigation. The menus are updateable; they can vary with additions or deletions to the verb list. They are maintained by the 'Menu Builder' card (see Help section 7.4.15). This was a special challenge.

Pop-up menus are limited to 256 characters total. To stay within this limit, the HyperTalk script behind this button takes the total number of characters for all verbs, conservatively divides it by 220, and mathematically finds the starting and ending verbs for the number of M menus required to list all the verbs (averaging 25 verbs per menu). The script then shows that many M buttons (up to seven).

M1 M2 M3 M4 M5 M6 M7

All this happens very quickly, as the first step in using the button. For the second step, go to the next card --->

M1 M2 M3 M4 M5 M6 M7

POSITION
PROCESS
PULL
PUSH
QUERY
RECHARGE
RECORD
RELEASE
REMOVE
REPORT
RESTRAIN
RESUME
RESUPPLY
RETRACT
ROTATE
ROUTE

NOTE:
This is a custom menu system.

Please send comments!

Clicking and holding down on any of the M buttons immediately causes a pop-up menu to appear with primitive verbs, starting and ending as specified by the Menu Builder card. Non-selectable verbs are shadowed; they are the deleted (omitted) primitives left in the stack for traceability (use the Find Verb, Show, Next, or Previous buttons to go to them). All other 'boldface' verbs are selectable; pulling the cursor down and releasing on them will take you to that card. Releasing the mouse on a deleted verb or off the menu will cause the menu to disappear. That's all - you won't go anywhere. To hide the M buttons, just click on again.

This process varies in speed with RAM size and processor. With the Mac SE and Plus, it is fairly slow.

TEJAS V1.0 Help Menu Define USER

- a corresponding 'TelePrimitives block' button is located at the BOTTOM of each primitive card. This button provides a quick way to check for the presence of that same verb in the TelePrimitives stack. Relatively few verbs are common; the telerobotics 'language' is more precise than the EVA parlance that has evolved in manned spaceflight. Common verbs generally have quite different definitions; these differences can be VERY enlightening (try this button at the EVA primitive ATTACH).

To use this button, click on it. If there IS an exact match, the script will save your place, then take you to that card in TelePrimitives. You can read it, then return to the EVA primitive by using the T-flag, or pressing 'escape'.

If the script cannot find the EXACT same verb in the other stack, it will answer "No exact match," and leave you in place. That may peak your curiosity to see just what telerobotics primitive DOES correspond (if any). You can then go to the TelePrimitives stack and search manually.

TEJAS V1.0 3/30/90 Help Menu Define USER

Relating EVA and Telerobot Primitives

EVA primitives are much more complex than telerobot primitives, because humans can multitask (perform more than one function at the same time) to deal with larger chunks of tasks than telerobots can. To see this, compare the syntax parsing schemes for EVAPrimitives (Help section 7.4.14) and TelePrimitives (Help section 7.5.14).

The definition, syntax, and other information must be complete for each EVA or telerobot primitive. The syntaxes of both telerobot and EVA primitives have generic arguments that lead to a virtually infinite set of potential specific primitives.

The transformation from generic primitives (in these stacks) to specific primitives is task-dependent and takes place in the Specific Tasks stacks (e.g., EVATask.4893, EVATask.3225, etc.). For each task, a set of specific EVA primitives must be built to construct a script that follows the task outline (see 'Building Specific from Generic Primitives,' Help section 7.4.9).

Relating EVA and Telerobot Primitives

The relationship between EVA and telerobot primitives is one-to-many. That is, a single EVA primitive usually relates to a set (more than one) of telerobot primitives. TEJAS attempts to build that link in the direction EVA-> Telerobotics, because EVA primitives are better understood than telerobotics primitives (telerobotics is a much younger evolving science).

It is difficult, almost impossible, to create definite links between generic, rather than specific, EVA and telerobot primitives. There are two reasons:

- The selection of a telerobot primitive may be telerobot-dependent. For example, the RMS would RELEASE a payload or object, but a telerobot with a multifingered end effector ('hand') would UNGRASP it.

- The order and selection of telerobot primitives may depend upon the mode of operation – pure teleoperation, automated sequences, traded control, shared control, supervised autonomy, etc.

Relating EVA and Telerobot Primitives

Although generic EVA and telerobot primitives may not be matched in a fixed relationship, there are clearly similarities in definition and syntax between verbs in either list. This is both intentional and desirable.

In the EVAPrimitives stack, a button has been provided (Help section 7.4.12) to seek the same verb in the complementary TelePrimitives stack. Sometimes primitives with the same verb but different meanings exist in both stacks (e.g., RELEASE). It can be instructional to see these homonyms.

With a standardized set of generic EVA and telerobot task primitives, a set of relational rules between the specific primitives that evolve from each generic list should be attainable. A researcher will be able to use these sets of rules to trade off using EVA or telerobots in a task or subtask.

Much more work needs to be done in this area. The TEJAS primitives stacks are a solid beginning, based on a cooperative effort.

TEJAS V1.0 | 3/30/90 | Help Menu | Define

EVA Primitives | GRASP

Syntax **Source** "Telerobotic Application to EVA" MDAC 10/88

(crew) GRASP (object_A) [with (tool)]

Definition, Notes etc. | **History**

To grip an object manually or by mechanical means through some hand-held tool or instrument (intended to extend the crewperson's reach); to secure a hold upon an object .

Like Verbs:

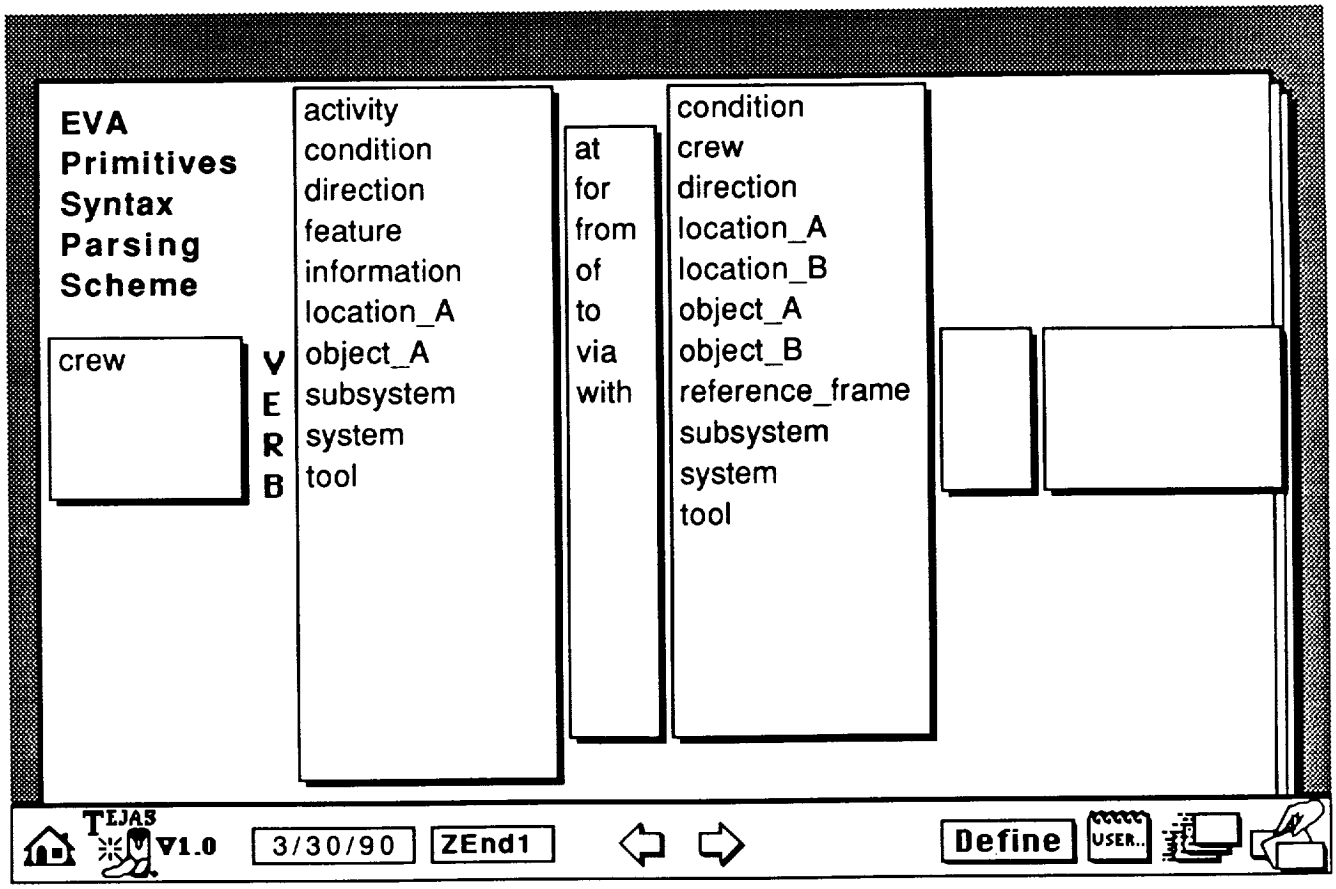
HOLD
SECURE

Antonym

RELEASE

Compare the TelePrimitive GRASP (section 7.5.13) with this EVA homonym. Notice the like verbs. The antonym here is the familiar verb RELEASE.

TEJAS V1.0 | 3/30/90 | Find Verb | Define



EVAPrimitives Stack - Parsing Scheme Card

7.4.14
1 of 1

The Parsing Scheme card is found third from the last in the stack. Its sole purpose is to suggest how to build and modify GENERIC syntaxes for task primitives. It is printed in the "TEJAS User's Guide" for use as a guide. The following discussion on syntax is from "Generic Extra-Vehicular Activity (EVA) and Telerobot Task Primitives for Analysis, Design, and Integration, Version 1.0: Reference Compilation," JPL Publication 90-10. To read it, scroll down on the field below.

The syntax used in both the crew-EVA and telerobot generic primitives is important, to ensure that information needed to perform analyses on the finished specific primitives will be present in them. Let's take an example:

(subsystem) ALIGN (object_A) [with (object_B/reference_frame)]

This telerobot primitive shows the generic 'subject-VERB-predicate' syntax used with all primitives in both the EVA and telerobot primitives lists. The subject is always a noun; in the case of a telerobot, either (system) (i.e. the RMS, SPDM, or FTS) or

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

EVA Primitives Menu Builder (Master) Rebuild

The 'Rebuild' button on this card (and the scripts attached to the stack) work to build and maintain pop-up menus of the EVAPrimitive verbs. On any verb card in the EVAPrimitives stack, click on the EVA block (upper left) to show the M1-? buttons, then press a button to show the pop-up menu and select a verb. Deleted verbs (in shadow) are not selectable.
In EVAPrimitives (except on this card), selecting a verb takes you to that card. To get to deleted verbs (say, to see why they were left out), use the 'Find Verb' button. Each time a new verb card (or a set of them) is added to or deleted from the stack, or a primitive's status changes (say, deleted to included), you must manually order a menu Rebuild. This can only be done from this card. Do so sparingly if you are making many changes, for it takes time. The menus will not update automatically at all, so if you notice verbs missing, Rebuild!

ACTIVATE,(ADJUST,ADJUST,ALIGN,ASSEMBLE,(ATTACH,(BERTH,(BOLT,(
CHECKOUT,CLEAN,CLOSE,(CLOSEOUT,(COLLECT,COMMUNICATE,
CONFIGURE,(CONNECT,(CONSTRUCT,(COORDINATE,(COVER,(DEACTIVATE,
(DECONTAMINATE,DEMATE,DEPLOY,(DETACH,(DISCONNECT,EGRESS,(
ERECT,(GRAPPLE,GRASP,(GUIDE,(HANDLE
,HANDOFF,HOLD,(IMPLEMENT,INGRESS,(INPUT,INSPECT,INSTALL,(
LATCH,(LOAD,(LOOSEN,LUBRICATE,MANEUVER,MATE,MEASURE,
MONITOR,(OBSERVE,(OBTAIN,OPEN,(PHOTOGRAPH,(POINT,(POSITION,(
PROCESS,PULL,PUSH,(QUERY,(RECHARGE,RECORD,RELEASE,REMOVE,(

<-This field, updated with each Rebuild, shows all the verbs in the stack. The # of menus is shown below.

4

TEJAS V1.0 | 3/30/90 | ZEnd2 | Define | USER..

EVAPrimitives Stack - Menu Builder Card

7.4.15
1 of 1

The Menu Builder card, second from the last in the stack, maintains the pop-up menus of primitive verbs available from the 'EVAPrimitives block' buttons (Help section 7.4.12). This card's visible and hidden fields and scripts work to rebuild and store these verb menus. The scripts' notation ensures that deleted verbs are non-selectable. The text on the card explains how to use it; be aware that rebuilding takes some time (longer for low-RAM Macs). Rebuild only when you have made a group of changes.

The selectable menus that this card and the scripts attached to the Primitives block and M buttons give you are more than a convenience. They provide the only place to view all the primitives in a complete list, noting which were included in the Version 1.0 integrated list and which were deleted (omitted). Viewing the list takes far less time than viewing cards one at a time or using the Show button. This facility cannot be built into other reference stacks (such as TeleTechnologies) because the number of characters in the different items makes menus impractical.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

EVA Primitives Contributions Card

NOTES TO THE READER: If you contribute a term and definition to this stack and list its source, that's great. Thank you. But if you contribute ALL of the terms in an existing document, or cross-correlate that source, that's even better, and needs to be noted here, so we know at a glance what this stack includes. Enter the source name & date with appropriate notes on a numbered line at left below, and your name & date of entry on the corresponding line, please.

COMPLETE SOURCES CHECKED/COMPILED	CONTRIBUTOR & DATE
1. "Telerobotic Application to EVA Activities", MDC H4121, McDonnell-Douglas Astronautics Co., 10/88; all terms/defs checked/compiled	1. J. Estus / C. Heneghan Jun 89
2. "Advanced Robotics for In-Space Vehicle Processing" (Interim), J.H. Smith et al JPL, 5/89	2. J. Estus / C. Heneghan Jun 89
3. "Telerobotics/EVA Joint Analysis System (TEJAS)" (Pre-release), M. Drews et al JPL, 6/89; used for cross-correlation & composition	3. M. Drews Jun 89
4. "Flight Telerobotic Servicer Task Analysis Methodology", GSFC Mission Utilization Team, 4/14/89; checked, no EVA primitives	4. C. Heneghan Jun 89
	5. J. Smith Jun 89
	6. J. Smith Jun 89

TEJAS V1.0 | 3/30/90 | ZEnd3 | DelFactor | Define | USER..

EVAPrimitives Stack - Contributions Card

7.4.16 1 of 1

The LAST card of every reference stack is like this one. When compiled, these cards form a bibliography of the TEJAS effort. The 'References' scrolling field gives a detailed list of documents, notes, or other sources that are also identified by abbreviations in the Source fields on the stack's information cards. Each reference also contains a short note about how the source was used. The corresponding numbered lines in the 'Contributor' scrolling field list who contributed the information and when. This data contibutes to the TEJAS goal of "total traceability."

With the primitives stacks, this card is particularly important. As the primitives are used, modified, and used again, this card will not be wiped clean. Instead, it will show, by the number and date of entry, the progression of compilation of community knowledge into a universal primitives stack. Please read and follow the card's instructions. If there is a reference that you think should be added but that you will not be compiling, let the TEJAS Editor know.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

Section 7.5

User Instructions: TelePrimitives Stack

TelePrimitives Help Menu

Menu 1 of 1

7.5 User Instructions

Background:

- ☐ 7.5.1 General Information
- ☐ 7.5.2 The User's Role
- ☐ 7.5.3 Changing the Standard
- ☐ 7.5.4 Adding Cards
- ☐ 7.5.5 Deleting Cards

Unique!

Generic Task Primitives:

- ☐ 7.5.6 Definition
- ☐ 7.5.7 Development
- ☐ 7.5.8 Conclusions
- ☐ 7.5.9 Building Specific from Generic Primitives

Stack-Specific Help:

- ☐ 7.5.10 Card Backgrounds
- ☐ 7.5.11 Information Fields
- ☐ 7.5.12 Buttons

Unique!

- ☐ 7.5.13 Relating EVA and Telerobot Primitives
- ☐ 7.5.14 Parsing Scheme Card
- ☐ 7.5.15 Menu Builder Card
- ☐ 7.5.16 Contributions Card

INSTRUCTIONS:
Click ☐ box to access section;
Click arrows to page through Help stack;
Click 'T-flag' to return to point of origin.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER...

Telerobot Primitives — Explanation Card

Syntax | **Source**

Definition, Notes etc. | **History**

This field is available to the researcher to write the final definition of the primitive as they understand it. The interim definition (and any comments received on it) should go in the History field, accessible by pressing the 'History' button above.

Like Verbs:

Antonym

S&P | CE | P&R | OI | SI

NASREM

This space is left blank to allow display of other, related information stored in hidden fields, e.g. graphics, text, etc. The History field is one such. Data on specific tools, objects (such as connectors, bolts etc.) and specifications (torques, temps, pressures etc.) can be displayed by means of a new button if desired.

TEJAS V1.0 | 3/30/90 | Find Verb | Define | USER...

TelePrimitives Stack - General Information

The TelePrimitives stack serves as repositories for a final set of generic task primitives for telerobot activity. Each card has one verb primitive, a definition, syntax, like (similar) verbs (NOT synonyms; see Help section 7.5.11), an antonym, and a field showing that primitive's evolution.

With relational hypermedia, you can add new or improved fields, or graphics, animation, and sound, if necessary, to completely convey the idea. Any card copied into any other stack would automatically include these functions.

The TelePrimitives and EVAPrimitives stacks are intended as master lists of GENERIC primitives for the nationwide telerobotics and EVA task analysis communities. TEJAS also accesses them during task analysis via a menu (see 'Task Analysis in TEJAS,' Help section 8.4.6). From these generic primitive 'roots,' SPECIFIC primitives evolve by specifying the arguments according to that specific task, leaving the master lists intact.

TelePrimitives Stack - The User's Role

This stack is meant to provide a standardized reference for many analyses. There are dozens of primitives involved in telerobotic and EVA activities. Scripting on-orbit tasks requires specific primitives derived from these lists (see Help section 7.5.9). Relating telerobotics to crew-EVA is possible through the use of these primitives stacks, but it requires VALID reference data. All users benefit from a standardized set. Please help make this stack complete and accurate by performing three very important operations:

1. CHECK for missing primitives (especially telerobot verbs already in use), then add them (see 'Adding Cards,' Help section 7.5.4). Version 1.0 of this stack will not be a complete list.
2. EXAMINE all the information fields. Make changes if necessary (see 'Changing the Standard,' Help section 7.5.3), but BE CERTAIN to keep the original Version 1.0 as a backup.
3. ADD comments or suggestions in the User Notes field for each primitive already in the stack.

TelePrimitives Stack - Changing the Standard

You can make changes in any stack information field, since none of the fields are locked. There are different mechanisms for entering data (see the 'Information Fields' Help cards in this section).

Make changes if you do not agree with the data on a particular primitive, but BE CERTAIN to justify those changes in the User Notes field AND to update the Source field for traceability.

TEJAS will track all changes by updating the Date field, and setting the TEJAS Version field to "V1.0+". When you feel you have compiled sufficient changes, send the updated stack to the TEJAS Editor. All changes and comments will be automatically retrieved and reviewed for incorporation into the next version of this stack. Remember that any time you change this reference stack data, it is no longer the Version 1.0 release but a modification of it (hence the "+"). Keep your original Version 1.0 stacks safely archived.

TelePrimitives Stack - Adding Cards

Before adding a new card, ensure a CLEAR NEED, i.e., check that the concept is not already covered by an existing primitive in the stack.

To add the new verb primitive:

1. Go to the Explanation card (first card in the stack).
2. Select 'New Card' from the Edit menu. A blank card will appear.
3. Fill out ALL the information fields, with comments in the User Notes field to explain why the primitive was suggested.
4. Select 'Card Info...' from the Objects menu. Type the verb as the card name. This ensures that the new verb will appear on the primitives menu.
5. Either cut and paste the new card alphabetically by verb, or sort.

NOTE: New verbs will not appear in the TelePrimitives verb menus until the Menu Builder card's 'Rebuild' button has been activated (see explanation of the Menu Builder Card, Help section 7.5.15).

TelePrimitives Stack - Deleting Cards

DO NOT DELETE ANY CARDS FROM THIS STACK!

Any primitive you find objectionable may not be so to others; compromise was necessary to reach the current stack and will continue to help evolve a truly complete, integrated primitives set for the telerobotics community.

Primitives that are defined as "deleted" are in fact still archived on cards in the stacks. They have only been omitted from the integrated set of TelePrimitives; their History fields reflect why (see Help section 7.5.11). TEJAS will prevent you from deleting any primitives. Instead, state your reasons for deletion in the User Notes, along with any other comments.

Remember that the primitives lists are like a spiderweb; everything is connected to something else. THINK IT THROUGH. What would deleting this verb do to the complete set? Could the definition just be changed? How does this affect relating TelePrimitives to EVAPrimitives?

Task Primitives - Definition

Two kinds of primitives exist: generic and specific. Their definitions are:

Primitive, Generic: The smallest descriptive task component for a crewmember or telerobot work system performing work, involving a subject (crew, system, or subsystem), an action VERB, and undefined arguments in a consistent syntax. Example Verbs: GRASP, TRANSLATE, ATTACH, VERIFY, etc.

Primitive, Specific: The smallest descriptive task component for a crewmember or telerobot work system performing work, involving a subject (EV1, EV2, or a telerobot work system or subsystem), an action VERB, the object of that action, and external factors, all defined as specific arguments connected by prepositions, and evolved (in the TEJAS stack system) from generic primitives. Examples: FTS GRASP wrench; EV2 TRANSLATE to MMU; EV1 ATTACH tether to slidewire; IV1 VERIFY RMS clear of obstructions, etc.

Task Primitives - Development

7.5.7
1 of 2

The steps in the development of this Version 1.0 release are illustrated on the next card and detailed below. Follow the process bars (and) to see the development. Development steps were:

- Generic task primitives included in this TelePrimitives stack first compiled from an initial set of published documents (first boxed list)

- Review release of EVAPrimitives and TelePrimitives stacks to members of the EVA and Telerobotics communities (first and cubes)

- Comments received from the primitives reviewers (feedback loop)

- Review and resolution of all comments to the review stacks. Primitives cards modified; all comments and final notes archived in History field.

- TEJAS Version 1.0 primitives stacks released (second and cubes)

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

Task Primitives - Development

7.5.7
2 of 2

- "Task Ranking for the Telerobot Demonstration", JPL/SRI Report 1988: preliminary telerobot primitives (Teleprimitives) & EVA primitives lists

- "Advanced Robotics for In-Space Vehicle Processing" (Interim), J.H. Smith et al JPL, 5/89: expanded teleprimitives & EVAprimitives lists

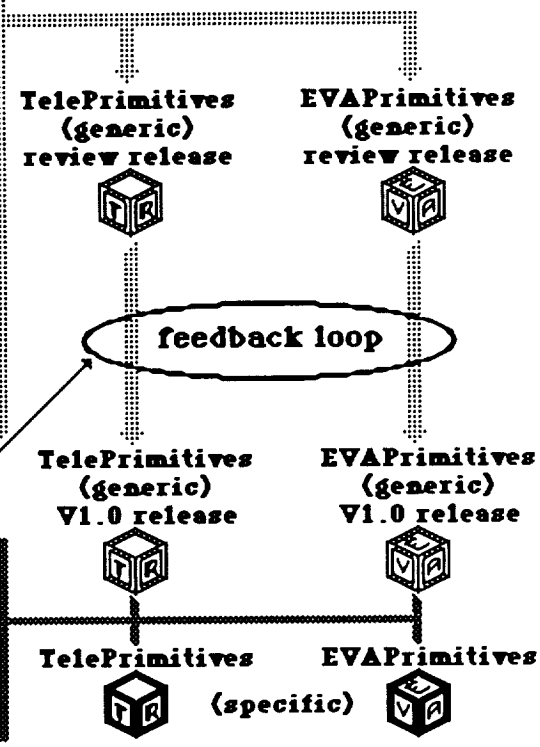
- "Flight Telerobotic Servicer Task Analysis Methodology", GSFC MUT 4/89: expanded teleprimitives list

- "Telerobotic Application to EVA Activities", MDAC 10/88: teleprimitives, EVAprimitives, written links

- Comments from EVA and telerobotics communities on TelePrimitives & EVAPrimitives review lists

- J.H. Smith "ARISVP": specific teleprimitives derived from TEJAS pre-release list

- "Vehicle Processing Operations Data Collection Set (VPOD) " CTA Inc. & LaRC 1989: specific teleprimitives derived from TEJAS pre-release list



T/R Primitives Task:

LOCATE

Source 4

FTS Task Analysis Methodology 4/14/89

Definition, Notes etc.

To determine position with respect to a frame of reference (syn: find)

PROPOSED: replace with 'To search with sensors for an object, identify it when sensed (if known and modelled or

Planning & Reasoning

NASREM

Copy of primitive card 'LOCATE' as released for review with original definition.

Syntax

(system) LOCATE (object A) in (reference frame)

Find Verb

TEJAS 6/19/89 Define

Telerobot Primitives LOCATE

Syntax **Source** FTS Task Analysis Methodology 4/14/89

(system) LOCATE (object_A) in (reference_frame)

Definition, Notes etc. **History**

To determine a sensed object's position with respect to a frame of reference (frequently the base of a manipulator); for for non-contact sensed objects, this implies that an ACQUIRE primitive has already been completed.

ORIGINAL DEFINITION (from Source): To determine position with respect to a frame of reference (syn: find)

JPL: replace with 'To search with sensors for an object, identify it when sensed (if known and modelled or reasoned), and

Like Verbs:

ACQUIRE
RANGE

Copy of primitive card 'LOCATE' from Version 1.0 release with original definition archived in the History field (shown).

Antonym

none

S&P CE P&R OI SI

NASREM Planning & Reasoning Sensing & Perception

TEJAS V1.0 3/30/90 Find Verb Define USER...

Task Primitives - Conclusions

- The basic steps of task analysis methodologies (TAMs) are similar between EVA and Telerobotics, up to the outline (see below):

1. Name the task.
2. Divide the task into subtasks; this can take several iterations. In TEJAS, all subtasks are considered to be 'tasks.'
3. Write a prose description of the task.
4. State the assumptions of the task: about task sequencing, lighting, environment, geometry, objects to be handled, tools used, etc.
5. State the open issues – things not decided or known.
6. Develop an outline (no set format) of the steps in the task.
7. Build the detailed task script of specific primitives.
8. Perform detailed analysis on this task script and attendant data.

At step 7, the approaches appear to diverge. The number and name of hierarchical levels in their detailed analysis varies by TAM.

Task Primitives - Conclusions

- Generic primitives have generic arguments. Specific primitives are derived from generic primitives by specifying their generic arguments (see Help section 7.5.9). Generic primitives are therefore a finite set of roots; specific primitives change according to each task and are a potentially unlimited set. -->

- Verb-based syntaxes for standardizing and relating generic primitives must be part of any compilation, to help automate the generic-to-specific step. Generic syntaxes will evolve into a standard form only through actual use in task analyses.

- Primitives are universal objects of task analysis, with their level set in each particular methodology. Primitives should be standardized, not the TAMs. With standardized generic primitives, all TAMs may be reconciled on an equal basis.

Task Primitives - Conclusions

- Generic EVA primitives are far more complex, but less numerous, than telerobot primitives, because a human can sense and identify, move etc. To accomplish a single EVA step, a telerobot must execute a greater number of preliminary steps, either sequentially or in parallel (depending on the microprocessor technology used). As an example, consider:

EV1 HANDOFF portable foot restraint to EV2 — **This specific EVA primitive...**

FTS ACQUIRE EV2
FTS LOCATE EV2
FTS MOVE portable foot restraint to EV2
FTS VERIFY EV2 has grasped portable foot restraint
FTS UNGRASP portable foot restraint

...may equate to this set of specific telerobot primitives.

- Relationships between EVA and telerobotics are through specific primitives, not generic primitives. These links are therefore task-dependent.

TEJAS V1.0 | 3/30/90 | Help Menu | Define

Telerobot Primitives | ORIENT

Syntax | Source FTS Task Analysis Methodology 4/14/89

Definition, Notes etc. | History

DELETED FROM V1.0

Version 1.0 FINAL NOTES: this verb IS less versatile than ALIGN, because it deals with relative positioning between two objects only, and only in one axis at a time. Deleted as unnecessary given ALIGN as it is defined.

Like Verbs:

'Deleted' primitive card, showing archived decision that justifies its omission from the integrated set.

Antonym

S&P | CE | P&R | OI | SI
NASREM | Control Execution | Sensing & Perception

TEJAS V1.0+ | 4/1/90 | Find Verb | Define

Building Specific From Generic Primitives

Specific primitives are built by specifying the generic arguments of a generic primitive syntax to fit the circumstances of a particular task. The specific primitives list approximates the outline for that task (see "Task Analysis in TEJAS," Help section 8.4.6).

Telerobot Task Summary

For a specific step in the task outline...

- Grasp hydrazine filler line
- Locate OMV hydrazine interface panel
- Move to OMV hydrazine interface panel
- Couple hydrazine filler line to OMV hydrazine interface panel

Telerobot Task Primitives (Generic)

...retrieve the generic primitive for that action...

(system) COUPLE (object_A) to (object_B)

Building Specific From Generic Primitives

system

(system) COUPLE (object_A) to (object_B)

FTS
JEM-RMS
JEM-SFA
RMS
SPDM
SSRMS

Add Item
Delete Item

...then specify each generic argument using items from a reconfigurable menu (or by hand)...

FTS COUPLE (object_A) to (object_B)

...and after limited repetition...

FTS COUPLE filler line to OMV hydrazine port

Telerobot Task Primitives (Specific)

...a specific primitive, built precisely for that task from the generic syntax, may be archived.

TelePrimitives Stack - Card Backgrounds

There are four different backgrounds in this stack. By specific name:

TelePrimitives.bg – main background for this stack. Different cards for each verb primitive. Incorporates primary information fields: ten visible background fields of different types, two hidden scrolling fields.

TelePrimsParsing.bg – specialized, for the Syntax Parsing card only. Unlocked, but a reference for all information cards in the stack. Changes are best made via the User Notes comments field (Help section 6.5).

TelePrimsMenu.bg – specialized, for the Menu Builder Card only. Unlocked, but a reference for all information cards in the stack. Changes are best made via the User Notes comments field (Help section 6.5).

Contributions.bg – specialized, for the Contributions Card only. Unlocked.

TelePrimitives Stack - Information Fields

There are nine information fields common to the 'EVAPrimitives.bg' background: Verb, Def/Notes, Syntax, Like Verbs, Antonym, Source, History, NASREM 1 and NASREM 2. Field specifications are on the following cards.

If at any time, you disagree with the contents of an unlocked field, you may change it. You can change the Definition, generic Syntax, Like Verbs and Antonym if you wish, but remember that the like verbs and antonym form a kind of thesaurus; do not change them without careful consideration.

Leave locked fields and the History field alone. Make general comments in the User Notes hidden field, either as a reminder to yourself or to communicate with the TEJAS Editor.

If you want your changes to be considered for compilation, please follow the simple conventions (e.g., verbs capitalized, generic syntax arguments in parentheses, etc.) detailed in the field specifications cards that follow.

TelePrimitives Stack - Information Fields

Field specifications:

Verb: unlocked, unlabeled shadow field at top right. Contains one- or two-word primitive verb. One-word verbs are desirable; two-word verbs (verb plus adverb or article) are used only to differentiate between different primitives with identical verbs. First word of verb is all capital letters.

Def/Notes: unlocked, labeled scrolling field at middle left. Contains definition and notes about the verb primitive, as compiled from the original definition and changes made during the review process.

Syntax: unlocked, labeled rectangle field across top of card. Contains the suggested generic syntax for the primitive with generic arguments (in parentheses) connected by prepositions (see 'Parsing Scheme Card,' Help section 7.5.14). Both format and content can be changed; submit suggested changes to the TEJAS Editor.

TelePrimitives Stack - Information Fields

Field specifications cont'd:

Like Verbs: unlocked, labeled rectangle field at lower left. Contains list of verbs with similar connotations to the present verb. Like Verbs ARE NOT SYNONYMS! Synonymous verbs would be redundant; however, Like Verbs are distinct, in definition and use (example: INSPECT has like verbs MONITOR, TEST and VERIFY). Pressing on the square button opposite a like verb takes you to that card.

Antonym: unlocked, labeled rectangle field beneath the Like Verbs field. Logically, only one antonym may (and should) exist, since there are no synonyms, only like verbs. Pressing on the square button opposite the verb antonym takes you to that card. If none of the primitive verbs in the stack applies as an antonym, the field will be blank. If there logically is no antonym, the field will say 'none'.

Field specifications cont'd:

Source: unlocked, labeled transparent field at upper right. Contains an abbreviated reference to the document or notes where the verb first came to the attention of the TEJAS project. For more definitive titles, see the Contributions Card (last card in the stack).

History: unlocked, labeled, hidden scrolling field at middle right, alongside Def/Notes. Contains "ORIGINAL DEFINITION (from Source):" for the verb primitive, notes, redlines, etc. received (with sender's name or initials) during the review process, and "Version 1.0 FINAL NOTES:" that tell how final definition evolved. Used for traceability; normally not printed. Visibility of this field is set via the History button (see Help section 7.5.12).

Field specifications cont'd:

NASREM 1 and NASREM 2: unlocked, labeled rectangle fields to the right of the 'NASREM' button at the bottom of each card. Contain the NASREM areas most closely associated with that verb.

NOTE: This information is experimental; GENERIC task primitives are difficult to classify. Depending on the mode (e.g., teleoperated vs. autonomous), a motion primitive such as MOVE may or may not require Planning & Reasoning, but it is always primarily a Control Execution verb. Therefore, TWO fields are provided for NASREM categorization; their relative weight is equivalent. The purpose of these fields is to provide a key word to help identify the required telelerobotics technologies, which ARE classifiable in a single NASREM area. The best way to check these entries is to USE the telerobot primitives and see if the NASREM categorization is useful and accurate.

EVAPrimitives Stack - Buttons

There are four buttons in the 'EVAPrimitives.bg' background that access information about each verb primitive, or a related one. They are

☐ - the square buttons are used to access Like Verbs and the Antonym for each verb. Click on these to navigate to the verb closest to each button.

History - the History field is hidden, to provide a space on the right side of each card for other information (graphic, video, or other text fields, for instance). Clicking on this button highlights it and shows the field; clicking again hides the field and turns the highlighting off.

Find Verb - to find a particular verb primitive, click here. A dialog box will ask "Find what Verb?". Type it in (capitalization not required) and click OK (or press return). If not found, a message will tell you so. Try again - you may have misspelled it. Using this button is faster than scanning cards one at a time with the Next, Previous, or Show buttons.

EVAPrimitives Stack - Buttons

- the 'EVAPrimitives block' button at the upper left corner of the EVAPrimitives cards is part of a customized, powerful script that creates a set of selectable menus of the verb primitives for quick navigation. The menus are updateable; they can vary with additions or deletions to the verb list. They are maintained by the 'Menu Builder' card (see Help section 7.4.15). This was a special challenge.

Pop-up menus are limited to 256 characters total. To stay within this limit, the HyperTalk script behind this button takes the total number of characters for all verbs, conservatively divides it by 220, and mathematically finds the starting and ending verbs for the number of M menus required to list all the verbs (averaging 25 verbs per menu). The script then shows that many M buttons (up to seven).

M1 M2 M3 M4 M5 M6 M7

All this happens very quickly, as the first step in using the button. For the second step, go to the next card --->

TelePrimitives Stack - Buttons

M1 M2 M3 M4 M5 M6 M7

TOP-OFF
TOUCH
TRACK
TRANSFER
TRANSLATE
TRANSMIT
TRANSPORT
TURN
UNBERTH
UNDOCK
UNFOLD
UNGRASP
UNSCREW
UNSTOW
UPDATE
UPLOAD

NOTE:
This is a custom menu system.

Please send comments!

Clicking and holding down on any of the M buttons immediately causes a pop-up menu to appear with primitive verbs, starting and ending as specified by the Menu Builder card. Non-selectable verbs are shadowed; they are the deleted (omitted) primitives left in the stack for traceability (use the Find Verb, Show, Next, or Previous buttons to go to them). All other 'boldface' verbs are selectable; pulling the cursor down and releasing on them will take you to that card. Releasing the mouse on a deleted verb or off the menu will cause the menu to disappear. That's all - you won't go anywhere. To hide the M buttons, just click on again.

This process varies in speed with RAM size and processor. With the Mac SE and Plus, it is fairly slow.

TelePrimitives Stack - Buttons

- a corresponding 'EVAPrimitives block' button is located at the BOTTOM of each primitive card. This button provides a quick way to check for the presence of that same verb in the EVAPrimitives stack. Relatively few verbs are common; the telerobotics 'language' is more precise than the EVA parlance that has evolved in manned spaceflight. Common verbs generally have quite different definitions; these differences can be VERY enlightening (try this button at the teleprimitive ATTACH).

To use this button, click on it. If there IS an exact match, the script will save your place, then take you to that card in EVAPrimitives. You can read it, then return to the teleprimitive by using the T-flag, or pressing 'escape'.

If the script cannot find the EXACT same verb in the other stack, it will answer "No exact match," and leave you in place. That may peak your curiosity to see just what crew-EVA primitive DOES correspond (if any). You can then go to the EVAPrimitives stack and search manually.

Relating EVA and Telerobot Primitives

Telerobot primitives are much less complex than EVA primitives, because humans can multitask (perform more than one function at the same time) to deal with larger chunks of tasks than telerobots can. To see this, compare the syntax parsing schemes for TelePrimitives (Help section 7.5.14) and EVAPrimitives (Help section 7.4.14).

The definition, syntax, and other information must be complete for each telerobot of EVA primitive. The syntaxes of both telerobot and EVA primitives have generic arguments that lead to a virtually infinite set of potential specific primitives.

The transformation from generic primitives (in these stacks) to specific primitives is task-dependent and takes place in the Specific Tasks stacks (e.g., TeleTask.4893, TeleTask.3225, etc.). For each task, a set of specific telerobot primitives must be built to construct a script that follows the task outline (see 'Building Specific from Generic Primitives,' Help section 7.5.9).

Relating EVA and Telerobot Primitives

The relationship between EVA and telerobot primitives is one-to-many. That is, a single EVA primitive usually relates to a set (more than one) of telerobot primitives. TEJAS attempts to build that link in the direction EVA-> Telerobotics, because EVA primitives are better understood than telerobotics primitives (telerobotics is a much younger evolving science).

It is difficult, almost impossible, to create definite links between generic, rather than specific, EVA and telerobot primitives. There are two reasons:

- The selection of a telerobot primitive may be telerobot-dependent. For example, the RMS would RELEASE a payload or object, but a telerobot with a multifingered end effector ('hand') would UNGRASP it.

- The order and selection of telerobot primitives may depend upon the mode of operation – pure teleoperation, automated sequences, traded control, shared control, supervised autonomy, etc.

Relating EVA and Telerobot Primitives

Although generic EVA and telerobot primitives may not be matched in a fixed relationship, there are clearly similarities in definition and syntax between verbs in either list. This is both intentional and desirable.

In the TelePrimitives stack, a button has been provided (Help section 7.5.12) to seek the same verb in the complementary EVAPrimitives stack. Sometimes primitives with the same verb but different meanings exist in both stacks (e.g., RELEASE). It can be instructional to see these homonyms.

With a standardized set of generic telerobot and EVA task primitives, a set of relational rules between the specific primitives that evolve from each generic list should be attainable. A researcher will be able to use these sets of rules to trade off using telerobots or EVA crew in a task or subtask.

Much more work needs to be done in this area. The TEJAS primitives stacks are a solid beginning, based on a cooperative effort.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

Telerobot Primitives | GRASP

Syntax **Source** TEJAS M. Drews et al, JPL 1989

(subsystem) GRASP (object_A)

Definition, Notes etc. **History**

To close a multi-fingered (2 or more) end effector upon an object with force sufficient order to eliminate relative motion between object and gripper; normally requiring extensive force-feedback and planning.

ORIGINAL DEFINITION (from Source): To take hold of firmly with a multi-fingered (2 or more) end effector, in order to eliminate relative motion between object and gripper and capture the object with t norm

Compare the EVAPrimitive GRASP (section 7.4.13) with this telerobot homonym. Notice the like verbs. The antonym here is the specific verb UNGRASP.

Like Verbs:

CLOSE gripper
GRAPPLE
SQUEEZE

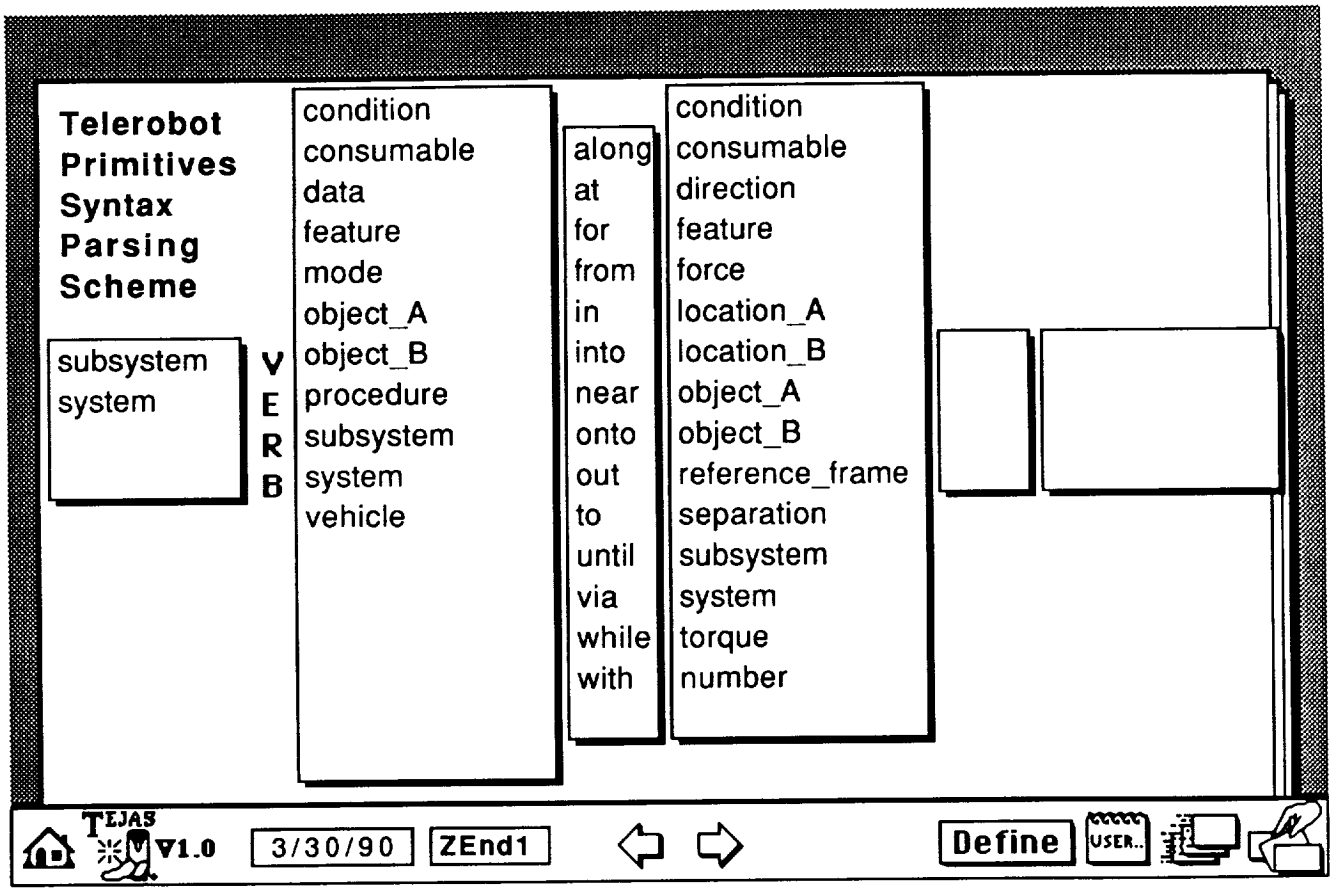
Antonym

UNGRASP

S&P | CE | P&R | OI | SI

NASREM | Planning & Reasoning | Control Execution

TEJAS V1.0 | 3/30/90 | Find Verb | Define | USER..



TelePrimitives Stack - Parsing Scheme Card

7.5.14
1 of 1

The Parsing Scheme card is found third from the last in the stack. Its sole purpose is to suggest how to build and modify GENERIC syntaxes for task primitives. It is printed in the "TEJAS User's Guide" for use as a guide. The following discussion on syntax is from "Generic Extra-Vehicular Activity (EVA) and Telerobot Task Primitives for Analysis, Design, and Integration, Version 1.0: Reference Compilation," JPL Publication 90-10. To read it, scroll down on the field below.

The syntax used in both the crew-EVA and telerobot generic primitives is important, to ensure that information needed to perform analyses on the finished specific primitives will be present in them. Let's take an example:

(subsystem) ALIGN (object_A) [with (object_B/reference_frame)]

This telerobot primitive shows the generic 'subject VERB predicate' syntax used with all primitives in both the EVA and telerobot primitives lists. The subject is always a noun; in the case of a telerobot, either (system) (i.e. the RMS, SPDM, or FTS) or

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

Telerobot Primitives Menu Builder (Master) Rebuild

The 'Rebuild' button on this card (and the scripts attached to the stack) work to build and maintain pop-up menus of the telerobot Primitive verbs. On any verb card in the TelePrimitives stack, click on the EVA block (upper left) to show the M1-? buttons, then press a button to show the pop-up menu and select a verb. Deleted verbs (in shadow) are not selectable.
In TelePrimitives (except on this card), selecting a verb takes you to that card. To get to deleted verbs (say, to see why they were left out), use the 'Find Verb' button. Each time a new verb card (or a set of them) is added to or deleted from the stack, or a primitive's status changes (say, deleted to included), you must manually order a menu Rebuild. This can only be done from this card. Do so sparingly if you are making many changes, for it takes time. The menus will not update automatically at all, so if you notice verbs

ACQUIRE,ACTIVATE,(ACTUATE,ADJUST,ALIGN,ANALYZE,(APPROACH,(
ASSEMBLE,ATTACH,BERTH,CALIBRATE,CAPTURE,(CHANGE-OUT,
CHECKOUT,(CLEAN,CLOSE,CLOSE gripper,COMPARE,COMPLY,(COMPUTE,
CONFIGURE,COUPLE,CUT,DEACTIVATE,(DECONTAMINATE,DECOUPLE,
DEMATE,DEPLOY,(DEPRESSURIZE,DERIGIDIZE,DESIGNATE,DETACH,
DIAGNOSE,(DISASSEMBLE,(DOCK,DOWNLOAD,DRAIN,DUMP,EGRESS,
EXTEND,EXTRACT,EXTRACT feature,FILL,(FIND,FOLD,FREEZE,GRAPPLE,
GRASP,(GRIP,HANDOVER,IDENTIFY,INDEX,INGRESS,INITIALIZE,INITIATE,
INSERT,INSPECT,(INSTALL,(LIMP,LOAD,(LOAD subsystem,LOCATE,

<-This field, updated with each Rebuild, shows all the verbs in the stack. The # of menus is shown below.

5

TEJAS V1.0 | 3/30/90 | ZEnd2 | Define | USER..

TelePrimitives Stack - Menu Builder Card

7.5.15
1 of 1

The Menu Builder card, second from the last in the stack, maintains the pop-up menus of primitive verbs available from the 'TelePrimitives block' buttons (Help section 7.5.12). This card's visible and hidden fields and scripts work to rebuild and store these verb menus. The scripts' notation ensures that deleted verbs are non-selectable. The text on the card explains how to use it; be aware that rebuilding takes some time (longer for low-RAM Macs). Rebuild only when you have made a group of changes.

The selectable menus that this card and the scripts attached to the Primitives block and M buttons give you are more than a convenience. They provide the only place to view all the primitives in a complete list, noting which were included in the Version 1.0 integrated list and which were deleted (omitted). Viewing the list takes far less time than viewing cards one at a time or using the Show button. This facility cannot be built into other reference stacks (such as TeleTechnologies) because the number of characters in the different items makes menus impractical.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

Telerobot Primitives Contributions

NOTES TO THE READER: If you contribute a term and definition to this stack and list its source, that's great. Thank you. But if you contribute ALL of the terms in an existing document, or cross-correlate that source, that's even better, and needs to be noted here, so we know at a glance what this stack includes. Enter the source name & date with appropriate notes on a numbered line at left below, and your name & date of entry on the corresponding line, please.

COMPLETE SOURCES CHECKED/COMPILED	CONTRIBUTOR & DATE
1. "Requirements Analysis for an ExtraVehicular Activity (EVA) Robotic Assistant", Final Report, SwRI Project #05-1488, 10/88; all terms/defs compiled	1. M. Drews May 89
2. "Task Ranking for the Telerobot Demonstration", SRI Project # 3528 7/88; all terms/defs compiled	2. M. Drews May 89
3. "Advanced Robotics for In-Space Vehicle Processing" (Interim), J.H. Smith et al JPL, 5/89	3. M. Drews May 89
4. "Flight Telerobotic Servicer Task Analysis Methodology", GSFC Mission Utilization Team, 4/14/89	4. M. Drews May 89
5. "Telerobotic Application to EVA Activities", MDC H4121,	5. M. Drews Jun 89
	6. M. Drews Jun 89
	7. M. Drews Jun 89

TEJAS V1.0 | 3/30/90 | ZEnd3 | DelFactor | Define | USER..

TelePrimitives Stack - Contributions Card

7.5.16
1 of 1

The LAST card of every reference stack is like this one. When compiled, these cards form a bibliography of the TEJAS effort. The 'References' scrolling field gives a detailed list of documents, notes, or other sources that are also identified by abbreviations in the Source fields on the stack's information cards. Each reference also contains a short note about how the source was used. The corresponding numbered lines in the 'Contributor' scrolling field list who contributed the information and when. This data contributes to the TEJAS goal of "total traceability."

With the primitives stacks, this card is particularly important. As the primitives are used, modified, and used again, this card will not be wiped clean. Instead, it will show, by the number and date of entry, the progression of compilation of community knowledge into a universal primitives stack. Please read and follow the card's instructions. If there is a reference that you think should be added but that you will not be compiling, let the TEJAS Editor know.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

Section 7.6

User Instructions: TeleSystems Stack

(Not available in Version 1.0 Help Stacks)

Section 7.7

User Instructions: TeleTechnologies Stack

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TeleTechnologies Help Menu

Menu 1 of 1

7.7 User Instructions

Background:

- ☐ 7.7.1 General Information
- ☐ 7.7.2 The User's Role
- ☐ 7.7.3 Changing the Standard
- ☐ 7.7.4 Adding Cards
- ☐ 7.7.5 Deleting Cards

Unique!

- ☐ 7.7.6 Technology Requirement and Criticality
- ☐ 7.7.7 Specifying Technology Requirements

Stack-Specific Help:

- ☐ 7.7.8 Card Backgrounds
- ☐ 7.7.9 Information Fields
- ☐ 7.7.10 Buttons

Unique!

- ☐ 7.7.11 Forecast Histograms
- ☐ 7.7.12 TeleTech Menus Card
- ☐ 7.7.13 Contributions Card

INSTRUCTIONS:
Click ☐ box to access section;
Click arrows to page through Help stack;
Click 'T-flag' to return to point of origin.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER...

TeleTechnologies Stack - General Information

7.7.1 1 of 1

This stack attempts to treat the technologies inherent in telerobotics as objects, each identifiable and quantifiable. These cards store information about each technology, including a Definition and a Forecast of the start years for eight different levels of readiness, based on a system standardized by the Office of Aeronautics and Space Technology (OAST). The Source field is actually three fields, that explain where the TEJAS project got the technology, its definition, and the forecast data (see 'Information Fields,' Help section 7.7.9). Another hidden field (Forecast Notes) details restrictions on that forecast, if there are any.

No standard of technology readiness levels has yet been specified by NASA-OSS, but the OAST system has been used extensively within Space Station studies. If another system is desired, it can easily be overlaid on the current information. The data shown, including the histograms, can be changed at any time. One of the TEJAS Version 2 objectives is to verify this forecasting and add approximate costs for transitions between levels.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER...

TeleTechnologies Stack - The User's Role

This stack is meant to provide a standardized reference for many analyses. There are hundreds of technologies involved in telerobotics. Telerobot work systems incorporate different sets of technologies, depending on the designers and their criteria. Conversely, on-orbit tasks require different sets. Relating telerobots or tasks to technologies can be done in many ways, but all require VALID reference data. All users benefit from a standardized set. You can help make this stack complete and accurate by performing three very important operations:

1. CHECK for missing technologies, then add them ('Adding Cards,' Help section 7.7.4). Version 1.0 of the this stack will not be a complete list.
2. EXAMINE the Forecast dates and Forecast Notes and make changes if necessary (see 'Changing the Standard', Help section 7.7.3), but BE CERTAIN to keep the original Version 1.0 as a backup.
3. ADD comments or suggestions in the User Notes field for each technology already on the stack.

TeleTechnologies Stack - Changing the Standard

You can make changes in any stack information field, since none of the fields are locked. There are different mechanisms for entering data (see the 'Information Fields' Help cards in this section).

Make changes if you do not agree with the data on a particular technology, but BE CERTAIN to justify those changes in the User Notes field AND to update the Source field for traceability. In particular, try to resolve any 'TBD' forecast dates.

TEJAS will track all changes by updating the Date field and setting the TEJAS Version field to "V1.0+". When you feel you have compiled sufficient changes, send the updated stack to the TEJAS Editor. All changes and comments will be automatically retrieved and reviewed for incorporation into the next version of this stack. Remember that any time you change this reference stack data, it is no longer the Version 1.0 release (hence the "+"). Keep your original Version 1.0 stacks safely archived.

TeleTechnologies Stack - Adding Cards

Before adding a new card, ensure a CLEAR NEED, i.e., check that the concept is not already covered by an existing technology in the stack.

To add the new technology card:

1. Go to any technology card (with the 'TeleTechnology.bg' background).
2. Select 'New Card' from the Edit menu. A blank card will appear.
3. Fill out ALL the information fields (see Help section 7.7.9 for conventions) and explain why the technology was suggested in the User Notes field.
4. DON'T construct a histogram; let the Editor do that (see Section 7.7.11).
5. Either cut and paste the new card alphabetically by technology, or sort.
6. Go to the first card and reload the menu (see Help section 7.7.12).

NOTE: The overall objective is to create a COMPLETE list of telerobotics technologies, for all areas. Many technologies may be missing in this Version 1.0 release. PLEASE add them, and make comments on the technologies already included. Community feedback is essential here.

TeleTechnologies Stack - Deleting Cards

DO NOT DELETE ANY CARDS FROM THIS STACK!

Any technology you find objectionable may not be so to others; compromise was necessary to build the current stack, and will continue to be necessary to evolve a truly complete, integrated set for the telerobotics community.

TEJAS will prevent you from deleting any technology cards. Instead of deleting a technology, state your reasons for deletion in the User Notes, along with any other comments. Remember that the technologies list is like a spiderweb; the presence or absence of a particular technology may change the results of any analysis performed using the data in this stack.

Eventually, every technology may be linked to something else. THINK IT THROUGH: What would deleting this technology do to the complete set? Could the definition just be changed? How does this affect relationships between this and the other technologies? Please add your comments.

Technology Requirement and Criticality

Previous technology studies have attempted to create lists of "critical" technologies, basing the criticality (rank) of each on the circumstances of the study. But that approach is incomplete and often misleading, because the "tall poles in the tent" (most critical technologies) are often different from and more extensive than what the author has divined. Sometimes it is as important to know ALL of the technologies involved, critical or not, when assessing a specific task for the applicability of telerobotics.

TEJAS will show the critical technologies using a two-step procedure:

Step 1: Identify ALL required technologies

Step 2: Select CRITICAL technologies from those required, based on user-selectable criteria for criticality

Step 1 is not possible without a complete list of telerobotics technologies, to be stored in this TeleTechnologies reference stack. For more on this analysis process, see the next card.

More -->

Technology Requirement and Criticality cont'd

NOTE: Before Step 1 can commence, a task must be broken down into a list of SPECIFIC task primitives (derived by specifying the arguments of GENERIC teleprimitives), and the task assumptions must be stated (see 'Task Analysis in TEJAS,' Help section 8.4.6).

Step 1: A set of rules (in TEJAS Version 2.0) will specify the requirement for each technology to execute each specific primitive, based upon the contents of that primitive and the assumptions for that task. The expert program must (at user request) document the reasoning behind each requirement, so that you can see the driving factors in the decision (in order to know what assumptions or steps to change before re-running the analysis). This justification requires keeping track of all specific primitives (representing steps in the task) that justify the need for each technology. These technologies are then compiled into a single list for the entire task.

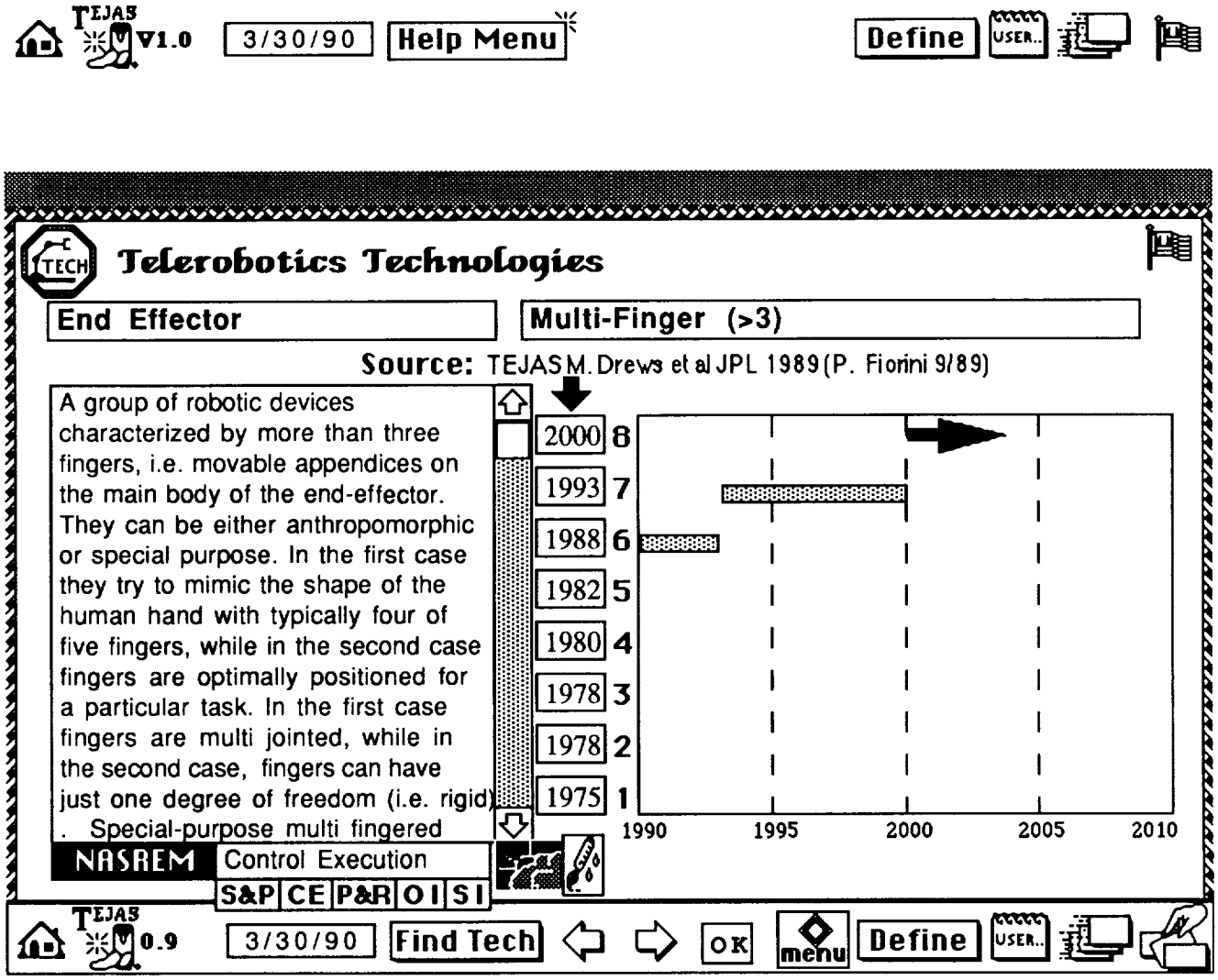
Go to the next card for an explanation of Step 2-->

Technology Requirement and Criticality cont'd

Step 2: Next the software must show the criticality of each required technology. The stack interface should give you a choice of how you can display the data. For example, if criticality is to be judged by a technology's readiness level versus the need date (mission date), then all technologies that will NOT reach Level 8 (full operational capability) by that date are critical, in order of how many years behind they'll be. The software must compare the mission date of that task with each required technology's Level 8 forecast to show the shortfalls.

Criticality might also be judged by the NUMBER of specific primitives requiring that technology. If all GRASP primitives require Multi-Fingered Gripper technology because of the lack of a dedicated grasp interface on an ORU, for example, then that technology is critical, even if available.

The objective is to be able to change your forecast or assumptions, rerun the analysis, and see the effect on the teletechnologies' list and ranking.



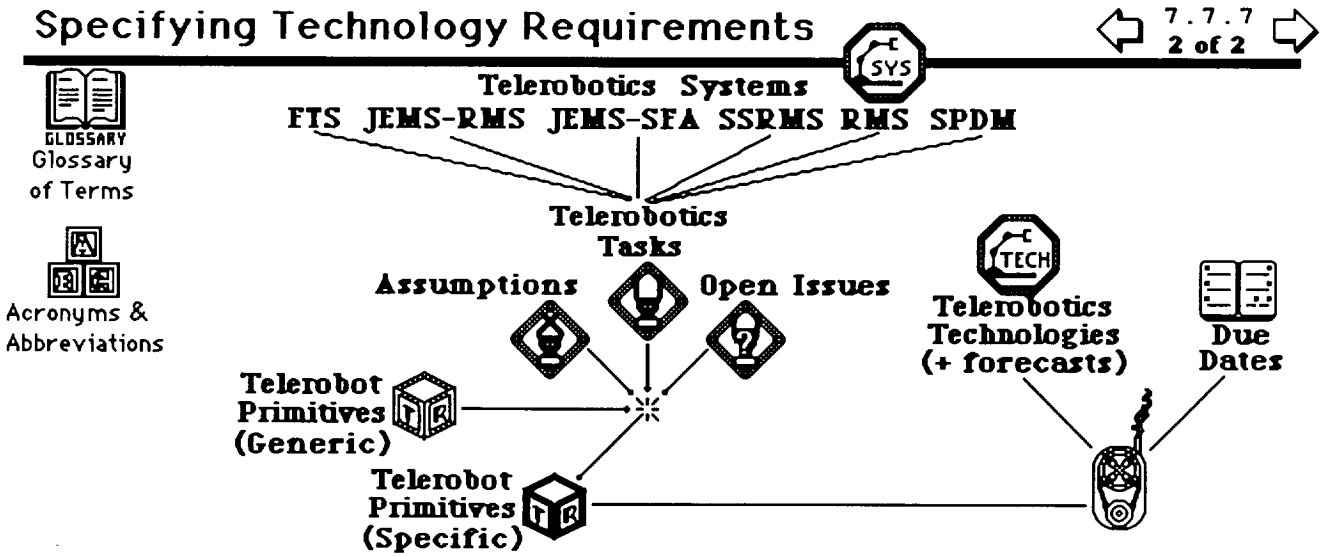
Specifying Technology Requirements

Technology requirements derive from a need to perform a task under certain circumstances. The TEJAS hypermedia approach creates specific verb primitives from generic ones, relating those specific primitives with the task description and outline, assumptions, information on tools, services, acronyms, terms, the environment, and the telerobot work system(s) used (FTS, JEMS-RMS, JEMS-SFA, MRMS, RMS, SPDM).

Relational rules in an analysis stack are then built in order to identify the required technologies. In determining the critical path of development, technology forecasts drive the telerobot calendar; the telerobot's selected missions impose the due dates.

TEJAS is RELATIONAL by design, rather than hierarchical. ANY hierarchy desired may be imposed on the data contained within these stacks (by adding discriminator fields) without disturbing the system's built-in versatility and components, or forcing the user through a set analysis path.

Specifying Technology Requirements



Technology requirements depend on task analysis. Specification of a) arguments of generic primitives, including work system, operating mode, conditions, etc., b) assumptions about the environment, the task, etc., and c) data about all telerobotics technologies will feed a decision engine.

TeleTechnologies Stack - Card Backgrounds

There are two different backgrounds in this stack, each with a specific name and a purpose:

TeleTechnologies.bg: main backgrounds for the stacks. Different cards for each technology. Incorporates primary information fields: thirteen visible background information fields of different types, one hidden shadow field (Forecast Notes), and two hidden rectangle Source fields (at any one time).

Contributions.bg: specialized, for the Contributions Card only. Unlocked.

TeleTechnologies Stack - Information Fields

There are sixteen information fields common to the 'TeleTechnologies.bg' background: Tech1, Tech2, Definition, Source.Technology, Source.Definition, Source.Forecast, NASREM, Level 1 - Level 8, and Forecast Notes. A forecast histogram is stored as a card picture (see Help section 7.7.11). Field specifications are on the following cards.

If at any time, you disagree with the contents of an unlocked field, you may change it (leave locked fields alone). The TEJAS project WANTS you to change the Definition, Level 1–8 forecasts, and Forecast Notes if you wish. Make general comments in the User Notes field. The TEJAS Version and Date fields will help you remember where you've made changes and comments. If you want your changes to be considered for compilation, please follow the simple conventions detailed in the field specifications.

All stacks returned to the TEJAS Editor will be compiled via scripts, after each change has been reviewed. PLEASE use the User Notes; SAVE TIME!

TeleTechnologies Stack - Information Fields

Field specifications:

Tech1, Tech 2: unlocked, unlabeled rectangle fields at top left and right. Enter the technology name. Two fields can provide enough information to find the technology quickly. The fields are therefore a de facto working categorization scheme, NOT a formal one, that aids in scanning the list of technologies on the TeleTechs Menu card (first in the stack).

Definition: unlocked, unlabeled scrolling field at middle left. Definition and notes about the technology, as compiled first from the Source.Definition and changed during a technologies review process.

NASREM: unlocked, labeled, rectangle field just below the Definition scrolling field. Shows categorization of the technology according to the NASREM standard model (see Contributions card for exact reference). See 'Buttons' Help cards for this stack on how to enter the NASREM category.

TeleTechnologies Stack - Information Fields

Field specifications cont'd:

Source.Technology, Source.Definition, Source.Forecast: unlocked, labeled transparent fields at upper right, superimposed one upon another in the same location, with only one field visible at any time, to save space. Accessed one-by-one through a pop-up menu attached to the Source button (see the 'Buttons' Help cards for this stack). Each field contains an abbreviated reference to the document or notes where the technology, definition, or forecast (respectively) was first contributed to the TEJAS project. For more definitive titles, see the Contributions card (last card in the stack).

TeleTechnologies Stack - Information Fields

Field specifications cont'd:

Level 1 – Level 8: locked, unlabeled, rectangle fields found to the immediate right of the Definition field; arranged in ascending order. Visible only when the Forecast button is highlighted (see Help section 7.7.10). These fields represent the START date for each technology readiness level for the particular technology represented by that card. The levels are:

Level 1: Basic principles understood
Level 2: Conceptual design formulated
Level 3: Conceptual design tested analytically or experimentally
Level 4: Critical functions/characteristics demonstration
Level 5: Component/brassboard tested in relevant environment
Level 6: Prototype/engineering model tested in environment
Level 7: Engineering model tested in space
Level 8: Initial/full operational capability on-orbit

More --->

TeleTechnologies Stack - Information Fields

Field specifications cont'd:

Level 1 – Level 8 continued: To change the forecast dates, click on the field opposite its level number (1-8) on the histogram. A dialog box will prompt you to enter the start date for that level (e.g., for Level 7, the prompt reads 'Start date engineering model test in space?'). Any date already in that field will appear as selected text in the response line. You can type in a new date and click on OK; this action will close the dialog box, and replace the original contents of the field with your entry.

NOTE: 'Cancel' CLEARS ALL DATA from that field!! If you enter a new date, then change your mind, RETYPE the original date and select 'OK'. DO NOT use Cancel at all. Click on any field to review the prompt, but click on OK or hit the return key to close the dialog box while preserving the original date.

NOTE: The histogram will NOT change with new dates (Help section 7.7.11).

TeleTechnologies Stack - Buttons

Only one button in the 'TeleTechnologies.bg' background helps to access information about each technology, or a related technology. The other background buttons are for showing, hiding, or updating information.

Find Tech - to find a particular technology, click here and hold down the mouse button. A pop-up menu will give you the choice of 'By Name' or 'From Menu' (neither is selected by default).

By Name
From Menu
Find Tech

If you choose 'From Menu', you will go to the first card of the stack, where you can use the 'Technologies Menu' (see 'TeleTech Menus Card,' Help section 7.7.12). Scroll the menu until you see the technology you want, and click on its name to go to that technology card. This is the fastest way to find technologies.

More -->

TeleTechnologies Stack - Buttons

Find Tech button (cont'd) -

By Name
From Menu
Find Tech

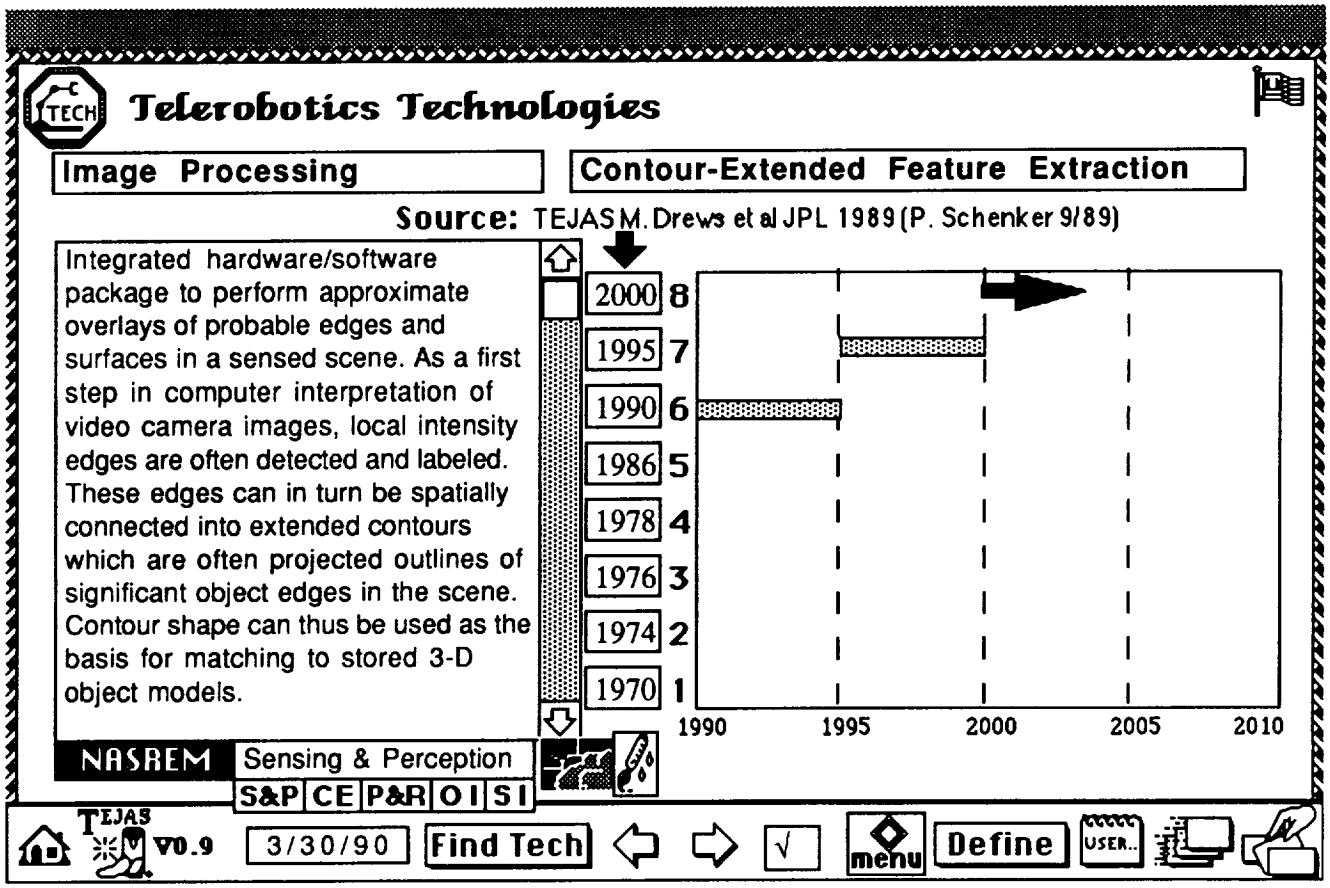
If you choose 'By Name' from the pop-up menu attached to this button, a dialog box will ask "Find what Technology?." Type in the key words you wish to find (for example, 'gripper'; capitalization is not required) and click OK (or press return). If not found, a message will tell you so. Try again - you may have misspelled it. This is faster than using the Next, Previous, or Show buttons to scan cards one at a time, if you know the technology's name. But using the 'By Name' device is not as fast or as efficient as using the 'From Menu' option to scan the Technologies menu (see 'TeleTech Menus Card,' Help section 7.7.12).

More -->

NASREM - Normally highlighted, this button shows and hides five buttons S&P CE P&R O I S I and the 'NASREM' rectangle field they affect. These buttons enter the NASREM categories Sensing & Perception, Control Execution, Planning & Reasoning, Operator Interface, and Systems Integration into the NASREM field, for quick sorting and searching. This categorization adheres to the NASREM standard model (NBS Technical Note 1235; see Contributions Card). PLEASE use the buttons to enter the NASREM category into the NASREM field, for absolute uniformity of spelling - it makes searching on that field accurate.

- These two buttons work interactively: when the Forecast button (cloudy sun) is highlighted (shown here), the Level 1-8 information fields and the forecast histogram (see Help section 7.7.11) are visible. The Forecast Notes (dripping pen) button hides the card picture (i.e., the histogram) to use that screen space to display the normally hidden Forecast Notes field, but does not hide the Level 1-8 fields (if visible).

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

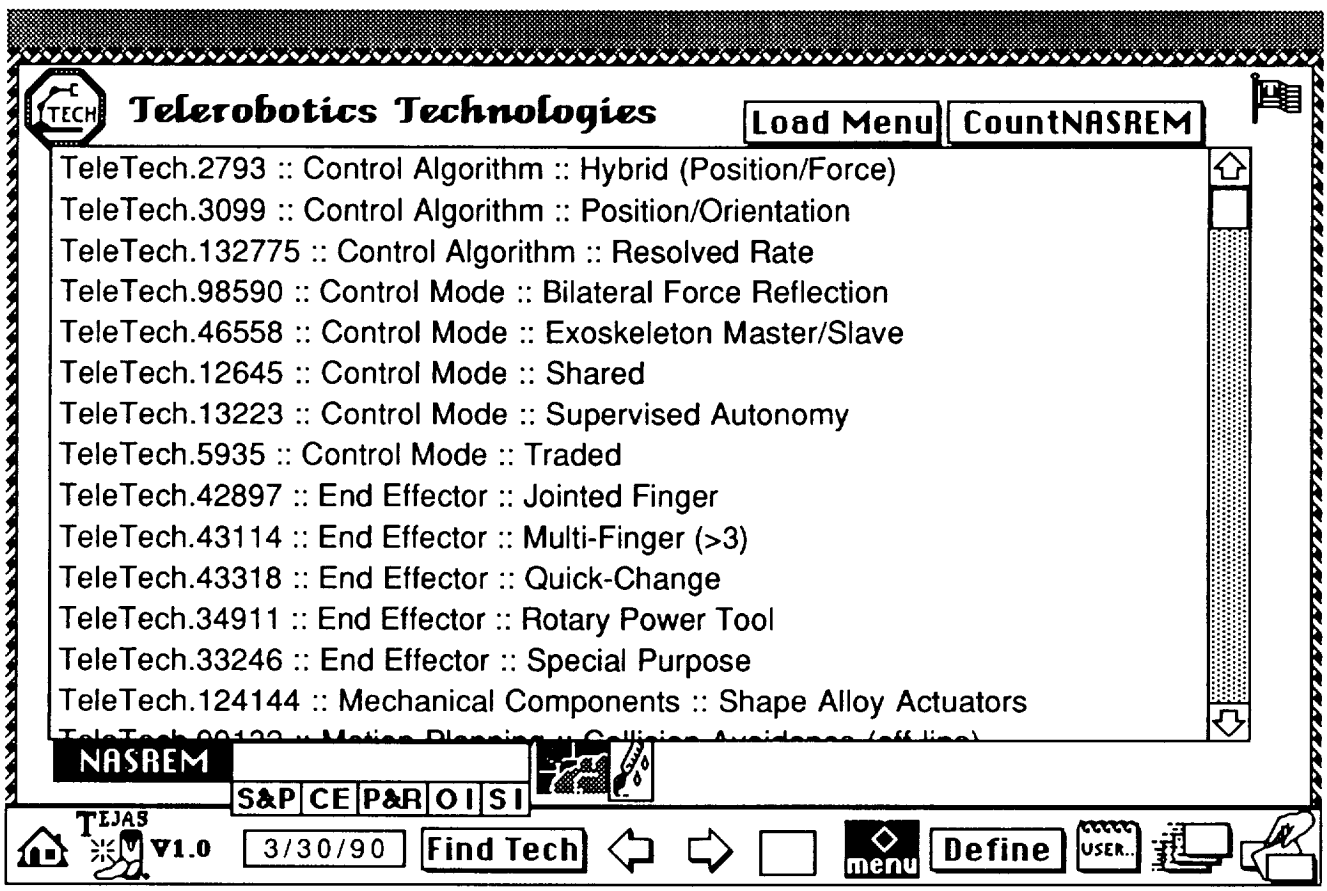


TeleTechnologies Stack - Forecast Histograms

The forecast histograms are the two-dimensional graphs that appear to the right of the Level 1-8 fields when the forecast button is highlighted. These graphs start at 1990 and run for twenty years. A filled bar represents that readiness level's duration, beginning at the start year shown, and ending at the start year of the next level. For Level 8, a running arrow is used instead (to draw attention). When the next level's start year is TBD, the histogram bar ends in TBD TBD after 3 years.

For TEJAS Version 1.0, these graphs were created by hand (using a draw program) according to the technology forecast, then pasted onto the card layer for each card... a tedious process (see the "HyperCard Hierarchy" information in the HyperCard User's Manual for more information on layers). This process may be automated (if so authorized) in a later TEJAS version, so that the histograms would respond to a new forecast date.
NOTE: DO NOT change the histograms if you change the forecast dates. Send the updated stack to the TEJAS Editor, who will remake the histogram.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER...



TeleTechnologies Stack - TeleTech Menus Card

7.7.12 1 of 1

The first card of this stack is the TeleTechnologies menu card. The number and length of TeleTechnology names require the use of a 'choice field', stored on this first card as a card field. Choice fields act like large menus; to view any technology card, scroll to that technology name in the TeleTechnologies Menu and click on it. You will immediately go to that card.

This card has two supporting card buttons:

Load Menu - This button will first warn you to be patient, then empty the menu, sort the stack, and reload the menu with the technology names. This function takes a few minutes, but must be done each time technologies are added to the stack. If you are adding a few cards, click here after finishing.

CountNASREM - This button will count the number of technologies in each NASREM category (see Help section 7.7.10), then show you the count in the HyperCard message box. It takes a few seconds.

TEJAS V1.0 | 3/30/90 | Help Menu | Define

TeleTechnologies Stack - Contributions Card

7.7.13 1 of 1

The LAST card of every reference stack is like this one. When compiled, these cards form a bibliography of the TEJAS effort. The 'References' scrolling field gives a detailed list of documents, notes, or other sources that are also identified by abbreviations in the Source fields on the stack's information cards. Each reference also contains a short note about how the source was used. The corresponding numbered lines in the 'Contributor' scrolling field list who contributed the information and when. This data contibutes to the TEJAS goal of "total traceability."

With the TeleTechnologies stacks, this card is particularly important. As the technology definitions and forecasts are used, modified, and used again, this card will not be wiped clean. Instead, it will show, by the number and date of entry, the progression of compilation of the community's knowledge into a universal technologies stack. Please read and follow the card's instructions. If there is a reference that you think should be added but that you will not be compiling, let the TEJAS Editor know.

TEJAS V1.0 | 3/30/90 | Help Menu | Define

Section 8

User Instructions: Analysis Stacks

Section 8.1

User Instructions: EVATasks Stack

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140

EVATasks Help Menu

Menu 1 of 1

8.1 User Instructions

Background:

- ☐ 8.1.1 General Information
- ☐ 8.1.2 The User's Role
- ☐ 8.1.3 Changing the Standard
- ☐ 8.1.4 Adding Cards
- ☐ 8.1.5 Deleting Cards

Unique!

- ☐ 8.1.6 Task Analysis in TEJAS
- ☐ 8.1.7 Relating Tasks, Assumptions, and Open Issues
- ☐ 8.1.8 Task Baseline Cards vs. Specific Task Stack

Stack-Specific Help:

- ☐ 8.1.9 Card Backgrounds
- ☐ 8.1.10 Information Fields
- ☐ 8.1.11 Buttons

Unique!

- ☐ 8.1.12 Building a Specific Task
- ☐ 8.1.13 EVATasks Menu

INSTRUCTIONS:
Click ☐ box to access section;
Click arrows to page through Help stack;
Click 'T-flag' to return to point of origin.

EVATasks Stack - General Information

8.1.1 1 of 1

The EVATasks stack is the starting point for analysis of tasks involving only human crew performing extravehicular operations. There is one task summary card for each task; each card contains a prose (unstructured) description and outline of that task.

This stack is the primary task analysis stack of a trio of stacks: EVATask, EVAAssume and EVAIssues. Together, these three stacks form an archive of basic information about any crew-EVA tasks you wish to analyze.

For a complete discussion of this process, see 'Tasks Analysis in TEJAS' (Help section 8.1.6).

EVATasks Stack - The User's Role

This stack is the starting point in your analysis of crew-EVA tasks (see 'Task Analysis in TEJAS', Help section 8.1.6). If you use TEJAS for task analysis, your role is to fill the task summary cards with a description and outline for each of your tasks (see 'Information Fields', Help section 8.1.10).

When a task summary card has been completed for a particular task, the next step is to fill out a corresponding EVAAssume card for the task assumptions (things you know; see Help section 8.2), and an EVAIssues card for the open issues (things you DON'T know; see Help section 8.3). These cards are created and named using the 'Assumptions' and 'Open Issues' icon buttons on any task summary card (Help section 8.1.11).

TEJAS uses HyperCard's own numbering scheme for card ID's to name and associate the task summaries, assumptions, and open issues cards for any task (see 'Relating Tasks, Assumptions, and Open Issues' and 'Task Baseline Cards vs. Specific Task Stack,' Help sections 8.1.7 and 8.1.8).

EVATasks Stack - Changing the Standard

Unlike the reference stacks, the TEJAS analysis stacks have no standardized information to maintain, review, or change.

However, the information that you enter on each of the task summary cards DOES form a kind of standard for YOUR task analyses, because multiple specific task stacks can be built from each task summary card (this process is complex, and covered completely in 'Building a Specific Task,' Help section 8.1.12). You should take the time to fill out each task summary card accurately and completely before proceeding further into the analysis.

NOTE: the TEJAS Version field will not change in the analysis stacks at all; only the Date field updates to keep track of changes.

EVATasks Stack - Adding Cards

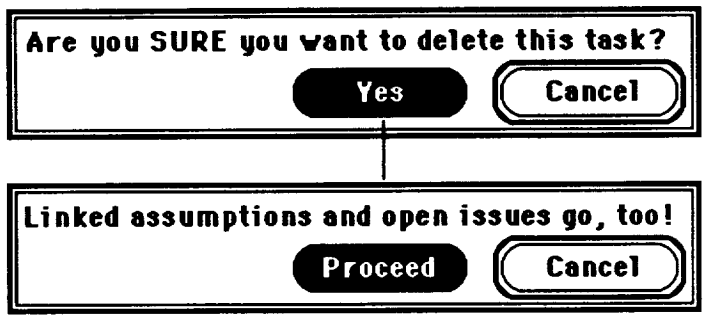
You can add any new Task Summary card as you feel the need, by choosing 'New Card' from the Edit menu.

Each time you add a card, HyperCard gives it a card ID (e.g., '5058'). The ID is helpful in uniquely identifying that task, so in addition, a TEJAS script sets the new card's name to 'EVATask.5058'. This number is then permanently associated with that task. These ID's appear in the Tasks Menu on the Explanation Card (see 'EVATasks Menu,' Help section 8.1.13), and in the names of the associated Assumptions and Open Issues cards (see 'Relating Tasks, Assumptions, and Open Issues' and 'Task Baseline Cards vs. Specific Task Stack,' Help sections 8.1.7 and 8.1.8).

NOTE: If you want this built-in system that identifies and relates task summaries, assumptions and open issues to work for you, DO NOT CHANGE any of the CARD NAMES in the analysis stacks!

EVATasks Stack - Deleting Cards

Any task summary card EXCEPT the Explanation Card (see next card) may be deleted if you wish to... after all, you created it. However, you must remember ONE IMPORTANT RULE about the EVATasks stack:
each task summary card is the first of a trio of baseline cards for that task.
For each task summary card, there are an associated assumptions card and an open issues card (see Help sections 8.1.7 and 8.1.8).



Therefore, although TEJAS will let you delete task summaries, you will get TWO chances to Cancel through dialog boxes, as shown. Each appears after a warning sound.

More --->

Suggestion: CHANGE a task summary card's text, rather than delete it.

This second message reminds you that the associated cards in the EVAAssume and EVAIssues stacks will also be deleted if you delete a task summary card. In fact, this is the ONLY way to delete assumptions and open issues cards; you cannot delete cards from inside the EVAAssume and EVAIssues stacks, because another HyperTalk script will prevent it, and give you a warning to delete cards from inside this EVATasks stack (see help sections 8.2.5 and 8.3.5).

BEWARE: This protection does not prevent you from cutting cards and then forgetting to paste them back in the stack. DON'T DO IT! Be careful.

NOTE: The Explanation Card (first card) is required for navigation and user understanding; it is the only card with the EVATasks menu (Help section 8.1.13). For that reason, it is both delete-protected and cut-protected.

Task Analysis in TEJAS

TEJAS performs task analysis as a means to an end, not as its primary function. The end result desired within TEJAS will be a list of the specific primitives that define that particular task exactly. These specific primitives (or 'specprims') may be exported to an existing Task Analysis Methodology (TAM) for further use. Before that list can be assembled, there are certain preliminary steps that must be taken; these are detailed on the next card.

Some of the fundamental ideas of task analysis in TEJAS include:

- Treat tasks as OBJECTS on an single level
- Make task information easy to access, WITHOUT negotiating a hierarchy
- Allow hierarchical structure to be overlaid on these objects if desired
- Provide a structure for analysis that is modular, flexible, and expandable
- Carry task analysis to the specific primitives list phase, then provide a mechanism for direct output to other task analysis tools

More --->

Task Analysis in TEJAS

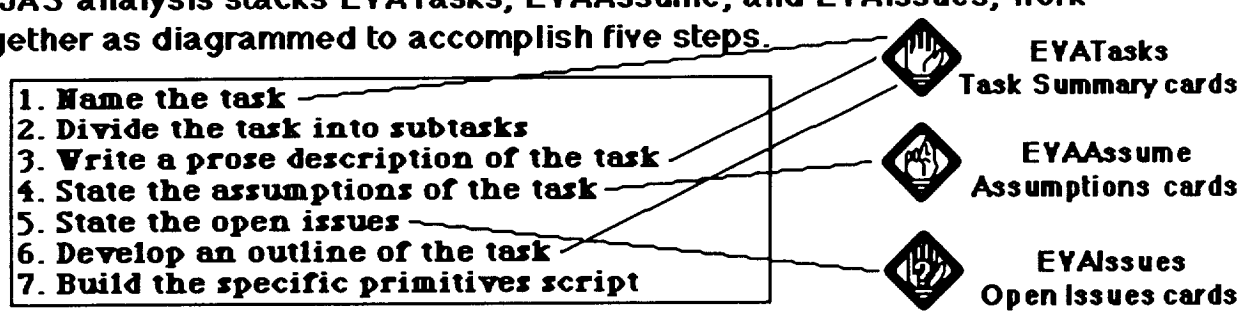
The work on task primitives that resulted in the EVAPrimitives and TelePrimitives stacks produced several significant conclusions (see Help sections 7.4.8 or 7.5.8). Existing Task Analysis Methodologies (TAMs), although different in hierarchical structure, are similar in approach up to a certain point. The steps they had in common were:

1. Name the task
2. Divide the task into subtasks; this can take several iterations.
3. Write a prose description of the task
4. State the assumptions of the task: about the task sequencing, the environment, geometry, lighting, objects to be handled, tools used, etc.
5. State the open issues – things not decided or known
6. Develop an outline (no set format) of the steps in the task
7. Build the detailed task script of specific primitives

The TEJAS analysis stacks are structured to accomplish these seven steps.

Task Analysis in TEJAS

The simplified list of seven steps appears below. The three integrated TEJAS analysis stacks EVATasks, EVAAssume, and EVAIssues, work together as diagrammed to accomplish five steps.

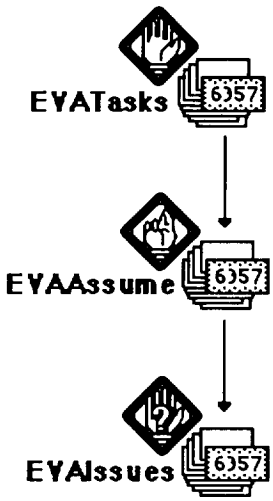


The information fields in each stack's cards store the information shown.

NOTE: To avoid a built-in hierarchy (as mentioned before), TEJAS assumes that step 2 has already been done. In TEJAS, all tasks are equivalent, no matter how you consider them. It is up to you to keep straight what is a subtask of a larger task in your hierarchy.

More --->

You begin by using the three analysis stacks with the EVATasks stack.



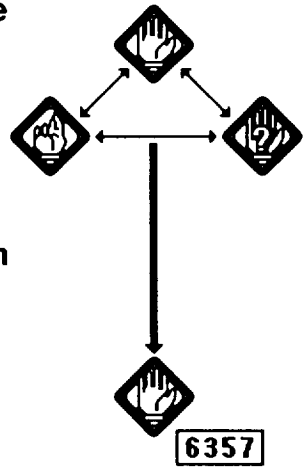
Open the EVATasks stack and select 'New Card' from the 'Edit' menu. A new task summary card is created and uniquely numbered and named. This numbering system is used to link the three associated cards (see 'Relating Tasks, Assumptions, and Open Issues', Help section 8.1.7).

Use the 'Assumptions' button on the new task summary card (Help section 8.1.11) to create an associated assumptions card in EVAAssume. You can list whatever assumptions you have now.

Now from either EVATasks or EVAAssume, use the 'Open Issues' button (Help section 8.1.11) to create an associated open issues card in EVAIssues. You can list whatever you do not know.

More --->

You can revisit any of these cards as many times as you want, in any order, from anyplace within TEJAS. An automatically updated menu at the front of each analysis stack will list the cards by their card name (with that unique task number), and the task name as originally entered on the task assumptions card (see Help sections 8.1.7, 8.1.10 and 8.1.11).



The EVATasks, EVAAssumptions, and EVAIssues stacks are therefore an integrated set of archives of information about the EVATasks you analyze.

When information on a particular task has been entered on all three cards, you are ready to create the specific primitives (specprims) list for that task. To build these specprims, you must first build a specific task stack (see 'Building a Specific Task', Help section 8.1.12).

Relating Tasks, Assumptions, and Open Issues

TEJAS uniquely relates the task summary, assumptions, and open issues cards (the baseline cards) for a given task as they are created. Here's how:

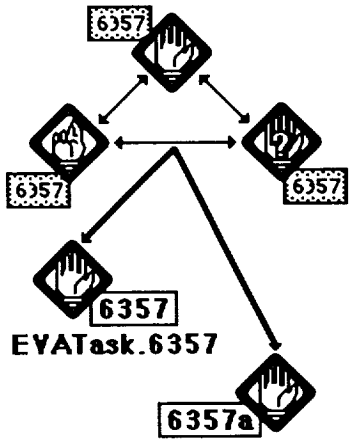
A HyperTalk script uses the four-to-six digit card ID #### assigned to every new card by HyperCard (see the "HyperCard User's Guide") to set the name of each new task summary card in EVATasks to 'EVATask.####' as it is created.

Similarly, another script sets the name of the corresponding assumptions card (Help section 8.2) to 'EVAAssume.####' and the open issues card (Help section 8.3) to 'EVAIssues.####' as they are created (see sections 8.1.7 and 8.1.12). Each card thus bears the task summary card's ID number in its own name.

Therefore, although the three baseline cards are in separate stacks, they are uniquely linked.

Task Baseline Cards vs. Specific Tasks Stack

"Why create a specific task stack before specifying the task primitives? Why perform that intermediary step?" The answer is, FLEXIBILITY!



Each specific task stack includes a COPY of the task summary card from EVATasks, the assumptions card from EVAAssume, and the open issues card from EVAIssues.

Within that specific task stack, you can CHANGE the description, outline, assumptions, open issues, etc. of that specific task. The original (baseline) data is still intact, safely archived on the original cards in their three respective stacks.

This leaves you free to go back to the original task summary card in EVATasks and create another specific task stack with the same data.

EVATasks Stack - Card Backgrounds

There is only one background in these stacks. By specific name:

EVATask.bg: main background for the stack; used for the Explanation Card and all task summaries (see Help sections 8.1.6 and 8.1.7).

EVATasks Stack - Information Fields

There are three information fields common to the 'EVATask.bg' background: Task, Description, and Outline. Field specifications are below.

Task: unlocked, labeled transparent field at top center. Enter the task name. It is best to be specific; there is enough space for long titles in this field.

Source: unlocked, labeled rectangle field for your name and organization.

Description: unlocked, labeled scrolling field. Enter a prose description of the task, either imported from an existing text file (section 5.0), or typed in.

Outline: unlocked, labeled scrolling field. Enter an approximation of the steps in the task. There are no restrictions on style; use a method familiar to you. Be complete; this Outline will be your guide to building the specific primitives list that exactly scripts the task. Modifications may be made at any time before building a specific task (Help section 8.1.12).

EVATasks Stack - Buttons

– The pop-up menu attached to this EVATasks button at the upper left corner of all task summary cards performs two very important functions, but only one at a time. In this stack, the menu shows only "Build Specific Stack." Within a specific task stack, it shows "Build Deriv Task" (see 'Building a Derivative Task', Help section 9.3.6).

To preview what you will see and what you must do when using this button to build a specific task, see 'Building a Specific Task' (Help section 8.1.12). DO NOT USE THIS BUTTON WITHOUT READING THAT HELP SECTION! But if you do, you can still Cancel from the dialog boxes that appear.

With only one selection, this button could have worked without a pop-up menu, using a single dialog box. But the menu forces you to MANUALLY select "Build Specific Task" after reading it, thereby giving you a first chance to avoid the whole process.

EVATasks Stack - Buttons

– The Assumptions button at the upper right corner of all task summary cards takes you immediately to the Assumptions card for the task summary you are viewing. If you have not yet created an associated card in the EVAAssume stack, the button will do this for you, assign it the ID number for that task, and put the task name in the Task field.

– The Open Issues button at the upper right corner of all task summary cards takes you immediately to the Open Issues card for the task summary you are viewing. If you have not yet created an associated card in the EVAIssues stack, the button will do this for you, assign it the ID number for that task, and put the task name in the Task field.

menu – The Tasks Menu button at lower right on all cards in this stack takes you immediately to the Explanation card and shows the Tasks Menu field. It will appear to highlight there; that is an overlaid card button (see Help section 8.1.13). This button does NOT sort the stack first!

EVATasks Stack - Building a Specific Task

Once you have completed your initial work with this stack, EVAAssume and EVAIssues (see 'Task Analysis in TEJAS', Help section 8.1.6), and you are ready to build a list of specific task primitives that exactly define that task, you are ready to use the 'Build Specific Task' option in the EVATasks button on the upper left corner of the summary card for that task. Here is how the process works:

Step 1. Click and hold down on the EVATasks button (shown at left).

Step 2. The button will highlight as shown, and a pop-up menu will appear with one option, "Build Specific Task."

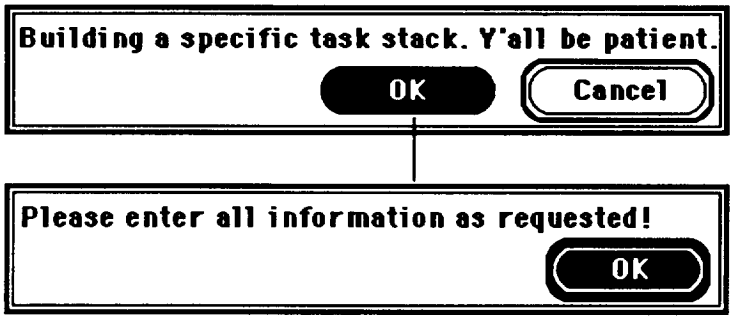
Build Specific Task

If you release the mouse key without selecting anything, the menu will disappear and the EVATasks button's highlight will return to normal, as it was before. But if you select "Build Specific Task", the following sequence begins:

More --->

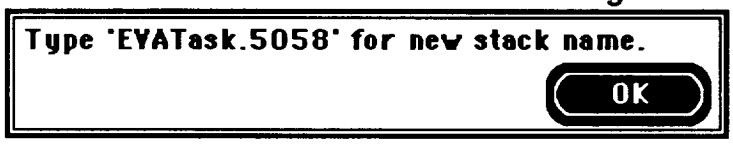
EVATasks Stack - Building a Specific Task

Step 3. If you select "Build Specific Task", the dialog box below warns you that the process is starting and gives you an option to Cancel:



Step 4. After clicking on OK, another dialog box appears, asking you to enter information exactly as a future message will prompt. Click on OK. You may notice a slight pause here, depending on your RAM.

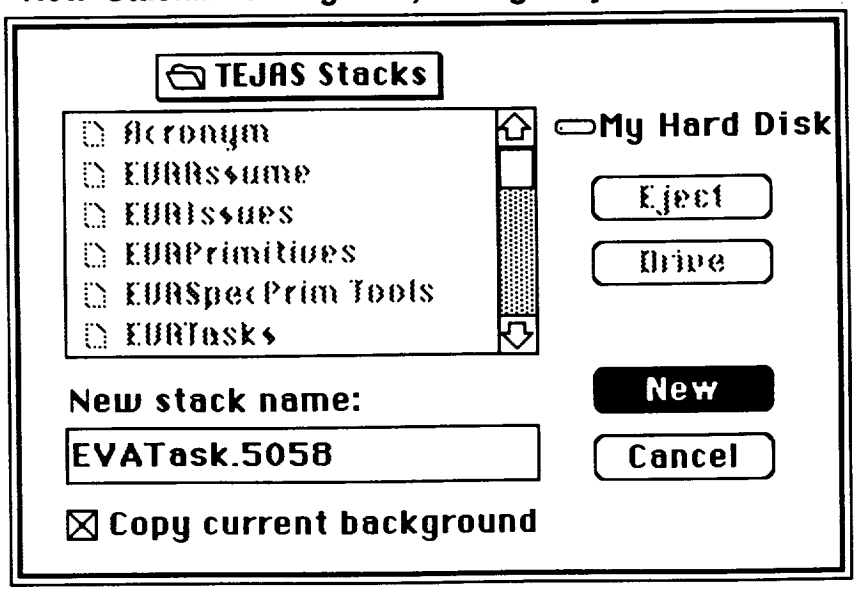
Step 5. The third dialog box will give you a new stack name. Click on OK, and wait for the 'New Stack...' dialog box to follow. Then type the stack name EXACTLY as shown between the single quotes (an example is shown).



More --->

EVATasks Stack - Building a Specific Task

Step 6. Once having passed the third dialog box, the script will open the 'New Stack...' dialog box, and give you the last of two options to Cancel:



To proceed, type the task name EXACTLY as previously requested (the same example is shown).

IMPORTANT! Leave the 'Copy current background' box selected.

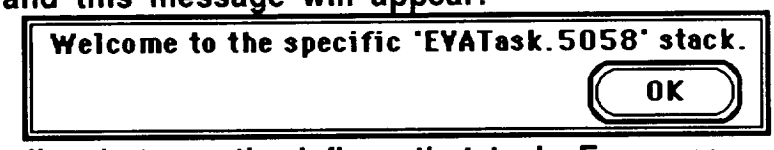
Click on the 'New' button (shown), or press return.

More --->

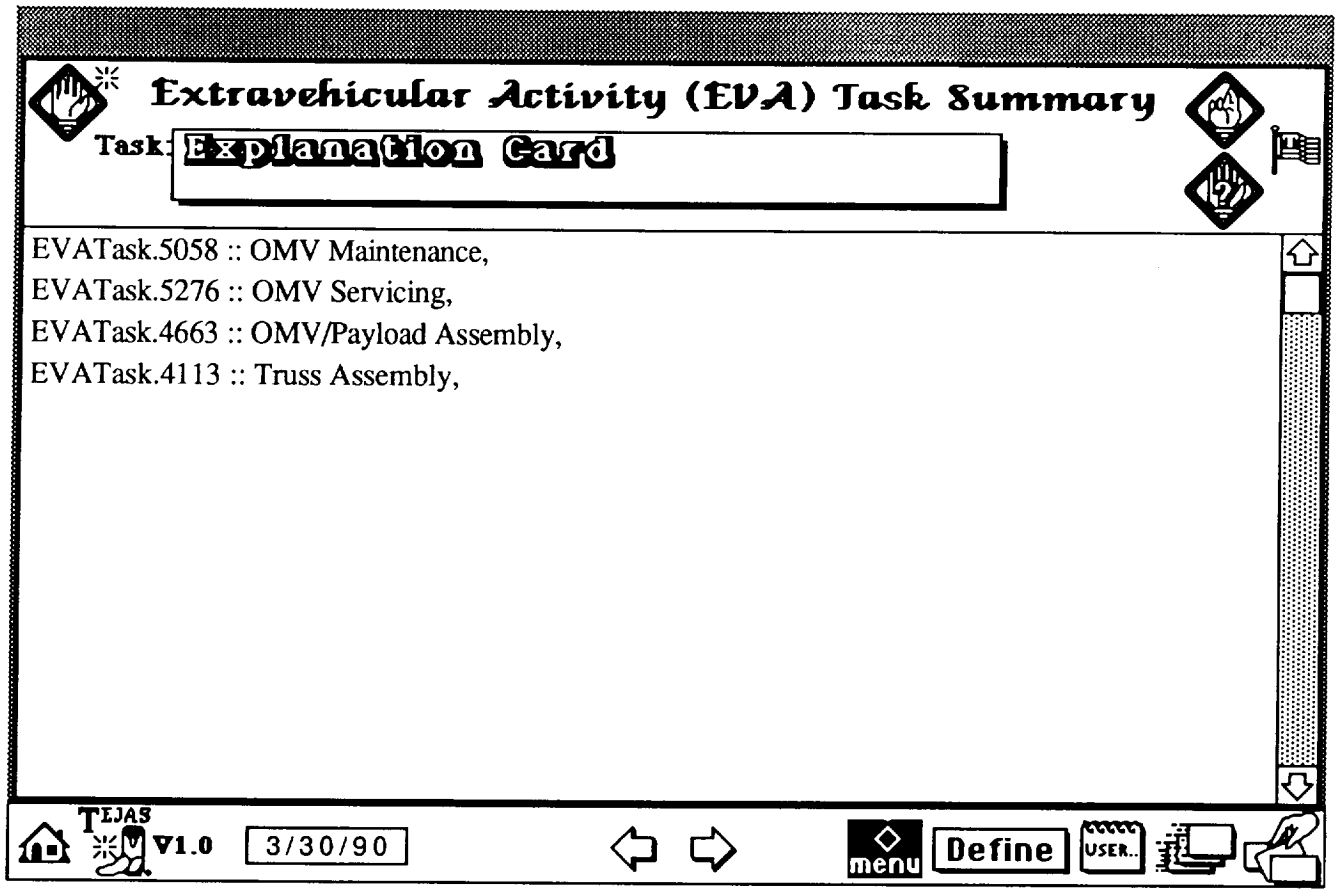
EVATasks Stack - Building a Specific Task

After completing the 'New Stack...' dialog box and pressing the 'New' button (or the return key on your keyboard), the dialog box disappears and the cursor turns into the 'busy' symbol . Depending on your Macintosh's processor and RAM configuration, your screen will remain frozen (with the busy symbol altering periodically) for several seconds while the program builds the new specific task stack.

When the screen is released, the first card in your new specific task stack will appear. A tune will play, and this message will appear:



This new specific task stack has the needed tools for building the specific primitives list that exactly defines that task. For more information on these tools, see 'EVASpecPrim Tools' stack help (Help section 9.1). For more information on how to use the new stack, see 'EVATask.5058 Example Stack' (Help section 9.3).



EVATasks Stack - EVATasks Menu

Located on the Explanation Card (first card in this stack) is a card field (Tasks Menu) that holds a list of the task summary cards in this stack. This menu can be used as a navigation aid, or to refresh your memory on what tasks you've defined, without having to scroll through the stack.
To navigate, click on the task whose summary card you wish to view.

Format of the menu is consistent: the card name (e.g., "EVATask.5058"; see Help section 8.1.4); two colons bracketed by spaces; and the Task name (e.g., "EVATask.5058 :: OMV Maintenance").

The tasks will be alphabeticized by Task name ONLY if the stack has already been sorted (see Help section 8.1.11).

The menu updates automatically. The card field is rebuilt each time it is shown using the Tasks Menu button (see Help section 8.1.11). For a large number of task summaries in the stack, rebuilding may take a few seconds.

Section 8.2

User Instructions: EVAAssume Stack

PAGE 154

EVAAssume Help Menu

Menu 1 of 1

8.2 User Instructions

Background:

- ☐ 8.2.1 General Information
- ☐ 8.2.2 The User's Role
- ☐ 8.2.3 Changing the Standard
- ☐ 8.2.4 Adding Cards
- ☐ 8.2.5 Deleting Cards

Unique!

- ☐ 8.2.6 Relating Tasks, Assumptions, and Open Issues

Stack-Specific Help:

- ☐ 8.2.7 Card Backgrounds
- ☐ 8.2.8 Information Fields
- ☐ 8.2.9 Buttons

Unique!

- ☐ 8.2.10 EVAAssumptions Menu

INSTRUCTIONS:
Click ☐ box to access section;
Click arrows to page through Help stack;
Click 'T-flag' to return to point of origin.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

EVAAssume Stack - General Information

8.2.1 1 of 1

The EVAAssume stack is the second step in analysis of tasks involving only human EVA crew performing operations. There is one assumptions card for each task; each card holds a prose (unstructured) list of the assumptions made when planning that task.

This stack is the secondary task analysis stack of a trio of stacks: EVATask, EVAAssume and EVAIssues. Together, these three stacks form an archive of basic information about any crew-EVA tasks you wish to analyze.

For a complete discussion of this process, see 'Tasks Analysis in TEJAS' (Help section 8.1.6).

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

EVAAssume Stack - The User's Role

This stack is for you to use in the analysis of crew-EVA tasks (see 'Task Analysis in TEJAS', Help section 8.1.6). Your role, if you use TEJAS for task analysis, is to fill the task assumption cards with a text listing of the assumptions you made about your particular tasks (see 'Information Fields', section 8.2.8).

When a task assumptions card has been completed for a particular task, the next step is to fill out a corresponding EVAIssues card for the open issues (things you DON'T know; see Help section 8.3). These cards can be created and named using the 'Open Issues' icon buttons found on the upper right of any assumptions card (see Help section 8.2.7).

TEJAS uses HyperCard's own numbering scheme for card ID's to name and associate the task summaries, assumptions, and open issues cards for any task (see 'Relating Tasks, Assumptions, and Open Issues' and 'Task Baseline Cards vs. Specific Task Stack,' Help sections 8.1.7 and 8.1.8).

EVAAssume Stack - Changing the Standard

Unlike the reference stacks (Glossary, Acronym, EVAPrimitives, TelePrimitives, and TeleTechnologies in TEJAS Version 1.0), the TEJAS analysis stacks have no standardized information to maintain, review, or change. But the stack format of this particular stack must change; your inputs are requested here (see the next card).

The information that you enter on each of the task assumptions cards DOES form a kind of standard for YOUR task analyses, because multiple specific task stacks can be built from each task summary card (this process is complex, and covered completely in Help section 8.1.12). In that process the associated assumptions card is copied into the new specific task stack. You should take the time to fill out each task assumptions card accurately and completely before proceeding further into the analysis.

NOTE: the TEJAS Version field will not change in the analysis stacks at all; only the Date field updates to keep track of changes.

EVAAssume Stack - Changing the Standard cont'd

The Version 1.0 EVAAssume stack consists of a single scrolling field with data on the task environment, crew, vehicles, and objects involved stored as text under subheadings. This system suffices as an interim solution to organizing your assumptions; you can read and interpret this information. But the format is too inconsistent for a HyperTalk script to use in analyzing the technologies involved. Therefore, the format of this stack must evolve.

Your assumptions in performing an EVA task will encompass certain repetitive choices and rules. A new EVAAssume stack format must provide dedicated fields and buttons in which HyperTalk scripts can find discrete data (e.g., environment characteristics, tools manifested, number of crew involved, etc.) with default values (where appropriate) and room for amorphous text descriptions (where necessary). The objective of this new format is (as always in TEJAS) to organize and interrelate the massive data set, not to provide an 'EVA cookbook.' Your comments and ideas on the new format's content and layout are welcome.

EVAAssume Stack - Adding Cards

DO NOT ADD ANY CARDS TO THIS STACK!

The cards in this stack and the EVAIssues stack (open issues) correspond to a particular task summary card in the EVATasks stack and to each other. TEJAS establishes that relationship through the use of a unique number for each task (see 'Task Analysis in TEJAS,' Help section 8.1.6).

Creating a new assumptions card in this stack, using either 'New Card' or 'Copy Card'/'Paste Card' circumvents the above process. DON'T DO IT.

Instead, should you enter this stack looking for a particular task's assumptions card and NOT find it, go to the EVATasks stack (using either the TEJAS boot button's pop-up menu or through TEJASHome). Find the task summary card for the task in question, and press the Assumptions button. You will return to a new, properly named card in this EVAAssume stack, with the task name already filled out.

EVAAssume Stack - Deleting Cards

Any task assumptions card EXCEPT the Explanation Card may be deleted, if you wish to. After all, you created it. However, it would be a very poor idea, and is therefore prevented by TEJAS. Here's why:

The cards in this stack are created by using the 'Assumptions' button in either the EVATasks or EVAIssues stacks (see Help sections 8.1.11 and 8.3.9). During this process, they are named with the ID number of that task (e.g., EVAAssume.5367; see 'Relating Tasks, Assumptions, and Open Issues,' Help section 8.1.7). Including the ID number in the name is crucial.

If you delete an assumptions card, you will have to go back to the EVATasks stack to replace it (see 'Adding Cards,' Help section 8.2.4). You should CHANGE the information on a card rather than delete it.

Assumptions cards should ONLY be deleted when deleting an entire task in the EVATasks stack (see Help section 8.2.5).

EVAAssume Stack - Deleting Cards

This second message reminds you that the associated cards in the EVAAssume and EVAIssues stacks will also be deleted if you delete a task summary card. In fact, this is the ONLY way to delete assumptions and open issues cards – you cannot delete them from inside the EVAAssume and EVAIssues stacks, because another HyperTalk script will prevent it, and give you a warning to delete cards from inside this EVATasks stack (see help sections 8.1.5 and 8.2.6).

BEWARE: This protection against deleting cards does not prevent you from cutting cards and then forgetting to paste them back in the stack.

NOTE: The Explanation Card (first card) is required for navigation and for user understanding; it is the only card with the EVAAssumptions menu (see Help section 8.2.10). For that reason, it is both delete- and cut-protected.

Relating Tasks, Assumptions, and Open Issues

TEJAS uniquely relates the task summary, assumptions, and open issues cards (the baseline cards) for a given task as they are created. Here's how:

Using the four-to-six digit card ID (####) assigned to every new card by HyperCard (see "The HyperCard User's Guide"), a TEJAS script sets the name of each new task summary card in EVATasks to 'EVATask.####' as it is created.

Similarly, a TEJAS script sets the name of the corresponding assumptions card (Help section 8.2) to 'EVAAssume.####' and the open issues card (Help section 8.3) to 'EVAIssues.####' as they are created (see sections 8.1.7 and 8.1.12). Each card thus bears the task summary card's ID number in its own name.

Therefore, even though the three baseline cards are in different stacks, they are uniquely linked.

EVAAssume Stack - Card Backgrounds

There is only one background in these stacks. By specific name:

EVAAssume.bg: main background for the stack; used for the Explanation Card and all task assumption cards (see Help sections 8.1.6 and 8.1.7).

EVAAssume Stack - Information Fields

There are two information fields common to the 'EVAAssume.bg' background: Task and Assumptions. Field specifications are below.

Task: unlocked, labeled transparent field at top center. Automatically filled out when the assumptions cards are created from either the task summary or open issue card for that task. You should never change the Task field if you want that field to match the other two cards.

Assumptions: unlocked, labeled scrolling field at middle. Enter a prose list of the assumptions for that task. This list can be either imported from an existing text file (see Help section 5.1), or typed in. Areas covered by these assumptions may include task, environment, sequencing, tools and services, objects, etc. This is a necessary precursor to building a particular list of specific primitives for that task. Specification must be more exact; future versions of TEJAS will include a very different, more quantitative stack for listing and analyzing this data (see Help section 8.2.3).

EVAAssume Stack - Buttons

-- The Assumptions icon button in the upper left corner of all task assumptions cards has no function in the TEJAS Version 1.0 EVAAssume stack other than as an identifier for the cards.

– The Task button in the upper right corner of all task assumptions cards takes you immediately to the associated task summary card in the EVATasks stack. Use it as a quick navigation aid.

– The Open Issues button in the upper right corner of all assumption cards takes you immediately to the Open Issues card for that task. Use it as a quick navigation aid. If an associated card in the EVAIssues stack does not yet exist, the button will create one for you, name it with the ID number for that task, put the task name in the Task field, and take you to that open issues card in the EVAIssues stack.

EVAAssume Stack - Buttons

menu – The Assumptions Menu button, found on all cards at lower right (between the Define and Show buttons) will take you immediately to the Explanation card and show the menu of task assumptions cards in the stack. The button will appear to highlight there; that is actually an overlaid card button (see Help section 8.2.10).

EVAAssume Stack - Assumptions Menu

Located on the Explanation Card (first card in this stack) is a card field (Assumptions Menu) that holds a list of the assumptions cards in this stack. This menu can be used as a navigation aid, or to refresh your memory on what assumptions you've defined, without having to scroll through the stack. To navigate, click on the card you wish to view.

Format of the menu is consistent: the card name (EVAAssume.####; see Help section 8.2.6); two colons bracketed by spaces; and the Task name (example: "EVAAssume.4663 :: OMV/Payload Assembly").

The tasks will be alphabetized by Task name ONLY if the stack has already been sorted (see Help section 8.2.9).

The menu updates automatically. The card field is rebuilt each time it is shown using the Assumptions Menu button (see Help section 8.2.9). For a large number of cards in the stack, rebuilding may take a few seconds.

Section 8.3

User Instructions: EVAIssues Stacks

EVAIssues Help Menu

Menu 1 of 1

8.3 User Instructions

Background:

- ☐ 8.3.1 General Information
- ☐ 8.3.2 The User's Role
- ☐ 8.3.3 Changing the Standard
- ☐ 8.3.4 Adding Cards
- ☐ 8.3.5 Deleting Cards

Unique!

- ☐ 8.3.6 Relating Tasks, Assumptions, and Open Issues

Stack-Specific Help:

- ☐ 8.3.7 Card Backgrounds
- ☐ 8.3.8 Information Fields
- ☐ 8.3.9 Buttons

Unique!

- ☐ 8.3.10 EVAAssumptions Menu

INSTRUCTIONS:
Click ☐ box to access section;
Click arrows to page through Help stack;
Click 'T-flag' to return to point of origin.

EVAIssues Stack - General Information

8.3.1 1 of 1

The EVAIssues stack is the third step in analysis of tasks involving only human EVA crew performing operations. There is one open issues card for each task; each card holds a unstructured prose list of the guidelines, specification, and steps left unresolved when planning that task.

This stack is the tertiary task analysis stack of a trio of stacks: EVATask, EVAAssume and EVAIssues. Together, these three stacks form an archive of basic information about any crew-EVA tasks you wish to analyze.

For a complete discussion of this process, see 'Tasks Analysis in TEJAS' (Help section 8.1.6).

EVAIssues Stack - The User's Role

This stack is for you to use in the analysis of crew-EVA tasks (see 'Task Analysis in TEJAS,' Help section 8.1.6). Your role is to fill the open issues cards with a text listing of the issues about your particular tasks that you were unable to resolve (see 'Information Fields', section 8.3.8).

When an open issues card has been completed for a particular task, you should be ready to create a specific task stack for that task (see Help section 8.1.12). There must be an associated assumptions card in EVAAssume and a task summary card in EVATasks (see Help section 8.1.8).

TEJAS uses HyperCard's own numbering scheme for card ID's to name and associate the task summaries, assumptions, and open issues cards for any task (see 'Relating Tasks, Assumptions, and Open Issues' and 'Task Baseline Cards vs. Specific Task Stack,' Help sections 8.1.7 and 8.1.8).

EVAIssues Stack - Changing the Standard

Unlike the reference stacks (Glossary, Acronym, EVAPrimitives, TelePrimitives, and TeleTechnologies in TEJAS Version 1.0), the TEJAS analysis stacks have no standardized information to maintain, review, or change. But for this stack, the stack format will change; your inputs are requested there.

However, the information that you place on each of the open issues cards DOES form a kind of standard for YOUR task analyses, because multiple specific task stacks can be built from each task summary card (this process is complex, and covered completely in Help section 8.1.12). In that process the associated open issues card is copied into that new specific task stack. You should take the time to fill out each open issues card accurately and completely before proceeding deeper into the analysis.

NOTE: the TEJAS Version field will not change in the analysis stacks at all; only the Date field updates to keep track of changes.

EVAIssues Stack - Adding Cards

DO NOT ADD ANY CARDS TO THIS STACK!

The cards in this stack and the EVAAssume stack (assumptions) correspond to a particular task summary card in the EVATasks stack and to each other. TEJAS establishes this relationship through the use of an ID number for each task (see Help section 8.3.6).

If you create a new assumptions card in this stack, using either New Card or Copy Card/Paste Card, you circumvent the above process. DON'T DO IT.

Instead, should you enter this stack looking for a particular task's open issues card and NOT find it, go to the EVATasks stack (using either the TEJAS boot button's pop-up menu or through TEJASHome). Find the task summary card for the task in question, and press the Open Issues button. You will return to a new, properly named card in this EVAIssues stack, with the task name already filled out.

EVAIssues Stack - Deleting Cards

Any task open issues card EXCEPT the Explanation Card can be deleted, if you wish to. After all, you created it. However, it would be a very poor idea, and is therefore prevented by TEJAS. Here's why:

The cards in this stack are created by using the 'Open Issues' button in either the EVATasks or EVAAssume stacks (see Help sections 8.1.11 and 8.2.9). During this process, they are named with the ID number of that task (e.g., EVAIssues.5367; see 'Relating Tasks, Assumptions, and Open Issues,' Help section 8.1.7). This unique name is essential.

If you delete an open issues card, you will have to go back to the EVATasks stack to replace it (see 'Adding Cards,' Help section 8.3.4). You should CHANGE the information on a card rather than delete it.

Open Issues cards should ONLY be deleted when deleting an entire task in the EVATasks stack (see Help section 8.3.5).

Relating Tasks, Assumptions, and Open Issues

TEJAS uniquely relates the task summary, assumptions, and open issues cards (the baseline cards) for a given task as they are created. Here's how:

Using the unique four-to-six digit card ID (####) assigned to every new card by HyperCard (see the "HyperCard User's Guide"), a TEJAS script sets the name of each new task summary card in EVATasks to 'EVATask.####' as it is created.

Similarly, a TEJAS script sets the name of the corresponding assumptions card (Help section 8.2) to 'EVAAssume.####' and the open issues card (Help section 8.3) to 'EVAIssues.####' as they are created (see sections 8.1.7 and 8.1.12). Each card thus bears the task summary card's unique card ID in its own name.

Therefore, even though the three baseline cards are in different stacks, they are uniquely linked.

EVAIssues Stack - Card Backgrounds

There is only one background in these stacks. By specific name:

EVAIssues.bg: main background for the stack; used for the Explanation Card and all open issues cards (see Help sections 8.1.6 and 8.1.7).

EVAIssues Stack - Information Fields

There are two information fields common to the 'EVAIssues.bg' background: Task and Assumptions. Field specifications are below:

Task: unlocked, labeled transparent field at top center. Automatically filled out when the open issues cards are created from either the task summary or assumptions card for that task. You should never change the Task field if you want that field to match the other two cards.

Open Issues: unlocked, labeled scrolling field at middle. Enter a prose list of the open issues for that task. This can be either imported from an existing text file (see Help section 5.1), or typed in. Areas covered by this text may include anything NOT covered in the open issues for that task. This is a necessary precursor to building a particular list of specific primitives for that task. Specification must be more exact; further versions of TEJAS will include a very different, more quantitative stack for listing and analyzing this data (see Help section 8.3.3).

EVAIssues Stack - Buttons

– The Open Issues icon button in the upper left corner of all open issues cards has no function in the TEJAS Version 1.0 EVAIssues stack other than as an identifier for the cards.

– The Task button in the upper right corner of all open issues cards takes you immediately to the associated task summary card in the EVATasks stack. Use it as a quick navigation aid.

– The Assumptions button in the upper right corner of all assumption cards takes you immediately to the Assumptions card for that task. Use it as a quick navigation aid. If an associated card in the EVAAssume stack does not yet exist, the button will create one for you, name it with the ID number for that task, put the task name in the Task field, and take you to that assumptions in the EVAAssume stack.

EVAIssues Stack - Buttons

menu – The Issues Menu button, found on all cards at lower right (between the Define and Show buttons) will take you immediately to the Explanation card, and show the menu of open issues cards in the stack. The button will appear to highlight there; that is actually an overlaid card button (see Help section 8.3.10).

EVAIssues Stack - Open Issues Menu

Located on the Explanation Card (first card in this stack) is a card field (Open Issues Menu) that holds a list of the task assumption cards in this stack. This menu can be used as a navigation aid, or to refresh your memory on what open issues you've uncovered, without having to scroll through the stack. To navigate, click on the card you wish to view.

Format of the menu is consistent: the card name (EVAIssue.####; see Help section 8.3.6); two colons bracketed by spaces; and the Task name (example: "EVAIssue.4663 :: OMV/Payload Assembly").

The tasks will be alphabetized by Task name ONLY if the stack has already been sorted (see Help section 8.3.9).

The menu updates automatically. The card field is rebuilt each time it is shown using the Issues Menu button (see Help section 8.3.9). For a large number of cards in the stack, rebuilding may take a few seconds.

Section 8.4

TeleTasks

170

TeleTasks Help Menu

8.4 User Instructions

Background:

- ☐ 8.4.1 General Information
- ☐ 8.4.2 The User's Role
- ☐ 8.4.3 Changing the Standard
- ☐ 8.4.4 Adding Cards
- ☐ 8.4.5 Deleting Cards

Unique!

- ☐ 8.4.6 Task Analysis in TEJAS
- ☐ 8.4.7 Relating Tasks, Assumptions, and Open Issues
- ☐ 8.4.8 Task Baseline Cards vs. Specific Task Stack

Stack-Specific Help:

- ☐ 8.4.9 Card Backgrounds
- ☐ 8.4.10 Information Fields
- ☐ 8.4.11 Buttons

Unique!

- ☐ 8.4.12 Building a Specific Task
- ☐ 8.4.13 TeleTasks Menu

INSTRUCTIONS:
Click ☐ box to access section;
Click arrows to page through Help stack;
Click 'T-flag' to return to point of origin.

TeleTasks Stack - General Information

The TeleTasks stack is the starting point for analysis of tasks involving only telerobot work systems performing extravehicular operations. There is one task summary card for each task; each card contains a prose (unstructured) description and outline of that task.

This stack is the primary task analysis stack of a trio of stacks: TeleTask, TeleAssume and TeleIssues. Together, these three stacks form an archive of basic information about any telerobot tasks you wish to analyze.

For a complete discussion of this process, see 'Tasks Analysis in TEJAS' (Help section 8.4.6).

TeleTasks Stack - The User's Role

This stack is the starting point in your analysis of telerobot tasks (see 'Task Analysis in TEJAS', Help section 8.4.6). If you use TEJAS for task analysis, your role is to fill the task summary cards with a description and outline for each of your tasks (see 'Information Fields', Help section 8.4.10).

When a task summary card has been completed for a particular task, the next step is to fill out a corresponding TeleAssume card for the task assumptions (things you know; see Help section 8.5), and an TeleIssues card for the open issues (things you DON'T know; see Help section 8.6). These cards are created and named using the 'Assumptions' and 'Open Issues' icon buttons on any task summary card (Help section 8.4.11).

TEJAS uses HyperCard's own numbering scheme for card ID's to name and associate the task summaries, assumptions, and open issues cards for any task (see 'Relating Tasks, Assumptions, and Open Issues' and 'Task Baseline Cards vs. Specific Task Stack,' Help sections 8.4.7 and 8.4.8).

TeleTasks Stack - Changing the Standard

Unlike the reference stacks, the TEJAS analysis stacks have no standardized information to maintain, review, or change.

However, the information that you enter on each of the task summary cards DOES form a kind of standard for YOUR task analyses, because multiple specific task stacks can be built from each task summary card (this process is complex, and covered completely in 'Building a Specific Task,' Help section 8.4.12). You should take the time to fill out each task summary card accurately and completely before proceeding further into the analysis.

NOTE: the TEJAS Version field will not change in the analysis stacks at all; only the Date field updates to keep track of changes.

TeleTasks Stack - Adding Cards

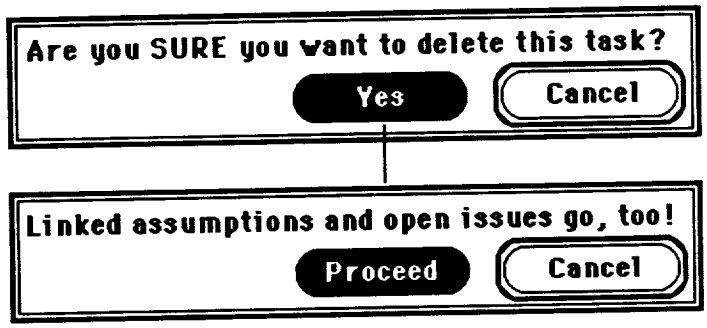
You can add any new Task Summary card as you feel the need, by choosing 'New Card' from the Edit menu.

Each time you add a card, HyperCard gives it a card ID (e.g., '4877'). The ID is helpful in uniquely identifying that task, so in addition, a TEJAS script sets the new card's name to 'TeleTask.4877'. This number is then permanently associated with that task. These ID's appear in the Tasks Menu on the Explanation Card (see 'TeleTasks Menu,' Help section 8.4.13), and in the names of the associated Assumptions and Open Issues cards (see 'Relating Tasks, Assumptions, and Open Issues' and 'Task Baseline Cards vs. Specific Task Stack,' Help sections 8.4.7 and 8.4.8).

NOTE: If you want this built-in system that identifies and relates task summaries, assumptions and open issues to work for you, DO NOT CHANGE any of the CARD NAMES in the analysis stacks!

TeleTasks Stack - Deleting Cards

Any task summary card EXCEPT the Explanation Card (see next card) may be deleted if you wish to... after all, you created it. However, you must remember ONE IMPORTANT RULE about the TeleTasks stack: each task summary card is the first of a trio of baseline cards for that task. For each task summary card, there are an associated assumptions card and an open issues card (see Help sections 8.4.7 and 8.4.8).



Therefore, although TEJAS will let you delete task summaries, you will get TWO chances to Cancel through dialog boxes, as shown. Each appears after a warning sound.

More --->

Suggestion: CHANGE a task summary card's text, rather than delete it.

TeleTasks Stack - Deleting Cards

This second message reminds you that the associated cards in the TeleAssume and TeleIssues stacks will also be deleted if you delete a task summary card. In fact, this is the ONLY way to delete assumptions and open issues cards; you cannot delete cards from inside the TeleAssume and TeleIssues stacks, because another HyperTalk script will prevent it, and give you a warning to delete cards from inside this TeleTasks stack (see help sections 8.5.5 and 8.6.5).

BEWARE: This protection does not prevent you from cutting cards and then forgetting to paste them back in the stack. DON'T DO IT! Be careful.

NOTE: The Explanation Card (first card) is required for navigation and user understanding; it is the only card with the TeleTasks menu (Help section 8.4.13). For that reason, it is both delete-protected and cut-protected.

Task Analysis in TEJAS

TEJAS performs task analysis as a means to an end, not as its primary function. The end result desired within TEJAS will be a list of the specific primitives that define that particular task exactly. These specific primitives (or 'specprims') may be exported to an existing Task Analysis Methodology (TAM) for further use. Before that list can be assembled, there are certain preliminary steps that must be taken; these are detailed on the next card.

Some of the fundamental ideas of task analysis in TEJAS include:

- Treat tasks as OBJECTS on an single level
- Make task information easy to access, WITHOUT negotiating a hierarchy
- Allow hierarchical structure to be overlaid on these objects if desired
- Provide a structure for analysis that is modular, flexible, and expandable
- Carry task analysis to the specific primitives list phase, then provide a mechanism for direct output to other task analysis tools

More --->

Task Analysis in TEJAS

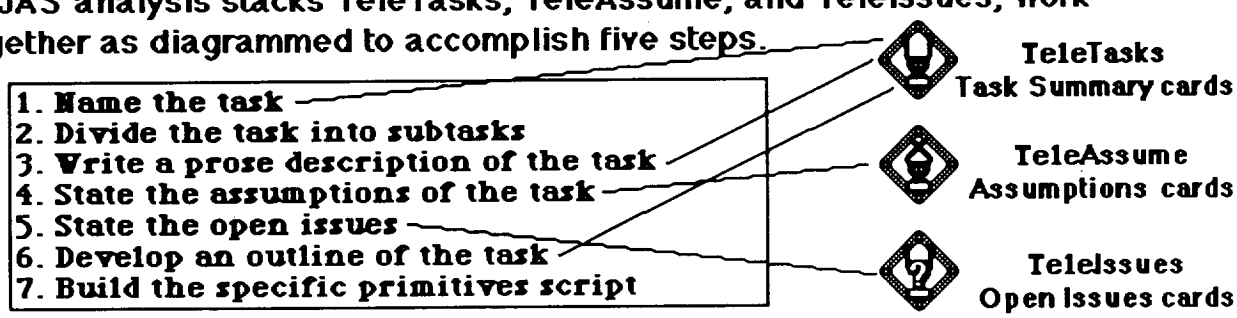
The work on task primitives that resulted in the EVAPrimitives and TelePrimitives stacks produced several significant conclusions (see Help sections 7.4.8 or 7.5.8). Existing Task Analysis Methodologies (TAMs), although different in hierarchical structure, are similar in approach up to a certain point. The steps they had in common were:

1. Name the task
2. Divide the task into subtasks; this can take several iterations.
3. Write a prose description of the task
4. State the assumptions of the task: about the task sequencing, the environment, geometry, lighting, objects to be handled, tools used, etc.
5. State the open issues – things not decided or known
6. Develop an outline (no set format) of the steps in the task
7. Build the detailed task script of specific primitives

The TEJAS analysis stacks are structured to accomplish these seven steps.

Task Analysis in TEJAS

The simplified list of seven steps appears below. The three integrated TEJAS analysis stacks TeleTasks, TeleAssume, and TeleIssues, work together as diagrammed to accomplish five steps.



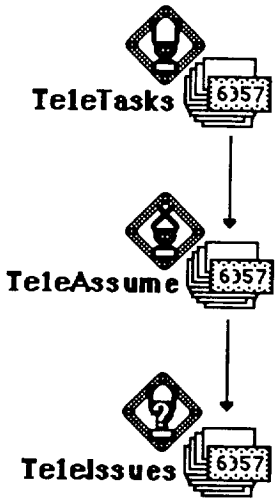
The information fields in each stack's cards store the information shown.

NOTE: To avoid a built-in hierarchy (as mentioned before), TEJAS assumes that step 2 has already been done. In TEJAS, all tasks are equivalent, no matter how you consider them. It is up to you to keep straight what is a subtask of a larger task in your hierarchy.

More --->

Task Analysis in TEJAS

You begin by using the three analysis stacks with the TeleTasks stack.



Open the TeleTasks stack and select 'New Card' from the 'Edit' menu. A new task summary card is created and uniquely numbered and named. This numbering system is used to link the three associated cards (see 'Relating Tasks, Assumptions, and Open Issues', Help section 8.4.7).

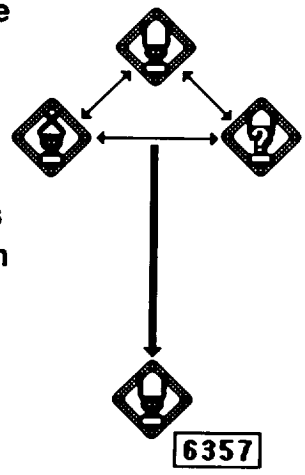
Use the 'Assumptions' button on the new task summary card (Help section 8.4.11) to create an associated assumptions card in TeleAssume. You can list whatever assumptions you have now.

Now from either TeleTasks or TeleAssume, use the 'Open Issues' button (Help section 8.4.11) to create an associated open issues card in TeleIssues. You can list whatever you do not know.

More -->

Task Analysis in TEJAS

You can revisit any of these cards as many times as you want, in any order, from anyplace within TEJAS. An automatically updated menu at the front of each analysis stack will list the cards by their card name (with that unique task number), and the task name as originally entered on the task assumptions card (see Help sections 8.4.7, 8.4.10 and 8.4.11).



The TeleTasks, TeleAssumptions, and TeleIssues stacks are therefore an integrated set of archives of information about the TeleTasks you analyze.

When information on a particular task has been entered on all three cards, you are ready to create the specific primitives (specprims) list for that task. To build these specprims, you must first build a specific task stack (see 'Building a Specific Task', Help section 8.4.12).

Relating Tasks, Assumptions, and Open Issues

TEJAS uniquely relates the task summary, assumptions, and open issues cards (the baseline cards) for a given task as they are created. Here's how:

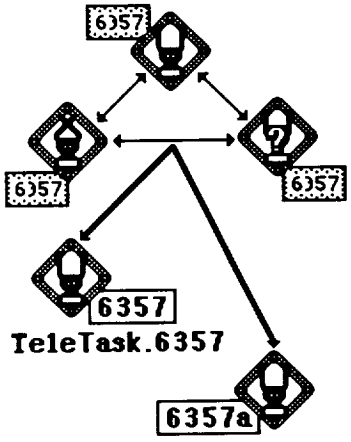
A HyperTalk script uses the four-to-six digit card ID #### assigned to every new card by HyperCard (see the "HyperCard User's Guide") to set the name of each new task summary card in TeleTasks to 'TeleTask.####' as it is created.

Similarly, another script sets the name of the corresponding assumptions card (Help section 8.5) to 'TeleAssume.####' and the open issues card (Help section 8.6) to 'TeleIssues.####' as they are created (see sections 8.4.7 and 8.4.12). Each card thus bears the task summary card's ID number in its own name.

Therefore, although the three baseline cards are in separate stacks, they are uniquely linked.

Task Baseline Cards vs. Specific Tasks Stack

"Why create a specific task stack before specifying the task primitives? Why perform that intermediary step?" The answer is, FLEXIBILITY!



Each specific task stack includes a COPY of the task summary card from TeleTasks, the assumptions card from TeleAssume, and the open issues card from TeleIssues.

Within that specific task stack, you can CHANGE the description, outline, assumptions, open issues, etc. of that specific task. The original (baseline) data is still intact, safely archived on the original cards in their three respective stacks.

This leaves you free to go back to the original task summary card in TeleTasks and create another specific task stack with the same data.

TeleTasks Stack - Card Backgrounds

There is only one background in these stacks. By specific name:

TeleTask.bg: main background for the stack; used for the Explanation Card and all task summaries (see Help sections 8.4.6 and 8.4.7).

TeleTasks Stack - Information Fields

There are four information fields common to the 'TeleTask.bg' background: Task, Source, Description, and Outline. Field specifications are below.

Task: unlocked, labeled transparent field at top center. Enter the task name. It is best to be specific; there is enough space for long titles in this field.

Source: unlocked, labeled rectangle field for your name and organization.

Description: unlocked, labeled scrolling field. Enter a prose description of the task, either imported from an existing text file (section 5.0), or typed in.

Outline: unlocked, labeled scrolling field. Enter an approximation of the steps in the task. There are no restrictions on style; use a method familiar to you. Be complete; this Outline will be your guide to building the specific primitives list that exactly scripts the task. Modifications may be made at any time before building a specific task (Help section 8.4.12).

TeleTasks Stack - Buttons

– The pop-up menu attached to this TeleTasks button at the upper left corner of all task summary cards performs two very important functions, but only one at a time. In this stack, the menu shows only "Build Specific Stack." Within a specific task stack, it shows "Build Deriv Task" (see 'Building a Derivative Task', Help section 9.6.6).

To preview what you will see and what you must do when using this button to build a specific task, see 'Building a Specific Task' (Help section 8.4.12). DO NOT USE THIS BUTTON WITHOUT READING THAT HELP SECTION! But if you do, you can still Cancel from the dialog boxes that appear.

With only one selection, this button could have worked without a pop-up menu, using a single dialog box. But the menu forces you to MANUALLY select "Build Specific Task" after reading it, thereby giving you a first chance to avoid the whole process.

TeleTasks Stack - Buttons

– The Assumptions button at the upper right corner of all task summary cards takes you immediately to the Assumptions card for the task summary you are viewing. If you have not yet created an associated card in the TeleAssume stack, the button will do this for you, assign it the ID number for that task, and put the task name in the Task field.

– The Open Issues button at the upper right corner of all task summary cards takes you immediately to the Open Issues card for the task summary you are viewing. If you have not yet created an associated card in the TeleIssues stack, the button will do this for you, assign it the ID number for that task, and put the task name in the Task field.

menu – The Tasks Menu button at lower right on all cards in this stack takes you immediately to the Explanation card and shows the Tasks Menu field. It will appear to highlight there; that is an overlaid card button (see Help section 8.4.13). This button does NOT sort the stack first!

TeleTasks Stack - Building a Specific Task

Once you have completed your initial work with this stack, TeleAssume and TeleIssues (see 'Task Analysis in TEJAS', Help section 8.4.6), and you are ready to build a list of specific task primitives that exactly define that task, you are ready to use the 'Build Specific Task' option in the TeleTasks button on the upper left corner of the summary card for that task. Here is how the process works:

Step 1. Click and hold down on the TeleTasks button (shown at left).

Step 2. The button will highlight as shown, and a pop-up menu will appear with one option, "Build Specific Task."

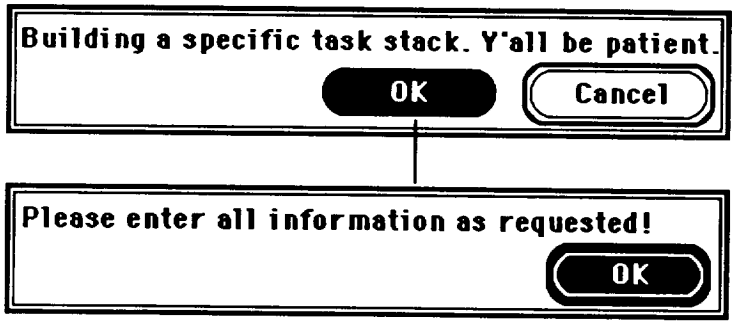
Build Specific Task

If you release the mouse key without selecting anything, the menu will disappear and the TeleTasks button's highlight will return to normal, as it was before. But if you select "Build Specific Task", the following sequence begins:

More --->

TeleTasks Stack - Building a Specific Task

Step 3. If you select "Build Specific Task", the dialog box below warns you that the process is starting and gives you an option to Cancel:



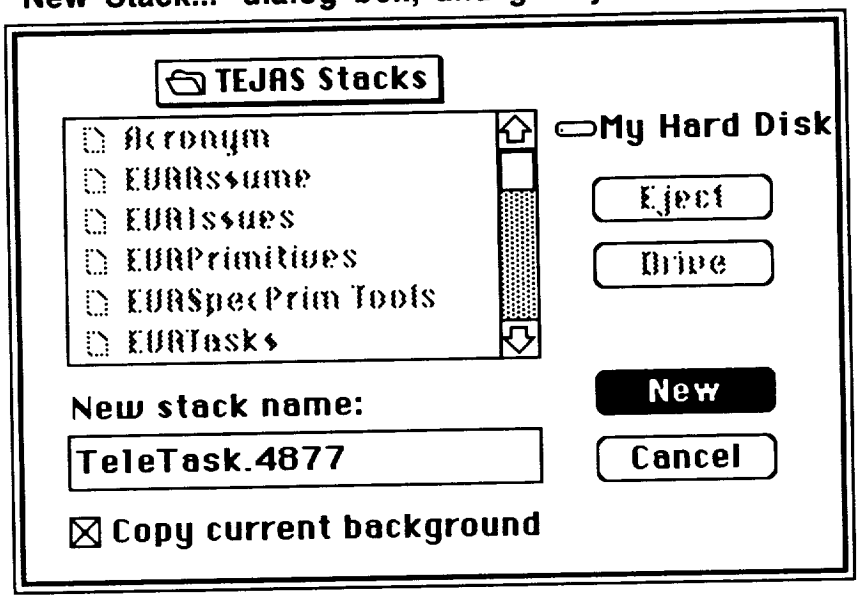
Step 4. After clicking on OK, another dialog box appears, asking you to enter information exactly as a future message will prompt. Click on OK. You may notice a slight pause here, depending on your RAM.

Step 5. The third dialog box will give you a new stack name. Click on OK, and wait for the 'New Stack...' dialog box to follow. Then type the stack name EXACTLY as shown between the single quotes (an example is shown).

More --->

TeleTasks Stack - Building a Specific Task

Step 6. Once having passed the third dialog box, the script will open the 'New Stack...' dialog box, and give you the last of two options to Cancel:



To proceed, type the task name EXACTLY as previously requested (the same example is shown).

IMPORTANT! Leave the 'Copy current background' box selected.

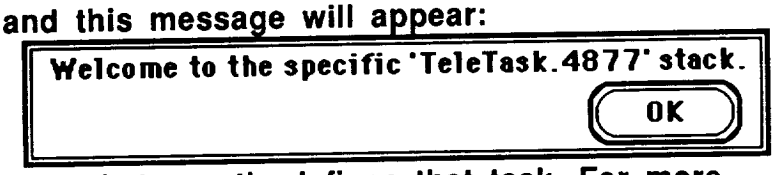
Click on the 'New' button (shown), or press return.

More --->

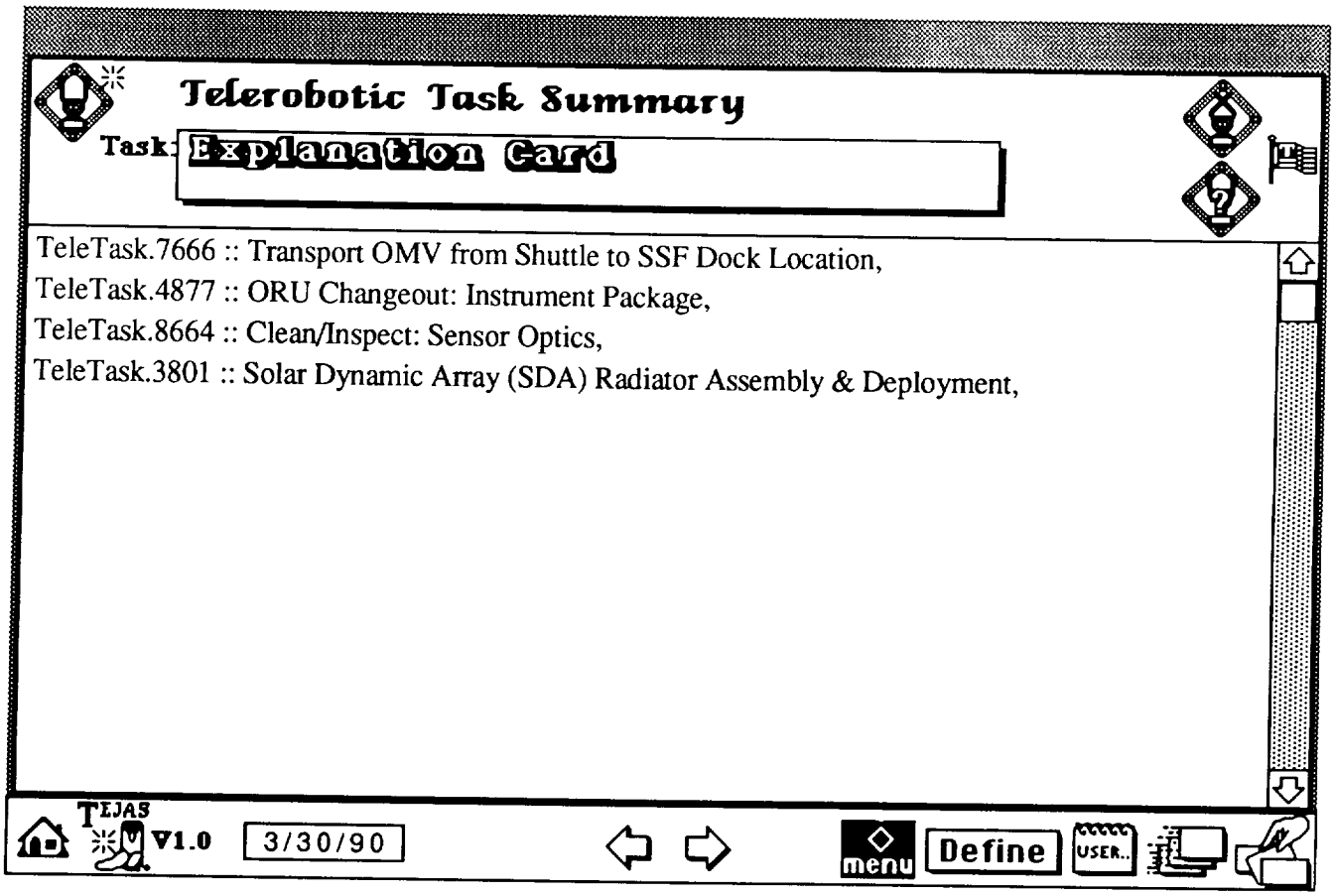
TeleTasks Stack - Building a Specific Task

After completing the 'New Stack...' dialog box and pressing the 'New' button (or the return key on your keyboard), the dialog box disappears and the cursor turns into the 'busy' symbol . Depending on your Macintosh's processor and RAM configuration, your screen will remain frozen (with the busy symbol altering periodically) for several seconds while the program builds the new specific task stack.

When the screen is released, the first card in your new specific task stack will appear. A tune will play, and this message will appear:



This new specific task stack has the needed tools for building the specific primitives list that exactly defines that task. For more information on these tools, see 'TeleSpecPrim Tools' stack help (Help section 9.1). For more information on how to use the new stack, see 'TeleTask.4877 Example Stack' (Help section 9.6).



TeleTasks Stack - TeleTasks Menu

8.4.13
1 of 1

Located on the Explanation Card (first card in this stack) is a card field (Tasks Menu) that holds a list of the task summary cards in this stack. This menu can be used as a navigation aid, or to refresh your memory on what tasks you've defined, without having to scroll through the stack.
To navigate, click on the task whose summary card you wish to view.

Format of the menu is consistent: the card name (e.g., "TeleTask.4877"; see Help section 8.4.4); two colons bracketed by spaces; and the Task name (e.g., "TeleTask.4877 :: OMV Maintenance").

The tasks will be alphabetized by Task name ONLY if the stack has already been sorted (see Help section 8.4.11).

The menu updates automatically. The card field is rebuilt each time it is shown using theTasks Menu button (see Help section 8.4.11). For a large number of task summaries in the stack, rebuilding may take a few seconds.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

Section 8.5

User Instructions: TeleAssume Stack

TeleAssume Help Menu

Menu 1 of 1

8.5 User Instructions

Background:

- ☐ 8.5.1 General Information
- ☐ 8.5.2 The User's Role
- ☐ 8.5.3 Changing the Standard
- ☐ 8.5.4 Adding Cards
- ☐ 8.5.5 Deleting Cards

Unique!

- ☐ 8.5.6 Relating Tasks, Assumptions, and Open Issues

Stack-Specific Help:

- ☐ 8.5.7 Card Backgrounds
- ☐ 8.5.8 Information Fields
- ☐ 8.5.9 Buttons

Unique!

- ☐ 8.5.10 TeleAssumptions Menu

INSTRUCTIONS:
Click ☐ box to access section;
Click arrows to page through Help stack;
Click 'T-flag' to return to point of origin.

TeleAssume Stack - General Information

8.5.1 1 of 1

The TeleAssume stack is the second step in analysis of tasks involving only telerobot work systems performing operations. There is one assumptions card for each task; each card holds a prose (unstructured) list of the assumptions made when planning that task.

This stack is the secondary task analysis stack of a trio of stacks: TeleTask, TeleAssume and TeleIssues. Together, these three stacks form an archive of basic information about any telerobot tasks you wish to analyze.

For a complete discussion of this process, see 'Tasks Analysis in TEJAS' (Help section 8.4.6).

TeleAssume Stack - The User's Role

This stack is for you to use in the analysis of telerobot tasks (see 'Task Analysis in TEJAS', Help section 8.4.6). Your role, if you use TEJAS for task analysis, is to fill the task assumption cards with a text listing of the assumptions you made about your particular tasks (see 'Information Fields', section 8.5.8).

When a task assumptions card has been completed for a particular task, the next step is to fill out a corresponding TeleIssues card for the open issues (things you DON'T know; see Help section 8.6). These cards can be created and named using the 'Open Issues' icon buttons found on the upper right of any assumptions card (see Help section 8.5.7).

TEJAS uses HyperCard's own numbering scheme for card ID's to name and associate the task summaries, assumptions, and open issues cards for any task (see 'Relating Tasks, Assumptions, and Open Issues' and 'Task Baseline Cards vs. Specific Task Stack,' Help sections 8.4.7 and 8.4.8).

TeleAssume Stack - Changing the Standard

Unlike the reference stacks (Glossary, Acronym, EVAPrimitives, TelePrimitives, and TeleTechnologies in TEJAS Version 1.0), the TEJAS analysis stacks have no standardized information to maintain, review, or change. But the stack format of this particular stack must change; your inputs are requested here (see the next card).

The information that you enter on each of the task assumptions cards DOES form a kind of standard for YOUR task analyses, because multiple specific task stacks can be built from each task summary card (this process is complex, and covered completely in Help section 8.4.12). In that process the associated assumptions card is copied into the new specific task stack. You should take the time to fill out each task assumptions card accurately and completely before proceeding further into the analysis.

NOTE: the TEJAS Version field will not change in the analysis stacks at all; only the Date field updates to keep track of changes.

TeleAssume Stack - Changing the Standard cont'd

The Version 1.0 TeleAssume stack consists of a single scrolling field with data on the environment, telerobots, vehicles, and objects involved stored as text under subheadings. This system suffices as an interim solution to organizing your assumptions; you can read and interpret this information. But the format is too inconsistent for a HyperTalk script to use in analyzing the technologies involved. Therefore, the format of this stack must evolve.

Your assumptions in performing a telerobot task will encompass certain repetitive choices and rules. A new TeleAssume stack format must provide dedicated fields and buttons in which HyperTalk scripts can find discrete data (e.g., environment characteristics, tools manifested, telerobot specifications, etc.) with default values (where appropriate) and room for amorphous text descriptions (where necessary). The objective of this new format is (as always in TEJAS) to organize and interrelate the massive data set, not to provide an 'operations cookbook.' Your comments and ideas on the new format's content and layout are welcome.

TeleAssume Stack - Adding Cards

DO NOT ADD ANY CARDS TO THIS STACK!

The cards in this stack and the TeleIssues stack (open issues) correspond to a particular task summary card in the TeleTasks stack and to each other. TEJAS establishes that relationship through the use of a unique number for each task (see 'Task Analysis in TEJAS,' Help section 8.4.6).

Creating a new assumptions card in this stack, using either 'New Card' or 'Copy Card'/'Paste Card' circumvents the above process. DON'T DO IT.

Instead, should you enter this stack looking for a particular task's assumptions card and NOT find it, go to the TeleTasks stack (using either the TEJAS boot button's pop-up menu or through TEJAS Home). Find the task summary card for the task in question, and press the Assumptions button. You will return to a new, properly named card in this TeleAssume stack, with the task name already filled out.

TeleAssume Stack - Deleting Cards

Any task assumptions card EXCEPT the Explanation Card may be deleted, if you wish to. After all, you created it. However, it would be a very poor idea, and is therefore prevented by TEJAS. Here's why:

The cards in this stack are created by using the 'Assumptions' button in either the TeleTasks or TeleIssues stacks (see Help sections 8.4.11 and 8.6.9). During this process, they are named with the ID number of that task (e.g., TeleAssume.5367; see 'Relating Tasks, Assumptions, and Open Issues,' Help section 8.4.7). Including the ID number in the name is crucial.

If you delete an assumptions card, you will have to go back to the TeleTasks stack to replace it (see 'Adding Cards,' Help section 8.5.4). You should CHANGE the information on a card rather than delete it.

Assumptions cards should ONLY be deleted when deleting an entire task in the TeleTasks stack (see Help section 8.5.5).

TeleAssume Stack - Deleting Cards

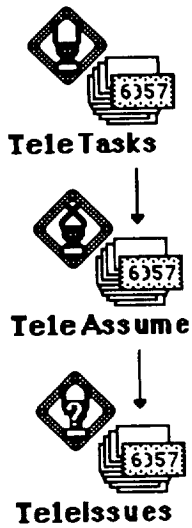
This second message reminds you that the associated cards in the TeleAssume and TeleIssues stacks will also be deleted if you delete a task summary card. In fact, this is the ONLY way to delete assumptions and open issues cards – you cannot delete them from inside the TeleAssume and TeleIssues stacks, because another HyperTalk script will prevent it, and give you a warning to delete cards from inside this TeleTasks stack (see help sections 8.4.5 and 8.5.6).

BEWARE: This protection against deleting cards does not prevent you from cutting cards and then forgetting to paste them back in the stack.

NOTE: The Explanation Card (first card) is required for navigation and for user understanding; it is the only card with the TeleAssumptions menu (see Help section 8.5.10). For that reason, it is both delete- and cut-protected.

Relating Tasks, Assumptions, and Open Issues

TEJAS uniquely relates the task summary, assumptions, and open issues cards (the baseline cards) for a given task as they are created. Here's how:



Using the four-to-six digit card ID (####) assigned to every new card by HyperCard (see "The HyperCard User's Guide"), a TEJAS script sets the name of each new task summary card in TeleTasks to 'TeleTask.####' as it is created.

Similarly, a TEJAS script sets the name of the corresponding assumptions card (Help section 8.5) to 'TeleAssume.####' and the open issues card (Help section 8.6) to 'TeleIssues.####' as they are created (see sections 8.4.7 and 8.4.12). Each card thus bears the task summary card's ID number in its own name.

Therefore, even though the three baseline cards are in different stacks, they are uniquely linked.

TeleAssume Stack - Card Backgrounds

There is only one background in these stacks. By specific name:

TeleAssume.bg: main background for the stack; used for the Explanation Card and all task assumption cards (see Help sections 8.4.6 and 8.4.7).

TeleAssume Stack - Information Fields

There are two information fields common to the 'TeleAssume.bg' background: Task and Assumptions. Field specifications are below.

Task: unlocked, labeled transparent field at top center. Automatically filled out when the assumptions cards are created from either the task summary or open issue card for that task. You should never change the Task field if you want that field to match the other two cards.

Assumptions: unlocked, labeled scrolling field at middle. Enter a prose list of the assumptions for that task. This list can be either imported from an existing text file (see Help section 5.1), or typed in. Areas covered by these assumptions may include task, environment, sequencing, tools and services, objects, etc. This is a necessary precursor to building a particular list of specific primitives for that task. Specification must be more exact; future versions of TEJAS will include a very different, more quantitative stack for listing and analyzing this data (see Help section 8.5.3).

TeleAssume Stack - Buttons

– The Assumptions icon button in the upper left corner of all task assumptions cards has no function in the TEJAS Version 1.0 TeleAssume stack other than as an identifier for the cards.

– The Task button in the upper right corner of all task assumptions cards takes you immediately to the associated task summary card in the TeleTasks stack. Use it as a quick navigation aid.

– The Open Issues button in the upper right corner of all assumption cards takes you immediately to the Open Issues card for that task. Use it as a quick navigation aid. If an associated card in the TeleIssues stack does not yet exist, the button will create one for you, name it with the ID number for that task, put the task name in the Task field, and take you to that open issues card in the TeleIssues stack.

TeleAssume Stack - Buttons

menu – The Assumptions Menu button, found on all cards at lower right (between the Define and Show buttons) will take you immediately to the Explanation card and show the menu of task assumptions cards in the stack. The button will appear to highlight there; that is actually an overlaid card button (see Help section 8.5.10).

TeleAssume Stack - Assumptions Menu

Located on the Explanation Card (first card in this stack) is a card field (Assumptions Menu) that holds a list of the assumptions cards in this stack. This menu can be used as a navigation aid, or to refresh your memory on what assumptions you've defined, without having to scroll through the stack. To navigate, click on the card you wish to view.

Format of the menu is consistent: the card name (TeleAssume.####; see Help section 8.5.6); two colons bracketed by spaces; and the Task name (example: "TeleAssume.7225 :: OMV/Payload Assembly").

The tasks will be alphabetized by Task name ONLY if the stack has already been sorted (see Help section 8.5.9).

The menu updates automatically. The card field is rebuilt each time it is shown using the Assumptions Menu button (see Help section 8.5.9). For a large number of cards in the stack, rebuilding may take a few seconds.

Section 8.6

User Instructions: TeleIssues Stack

TeleIssues Help Menu

Menu 1 of 1

8.6 User Instructions

Background:

- ☐ 8.6.1 General Information
- ☐ 8.6.2 The User's Role
- ☐ 8.6.3 Changing the Standard
- ☐ 8.6.4 Adding Cards
- ☐ 8.6.5 Deleting Cards

Unique!

- ☐ 8.6.6 Relating Tasks, Assumptions, and Open Issues

Stack-Specific Help:

- ☐ 8.6.7 Card Backgrounds
- ☐ 8.6.8 Information Fields
- ☐ 8.6.9 Buttons

Unique!

- ☐ 8.6.10 TeleIssues Menu

INSTRUCTIONS:
Click ☐ box to access section;
Click arrows to page through Help stack;
Click 'T-flag' to return to point of origin.

TeleIssues Stack - General Information

8.6.1 1 of 1

The TeleIssues stack is the third step in analysis of tasks involving only telerobot work stations performing operations. There is one open issues card for each task; each card holds a unstructured prose list of the guidelines, specification, and steps left unresolved when planning that task.

This stack is the tertiary task analysis stack of a trio of stacks: TeleTask, TeleAssume and TeleIssues. Together, these three stacks form an archive of basic information about any telerobot tasks you wish to analyze.

For a complete discussion of this process, see 'Tasks Analysis in TEJAS' (Help section 8.4.6).

TeleIssues Stack - The User's Role

This stack is for you to use in the analysis of telerobot tasks (see 'Task Analysis in TEJAS,' Help section 8.4.6). Your role is to fill the open issues cards with a text listing of the issues about your particular tasks that you were unable to resolve (see 'Information Fields', section 8.6.8).

When an open issues card has been completed for a particular task, you should be ready to create a specific task stack for that task (see Help section 8.4.12). There must be an associated assumptions card in TeleAssume and task summary card in TeleTasks (see Help section 8.4.8).

TEJAS uses HyperCard's own numbering scheme for card ID's to name and associate the task summaries, assumptions, and open issues cards for any task (see 'Relating Tasks, Assumptions, and Open Issues' and 'Task Baseline Cards vs. Specific Task Stack,' Help sections 8.4.7 and 8.4.8).

TeleIssues Stack - Changing the Standard

Unlike the reference stacks (Glossary, Acronym, EVAPrimitives, TelePrimitives, and TeleTechnologies in TEJAS Version 1.0), the TEJAS analysis stacks have no standardized information to maintain, review, or change. But for this stack, the stack format will change; your inputs are requested there.

However, the information that you place on each of the open issues cards DOES form a kind of standard for YOUR task analyses, because multiple specific task stacks can be built from each task summary card (this process is complex, and covered completely in Help section 8.4.12). In that process the associated open issues card is copied into that new specific task stack. You should take the time to fill out each open issues card accurately and completely before proceeding deeper into the analysis.

NOTE: the TEJAS Version field will not change in the analysis stacks at all; only the Date field updates to keep track of changes.

TeleIssues Stack - Adding Cards

DO NOT ADD ANY CARDS TO THIS STACK!

The cards in this stack and the TeleAssume stack (assumptions) correspond to a particular task summary card in the TeleTasks stack and to each other. TEJAS establishes this relationship through the use of an ID number for each task (see Help section 8.6.6).

If you create a new assumptions card in this stack, using either New Card or Copy Card/Paste Card, you circumvent the above process. DON'T DO IT.

Instead, should you enter this stack looking for a particular task's open issues card and NOT find it, go to the TeleTasks stack (using either the TEJAS boot button's pop-up menu or through TEJAS Home). Find the task summary card for the task in question, and press the Open Issues button. You will return to a new, properly named card in this TeleIssues stack, with the task name already filled out.

TeleIssues Stack - Deleting Cards

Any task open issues card EXCEPT the Explanation Card can be deleted, if you wish to. After all, you created it. However, it would be a very poor idea, and is therefore prevented by TEJAS. Here's why:

The cards in this stack are created by using the 'Open Issues' button in either the TeleTasks or TeleAssume stacks (see Help sections 8.4.11 and 8.5.9). During this process, they are named with the ID number of that task (e.g., TeleIssues.5367; see 'Relating Tasks, Assumptions, and Open Issues,' Help section 8.4.7). This unique name is essential.

If you delete an open issues card, you will have to go back to the TeleTasks stack to replace it (see 'Adding Cards,' Help section 8.6.4). You should CHANGE the information on a card rather than delete it.

Open Issues cards should ONLY be deleted when deleting an entire task in the TeleTasks stack (see Help section 8.6.5).

Relating Tasks, Assumptions, and Open Issues

TEJAS uniquely relates the task summary, assumptions, and open issues cards (the baseline cards) for a given task as they are created. Here's how:

Using the unique four-to-six digit card ID (####) assigned to every new card by HyperCard (see the "HyperCard User's Guide"), a TEJAS script sets the name of each new task summary card in TeleTasks to 'TeleTask.####' as it is created.

Similarly, a TEJAS script sets the name of the corresponding assumptions card (Help section 8.5) to 'TeleAssume.####' and the open issues card (Help section 8.6) to 'TeleIssues.####' as they are created (see sections 8.4.7 and 8.4.12). Each card thus bears the task summary card's unique card ID in its own name.

Therefore, even though the three baseline cards are in different stacks, they are uniquely linked.

TeleIssues Stack - Card Backgrounds

There is only one background in these stacks. By specific name:

TeleIssues.bg: main background for the stack; used for the Explanation Card and all open issues cards (see Help sections 8.4.6 and 8.4.7).

TeleIssues Stack - Information Fields

There are two information fields common to the 'TeleIssues.bg' background: Task and Assumptions. Field specifications are below:

Task: unlocked, labeled transparent field at top center. Automatically filled out when the open issues cards are created from either the task summary or assumptions card for that task. You should never change the Task field if you want that field to match the other two cards.

Open Issues: unlocked, labeled scrolling field at middle. Enter a prose list of the open issues for that task. This can be either imported from an existing text file (see Help section 5.1), or typed in. Areas covered by this text may include anything NOT covered in the open issues for that task. This is a necessary precursor to building a particular list of specific primitives for that task. Specification must be more exact; further versions of TEJAS will include a very different, more quantitative stack for listing and analyzing this data (see Help section 8.6.3).

TeleIssues Stack - Buttons

– The Open Issues icon button in the upper left corner of all open issues cards has no function in the TEJAS Version 1.0 TeleIssues stack other than as an identifier for the cards.

– The Task button in the upper right corner of all open issues cards takes you immediately to the associated task summary card in the TeleTasks stack. Use it as a quick navigation aid.

– The Assumptions button in the upper right corner of all assumption cards takes you immediately to the Assumptions card for that task. Use it as a quick navigation aid. If an associated card in the TeleAssume stack does not yet exist, the button will create one for you, name it with the ID number for that task, put the task name in the Task field, and take you to that assumptions in the TeleAssume stack.

TeleIssues Stack - Buttons

menu – The Issues Menu button, found on all cards at lower right (between the Define and Show buttons) will take you immediately to the Explanation card, and show the menu of open issues cards in the stack. The button will appear to highlight there; that is actually an overlaid card button (see Help section 8.6.10).

TeleIssues Stack - Open Issues Menu

Located on the Explanation Card (first card in this stack) is a card field (Open Issues Menu) that holds a list of the task assumption cards in this stack. This menu can be used as a navigation aid, or to refresh your memory on what open issues you've uncovered, without having to scroll through the stack. To navigate, click on the card you wish to view.

Format of the menu is consistent: the card name (TeleIssue.####; see Help section 8.6.6); two colons bracketed by spaces; and the Task name (example: "TeleIssue.7225 :: OMV/Payload Assembly").

The tasks will be alphabetized by Task name ONLY if the stack has already been sorted (see Help section 8.6.9).

The menu updates automatically. The card field is rebuilt each time it is shown using the Issues Menu button (see Help section 8.6.9). For a large number of cards in the stack, rebuilding may take a few seconds.

Section 9

User Instructions: Analysis Stacks

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Section 9.1

EVASpecPrim Tools

PAGE 202 INTEN

EVASpecPrim Tools Help Menu

Menu 1 of 1

9.1 User Instructions

Background:

- ☐ 9.1.1 General Information
- ☐ 9.1.2 The User's Role
- ☐ 9.1.3 Changing the Standard
- ☐ 9.1.4 Adding Cards
- ☐ 9.1.5 Deleting Cards

Unique!

- ☐ 9.1.6 Stack Organization
- ☐ 9.1.7 EVASpecPrims List
- ☐ 9.1.8 EVASpecPrim Builder
- ☐ 9.1.9 EVASpecPrim Arg Menus

Stack-Specific Help:

- ☐ 9.1.10 Card Backgrounds
- ☐ 9.1.11 Common Fields
- ☐ 9.1.12 Common Buttons

Unique!

- ☐ 9.1.13 Analysis Fields
- ☐ 9.1.14 Analysis Buttons
- ☐ 9.1.15 Analysis Menus

INSTRUCTIONS:
Click ☐ box to access section;
Click arrows to page through Help stack;
Click 'T-flag' to return to point of origin.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER...

EVASpecPrim Tools Stack - General Information

This stack contains three cards (detailed below). The cards are unimportant and inert until a task is well defined, and you are ready to build a specific task stack (Help section 8.1.12). Within an EVATask.#### stack, these cards form powerful tools for building, archiving and outputting specific crew-EVA primitives. The cards and their functions are:

EVA Specific Primitives List card: lists, archives, and outputs specific task primitives to a transfer spreadsheet or document (see Help section 9.1.7).

EVA Specific Primitive Builder card: creates specific EVA primitives for each task from generic EVAPrimitives or archived specific primitives and stores them on card records (see Help section 9.1.8).

EVA Specific Primitive Argument Menus: provides user-customizable menus of specific arguments for all generic arguments (except 'condition') within a generic EVAPrimitive (see Help section 9.1.9).

EVASpecPrim Tools Stack - General Information

This section's Help cards are organized differently from the other stack-specific Help sections, because the EVASpecPrim Tools stack contains only tool templates that are empty of data. In Help sections 9.1.13 to 9.1.15, the buttons, fields, and menus on each of the EVASpecPrim Tools stack's three cards are described and their action explained. However, detailed examples of how you use these objects in task analysis are possible only within a specific task stack. The EVATask.5058 example stack serves that purpose (see Help section 9.3).

Although dividing analysis tools into their own inert stack may seem confusing to you at first, and the Help sections somewhat disjointed, it is intentional. This organization scheme makes it easy to update these tool cards and to create more powerful analysis tools in the future. With some knowlege of HyperTalk, you can build more complex analysis stacks using these tool cards. Experience with TEJAS task analysis will show you how.

EVASpecPrim Tools Stack - The User's Role

EVASpecPrim Tools is not a complete, functioning stack by itself. Instead, this stack simply stores empty masters (templates) of the three complex analysis cards needed to provide task analysis capability within TEJAS. There is nothing to change in this stack. Most text fields are locked and most of the stack-specific buttons will not function until the cards are in a specific 'EVATask.####' stack. If you wish to try all the buttons, fields and pop-up menus on the cards in this stack, do so by using them there.

For specifications and an explanation of the purpose of the analysis fields, analysis buttons, and analysis menus, read Help sections 9.1.13 to 9.1.15. To understand how the buttons, scripts, etc. work, read the 'EVATask.5058 Example Stack,' Help section 9.3.

Please DON'T TAMPER with any objects – field, button, menu, picture, script, etc. - in this stack. Don't even move them. To do so may affect your ability to perform task analysis within TEJAS.

EVASpecPrim Tools Stack- Changing the Standard

This is a critical stack for task analysis in TEJAS. Its three cards are templates for the analysis "engine" for all specific 'EVATask.####' stacks you will build. The complex HyperTalk scripts, buttons, interface design, etc. are designed to make the task analysis faster, more powerful and more 'user-friendly.' Comments in the HyperTalk scripts explain each step in the code and make the action easier to understand.

If you think that functional changes should be made to any card in this stack, please suggest them in a detailed way. A letter to the TEJAS Editor would be a good start. This stack is a standard only to TEJAS. No other mechanism is needed for changing the standard.

As an exercise (ONLY with a COPY of this stack) you may wish to make changes to the card's scripts, buttons, layout, etc. BEWARE: you may find this a challenging task. Before attempting it, you'd better have a GOOD reason, allow plenty of time, know HyperTalk well, and read all the scripts.

EVASpecPrim Tools Stack - Adding Cards

DO NOT ADD ANY CARDS TO THIS STACK!!

EVASpecPrim Tools is not an archival stack, but a template stack for cards that do the analysis work. To prevent you from adding any cards, there is a built-in protective HyperTalk stack script. This script will intercept the New Card and Paste Card menu commands if issued and will give you the message "Cannot add any cards to this stack!" with a warning tone. This and the corresponding TeleSpecPrim Tools stack are the only TEJAS Version 1.0 analysis stacks to which you should NEVER add cards.

EVASpecPrim Tools Stack - Deleting Cards

DO NOT DELETE ANY CARDS FROM THIS STACK!

There are only three cards in this stack: the EVA Specific Primitives List card, the EVA Specific Primitive Builder card and the EVA Specific Primitive Argument Menus card.

All three cards are important to TEJAS' task analysis capability and are individually delete-protected in the Card Info... dialog box. They are further protected by a HyperTalk script that will intercept the Delete Card and Cut Card menu commands if issued and will give you the message "Cannot delete or cut any cards in this stack!" with a warning tone.

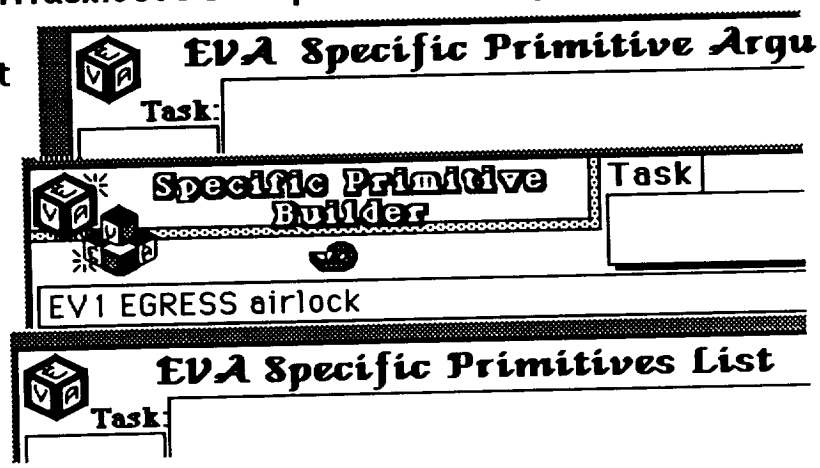
EVASpecPrim Tools Stack - Stack Organization

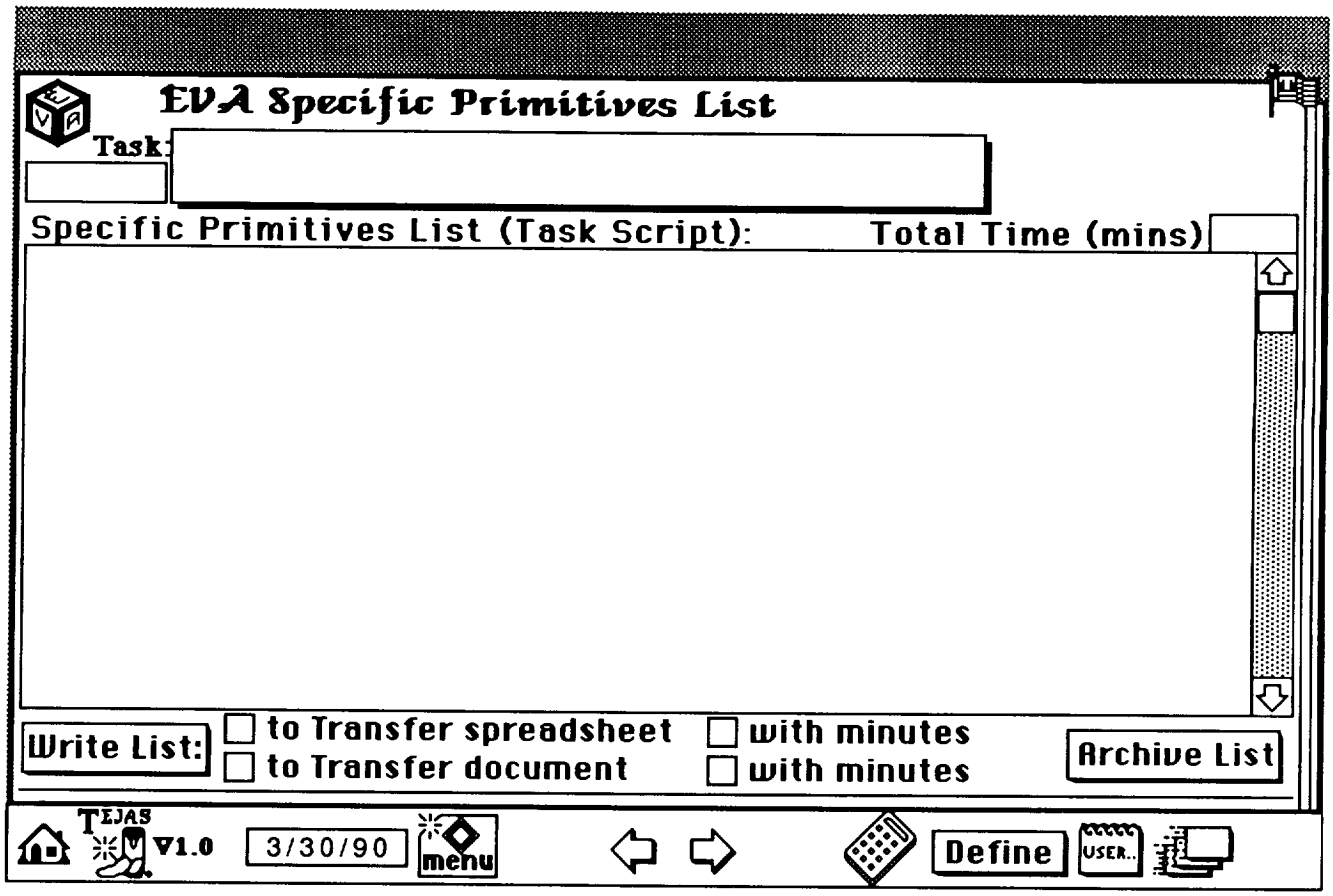
The organization of cards in this stack has no particular significance, except to show the order that these three cards will appear in any EVA specific task stack (see 'EVATask.5058 Example Stack,' Help section 9.3).

Specific Primitive Argument menus: unique, last card in this stack

Specific Primitive Builder: unique, middle card in this stack

Specific Primitives List: unique, first card in this stack





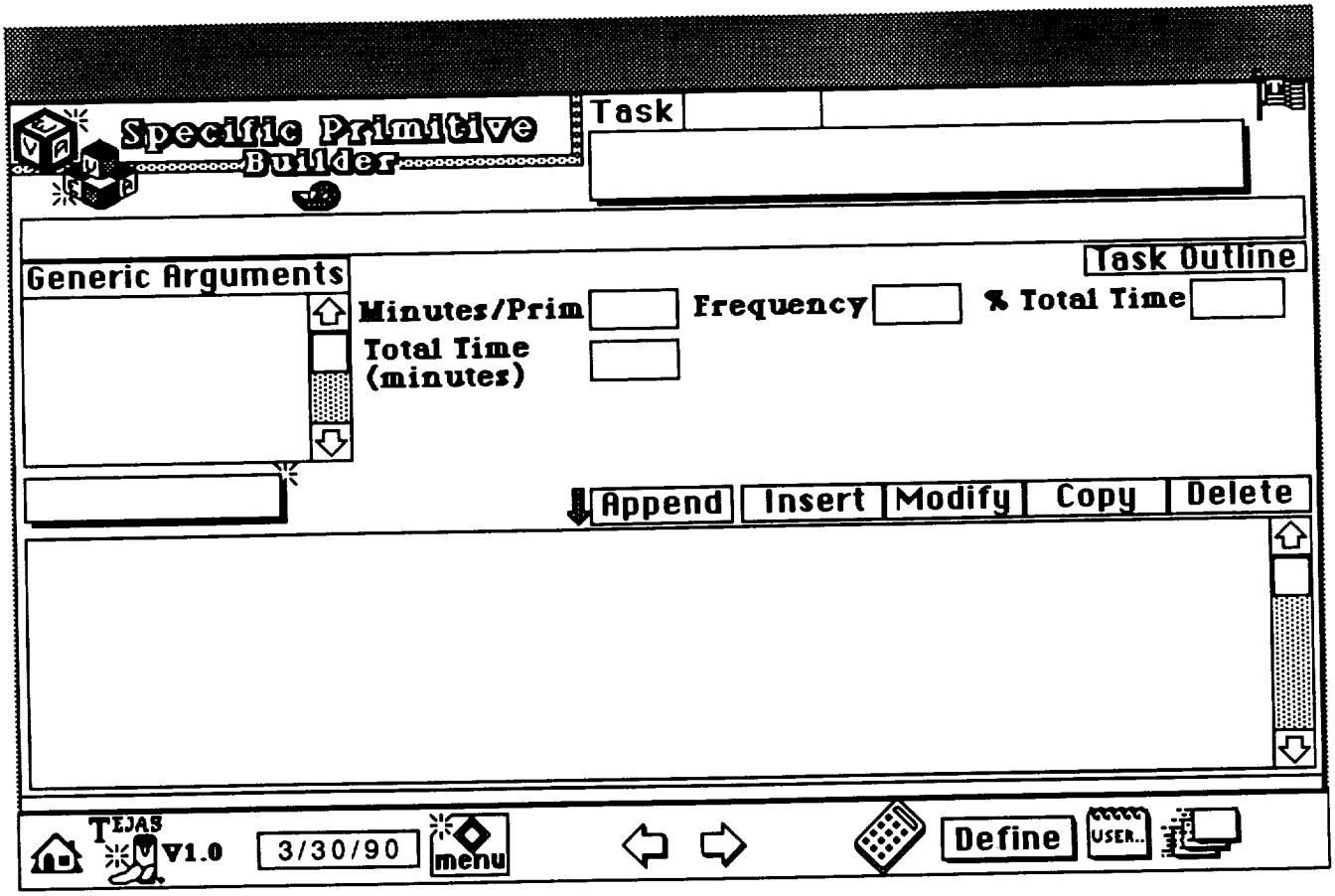
EVASpecPrim Tools - EVASpecPrims List

The EVA Specific Primitives List is the fourth card in all 'EVATask.####' specific task stacks when these stacks are created (see 'EVATask.5058 Example Stack,' Help section 9.3). This card's purpose is as follows:

1. To provide a complete listing of all the specific primitives created for that specific task stack in a readily printable, transferable scrolling field.

2. To provide an automatic export routine for writing the specific primitives list to one or two text-only files ("Transfer spreadsheet" and/or "Transfer document"), which it creates for this purpose. This allows you to operate on the newly created specific primitives and their durations in another analysis tool, including those in other microcomputer formats (e.g., DOS).

3. To provide a sophisticated way of archiving specific primitives in the EVASpecPrim Archives stack (see Help section 9.2), for quick use in another specific task stack if desired.



EVASpecPrim Tools - EVASpecPrim Builder

The EVA Specific Primitives List card is the fifth card of all 'EVATask.####' specific task stacks when these stacks are created (see 'EVATask.5058 Example Stack,' Help section 9.3). This card's purpose is as follows:

1. To provide an intuitive, semi-automated mechanism for building and modifying specific primitives that 'script' a specific crew-EVA task in an 'EVATask.####' stack (see 'Building Specific Primitives,' section 9.3.7).

2. To create card records (of background EVASpecPrim.bg, the same as this card) for each specific primitive built within the specific task stack, each card record listing the primitive and its ancillary information (see 'Analysis Fields,' Help section 9.1.13).

2. To automatically keep track of the frequency of occurrence of each specific primitive within a specific task through use of the Append, Insert, Modify and Delete card buttons (see 'Analysis Buttons,' Help section 9.1.14).

EVASpecPrim Tools - EVASpecPrim Builder

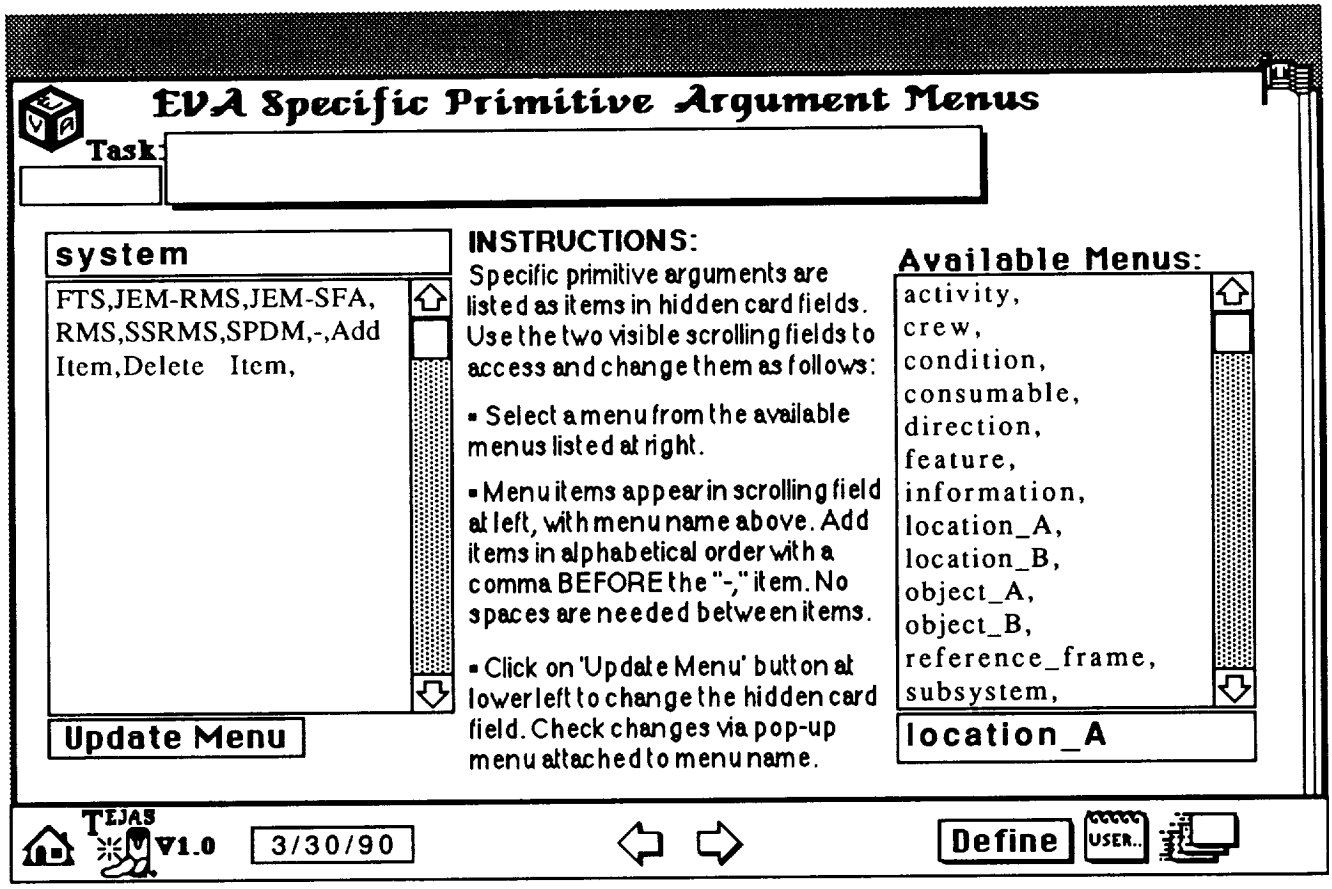
The Specific Primitive Builder card contains three card fields and nine card buttons. These are not present on the card records of the specific primitives (created within a specific task stack; see 'EVATask.5058 Example Stack,' Help section 9.3) that share this same 'EVASpecPrim.bg' background. Therefore, although the appearance of this EVA Specific Primitive Builder card is similar to the specific primitive card records, it is unique in function and importance (please see the next card).

The HyperTalk scripts attached to the card buttons and fields on the EVASpecPrim Builder card are quite complex. Together, they take most of the work out of building specific primitives for any task. To do this, they work in concert with other card-based utilities, such as the argument menus available from the EVASpecPrim Arg menus card (Help section 9.1.9) and the primitives menu available from the EVAPrimitives Menu Builder card (Help section 7.4.15). Please read the entire 'EVATask.5058 Example Stack,' Help section 9.3 for a full understanding of the analysis process.

EVASpecPrim Tools - EVASpecPrim Builder

The greatest utility of the EVASpecPrim Builder is as a standardization tool. Here's why: ultimately, all specific primitives built with this card originate with a generic primitive from the EVAPrimitives stack (Help section 7.4). The EVAPrimitives stack's generic primitive verbs and syntaxes were compiled from the task analysis community's lists through a process of combination, mutual review, integration and comment resolution. Therefore, ALL resulting specific primitives built on this TEJAS card have a common, integrated, generic root. That means that anyone with a copy of TEJAS can understand exactly what every specific primitive in ANY task script means and how it is related to its like verbs and antonyms by checking its root generic primitive in the EVAPrimitives stack (two mouse clicks).

For a complete explanation of the compilation of the EVAPrimitives and TelePrimitives, please read "Generic Extra-Vehicular Activity (EVA) and Telerobot Task Primitives for Analysis, Design, and Integration, Version 1.0: Reference Compilation," JPL Publication 90-10.



EVASpecPrim Tools - EVASpecPrim Arg Menus

The EVA Specific Primitives List is the sixth card of all 'EVATask.####' specific task stacks when these stacks are created (see 'EVATask.5058 Example Stack,' Help section 9.3). This card's purpose is as follows:

1. To provide a way for you to build, maintain, and modify pop-up menus for all specific arguments that replace the generic arguments in a root generic syntax (see 'Building Specific from Generic Primitives,' Help section 7.4.9, and the generic arguments list on the EVAPrimitives 'Parsing Scheme Card' Help section 7.4.14).

2. To provide the above capability on a card within each specific task stack, so that the menus can be optimized for that task. The argument menus are reduced to manageable menus that list only the tools, objects, consumables, etc. involved in that task instead of a 'master list' of all possible menu items. This organization also makes it easier to use a future hypermedia stack of tools and services, consumables, safety procedures, etc. for detailed reference.

The card fields of this card store default menus for all the generic arguments included in the generic syntaxes of the EVAPrimitives stack's cards. The items in each of the menu card fields can be substituted for the generic syntax arguments when building a specific primitive from a generic one on the EVASpecPrim Builder card (see 'Building Specific Primitives,' Help section 9.3.7).

The items that appear can be changed in two ways: by changing the menu directly on the EVASpecPrim Arg Menus card, or by using the Add Item or Delete Item input devices (see 'Analysis Menus,' Help section 9.1.15). But if a menu is changed in this stack, ALL of the specific task stacks built thereafter will have this new version of the menu when originally created (see 'EVATask.5058 – Stack Organization,' Help section 9.3.3).

The best way to use this Arg Menus card is to archive it as released in TEJAS V1.0, then change the default menus to suit the needs of each task.

EVASpecPrim Tools Stack - Card Backgrounds

There are three different backgrounds in these stacks. By specific name:

EVASpecPrims List.bg: used only for the EVA Specific Primitives List card, card name EVASpecPrims List; (see Help section 9.1.7).

EVASpecPrim.bg: used for the EVA Specific Primitive Builder card, card name EVASpecPrim Builder, and for all Specific Primitive Record Cards created by the EVASpecPrim Builder card in the process of performing task analysis in TEJAS; (see Help sections 9.1.8 and 9.3.4).

EVASpecPrim Args.bg: used only for the EVA Specific Primitive Argument Menus card, card name EVASpecPrim Arg Menus; (see Help section 9.1.9).

EVASpecPrim Tools Stack - Common Fields

The three backgrounds in this stack have two common fields: Task and SpecTask Number. Field specifications are below.

Task: locked, labeled shadow field at top center or top right. Automatically assigned the specific task name when the three cards in this stack are copied into a specific task stack. Do not attempt to change the contents of this field; it must match the Task field on the interrelated task summary, assumptions, and open issues cards of any EVATask.#### stack.

SpecTask Number: locked, unlabled, rectangle field at top left or top center that quickly identifies the stack. Automatically assigned the four- or five-digit ID number when a specific task stack is created (see 'Relating Tasks, Assumptions, and Open Issues,' Help section 8.1.7). This field must match the corresponding field on the interrelated task summary, assumptions, and open issues cards of any EVATask.#### stack.

EVASpecPrim Tools Stack - Common Buttons

menu - The SpecTask Menu button (at bottom left) provides an easy way to navigate around the seven most important cards in a specific task stack. Its pop-up menu (denoted by the ⁜ sign and shown below) gives you a choice among the major seven cards in a specific task stack. Selecting and releasing on any item takes you directly to that card in the stack, for faster navigation among these baseline cards.

Task Summary
Assumptions
Open Issues
SpecPrims List
SpecPrim Builder
Arguments Menus
Primitives Menus

This button works within the EVASpecPrim Tools card for the three cards in that stack only. It is present on the task summary, assumptions, open issues and primitives menu builder cards for each specific task as well, but remains hidden on those cards until a specific task stack is built (see 'Building a Specific Task,' Help section 8.1.12).

EVASpecPrim Tools Stack - Analysis Fields

NOTE: The analysis fields in this stack are not common to the three card backgrounds, and are unusable until included in a specific EVATask.#### stack. The specifications that follow, by card, explain the purpose of each field to the task analysis.

More than anything else, these analysis fields are what guided the design of the three tool cards in this stack. Moreover, there is still room for more fields, as numerical background fields associated with each specific primitive on the EVASpecPrim.bg cards, or as text or graphics fields on a new background. As you perform task analysis, keep in mind what future capability you would most like to add. Then either send your comments to the TEJAS Editor, or attempt to build a new tool card yourself.

EVASpecPrim Tools Stack - Analysis Fields

EVASpecPrims List card:

SpecPrims List: locked, labeled, visible scrolling text field at center of card. Its purpose is to show a large segment of the script of specific primitives for that task as you build them. A HyperTalk script automatically keeps it updated with whatever appears in the corresponding (but smaller) SpecPrims List field on the EVASpecPrims Builder card. Whatever changes you make to the specific primitives on the EVASpecPrims Builder card will show up in this field.

Total Time: locked, labeled, visible rectangle field at upper right. Updated with the running total of combined specific primitive times when the Calculate button is used (see Help section 9.1.14).

EVASpecPrim Tools Stack - Analysis Fields

EVASpecPrim Builder card:

Syntax: unlocked, unlabeled rectangle field at top center. Background field, common to this card and all specprim record cards (see 'Specific Primitive Record Cards,' Help section 9.3.4). Used as a work field to display and modify primitives before inclusion in the specprims list.

PrimMinutes: unlocked, labeled (as Minutes/Prim) rectangle field at middle center. Enter duration for each specific primitive here in minutes (e.g., 1.2). Affects Total Time and pctTotalTime fields.

Frequency: locked, labeled rectangle field at middle center. Maintained automatically by five card buttons – Append, Insert, Modify, Copy and Delete (see Help section 9.1.14) – as the list of specific primitives is built within each specific task stack (see 'Maintaining the Frequency,' Help section 9.3.13). Affects Total Time and pctTotalTime fields.

EVASpecPrim Builder card (cont'd):

Total Time: unlocked, labeled rectangle field at middle center. Automatically updated by the Calculate button (see Help section 9.1.14) by summing the product of the Frequency and PrimMinutes fields for each specific primitive record card.

pctTotalTime: unlocked, labeled (as '% Total Time') rectangle field at middle center. Automatically updated by the Calculate button (see Help section 9.1.14) by dividing the product of the Frequency and PrimMinutes fields for each specific primitive record card.

EVASpecPrim Builder card (cont'd):

SpecPrims List: locked, unlabeled, visible scrolling text field at bottom center; shows six lines of the list of specific primitives for that task as you build them. Works interactively with the five card buttons Append, Insert, Modify, Copy and Delete (Help section 9.1.14). Primitives may be appended in one step, but must be selected (by pointing to them with the cursor and clicking on the mouse, so that the primitive line highlights) before inserting, modifying, copying, or deleting. For a step-by-step explanation of each of these processes, see Help sections 9.3.8 to 9.3.12.

EVASpecPrim Arg Menus card: no analysis fields; see 'Analysis Menus,' Help section 9.1.15.

EVASpecPrim Tools Stack - Analysis Buttons

NOTE: The analysis buttons in this stack are not common among the three card backgrounds, and are unusable until included in a specific EVATask.## ## stack. The specifications that follow, by card, explain the purpose of each button to the task analysis.

EVASpecPrims List and EVASpecPrim Builder cards:

- The Calculate button (at bottom right) automatically recalculates the Total Time field on the EVASpecprims List card and the Total Time and and % Total Time fields on the EVASpecPrim Builder card. These calculations are based on the PrimMinutes and Frequency fields of each specific primitive record card, which are created in each specific task stack when a new specific primitive is added to the specprims list on the EVASpecPrim Builder card (see 'Building Specific Primitives,' Help section 9.3.7).

EVASpecPrim Tools Stack - Analysis Buttons

EVASpecPrims List card: Write List: ☐ to Transfer spreadsheet ☐ with minutes ☐ to Transfer document ☐ with minutes

These five background buttons work together to provide the only automated output device within TEJAS Version 1.0. Nowhere are you more likely to export detailed information from TEJAS V1.0 than in a specific task stack. Here, the specific primitives (specprims) list is the end result, and the possible starting point for more analyses in existing spreadsheets and databases.

To export the specprims list, check the appropriate boxes for output with or without the specprim durations (in minutes), then click on Write List. The button will create the text-only files 'Transfer spreadsheet' and/or 'Transfer document' for you (the names are simply serve to keep them straight). When opened as a spreadsheet or a word-processed document, the specprims list 'with minutes' will be a two-column file.

EVASpecPrims List card cont'd:

Archive List - The specific primitives created in each EVATask.#### specific task stack are collected on individual card records within that stack (see 'Specific Primitive Record Cards,' Help section 9.3.4). There they form an expandable file of discrete steps in the task. You can always Copy, Modify and Append or Insert these specific primitives within that same specific task stack (see the other cards in this section and Help sections 9.3.8 to 9.3.12). But what if these same specific primitives can be used in another, similar task? How can you avoid rebuilding them? For that utility, you need ready access to all specific primitives you ever created, in ANY specific task stack. The Archive List button and the EVASpecPrim Archives stack (Help section 9.2) make that possible. More --->

When you click on this button, the message shown at right appears. You can cancel at this point.

EVASpecPrims List card cont'd:

Archive List cont'd -

If you choose to archive the list of specific primitives visible on the EVASpecPrims List card, the cursor turns to a busy symbol and the screen freezes. One by one, the HyperTalk script checks for the presence of each specific primitive in the EVASpecPrims Archive stack. For example, if your specific primitives list included "EV1 EGRESS airlock" (a fairly common step) and that primitive had been previously archived on the verb card EGRESS, the script will move on to the next specific primitive. But if for example, the next specific primitive were "EV2 EGRESS airlock after EV1 is clear," and this primitive had NOT been archived, then the primitive, its duration in minutes, and the name of its origin stack (EVATask.####) would be copied onto the EGRESS card in EVASpecPrim Archives (see Help section 9.3.14).

EVASpecPrim Tools Stack - Analysis Buttons

EVASpecPrim Builder card:

- The 'EVASpecPrims block' button at the upper left corner and its companion the 'EVASpecPrims stacked blocks' button use the same customized, powerful script as the 'EVAPrimitives block' button in the EVAPrimitives stack to access a set of updateable selection menus of the generic EVAPrimitives' verbs maintained by the 'Menu Builder Master' card in the EVAPrimitives stack (see Help sections 7.4.12 and 7.4.15).

As with the button in the EVAPrimitives stack, pressing either of the above two buttons reveals up to seven numbered buttons, according to the number of menus specified by the Menu Builder card (see below).

M1 M2 M3 M4 M5 M6 M7

S1 S2 S3 S4 S5 S6 S7

More --->

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

EVASpecPrim Tools Stack - Analysis Buttons

M1 M2 M3 M4 M5 M6 M7

POSITION
PROCESS
PULL
PUSH
QUERY
RECHARGE
RECORD
RELEASE
REMOVE
REPORT
RESTRAIN
RESUME
RESUPPLY
RETRACT
ROTATE
ROUTE

NOTE:
This is a custom menu system.

Please send comments!

Clicking and holding down on any of the M or S buttons immediately causes a pop-up menu to appear with primitive verbs, starting and ending as specified by the Menu Builder card. Non-selectable verbs are shadowed; they are the deleted (omitted) primitives left in the EVAPrimitives stack for traceability. All other boldface verbs are selectable.

Releasing the mouse on a deleted verb or off the menu will cause the menu to disappear. That's all. Nothing else will happen.

Releasing the mouse on a selectable verb causes one of two things to happen:

More --->

TEJAS V1.0 | Help Menu | Define | USER..

EVASpecPrim Builder card (cont'd):

These card buttons do not function in the EVASpecPrim Tools stack. But in a specific task stack, they are used to retrieve generic primitive syntaxes (using the M buttons) or archived specific primitives (S buttons) into the syntax field on the SpecPrim Builder card. You can then type new arguments into the primitive directly, cut and paste them using the Generic Arguments menus (Help sections 9.1.15 and 9.3.7), change the duration, or change nothing at all, before Appending or Inserting the resulting specific primitive into the SpecPrims List for that specific task.

For a step-by-step explanation of this process, see the EVATask.5058 example stack.

EVASpecPrim Builder card (cont'd):

Generic Arguments - This rectangle card button at top left (below the Syntax field) automatically pulls out the generic arguments from any primitive in the Syntax field and lists these arguments in order of occurrence in the Generic Args scrolling field (see 'Analysis Menus,' Help section 9.1.15). This same script is used by the button's script after you have used the set of pop-up, 'M-button' menus to retrieve a generic primitive syntax from the EVAPrimitives reference stack into theSyntax field on the SpecPrim Builder card (see earlier cards, this Help section).

As an example, suppose you were building a specific primitive from the generic syntax "(crew) HANDOFF (object_A) to (crew/system)" and had modified it to read "EV1 HANDOFF ORU2 to (crew/system)". Clicking on the Generic Arguments button would cause the last two remaining generic arguments "crew" and "system" to appear in the Generic Args scrolling field.

EVASpecPrim Builder card (cont'd):

- The 'TapeIt' button is used to paste a specific primitive argument chosen from the arguments menus onto text selected in the Syntax line. The specific argument you are pasting will appear in the message box when selected (see 'Building Specific Primitives,' Help section 9.3.7 for a complete example of this button's use).

[Task Outline] - This card button at middle right hides and shows the task outline in a scrolling text field that appears over the numerical fields, to save space on this card. This function gives you the ability to check where you are in the task scripting process without leaving the EVASpecPrim Builder card, saving you trips back to the task summary card to review the outline.

EVASpecPrim Builder card (cont'd):

The following five card buttons perform the functions of a line editor on the list of specific primitives found in the SpecPrims List field.

[Append] [Insert] [Modify] [Copy] [Delete] They are specified in detail on the following cards.

All five card buttons work interactively with the background analysis fields Syntax and SpecPrims List and the ancillary number fields PrimMinutes, Frequency, Total Time, and pctTotalTime (see Help section 9.1.13).

The most important thing to remember about these text manipulation buttons is that although they are complex, they're not mysterious. Their HyperTalk scripts are heavily commented, to explain each step. If the Help cards and your own experimentation fail to help you grasp their function and significance, try printing out the button scripts and reading them. For a step-by-step example of their operation, read Help section 9.3.

EVASpecPrim Builder card (cont'd):

Append - This button takes the contents of the Syntax field at top and appends them to (adds that line to the end of) the SpecPrims List scrolling field at bottom. Before it does so, it checks the specific primitive record cards in that specific task stack for the new specprim. If found, it updates the Frequency count by one on that primitive's record card; if there is no record card for this exact primitive, the script creates one and stores the new primitive on it. In either case, it adds the primitive at the end of the specprims list, and updates the Frequency field accordingly.

Append works in one step. Unlike the other four text manipulation card buttons, no specific primitive in the SpecPrims List field must be selected first - whatever is in the Syntax field is immediately appended. Therefore, this button is separated from the other four card buttons, and carries the down arrow as a reminder to think before using it.

EVASpecPrim Builder card (cont'd):

Insert - This button works in TWO STEPS to insert the Syntax field at top after an insertion point (any line you choose) in the SpecPrims List below.

Step 1: When you are ready to insert a new specprim, click on the primitive in the SpecPrims List field that you want the new specprim to follow. That line will highlight; this is your insertion point.

Step 2: Click on the Insert button. The button's HyperTalk script checks the specific primitive record cards in that specific task stack for the new specprim. If found, the script updates the Frequency count on that primitive's record card by one; if there is no record card for this exact primitive, the script creates one and stores the new specprim on it. In either case, the script then adds the primitive immediately after the highlighted primitive in SpecPrims List, and updates the Frequency field accordingly.

EVASpecPrim Builder card (cont'd):

[Modify] - This button works in THREE STEPS in conjunction with the Syntax field at the top of the EVASpecPrim Builder card to change whatever specific primitive you choose in the SpecPrims List at bottom.

Step 1: Select the specific primitive you wish to change in the SpecPrims List field by clicking on it. That specprim's line will highlight.

[Cancel] [Modify] Step 2: Click on the Modify button. The button will highlight and a Cancel button will appear directly above it (shown).
The specific primitive you selected will appear in the Syntax field at the top of the SpecPrim Builder card, along with its duration in minutes and frequency of occurrence in the PrimMinutes and Frequency fields. The selected line will revert to normal (unhighlighted), and you will be ready to modify the specific primitive and/or its duration.

More --->

EVASpecPrim Builder card (cont'd):

[Modify] Step 3: Make your modifications to that specific primitive.
At this point, you have four possible alternatives:

1. Cancel the Modify process by clicking on the Cancel button. If you do, the Cancel button disappears and the Modify button returns to normal (unhighlighted). The primitive you selected still appears in the Syntax field; you can continue to change and Append or Insert it into the SpecPrims List if you wish. In this respect, canceling Modify is similar to using the Copy button.

2. Modify nothing at all in the primitive, but complete the Modify process by pressing the Modify button again anyway. In this case, nothing will change in the specprims list or in the specific primitive's record card, because the Modify script will register no change.

More --->

EVASpecPrim Builder card (cont'd):

Modify Step 3 (cont'd):

3. Modify only the duration of the primitive in the PrimMinutes field. Then if you complete the Modify process by pressing the Modify button again, this duration will be changed for all occurrences of that same specprim in the list, but the specific primitive itself will not change.

4. Modify the specific primitive and/or its duration, then complete the Modify process by pressing the Modify button again.

After the highlighted Modify button is pressed again, its HyperTalk script has to treat the primitive in the Syntax field as an unknown.

More --->

EVASpecPrim Builder card cont'd:

Modify Step 3 (cont'd):

The Modify button's HyperTalk script checks the specific primitive record cards in that specific task stack for the modified specprim. If the specprim is there, it means either you didn't change the primitive or you modified it inadvertently into another specprim already in the list. The script knows which; if you created an existing primitive by modification, the script updates the Frequency count by one on that primitive's record card.

If there is no record card for this exact primitive, the script creates one and stores the new specprim on it. In either case, the script then changes the specific primitive you originally selected in the SpecPrims List in Step 1 to the modified specific primitive in the Syntax field.

EVASpecPrim Tools Stack - Analysis Buttons

EVASpecPrim Builder card (cont'd):

[Copy] - This button works in TWO STEPS to transfer any specific primitive you choose in the SpecPrims List field into the Syntax field at top. This allows you to change it and then Append or Insert it into the list, without having to build it anew from its generic primitive syntax.

Step 1: Select the specific primitive you wish to copy in the SpecPrims List field by clicking on it. That line will highlight.

Step 2: Click on the Copy button. The script will place the specprim in the Syntax field at top and retrieve its ancillary information into the PrimMinutes, Frequency, pctTotalTime and Total Time fields from the record card for that specprim. You can now change it, then Append or Insert it into the specprims list.

EVASpecPrim Tools Stack - Analysis Buttons

EVASpecPrim Builder card (cont'd):

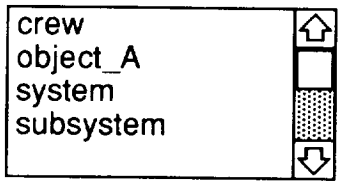
[Delete] - This button works in THREE STEPS to remove any specific primitive you choose from the list of specific primitives for a specific task.

Step 1: Select the specific primitive you wish to delete in the SpecPrims List field by clicking on it. That line will highlight.

Step 2: Click on the Delete button. The script will place the specprim in the Syntax field at top and retrieve its ancillary information from the record card for that specprim. The message "Delete that specific primitive?" appears, giving you a chance to Cancel your deletion. To complete the deletion, click on the OK button. The Delete script will remove that occurrence of the specprim from the SpecPrims List, and either reduce its Frequency count by one, or delete the entire record card for that specprim if it only occurs once in the list.

NOTE: The analysis menus within this stack are not common to the three card backgrounds. They are active without first being included in a specific EVATask.#### stack. The specifications that follow, by card, explain the purpose of each menu in performing task analysis in a specific task stack.

EVASpecPrim Builder card:



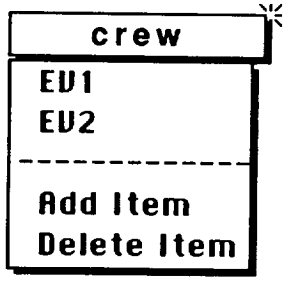
- 'Generic Args' is a locked, visible scrolling card field on the EVASpecPrim Builder card below the 'Generic Arguments' button (see Help section 9.1.14; example arguments shown).

A HyperTalk script turns the field into a choice field; that is, any argument selected (clicked on) from the field briefly highlights, then appears in the 'Argument' field below for access to the pop-up menu of specific arguments that can replace the generic one.

EVASpecPrim Builder card (cont'd):

- 'Argument' is a locked, visible shadow card field on the EVASpecPrim Builder card, just below the 'Generic Args' field. The ⁜ symbol shows that it supports a pop-up menu of specific arguments taken from the EVASpecPrim Arg Menus card. This field looks and acts like any button with a pop-up menu; but unlike the TEJAS boot button (see Help section 6.2), this menu changes depending on the generic argument appearing in the field.

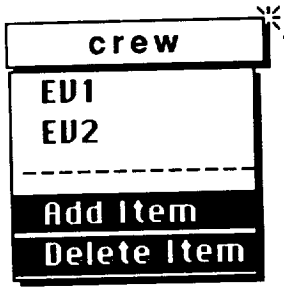
As an example, suppose the Argument field contains the generic argument "crew" (shown). Pressing on the field causes the pop-up to appear (shown at right).



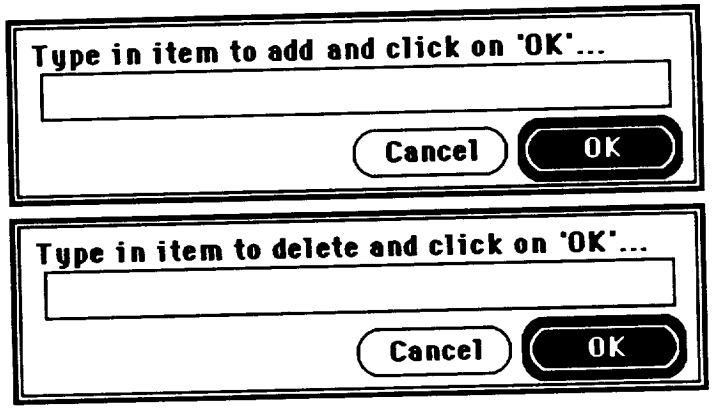
You can add or delete items from the menu here, or on the EVASpecPrim Arg Menus card... More --->

EVASpecPrim Tools Stack - Analysis Menus

EVASpecPrim Builder card cont'd:



To add or delete an item from any pop-up argument menu, select 'Add Item' or 'Delete Item.' One of these messages will appear:



You can cancel the process at this point. Typing in an item and clicking OK will give you either an "Item added. Pop menu to check." message or an " Item deleted. Pop menu to check." message. The item will be either added or deleted from the menu just above the dashed line before Add Item.

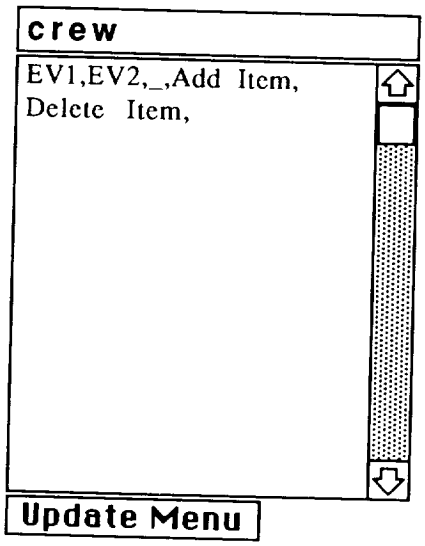
EVASpecPrim Tools Stack - Analysis Menus

EVASpecPrim Arg Menu card:

The EVASpecPrim Arg Menus card is where the menus accessed with the Argument field of the SpecPrim Builder card are actually stored. Each generic argument from the generic EVAPrimitives' syntaxes has it own individual, hidden card field, with appropriate specific arguments listed as items (e.g., the 'crew' menu contains "EV1,EV2,-,Add Item, Delete Item"). By going directly to the EVASpecPrim Arg Menus card within a specific task stack and changing the menus there, you can quickly provide a complete set of menus containing items customized to the task you're analyzing. This avoids adding and deleting items one at a time and speeds up the analysis.

Only two scrolling fields are visible on the EVASpecPrim Arg Menus card: 'Mod Menu' on the left and 'Menu List' on the right, with empty space between. These two fields work interactively with others. More --->

EVASpecPrim Arg Menu card (cont'd):



<-- Menu Name – holds the name of the generic argument selected from the Menu list scrolling field at right (see next Help card). The Menu Name field provides a pop-up menu that shows how the specific argument items will appear when the menu is called on the SpecPrim Builder card's Argument field.

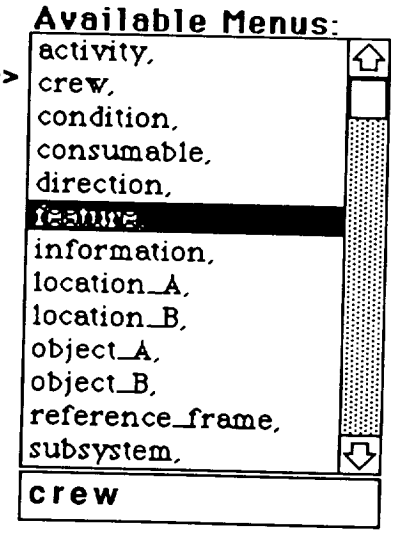
<-- Mod Menu – this field is unlocked. In it appear the menu items from any hidden argument field whose name appears in the Menu Name field above. You can add, delete, or change items by typing them in here directly – in alphabetical order, with a comma – and then clicking on Update Menu.

EVASpecPrim Arg Menu card (cont'd):

To get the menu items for each generic argument into the unlocked Mod Menu field, you must click on the argument in the Menu List field (at right).--->

For instance, if you click on 'feature' (shown), the Menu Name field changes to "feature" and the menu of items in the hidden card field 'feature' will appear in the Mod Menu scrolling field.

The name of the menu that previously appeared in Mod Menu ('crew' in our example) appears simultaneously in the 'Precursor' rectangle field immediately below the Menu List (at right).------>



Section 9.2

User Instructions: EVASpecPrim Archives Stack

9.2 User Instructions

Background:

- ☐ 9.2.1 General Information
- ☐ 9.2.2 The User's Role
- ☐ 9.2.3 Changing the Standard
- ☐ 9.2.4 Adding Cards
- ☐ 9.2.5 Deleting Cards

Unique!

- ☐ 9.2.6 Carrying Back Specific Primitives

Stack-Specific Help:

- ☐ 9.2.7 Card Backgrounds
- ☐ 9.2.8 Information Fields
- ☐ 9.2.9 Buttons

Unique!

- ☐ 9.2.10 Menu Builder Card

INSTRUCTIONS:
Click ☐ box to access section;
Click arrows to page through Help stack;
Click 'T-flag' to return to point of origin.

EVASpecPrim Archives

Explanation Card

This stack archives all specific primitives sent to it from any specific task stack (e.g., EVATask.5058). There is a card for each primitive verb, similar to the generic primitive cards in the TelePrimitives stack; however, only the integrated EVAPrimitive verbs have corresponding cards in this stack.

The scrolling field on each card lists all the specific primitives for each primitive verb that were created using the Specific Primitive Builder card in one or more specific task stacks. These archived specific primitives are for INTERNAL USE ONLY. This stack is NOT meant to standardize specific primitives for telerobot work systems, but rather to provide for quick retrieval of primitives created by an analysis group in the course of analyzing a particular set of tasks in a given environment.
Read this stack's TEJAS Help cards carefully!

TEJAS V1.0+ | 3/24/90 | Sort List | Find Verb | Define | USER..

EVASpecPrim Archives - General Information

9.2.1
1 of 1

The EVASpecPrim Archives stack stores all specific primitives sent to it by the Archive List button on the EVASpecPrims list card in any specific task stack (see 'Archiving Specific Primitives,' Help section 9.3.14). The specific primitives are not removable; once archived, they are there permanently.

This stack is organized similarly to the EVAPrimitives stack; there is a separate card for each primitive verb. However, unlike the EVAPrimitives stack, which retains all integrated verbs (part of the interrelated set of TEJAS Version 1.0) and deleted verbs (omitted from that set), the EVASpecPrim Archives stack has cards for only the integrated verbs. Any verb added to the integrated EVAPrimitives' integrated set can be represented here by a new card; the stack is therefore expandable.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

EVASpecPrim Archives - The User's Role

To avoid recreating specprims, this stack can provide a quick listing of specific primitives built by a particular group or organization of analysts. This means INTERNAL USE ONLY. It is critical that you understand why.

Specific primitives created within a specific 'EVATask.####' stack were created under the assumptions and circumstances detailed in that stack. For that reason, these primitives may or may not be usable by another group analyzing other types of tasks, or the same tasks under substantially different circumstances (e.g., more crew, improved tools, etc.). REMEMBER:

- This stack (and the button scripts to use its data) are provided for your convenience only, not in any attempt to 'standardize' specific primitives.

- You must question ALL durations for ANY specprims retrieved from this stack during task analysis in a specific primitives stack.

EVASpecPrim Archives - Changing the Standard

This stack is empty when released in TEJAS Version 1.0. You cannot make any changes in any stack information field, except to add primitives by using the 'Archive List' button on the EVASpecPrims list card in any specific task stack (see 'Archiving Specific Primitives,' Help section 9.3.14). You cannot delete archived primitives either, but you must create a lot of specific primitives to reach the upper limit of 30,000 characters for the field. Nevertheless, you should keep the original, empty stack safely archived.

As a convenience, you can leave detailed notes for other users in the User Notes field. You can also use different copies of this stack to archive specprims from different task analysis projects, if you wish. Such mobile specprim libraries can save time, if you keep the stacks straight.

This stack's contents are a standard for you only. Its format and function were derived from requests from TEJAS beta-testers. Please send the TEJAS Editor written, detailed suggestions for any further changes.

EVASpecPrim Archives - Adding Cards

All integrated primitive verbs in the TEJAS Version 1.0 EVAPrimitives stack are represented here by an archive card. Any new EVAPrimitives must have a corresponding archive card, or their specprims cannot be archived from a specific task stack. Changes to the EVAPrimitives should be standardized by community review, but if you MUST add a new archive card here, then:

1. Go to the Explanation card (first card in the stack).
2. Select 'New Card' from the Edit menu. A blank card will appear.
3. Fill out only the Verb field; you must unlock it or use the 'put' command.
4. Select 'Card Info...' from the Objects menu. Type the verb as the card name. This ensures that the new verb will appear on the primitives menu.
5. Either cut and paste the new card alphabetically by verb, or sort.

NOTE: New verbs will not appear in the EVAPrimitives verb menus until the 'Update' button on this stack's Menu Builder card's has been activated (see 'Menu Builder Card,' Help section 9.2.10).

EVASpecPrim Archives - Deleting Cards

DO NOT DELETE ANY CARDS FROM THIS STACK!

Since this is purely an archive stack, containing only one card for each integrated primitive verb in the EVAPrimitives stack, there should be no need to delete cards. But just in case, a HyperTalk script will prevent deleting and cutting all cards in the stack. Please do not circumvent it.

Carrying Back Specific Primitives

The purpose of the EVASpecPrim Archives stack is to give you the option of copying specific primitives built and used in an earlier EVATask.#### stack into your current specific task stack. But having the stack is not enough; there should be a quick way to find the specprim you want in the archive cards (provided by a menu button, see Help section 9.1.14), to see where it originated (the Origin field, Help section 9.2.8), and to return with it to your specific task stack (the Carry Back button, Help section 9.2.9).

Carrying back specific primitives is optional; should you enter the EVASpecPrim Archives stack from a specific task stack and then decide to return to that EVATask.#### stack without carrying back a specprim, you can do so by clicking on the button at the top right corner of any archive card, even if you have viewed several different archive cards.

EVASpecPrim Archives - Card Backgrounds

There are two different backgrounds in this stack. By specific name:

EVASpecPrim Archives.bg – main background for this stack. Different cards for each verb primitive. Incorporates primary information fields: eight visible background fields of different types, two hidden scrolling fields.

EVAPrimsMenu.bg – specialized, for the Menu Builder Card only. Unlocked, but a reference for all information cards in the stack. Changes are best made via the User Notes comments field (Help section 6.5).

EVASpecPrim Archives - Information Fields

There are five information fields common to the 'EVASpecPrim Archives.bg' background: Verb, EVASpecPrims, EVASpecPrims.complete, Copied SpecPrim, PrimMinutes. Field specifications follow.

All fields are locked and may NOT be changed. This stack is a pure archive; only specific primitives built within TEJAS specific task stacks are sent to it. Please do not unlock any fields or delete any items from them; this would harm the functionality of the stack.

Field specifications:

Verb: locked, unlabeled shadow field at top right. Contains one- or two-word primitive verb from the EVAPrimitive verbs in that stack. Cards exist for integrated verbs only; this stack has no card archives for specific primitives derived from deleted (omitted) primitives.

EVASpecPrim Archives - Information Fields

Field specifications (cont'd):

EVASpecPrims: locked, visible unlabeled scrolling field across body of card. Contains all archived specific primitives based on the verb each card represents; archiving is accomplished via the 'Archive List' button on the EVASpecPrims List card in any specific task stack (see Help section 9.1.7). This is a large selection field, where primitives you click on are retrieved for use in a specific task stack (see 'Retrieving Archived SpecPrims,' Help section 9.3.15).

EVASpecPrims.complete: locked, hidden unlabeled scrolling field across body of card. Contains all specific primitives, their specific task stack of origin (to provide traceability), and their duration in minutes (example item: "EV1 EGRESS airlock :: EVATask.7632 :: 2"). Hidden in favor of the more readable EVASpecPrims field above, which lists only the specific primitives.

EVASpecPrim Archives - Information Fields

Field specifications (cont'd):

Copied SpecPrim: locked, visible, labeled rectangle field directly beneath the EVASpecPrims field. Filled automatically with specific primitive from EVASpecPrims field when user selects a specific primitive there for retrieval (see 'Retrieving Archived SpecPrims,' Help section 9.3.15).

Origin: locked, visible, labeled transparent field at bottom left on all archive cards. Filled automatically with name of specific task stack where a specific primitive the user selects from the EVASpecPrims field originated and was first archived.

PrimMinutes: locked, visible, labeled (as Minutes/Prim) transparent field at bottom center on all archive cards. Filled automatically with duration of specprim in minutes (if archived) of a specific primitive the user selects from the EVASpecPrims field.

EVASpecPrim Archives - Buttons

EVASpecPrim Builder card:

- The 'EVASpecPrims stacked blocks' button uses the same customized, powerful script as the 'EVAPrimitives block' button in the EVAPrimitives stack to access a set of updateable selection menus of the generic EVAPrimitives' verbs maintained by the Menu Builder Master card in the EVAPrimitives stack (see Help sections 7.4.12 and 7.4.15).

As with the button in the EVAPrimitives stack, pressing on the above button reveals up to seven numbered buttons (as shown below), according to the number of menus specified by the Menu Builder card (see Help section 9.2.10).

S1 S2 S3 S4 S5 S6 S7 More --->

S1 S2 S3 S4 S5 S6 S7

POSITION
PROCESS
PULL
PUSH
QUERY
RECHARGE
RECORD
RELEASE
REMOVE
REPORT
RESTRAIN
RESUME
RESUPPLY
RETRACT
ROTATE
ROUTE

NOTE:
This is a custom menu system.

Please send comments!

Clicking and holding down on any of the S buttons immediately causes a pop-up menu to appear with primitive verbs. Non-selectable verbs are shadowed; they are the deleted (omitted) primitives left in the EVAPrimitives stack for traceability but omitted entirely from this archive stack (i.e., no cards exist for them). All other boldface verbs are selectable.

Releasing the mouse on a deleted verb or off the menu will cause the menu to disappear. That's all; nothing else will happen.

Releasing the mouse on a selectable verb takes you immediately to that verb's archive card in the stack.

Carry Back ○ with mins ◉ without mins - These background buttons are hidden until you select a specific primitive, then they become visible at the bottom right of the archive card. The buttons hide again whenever a card is closed.

If you left the EVASpecPrim Builder card of an 'EVATask.####' stack in search of an archived specprim, and are ready to carry that specprim back for use in your task's script, you must decide whether to take the specprim with or without its archived duration in minutes. The default (preselected) choice is 'without mins' (shown), because it is safer: you cannot tell the assumptions or sequence of events that led to assigning that specific primitive the duration archived with it unless you review its origin.

Either way, clicking on 'Carry Back' returns you to the EVASpecPrim Builder card in the EVATask.#### stack you left and enters the specprim in the Syntax field there (with the duration in the PrimMinutes field, if needed).

EVA Primitives Menu Builder

Update

The 'Update' button on this card (and the scripts attached to the stack) work to build and maintain pop-up menus of the crew-EVA Primitive verbs. On any archive card in the EVASpecPrim Archives stack, click on the stacked EVA blocks (upper left) to show the S1-? buttons, then press an S button to show the pop-up menu and select a verb (try it!).
In this stack (except on this card), selecting a verb takes you to that archive. Each time a new verb card (or a set of them) is added to or deleted from the EVAPrimitives stack, or a primitive's status changes there (say, deleted to included), you must manually order a menu Rebuild from the Master Menu Builder card in EVAPrimitives, then return to this card and Update. Do so sparingly if you make many changes to EVAPrimitives, for it takes time. The menus will not update automatically, so if you notice verbs missing, Update!

ACTIVATE,(ADJUST,ADJUST,ALIGN,ASSEMBLE,(ATTACH,(BERTH,(BOLT,(
CHECKOUT,CLEAN,CLOSE,(CLOSEOUT,(COLLECT,COMMUNICATE,
CONFIGURE,(CONNECT,(CONSTRUCT,(COORDINATE,(COVER,(DEACTIVATE,
(DECONTAMINATE,DEMATE,DEPLOY,(DETACH,(DISCONNECT,EGRESS,(
ERECT,(GRAPPLE,GRASP,(GUIDE,(HANDLE
,HANDOFF,HOLD,(IMPLEMENT,INGRESS,(INPUT,INSPECT,INSTALL,(
LATCH,(LOAD,(LOOSEN,LUBRICATE,MANEUVER,MATE,MEASURE,
MONITOR,(OBSERVE,(OBTAIN,OPEN,(PHOTOGRAPH,(POINT,(POSITION,(
PROCESS,PULL,PUSH,(QUERY,(RECHARGE,RECORD,RELEASE,REMOVE,(

<-This field, updated with each Update, shows all the verbs in the stack. The # of menus is shown below.

4

TEJAS V1.0+ 2/4/90 ZEnd2 Define USER..

EVASpecPrim Archives Stack - Menu Builder Card

9.2.10 1 of 1

The Menu Builder card, last in the stack, maintains the pop-up menus of primitive verbs available from the 'EVASpecPrim stacked block' button (Help section 9.2.9). This card's visible and hidden fields and scripts work to update and store these verb menus, based on the background and card fields of the Menu Builder Master card in the EVAPrimitives stack. The text on the card explains how to use it; note that Updating assumes the EVAPrimitives stack's Menu Builder Master card is current (i.e., has been rebuilt following any changes made to the EVAPrimitives stack).

TEJAS V1.0 3/30/90 Help Menu Define USER..

Section 9.3

User Instructions: EVATask.5058 Example Stack

EVATask.5058 Example Stack Help Menu

Menu 1 of 1

9.3 User Instructions

Background:

- ☐ 9.3.1 General Information
- ☐ 9.3.2 Before You Create Specprims

☐ **Stack-Specific Help:**

- ☐ 9.3.3 Stack Organization
- ☐ 9.3.4 Specific Primitive Record Cards
- ☐ 9.3.5 Configuring Argument Menus
- ☐ 9.3.6 Building a Derivative Task
- ☐ 9.3.7 Building Specific Primitives

Stack-Specific Help (cont'd)

- ☐ 9.3.8 Using the Append Button
- ☐ 9.3.9 Using the Insert Button
- ☐ 9.3.10 Using the Modify Button
- ☐ 9.3.11 Using the Copy Button
- ☐ 9.3.12 Using the Delete Button
- ☐ 9.3.13 Maintaining the Frequency
- ☐ 9.3.14 Archiving Specific Primitives
- ☐ 9.3.15 Retrieving Archived SpecPrims
- ☐ 9.3.16 After You Create Specprims

INSTRUCTIONS:
Click ☐ box to access section;
Click arrows to page through Help stack;
Click 'T-flag' to return to point of origin.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER...

EVATask.5058 - General Information

This is a specific task stack, created as an example that you can follow to better understand how task analysis works in TEJAS. Its list of specific primitives is deliberately incomplete so that you can change them without restriction and experiment with the built-in analysis functions.

Each specific task stack that you build in TEJAS collects and organizes enough information about a particular task to allow you to build a list of specific primitives that approximates the steps the EVA crew will follow to inspect, assemble, service, maintain, reconfigure, or repair space systems. Once you have built and archived these primitives, the job of the specific EVATask.#### task is completed. You can then proceed to other analyses using this specific primitives list with any application on any computer.

NOTE: to save space, the contraction "specprim" will often be substituted for the words "specific primitive."

EVATask.5058 - Before You Create Specprims

The EVATask.5058 stack can be a useful example many times over, but only if you start with it as delivered to you in TEJAS Version 1.0. Since you will change things as you follow instructions in these Help cards, save a copy of the EVATask.5058 stack now, on your hard disk or on a floppy disk.

Don't be afraid to deviate from the instructions on these Help cards and try buttons and menus yourself until you are comfortable with them. This is not a test; the example stack is a learning tool for you.

CAUTION: The HyperTalk code that performs the analysis functions references the names of OBJECTS – buttons, fields, cards, backgrounds, and the stack. These names are accessible to you in the Button Info..., Field Info..., Card Info..., Background Info..., and Stack Info... dialog boxes from the Objects menu (see "Objects menu" in the "HyperCard User's Guide"). In order to ensure proper operation of the stack's functons, please do not alter any object's name!

EVATask.5058 - Stack Organization

As delivered with TEJAS Version 1.0, this example specific task stack has eleven cards. From first to last by name, they are:

- EVATask.5058 (task summary card), from the EVATasks stack
- EVAAssume.5058 (assumptions card), from the EVAAssume stack
- EVAIssues.5058 (open issues card), from the EVAIssues stack
- EVASpecPrims List, from the EVASpecPrim Tools stack
- EVASpecPrim Builder, from the EVASpecPrim Tools stack
- Record card for specprim "EV1 EGRESS airlock"
- Record card for specprim "EV1 TRANSLATE to MSC via slidewire"
- Record card for specprim "EV1 UNSTOW pliers from tool locker"
- Record card for specprim "EV1 UNSTOW wrench from tool locker"
- EVASpecPrim Arg Menus, from the EVASpecPrim Tools stack
- EVAPrimitives Menus, from the EVAPrimitives stack

NOTE: The four record cards were added when those specprims were built.

EVATask.5058 - Stack Organization

Every card in every specific task stack contains the rectangle field SpecTask Number, containing the ID number (5058 in this example stack) included in that stack's name when it the stack is built (see Help section 8.1.12). This locked field is hidden on the task summary, assumptions, and open issues cards in their original form in the EVATasks, EVAAssume and EVAIssues stacks. It is revealed when those cards are copied into a specific task stack, to immediately identify the stack from any card.

The organization of each specific task stack is fixed. Specific primitive record cards are created or deleted (placed in the stack following the EVASpecprim Builder card) as the specprims themselves are created or deleted. You cannot sort the cards in this stack, because the Sort button was hidden when the stack was built. But don't worry. There is an easy way around the seven major cards in any specific task stack using the pop-up menu attached to the SpecTask Menu button (see Help section 9.1.12).

EVATask.5058 - Specific Primitive Record Cards

When you build a new specific primitive on the EVASpecPrim Builder card, an individual card record is created for it (see below).

Specific Primitive | Task 5058 | OMV Maintenance

EV1 EGRESS airlock

Derived from generic syntax of primitive verb: EGRESS

Minutes/Prim 2 | Frequency 1 | % Total Time

Total Time (minutes)

The Minutes/Prim field is the ONLY unlocked field on this card, because it is the only one you should change. TEJAS maintains the Frequency count (showing the number of times that specprim occurs in that task's specprims list), and the Calculate button (Help section 9.1.14) computes the rest.

EVATask.5058 - Specific Primitive Record Cards

The PrimMinutes field (labeled Minutes/Prim) is the ONLY unlocked field on this card, because it is the only one you should change on this record card.

Specific Primitive | Task 5058 | OMV Maintenance

EV1 EGRESS airlock slowly

Derived from generic syntax of primitive verb: EGRESS

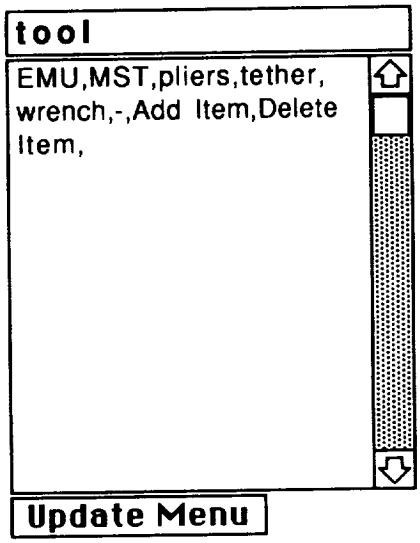
Minutes/Prim 3 | Frequency 1 | % Total Time

Total Time (minutes)

Note that this duration applies to ALL occurrences of the specprim in the execution of that task. The unstated assumption is that if the duration changed, the specprim should change too. In the specprim above, adding "slowly" implies 3 minutes duration (versus 2 for "EV1 EGRESS airlock").

EVATask.5058 - Configuring Argument Menus

You can simplify the work of building specific from generic primitives into a select-and-paste operation by using the argument menus accessed via the Generic Args and Argument fields (Help section 9.1.15) on the EVASpecPrim Builder card.

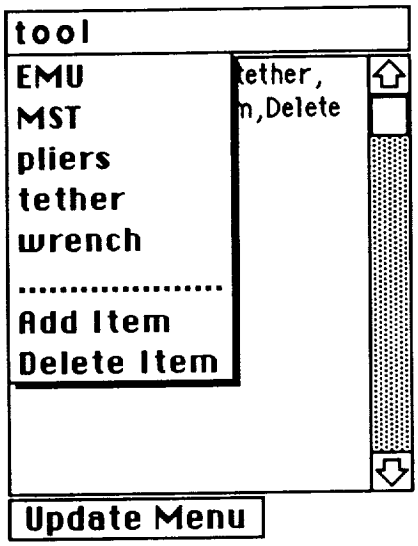


These menus are maintained in the card fields of the EVASpecPrim Arg Menus card found in every specific task stack (Help sections 9.1.9 and 9.1.15). By configuring those card fields BEFORE you begin the analysis, you save adding items one at a time during your later work.

Go to the EVASpecPrim Arg Menus card in the example EVATask.5058 stack and click on 'tool' in the scrolling list of available menus at RIGHT. The fields on the left will appear as shown.

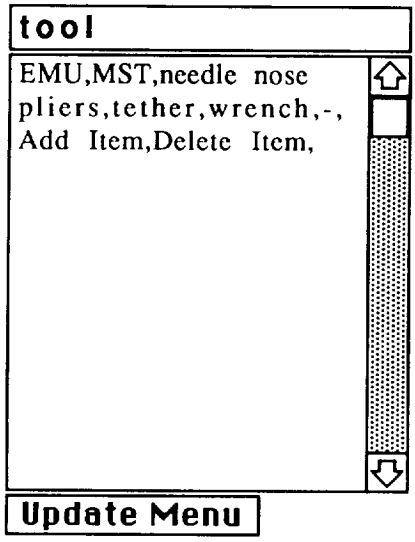
EVATask.5058 - Configuring Argument Menus

The items listed in the ModMenu scrolling field shown below are from the hidden 'tools' card field on this EVASpecPrim Arg Menus card. By selecting 'tool' from the available menus field at right, you have made it possible to modify the items of the card field 'tool' in this ModMenus field, and to view the changes in a pull-down menu.



To check a menu's status at any time, position the mouse cursor over the rectangle field at top left (showing the word 'tool' here) and press the mouse button down. A pull-down menu appears as shown at left. This menu has exactly the same items as those in the ModMenus field, except that each is now on a separate line (thanks to the commas between them), and the hyphen item has inserted a dividing line in the menu. More --->

You should know the list of tools involved in your task. The tools shown in the ModMenu scrolling field previously are the default items of TEJAS V1.0.



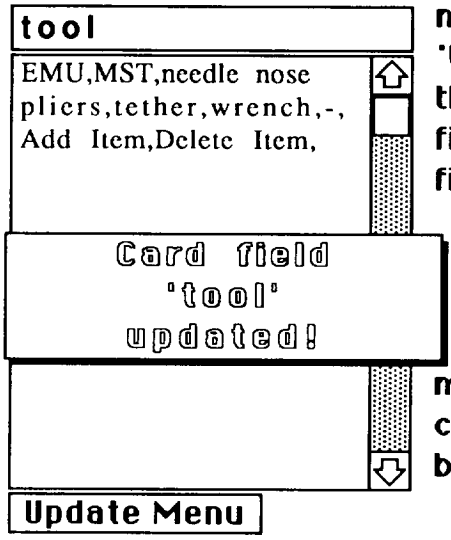
Let's suppose that in addition to these items, you will also need the bolt puller and the EVA bag (for stowing parts). You also want to specify exactly what pliers and wrench will be used; namely, the needle nose pliers and the 1/2-inch drive ratchet.

The ModMenu field is unlocked. Position the cursor just before the word 'pliers' and type 'needle nose' (with a space after 'nose'), so that the list looks as shown at left. Don't worry about the text wrapping around at the end of the field.

Now check the pull-down 'tool' menu. It hasn't changed! Why?

More --->

The process of configuring argument menus allows you to make changes to the menu items and then check them carefully, in case you change your mind or make a mistake. Unless you click on the 'Update Menu' button at bottom left first, none of the changes you make in the unlocked Modmenu field will be copied into the menu's hidden card field, and the menu will not change.



Click on the 'Update Menu' button. The button will highlight, and then a tune will play and the message shown at left briefly appears. This means that you have changed the 'tool' menu's card field. Check the menu by pulling it down as before. Now the third item is 'needle nose pliers.'

More --->

EVATask.5058 - Configuring Argument Menus

Now in the same way, add 'bolt puller' and 'EVA bag' to the list of tools in the ModMenu field and change 'wrench' to '1\2-inch ratchet drive.'

```
tool
1\2-inch ratchet drive
bolt puller
EMU
EVA bag
MST
needle nose pliers
tether
.................................
Add Item
Delete Item
Update Menu
```

Use the Update Menu button to effect the changes. Clicking on the 'tool' pull-down menu will show the menu with the changes (at left).

You can position these new items in any order. The example shown has the items inserted alphabetically, to make scanning them easier for you. Another order will not affect the way the menu works (in fact, the 'Add Item' utility always adds items just before the dividing line).

NOTE: The pull-down menu's width will adjust automatically to accommodate the largest item.

More --->

EVATask.5058 - Configuring Argument Menus

You will not use all menus in all tasks, but only those menus for arguments that appear in the syntax of the generic primitives used as roots to build specific primitives (see Help section 9.3.7). Therefore, you need not configure ALL menus before beginning your analysis. For example, you should not need to configure the 'consumable' menu for any tasks but those involving refueling.

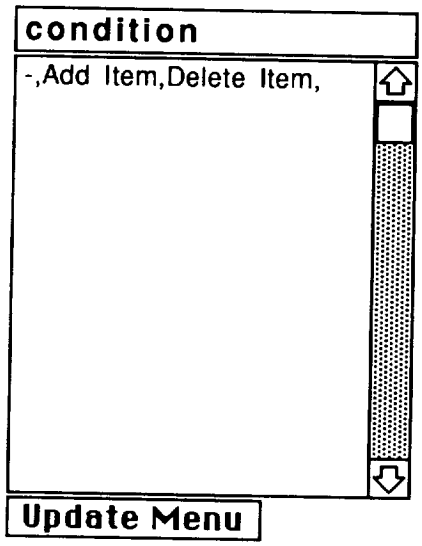
```
direction
clockwise,
counterclockwise,X plus,
X minus,Y plus,Y minus,
Z plus,Z minus,Pitch
plus,Pitch minus,Yaw
plus,Yaw minus,Roll
plus,Roll minus,-,Add
Item,Delete Item,
Update Menu
```

Some menus have no default items (see the next card about the 'condition' menu). Others may not have what you expect or in an order you prefer. The items in the 'direction' menu at left are arranged in the traditional 'X,Y,Z,Pitch,Yaw,Roll' order, without numerical values. These values vary by specprim, and should be typed directly into the specprim as you create it.

More --->

EVATask.5058 - Configuring Argument Menus

In general, an argument menu applies to all uses of that argument to build any task's specific primitives. The 'condition' menu is different, however.



It varies by primitive; there are no default values.

As an example, consider the syntaxes of the two EVAPrimitives ADJUST and VERIFY (below).

(crew) ADJUST (condition) of (object_A)
(crew) VERIFY (condition)

In specifying the arguments of ADJUST's syntax, 'condition' might be replaced with 'flow rate.' This same specific argument could also fit in VERIFY. But 'clearance acceptable' only makes sense in VERIFY, not in ADJUST. This is why the 'condition' menu is your responsibility. More --->

EVATask.5058 - Configuring Argument Menus

Configuring the argument menus is a worthwhile first step in your analysis. For maximum effect, follow these guidelines:

- As a minimum, configure the argument menus for activity, crew, consumable, direction, feature, location_A, location_B, object_A, object_B, subsystem, system, and tool. These are items you should know before the analysis (NOTE: any '_A' and '_B' items should be the same).

- Keep track of these argument menus. Once you build them on one specific task's EVASpecPrim Arg Menus card, they can be used as templates for the same card in another EVATask.#### stack.

- Use the same source of items (e.g, tool catalogs, etc.) for all tasks.

Remember, you can ALWAYS change menus at any point in your analysis, using 'Add Item' and 'Delete Item' or the EVASpecPrim Arg Menus card.

EVATask.5058 - Building a Derivative Task

At any time in any specific task stack, you may decide that you want to repeat the analysis of that task, but with a few changes, while still saving what you have done so far. Perhaps you make new assumptions, resolve an open issue, add a new subsystem or tool, or shorten the task. The 'Build Derivative Task' option in the EVATasks button on the upper left corner of the task summary card allows you to do this. Here's how:

Step 1. Click and hold down on the EVATasks button (shown at left).

Step 2. The button will highlight as shown, and a pop-up menu will appear with "Build Derivative Task" as the only option. If you release the mouse key without selecting anything, the menu will disappear, and the EVATasks button's highlight will return to false, as it was before. But if you select "Build Derivative Task," the following sequence begins:

Build Derivative Task

More --->

EVATask.5058 - Building a Derivative Task

Step 3. When you select "Build DerivativeTask" a dialog box appears, asking you to enter information exactly as prompted to name the stack.

Please enter all information as requested!
OK

Step 4. After clicking on 'OK', another dialog box appears, asking if you're ready to name the derivative stack and giving you a chance to Cancel.

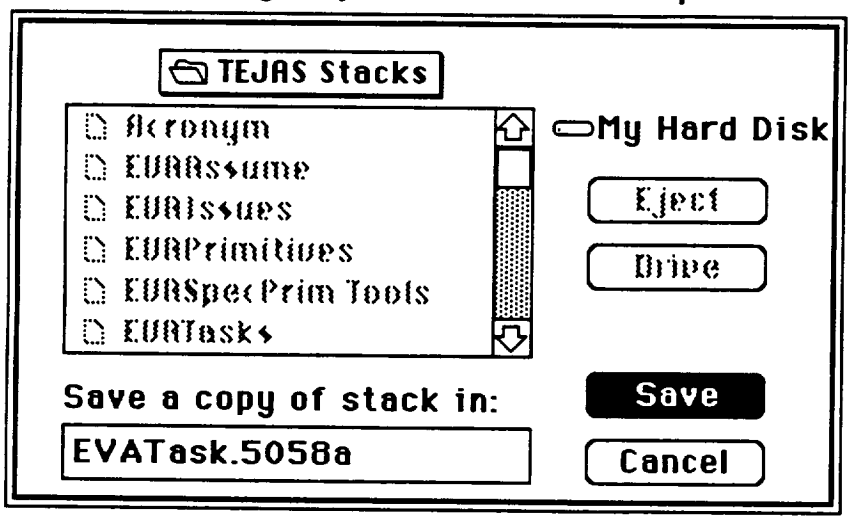
Building derivative task. Ready to name it?
OK Cancel

Step 5. The third dialog box prompts you to make the new stackname related to the original one by adding an unused letter after the name of your current stack. Click OK, and wait for the "New Stack..." dialog box to follow. Then type the name you wish to give your derivative stack.

Add an unused letter after 'EVATask.5058'.
OK

More --->

Step 6. Once having passed the third dialog box, the script will open the 'Save a Copy...' dialog box, highlight "Copy of 'EVATask.5058' " (in our example), and give you the last of two options to Cancel:

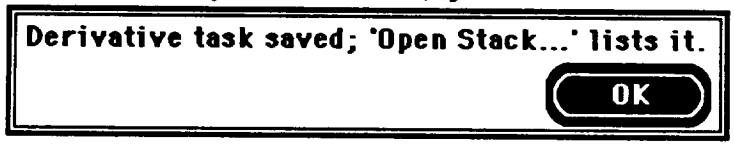


To proceed, change the task name to the suggested derivative ('EVATask.5058a' shown) to create a path to the original task.

Click on the 'Save' button (shown), or press return.

More --->

After filling in the 'Save a Copy...' dialog box and pressing the 'Save' button (or the return key on your keyboard), the dialog box disappears and the cursor turns into the 'watch' symbol. Depending on your Macintosh's processor and RAM configuration, your screen will remain frozen for several seconds while the program saves a copy of the specific task stack under the name you specified. When the process ends, you will see another message:



Click OK. The message disppears; you are back on the EVATask.5058 task summary card. To see the derivative stack you created, choose 'Open Stack...' from the File menu and release on the derivative stack name. The new number (5058a in our example) now appears in the SpecTask Number field on each card.

EVATask.5058 - Building a Derivative Task

Building derivative tasks is a quick way of performing variations on the analysis of any specific task, without redoing the work. But as with any utility, you can overuse it. For maximum effect, follow these guidelines:

- Follow the suggestions for new stacks' names to keep track of derivative task's origins. It helps to know a stack's "pedigree"!

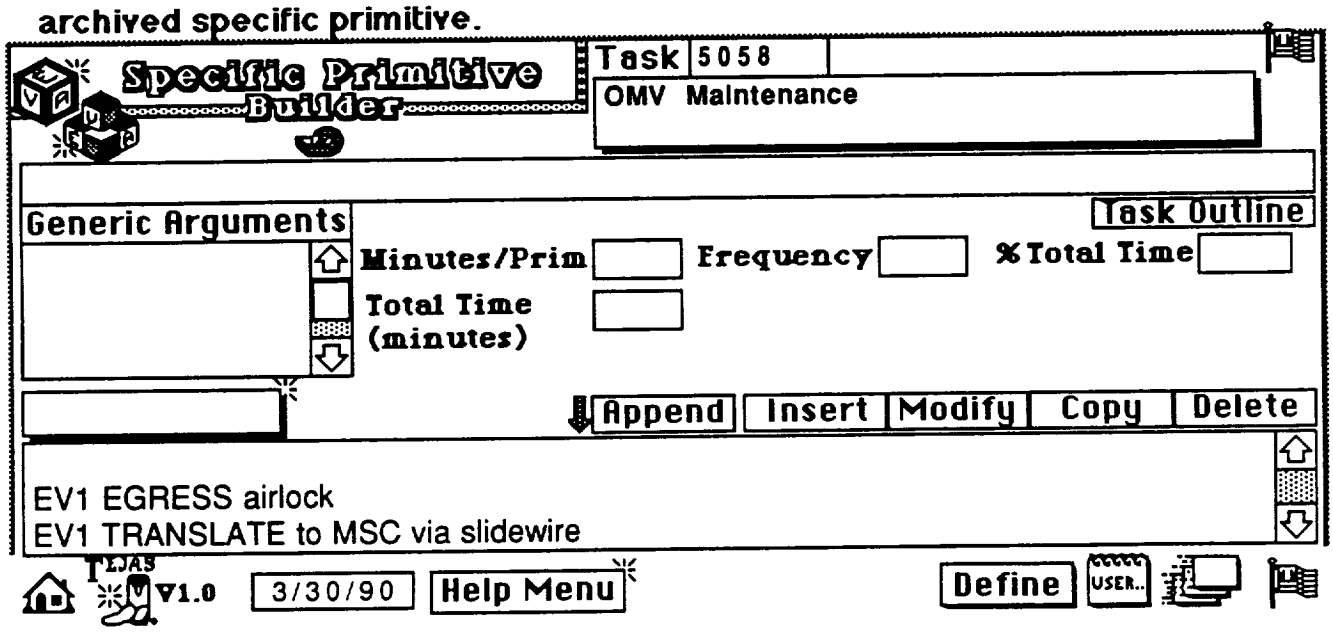
- You can build derivatives of derivative tasks, using the same process (e.g., a derivative of 'EVATask.5058a' might be 'EVATask.5058a1'). Be concise; the SpecTask Number field will wrap around a long number.

- Don't use this utility to save copies of your specific task stacks; use 'Save a Copy...' instead. To save the most work, build derivative tasks after the specprim list is complete for any specific task.

Remember, you can ALWAYS change menus at any point in your analysis, using 'Add Item' and 'Delete Item' or the EVASpecPrim Arg Menus card.

EVATask.5058 - Building a Specific Primitive

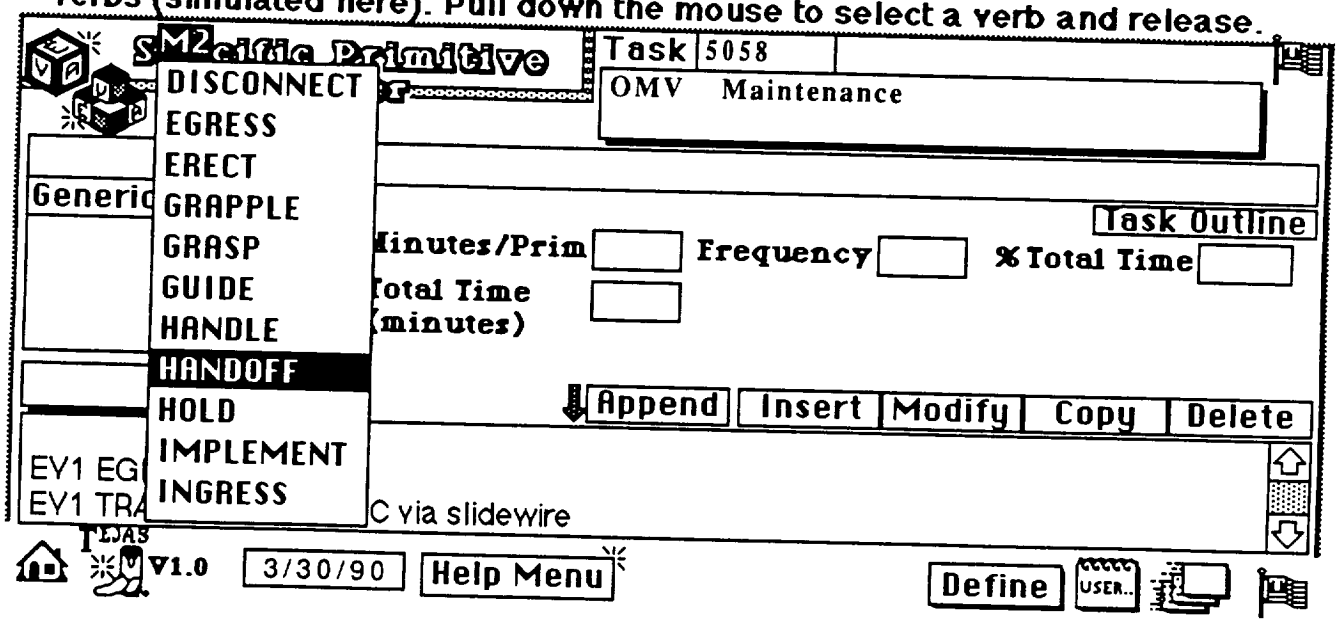
There are many ways to build a new specific primitive. Using this rather compressed version of the EVASpecPrim Builder card, we'll demonstrate the main two: transforming a generic primitive syntax, and modifying an archived specific primitive.



EVATask.5058 - Building a Specific Primitive

9.3.7
2 of 7

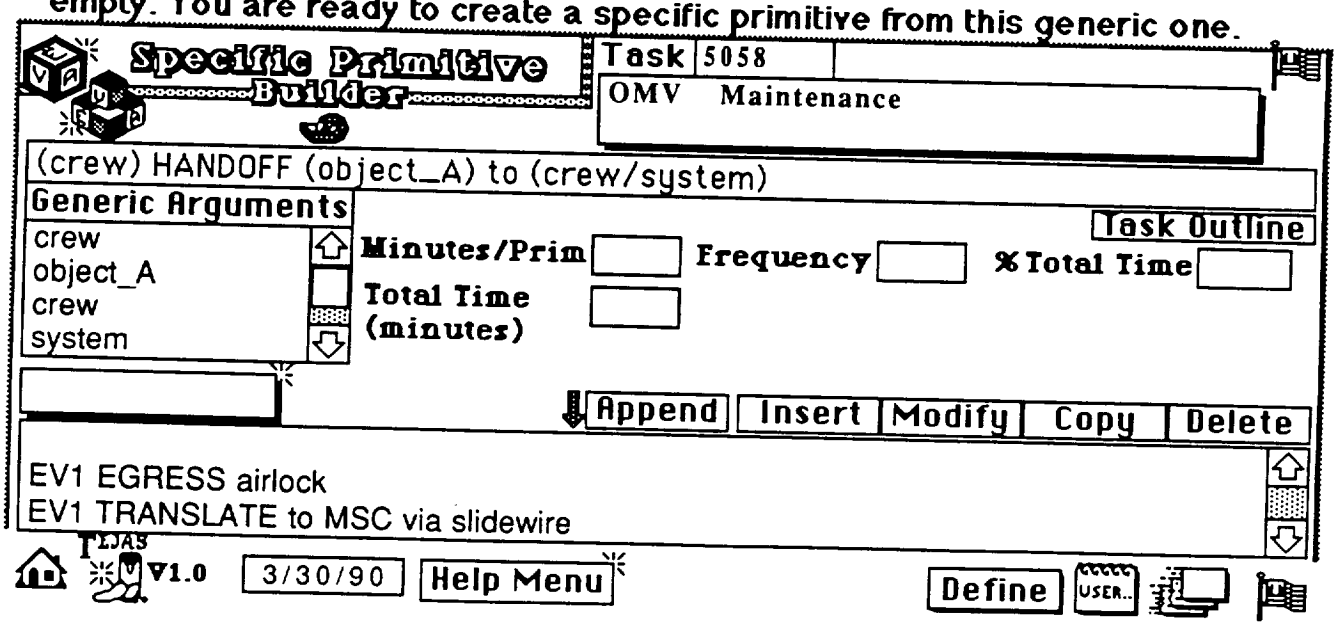
To retrieve a generic primitive syntax for any EVAPrimitive, click on the button at top left. A series of numbered M buttons will appear. Click and hold down the mouse on any of these to get a pop-up menu of primitive verbs (simulated here). Pull down the mouse to select a verb and release.



EVATask.5058 - Building a Specific Primitive

9.3.7
3 of 7

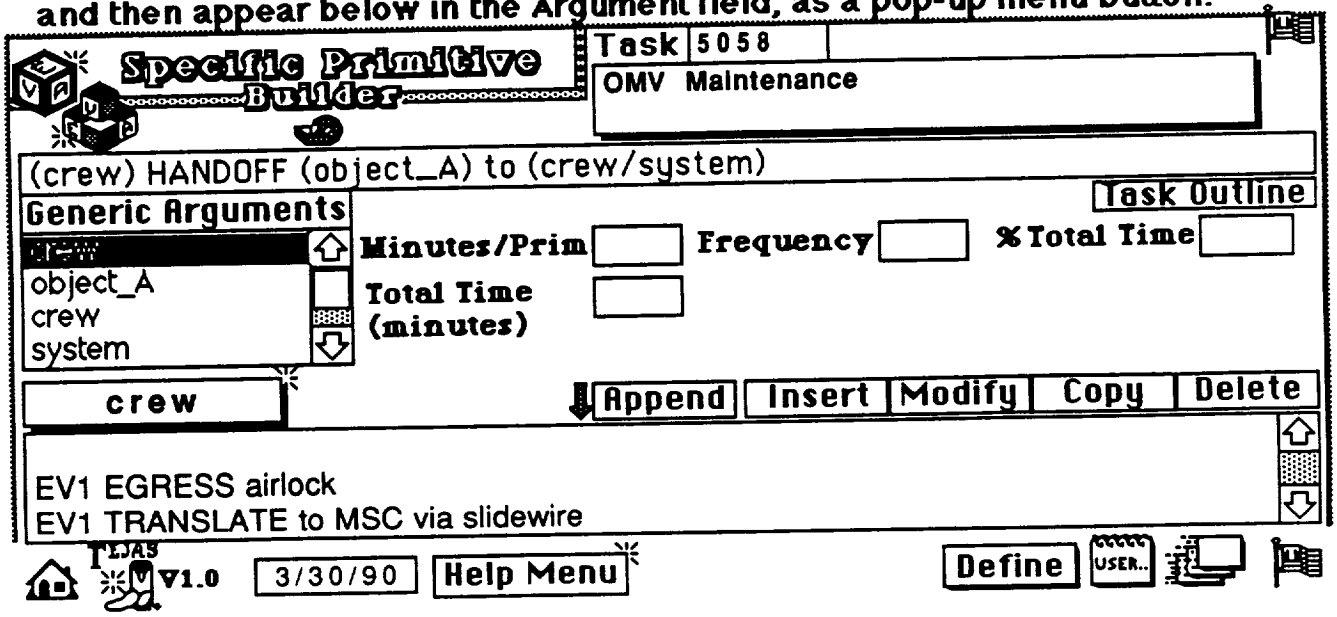
After a short wait, the generic syntax for the selected verb will appear in the Syntax field. The generic arguments for that syntax will appear in the Generic Args scrolling field at left, and the four ancillary data fields will empty. You are ready to create a specific primitive from this generic one.



EVATask.5058 - Building a Specific Primitive

9.3.7 4 of 7

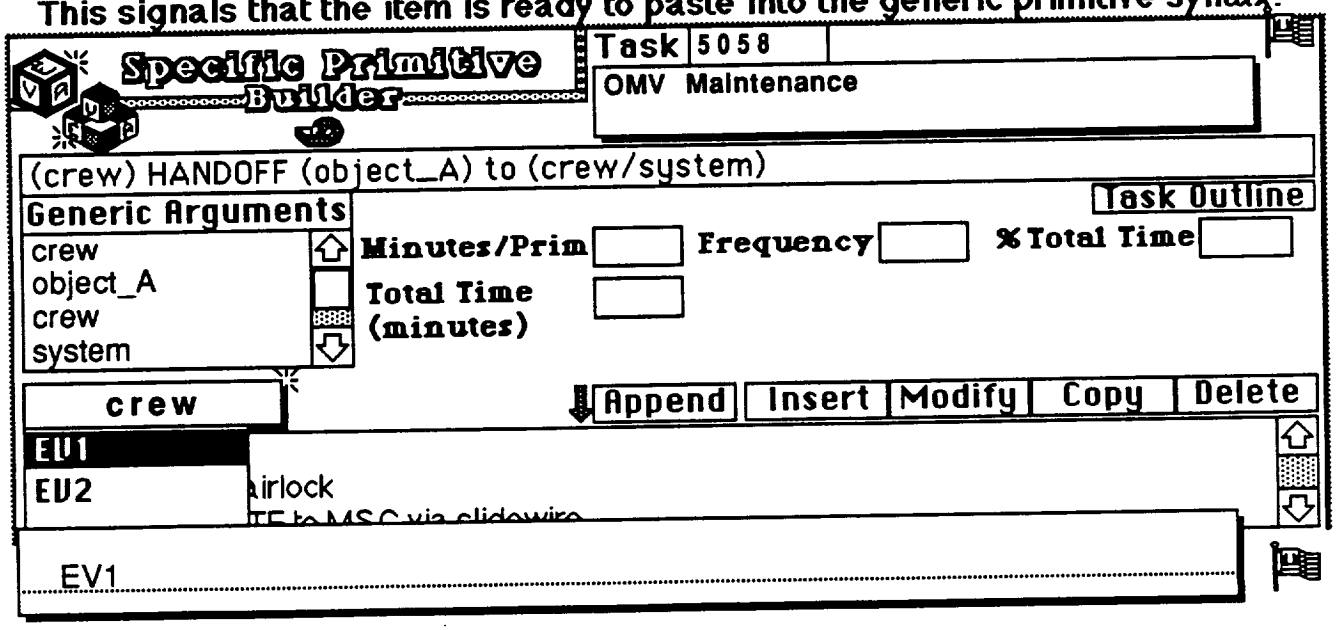
You can replace a generic syntax argument by typing over it, or use the argument menus from the EVASpecPrim Arg Menus card. To do the latter, click on an argument in the Generic Args scrolling field. It will highlight, and then appear below in the Argument field, as a pop-up menu button.



EVATask.5058 - Building a Specific Primitive

9.3.7 5 of 7

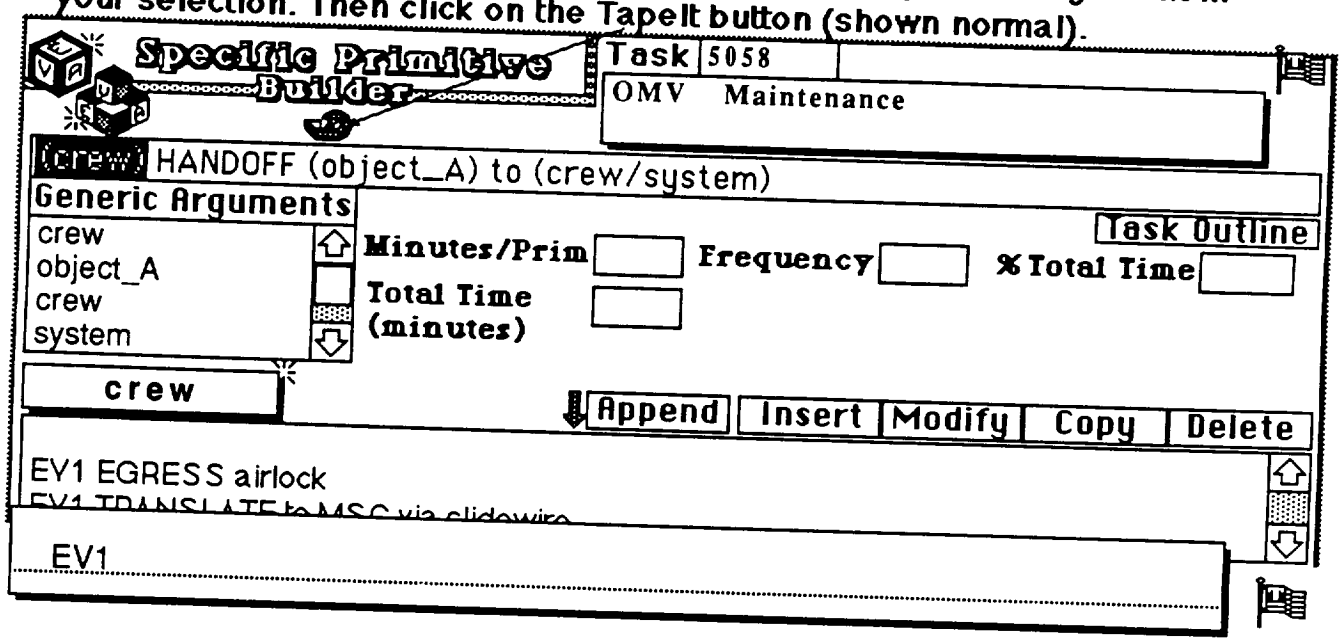
Position the cursor over the pop-up menu 'crew,' then click and hold down on the mouse. Select an item from the menu that appears. The item will appear in the HyperCard message box (simulated below by a shadow field). This signals that the item is ready to paste into the generic primitive syntax.



EVATask.5058 - Building a Specific Primitive

9.3.7
6 of 7

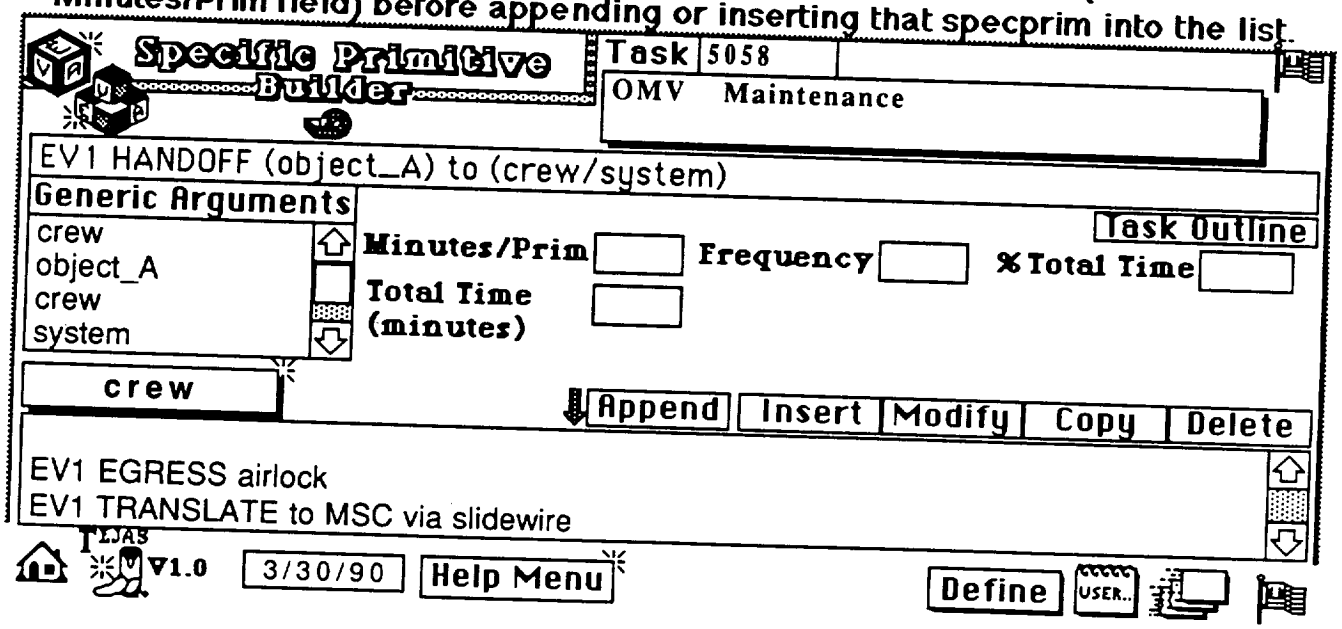
Now click and drag the cursor over the argument in the Syntax menu that the selected item is intended to replace (or pick an insertion point for the item). Be sure to include the parentheses around a generic argument in your selection. Then click on the TapeIt button (shown normal).



EVATask.5058 - Building a Specific Primitive

9.3.7
7 of 7

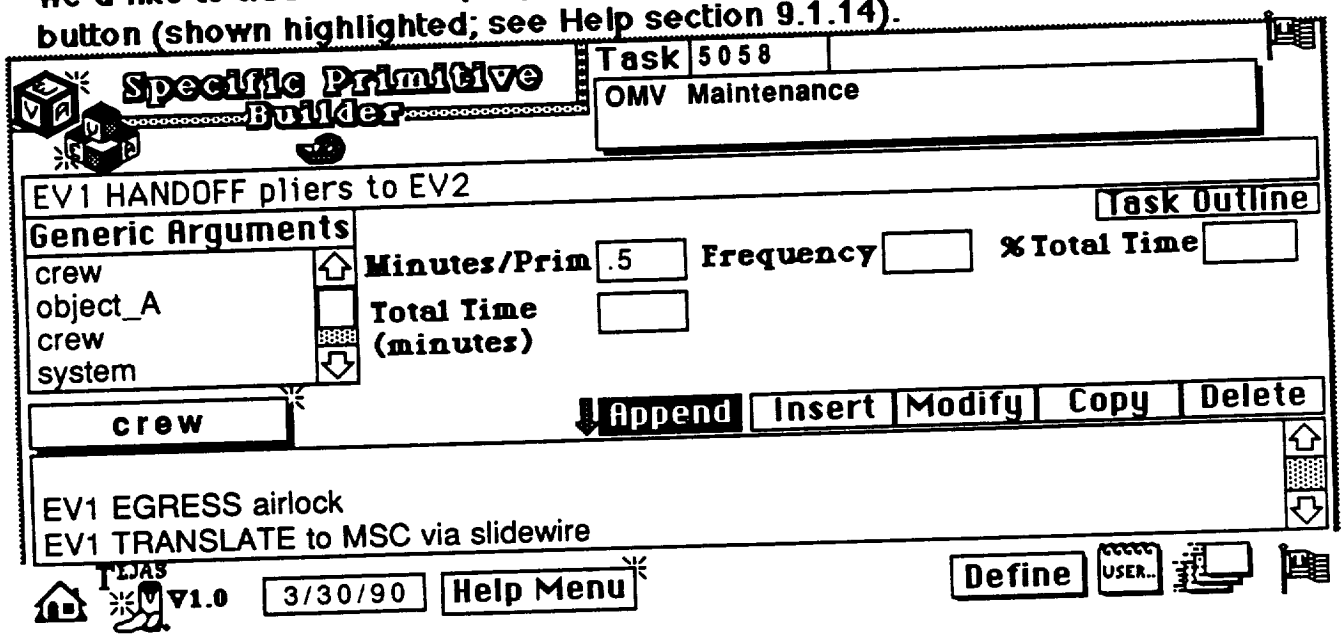
Immediately, the item in the message box replaces the selected argument in the Syntax field and the message box disappears. Now you can finish specifying the other generic arguments, and assign a duration (in the Minutes/Prim field) before appending or inserting that specprim into the list.



EVATask.5058 - Using the Append Button

9.3.8 1 of 3

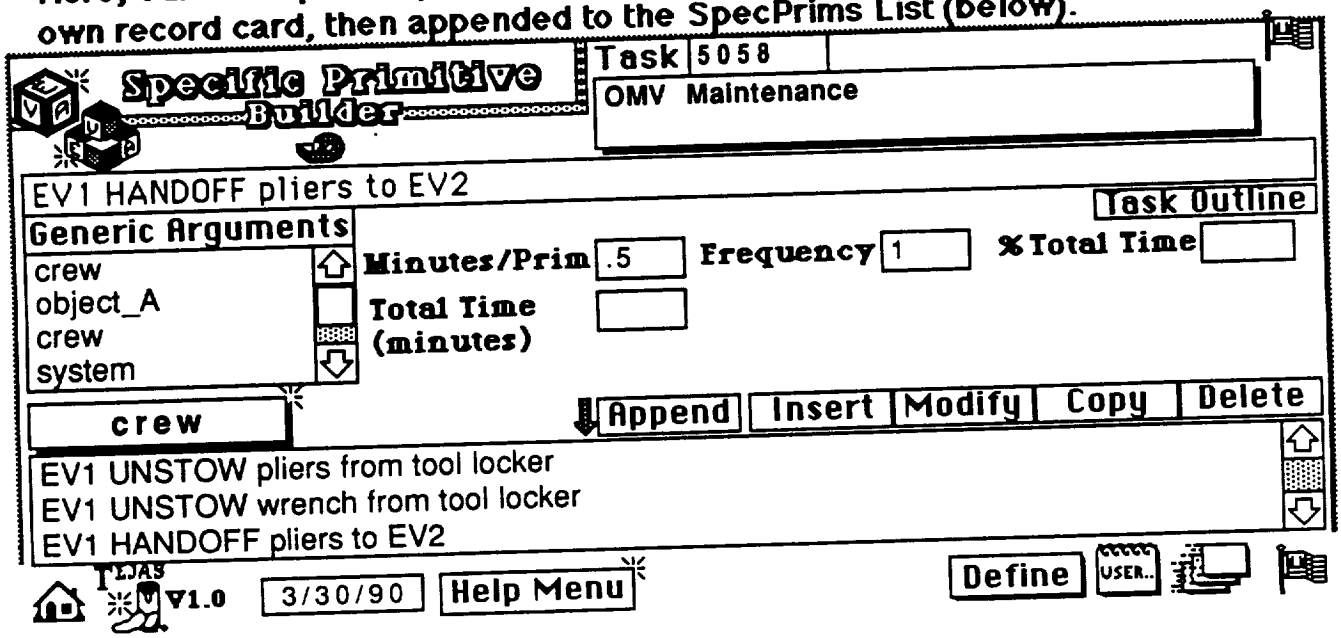
Let's suppose we've finished building the specprim below from the generic syntax for the verb HANDOFF, including a duration of one half minute. Now we'd like to add it to the specprims list at bottom. Just click on the Append button (shown highlighted; see Help section 9.1.14).



EVATask.5058 - Using the Append Button

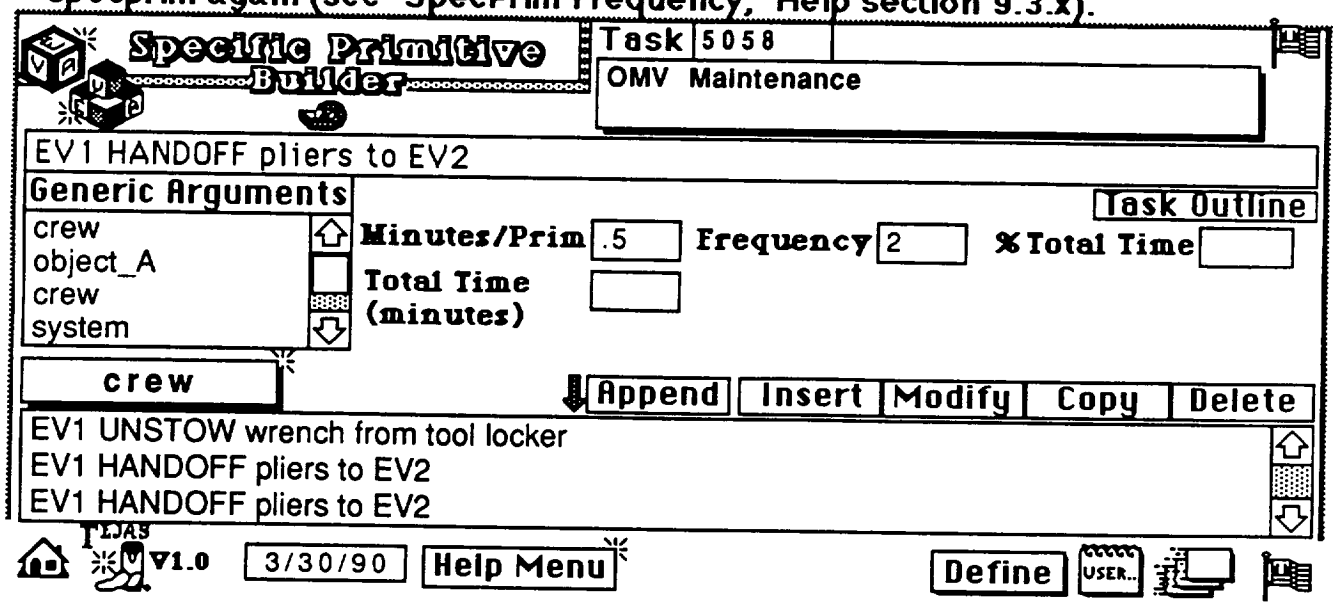
9.3.8 2 of 3

The Append button checks for a specprim record card (Help section 9.3.4) for the specprim shown in the Syntax field. There will be a slight pause. Here, our new specific primitive is given a Frequency of 1, stored on its own record card, then appended to the SpecPrims List (below).



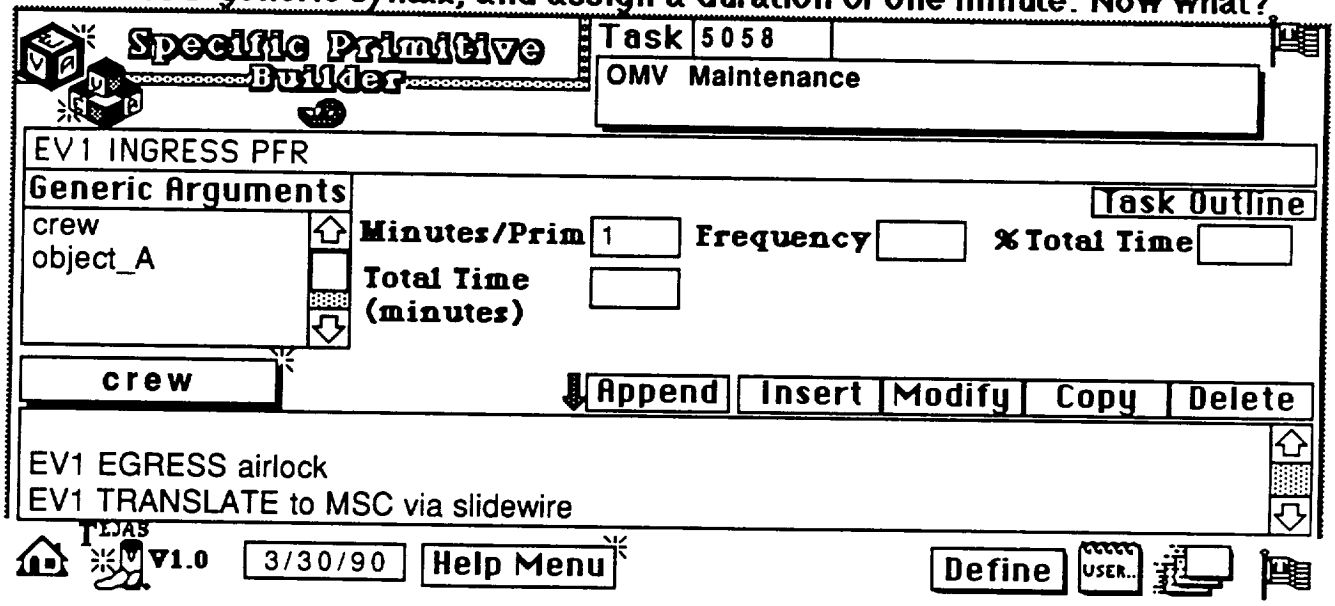
EVATask.5058 - Using the Append Button

Suppose we clicked on Append a second time. This time, the button's HyperTalk script would find a record card for our HANDOFF specprim. Therefore, the script would just update the Frequency to 2, and append the specprim again (see 'SpecPrim Frequency,' Help section 9.3.x).



EVATask.5058 - Using the Insert Button

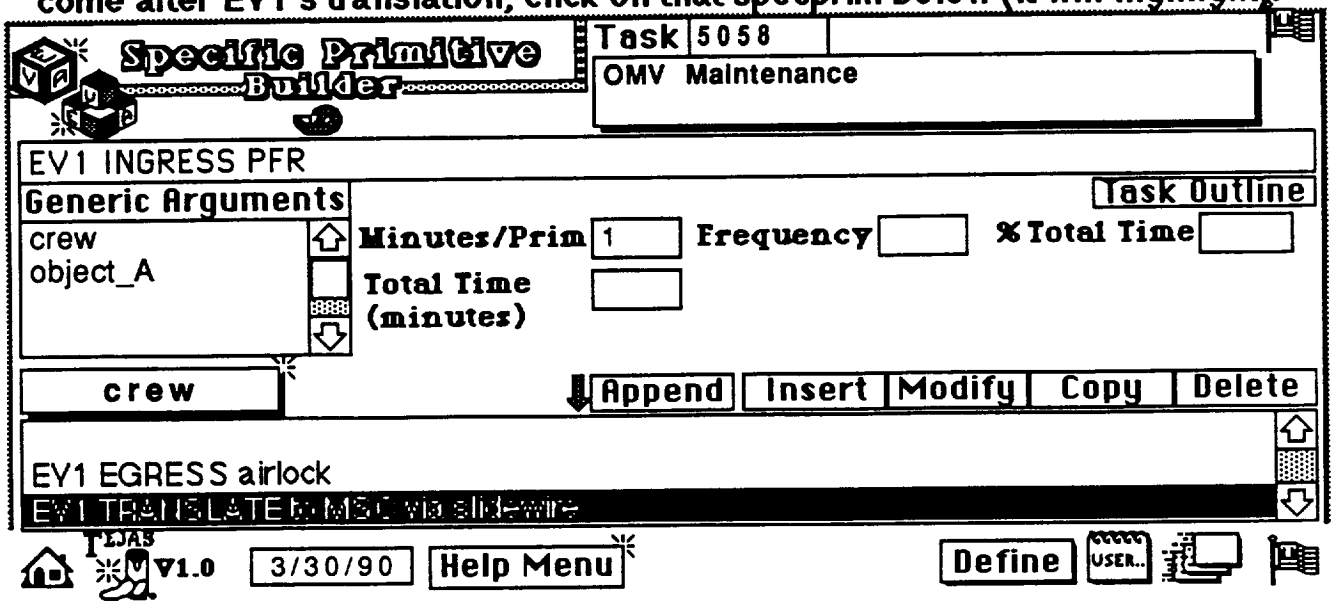
Now suppose that in reviewing the specprims list, you realize that after translating to the MSC, EV1 should have ingressed a portable foot restraint before starting to unstow tools. You build the specprim below from the INGRESS generic syntax, and assign a duration of one minute. Now what?



EVATask.5058 - Using the Insert Button

9.3.9 2 of 3

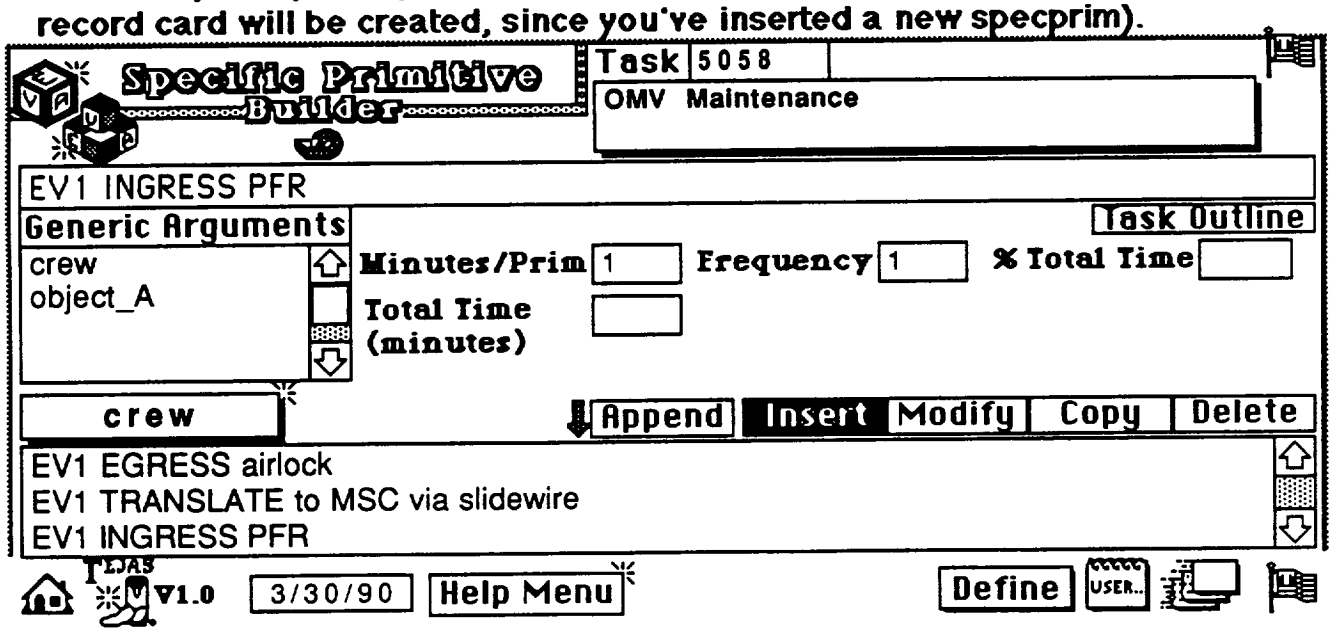
Before you can insert the INGRESS specprim into the specprims list, you have to choose an insertion point (a message will rebuke you should you click on Insert without having done so). Since you want this specprim to come after EV1's translation, click on that specprim below (it will highlight).



EVATask.5058 - Using the Insert Button

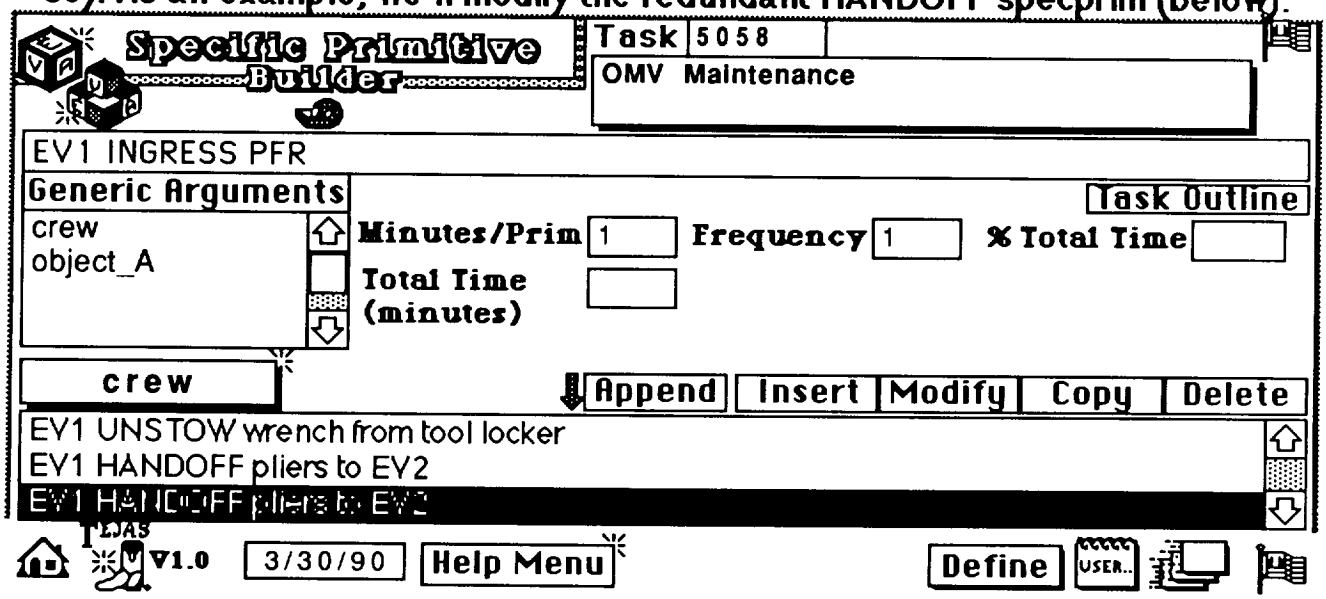
9.3.9 3 of 3

With the insertion point selected, click on the Insert button. It will highlight briefly (shown), and immediately add your new specprim to the list after the insertion point (below). The Frequency will update (to 1 in this case, and a record card will be created, since you've inserted a new specprim).



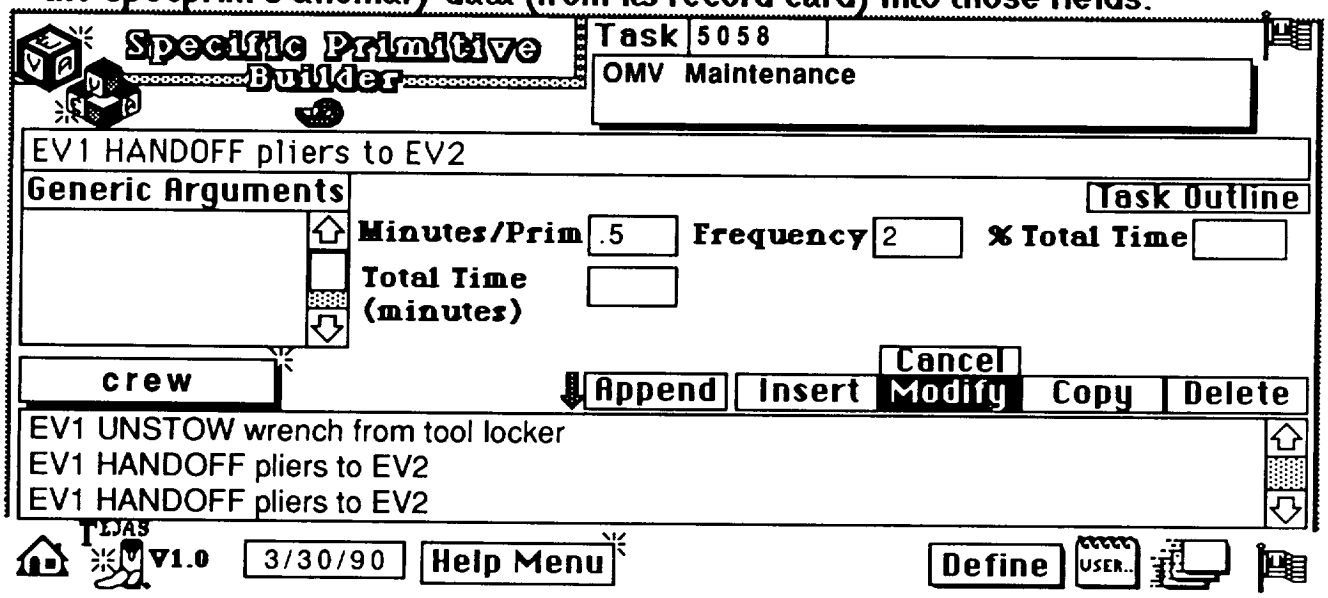
EVATask.5058 - Using the Modify Button

The Modify button allows you to change a specprim in the specprims list without deleting and replacing it. To begin, select the specprim to modify (a message will rebuke you should you click on Modify without having done so). As an example, we'll modify the redundant HANDOFF specprim (below).



EVATask.5058 - Using the Modify Button

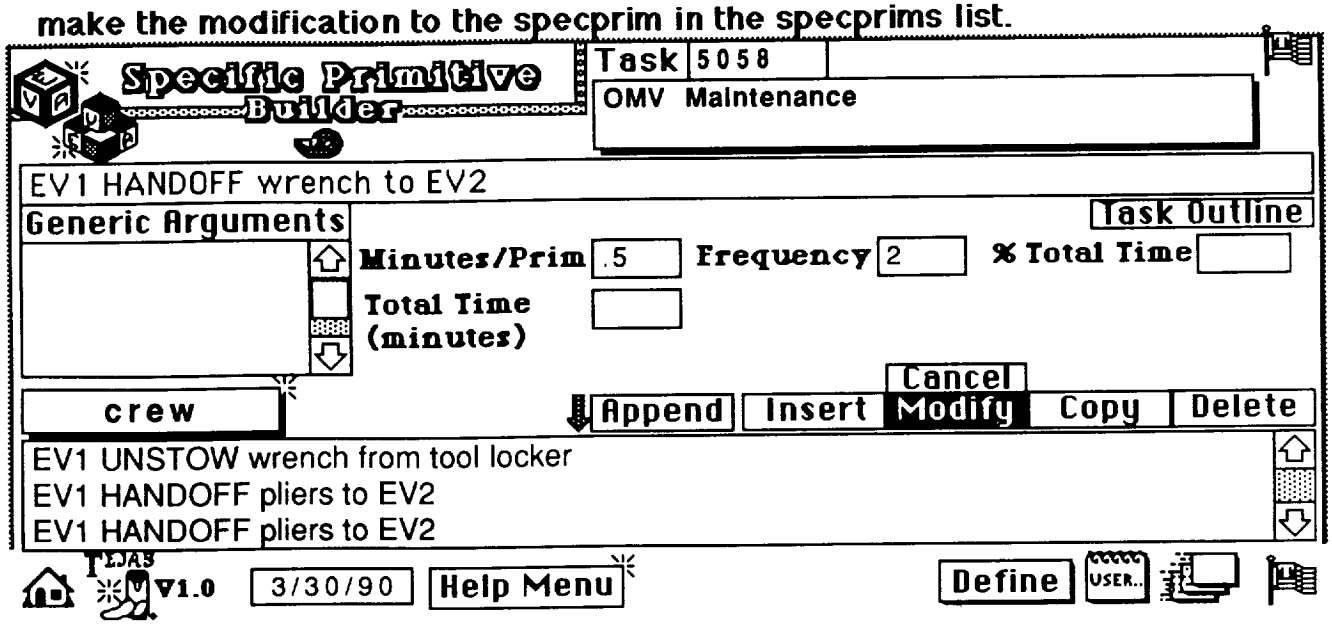
With the specprim you want to change selected, click on the Modify button. It will highlight, and a Cancel button will appear above (shown). The HyperTalk script will insert the selected specprim into the Syntax field and the specprim's ancillary data (from its record card) into those fields.



EVATask.5058 - Using the Modify Button

9.3.10 3 of 4

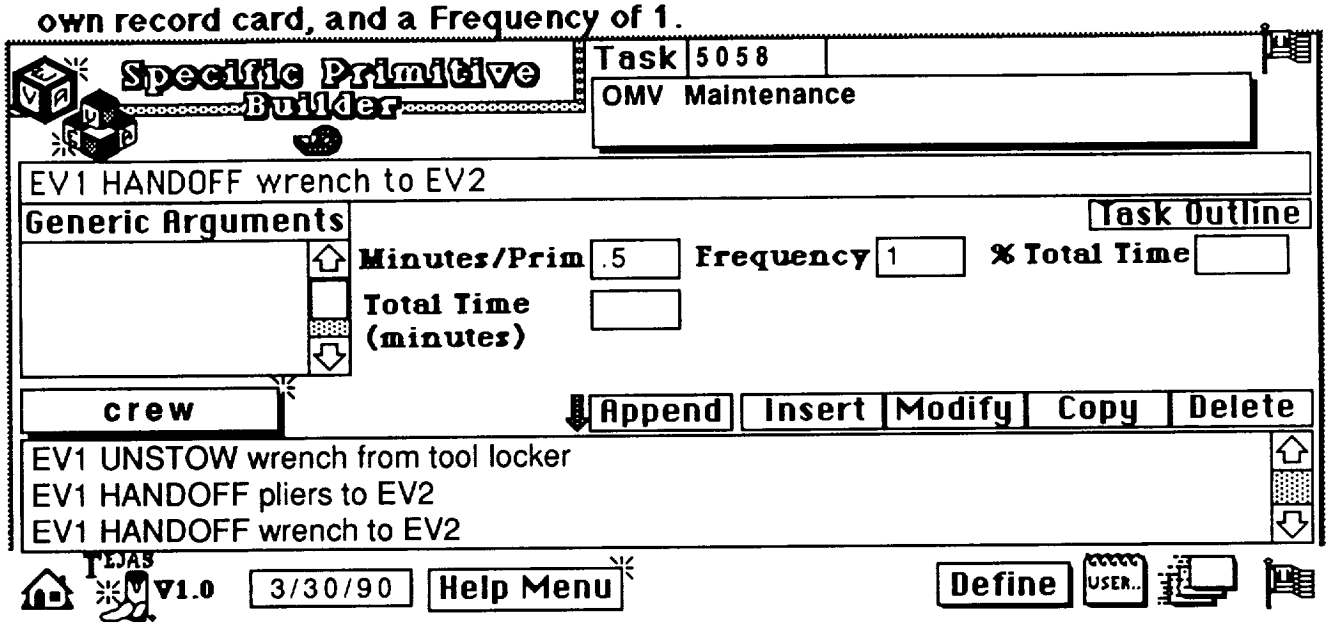
Now you can change that specprim and/or its duration; there are several alternatives (see Help section 9.1.14). Let's change the specprim as shown, and leave the duration at one-half minute. Now you're ready to actually make the modification to the specprim in the specprims list.



EVATask.5058 - Using the Modify Button

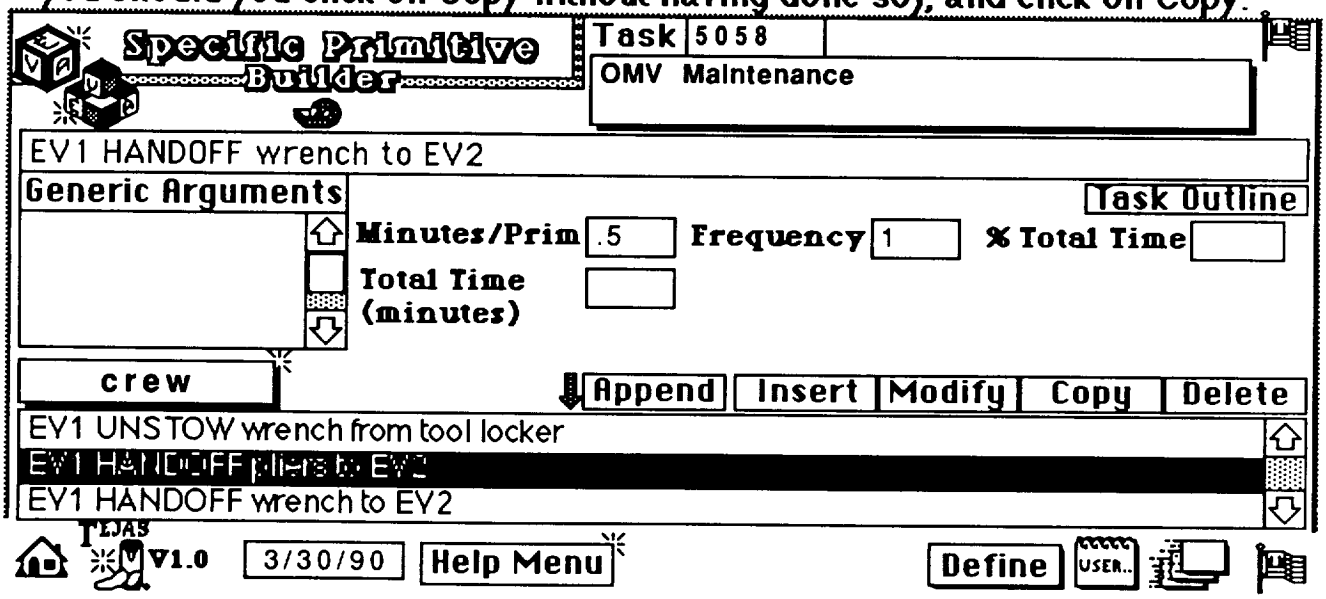
9.3.10 4 of 4

Click Modify again. Its highlight and the Cancel button vanish (shown), and the modified specprim is inserted in place of the original specprim. Since "EV1 HANDOFF wrench to EV2" is a new specprim to this task, it gets its own record card, and a Frequency of 1.



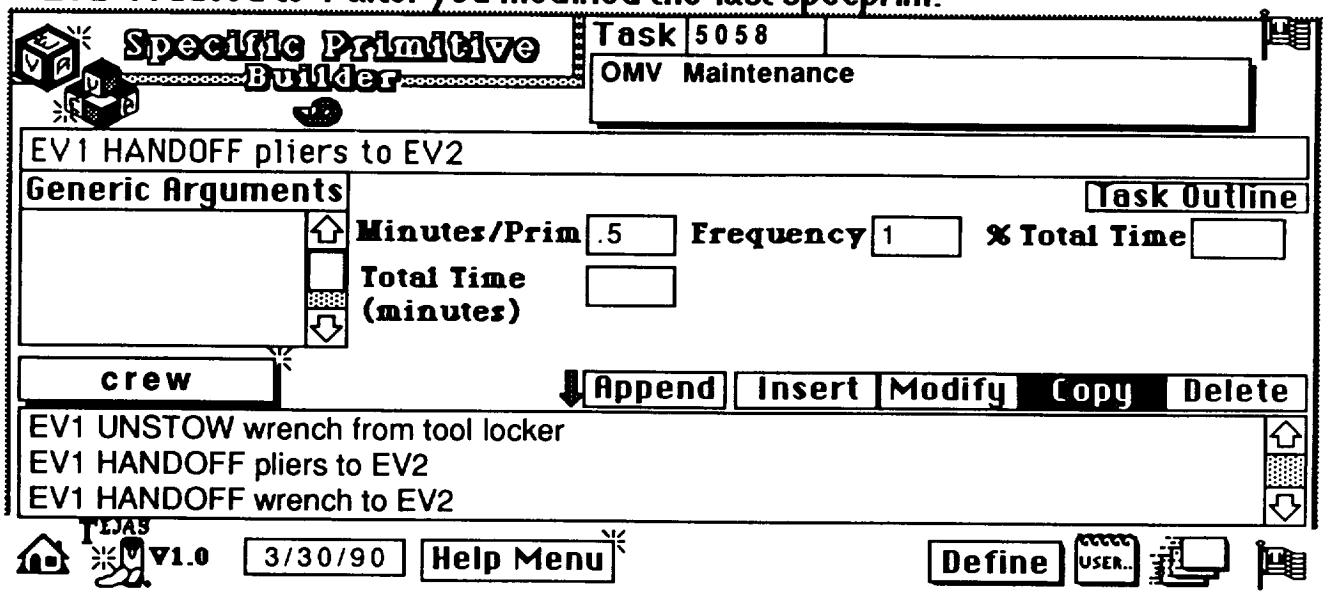
EVATask.5058 - Using the Copy Button

What happened to the record of the specprim that we modified in the previous section? We can check with the Copy button. Select the specprim (shown) you wish to copy into the Syntax field first (a message will rebuke you should you click on Copy without having done so), and click on Copy.



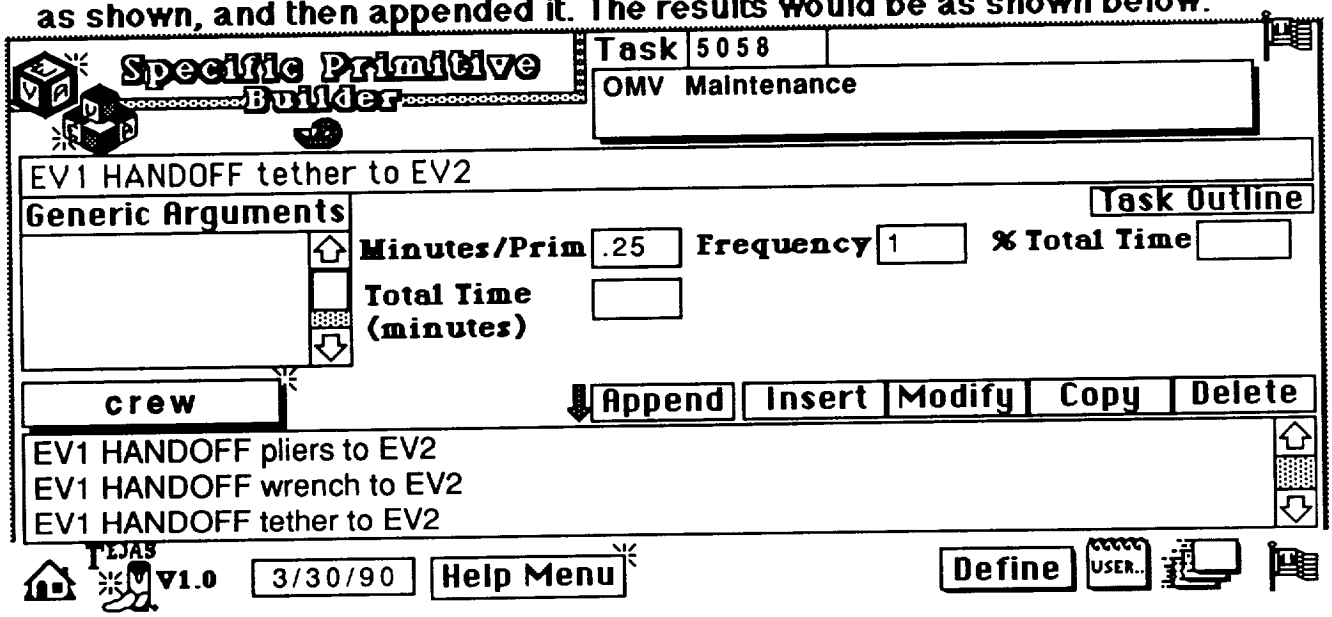
EVATask.5058 - Using the Copy Button

Clicking on Copy causes that button to highlight briefly (shown), the desired specprim to be inserted into the Syntax field, and its ancillary data into those fields. As expected, the Frequency of "EV1 HANDOFF pliers to EV2" reduced to 1 after you modified the last specprim.



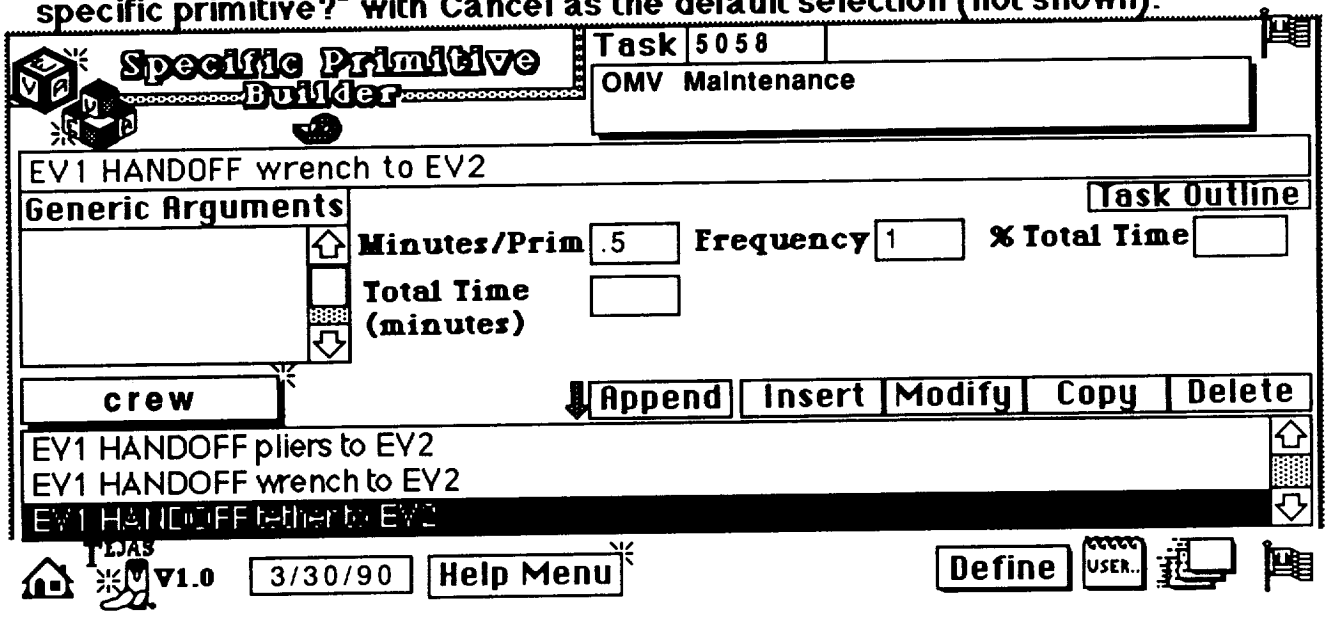
EVATask.5058 - Using the Copy Button

You can use Copy with the Append or Insert buttons to save time adding specprims of often-used verbs to a specific task stack, instead of rebuilding them from their generic roots. Suppose you changed the copied specprim as shown, and then appended it. The results would be as shown below.



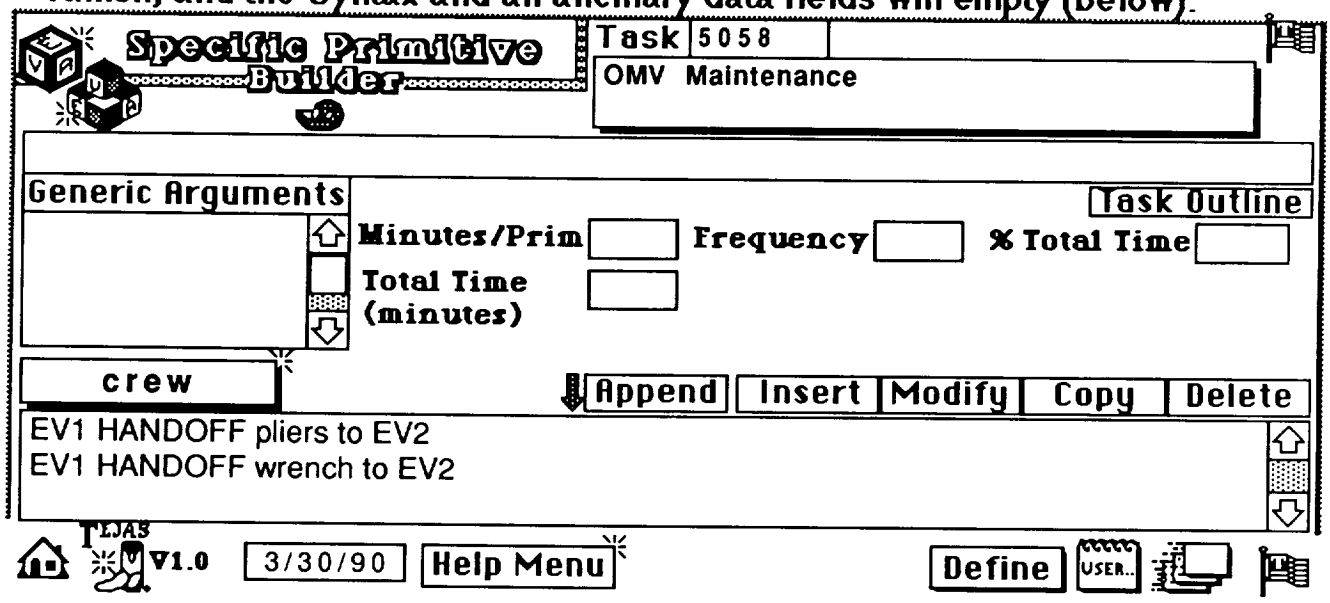
EVATask.5058 - Using the Delete Button

The Delete button works like Copy, but with a built-in restriction. You must first select a specprim to delete (shown), then click on Delete. The button will not highlight; instead, a message will appear asking "Delete that specific primitive?" with Cancel as the default selection (not shown).



EVATask.5058 - Using the Delete Button

If you click OK in the "Delete?" message box, the box will disappear and a brief pause will ensue, followed by two quick changes. First, the Frequency field will decrease (if it is >1); then that occurrence of the specprim will vanish, and the Syntax and all ancillary data fields will empty (below).



EVATask.5058 - Maintaining the Frequency

TEJAS maintains the Frequency count for each specific primitive as each Append, Insert, Modify, and Delete operation is executed (Copy does not alter the specprims list in any way, so its use does not affect Frequency). This automatic facility allows TEJAS to treat each specprim as an object.

This method has several advantages. First, it saves you from manually counting specprims in the list. Second, it saves space within each specific task stack, by having ONE record card for ALL occurrences of a specprim. Third, it provides a quick way to compute the total time for each task and the percentage of that total time each specprim takes, at any point in the analysis. Last, it allows you to archive specific primitives with their durations and origin in the EVASpecPrim Archives stack (Help section 9.2) and to retrieve these specprims later within any EVATask.#### stack.

Therefore, although the five-button 'line editor' may seem strange at first, bear with it. The object-oriented approach WILL save you time.

EVATask.5058 - Archiving Specific Primitives

Once a task's specific primitives have all been built and (i.e., the task is fully scripted), you can use the 'Archive List' button on the EVASpecPrims List card to store all your specific primitives with their durations and stack of origin in the EVASpecPrim Archives stack (see Help section 9.1.14). This complex process is simple to do, but time-consuming. DON'T do it in this example; you want only REAL specprims archived.

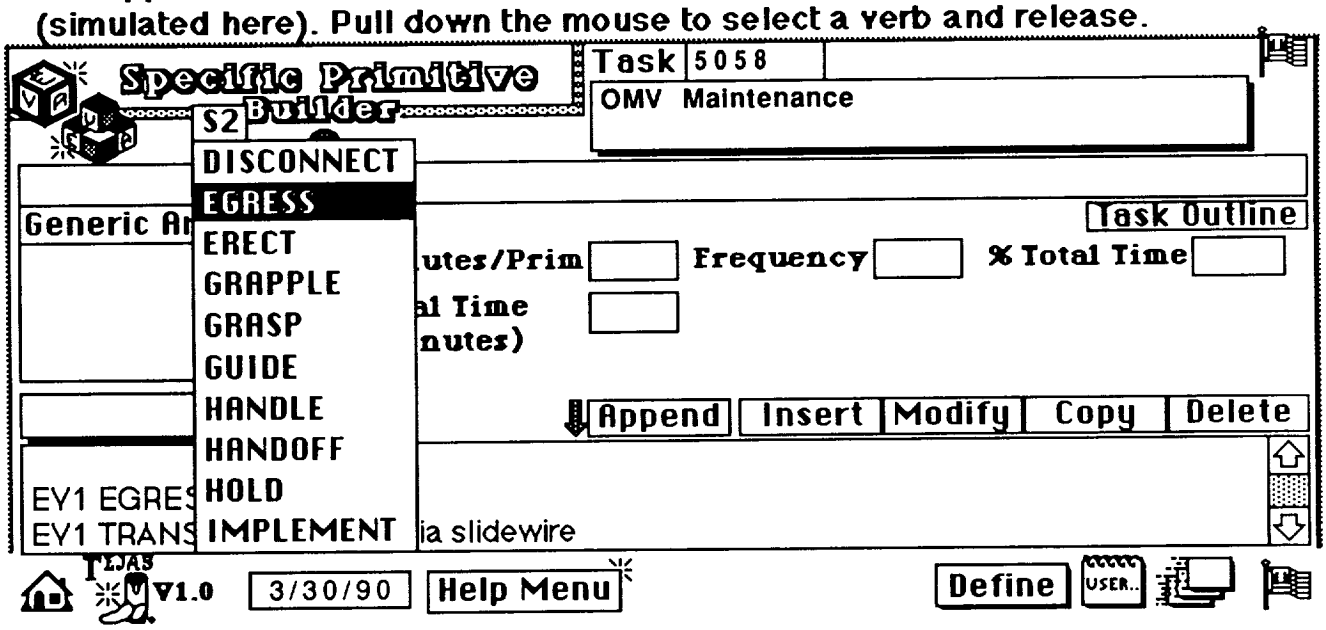
You need not archive specprims until all your analysis is complete within an EVATask.#### stack, or until you begin another task. Within any specific task stack, you can retrieve any specific primitive in the specprims list by using the Copy, Modify and Delete buttons. The only other specprims you might want have already been archived from other stacks; therefore, archiving the current list does not give you anything new within the stack.

Save time. Archive specprims only when your task analysis is complete for a specific task, or you are building a new specific task stack.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

EVATask.5058 - Retrieving Specific Primitives

To retrieve a specific primitive from EVASpecPrim Archives, click on the button on the EVASpecPrim Builder card. A series of numbered S buttons will appear. Click on any of these to yield a pop-up menu of primitive verbs (simulated here). Pull down the mouse to select a verb and release.



EVATask.5058 - Retrieving Specific Primitives

9.3.15 3 of 4

The specprim you select will highlight (shown), and three hidden buttons will appear: Carry Back, ○ with mins, and ◉ without mins. The last two buttons affect whether you retrieve a specprim with its duration or not.

EVASpecPrim Archives | GRASP

EV1 GRASP CMG21 release latches
EV2 GRASP tether reel
EV1 GRASP EV2 at safety hardpoint
EV1 GRASP solar array panel edge carefully

Copied SpecPrim: EV2 GRASP tether reel

Origin: EVATask.13397 | **Minutes/Primitive:** .5 | Carry Back | ◉ with mins ○ without mins

The selected specprim appears in the Copied SpecPrim field, with its origin and duration in their respective fields. If you wish to review the assumptions that led to that duration value, you can go to the stack of origin now. Otherwise, click on the Carry Back button.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

EVATask.5058 - Retrieving Specific Primitives

9.3.15 4 of 4

After clicking Carry Back on an archive card in the EVASpecPrim Archives stack, you will return to the EVASpecPrim Builder card. The specific primitive you selected (with its duration, if you so chose) will be on the card. You can now treat it like any other specprim you have built before.

Specific Primitive Builder | Task 5058 | OMV Maintenance

EV2 GRASP tether reel

Generic Arguments | Task Outline

Minutes/Prim .5 | **Frequency** | **% Total Time**

Total Time (minutes)

Append | Insert | Modify | Copy | Delete

EV1 EGRESS airlock
EV1 TRANSLATE to MSC via slidewire

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

EVATask.5058 - After You Create Specprims

At the conclusion of the examples within this Help section, you can continue to practice creating, changing, archiving and retrieving specific primitives and their ancillary data, or you can restore the EVATask.5058 example stack to an unaltered state for the next practice session.

To restore the stack

- exit the EVATask.5058 example stack you have been using. Go to any other HyperCard stack, or quit HyperCard (not required);
- locate your archived copy of the original EVATask.5058 example stack;
- on the Macintosh desktop, throw your altered copy of the EVATask.5058 stack in the trash and empty the trash;
- copy your archived original EVATask.5058 stack back into the folder on your hard disk that holds the other TEJAS stacks. Make sure you still have an archived copy of the example stack!

Following this procedure will preserve your example stack as released.

Section 9.4

User Instructions: TeleSpecPrim Tools

TeleSpecPrim Tools Help Menu

Menu 1 of 1

9.4 User Instructions

Background:

- ☐ 9.4.1 General Information
- ☐ 9.4.2 The User's Role
- ☐ 9.4.3 Changing the Standard
- ☐ 9.4.4 Adding Cards
- ☐ 9.4.5 Deleting Cards

Unique!

- ☐ 9.4.6 Stack Organization
- ☐ 9.4.7 EVASpecPrims List
- ☐ 9.4.8 EVASpecPrim Builder
- ☐ 9.4.9 EVASpecPrim Arg Menus

Stack-Specific Help:

- ☐ 9.4.10 Card Backgrounds
- ☐ 9.4.11 Common Fields
- ☐ 9.4.12 Common Buttons

Unique!

- ☐ 9.4.13 Analysis Fields
- ☐ 9.4.14 Analysis Buttons
- ☐ 9.4.15 Analysis Menus

INSTRUCTIONS:
Click ☐ box to access section;
Click arrows to page through Help stack;
Click 'T-flag' to return to point of origin.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

TeleSpecPrim Tools Stack - General Information

This stack contains three cards (detailed below). The cards are unimportant and inert until a task is well defined, and you are ready to build a specific task stack (Help section 8.4.12). Within an TeleTask.#### stack, these cards form powerful tools for building, archiving and outputting specific telerobot primitives. The cards and their functions are:

Telerobot Specific Primitives List card: lists, archives, and outputs specific task primitives to a transfer spreadsheet or document (Help section 9.4.7).

Telerobot Specific Primitive Builder card: creates specific telerobot primitives for each task from generic TelePrimitives or archived specific primitives and stores them on card records (see Help section 9.4.8).

Telerobot Specific Primitive Argument Menus: provides user-customizable menus of specific arguments for all generic arguments (except 'condition') within a generic TelePrimitive (see Help section 9.4.9).

TeleSpecPrim Tools Stack - General Information

This section's Help cards are organized differently from the other stack-specific Help sections, because the TeleSpecPrim Tools stack contains only tool templates that are empty of data. In Help sections 9.4.13 to 9.4.15, the buttons, fields, and menus on each of the TeleSpecPrim Tools stack's three cards are described and their action explained. However, detailed examples of how you use these objects in task analysis are possible only within a specific task stack. The TeleTask.4877 example stack serves that purpose (see Help section 9.6).

Although dividing analysis tools into their own inert stack may seem confusing to you at first, and the Help sections somewhat disjointed, it is intentional. This organization scheme makes it easy to update these tool cards and to create more powerful analysis tools in the future. With some knowlege of HyperTalk, you can build more complex analysis stacks using these tool cards. Experience with TEJAS task analysis will show you how.

TeleSpecPrim Tools Stack - The User's Role

TeleSpecPrim Tools is not a complete, functioning stack by itself. Instead, this stack simply stores empty masters (templates) of the three complex analysis cards needed to provide task analysis capability within TEJAS. There is nothing to change in this stack. Most text fields are locked and most of the stack-specific buttons will not function until the cards are in a specific 'TeleTask.####' stack. If you wish to try all the buttons, fields and pop-up menus on the cards in this stack, do so by using them there.

For specifications and an explanation of the purpose of the analysis fields, analysis buttons, and analysis menus, read Help sections 9.4.13 to 9.4.15. To understand how the buttons, scripts, etc. work, read the 'TeleTask.4877 Example Stack,' Help section 9.6.

Please DON'T TAMPER with any objects – field, button, menu, picture, script, etc. - in this stack. Don't even move them. To do so may affect your ability to perform task analysis within TEJAS.

TeleSpecPrim Tools Stack-Changing the Standard

This is a critical stack for task analysis in TEJAS. Its three cards are templates for the analysis "engine" for all specific 'TeleTask.####' stacks you will build. The complex HyperTalk scripts, buttons, interface design, etc. are designed to make the task analysis faster, more powerful and more 'user-friendly.' Comments in the HyperTalk scripts explain each step in the code and make the action easier to understand.

If you think that functional changes should be made to any card in this stack, please suggest them in a detailed way. A letter to the TEJAS Editor would be a good start. This stack is a standard only to TEJAS. No other mechanism is needed for changing the standard.

As an exercise (ONLY with a COPY of this stack) you may wish to make changes to the card's scripts, buttons, layout, etc. BEWARE: you may find this a challenging task. Before attempting it, you'd better have a GOOD reason, allow plenty of time, know HyperTalk well, and read all the scripts.

TeleSpecPrim Tools Stack - Adding Cards

DO NOT ADD ANY CARDS TO THIS STACK!!

TeleSpecPrim Tools is not an archival stack, but a template stack for cards that do the analysis work. To prevent you from adding any cards, there is a built-in protective HyperTalk stack script. This script will intercept the New Card and Paste Card menu commands if issued and will give you the message "Cannot add any cards to this stack!" with a warning tone. This and the corresponding EVASpecPrim Tools stack are the only TEJAS Version 1.0 analysis stacks to which you should NEVER add cards.

TeleSpecPrim Tools Stack - Deleting Cards

DO NOT DELETE ANY CARDS FROM THIS STACK!

There are only three cards in this stack: the Telerobot Specific Primitives List card, the Telerobot Specific Primitive Builder card and the Telerobot Specific Primitive Argument Menus card.

All three cards are important to TEJAS' task analysis capability and are individually delete-protected in the Card Info... dialog box. They are further protected by a HyperTalk script that will intercept the Delete Card and Cut Card menu commands if issued and will give you the message "Cannot delete or cut any cards in this stack!" with a warning tone.

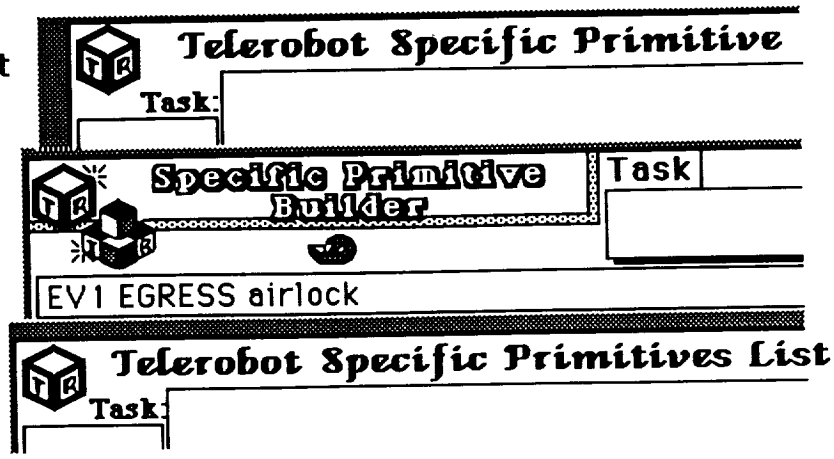
TeleSpecPrim Tools Stack - Stack Organization

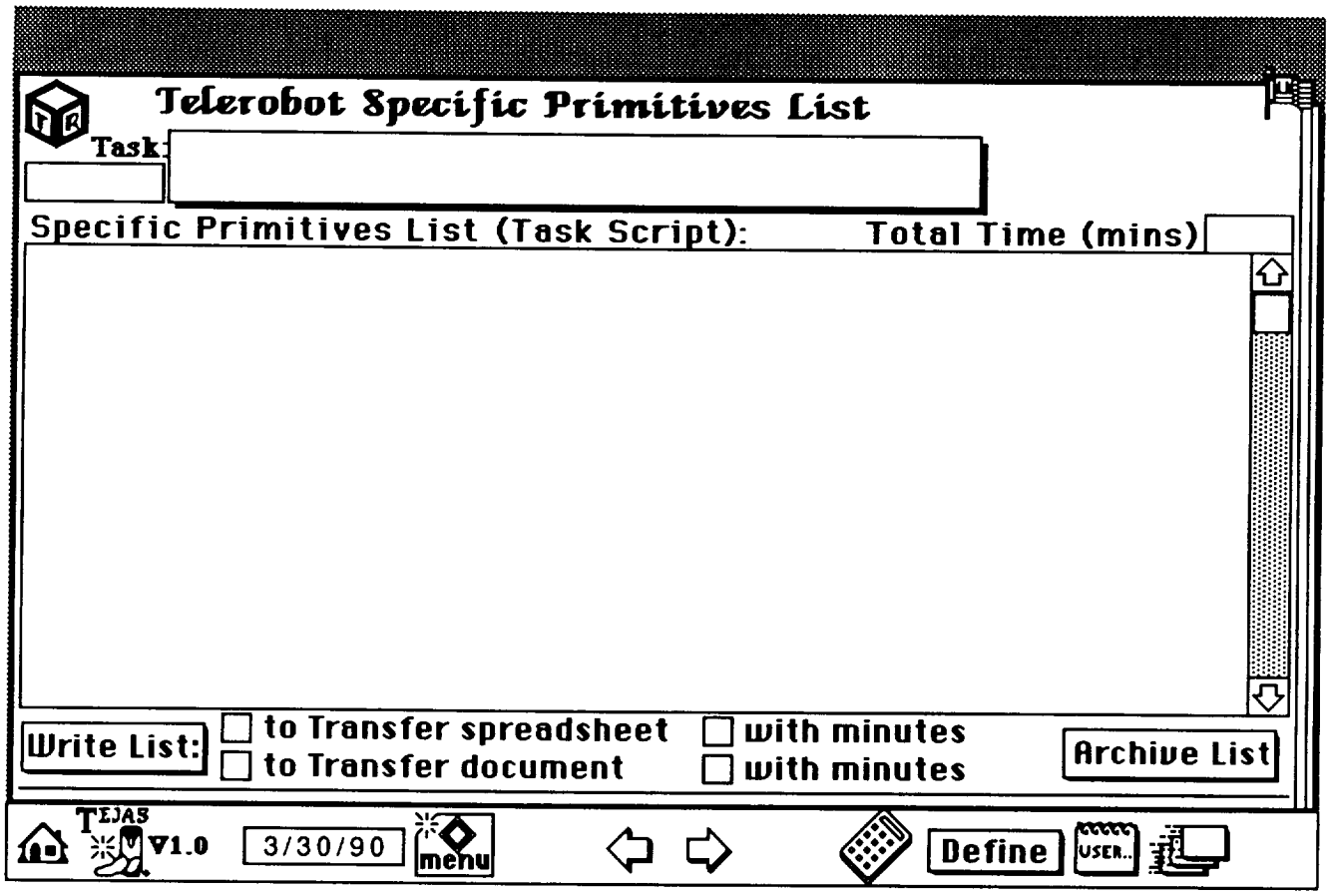
The organization of cards in this stack has no particular significance, except to show the order that these three cards will appear in any telerobot specific task stack (see 'TeleTask.4877 Example Stack,' Help section 9.6).

Specific Primitive Argument menus: unique, last card in this stack

Specific Primitive Builder: unique, middle card in this stack

Specific Primitives List: unique, first card in this stack





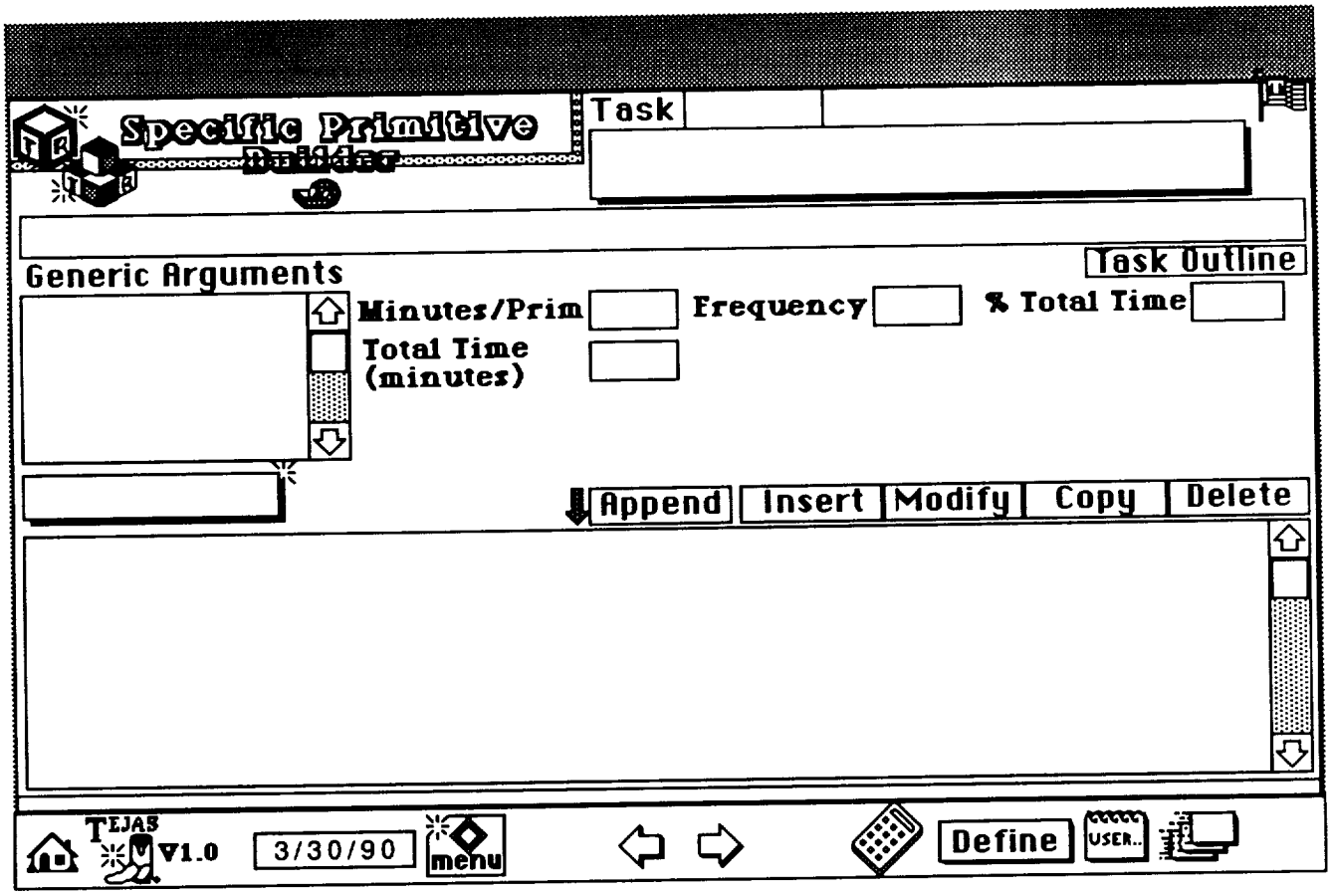
TeleSpecPrim Tools - TeleSpecPrims List

The Telerobot Specific Primitives List is the fourth card in all 'TeleTask.####' stacks when these stacks are created (see 'TeleTask.4877 Example Stack,' Help section 9.6). This card's purpose is as follows:

1. To provide a complete listing of all the specific primitives created for that specific task stack in a readily printable, transferable scrolling field.

2. To provide an automatic export routine for writing the specific primitives list to one or two text-only files ("Transfer spreadsheet" and/or "Transfer document"), which it creates for this purpose. This allows you to operate on the newly created specific primitives and their durations in another analysis tool, including those in other microcomputer formats (e.g., DOS).

3. To provide a sophisticated way of archiving specific primitives in the TeleSpecPrim Archives stack (see Help section 9.5), for quick use in another specific task stack if desired.



TeleSpecPrim Tools - TeleSpecPrim Builder

The Telerobot Specific Primitives List card is the fifth card of all 'TeleTask.####' stacks when these stacks are created (see 'TeleTask.4877 Example Stack,' Help section 9.6). This card's purpose is as follows:

1. To provide an intuitive, semi-automated mechanism for building and modifying specific primitives that 'script' a specific telerobot task in a 'TeleTask.####' stack (see 'Building Specific Primitives,' section 9.6.7).

2. To create card records (of background TeleSpecPrim.bg, the same as this card) for each specific primitive built within the specific task stack, each card record listing the primitive and its ancillary information (see 'Analysis Fields,' Help section 9.4.13).

2. To automatically keep track of the frequency of occurrence of each specific primitive within a specific task through use of the Append, Insert, Modify and Delete card buttons (see 'Analysis Buttons,' Help section 9.4.14).

TeleSpecPrim Tools - TeleSpecPrim Builder

The Specific Primitive Builder card contains three card fields and nine card buttons. These are not present on the card records of the specific primitives (created within a specific task stack; see 'TeleTask.5058 Example Stack,' Help section 9.6) that share this same 'TeleSpecPrim.bg' background. Therefore, although the appearance of this Telerobot Specific Primitive Builder card is similar to the specific primitive card records, it is unique in function and importance (please see the next card).

The HyperTalk scripts attached to the card buttons and fields on the TeleSpecPrim Builder card are quite complex. Together, they take most of the work out of building specific primitives for any task. To do this, they work in concert with other card-based utilities, such as the argument menus available from the TeleSpecPrim Arg menus card (Help section 9.4.9) and the primitives menu available from the TelePrimitives Menu Builder card (Help section 7.5.15). Please read the entire 'TeleTask.4877 Example Stack,' Help section 9.6 for a full understanding of the analysis process.

TeleSpecPrim Tools - TeleSpecPrim Builder

The greatest utility of the TeleSpecPrim Builder is as a standardization tool. Here's why: ultimately, all specific primitives built with this card originate with a generic primitive from the TelePrimitives stack (Help section 7.5). The TelePrimitives stack's generic primitive verbs and syntaxes were compiled from the task analysis community's lists through a process of combination, mutual review, integration and comment resolution. Therefore, ALL resulting specific primitives built on this TEJAS card have a common, integrated, generic root. That means that anyone with a copy of TEJAS can understand exactly what every specific primitive in ANY task script means and how it is related to its like verbs and antonyms by checking its root generic primitive in the TelePrimitives stack (two mouse clicks).

For a complete explanation of the compilation of the TelePrimitives and TelePrimitives, please read "Generic Extra-Vehicular Activity (EVA) and Telerobot Task Primitives for Analysis, Design, and Integration, Version 1.0: Reference Compilation," JPL Publication 90-10.

Telerobot Specific Primitive Argument Menus

Task:

mode

pure teleoperation, force-position teleop, force-torque teleop, traded,shared,semi-autonomous,autonomous, -,Add Item,Delete Item,

Update Menu

INSTRUCTIONS:

Specific primitive arguments are listed as items in hidden card fields. Use the two visible scrolling fields to access and change them as follows:

- Select a menu from the available menus listed at right.
- Menu items appear in scrolling field at left, with menu name above. Add items in alphabetical order with a comma BEFORE the "-," item. No spaces are needed between items.
- Click on 'Update Menu' button at lower left to change the hidden card field. Check changes via pop-up menu attached to menu name.

Available Menus:

condition,
consumable,
data,
direction,
feature,
force,
location_A,
location_B,
mode,
number,
object_A,
object_B,
procedure,

tool

TEJAS V1.0 | 3/30/90 | Define | USER..

TeleSpecPrim Tools - TeleSpecPrim Arg Menus

9.4.9
1 of 2

The Telerobot Specific Primitives List is the sixth card of all 'TeleTask.####' specific task stacks when these stacks are created (see 'TeleTask.4877 Example Stack,' Help section 9.6). This card's purpose is as follows:

1. To provide a way for you to build, maintain, and modify pop-up menus for all specific arguments that replace the generic arguments in a root generic syntax (see 'Building Specific from Generic Primitives,' Help section 7.5.9, and the generic arguments list on the TelePrimitives 'Parsing Scheme Card' Help section 7.5.14).

2. To provide the above capability on a card within each specific task stack, so that the menus can be optimized for that task. The argument menus are reduced to manageable menus that list only the tools, objects, consumables, etc. involved in that task instead of a 'master list' of all possible menu items. This organization also makes it easier to use a future hypermedia stack of tools and services, consumables, safety procedures, etc. for detailed reference.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

The card fields of this card store default menus for all the generic arguments included in the generic syntaxes of the TelePrimitives stack's cards. The items in each of the menu card fields can be substituted for the generic syntax arguments when building a specific primitive from a generic one on the TeleSpecPrim Builder card (see 'Building Specific Primitives,' Help section 9.6.7).

The items that appear can be changed in two ways: by changing the menu directly on the TeleSpecPrim Arg Menus card, or by using the Add Item or Delete Item input devices (see 'Analysis Menus,' Help section 9.4.15). But if a menu is changed in this stack, ALL of the specific task stacks built thereafter will have this new version of the menu when originally created (see 'TeleTask.4877 – Stack Organization,' Help section 9.6.3).

The best way to use this Arg Menus card is to archive it as released in TEJAS V1.0, then change the default menus to suit the needs of each task.

TeleSpecPrim Tools Stack - Card Backgrounds

There are three different backgrounds in these stacks. By specific name:

TeleSpecPrims List.bg: used only for the Telerobot Specific Primitives List card, card name TeleSpecPrims List; (see Help section 9.4.7).

TeleSpecPrim.bg: used for the Telerobot Specific Primitive Builder card, card name TeleSpecPrim Builder, and for all Specific Primitive Record Cards created by the TeleSpecPrim Builder card in the process of performing task analysis in TEJAS; (see Help sections 9.4.8 and 9.6.4).

TeleSpecPrim Args.bg: used only for the Telerobot Specific Primitive Argument Menus card, card name TeleSpecPrim Arg Menus; (see Help section 9.4.9).

TeleSpecPrim Tools Stack - Common Fields

The three backgrounds in this stack have two common fields: Task and SpecTask Number. Field specifications are below.

Task: locked, labeled shadow field at top center or top right. Automatically assigned the specific task name when the three cards in this stack are copied into a specific task stack. Do not attempt to change the contents of this field; it must match the Task field on the interrelated task summary, assumptions, and open issues cards of any TeleTask.#### stack.

SpecTask Number: locked, unlabeled, rectangle field at top left or top center that quickly identifies the stack. Automatically assigned the four- or five-digit ID number when a specific task stack is created (see 'Relating Tasks, Assumptions, and Open Issues,' Help section 8.4.7). This field must match the corresponding field on the interrelated task summary, assumptions, and open issues cards of any TeleTask.#### stack.

TeleSpecPrim Tools Stack - Common Buttons

menu - The SpecTask Menu button (at bottom left) provides an easy way to navigate around the seven most important cards in a specific task stack. Its pop-up menu (denoted by the ⌘ sign and shown below) gives you a choice among the major seven cards in a specific task stack. Selecting and releasing on any item takes you directly to that card in the stack, for faster navigation among these baseline cards.

Task Summary
Assumptions
Open Issues
SpecPrims List
SpecPrim Builder
Arguments Menus
Primitives Menus

This button works within the TeleSpecPrim Tools card for the three cards in that stack only. It is present on the task summary, assumptions, open issues and primitives menu builder cards for each specific task as well, but remains hidden on those cards until a specific task stack is built (see 'Building a Specific Task,' Help section 8.4.12).

TeleSpecPrim Tools Stack - Analysis Fields

NOTE: The analysis fields in this stack are not common to the three card backgrounds, and are unusable until included in a specific TeleTask.#### stack. The specifications that follow, by card, explain the purpose of each field to the task analysis.

More than anything else, these analysis fields are what guided the design of the three tool cards in this stack. Moreover, there is still room for more fields, as numerical background fields associated with each specific primitive on the TeleSpecPrim.bg cards, or as text or graphics fields on a new background. As you perform task analysis, keep in mind what future capability you would most like to add. Then either send your comments to the TEJAS Editor, or attempt to build a new tool card yourself.

TeleSpecPrim Tools Stack - Analysis Fields

TeleSpecPrims List card:

SpecPrims List: locked, labeled, visible scrolling text field at center of card. Its purpose is to show a large segment of the script of specific primitives for that task as you build them. A HyperTalk script automatically keeps it updated with whatever appears in the corresponding (but smaller) SpecPrims List field on the TeleSpecPrims Builder card. Whatever changes you make to the specific primitives on the TeleSpecPrims Builder card will show up in this field.

Total Time: locked, labeled, visible rectangle field at upper right. Updated with the running total of combined specific primitive times when the Calculate button is used (see Help section 9.4.14).

TeleSpecPrim Tools Stack - Analysis Fields

TeleSpecPrim Builder card:

Syntax: unlocked, unlabeled rectangle field at top center. Background field, common to this card and all specprim record cards (see 'Specific Primitive Record Cards,' Help section 9.6.4). Used as a work field to display and modify primitives before inclusion in the specprims list.

PrimMinutes: unlocked, labeled (as Minutes/Prim) rectangle field at middle center. Enter duration for each specific primitive here in minutes (e.g., 1.2). Affects Total Time and pctTotalTime fields.

Frequency: locked, labeled rectangle field at middle center. Maintained automatically by five card buttons – Append, Insert, Modify, Copy and Delete (see Help section 9.4.14) – as the list of specific primitives is built within each specific task stack (see 'Maintaining the Frequency,' Help section 9.6.13). Affects Total Time and pctTotalTime fields.

TeleSpecPrim Builder card (cont'd):

Total Time: unlocked, labeled rectangle field at middle center. Automatically updated by the Calculate button (see Help section 9.4.14) by summing the product of the Frequency and PrimMinutes fields for each specific primitive record card.

pctTotalTime: unlocked, labeled (as '% Total Time') rectangle field at middle center. Automatically updated by the Calculate button (see Help section 9.4.14) by dividing the product of the Frequency and PrimMinutes fields for each specific primitive record card.

TeleSpecPrim Builder card (cont'd):

SpecPrims List: locked, unlabeled, visible scrolling text field at bottom center; shows six lines of the list of specific primitives for that task as you build them. Works interactively with the five card buttons Append, Insert, Modify, Copy and Delete (Help section 9.4.14). Primitives may be appended in one step, but must be selected (by pointing to them with the cursor and clicking on the mouse, so that the primitive line highlights) before inserting, modifying, copying, or deleting. For a step-by-step explanation of each of these processes, see Help sections 9.6.8 to 9.6.12.

TeleSpecPrim Arg Menus card: no analysis fields; see 'Analysis Menus,' Help section 9.4.15.

TeleSpecPrim Tools Stack - Analysis Buttons

NOTE: The analysis buttons in this stack are not common among the three card backgrounds, and are unusable until included in a specific TeleTask.#### stack. The specifications that follow, by card, explain the purpose of each button to the task analysis.

TeleSpecPrims List and TeleSpecPrim Builder cards:

- The Calculate button (at bottom right) automatically recalculates the Total Time field on the TeleSpecprims List card and the Total Time and and % Total Time fields on the TeleSpecPrim Builder card. These calculations are based on the PrimMinutes and Frequency fields of each specific primitive record card, which are created in each specific task stack when a new specific primitive is added to the specprims list on the TeleSpecPrim Builder card (see 'Building Specific Primitives,' Help section 9.6.7).

TeleSpecPrim Tools Stack - Analysis Buttons

TeleSpecPrims List card: Write List: ☐ to Transfer spreadsheet ☐ with minutes ☐ to Transfer document ☐ with minutes

These five background buttons work together to provide the only automated output device within TEJAS Version 1.0. Nowhere are you more likely to export detailed information from TEJAS V1.0 than in a specific task stack. Here, the specific primitives (specprims) list is the end result, and the possible starting point for more analyses in existing spreadsheets and databases.

To export the specprims list, check the appropriate boxes for output with or without the specprim durations (in minutes), then click on Write List. The button will create the text-only files 'Transfer spreadsheet' and/or 'Transfer document' for you (the names are simply serve to keep them straight). When opened as a spreadsheet or a word-processed document, the specprims list 'with minutes' will be a two-column file.

TeleSpecPrims List card (cont'd):

Archive List - The specific primitives created in each TeleTask.#### specific task stack are collected on individual card records within that stack (see "Specific Primitive Record Cards," Help section 9.6.4). There they form an expandable file of discrete steps in the task. You can always Copy, Modify and Append or Insert these specific primitives within that same specific task stack (see the other cards in this section and Help sections 9.6.8 to 9.6.12). But what if these same specific primitives can be used in another, similar task? How can you avoid rebuilding them? For that utility, you need ready access to all specific primitives you ever created, in ANY specific task stack. The Archive List button and the TeleSpecPrim Archives stack (Help section 9.5) make that possible. More --->

When you click on this button, the message shown at right appears. You can cancel at this point.

TeleSpecPrims List card (cont'd):

Archive List cont'd -

If you choose to archive the list of specific primitives visible on the TeleSpecPrims List card, the cursor turns to a busy symbol and the screen freezes. One by one, the HyperTalk script checks for the presence of each specific primitive in the TeleSpecPrims Archive stack. For example, if your specific primitives list included "FTS GRASP ORU1" (a fairly common step) and that primitive had been previously archived on the verb card GRASP, the script will move on to the next specific primitive. But if for example, the next specific primitive were "FTS GRASP ORU1 with force feedback," and this primitive had NOT been archived, then the primitive, its duration in minutes, and the name of its origin stack (TeleTask.####) would be copied onto the GRASP card in TeleSpecPrim Archives (see Help section 9.6.14).

TeleSpecPrim Tools Stack - Analysis Buttons

TeleSpecPrim Builder card:

- The 'TeleSpecPrims block' button at the upper left corner and its companion the 'TeleSpecPrims stacked blocks' button use the same customized, powerful script as the 'TelePrimitives block' button in the TelePrimitives stack to access a set of updateable selection menus of the generic TelePrimitives' verbs maintained by the 'Menu Builder Master' card in the TelePrimitives stack (Help sections 7.5.12 and 7.4.15).

As with the button in the TelePrimitives stack, pressing either of the above two buttons reveals up to seven numbered buttons, according to the number of menus specified by the Menu Builder card (see below).

M1 M2 M3 M4 M5 M6 M7

S1 S2 S3 S4 S5 S6 S7

More --->

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER...

TeleSpecPrim Tools Stack - Analysis Buttons

M1 M2 M3 M4 M5 M6 M7

TOP-OFF
TOUCH
TRACK
TRANSFER
TRANSLATE
TRANSMIT
TRANSPORT
TURN
UNBERTH
UNDOCK
UNFOLD
UNGRASP
UNSCREW
UNSTOW
UPDATE
UPLOAD

NOTE:
This is a custom menu system.

Please send comments!

Clicking and holding down on any of the M or S buttons immediately causes a pop-up menu to appear with primitive verbs, starting and ending as specified by the Menu Builder card. Non-selectable verbs are shadowed; they are the deleted (omitted) primitives left in the TelePrimitives stack for traceability. All other boldface verbs are selectable.

Releasing the mouse on a deleted verb or off the menu will cause the menu to disappear. That's all. Nothing else will happen.

Releasing the mouse on a selectable verb causes one of two things to happen:

More --->

TEJAS V1.0 | Help Menu | Define | USER...

TeleSpecPrim Builder card (cont'd):

These card buttons do not function in the TeleSpecPrim Tools stack. But in a specific task stack, they are used to retrieve generic primitive syntaxes (using the M buttons) or archived specific primitives (S buttons) into the syntax field on the SpecPrim Builder card. You can then type new arguments into the primitive directly, cut and paste them using the Generic Arguments menus (Help sections 9.4.15 and 9.6.7), change the duration, or change nothing at all, before Appending or Inserting the resulting specific primitive into the SpecPrims List for that specific task.

For a step-by-step explanation of this process, see the TeleTask.4877 example stack.

TeleSpecPrim Builder card (cont'd):

Generic Arguments - This rectangle card button at top left (below the Syntax field) automatically pulls out the generic arguments from any primitive in the Syntax field and lists these arguments in order of occurrence in the Generic Args scrolling field (see 'Analysis Menus,' Help section 9.4.15). This same script is used by the button's script after you have used the set of pop-up, 'M-button' menus to retrieve a generic primitive syntax from the TelePrimitives reference stack into theSyntax field on the SpecPrim Builder card (see earlier cards, this Help section).

As an example, suppose you were building a specific primitive from the generic syntax "(system) MOVE (object_A) to (location_A)" and had modified it to read "RMS MOVE (object_A) to (location_A)". Clicking on the Generic Arguments button would cause the last two remaining generic arguments "object_A" and "location_A" to appear in the Generic Args field.

TeleSpecPrim Builder card (cont'd):

- The 'TapeIt' button is used to paste a specific primitive argument chosen from the arguments menus onto text selected in the Syntax line. The specific argument you are pasting will appear in the message box when selected (see 'Building Specific Primitives,' Help section 9.6.7 for a complete example of this button's use).

[Task Outline] - This card button at middle right hides and shows the task outline in a scrolling text field that appears over the numerical fields, to save space on this card. This function gives you the ability to check where you are in the task scripting process without leaving the TeleSpecPrim Builder card, saving you trips back to the task summary card to review the outline.

TeleSpecPrim Builder card (cont'd):

The following five card buttons perform the functions of a line editor on the list of specific primitives found in the SpecPrims List field.

[Append] [Insert] [Modify] [Copy] [Delete] They are specified in detail on the following cards.

All five card buttons work interactively with the background analysis fields Syntax and SpecPrims List and the ancillary number fields PrimMinutes, Frequency, Total Time, and pctTotalTime (see Help section 9.4.13).

The most important thing to remember about these text manipulation buttons is that although they are complex, they're not mysterious. Their HyperTalk scripts are heavily commented, to explain each step. If the Help cards and your own experimentation fail to help you grasp their function and significance, try printing out the button scripts and reading them. For a step-by-step example of their operation, read Help section 9.6.

TeleSpecPrim Builder card (cont'd):

Append - This button takes the contents of the Syntax field at top and appends them to (adds that line to the end of) the SpecPrims List scrolling field at bottom. Before it does so, it checks the specific primitive record cards in that specific task stack for the new specprim. If found, it updates the Frequency count by one on that primitive's record card; if there is no record card for this exact primitive, the script creates one and stores the new primitive on it. In either case, it adds the primitive at the end of the specprims list, and updates the Frequency field accordingly.

Append works in one step. Unlike the other four text manipulation card buttons, no specific primitive in the SpecPrims List field must be selected first - whatever is in the Syntax field is immediately appended. Therefore, this button is separated from the other four card buttons, and carries the down arrow as a reminder to think before using it.

TeleSpecPrim Builder card (cont'd):

Insert - This button works in TWO STEPS to insert the Syntax field at top after an insertion point (any line you choose) in the SpecPrims List below.

Step 1: When you are ready to insert a new specprim, click on the primitive in the SpecPrims List field that you want the new specprim to follow. That line will highlight; this is your insertion point.

Step 2: Click on the Insert button. The button's HyperTalk script checks the specific primitive record cards in that specific task stack for the new specprim. If found, the script updates the Frequency count on that primitive's record card by one; if there is no record card for this exact primitive, the script creates one and stores the new specprim on it. In either case, the script then adds the primitive immediately after the highlighted primitive in SpecPrims List, and updates the Frequency field accordingly.

TeleSpecPrim Builder card (cont'd):

[Modify] - This button works in THREE STEPS in conjunction with the Syntax field at the top of the TeleSpecPrim Builder card to change whatever specific primitive you choose in the SpecPrims List at bottom.

Step 1: Select the specific primitive you wish to change in the SpecPrims List field by clicking on it. That specprim's line will highlight.

[Cancel] [Modify] Step 2: Click on the Modify button. The button will highlight and a Cancel button will appear directly above it (shown).
The specific primitive you selected will appear in the Syntax field at the top of the SpecPrim Builder card, along with its duration in minutes and frequency of occurrence in the PrimMinutes and Frequency fields. The selected line will revert to normal (unhighlighted), and you will be ready to modify the specific primitive and/or its duration.

More --->

TeleSpecPrim Builder card (cont'd):

[Modify] Step 3: Make your modifications to that specific primitive.
At this point, you have four possible alternatives:

1. Cancel the Modify process by clicking on the Cancel button. If you do, the Cancel button disappears and the Modify button returns to normal (unhighlighted). The primitive you selected still appears in the Syntax field; you can continue to change and Append or Insert it into the SpecPrims List if you wish. In this respect, canceling Modify is similar to using the Copy button.

2. Modify nothing at all in the primitive, but complete the Modify process by pressing the Modify button again anyway. In this case, nothing will change in the specprims list or in the specific primitive's record card, because the Modify script will register no change.

More --->

TeleSpecPrim Builder card (cont'd):

Modify Step 3 (cont'd):

3. Modify only the duration of the primitive in the PrimMinutes field. Then if you complete the Modify process by pressing the Modify button again, this duration will be changed for all occurrences of that same specprim in the list, but the specific primitive itself will not change.

4. Modify the specific primitive and/or its duration, then complete the Modify process by pressing the Modify button again.

After the highlighted Modify button is pressed again, its HyperTalk script has to treat the primitive in the Syntax field as an unknown.

More --->

TeleSpecPrim Builder card cont'd:

Modify Step 3 (cont'd):

The Modify button's HyperTalk script checks the specific primitive record cards in that specific task stack for the modified specprim. If the specprim is there, it means either you didn't change the primitive or you modified it inadvertently into another specprim already in the list. The script knows which; if you created an existing primitive by modification, the script updates the Frequency count by one on that primitive's record card.

If there is no record card for this exact primitive, the script creates one and stores the new specprim on it. In either case, the script then changes the specific primitive you originally selected in the SpecPrims List in Step 1 to the modified specific primitive in the Syntax field.

TeleSpecPrim Tools Stack - Analysis Buttons

TeleSpecPrim Builder card (cont'd):

[Copy] - This button works in TWO STEPS to transfer any specific primitive you choose in the SpecPrims List field into the Syntax field at top. This allows you to change it and then Append or Insert it into the list, without having to build it anew from its generic primitive syntax.

Step 1: Select the specific primitive you wish to copy in the SpecPrims List field by clicking on it. That line will highlight.

Step 2: Click on the Copy button. The script will place the specprim in the Syntax field at top and retrieve its ancillary information into the PrimMinutes, Frequency, pctTotalTime and Total Time fields from the record card for that specprim. You can now change it, then Append or Insert it into the specprims list.

TeleSpecPrim Tools Stack - Analysis Buttons

TeleSpecPrim Builder card (cont'd):

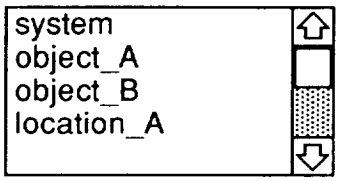
[Delete] - This button works in THREE STEPS to remove any specific primitive you choose from the list of specific primitives for a specific task.

Step 1: Select the specific primitive you wish to delete in the SpecPrims List field by clicking on it. That line will highlight.

Step 2: Click on the Delete button. The script will place the specprim in the Syntax field at top and retrieve its ancillary information from the record card for that specprim. The message "Delete that specific primitive?" appears, giving you a chance to Cancel your deletion. To complete the deletion, click on the OK button. The Delete script will remove that occurrence of the specprim from the SpecPrims List, and either reduce its Frequency count by one, or delete the entire record card for that specprim if it only occurs once in the list.

NOTE: The analysis menus within this stack are not common to the three card backgrounds. They are active without first being included in a specific TeleTask.#### stack. The specifications that follow, by card, explain the purpose of each menu in performing task analysis in a specific task stack.

TeleSpecPrim Builder card:



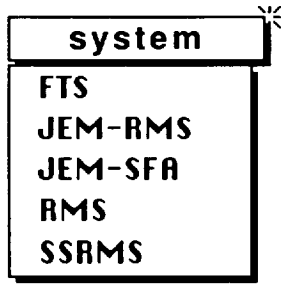
- 'Generic Args' is a locked, visible scrolling card field on the TeleSpecPrim Builder card below the 'Generic Arguments' button (see Help section 9.4.14; example arguments shown).

A HyperTalk script turns the field into a choice field; that is, any argument selected (clicked on) from the field briefly highlights, then appears in the 'Argument' field below for access to the pop-up menu of specific arguments that can replace the generic one.

TeleSpecPrim Builder card (cont'd):

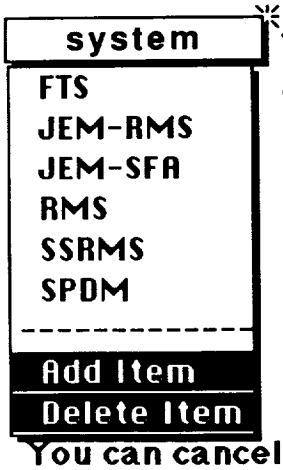
- 'Argument' is a locked, visible shadow card field on the TeleSpecPrim Builder card, just below the 'Generic Args' field. The symbol shows that it supports a pop-up menu of specific arguments taken from the TeleSpecPrim Arg Menus card. This field looks and acts like any button with a pop-up menu; but unlike the TEJAS boot button (see Help section 6.2), this menu changes depending on the generic argument appearing in the field.

As an example, suppose the Argument field contains the generic argument "system" (shown). Pressing on the field causes the pop-up to appear (shown at right).

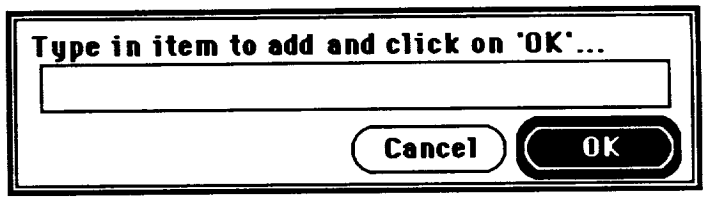


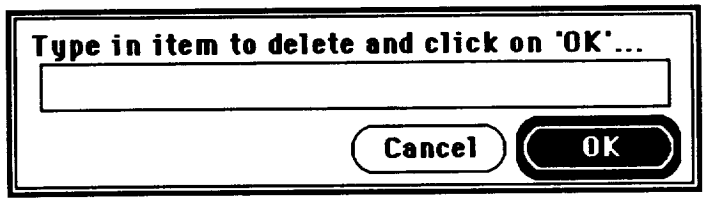
You can add or delete items from the menu here, or on the TeleSpecPrim Arg Menus card... More --->

TeleSpecPrim Builder card cont'd:



To add or delete an item from any pop-up argument menu, select 'Add Item' or 'Delete Item.' One of these messages will appear:





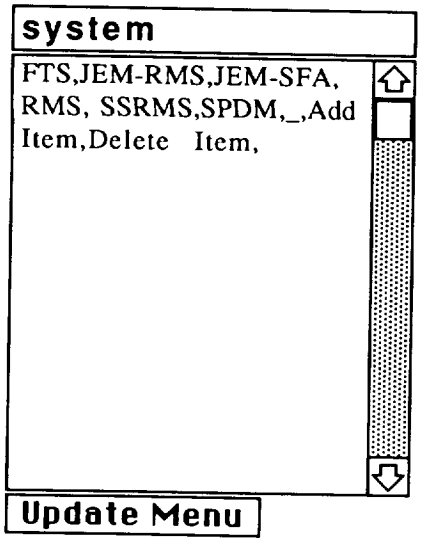
You can cancel the process at this point. Typing in an item and clicking OK will give you either an "Item added. Pop menu to check." message or an " Item deleted. Pop menu to check." message. The item will be either added or deleted from the menu just above the dashed line before Add Item.

TeleSpecPrim Arg Menu card:

The TeleSpecPrim Arg Menus card is where the menus accessed with the Argument field of the SpecPrim Builder card are actually stored. Each generic argument from the generic TelePrimitives' syntaxes has it own individual, hidden card field, with appropriate specific arguments listed as items (e.g., the 'system' menu contains "FTS,JEM-RMS,JEM-SFA,RMS, SSRMS,SPDM,-,Add Item, Delete Item"). By going directly to the TeleSpecPrim Arg Menus card within a specific task stack and changing the menus there, you can quickly provide a complete set of menus containing items customized to the task you're analyzing. This avoids adding and deleting items one at a time and speeds up the analysis.

Only two scrolling fields are visible on the TeleSpecPrim Arg Menus card: 'Mod Menu' on the left and 'Menu List' on the right, with empty space between. These two fields work interactively with others. More --->

TeleSpecPrim Arg Menu card (cont'd):



<-- Menu Name – holds the name of the generic argument selected from the Menu list scrolling field at right (see next Help card). The Menu Name field provides a pop-up menu that shows how the specific argument items will appear when the menu is called on the SpecPrim Builder card's Argument field.

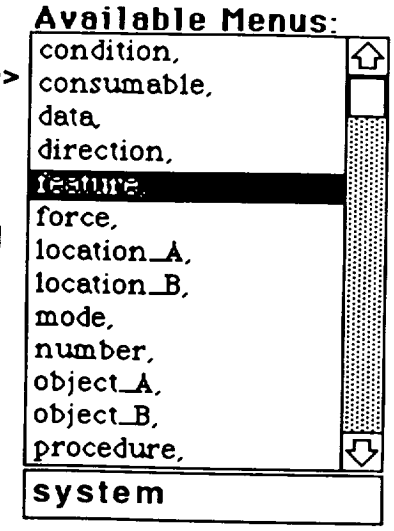
<-- Mod Menu – this field is unlocked. In it appear the menu items from any hidden argument field whose name appears in the Menu Name field above. You can add, delete, or change items by typing them in here directly – in alphabetical order, with a comma – and then clicking on Update Menu.

TeleSpecPrim Arg Menu card (cont'd):

To get the menu items for each generic argument into the unlocked Mod Menu field, you must click on the argument in the Menu List field (at right).--->

For instance, if you click on 'feature' (shown), the Menu Name field changes to "feature" and the menu of items in the hidden card field 'feature' will appear in the Mod Menu scrolling field.

The name of the menu that previously appeared in Mod Menu ('crew' in our example) appears simultaneously in the 'Precursor' rectangle field immediately below the Menu List (at right).------->



Section 9.5

User Instructions: TeleSpecPrim Archives Stack

PAGE 294 INTE

9.5 User Instructions

Background:

- ☐ 9.5.1 General Information
- ☐ 9.5.2 The User's Role
- ☐ 9.5.3 Changing the Standard
- ☐ 9.5.4 Adding Cards
- ☐ 9.5.5 Deleting Cards

Unique!

- ☐ 9.5.6 Carrying Back Specific Primitives

Stack-Specific Help:

- ☐ 9.5.7 Card Backgrounds
- ☐ 9.5.8 Information Fields
- ☐ 9.5.9 Buttons

Unique!

- ☐ 9.5.10 Menu Builder Card

INSTRUCTIONS:
Click ☐ box to access section;
Click arrows to page through Help stack;
Click 'T-flag' to return to point of origin.

TeleSpecPrim Archives

Explanation Card

This stack archives all specific primitives sent to it from any specific task stack (e.g., TeleTask.4877). There is a card for each primitive verb, similar to the generic primitive cards in the TelePrimitives stack; however, only the integrated TelePrimitive verbs have corresponding cards in this stack.

The scrolling field on each card lists all the specific primitives for each primitive verb that were created using the Specific Primitive Builder card in one or more specific task stacks. These archived specific primitives are for INTERNAL USE ONLY. This stack is NOT meant to standardize specific primitives for telerobot work systems, but rather to provide for quick retrieval of primitives created by an analysis group in the course of analyzing a particular set of tasks in a given environment. Read this stack's TEJAS Help cards carefully!

TEJAS V1.0 | 3/30/90 | Sort List | Find Verb | Define | USER..

TeleSpecPrim Archives - General Information

9.5.1 1 of 1

The TeleSpecPrim Archives stack stores all specific primitives sent to it by the Archive List button on the TeleSpecPrims list card in any specific task stack (see 'Archiving Specific Primitives,' Help section 9.6.14). The specific primitives are not removable; once archived, they are there permanently.

This stack is organized similarly to the TelePrimitives stack; there is a separate card for each primitive verb. However, unlike the TelePrimitives stack, which retains all integrated verbs (part of the interrelated set of TEJAS Version 1.0) and deleted verbs (omitted from that set), the TeleSpecPrim Archives stack has cards for only the integrated verbs. Any verb added to the integrated TelePrimitives' integrated set can be represented here by a new card; the stack is therefore expandable.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

TeleSpecPrim Archives - The User's Role

To avoid recreating specprims, this stack can provide a quick listing of specific primitives built by a particular group or organization of analysts. This means INTERNAL USE ONLY. It is critical that you understand why.

Specific primitives created within a specific 'TeleTask.####' stack were created under the assumptions and circumstances detailed in that stack. For that reason, these primitives may or may not be usable by another group analyzing other types of tasks, or the same tasks under substantially different circumstances (e.g., more crew, improved tools, etc.). REMEMBER:

- This stack (and the button scripts to use its data) are provided for your convenience only, not in any attempt to 'standardize' specific primitives.

- You must question ALL durations for ANY specprims retrieved from this stack during task analysis in a specific primitives stack.

TeleSpecPrim Archives - Changing the Standard

This stack is empty when released in TEJAS Version 1.0. You cannot make any changes in any stack information field, except to add primitives by using the 'Archive List' button on the TeleSpecPrims list card in any specific task stack (see 'Archiving Specific Primitives,' Help section 9.6.14). You cannot delete archived primitives either, but you must create a lot of specific primitives to reach the upper limit of 30,000 characters for the field. Nevertheless, you should keep the original, empty stack safely archived.

As a convenience, you can leave detailed notes for other users in the User Notes field. You can also use different copies of this stack to archive specprims from different task analysis projects, if you wish. Such mobile specprim libraries can save time, if you keep the stacks straight.

This stack's contents are a standard for you only. Its format and function were derived from requests from TEJAS beta-testers. Please send the TEJAS Editor written, detailed suggestions for any further changes.

TeleSpecPrim Archives - Adding Cards

All integrated primitive verbs in the TEJAS Version 1.0 TelePrimitives stack are represented here by an archive card. New TelePrimitives must have a corresponding archive card, or their specprims cannot be archived from a specific task stack. Changes to the TelePrimitives should be standardized by community review, but if you MUST add a new archive card here, then:

1. Go to the Explanation card (first card in the stack).
2. Select 'New Card' from the Edit menu. A blank card will appear.
3. Fill out only the Verb field; you must unlock it or use the 'put' command.
4. Select 'Card Info...' from the Objects menu. Type the verb as the card name. This ensures that the new verb will appear on the primitives menu.
5. Either cut and paste the new card alphabetically by verb, or sort.

NOTE: New verbs will not appear in the TelePrimitives verb menus until the 'Update' button on this stack's Menu Builder card's has been activated (see 'Menu Builder Card,' Help section 9.5.10).

TeleSpecPrim Archives - Deleting Cards

DO NOT DELETE ANY CARDS FROM THIS STACK!

Since this is purely an archive stack, containing only one card for each integrated primitive verb in the TelePrimitives stack, there should be no need to delete cards. But just in case, a HyperTalk script will prevent deleting and cutting all cards in the stack. Please do not circumvent it.

Carrying Back Specific Primitives

The purpose of the TeleSpecPrim Archives stack is to give you the option of copying specific primitives built and used in an earlier TeleTask.#### stack into your current specific task stack. But having the stack is not enough; there should be a quick way to find the specprim you want in the archive cards (provided by a menu button, see Help section 9.4.14), to see where it originated (the Origin field, Help section 9.5.8), and to return with it to your specific task stack (the Carry Back button, Help section 9.5.9).

Carrying back specific primitives is optional; should you enter the TeleSpecPrim Archives stack from a specific task stack and then decide to return to that TeleTask.#### stack without carrying back a specprim, you can do so by clicking on the button at the top right corner of any archive card, even if you have viewed several different archive cards.

TeleSpecPrim Archives - Card Backgrounds

There are two different backgrounds in this stack. By specific name:

TeleSpecPrim Archives.bg – main background for this stack. Different cards for each verb primitive. Incorporates primary information fields: eight visible background fields of different types, two hidden scrolling fields.

TelePrimsMenu.bg – specialized, for the Menu Builder Card only. Unlocked, but a reference for all information cards in the stack. Changes are best made via the User Notes comments field (Help section 6.5).

TeleSpecPrim Archives - Information Fields

There are five information fields common to the 'TeleSpecPrim Archives.bg' background: Verb, TeleSpecPrims, TeleSpecPrims.complete, Copied SpecPrim, PrimMinutes. Field specifications follow.

All fields are locked and may NOT be changed. This stack is a pure archive; only specific primitives built within TEJAS specific task stacks are sent to it. Please do not unlock any fields or delete any items from them; this would harm the functionality of the stack.

Field specifications:

Verb: locked, unlabeled shadow field at top right. Contains one- or two-word primitive verb from the TelePrimitive verbs in that stack. Cards exist for integrated verbs only; this stack has no card archives for specific primitives derived from deleted (omitted) primitives.

TeleSpecPrim Archives - Information Fields

Field specifications (cont'd):

TeleSpecPrims: locked, visible unlabeled scrolling field across body of card. Contains all archived specific primitives based on the verb each card represents; archiving is accomplished via the 'Archive List' button on the TeleSpecPrims List card in any specific task stack (see Help section 9.4.7). This is a large selection field, where primitives you click on are retrieved for use in a specific task stack (see 'Retrieving Archived SpecPrims,' Help section 9.6.15).

TeleSpecPrims.complete: locked, hidden unlabeled scrolling field across body of card. Contains all specific primitives, their specific task stack of origin (to provide traceability), and their duration in minutes (example item: "SPDM GRASP handle :: TeleTask.7632 :: 2"). Hidden in favor of the more readable TeleSpecPrims field above, which lists only the specific primitives.

TeleSpecPrim Archives - Information Fields

Field specifications (cont'd):

Copied SpecPrim: locked, visible, labeled rectangle field directly beneath the TeleSpecPrims field. Filled automatically with specific primitive from TeleSpecPrims field when user selects a specific primitive there for retrieval (see 'Retrieving Archived SpecPrims,' Help section 9.6.15).

Origin: locked, visible, labeled transparent field at bottom left on all archive cards. Filled automatically with name of specific task stack where a specific primitive the user selects from the TeleSpecPrims field originated and was first archived.

PrimMinutes: locked, visible, labeled (as Minutes/Prim) transparent field at bottom center on all archive cards. Filled automatically with duration of specprim in minutes (if archived) of a specific primitive the user selects from the TeleSpecPrims field.

TeleSpecPrim Archives - Buttons

TeleSpecPrim Builder card:

- The 'TeleSpecPrims stacked blocks' button uses the same customized, powerful script as the 'TelePrimitives block' button in the TelePrimitives stack to access a set of updateable selection menus of the generic TelePrimitives' verbs maintained by the Menu Builder Master card in the TelePrimitives stack (see Help sections 7.5.12 and 7.5.15).

As with the button in the TelePrimitives stack, pressing on the above button reveals up to seven numbered buttons (as shown below), according to the number of menus specified by the Menu Builder card (see Help section 9.5.10).

S1 | S2 | S3 | S4 | S5 | S6 | S7

More --->

S1 S2 S3 S4 S5 S6 S7

TOP-OFF
TOUCH
TRACK
TRANSFER
TRANSLATE
TRANSMIT
TRANSPORT
TURN
UNBERTH
UNDOCK
UNFOLD
UNGRASP
UNSCREW
UNSTOW
UPDATE
UPLOAD

NOTE:
This is a custom menu system.

Please send comments!

Clicking and holding down on any of the S buttons immediately causes a pop-up menu to appear with primitive verbs. Non-selectable verbs are shadowed; they are the deleted (omitted) primitives left in the TelePrimitives stack for traceability but omitted entirely from this archive stack (i.e., no cards exist for them). All other boldface verbs are selectable.

Releasing the mouse on a deleted verb or off the menu will cause the menu to disappear. That's all; nothing else will happen.

Releasing the mouse on a selectable verb takes you immediately to that verb's archive card in the stack.

Carry Back ○ with mins ◉ without mins - These background buttons are hidden until you select a specific primitive, then they become visible at the bottom right of the archive card. The buttons hide again whenever a card is closed.

If you left the TeleSpecPrim Builder card of an 'TeleTask.####' stack in search of an archived specprim, and are ready to carry that specprim back for use in your task's script, you must decide whether to take the specprim with or without its archived duration in minutes. The default (preselected) choice is 'without mins' (shown), because it is safer: you cannot tell the assumptions or sequence of events that led to assigning that specific primitive the duration archived with it unless you review its origin.

Either way, clicking on 'Carry Back' returns you to the TeleSpecPrim Builder card in the TeleTask.#### stack you left and enters the specprim in the Syntax field there (with the duration in the PrimMinutes field, if needed).

Telerobot Primitives Menu Builder (Master) Update

The 'Update' button on this card (and the scripts attached to the stack) work to build and maintain pop-up menus of the crew-EVA Primitive verbs. On any archive card in the EVASpecPrim Archives stack, click on the stacked EVA blocks (upper left) to show the S1-? buttons, then press an S button to show the pop-up menu and select a verb (try it!).
In this stack (except on this card), selecting a verb takes you to that archive. Each time a new verb card (or a set of them) is added to or deleted from the EVAPrimitives stack, or a primitive's status changes there (say, deleted to included), you must manually order a menu Rebuild from the Master Menu Builder card in EVAPrimitives, then return to this card and Update. Do so sparingly if you make many changes to EVAPrimitives, for it takes time. The menus will not update automatically, so if you notice verbs missing, Update!

ACQUIRE,ACTIVATE,(ACTUATE,ADJUST,ALIGN,ANALYZE,(APPROACH,(
ASSEMBLE,ATTACH,BERTH,CALIBRATE,CAPTURE,(CHANGE-OUT,
CHECKOUT,(CLEAN,CLOSE,CLOSE gripper,COMPARE,COMPLY,(COMPUTE,
CONFIGURE,COUPLE,CUT,DEACTIVATE,(DECONTAMINATE,DECOUPLE,
DEMATE,DEPLOY,(DEPRESSURIZE,DERIGIDIZE,DESIGNATE,DETACH,
DIAGNOSE,(DISASSEMBLE,(DOCK,DOWNLOAD,DRAIN,DUMP,EGRESS,
EXTEND,EXTRACT,EXTRACT feature,FILL,(FIND,FOLD,FREEZE,GRAPPLE,
GRASP,(GRIP,HANDOVER,IDENTIFY,INDEX,INGRESS,INITIALIZE,INITIATE,
INSERT,INSPECT,(INSTALL,(LIMP,LOAD,(LOAD subsystem,LOCATE,

<-This field, updated with each Update, shows all the verbs in the stack. The # of menus is shown below.

5

TEJAS V1.0 | 3/30/90 | ZEnd2 | Define | USER..

TeleSpecPrim Archives Stack - Menu Builder Card

9.5.10 1 of 1

The Menu Builder card, last in the stack, maintains the pop-up menus of primitive verbs available from the 'TeleSpecPrim stacked block' button (Help section 9.5.9). This card's visible and hidden fields and scripts work to update and store these verb menus, based on the background and card fields of the Menu Builder Master card in the TelePrimitives stack. The text on the card explains how to use it; note that Updating assumes the TelePrimitives stack's Menu Builder Master card is current (i.e., has been rebuilt following any changes made to the TelePrimitives stack).

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

Section 9.6

User Instructions: TeleTask.4877 Example Stack

TeleTask.4877 Example Stack Help Menu

Menu 1 of 1

9.6 User Instructions

Background:

- ☐ 9.6.1 General Information
- ☐ 9.6.2 Before You Create Specprims

☐ Stack-Specific Help:

- ☐ 9.6.3 Stack Organization
- ☐ 9.6.4 Specific Primitive Record Cards
- ☐ 9.6.5 Configuring Argument Menus
- ☐ 9.6.6 Building a Derivative Task
- ☐ 9.6.7 Building Specific Primitives

Stack-Specific Help (cont'd)

- ☐ 9.6.8 Using the Append Button
- ☐ 9.6.9 Using the Insert Button
- ☐ 9.6.10 Using the Modify Button
- ☐ 9.6.11 Using the Copy Button
- ☐ 9.6.12 Using the Delete Button
- ☐ 9.6.13 Maintaining the Frequency
- ☐ 9.6.14 Archiving Specific Primitives
- ☐ 9.6.15 Retrieving Archived SpecPrims
- ☐ 9.6.16 After You Create Specprims

INSTRUCTIONS:
Click ☐ box to access section;
Click arrows to page through Help stack;
Click 'T-flag' to return to point of origin.

TEJAS V1.0 | 3/30/90 | Help Menu | Define | USER..

TeleTask.4877 - General Information

This is a specific task stack, created as an example that you can follow to better understand how task analysis works in TEJAS. Its list of specific primitives is deliberately incomplete so that you can change them without restriction and experiment with the built-in analysis functions.

Each specific task stack that you build in TEJAS collects and organizes enough information about a particular task to allow you to build a list of specific primitives that approximates the steps the telerobot will follow to inspect, assemble, service, maintain, reconfigure, or repair space systems. Once you have built and archived these primitives, the job of the specific TeleTask.#### task is completed. You can then proceed to other analyses using this specific primitives list with any application on any computer.

NOTE: to save space, the contraction "specprim" will often be substituted for the words "specific primitive."

TeleTask.4877 - Before You Create Specprims

The TeleTask.4877 stack can be a useful example many times over, but only if you start with it as delivered to you in TEJAS Version 1.0. Since you will change things as you follow instructions in these Help cards, save a copy of the TeleTask.4877 stack now, on your hard disk or on a floppy disk.

Don't be afraid to deviate from the instructions on these Help cards and try buttons and menus yourself until you are comfortable with them. This is not a test; the example stack is a learning tool for you.

CAUTION: The HyperTalk code that performs the analysis functions references the names of OBJECTS – buttons, fields, cards, backgrounds, and the stack. These names are accessible to you in the Button Info..., Field Info..., Card Info..., Background Info..., and Stack Info... dialog boxes from the Objects menu (see "Objects menu" in the "HyperCard User's Guide"). In order to ensure proper operation of the stack's functons, please do not alter any object's name!

TeleTask.4877 - Stack Organization

As delivered with TEJAS Version 1.0, this example specific task stack has eleven cards. From first to last by name, they are:

- TeleTask.4877 (task summary card), from the TeleTasks stack
- TeleAssume.4877 (assumptions card), from the TeleAssume stack
- TeleIssues.4877 (open issues card), from the TeleIssues stack
- TeleSpecPrims List, from the TeleSpecPrim Tools stack
- TeleSpecPrim Builder, from the TeleSpecPrim Tools stack
- Record card for specprim "camera1 ACQUIRE ORU1 near alpha joint
- Record card for specprim "modeler IDENTIFY tag from ORU1"
- Record card for specprim "camera1 ACQUIRE ORU1R near alpha joint"
- Record card for specprim "modeler IDENTIFY tag from ORU1R"
- TeleSpecPrim Arg Menus, from the TeleSpecPrim Tools stack
- TelePrimitives Menus, from the TelePrimitives stack

NOTE: The four record cards were added when those specprims were built.

TeleTask.4877 - Stack Organization

Every card in every specific task stack contains the rectangle field SpecTask Number, containing the ID number (4877 in this example stack) included in that stack's name when it the stack is built (see Help section 8.4.12). This locked field is hidden on the task summary, assumptions, and open issues cards in their original form in the TeleTasks, TeleAssume and TeleIssues stacks. It is revealed when those cards are copied into a specific task stack, to immediately identify the stack from any card.

The organization of each specific task stack is fixed. Specific primitive record cards are created or deleted (placed in the stack following the TeleSpecprim Builder card) as the specprims themselves are created or deleted. You cannot sort the cards in this stack, because the Sort button was hidden when the stack was built. But don't worry. There is an easy way around the seven major cards in any specific task stack using the pop-up menu attached to the SpecTask Menu button (see Help section 9.4.12).

TeleTask.4877 - Specific Primitive Record Cards

When you build a new specific primitive on the TeleSpecPrim Builder card, an individual card record is created for it (see below).

Specific Primitive Task 4877
OMV Maintenance

FTS MOVE panel to insertion point

Derived from generic syntax of primitive verb: MOVE

Minutes/Prim 3 Frequency 1 % Total Time

Total Time (minutes)

The Minutes/Prim field is the ONLY unlocked field on this card, because it is the only one you should change. TEJAS maintains the Frequency count (showing the number of times that specprim occurs in that task's specprims list), and the Calculate button (Help section 9.4.14) computes the rest.

TEJAS V1.0 3/30/90 Help Menu Define USER..

TeleTask.4877 - Specific Primitive Record Cards

The PrimMinutes field (labeled Minutes/Prim) is the ONLY unlocked field on this card, because it is the only one you should change on this record card.

Specific Primitive Task 4877
OMV Maintenance

FTS MOVE panel to insertion point with constrained motion

Derived from generic syntax of primitive verb: MOVE

Minutes/Prim 5 Frequency 1 % Total Time

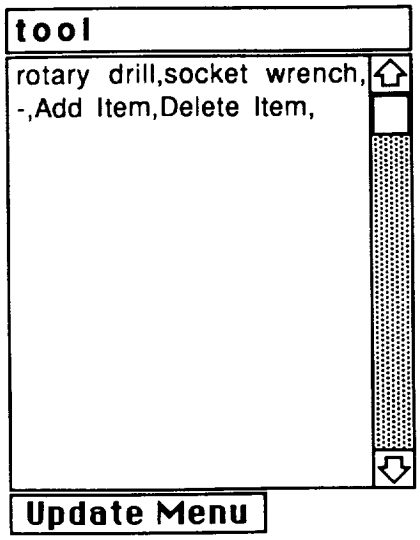
Total Time (minutes)

Note that this duration applies to ALL occurrences of the specprim in the execution of that task. The unstated assumption is that if the duration changed, the specprim should change too. In the specprim above, adding "constrained" implies 5 minutes duration (versus 3 for the other MOVE specprim).

TEJAS V1.0 3/30/90 Help Menu Define USER..

TeleTask.4877 - Configuring Argument Menus

You can simplify the work of building specific from generic primitives into a select-and-paste operation by using the argument menus accessed via the Generic Args and Argument fields (Help section 9.4.15) on the TeleSpecPrim Builder card.

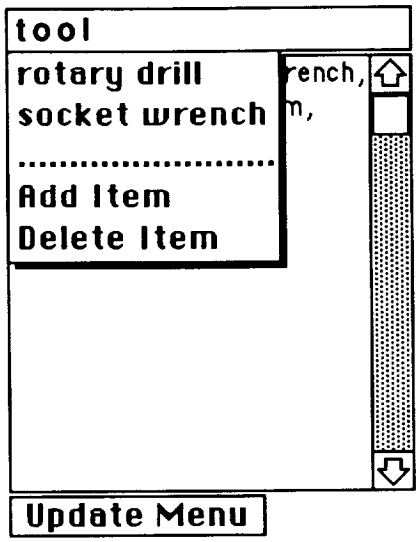


These menus are maintained in the card fields of the TeleSpecPrim Arg Menus card found in every specific task stack (Help sections 9.4.9 and 9.4.15). By configuring those card fields BEFORE you begin the analysis, you save adding items one at a time during your later work.

Go to the TeleSpecPrim Arg Menus card in the example TeleTask.4877 stack and click on 'tool' in the scrolling list of available menus at RIGHT. The fields on the left will appear as shown.

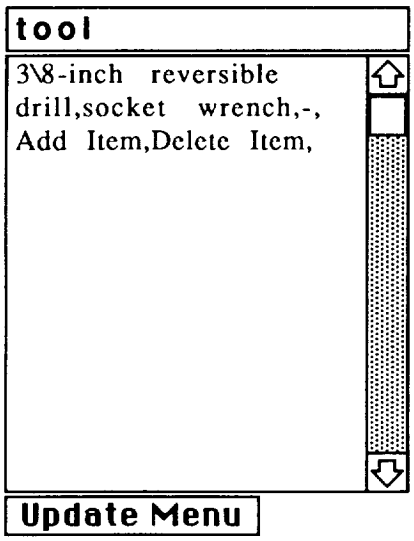
TeleTask.4877 - Configuring Argument Menus

The items listed in the ModMenu scrolling field shown below are from the hidden 'tools' card field on this TeleSpecPrim Arg Menus card. By selecting 'tool' from the available menus field at right, you have made it possible to modify the items of the card field 'tool' in this ModMenus field, and to view the changes in a pull-down menu.



To check a menu's status at any time, position the mouse cursor over the rectangle field at top left (showing the word 'tool' here) and press the mouse button down. A pull-down menu appears as shown at left. This menu has exactly the same items as those in the ModMenus field, except that each is now on a separate line (thanks to the commas between them), and the hyphen item has inserted a dividing line in the menu. More --->

You should know the list of tools involved in your task. The tools shown in the ModMenu scrolling field previously are the default items of TEJAS V1.0.



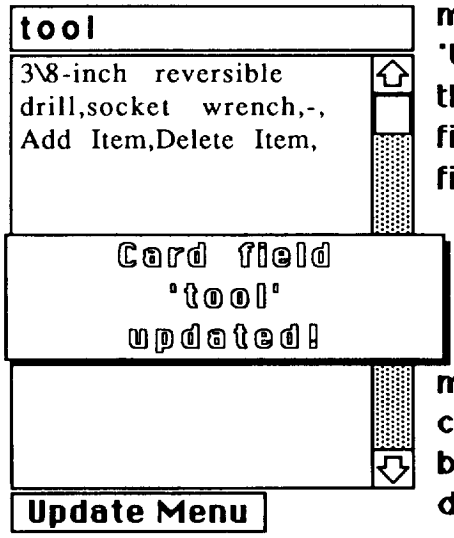
Let's suppose that in addition to these items, you will also need the bolt puller and the EVA bag (for stowing parts). You also want to specify exactly what drill and wrench will be used; namely, the 3/8-inch reversible drill and the 1/2-inch drive ratchet.

The ModMenu field is unlocked. Click and drag the cursor over the word 'rotary' and type '3\8-inch reversible' so that the list looks as shown at left (NOTE: use a reverse slash to separate 3 and 8!). Don't worry about the text wrapping around at the end of the field.

Now check the pull-down 'tool' menu. It hasn't changed! Why?

More --->

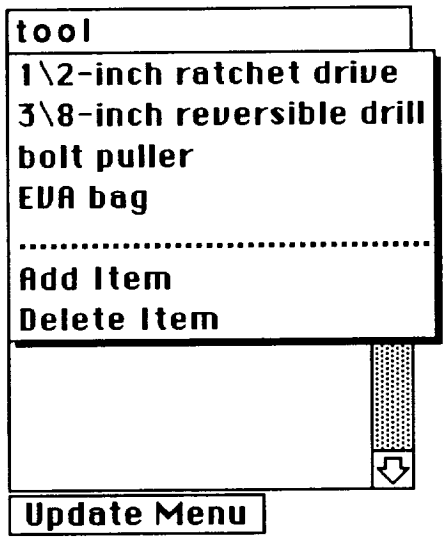
The process of configuring argument menus allows you to make changes to the menu items and then check them carefully, in case you change your mind or make a mistake. Unless you click on the 'Update Menu' button at bottom left first, none of the changes you make in the unlocked Modmenu field will be copied into the menu's hidden card field, and the menu will not change.



Click on the 'Update Menu' button. The button will highlight, and then a tune will play and the message shown at left briefly appears. This means that you have changed the 'tool' menu's card field. Check the menu by pulling it down as before. Now the first item is '3/8-inch reversible drill.'

More --->

Now in the same way, add 'bolt puller' and 'EVA bag' to the list of tools in the ModMenu field and change 'socket wrench' to '1\2-inch ratchet drive.'



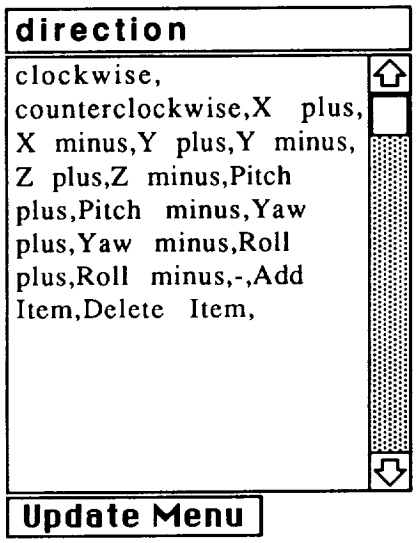
Use the Update Menu button to effect the changes. Clicking on the 'tool' pull-down menu will show the menu with the changes (at left).

You can position these new items in any order. The example shown has the items inserted alphabetically, to make scanning them easier for you. Another order will not affect the way the menu works (in fact, the 'Add Item' utility always adds items just before the dividing line).

NOTE: The pull-down menu's width will adjust automatically to accommodate the largest item.

More --->

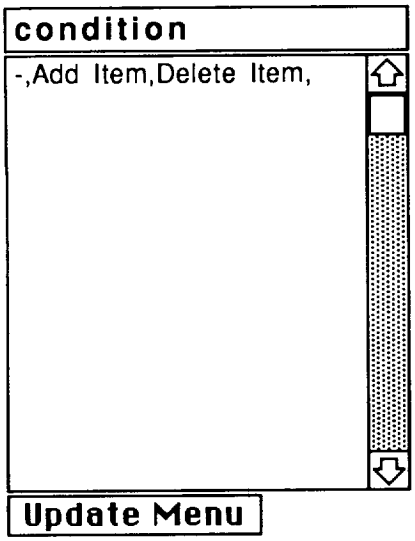
You will not use all menus in all tasks, but only those menus for arguments that appear in the syntax of the generic primitives used as roots to build specific primitives (see Help section 9.6.7). Therefore, you need not configure ALL menus before beginning your analysis. For example, you should not need to configure the 'consumable' menu for any tasks but those involving refueling.



Some menus have no default items (see the next card about the 'condition' menu). Others may not have what you expect or in an order you prefer. The items in the 'direction' menu at left are arranged in the traditional 'X,Y,Z,Pitch,Yaw,Roll' order, without numerical values. These values vary by specprim, and should be typed directly into the specprim as you create it.

More --->

In general, an argument menu applies to all uses of that argument to build any task's specific primitives. The 'condition' menu is different, however. It varies by primitive; there are no default values.



As an example, consider the syntaxes of the two TelePrimitives ADJUST and CONFIGURE (below).

(system) ADJUST (condition) of (object_A)
(system) CONFIGURE (subsystem) with (condition)

In specifying the arguments of ADJUST's syntax, 'condition' might be replaced with 'flow rate.' This same specific argument could also fit in CONFIGURE. But 'clearance' only makes sense in ADJUST, not in CONFIGURE. This is why the 'condition' menu is your responsibility. More --->

Configuring the argument menus is a worthwhile first step in your analysis. For maximum effect, follow these guidelines:

- As a minimum, configure the argument menus for consumable, direction, feature, location_A, location_B, mode, object_A, object_B, procedure, reference frame, subsystem, system, and tool. These are items you should know before the analysis (NOTE: any '_A' and '_B' items should be the same).

- Keep track of these argument menus. Once you build them on one specific task's TeleSpecPrim Arg Menus card, they can be used as templates for the same card in another TeleTask.#### stack.

Remember, you can ALWAYS change menus at any point in your analysis, using 'Add Item' and 'Delete Item' or the TeleSpecPrim Arg Menus card.

At any time in any specific task stack, you may decide that you want to repeat the analysis of that task, but with a few changes, while still saving what you have done so far. Perhaps you make new assumptions, resolve an open issue, add a new subsystem or tool, or shorten the task. The 'Build Derivative Task' option in the TeleTasks button on the upper left corner of the task summary card allows you to do this. Here's how:

Step 1. Click and hold down on the TeleTasks button (shown at left).

Step 2. The button will highlight as shown, and a pop-up menu will appear with "Build Derivative Task" as the only option. If you release the mouse key without selecting anything, the menu will disappear, and the TeleTasks button's highlight will return to false, as it was before. But if you select "Build Derivative Task," the following sequence begins:

Build Derivative Task

More --->

Step 3. When you select "Build DerivativeTask" a dialog box appears, asking you to enter information exactly as prompted to name the stack.

Please enter all information as requested!
OK

Building derivative task. Ready to name it?
OK Cancel

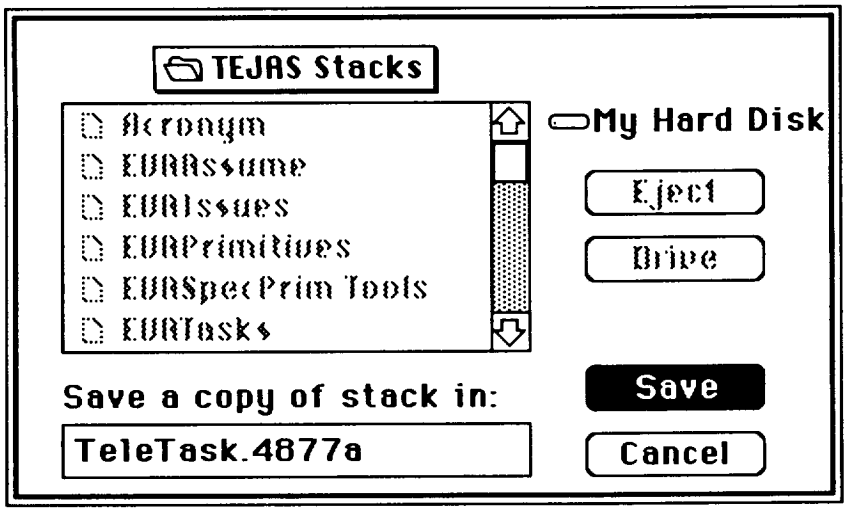
Step 4. After clicking on 'OK', another dialog box appears, asking if you're ready to name the derivative stack and giving you a chance to Cancel.

Step 5. The third dialog box prompts you to make the new stackname related to the original one by adding an unused letter after the name of your current stack. Click OK, and wait for the "New Stack..." dialog box to follow. Then type the name you wish to give your derivative stack.

Add an unused letter after 'TeleTask.4877'.
OK

More --->

Step 6. Once having passed the third dialog box, the script will open the 'Save a Copy...' dialog box, highlight "Copy of 'TeleTask.4877' " (in our example), and give you the last of two options to Cancel:

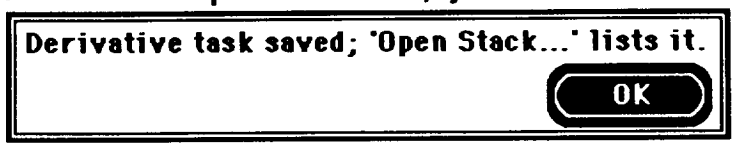


To proceed, change the task name to the suggested derivative ('TeleTask.4877a' shown) to create a path to the original task.

Click on the 'Save' button (shown), or press return.

More --->

After filling in the 'Save a Copy...' dialog box and pressing the 'Save' button (or the return key on your keyboard), the dialog box disappears and the cursor turns into the 'watch' symbol. Depending on your Macintosh's processor and RAM configuration, your screen will remain frozen for several seconds while the program saves a copy of the specific task stack under the name you specified. When the process ends, you will see another message:



Click OK. The message disappears; you are back on the TeleTask.4877 task summary card. To see the derivative stack you created, choose 'Open Stack...' from the File menu and release on the derivative stack name. The new number (4877a in our example) now appears in the SpecTask Number field on each card.

TeleTask.4877 - Building a Derivative Task

Building derivative tasks is a quick way of performing variations on the analysis of any specific task, without redoing the work. But as with any utility, you can overuse it. For maximum effect, follow these guidelines:

- Follow the suggestions for new stacks' names to keep track of derivative task's origins. It helps to know a stack's "pedigree"!

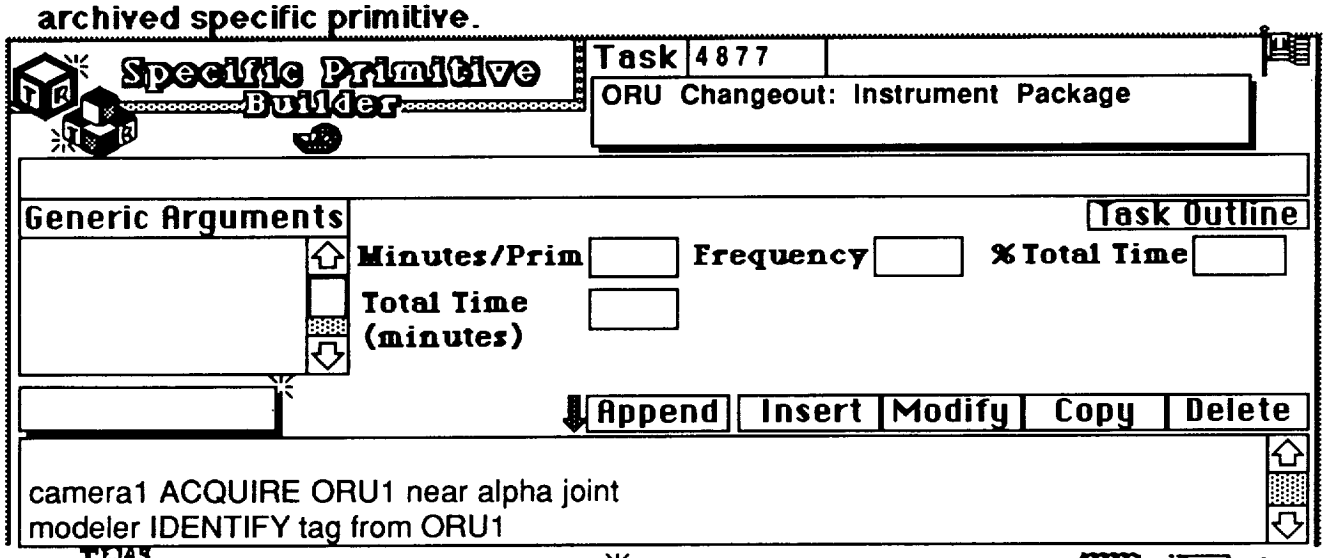
- You can build derivatives of derivative tasks, using the same process (e.g., a derivative of 'TeleTask.4877a' might be 'TeleTask.4877a1'). Be concise; the SpecTask Number field will wrap around a long number.

- Don't use this utility to save copies of your specific task stacks; use 'Save a Copy...' instead. To save the most work, build derivative tasks after the specprim list is complete for any specific task.

Remember, you can ALWAYS change menus at any point in your analysis, using 'Add Item' and 'Delete Item' or the TeleSpecPrim Arg Menus card.

TeleTask.4877 - Building a Specific Primitive

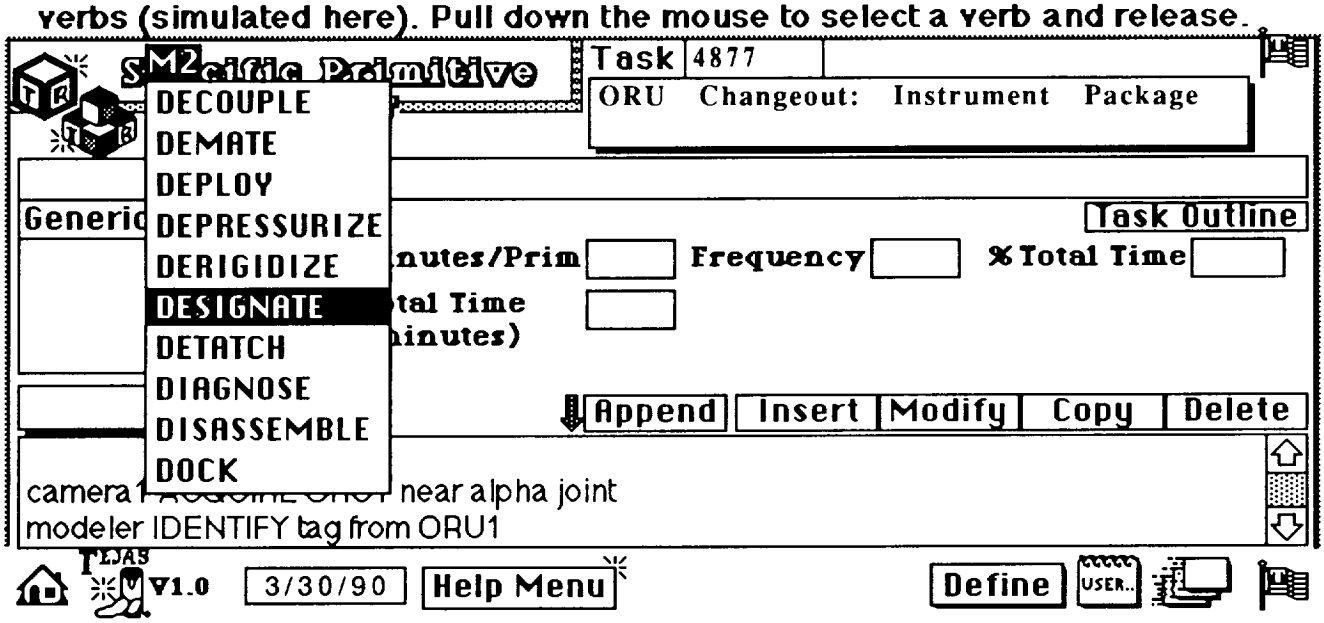
There are many ways to build a new specific primitive. Using this rather compressed version of the TeleSpecPrim Builder card, we'll demonstrate the main two: transforming a generic primitive syntax, and modifying an archived specific primitive.



TeleTask.4877 - Building a Specific Primitive

9.6.7 2 of 7

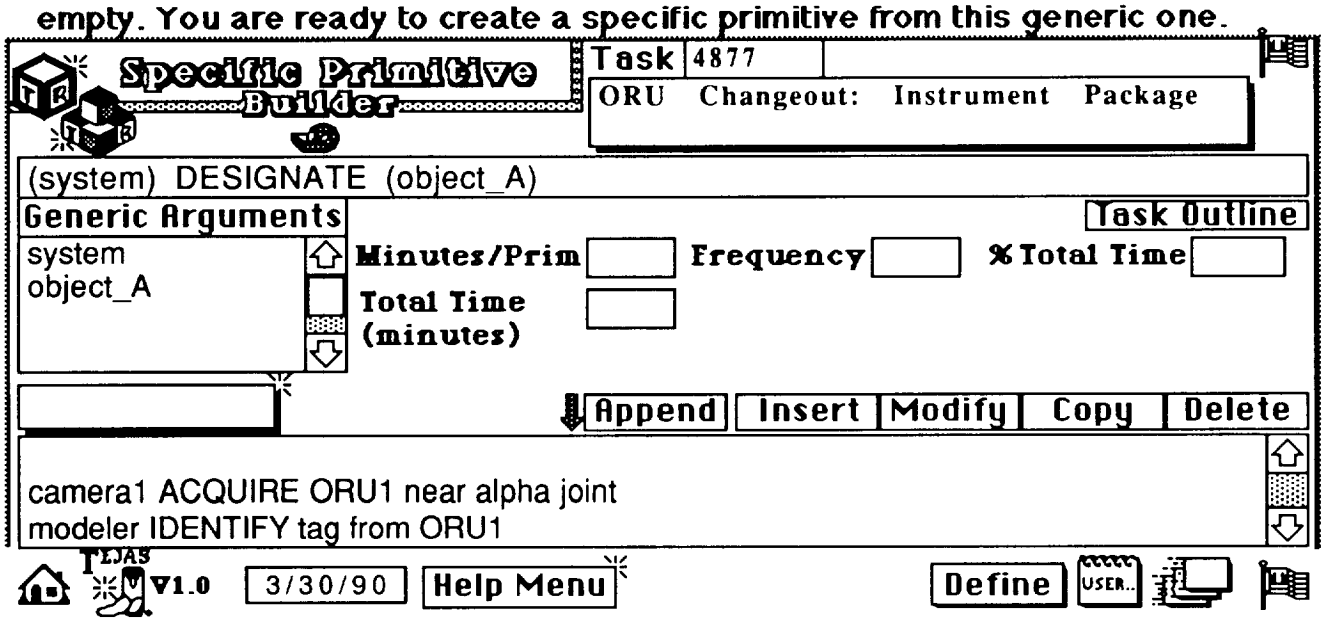
To retrieve a generic primitive syntax for any TelePrimitive, click on the button at top left. A series of numbered M buttons will appear. Click and hold down the mouse on any of these to get a pop-up menu of primitive verbs (simulated here). Pull down the mouse to select a verb and release.



TeleTask.4877- Building a Specific Primitive

9.6.7 3 of 7

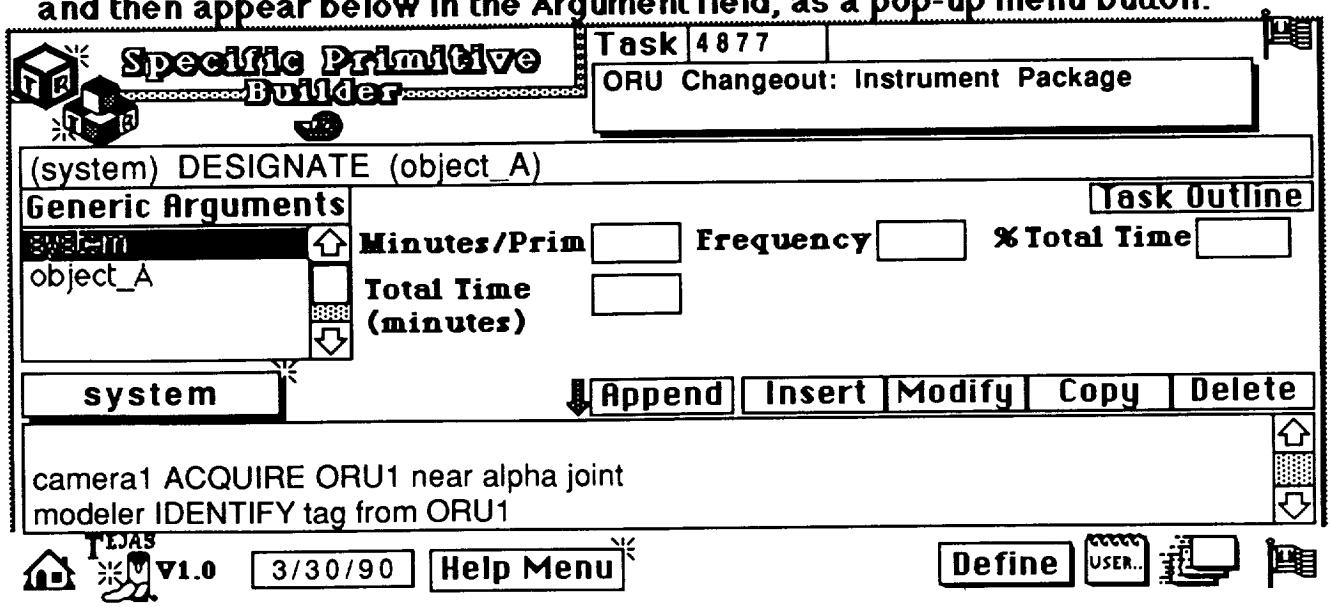
After a short wait, the generic syntax for the selected verb will appear in the Syntax field. The generic arguments for that syntax will appear in the Generic Args scrolling field at left, and the four ancillary data fields will empty. You are ready to create a specific primitive from this generic one.



TeleTask.4877 - Building a Specific Primitive

9.6.7
4 of 7

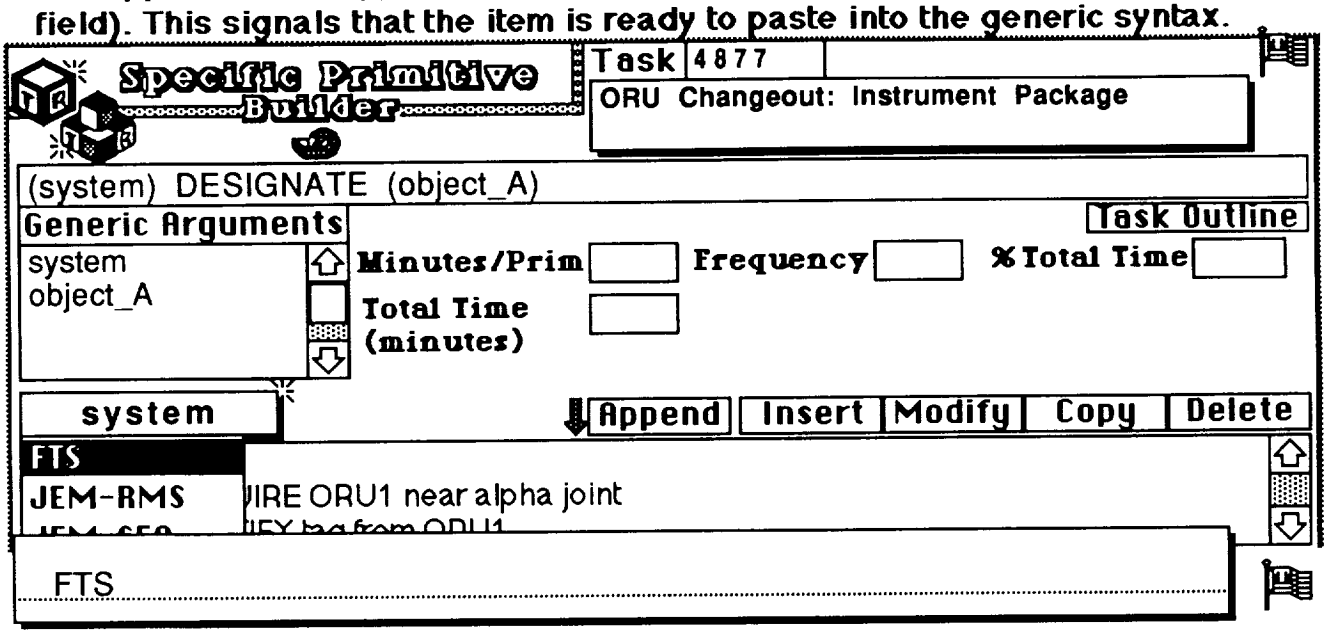
You can replace a generic syntax argument by typing over it, or use the argument menus from the TeleSpecPrim Arg Menus card. To do the latter, click on an argument in the Generic Args scrolling field. It will highlight, and then appear below in the Argument field, as a pop-up menu button.



TeleTask.4877 - Building a Specific Primitive

9.6.7
5 of 7

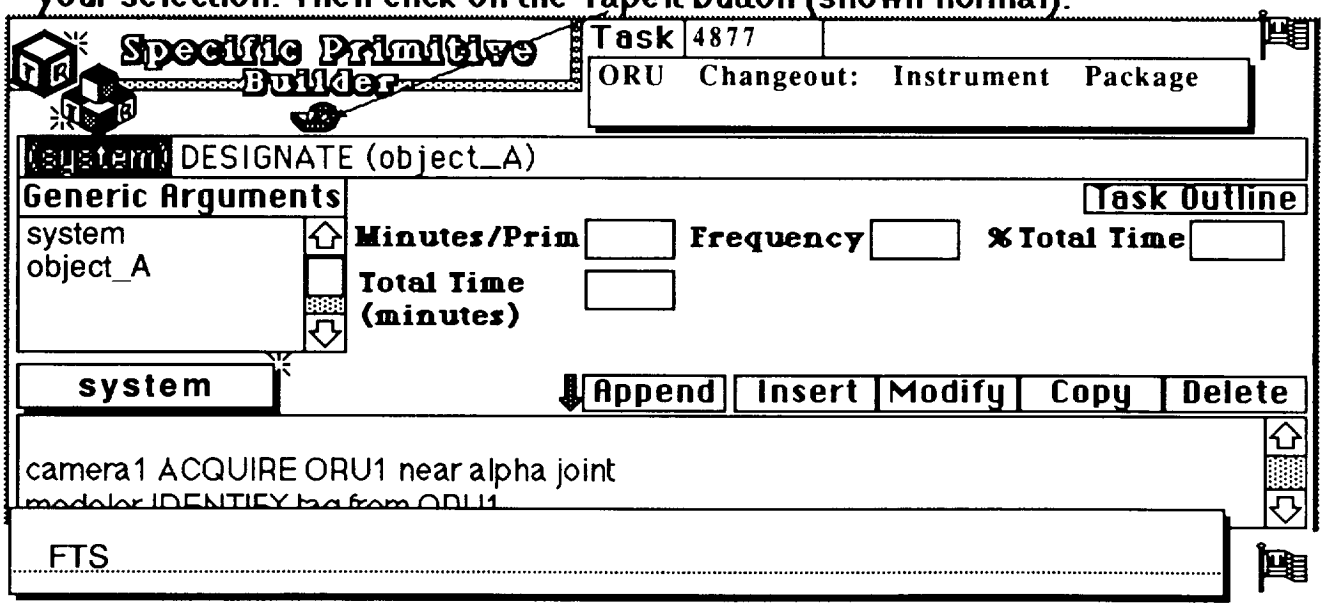
Position the cursor over the pop-up menu 'system,' then click and hold down on the mouse. Select an item from the menu that appears. The item will appear in the HyperCard message box (simulated below by a shadow field). This signals that the item is ready to paste into the generic syntax.



TeleTask.4877 - Building a Specific Primitive

9.6.7
6 of 7

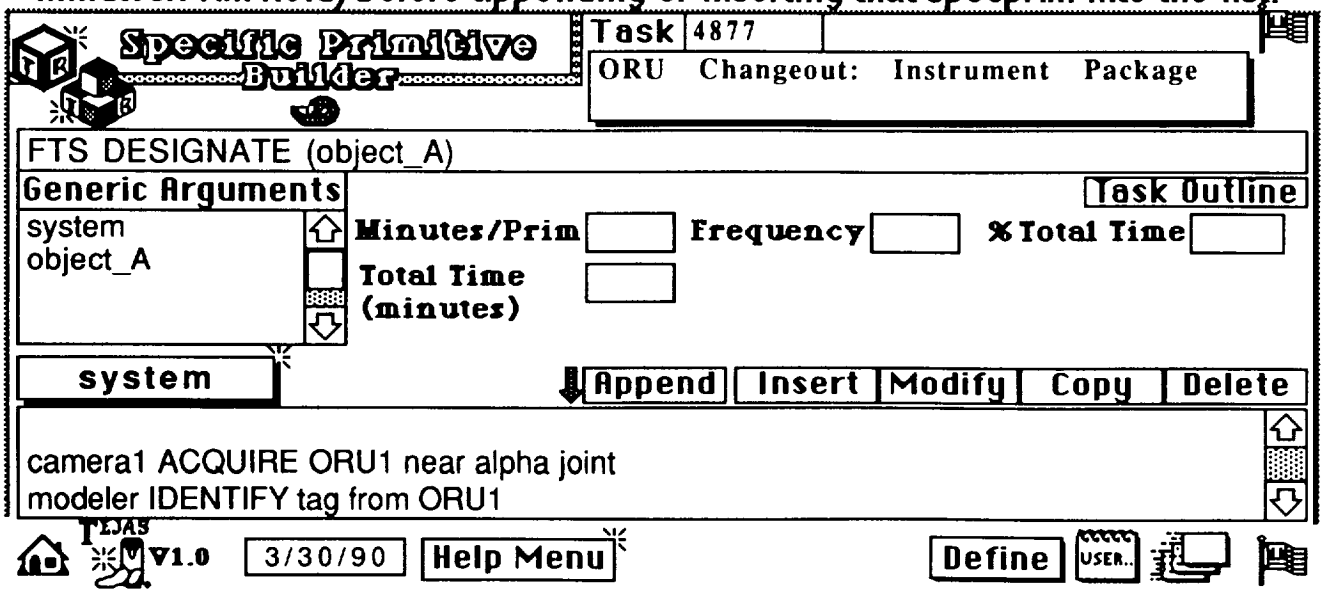
Now click and drag the cursor over the argument in the Syntax menu that the selected item is intended to replace (or pick an insertion point for the item). Be sure to include the parentheses around a generic argument in your selection. Then click on the TapeIt button (shown normal).



TeleTask.4877 - Building a Specific Primitive

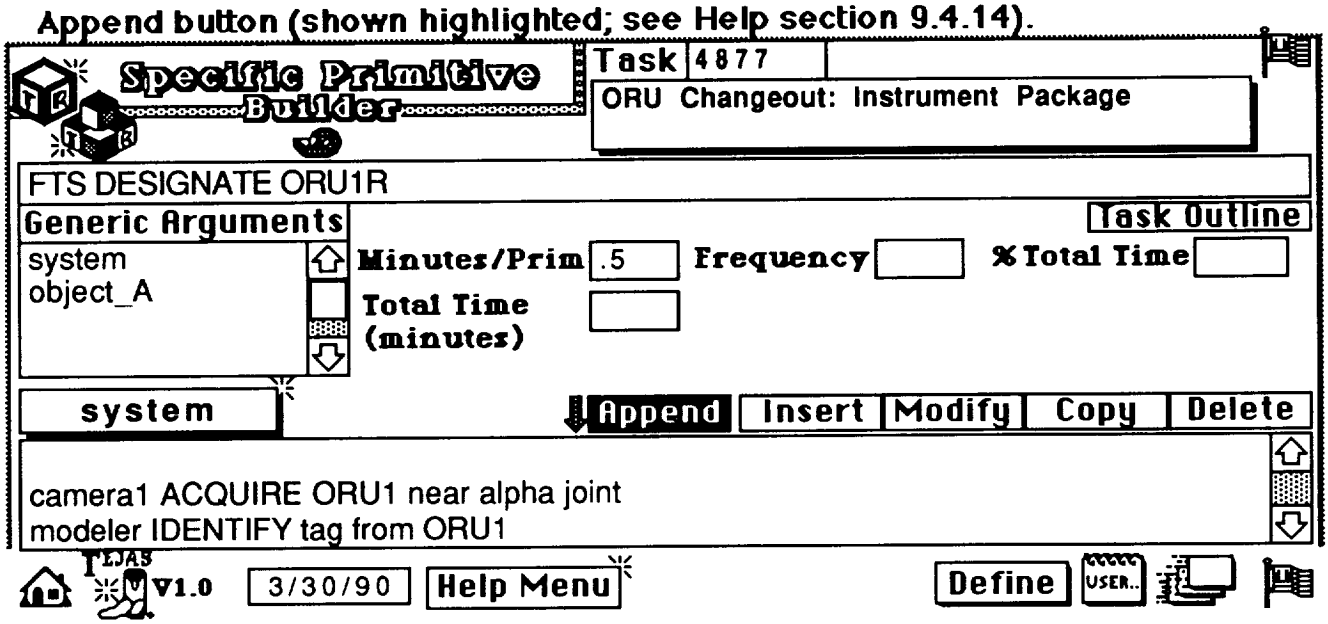
9.6.7
7 of 7

Immediately, the item in the message box replaces the selected argument in the Syntax field and the message box disappears. Now you can finish specifying the other generic arguments, and assign a duration (in the Minutes/Prim field) before appending or inserting that specprim into the list.



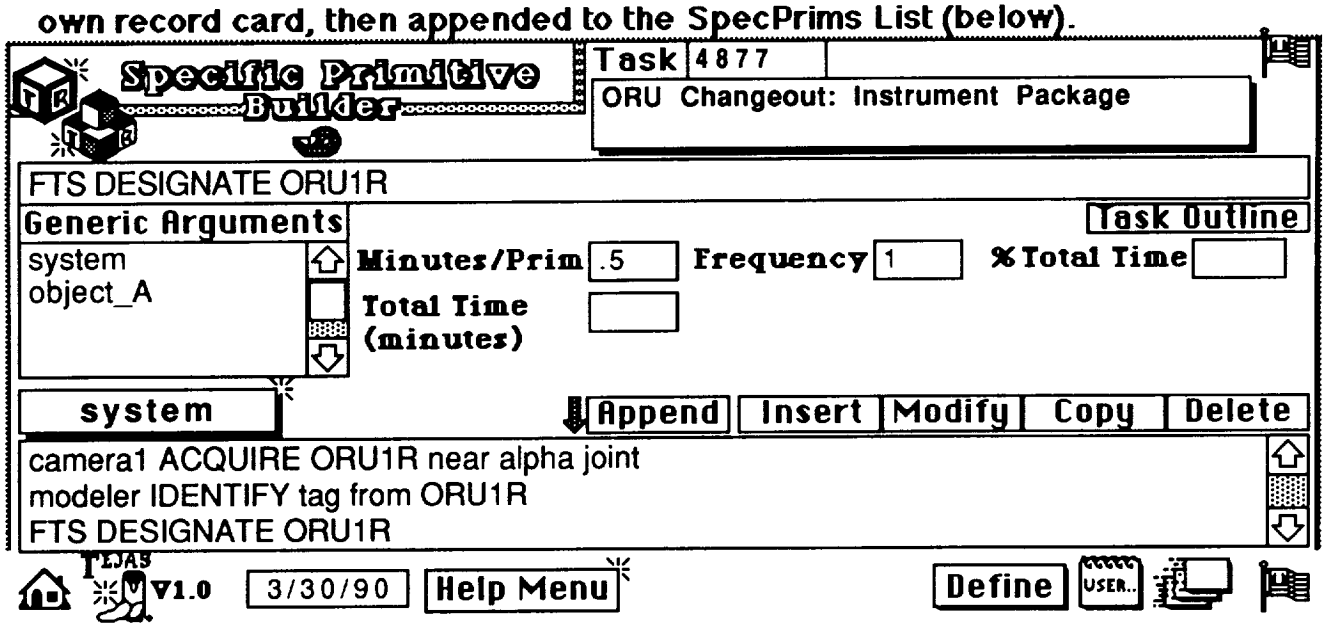
TeleTask.4877 - Using the Append Button

Let's suppose we've finished building the specprim below from the generic syntax for the verb DESIGNATE, including a duration of one-half minute. Now we'd like to add it to the specprims list at bottom. Just click on the Append button (shown highlighted; see Help section 9.4.14).



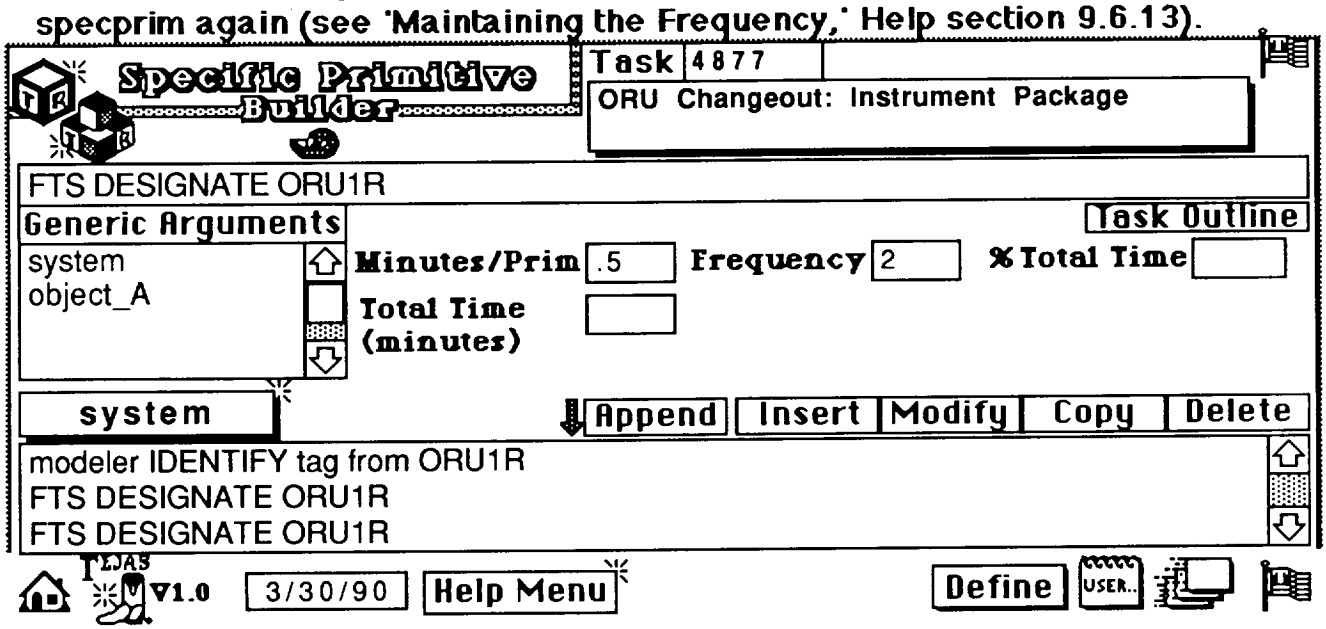
TeleTask.4877 - Using the Append Button

The Append button checks for a specprim record card (Help section 9.6.4) for the specprim shown in the Syntax field. There will be a slight pause. Here, our new specific primitive is given a Frequency of 1, stored on its own record card, then appended to the SpecPrims List (below).



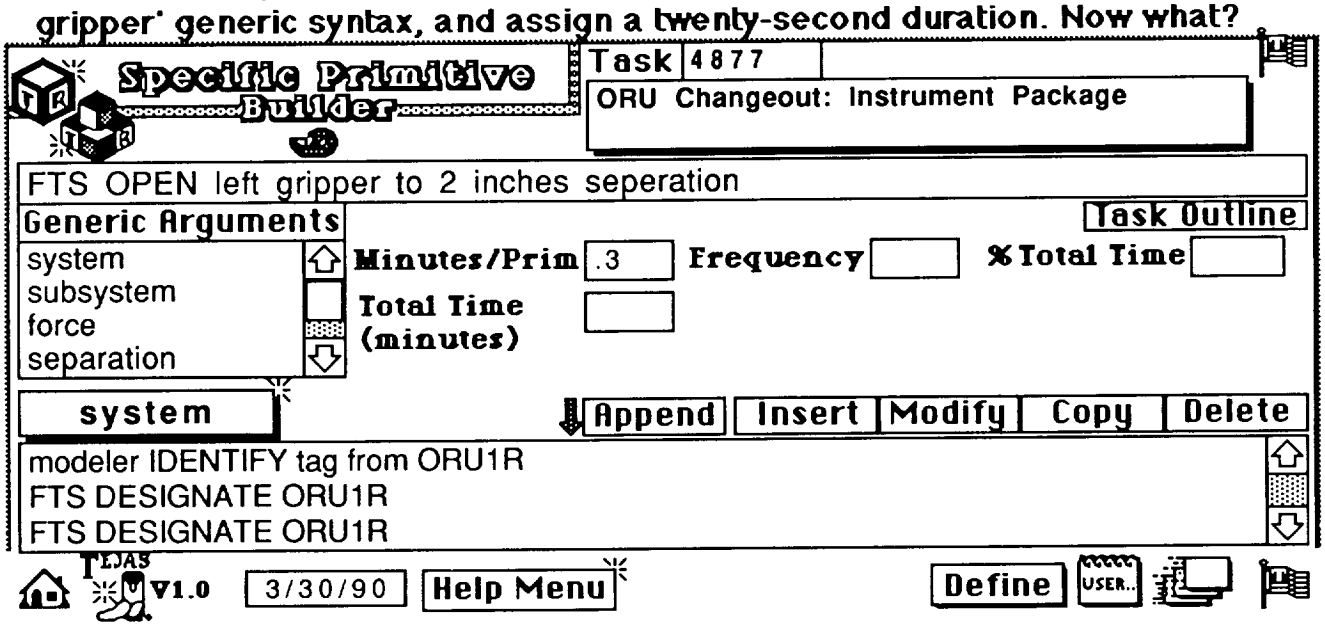
TeleTask.4877 - Using the Append Button

Suppose we clicked on Append a second time. This time, the button's HyperTalk script would find a record card for our DESIGNATE specprim. Therefore, the script would just update the Frequency to 2, and append the specprim again (see 'Maintaining the Frequency,' Help section 9.6.13).



TeleTask.4877 - Using the Insert Button

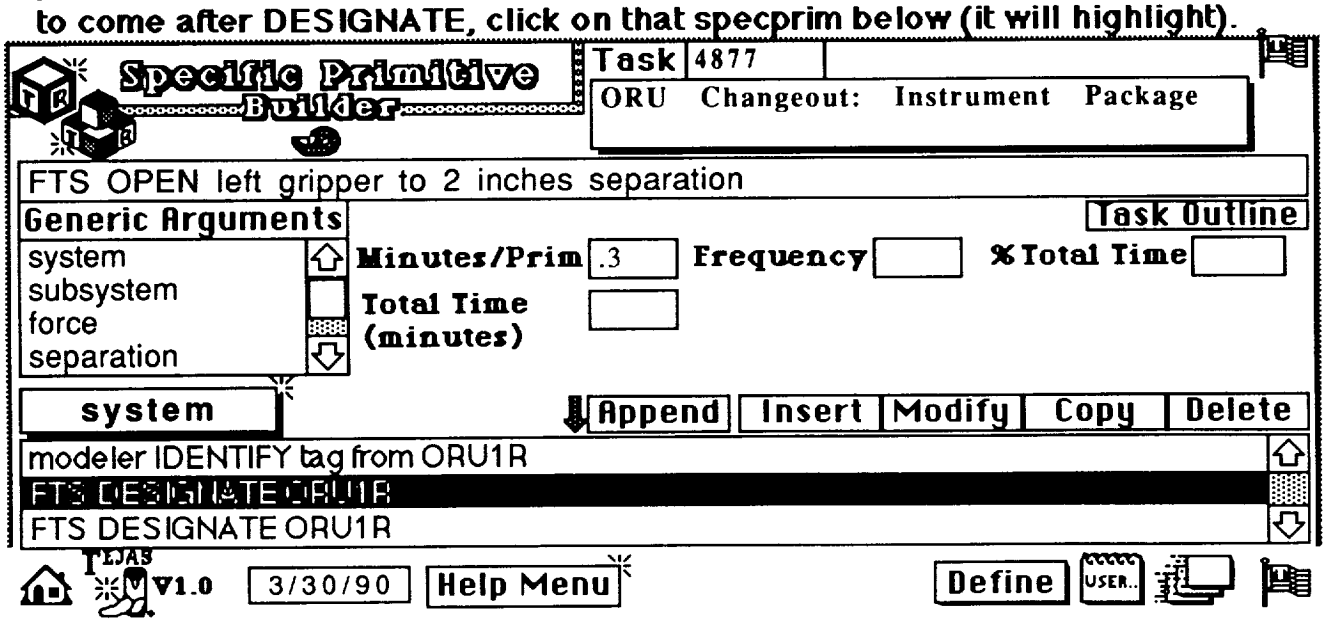
Now suppose that in reviewing the specprims list, you realize that after designating the replacement ORU, the telerobot should open its gripper before starting to grasp. You build the specprim below from the 'OPEN gripper' generic syntax, and assign a twenty-second duration. Now what?



TeleTask.4877 - Using the Insert Button

9.6.9 2 of 3

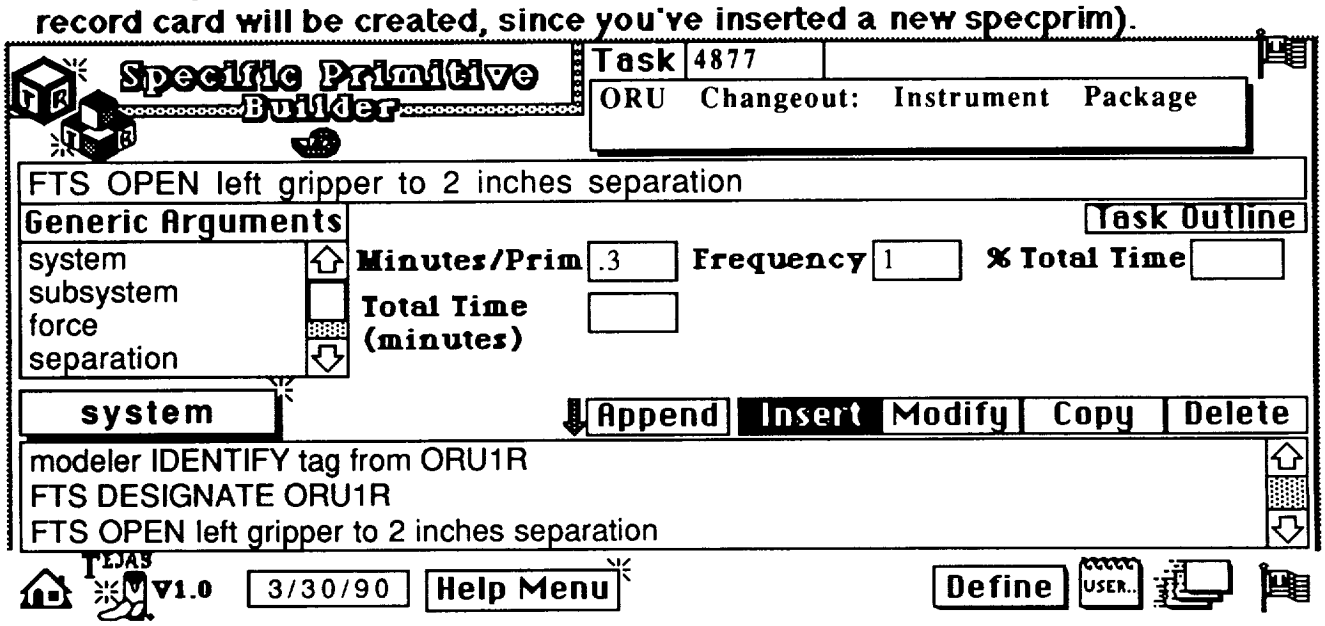
Before you can insert the OPEN gripper specprim into the specprims list, you have to choose an insertion point (a message will rebuke you should you click on Insert without having done so). Since you want this specprim to come after DESIGNATE, click on that specprim below (it will highlight).



TeleTask.4877 - Using the Insert Button

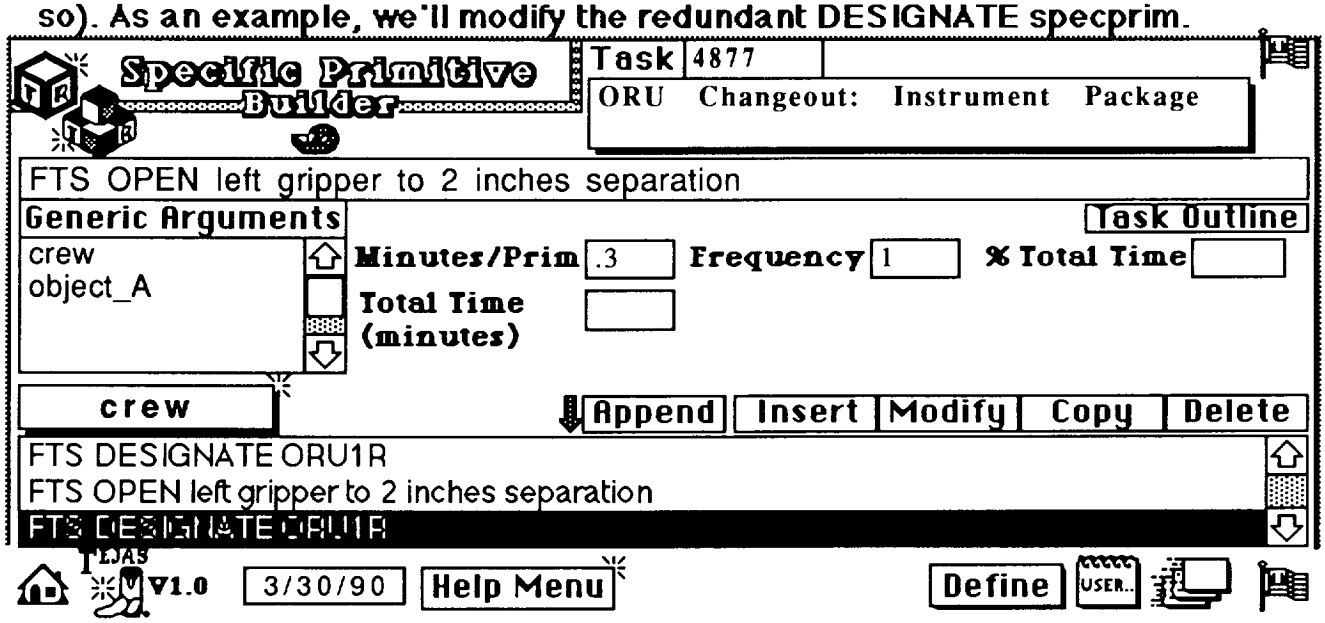
9.6.9 3 of 3

With the insertion point selected, click on the Insert button. It will highlight briefly (shown), and immediately add your new specprim to the list after the insertion point (below). The Frequency will update (to 1 in this case, and a record card will be created, since you've inserted a new specprim).



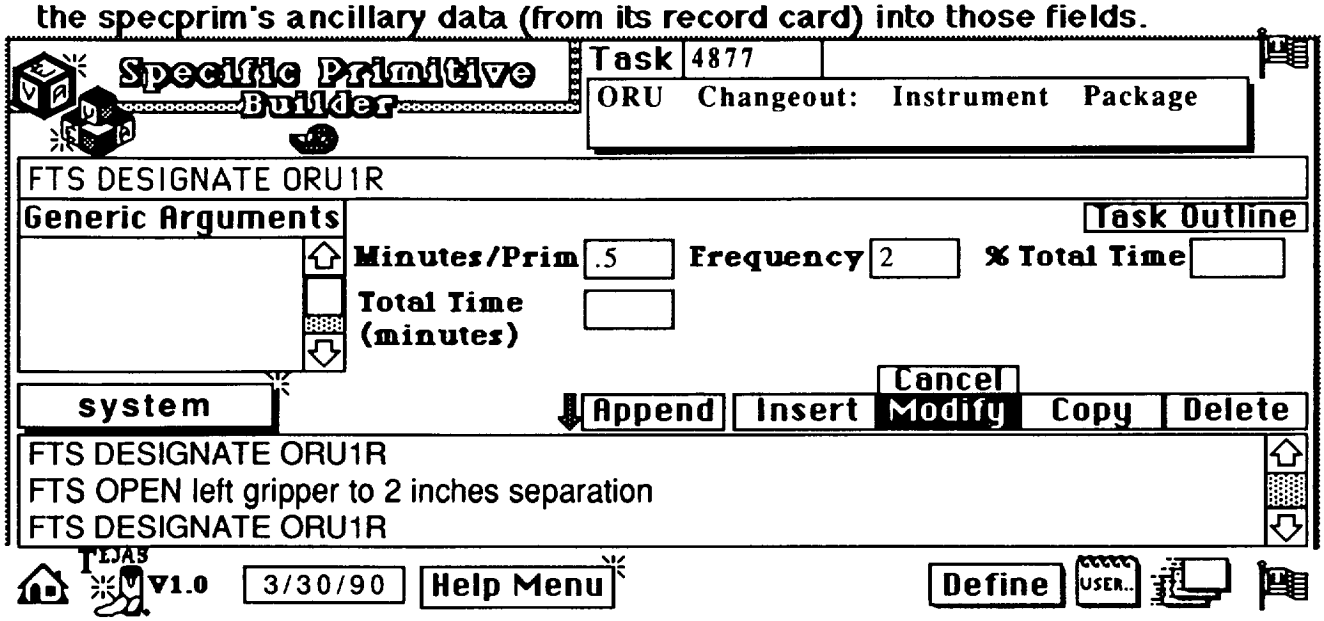
TeleTask.4877 - Using the Modify Button

The Modify button allows you to change a specprim in the specprims list without deleting and replacing it. To begin, select the specprim to modify (a message will rebuke you should you click on Modify without having done so). As an example, we'll modify the redundant DESIGNATE specprim.



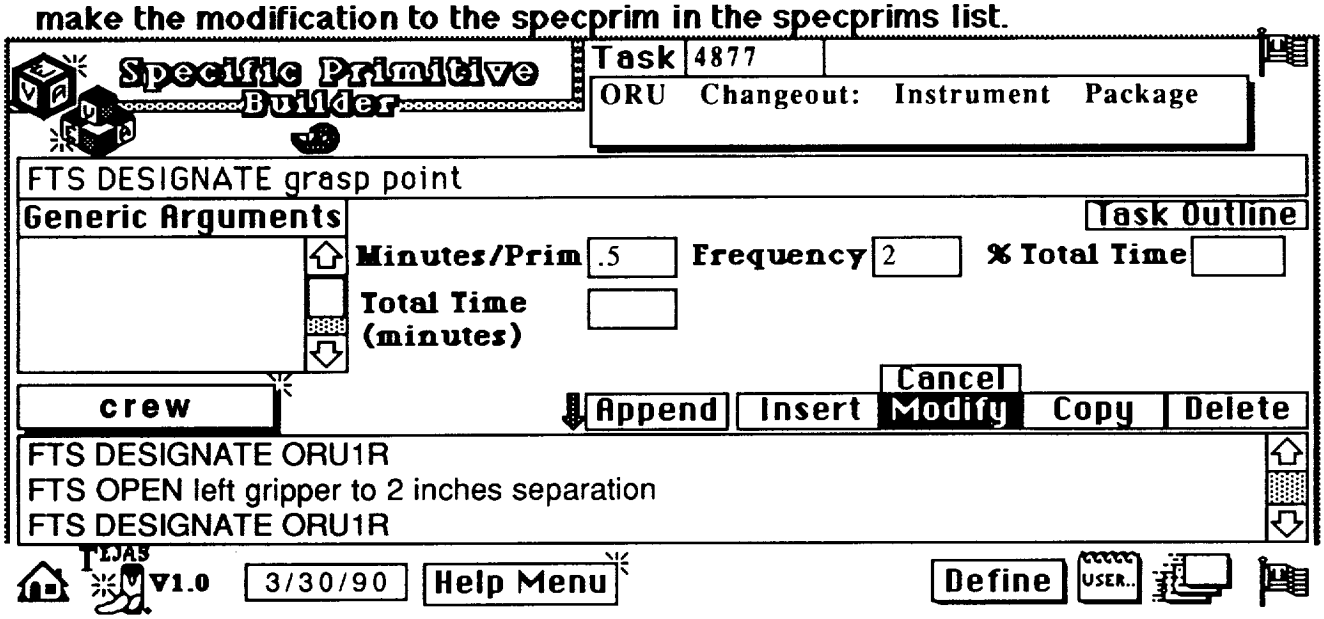
TeleTask.4877 - Using the Modify Button

With the specprim you want to change selected, click on the Modify button. It will highlight, and a Cancel button will appear above (shown). The HyperTalk script will insert the selected specprim into the Syntax field and the specprim's ancillary data (from its record card) into those fields.



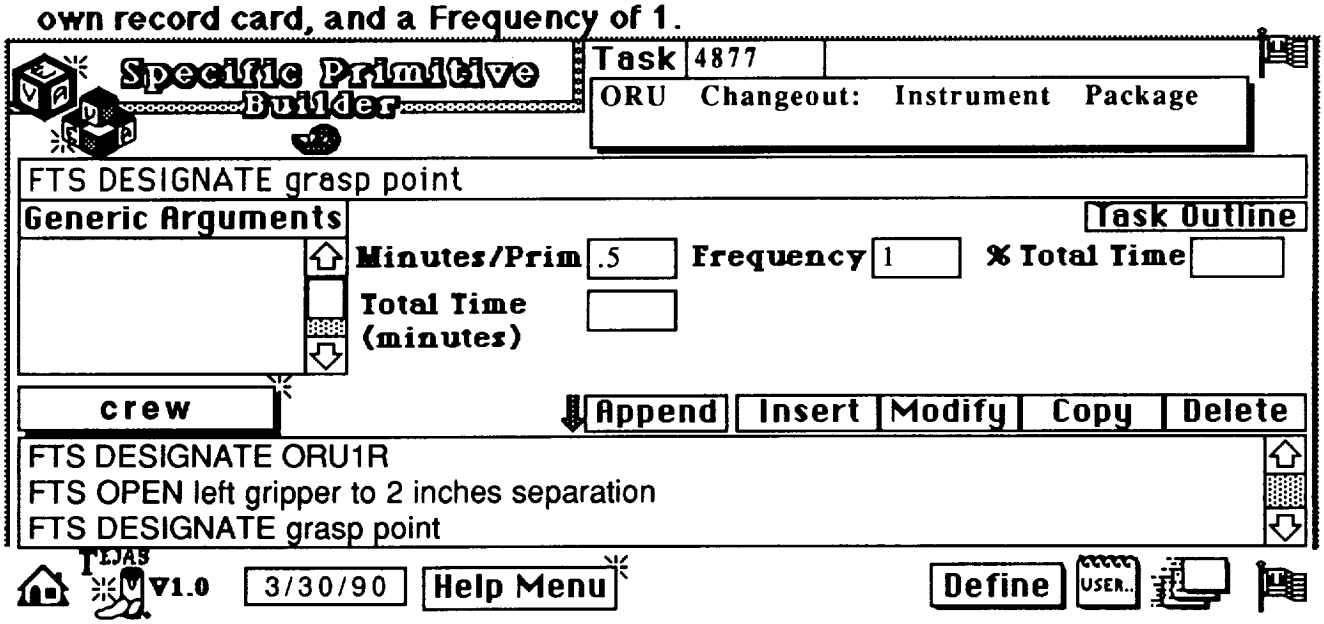
TeleTask.4877 - Using the Modify Button

Now you can change that specprim and/or its duration; there are several alternatives (see Help section 9.4.14). Let's change the specprim as shown, and leave the duration at one-half minute. Now you're ready to actually make the modification to the specprim in the specprims list.



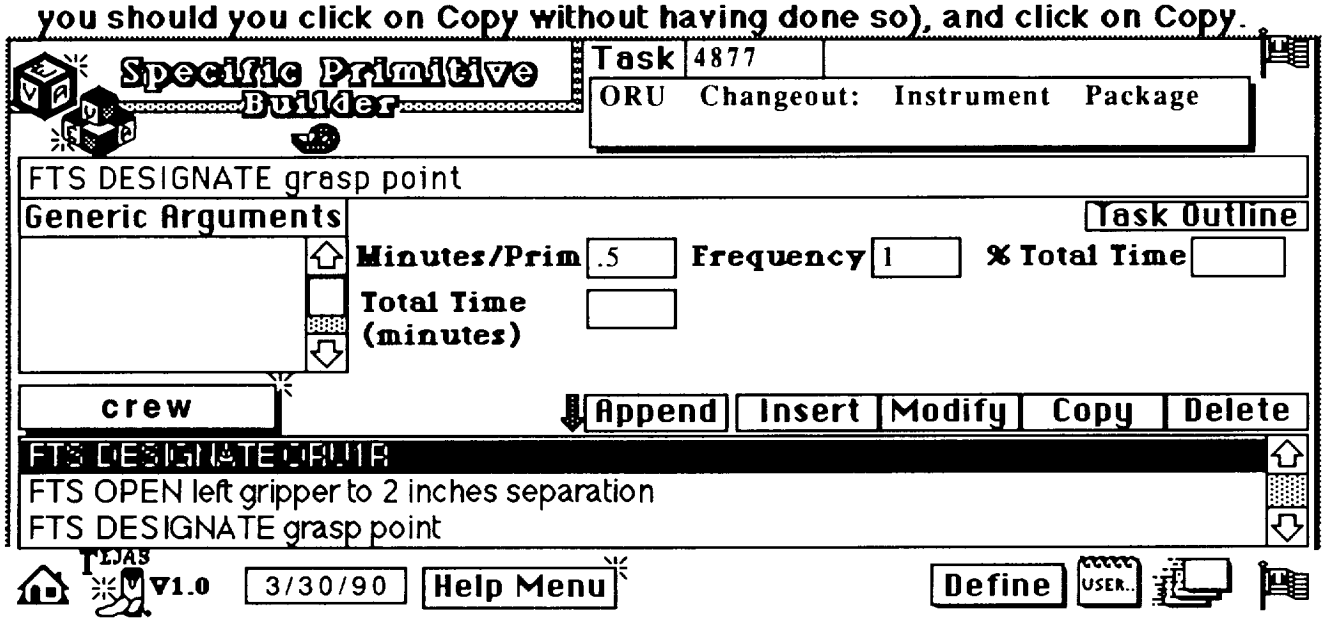
TeleTask.4877 - Using the Modify Button

Click Modify again. Its highlight and the Cancel button vanish (shown), and the modified specprim is inserted in place of the original specprim. Since "FTS DESIGNATE grasp point" is a new specprim to this task, it gets its own record card, and a Frequency of 1.



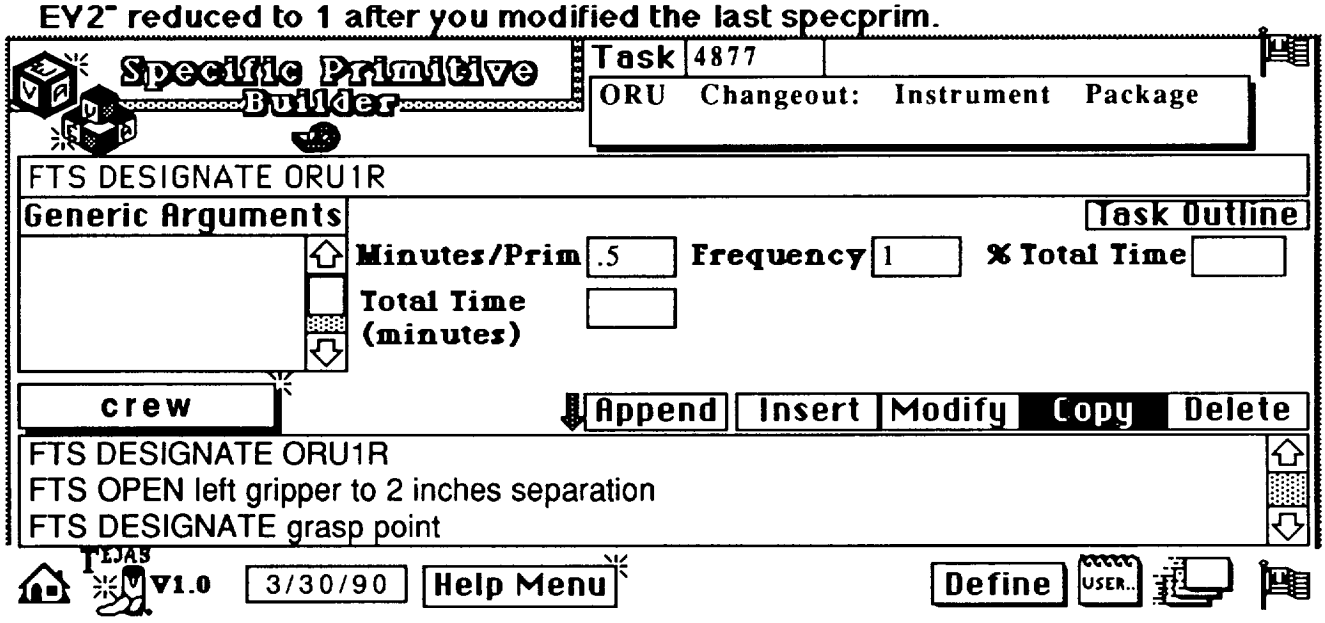
TeleTask.4877 - Using the Copy Button

What happened to the record of the specprim that we modified in the previous section? We can check with the Copy button. Select the specprim (shown) you wish to copy into the Syntax field first (a message will rebuke you should you click on Copy without having done so), and click on Copy.



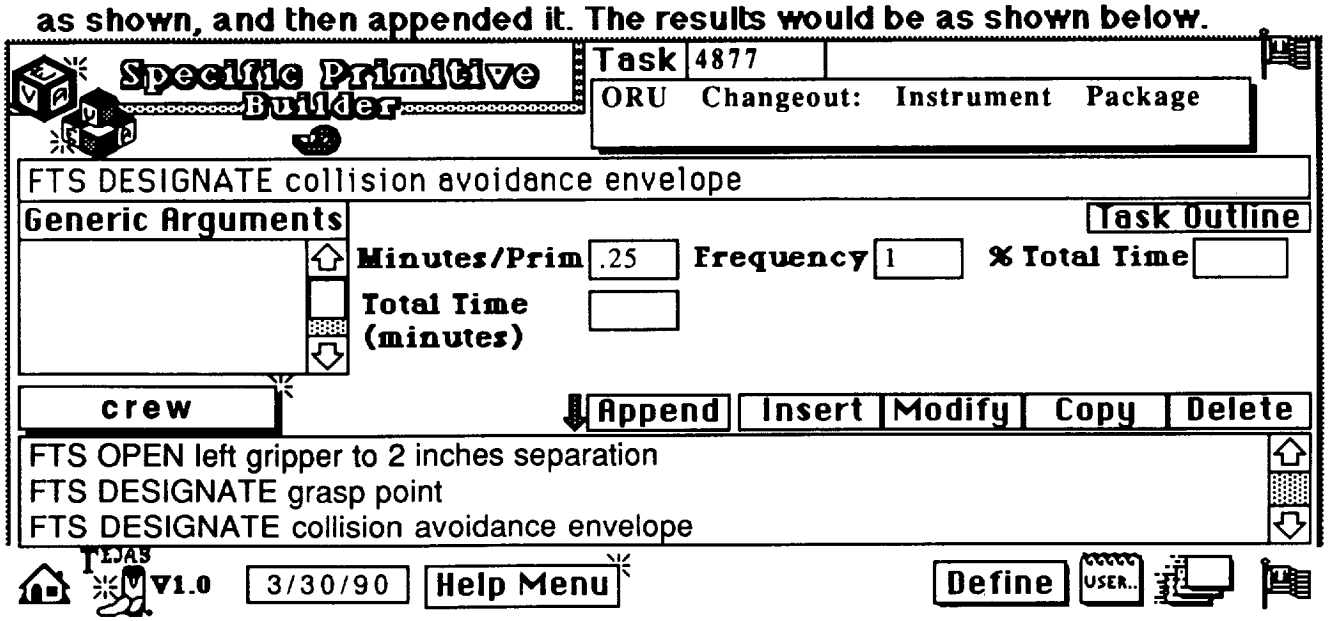
TeleTask.4877 - Using the Copy Button

Clicking on Copy causes that button to highlight briefly (shown), the desired specprim to be inserted into the Syntax field, and its ancillary data into those fields. As expected, the Frequency of "EY1 HANDOFF pliers to EY2" reduced to 1 after you modified the last specprim.



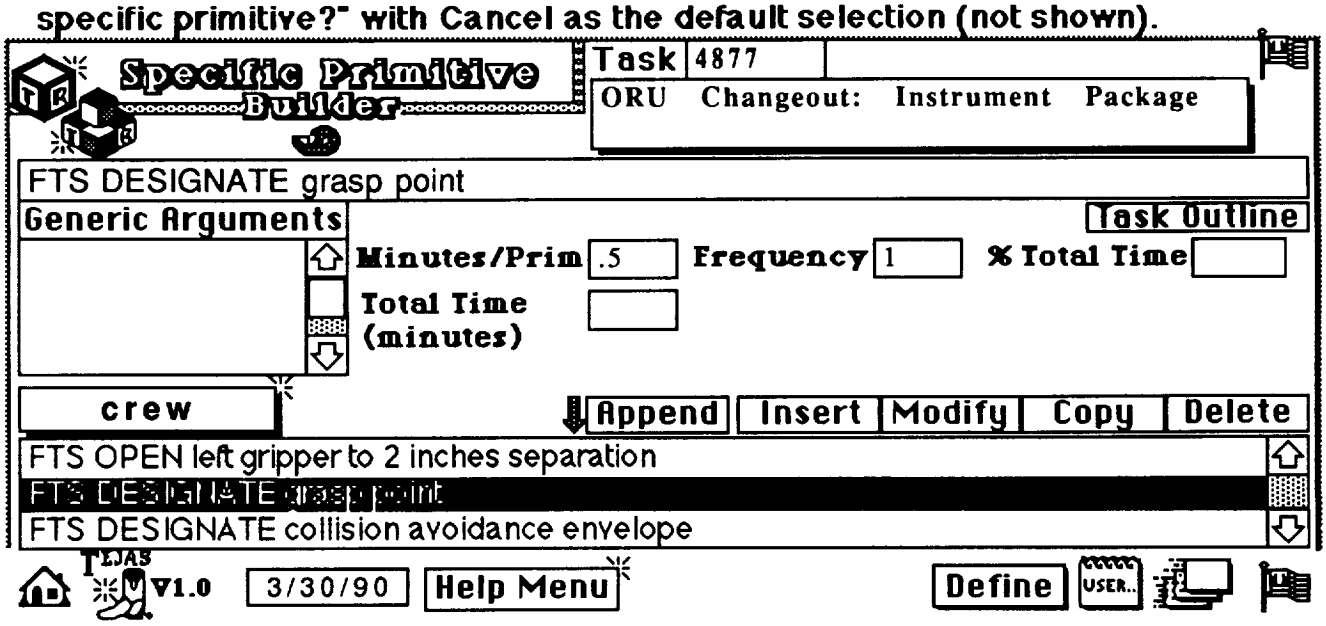
TeleTask.4877 - Using the Copy Button

You can use Copy with the Append or Insert buttons to save time adding specprims of often-used verbs to a specific task stack, instead of rebuilding them from their generic roots. Suppose you changed the copied specprim as shown, and then appended it. The results would be as shown below.



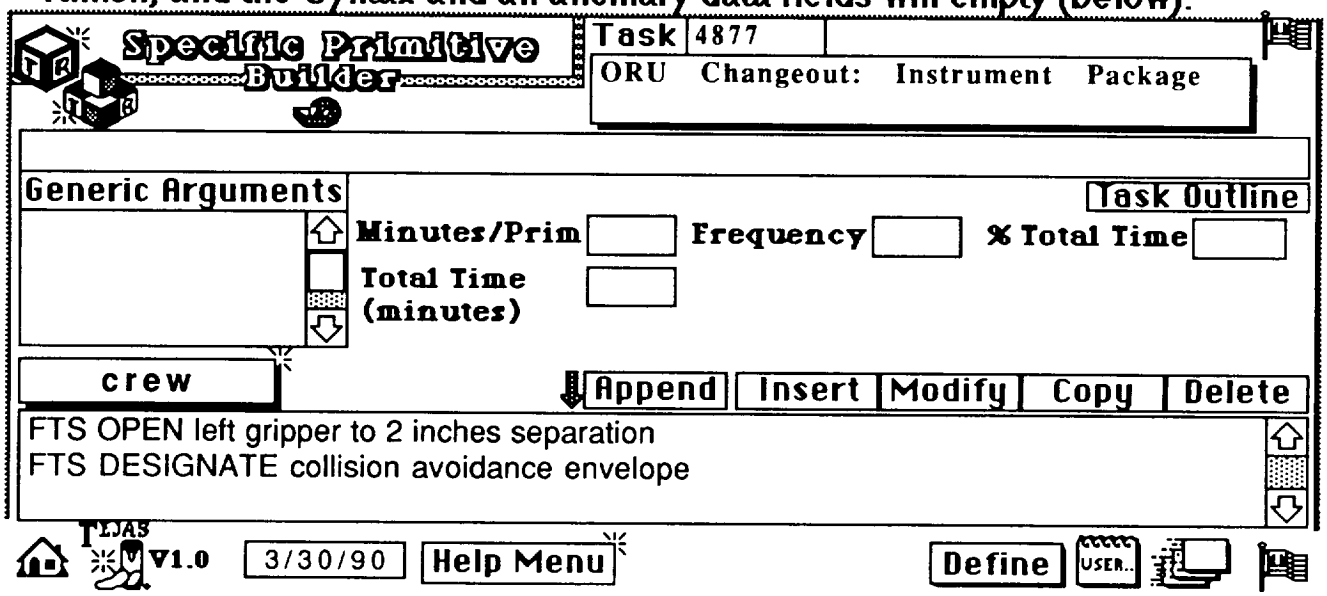
TeleTask.4877 - Using the Delete Button

The Delete button works like Copy, but with a built-in restriction. You must first select a specprim to delete (shown), then click on Delete. The button will not highlight; instead, a message will appear asking "Delete that specific primitive?" with Cancel as the default selection (not shown).



TeleTask.4877 - Using the Delete Button

If you click OK in the "Delete?" message box, the box will disappear and a brief pause will ensue, followed by two quick changes. First, the Frequency field will decrease (if it is >1); then that occurrence of the specprim will vanish, and the Syntax and all ancillary data fields will empty (below).



TeleTask.4877 - Maintaining the Frequency

TEJAS maintains the Frequency count for each specific primitive as each Append, Insert, Modify, and Delete operation is executed (Copy does not alter the specprims list in any way, so its use does not affect Frequency). This automatic facility allows TEJAS to treat each specprim as an object.

This method has several advantages. First, it saves you from manually counting specprims in the list. Second, it saves space within each specific task stack, by having ONE record card for ALL occurrences of a specprim. Third, it provides a quick way to compute the total time for each task and the percentage of that total time each specprim takes, at any point in the analysis. Last, it allows you to archive specific primitives with their durations and origin in the TeleSpecPrim Archives stack (Help section 9.5) and to retrieve these specprims later within any TeleTask.#### stack.

Therefore, although the five-button 'line editor' may seem strange at first, bear with it. The object-oriented approach WILL save you time.

TeleTask.4877 - Archiving Specific Primitives

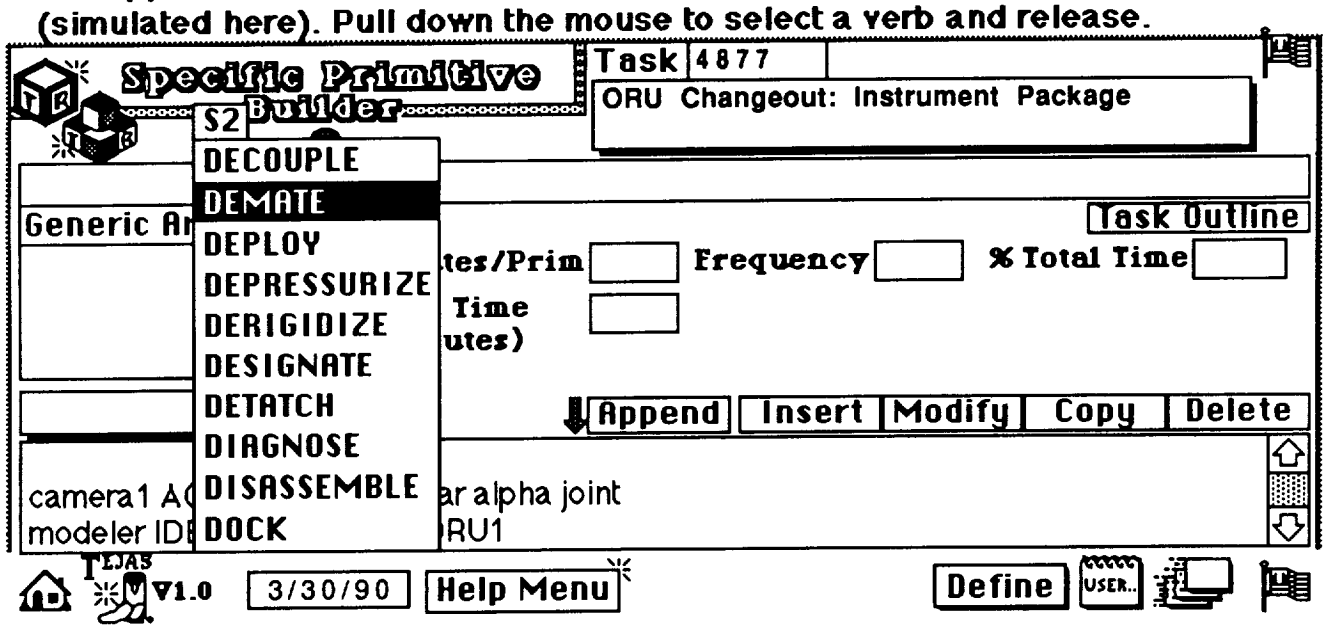
Once a task's specific primitives have all been built (i.e., the task is fully scripted), you can use the 'Archive List' button on the TeleSpecPrims List card to store all your specific primitives with their durations and stack of origin in the TeleSpecPrim Archives stack (see Help section 9.4.14). This complex process is simple to do, but time-consuming. DON'T do it in this example; you want only REAL specprims archived.

You need not archive specprims until all your analysis is complete within an TeleTask.#### stack, or until you begin another task. Within any specific task stack, you can retrieve any specific primitive in the specprims list by using the Copy, Modify and Delete buttons. The only other specprims you might want have already been archived from other stacks; therefore, archiving the current list does not give you anything new within the stack.

Save time. Archive specprims only when your task analysis is complete for a specific task, or you are building a new specific task stack.

TeleTask.4877 - Retrieving Specific Primitives

To retrieve a specific primitive from TeleSpecPrim Archives, click on the button on the TeleSpecPrim Builder card. A series of numbered S buttons will appear. Click on any of these to yield a pop-up menu of primitive verbs (simulated here). Pull down the mouse to select a verb and release.



TeleTask.4877 - Retrieving Specific Primitives

9.6.15 3 of 4

The specprim you select will highlight (shown), and three hidden buttons will appear: Carry Back, ○ with mins, and ◉ without mins. The last two buttons affect whether you retrieve a specprim with its duration or not.

TeleSpecPrim Archives | DEMATE

SPDM DEMATE RS232 connector
FS DEMATE standard J3 connector
JEM-SFA DEMATE video plug

Copied SpecPrim: FTS DEMATE standard J3 connector

Origin: TeleTask.3562 | **Minutes/Primitive:** 1.5 | Carry Back | ◉ with mins ○ without mins

The selected specprim appears in the Copied SpecPrim field, with its origin and duration in their respective fields. If you wish to review the assumptions that led to that duration value, you can go to the stack of origin now. Otherwise, click on the Carry Back button.

TEJAS V1.0 | 3/30/90 | Help Menu | Define

TeleTask.4877 - Retrieving Specific Primitives

9.6.15 4 of 4

After clicking Carry Back on an archive card in the TeleSpecPrim Archives stack, you will return to the TeleSpecPrim Builder card. The specific primitive you selected (with its duration, if you so chose) will be on the card. You can now treat it like any other specprim you have built before.

Specific Primitive Builder | Task 4877

ORU Changeout: Instrument Package

FTS DEMATE standard J3 connector

Generic Arguments | Task Outline

Minutes/Prim 1.5 **Frequency** **% Total Time**

Total Time (minutes)

Append | Insert | Modify | Copy | Delete

camera1 ACQUIRE ORU1 near alpha joint
modeler IDENTIFY tag from ORU1

TEJAS V1.0 | 3/30/90 | Help Menu | Define

TeleTask.4877 - After You Create Specprims

At the conclusion of the examples within this Help section, you can continue to practive creating, changing, archiving and retrieving specific primitives and their ancillary data, or you can restore the TeleTask.4877 example stack to an unaltered state for the next practice session.

To restore the stack,

- exit the TeleTask.4877 example stack you have been using. Go to any other HyperCard stack, or quit HyperCard (not required);
- locate your archived copy of the original TeleTask.4877 example stack;
- on the Macintosh desktop, throw your altered copy of the TeleTask.4877 stack in the trash and empty the trash;
- copy your archived original TeleTask.4877 stack back into the folder on your hard disk that holds the other TEJAS stacks. Make sure you still have an archived copy of the example stack!

Following this procedure will preserve your example stack as released.

A
adding cards
general rules 4.8
to specific stacks 7.1.4, 7.2.4, 7.3.4, 7.4.4, 7.5.4, 7.7.4, 8.1.4, 8.2.4, 8.3.4, 8.4.4, 8.5.4,.8.6.4, 9.1.4, 9.2.4, 9.3.4, 9.4.4, 9.5.4, 9.6.4
analysis buttons 9.1.14, 9.4.14
analysis fields 9.1.13, 9.4.13
analysis menus 9.1.15, 9.4.15
analysis stacks, listed 4.4
archive cards
EVASpecPrim Archives stack 9.2
TeleSpecPrim Archives stack 9.5
Archive List button 9.1.
archiving specific primitives 9.1.14, 9.4.14, 9.3.14, 9.6.14
arguments to primitives
generic (*see* parsing scheme)
specific (*see* Specprim Arg Menus card and primitive, specific)
assumptions
relating to task summary and open issues 8.1.7, 8.4.7

B
background specifications (by name)
Acronym.bg 7.3.6
Bibliography.bg 7.1.6
Contributions.bg 7.2.6, 7.3.6, 7.4.10, 7.5.10, 7.7.8
EVAAssume.bg 8.2.7
EVAIssue.bg 8.3.7
EVAPrimsMenu.bg 7.4.10
EVAPrimsParsing.bg 7.4.10
EVAPrimitives.bg 7.4.10
EVASpecPrim Args.bg 9.1.8
EVASpecPrim.bg 9.1.7
EVASpecPrims List.bg 9.1.6
EVATask.bg 8.1.9
Glossary.bg 7.2.6
TEJASHome.bg 7.1.6
TeleAssume.bg 8.5.7
TeleIssue.bg 8.6.7
TelePrimsMenu.bg 7.5.10
TelePrimsParsing.bg 7.5.10
TelePrimitives.bg 7.5.10
TeleSpecPrim Args.bg 9.1.8
TeleSpecPrim.bg 9.1.7
TeleSpecPrims List.bg 9.1.6
TeleTask.bg 8.4.9
baseline cards 8.1.8, 8.4.8
button(s)
common navigation and action 6.2
specific stack 7.1.8, 7.2.8, 7.3.8, 7.4.12, 7.5.12, 7.7.10, 8.1.11, 8.2.9, 8.3.9, 8.4.11, 8.5.9,.8.6.9, 9.1.12, 9.1.14, 9.2.9, 9.3.8 - 9.3.12, 9.4.12, 9.4.14, 9.5.9, 9.6.8 - 9.6.12

C
card background(s)
specific stack 7.1.6, 7.2.6, 7.3.6, 7.4.10, 7.5.10, 7.7.8, 8.1.9, 8.2.7, 8.3.7, 8.4.9, 8.5.7, 8.6.7, 9.1.10, 9.2.7, 9.4.10, 9.5.7
card picture and forecast histograms 7.7.11
cards
adding (*see* adding cards)
defined 2.6
deleting (*see* deleting cards)
commands
Back (Go menu) 6.1
Button Info (Objects menu) 6.2
Card Info (Objects Menu) 7.2.3, 7.3.3
Cut Card (Edit menu) 7.1.5, 7.2.5, 7.3.5, 7.4.5, 7.5.5, 7.7.5, 8.1.5, 8.2.5, 8.3.5, 8.4.5, 8.5.5,.8.6.5, 9.1.5, 9.2.5, 9.3.5, 9.4.5, 9.5.5, 9.6.5
Compact stack (File menu) 6.1
Delete Card (Edit menu) (*see* deleting cards)
Find (Go menu) 6.1
First (Go menu) 6.1
Home (Go menu) 6.1
Last (Go menu) 6.1

Message (Go menu) 6.1
New Card (Edit menu) 7.2.3, 7.3.3,
New Stack 8.1.12, 8.4.12
Next (Go menu) 6.1
Previous (Go menu) 6.1
Print Card (File menu) 5.3
Print Report (File menu) 5.3, 5.4
Print Stack (File menu) 5.3
Recent (Go menu) 6.1
Stack Info (Objects menu) 6.1
configuration control 6.4
configuration fields 6.4
Contributions card
Acronym stack 7.3.9
Glossary stack 7.2.9
EVAPrimitives stack 7.4.16
TelePrimitives stack 7.5.16
TeleTechnologies stack 7.7.13

D
defining
acronyms and abbreviations 6.2
associated terms 6.2
exact define 6.2
terms 6.2

deleting cards
general rules 4.9
in specific stacks 7.1.5, 7.2.5, 7.3.5, 7.4.5, 7.5.5, 7.7.5, 8.1.5, 8.2.5, 8.3.5, 8.4.5, 8.5.5,.8.6.5, 9.1.5, 9.2.5, 9.3.5, 9.4.5, 9.5.5, 9.6.5
DOS compatibility 9.1.7, 9.4.7

E
EVAPrimitives
defined 7.4.6, 7.5.6
development 7.4.7, 7,4,7
relationship to teleprimitives 7.4.8, 7.4.9, 7.4.13, 7.5.8, 7.5.9, 7.5.13
stack 7.4
EVASpecPrim Arg Menus card 9.1.8
EVASpecPrim Builder card 9.1.7
EVASpecPrims List card 9.1.6

F
field
comment (defined) 6.3
configuration (defined) 6.3
configuration (listed) 6.4
Date 6.4
information (defined) 6.3, 6.6
types of 6.6
field specifications (by name)
1stTerm 7.2.7
Acronym 7.3.7
Antonym 7.4.11, 7.5.11
Argument 9.1.15, 9.4.15
Associated Terms 7.2.7
Assumptions 8.2.8, 8.5.8
Assumptions Menu 8.2.10, 8.5.10
Contribution 7.2.9, 7.3.9, 7.4.16, 7.5.16, 7.7.13
Contributor 7.2.9, 7.3.9, 7.4.16, 7.5.16, 7.7.13
Date 6.4
Definition 7.2.7, 7.3.7, 7.7.9
Def/Notes 7.4.11, 7.5.11,
Description 8.1.10, 8.4.10
Forecast Notes 7.7.9
Generic Args 9.1.15, 9.4.15
History 7.4.11, 7.5.11
Issues Menu 8.3.10, 8.6.10
Level 1 – 8 7.7.9
Like Verbs 7.4.11, 7.5.11
Menu List 9.1.15, 9.4.15
Menu Name 9.1.15, 9.4.15
Mod Menu 9.1.15, 9.4.15
My Copy 7.1.2
NASREM 7.7.9
NASREM1, NASREM2 7.5.11
Outline 8.1.10, 8.4.10,
Open Issues 8.3.8, 8.6.8
pctTotalTime 9.1.13, 9.4.13
Precursor 9.1.15
PrimMinutes 9.1.13, 9.4.13
References Used 7.1.6
Software Used 7.1.6

Source 7.2.7, 7.3.7, 7.4.11, 7.5.11
Source.Definition 7.7.9
Source.Forecast 7.7.9
Source.Technology 7.7.9
SpecPrims List 9.1.13, 9.2.8, 9.4.13 9.5.8
SpecPrims List.complete 9.2.8, 9.5.8
SpecTask Number 9.1.11, 9.2.8, 9.4.11, 9.5.8
Syntax 7.4.11, 7.5.11, 9.1.13, 9.4.10
Task 8.1.10, 8.4.10, 9.1.11, 9.4.11
Tasks Menu 8.1.10, 8.4.10
Tech1, Tech2 7.7.9
TeleTechnologies.bg 7.7.8
Term 7.2.7
TEJAS Version 6.4
Total Time 9.1.13
User Notes 6.5
Verb 7.4.11, 7.5.11, 9.1.11, 9.2.8, 9.4.11, 9.5.8

G
generic primitive (*see* primitive, generic)

H
hardware requirements 3.3
histograms, teletechnologies 7.7.11
Home in HyperCard 6.2
HyperCard
  application support 3.4
  DOS compatibility 3.3
  Help stacks 3.1
  basics 3.1, 3.5
  references 3.1
  User's Guide 3.1
  versions used with TEJAS 3.4
hypermedia
  attributes 2.5
  communications with 4.6
  rationale for TEJAS, 2.5

I
icon buttons 6.2
information fields 6.3, 6.6
installing TEJAS stacks 3.5

input
  spreadsheets and databases 5.2
  text files 5.1

K
key words used with Define 6.2

M
menus
  EVAAssumptions 8.2.10
  EVAIssues 8.3.10
  EVATasks 8.1.13
  Generic Args 9.1.15
  Mod Menu 9.1.15
  TeleAssumptions 8.5.10
  TeleIssues 8.6.10
  TeleTasks 8.4.13
  TeleTechnologies 7.7.12
modifying cards (general) 4.7

O
object-oriented programming 2.3
open issues cards 8.17, 8.4.7
output
  spreadsheets and databases 5.2
  text files 5.1

P
parsing scheme 7.4.14, 7.5.14
participants in TEJAS Version 1.0 3.8
pop-up menus 6.2
primitive
  building specific from generic 7.4.9, 7.5.9
  definition 7.4.6, 7.4.7, 7.4.8, 7.5.6, 7.5.7, 7.5.8
  development 7.4.7, 7.4.8
  generic 7.4.6, 7.4.7, 7.4.8, 7.5.6, 7.5.7, 7.5.8
  parsing scheme 7.4.14
  relating EVA and telerobot, 7.4.8, 7.4.9, 7.5.8, 7.5.9

specific 7.4.6, 7.4.7, 7.4.8, 7.5.6, 7.5.7, 7.5.8
printing
cards 5.3
reports 5.4
stacks 5.3
tips for HyperCard 5.3

R
RAM limitations
during searches 7.2.3, 7.3.3
for TEJAS 3.3
when building specific task stacks 8.1.12, 8.4.12
when sorting 6.2

S
software requirements 3.4
sort button 6.2
specific primitive (*see* primitive, specific)
specific task stack
building 4.4, 8.1.12, 8.4.12
naming 8.1.4, 8.1.12, 8.4.4, 8.4.12
SpecPrim Arg menus card 9.1.9, 9.4.9
SpecPrim Builder card 9.1.8 9.4.8
SpecPrims List card 9.1.7 9.4.7
stacks
defined 2.6
overview 4.2, 4.3. 4.4
TEJAS Version 1.0 list 4.1

T
task analysis
common steps 8.1.6, 8.4.6
TEJAS method 8.1.12, 8.4.12
Task Analysis Methodology (TAM) 4.3, 7.4.8, 7.5.8, 8.1.6, 8.4.6
task baseline cards (*see* baseline cards)
task summary
relating to assumptions and open issues 8.1.7, 8.4.7
TEJAS Help
menus 3.6
sections 3.6
stack 3.6
use of 3.6
TEJAS User's Guide, explanation of 3.7
teleprimitives
defined 7.4.6, 7.5.6
development 7.4.7, 7,4,7
relationship to EVAprimitives 7.4.8, 7.4.9, 7.4.13, 7.5.8, 7.5.9, 7.5.13
stack 7.5
telerobotics relationship to EVA 1.1, 1.2
TeleSpecPrim Arg Menus card 9.4.8
TeleSpecPrim Builder card 9.4.7
TeleSpecPrims List card 9.4.6
teletechnologies
criticality 7.7.6
development 1.1
readiness levels 7.7.1, 7.7.9, 7.7.11
requirements 7.7.6, 7.7.7
text files
exporting 5.5, 5.6
importing 5.1
text searches in TEJAS, tips 6.1
Transfer document 9.1.14
Transfer spreadsheet 9.1.14

U
updating TEJAS 4.10
user levels 2.5
User Notes
button 6.2
field 6.5
user's role
general rules 4.11
specific stacks 7.1.2, 7.2.2, 7.3.2, 7.4.2, 7.5.2, 7.7.2, 8.1.2, 8.2.2, 8.3.2, 8.4.2, 8.5.2,.8.6.2, 9.1.5, 9.2.2, 9.3.2, 9.4.2, 9.5.2, 9.6.2