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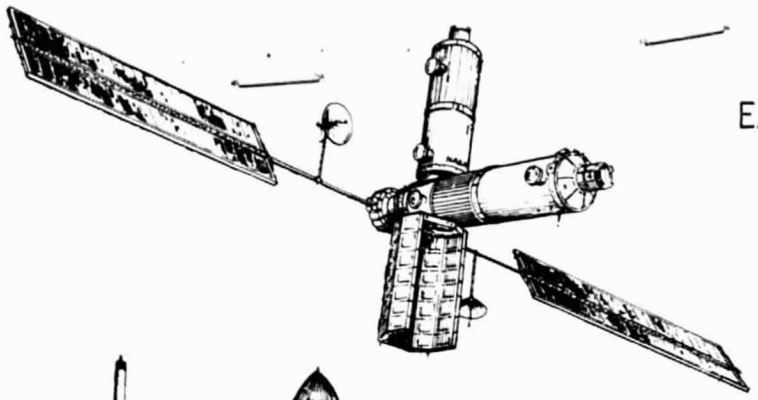


MID-TERM REVIEW
EXECUTIVE OVERVIEW
15 NOVEMBER 1982
COPY NO. 8

(NASA-CR-173707) SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS: MIDTERM REVIEW, EXECUTIVE OVERVIEW (Lockheed Missiles and Space Co.) 53 p HC A04/MF A01 CSCL 22B G3/18

N84-27818

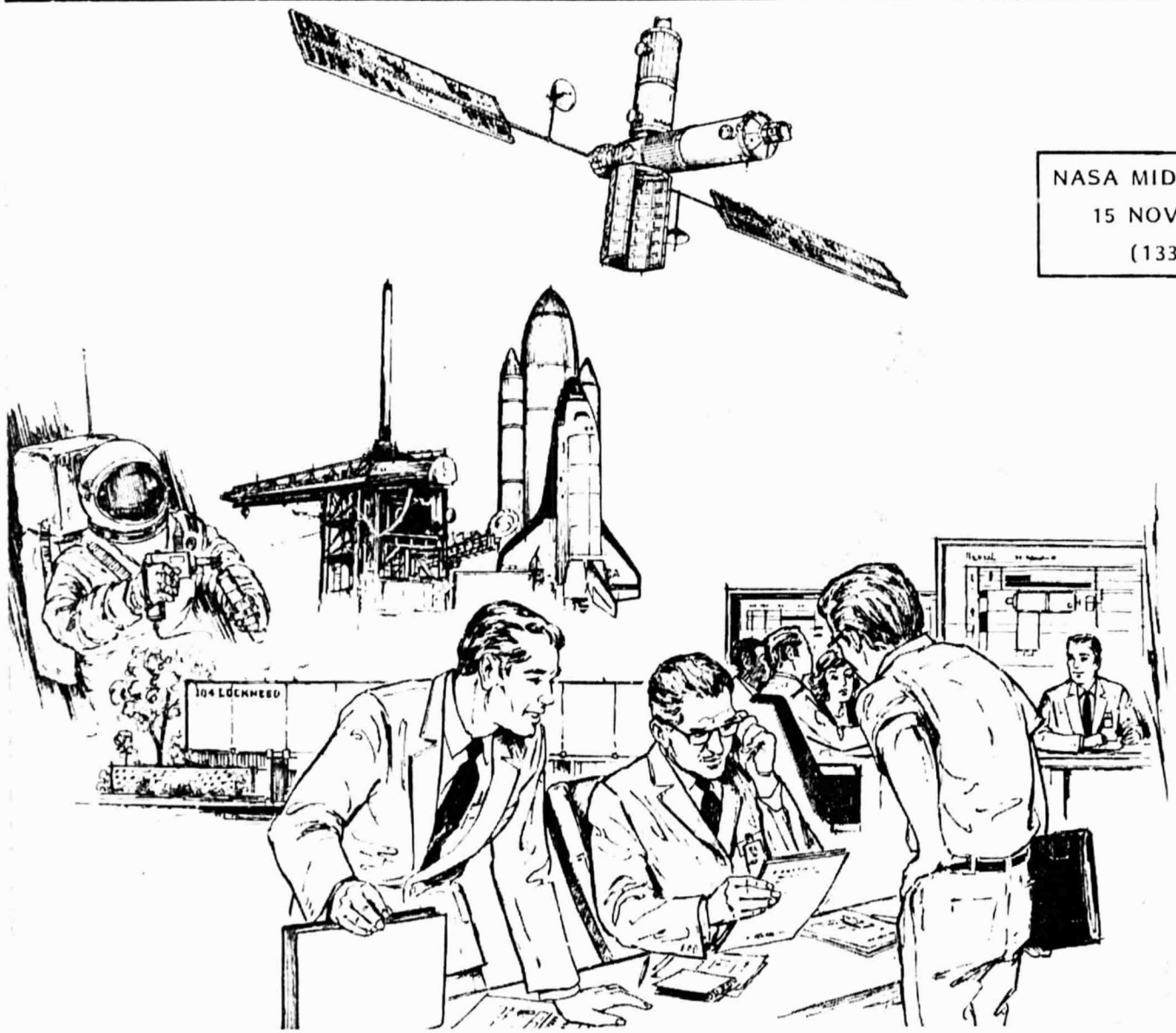
Unclas
00952

NASA

Space Station Needs, Attributes and Architectural Options

Lockheed Missiles & Space Company, Inc.

NASA Space Station Needs, Attributes and Architectural Options



NASA MID TERM REVIEW
15 NOVEMBER 1982
(1330 - 1730)

SPACE STATION USER NEEDS

Lockheed

LOCKHEED APPROACH

- USER CONTACT PLAN HAS BEEN IMPLEMENTED JUST AS PROPOSED
  - SMALL GROUPS, REPEAT VISITS, BROAD BASE

- EXISTING DATA BANK IS PROBABLY ADEQUATE TO DEFINE 90% OF STATION REQUIREMENTS

  THUS-

  SEVERAL HUNDRED VALID MISSION SCENARIOS COULD BE CONSTRUCTED UTILIZING EXISTING DATA BANK INDEPENDENT OF USERS

  INSTEAD-

  OUR APPROACH IS TO DEVELOP 10 TO 15 VALID MISSIONS AND OBTAIN SOLID, MULTIPLE USER CONCURRANCE

- NASA DATA FORMAT IS BEING USED — BUT IT ASKS FOR MORE THAN NECESSARY DETAIL AT THIS STAGE

- ARCHITECTURAL OPTIONS WILL BE STUDIED, BUT DEVELOPMENT OF DETAILED DESIGNS IS BEING DELIBERATELY AVOIDED

SPACE STATION USER NEEDS

Lockheed

USER CONTACT PLAN WORKS!

VISITS AND REVISITS OF POTENTIAL USERS HAS INCREASED THEIR INTEREST AND A PERCEPTIBLE MOMENTUM IS DEVELOPING TO SUPPORT A SPACE STATION

SPACE STATION USER NEEDS

Lockheed

MID-TERM REVIEW AGENDA
15 NOVEMBER 1982 (1330 - 1730 HRS)

1. EXECUTIVE OVERVIEW	FORSBERG	1:30 - 2:10
2. STUDY ACTIVITY AND STATUS		
TASK 1 - MISSION REQUIREMENTS (NASA and DoD)	FORSBERG	2:10 - 2:15
1.1 USER ALIGNMENT PLAN		
1.1.1 SCIENCE AND APPLICATION	OLCOTT	2:15 - 2:35
1.1.2 COMMERCIAL	GLASER	2:35 - 3:05
1.1.3 U. S. NATIONAL SECURITY	(SEE ITEM 5)	
1.1.4 SPACE OPERATIONS	D. SMITH	3:05 - 3:35
1.2 REQUIREMENTS FROM USER NEEDS		
- B R E A K -		
TASK 2 - MISSION IMPLEMENTATION CONCEPTS	HEKKING	3:45 - 4:15
TASK 3 - COST AND PROGRAMMATIC ANALYSIS	HOPKINS	4:15 - 4:35
3. STATUS/CONCLUSIONS/OBSERVATIONS	FORSBERG	4:35 - 4:45
4. PLAN TO COMPLETION		
5. U. S. NATIONAL SECURITY (SECURITY)	FORSBERG/ P. SMITH	4:45 - 5:30

SPACE STATION USER NEEDS

Lockheed

EXECUTIVE OVERVIEW

SPACE STATION USER NEEDS

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STUDY OBJECTIVES

- TO CREATE USER SUPPORT FOR THE SPACE STATION
- TO IDENTIFY USERS IN AREAS NOT CONTACTED BEFORE
- TO GAGE THE "POTENTIAL USER" CLIMATE IN REGARD TO SPACE STATION START-UP IN FIVE AREAS (PER S.O.W.)
  - SCIENCE
  - APPLICATIONS
  - COMMERCIAL
  - U.S. NATIONAL SECURITY
  - SPACE OPERATIONS
- TO DEFINE USER REQUIREMENTS
- TO ESTABLISH TIME-PHASED ARCHITECTURE FOR OPTIMAL DEVELOPMENT/ INTEGRATION/OPERATION OF A SPACE STATION

SPACE STATION USER NEEDS

Lockheed

PRECEPTS

- SPACE STATION IS NOT AN END IN ITSELF
- ITS PURPOSE IS TO FACILITATE USE OF SPACE
- USER REQUIREMENTS ARE PARAMOUNT
- WE MUST ANSWER THE QUESTIONS
  - WHY A SPACE STATION?
  - WHY MANNED?

SPACE STATION USER NEEDS

Lockheed

GENERAL FINDINGS FROM USER SURVEY

- THERE IS INCREASING INTEREST IN SPACE STATION
- THERE IS WILLINGNESS TO HELP, BUT USERS EXPRESS
  - CONCERN ABOUT BUDGET (AFRAID TO COMMIT)
  - CONCERN ABOUT NASA OBJECTIVITY
  - CONCERN ABOUT NEED FOR MAN IN SPACE BEYOND SHUTTLE (MIXED REACTION)
  - CONCERN ABOUT BEING BEHIND IN SPACE ACTIVITY
- USER INTERACTION IS VITAL TO THE PROGRAM
- NO NEW SPACE STATION FUNCTIONS HAVE BEEN IDENTIFIED - BUT MISSIONS MUST BE RESTATED IN TERMS OF USER NEEDS
- SUPPORT FOR MISSION SCENARIOS NOW BEING RECEIVED (PARTICULARLY FROM DoD)

SPACE STATION USER NEEDS

TASK 1 — MISSION REQUIREMENTS (NASA AND DOD)

TASK 2 — MISSION IMPLEMENTATION CONCEPTS

TASK 3 — COST AND PROGRAMMATIC ANALYSIS

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SPACE STATION USER NEEDS

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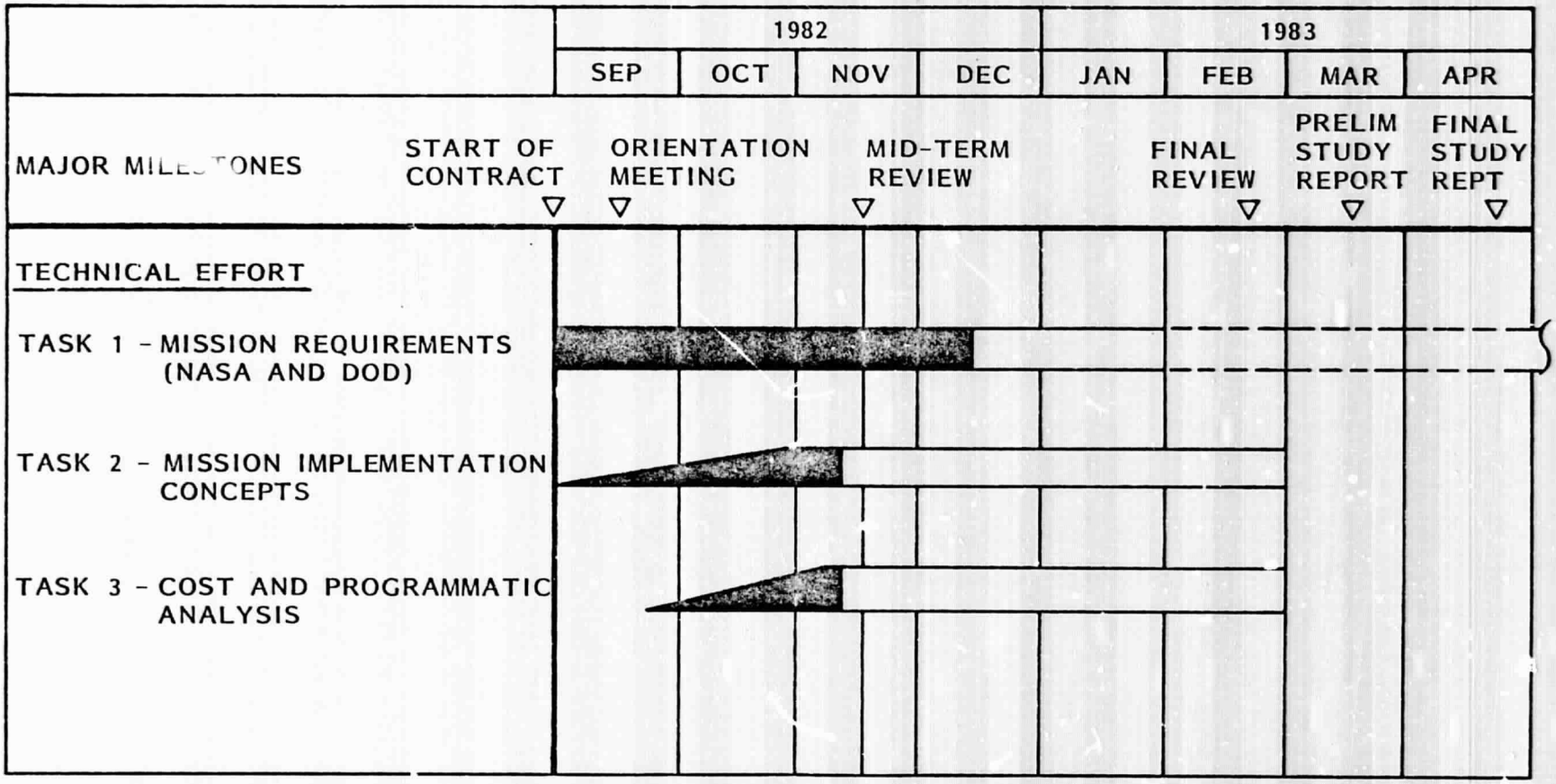
STUDY SCHEDULE



SPACE STATION USER NEEDS

TASK 1
MISSION REQUIREMENTS

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SPACE STATION USER NEEDS

Lockheed

TASK 1 — MISSION REQUIREMENTS

1.1 USER ALIGNMENT PLAN

1.1.1 SCIENCE AND APPLICATIONS
— PHYSICAL SCIENCES
— LIFE SCIENCES

1.1.2 COMMERCIAL

1.1.3 U.S. NATIONAL SECURITY

1.1.4 SPACE OPERATIONS

1.2 REQUIREMENTS FROM USER NEEDS

THE BULK OF THE EFFORT DURING THE FIRST HALF OF THIS CONTRACT WAS DEVOTED TO THIS TASK IN ACCORD WITH OUR PROPOSED PLAN.

SPACE STATION USER NEEDS

Lockheed

TASK 1.1 - USER ALIGNMENT PLAN

- SMALL GROUP APPROACH - DISCIPLINE ORIENTED
- FOLLOW-UP CONTACT CONCEPT
- EMPHASIZE NATIONAL SECURITY AND COMMERCIAL
- SCIENCE CONTACTS (PRIMARILY THROUGH NASA)
- APPLICATIONS (OVERLAP WITH COMMERCIAL AND SCIENCE)
- OPERATIONS/LOGISTICS SUPPORT INTEGRAL TO ALL CATEGORIES
- FOREIGN CONTACTS (EXPRESSING CONSIDERABLE INTEREST)
- INFORMATION FROM CONTACTS ENTERED INTO COMPUTERIZED DATABASE
- SEMINAR TO EDUCATE HIGH LEVEL COMMERCIAL INTERESTS

SPACE STATION USER NEEDS

Lockheed

TASK 1.1 - USER ALIGNMENT PLAN

USER CONTACTS

SCIENCE AND APPLICATIONS	COMMERCIAL	U.S. NATIONAL SECURITY
NASA	FOREIGN SCIENCE ATTACHÉS	AIR FORCE
USDA	COMMUNICATIONS	NAVY
USDI	MATERIAL PROCESSING	ARMY
SELECTED MEMBERS OF INDUSTRY AND UNIVERSITY SCIENTIFIC COMMUNITY	MEDICAL	DARPA
	SERVICES (LAB RENTAL)	DIA
	FINANCIAL	OSD
		OSAF

SPACE STATION USER NEEDS

Lockheed

TASK 1.1 — USER ALIGNMENT PLAN USER CONTACT LIST

REPORT 8 5-NOV-82
SORTED BY ARTEMIS RECORD NUMBER

SPACE STATION NEEDS, ATTRIBUTES & ARCHITECTURAL OPTIONS

PAGE 12

UPDTE REF	OFFICE	AGENCY/ COMPANY	USERNAME	PHONE	LOCATION/ CITY	FLG	CO MEMBER-1	CONTACT TEAM MEMBER-2	MEMBER-3	VISITS SCHED	ACTUAL	REMARKS
273		CONGRESS OFF TECHN			WASH	EA	FORSBERG			27-OCT-82	27-OCT-82	LEGIS ASST - COMM. FLT/
										13-OCT-82	13-OCT-82	
										5-OCT-82	5-OCT-82	CHIEF, MED OPER DI
										5-OCT-82	5-OCT-82	OPER MEDICAL SUPPORT
										6-OCT-82	6-OCT-82	LIFE SUPPORT
										7-OCT-82	7-OCT-82	CH-MED SCI SPACE MS
										7-OCT-82	7-OCT-82	HUMAN VESTIBULAR SCI
										6-OCT-82	6-OCT-82	ASST-SPACE & LIFE SCI DIRECTORATE
										8-OCT-82	8-OCT-82	CREW SYST DEPUTY
										8-OCT-82	8-OCT-82	ENVIRON CONTROL/LS
										6-OCT-82	6-OCT-82	DIR,SPACE STATION OFFICE
										29-OCT-82	29-OCT-82	
										26-OCT-82	26-OCT-82	
										26-OCT-82	26-OCT-82	
										27-OCT-82	27-OCT-82	
										27-OCT-82	27-OCT-82	
										10-NOV-82		
										10-NOV-82		
										10-NOV-82		
										10-NOV-82		PRES, LEO
										10-NOV-82		VP, CORP TECH

REPORT 8 5-NOV-82
SORTED BY ARTEMIS RECORD NUMBER

SPACE STATION NEEDS, ATTRIBUTES & ARCHITECTURAL OPTIONS

PAGE 4

UPDTE REF	OFFICE	AGENCY/ COMPANY	USERNAME	PHONE	LOCATION/ CITY	FLG	CO MEMBER-1	CONTACT TEAM MEMBER-2	MEMBER-3	VISITS SCHED	ACTUAL	REMARKS
65		NASA	W P GIERUN		NSFC	SO	LS OLCOTT	BUDGET		29-SEP-82	6-OCT-82	DIRECTOR ADV SYS OFFICE
										29-SEP-82	6-OCT-82	CHIEF-SPACE SCIENCES LAB
										29-SEP-82		CHIEF-ENVR ANAL-LIFE SUPP
										29-SEP-82	6-OCT-82	CHIEF-ECLS BRANCH-LIFE SUPP
										29-SEP-82		SPACE STN DEP PROG MGR
										4-OCT-82	5-OCT-82	DEP DIR-LIFE SCIENCES OFFICE
												CHIEF-BIOSYS DIV
										24-SEP-82	24-SEP-82	DEPUTY-BIOSYS DIV
												SPACE STN LIFE SCIENCE FACIL
												FLT EXPER PROJ OFFICE
												CHIEF-BIOMED RES DIV
												CHIEF-ADV LIFE SUPP-ECLSS R/D
												LIFE SCIENCE DATA MGMTS (SPECIAL)
										1-OCT-82		AEROSPACE MEDICAL RES LAB (AMRL)
										1-OCT-82		AMRL
												PROJ MGR-AF OFF OF SCIENTIFIC RES
										14-SEP-82	14-SEP-82	SUPPORT ROCKWELL
												CHAIRMAN-LIFE SCI ADVIS COM

REPORT 8 5-NOV-82
SORTED BY ARTEMIS RECORD NUMBER

SPACE STATION NEEDS, ATTRIBUTES & ARCHITECTURAL OPTIONS

PAGE 1

UPDTE REF	OFFICE	AGENCY/ COMPANY	USERNAME	PHONE	LOCATION/ CITY	FLG	CO MEMBER-1	CONTACT TEAM MEMBER-2	MEMBER-3	VISITS SCHED	ACTUAL	REMARKS
1	SPACE SYS DUDPE	DOD	CO FORSITH	202/697-0157	PENTAGON	EA	R FORSBERG	STEGMAN	HUNTER	13-SEP-82	13-SEP-82	SPACE & ADV SYS
							FORSBERG	P. SMITH		14-OCT-82	14-OCT-82	UNDER SECRETARY DEFENSE
							FORSBERG	STEGMAN	P. SMITH	26-OCT-82	26-OCT-82	
2	NSF (PHE 186)	USN	DR. FW DIETRICH	202/692-2182	WASH DC	EA	R FORSBERG	STEGMAN	HUNTER	13-SEP-82	13-SEP-82	NAVY SPACE PROJ TECH DIR PHE 186

4. NAV OCEAN. CDR D. HONHART 202/254-4562

13 SEP 82
14 OCT 82
27 OCT 82

6	SPEC ASST, DIR	DARPA	LC R AL LUMMIS	202/695-4861	PENTAGON	EA	R FORSBERG	STEGMAN	HUNTER	16-SEP-82	16-SEP-82	
							STEGMAN	P. SMITH		26-OCT-82	26-OCT-82	
7	SPEC ASST, DIR	DARPA	LC W O HUNT		PENTAGON	EA	R FORSBERG			16-SEP-82		
8	NAVY SSP	USN	CAPT C TURNIS	202/697-5575	PENTAGON	EA	R FORSBERG	STEGMAN		16-SEP-82	16-SEP-82	STRAT. PLANS AND POLICY
							FORSBERG			26-OCT-82	26-OCT-82	
9	SAF/AQS	USAF	COL J P FOSTER		PENTAGON	EA	R FORSBERG	STEGMAN		16-SEP-82	16-SEP-82	SPACE PLANS DEP
							FORSBERG	P. SMITH		14-OCT-82	14-OCT-82	ASST SEC OF AF
							FORSBERG	STEGMAN	P. SMITH	26-OCT-82	26-OCT-82	
10	ASPO	USN	COL R A SHAW	703/274-6342	ALEXANDRIA	EA	R FORSBERG	STEGMAN	HUNTER	17-SEP-82	17-SEP-82	NAVY SPACE PROGRAM
11	ASPO	USA	W J HORAN	703/274-6342	ALEXANDRIA	EA	R FORSBERG	STEGMAN	HUNTER	17-SEP-82	17-SEP-82	ARMY SPACE PROGRAM
12	DEP DIR NSS	USN	CAPT W B PEIBLE		PENTAGON	EA	R FORSBERG	STEGMAN		17-SEP-82	17-SEP-82	
							FORSBERG	P. SMITH		15-OCT-82	15-OCT-82	
13	ARMY ISC	USA	MAJ G BREWER	202/695-5567	PENTAGON	EA	R FORSBERG	STEGMAN		17-SEP-82	17-SEP-82	ACSI-INTELL
14	HQ AD/DVSS	USAF	MAJ L GANOZZO		PETERSON AFB	PW	R FORSBERG	STEGMAN		27-SEP-82	27-SEP-82	

SPACE STATION USER NEEDS

TASK 1 — MISSION REQUIREMENTS

1.1 USER ALIGNMENT PLAN

1.1.1 SCIENCE AND APPLICATIONS
- PHYSICAL SCIENCES
- LIFE SCIENCES

1.1.2 COMMERCIAL

1.1.3 U.S. NATIONAL SECURITY

1.1.4 SPACE OPERATIONS

1.2 REQUIREMENTS FROM USER NEEDS

Lockheed

SPACE STATION USER NEEDS

Lockheed

TASK 1.1.1 - SCIENCE AND APPLICATIONS USER CONTACTS

PHYSICAL AND LIFE SCIENCES

COMPLETED

• NASA HEADQUARTERS	16
• NASA AMES RESEARCH CENTER	11
• NASA JOHNSON SPACE CENTER	15
• NASA MARSHALL SPACE FLIGHT CENTER	6
• NASA KENNEDY SPACE CENTER	5
• UNIVERSITIES	11
• RESEARCH INSTITUTES	3

TO BE COMPLETED

• NASA	~6
• AIR FORCE	~4
• UNIVERSITIES	~6
• ADVISORY COMMITTEES	~4
• JPL	~2

SPACE STATION USER NEEDS

Lockheed

TASK 1.1.1 - SCIENCE AND APPLICATIONS USER CONTACTS

PHYSICAL SCIENCE SUMMARY

- EXISTING NASA STUDIES ARE THE PRIMARY DATABASE FOR USER REQUIREMENTS
- MISSION PRIORITIES ARE DERIVED FROM NASA LIST OF CANDIDATE MISSIONS
- DATABASE VALIDITY AND COMPLETENESS IS BEING VERIFIED BY SELECTED USER INTERACTIONS
- TRY TO AUGMENT EXISTING DATABASE WITH INNOVATIVE CONCEPTS THAT REQUIRE SPACE STATION CAPABILITY

SPACE STATION USER NEEDS

Lockheed

TASK 1.1.1 - SCIENCE AND APPLICATIONS USER CONTACTS

LIFE SCIENCES SUMMARY

- SPACE STATION IS FELT BY MANY TO BE AN ESSENTIAL STEP TO OBTAIN LIFE SCIENCES ANSWERS FOR FUTURE
- LIFE SCIENCES DOES NOT IN ITSELF JUSTIFY MANNED ACTIVITIES IN SPACE; BUT, LIFE SCIENCES RESEARCH IN SPACE IS REQUIRED TO QUALIFY MAN FOR LONG TERM SPACE FLIGHT
- MOST LIFE SCIENCES RESEARCH REQUIRES LONGER THAN 7-14 DAYS AVAILABLE ON SHUTTLE
- PLANNED DEDICATED SHUTTLE/SPACELAB TIME BETWEEN NOW AND 1990 IS ONLY 20 TO 30 DAYS ON ORBIT

SPACE STATION USER NEEDS

TASK 1 — MISSION REQUIREMENTS

1.1 USER ALIGNMENT PLAN

1.1.1 SCIENCE AND APPLICATIONS
— PHYSICAL SCIENCES
— LIFE SCIENCES

1.1.2 COMMERCIAL

1.1.3 U.S. NATIONAL SECURITY

1.1.4 SPACE OPERATIONS

1.2 REQUIREMENTS FROM USER NEEDS

Lockheed

SPACE STATION USER NEEDS

Lockheed

TASK 1.1.2 - COMMERCIAL USER CONTACTS

COMMERCIAL CONTACT SUMMARY

- EXECUTIVES INVITED TO SEMINAR 120
  ATTENDED 27
- MEETINGS HELD IN ADDITION TO SEMINAR
  COMMERCIAL USERS - DOMESTIC 18
  COMMERCIAL USERS - FOREIGN 11
  NASA 15

SPACE STATION USER NEEDS

Lockheed

TASK 1.1.2 - COMMERCIAL USER CONTACTS

A.D. LITTLE/LOCKHEED COMMERCIAL USERS SEMINAR (10 NOVEMBER)

A. PURPOSE:

- INTERACTION NECESSARY TO GAIN COMMERCIAL HIGH LEVEL MANAGEMENT INVOLVEMENT
- IDENTIFY COMMERCIAL INTEREST
- SOLICIT AND DEMONSTRATE NEED FOR USER INTERACTION, SUPPORT AND HIGH TECHNOLOGY INFUSION

B. EXECUTIVES OF 120 LARGE COMMERCIAL ENTERPRISES WERE INVITED TO BOSTON, MASS.

- 27 ATTENDED FROM BROAD SPECTRUM OF NON-AEROSPACE INDUSTRIES
- THERE WAS LIVELY DISCUSSION AND STRONG INTEREST
- FOLLOW-UP VISITS WILL BE MADE ON AN INDIVIDUAL COMPANY BASIS IN DECEMBER AND JANUARY

SPACE STATION USER NEEDS

Lockheed

TASK 1.1.2 - COMMERCIAL USER CONTACTS CONFERENCE AGENDA

COMMERCIALIZING SPACE: THE BARRIERS AND OPPORTUNITIES

AGENDA

Tuesday Evening, November 9

6:00-8:00 **Welcoming Reception — The Colonnade West**

Wednesday, November 10 Meeting — The Embassy Suite

8:30	Coffee	
9:00	**Opening Remarks**	Mr. William F. Wright *Vice President, Space Systems Division Lockheed Missiles and Space Company, Inc.*
	Overview	Dr. Peter Glaser *Meeting Chairman, Vice President, Arthur D. Little, Inc.*
	Space Station — Attributes and Needs	Mr. John D. Hodge, *Director, Space Station Task Force, NASA*
	User Involvement in Space Station Development	Dr. Kevin Forsberg, *Manager, Space Station Program, Lockheed Missiles and Space Company, Inc.*
	Working in Space	Dr. Gerald P. Carr *Senior Consultant Applied Research, Inc.*
	Rationale for Commercial Activities in Space	Dr. Peter Glaser
10:45	Break	
11:00	**Concurrent Seminars Led by Arthur D. Little Technical Staff:**	
	• Utility Services	Dr. Philip K. Chapman *Senior Professional Staff*
	• Materials Processing	Dr. Arthur A. Fowle, *Consultant to Arthur D. Little, Inc.*
	• Telecommunications	Mr. Robert S. Gordon *Senior Professional Staff*
	• Medical Services	Dr. Jack Kasten *Vice President*
12:00	Luncheon	
1:45	**Panel and General Discussion** • Business factors and highlights including NASA support of commercial space operations • NASA handling of proprietary data • Open discussion	Dr. Thomas O. Paine, *Moderator Chairman, Thomas Paine Associates*
3:45	**Summation**	Dr. Peter Glaser
4:00	**Adjournment**	

Members of Lockheed/Arthur D. Little Study Team will be available for informal discussion.

Arthur D. Little, Inc.

SPACE STATION USER NEEDS

TASK 1 — MISSION REQUIREMENTS

1.1 USER ALIGNMENT PLAN

- 1.1.1 SCIENCE AND APPLICATIONS
  - — PHYSICAL SCIENCES
  - — LIFE SCIENCES
- 1.1.2 COMMERCIAL
- 1.1.3 U.S. NATIONAL SECURITY
- 1.1.4 SPACE OPERATIONS

1.2 REQUIREMENTS FROM USER NEEDS

Lockheed

SPACE STATION USER NEEDS

Lockheed

TASK 1.1.3 - U.S. NATIONAL SECURITY USER CONTACTS

PRIMARY USER CONTACTS	TOTAL NUMBER OF INDIVIDUALS (PRIMARY CONTACTS)	FOLLOW-UP VISITS SECOND	FOLLOW-UP VISITS THIRD
AIR FORCE	14	5	2
NAVY	8	5	1
ARMY	9	2	
DARPA	1	1	
DIA	1	1	
OSD	1	1	1
OSAF	3	3	1
TOTAL	37	18	5

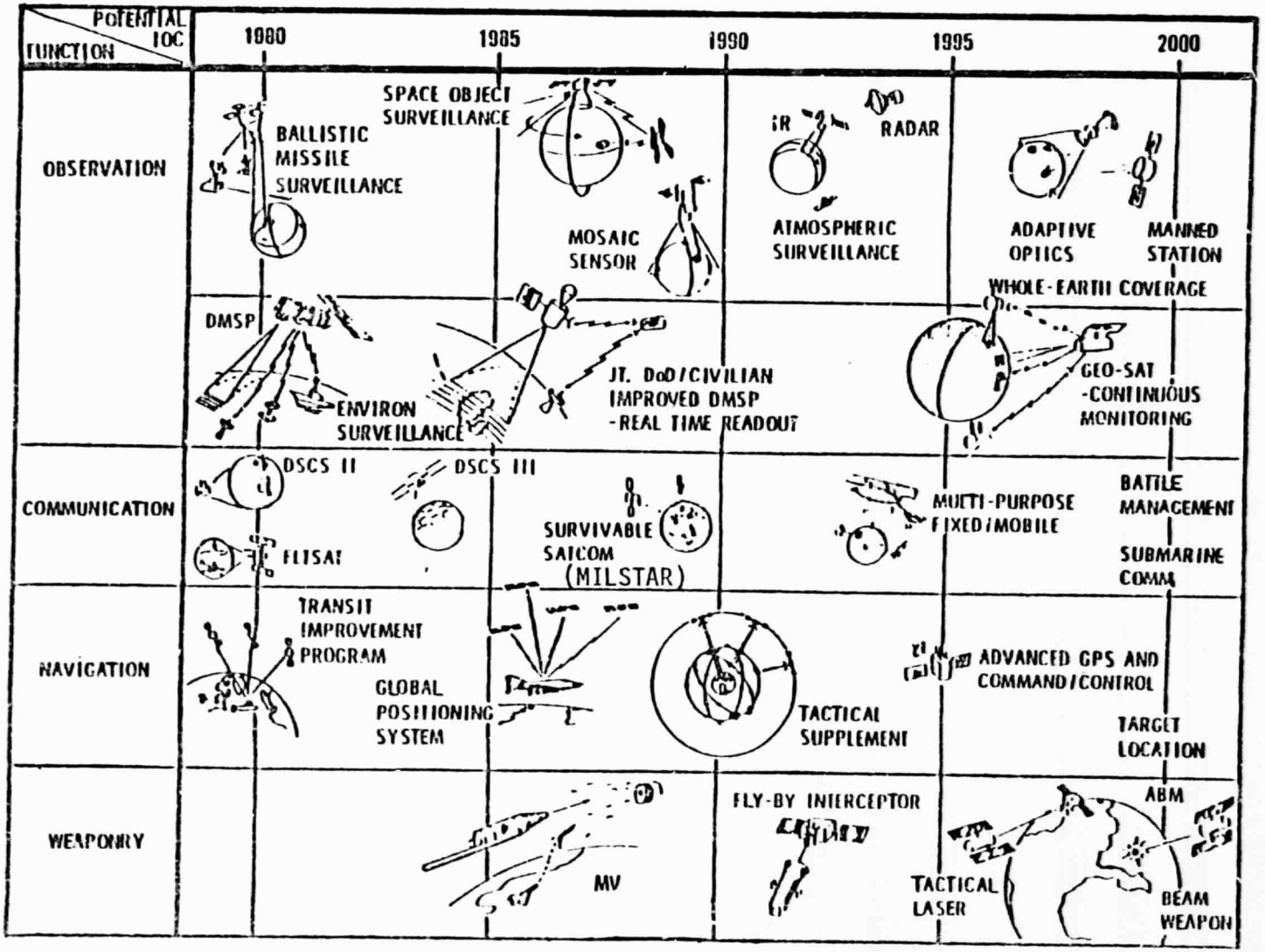
NOTE: 60 VISITS WITH 37 PRIMARY CONTACTS

SPACE STATION USER NEEDS

Lockheed

TASK 1.1.3 - U.S. NATIONAL SECURITY USER CONTACTS

FUTURE MILITARY MISSIONS*



* AIAA
14 JAN 81

SPACE STATION USER NEEDS

Lockheed

TASK 1.1.3 - U.S. NATIONAL SECURITY USER CONTACTS

MILITARY BENEFITS OF SPACE STATION

- RESEARCH AND DEVELOPMENT MISSIONS
  - IMPROVED PROGRAM PERFORMANCE WITH LONGER TIME IN ORBIT
    E.G., TALON GOLD
  - SENSOR DEVELOPMENT - MANNED INTERACTION DURING TEST
    E.G., NAVY OCEANOGRAPHIC SYSTEMS
- LOGISTICS AND RESUPPLY
  - E.G., REFUEL ATTITUDE CONTROL, MANEUVER PROPELLANTS, SATELLITE SERVICING (MAINTENANCE AND REPAIR) ON ORBIT AND LARGE STRUCTURES ASSEMBLY
  - NEED TO EVALUATE SHUTTLE VS. SPACE STATION
- OPERATIONS
  - COMMAND AND CONTROL
    E.G., EXTENSION OF NATIONAL MILITARY COMMAND SYSTEM
  - SPACE OBSERVATION

SPACE STATION USER NEEDS

TASK 1 — MISSION REQUIREMENTS

1.1 USER ALIGNMENT PLAN

- 1.1.1 SCIENCE AND APPLICATIONS
  - — PHYSICAL SCIENCES
  - — LIFE SCIENCES
- 1.1.2 COMMERCIAL
- 1.1.3 U.S. NATIONAL SECURITY
- 1.1.4 SPACE OPERATIONS

1.2 REQUIREMENTS FROM USER NEEDS

Lockheed

SPACE STATION USER NEEDS

Lockheed

TASK 1.1.4 - SPACE OPERATIONS USER CONTACTS

- USERS OF SPACE-BASED OPERATIONS ARE PART OF THE OTHER THREE USER GROUPS (SCIENCE AND APPLICATIONS, COMMERCIAL, AND U.S. NATIONAL SECURITY)

- FIRST-ROUND VISITS WITH POTENTIAL USERS CONCENTRATE ON THEIR SPECIFIC MISSIONS IN SPACE - WITHOUT REGARD, INITIALLY, TO USE OF SHUTTLE OR SPACE STATION

- ONCE THE USER'S END OBJECTIVE IS DEFINED, SUPPORT FOR SPACE-BASED OPERATIONS IS EASIER TO IDENTIFY AND USER SUPPORT IS EASIER TO OBTAIN

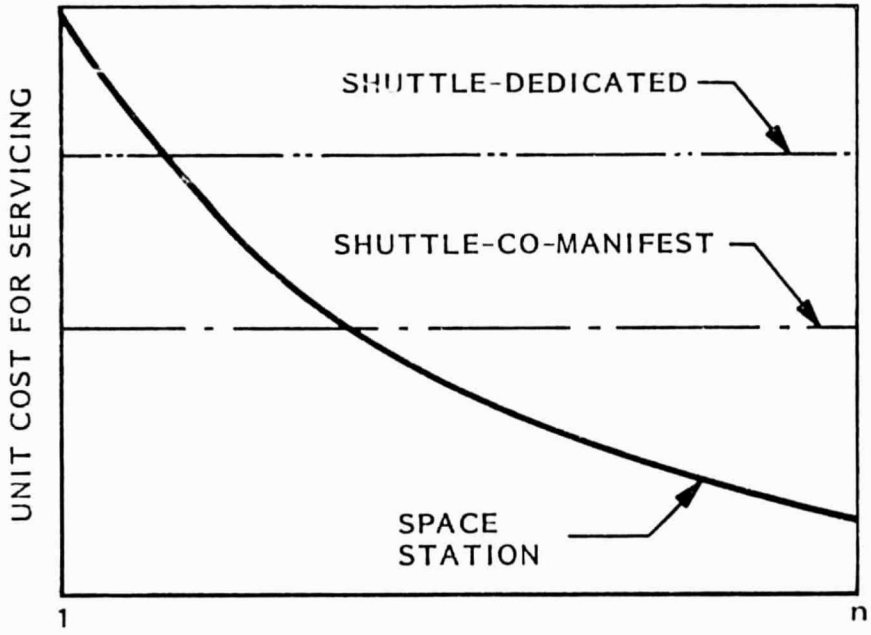
  <u>THUS</u>

  THIS AREA IS BEING EMPHASIZED IN SECOND-ROUND VISITS

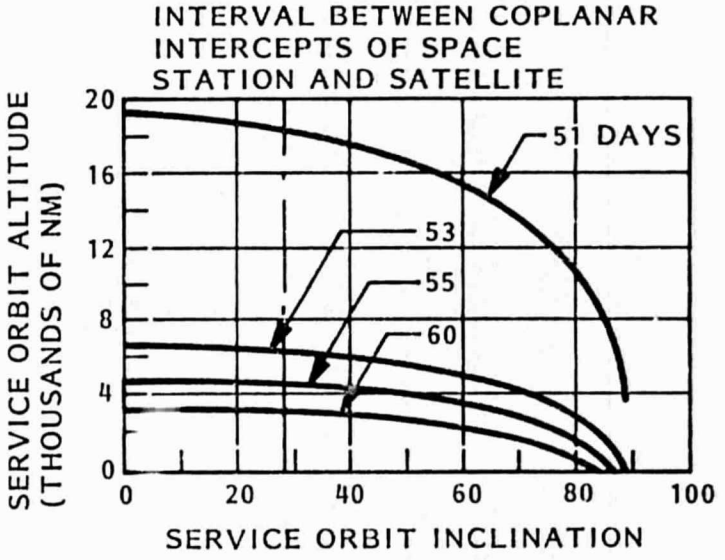
SPACE STATION USER NEEDS

Lockheed

TASK 1.1.4 — SPACE OPERATIONS USER CONTACTS



USERS NEED TO BE AWARE OF ADVANTAGES - AND LIMITATIONS - OF SPACE-BASED SATELLITE SERVICING VS SHUTTLE BASED SERVICING



SPACE STATION LOCATION:
220 NMi
28.5 DEG

NOTE: SHUTTLE CAN BE LAUNCHED DIRECTLY INTO PROPER ORBIT PLANE (INCLINATION AND NODAL CROSSING)

RESPONSE TIME IS INFLUENCED BY
- LAUNCH TURNAROUND
- MANIFEST (PRIORITY)

SPACE STATION USER NEEDS

TASK 1 — MISSION REQUIREMENTS

1.1 USER ALIGNMENT PLAN

- 1.1.1 SCIENCE AND APPLICATIONS
  - — PHYSICAL SCIENCES
  - — LIFE SCIENCES
- 1.1.2 COMMERCIAL
- 1.1.3 U.S. NATIONAL SECURITY
- 1.1.4 SPACE OPERATIONS

1.2 REQUIREMENTS FROM USER NEEDS

Lockheed

SPACE STATION USER NEEDS

Lockheed

TASK 1.2 - REQUIREMENTS FROM USER NEEDS

DEVELOPMENT OF PAYLOAD ACCOMMODATION MISSIONS FROM USER SURVEY

SOURCE	MISSION SCENARIO
USER SURVEY	
• SCIENCES	LIFE SCIENCE HUMAN RESEARCH LAB
	LIFE SCIENCE NON-HUMAN RESEARCH LAB
	CELESTIAL OBSERVATORY
	SPACE ENVIRONMENT FACILITY
• APPLICATIONS	EARTH OBSERVATION FACILITY
	EARTH HABITABILITY OBSERVATION LABORATORY
	METEORLOGICAL FACILITY
• COMMERCIAL	MATERIAL PROCESSING RESEARCH LAB
	MATERIAL PROCESSING FACILITIES
• U.S. NATIONAL SECURITY	SPACE OBSERVATION DEVELOPMENT LABORATORY
	OCEANOGRAPHIC OBSERVATORY DEVELOPMENT LABORATORY
	ORBITING NATIONAL COMMAND POST
	SPACE OBJECTS IDENTIFICATION SYSTEM
• SPACE OPERATIONS	ON ORBIT SATELLITE SERVICING IN LEO (ITSS SPACECRAFT; SPACE BASED RADAR; GPS)
	LARGE SATELLITE ASSEMBLY (SBL)
	ON ORBIT SATELLITE SERVICING IN HEO (MILSTAR)
	SPACE PLATFORM SERVICING-FREE FLYER (ASTRONOMY PLATFORMS AND MMS DERIVATIVES)

SPACE STATION USER NEEDS

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TASK 1.2 - REQUIREMENTS FROM USER NEEDS

TYPICAL DEVELOPMENT USER MISSION SCENARIO

"OCEANOGRAPHIC OBSERVATORY DEVELOPMENT LAB"

SPACE STATION USER NEEDS

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TASK 1.2 - REQUIREMENTS FROM USER NEEDS

TYPICAL SCENARIO: "OCEANOGRAPHIC OBSERVATORY DEVELOPMENT LAB"

MISSION CATEGORY: U.S. NATIONAL SECURITY

SYSTEM/PROGRAM: OCEANOGRAPHIC OBSERVATORY DEVELOPMENT LABORATORY

OBJECTIVE:

- TO DEVELOP MULTI-SENSOR SYSTEMS AND EXPAND EXISTING CAPABILITIES
- TO PROVIDE MEANS FOR EXTENDED TIME REAL TIME OBSERVATION OF DYNAMIC OCEAN PHENOMENA AND CONTROL OF SENSOR POINTING AND DUTY CYCLES
- TO CORRELATE VISUAL OBSERVATIONS IN SPACE AND DATA FROM VARIOUS SENSORS
- TO PROVIDE MEANS TO REDUCE DEVELOPMENT COSTS AND TO MINIMIZE DEVELOPMENT SPANS BY MAKING USE OF MANNED CAPABILITIES
- TO PROVIDE DATA TO EVALUATE ROLE OF MAN IN AN OPERATIONAL ENVIRONMENT

SYSTEM DESCRIPTION:

LIFETIME: 3 TO 6 MONTHS PER EXPERIMENT SEQUENCE
10 YEAR USEFUL OPERATION

LAUNCH VEHICLE: SHUTTLE

TRANSFER VEHICLE: NONE REQUIRED FOR SPACE STATION SORTIE MISSIONS
TMS REQUIRED FOR CLUSTER-FREE-FLYER

OPERATIONAL LOCATIONS: 300 - 700 km AT 65° PREFERRED
300 km AT 28.5° USEFUL

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TASK 1.2 - REQUIREMENTS FROM USER NEEDS

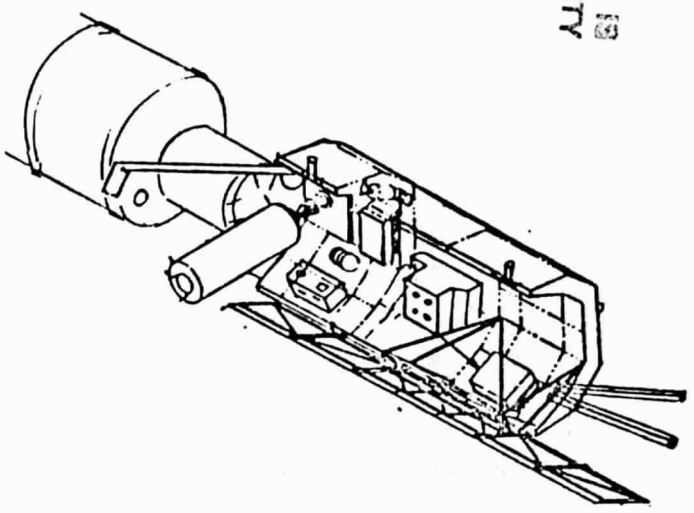
TYPICAL SCENARIO: "OCEANOGRAPHIC OBSERVATORY DEVELOPMENT LAB" (continued)

SYSTEM DESCRIPTION: (cont')

TOTAL MASS AT OPERATIONAL LOCATIONS: TBD (BUT LESS THAN 14,000 kg)
AVERAGE OPERATIONAL POWER: TBD (BUT LESS THAN 5 kW)
DESIRED INITIAL OPERATIONAL DATE: 1988 (SHUTTLE BASED EXPERIMENTS)
1990 (SPACE STATION BASED EXPERIMENTS)

GENERAL NEEDS:

- EQUIPMENT TO BE MOUNTED ON EXISTING PALLET (E.G., ESS OR SPACELAB PALLET)
- LABORATORY IS TO BE CAPABLE OF SUPPORTING EXPERIMENTAL (BRASSBOARD) HARDWARE AND SENSORS
- PHYSICAL CHARACTERISTICS:
  30ft x 14ft DIAMETER
  UP TO 40ft ANTENNA (SORTIE) EXPANDABLE OR UNFOLDABLE
  UP TO 300ft ANTENNA (FREE FLYER)
- OPERATIONAL CREW:
  2 EXPERIMENTORS MINIMUM (NO EQUIPMENT MODS)
  10-MAN CREW (TECHNICIANS)
- DATA: ON-BOARD DATA PROCESSING, $\sim 10^3$ MBPS



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TASK 1.2 - REQUIREMENTS FROM USER NEEDS

TYPICAL SCENARIO: "OCEANOGRAPHIC OBSERVATORY DEVELOPMENT LAB" (continued)

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U. S. NATIONAL SECURITY
OPERATIONAL MISSION

ORBITING NATIONAL COMMAND POST

(PRESENTED IN CLASSIFIED SECTION)

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TASK 1.2 - REQUIREMENTS from USER NEEDS

TYPICAL OPERATIONAL SCENARIO: "ORBITING NATIONAL COMMAND POST" (continued)

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SPACE STATION USER NEEDS

TASK 2

MISSION IMPLEMENTATION CONCEPT

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SPACE STATION USER NEEDS

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TASK 2 - MISSION IMPLEMENTATION CONCEPTS

- BASIC SPACE STATION COMPONENTS HAVE BEEN ENTERED INTO CADAM TO ALLOW EASY MANIPULATION AND MODIFICATION OF ARCHITECTURAL CONCEPTS

- WORK HAS BEEN INITIATED TO EVALUATE EACH OF THE COMPLETED MISSION SCENARIOS (17) AND TO DEFINE ARCHITECTURAL OPTIONS CABLE OF SUPPORTING THE USER NEEDS

SPACE STATION USER NEEDS

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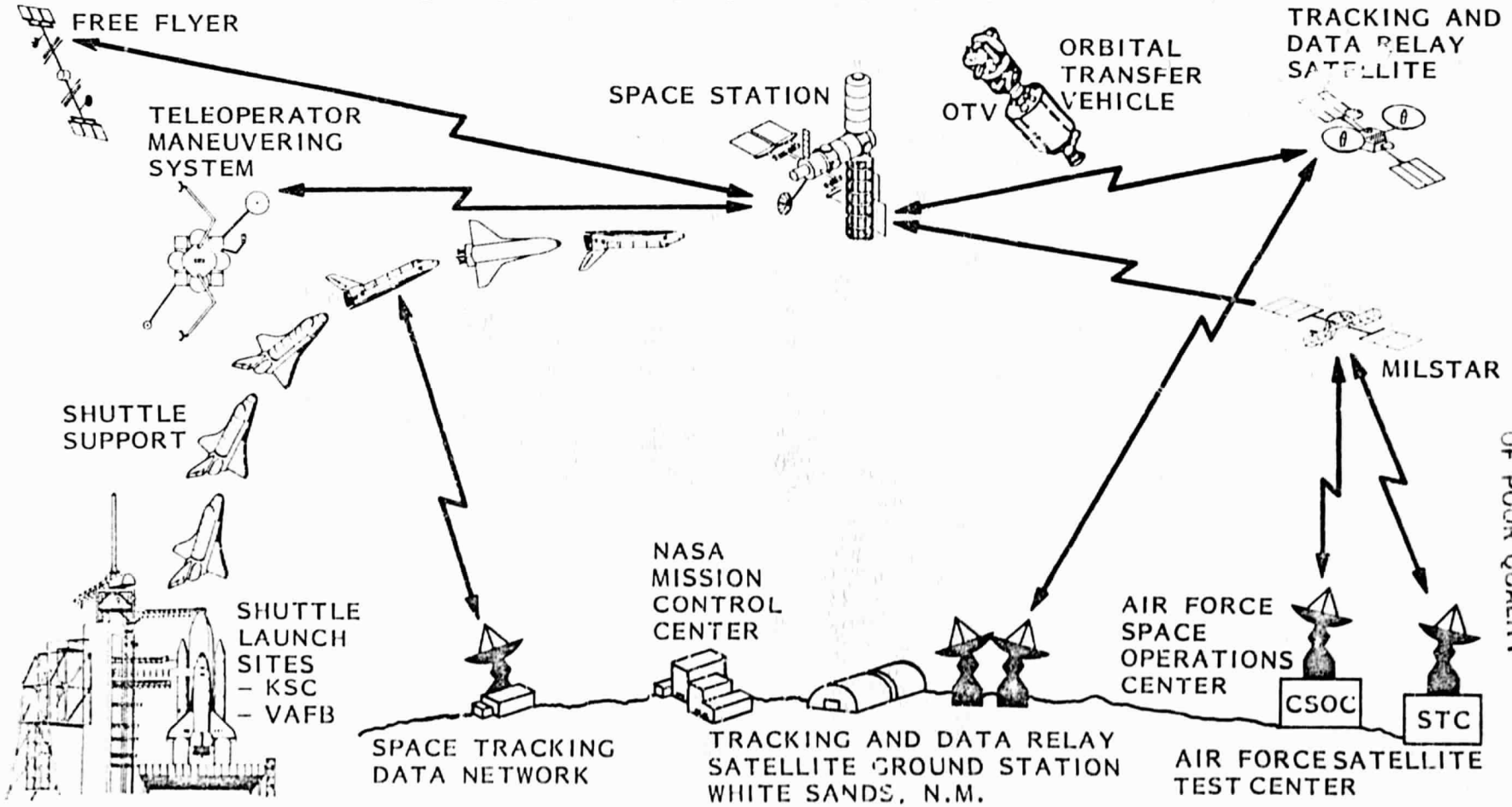
TASK 2 — MISSION IMPLEMENTATION CONCEPTS
SPACE TRANSPORTATION SYSTEM



SPACE STATION USER NEEDS

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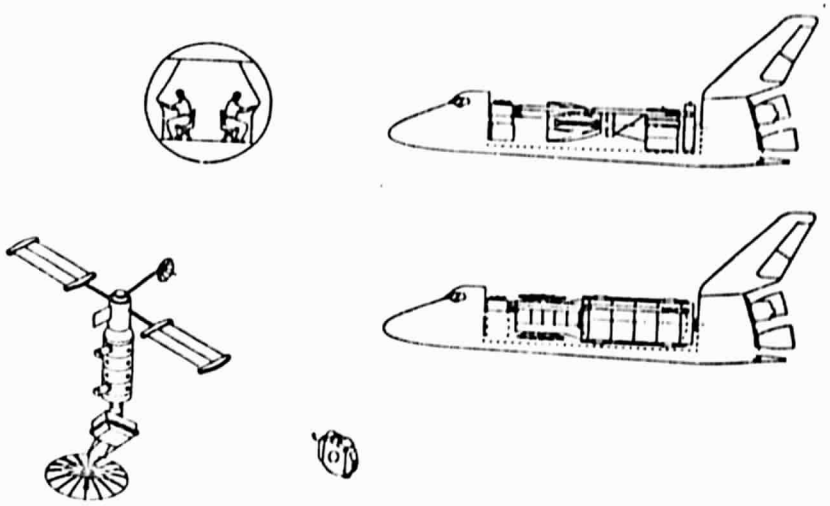
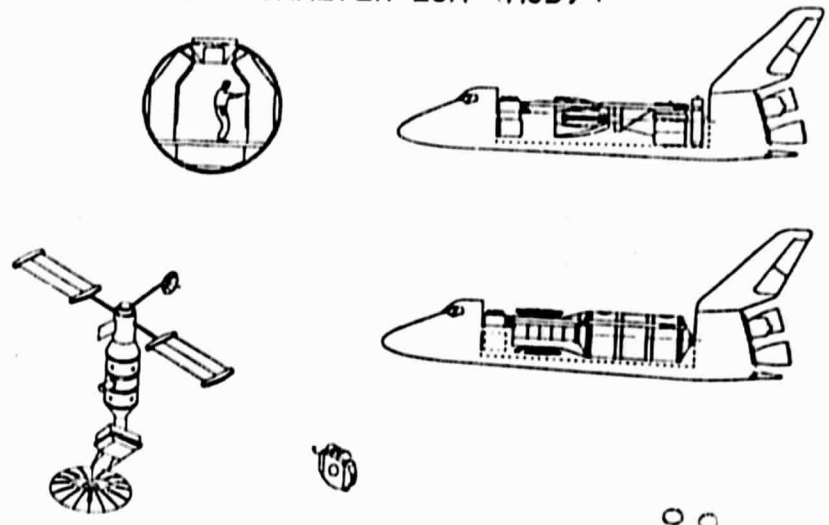
TYPICAL ARCHITECTURAL OPTIONS

A 12 ft DIAMETER (NEW)



C 14 ft DIAMETER ESA (MOD)



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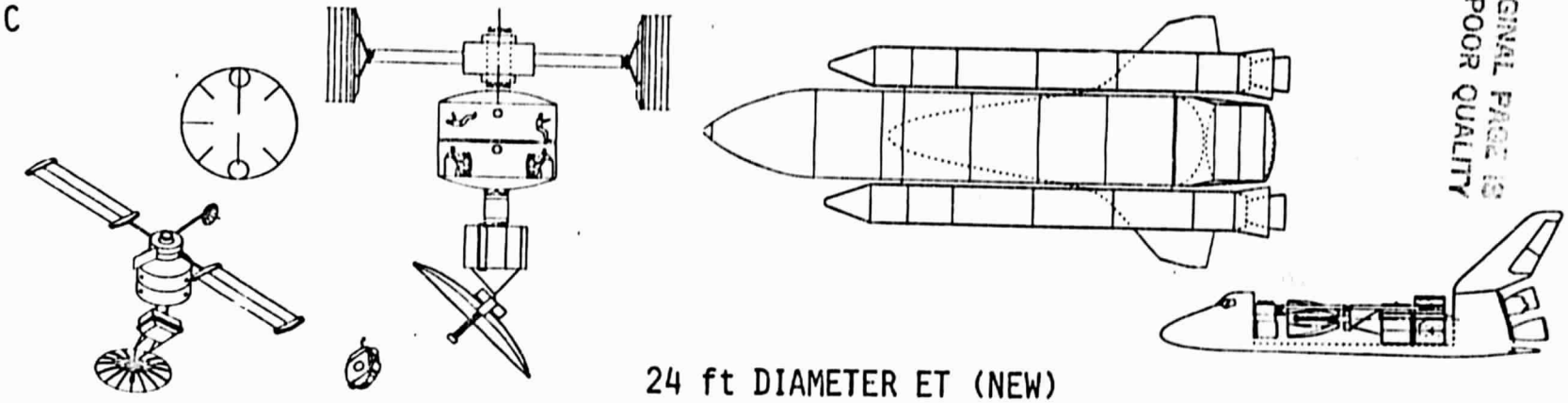

24 ft DIAMETER ET (NEW)

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TASK 2 — MISSION IMPLEMENTATION CONCEPTS

SPACE STATION EVOLUTION

SPACE STATION—PHASE IV

TIME	MISSION	SPACE STATION SERVICES	IMPACTS AND OPTIONS	COMMENTS AND CONSIDERATIONS
1996	DoD OPERATIONS	EXPANDED C^3 I	NUCLEAR POWER	MAY INCLUDE MAIN STATIONS IN
		ESCAPE CAPSULE	HIGH THRUST PROPULSION	CRITICAL ORBITS WITH SMALL OUTPOST
2000	C & C	LARGE CREW	SHIELDING	STATION EQUALLY SPACED
	WEAPON DELIVERY	HARDENING	CO-LOCATED DEFENSE	

SPACE STATION—PHASE III

TIME	MISSION	SPACE STATION SERVICES	IMPACTS AND OPTIONS	COMMENTS AND CONSIDERATIONS
1995	INSTALLING & SERVICING	CAPABILITY TO TRANSFER	MAIN LEO STATION &	MAINTENANCE SCHEDULE WILL ESTABLISH
				TRIDENT. PROBABLY
				VISITS
				TE TANK FARM ON
				ARGE LASER BATTLE

SPACE STATION—PHASE II

TIME	MISSION	SPACE STATION SERVICES	IMPACTS AND OPTIONS	COMMENTS AND CONSIDERATIONS
1993	SATELLITE SERVICING	DOCKING FOR:	ENCLOSED OR OPEN	HOW MUCH EVA CAN BE EXPECTED -
		SPACECRAFT	HANGERS & WORK PLATFORMS	WILL ENCLOSED WORK STATIONS BE
	OTV SERVICING	OTV		REQUIRED?
1994		TMS	EXTENT OF TESTING OF OTV/	
				E VOLUME FOR SPARES?
				UIREMENT FOR LOCAL
				SPORTATION?
				ARD RANGE WITH
				F FUEL?

SPACE STATION—PHASE I

TIME	MISSION	SPACE STATION SERVICES	IMPACTS AND OPTIONS	COMMENTS AND CONSIDERATIONS
1990	SCIENCE & APPLICATION EXPERIMENTS	HABITAT	NUCLEAR OR SOLAR POWER	MUST BE CAPABLE OF USING EITHER SOL OR NUC PERHAPS TIME PHASED
	DOD R& D	POWER	SEPARATE MANNED LAB	INTERNAL LAUNCH SENSOR VIEWING/PORTS ACCESS TO SPACE
	COMMERCIAL PROCESSING EXPERIMENTS	EXPERIMENT SUPPORT	FIXED EXPERIMENT PALLET	MAN TENDED
	OPERATIONAL EXPERIENCE	COMMUNICATIONS	ISOLATED EXPERIMENT PALLET	ISOLATED PALLET REQUIREMENTS PRIMARILY
		ENVIRONMENT	SEPARATE OR INTEGRAL C & DH CAPSULE	SATISFIES DOD PHASE I BY LARGELY TEMPERED PALLET
		ZERO G		USE OF ESA SPACE LAB EUREKA
		LOW CONTAMINATION	EMERGENCY SHELTER	HOW CAN ELECTRONICS BE UPDATED OR REPAIRED - IN ORBIT OR GROUND
				HOW LONG? SHOULD IT HAVE A RE-ENTRY CAPABILITY - (SHUTTLE DISASTER)

SPACE STATION USER NEEDS

TASK 3
COST AND PROGRAMMATIC ANALYSIS

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STATUS OF COST AND PROGRAMMATIC ANALYSIS

WORK BREAKDOWN STRUCTURE

- SSCAG STANDARD WBS TAILORED

SPACE STATION COST MODEL

- PROGRAM LISTING ACQUIRED
- PROGRAMMED ON TELEVIDEO 860 MICROCOMPUTER
- TEST CASES RUN

PRICE MODEL

- TEST CASES RUN ON SPACE STATION MODULE
- COST AND SCHEDULE DATA DERIVED

COST/SCHEDULE ESTIMATION APPROACH FORMULATED

- MODEL OUTPUTS EVALUATED
- STRENGTHS OF EACH MODEL COMBINED

BENEFITS TERMINOLOGY AND TOOLS IN PLACE

SPACE STATION USER NEEDS

FOREIGN CONTACTS

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SPACE STATION USER NEEDS

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INFORMATION EXCHANGE AGREEMENTS

AGREEMENTS AT NO COST WERE FORMALIZED WITH:

SPAR	-	TORONTO, CANADA
GTS	-	LONDON, ENGLAND
ERNO/MBB	-	BREMEN, MÜNCHEN - GERMANY
DORNIER	-	FRIEDRICHSHAFEN - GERMANY

VISITS PLANNED 6 TO 17 DEC.:

GTS	-	LONDON
ERNO/MBB	-	BREMEN/MÜNCHEN
DORNIER	-	FRIEDRICHSHAFEN
ESA	-	PARIS
ONERA	-	PARIS
TNO	-	DELFT
FOKKER	-	AMSTERDAM
DFVLR	-	KÖLN
ESTEC	-	NOORDWYK

MINISTRIALRAT DEUTSCHLAND - BONN

SPACE STATION USER NEEDS

STATUS

CONCLUSIONS

OBSERVATIONS

PLANS FOR COMPLETION

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SPACE STATION USER NEEDS

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STUDY STATUS

- OVER 200 USER CONTACTS MADE
- DISCRETE USER DATA OBTAINED VIA THE FORMAL USER CONTACTS TO DATE
- USERS HAVE AS YET PROVIDED ONLY GENERAL REQUIREMENTS
- 17 SCENARIOS DEVELOPED FOR USER CONSIDERATION
- SOME 250 SCIENCE MISSIONS HAVE BEEN ENTERED INTO DATABASE
- CONCEPTUAL STATION ARCHITECTURAL APPROACHES HAVE BEEN IDENTIFIED

SPACE STATION USER NEEDS

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CONCLUSIONS

- APPROACH TO USER CONTACTS (BROAD BASE, SMALL GROUPS, REPEAT VISITS) IS TIME CONSUMING, BUT IS BEGINNING TO BEAR FRUIT
- CONTACTS ARE RESULTING IN A NEW AWARENESS WHICH SHOULD STIMULATE POTENTIAL SPACE STATION USE
- REQUIREMENTS DATA AVAILABLE FROM USERS IS VERY LIMITED
- IF STATION EXISTS, IT WILL BE USED BY MANY
- A FEW KEY SPACE STATION UNIQUE MISSIONS HAVE BEEN IDENTIFIED
- SEVENTEEN MISSION SCENARIOS ARE IN PROCESS: FIVE HAVE BEEN REVIEWED - AND ACCEPTED - BY USERS
- SIGNIFICANT U.S. NATIONAL SECURITY STATION INTEREST HAS BEEN CREATED BY ONE-ON-ONE AND SMALL GROUP INTERACTIONS

SPACE STATION USER NEEDS

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OBSERVATIONS

- STUDY ACTIVITY AND CONTACTS IN BOTH COMMERCIAL AND DoD AREAS ARE STIMULATING CLOSE SCRUTINY OF MANNED SPACE STATION WHICH SHOULD RESULT IN A REALISTIC ASSESSMENT OF THE PROGRAM REQUIREMENTS

  > AS WE HAVE VISITED AND REVISITED POTENTIAL USERS INTEREST HAS INCREASED AND A PERCEPTIBLE MOMEMTUM FOR SUPPORT OF SPACE STATION IS OBSERVED

- THERE IS A GENERAL ACCEPTANCE OF STATION FOR R&D WHICH WOULD SUPPORT DEVELOPMENT OF AUTOMATED SYSTEMS
- OPERATIONAL NEEDS FOR A SPACE STATION HAVE BEEN IDENTIFIED BUT CONSIDERABLE EFFORT IS REQUIRED TO ESTABLISH AND MAINTAIN USER INVOLVEMENT AND SUPPORT
- SATELLITE SERVICING FUNCTION FROM STATION MUST BE EVALUATED VIS-A-VIS SHUTTLE-BASED SATELLITE SERVICING
- THE PROCESS OF DEVELOPING USER SUPPORT REQUIRES MULTIPLE VISITS AND A LONG-TERM FOLLOW-THROUGH

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PLAN FOR STUDY COMPLETION

15 NOVEMBER 1982 - 20 FEBRUARY 1982

- CONTINUE POTENTIAL USER CONTACTS
- CARRY OUT FOREIGN CONTACT PLAN AS PRESENTED
- FINALIZE MISSION SCENARIOS WITH USER ASSISTANCE
- FINALIZE TIME-PHASED SPACE STATION MISSION REQUIREMENTS
- DEVELOP INITIAL AND ULTIMATE SPACE STATION ARCHITECTURE
- PERFORM COST ANALYSES OF INCREMENTAL CAPABILITY
- DEFINE TIME-PHASED COSTS
- CONDUCT BENEFITS ANALYSES