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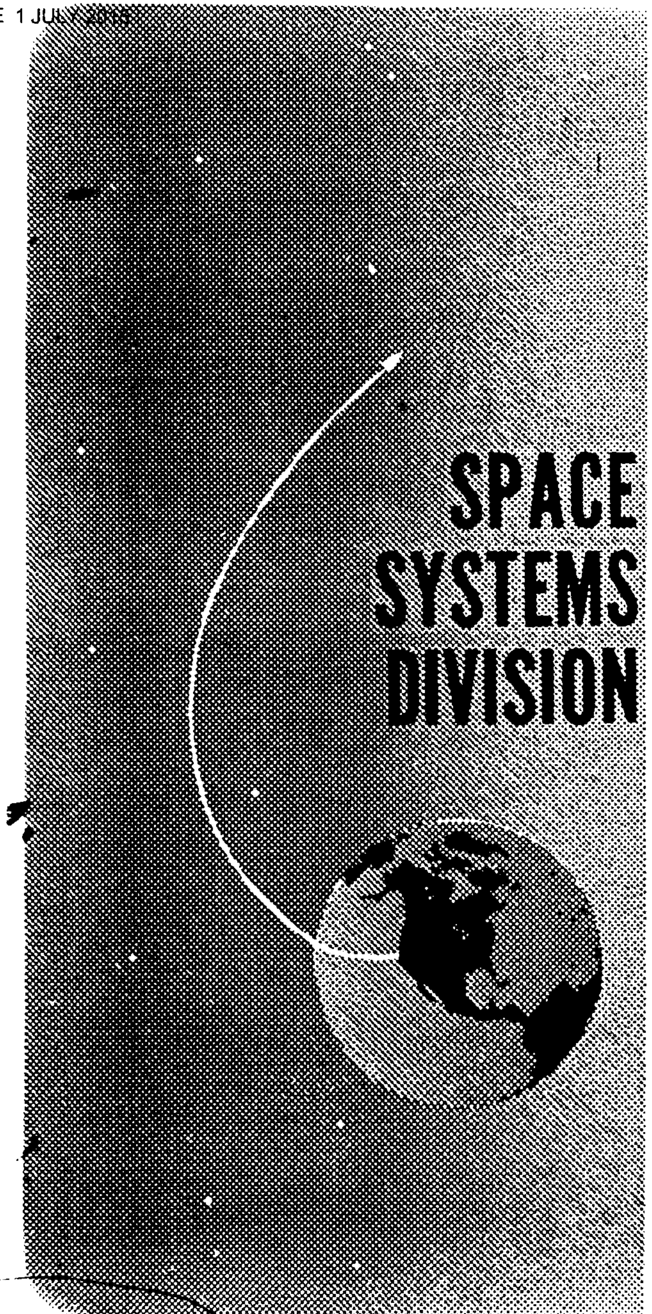

MANNED ORBITAL LABORATORY

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PRESENTATION BY

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PRESENTED TO

GENERAL B. A. SCHRIEVER	3 JANUARY 1964
HQ USAF	4 JANUARY 1964
DEPARTMENT OF THE AIR FORCE	6 JANUARY 1964
DEPARTMENT OF DEFENSE	7 JANUARY 1964

INTRODUCTION

THE PURPOSE OF THIS PRESENTATION IS TO OUTLINE IN GENERAL TERMS THE TECHNICAL SCOPE AND OBJECTIVES OF THE PROGRAM AND TO PRESENT A CONCEPT FOR THE MANAGEMENT AND ADMINISTRATION PROCEDURES TO BE FOLLOWED THROUGHOUT THE LIFE OF THE PROGRAM. DURING THE NEXT FEW MONTHS /THE DEFINITION PHASE/ THE PROGRAM WILL BE DEFINED IN SOMEWHAT PRECISE TERMS, THE MANAGEMENT AND ADMINISTRATIVE PROCEDURES WILL BE FINALIZED AND THE ROLES AND RESPONSIBILITIES OF ALL PARTICIPATING AGENCIES WILL BE ESTABLISHED. THE DEFINITION PHASE PRECEDING THE DEVELOPMENT EFFORT WILL BE PRIMARILY AN ENGINEERING STUDY EFFORT ON THE PART OF THE AIR FORCE AEROSPACE TEAM AND CERTAIN SELECTED CONTRACTORS. SPECIFICALLY, THE FOLLOWING MAJOR CONSIDERATIONS WILL BE USED AS A GUIDE DURING THE DEFINITION PHASE EFFORT. THE DECISION TO GO A HEAD WITH THIS PHASE OF THE MOL IMPLIES AN ASSUMPTION OF THE FEASIBILITY OF THE CONCEPT. THE IMMEDIATE EFFORT TO BE UNDERTAKEN AT THIS TIME ENCOMPASSES THOSE TASKS NECESSARY TO VALIDATE THE FEASIBILITY AND DESIRABILITY OF PROCEEDING WITH THE FULL SCALE DEVELOPMENT. INCLUDED IN THIS EFFORT, BUT NOT NECESSARILY LIMITED TO, ARE SUCH THINGS AS IDENTIFYING THE PRINCIPAL AREAS OF MAJOR RISKS IN EACH MAJOR COMPONENT AREA, THE CONSIDERATION OF ALTERNATIVE APPROACHES TO DETERMINE THE ADVANTAGES AND DISADVANTAGES OF THE RECOMMENDED APPROACH OVER THE DISCARDED ONE, MAKE FULL USE OF DEVELOPED SUBSYSTEMS, FOR INSTANCE, GEMINI, APOLLO, X-20, AND TO AVOID TO THE EXTENT POSSIBLE THE NECESSITY FOR DEVELOPING ANY SUBSYSTEMS AND EQUIPMENTS, TO PROCEED WITH THE GEMINI WITH MINIMUM MODIFICATIONS, AND ELIMINATION OF UNNECESSARY COMPONENTS AND HIGH RISK SUBSYSTEMS.

IN THE MANAGEMENT AREA, PROCEDURES AND TECHNIQUES ARE TO BE EMPLOYED IN ORDER TO PROVIDE VERY HIGH CONFIDENCE IN PROGRAM SCHEDULES AND COST ESTIMATES. PROGRAM MANAGEMENT TECHNIQUES WILL BE DEVELOPED AND ADOPTED TO MONITOR AND CONTROL COSTS AND SCHEDULES DURING THE ACTUAL DEVELOPMENT CYCLE. THE DEVELOPMENT PHASE TIME PERIOD SHOULD BE HELD TO A MINIMUM CONSISTENT WITH PROVIDING A HIGH CONFIDENCE IN SUCCESS OF THE PROGRAM; DEFINE THE PROGRAM WITH PRECISION SUFFICIENT TO ALLOW ESTABLISHING A SET OF DEVELOPMENT PRINCIPLES AND OBJECTIVES THAT WILL NOT CHANGE DURING THE DEVELOPMENT OF THE PROGRAM. TO DEFINITIZE AND NEGOTIATE CONTRACTS WHICH GUARANTEE THAT ALL ELEMENTS OF COST HAVE BEEN IDENTIFIED AND CONSIDERED IN THE TOTAL COST OF THE PROGRAM; THAT THE SCHEDULES PROVIDED CAN BE MAINTAINED AND IN THE FINAL ANALYSIS THAT THIS IS A PROGRAM WHICH IS WANTED AND CAN BE SUPPORTED BY THE DOD.

MANAGEMENT OBJECTIVES: IT IS THE INTENT OF SSD TO MAKE AN INTENSIVE STUDY OF THE MANAGEMENT PHILOSOPHY TO BE EMPLOYED ON THIS PROGRAM, BOTH WITH RESPECT TO PHASE I ACTIVITIES AND FOR THE FOLLOW-ON DEVELOPMENT PROGRAM. THE SPECIFIC AREAS OF MANAGEMENT WHICH WILL RECEIVE PARTICULAR ATTENTION INCLUDE ORGANIZATION, THE METHOD FOR PROVIDING SYSTEM DESIGN CONTROL, THE CONTRACTING APPROACH, THE

PROPOSAL PREPARATION, COST ESTIMINATION AND PROGRAM REPORTING. ALL OF THESE ASPECTS OF MANAGEMENT HAVE BEEN STUDIED WITH THE AIM OF EVOLVING IMPROVED TECHNIQUES TO INSURE PROGRAM OBJECTIVES ARE ACHIEVED ON SCHEDULE AND WITHIN THE COST ESTIMATES. WITHIN SSD, A STRONG CENTRALIZED PROJECT ORGANIZATION WILL BE ESTABLISHED, ONE IN WHICH ALL ITEMS UNIQUE TO THE PROGRAM WILL BE PLACED WITHIN THE PROGRAM DIRECTORS AUTHORITY. IN ADDITION TO THE AIR FORCE PROGRAM OFFICE, THE FUNCTIONS CONTAINED IN THE SYSTEM PROGRAM OFFICE WHICH ARE DIRECTLY RESPONSIVE TO THE PROGRAM DIRECTOR ARE THE FOLLOWING: ALL ENGINEERING DEVELOPMENT, TEST AND EVALUATION AND PROCUREMENT RESPONSIBILITIES FOR ALL ELEMENTS OF THE MOL AND A MODIFIED GEMINI. A CORRESPONDINGLY STRONG AEROSPACE CORPORATION DEVELOPMENT ENGINEERING GROUP WILL BE ESTABLISHED TO PROVIDE GENERAL SYSTEMS ENGINEERING AND TECHNICAL DIRECTION SERVICES FOR THIS PROGRAM. THIS OFFICE WILL HAVE WITHIN IT ALL TECHNICAL ELEMENTS TO SUPPORT THE SYSTEM PROGRAM OFFICE. IT IS PLANNED THAT CONTRACTOR ORGANIZATIONAL STRUCTURES WILL ALSO FOLLOW A STRONG CENTRALIZED PROJECTIZED ORGANIZATION. AMONG THE MAJOR TASKS TO BE CONDUCTED BY THE AEROSPACE CORPORATION ARE SUCH THINGS AS SPACE CRAFT DESIGN STUDIES TO ESTABLISH BASIC CRITERIA AND CAPABILITY, SUBSYSTEM STUDIES TO SELECT DESIRABLE MAJOR SUBSYSTEM ELEMENTS, RELIABILITY STUDIES TO ESTABLISH A RELIABILITY MODEL AND STUDIES TO IDENTIFY CRITICAL AREAS. THESE STUDIES WILL PRODUCE SYSTEM DEFINITION AND SYSTEM CRITERIA.

THESE DEFINITIONS AND CRITERIA WILL BE INCORPORATED IN PROPOSAL WORK STATEMENTS AND WILL BE PROVIDED TO THOSE CONTRACTORS SELECTED TO COMPETE IN SUBSEQUENT COMPETITION. TO PROVIDE THE NECESSARY ENGINEERING DISCIPLINE DURING THE DEVELOPMENT PERIOD, THE AEROSPACE CORPORATION WILL CONTINUE TECHNICAL DIRECTION TO THE ASSOCIATE CONTRACTORS. THIS WILL ALLOW THE FULL USE OF INDUSTRY CAPABILITY AND ALSO PROVIDE FOR OBJECTIVE SYSTEMS ENGINEERING AND TECHNICAL DIRECTION BY AN IMPARTIAL ORGANIZATION. DISCIPLINE WILL ALSO BE PROVIDED THROUGH THE USE OF PERT/TIME AND COST SPECIFICATIONS A CONFIGURATION CONTROL BOARD AND DEVELOPMENT ENGINEERING INSPECTIONS AS WELL AS THE POSSIBLE FULL TIME ASSIGNMENT OF AEROSPACE PERSONNEL AT THE SYSTEM ASSEMBLY AND TEST AT THE CONTRACTOR'S PLANT.

EMPLOYING THESE MANAGEMENT TECHNIQUES AND PROCEDURES WILL RESULT IN A SUCCESSFUL PROGRAM MEETING THE DOD OBJECTIVES AND SERVING THE NATIONAL INTERESTS.

MANNED

ORBITAL

LABORATORY

PURPOSE

PURPOSE

TO PRESENT IN GENERAL TERMS

- THE TECHNICAL SCOPE, OBJECTIVES AND APPROACH

- A CONCEPT FOR THE MANAGEMENT

SELF EXPLANATORY

OUTLINE

- BASIS FOR PLAN
- PROGRAM OBJECTIVES
- DEFINITION PHASE
- MANAGEMENT CONSIDERATIONS
  - AFSC DIVISION RESPONSIBILITIES
  - SSD/AEROSPACE CONTRACTOR TEAM
  - CONTRACT APPROACH
  - NASA/AF RELATIONS
  - ORGANIZATION
- PLANS
  - OSS STUDY
- FUNDING
- TECHNICAL APPROACH

SELF EXPLANATORY

BASIS FOR PLAN

- GUIDANCE
  - ▲ DOD NEWS RELEASE — 10 DEC
  - ▲ DDR&E MEMO TO SAFRD — 11 DEC
  - ▲ USAF & AFSC INSTRUCTIONS — 13, 16, 17 & 20 DEC
- MILITARY ORBITAL LABORATORY
  - ▲ CONDUCT MILITARY EXPERIMENTS INVOLVING MANNED USE OF EQUIPMENT & INSTRUMENTATION IN ORBIT
  - ▲ IF DESIRED BY NASA CONDUCT EXPERIMENTS FOR SCIENTIFIC & CIVILIAN PURPOSES
  - ▲ PERMIT RENDEZVOUS IN SPACE
  - ▲ SHIRT SLEEVE ENVIRONMENT FOR UP TO 30 DAYS
  - ▲ INTEGRAL LAUNCH WITH GEMINI "B" & T-IIIC
  - ▲ SIX LAUNCHES
  - ▲ FIRST MANNED FLIGHT LATE '67 EARLY '68
  - ▲ "BARE BONES" APPROACH
  - ▲ FY 64 - $ 10. M FY 65 - $ 75.0 M
- MAXIMUM COOPERATION & USE OF NASA RESOURCES
- DOD/AF SPECIAL MANAGEMENT RELATIONSHIPS

PROGRAM OBJECTIVES

THE PRIMARY OBJECTIVE OF THE MOL PROGRAM IS TO ASSESS MAN'S ABILITY AND USEFULNESS TO PERFORM MILITARY MISSIONS IN SPACE. TO DO THIS THE ORBITAL LABORATORY MUST HAVE THE FLEXIBILITY TO ENABLE GENERAL AND BIOASTRONAUTIC TESTING OF MAN'S CAPABILITY TO FUNCTION IN A SPACE ENVIRONMENT. IT MUST ALSO HAVE THE CAPABILITY TO VARY TEST EQUIPMENTS TO MEET MILITARY AND SCIENTIFIC (NASA) PURPOSES. FINALLY, THE PROGRAM SHOULD HAVE GROWTH POTENTIAL TO PERFORM USEFUL MILITARY MISSIONS, SHOULD THE RESULTS OF THE PROGRAM BE POSITIVE AND MILITARY REQUIREMENTS DICTATE.

PROGRAM OBJECTIVES

PROVIDE A MANNED ORBITING LABORATORY (MOL) TO DETERMINE MAN'S ABILITY TO PERFORM MILITARY SPACE MISSIONS.

PROVIDE THE FLEXIBILITY FOR GENERAL TESTING OF MAN AND EQUIPMENT FOR DOD AND NASA PURPOSES.

PROVIDE FOR GROWTH POTENTIAL SHOULD THE RESULTS OF THE PROGRAM AND MILITARY REQUIREMENTS DICTATE.

PROGRAM DEFINITION

AT THE ONSET A PROGRAM DEFINITION PHASE IS PLANNED. THE ELEMENTS OR AREAS TO BE COVERED IN THIS PHASE ARE AS SHOWN ON THIS CHART. THE APPROACH TAKEN FOLLOWS THAT PRESCRIBED BY THE DOD.

PROGRAM DEFINITION

- ANALYSIS & STUDIES
  - ALTERNATIVE APPROACHES
  - TRADE-OFF CONSIDERATIONS
- VERIFY FEASIBILITY OF OVERALL PROGRAM OBJECTIVES
- FIRM UP SYSTEM CONSIDERATIONS & CHARACTERISTICS
- EVALUATE
  - SYSTEM APPLICABILITY TO CARRY OUT ASSIGNED MISSIONS
  - TECHNICAL RISKS
- NEGOTIATE
  - REALISTIC SPECIFICATIONS
  - PERFORMANCE
  - RELIABILITY
- FORMULATE PROGRAM PLANS

MANAGEMENT CONSIDERATIONS

IN PREPARING FOR THE MOL PROGRAM, THERE WERE CERTAIN BASIC CONTRACTING PHILOSOPHIES AS OUTLINE ON THE CHART. EACH OF THE TOPICS LISTED ARE DISCUSSED IN GREATER DETAIL ON SUBSEQUENT CHARTS.

MANAGEMENT CONSIDERATIONS

ASSOCIATE CONTRACTOR METHOD

AEROSPACE CORP - GSE/TD

AF DIRECT CONTRACTS FOR MAJOR SUBSYSTEMS

SINGLE VS DUAL CONTRACTOR (S)

TYPE OF CONTRACT

TERMS AND CONDITIONS

NASA RELATIONSHIPS

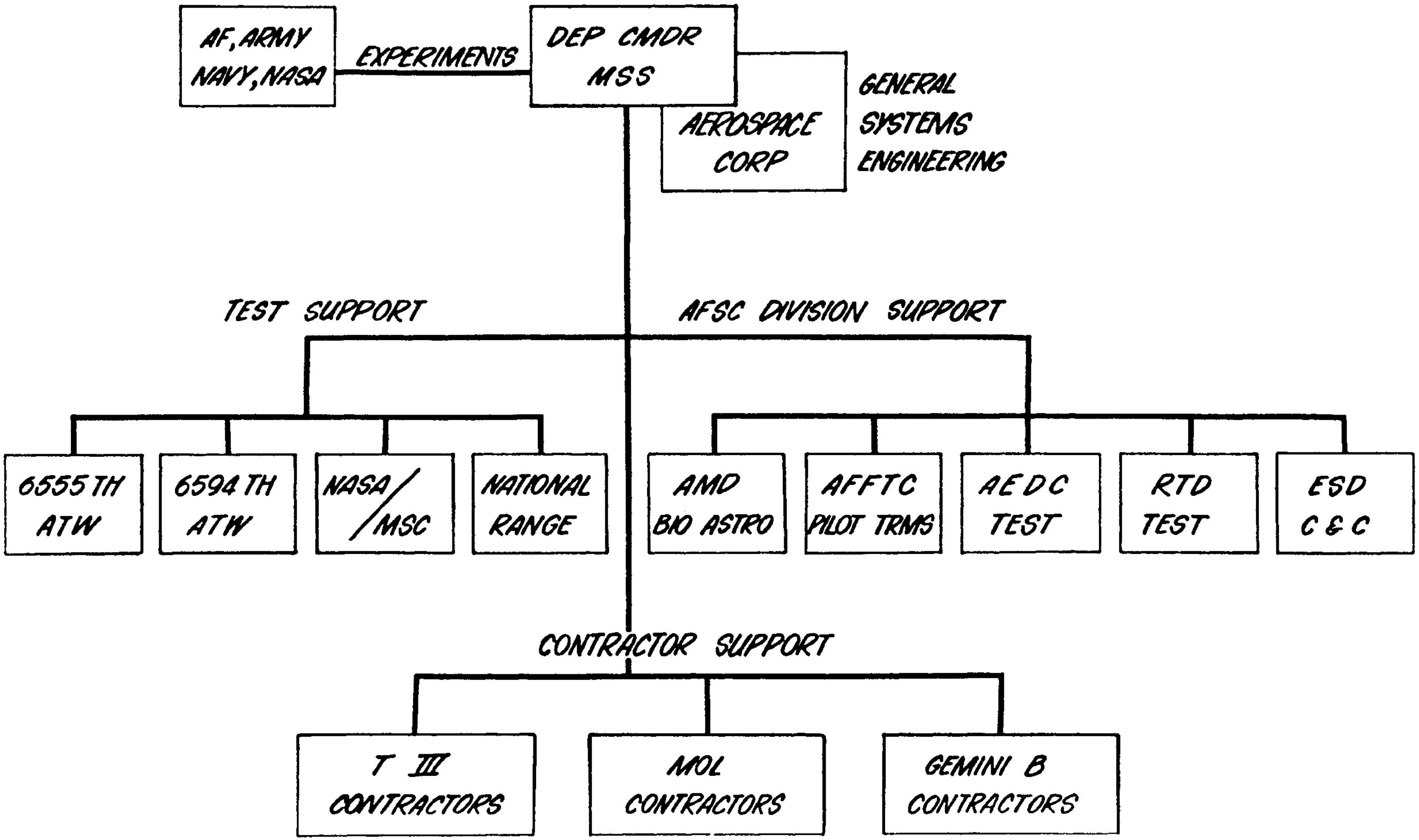
ORGANIZATION

PROGRAM MANAGEMENT

THE MANAGEMENT STRUCTURE WITHIN AFSC IS AS INDICATED. AT SSD THE FOCAL POINT IS WITHIN A PROPOSED DEPUTY COMMANDER FOR MANNED SPACE SYSTEMS. THIS OFFICE INCLUDES DIRECT SUPERVISION OF THE TITAN III PROGRAM OFFICE, THE MOL PROGRAM OFFICE, AND GEMINI; AND HENCE THE CONTRACTING EFFORTS AS SHOWN. IN ADDITION, THE PARTICIPATION AND SUPPORT OF APPROPRIATE AFSC DIVISIONS AND TEST SUPPORT AGENCIES WILL BE DIRECT TO THE PROGRAM EFFORT. IN THOSE CASES WHERE THE DEGREE OF PARTICIPATION AND SUPPORT WARRANTS, AS IN THE CASE OF AMD, FULL TIME REPRESENTATION WILL BE ESTABLISHED IN THE PROGRAM OFFICE. FOR THE MOST PART INITIAL DISCUSSION HAS ALREADY BEEN HELD WITH THE PARTICIPATING AGENCIES.

IT IS ALSO EXPECTED THAT INPUTS AND REQUIREMENTS OR EXPERIMENTS WILL BE FORTHCOMING FROM THE ARMY, NAVY, AND NASA.

PROGRAM MANAGEMENT



ASSOCIATE CONTRACTOR TEAM

THE MOL PROGRAM WILL USE THE ASSOCIATE CONTRACTOR CONCEPT AS DEFINED IN AFR 70-9. THE PROGRAM HAS SIX MAJOR TECHNICAL AREAS. FOUR OF THESE AREAS WILL BE CONTRACTED FOR BY THE AIR FORCE; THE MOL CONTRACTOR TO BE SELECTED AFTER A TECHNICAL COMPETITION, THE OTHER THREE WILL BE SOLE SOURCE BY REASON OF PRESENT PROGRAM AFFILIATIONS. THE LAST TWO MAJOR AREAS WILL BE A CONTINUATION OF NASA'S PRESENT EFFORTS WITH AIR FORCE PARTICIPATION IN THE AREA OF RECOVERY SYSTEM AND ESCAPE SYSTEM. AT THE CONCLUSION OF NASA'S DEVELOPMENT EFFORT, THESE SYSTEMS WILL BE INTEGRATED INTO THE MOL SYSTEM AS A MAJOR SUBSYSTEM OF THE PROGRAM.

ASSOCIATE CONTRACTOR TEAM

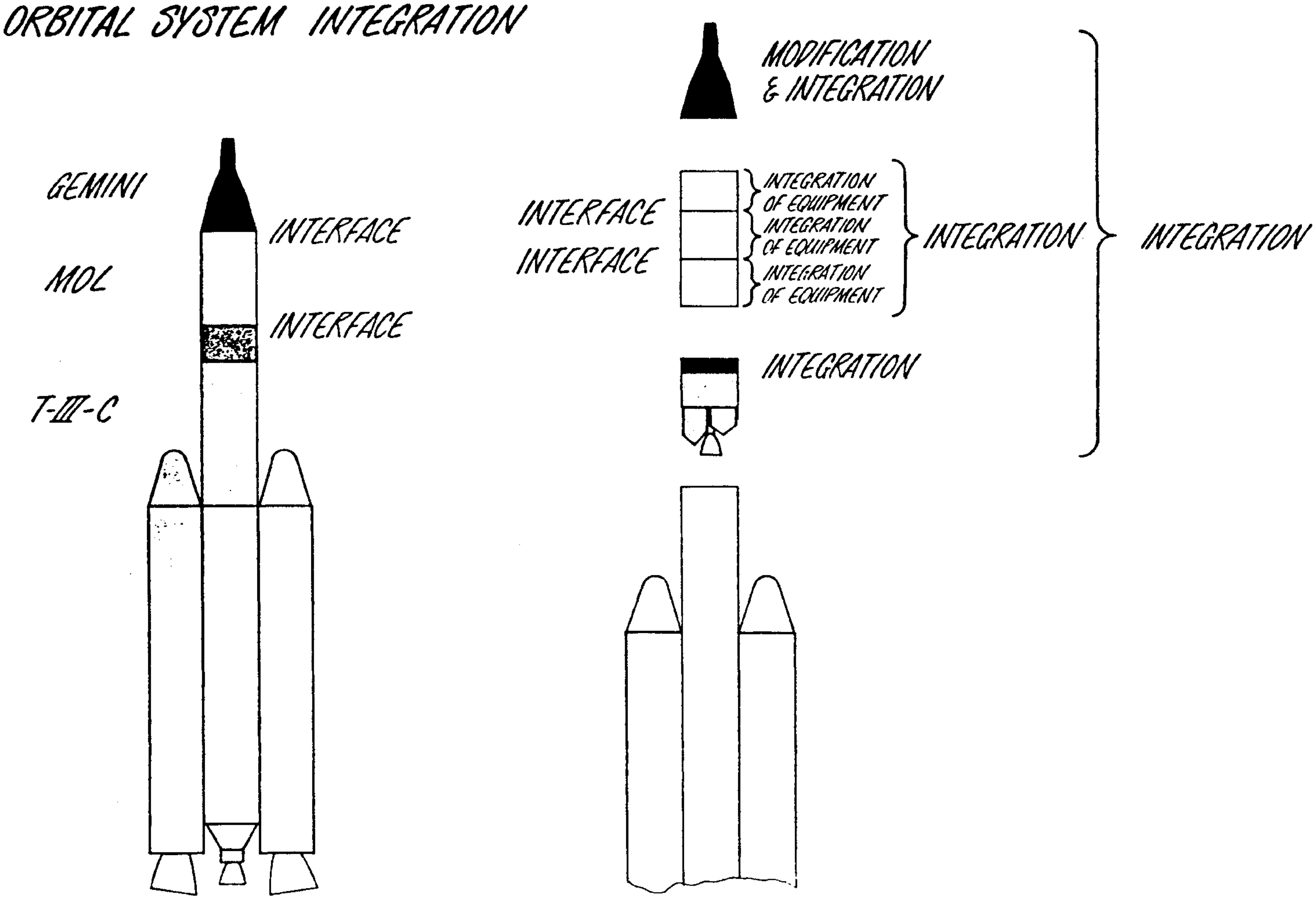
1. MOL CONTRACTOR:	TO BE SELECTED BY SOURCE SELECTION PROCEDURES (SSDR-80-7)
2. GUIDANCE (GEM MOD) CONTRACTOR M.H. IBM	SOLE SOURCE JUSTIFIED AS FOLLOW-ON TO NASA GEMINI PROGRAM (COMPATIBILITY WITH ACSP GUIDANCE)
3. GEMINI CONTRACTOR: McDONNELL AIRCRAFT	SOLE SOURCE JUSTIFIED AS FOLLOW-ON TO NASA GEMINI PROGRAM
4. SLV-5C STRUCTURE INTEGRATION, ITL, AGE CONTRACTOR: MARTIN COMPANY	SOLE SOURCE JUSTIFIED ON BASIS OF TITAN III ROLE AS STRUCTURAL SYSTEM INTEGRATOR
5. RECOVERY SYSTEM (PARAGLIDER IF USED)	ACTIVE PARTICIPATION BY AF
6. ESCAPE SYSTEM (IF REQUIRED)	ACTIVE PARTICIPATION BY AF

MAJOR DEVELOPMENT PROBLEMS

THIS CHART HIGHLIGHTS THE MAJOR INTERFACES AND UNDERLINES THE FACT THAT THE DEVELOPMENT PROBLEMS MOST CRITICAL TO THE SUCCESS OF THE MOL PROGRAM ARE THOSE OF INTEGRATION. NOT ONLY MUST TEST EQUIPMENT BE INTEGRATED INTO THE LABORATORY MODULES, BUT INTEGRATION DECISIONS MADE AND EXECUTED REGARDING THE DISTRIBUTION OF FUNCTIONS AND ASSOCIATED CONTROL GUIDANCE, PROPULSION EQUIPMENT, ETC., BETWEEN THE GEMINI B, THE LABORATORY, AND THE TITAN III.

MAJOR DEVELOPMENT PROBLEM

ORBITAL SYSTEM INTEGRATION



AEROSPACE CORPORATION ROLES AND RESPONSIBILITIES

THE AEROSPACE CORPORATION IS A NOT-FOR-PROFIT CONTRACTOR TO SSD TO PROVIDE A TECHNICAL CAPABILITY FOR PROGRAM GENERAL SYSTEMS ENGINEERING AND TECHNICAL DIRECTION. THEY WILL PERFORM THIS ROLE ON THE MOL PROGRAM.

AEROSPACE CORPORATION ROLES AND RESPONSIBILITIES

- PROVIDES SERVICES OF A TECHNICAL GROUP RESPONSIBLE FOR GSE/TD FOR THE MOL PROGRAM

- GSE - OVERALL INTEGRATION OF THE SYSTEM, DESIGN COMPROMISES AMONG SUBSYSTEMS, DEFINITION OF INTERFACES, ANALYSIS OF SUBSYSTEMS AND SUPERVISION OF SYSTEM TESTING

- TD - PROCESS OF REVIEWING ASSOCIATE CONTRACTOR EFFORTS, EXCHANGE TECHNICAL INFORMATION, FORMULATING PLANS FOR CONTRACT ACTIONS AND WHEN NECESSARY TO MEET AIR FORCE OBJECTIVES MODIFY, REALIGN OR REDIRECT ASSOCIATE CONTRACTOR TECHNICAL EFFORT. (BY USE OF FORMALIZED TD AS REQUIRED)

AUTHORITY TO NEGOTIATE

BECAUSE OF THE R&D NATURE OF THE PROGRAM AND THE LACK OF FIRM SPECIFICATIONS ADEQUATE TO SUPPORT ADVERTISING, THIS PROCUREMENT WILL BE NEGOTIATED UNDER EXCEPTION "11". A CLASS D&F IS BEING REQUESTED COVERING THE 18 MONTH PERIOD, JANUARY 1964 - JUNE 1965, BECAUSE OF THE NEED TO BEGIN THE DEVELOPMENT PHASE PROCUREMENT ACTION (SUCH AS SEND OUT RFPs) PRIOR TO THE END OF THE PROGRAM DEFINITIVE PHASE.

AUTHORITY TO NEGOTIATE

- NEGOTIATE PURSUANT TO 10 USC 2304 (a) 11
- CLASS D&F FOR PERIOD JAN 1964 THROUGH JUN 1965
- REQUIRED PRIOR TO PROCUREMENT ACTION

SEPARATE AIR FORCE CONTRACT

ABOVE AND BEYOND THE TECHNICAL CONSIDERATIONS OF MAGNITUDE OF CHANGE, THERE ARE OTHER REASONS WHICH ESTABLISH THE NECESSITY OF SEPARATE AF CONTRACTS FOR THE MAJOR SUBSYSTEMS OF THE MOL PROGRAM. FOREMOST AMONG THESE ARE: THE NEED TO DEFINE PRECISE ROLES AND RESPONSIBILITIES FOR ALL PARTICIPATING CONTRACTORS TO INSURE A WELL ORDERED TEAM WORKING TOWARD A SINGLE OBJECTIVE; THE USE OF INCENTIVE CONTRACTING WOULD BE JEOPARDIZED IF ALL CONTRACTORS DID NOT HAVE A "STAKE" IN THE PROGRAM'S SUCCESS - TO PERMIT ONE MAJOR CONTRACTOR TO BE OUTSIDE THIS RELATIONSHIP COULD NULLIFY THE ENTIRE INCENTIVE; AND FINALLY, THE NEED TO "BREAK-OUT" MAJOR SUBSYSTEMS AND COMPONENTS IN ORDER TO ACHIEVE MAXIMUM PRICE COMPETITION REQUIRES SEPARATE CONTRACT CONTROL.

SEPARATE AIR FORCE CONTRACT

- CLEARLY DEFINE ROLES AND RESPONSIBILITIES
- ACHIEVE INCENTIVE CONTRACTS
- RESPONSE TO PROGRAM MANAGEMENT
- PERMIT BREAKOUT OF MAJOR SUBSYSTEMS
- FUND MANAGEMENT

MOL CONTRACTOR SELECTION

IN COMPLETING THE MOL PROGRAM, SSD WILL ESTABLISH A SOURCE SELECTION BOARD TO CONSIDER ALL POSSIBLE SOURCES, REVIEW THE RFP AND WORK STATEMENTS, AND TECHNICALLY EVALUATE PROPOSALS RECEIVED. THE SOURCE SELECTION BOARD WILL FOLLOW ESTABLISHED PROCEDURES. THE INCLUSION OF MAC AND MMC IS DEPENDENT ON THE DEFINITION PHASE APPROACH AND TIMING. AN UNFAIR COMPETITIVE ADVANTAGE WOULD OCCUR IF EITHER OF THESE CONTRACTORS WERE TO BE PLACED IN COMPETITION WITH ANY OTHER COMPANY.

MOL CONTRACTOR SELECTION

MAXIMUM INDUSTRY COMPETITION

SOURCE SELECTION BOARD PROCEDURES

INCLUDES MAC AND MMC UNLESS OSS/MOL

TIMING OR DUAL SOURCE APPROACH ESTABLISHES

A PREJUDICIAL COMPETITIVE ADVANTAGE

TYPES OF CONTRACTS

THE USE OF LETTER CONTRACTS WILL BE AVOIDED AS FAR AS POSSIBLE. THROUGH TIMELY GO-AHEAD, FUNDING AND PROCUREMENT ACTION, DEFINITIVE CONTRACTS CAN BE ACHIEVED ALTHOUGH IT WILL MEAN THE USE OF ANTICIPATORY COST AUTHORIZATION TO GET THE CONTRACTORS WORKING. THIS WILL BE DONE ONLY AFTER THE NEGOTIATIONS HAVE BEEN SUCCESSFULLY COMPLETED. FOR THE DEFINITION PHASE, FIRM FIXED PRICE CONTRACTS WILL BE AWARDED. INCENTIVE CONTRACTS (CPIF-PV) WILL BE USED FOR THE APPROPRIATE DEVELOPMENT PHASE PORTIONS OF THE TASKS. CERTAIN SELECTED TASKS, AS IDENTIFIED DURING THE DEFINITION PHASE, MAY BE PROCURED BY A CPFF TYPE CONTRACT BECAUSE OF THE COMPLEXITY AND MAGNITUDE OF THE SYSTEM INTEGRATION TASKS.

TYPES OF CONTRACTS

- NO LETTER CONTRACTS
- DEFINITION PHASE-FIXED PRICE
- DEVELOPMENT-INCENTIVES

  EXCEPT SELECTED TASKS

TERMS AND CONDITIONS

IN THE PROCESS OF FORMULATING THE CONTRACT STRUCTURE OF THE PROGRAM, THERE ARE CERTAIN COMMON ELEMENTS THAT REQUIRE PROMPT MANAGEMENT ATTENTION. THESE ELEMENTS ARE SET FORTH ON THIS CHART -- SOME ARE SELF-EXPLANATORY, SOME ARE ASPR/AFPI REQUIREMENTS, OTHERS REQUIRE COMMENT. ONE ITEM -- DX PRIORITY RATING -- IS AN INTERNAL DOD ACTION ITEM -- OUR REQUEST HAS BEEN SUBMITTED.

A. ROLES & RESPONSIBILITIES OF ALL PARTICIPANTS, DOTH GOVERNMENTAL AND CONTRACTOR, MUST BE PRECISELY AND PROMPTLY DEFINED IN ORDER TO ACHIEVE ECONOMY AND REDUCE CONFUSION. THIS IS THE KEYSTONE ON WHICH CONTRACT WORK STATEMENTS AND INCENTIVE PLANS ARE BASED.

B. ORGANIZATION STRUCTURE -- THIS ITEM IS AIMED AT INSURING THE ESTABLISHMENT OF A CONTRACTOR PROJECTIZED ORGANIZATION STRUCTURE AND FOR INSURING CONTINUITY OF KEY PERSONNEL.

TERMS AND CONDITIONS

- ROLES AND RESPONSIBILITIES
- ORGANIZATION STRUCTURE
- MAKE OR BUY
- SPECIAL TOOLING / TEST EQUIPMENT
- FACILITIES
- DX PRIORITY RATING
- INCENTIVE STRUCTURE
- PERT TIME / COST

NASA - AF RELATIONS

THIS CHART LISTS THE THREE AREAS WHERE NASA-AF INTERFACES WILL REQUIRE FACT-FINDING, DISCUSSIONS, DECISIONS AND COOPERATIVE ACTION.

NASA - AF RELATIONS AREAS

- METHOD OF CONTRACTING FOR GEMINI B
- METHOD OF INCLUDING NASA EXPERIMENTS
- USE OF NASA RESOURCES

GEMINI B CONTRACTING OBJECTIVES

THE OBJECTIVES WHICH THE AIR FORCE, WORKING WITH NASA, MUST PURSUE IN DEVELOPING A METHOD FOR CONTRACTING FOR THE GEMINI B DEVELOPMENT ARE LISTED IN THIS CHART. CERTAINLY THE VITAL NEEDS OF THE NASA GEMINI PROGRAM MUST BE PROTECTED. ALSO, DOD MANAGEMENT PRINCIPLES AND THE CHARACTERISTICS OF THE JOB TO BE DONE BY MCDONNELL IN DEVELOPING THE GEMINI B AS A SUBSYSTEM OF THE MOL VEHICLE SYSTEM IMPOSE CERTAIN REQUIREMENTS WHICH THE GEMINI B CONTRACTING METHOD MUST MEET. THESE ARE LISTED ON THE NEXT CHART.

GEMINI B CONTRACTING OBJECTIVES

- SATISFY MOL CONTRACTING REQUIREMENTS
- PROTECT NASA GEMINI PROGRAM

REQUIREMENTS FOR ALL CONTRACTS INCLUDING GEMINI

THE METHOD OF CONTRACTING SELECTED FOR GEMINI B MUST SATISFY THE BASIC REQUIREMENTS FOR PROGRAM INTEGRITY AND UNITY INCLUDING CLEAR-CUT IDENTIFICATION OF CONTRACTUAL EFFORTS WITH THE MOL PROGRAM. THE PROGRAM DIRECTOR MUST HAVE THE AUTHORITY AND THE CONTRACTUAL MACHINERY TO CONTRACT THE MANAGEMENT OF ALL ELEMENTS OF THE PROGRAM.

AEROSPACE WILL BE RESPONSIBLE FOR GENERAL SYSTEMS ENGINEERING FOR THE ENTIRE MOL SYSTEM. THIS RESPONSIBILITY INCLUDES DETERMINING OPTIMUM TRADE-OFFS IN SUBSYSTEMS FUNCTIONS AMONG THE SEVERAL VEHICLE ELEMENTS OF THE TOTAL SYSTEM. AEROSPACE MUST, THEREFORE, BE ABLE TO DIRECT THE EFFORTS OF THE CONTRACTORS IN DEVELOPING TRADE-OFF ALTERNATIVES, IN DEVELOPING SPECIFICATIONS FOR ALL SUBSYSTEMS AND IN EXECUTING THE DEVELOPMENT AND TEST EFFORT. THE CONTRACTING SYSTEM MUST PERMIT CERTAIN COMPONENTS, PRESENTLY BEING DEVELOPED ON SUBCONTRACT TO THE NASA CONTRACT WITH MCDONNELL, TO BE COVERED BY SEPARATE CONTRACTS. AN EXAMPLE IS THE GEMINI GUIDANCE SYSTEM. THE REQUIREMENT AND POTENTIALITIES FOR THIS SYSTEM IN MOL HAVE YET TO BE DETERMINED AND MUST BE DETERMINED AS PART OF THE INTEGRATION TASK FOR THE MOL-TITAN III VEHICLE SYSTEM.

THE AIR FORCE WILL WANT THE GEMINI B DEVELOPMENT, IN COMMON WITH ALL OTHER MAJOR MOL SUBSYSTEMS, TO BE EXECUTED UNDER COST AND INCENTIVE FEE CONTRACTS WHICH ARE CONTRIBUTING SO MUCH TO GOOD MANAGEMENT IN THE TITAN III AND OTHER DOD PROGRAMS. THE METHOD SELECTED MUST ALSO ENABLE CONTRACTOR ROLES AND RESPONSIBILITIES TO BE SHARPLY DEFINED.

REQUIREMENTS FOR ALL CONTRACTS INCLUDING GEMINI B

- PROGRAM INTEGRITY, UNITY AND IDENTITY
- PROGRAM DIRECTOR MANAGE ALL ELEMENTS OF MOL PROGRAM
- AEROSPACE TECHNICAL DIRECTION ALL ELEMENTS OF MOL SYSTEM
- BREAKOUT OF SELECTED SUBSYSTEMS
- COST AND PERFORMANCE INCENTIVES
- CLEAR-CUT ROLES AND RESPONSIBILITIES

PROBLEM

THE SSD BELIEVES THAT THE CONTRACTING REQUIREMENTS DISCUSSED ON THE PREVIOUS CHART CAN BE EFFECTIVELY MET ONLY THROUGH A DIRECT CONTRACT WITH MC DONNELL FOR GEMINI B DEVELOPMENT. FURTHERMORE, THE ENGINEERING, FABRICATION, AND TEST PHASES OF GEMINI B DEVELOPMENT APPEAR TO TRAIL SIMILAR EFFORTS FOR THE NASA GEMINI SUFFICIENTLY TO ENABLE A METHOD TO BE WORKED OUT FOR ACCOMMODATING THE GEMINI B WHICH WILL NOT DRAIN MC DONNELL RESOURCES NEEDED FOR THE NASA PROGRAM.

PROBLEM

- AIR FORCE WANTS DIRECT CONTRACT
- NASA WANTS NASA CONTRACT

APPROACH TO RESOLUTION

IT IS PROPOSED THAT THIS PROBLEM BE RESOLVED AT THE PROGRAM OFFICE LEVEL. IN OUR JUDGEMENT, THIS PROBLEM SHOULD BE RESOLVED AT THE LOWEST MANAGEMENT LEVEL IN BOTH AFSC AND NASA. THIS LEVEL OF MANAGEMENT IS THE SSD PROGRAM OFFICE RESPONSIBILITY FOR THE MOL AND THE GEMINI PROGRAM OFFICE AT THE MANNED SPACECRAFT CENTER OF NASA. AT THIS LEVEL OF MANAGEMENT, ALL OF THE SECTIONS PERTAINING TO THE PROBLEM ARE ALREADY AVAILABLE INCLUDING THE RESPECTIVE PROGRAM DIRECTORS RESPONSIBLE FOR THE EFFORTS. THE SAME PHILOSOPHY AND APPROACH AS WORKED OUT ON THE TITAN III-TITAN II ICBM INTERFERENCE CONSIDERATIONS COULD BE USED AS A GUIDE IN ESTABLISHING AND RESOLVING THESE PROBLEMS. A PLAN WHEREBY THE PROGRAM DIRECTOR OF SSD, THE PROGRAM DIRECTOR OF NASA, AND THE MCDONNELL SENIOR MANAGER WOULD AGREE IN WRITING ALL OF THE ISSUES INVOLVING PRODUCTION RATE, PRODUCTION CAPABILITY, USE OF KEY PERSONNEL, THE TRANSFER OF PERSONNEL FROM ONE ORGANIZATION TO ANOTHER AND SIMILAR CONSIDERATIONS BEFORE ANY ACTION IS COMPLETED. THE FIRST STEP WOULD BE FOR A FIXED PRICE LEVEL-OF-EFFORT STUDY CONTRACT TO BE INITIATED BETWEEN SSD AND MCDONNELL, WITH FULL MSC PARTICIPATION TO FIND AND ANALYZE THE FACTS BEARING ON THE INTERFERENCE ISSUE. A SIMILAR DIRECT CONTRACT HAS BEEN ENTERED INTO BY SSD AND MCDONNELL, WITH MSC APPROVAL, TO DEVELOP A TECHNICAL PLAN FOR INTEGRATING DOD EXPERIMENTS IN NASA GEMINI FLIGHTS. IT IS WORKING WELL. THE SCOPE OF THIS STUDY CONTRACT IS INDICATED ON THE CHART. THE VARIOUS GEMINI B CONFIGURATION ALTERNATIVES MUST BE DETERMINED BY MCDONNELL WITH AEROSPACE PROVIDING GUIDANCE STEMMING FROM MOL INTEGRATION TRADE-OFFS. SUBSYSTEM BREAKOUT ASPECTS WILL BE STUDIES AND MCDONNELL ROLES AND RESPONSIBILITIES DERIVED IN KEEPING WITH THE DOD MANAGEMENT AND TECHNICAL APPROACH. THE RESOURCES AT MCDONNELL, BOTH GOVERNMENT AND CORPORATE OWNED, REQUIRED FOR THE GEMINI B WILL BE DETERMINED, INTERFACES WITH THE NASA PROGRAM DETERMINED AND SCHEDULES LAID OUT TO HIGHLIGHT POTENTIAL INTERFERENCE POINTS AND ENABLE MEASURES TO BE DEVISED WHICH WILL PREVENT POTENTIAL INTERFERENCES TO BE AVOIDED COMPLETELY, OR MADE ACCEPTABLE THROUGH MANAGEMENT TECHNIQUES. FINALLY, COSTS OF THE GEMINI B PROGRAM WILL BE ACCURATELY FORECASTED FOR A PREFERRED APPROACH AND THE GROUNDWORK LAID FOR INCENTIVE CONTRACT NEGOTIATIONS. THIS PROCESS SHOULD BRING INTO SHARP FOCUS ALL PARAMETERS BEARING ON THE PROBLEM OF THE METHOD FOR CONTRACTING AND ENABLE IT TO BE EFFECTIVELY RESOLVED AT THE FIELD OFFICE LEVEL.

APPROACH TO RESOLUTION

- DEVELOP FACTS
  - DIRECT AF-MAC STUDY CONTRACT
  - MSC PARTICIPATION
  - SCOPE:
    - CONFIGURATION ALTERNATIVES
    - SUBSYSTEMS BREAKOUT
    - MAC ROLES AND RESPONSIBILITIES
    - RESOURCES AT MAC
    - NASA GEMINI INTERFACES
    - SCHEDULE
    - COST
    - INCENTIVES
- RESOLVE AT PROGRAM OFFICE LEVEL

NASA EXPERIMENTS IN MOL

A MILITARY REQUIREMENT OCCASIONED THE MOL PROGRAM JUST AS A NASA REQUIREMENT OCASSIONED THE GEMINI PROGRAM.

AS THE NASA-GEMINI PROGRAM ACCOMMODATES DOD EXPERIMENT REQUIREMENTS ON A PRIORITY SECOND TO THE PRIMARY NASA OBJECTIVE FOR GEMINI, SO THE MOL WILL ACCOMMODATE NASA REQUIREMENTS ON A PRIORITY SECOND TO THE PRIMARY DOD OBJECTIVE FOR MOL.

THE OVERLAP IN DOD AND NASA EXPERIMENT OBJECTIVES WILL RESULT IN SIGNIFICANT NASA OBJECTIVES BEING SATISFIED BY DOD EXPERIMENTS.

THE NASA PARTICIPATION IN THE MOL PROGRAM SHOULD BE DESIGNED TO INSURE MAXIMUM BENEFIT TO NASA FROM MOL EXPERIMENTS. BASED UPON THE EFFECTIVENESS OF THE AIR FORCE FIELD OFFICE AT NASA MSC IN INTEGRATING DOD EXPERIMENTS IN THE NASA-GEMINI FLIGHTS, IT IS SUGGESTED THAT NASA INSTALL A FIELD OFFICE AT SSD TO PERFORM A SIMILAR FUNCTION WITH REGARD TO THE MOL. THIS OFFICE COULD INSURE NASA INPUTS INTO THE MOL PROGRAM DURING PROGRAM DEFINITION PHASE AS WELL AS THE OPERATIONAL PHASE.

NASA EXPERIMENTS IN MOL

- NASA EXPERIMENT REQUIREMENTS TO BE ACCOMMODATED CONSISTENT WITH OBJECTIVES OF MOL

- PRECEDENT OF DOD EXPERIMENTS IN GEMINI

- NASA FIELD OFFICE AT SSD

  IMPACT ON DEFINITION PHASE

  INTEGRATION IN DEVELOPMENTAL OPERATIONAL PHASES

GEMINI EXPERIMENT PROGRAM

GEMINI EXPERIMENT PROGRAM OBJECTIVES ARE CONSISTENT WITH THOSE OF MOL. GEMINI EXPERIMENTS WERE DESIGNED TO EXPLOIT THE EARLY FLIGHT OPPORTUNITIES AFFORDED BY THE NASA-GEMINI PROGRAM TO PERFORM MANNED IN-SPACE EXPERIMENTS WITHIN THE CAPABILITY OF THE NASA-GEMINI SYSTEMS WHICH ARE WORTH THEIR COST IN ANTICIPATION OF A SPACE STATION PROGRAM TO FOLLOW. THUS A DECISION TO PROCEED WITH THE MOL DOES NOT ALTER THE JUSTIFICATION FOR THE GEMINI EXPERIMENTS.

A RE-EXAMINATION OF GEMINI EXPERIMENTS CONFIRMS:

1. MORE FIRMLY PLANNED EXPERIMENTS EITHER SUPPORT THE MOL FLIGHT PROGRAM (AS THE ASTRONAUT MANEUVERING UNIT) OR THE OBJECTIVES OF MOL (AS EARLY INSIGHT INTO CAPABILITY OF MAN TO OBTAIN MORE USEABLE INFORMATION THROUGH PHOTOGRAPHIC, PHOTOMETRIC, AND ELECTRO-OPTICAL TECHNIQUES AND EQUIPMENTS).

2. VALUE OF EXPERIMENTS AS YET INCOMPLETELY DEFINED SHOULD BE JUDGED AFTER DEFINITION PROCESS HAS BEEN COMPLETED.

3. GEMINI EXPERIMENTS WILL BE COMPLETED AT LEAST A YEAR BEFORE MOL EXPERIMENTS BEGIN.

THE GEMINI EXPERIMENT PROGRAM SHOULD BE DEVELOPED AND CONDUCTED AS PLANNED. A MJAOR IMPACT OF MOL - TO PROVIDE OPPORTUNITY TO TEST EXPERIMENTS PLANNED FOR GEMINI WHICH THE NASA PROGRAM MAY BE UNABLE TO HANDLE DUE TO PAYLOAD OR OTHER CONSTRAINTS.

GEMINI EXPERIMENTS

- PROGRAM WAS PLANNED WITH EXPECTATION OF A SPACE STATION PROGRAM TO FOLLOW.
- FIRMLY PLANNED EXPERIMENTS CONTRIBUTE TO THE MOL PROGRAM OR TO ITS OBJECTIVES.
- APPROPRIATENESS OF TENTATIVE EXPERIMENTS TO BE DETERMINED IN DEFINITION STUDIES NOT YET COMPLETED
- TIME PERIOD FOR GEMINI EXPERIMENTS: FEBRUARY 1965–FEBRUARY 1967.
- TIME PERIOD FOR MOL EXPERIMENTS BEGINS IN 1968.
- PROGRAM SHOULD BE DEVELOPED AND CONDUCTED AS PLANNED.

USE OF NASA RESOURCES

THE MOL PROGRAM WILL BE DEFINED AND COORDINATION WITH NASA WILL BE CARRIED OUT TO ACHIEVE OPTIMUM USE OF NASA RESOURCES. "OPTIMUM" MEANS LEAST COST CONSISTENT WITH OPERATIONAL PRACTICABILITY FOR NASA AND MOL PROGRAMS. NASA OPERATIONAL AND TRAINING RESOURCES TO BE CONSIDERED ARE LISTED ON THIS CHART. PRODUCTION AND CHECKOUT FACILITIES WILL ALSO BE USED AS FAR AS POSSIBLE. SOME OF THE KEY ASPECTS TO BE COVERED ARE LISTED ON THE CHART. A MAJOR PROBLEM IS SATURATION OF PLANNED NASA FACILITIES DUE TO NASA REHERSALS AS WELL AS OPERATIONS. ADDING MOL OPERATIONS WILL REQUIRE EQUIPMENT AND PERSONNEL REGIMENTATION FOR THE AROUND-THE-CLOCK OPERATIONS INVOLVED.

MOL OPERATIONS REQUIRE A HIGHER LEVEL OF SECURITY THAN NASA OPERATIONS, PARTICULARLY FOR RETRIEVAL OF DATA. ALSO, THE AIR FORCE REQUIRES AN ARRANGEMENT AFFORDING AIR FORCE OPERATIONAL CONTROL OVER MOL FLIGHTS. IN REGARD TO THE OPTIMUM USE OF AVAILABLE RESOURCES, ADAPTATIONS OF DOD AS WELL AS NASA RESOURCES MUST, OF COURSE, BE CONSIDERED.

THESE PROBLEMS ARE COMPLEX. THEIR RESOLUTION WILL REQUIRE SUBSTANTIAL EFFORT THROUGH THE PROGRAM DEFINITION PHASE.

USE OF NASA RESOURCES

- TO BE CONSIDERED ARE:
  - MISSION CONTROL CENTER
  - COMMUNICATIONS NET
  - TRACKING NET
  - TRAINING FACILITIES
  - PEOPLE

- ASPECTS:
  - INTERFERENCE
    - REHEARSALS - THEIRS AND OURS
    - OPERATIONS - THEIRS AND OURS
  - EQUIPMENT AUGMENTATION
  - MULTIPLE CREWS
  - SECURITY
  - AF CONTROL
  - AVAILABILITY OF AF RESOURCES

- RESOLUTION
  - WILL REQUIRE CONTINUOUS COOPERATIVE EFFORT DURING PROGRAM DEFINITION

CONFERENCES WITH NASA MSC 21-23 DEC 63

NASA MSC MANAGEMENT PERSONNEL VISITED THIS HEADQUARTERS ON 21 DEC 63 TO DISCUSS NASA-AIR FORCE INTERFACE PROBLEMS INCLUDING AF USE OF NASA FLIGHT TEST TRACKING AND CONTROL RESOURCES FOR THE MOL PROGRAM. THE DISCUSSIONS LED TO AN ADDITIONAL MEETING OF MOL STAFF PEOPLE WITH NASA IN HOUSTON ON 23 DEC 63 ON FLIGHT OPERATIONS MATTERS TO FURTHER DEFINE PROBLEM AREAS AND OPERATING PHILOSOPHY. THE FOLLOWING FOUR CHARTS PRESENT THE RESULTS OF THESE TWO CONFERENCES.

NASA CONFERENCE

21-23 DEC 63

FINDINGS

GEMINI OPERATIONAL NET CAPABILITIES

THIS CHART SUMMARIZES THE PLANNED CAPABILITIES OF THE NASA GEMINI TRACKING, TELEMETRY, CONTROL, AND COMMUNICATIONS, AS APPLICABLE TO MOL. THE ENTIRE WORLD WIDE CAPABILITY IS TERMED "THE OPERATIONAL NET."

(1) THE NASA OPERATIONAL NET APPEARS CAPABLE OF TECHNICALLY SUPPORTING THE MOL. THIS MEANS THAT TRACKING CAPABILITIES, COMMUNICATIONS METHODS, TELEMETRY BAND-WIDTH RECEPTION, ETC., CAN BE SO CONFIGURED AS TO BE SUITABLE FOR THE AIR FORCE PROGRAM.

(2) HOWEVER, BASED ON THE CURRENT GEMINI AND APOLLO SCHEDULING, IT APPEARS THAT THE OPERATIONAL CAPABILITIES OF THE NET WILL BE SATURATED BY NASA IN THE MOL TIME PERIOD. IT MUST BE RECOGNIZED THAT THE ENTIRE NASA OPERATIONAL NET IS CONFIGURED FOR ONLY ONE FLIGHT OPERATION IN PROGRESS AT ANY TIME. THIS INCLUDES THE INTEGRATED MISSION CONTROL CENTER AT HOUSTON.

(3) BUT THE MERCURY CONTROL CENTER AT THE AMR WILL HAVE COMPLETED ITS ASSIGNED NASA GEMINI CONTROL CENTER FUNCTION BY MID '65 AND AT THAT TIME WILL BE AVAILABLE FOR TURNOVER TO THE AIR FORCE.

GEMINI OPERATIONAL NET CAPABILITIES

1. TECHNICALLY COMPATIBLE W/MOL

2. FULLY COMMITTED W/NASA

3. MERCURY CONTROL CENTER AF AVAILABLE MID-65

NASA AND MOL SCHEDULE

THIS IS A SCHEDULE OF THE NASA GEMINI AND APOLLO ORBITAL OPERATIONS TO BE ACCOMPLISHED IN THE NEXT FIVE YEARS, AND THE TIME TABLE FOR MOL FLIGHT TESTS DURING THE SAME TIME PERIOD. THIS SCHEDULE, TOGETHER WITH THE AFOREMENTIONED LIMITATION OF THE NET TO A SINGLE FLIGHT OPERATION AT ONE TIME IS THE BASIS FOR THE NEED TO AUGMENT NASA CAPABILITIES TO ACCOMODATE MOL IN THE LATTER TWO YEARS.

NASA AND MOL
SCHEDULE

	CY 64				CY 65				CY 66				CY 67				CY 68				
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
GEMINI	X		X	X	X	X	X	X	X	X	X	X	X								
SATURN 1B									X	X	X	X	X	X	X	X	X	X	X	X	
SATURN C5													X	X	X	X	X	X	X	X	X
MOL																X	X	X	X	X	X

23 DEC 1963

AUGMENTATION REQUIREMENTS

(1) TO ACCOMMODATE A MOL FLIGHT OPERATION IN PROGRESS COINCIDENT WITH THE NASA SCHEDULE, THE IMCC AT HOUSTON WILL REQUIRE AN ADDITIONAL OPERATIONAL CONTROL ROOM. ALSO ADDITIONAL SUPPORT WILL BE REQUIRED OF THE NASA COMPUTERS TO SATISFY THE IN-FLIGHT AND PRE-FLIGHT NEEDS OF AIR FORCE MOL. THIS WILL INCLUDE COMPUTER INPUT TO SIMULATORS, PLUS ADDITIONAL SIMULATORS IN THE FORM OF THE ORBITAL LABORATORY SIMULATOR, GEMINI B SIMULATOR, AND COMBINED-OPERATION SIMULATOR. TOTAL COSTS FOR THIS AUGMENTATION IS ESTIMATED TO BE SOMEWHERE BETWEEN 30-50 MILLION DOLLARS, WITH THE BULK OF COSTS EXPENDED FOR SIMULATORS.

(2) IF THE MCC AT AMR IS USED, A DUAL OPERATIONS WILL NOT BE NECESSARY. THEN, ONLY A SMALL AMOUNT OF ADDITIONAL COMPUTER SUPPORT WILL BE REQUIRED, PLUS THE SIMULATORS EQUIVALENT TO THAT STATED ABOVE. HERE THE COSTS, AGAIN ATTRIBUTED PRIMARILY TO THE SIMULATORS, ARE ESTIMATED TO BE BETWEEN 20-30 MILLION DOLLARS ADDITIONAL MONIES.

(3) REGARDLESS OF WHICH CONTROL CENTER IS USED, THE WORLD WIDE PORTION OF THE NASA OPERATIONAL NET WILL REQUIRE AUGMENTATION TO GIVE IT A DUAL INSTRUMENTED CAPABILITY FOR TELEMETRY AND TRACKING. ALSO, ADDITIONAL, PLUS SOME SECURE, COMMUNICATIONS LINKS MUST BE IDENTIFIED AND PROGRAMMED. COST HERE, PRIMARILY IDENTIFIED FOR INSTRUMENTATION, IS ESTIMATED TO BE BETWEEN 30-50 MILLION DOLLARS.

(4) ADDITIONAL DOD PERSONNEL WOULD HAVE TO BE SUPPLIED TO OPERATE THE NET AND THE IMCC AT AMR TO ACCOMMODATE MOL OPERATIONS.

AUGMENTATION REQUIREMENTS

1. INTEGRATED MISSION CONTROL CENTER (HOUSTON) 30-50 $M
   - OPS CONTROL ROOM
   - COMPUTER SUPPORT
   - SIMULATORS
2. MERCURY CONTROL CENTER (AMR) 20-30 $M
   - COMPUTER SUPPORT
   - SIMULATORS
3. WORLD WIDE NET 30-50 $M
   - DUAL INSTRUMENTATION
   - ADDITIONAL COMMUNICATION

PRELIMINARY INDICATIONS

SOME PRELIMINARY INDICATIONS EMERGE FROM THE FOREGOING STATEMENTS AND FROM THE DISCUSSIONS AT MSC:

(1) MSC APPEARS RECEPTIVE TO A DOD JOINT OPERATIONS WITH NASA.

(2) ADDITIONAL DOD OPERATIONS PERSONNEL WILL BE REQUIRED IN THE CONTROL CENTER IN THE NET AROUND THE WORLD.

(3) MSC APPEARS RECEPTIVE TO THE AIR FORCE EXERCISING OPERATIONAL CONTROL DURING MOL MISSIONS.

(4) NASA DESIRES TO RETAIN CONTROL OF CONFIGURATION OF THE OPERATIONAL NET INSOFAR AS MODIFICATIONS OR ADDITIONS TO THE NET ARE CONCERNED.

(5) USE OF THE IMCC AT HOUSTON FOR MOL FLIGHT OPERATIONS MAY HAVE ADVANTAGES IN:

A. FACILITATING COORDINATION OF SHARED FACILITIES.

B. INITIAL TRAINING OF DOD OPERATING PERSONNEL.

C. POSSIBLE SAVING IN TOTAL DOD PLUS NASA MANPOWER.

(6) USE OF MCC AT AMR MAY HAVE ADVANTAGES IN:

A. COST.

B. REDUCED INTERDEPENDENCE OF MOL AND NASA PROGRAMS.

C. SECURITY.

D. GROWTH POTENTIAL FOR MILITARY OPERATIONS.

(7) NASA STATIONS OF GUAYMAS, KANO, AND ZANZIBAR, WILL BE AVAILABLE TO A MILITARY MANNED SPACE EFFORT. HOWEVER, THESE STATIONS OFFER VERY LITTLE OTHER THAN COMMUNICATIONS IN THE WORLD WIDE CAPABILITY.

PRELIMINARY INDICATIONS

- NASA MSC RECEPTIVE TO JOINT OPERATIONS
- ADDITIONAL DOD PERSONNEL REQUIRED
- AF CAN EXERCISE OPERATIONAL CONTROL
- NASA WILL RETAIN OPERATIONAL NET CONFIGURATION CONTROL
- POSSIBLE ADVANTAGES OF IMCC, HOUSTON
  - COORDINATION SHARED FACILITIES
  - INITIAL DOD TRAINING
  - SAVING DOD PLUS NASA MANPOWER
- POSSIBLE ADVANTAGES OF MCC, AMR
  - COST
  - REDUCED DOD/ NASA INTERDEPENDANCE
  - SECURITY
  - GROWTH POTENTIAL, MILITARY OPERATIONS
- STATIONS DENIED MOL:
  - GUAYMAS, MEXICO KANO, NIGERIA ZANZIBAR

ALTERNATE CONTRACTING PLAN

THREE PLANS HAVE BEEN CONSIDERED AS NOTED ON THIS CHART. THEIR INPACTS ON THE MOL PROGRAM APPEAR IN THE AREAS OF SCHEDULE, THE DISTRIBUTION OF FUNDS BY YEAR (BUT NOT AS MUCH ON TOTAL FUNDS FOR THE SIX-FLIGHT PROGRAM), NUMBERS OF DECISION POINTS, AND CONTRACTING CONSTRAINTS. TWO PLANS, A AND B, PRESUME THE OSS STUDY WILL BE CARRIED OUT, MODIFIED AS DISCUSSED IN THE NEXT SEVERAL CHARTS.

ALTERNATE CONTRACTING PLAN

PLAN A	MOL CONTRACTOR SELECTION DURING OSS STUDY
PLAN B	MOL CONTRACTOR SELECTION AFTER OSS STUDY
PLAN C	ELIMINATE OSS AS SEPARATE CONTRACT ACTION FOR MOL

OSS STUDY CONTRACTS

ORBITAL SPACE STATION STUDY

OBJECTIVE

THE OBJECTIVE OF THE STUDY, EVEN THOUGH WORDY, IS QUOTED FROM THE WORK STATEMENT ON THIS CHART. IN BRIEF, THE OBJECTIVE IS TO DETERMINE SPECIFIC TEST AND THE PARAMETERS OF AN ORBITAL LABORATORY TO DETERMINE MAN'S ABILITY AND USEFULNESS IN PERFORMING MILITARY MISSIONS IN SPACE.

ORBITAL SPACE STATION STUDY

OBJECTIVE:

"TO ESTABLISH SPECIFICATIONS & CHARACTERISTICS INCLUDING CONFIGURATION & SIZE, MISSION DURATION, SUPPORT & FACILITY REQUIREMENTS, ORBITAL TEST, EQUIPMENT REQUIREMENTS AND RECOVERY TECHNIQUES NECESSARY TO DEMONSTRATE AND ASSESS QUANTITATIVELY THE UTILITY OF MAN FOR MILITARY PURPOSES IN SPACE"

OSS WORKSTATEMENT PG. 1

REVISIONS TO THE WORK STATEMENT

TO ORIENT THE OSS STUDIES TO THE MOL PROGRAM THE ONLY SIGNIFICANT CHANGE PROPOSED IS IN TASK FOUR. ORIGINALLY THIS TASK REQUIRED THE CONTRACTOR TO PERFORM TRADE-OFF STUDIES AND PRELIMINARY SYSTEMS DESIGN OF A SPACE STATION USING NOT ONLY THE GEMINI BUT THE X-20 AND APOLLO FOR THE PERSONNEL MODULE AND ALSO CALLED FOR COMPARATIVE STUDIES OF BOTH THE TITAN-IIIC AND SATURN BOOSTER. IN LINE WITH RECENT MOL GUIDANCE THIS TASK HAS NOW BEEN REVISED TO PRELIMINARY DESIGN ONLY OF A MANNED ORBITAL LABORATORY USING THE GEMINI AS THE PERSONNEL MODULE AND THE TITAN-IIIC BOOSTER. EMPHASIS IS TO BE PLACED ON DETERMINING THE PROBLEM AREAS IN THIS CONFIGURATION WHICH CAN BE RESOLVED IN THE PROGRAM DEFINITION PHASE.

REVISIONS IN THE OTHER THREE TASKS ARE MINOR IN NATURE AND CONSIST OF REWORDING FOR CLARITY AND CONSISTENCY.

THE PROPOSED REVISIONS HAVE BEEN REVIEWED BY OUR PROCUREMENT PEOPLE AND THE CHAIRMAN OF THE SOURCE SELECTION BOARD AND JUDGED TO BE WITHIN THE SCOPE AND INTENT OF THE RFP WORK STATEMENT.

REVISIONS TO WORKSTATEMENT

TASK I, II & III

MINOR CHANGES ONLY FOR CLARIFICATION

TASK IV

ORIGINAL REQUIRED COMPARATIVE SYSTEM STUDIES USING GEMINI-X-20-APOLLO SPACECRAFT & T-III & SATURN BOOSTER

REVISED CONFINED TO GEMINI & T-III C

THE TASKS IN THE REVISED WORK STATEMENT ARE INDICATED ON THIS CHART AND REFLECTS THE MAJOR CHANGE WHICH IS IN TASK #4.

WORKSTATEMENT TASKS

I

ANALYZE MILITARY MISSION MODELS
DETERMINE TECHNICAL REQUIREMENTS

II

DEFINE EXPERIMENTS & EQUIPMENTS
DETERMINE TEST PLAN

III

ANALYZE TEST PLAN
DEFINE PARAMETRIC CRITERIA

IV

PRELIMINARY MOL SYSTEM
CONFIGURATION USING TIIIC & GEMINI

SCHEDULE

OSS STUDY CONTRACTS

THIS CHART SHOWS THE OSS SCHEDULE AS WE SEE IT NOW. WE HAVE ASSUMED THAT WE CAN HAVE CONTRACTS UNDERWAY BY 15 JANUARY WHICH WILL RESULT IN THE FINAL REPORT BY 15 MAY. IN THE INTERIM THE MONTHLY PROGRESS REPORTS WHICH ARE REQUIRED BY THE WORK STATEMENT CAN PROVIDE DATA FOR PREPARING THE MOL PHASE I WORK STATEMENT. LATER DISCUSSION WILL RELATE THE OSS SCHEDULE TO POSSIBLE MOL SCHEDULES.

SCHEDULE
OSS STUDY CONTRACTS

	CY 1964						
	JAN	FEB	MAR	APR	MAY	JUN	JUL
CONTRACTOR GO-AHEAD	Δ						
INTERIM REPORT		Δ					
"			Δ				
"				Δ			
CONT FINAL REPORT					Δ		
AF EVALUATION						Δ	

RESULTS

THE OSS STUDIES CONTRIBUTE TO THE MOL PROGRAM THE INPUTS LISTED ON THIS CHART.

IT SHOULD BE NOTED THAT MUCH OF THE WORK COVERED BY THE OSS WORK STATEMENT MUST BE PERFORMED FOR THE MOL PROGRAM, EITHER AS A SEPARATE CONTRACTUAL EFFORT AS THE OSS STUDY, OR AS AN INTEGRAL PART OF THE MOL PROGRAM DEFINITION.

RESULTS

PRELIMINARY MOL CONFIGURATION DATA

EXPERIMENTS & EXPERIMENTAL EQUIPMENT DATA

ENHANCE PROGRAM DEFINITION (PHASE I) IN FINAL
DESIGN - COSTS - SCHEDULES

IMPACT OF OSS STUDY ON MOL CONTRACTING

THIS CHART GIVES THE IMPACTS ON MOL CONTRACTING OF THE OSS STUDY UNDER PLANS A AND B. PLAN A, IT WILL BE NOTED, IS LESS SEVERELY AFFECTED THAN PLAN B, WHICH PUTS THE OSS STUDY CONTRACTORS IN A PREFERRED POSITION BECAUSE THEY WILL HAVE COMPLETED THEIR STUDIES BEFORE PREPARING A MOL PROPOSAL.

IMPACT OF OSS STUDY ON MOL CONTRACTING

PLAN "A"

- OSS CONTRACTORS BEING PAID DURING PREPARATION OF PROPOSAL
- POSSIBLE LACK OF PERSONNEL BY OSS CONTRACTORS TO CONDUCT STUDY & PREPARE MOL PROPOSAL

PLAN "B"

- OSS CONTRACTORS IN PREFERRED POSITION
- OSS RFP PRECLUDES DIRECT SELECTION OF OSS CONTRACTORS FOR MOL PHASE I

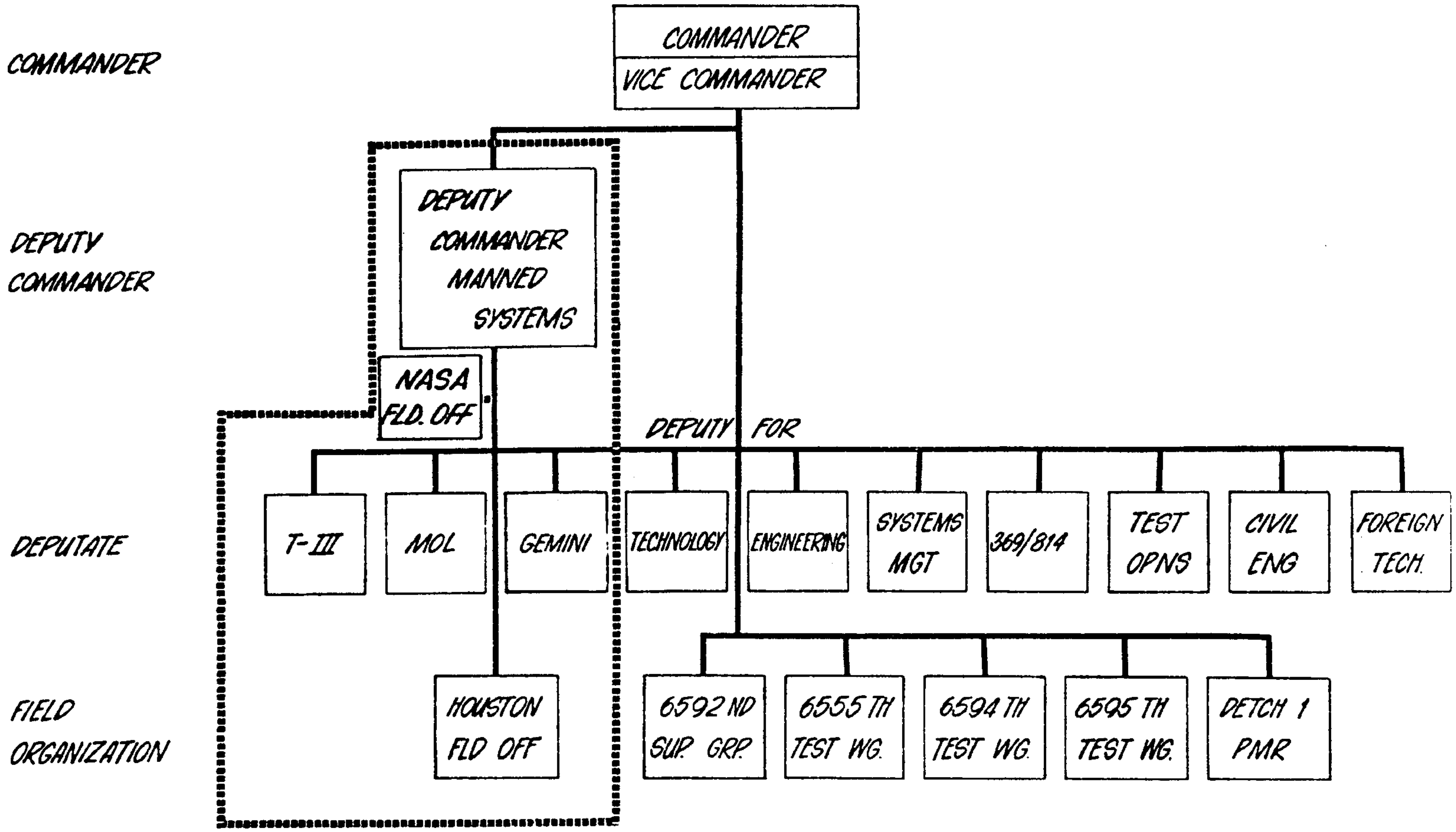
ORGANIZATION

THIS CHART DEPICTS THE SSD ORGANIZATION PROPOSED FOR THE MOL PROGRAM.

A DEPUTY COMMANDER, MANNED SYSTEMS, IS ENVISIONED. HE WILL OCCUPY A POSITION IN THE SSD ORGANIZATIONAL STRUCTURE ABOVE THE PRESENT DEPUTATES. FROM THIS VANTAGE POINT, HE CAN DRAW READILY ON ALL SEGMENTS OF THE SSD ORGANIZATION AS WELL AS COMMAND, DIRECTLY, A SUPER SYSTEMS PROGRAM OFFICE. THIS SUPER SPO WILL ENCOMPASS THE TITAN III, THE MOL, AND THE GEMINI.

THE AFSC FIELD OFFICE AT HOUSTON WILL REPORT DIRECTLY TO THE DCM/S.

SPACE SYSTEMS DIVISION (AFSC)



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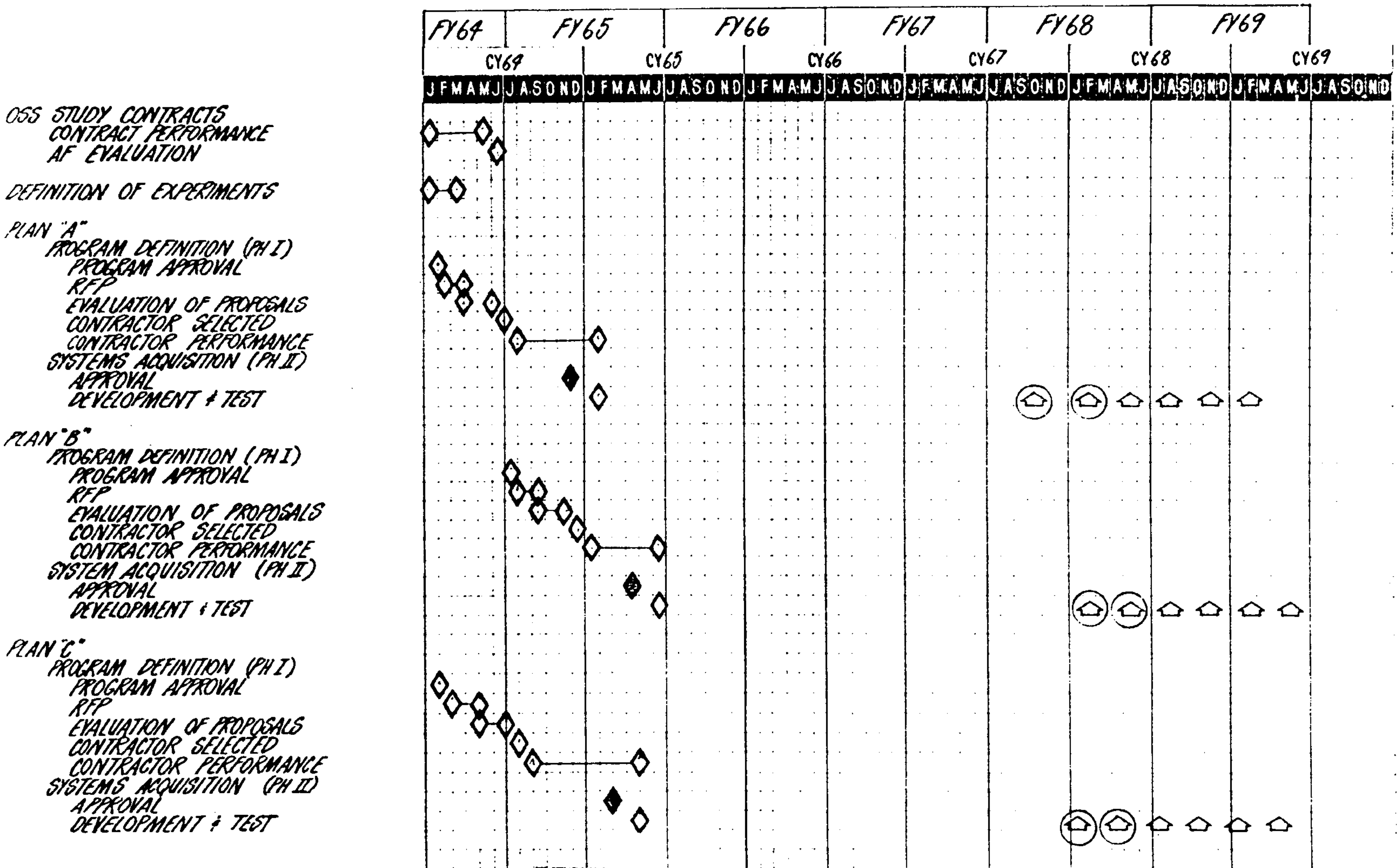
PRELIMINARY SCHEDULE



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SSM

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TOTAL PROGRAM FUNDING SUMMARY
MILLIONS

FY	64	65	66	67	68	69	70	TOTAL
PLAN A								
• OSSS	1							1
• PROGRAM DEFINITION	10	5						15
• SYSTEM ACQUISITION		83	307	314	260	74		1048
TOTAL	11	88	307	314	260	74		1064
PLAN B								
• OSSS	1							1
• PROGRAM DEFINITION	6	9						15
• SYSTEM ACQUISITION		19	267	346	315	101		1048
TOTAL	7	28	267	346	315	101		1064
PLAN C								
• PROGRAM DEFINITION	8	8						16
• SYSTEM ACQUISITION		38	294	352	280	84		1048
TOTAL	8	46	294	352	280	84		1064

~~SECRET~~

PHASE I-PROGRAM DEFINITION FUNDING

PRELIMINARY ESTIMATE

	(DOLLARS IN MILLIONS)
• OSS STUDY-3 CONTRACTORS	1.0
• MOL CONTRACTORS $4.5 M/CONTRACTOR	9.0
• GEMINI "B" CONTRACTOR	3.0
• T-III C CONTRACTOR	1.0
• AEROSPACE	2.0
TOTAL	16.0

SECRET

MOL SYSTEM ACQUISITION FUNDING ESTIMATE
(MILLIONS OF DOLLARS)

PLAN A

FY	64	65	66	67	68	69	70	71	72	73	74	75	TOTAL
• MOL		44	111	96	67	8							326
• GEMINI		16	45	62	49	8							180
• T-III C		5	13	31	33	6							88
• SPARES			7	20	16								43
• SAT CONTROL NET			2	6	19	15							42
• RECOVERY					3	3							6
• DATA REDUCTION & EVAL.					6	6							12
• AGE		6	32	16	6								60
• FACILITIES		2	6	2									10
• TRAINING		4	22	10	2								38
• GSE & TD		6	8	8	7	5							34
		83	246	251	208	51							839
• CONTINGENCIES			61	63	52	33							209
TOTAL		83	307	314	260	84							1048

SECRET

SSM-22

SECRET

MOL SYSTEM ACQUISITION FUNDING ESTIMATE

(MILLIONS OF DOLLARS)

PLAN B

FY	64	65	66	67	68	69	70	71	72	73	74	75	TOTAL
• MOL		9	101	113	85	18							326
• GEMINI		3	36	62	65	14							180
• T-III C			6	33	40	9							88
• SPARES				21	22								43
• SAT CONTROL NET				6	16	20							42
• RECOVERY					2	4							6
• DATA REDUCTION & EVAL.					4	8							12
• AGE		1	34	19	6								60
• FACILITIES		1	6	2	1								10
• TRAINING		1	24	11	2								38
• GSE & TD		4	7	9	9	5							34
		19	214	276	252	78							839
• CONTINGENCIES			53	70	63	23							209
TOTAL		19	267	346	315	101							1048

SECRET

MOL SYSTEM ACQUISITION FUNDING ESTIMATE
(MILLIONS OF DOLLARS)

FY	64	65	66	67	68	69	70	71	72	73	74	75	TOTAL
PLAN C													
● MOL		17	106	99	82	12							326
● GEMINI		6	44	62	58	10							180
● T-III C			6	44	29	9							88
● SPARES			6	20	17								43
● SAT CONTROL NET			2	6	14	20							42
● RECOVERY					2	4							6
● DATA REDUCTION & EVAL					4	8							12
● AGE		2	34	18	6								60
● FACILITIES		1	6	2	1								10
● TRAINING		1	24	11	2								38
● GSE & TD		4	7	9	9	5							34
		31	235	281	224	68							839
● CONTINGENCIES		7	59	71	56	16							209
TOTAL		38	294	352	280	84							1048

NOTE: DOLLARS IN MILLIONS

IN SUMMARY

- MANAGEMENT
  - STRONG AF/AEROSPACE-CONTRACTOR TEAM APPROACH.
  - FULL USE OF AFSC CAPABILITIES.
  - NASA PARTICIPATION AT PROGRAM OFFICE LEVEL.
  - DIRECT CONTRACT AND PROCUREMENT BY AF.
- TECHNICAL
  - MAJOR PROBLEM ONE OF INTEGRATION.
  - FINAL MOL CONFIGURATION RESULT OF FURTHER DEFINITION.
  - 6 FLIGHT PROGRAM LIMITS ACHIEVING PROGRAM OBJECTIVES.
- FUNDING AND SCHEDULE
  - COSTS INDICATE MAGNITUDE OF PROGRAM
  - TO BE REFINED IN PROGRAM DEFINITION PRIOR TO DEVELOPMENT GO-AHEAD.
  - DOES NOT INTERFERE WITH NASA EFFORTS.

[redacted]

RECOMMEND

- AF CONTRACT DIRECT WITH MAC FOR GEMINI "B"
- SINGLE CONTRACT FOR MOL DURING PROGRAM DEFINITION
- DECISION ON IMCC VS MCC BASED ON FURTHER STUDY
- CONTINUE GEMINI EXPERIMENTS PROGRAM
- PLAN "C" APPROACH
- APPROVAL OF D & F
- DEFER OSS STUDIES OK

[redacted]

MOL-3"-Y13723-R

MANNED ORBITING LABORATORY

(MOL)

TECHNICAL PRESENTATION

AEROSPACE CORPORATION

MANNED ORBITING LABORATORY
(MOL)

TECHNICAL PRESENTATION

1. PROGRAM PHILOSOPHY
2. GEMINI MODIFICATIONS
3. DESIGN CONSIDERATIONS
4. TYPICAL MOL SPACECRAFT CONFIGURATIONS
5. TYPICAL MOL WEIGHT STATEMENTS
6. EXPERIMENTAL PROGRAM
7. BASIC TEST PHILOSOPHY
8. TYPICAL MANNED RECONNAISSANCE TEST EQUIPMENT
9. TYPICAL MANNED RECONNAISSANCE TEST LAYOUT
10. [redacted]
11. [redacted]
12. GENERAL EXPERIMENTS
13. BIOASTRONAUTICS TEST REQUIREMENTS
14. BIOASTRONAUTICS TEST EQUIPMENTS
15. MOL FLIGHT TEST PROGRAM

PROGRAM PHILOSOPHY

The basic philosophy of the program is to test the performance of man. Therefore, the development of new equipments and systems will be held to an absolute minimum. Where practical, full use will be made of the substantial NASA developments in equipments, facilities and capabilities.

[redacted]

PROGRAM PHILOSOPHY

- MINIMUM MODIFICATIONS TO GEMINI VEHICLE TO PROVIDE LAUNCH AND RE-ENTRY CREW ENVIRONMENT
- USE OF EXISTING SUBSYSTEMS AND TECHNIQUES IN MOL DESIGN
- MINIMUM MODIFICATIONS TO TRANSTAGE TO PROVIDE FINAL LAUNCH PHASE ORBIT ADJUST AND ON-ORBIT STABILIZATION
- USE OF AMR LAUNCH FACILITIES WITH MINIMUM MODIFICATIONS
- USE OF NASA CONTROL NET WITH MINIMUM MODIFICATIONS
- RECOVERY SYSTEM THE SAME AS NASA GEMINI PROGRAM

TYPICAL GEMINI MODIFICATIONS

The Gemini subsystems not required for Gemini B are in the area of rendezvous, docking, and long life 14-day) power and life support systems. Additionally, the land landing system, i.e., paraglider and the associated landing gear equipment, will be deleted in consonance with the present Gemini Program. Serious consideration is being given to deletion of the Gemini guidance system since it is primarily required by the paraglider landing system. The final decision on guidance must await more detailed definition of the experimental program to ascertain if on-orbit guidance requirements exist.

A number of structural modifications to the Gemini may be required, depending upon the particular method chosen for astronaut transfer from the Gemini to the MOL. Because of the use of the Titan IIIC launch-vehicle with its increased acoustic, vibration and shock environment in relation to the Gemini launch vehicle, the Gemini subsystems will probably have to be requalified. In the area of re-entry requirements, the Gemini heat shield ablation material thickness and the number of retrorockets may have to be increased because of possibly increased altitude operations and reduced reliability due to long term space storage. The increased number of retrorockets may also be required during abort because of changed launch vehicle characteristics.

Since the Gemini B will be required to stay on-orbit at least 30 days, a problem is presented due to lack of applicable test data for most of the Gemini subsystems. Additionally, other types of long term storage data must be developed, such as the reliability of electronic subsystems after reactivation.

Certain protective approaches such as low pressure pressurization to avoid hard vacuum effects and selective temperature control are reasonable and will be employed wherever possible. Additionally, due to the presence of the astronauts, there is the possibility of limited maintenance and repair or replacement of subsystems.

The reduction of the service module and other changes envisioned will probably result in reducing the weight of the Gemini from its present 7000 to about 6000 pounds.

TYPICAL GEMINI MODIFICATIONS

- POSSIBLE DELETIONS
  - AGENA RENDEZVOUS AND DOCKING SYSTEM
  - LONG TERM POWER AND LIFE SUPPORT SYSTEMS
  - LAND LANDING SYSTEM
  - GUIDANCE SUB-SYSTEM

- POSSIBLE ADDITIONS
  - INCREASED RE-ENTRY AND ABORT CAPABILITIES
  - STRUCTURAL CHANGES

- SPACE STORAGE REQUIREMENTS
  - TEST DATA REQUIRED
  - PROTECTIVE CONCEPTS
  - OPERATIONAL APPROACHES

- ESTIMATED GEMINI B WEIGHT $\simeq$ 6000 POUNDS

MOL DESIGN CONSIDERATIONS

The basic objective of the program is determining the value of man in military space missions and performing space testing; thus, a pressurized module providing a shirt-sleeve environment is a fundamental requirement.

In order to test large diameter high resolution optical systems and IR systems, the use of open apertures is indicated. In addition, testing of equipments that ultimately must operate in the space environment should be done in an unpressurized module; thus, the MOL should have both a pressurized and unpressurized section.

From a safety standpoint, it appears desirable to have the pressurized module divided into two sections so that the astronauts can retreat and close the hatch in case of fire or loss of pressure in one section. This design also provides, in effect, a pressure lock for exit and entry for extravehicular operations. The volume to be used should be large enough to house bulky test equipment and provide space for optimum manned operations including maintenance and servicing. On the other hand, less structure or volume will result in greater test payload with the Titan III Booster. This becomes even more important if the basic design is to be used ultimately as a resupply vehicle for operation out of PMR. In terms of growth to long duration testing and cost-effective mission applications such as reconnaissance, launch of an unmanned station with subsequent rendezvous of a supply vehicle is indicated.

MOL-30 Y13738-R

MOL DESIGN CONSIDERATIONS

MANNED OPERATIONS	PRESSURIZED MODULE
LARGE APERTURES VACUUM CONDITIONS	UNPRESSURIZED MODULE
SAFETY EXTRA VEHICULAR OPERATIONS	2 SEPARATE ENVIRONMENT UNITS
MANNED OPERATIONS BULKY TEST EQUIPMENT	LARGE VOLUME
INCREASE TEST PAYLOAD RESUPPLY FOR PMR OPERATIONS	SMALL VOLUME
MISSION APPLICATION LONG DURATION & LARGE PAYLOAD	RENDEZVOUS

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MOL WEIGHT STATEMENTS

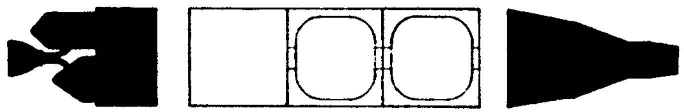
The MOL Spacecraft is composed of a pressurized volume with the requisite subsystems such as life support, power and attitude control and an unpressurized module for mounting test equipment.

The pressure vessel will be designed to sustain approximately a 7 psig operating pressure. The side wall is assumed to be a multilayer construction selected to yield a probability of no meteoroid penetration of 0.995 for 180 days, based on a conservative estimate of the meteoroid environment. The life support system is based on a two-gas system and is sized to provide 30 days of expendables plus a reserve. The power system is a solar cell and battery system providing an over-all power of 1.4 kw. The attitude control system is based upon a bipropellant hot gas system to provide a ±10-degree limit cycle operation.

The pressurized volume will probably be built up in two separate compartments for operational and safety reasons; approximately 1000 cubic feet of pressurized volume appears to be about the right compromise between support of the men and experimental payload.

The weight penalty for two 500-cubic foot chambers as opposed to one 1000-cubic foot chamber is estimated to be only 100 to 200 pounds.

TYPICAL MOL WEIGHT STATEMENTS



	1000 FT^3 PRESSURE VESSEL	500 FT^3 PRESSURE VESSEL
PRESSURE VESSEL	2550	1350
LIFE SUPPORT EQUIPMENT *(2MEN)	2090	1650
REACTION CONTROL SYSTEM	250	250
POWER SYSTEM (SOLAR PANEL)	880	880
FURNISHINGS, ELECTRONICS, SPARES, ETC	1530	970
TEST MODULE	1100	1100
TOTAL	8400	6200

*30 DAYS EXPENDABLES PLUS RESERVES

TYPICAL MOL SPACECRAFT CONFIGURATIONS

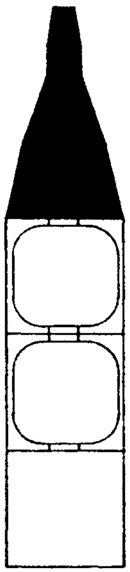
The R&D launches from AMR will provide a gross experimental payload of 4600 pounds based upon the use of substantial spacecraft weight and launch vehicle performance contingencies (2000 pounds each).

Assuming the results of the initial test program are positive and a mission requirement develops, it is important to explore the performance associated with a polar launch from PMR. Since this program would not develop until several years after the Titan IIIC had become man-rated, the predicted performance with no contingency (19,000 pounds at 200 nautical miles polar) is used. If the pressure vessel volume could be reduced by one half (to 500 ft^3) the available polar payload weight would be essentially the same value as that available during the R&D program conducted at AMR. On the other hand, if the 1000-ft^3 pressure vessel were not designed to allow such a reduction in volume then the payload at PMR would be reduced to a very marginal 2600 pounds. Therefore, there is a strong incentive to make the two 500-cubic foot chambers identical and repairable.

The 4800-pound payload vehicle as a polar orbit could provide an attractive capability for (1) a short-time-on orbit reconnaissance mission integrally launched or (2) a resupply shuttle vehicle supporting a long-time-on orbit reconnaissance space station.

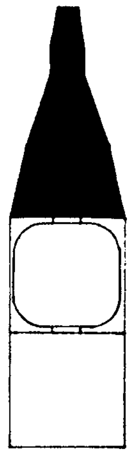
TYPICAL MOL SPACECRAFT CONFIGURATIONS

AMR



GEMINI B	6000
MOL (1000 FT^3)*	8400
CONTINGENCY	2000
TOTAL SPACECRAFT WEIGHT	16,400
TIIIC, 200 N.MI. 106° LAUNCH AZIMUTH	23,000
CONTINGENCY	2000
GROSS PAYLOAD	4,600

PMR



GEMINI B	6000
MOL (500 FT^3)*	6200
CONTINGENCY	2000
TOTAL SPACECRAFT WEIGHT	14,200
TIIIC, 200 N.MI.	19,000
POLAR CONTINGENCY	0
GROSS PAYLOAD	4,800

* 30 DAYS EXPENDABLES PLUS RESERVES

TEXT FOR EXPERIMENTAL PROGRAM

The basic objective of the experimental program is to determine the value of man both in military space missions and for performing space testing. The most promising missions for manned application are reconnaissance [redacted] In addition to the general test the experimental program must provide the necessary bioastronautic testing to determine the physiological and psychological effects of the space environment on man.

EXPERIMENTAL PROGRAM

- RECONNAISSANCE [redacted]
- [redacted]
- GENERAL TESTING
- BIOASTRONAUTICS

BASIC TEST PHILOSOPHY

The basic philosophy of the test program is to make maximum use of existing equipment. This can be done particularly well in the general test area. In the mission area, because of the extension of capabilities possible with man, some advanced sensors are needed. These need not be qualified hardware but can be breadboard-type equipment. Also these prototype equipments should be planned as a step in the eventual development of operational capability in the event that the results of the test program are positive.

Ground and aircraft simulation will be used to eliminate needless space testing and provide a reference for measuring human performance degradation caused by the space environment. In mission areas, while breadboard equipments may be used, controlled exercises also will be conducted to obtain a quantitative measure of man's performance. Careful studies must be carried out to determine the proper mix of prototype equipments, special test equipment, and simulation devices.

BASIC TEST PHILOSOPHY

- DETERMINE VALUE OF MANNED MILITARY FUNCTION IN SPACE
- GENERAL TEST AND EXPERIMENTS TO MAKE MAXIMUM USE OF EXISTING EQUIPMENT
- RECONNAISSANCE [redacted] EQUIPMENTS TO BE BREADBOARD MODELS OR COMPOSITES OF EXISTING EQUIPMENTS
- RECONNAISSANCE [redacted] TESTS MUST BE STEP TOWARD DEVELOPING FIRST GENERATION MANNED SYSTEMS

TYPICAL MANNED RECONNAISSANCE TEST EQUIPMENTS

Multi-sensors are indicated to fully capitalize on the manned capabilities in the reconnaissance mission. Shown on this chart is a typical group of such sensors which fit within the weight and volume constraints and could supply the necessary experimental data for strategic and technical intelligence, as well as short term indicators.

In general, tests will be performed to establish the performance of man in adjusting and tuning equipments, acquiring and tracking targets, pointing the high resolution camera and establishing tracking rates, decision making and managements of sensor utilization, visual monitoring of sensor signals, etc. In addition, on-board processing of film will permit tests on tuning for optimum sensor performance and the possibilities for limited photo interpretation to reduce requirements for ground-link data transmitted.

The panoramic camera, IR scanner and sensors, and pointing and tracking scope are certainly within the state-of-the-art. The high resolution camera and radar will require development.

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MOL-3S-Y1371?-R1

TYPICAL MANNED RECONNAISSANCE TEST EQUIPMENTS

SENSOR	WEIGHT (LBS)	SENSOR PERFORMANCE 100 N.MI. ALT.
HIGH RESOLUTION CAMERA WITH PROCESSOR (INCLUDES IR)	2000	[redacted] OPTICAL [redacted] IR
POINTING & TRACKING SCOPE	150	6 X - 96X (ZOOM)
IR SCANNING CAMERA	85	150 FT - 1.°C
PANORAMIC CAMERA	150	6 FT
SIDE LOOKING RADAR (1 UNIT)	700	[redacted] N.MI. SWATH
ANCILLARY EQUIPMENT (SPARES, FILM, POWER SUPPLY, ATTITUDE CONTROL PROPELLANT, ETC.)	1300	——

TYPICAL RECONNAISSANCE TEST LAYOUT

The basic building blocks for reconnaissance tests are of the 500-cubic foot pressurized capsules and the unpressurized volume. The pressurized volume contains the monitoring and display equipment, film packs, and those portions of the radar equipment expected to require substantial servicing for long-life operation. The major optics for the high resolution camera, tracking scope, and infrared equipment are placed in the unpressurized volume to avoid the need for large optical quality windows and to avoid certain pressure and thermal problems. The equipment interface between the two volumes will be designed through a special plate in the aft hatch area, thus reducing the number of modifications to the basic design.

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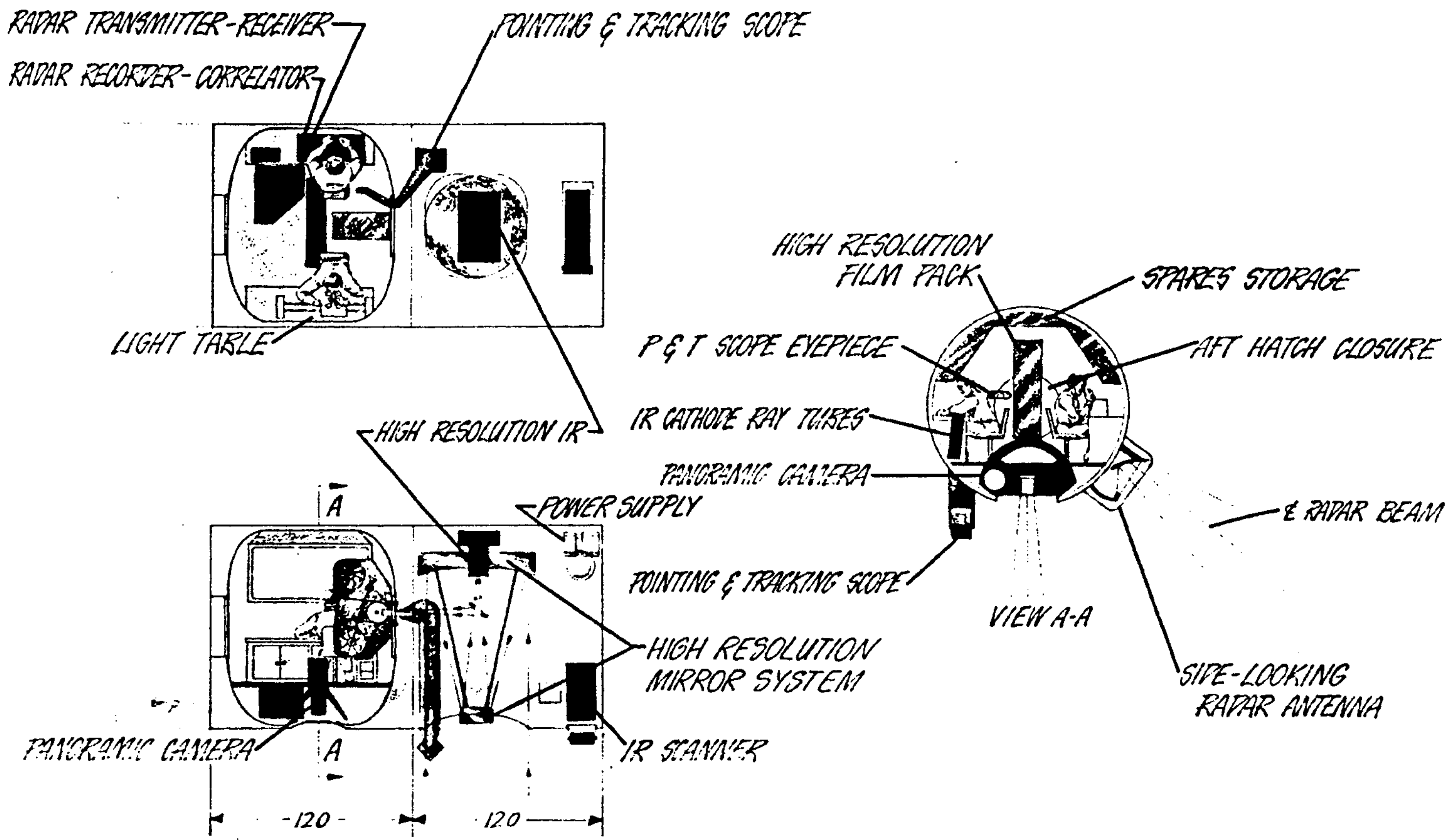
TYPICAL MANNED RECONNAISSANCE TEST LAYOUT



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NRO APPROVED FOR
RELEASE 1 JULY 2015

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TYPICAL GENERAL TEST EXPERIMENTS

Shown in this chart are various categories of general experiments that might be carried out in the MOL. For each category an illustrative example has been given along with a preliminary weight estimate associated with the experiment.

In the category of subsystem development, the catalytic regeneration of oxygen represents the advance development of a life support subsystem which could be of great significance to long duration military missions, by reducing the resupply weight requirements. In the area of space operations, the extravehicular experiment is important to the success of the MOL and longer duration vehicles in that many maintenance and repair operations will be dependent on this capability. Definition of these experiments will be based upon the equipments and results of similar experiments to be carried out in the Gemini experiments program (631A). While numerous examples of space physics can be chosen, manned pointing and adjusting capabilities are undoubtedly of great significance in getting satisfactory background and missile launch measurements in the ultraviolet, infrared and millimeter region.

Of fundamental importance in the engineering technology area is obtaining data on the performance of materials, bearings, seals, etc., when exposed to the space environment.

MOL-SU-Y15722-R1

TYPICAL GENERAL TEST EXPERIMENTS

EXPERIMENT	WT. (LBS)	OBJECTIVE
• SUBSYSTEM DEVELOPMENT		
• CATALYTIC REGENERATION OF OXYGEN	120	QUALIFY ADVANCED LIFE SUPPORT SUB-SYSTEM
• SPACE OPERATIONS		
• EXTRAVEHICULAR OPERATIONS	410	EXPLORE REPAIR, MAINTENANCE, AND TESTING CAPABILITIES
• SPACE PHYSICS		
• RADIANCE MEASUREMENTS	243	PROVIDE BASIC DATA ON IR, UV, AND MM
• ENGINEERING TECHNOLOGY		
• EXPOSED MATERIALS AND MECHANISMS PERFORMANCE	388	DETERMINE DATA ON BEARINGS, EXPANDABLES, SEALS, ETC.

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BIOASTRONAUTICS TEST REQUIREMENTS

The objectives noted for the biomedical studies of weightlessness are extremely important in view of the penalties that would be imposed on operational systems if artificial gravity were a requirement. Although it is expected that little physiological change will be experienced in 30 days of weightlessness, test data are required to confirm or possibly refute this judgment. This information, to be secured on early flights, will form the basis of improved preventive measures--some of which may be tested in subsequent flights. The data are also essential to considerations of mission durations beyond 30 days.

The initial philosophy has been to consider a reasonably comprehensive bioastronautics test program for the first two 30-day flights and a much reduced effort on subsequent flights. Such an approach allows for the contingency of problems arising in 14-day Apollo flights, which require more detailed investigation as well as providing a firm "bench mark" at 30 days. Since this goal can be achieved at relatively modest cost it is reasonable to be prepared for a comprehensive effort initially and to reduce the effort as time and experience dictate.

Testing the performance of the crew involves a critical assessment of the man as a subsystem in the mission-oriented test program. For example, manual, rate-tracking may be employed to secure image motion compensation in the high resolution photography. In such a case the tracking loop might be instrumented to give certain direct quantitative estimates of operator performance, e.g., the precision of the rate damping operation might be obtained directly from a photoelectric grid type monitor. This human subsystem performance could then be compared with equivalent ground simulation studies. Thus, from a task function analysis of the various mission-oriented testing modes, a set of directly coupled performance tests will be devised wherever feasible.

BIOASTRONAUTICS TEST REQUIREMENTS

- MEASUREMENT OF GRAVITY SENSITIVE HUMAN FUNCTIONS TO:
  - DEFINE THE RESIDUAL EFFECTS OF WEIGHTLESSNESS USING "BEST" INITIAL PREVENTIVE MEASURES
  - DEVELOP IMPROVED METHODS FOR EXTENDING MISSION DURATIONS TO OBVIATE (IF POSSIBLE) NEED FOR ARTIFICIAL GRAVITY
- MEASUREMENT OF HUMAN PERFORMANCE IN TASKS SUCH AS:
  - ACQUISITION AND TRACKING OF TARGETS
  - INFORMATION MANAGEMENT
  - MULTIPLE-MODE OPERATIONS
  - MAINTAINING SYSTEMS

BIOASTRONAUTICS TEST EOUIPMENT

The laboratory facilities and parameters noted are based on two factors, namely: a rather comprehensive test program and essentially off-the-shelf equipment (as noted in Republic's BIOSTAT Study). After initial flight, the payload, volume and testing time can probably be reduced. This program represents a contingency for studying more severe problems than are currently anticipated, and to secure a broad spectrum of data if the combined requirements of NASA and DOD so dictate.

The medical monitoring, biomedical testing and human performance testing volume are included within the 70 ft^3 cabinets.

BIOASTRONAUTICS TEST EQUIPMENT

	WEIGHT (LBS)	VOLUME (FT^3)	POWER (WATTS)
• MEDICAL MONITORING & MISSION SAFETY	140	6	25 (40% TIME)
• BIOMEDICAL TESTING	330	24	50
• HUMAN PERFORMANCE TESTING	260	25	500 (10-15 MIN.)
• CABINETS, RACK WITH STORAGE WIRING, ETC.	140	70	
• WORKING, "FREE" VOLUME		400	
TOTAL	870	470 *	500 (MAX)

* CABINETS + WORK VOLUME

FLIGHT TEST PROGRAM

The present plan is based on a six flight program. Two unmanned flights are allocated to check the on-orbit systems operation of MOL and the on-orbit storage and re-entry capability of the modified Gemini. The following four manned flights would be devoted largely to bioastronautics and reconnaissance testing. It is reasonable to assume that some weight, volume and power would be available for more general testing of both a military and scientific nature. It is envisioned that follow-on flights (beyond six) would be directed toward longer on-orbit stay times, including rendezvous and docking of one MOL to another and more complete investigations of "critical" subsystems of other missions. [redacted]

MOL-3S-Y13715-R1

FLIGHT TEST PROGRAM

- SIX TOTAL FLIGHTS

  2 UNMANNED
  - CHECK SYSTEM OPERATION
  - CHECK GEMINI ON-ORBIT STORAGE AND RE-ENTRY

  4 MANNED
  - MANNED OPERATION AND SYSTEM CHECKOUT
  - BIOASTRONAUTICS TESTS TO 30 DAYS
  - RECONNAISSANCE [redacted] MANNED OPERATION
  - POSSIBLE GENERAL TESTS, AS AVAILABLE

- FOLLOW-ON TEST PROGRAM
  - LONG STAY TIME ON-ORBIT; 60 DAYS UP
  - RENDEZVOUS AND DOCK WITH OTHER MOL
  - OTHER SYSTEM TESTING ([redacted] GENERAL, ETC)