HEADQUARTERS
SPACE SYSTEMS DIVISION
AIR FORCE SYSTEMS COMMAND
DOWNGRADED AT 12 YEAR INTERVALS.
NOT AUTOMATICALLY DECLASSIFIED.
DOD DIR 5200.10
WDLAR-S-458
SECRET
AIR FORCE SPACE SYSTEMS DIVISION
AIR FORCE SYSTEMS COMMAND
29 May 1961

SECRET LUNAR EXPEDITION PLAN

Lunex

by **Mark Wade**
from EncyclopediaAstronautica Website

In May 1961, just as Kennedy had decided that NASA should put an American on the moon, the US Air Force released a secret report, summarising the result of years of planning to place a military base on the moon by 1967. As you read through the Lunex project report, it is interesting to note the following:

If Project Lunex had been pursued instead of Apollo, the United States would have ended the sixties with a launch vehicle very similar to the Shuttle - solid rocket boosters, a Lox/LH2 core, a lifting re-entry vehicle. This clearly could have provided a better basis for follow-on programs than Apollo did. The USAF launch vehicle studies of the late 1960's again came up with a very similar configuration, and NASA finally came to the same conclusion for the Shuttle design as well. One advantage of the Lunex booster is that it also provided a heavy-lift launch vehicle in the pure cargo version.

In this report you will discover the reason for USAF support of development of the advanced and large rocket engines begun in the late 1950's: the LR-115 (RL-10), J-2, F-1, M-1, and large solid rocket motors. The RL-10, designed for the USAF from the beginning as a throttleable motor for the Lunex lunar lander, finally put this capability to use twenty years later in the DC-X VTOL vehicle.

The schedule was extremely over-optimistic. First lunar landing was by the end of 1966, while the booster and vehicle were considerably more advanced than the Apollo approach. Examples include:

- Lox/LH2 in the lunar landing stages, including throttleability and months-long lunar hibernation times between engine restarts
- Mach 35 lifting body re-entry vehicle
- Computer data storage capabilities and technologies not even achieved today
- Electrostatic gyro platforms (not perfected until the late 1970's in the B-52's SPN-GNS platform)

In hindsight it is apparent that increasing Air Force preoccupation with the Viet Nam War in the same period would have resulted in the program stretching and perhaps eventually being cancelled (as with all other Air Force manned space projects).

Many of the techniques for Project Lunex reappear in Korolev's early L3 lunar expedition plans. These include the selection of base sites by automated probes; the planting of homing transponders on the lunar surface for precision landing of manned landers and cargo craft (by Surveyor spacecraft in Lunex, by Luna Ye-8 landers and Lunokhods in the Russian plans); and methods of direct lunar landing.

The Intelligence Section contains a mixture of erroneous beliefs as to the characteristics of the booster stages of the R-7 launch vehicle, mixed with some accurate intelligence on the upper stages (calculable from tracking and telemetry intercepts for Turkey). It would seem that as of this date no accurate intelligence or photograph of the R-7 vehicle on the pad had been made. The information as to Soviet intentions (no plans to go to the moon) was more accurate,. It would seem that both the

USAF and Kennedy picked the moon goal as one in which the Russians were not really interested.
Many thanks to Joel Carpenter for locating and providing a copy of the declassified Lunex report

LUNAR EXPEDITION PLAN - LUNEX

FORWARD

This document provides a plan for a manned Lunar Expedition. It was prepared to furnish more detailed information in support of the National Space Program proposed by a USAF committee chaired by Major General J R Holzapple. That report pointed out the dire need for a goal for our national apace program. The Lunar Expedition was chosen as the goal since it not only provides a sufficient challenge to the nation, but also provides technical fall-outs for greatly improved apace capabilities.

Previous editions of this plan have provided guidance and incentive to Air Force technical groups. Consequently, their efforts have established a broad technical base within the Air Force from which rapid advances can be made. This capability has been taken into account in laying out the accelerated schedules in this plan.

O J RITLAND
Major General, USAF
Commander

PROPOSED SYSTEM PACKAGE PLAN FOR
LUNAR EXPEDITION

Prepared by **Support Systems Plans Division**
Approved by **Norair M. Lulejian**
Colonel, USAF
Director, Advanced Systems Plans and Analysis
WDLAR-S-458

SECTION I - SUMMARY

1.1 PURPOSE

The Lunar Expedition has as its objective manned exploration of the moon with the first manned landing and return in late 1967. This one achievement if accomplished before the USSR, will serve to demonstrate conclusively that this nation possesses the capability to win future competition in technology. No space achievement short of this goal will have equal technological significance, historical impact, or excite the entire world.

1.2 BACKGROUND

Extensive studies by Air Force-Industry teams during 1958, 1959, and 1960 examined all facets of the problem and techniques of sending men to the moon and resulted in a feasible concept which is attainable at an early date and is economical and reliable. Laboratories within the Air Force participated in this effort, thus establishing a broad technological base which can react quickly to an expanded high priority program.

1.3 DESCRIPTION

The lunar mission would be initiated by the launching of the lunar payload by a large, three-stage liquid or solid propellant booster to escape velocity on a lunar intercept trajectory. The payload, consisting of a Lunar Landing Stage, Lunar Launching Stage and a manned vehicle, would use a lunar horizon scanner and a Doppler altimeter for orientation prior to a soft landing using the Lunar Landing Stage. Terminal guidance using pre-positioned beacons would be required for landing at a pre-selected site. The Lunar Launch Stage would provide the necessary boost for the return to earth of the manned Lunex Re-entry Vehicle. Using mid-course guidance and aerodynamic braking, the vehicle would effect re-entry and a normal unpowered aircraft landing at a ZI base.

In addition to the manned vehicle a cargo payload is included in this plan. The cargo payload would utilise the same three-stage earth launch booster and the same lunar landing techniques. However it would not be returned to earth and would be used only to transport supplies and cargo to the expedition on the moon.

The primary concept recommended in this plan is the "direct shot" method since studies have indicated it could be available at an earlier date and it would be more reliable. Another concept is also suggested which consists of the rendezvous and assembly of components in an earth orbit before ejection into a lunar trajectory. The techniques and development required for this latter concept are documented under a separate SSP titled, SAINT. Therefore, no details of this concept are presented in this plan. All schedules relating the two plans have been co-ordinated to insure compatibility and to take advantage of mutual advances. Since neither rendezvous techniques nor large boosters have been demonstrated, both approaches must be pursued until it becomes obvious that one of them has clear advantages over the other.

The following developments are required in order to accomplish the lunar expedition:

> **a.** A three-man Lunex Re-entry Vehicle. This vehicle must be capable of re-entry into the earth's atmosphere at velocities of 37, 000 ft/sec. It must also be capable of making a conventional aircraft landing. Control and improved guidance for entering the earth's atmosphere at the proper place and angle is needed as well as improved materials to withstand the high surface temperatures. Adequate life support equipment is also required. The development of this vehicle is the key to the accomplishment of the Lunex program and is one of the pacing development items. A detailed schedule for its development is included.
>
> **b.** A Lunar Landing Stage for decelerating and landing the entire payload. This stage must have the capability to decelerate 134,000 pounds from a velocity of almost 9,000 ft/sec to 20 ft/sec at touchdown. A Doppler altimeter is required to provide information for ignition and control of the engine. Horizon scanners must be used to orient the payload to the local vertical.
>
> **c.** A Lunar Launch Stage capable of launching the manned Lunex Re-entry Vehicle from the lunar surface. Lunar ascent guidance is required to place the vehicle on the proper trajectory.
>
> **d.** A three-stage earth launch booster, referenced as a space launching system. The first stage will use either LOX/LH2 with six million pounds of thrust or a solid fuel with an equivalent launch capability. The second and third stages will use LOX/LH2. The development of this space launching system is considered the pacing development item for the Lunex program. Because of the magnitude of the booster program and the applicability of the booster to other programs, the plan for its development is being presented separately.

In addition to the above listed hardware developments, additional information is required about the lunar surface such as its physical and roughness characteristics. High resolution photographs of the entire lunar surface may provide this information. Present NASA plans if expedited could provide the information for this Lunex program. NASA's Surveyor (soft lunar landing) program could also incorporate radio-light beacons which would be used later in conjunction with a terminal landing system. A core sample of lunar material is required as soon as possible so that design of lunar landing devices and lunar facilities can be accomplished.

1.4 MAJOR PROBLEM AREAS

The development of techniques for re-entering the earth's atmosphere at 37,000 ft/sec is one of the major problems. Guidance equipment must be very accurate to insure that the re-entry angle is within +- 2°. Too steep an entry angle will cause overheating and intolerable G loads, while too shallow an entry angle may permit the Lunex Re-entry Vehicle to skip out of the atmosphere into a highly eccentric earth orbit. If this happens, the vehicle may spend several days in the trapped radiation belts and may exceed the time limits of the ecological system.

The Lunar Landing Stage will be a difficult development because of a requirement for orientation with the local vertical when approaching the moon. It must also be guided to the selected landing site. Many tests will be required to develop the necessary equipment.

The Lunar Launching Stage will be another difficult development. The pre-launch countdown must be performed automatically and, if the launching booster is not vertical upon launch, corrections must be made in order to attain the required moon-earth trajectory.

Although the foregoing developments are difficult, no technological break-through will be required. All designs can be based on extrapolation of present technology.

1.5 MILESTONES

Major milestones in the program are:

- **a.** Recovery of a manned re-entry vehicle from 50,000 miles in 1965.
- **b.** Manned Circumlunar flight in 1966.
- **c.** Manned lunar landing and return in 1967.

These and other significant events are shown on Chart I-A.

1.6 CAPABILITIES DEVELOPED

The development of large boosters, rendezvous techniques and manoeuvrable space vehicles, all required for the Lunar Expedition, will also provide a capability for many new and advanced space achievements. For example, the Space Launching System which will boost 134,000 pounds to escape velocity will boost approximately 350,000 pounds into a 300 nm orbit, or will launch a manned vehicle on a pass around either Mars or Venus.

1.7 MANAGEMENT ACTIONS REQUIRED

The major Management Milestones for FY62 and FY63 are shown on Chart I-B. Immediate attention by Management to obtain Program Approval and Funding by July 1961 is necessary if the United States is to put a "man on the moon" by August 1967.

Throughout the Lunex program time allocated for management and Air Force technical evaluations has been kept to a minimum. This is essential to meet the schedules, and delays in providing funding as indicated, or in receiving notification of required decisions, will have the direct effect of delaying the program end objective.

SECTION II - PROGRAM DESCRIPTION

2.0 BACKGROUND

Shortly after the first Sputnik was launched in October 1957, Headquarters, ARDC initiated a series of studies to examine the military potential of space operations. These studies were accomplished by Industry-Air Force teams each working independently. Two of these studies which were the forerunners of this Lunex plan were "Lunar Observatory" and "Strategic Lunar System." The objective of the first study was to examine an economical, sound and logical approach for establishing a manned intelligence observatory on the moon, and the second study examined the military potential of lunar operations. These studies showed that it is technically and economically feasible to build a manned lunar facility.

A third study titled, "Permanent Satellite Base and Logistic Study" is presently under way and will be completed in August 1961. This study will provide a conceptual design of a three-man re-entry vehicle which will carry men to and from the moon. The three-man vehicle is the key item in the lunar transportation system as its weight will dictate the booster sizes. For this reason it is given special attention in this plan.

2.1 Lunex PROGRAM OBJECTIVE

The objective of the Lunar Expedition program is the manned exploration of the moon with the first manned lunar landing to occur as soon as possible. The execution of this plan will land three men on the moon and return them during the 3rd quarter of calendar year 1967, and will establish the Lunar Expedition in 1968.

Completion of this plan will require the development of equipment, materials, and techniques to transport men to and from the lunar surface and to provide a lunar facility which will allow men to live and work in the extremely harsh lunar environment.

2.2 Lunex PROGRAM - DESCRIPTION

The Lunar Expedition Program is primarily concerned with the development of the equipment necessary to transport men and supplies to the lunar surface.

The key development in this program is the Lunar Transport Vehicle which is composed of the Space Launching System and either the Manned Lunar Payload or the Cargo Payload. The Manned Lunar Payload consists of a three-man Lunex Re-Entry Vehicle, a Lunar Launch Stage, and a Lunar Landing Stage. The same Lunar Landing Stage, plus a cargo package, composes the Cargo Payload. The relative effort required for the development of these two payloads in comparison with other portions of the complete Lunar Expedition Program is shown in Figure 2-1. A breakdown of the Lunar Transport Vehicle is shove in Figure 2-2.

The Space Launching System consists of a three-stage booster capable of placing either the Manned Lunar Payload or the Cargo Payload on a lunar intercept trajectory at escape velocity. This plan does not contain development information on the Launching System since such information is contained in a separate System Package Plan being prepared concurrently. The development schedules in these plans have been co-ordinated to insure compatibility.

In operation, the Manned Lunar Payload, weighing 134,000 pounds, will be boosted to escape velocity of approximately 37,000 ft/sec on a trajectory which intercepts the moon. Velocity will be sufficient to reach the moon in approximately 2 1/2 days. As the Manned Lunar Payload approaches the moon it is oriented with the local vertical by the use of horizon scanners. The Lunar Landing Stage decelerates the Manned Lunar Payload for a soft landing at a pre-selected site using an altitude sensing device to determine time of ignition. Landing at the pre-selected site will be accomplished using terminal guidance equipment and a prepositioned beacon to effect an offset landing.

The Lunar Launching Stage, using the Landing Stage as a base, will launch the Lunex Re-entry Vehicle on the return trajectory. In early test shots before men are included, the countdown and launch will be effected automatically by command from the earth. Small mid-course corrections may be necessary to insure re-entry into the earth's atmosphere within allowable corridor limits.

The Lunex Re-entry Vehicle will re-enter the earth's atmosphere within the allowable corridor so that it will not skip back into space again nor burn from excess heat. It will use aerodynamic braking to decelerate and will have sufficient lift capability to effect a normal unpowered aircraft landing at a base such as Edwards Air Force Base.

Several successful unmanned completely automatic flights of the type just described must be completed in order to establish confidence in the system reliability before manned missions will be attempted.

Cargo will be transported to the lunar surface using the same procedures and equipment except that the Lunar Launch Stage is not needed. The Cargo Package will have a weight equal to the combined weight of the Lunex Re-entry Vehicle and the Lunar Launch Stage.

As a separate approach to the problem of placing large payloads on the moon, techniques of rendezvous and assembly in earth orbit are being examined. Use of these techniques would require the launch, rendezvous and orbital assembly of sections of the Manned Lunar Payload and the Cargo Payload along with the required orbital launch booster and its fuel. The assembled vehicle would then be boosted from orbital velocity to escape velocity and would proceed as described above. Details of the major developments required such as rendezvous, docking and orbital assembly are outlined in a System Package Plan titled SAINT, being prepared concurrently. All programming information and schedules have been co-ordinated with this plan to insure compatibility and mutual support.

2.3 DESIGN PHILOSOPHY

The Lunar Expedition Plan has been oriented toward the development of a useful capability rather than the accomplishment of a difficult task on a one-time basis. The use of a large booster is favoured for the direct shot approach since studies have shown this to be more reliable, safer and more economical as well as having earlier availability. However, another approach using a smaller booster in conjunction with orbital rendezvous and assembly is also considered.

The manned Lunex Re-entry Vehicle is the key item in determining booster sizes. Its weight determines the size of the Lunar

Launch Stage which in turn determined the size of the Lunar Landing Stage. The total weight of these three items is the amount that must be boosted to earth escape velocity by the Space Launching System. In this manner the size of the Space Launching System was determined.

A 2 1/2 day trajectory each way was selected as a conservative design objective. Longer flights would have more life support and guidance problems while shorter flights require higher boost velocity.

An abort capability will be included in the design insofar as possible. The next section describes the abort system in considerable detail.

Development and tests are scheduled on a high priority basis. Thus, the schedules shown in this plan are dictated by technological limitations and not by funds.

The entire program as described herein is an integrated program in that later development tests build on the results of early tests. Thus, equipment and techniques are proved out early, and confidence in the reliability is obtained by the time a man is included.

2.4 ABORT PHILOSOPHY

The insertion of a man into a space system creates a safety and reliability problem appreciably greater than the problem faced by any unmanned system. It is well recognised that maximum reliability is desirable, but also known that reliabilities in excess of 85 to 90% are extremely difficult to achieve with systems as complex as the Lunar Transportation System. Therefore, the need for an abort system to protect the man during the "unreliable" portions of the lunar mission is accepted.

A review of the proposed techniques and equipment to provide "full abort" capability has shown that due to payload limitations this is not practical during the early lunar missions. Thus a reasonable element of risk will be involved. In order to decrease this element of risk and to understand where it occurs the lunar mission has been divided into six time periods.

These time periods are as follows:

a. Earth ascent.
b. Earth-moon transit.
c. Lunar terminal.
d. Lunar ascent.
e. Moon-earth transit.
f. Re-entry.

The development and test philosophy for this program is to launch the manned systems as early as possible in the program, but in an unmanned status. This will provide experience and allow the system to be checked out and "man-rated" before the first manned flight. It also means that the Lunex Re-entry Vehicle will be used for orbital and circumlunar flights prior to the lunar landing and return flight. The propulsion systems used for these early flights will be used throughout the program and the experience gained from each flight will increase the probability of success in reaching the final lunar landing and return objective.

Also these propulsion systems will be used concurrently in other programs and at the time of man-rating will possess greater launch experience than can be expected for the largest booster of the Space Launching System. This would indicate that a larger number of unmanned flights should be scheduled for the larger full boost system than for the early nights. It also points out the need for a sophisticated Earth Ascent Abort capability during the first manned lunar landing and return flight.

In providing an abort philosophy for the Lunar Program it should be noted that the Lunar Re-entry Vehicle, the Lunar Landing Stage and the Lunar Launching Stage all possess inherent abort capability if utilised properly during an emergency. With sufficient velocity the re-entry vehicle is capable of appreciable manoeuvring and landing control to provide its own recovery system. The Lunar Launching and Lunar Landing Stages possess an appreciable delta-v capability that can be used to alter the payload trajectory to better accomplish recovery of the man. However, in either case the manoeuvres mill have to rely on computing techniques to select the best possible abort solution for any specific situation.

With this background, and with the understanding that in a future final design effort "full abort" may be required, the following abort design objectives for the Manned Lunar Payload are presented:

Earth Ascent Phase

- On Pad - Full abort system will be provided.
- Lift-off to Flight Velocity for the Re-entry Vehicle - Full abort system will be provided.
- Flight Velocity for the Re-entry Vehicle to Escape Velocity - The basic Manned Lunar Payload will provide the abort capability.

Earth-Moon Transit
Injection - Abort capability to compensate for injection error is desired as part of the basic Manned Lunar Payload. Computing, propulsion, etc., capabilities should be designed into the basic system to provide for the selection of the optimum abort trajectory.

Mid-Course - Abort capability during Earth-Moon transit is desired for the Re-Entry Vehicle by means of a direct earth return, earth orbit, or circumlunar flight and earth return. Circumlunar flight generally requires the least, but the actual selection of the optimum trajectory should be accomplished when required by a computing capability, and executed by the Lunar Payload.

Lunar Terminal
This type of abort generally results from loss of propulsion or control of the Lunar Landing Stage. Where possible the Lunar Launching Stage will be used to attain a direct or circumlunar trajectory that terminates in an earth return. When this is not possible the Lunar Launching Stage will be used to accomplish the safest possible lunar landing. Recovery of the crew will not be provided in this system and selection of the above alternatives will be accomplished automatically on-board. Crew recovery will be provided by another stand-by Lunar Transport Vehicle.

Lunar Ascent
Maximum inherent reliability by over-design of components and systems in the Lunar Launching Stage seems to be the most logical approach for this phase due to the extreme weight penalty imposed by a separate abort system.

The early missions will be faced with the highest risk, but as a facility on the lunar surface is developed, a rescue capability and the addition of an abort capability can be developed. No specific abort system will be provided for this phase, but consideration should be given to the possibility of future lunar modifications to provide for abort.

Moon-Earth Transit
This would generally be associated with a gross trajectory error, or loss of control on re-entry. The only solution is to utilize the on-board capability that remains to achieve an earth orbit. After achieving orbit an earth-launched rescue mission would be initiated. This approach requires no additional abort system to be provided for this phase.

Re-entry
Exceeding re-entry corridor limits, or loss of control could cause an emergency where abort would be desirable. Should sufficient delta-V remain from the over-design of the lunar launch stage, and not be used during Moon-Earth transit this would be used to attain an earth orbit where rescue could be achieved. No separate abort capability is required for this phase, but availability of propellant should be considered.

2.5 EXPEDITION PLANNING

A detailed plan must be prepared for the complete Lunar Expedition operation. This plan must start from the first time man lands on the lunar surface and account for every single effort, or objective he is to accomplish during his stay on the surface. A crew of three men will be sent into a new and hostile environment where rescue or assistance from other human beings will be extremely difficult, if not impossible, for the first mission. Time will be at a premium and all items of equipment must be planned, designed and delivered in the Cargo Payloads so that they can be used in the easiest possible manner.

The procedures for first exploring the surface and then for constructing the expedition facility must all be derived, demonstrated and proven by earth operations prior to attempting the desired operation on the moon. An environmental facility that simulates the lunar surface with sufficient work area to test out equipment and procedures will be required.

The actual landing operation and the first effort by men on the surface requires detailed data about the moon's surface. The following chart represents the best available data. The chart is a portion of a Lunar Sectional having a scale of 1:1,000 (1 inch equals 16 miles) produced by the USAF Aeronautical Chart and Information Center, St Louis, Missouri. Present plans call for the eventual production of 144 charts to cover the complete lunar surface.

The best photographic resolution to date is around one-half mile on the lunar surface, which provides adequate data for charts having a scale of 1:1,350,000. Good astronomical telescopes can be used to improve on the photographic data and obtain sufficient detail to prepare sectional charts like the one included. However, larger scale, accurate lunar charts will be required to complete detailed plans. Data can be obtained for such charts from a lunar orbiting photographic satellite which will provide sufficient resolution and overlap to enable stereographic compilation of contours and elevations. The NASA proposed Lunar Orbiter program is a possible source of the required data.

Planning for construction of the expedition facility can begin only after detailed surface information becomes available. Examination of returned lunar core samples will be necessary before plans can be completed.

SECTION III - MASTER SCHEDULES

3.0 INTRODUCTION

The establishment of the Lunar Expedition Program as a national objective will provide a worthy goal for the United States industrial and governmental organizations. The Lunar Expedition program has been based on extensive study, design, and research work during the past three years.

A Lunar Expedition program will require the use and centralised control of a major portion of the present military space capability. This will have the effect of giving the military program a scheduled long-range objective, and still provide useable military capabilities throughout the period. As an example, manned re-entry vehicles for orbital operations will be available in early 1965. They will be followed by a manned lunar re-entry vehicle in 1966.

Propulsion and Space Launching systems will be required to support the Lunex program. The program will set orbital and escape velocity payload requirements ranging from 20 to 350 thousand pounds in a 300 mile orbit and from 24,000 to 134,000 pounds at escape velocity. This capability will be obtained at an accelerated pace for the Lunex program and as a result the same capability will be available for military use much earlier than could be achieved if the start of the development programs had to be justified at this time entirely on the basis of military usefulness.

The accomplishment of the Lunex program will require maximum use of several presently programmed efforts and reorientation of others. The major program of direct interest to the Lunex are the SAINT and BOSS programs. Therefore, these efforts have been co-ordinated and integrated with the Lunex program. The BOSS shots will provide the necessary orbital primate test data to allow the manned life support package for the Lunex Re-entry Vehicle to be designed. The SAINT unmanned and manned program will provide additional orbital information on rendezvous, docking, and personnel and fuel transfer. In the event that the direct shot approach for the lunar expedition requires reorientation in future years to use orbital assembly techniques this capability will be available from the SAINT program.

3.1 MASTER PROGRAM PHASING CHART

This schedule presents the integrated military program required to accomplish the Liner Expedition mission and to develop techniques for operating in the earth orbital and lunar arena. It was prepared to indicate the interface between this Lunar Expedition System Package Plan and the Space Launching system. The major national objective of this integrated program is to land men on the moon and return them in August of 1967.

3.2 LUNAR EXPEDITION PROGRAM SCHEDULE

This schedule presents the major items to be accomplished as a result of the Lunex program. The costing as shown on the schedule does not include the cost of developing the Space Launching System since this is provided under a separate System Package Plan. However, the cost of purchasing the flight vehicles is included.

The major "prestige" milestones of the program can be summarised as follows:

- First Manned Orbital Flight (3 Man Space Vehicle) - April 1965
- First Lunar Landing Cargo) - July 1966
- Manned Circumlunar Flight - Sept. 1966
- Manned Lunar Landing & Return - Aug. 1967
- Permanently Manned Lunar Expedition Jan. 1968

LUNAR EXPEDITION MANAGEMENT MILESTONES FY62 - FY63

This schedule indicates the major Lunex program efforts required during fiscal years 1962 and 1963. The time allocation for management and Air Force technical evaluations have been kept to a minimum in order to meet the end objective of "man on the moon" in August 1967.

Several critical major decisions are required and are summarised below:

- Program Approval & Funding - July 1961
- Development-Production Funding - Dec. 1962
- Design Concept Decision - Jan. 1963
- Approval for Hardware Go-Ahead - Feb. 1963

Delays in providing the funding indicated, or in receiving notification of decisions required, will have the direct effect of delaying the end objectives. This problem could be effectively solved by a streamlined management structure having a minimum number of reviewing authorities. The present AFSC procedures are a step in the right direction but more direct channels are desirable at the higher command levels

3.4 LUNAR EXPEDITION TEST SCHEDULE

This schedule presents the major test items required for the Lunex program. Upon completion of the program, manned transport and unmanned cargo vehicles will be available to support the Lunar Expedition. The cargo vehicle will be capable of transporting approximately 45,000 pound "cargo packages" to the lunar surface for supporting the expedition. This same vehicle would be capable of transporting future military payloads to the lunar surface to support space military operations.

A detailed high-speed re-entry test program and an abort system test program is scheduled to provide basic re-entry data and to insure the safety of the men in the Lunex Re-entry Vehicle.

Prior to the first "manned lunar landing and return" flight, a series of test and check-out flights will be required. These will initially consist of orbital flights, and then very high altitude (50,000 miles or more) elliptical flights for testing the vehicles under re-entry conditions. When these have been completed, the first flights will be made around the moon (circumlunar) and return to an earth base. With a completely man-rated vehicle, and unmanned lunar landing flights completed, man will then make the first landing on the moon for the purpose of selecting a site for the Lunar Expedition Facility.

3.5 LUNEX SPACE LAUNCHING REQUIREMENTS

The purpose of this schedule is to summarise the space launching vehicle requirements and indicate when the launches will be needed.

The THOR-ABLE-STAR boosters will be used for the re-entry test program. The Space Launching System boosters designated as A, AB and BC, and solids as required, will be needed as indicated and their payload capabilities are estimated as follows:

- Booster: Payload
- A 410: 20,000 pounds (300 mile orbit)
- AB 825: 87,000 pounds (300 mile orbit)
- AB 825: 24,000 pounds (escape velocity)
- BC 2720: 134,000 pounds (escape velocity)

3.6 PERSONNEL AND TRAINING

The Lunar Expedition program will require military personnel and a military training program. Details of this program are presented in Section IX and summarised on the Lunex Training Schedule included in this section.

The number of personnel required will increase from a limited staff in the early Program Office to a total of 6,000 personnel in the active expedition year. This total does not include "in plant" contractor personnel which is estimated to be on the order of 60 thousand.

Training of military personnel to meet the requirements of the Lunex program will be done by contractor and military training personnel. Maximum use will be made of program equipment when it can be scheduled for training purposes and in addition, allocation of production equipment is necessary to meet training requirements.

3.7 LUNEX CIVIL ENGINEERING FACILITIES SCHEDULE

The facilities development and construction program is shown on this schedule. The first item to be accomplished is a site survey to determine the extent that the Lunex program can be supported by AMR and PMR. When this has been accomplished it will be possible to determine if the early Lunex test launches can be accomplished by using present facilities.

Full consideration will be given to the possibility of building the Lunex Launch Complex as an expansion of the AMR or PMR. A more detailed presentation of the facilities program is contained in Section VIII, Civil Engineering.

Back to Contents or **Continue to Section IV...** →