SECTION X

INTELLIGENCE ESTIMATE

LUNAR EXPEDITION (U)

(LUNEX)

RECORD OF CHANGES

CHANGE NO.	DESCRIPTION OF CHANGE	DATE OF CHANGE	REFERENCE TO BASIC PART

[redacted]

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INDEX

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10. INTELLIGENCE ESTIMATES

10.0 INTRODUCTION

The purpose of this section of the program plan is to estimate the foreign threat in terms of technical capabilities and probable programs which may affect the establishment of a lunar expedition. The threat will be defined in terms of major performance capability and dates of operational availability.

10.1 FOREWORD

The following data was obtained from DCS/Intelligence, Hq ARDC and published Intelligence estimates.

10.2 PERFORMANCE CAPABILITY

The Soviets have flown geophysical and component equipment payloads on their vertical rockets for the development, modification, and acceptance testing of instrumentation for use on their satellite and lunar aircraft. They developed and used complex scientific instrumentation on Sputnik III, and stabilization, orientation and control equipment on Lunik III and Sputnik IV. Presently, by using their vertical rockets, the Soviets are testing infrared equipment, in addition to collecting data on the background noise level of the earth's surface. It is believed that a development program exists which eventually could lead to detection and reconnaissance satellites. The development program which led to the photographic system used in Lunik III is expected to continue, with an eventual application in photographic reconnaissance and weather satellites.

The Soviet space launch capability is shown in the following table of Sputnik and Lunik booster thrust levels:

Sputnik I	300,000 pounds
Sputnik II	300,000 pounds
Sputnik III	432,000 pounds
Lunik I, II, and III	456,000 pounds
Lunik IV, V, and VI	466,600 pounds

There is also evidence of a cluster of five 140,000 pound units. The Soviets are developing engines of 1 to $2\frac{1}{2}$ million

pound thrust. The estimated time for a booster to match this engine is as follows:

Single engine booster - 1963

Clustered engine booster - 1965

In general, it takes approximately half the time for development required in the U.S.

The maximum Soviet orbit capability, with present ICBM boosters using five (140,000 pound thrust) engines and four (6,600 pound thrust) engines is 10,000 pounds in low altitude orbit. All Lunik and Sputnik vehicles utilized a third stage having 12,500 pound thrust engine burning for approximately 420 seconds.

By using higher energy chemical propellants in modified upper stages, the payload can be increased up to 15,000 or 20,000 pounds during 1961. However, approximately 50,000 pounds of payload may be attained by 1962 if ICBM launch vehicle thrust is increased.

In the 1965-1970 period, a new clustered chemical booster should allow the Soviets to place 50 to 100 tons in orbit on individual launches. This will permit landing a man on the moon.

10.3 SUMMARY AND CONCLUSIONS

Very early the Soviets realized the propaganda value obtainable from space adventures and, accordingly, have striven continuously for "firsts". This has apparently influenced the detailed pattern for their space planning. Even though the Soviets have achieved "firsts" in:

1) Establishment of an artificial earth satellite

2) Rocketing past the moon and placing a vehicle into a solar orbit

3) Hard impact on the moon

4) Photographing the side of the moon not visible from the earth

5) Safely returning mammals and men from orbit

it seems obvious that the Soviet attempts to score "firsts" will continue.

Although large orbiting spacecraft appear to be the prime Soviet technical objective during the period of this estimate, it is believed they will continue to use and improve their current lunar probe capability since there are many "firsts" yet to be accomplished in the exploration of the moon. These include lunar satellites, lunar soft landings, lunar soft landings and return with actual samples of the lunar surface, and, finally, a tankette for a true lunar exploration.

It is expected that the Soviets will continue to launch unmanned lunar rocket probes for the purpose of reconnoitering the moon and near moon environment for the application of this knowledge to the development of manned lunar exploration systems.

Since soft landings are essential for obtaining data on the lunar surface, it is believed that the Soviets definitely will have to develop techniques for achieving lunar soft landings, especially soft landings and return to earth, to establish the procedures to be employed in accomplishing the main objective of establishing a manned lunar station. The first of these test vehicles could be very similar to their Arctic automatic weather stations that presently are jettisoned from aircraft. This vehicle would be able to record temperature, micro-meteorite impact, various types of radiation, particle concentration, seismic disturbances, solid resistivity, and depth of probe penetration. As landing techniques are improved, larger payloads with increased instrumentation for terminal control and lunar re-start and launch capabilities will undoubtedly be developed.

Circumlunar flights by manned space vehicles, and eventually lunar landings, will be required in order to know more precisely the environmental situation preliminary to the eventual establishment of a lunar base and the complete conquest of this body. This is considered to be a more distant objective of the Soviet program and its attainment will appear, if at all during this decade, toward the end of the period.

Although the landing of a "tankette" on the moon falls under the category of a soft landing, the size and weight of such a vehicle makes it a sufficiently worthy subject for special consideration. The Soviets have published extensively on such a vehicle, and Yu D. Khelbtsvich, Chairman of the Science Technical Committee for Radio Remote Control of Cosmic Rockets, has published his preliminary design of a tankette laboratory for lunar exploration. Graduate students of Moscow High Technical School now are experimenting with models of a tankette in layers of powdered cement to simulate powdered soil conditions which might be expected on the moon.

Actual accomplishment of the project will have to await the availability and flight testing of the new booster with thrust in the millions of pounds category in the 1965 time period.

The Soviets do not differentiate between military and non-military space systems. They have talked of a peaceful intent of their space program but there are many pounds of payload in their satellites which cannot be accounted for on the basis of data given out. It should be presumed that this could be military payloads. With this in mind, it can be stated that during the early 1970's it is possible that space weapon systems will be developed as a supplement to earth-based delivery systems. It is also possible that military facilities may have been established on or in orbit around the moon. Atmospheric and climatic conditions will demand an air conditioned environment for moon-based delivery systems. For increased survival security and decreased requirements for "imported" construction material, it seems reasonable to assume that these would be constructed under rather than above the moon's surface.

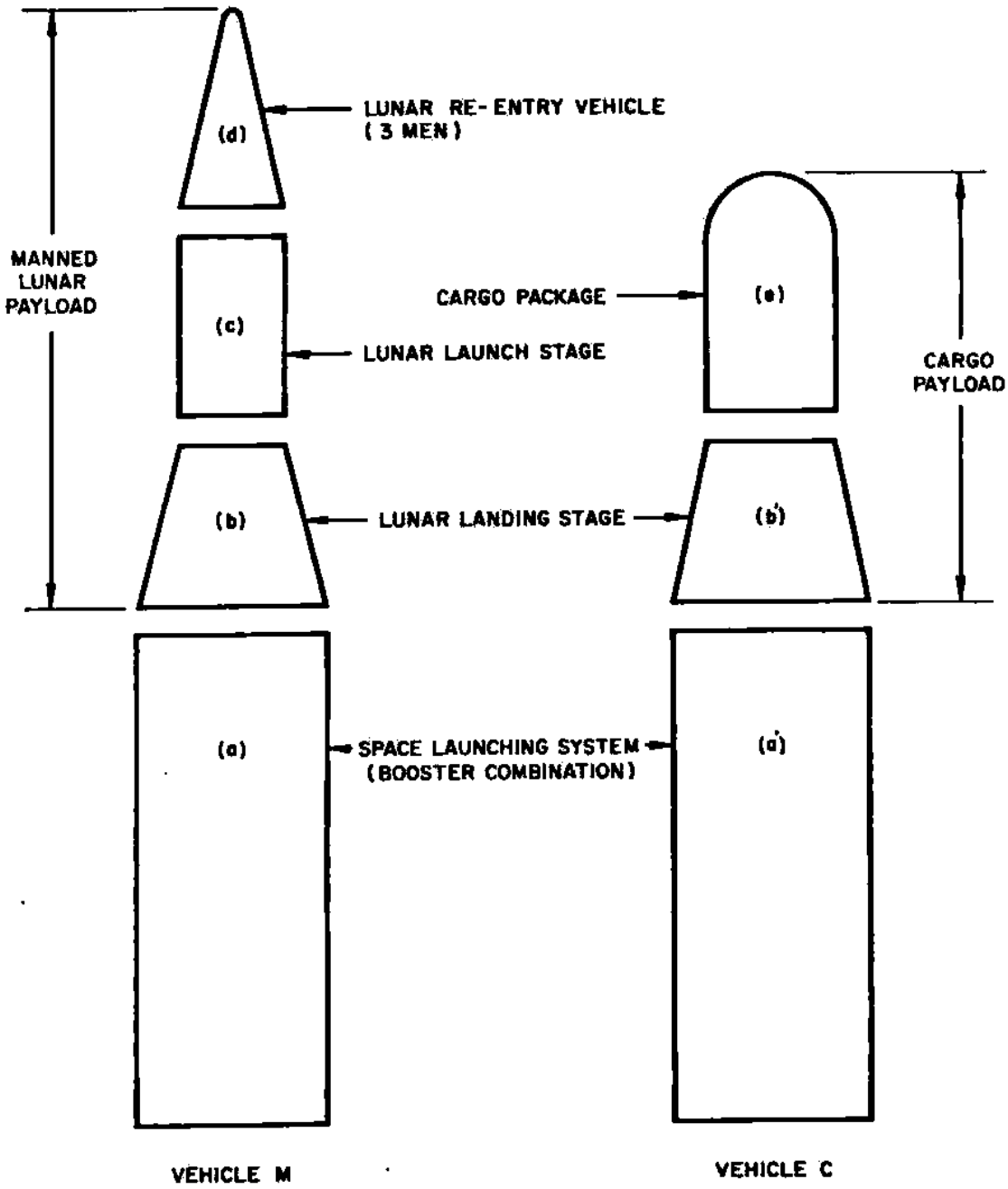

FIGURE A-1 LUNAR TRANSPORT VEHICLE

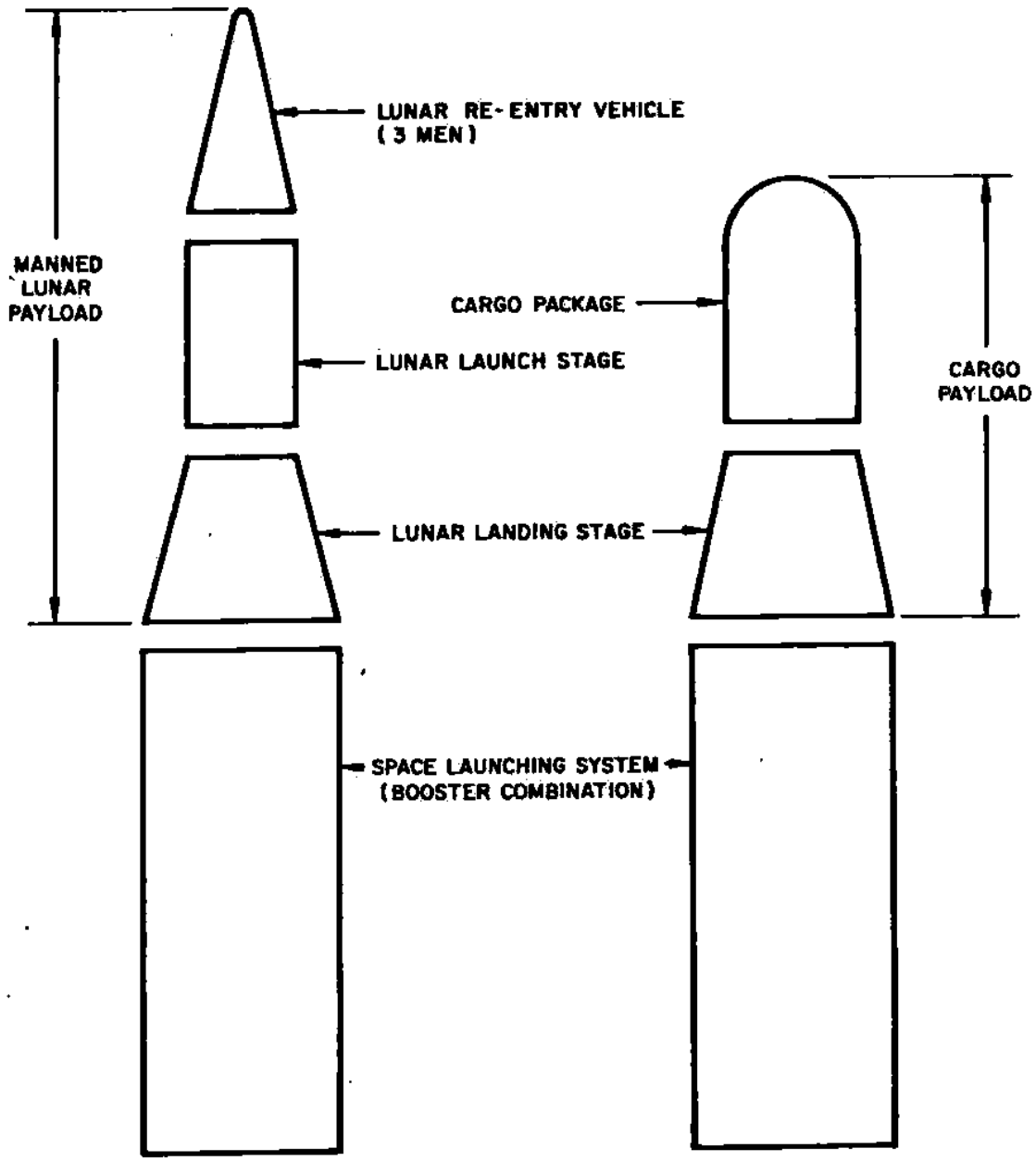

FIGURE 2-2 LUNAR TRANSPORT VEHICLE

WDLAR-S-458

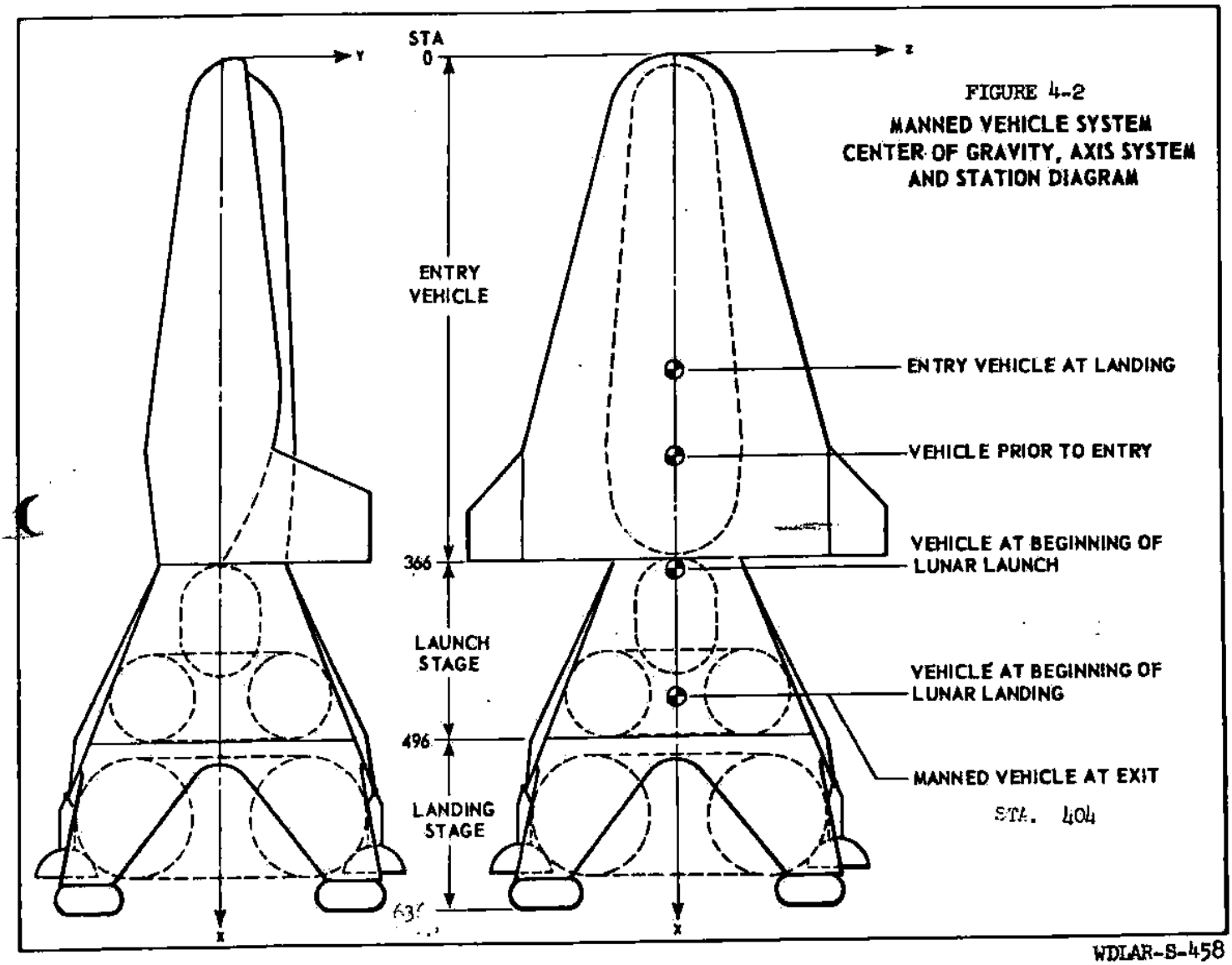

FIGURE 4-2
MANNED VEHICLE SYSTEM
CENTER OF GRAVITY, AXIS SYSTEM
AND STATION DIAGRAM

WDLAR-S-458

Cargo Package

The Lunar Cargo Package (See Figure A-1, item e) is that part of the Cargo Payload which represents a package consisting of supplies, equipment, etc., needed on the lunar surface. Preliminary design data indicates that an amount in excess of 40,000 pounds must and can be delivered to the lunar surface.

Cargo Payload

The Cargo Payload is that part of the Lunar Transport Vehicle which is placed on a selected lunar trajectory and is boosted to earth escape velocity. It consists of two major parts. These are:

Lunar Landing Stage

Cargo Package

This division is schematically represented in Figure A-1 by the parts labelled b and e. The cargo payload does not include a Lunar Launch Stage since the cargo package remains on the lunar surface. The weight of the Cargo Package is equivalent to the combined weight of the Lunex Re-entry Vehicle (3 men) and the Luner Launch Stage. The Cargo Payload weighs 134,000 pounds at earth escape.

Circumlunar

A highly elliptical trajectory that goes around the moon and returns to the earth.

Circumlunar Propulsion Stage

A stage attached to the Lunex Re-entry Vehicle to provide a suitable propulsion and control capability for maintaining the Re-entry Vehicle on a circumlunar trajectory.

Delayed Procurement Concept

Concept of deferring the final ordering and production of high-cost insurance type spares until maximum flight experience is available.

High-Speed Re-entry Test

A test program using a special Re-entry Test Vehicle designed to obtain fundamental re-entry data and specific configuration data at re-entry velocities of 25 to 45 thousand feet per second.

Lunar Expedition Facility

A facility designed to be constructed under the lunar surface and to support the Lunar Expedition. This facility will be designed so that it can be readily expanded to support future military requirements

Lunar Landing Stage

The Lunar Landing Stage is that part of the Manned Lunar Payload that will land the Manned Lunar Payload at a selected site on the surface of the moon. The expended portion of this stage is left on the lunar surface when the Lunex Re-entry Vehicle is launched for the return trip to earth (See Figure A-1, item b.).

Lunar Landing Stage - Cargo

The Lunar Landing Stage of the Cargo Payload (See Figure A-1, item b') is identical to the landing stage of the manned Lunar Payload. It provide the capability of soft landing the Cargo Package at a preselected site. The Cargo Payload is unmanned and the landing operation is automatic. The Lunar Landing Stage remains on the lunar surface with the Cargo Payload.

Lunar Launch Complex

The Lunar Launch Complex consists of the base facilities, integration buildings, check-out buildings, launch pads, propellant manufacturing plants, the complex control center and all of the equipment required to earth launch and support the Lunar Expedition.

Lunar Launching Stage

The Lunar Launch Stage (See Figure A-1, item c) is that part of the Manned Lunar Payload that will boost the Lunex Re-entry Vehicle to lunar escape velocity on a moon-to-earth trajectory. It will be ejected prior to earth re-entry.

Lunar Team

The Lunar Team consists of Air Force technical personnel from various Air Force System Command organizations and the various Air Force Command orgenizations. This team was formed to assist the SSD in establishing a sound Lunar Expedition program. The membership during the past two years has varied from 30 to 50 personnel:

Lunar Transport Vehicle

The Lunar Transport Vehicle is required to transport men and materials for the Lunar Expedition. The Lunar Transport Vehicle

consists of a Space Launching Vehicle and one of two payloads. One payload is the Manned Lunar Payload and the other is the Cargo Payload (See Figure A-1)

LUNEX

LUNEX is a short title for the Lunar Expedition Program

Lunex Program Director

The Lunex Program Director is the individual responsible for directing and controlling all facets of the Lunar Expedition Program.

Lunex Re-entry Vehicle

The Lunex Re-entry Vehicle (See Figure A-1, item d) is the only part of the Manned Lunar Payload that returns to the earth. It carries three men and all the necessary life support, guidance, and communication equipment that is required. It re-enters the earth's atmosphere and uses aerodynamic braking to slow down and land like a conventional airplane. The preliminary design of the Lunex Re-entry Vehicle calls for a vehicle 52 ft. long with a return weight of 20,000 pounds.

Man-rated

A vehicle, or system is considered to be "man-rated" when sufficient ground and flight test data has been accumulated to determine that the reliability objectives for the item have been achieved and that the abort system satisfactorily compensates for the inherent unreliability of the system.

Manned Lunar Payload

The Manned Lunar Payload is that part of the Lunar Transport Vehicle which is placed on a selected lunar trajectory and is boosted to an earth escape velocity of approximately 37,000 feet per second. It consists of three major parts. These are:

Lunar Landing Stage

Lunar Launch Stage

Lunex Re-entry Vehicle (3 men)

This division is schematically represented in Figure A-1 by the parts labelled b, c, and d. The complete Manned Lunar Payload weighs 134,000 pounds at earth escape.

Responsive Production Concept

A concept whereby long lead portions of high-cost operational spares are purchased unassembled to reduce costs until final decision is made on spares procurement.

Space Launching System

The complete system, including ground facilities, propellant manufacturing facilities, etc., as required to launch the boosters required for space operations.

STANDARD TERMINOLOGY

AGE

A term used to describe the Aerospace Ground Environment required for a specified system.

Abort System

The Abort System includes all the equipment required to remove, or return the crew members of the Lunex Re-entry Vehicle to a position of safety in the event of a malfunction of the Lunar Transport Vehicle.

PEP

P.E.P. are the initials for "Program Evaluation Procedure". It is a management tool which uses an electronic digital computer. It has the capacity to handle large masses of data quickly. The PEP system provides information that will enable the Lunex Program Director to quickly identify, locate, and consequently, correct program trouble spots.

QQPRI

A term used to describe Qualitative and Quantitative Personnel Requirements Information that is required to properly plan for personnel training.

RPIE

A term meaning Real Property Installed Equipment that is synonymous with Technical Facilities. Technical Facilities are those structural and related items which are built and/or installed by the Corps of Engineers and then turned over to the Air Force or an Air Force contractor.

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UTAF Lunar Chart

A chart prepared to a scale of 1:1,000,000 and covering the lunar surface. Present plans call for the preparation of 144 individual charts to cover the complete lunar surface.

PROGRAM TITLES:

BOSS

BOSS is the designation for "Biomedical Orbiting Satellite System". The BOSS program uses primates to provide life science data for designing manned space systems.

SAINT

The SAINT program will develop and demonstrate orbital rendezvous and satellite inspection techniques. It will further demonstrate the capability of closing, docking, and refueling.