

FUTURE USES OF THE LUNAR MODULE (LM)

(From appendix A; Grumman Aircraft)

Use of the Lunar Module hardware for post-Apollo programs is discussed. One of the promising Voyager Mars landing capsule configurations under study uses significant portions of Lunar Module hardware and technology, including the LM descent engine. The resultant decrease in development costs could represent considerable dollar savings to the Government for a Mars lander type of vehicle.

The LM has over 2,300 cubic feet of available volume and can carry over 20,000 pounds of payload. Study has been made of many manned and unmanned LM configurations and modifications which use its large volume, payload and propulsion capability to satisfy the goals of lunar exploration, Earth and lunar orbital missions.

The LM derivatives can perform missions that provide the basis for further long-duration space stations, lunar bases, manned planetary vehicles, and lunar roving vehicles. The studies have shown the LM can perform all of the Earth orbital missions that have been proposed. The advantages gained in using LM hardware for these missions stems from the continued use of the experienced LM engineering, manufacturing, and test teams together with the existing clean room type assembly areas, special test facilities and the three operational ACE stations located at the contractor's plant. Another advantage stems from the use of existing astronaut crews who will be thoroughly trained in the operation of Apollo/LM vehicles.

For over 3 years a wide variety of LM derivation have been studied to fulfill the following missions:

- Extended Earth orbit with resupply:

 - To 45 days.

 - To 105 days.

- Extended lunar orbit: To 28 days.

- On the lunar surface: To 14 days.

- Lunar roving vehicle: To 14 days.

- Space rescue.

- Military.

- Scientific (astronomy etc.).

- Applications (communications, Earth resources, etc.).

A short list of a few of the vehicles studied are:

- Apollo telescope mount LM: To obtain solar astronomy data unobtainable from any other method.

- Earth resources LM: Survey Earth resources on a large scale, particularly in remote areas. Separate module for sensors could be used for other missions.

- Augmented lunar module: Increased payload capability with astronauts for mission up to 14 days on the Moon.

- LM truck: A modified LM descent stage capsule of landing over 10,000 pounds payload on the Moon.

- 3-Man LM: Used for space rescue, place more men on the Moon or in space. Used as a space shuttle.