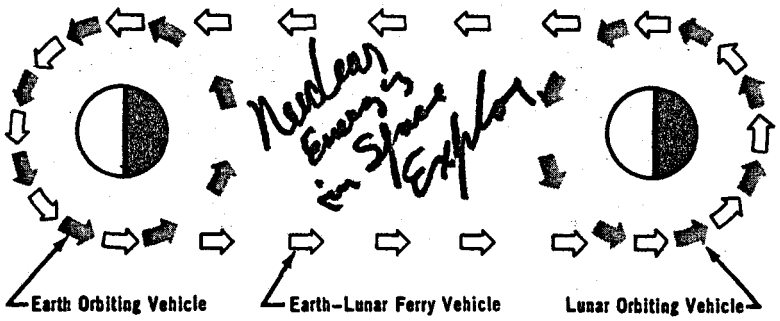

Figure 4. A lunar ferry system.

propellant energy. Thus nuclear rockets offer significant advantages in such an application because of their propellant economy. Although requirements for such an orbital taxi service have not been defined, it seems inevitable that it would be a vital link in a space program that includes manned orbital research laboratories and operational satellite systems for communications, navigation, meteorology, ground observation, and astronomy.

There is a mounting interest in the near planets Mars and Venus and, to a lesser extent, in the other bodies of the solar system. The amount of scientific interest stems from the good prospects of getting there with instruments and, ultimately, with men and also from the great importance of these planets in the search for knowledge of the solar system and of life.

We have recognized for a long time that nuclear rockets are vital to a manned exploration of Mars. The early objective of manned planetary flight will be similar to that of Apollo in relation to lunar exploration: to transport a few men to the surface of the planet with the capability of doing limited exploration and sample collection and to return them to earth. Even with nuclear rockets this will require that several million pounds of spacecraft and propulsion stages be boosted into earth orbit and assembled there into an interplanetary vehicle. With chemically powered rockets the initial weight would be two to four times greater.

Under one mission approach the Mars-bound vehicle would be propelled out of earth orbit into a transfer trajectory to Mars with the thrust furnished by two to four standard nuclear rocket engines. After a 200-day coasting trip, the next nuclear rocket stage would