

costs of about \$250 million for systems integration, facility modifications at ETR, additional checkout equipment, control center modifications, and two unmanned launches to qualify the new Titan IIIM-Apollo system. The Titan IIIM-Apollo system would have lower recurring costs than the uprated Saturn I-Apollo system by about \$15 million per launch, and after about 17 launches the savings would amortize the initial nonrecurring costs. Compared to a corresponding program using the uprated Saturn I-Apollo system, and assuming four launches per year in both cases, it is estimated that the crossover point at which a lower total program cost would result from introduction and use of the Titan IIIM-Apollo system would not occur until 7 years after a decision to proceed with it.

(c) Use of the Titan IIIM-Apollo system would have several disadvantages as compared to the uprated Saturn I-Apollo system. These include: (1) the payload penalty of about 10 percent; (2) the problems of integrating the Apollo system with Titan IIIM; (3) the program discontinuities involved in shifting to the Titan IIIM-Apollo after 12 uprated Saturn I-Apollo launches; (4) the delay of about 2 years in the time at which a post-Apollo nonmilitary low earth orbital manner program could get underway; and (5) the fact that the Titan IIIM cannot be used to place S-IVB stages in orbit for use and reuse with the airlock in the approach to the development of long duration flight capabilities which now appears to have significant advantages.

The only advantage in using the Titan IIIM to launch the Apollo system appears to be the lower ultimate total program cost if the total number of launches is large enough so that the potential long-term savings can be realized. In view of the experimental nature of the nonmilitary post-Apollo Manned Space Flight program now under consideration, and the possibility of a decision sometime in the next several years that a new system should be developed to meet the requirements as seen at that time, it does not appear prudent to make a decision at this time based on the assumption of high-volume or long-term use of either the Saturn IB-Apollo or Titan IIIM-Apollo system.

2. With respect to the use of the Titan IIIM-MOL system in place of the uprated Saturn I-Apollo system:

(a) An unmodified Titan IIIM-MOL system could meet some NASA post-Apollo objectives but would not be capable of achieving the longer duration flight and related experiment objectives which are a primary post-Apollo goal. An extensively modified Titan IIIM-MOL system suggested by the DOD (designated the uprated MOL system) might accomplish some of the long-duration flight objectives now envisaged, and this configuration has been used for comparison with the uprated Saturn I-Apollo system. Development of the uprated MOL system is estimated to require almost 4 years from the time a decision is made. With a vigorous