Opportunities for reconnaissance missions to Venus occur every 19.2 months. Venus reconnaissance missions are less demanding than Mars missions, total mission time being on the order of 1 year and energy requirements being approximately 80 percent of that required for Mars twilight missions.

Several mission variations on the basic Mars reconnaissance mission are available as possible follow-ons to a 1975 Mars twilight mission. Of particular interest among these are multiplanet reconnaissance missions. Multiplanet missions appear attractive because of the opportunity of exploring Venus, as well as avoiding mission profiles that go much beyond the Mars orbit near the asteroid belt. However, to date, only two opportunities for multi-planet reconnaissance missions have been identified during the 1975–1980 time period of interest.

Mission description and scientific return

Such a reconnaissance mission is a single impulse flight which makes a hyperbolic encounter with the planet, or planets, and provides a free return to earth. The manned reconnaissance spacecraft could carry a crew of four to six, a payload for inflight experiments and observations, planetary orbiting, impacting, and landing probes and a Mars Surface Sample Return probe. This flight system would be capable of experimentation in all fields of interest, including photography, exobiology, solid body and surface properties, and atmospheric properties, in addition to enroute experiments in astronomy, physics, and bio-medicine.

This chart shows a typical Mars Mission Profile (fig 116, MT66–10,212). The spacecraft proceeds along its trajectory with attitude control provided as necessary to maintain the desired orientation. During the interplanetary journey, many observations and measurements are made, and enroute experiments performed. Prior to Mars encounter, probes and orbiters are launched from the reconnaissance spacecraft. They are timed to arrive ahead of encounter, that is, the time of closest planetary approach by the manned spacecraft.

TYPICAL MARS/VENUS RECONNAISSANCE FLIGHT OPPORTUNITIES

LAUNCH DATE	LEGS IN DAYS	DURATION IN DAYS	ΔV INJECTION FEET PER SECOND	REENTRY VELOCITY FEET PER SECOND
MARS				
SEPT. '75	130/537	667	15,400	49,100
OCT. '77	145/533	678	14,800	48,700
NOV. '79	132/554	686	14,800	47,400
VENUS				
JUNE '75	117/250	367	12,000	44,600
JAN. '77	117/257	374	11,800	44,800
AUG. '78	116/249	365	11,800	43,300
APR. '80	109/250	359	12,000	45,000
VENUS/MARS				
DEC. '78	142/230/253	625	16,000	45,000
VENUS/MARS/VENUS				
FEB. '77		715	13,000	39,700

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FIGURE 115