

Dated: 02/22/01

## **EXHIBIT VII** **ASSUMPTIONS AND CONSTRAINTS**

The assumptions and constraints presented here are deemed to be applicable to the Mars Sample Return mission and other Mars Exploration Program elements which relate directly to sample return.

### **DESIGN CONSTRAINTS**

#### Design Margins:

For pre-project concept development studies, design margins for system masses, flight power and costs should be held to at least 30% where

$$\% = 100 * \frac{\text{Allocated} - \text{Estimated}}{\text{Allocated}}$$

#### Mars Landing Safety:

All technical approaches shall place a premium on landing safely on Mars, using:

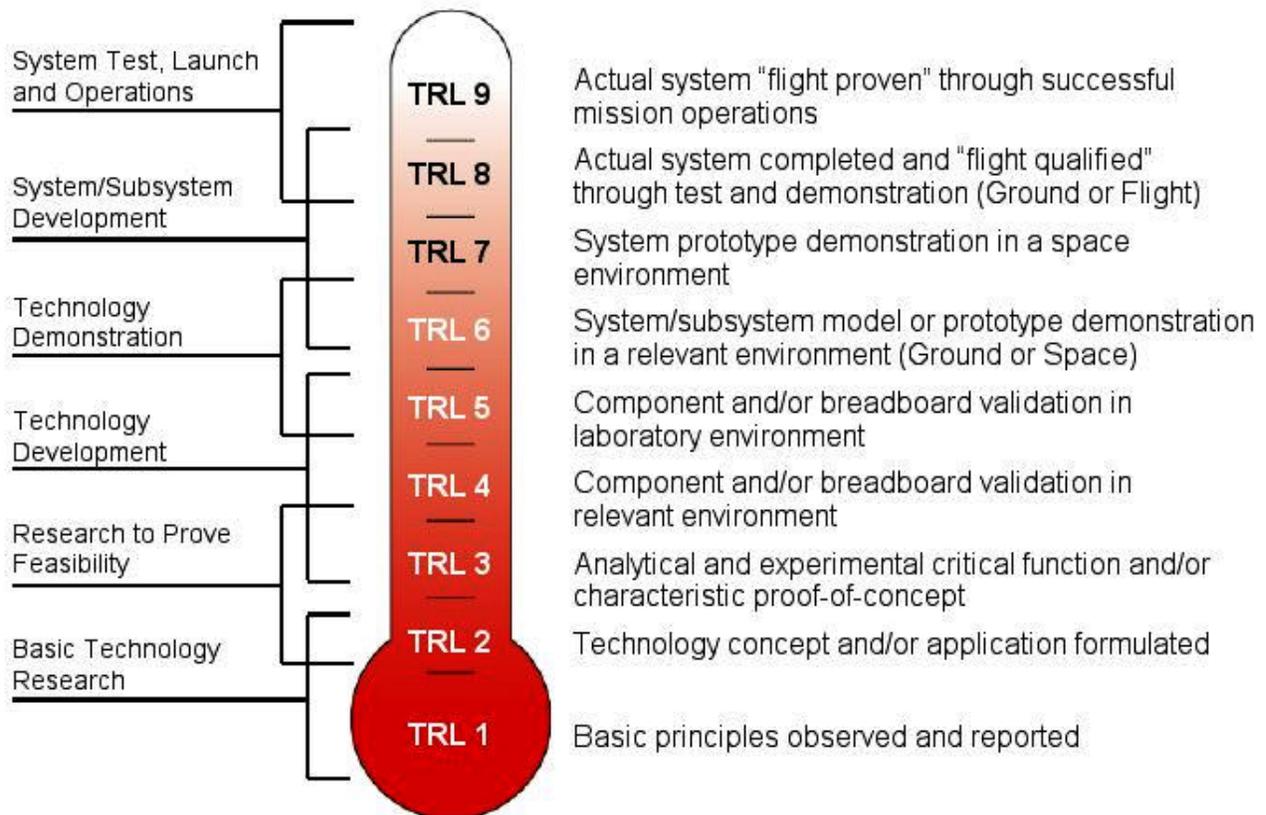
- robustness of landing system design to potential surface hazards  
and/or
- systems for hazard avoidance during landing.

## Technology Readiness:

Technology Readiness Level Achievement schedule constraints are specified as follows (See Technology Readiness Level Definitions Chart following):

- TRL 5 - by Preliminary Mission System Review  
(before Phase B start)
- TRL 6 - by Preliminary Design Review  
(before Phase C start)
- TRL 7 - by Critical Design Review (if required)  
(before Phase D start)

## Technology Readiness Levels (TRLs)



## **INFRASTRUCTURE AVAILABILITY ASSUMPTIONS**

- Ground telecommunications support - Deep Space Net
- Flight telecommunications support - at least one Mars orbiter in place to support sample return elements with telecommunications relay and proximity navigation support.
- Mission Operations - full services supplied by the JPL TMOD Mission Management Office (service in addition to core support must be costed)
  - Service functional description TBS at Kickoff Meeting

## **LAUNCH VEHICLE AVAILABILITY ASSUMPTIONS**

The following launch vehicles should be assumed available for Mars Sample Return missions:

- Delta family:
  - 2925, 2925H, 3940, 4040, 4240, 4450, 4050H
- Atlas family:
  - IIIB, V-401, V-501, V-511, V-521, V-531, V-541, V-551
- STS

## **SURFACE SCIENCE**

All technical approaches shall include capability for conducting science activities on the surface of Mars. All Lander designs shall allocate at least 50 kg for science instruments, including those to be used for:

- sample selection
- in situ science
- experiments supporting future human exploration

## **PROGRAM ACQUISITION STRATEGY**

- Statements in the Program Acquisition Strategy relevant to sample return are:
- Orbiters – RFP to industry (this shall apply to an orbiter used as part of a sample return mission, unless such an orbiter is supplied by international partners)
- Landers – hybrid in-house (JPL)/Industry effort (this shall apply to landers used as part of sample return)
- Science Instruments
  - Announcement of Opportunity by NASA
  - NASA declaration of facility instrument
- Other acquisition strategy elements possibly applicable to sample return:
  - Mars Ascent Vehicle – MSFC/Industry
  - Earth Atmospheric Entry Vehicle – LaRC/Industry
  - Sample Capture by STS at Earth – JSC/Industry