CRAF/CASSINI (C/C)

TDS Mgr: R. Gillette
NOPE: TBS

Project Mgr: J. Casani
Deputy Project Mgr: R. Draper

Launch Date: Cassini - November 26, 1995
CRAF - February 10, 1996

Projected SC Life/DSN Support: CRAF - 9.4 years
Cassini - 12.6 years

Project Responsibility: Jet Propulsion Laboratory

Source: SIRD August 1991
Sponsor: OSO

A. MISSION DESCRIPTION

CRAF (Comet Rendezvous Asteroid Flyby) - A mission to rendezvous with the comet Tempel 2 and to station-keep at the comet for a period of 2.6 years, including the comet perihelion. There is a flyby of the asteroid Mandeville prior to arrival at Tempel 2.

Cassini - A mission to place a spacecraft in a highly elliptical orbit around the planet Saturn and deliver a probe to the surface of its satellite Titan. There is a flyby of the asteroid 1989 UR1 prior to Saturn arrival.

Current Status - Congressional action on the Fiscal Year 1992 budget has cut funding for CRAF/Cassini, which will likely result in launch date changes. The next CRAF opportunity is a May 1997 launch to comet Kopff with arrival in late 2005. A likely Cassini launch would be October 1997 with arrival at Saturn in June 2004.

B. FLIGHT PROFILE

1. CRAF

Event	Date
Launch	10 February 1996
Maneuvers	6 November 1997, 1 November 1998, 18 September 2000, Others are TBD
Venus Gravity Assist	28 April 1997
Venus Gravity Assist	5 June 1998
Asteroid Flyby	25 February 1999
Earth Gravity Assist	19 June 2000
Comet Rendezvous	16 February 2003
Perihelion	15 February 2005
End of Mission	31 June 2005

2. Cassini

Event	Date
Launch	26 November 1995
Maneuvers	9 July 1998, 22 November 1998, Others are TBD
Venus Gravity Assist	2 December 1996
Earth Gravity Assist	5 July 1998
Asteroid Flyby 1989 UR1	7 January 1999
Jupiter Gravity Assist	9 April 2000
Saturn Orbit Insertion	25 June 2004
Probe Separation	20 October 2004
Probe Entry	12 November 2004
End of Mission	1 July 2008

C. COVERAGE GOALS

1. CRAF

The Project requires one tracking pass (plus one Delta VLBI pass) per week from the 34-m HEF stations during cruise periods, continuous 34-m HEF coverage from launch to L + 30 days and around gravity assists and maneuvers. Coverage from the 70-m is required during asteroid flyby, maneuvers, comet arrival and search. For a radio science experiment, continuous 34-m HEF and 70-m coverage is required for 30 days (March 20 through April 16, 2001).

2. Cassini

The Project requires one tracking pass (plus one Delta VLBI pass) per week from the 34-m HEF stations during cruise, continuous 34-m HEF coverage from launch to L + 30 days and around gravity assists and maneuvers. During Saturn orbital operations, one 34-m HEF pass per day for the 24 days of cruise-like activities, and continuous 34-m HEF support during the 6 days of high- level activities for each 30-day orbit are required.

3. Additional Anticipated Coverage

Both CRAF and Cassini will use their Low Gain Antenna (LGA) during most of the first three years of cruise. While using the LGA, 70-m support will be required to support the low 5- and 10-b/s telemetry. If the 70-m subnet is not implemented with an X-band uplink capability, simultaneous 34-m coverage will be required to provide the uplink in order to meet the command and navigation requirements.

D. FREQUENCY ASSIGNMENTS

CRAF is an X-band uplink and downlink mission. Cassini will be X-band uplink with either X- or Ka-band downlink. Ka-band will not be supported until January, 2002. Cassini will also have an S-Band Radio Science downlink capability. X-band, Ka-band and S-band channel assignments are TBS.

E. SUPPORT PARAMETERS

The support parameters for these missions are:

1. Telemetry	CRAF	Cassini
Initial Acquisition Time	30 min	Same
Radio frequency	X-band	S-, X-, and Ka-band (S-band carrier only)

Data rate	5 b/s to 497.7 kb/s	5 b/s to 497.7 kb/s (X-band), 169.5 (Ka-band)
Subcarrier frequency	22.5 kHz, 360 kHz	Same
Coding		
Convolutional	K-15, R=1/6	Same
Reed-Solomon	J=8,E=16,I=5	Same

2. Command

Radio frequency	X-band	Same
Data rate	7.8125 to 500 b/s	Same
Subcarrier frequency	16 kHz	Same
Subcarrier waveform	sinewave	Same
Coding	PSK/NRZ-L	Same
Power (emergency support)	20 kW on 70m or 80 kW on 34m (Jan., 2000)	Same

3. Navigation

Doppler, ranging, wide-band and narrow-band VLBI	Required	Required

4. Radio Science

Open-loop (near-real time)	Required	Required
Closed-loop (real time)	Required	Required

5. Monitor

Real-time station data	Required	Required

F. TRACKING SUPPORT RESPONSIBILITY

The DSN is responsible for all support for both CRAF and Cassini, including pre-launch checkout at CTA 21 and MIL 71.