TRACKING AND DATA RELAY SATELLITE SYSTEM (TDRSS)

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Launch Date: C - 29 September 1988; D - 13 March 1989; E - January 31, 1991; F - 19 November 1992
Projected SC Life/DSN Support: 10 years/10 years

Project Responsibility: Goddard Space Flight Center (GSFC)

Source: SIRD December 1982
Sponsor: OSSA

A. MISSION DESCRIPTION

The Tracking and Data Relay Satellite System (TDRSS) consists of four identical satellites in geosynchronous orbits and a dedicated ground station. The first two satellites (TDRS east and TDRS west) will form the operational TDRS service providing near-global real-time user satellite coverage. The third satellite will be an in-orbit spare.

The payload of each TDRS is a telecommunications service system that relays communication signals between low Earth-orbiting user spacecraft and the TDRSS ground terminal. This relay is accomplished by two types of communications links: (1) a multiple-access system, with one 30-element S-band phased-array antenna system; and (2) a single-access system, either S-band single-access or K-band single-access, with two 4.8-meter parabolic antennas, each operating at both S-band and K-band.

B. FLIGHT PROFILE

Each TDRS will be placed into a geostationary orbit with an altitude of 35,800 km. At apogee, the satellites will arrive at 56, 79, 102, or 94 degrees west longitude corresponding to deployment and transfer from the Shuttle orbits of 8th descending, 9th descending, 10th descending, or 18th ascending nodes, respectively. From one of these initial locations, each TDRS will drift to its operational position, resulting in one TDRS at 41 degrees west longitude (TDRS east) and one at 171 degrees west longitude (TDRS west). Each spacecraft will have an inclination of 0 degree. The in-orbit spare will be located between 55 and 70 degrees west longitude at a 0-degree inclination to minimize the time needed to reach either geosynchronous station.

C. COVERAGE

1. Coverage Goals

The DSN is responsible for supporting launch and transfer orbits and providing emergency support from Goldstone and Madrid beginning in February 1985. The 26- or 34-m antenna will provide the emergency support. Follow-on launch and transfer orbit support will be required for replacement launches from all three complexes.

2. Network Support

The support provided by the DSN is indicated in the following table:

System	Goldstone		Canberra		Madrid	
	12 14 15 16		42 43 45 46		61 63 66	
S-band TLM	B	P	B	P	B	P
S-band CMD	B	P	B	P	B	P
S-band TRK	B	P	B	P	B	P

NOTE: B = Backup; P = Prime (Launch support to ON stations)

D. FREQUENCY ASSIGNMENTS

Frequencies are allocated according to the following table:

System	Uplink (MHz)	Downlink (MHz)	Polarization
S-band TLM	--	2211.0	RCP
S-band CMD	2035.96	--	RCP
S-band TRK	2035.96	2211.0	RCP

E. SUPPORT PARAMETERS

The support parameters for the Telemetry, Command, and Support Systems are listed below:

(1) Telemetry

Data Streams	1
Format	PCM(NRZ-L)/PSK/PM
Subcarrier Frequency	1024 kHz
Bit Rate	250 or 1000 b/s
Record	Required

(2) Command

Format	PCM/PSK/PM
Bit Rate	2000 b/s
Subcarrier Frequency	16 kHz

(3) Support

Uplink Power	2 kW or 16 kW
Antenna Rate	Nil
Antenna Angle Data	Not required
Antenna Autotrack	Required
Doppler Rate	Nil
Range Format	Tone (Prime), DSN standard (Backup)
Recording	
. Analog	Required
. Digital	Required for radio metric data in 34-m backup mode

F. TRACKING SUPPORT RESPONSIBILITY

The allocation of responsibilities for tracking support is listed in the following table:

Mission Phase	Support Responsibility
STS Launch	STDN
Geostationary Orbit	WSGT
Emergency Support	DSN

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