The First 50 Years: A Historical Perspective

Deep Space Network

Doug Mudgway
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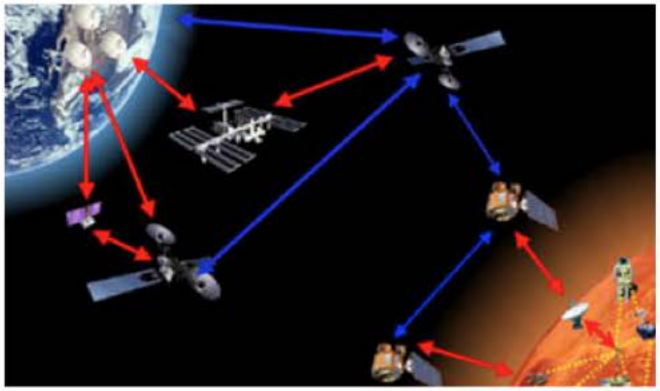
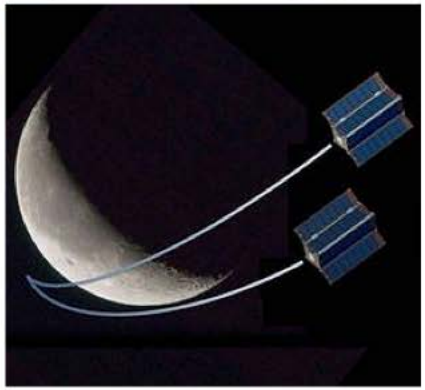
Deep Space Network, Service Management Office





This document has been reviewed and determined not to contain export controlled technical data.

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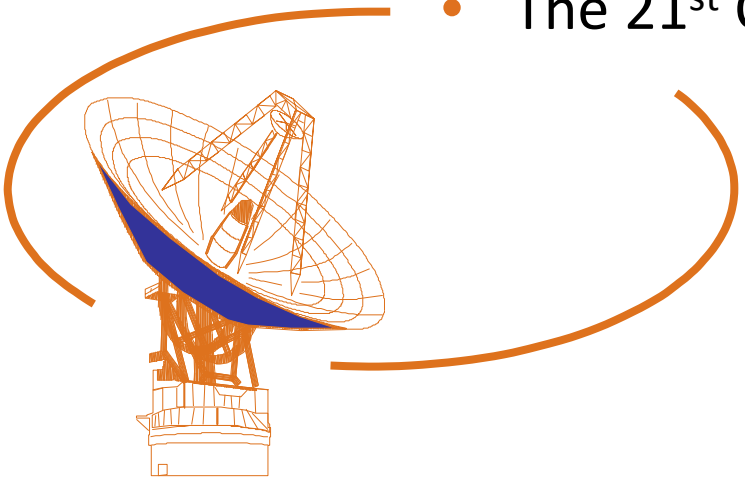
Agenda

- Deep Space Instrumentation Facility (DSIF)
- The Early Years of the DSN
- The 80's and 90's
- The 21st Century



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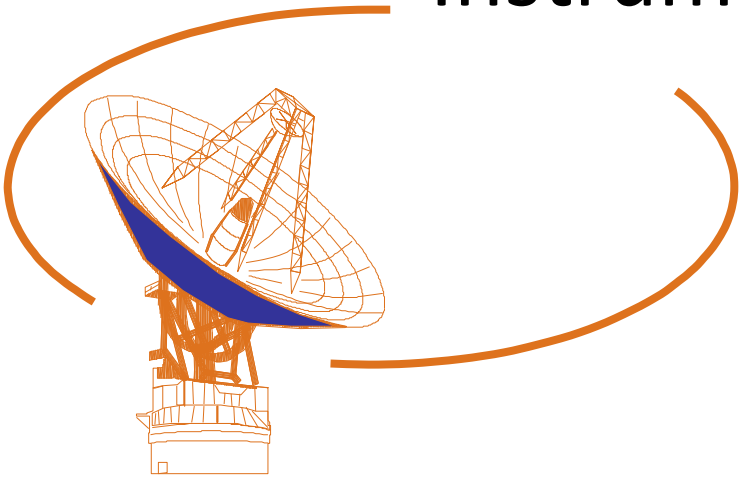
The Deep Space Instrumentation Facility (DSIF)



Deep Space Instrumentation Facility (DSIF)

The Original 26m Antennas

- DSS-11, Pioneer, Goldstone, California
- DSS-41, Woomera, Australia
- DSS-51, Hartebeestpoort, South Africa

DSS-11

DSS-41

DSS-51

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Deep Space Instrumentation Facility (DSIF)

DSIF Control Center 1962

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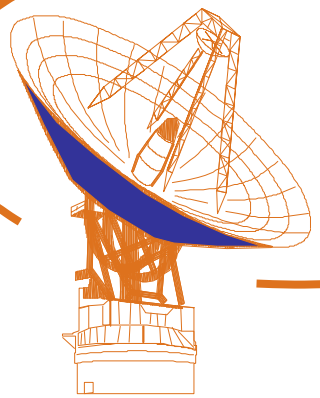
The Early Years of the DSN



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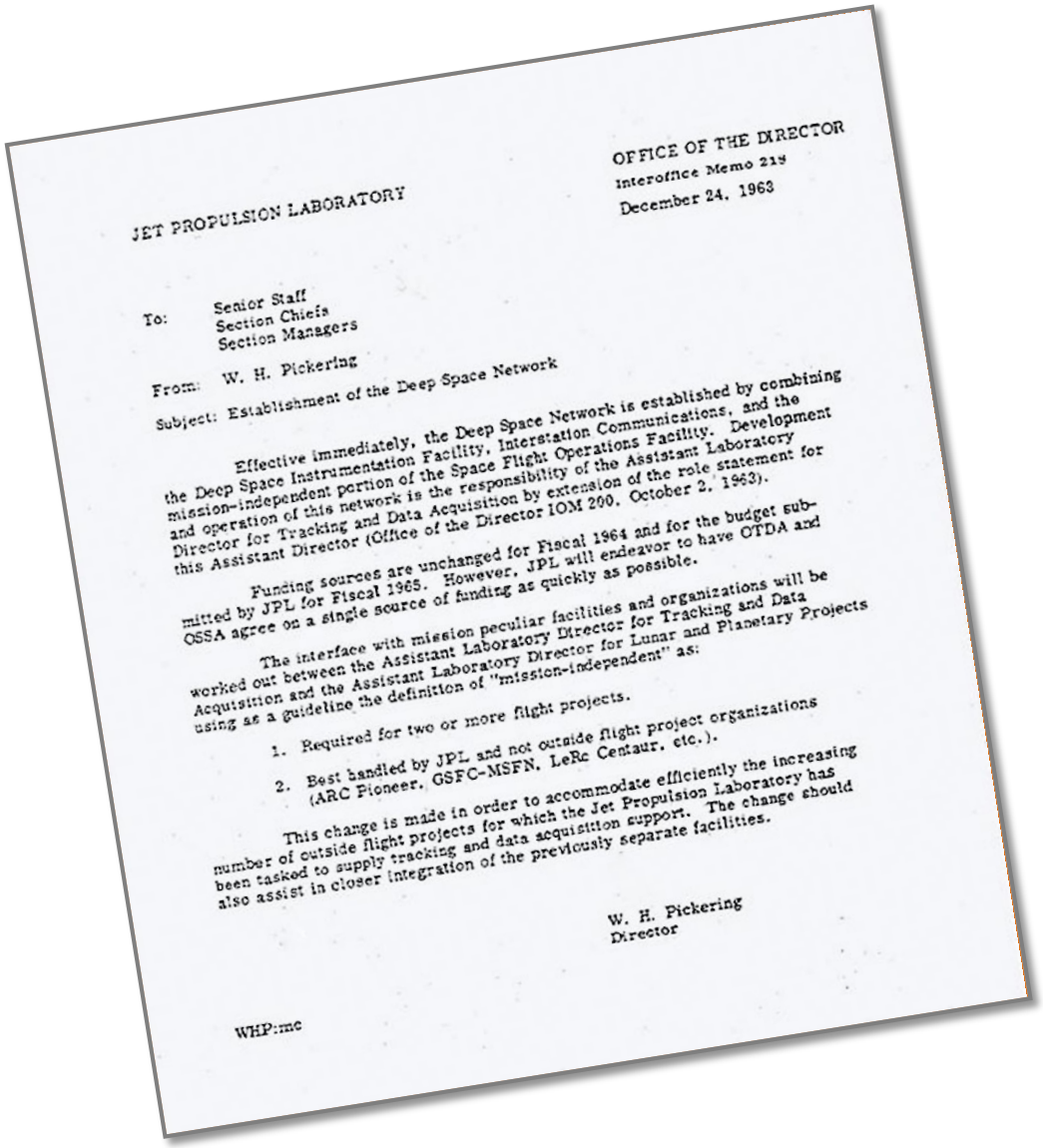
The Early Years



JET PROPULSION LABORATORY

OFFICE OF THE DIRECTOR
Interoffice Memo 219
December 24, 1963

To: Senior Staff
Section Chiefs
Section Managers

From: W. H. Pickering

Subject: Establishment of the Deep Space Network

Effective immediately, the Deep Space Network is established by combining the Deep Space Instrumentation Facility, Interstation Communications, and the mission-independent portion of the Space Flight Operations Facility. Development and operation of this network is the responsibility of the Assistant Laboratory Director for Tracking and Data Acquisition by extension of the role statement for this Assistant Director (Office of the Director IOM 200, October 2, 1963).

Funding sources are unchanged for Fiscal 1964 and for the budget submitted by JPL for Fiscal 1965. However, JPL will endeavor to have OTDA and OSSA agree on a single source of funding as quickly as possible.

The interface with mission peculiar facilities and organizations will be worked out between the Assistant Laboratory Director for Tracking and Data Acquisition and the Assistant Laboratory Director for Lunar and Planetary Projects using as a guideline the definition of "mission-independent" as:

1. Required for two or more flight projects.
2. Best handled by JPL and not outside flight project organizations (ARC Pioneer, GSFC-MSFN, LeRc Centaur, etc.).

This change is made in order to accommodate efficiently the increasing number of outside flight projects for which the Jet Propulsion Laboratory has been tasked to supply tracking and data acquisition support. The change should also assist in closer integration of the previously separate facilities.

W. H. Pickering
Director

WHP:mc

Establishment of the Deep Space Network

W. H. Pickering

December 24, 1963

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The Early Years

JPL Space Flight Operations Facility (SFOF) - 1964

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The Early Years

JPL Space Flight
Operations
Facility
Darkroom

- 1964

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The Early Years

DSS-14 – 64m – Goldstone, CA

26M antennas (Operational in 1965) – "Second Network"

- DSS-12
- DSS-42
- DSS-61

64M antennas

- DSS-14 (Operational in March 1966)
- DSS 43 (Operational in April 1973)
- DSS-63 (Operational in September 1973)

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The Early Years

Goldstone, California – 1964

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The Early Years

JPL SFOF Darkroom - 1969

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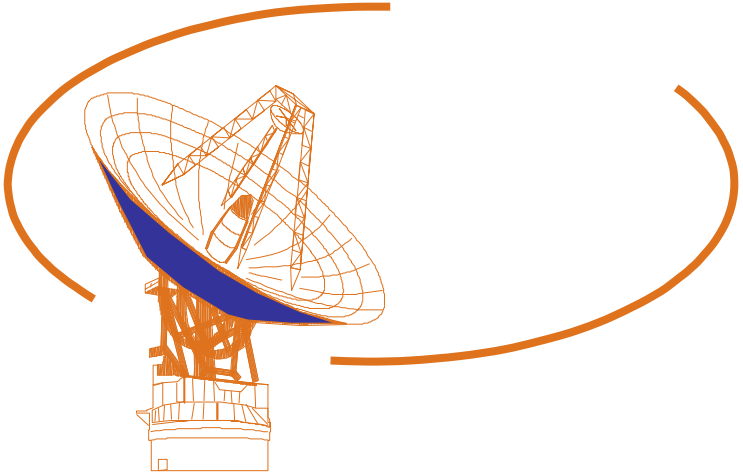
The 80's and 90's



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The 80's and 90's

DSS-12 – 34m – Goldstone, CA

- 26M upgrade to 34M and retrofitted with X-band receivers (November 1978 – April 1980)
- MKIVA Upgrade 1981-1985
- 34M High Efficiency Antennas (first X-band Uplink) for Voyager Uranus Encounter (1984-1987)

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The 80's and 90's

DSS-14 – 70m – Goldstone, CA

- 64M upgrade to 70M (1987-88) for Voyager Neptune Encounter
- 34M Beam Waveguide Antennas (February 1995 – October 1997)
- Block V Receiver
- DSN special development for the Galileo Low Gain Antenna Mission
  - First inter-continental arraying
  - First full-spectrum combining
  - The "Ultracone"

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The 80's and 90's

Apollo Valley
Goldstone, CA

USA

Jet Propulsion Laboratory
California Institute of Technology

The 80's and 90's

Madrid
Deep Space
Communications
Complex

Spain

Jet Propulsion Laboratory
California Institute of Technology

The 80's and 90's

Canberra
Deep Space
Communications
Complex

Australia

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California Institute of Technology

The 80's and 90's

JPL SFOF Darkroom – 1997

JPL SFOF Designated a United States National Historic Landmark in 1985

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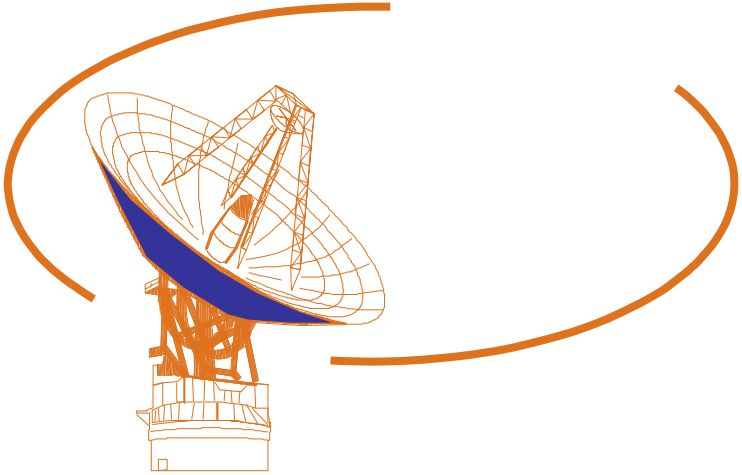
The 21st Century



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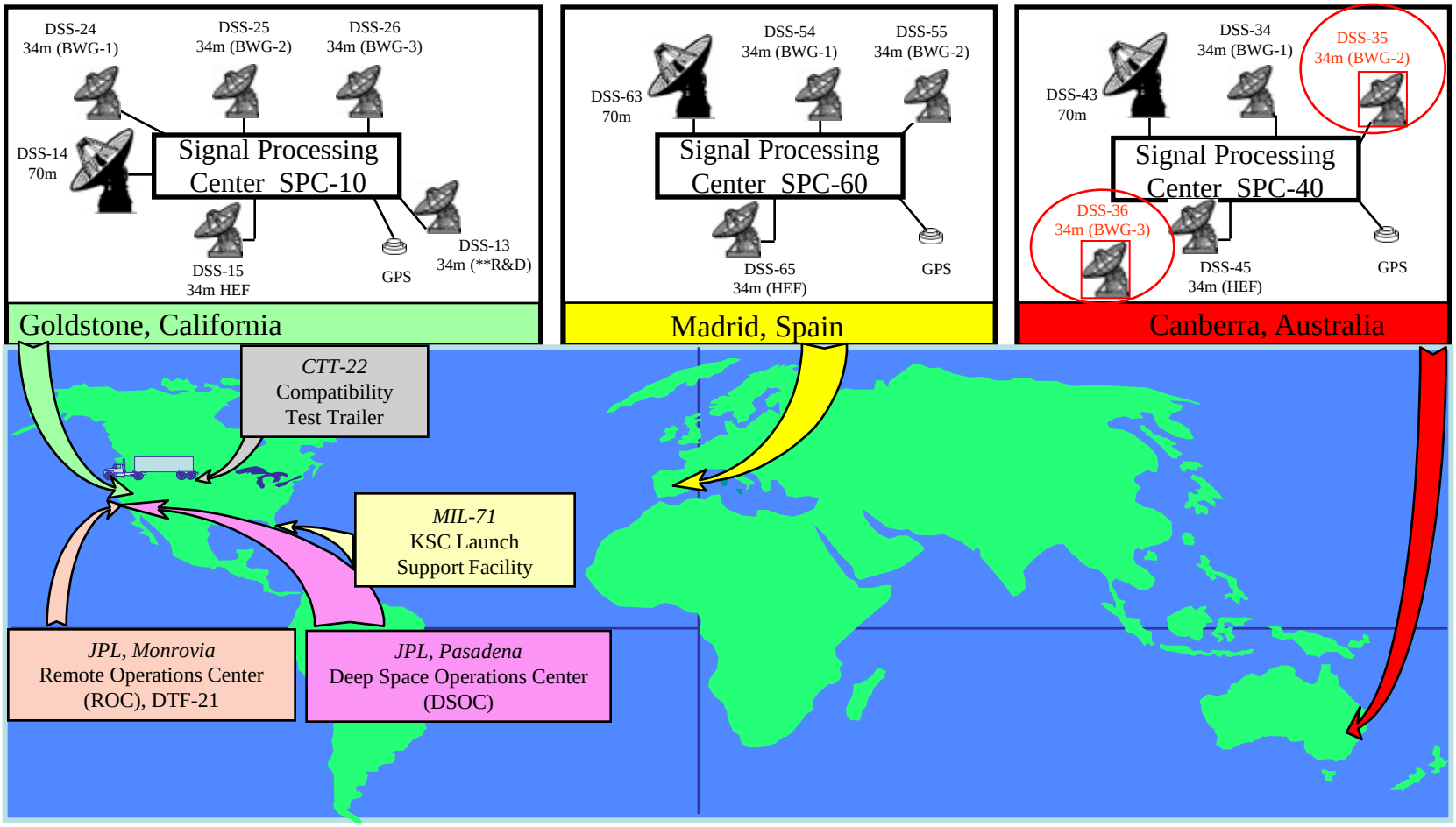
The 21st Century



DSN Facilities 2014

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The 21st Century

JPL SFOF Darkroom - 2014

- Network Simplification Project (NSP)
- 2003/04 and 2011 Asset (Antenna) Contention Periods
- K and Ka -band implementation

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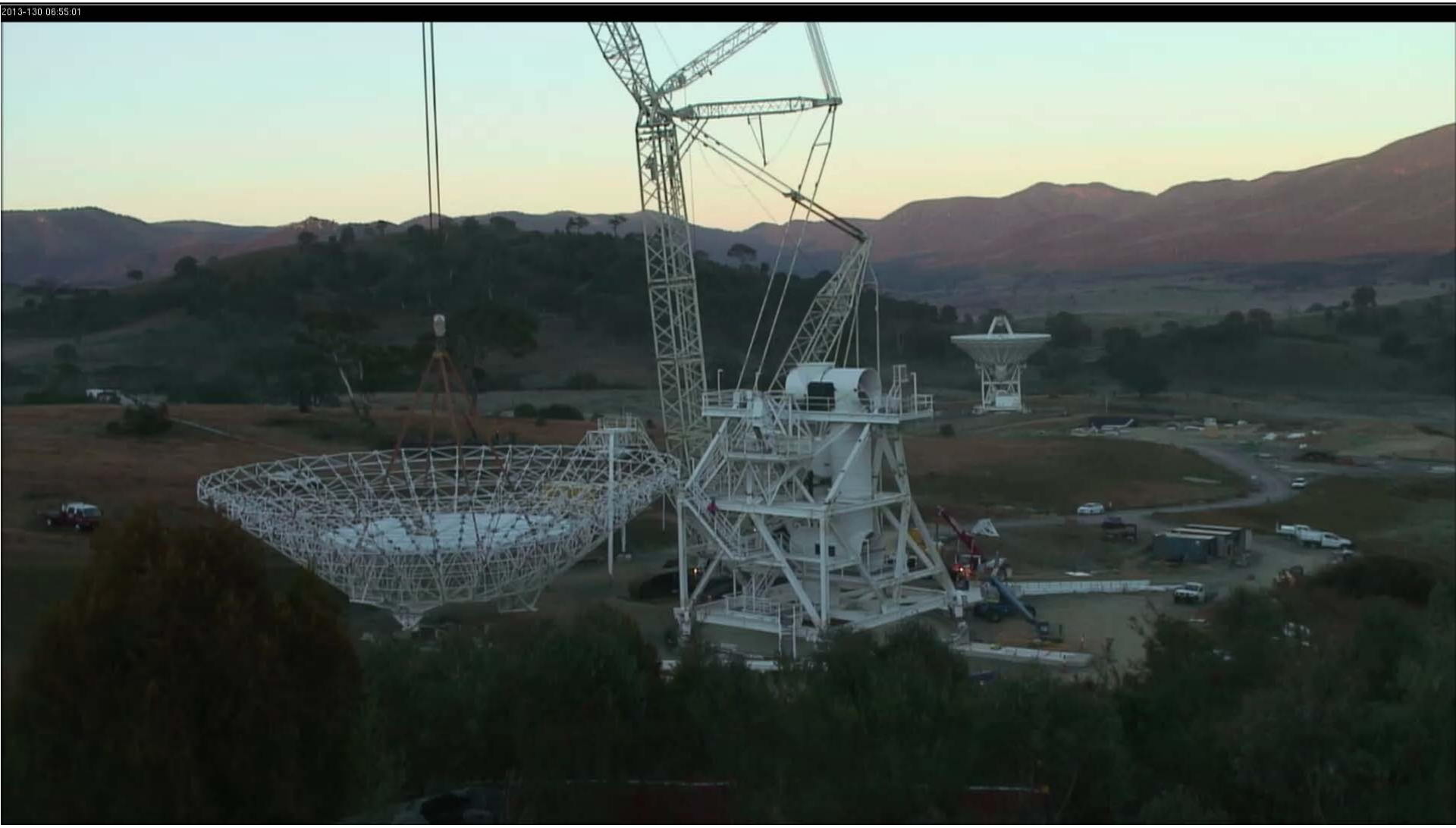
The 21st Century



Film of DSS-35 Dish Lift

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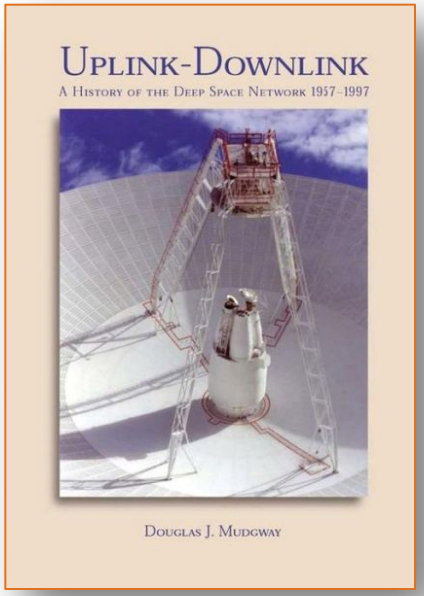
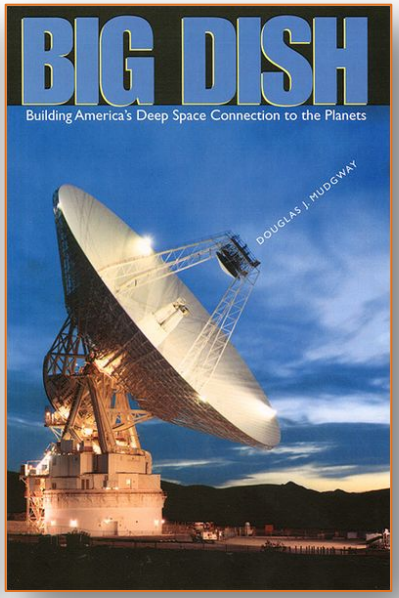
References for Further Reading



Uplink-Downlink

A History of the Deep Space Network 1957-1997

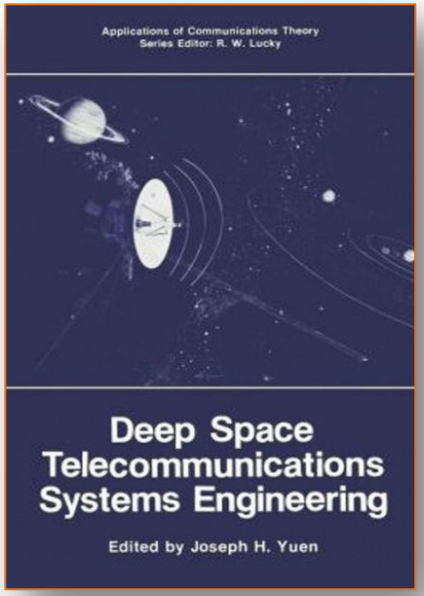
Douglas J. Mudgway



Big Dish

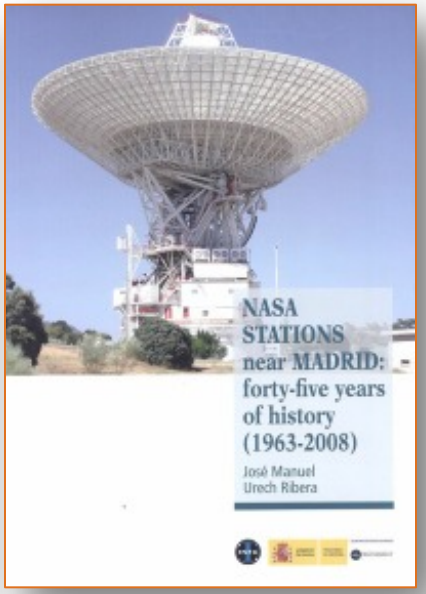
Building America's Deep Space Connection to the Planets

Douglas J. Mudgway



Deep Space Telecommunications Systems Engineering

Joseph H. Yuen (Ed.)



NASA Stations Near Madrid: Forty Five Years of History (1963 – 2008)

Jose Manuel, Urech Ribera