



2002 Space Ops Conference

Developing a Cross-Project Support System During Mission Operations: Deep Space 1 Extended Mission Flight Control

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DS1

- Testing New Technology
- Science Mission
- Small Team
- Multi-Mission Teams
 - S/C Teams
 - Flight Control



Flight Control Team

- Cross-Project Dedicated Aces VS Multi-Mission Support
 - Number of S/C tracked at one time
 - Where the tracks were run from
 - Track complexity
- Galileo and Cassini
- Aces-Turned-Managers



Spacecraft Team Interactions

- Questions About the Track:
 - The Answers:
 - Meetings
 - Overview with the Flight Director.
- *What was the amount of commanding?*
 - *What mode would the spacecraft be in during the track?*
 - *Were any unusual occurrences/anomalies expected?*
 - *Were there any spacecraft activities for the pass?*
 - *What was the amount of interaction the team wanted with the Ace?*



FCT Tools

- VOCA
- NOCC RT →
- DMD
 - DSN Monitor
 - S/C Engineering

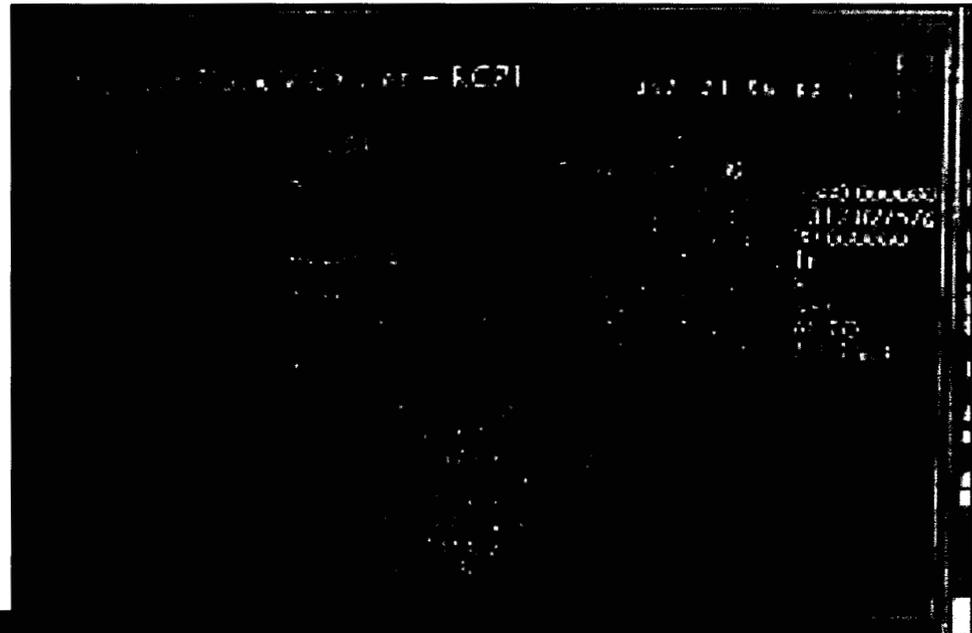


Photo credit: Ben Toyoshima, DS1 Media Album

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CPL=22:41:25          STFT1586  B#0      Pg= 1  #=000
FRT=00:00:00          M#0      0#0      DSS
  SFN  1      QUC  0      1586  0      1586  0      0000  0
  SFR  1      MAX  0      1586  0      1586  0      0000  0
  SFS  1      VUB  0      1586  0      1586  0      0000  0
  SFH  1      W21  0      1586  0      1586  0      0000  0
  SFC  1
  
```

Sub-Alarm DMD format used by most projects; from SIRTF

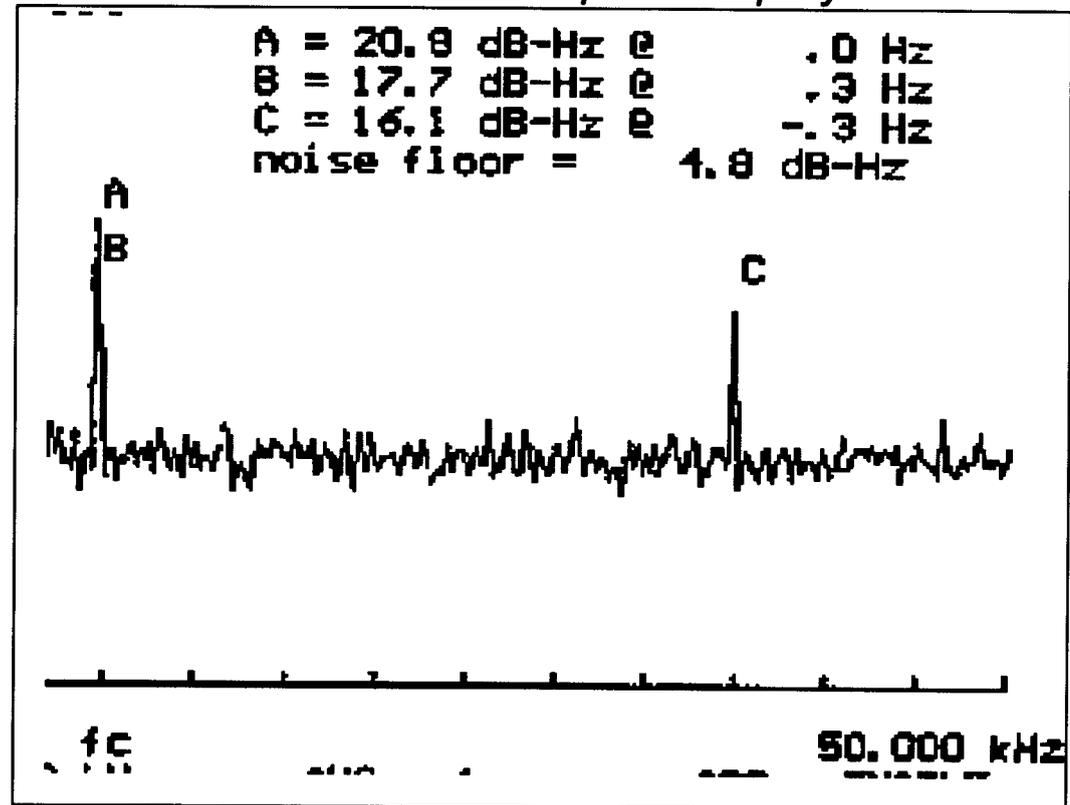


DSN Configuration

- New Technology
 - Ka Band Telemetry
 - Beacon Tone
- Ace-Station Interaction
- Documentation as a Solution

FFT Display:

From DSN tone pass displays





Communicating Pass Information

- Ace Binder
 - Pre-Pass Briefings
 - Track Information
 - Command Logs
 - Special Instructions
 - FCT Procedures/NOP

- Personal Contact
 - General passes
 - Complex Passes

DS1 FCT PRE-PASS BRIEFING SHEET – TONE PASS			
<u>General Spacecraft Health and Status:</u>			DOY:
DSS-	BOA:	EOA:	
Downlink			
o BOT is at _____ UTC and EOT is at _____ UTC			
o Please Use BVR Table: _____			
o Tone comes on at _____ UTC and ends at _____ UTC			
o Spacecraft Antenna: <u>HGA</u> <u>+X LGA</u> <u>-Z LGA</u>			
o the Downlink is <u>X-Band</u> , <u>Ka-Band</u> , the Polarization is <u>RCP</u> <u>LCP</u> , and Coding is <u>K=7 Rate= 1/2</u> <u>K=15 Rate= 1/6</u>			
o The expected subcarrier is 35 KHz, but it may be 20 KHz			
o Is the DSN set up to send a fax or an email of the FFT plots? (The fax and email info is also in the DKF.)			
(818-393-0530)		Email (F.H.Taylor@jpl.nasa.gov)	
o For FCT Information only (or if requested by DSN): (Mod Index = 45 Degrees)			



MSA Operability

- DS, Cassini, and Galileo MSAs
- Workstation Maintenance
- Logins
 - AAN
 - ACT
- Commanding





Did It Work?

- A “flawless” encounter.
- No major anomalies caused by Aces
 - No commanding errors made by the Ace
 - S/C anomalies were addressed quickly



Planning in the Future

- DS1's decision to use cross-project support was worked out during the mission, and even during a track.
- In the Future
 - Training *all* the Aces
 - Electronic Documentation