Orbits

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Orbit Requirements

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Requirements

- Minimize Eclipsing Over Mission
- Minimize All Propulsion Maneuvers
- Maintain Visibility Over BP (5° Minimum Elevation)
- Dispose of Observatory in GEO + 300 km Orbit
- Dispose of AKM in GEO + 300 km Orbit
- Perform Maneuvers to Achieve and Maintain Mission Orbit

Baseline Approach

- Orbit Transfer Plan Places Observatory in Orbit With LAN at 105°.
  - Standard Wait For Stage II Re-Ignition to Center GTO Maneuver at Equator
  - Dwell of 3.5 Revs on GTO to Allow Ground Track Drift to Desired LAN and to Generate Radiometric Data for Orbit Determination
- Place Ran of Mission Orbit Near 180° ± 50°
- Bias Initial Ran 11° to Account for Drift Over Mission
- During AKM Firing, Set Inclination to <31°
- Jettison AKM During SuperSync Orbit Phase
- Plan Contingency Orbit Transfers to Accommodate Impulse/pointing Errors During Maneuvers and Missed Maneuvers
- Plan Potential Orbit Trim Maneuvers (~1.25 Years) to Minimize LAN Drift
- Transfer FAME Observatory to Disposal Orbit at EOL

Major Trade Studies

- Use of E-W Station-Keeping to Maintain 88° West LAN
- Shortened Drift Between SECO-1 and Stage II Restart for GTO Maneuver
- Alternate Dwell Time on GTO (1.5 Revs) Before AKM Firing
- Eccentric vs Circular Mission Orbit
- Tradeoff Between Launch Window and Increased Eclipse Time Over Mission

Additional Trades/Studies

- Alternate Transfer Plans to Allow More Time on GTO for More Precise Orbit Determination
- Optimize Phasing Plan to Achieve Precise Mission Orbit
- Perform Contingency Planning for Orbit Transfer Plan

Orbit Determination

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Requirements

- Velocity Knowledge: 1 cm/sec, 3D RMS Postprocessed
- Use BP As Primary Tracking Site
- Minimize Active Ranging and 2 Way - Range-Rate
- Provide Tracking Requirements for All Mission Phases
- Provide Orbit Ephemeris for Maneuver Planning Support
- Perform Orbit Determination During All Mission Phases

Baseline Approach

- Define Tracking Accuracy (Range, Range-Rate)
- Use Covariance Analysis and Monte-Carlo Simulation to Establish Tracking Requirements (ODEAS and Other Internal Tools)
- Recommend Tracking Implementation and Tracking Schedule to Meet Mission Requirements
- Determine Data Arc Length for Best Velocity Fit (4 Day Batch)
- Simulate Radiometric Tracking Data and Validate Orbit Determination Solution Meets Requirements

Trade Studies

BP 2-Way Range-Rate BP 2-Way Range (10m / 8hr)	2-Way RR Duration and Interval	Velocity Error Avg cm/sec	Velocity Error Max cm/sec
Noise: rr 3s 3 mm/s r 3s 3 m Bias: r 15 m Station Location Bias 1 m	1hr / 8hr	1.05	1.09
Noise: rr 3s 3 mm/s r 3s 3 m Bias: r 15 m Station Location Bias 1 m	1hr / 24 hr	1.12	1.19

Additional Trades/Analysis

- **Perform Covariance Analysis on Launch Through Mission Orbit Insertion to Determine Minimum Tracking Sessions and Expected OD Performance**