

A Navigation Summary of OMM13 Performance

OMM13 was successfully implemented on 12 January 2000 at the scheduled burn centroid time of 10:39 UTC. This maneuver occurred on orbit number 34,716 near the boundary between repeat cycles 269 and 270. The commanded magnitude was 3.2001 mm/sec, compared to an ideal value of 3.20 mm/sec. This maneuver was applied in the orbit along-track direction to increase the mean semimajor axis by ~6.87 meters to reverse the satellite ground track drift westward and thereby remain inside the ± 1 -km control band.

The maneuver magnitude was selected in the presence of solar array lead positioning during all post-maneuver fixed yaw periods, most notably between 26 January and 19 February 2000, and next between 29 March and 19 April 2000. This strategy allows the adaptive use of lead or lag solar array positioning during these post-maneuver fixed yaw periods to selectively add available orbital boost or deboost to compensate for any errors in maneuver execution, or in predicting solar activity and the anomalous forces.

At the time of the maneuver, the ground track was ~182 meters east of the reference ground track, having a projected control band exit on 15 February 2000. OMM13 implementation on 12 January 2000 allowed for a single backup opportunity at the next cycle boundary on 22 January; this location was ~164 meters east of the reference track. The ground track location of the backup maneuver was very nearly the same as the primary maneuver location because lunar-solar gravitational perturbations temporarily offset the effects of the orbital decay induced by drag and the anomalous forces.

Orbit determination solutions obtained from the GSFC/FDF following the maneuver were used by the NAVT to estimate an achieved V of ~3.054 mm/s, which is ~4.5% lower than the commanded value of 3.2001 mm/s. The precision of this estimate is about 0.02 mm/s.

Based on the above performance evaluation, the ground track is expected to exit the control band in late April 2000 near repeat cycles 280 or 281, soon after the fixed yaw period that ends on 19 April. To move the maneuver location further away from this fixed yaw period in order to aid both maneuver design and evaluation processes, the NAVT will recommend use of partial lead/lag positioning of the solar array while flying backward in fixed yaw in February 2000. This strategy will be followed by full lead/lag positioning during the March-April fixed yaw period.

The exact placement of the partial lead/lag in February 2000 depends on the future behavior of the anomalous forces and solar activity, and their effect on the ground track. It is likely that the duration of the lag will be a couple of days, introduced by a real-time command sometime prior to returning to yaw steering on 19 February 2000. The return to lead position by stored command can then follow on 19 February during the scheduled transition back to yaw steering.

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