A Navigation Summary of OMM5 Performance

OMM5 was successfully implemented on 31 January 1994 at the scheduled burn centroid time of 20:50:30 UTC. The desired magnitude was 4.001 mm/s; the achieved magnitude was determined to be 4.116 mm/s, based on a 4-day postmaneuver tracking arc and a 26x26 truncation of JGM2 (a 20x20 model is used for routine operations).

The 2.9% overburn appears to be mostly attributable to limitations in predicting propulsion tank pressures (see SPAT material). This overburn will cause the satellite ground track to drift ~145 meters west of the targeted ground track (a net of ~180 meters from the west control boundary).

Limited post-maneuver analysis shows that current anomalous force levels have ~3 cm/day more boost in the orbit semimajor axis than the prediction model used for maneuver design. A larger boost rate increases the westward ground track drift rate. If these higher levels persist, the ground track could cross the west control band. Additional post-maneuver monitoring of the anomalous force is needed to more confidently predict the ground track using an updated prediction model.

The current discrepancy between the observed and predicted anomalous forces arises from a poor understanding of the force behavior as the satellite enters and exits periods of full sun (when $|\beta'|>55.7$ deg). The best available physical models do not predict the observed behavior. Empirical models based on the most recent observations have also proven limited, as the force does not exhibit repeatable behavior. Additional work is needed to improve the prediction model to reduce the effect of modeling errors on the ground track prediction accuracy.

Should updated predictions indicate the ground track has a high probability of crossing the west boundary, it may be possible to effectively reduce the excess westward drift during the next period of fixed yaw (nominal time 22 Feb-5 Mar 94). Entering fixed yaw early and/or returning to yaw steering sooner reduces the net orbital boost. The NAVT will be actively studying the sensitivities of ground track drift to changes in yaw event times to determine the need for any changes to better control the ground track.

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