Near Frozen Orbit Achievement of the KOMPSAT-1 Spacecraft

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The Korea Multi-Purpose Satellite-1 (KOMPSAT-1) was successfully launched by the Taurus at 07:13:00 UTC, December 21, 1999, from Vandenberg Airforce Base, California, U.S.A. Although the injection orbit of the KOMPSAT-1 was within the allowable tolerances of the Taurus launch vehicle, the size of the orbit was somewhat larger than that of the nominal size and the inclination of the orbit is greater than that of the nominal inclination. So, both in-plane and out-of-plane maneuvers were required to achieve the nominal orbit of the KOMPSAT-1 mission. The first in-plane orbit maneuver for decreasing the semi-major axis was performed on Jan. 1, 2000. Total burn time for the first maneuver was fixed to 3 minutes for calibrating the thruster performance and monitoring the attitude control stability. The first out-of-plane orbit maneuver for decreasing the inclination was performed on Feb. 2, 2000. Total burn time for the maneuver was 4 minutes and the thruster firing was executed at descending node. The second out-of-plane orbit maneuver for achieving the final target inclination was performed on Feb. 9, 2000. Total burn time for the maneuver was 6 minutes and the thruster firing was executed at descending node. The second in-plane orbit maneuver for decreasing the semi-major axis to the operational KOMPSAT-1 orbit was performed on Feb. 16, 2000. Total burn time for the maneuver was 263 seconds and the thruster firing was executed during the KGS contact time. Near frozen orbit was achieved by the second in-plane orbit maneuver. In this paper, the second in-plane orbit maneuver for achieving near frozen orbit of the KOMPSAT-1 is described. The post-burn orbit determination is performed and the performance of the thrusting is analyzed. Then, the variation of the mean orbital elements in near frozen orbit is derived.