



SHUTTLE FLEET LEADER OMS/RCS TESTING

SUMMARY

White Sands Test Facility (WSTF) is capable of performing ambient and altitude level testing of existing hypergolic orbiter maneuvering systems (OMS) and reaction control systems (RCS). The capability exists to maintain the systems in a manner similar to their flight counterparts and to perform repeated mission duty cycles representative of on-orbit missions to maintain a lead over the operational fleet. In addition, maintaining the OMS and RCS test articles in operational status provides a test bed capability to perform special system level or component level tests upon request. The capability also exists to track component and system level historical data.

BACKGROUND

The Shuttle Fleet Leader Program was initiated in December 1989. The OMS Forward Reaction Control System (FRCS) and Aft Reaction Control System (ARCS) space shuttle qualification test articles at WSTF are maintained in a manner similar to their flight counterparts at Kennedy Space Center (KSC). The overall goal of the project is to provide the shuttle program with high fidelity OMS and RCS ground test articles for use in hot-fire and off-line system and component tests. Fleet Leader data is used to extend system and component life, expand operating limits, and detect, predict, and prevent OMS and RCS life-dependent failures before they impact the shuttle fleet. This is accomplished by maintaining a lead of 35 percent equivalent missions over the "oldest" flight subsystem.

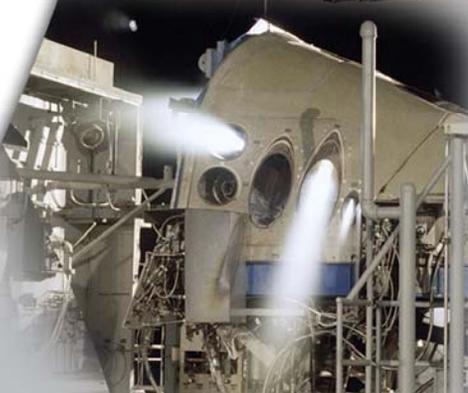
TEST ARTICLE CAPABILITIES

General requirements for the Fleet Leader Program include the performance of ARCS, FRCS, and OMS Fleet Leader mission duty cycle (MDC) firings. A firing cycle includes hot-fire preparations, propellant loading, propellant conditioning, the mission duty cycle firing and post-firing maintenance, post-firing inspection and evaluation, component and system functional checkouts, and recording of component and system level performance data. The data is tracked to determine historical failure trends, anomalies, and system performance. Additional capabilities include the ability to provide temperature condition and/or helium saturated propellant to any of the test articles to simulate in-flight conditions.

The Fleet Leader Program is also capable of special OMS/RCS-related testing. Special tests typically involve use of one of the Fleet Leader test articles or test stands. However, non-test article related special tests are also performed if they fall within the scope of the Fleet Leader Program. Also, general support to the shuttle program, including Shuttle Operational Data Book (SODB) and Operations and Maintenance Requirements and Specifications Document (OMRSD) scrubs, participation in the PRT, and telecons, is provided as required to provide input in system level and component level decisions.

OMS TEST ARTICLE

The OMS qualification test article is a complete subsystem mounted within a left-hand (LH) flight weight pod structure. It includes OMS helium pressurization system and propellant tanks, the orbital maneuvering engine (OME), and related system components. The OME ground support equipment (GSE) stiff links are used in lieu of motorized position actuators. No RCS components are installed in the pod. A LH RCS and a right-hand pod simulator are attached directly to the appropriate



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OMS fluid system interface. The OMS test article is installed in Test Stand (TS) 403, an altitude simulation test facility providing pressurant, propellant, control, and instrumentation interface to the OMS test article.

ARCS TEST ARTICLE

The ARCS qualification test article is a complete flight representative LH pod subsystem, but is mounted within a heavyweight test fixture. It includes the ARCS helium pressurization system, propellant tanks, sea-level primary and vernier engines, related system components, and OMS fluid system simulation hardware. A right-hand pod simulator is attached directly to the ARCS cross-feed system interface. The ARCS test article is installed in TS-301, an ambient test facility providing pressurant, propellant, control, and instrumentation interfaces to the ARCS test article. The test article is mounted to a mechanical structure capable of rotating the test article from the normally vertical launch attitude (90°) to the nose up ($+8^\circ$), horizontal (0°), and nose down (-2° and -12°) positions.

FRCS TEST ARTICLE

The FRCS qualification test article is a complete subsystem mounted within a flight-weight forward module structure. It includes FRCS helium pressurization system, propellant tanks, sea-level primary and vernier engines, and related system components. The FRCS test article is installed in TS-328. TS-328 is an ambient test facility providing pressurant, propellant, control, and instrumentation interfacing to the FRCS test article. The test article is mounted to a mechanical structure capable of rotating the test article from the normally horizontal to the vertical 90° and 98° launch positions.

CONTACT

David L. Baker, NASA White Sands Test Facility, Chief, Propulsion Test Office,
david.l.baker@nasa.gov, (575) 524-5605

