

# **NASA Range Safety Program 2006 Annual Report**

## **INDEPENDENT ASSESSMENTS PROGRAMMATIC AUDIT AND REVIEW ELV PROGRAM ORBITAL SCIENCES CORPORATION**

In 2006, the NASA Headquarters Office of Safety and Mission Assurance, Review and Assessment Division performed a compliance verification audit of Orbital Sciences Corporation's expendable launch vehicle contracts. The specific objective of the audit was to verify compliance to NASA's Safety and Mission Assurance requirements imposed within Orbital Sciences Corporation Small Expendable Launch Vehicle Services contract, NAS1099005, and the NASA Launch Services contract, NNK05LB04B.

The NASA Audit Team focused on the following six key areas within the contract: management; product control; process control; purchasing; safety, reliability, and quality; and launch complex. The audit was conducted at three major Orbital Science Corporation sites: Dulles, Virginia (April 24-28); Chandler, Arizona (May 8-12); and Vandenberg Air Force Base, California (May 15-19). The audit team at Vandenberg is shown in the photograph below.

### **Launch Complex Team**

The NASA Range Safety Office participated on the Launch Complex Team to assess Orbital Sciences Corporation's range safety and launch operations safety elements for compliance with the contracts and Orbital Sciences Corporation corporate policies, plans, procedures, and practices. Team members were Mike Dook, Lead (NASA Headquarters, Office of Safety and Mission Assurance), Jon Mullin (NASA Headquarters, Office of Safety and Mission Assurance), Tom Palo (Kennedy Space Center, Safety and Mission Assurance), and Marv Becker (SRS Technologies, Kennedy Space Center).

### **Basis for Assessment**

The assessment was based on observations of objective evidence; reviews of written procedures, records, and reports; inspections of Orbital Sciences Corporation facilities and launch vehicle flight hardware; and interviews with key personnel. The Launch Complex Team also reviewed the contracts and related documents to observe how those documents reflect current NASA policy and requirements related to range safety and the safety of launch operations. Mr. Dook and Mr. Mullin participated in the review at all three Orbital Sciences Corporation facilities. Mr. Palo and Mr. Becker joined the Launch Complex Team for the reviews at Chandler and Vandenberg.

### **Orbital Sciences Corporation—Dulles, Virginia**

The Launch Complex Team's primary point of contact while at Dulles was the Principal Safety Engineer for Pegasus and Taurus. The Principal Safety Engineer is responsible for ensuring that the requirements related to flight safety are satisfied for each Pegasus and Taurus launch. This includes all required coordination with the appropriate range safety organizations involved in each launch. The Principal Safety Engineer had been in that position for less than a year, but the person who held that position for the previous

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six or more years was available for consultation. The Launch Complex Team found these individuals to possess comprehensive knowledge of the Pegasus and Taurus launch vehicles as well as the NASA contracts and Orbital Sciences Corporation's approach to satisfying the associated requirements. The Launch Complex Team reviewed the corporation's corporate policy and internal safety requirements documents, Pegasus and Taurus program safety plans and procedures, documentation of mission specific safety decisions, and records of the corporation's coordination with range safety organizations on flight termination system and other range safety and launch operations related issues.

### **Orbital Sciences Corporation—Chandler, Arizona**

At Chandler, the primary point of contact for the Launch Complex Team was the Safety Manager for Orbital Sciences Corporation's Launch Systems Group. The Safety Manager oversees Orbital Sciences Corporation's safety program as it pertains to the development, production, and operation of Orbital Sciences Corporation launch vehicles including Pegasus and Taurus. The Launch Complex Team also spent significant time with the Principal Engineer for Industrial Safety at the Chandler facility. The team inspected high bays, workshops, and explosives storage facilities. The team also reviewed corporate policy and internal safety requirements documents, Pegasus and Taurus program safety plans and procedures, documentation of mission specific safety decisions, documentation of safety related engineering changes, and records of the corporation's coordination with range safety organizations on flight termination system and other range safety and launch operations related issues.

### **Orbital Sciences Corporation—Vandenberg Air Force Base, California**

At Vandenberg, the primary point of contact for the Launch Complex Team was the Principal Safety Engineer for Orbital Sciences Corporation's Vandenberg Operations. This engineer is responsible for the corporation's safety program at the Vandenberg facility and for coordinating with the Air Force on facility and operational/ground safety concerns associated with preparing Orbital Sciences Corporation launch vehicles for flight. The Principal Safety Engineer at Vandenberg also assists the Principal Safety Engineer for Pegasus and Taurus in resolving any flight safety concerns. The Launch Complex Team had significant discussions with the corporation's Safety, Reliability and Quality Assurance Director and Chief Engineer.

The team inspected Building 1555, which Orbital Sciences Corporation occupies on Vandenberg Air Force Base under a Commercial Space Launch agreement. The team reviewed facility safety elements, including fire protection, explosive safety, and lightning protection. The team also inspected the flight hardware currently being processed in Building 1555, which included the Pegasus Stages 1, 2, and 3 that will be used for NASA's Aeronomy of Ice in the Mesosphere mission. The Launch Complex Team walked down the flight termination system components currently installed on those stages. The team reviewed the safety inspection process implemented at Vandenberg,

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documentation of mission specific safety decisions, documentation of safety related engineering changes, and records of the corporation's coordination with the Air Force range safety organization on facility safety and launch operations related issues.

**Audit Results**

The audit results were briefed to the Launch Services Program and Kennedy Space Center management, and all range safety related findings will be tracked to closure by Kennedy Space Center Safety and Mission Assurance. The audit final report, dated 7 July 2006, and all findings can be accessed at the NASA Process Based Mission Assurance website <https://secureworkgroups.grc.nasa.gov/> under the ELV PA&R Compliance Verification Audits Enhanced Secure Work Group.