

2011

**NASA Range Safety
Annual Report**

D. Kennedy Space Center

In addition to hosting the NASA Range Safety Staff, KSC has its own Center Range Safety team led by the KSC Range Safety Representative. The KSC Range Safety Representative is tasked with implementing NASA policy and keeping the NASA Range Safety Manager informed of all KSC activities related to range safety. Over the course of the past year, KSC Range Safety supported a multitude of range safety activities including Design, Development, Test, and Evaluation (DDT&E) support to new programs, and support to Shuttle and ELV launch operations on both coasts. The following articles provide a brief summary of these activities.

1. DDT&E Support

a. Ground Systems Development and Operations (GSDO) Program

The advent of the GSDO Program, formerly 21st Century Space Launch Complex, and the Range Interface and Control Services Product Line in particular provides a unique opportunity for NASA and the USAF to work together to increase the flexibility, responsiveness, affordability, and capacity to support launches with the frequency and turnaround times necessary to meet customers' needs.

KSC Range Safety provided technical support and leadership to the GSDO Range Interface and Control Services (RICS) product line in 2011. KSC Range Safety and 45th Space Wing (45 SW) safety personnel proposed several potential GSDO projects and became the technical co-leads for the Range Architecture Study Tools & Processes sub-team which contains most of the range safety-related projects. KSC Range Safety worked closely with 45 SW safety personnel and Space and Missile System Center (SMC) personnel in 2011 to research fully, justify, and plan the technical approach and acquisition strategy for these projects, in addition to developing an overall range architecture for the future (2012 goal). Selected projects approved by the GSDO Program Control Board in 2011 are highlighted below.

(1) Chevron and Destruct Line Automation

This project replaces the chevron and destruct line manual AutoCAD processing with automated processing using the 45 SW's Safety Hazard Analysis and Risk Processing (SHARP) toolset. Other range processes have already been developed, certified, and replaced at the 45 SW using SHARP. Chevron lines enable rapid interpretation and response of an anomalous vehicle and provide higher fidelity in the immediate launch area where it is needed. This project could reduce the flight analysis mission support timeline by as much as three to five days.

(2) Risk-Based Safe Siting Tools

This project develops a suite of software tools for risk-based explosive safe siting and hazard assessment (RES). Traditional Quantity-Distance safe siting is by simple equation, based only on weight and type of energetic material. RES approach allows for more realistic analysis of fragmentation, thermal effects, acoustics, toxics, etc., and integrates with a detailed evaluation of hazards. The RES toolset can be used across NASA for hazardous operations analysis to reduce conservatism and increase flexibility. With physics-based tools, the safety staff can focus on protecting people and critical equipment while identifying unnecessary/costly mitigations. A product of one of the tools being developed by ACTA, Inc is shown in Figure 19.

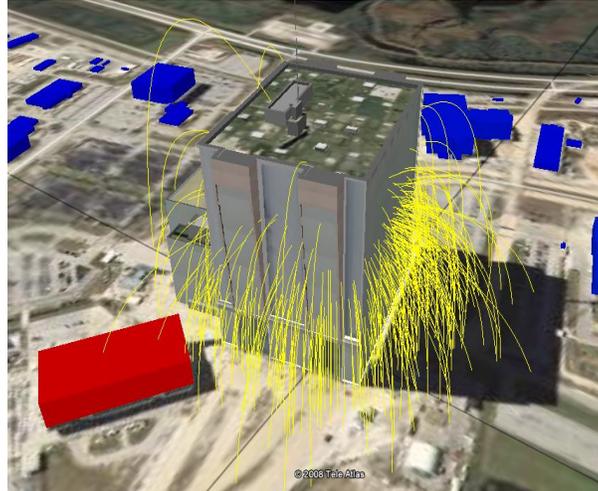


FIGURE 19: VEHICLE ASSEMBLY BUILDING (VAB) RISK-BASED EXPLOSIVE SAFE SITING AND HAZARD ASSESSMENT (RES) DEMO

(3) Central Command Remoting System (CCRS) Upgrade

This project replaces the current 1970s technology Central Command Remoting System (CCRS) located in the Morrell Operations Center (MOC) at CCAFS. The current system has vanishing spares and equipment failures that have caused Range Red conditions for several missions. The Air Force is currently funding FY10 development and testing of a prototype system that includes Enhanced Flight Termination System (EFTS) flight code capability. The current CCRS does not have EFTS capability, which must be in place by 2015 to meet USAF requirements. This project will help fund the installation, testing, and operational acceptance of the new CCRS system at Jonathan Dickinson Missile Tracking Annex (Figure 20).



FIGURE 20: JONATHAN DICKINSON MISSILE TRACKING ANNEX

b. Commercial Crew Program Office (CCPO)

KSC Range Safety provided technical support to the Commercial Crew Program Office (CCPO) in 2011 by developing the Range Safety inputs for the Commercial Crew suite of requirements and standards documents.

The requirements document will contain the technical, safety, and crew health and medical requirements that are mandatory for commercial provider's attempting to obtain a Crew Transportation System Certification to transport NASA crew and limited cargo to and from the International Space Station. The NASA Range Flight Safety Program (NPR 8715.5 Rev A) requirements are currently listed as part of these mandatory requirements. If the commercial crew missions are licensed by the FAA, then FAA Safety regulations will apply and NPR 8715.5 will not. Thanks to the efforts of the Common Standards Working Group, any differences between the FAA regulations and NASA range safety requirements are minimal. NASA range safety would remain engaged as needed to support the CCPO and coordinate with safety authorities regarding any FAA licensed activities.

The requirements document will contain descriptions of processes, standards, and specifications, as well as the criteria that will be used to evaluate the acceptability of the commercial provider's proposed processes, standards, and specifications. Portions of NPR 8715.5 Rev A and/or its referenced documents may be included in this document.

The KSC Range Safety Office will continue to support refinement of these documents and the associated range safety requirements for commercial crew as the program evolves in 2012.

c. Exploration Flight Test One (EFT-1)

KSC Range Safety provided technical support to the EFT-1 program (formerly Orion Flight Test One) in 2011 by assisting in the development of requirements, participating in working group meetings, and reviewing proposed tailoring to AFSPCMAN 91-710 Range Safety Requirements.

Since no decision has been made regarding whether EFT-1 will be developed as an FAA-licensed launch operation or as a NASA-led operation, KSC Range Safety interfaced with JSC and Lockheed Martin to discuss the affect on Range Safety requirements each option would present.

The KSC Range Safety office will continue to provide support in establishing and reviewing requirements and operations for the EFT-1 program as it continues toward launch in late 2013.

2. Current Operations (Eastern and Western Range)

NASA/KSC Range Safety supported 13 launches this year. There were ten launches from the Eastern Range (three NASA-sponsored expendable launch vehicles, four non-NASA launches in the 45th Space Wing Risk Assessment Center, and the final three Shuttle launches). The remaining three launches were NASA-sponsored expendable launch vehicles from the Western Range (Vandenberg Air Force Base).

In order to ensure the requirements of NPR 8715.5 are met during pre-launch, launch, and post launch operations, NRS personnel worked side-by-side with our Department of Defense counterparts in the Eastern or Western Range Operations Control Centers. NRS personnel

ensured any range safety-related activities that could have an impact on NASA launch criteria were communicated to the NASA Safety and Program decision makers to ensure safe flight and compliance with requirements identified in NASA Range Safety directives.

We look forward to 2012 and supporting the numerous ELV launches at both the Eastern and Western Ranges.

Eastern and Western Range				
Mission	Vehicle	Launch Site	Launch Date	Responsible Org
ULF-5	STS-133	KSC	02/24/11	NASA
GLORY	Taurus	VAFB	03/04/11	DoD
OTV-2	Atlas V	CCAFS	03/05/11	DoD
NROL-27	Delta IV	CCAFS	03/11/11	DoD
SBIRS GEO 1	Atlas V	CCAFS	05/07/11	DoD
ULF-6	STS-134	KSC	05/16/11	NASA
SAC-D/Aquarius	Delta II	VAFB	06/10/11	DoD
ULF-7	STS 135	KSC	07/08/11	NASA
GPS 2F-2	Delta IV	CCAFS	07/16/11	DoD
JUNO	Atlas V	CCAFS	08/05/11	DoD
GRAIL	Delta II	CCAFS	09/10/11	DoD
NPP	Delta II	VAFB	10/28/11	DoD
MSL	Atlas V	CCAFS	11/26/11	DoD

FIGURE 21: EASTERN AND WESTERN RANGE MISSIONS SUPPORTED BY KSC IN 2011