

NASA RANGE SAFETY PROGRAM 2005 ANNUAL REPORT

Uninhabited Aerial Vehicles

Uninhabited aerial vehicles (UAVs) are aircraft that are controlled remotely, autonomously, or a combination of both and are operated in a manner consistent with a “conventional” aircraft. UAVs fall into two categories: experimental and operational. For example, experimental UAVs may be used to test a new aerodynamic shape while operational UAVs with proven flight experience are used strictly as airborne platforms with payloads and experiments on board. The operational category of vehicles also includes vehicles dropped from other aerial vehicles, subscale flight test vehicles, or lifting bodies. UAVs may travel at speeds ranging from slow subsonic (20 to 30 mph) to hypersonic (700+ mph).



UAVs may also be referred to as *unmanned air vehicles*, *unmanned aerial vehicles*, *remotely piloted aircraft*, *remotely operated aircraft*, or *remotely piloted vehicles*. Model aircraft—normally vehicles of less than 55 pounds gross weight flown under manual control within unaided visual contact range—are not considered UAVs.

Development of a UAV Program

In August of 2005, the KSC Spaceport Engineering and Technology directorate initiated development of a UAV program to support future programs at KSC,

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Cape Canaveral Air Force Station, and Patrick Air Force Base. To aid in meeting program requirements, the 45th Space Wing Safety Office and the KSC Range Safety Office are in the process of jointly developing a UAV range safety requirements document, UAV flight certification approval process, UAV concept of operations, operational agreements, project and program interface, and technical product compliance standards.

It is KSC's responsibility to take all reasonable precautions to identify, evaluate, and mitigate safety related risks to protect the general public, the NASA work force, and high value assets through ground safety, flight safety, and range safety. An in-depth research of current safety related documents, as well as coordination and interface with Wallops Flight Facility, Dryden Flight Research Center, and Patuxant River Air Test Center, is being conducted to identify range safety policies, processes, procedures, standards, and requirements for safe UAV operations.

KSC's Role in UAV Operations

The KSC role in UAV operations may be as a user, sponsor, host, or any combination of the three. Each role encompasses unique responsibilities and safety requirements for UAV operations conducted at KSC.

The UAV User at KSC. In this operation, KSC acts as the owner and operator of the vehicle and any flight is considered a NASA (or NASA contractor) developed mission that requires a range safety program and will use range assets as part of its program. In this capacity the UAV project takes on traditional roles and responsibilities with respect to mission success, ground safety, flight safety, and range safety as documented in NPR 7120.5C, *NASA Program and Project Management Processes and Requirements*.

The UAV Sponsor at KSC. If the project is owned and operated by an outside organization funded by NASA, it becomes a relationship between the project and KSC sponsor, wherein KSC will have range safety, flight safety, ground safety, and mission success responsibilities based on a memorandum of understanding or agreement. Similar to the user at KSC relationship, the project comes to KSC to use assets and personnel to accomplish mission objectives. Based on the memorandum of understanding or agreement, KSC Range Safety will only participate and review project activities to a level that adequately evaluates and ensures safety for its areas of responsibility.

The UAV Host at KSC. If the project is owned and will be operated on the range by an outside organization, KSC Safety does not have any flight responsibilities for range safety, flight safety, or mission success. KSC's only role will be to provide facility support and ground safety. KSC Ground Safety

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will participate and review project activities to a level that adequately evaluates and ensures safety for its areas of responsibility.

Based on KSC's involvement (user, sponsor, host) and the assessment of the project risks and hazards associated with UAV flights, KSC will establish flight safety review requirements that are commensurate with the degree of risk identified.