

GROUND SAFETY PLAN
FOR
AEROSONDE UNINHABITED AERIAL VEHICLES
TO BE LAUNCHED FROM WALLOPS FLIGHT FACILITY
MAIN BASE AND ISLAND LAUNCHES
REVISION F

PREPARED:

(b) (6) 4/12/07
Date
Ground Safety Group

REVIEWED:

(b) (6) 4/12/07
Date
Ground Safety Group Lead

ACCEPTED:

(b) (6) 4/12/07
Date
Project Manager

APPROVED:

(b) (6) 4/12/07
Date
Range Safety Officer

TABLE OF CONTENTS

SECTION

6100	SCOPE	4
6200	SAFETY RESPONSIBILITIES	4
6300	HAZARDOUS SYSTEMS	4
6310	Flammables	4
6320	Pre-flight Checks	
6330	Test Stand Stability	5
6340	Launch	5
6341	Launch From Automobile	5
6342	Launch From Catapult Launcher	6
6400	HAZARDS CLASSIFICATION	7
6500	HAZARDOUS SYSTEMS	7
6600	HAZARD AREAS	7
6610	General Hazard Areas – All Launches	7
6620	Hazard Areas – Automobile Launches	7
6630	Hazard Areas – Catapult Launches	8
6640	Main Base Hazard Areas	8
6650	Island Hazard Areas	8
6660	CONTINGENCY PLAN (Wallops Island Only)	9
6661	Test Launches (MOD)	9
6662	Redundant Launches (SOP)	9
6700	PERSONNEL RESTRICTIONS	10
6800	HAZARDOUS CIRCUITS	10
6900	PROCEDURES	10
FIGURES		
1.	HAZARDOUS SYSTEMS DIAGRAM	11
2.	CATAPULT LAUNCHER HAZARD AREA	12
3.	HAZARD/DANGER AREA MAP—ISLAND	15
4.	HAZARD / DANGER AREA MAP—MAIN BASE	16
ENCLOSURES		
1.	OSS Checklists – Island Launches	13
2.	OSS Checklists – Main Base Launches	14

6100 SCOPE

This document will be a stand-alone document and apply to all Aerosonde operations at WFF. This Ground Safety Plan (GSP) identifies the hazardous operations and safety measures associated with Aerosonde UAV missions. A Risk Analysis Report (RAR) complements this GSP and is published under separate cover titled RISK ANALYSIS REPORT FOR AEROSONDE UNINHABITED AERIAL VEHICLES TO BE LAUNCHED FROM WALLOPS FLIGHT FACILITY.

Personnel restrictions will be imposed on NASA WFF personnel, NASA contractors, and range users, who collectively will be referred to hereafter as the mission team. This document applies to dry or wet runway conditions and launch operations during inclement weather.

6200 SAFETY RESPONSIBILITIES

The controlling document for safety for all WFF operations is the GSFC/WFF Range Safety Manual, RSM 2002.

The Test Director (TD) or the Operations Safety Supervisor (OSS) shall be notified prior to the performance of any hazardous operations.

The NASA RSO and NASA OSS share responsibility (within the limits of their jurisdiction) for the safe conduct of operations associated with the mission.

The NASA RSO, OSS, TD and Project Manager are responsible for assuring the implementation of this safety document, for ensuring the NASA team complies with these requirements, and that there are no violations of the NASA safety requirements as stated in RSM 2002.

The Aerosonde Team may provide their own dedicated and certified OSS for missions operating under Work Instruction 840-WI-7120-1.1.

6300 HAZARDOUS SYSTEMS

6310 Flammables

The fueling system has been addressed in the RAR. This GSP will additionally address the handling of the fuel and other chemicals associated with the UAV.

The Aerosonde UAV Mark 2 uses Avgas 100LL. The Aerosonde Mark 3 & 4 Series uses high-octane unleaded gasoline. Fuel used in Aerosonde UAVs will have documentation detailing the type of fuel as well as date and place of purchase. Safety measures for handling this fuel require the use of

chemical goggles, as well as access to an emergency shower and eyewash station.

Castrol Formula R Synthetic Oil and Narrow Cut or K1 Kerosene are also associated with the UAV and are expected to be stored in small quantities in D-1 and X-15. MSDS(s) will be distributed in the same manner as the fuel, and MSDS PPE guidelines will be adhered to during use. Kerosene will be used during purging of the UAV fuel tank.

Fuel, lubricants, and kerosene will be stored at WFF. These items are approved for storage in buildings D-1 and X-15, under the guidelines described in this GSP. All chemicals will be stored and/or transported in approved containers. The Aerosonde procedures listed in section 6900 of this GSP are to be used during all operations involving fuel. Fuel's MSDS(s) must be on file with the Safety Office, Wallops Fire Department, and kept at the locations of storage and operations. Eye and skin protection are required per the fuel's MSDS, as well as proper ventilation.

A flammables locker has been provided for fuel storage. Aerosonde procedures require the use of bonding and grounding during fuel transfer. Facility static grounds must be in compliance with NASA policies and procedures. Any fuel determined by Aerosonde to be contaminated or otherwise unusable will be disposed of through the WFF Environmental Office Code 205.

6320 Preflight Checks

Aerosonde personnel perform preflight checks before each flight. The preflight checklist includes the following safety measures: inspect for fuel and oil leaks, engine screws, head screws, fuel and oil lines secured and clamped. Wires are also checked for abrasion.

6330 Test Stand Stability

In addition to Aerosonde procedural requirements, a sandbag (or similar counterweight) will be placed on the test stand during ground testing of the UAV.

6340 Launch

6341 Launch From Automobile

The UAV may be launched from a cradle that is strapped to the top of an automobile. The automobile is to be driven along the UAV runway on Wallops Island or the Main Base runway. Approximate vehicular speed

required for the UAV to release is 50 mph. The UAV will lift out of the launch cradle by remote command of the pilot.

Hazards associated with the launch procedure are as follows: exceeding Wallops Island or Main Base maximum speed limits; deer strike during launch attempt; propeller strike during engine start; injury or damage due to a thrown propeller; injury or damage due to crashing the automobile; and a wayward UAV, after launch, colliding with people or property.

The risks associated with exceeding the speed limit will be controlled by roadblocks and defined hazard areas. Nonessential personnel will not be permitted within the launch hazard area. Essential personnel, including the mobile ground station van, will operate behind jersey barriers placed approximately 30 feet east of the runway at the Island runway's approximate midway point, or behind the automobile's starting point on the Main Base runway. The Island runway has been extended to a total of 1500 feet, which is sufficient to launch and land the Aerosonde UAVs. Preflight checks will be performed prior to each flight.

6342 Launch From Catapult Launcher

In 2004, a catapult launching system was developed to enhance the operational capability of the AAI Aerosonde. This system will be used on the Wallops Island and Main Base runways and, eventually, on ships at sea. The launcher consists of an aluminum and steel frame with bungee cords, a battery powered winch and a control box with load cell. Additional hazards introduced by the use of this launcher include: inadvertent bungee release; and exposure to shock hazard.

When the bungee is loaded, the catapult launching system is capable of delivering a large impulse of energy. If a bungee is damaged, or if the apparatus is improperly used, the system could inflict severe injury or death to personnel in close proximity. To minimize the risk of injury by premature bungee/catapult release the following conditions will be enforced:

- (1) Nonessential personnel are not permitted in the launcher hazard area;
- (2) The operators will be fully trained;
- (3) The operators will wear Personal Protective Equipment such as leather gloves, hard hats, and goggles or face shields during critical loading operations;
- (4) The launcher is assembled per detailed instructions given in the Assembly Procedures;

- (5) The bungee and associated hardware are inspected for damage before, during, and after assembly per instructions in the Launcher Training Manual;
- (6) Safety design features such as hold back straps, rail enclosures and a manual safety (retaining) pin have been incorporated;
- (7) Safety inspections are performed during the Daily and Pre-Flight Checklists;
- (8) Safety measures are incorporated into the Launch Operator, Launch Abort, Hang-Up Checklists, and the Disassembly Procedures; and
- (9) Damaged hardware is avoided by adherence to the maintenance intervals and replacement lists.

All of these procedures and checklists are contained in the AAI/Aerosonde Launcher Training Manual. The power supply, control box and associated cabling are capable of delivering an electric shock if an operator comes into contact with damaged or improperly assembled wiring. The risk of electric shock is mitigated by operator training and by adherence to the assembly and inspection instructions incorporated throughout all of the procedures and checklists in the AAI/Aerosonde Launcher Training Manual. The power system and cabling are maintained and replaced at the defined intervals therein.

These hazards are detailed, with mitigating controls, in the Hazard Analysis Reports included in Enclosure 6 of the Risk Analysis Report.

6400 HAZARDS CLASSIFICATION

Not applicable.

6500 HAZARDOUS SYSTEMS CLASSIFICATION

Not applicable.

6600 HAZARD AREAS

6610 General Hazard Areas – All Launches

The fuel transfer procedure, explained in the RAR, when indoors, must take place at least three feet from any open electric source (i.e. wall outlet), excluding the 12vdc pump battery.

6620 Hazard Areas – Automobile Launches

Essential Team Members during launch are considered to be the Driver, Pilot, Aircraft Technician, and OSS. The Driver of the vehicle is obviously excluded from the restrictions mentioned below.

Aerosonde procedures, listed in section 6900, designate that mandatory braking markers be placed and a dry run accomplished before the actual launch. The RAR determines that minimum safe braking distance, based upon reaction time, calculated to 638 feet. Aerosonde can place braking markers at any point along the automobile's path that they feel comfortable with as long as the markers are further than 638 feet from the end point.

6630 Hazard Areas – Catapult Launches

Essential Team Members during launch are considered to be the Pilot, Aircraft Technician, one or two Launcher Operators and a certified OSS.

The Launcher Hazard Area is 100 meters square plus a 25-meter radius semi-circle centered on the rear of the launcher. See Figure 2. Only the launcher operator(s) and Aircraft Technician will be allowed in the launcher hazard area and only before the bungee is fully loaded – there will be some minimal pre-tension on the lines, on the order of 16 kgs (35 pounds). After the aircraft has been positioned on the launcher and readied for launch, the area will be cleared of all but one person. This person will pull the retaining pin lanyard from no less than 20 feet away and then exit the hazard area. Then the bungee will be loaded remotely to full launch energy values.

6640 Main Base Hazard Areas

For Main Base operations, the Airport Control Tower is also an Essential Team Member. The hazard area will be the assigned runway to be used. All restrictions pertaining to runway usage will apply and all egress and departures will be cleared by the Wallops Control Tower. The Aircraft Mishap Response Plan for Goddard Space Flight Center, Wallops Flight Facility (GMI 1700.2 and GMI 1040.5) will be the governing procedure for any airport mishap.

The Mission Team Members will situate themselves behind the automobile's starting point, or at a distance of 75 ft. minimum. A camera crew may be situated at the base of the A1 Tower. Restrictions as specified in the FAA "Airman's Information Manual" are used by the Wallops Flight Facility Airport.

6650 Island Hazard Areas

To protect the operations area on Wallops Island, the roadblock will be closed at the intersection near Pad 0B. Additional Flight Hazard Area Roadblocks may be necessary and will be addressed on a case by case basis.

For Wallops Island launches, essential Mission Team members will position themselves behind “jersey barriers” placed along the side of the runway. Nonessential members of the Mission Team can observe launch operations from the designated viewing area near building X-55.

Still photographers are admissible during Island launches with the following restrictions:

- During MOD launches, no still photographers will be allowed within the hazard area during launch operations.
- During SOP launches, still photographers must be situated behind the Jersey Barriers.

6660 CONTINGENCY PLAN (Wallops Island Only)

6661 Test Launches (MOD)

In the event of lost communications during test launches (MOD), the following procedure will be implemented: (reference Flight Safety Plan (FSP), see also FSP section 7522.) In the Worst-case scenario, this procedure may need to be accomplished within sixteen minutes.

- Aerosonde TC will inform the TD, PM and FSO & OSS after one minute of Losing communications with the Aerosonde UAV.
- PM will notify Security.
- PM will announce over PA system that all non-participants must remain indoors.
- Security or Range Support Personnel (building X-55) will place roadblocks at Bypass Road and Beach Road (Flagpole area), preventing southbound access from the flagpole area and clear the area of personnel up to and including Pad 0B.

6662 Redundant Launches (SOP)

For launches under 840-WI-7120.1.1A, the Lost Communications contingency plan and notification process will be worked out at the Technical Interchange Meeting. During operations, the OSS will assure all conditions of the Contingency Plan are met in the event of Lost Communications. At minimum, the following will be addressed:

- Process to Notify Team Members in place
- Process to notify Security in place
- Personnel identified to set road blocks
- Road block locations
- Personnel identified to notify the Wallops Tower (or the Wallops Fire Dept if after hours). The Wallops Main Base Airport Control Tower

will alert the Fire Department, which will initiate “The Aircraft Mishap Response Plan for Goddard Space Flight Center, Wallops Flight Facility” accordingly.

6700 PERSONNEL RESTRICTIONS

PM will notify Wallops Security one day prior to the start of operations. Wallops Security has been instructed that the contingency plan may be put into action at any time during the operation. Gate Guards have been briefed to inform everyone passing through the gate prior to operations that they may be instructed to remain indoors in the event of an Aerosonde autonomous landing.

Unessential personnel will not be permitted within the launch hazard area. Some visitors or observers may be considered essential and must be approved by the Range Safety Officer or their designee. Essential personnel, including the mobile ground station van, will operate in accordance section 6600 of the GSP. For Island operations, one roadblock will be placed north of the runway at the three way intersection near Pad 0B. This will prevent any non-mission vehicles / pedestrians from accessing the roadway leading to the UAV runway.

For Wallops Main Base operations, Wallops Airport Restrictions will apply. This includes all hazard distances (75 feet) and personnel restrictions. Figure 4 shows approximate ground crew locations for runway launches. These are approximations and can be manipulated to facilitate mission requirements. The 75 foot hazard distance still applies.

When appropriate, Roadblocks # UAV/MB-1, UAV/MB-2 and UAV/MB-3 will be placed in series (end-to-end), such that they block the entire width of the service road which runs parallel to Runway 10-28, as shown in Figure 4. Permission to enter the hazard area (runways) will be controlled by the Wallops Airport Tower.

6800 HAZARDOUS CIRCUITS

Not applicable.

6900 PROCEDURES

NASA

800-PG-8715.0.1B Work Hours Policy

800-PG-8715.1.1 Unmanned Roadblocks for Hazardous Operations

Aircraft Mishap Response Plan for Goddard Space Flight Center, Wallops Flight Facility (GMI 1700.2 and GMI 1040.5).

FAA-Airman’s Information Manual

AEROSONDE

The Aerosonde procedures listed below have been reviewed and approved by WFF Ground Safety. Field modification must be approved by the Ground Safety Office.

Aerosonde Runway Safety Checklist (with explanation document)

Aerosonde Fuel Vapor Neutralising Procedure (October 03) (includes fuel drain and fill procedures)

Aerosonde Operations Manual Sections A.3.5, A.3.6, A.3.10, A.6, and F.9

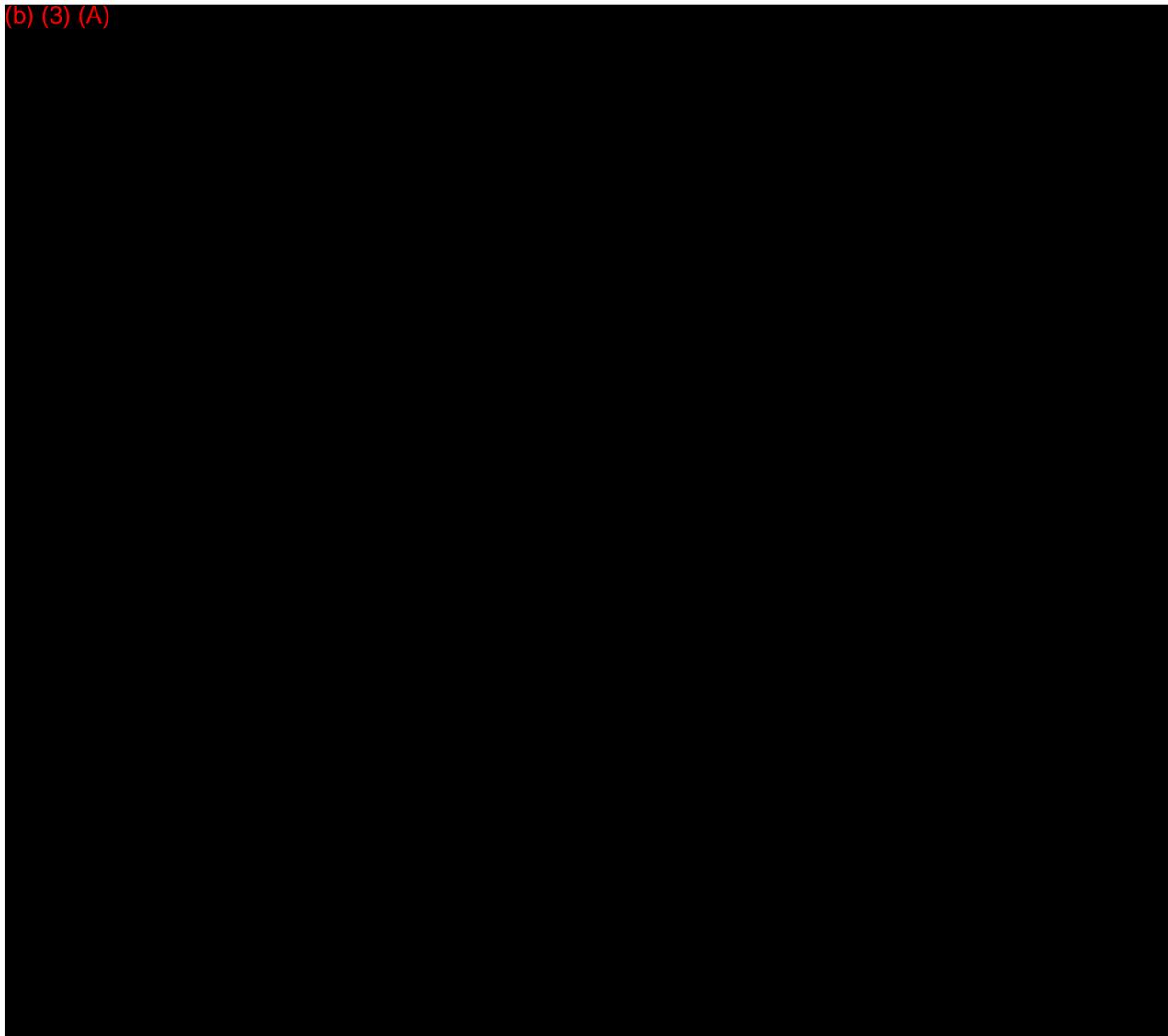
Pilots operating handbook Fuel and Storage Handling (see Fuel and Storage Handling Info Sheet)

Aerosonde Start / Take Off checklist (applicable series)

Aerosonde Pre-flight checklist (applicable series)

Communications Failure Procedure

(b) (3) (A)



(b) (3) (A)



1

Enclosure 1

OSS checklist--- ISLAND LAUNCHED

Mission : Aerosonde UAV

Date: _____

Occurrence	initial
MSDS(s) available	
Emergency shower / eye wash station operational	
Roadblocks in place	
Start / end point markers in place	
Brake point markers in place (if automobile launch used)	
Sandbags used on test stand	
Cage used on propeller during ground tests	
Jersey barriers in place	
Loss Comm. Procedure verification accomplished	
Runway safety checklist complied with	
Start / take off checklist complied with	
Pre flight checklist complied with	
Internal clock verification accomplished	
Contingency Plan in place (as agreed upon at the TIM)	
Personnel location during take off	

OSS checklist--- MAIN BASE LAUNCHED

Mission : Aerosonde UAV

Date: _____

Occurrence	initial
MSDS(s) available	
Emergency shower / eye wash station operational	
Confirm permission from Tower to enter runway	
Start / end point markers in place	
Brake point markers in place (if automobile launch used)	
Sandbags used on test stand	
Cage used on propeller during ground tests	
Assure van located min. distance of 75 ft. from edge of runway	
Loss Comm. Procedure verification accomplished	
Runway safety checklist complied with	
Start / take off checklist complied with	
Pre flight checklist complied with	
Contingency Plan in place (As agreed upon at the TIM)	
Internal clock verification accomplished	
Non essential personnel beyond 75 feet of launch automobile, OR	
Outside catapult launcher hazard area	

