Gulfstream

AIRCRAFT EXPOSURE TO VOLCANIC ASH

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# REVISION APPROVAL

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### REVISION HISTORY

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1.0 INTRODUCTION

This SGER is to be used as reference only to provide inspection/function test procedures for Gulfstream aircraft that have been exposed to volcanic ash.

Volcanic ash is very abrasive, acidic, and conductive, it may also carry a high static charge for up to two days after being ejected from a volcano. In addition to adhering to painted or polished surfaces, volcanic ash can damage airframe and flight surfaces, clog air data ports, abrade windows and damage engines, unless it is carefully removed.

The ash is easily entrained in the air by wind or vehicle movement and may remain suspended in the air for many minutes. Due to the combination of these qualities, volcanic ash is pervasive. It can penetrate all but the most tightly-sealed enclosures, and it can be very difficult to remove from electronic components.

Volcanic ash can easily absorb water and can weigh up to 87.4 lbs/ft$^3$. Wet ash is very slippery and can cause traction problems. Ash must be physically removed and controlled after removal to prevent re-entrainment.

Electronic components exposed to ash can cause arcing, short circuits, and intermittent failures due to its conductive nature. High-voltage circuits and components are especially vulnerable. Ash dampened by water can cause arcing and flashovers on electrical distribution systems. Moving parts are subject to abrasion damage from volcanic ash. The ash is attracted to – and entrained in – any exposed lubricant; thus, abrasion effects will continue even after the bulk of the ash has been removed. Bearings, brakes, and gear driven mechanisms wear out very quickly.
2.0 PROCEDURES

2.1 AIRCRAFT PREPARATION

Prepare aircraft for safe ground maintenance. Reference the following AMM procedures:

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<tr>
<th>Effectivity</th>
<th>AMM Reference</th>
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<tr>
<td>GII/GIIB/GIII/GIV</td>
<td>(a) Servicing – Maintenance Practices, 12-00-00</td>
</tr>
<tr>
<td>G100/G150/G200/GIV-X/GV/GV-SP</td>
<td>(a) Standard Maintenance Practices – Maintenance Practices, 20-00-00</td>
</tr>
</tbody>
</table>

2.1.1 Materials

- Fire Retardant Plastic Sheet (min. 4 Mil)
- 2” wide Fire Retardant Tape

2.2 OUTSIDE STORAGE – PRE-ASHFALL

Prior to storage perform the following:

(a) Install wheel chocks on forward and rear faces of main wheels.

(b) Set gust lock on aircraft and ensure gust lock lever is ON.

(c) Install tie-down lines, if required.

(d) Install the following protective covers (Refer to Fig 1):

- Plugs in air conditioning ram air scoops
- Covers on ram air exhaust
- Plug in Auxiliary Power Unit (APU) exhaust
- Cover on cabin outflow valves
- Cover on wing anti-ice exhaust port
- Screen on wing vent openings
- Cover on tail compartment vent
- Cover static ports, but do not make them airtight
- Cover AOA and Pitot probes
- Caution signs, safety pins and red streamers as required

NOTE: Tape over protective cover seams to minimize ash penetration.

(e) Wrap entire Nose Landing Gear with plastic, starting from around the tires, wrapping in the upwards direction. Secure plastic tightly around NLG with tape.

(f) Tape plastic around any opening around the NLG doors area to prevent ash from traveling into the wheel well area.

(g) Wrap entire Main Landing Gear (Left and Right) with plastic, starting from around the tires, wrapping in the upwards direction. Secure plastic tightly around MLG with tape.
(h) Secure plastic with tape around any opening around the left and right MLG doors area to prevent ash from traveling into the wheel well area.

(i) Secure plastic around all flight control surfaces on both wings with tape. Ensure that all seams between the wing structure and the control surfaces (spoilers, flaps, slats, and aileron) are covered. Refer to Figure 2 and 3.

NOTE: Ensure that all seams are sealed as ash build-up in or around flight control seals can cause damage to seals and interfacing structure. Also, bare lubricated moving parts can be unusually worn if exposed to volcanic ash.

(j) Secure plastic around the rudder with tape. Ensure that the seam between the rudder surface and vertical stabilizer is covered.

(k) Secure plastic around the elevator with tape. Ensure that the seam between the elevator surface and horizontal stabilizer is covered.

(l) Tape over all door seams (Main Entry and Baggage Compartment). Ensure that the seam between the doors and aircraft structure is covered.

NOTE: Ensure that all seams are sealed as ash build-up in or around door seals can cause damage to seals and may result in pressurization issues after dispatch.

(m) Tape over engine pylon seals.

(n) Tape over both engine cowls and thrust reversers seams.

(o) Tape over APU inlet doors seams.

(p) Tape over all external hinged access panel seams.

- Ground service panel
- Oxygen panel
- Wing fueling
- Tail compartment door
- Emergency window release
- Lavatory servicing panels
AIRCRAFT EXPOSURE TO VOLCANIC ASH

Figure 1
Protective Cover Locations
(Typical for all large cabin models)
Figure 2
Plastic Protection Locations (shaded area)
(Typical for all large cabin models)
Figure 3
Plastic Protection Locations (shaded area)
(Typical for all mid cabin models)
2.3 POST ASHFALL CLEANING AND INSPECTION

(1) Inspection Requirements

(a) Volcanic ash particles are usually less than 5 microns and very abrasive. It can penetrate all orifices and cause erosion or etching on the surface. Ash particles can accumulate on all lubricated surfaces, in all corners and can cause contamination on all system filters. It is not possible to determine the level of damage volcanic ash contamination can cause. Therefore, a full aircraft inspection is necessary to determine the extent of the contamination.

(b) All inspection are visual unless otherwise instructed by text.

(c) If structural or surface damage is found, refer to the Structural Repair Manual (SRM).

(2) Aircraft Cleaning

CAUTION: DO NOT RUB THE SURFACE WHEN YOU REMOVE ASH FROM THE AIRCRAFT. RUBBING THE SURFACE CAN CAUSE ABRASION. REMOVE ASH WITH A VACUUM CLEANER (IF VACUUM CLEANING IS NOT PRACTICAL, USE AN AIR BLOWER, OR A SOFT CLOTH)

(a) If a layer of ash is present on the aircraft surfaces, remove ash with a vacuum cleaner. Ash can be blown off or removed with a soft cloth, but only if vacuuming is not practical.

(b) Wash off remaining residue by following the below procedure.

NOTE: Pressure washing of aircraft is not recommended due to the adverse effects on aircraft components. The high-velocity water and cleaning agents can force dirt, contamination and moisture into bearings, bushed joints, actuator seals, electrical components, faying surfaces and structural joints resulting in increased maintenance costs and unserviceability.

NOTE: If protective covers/devices are installed on aircraft as per section 2.2 (Outside Storage- Pre-Ashfall), leave it on until aircraft washing complete.

Wash aircraft exterior per the following AMM reference:

<table>
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<td>GII /GIIB /GIII / GIV</td>
<td>(a) Servicing – Maintenance Practices, 12-00-00</td>
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<tr>
<td>G100</td>
<td>(a) Cleaning - Aircraft Exterior, 12-30-00</td>
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<td>G200</td>
<td>(a) Servicing – Aircraft Exterior Washing, 12-27-00</td>
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<tr>
<td>G150/ GIV-X / GV / GV-SP</td>
<td>(a) Servicing - External Aircraft Washing, 12-25-00</td>
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2.3.1 External Inspection

(a) Remove all protective devices/covers that were installed in section 2.2 of this procedure (if applicable).

I. From ground level, at no greater than touching distance, begin visual inspection forward of main entrance door and proceed clockwise around aircraft.


III. During Inspection, visually inspect lower fuselage exterior (floor level and below) and wing as follows:

1. Verify there is no evidence of ash ingestion and / or clogging of fuselage mounted probes / ports, pressurization relief valve, outflow valve, wing tank vents and Auxiliary Power Unit (APU) exhaust.

2. Verify there is no evidence of erosion on painted surfaces of radome.

3. Inspect the following on the landing gears:

NOTE: If the aircraft was on ground with the applicable protective covers/devices installed (as in step 2.2) when the volcanic ash contamination occurred, landing gear inspection is not necessary if there is no ash discovered after the protective covers were removed.

Inspect all landing gear structure, wheel wells and all associated components for damage and/or ash contamination including:

i. Attachment section of the landing gear

ii. Actuator rods

iii. Chrome area of shock absorber

iv. Mechanical linkages and moving parts

v. Electronic switches/sensors

4. Check the landing gear strut chrome areas for corrosion and recoat with MIL-PRF-5606 as required.

5. Inspect all landing gear doors for ash contamination including:

i. Door skin

ii. Door hinges

iii. Actuator rods

6. Verify there is no evidence of erosion on painted surfaces, upper / lower wing.

7. Verify there is no evidence of erosion or abrasions on wing leading edges, landing or navigation light lenses.
8. Examine all aerodynamic seals/curtains.

9. Examine all lower antennas for damage.

**NOTE:** If the aircraft was on ground with the applicable protective covers/devices (as installed in step 2.2) when the volcanic ash contamination occurred, this inspection is not necessary if there is no ash discovered after the protection covers were removed.

10. Perform detailed inspection for evidence of ash accumulation on all flight control components.

   i. Lubricate exposed portions of the flight control actuator pistons using skydrol. Operate all control surfaces, listening for abnormal sounds and correct as required.

IV. From a maintenance platform, or on surface of fuselage, visually inspect upper fuselage exterior (above floor level) and empennage.

1. Verify there is no evidence of erosion on painted surfaces around windshields, side windows.

2. Verify there is no evidence of abrasions on windshield and side windows or frames, cabin fixed frames, emergency exit windows or frames, vertical stabilizer and horizontal stabilizer leading edges.

3. Verify there is no evidence of ash ingestion or clogging of ram air inlet duct or APU air inlet door.

4. Examine all upper antennas for damage.

5. Verify that all pylon seals are not contaminated.

6. Verify that the elevator/horizontal stabilizer seals/curtains are not contaminated.

(b) Inspect aircraft systems as follows:

   i. Inspect all probes and sensors for damage and for ash contamination.

**NOTE:** If the aircraft was on ground with the applicable protective covers/devices installed (as in step 2.2) when the volcanic ash contamination occurred, this inspection is not necessary if there is no ash discovered after the protection covers were removed.

1. Pitot probes

2. Static ports

3. TAT probes

4. AOA probes

**NOTE:** Ensure that AOA probes move freely and that the Pitot probes drain holes are not clogged.

   ii. Visually inspect fuselage ram air inlet interior for ash clogging or coating.

   iii. Visually inspect left and right fuselage ram air overboard vent interiors for ash clogging or coating.
iv. Visually inspect left and right pylon fan air outlet louvers for ash clogging or coating.

**NOTE:** If ash clogging or coating is observed in Step 2.3.1(b)(ii) or Step 2.3.1(b)(iii) access internal areas / components of the air conditioning packs and air cycle machines and inspect.

(c) Perform Engine After Ingestion of Volcanic Ash Inspection (if applicable), per applicable Engine Maintenance Manual.

**NOTE:** If the aircraft was on the ground with the applicable protective covers/devices installed (as in step 2.2) when the volcanic ash contamination occurred, this inspection is not necessary if there is no ash discovered after the protection covers were removed.

(d) Perform APU After Ingestion of Volcanic Ash Inspection (if applicable) as follows:

**NOTE:** If the aircraft was on ground with the applicable protective covers/devices installed (as in step 2.2) when the volcanic ash contamination occurred, this inspection is not necessary if there is no ash discovered after the protection covers were removed.

**CAUTION:** AVOID OPERATION IN KNOWN VOLCANIC ASH-LADEN ENVIRONMENTS. OPERATION IN HIGH CONCENTRATIONS OF ASH CONCENTRATIONS FOR PROLONGED PERIODS IS CONSIDERED ABUSIVE TO THE AUXILIARY POWER UNIT AND WILL LIKELY RESULT IN INCREASED COST OF OWNERSHIP.

(e) If operation in ash laden regions cannot be avoided, Honeywell/Allied Signal Service Information Letter (SIL), APU-3, dated December 11, 1985, Maintenance and Inspection Recommendations for Auxiliary Power Units Operating in Volcanic Ash-laden Environments provides the following:

I. Visually inspect APU oil and fuel filters.

**NOTE:** APU oil should be replaced each 100 APU hours of operation.

II. Service / replace APU oil as required.

III. At this interval, visually inspect compressor section to assure there is no abnormal.

Honeywell/Allied Signal Service Information Letter (SIL), APU-4, dated December 6, 1985, Maintenance and Inspection Recommendations for Pneumatic System products Operating in Volcanic Ash-laden Environments provides the following:

I. Whenever possible, avoid operation in known volcanic ash laden environment.

II. If operation in an ash laden environment cannot be avoided the following is recommended:

1. Whenever possible turn off those bleed systems not required consistent with the aircraft manufacturers operating procedures to minimize pneumatic system contamination.

2. Remove, inspect, and clean or replace as appropriate, all control air filters at an increased frequency consistent with the operator’s experience.

3. Spare end units and detail parts carried on board affect aircraft should be properly protected/packaged.

4. Unscheduled removals should be carefully analyzed to determine the degree of contamination and to what extent this condition contributed to
component removal. This would allow appropriate inspection intervals and/or increased control circuit filtration to be determined.

5. External component surfaces should be examined for ash built-up over/around vent areas, including working surfaces, linkages, and unsealed bearings. Clean and/or remove as appropriate.

(3) Inspect the Main Entry Door and lubricate per the following AMM references:

NOTE: If the aircraft was on ground with the applicable protective covers/devices installed (as in step 2.2) when the volcanic ash contamination occurred, this inspection is not necessary if there is no ash discovered after the protection covers were removed.

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<th>Effectivity</th>
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<td>ALL</td>
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<td>(b) Main Entrance Door – Servicing, 52-10-00</td>
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2.3.2 Interior Inspection

(a) Inspect the following cabin and cockpit areas for ash contamination and vacuum/soft cloth clean if required:

i. Interior surfaces

ii. Full face oxygen masks

iii. Avionics compartment (all items that are visible)

- Cooling/Ventilation areas

- Electrical Connection points

- Line Replaceable Units (LRUs)

NOTE: LRUs that have signs of heavy contaminating, especially around ventilation holes may have to be returned to their respective equipment manufacturer for internal inspection.

(b) Inspect the tail compartment for ash contamination and vacuum/soft clot clean if required.

(c) Record all maintenance actions in accordance with current Federal Aviation Regulation.