

**1 JULY 2003**

**Maintenance**

**ADVANCE COMPOSITE MISHAP RESPONSE**



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This instruction establishes responsibilities, unit capabilities, and procedures necessary for Advanced Composite Mishaps (ACM) in the Charleston AFB area of responsibility to include all host and transient aircraft. All agencies involved with response, containment and disposal operations will ensure compliance with this instruction to ensure a cooperative, coordinated and safe response to an ACM situation.

**1. Procedures:** In the event of an Aircraft Advanced Composite Mishap, all affected agencies must ensure compliance with the following:

1.1. Initial Response Requirements

1.2. The First-Responder(s) will be the 437th Civil Engineering Squadron (CES) Fire Department. The Senior Fire Official will conduct an initial survey to inspect for:

1.2.1. Signs of fire damaged composites (See **Attachment 4** for C-17 aircraft locations)

1.2.2. Presence of loose/airborne fibers and particulates

1.2.3. Prevailing weather conditions/directions

1.2.4. Degree of site exposed to fire/explosion/impact

1.2.5. Local/proximal equipment/asset damage and danger

1.2.6. Exposed personnel

1.3. The 437th Mission Support Group (MSG) Security Forces will enforce an **initial** cordoned area centered on the burning/smoking mishap site. Restrict personnel and traffic from entering.

1.3.1. Evacuate areas in the vicinity of the mishap site affected by direct and dense fallout from the fire/explosion generated smoke plume, along with easily mobile, critical equipment. Base Operations, when directed by the On Scene Commander (OSC), will initiate the alteration/

removal of aircraft and flight operations exposed to the immediate fallout area as soon as safely practical. Restrict all unprotected personnel from assembling downwind of crash site.

1.4. Extinguish fire and cool composites to below 300°F. **ONLY** fire fighters equipped with Self-Contained Breathing Apparatus (SCBA) are authorized within the hot zone of a burning/smoking mishap site until the Senior Fire Official declares the area fire safe.

1.4.1. Avoid high-pressure water break-up and dispersal of composite structures.

1.4.2. Do **NOT** use helicopters or low flying aircraft to control/suppress the fire. No flying/hovering/taxiing within 500 ft above ground level (AGL) of the site and 1,000 ft horizontally.

1.5. The Senior Fire Official will establish control at the mishap site until fires are extinguished and composites are cooled below 300°F. When the mishap scene is deemed fire safe by the Senior Fire Official, the On-Scene Commander (OSC) will assume control. To mitigate risk to response personnel and preserve critical evidence, the OSC will immediately consult with either the Interim or Permanent Safety Investigation Board (SIB) President on containing damaged advanced composite surfaces (In Accordance With Paragraphs **2.2.-2.4.**).

1.6. The OSC will consult with the 437th Medical Group Bioenvironmental Engineer to determine if the Personal Protective Equipment (PPE) annotated in **Attachment 3** is appropriate for that specific mishap. The OSC will ensure all responding personnel within the clearance zone will wear appropriate PPE.

1.7. The OSC will consult with the 437th Medical Group Bioenvironmental Engineer, and determine when to downsize the cordoned area. As a guide, a peripheral area will be established. At a minimum, the peripheral will be defined as **more than 25** feet away from damaged composite parts, although it may vary depending upon environmental conditions (rain, dry, high winds, remote site, etc.).

1.7.1. 437th Security Forces will rope or cordon off the mishap area as established by the OSC/Bioenvironmental Engineering Flight, establish a single entry/exit point, and generate an Air Force Form 1109 to maintain accountability. **Only** sufficiently protected individuals are authorized in the immediate mishap site and the cordoned area (See **Attachment 3**).

1.8. The OSC will identify specific aircraft hazards by inspection, consulting with the crew chief, weapons system manager, reference documents, contractor, or aircraft specialists. The OSC will then notify mishap response members and other personnel as required of the composite hazards and other hazardous materials.

1.8.1. Access to the crash site to conduct a more thorough survey will be coordinated with the OSC. Ensure appropriate PPE is utilized (See **Attachment 3**).

1.9. Advanced Composites Specific Concerns.

1.9.1. If personnel other than those at the accident site have been exposed to adverse material hazards, the base medical staff will be consulted for evaluation and tracking. Advise the populace in affected or fallout areas as needed to:

1.9.1.1. Remain in-doors

1.9.1.2. Shut external doors and windows

1.9.1.3. Turn off forced air intakes

1.9.1.4. Await further notification

1.9.2. When practical, remove contaminated outer garments of victims/response personnel at the scene to protect the medical staff. Advise the local medical staff and local hospitals as needed of any ill effects they believe are related to their exposure to the advanced composite materials. Symptoms of ill effects include, but are not limited to:

1.9.2.1. Respiratory tract irritation, reduced respiratory capacity and difficulty breathing

1.9.2.2. Eye irritation

1.9.2.3. Skin irritation, sensitization, rashes, or infections

1.9.3. Avoid excessive disturbance of the dust by walking, working, or moving at the mishap site to minimize airborne particulate fibers and dust. All contaminated footwear will be cleaned to limit the spread of debris in the area and inside support vehicles.

1.9.4. A Contamination Control Area (CCA) (i.e. tent or trailer) for removal of PPE will be set-up by the 437th Civil Engineer Readiness Flight when deemed necessary by the 437th Bioenvironmental Engineering Flight (In Accordance With [Attachment 5](#) and [Attachment 6](#)). Personnel exiting the mishap site will enter the CCA where members of a trained base detail will direct them on decontamination procedures and use high efficiency particulate air (HEPA) filtered vacuums to remove advanced composite contaminants from their outer clothing, work gloves, boots, head-gear, and equipment.

1.9.4.1. The 437th Civil Engineer Readiness Flight is the office of primary responsibility for the CCA. As such, they are responsible for: requesting a base detail to man the site, procuring the necessary equipment (i.e. HEPA vacuums and plastic bags) from across the base, coordinating with the 437th Contracting Squadron should additional HEPA vacuums need to be rented from local vendors, and arranging for the 437th Bioenvironmental Engineering Flight to provide just-in-time training to those detailed.

1.9.5. No eating, drinking, or smoking is permitted within either the established cordoned area or the CCA. Personnel must be advised to wash hands, forearms, and face prior to eating, drinking, or smoking. Personnel will be directed to shower (in cool water) as soon as possible to preclude injury from loose fibers.

1.9.6. Disposable protective clothing will be wrapped and sealed in protective plastic bags and discarded as routine waste. Severely contaminated clothing will be labeled and discarded in accordance with paragraph [3.2.](#), otherwise, non-disposable clothing should be laundered separately.

**2. Containment:** All affected agencies must ensure compliance with the following:

2.1. 437 CES Fire Fighters will secure burned/mobile composite fragments and loose ash/particulate residue with fire-fighting foam or a fine water mist until a hold-down fixant material can be applied to immobilize the fibers. Initial actions will concentrate on debris containment.

2.2. The 437th Maintenance Squadron (MXS) Crash Recovery Team (CRT) will deploy to mishap site with a fixant or "hold-down" solution, consisting of either acrylic floor wax and water mixed in a 10:1 water to wax ratio, or Polyacrylic Acid (PAA-Carboset XL-11). The CRT will maintain solutions and spray equipment. The CES Fire Department will assist the CRT as able.

2.2.1. Fire must be completely out and the composites cooled to below 300°F (149 °C) **before** fixant application. Fire fighting equipment will be available during fixant application, and aircraft break-up and recovery.

2.2.2. The CRT will apply (preferably spray) a heavy coating of the fixant solution to all burned composite materials and to areas containing scattered/settled composite debris. Completely coat the material until wet to ensure the particulate fiber/dust is immobilized. Immediately flush/clean fixant-application equipment with a dilute solvent to avoid clogging.

2.3. The CRT will use Soil-Tackifiers (i.e. Polychem, J-Tack, Terra Tack) to hold materials on sand or soil. Solution will be sprayed onto the ground at a rate of 0.5 gal/sq.yd.

2.4. If fixant cannot be used, or further protection is needed, carefully wrap the coated parts and/or material with plastic sheet/film or place in a plastic bag that is minimum of 0.006 inches (6 mils) thick. Seal and secure the damaged materials with tape.

2.4.1. Apply masking tape over the non-fire/crash damaged composite parts/material. These parts/materials may be required for investigative purposes. Place the damaged composite part/material in a plastic bag if possible and label as required. Pad all sharp projections from damaged composite parts to prevent accidental injuries.

2.5. Improved hard surfaces (i.e. concrete, asphalt) will be vacuumed (with electrically protected HEPA vacuums) or washed down with a detergent and water solution. The waste will be collected via plastic or burlap coated trenches or drainage ditches. Sweeping operations will be avoided, as they will disperse the particulate debris.

### 3. Clean-Up and Disposal of Exposed Advanced Composites

3.1. Conduct material disposal according to local, state, federal, and international guidelines. The 437th Bioenvironmental Engineering Flight will be contacted to coordinate sampling of the advanced composite parts/material that do **not** require accident investigation, evaluation, repair, or are not needed. Samples of the composite materials are required to determine whether or not waste materials are classified as hazardous waste. Ensure the Safety Investigation Board (SIB) releases the parts before disposal is authorized. All disposals must be coordinated with the 437 CES Environmental Flight.

3.2. If possible, a HEPA vacuum will be used to clean-up the local area. Ensure composite materials to be disposed of are de-militarized, netted, and double wrapped in plastic for disposal purposes. All crash debris, vacuum bags, coveralls, gloves, and any other contaminated materials will be properly disposed of and labeled appropriately with the following: "**Carbon Fiber Debris. Do not incinerate. Do not sell for scrap. Dispose of in approved landfill. Composite Waste.**" Any required hazard warnings will also be added. Disposal of all hazardous waste must be coordinated through the 437 CES Environmental Flight.

3.3. For an open terrain mishap area; the surface will be sprayed with a final foam application. The 437<sup>th</sup> Bioenvironmental Engineering Flight will evaluate the site to determine if any composite dangers still exist. They will brief the dangers to the 437th CES Environmental Flight. Disposal of the composite waste must be coordinated through the 437th CES Environmental Flight.

3.4. If aircraft were subjected to mishap smoke and debris, the following will be undertaken:

3.4.1. Inspect and vacuum the air intakes and all compartments with an electrically protected vacuum cleaner.

3.4.2. The 437th Bioenvironmental Engineering Flight will evaluate (via air sampling and/or swipe sampling) the effectiveness of decontamination to ensure the aircraft is safe before being put back into service.

3.4.3. Prior to flying, perform electrical checks and engine run-up.

#### **4. Training.**

4.1. 437th Maintenance Group, Crash Recovery Team Members, Firefighters, Bioenvironmental Engineering Flight, Security Forces, Medical Response Team, Wing Safety and all other Initial and Secondary Response Teams will receive composite mishap awareness training from their units.

4.1.1. Crash & Recovery Team members will remain full-face respirator qualified through the 437th Medical Group Bioenvironmental Engineering Flight.

4.1.2. Direct all technical advanced composite questions to the 437 MXS Aircraft Structural Maintenance Shop (Bldg. 536, Phone 963-6389/DSN 673-6389).

BROOKS L. BASH, Colonel, USAF  
Commander

**Attachment 1****GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION*****References***

T.O. 00-105E-9, Aircraft Emergency Rescue Information

T.O. 1C-17A-3-1, Structural Repair Standard Practices

T.O. 1C-17A-3-8, Disabled Aircraft and Special Maintenance

USAF Advanced Composites Program Office (ACPO) Mishap Risk Control Guidelines

USAF Advanced Composites Program Office (ACPO) Mishap Response Checklist

AL-OE-BR-CL-1998-0108, Human Systems Center Interim Guidance

Response to Aircraft Mishaps Involving Composite Materials

Hazardous Aerospace Material Mishap Emergency Response Field Guide 521

***Terms***

**Hot Zone**—the area immediately surrounding the mishap.

**Warm Zone**—the corridor which provides access to the mishap and where decontamination procedures occur.

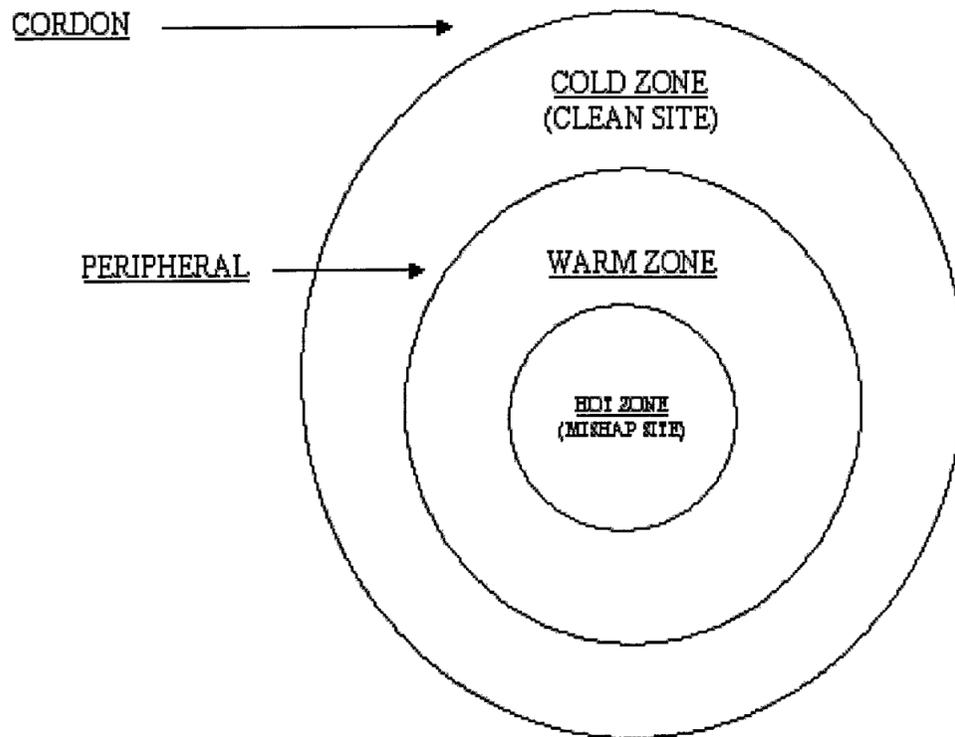
**Peripheral**—the area that divides the warm and cold zones and is at a minimum more than 25 feet away from damaged composite parts.

**Cold Zone**—the “clean” area, as determined by the Bioenvironmental Engineering Flight, where primary and secondary responders conduct necessary functions.

**Cordon**—the area secured by the Security Forces and separates the cold zone from non-essential personnel and the general populace.

Attachment 2

DIAGRAM OF CONTROLLED MISHAP SITE



**Attachment 3****ADVANCED COMPOSITES PERSONAL PROTECTIVE EQUIPMENT (PPE) GUIDELINES****A. Burning or Smoldering Advanced Composites**

1. Self Contained Breathing Apparatus (SCBA)
2. Full protective clothing (NFPA Standards 1971 and 1976)
3. Do **not** use rubber gloves

**B. Handling Broken or Splintered Advanced Composites**

1. Full-face respirator with dual cartridge (high efficiency particulate air (HEPA/P-100) and organic vapor cartridge)
2. Coated, hooded Tyvek suit with booties
3. Leather work gloves (outer)
4. Disposable or reusable Nitrile gloves (inner)
5. Hard-soled work boots (steel toe and shank required)

**C. Initial Cordoned Area**

1. Full-face respirator with dual cartridge (high efficiency particulate air (HEPA/P-100) **and** organic vapor cartridge)
2. Coated, hooded Tyvek suit with booties
3. Disposable or reusable Nitrile gloves
4. Hard-soled work boots (steel toe and shank required)

**D. Peripheral Composite Exposure**

1. BDU's sleeves rolled down
2. Safety glasses with side shields
3. Disposable or reusable Nitrile gloves (inner)
4. Hard-soled work boots (steel toe and shank required)

**E. Advanced Composite Mishap Decontamination Equipment**

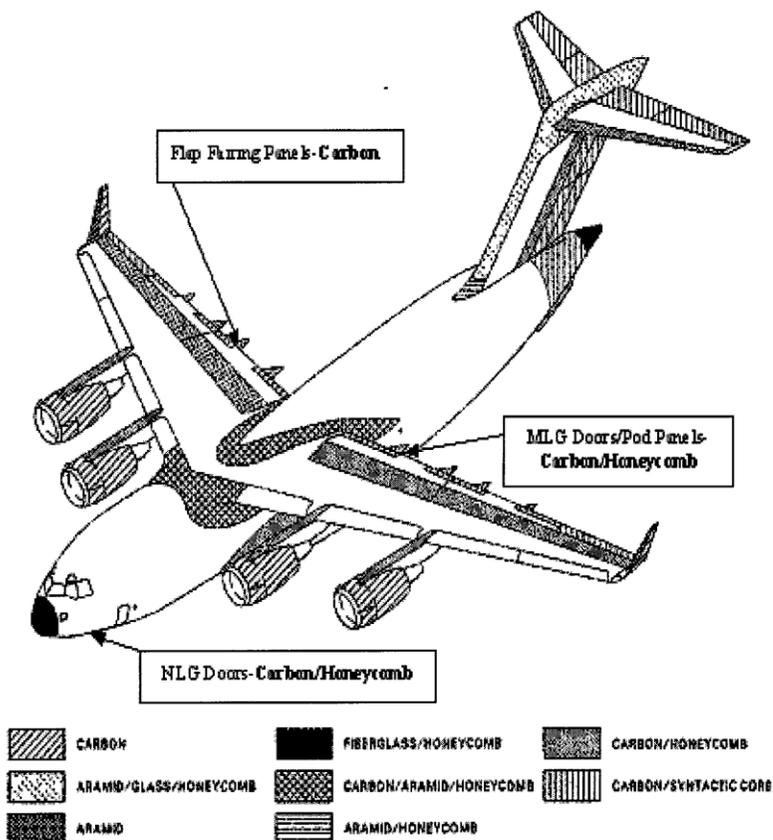
1. Electrically Protected (HEPA/P-100) Filtered Vacuum (Site and Personnel Clean-up)
2. Portable Eyewash Unit
3. Tent or Trailer for Decon (If possible)

**F. Advanced Composite Containment Equipment**

1. Fixant solution (Liquid PAA or Acrylic Floor Wax Solution) See Para. 2.1.1.
2. Fixant spray equipment (Garden Sprayer or Insecticide Sprayer)
3. Plastic sheeting <0.006" thick
4. <2" Masking Tape
5. 55 gallon drums, and thick (<0.006") plastic bags (Hazardous Waste Disposal)

Attachment 4

C-17 COMPOSITE LOCATIONS



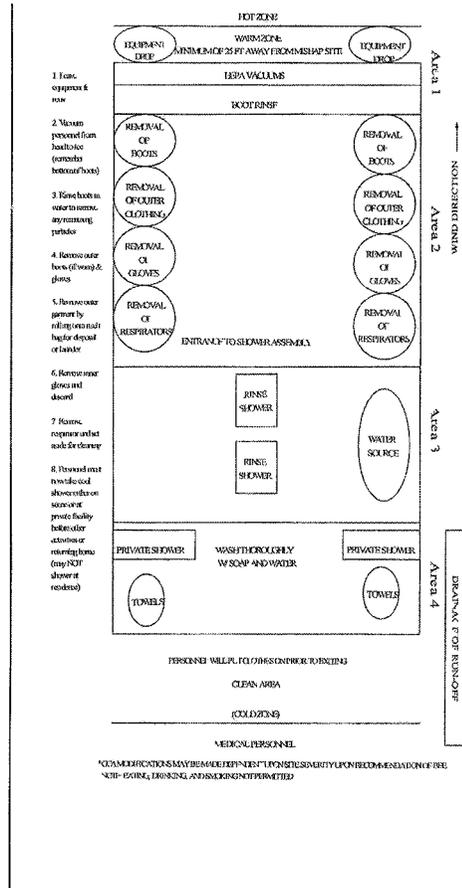
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Figure 7-1 Locations of Composite Component

Attachment 5

DIAGRAM OF CONTAMINATION CONTROL AREA



**Attachment 6****CONTAMINATION CONTROL AREA MANNING REQUIREMENTS AND INSTRUCTIONS****A. Area 1**

1. Manning Requirements: 1-2 personnel to process and vacuum outer garments
2. Personnel will drop equipment for reuse
3. Vacuum outer garments head to toe to remove composite fragments using a high efficiency particulate air (HEPA) vacuum
4. Rinse boots in bucket of water

**B. Area 2**

1. Manning Requirements: 2-6 personnel to assist with proper removal and disposal of clothing
2. Remove outer boots and gloves
3. Remove outer garments (as possible), rolling them onto themselves
4. Dispose of disposable outer garments (IAW 437th CES Environmental Flight) launder non-disposable clothing separately
5. Remove inner gloves and discard
4. Remove respirator and set aside for proper cleaning

**C. Area 3**

1. Manning Requirements: 2-4 personnel to assist with showers/hoses and to monitor run-off
2. Rinse from head to toe using cool water to remove any remaining fibers
3. Area 3 may be substituted by Area 4 as recommended by the 437th Bioenvironmental Engineering Flight

**D. Area 4**

1. Manning Requirements: 2-4 personnel to provide last minute checks and assist where needed
2. Direct individuals to take private showers with cool water and soap for complete body rinse before leaving duty
3. Showers may be located offsite (i.e. gym locker rooms); may NOT shower at home