6.0 Hazardous Materials

6.1 General

Two kinds of programs apply to the transport of hazardous materials by the Gulfstream-159 (G-1) aircraft. The first of these programs is concerned with transportation of hazardous materials in air commerce (Section 6.1.1). The second program applies when the G-1 is transporting hazardous materials when doing business for the U.S. government (Section 6.1.2).

6.1.1 Commercial Transport of Hazardous Materials

This annually reviewed hazardous materials program will be adhered to by all Pacific Northwest National Laboratory (PNNL) employees or agents acting for PNNL when they are involved in the acceptance, handling, storage, and transportation of hazardous materials in air commerce. Such hazardous materials are defined in the most recently published Title 49, Code of Federal Regulations (49 CFR), Parts 171 through 175 for domestic transport by air. For international transport by air, hazardous materials are defined under the provisions of the International Civil Aviation Organization (ICAO) Technical Instructions for the Safe Transport of Dangerous Goods by Air.

This program is intended to ensure that no employees or agents of PNNL perform any assigned duties or have responsibilities involving the acceptance, handling, storage, or transporting of hazardous materials, unless they have satisfactorily completed the PNNL FAA-approved initial or recurrent hazardous materials training program.

A current copy of this program and of the pertinent regulations shall be available at each PNNL office where hazardous materials are accepted, stored, or otherwise prepared for air transportation. PNNL will ensure that hazardous material information warning signs are posted at appropriate locations where the company conducts flight operations or accepts cargo. These signs will advise shippers of the potential hazards and penalties associated with the offering for carriage of such materials aboard an aircraft, if the shipper fails to comply with the appropriate regulations. PNNL will ensure the proper shipping authorities are immediately advised of any incidents or discrepancies that are discovered per 49 CFR Part 175.

"175.5 Applicability
(a) This part applies to the acceptance for transportation, loading and transportation of hazardous materials in any aircraft in the United States and in aircraft of United States registry anywhere in air commerce. This part does not apply to:
…

(2) Aircraft which are not owned by a government nor engaged in carrying persons or property for commercial purposes but which are under the exclusive direction and control of a government for a period of not less than 90 days as specified in a written contract or lease. An aircraft is under the exclusive direction and control of a government when the government exercises responsibility for:

(i) Approving crewmembers and determining that they are qualified to operate the aircraft.

(ii) Determining the airworthiness and directing maintenance of the aircraft; and

…"

With regard to the airworthiness of the G-1, refer to Appendix A, page A.25. This appendix includes the forms used by the FAA to certify the airworthiness of the aircraft.

6.1.2 Hazardous Material Transport Exception Allowed for Government Business

The G-1 aircraft operates in the public aircraft mode when doing business for the U.S. government per the Hazardous Materials section of FAR 175.10. Under the restricted category the aircraft is allowed to carry hazardous materials in the operation of government atmospheric research as follows:

"175.10 Exceptions

(a) This subchapter does not apply to:

…

(2) Hazardous materials required aboard an aircraft in accordance with the applicable airworthiness requirements and operating regulations. Unless otherwise approved by the Associate Administrator for Hazardous Materials Safety, items of replacement for such hazardous materials must be transported in accordance with this subchapter except that:

(i) In place of the required packagings, packagings specially designed for the transport of aircraft spares and supplies may be used, provided such packagings provide at least an equivalent level of protection to those that would be required by this subchapter;

(ii) Aircraft batteries are not subject to quantity limitations such as those provided in §172.101 or §175.75(a) of this subchapter; and,

(iii) A tire assembly with a serviceable tire is not subject to the provisions of this subchapter provided the tire is not inflated to a gauge pressure exceeding the maximum rated pressure for that tire.

…"

With regard to work for others, or for non-government-funded projects, the G-1 operates under the restricted category certificate for atmospheric research. Because of the restricted category exceptions, the G-1 is allowed to carry hazardous materials under FAR 175.10.

6.2 Staff Responsibilities

No employee or agent of PNNL (unless trained and tested in this function) may accept hazardous material for shipment unless the material is

- properly described on the shipping papers
- required certifications are on the shipping papers
- authorized package is marked and labeled, as required
- shipment is authorized for transportation by air.

If the shipment is offered in accordance with the ICAO regulations, the accepting employee or agent must assure the shipper has complied with all applicable U.S. variations to the ICAO regulations.

No employee or agent of PNNL (unless trained and tested in this function) may load or transport aboard this company's aircraft any hazardous material unless the

- shipment has met acceptance requirements and package integrity immediately prior to the loading procedures
- pilot in command (PIC) has received complete materials safety data sheets for each material along with a statement on the quantity of material and procedure for on-board use or storage
- shipment is stored and loaded in accordance with the applicable regulations and the stated procedures of PNNL.

No employee or agent of PNNL, unless trained and tested in this function, may prepare hazardous material for shipment [including company material (COMAT)]. Prior to loading hazardous materials onboard a PNNL aircraft, the required compatibility and separation distances relative to other cargo will be determined for the material. This information will be obtained from 49 CFR Part 175.

6.3 Training Requirements for Carriage of Hazardous Cargo

PNNL utilizes the research aircraft on a limited basis for the carriage of hazardous material in support of Lab research programs. The training program is, therefore, limited to those portions of the PNNL policy on transport of hazardous material that relate to the specific materials that are carried in the company aircraft. The Hazardous Material Transportation Officer, PNNL Laboratory Safety Department, is responsible for the initial training and retraining of staff members involved in the transport of hazardous material.

Prior to transport of a specific hazardous material, training shall be given to staff members in the requirements of 49 CFR and, for international shipments, the requirements of the ICAO and the IATA Dangerous Goods Regulations. The training will be of sufficient scope and depth to ensure that personnel who successfully complete this course of training will be able to perform their duties in relation to hazardous materials in a safe and efficient manner.

The lesson plan outlining the specific requirements for the material to be transported will include, as applicable, the following:

1. Applicable regulations
2. General transportation requirements
3. Use of 49 CFR, ICAO, and International Air Transport Association (IATA) regulations
4. Definitions used in air transport of hazardous materials
5. Hazardous material classification and definition
6. Purpose and use of the HMT
7. Shipping paper requirements, including
    a. Description of hazardous material
    b. Shipper's certification
    c. Types of documents required.
8. Marking and labeling requirements
9. Pilot notification
10. Specific packaging for the material to be transported
11. Acceptance procedures and requirements for the material
12. Storage and replacement of hazardous material labels
13. Quantity limitations of the material on the aircraft
14. Stowage compatibility
15. Orientation, securing, and location of packages

16. Damaged shipments

17. Special requirements:

    a. Poisons, etiologic agents, asbestos

    b. Radioactive materials.

18. Hazardous materials discrepancy/incident reporting

19. Emergency regulations and notifications

20. Enforcement

21. Compliance orders (DOE Order 440.2)

22. Use of preflight checklists.

6.4 Acceptance of Hazardous Materials

Any package containin g hazardous materials that is damaged or leaking will be refused without further processing. If the package integrity is satisfactory, the acceptance process may continue.

Domestic shipments may be offered/accepted under either 49 CFR or ICAO regulations. Whichever regulation is chosen, it must be complied with in its entirety. All international shipments must comply with ICAO requirements and the pertinent U.S. variations. Note: ICAO requires a compliance checklist.

PNNL shall maintain a supply of labels at each facility where hazardous materials are accepted, stored, or otherwise prepared for transportation by air. Only an employee or agent of PNNL who is trained and tested in the acceptance procedures may replace a lost or detached label and only in accordance with the information presented by the shipper on the shipping papers. If, for any reason, the acceptance checklist cannot be completed at the time (for instance, a qualified/trained agent is not available or the volume of work prevents immediate acceptance), the uncompleted checklist must be attached to the shipment. The shipment must be placed in an area designated for conditional acceptance until the checklist is completed. When all the items have been checked off and the person who completed the inspection has signed the checklist, the shipment may be moved to the cargo staging area.

The Hazardous Material Transportation Officer, Laboratory Safety Department at PNNL, resolves any questions regarding the handling or acceptance of cargo consigned to PNNL.

6.5 Assistance to Shippers

Whenever possible, PNNL may assist its customers to ensure their shipment is prepared in accordance with 49 CFR or ICAO. Such support may consist of informing the shipper of information

stated in the regulations and by providing the shipper with the required forms, such as shippers declaration, labels, and airway bills. PNNL may assist the shipper with regard to the order in which the information is required on the packages and forms. This task can be accomplished orally or by showing the customer an example of a properly completed form. Such assistance shall in no way relieve the shipper of responsibility. Before any action to assist the customer can be taken, the person who has been delegated this responsibility by PNNL must give final approval.

6.6 Exemptions

When PNNL accepts or transports a hazardous material under the authority of an exemption granted by the Associate Director, Office of Hazardous Materials Regulation, U.S. Department of Transportation (DOT), all provisions of that exemption shall be complied with. For more information, refer to 49 CFR Part 107, Subpart B.

6.7 Records

a. When PNNL is the originating carrier, a copy of the hazardous material shipping papers will be retained for a period of 90 days after the date of completion of the shipment.

b. A copy of the PNNL Hazardous Material Training and Testing Records for an employee will be retained for 90 days after the employee's date of termination of employment.

c. A copy of all documents relating to a shipment of hazardous materials on PNNL aircraft will be retained for 90 days after the completion of the shipment. These records will be maintained at the PNNL Flight Operations Office and will be made available to the FAA.

6.8 Acceptance

6.8.1 Shipping Papers

Per 49 CFR Part 172, ensure the following:

1. The shipping name listed on the shipping paper is one authorized by Column 2 of the Hazardous Materials Table (HMT) (49 CFR 172.101).

2. The hazard class listed on the shipping paper is the same as shown in Column 3 of the HMT for the entry.

3. The identification number shown on the shipping paper is the same as that shown in Column 3A of the HMT for the entry and is in proper sequence.

4. The list includes the total quantity, by weight or volume, of the material covered by the description.

5. The additional entry requirements follow the same basic description.

6. The certification is affixed and signed.

7. Per ICAO, three sequences are required.

    a. The first sequence is the basic description [proper shipping name, hazard class, and identification (ID) number] as listed in Columns 1, 2, 3, and (if applicable) 4 of the ICAO Dangerous Goods List (DGL).

    b. The second sequence designates the quantity and type of packing.

    c. The third sequence indicates the packing instructions used and is taken from DGL Columns 9 or 11 and 8. Additional entry requirements follow the appropriate sequence.

8. Two copies of the shipping papers must be offered with the shipment. One copy must accompany each shipment, and the originating operator must retain a copy on file for 90 days.

6.8.2 Marking

Per 49 CFR Part 172, ensure the following.

1. The proper shipping name and identification numbers that appear on the shipping paper are also marked on the outside of the package, outside container, or overpack.

2. The name and address of either the consignee or consignor must also be marked on each package.

3. Orientation arrows must be marked on two vertical sides, if the package has inside packaging containing liquid hazardous materials.

4. Any additional marking requirements specified in 49 CFR for the package or material being shipped (such as specification package marking or overpack marking) must be met.

6.8.3 Labeling

Per 49 CFR Part 172, verify the following.

1. The outside of the package is labeled with the appropriate label(s) from Column 4 of the HMT.

2. Additional labels are in place when required and ascertainable by inspection of the shipping paper.

3. The *Cargo Aircraft Only* label is attached for those packages containing a quantity of hazardous materials that may be shipped only on cargo aircraft. This label also applies to packages that are

forbidden for carriage on a passenger aircraft, but are permitted for carriage on cargo-only aircraft per Columns 6a and 6b of the HMT.

Per ICAO Column 5, the requirements are basically the same as for 49 CFR. Major differences are as follows.

1. The United Nations (UN) class number (and in some cases division numbers) must be entered in the lower corner of the label for primary risk labels.

2. Subsidiary risk labels must not display the UN class or division numbers.

3. Requirements for infectious substances and poisonous materials (packing Group III) labels differ from those in 49 CFR.

4. Orientation labels are required for liquid dangerous goods; labels on two opposite vertical sides are required for any package with liquid hazardous materials.

Replacement Labels: lost or destroyed labels must be replaced in accordance with information provided on the shipping papers.

6.8.4 Placard Placement

Unit load device (ULD) and freight containers over 640 cubic ft that contains hazardous materials must carry placards. ULD and freight containers less than 640 cubic ft capacity, containing hazardous material, must carry either a placard or a label. This rule is a carrier requirement when packages are consolidated for easier handling. Shippers may not offer a carrier hazardous materials in a freight container without proper identification.

6.8.5 Storage/Handling/Loading Procedures

Packages, outside containers, or overpacks containing hazardous materials shall be stored or loaded aboard the aircraft in accordance with the table contained in 49 CFR Part 175.

1. *Poisons*. Packages bearing the poison or etiological agent/infectious substance label may not be carried in the same compartment of an aircraft as material known to be foodstuffs, feed, or any other edible material intended for consumption by humans or animals, with one exception. Such packages may be carried, if loaded in separate ULDs that are not adjacent to each other.

2. *Radioactive Materials (RAM)*. While in storage, no more than 50.0 Transport Index (TI) of RAM may be stored in any one group of packages. Any group of packages containing 50.0 TI must be separated by 20 ft from any other package or group of packages containing RAM. No such package (or group of packages) may be in a position continuously occupied by people (or animals or undeveloped film) that is closer than the distances on the charts in 49 CFR Part 175.

6.8.6 Pre-Board Inspection

No PNNL employee or agent may load any package, outside container, or overpack containing hazardous material (HM) aboard an aircraft or into a freight container or onto a pallet prior to loading it aboard an aircraft unless it has been inspected. Immediately prior to loading, the PNNL employee or agent must inspect the exterior of the packages, outside container, or overpack and determine that it has no holes, leakage, or other obvious indications that integrity has been compromised.

The pre-loading inspection is not required for shipments of dry ice (carbon dioxide solid), magnetized materials, or freight containers of ORM-D-Air materials packaged by and offered by a single shipper. A ULD may not be loaded until it has been inspected and found to be free from any evidence of leakage or of damage to any package containing hazardous materials.

6.8.7 Passenger Carrier Quantity Limitations

Except for radioactive material, irritating materials, etiologic agents, and Poison B liquids and solids not bearing a flammable liquid or flammable solid label, a PNNL passenger-carrying aircraft has weight limitations on certain materials. No more than 50 pounds net weight of hazardous materials, or 150 pounds of nonflammable compressed gas that is acceptable for carriage on passenger-carrying aircraft, may be carried in the following locations:

- Each inaccessible cargo compartment
- Each freight container within an accessible cargo compartment
- An inaccessible position, within an accessible cargo compartment on a cargo-only aircraft.

Amounts exceeding 50 pounds net weight of hazardous materials or 150 pounds of nonflammable compressed gas, acceptable for carriage on passenger-carrying aircraft, must be carried in a location that is accessible to a crew member during flight.

6.8.8 Passenger Carrier Radioactive Materials Limitations

On a passenger-carrying aircraft when separation distances can be satisfied, up to 50.0 TI total may be carried. For cargo-only aircraft, this 50.0-TI limit usually will apply also. However, when the size of the aircraft permits groups of packages, per 49 CFR Part 175, up to 200.0 TI may be carried, if separation distances are satisfied.

Radioactive Materials: Each package containing labeled RAM must be inspected to ensure the security seal is not broken. This requirement does not apply to packages of RAM that are in overpacks.

a. Passenger Aircraft: In addition to any other requirement, packages requiring a radioactive yellow II or III label must meet the following loading requirements.

- The radioactive material must be intended for use in (or incident to) research or medical diagnosis or treatment, as indicated by the shipper's certification.

- No single package carried on a passenger-carrying aircraft may exceed the TI indicated for the category of label listed:

  Radioactive Yellow II Label: 1.0 TI
  Radioactive Yellow III Label: 3.0 TI

- Each package must be carried on the floor of the cargo compartment.

- Each package must be loaded and carried on the aircraft in accordance with the separation distance specified on the tables in 49 CFR Part 175 and each must be suitably safeguarded and secured so as to prevent its becoming a hazard by shifting or moving.

b. Cargo-Only Aircraft: In addition to any other requirement, packages requiring a radioactive yellow II or III label must meet the following loading requirements:

   - No single package carried on a cargo-only aircraft may exceed the TI indicated for the category of label listed:

     Radioactive Yellow II: 1.0 TI
     Radioactive Yellow III: 10.0 TI

   - The total TI of all of the packages loaded on the aircraft must not exceed 50.0. Each package must be loaded on the aircraft in accordance with the separation distance or pre-designated area, as noted in 49 CFR Part 175. Each package must be suitably safeguarded and secured, so as to prevent its becoming a hazard by shifting or movement.

   - If the total TI for all of the packages exceeds 50.0, and the size of the aircraft permits use of groups of packages, the following criteria must be met:

   - The separation distance between the surfaces of the RAM packages and the surfaces bounding the space occupied by persons or animals is at least 30 ft.

   - The TI for any group of packages does not exceed 50.0 and each group is separated by at least 20 ft from any other (as measured from the outer surface of each group).

   - For purposes of this paragraph, the term *group of packages* means packages that are separated from each other in an aircraft by a distance of 20 ft or less.

   - The total TI for all packages containing fissile RAM does not exceed 50.0.

c. Aircraft used routinely for the carriage of radioactive materials shall be periodically checked for radioactive contamination. If contamination equals or exceeds 0.5 millirem per hour, the aircraft must be taken out of service until it is decontaminated.

6.8.9 Pilot Notification

a. After the aircraft is loaded and prior to departure, the PIC must be given written notification advising the basic description, additional description, total packages, and quantity of each hazardous material location aboard the aircraft and the confirmation that no damaged or leaking packages have been loaded. For radioactive material, the number of packages, category, and transport index must also be given.

b. If the PIC loads the aircraft, the pre-loading inspection is a required duty. If someone other than the PIC loads the aircraft and conducts the inspection, that person shall furnish the PIC with the written pilot notification.

c. A copy of the PIC notification must be readily available to the PIC during flight.

6.8.10 Offloading Shipments

Packages, overpacks, and ULDs containing hazardous materials must be inspected for damage or leakage after being unloaded from an aircraft. Any evidence of leakage or damage requires further inspection of aircraft where material was stored and of the abutting packages.

6.8.11 Special Flights

a. The transportation of flammable liquid fuel in small passenger-carrying aircraft is authorized only when the provisions of 49 CFR are met.

b. Air transportation of hazardous materials is authorized when cargo-only aircraft is the only means of transportation available. In addition, compliance with all other conditions of 49 CFR 175.320 is required.

c. Flights made under the provisions of a DOT exemption must comply with the conditions specified in the exemption.

6.8.12 Required Reports

a. Incident Reporting

1. In the event any of the following incidents occur as a direct result of transporting a hazardous material, the appointed PNNL employee will make a telephone report containing the required information to the FAA Civil Aviation Security Office (the PNNL Emergency number should also be contacted; see Appendix D) as soon as possible:

- A person is killed.

- A person receives injuries requiring hospitalization.

- Property damage is estimated at $50,000 or more.

- Fire, breakage, spillage, or suspected contamination is present from a shipment of RAM or etiologic agents.

2. Radioactive Materials: In addition to the notification to FAA, the shipper of any RAM involved in an incident must be notified by telephone.

3. Etiologic Agents: In addition to the notification to the FAA, the Centers for Disease Control in Atlanta and the shipper are notified of any etiologic materials involved in an incident.

4. The Chemtrek information number is available for help/advice on spills.

5. Incident reports made by telephone shall contain the following information:

   - Name of employee or agent making report

   - Company name and address of flight operations

   - Phone number where person making the report can be reached

   - Date, time, and location of incident, accident, or discharge

   - The extent of injuries, if any

   - The proper shipping name, hazard class, DOT ID number, and quantity of the material involved in the incident

   - Whether or not a continuing danger to life exists at the scene, if the information can be reasonably ascertained.

6. Written Reports (DOT Form 5800-1)

   - A written report will be submitted in duplicate on a DOT Form 5800.1 to the Materials Transportation Bureau with a copy forwarded to the FAA Civil Aviation Security Office within 15 days following the discovery of

i. an incident requiring an immediate telephonic notification

ii. an unintentional release of any amount of a regulated material from a package.

(It is the responsibility of the employee or agent at the scene of the incident, accident, or discharge to complete the DOT Form 5800.1 as soon as practicable.)

b. Report of Discrepancies: Each person who discovers a discrepancy relative to the shipment of an hazardous material, following its acceptance for transportation aboard an aircraft shall, as soon as practicable, notify the FAA Civil Aviation Security Office by telephone, and provide the following information:

- Name and telephone number of the person reporting the discrepancy
- Name of the aircraft operator
- Specific location of the shipment concerned
- Name of the shipper
- Nature of the discrepancy.

6.8.13 Orientation and Securing of Hazardous Material (HM) Packages

As required by 49 CFR Part 175, a package containing HM marked or labeled to indicate proper orientation will be loaded and secured in accordance with such marking or labels. Liquid HM without such markings will be loaded and secured with closures up. Hazardous material packages will be secured to prevent any movement in flight that would result in damage to or change in orientation of the package.

6.9 Emergency (Damaged Shipments or Incidents)

The PIC, or other persons designated and trained by PNNL, shall remove from the aircraft any package or hazardous material that appears to be damaged or leaking. These packages shall be placed in the designated isolation area and the shipper notified. PNNL emergency notification procedures shall be followed. (Note: See Section 6.11.)

The designated PNNL employee shall make required notification of incidents and subsequent reports in compliance with 49 CFR Parts 171 and 175. This notice does not preempt any other required notification. The PNNL Laboratory Safety Department will identify the appropriate action and provide forms.

6.10 Emergency Notification

The contact numbers are as follows:

All emergencies and unusual conditions PNNL Single-Point Contact	(509) 375-2400
U.S. Department of Transportation	(800) 424-8802
Emergencies involving etiologic agents; Centers for Disease Control	(800) 232-0124

Notice involving shipments transported by aircraft must be given to the nearest FAA Civil Aviation Security Office by telephone at the earliest practical moment after an incident. See also the incident/accident/off-normal event operations checklist on pages A.22 and A.23 of Appendix A.