4.0 Standard Operational Procedures for PNNL Research Aircraft

All flights will be planned in detail and crew members will have a clear understanding of flight objectives and the desired results. Pilots and crew members will be on hand a minimum of one hour prior to a scheduled flight. It will be the responsibility of the designated PIC to ensure that each member of the crew fully understands the mission profile and is aware of any special requirements. The judicious use of checklists is a basic requirement of flight planning.

4.1 Documentation Required

Each aircraft used by PNNL will be registered with the FAA and with state or local agencies whenever required. A field operation of short duration will normally require little or no advance registration with local authorities. If it is expected that an aircraft will be required to operate out of a certain flight operations hangar for long periods, local regulations or registration could become a requirement and possibly affect the research operation. Registration is especially important if low-level operation is required.

In accordance with FAR 91.203, every civil aircraft will and must display a current airworthiness certificate and the owner's registration certificate in the aircraft where they are legible to the passengers or crew. As part of preflight duties, the assigned PIC will, as required by FAR 135.203(e),

1. Note the date and the aircraft tach time and compare them with the inspection due dates and times listed on the aircraft status sheet.

2. Determine whether the flight or series of flights can be completed without any required inspection being due before the aircraft returns to home base.

3. If the scheduled flight(s) cannot be completed without one of the previously mentioned inspections becoming overdue, the PIC will immediately contact the Director of Flight Operations for instructions. Under no conditions will a PIC begin a flight, if any required inspection time has been exceeded.

4. Concerning deferred and corrected mechanical irregularities, determine the aircraft has been certified as ready for return to service by an Airframe and Powerplant Mechanic (or by the Director of Maintenance). This certification will appear on the mechanical irregularity report (MIR) in the area of the form reserved for maintenance use.

5. If the FAA requires a waiver for any portion of a flight, a copy of such waiver will be carried in the aircraft. Also, a copy of the flight plan, showing all conditions of such waiver as will be exercised, must be filed with the FAA prior to the flight.

6. *Special Use Airspace* in the United States is defined as those areas that are Prohibited, Restricted, Warning, or Alert areas, and are so designated on aeronautical charts. Permission to operate in these areas can sometimes be obtained by a telephone call, but occasionally the controlling agency may require detailed descriptions of flight patterns before giving specific written authorization. A copy of such authorization will be carried on the aircraft when operating in the Special Use Airspace. Permission to operate in the area will be noted on the FAA flight plan.

7. An FAA-approved Aircraft Operating Manual with current revisions is required to be on board the aircraft at all times.

8. A copy of the PNNL Flight Operations Manual will be carried on board each aircraft operated by PNNL.

9. Current weight and balance data will be carried on board each aircraft operated by PNNL.

10. Material Safety Data Sheets for all chemicals carried on board the aircraft.

11. Pertinent VFR Aeronautical Charts, (WAC, SEC). IFR, Navigation, Enroute, and Let Down Charts.

4.1.1 Checklists

- Checklists shall be available in the cockpit and used for all phases of flight from preflight inspection to parking and securing of the aircraft, including the outlining of emergency and abnormal procedures. Checklists shall be based on the manufacturers' recommended operating instructions and checklist flow shall be as nearly standardized as possible for all PNNL aircraft.

- It shall be the responsibility of the PIC to ensure the appropriate checklist is used for all phases of flight, utilizing the challenge and response system indicated on the checklist.

- Deletions, additions, or alterations to any checklist must first be approved by the Director of Flight Operations and Chief Pilot.

- The Pilot Flying the aircraft makes all calls for checklists.

- Checklists are to be accomplished in the following priority:

  - Emergency procedures

  - Normal procedures

  - Abnormal procedures

4.1.2 Development of Aircraft Checklists

The following list of criteria and principles will be used in the development and use of aircraft checklists.

- Include as many required systems checks in the cockpit preflight as practical to preclude unnecessary distractions while taxiing.
- During critical phases of operation, such as runway lineup, in-range, and landing, checklist items should be limited to facilitate crew member attention and focus on flying activities.
- Checklists should be manageable in terms of physical dimensions and legibility.
- Procedures should enable delay of climb checks until clearing the airport traffic area.
- Checklists should be designed ergonomically. Flow patterns should direct the pilot through the cockpit in an efficient manner.
- Checklists are not a substitute for good pilot judgment.
- Checklists cannot contain all standard operating procedures and operating policies delineated by this manual and FAR.
- Checklists should facilitate good challenge and response procedures by cockpit crews.

4.2 Preparation for Research Flight

4.2.1 Cross Country Flights

Flight plans for all instrument flight rules (IFR) flights and all visual flight rules (VFR) cross-country flights will be filed with the FAA. Flight plans will be filed prior to takeoff, except in those cases where communications facilities are not available or are inoperative. In such cases, the PIC will file in flight, as soon as practical after takeoff. If VFR cross-country flights are to be conducted through areas served by radar, VFR flight following will be acceptable in lieu of a formal FAA flight plan (Airman's Information Manual [AIM] Part 1, Section II B.)

4.2.2 Project Flights

Due to the specialized and varying nature of research flight activities, it is not always practical to file a formal flight plan for VFR operations. However, when flight operations are conducted in areas served by radar or high-density traffic areas, the appropriate air traffic control (ATC) personnel will be contacted and advised of the type of operation and the pilot's intentions. This policy is applicable, whether the area is covered by radar or not (for example, terminal areas, airway intersections, or very high frequency

omnidirectional radio range or [VOR]). VFR flight following, when available, should be used during VFR flight operations. When extended offsite operations are planned in areas of high traffic density, the ATC facility should be visited, and the Chief of Operations should be advised of the operational details of the project.

4.2.3 Preflight Planning

The PIC will be responsible for all flight preparations and the submission of flight plans to the FAA (when required). Flight preparation will vary, depending on the operation to be conducted (for example, cross-country vs. project, IFR vs. VFR). However, the preparation will generally include the following:

1. The correct amounts of fuel and oxygen, plus the correct seating installation, equipment, and necessary supplies, will be verified. These preparations will start at the earliest practical time to ensure that all is ready at the proposed time for departure.

2. A detailed preflight weather briefing is essential to the preparation and use of a flight plan. These briefings may be obtained from FAA Flight Service Stations (FSS), a Combined Station/Tower (CS/T), or a National Weather Service Office (NWSO). For a detailed forecast and comprehensive briefing, the pilot should identify himself and give the number of the aircraft, route of flight, times, and any other information that may be pertinent to the flight. The pilot should obtain and record all weather advisories along the route of flight or in the intended area of operation, en route weather, destination and alternate destination weather, prognostic forecasts for later flights, and the winds aloft.

3. NOTAMS (Notices to Airmen) will be checked with the FSS to make sure that all en route facilities are operational and terminal information is accurate.

4. In planning the flight, the most direct route available is normally used, as long as it is consistent with the safety of the flight. It must comply with FAR, air traffic control instructions, terrain, weather conditions, availability of navigational aids, and other influencing factors. In the event it is necessary to conduct research flights below 2000 ft above ground level (AGL), the PIC shall maintain obstacle maps that are updated prior to each flight. The maps indicate the height above ground level of all existing obstacles to flight in the area of operations. If the use of a waiver or permission to operate in a Prohibited or Restricted Area is required, such will be noted in the *Remarks* section of the flight plan.

5. The PIC will file the flight plan with the FAA (when required), giving a proposed departure time as accurately as practical. In the event of a delay in departure of one hour or more, the PIC notifies the FSS of the new proposed time of departure or a new flight plan is filed.

6. The PIC and second in command (when required) will perform a preflight inspection of the aircraft using an approved Research Aircraft Preflight Security Checklist (Appendix A, page A.4). Close attention must be given to every item on the aircraft-approved preflight checklist to assure maximum safety in flight.

4.2.4 Weather Requirements and Reporting (FAR 135.213)

The PIC or First Officer shall obtain a weather briefing prior to every flight and shall use the U.S. National Weather Service or a source approved by the Weather Service. However, for operations under VFR, if such a report is not available, the Pilot in Command (PIC) may use weather information based on the pilot's own observations or on those of other persons competent to supply appropriate observations.

The PIC shall ensure that all required crew members have received a complete weather briefing prior to each flight. Such briefing should also include Notices to Airmen, the pilot reports, Significant Meteorological Information (SIGMETS), and Airman's Meteorological Information (AIRMETS).

4.2.5 Weight and Balance [FAR 135.23(b)]

4.2.5.1 Weight and Balance Checks

PNNL research flight operations frequently require that scientific research equipment be added, removed, or repositioned. Accordingly, the PIC will closely and continually check the aircraft weight and balance to ensure that it is properly computed and documented.

4.2.5.2 Calculations

The PIC will calculate the gross takeoff weight, gross landing weight (if the maximum allowable gross landing weight is less than the maximum allowable gross takeoff weight for this aircraft), and the actual center of gravity for the loaded weight. The PIC will determine that these calculated values fall within the manufacturer's allowable weight and balance limits for the aircraft. The PIC will make these calculations using the actual weights of the airplane, fuel, oil, crew, passengers, cargo, and baggage. Estimated or average weight figures are not permitted during research operations.

4.2.5.3 Weight Determination

The following weights are used when loading aircraft and when determining the loaded condition:

1. Actual weights of passengers and crewmembers will be used. In the event a scale is not available, the PIC will ask the person's weight and add to it the estimated weight of hand-carried articles or heavy clothing.

2. All baggage, cargo, or equipment loaded at the main base of operations will be weighed and the actual weight used in computations. When away from the main base, the PIC will judiciously estimate the weight of all articles and check loading of passengers and baggage.

3. The standard unit weights of fuel and oil will be used for determining quantity of fluids to be carried. If the weight and balance conditions for take-off and landing permit, all fuel tanks should be filled to capacity and oil tanks filled to optimum for all flights of more than one hour. If fuel supply is limited for the flight, the PIC will ensure the specified amount of fuel, as computed, is in each tank. If too

much fuel is on board, the PIC will have the aircraft de-fueled to the specified amount or will off-load cargo and baggage to accommodate the extra fuel weight. Sufficient fuel will be carried on all flights to meet the following minimum requirements:

- Visual Flight Rules (VFR)--Fuel to fly to the first point of intended landing and, assuming normal cruising fuel consumption, to fly thereafter for 30 minutes, if daytime, or for 45 minutes, if at night (FAR 91.151).

- Instrument Flight Rules (IFR)--Fuel to fly to the point of intended landing, and thereafter to an alternate airport (if required), and then to fly for 45 minutes more at normal cruising fuel consumption (FAR 91.167).

4. When seats are used to hold cargo during a flight, the weight will be restricted to 170 pounds per seat and the cargo must be properly secured. Heavy cargo with locally concentrated weights or weight points must be secured so that the load is equally distributed on the floor. Good judgement will be used in the placement of all equipment or cargo. All securing will meet or exceed FAA approved requirements.

5. Weight, airport elevation, temperature, wind, runway gradient, and runway conditions affect takeoff and landing performance of aircraft. The PIC will check the aircraft-approved flight manual to make sure the aircraft will be able to take off safely at the calculated gross weight and with the runway available, and then land at a safe and allowable weight (FAR 91.103).

4.2.6 Airworthiness Release

A PNNL PIC will not accept an aircraft for flight unless it has a current airworthiness release. While away from home base, the PIC is responsible for determining airworthiness, based on the initial release and subsequent events that may affect airworthiness.

The airworthiness release consists of a signed copy of the Post-Flight Checklist for the aircraft to be flown (see Appendix A). This sheet attests to the compliance with all FAR, the manufacturer's inspection program, and PNNL/DOE directives regarding airworthiness.

4.2.7 Flight Locating Procedures [FAR 135.23(l)]

PNNL has established the following procedures to be used if an FAA flight plan cannot be filed for a particular flight:

- The PIC will complete a flight plan (FAA form 7233-1) and leave a copy with research ground personnel at the point of departure. The PIC will complete the flight plan information as if it were being filed with the FAA. In addition, the PIC will give the research ground personnel the estimated time to expect a telephone call after completion of the flight.

- If the flight goes beyond the calculated search commence time (one hour after the contact time given by the PIC or the time calculated for fuel exhaustion, whichever is sooner), ground research personnel will immediately contact the appropriate FSS (identified in advance by the PIC). Ground personnel will give the FSS the particulars of the flight and request commencement of a search.

4.2.8 Fueling/Refueling Procedures

Although line service personnel have the technical responsibility for the actual fueling/refueling process, the PIC has the primary responsibility for ensuring correct procedures are followed. This responsibility of the PIC is especially acute when refueling is accomplished en route or at remote bases. In all cases, the safety of equipment and personnel is of prime concern.

During fueling/refueling the aircraft, PNNL personnel use the following procedures and precautions for detecting and preventing fuel contamination, protecting against fire, and supervising and protecting personnel. Before the refueling is started, the PIC should determine the grade and quantity of fuel.

- No aircraft will be fueled or de-fueled inside hangars or while engines are operating.
- No smoking, flames, or fires are permitted within 50 ft of an aircraft being fueled or de-fueled.
- The aircraft must be grounded to the dispensing unit before tank caps are removed.
- Aircraft batteries will not be installed or removed during fuel servicing.
- Battery chargers will not be physically connected, operated, or disconnected during fuel servicing.
- Aircraft ground power units should be located as far away as practical and neither connected nor disconnected during fuel servicing.
- No aircraft or research equipment electrical switch may be turned on or off while refueling is in progress.
- No aircraft will be refueled with personnel on board other than one crew member to monitor gages, if required.
- Fueling operations should not be conducted within 100 ft of energized airborne radar equipment or within 300 ft of energized ground radar equipment.
- Photo-flash should not be used within 50 ft of a refueling aircraft.
- Flashlights used should be of the type approved by the Underwriter's Laboratories for use in hazardous locations.

- No aircraft will be refueled during thunderstorms. Covers for fuel openings should be provided when refueling in rain, snow, or sleet.

The three most common sources of ramp fires are smoking, fuel spills, and engine starts. In the interest of maximum safety, smoking is not allowed within 50 ft of a refueling operation and the pilot will watch all personnel in the area to enforce the *no smoking* rule. Fuel spills require immediate attention, and if it is more than 6 ft in any dimension, the spill should be blanketed with foam. Every spill is considered very dangerous and a potential fire. A fire guard will be posted to keep unauthorized persons away, and the spill will be cleaned up as quickly as possible.

After the refueling operation is completed, and before the flight, the PIC will

- Take fuel samples from the tank and sump drains and verify these fuel samples are free from moisture and other contamination

- Verify the fuel and oil caps and associated access doors are secured.

4.2.9 Passenger Briefings

It is the responsibility of the PIC to ensure compliance with FAA regulations regarding the use of seat belts, smoking, oxygen, and emergency exits.

When applicable, reference to survival equipment is included in the briefing. On an aircraft with a Cabin Attendant, the briefing is normally accomplished while taxiing for takeoff. On aircraft with two pilots, immediately after boarding one of the pilots will give the briefing in the cabin, pointing out the exits, seat belts, oxygen masks, fire extinguishers, and survival gear location. The standard briefing for the PNNL aircraft is:

- Welcome on board PNNL's research aircraft. Before getting underway, I would like to review the important safety features of our aircraft. Please read the passenger briefing form.

- In the unlikely event that we should have to evacuate the aircraft on the ground, we can use (specify how many exits): (At this point, specify where the exits are located, how to operate them, and how to get out the exit.)

- Should there be a sudden or abnormal change in cabin pressure, oxygen masks can be found (show location). Place the mask over your nose and mouth and breathe normally.

- Should a cabin fire break out, fire extinguishers are located (show locations).

- In the event of an injury or incident, first aid kits and survival gear are located (show locations).

- Observe and comply with the *seat belt* and *no smoking* signs.

- A reminder, smoking is not permitted.

Whenever possible, the passengers should be briefed on destination weather, estimated time of arrival (ETA), route of flight, and alternate plans, if destination weather is marginal.

An announcement should be made any time turbulence is expected. It is recommended that passengers keep their seat belts loosely fastened, unless it is necessary for them to move about the cabin.

When possible, prior to descent below 10,000 ft, an announcement should be made with updated destination weather.

Note: The G-1 Passenger Briefing Form is shown in Appendix A, page A.1.

4.2.10 Ground Handling

In North America, operators are accustomed to the assistance of Airport Service Operations (ASO), normally known as Fixed Base Operator (FBO). However, with the exception of Western Europe, such assistance may not exist at overseas destinations. Most countries do not have enough general aviation traffic to support such specific services. Therefore, the assistance of a ground handling agent is often required to procure services.

Domestic, regional, or international airlines with operations at a specific airport, as well as affiliates of U.S.-based, flight planning companies, can provide many of the necessary services. Other services, such as help with Customs, immigration, and public health procedures, expediting shipment of spares, and aircraft maintenance, may also be arranged through such agents.

4.2.11 Use of Auxiliary Power Unit

On aircraft equipped with an Auxiliary Power Unit (APU), such equipment shall be used primarily to provide heating, cooling, and lighting for passengers and crew or for the warm-up of required equipment. To meet these requirements, an APU normally needs to be turned on 30 minutes before the scheduled departure.

When an APU is running, at least one crew member shall be available to monitor the unit in the event a malfunction occurs. If the APU is required to run an engine, at least one crew member shall be at a cockpit station to permit the use of aircraft brakes and the handling of a malfunction.

4.2.12 Catering

The PIC ensures all cabin supplies and catering are on board.

4.2.13 Noise Abatement Procedures

Pilots must be considerate and sensitive to surrounding populations. At airports where specific procedures have been established, those procedures will be followed commensurate with safe operating practices.

At airports where specific procedures have not been established, profiles outlined in the Aircraft Flight Operations Manual will be followed.

Regarding noise abatement, safety of flight shall be the overriding factor in decisions.

4.3 In-Flight Operations

Prior to any flight, the PIC shall become familiar with the route and the airports to be utilized by obtaining NOTAMS, Airport Traffic Information System (ATIS), and any pertinent data from the Jeppesen Manuals.

4.3.1 Departure

4.3.1.1 Takeoff and Landing Data

- PNNL aircraft will have takeoff and landing airspeed designators. Crew members are expected to complete the Takeoff & Landing Data Cards (see Appendix A, page A.9).

- Airspeed designators will be set for critical engine failure recognition speed (V1), rotation speed (VR), and takeoff safety speed (V2) for takeoff. VREF will be designated for landing.

4.3.1.2 Weather Briefing

- The PIC or First Officer shall obtain a weather briefing prior to every flight.

- The briefing should include such information as required to plan the flight and complete the trip.

- The PIC shall ensure that all required crew members have received a complete weather briefing prior to each flight.

4.3.1.3 Fuel Planning

- It shall be the responsibility of the PIC to ascertain that fuel planning for any flight segment is correct, utilizing all of the pre-planning data available at that time.

- Special consideration shall be given to extra fuel used, contingent upon extended APU run, departure delays, use of anti-icing equipment, altitude blocks, more adverse wind or temperature than forecast, weather detours, ATC reroutes, or holds.

4.3.1.4 Radio Equipment Checks

- It shall be the responsibility of the PIC to determine that all required radio and navigation equipment is functioning normally prior to departure.

- VOR checks shall be accomplished in accordance with FAR 91.171 and noted in the Flight Logbook. A ground or in-flight check must be accomplished within each 30-day period and an error greater than "4 degrees noted for maintenance action.

4.3.1.5 Departure Sequence

No PNNL aircraft shall be moved from the chocks until the AFTER START checklist is completed. The time to call for a checklist is as follows:

- After Start (prior to taxi)

- Taxi (during taxi to runway)

- Line Up (prior to taking runway)

- Climb (out of 3000 ft AGL, leaving the airport traffic area).

4.3.1.6 Takeoff Briefing

The Pilot Flying will make the takeoff briefing. It is the responsibility of the PIC to ensure that a briefing has been accomplished.

The takeoff briefing will include power adjustments, compass checks, speeds to be called out, abort procedures (including which pilot will execute the abort), initial climb instructions, and emergency return procedures. A complete takeoff briefing will be given by the Pilot Flying for the first flight of the day for a particular crew combination. For subsequent multiple flights, the takeoff briefing may consist of the numbers, compass checks, the term *standard brief*, the pilot who will execute the abort, and initial climb instructions.

4.3.1.7 Takeoff Procedures

- Power shall be set in accordance with the Aircraft Flight Operations Manual.

- Power levers are to be advanced by the Pilot Flying. The PNF will confirm that minimum takeoff power has been obtained. The PNF shall make the call "Take-off Power Set" and monitor the engine instruments.

- Pilot Flying will take his hands off the power levers at V1.

4.3.1.8 Abort Decision

The decision to abort a takeoff will be made using the following criteria:

- Up to 80 kt - Call "ABORT" for:

  a. Any system malfunction

  b. Any yellow or red system warning lights

  c. Any aural warnings.

- After 80 kt up to V1- Call "ABORT" for:

  a. Engine power loss

  b. Engine fire

  c. Loss of directional control.

- Either pilot will call "ABORT."

- Under all conditions, the Captain has the authority to execute an abort at any time.

- PNF will notify Tower of ABORT.

4.3.1.9 Radar Altimeter

Set for 400 ft for takeoff as a reminder of the minimum flap retraction altitude.

4.3.1.10 Airspeed Callout

- The airspeeds to be called out by the PNF are: 80 kt, V1, Rotate, V2.

- The 80-kt callout is for an airspeed cross check between the airspeed indicators.

- The Flying Pilot will acknowledge the 80-kt callout and call "My Yoke."

4.3.1.11 Climb

- After the landing gear is retracted, the PNF will report "gear up and landing gear lights out."
- After flap retraction, the PNF will report Aflaps indicate up."
- The climb checklist shall be called for by the Pilot Flying.

4.3.1.12 Maximum Deck Angle

For passenger comfort and safety, a maximum deck angle during a climb of 15 degrees should not be exceeded, except for specific noise abatement situations.

4.3.1.13 Noise Abatement

When applicable, follow recommended noise abatement procedures.

4.3.1.14 Departure/Climb Airspeeds

Climb schedules will be calculated for each flight using gross weight data.

4.3.2 Cruise/Route

4.3.2.1 Cockpit Duties

During takeoff, climb, descent, and landing, both pilot crew members shall have their flight controls and seats in position to hand fly the aircraft.

During VFR conditions, it shall be the responsibility of the PIC to assign at least one crew member to watch for conflicting traffic.

4.3.2.2 Altitude Callout

Both pilots call out and acknowledge each altitude callout of 1000 ft, prior to the assigned altitude.

4.3.2.3 Flight Level 180 Callout

Both pilots call out the climb and descent altimeter settings for flight level (FL) 180 (18,000 ft).

4.3.2.4 Weather Updating

At least once during any flight of more than two hours, it shall be the responsibility of the PIC to obtain current weather and forecasts for the destination and alternate airports.

4.3.2.5 Flight Crew Members at Stations

A PNNL Captain shall occupy a pilot seat for takeoff and landing. Flight crew members shall be at their stations for all takeoffs, approaches, and landings. Pilot flight crew members shall be at their stations for all climbs and descents, except for urgent reasons.

Pilot flight crew members shall not leave their stations for reasons other than physiological needs, to perform duties in connection with the operation of the aircraft, or to attend to medical emergencies. Crew members shall keep their seat belts fastened while at their stations.

4.3.2.6 Pilot Incapacitation

Obvious incapacitation: Fly the aircraft and engage the auto pilot; restrain/remove incapacitated crew member.

Subtle incapacitation: Whenever a pilot does not respond to the second attempt at communication concerning any deviation from normal flight profiles, announce "I've got the airplane".

- Take control of the aircraft.
- Use auto pilot.
- Use cabin assistance to restrain/remove crew member.
- Declare an emergency and land.

4.3.2.7 Paperwork En Route

Other than logbook entries, brief notes, and flight plan entries, no paperwork shall be done in the cockpit while en route.

4.3.2.8 Supplemental Oxygen (FAR 91.2110)

Supplemental oxygen will be provided and used by all personnel on the flight, as prescribed by FAR 135.89. PNNL aircraft at flight altitudes above FL250 (25,000 ft) can operate only if a 10-minute supply of supplemental oxygen is available for each occupant of the aircraft in the event that a descent is necessitated by loss of cabin pressurization. If, for any reason at any time it is necessary for one pilot to leave the controls of the aircraft when operating above FL350 (35,000 ft), the remaining pilot at the controls shall use an oxygen mask until the other pilot has returned to that crew member's station.

During research flight operations, each pilot of an unpressurized aircraft shall use oxygen continuously at altitudes above 10,000 ft through 16,000 ft MSL for that part of the flight at those altitudes that is more than 30 minutes in duration.

4.3.2.9 Icing Conditions

No flight shall be operated in areas of known icing, unless the aircraft is equipped with functioning de-icing/anti-icing equipment that is suitable for the condition to be encountered. The recommended anti-ice procedures from the approved Aircraft Flight Operations Manual shall be used.

In no case, shall a PNNL aircraft be flown into a known forecast condition of heavy icing. In applying these restrictions, the following definitions shall apply.

- *Trace of ice* - an ice accumulation of no consequence that does not affect the performance characteristics of the aircraft.
- *Light ice* - de-icing/anti-icing equipment will manage the accumulation safely and permit the aircraft to be flown indefinitely.
- *Moderate ice* - de-icing/anti-icing equipment will still manage the accumulation safely, but it is an indication to the PIC to alter course or altitude to avoid this condition.
- *Heavy ice* - de-icing/anti-icing equipment cannot control the accumulation. The PIC shall change altitude or course immediately or locate the nearest suitable airport and land.
- All icing conditions shall be reported to ATC.

4.3.2.10 Turbulence and Thunderstorms

The following rules shall apply:

- Weather and storm scope will be on for all adverse weather operations.
- At altitudes greater than FL230 (23,000 ft), thunderstorm echoes shall be avoided by at least 20 miles.
- At altitudes less than FL230, echoes shall be avoided by at least 5 miles, if outside air temperature (OAT) is 0°C or higher, and by 10 miles if 0°C or lower. Double these distances, if radar indicates rapid increase in size or changes in echo shape, hooks, fingers, or scalloped edges associated with the cell(s).
- Deviate upwind when possible.
- Flying under a cumulonimbus overhang shall be avoided when possible.
- When turbulence is expected or encountered, air speed shall be reduced to the rough air penetration speed.

- Flights shall proceed with extreme caution through areas of forecast tornadoes. While flying through these areas, a listening watch shall be maintained on appropriate frequencies giving weather information and radar shall be monitored carefully to avoid sharply defined echoes.

- A deviation in routing shall be considered preferable to flying through areas of known or forecast tornadoes.

4.3.2.11 Portable Electronic Devices

Passengers are prohibited from using portable electronic devices while in flight, with the exception of:

- Portable voice recorders
- Electric shavers
- Hearing aids
- Mission research equipment
- Electric watches
- Heart pacemakers
- Laptop computers

Normally, none of the allowable communication devices will be used below 10,000 ft.

4.3.3 Arrival

4.3.3.1 Arrival Sequence

Checklists will be called for as follows:

- Descent - Initial descent from altitude.
- In Range - Out of 10,000 ft AGL (approximately 30 miles out).
- Approach - After completion of the In Range check and prior to reaching the Initial Approach Fix (IAF) for the approach to be flown.

- Landing - Landing checklist is to be completed before the final approach fix inbound or three miles out on a visual approach.

- After Landing - No items are to be completed until the aircraft has cleared the runway, or called for by the PIC.

- Shut Down - In the chocks.

4.3.3.2 Descents and Descent Altitude Callout

- Descents shall be initiated so the aircraft is at approximately 10,000 ft, approximately 30 miles from destination.

- The descent checklist is requested upon initiation of descent.

- When using a profile descent procedure, the Pilot Flying the aircraft will retain the descent plate and fly the appropriate procedure.

- The callout for descent altitude is 18,000 ft for altimeters and 10,000 ft for the 250-kt speed reduction.

- The In-Range checklist will be called for at either 10,000 ft AGL or 30 miles from destination.

4.3.3.3 Approach Briefing

Upon receiving the appropriate approach information and verifying that both altimeters are correctly set, the Pilot Not Flying (PNF) will pull the approach plate for review by the Pilot Flying.

The approach briefing will include the following items:

- Minimum Safe Altitude (MSA)

- Type of approach

- Runway of intended landing and length

- Visual aids

- Initial approach altitude

- Minimum Descent Altitude (MDA), Decision Height (DH), or Visual Director Visual Descent Point (VDP)

- Landing approach speed. Time to the missed approach or the missed approach point. Missed approach procedure

- VREF speed.

Visual Approach Briefings may be abbreviated to the following items:

- Airport MSA

- Pattern Altitude

- Runway Being Used

- VREF Speed.

The approach plate will be retained by the PNF for monitoring purposes.

4.3.3.4 First Officer Approach and Landing

- Normally, the First Officer may make approaches and landings at the discretion of the PIC.

- A First Officer shall not make an approach and landing when the Captain has less than 100 hours of PIC time in the assigned equipment.

- It is the prerogative of the PIC to make the approach and landing during inclement weather or adverse runway conditions.

4.3.3.5 Arrival Message

An arrival message shall be transmitted to the Fixed Base Operator (FBO) at the intended point of landing for the purpose of coordinating and expediting the ground handling of the aircraft and passengers.

4.3.3.6 Landing/Taxi/Pulse Lights

Landing lights should be turned on anytime a PNNL aircraft is in a Class B airspace or near an active airport. Landing lights have been proven to diminish bird strikes, so PNNL aircraft will use them at anytime flight is performed below 1000 ft AGL or when exercising the provisions of low-level waivers.

During flight under day VFR conditions, pilots should use the anti-collision and position lights available in the aircraft they are flying. These lights include rotating beacons, strobes, and navigation lights. This procedure is consistent with the FAA *see and avoid* concept for in-flight safety.

4.3.3.7 NAVAID Tuning/Radar Altimeter

When cleared for the approach or receiving radar vectors, the PNF will tune and identify the appropriate NAVAIDS. When necessary, the radios of the PNF will be left on the NAVAIDS required for orientation or intersections.

Prior to intercept, the PNF will leave his radios tuned to the appropriate NAVAIDS for the approach for monitoring and redundancy, unless required for other approach fixes.

The radar altimeter will be set either for the MSL or DH for an instrument approach, or to 500 ft for a visual approach, as a minimum altitude reminder.

4.3.3.8 Approach Speeds

PNNL aircraft will fly an approach at VREF + 10 kt with full flaps.

It is recommended the gust velocity be added to the VREF + 10 speed for approaches in gusting conditions. No more than VREF + 20 is recommended.

Nonstandard aircraft configurations will be flown at the recommended speed without a 10-kt addition, except for gust factors.

4.3.3.9 Monitoring of Approach and Callout

Any callout outside normal parameters requires a response from the Pilot Flying.

During final approach, the PNF shall follow through on the flight controls for the purpose of assuming immediate control of the aircraft in the event the other pilot becomes suddenly incapacitated.

4.3.3.10 Instrument Approaches

The PNF the aircraft shall also monitor airspeed, altitude, and basic instrument approach references. Each following callout is mandatory:

1. Airspeed callout is made upon any deviation below VREF + 10 or above VREF + 20.

2. Altitude callout on all aircraft is 500 ft above minimums, 100 ft above minimums, and at minimums. Callout is made to back up audible advisory systems.

   The 500-ft callout is acknowledged by the Pilot Flying.

   Altitude callout is made until the Pilot Flying states “I am visual.” Then the visual approach callout applies.

3. Deviations are called out any time more than one dot displacement or "5° of bearing deviation occurs.

4. Sink rate is called out anytime it exceeds 1000 ft per minute on final approach.

5. Upon reaching minimums, the PNF will call out one of the three below. The Pilot Flying will then fly the procedure associated with the callout.

    a. "MISSED APPROACH" - The Pilot Flying will then execute the missed approach procedure.

    b. "APPROACH LIGHTS IN SIGHT, STAY ON INSTRUMENTS" - The Pilot Flying will continue flying the approach, until the PNF calls either "Runway in sight" or "missed approach."

    c. "RUNWAY IN SIGHT, GO VISUAL" - The Pilot Flying will then go to visual approach. Call out "I am visual" and land the aircraft. The PNF will monitor the instruments and give the standard, mandatory callout.

4.3.3.11 Visual Approaches

If available, an electronic guide slope shall be tuned, identified, and utilized while making a visual approach.

The PNF shall monitor airspeed, altitude, and other aircraft. Each callout following is mandatory:

1. Airspeed callout is made upon any deviation below VREF + 10 or above VREF + 20.

2. Sink rate is to be called out anytime it exceeds 1000 ft per minute on final approach.

3. Altitude is called out at 500 ft AGL. This callout will be acknowledged by the Pilot Flying.

4.3.3.12 Stabilized Approaches

Flight crews are expected to fly stabilized approaches during visual and instrument approaches.

Approaches are considered stabilized when the aircraft is fully configured for landing, and is on the glide slope or on a 3-degree visual glide slope. On an Instrument Landing System (ILS) equipped runway, or no less than three miles out on a visual runway, approaches are considered stabilized when the landing checklist is completed by the outer marker.

At times, the ATC may request speeds to the outer marker or some other fix that precludes final flap settings. It is the responsibility of the PIC to ensure the approach can be safely executed and the checklist and final flap setting can be completed as close as possible to the 3-mile out point.

Under no circumstance will an approach continue from a point 500 ft above MDA/DH or 500 ft AGL on a visual approach, unless the aircraft is fully configured for landing, airspeed on target, and the landing checklist is complete.

4.3.3.13 Required Runway

Except in an emergency, PNNL aircraft shall not operate from a runway less than 5000 ft long and 75 ft wide. Under no circumstance shall a PNNL aircraft take off or land on runways shorter than that required by the Aircraft Flight Operations Manual.

Landing distance factors due to abnormal aircraft equipment operations shall be computed using the Aircraft Flight Operations Manual.

4.3.4 Navigation Procedures

The PNF will normally program navigation information and monitor flight progress.

4.3.4.1 VOR Only Navigation

The PNF will normally tune and identify radio frequencies. On NAVS he will set the intercept radial on the Pilot Flying side and any cross radials on his. On legs between stations, he will set the outbound radial on #2 course deviation indicator (CDI) as reference to be used by the Pilot Flying on the next leg. After station passage, the #2 NAV information will be transferred to the #1 NAV and the #2 NAV then tuned to the next station with the inbound radial set in.

4.3.4.2 Global Positioning System Navigation

The PIC is responsible for determining the accuracy of the Global Positioning System (GPS) signal in accordance with the procedures set forth in the appropriate operator's manual. During en route operations, GPS and VOR navigation information shall be routinely cross-checked and updated as required. The following procedures shall be followed when navigating by reference to GPS:

1. Both navigation radios shall be tuned to the VORs to monitor navigational progress.

2. Failure of the GPS navigation system shall be reported to the controlling ATC facility as soon as practicable.

4.3.5 Interruption of Flight Due to Passenger Medical Problems

Passengers experiencing distress or a life-threatening emergency should be immediately attended by the PIC, unless the event occurs in the takeoff, landing, or initial climb or descent phases. If the event occurs during these phases of flight, a decision will be made whether to expedite the arrival or return to the departure airport. If the event occurs during some other phase of flight, and the PIC feels that further

action is needed, the PIC will administer first aid when appropriate and instruct the SIC to find and head toward a suitable airport.

The PIC shall make the decision whether to request priority handling by ATC or to declare an emergency, depending on the severity of the situation.

The PIC will make a report of the incident to the Director of Flight Operations, as soon as practicable.

4.3.6 Manipulation of Flight Controls by Non-Employee Pilots (FAR 135.115)

Only the PIC and SIC may manipulate the flight controls of an aircraft during flight. No other person may manipulate the flight controls during flight, unless that person has the permission of the PIC and is an authorized safety representative of the FAA administrator or is a pilot employed by PNNL and qualified in the aircraft.

4.3.7 Admission to Cockpit

When below 10,000 ft, admission to the aircraft flight deck is restricted to:

- Crew members
- Factory or Instructor Pilot
- Aviation Maintenance Technician
- Approved jump seat passengers.

When operating above 10,000 ft, passengers may be admitted to the flight deck at the discretion of the PIC.

Below 10,000 ft, passengers may be allowed in the jump seat at the discretion of the PIC. This practice is not to be encouraged and invitations to occupy the jump seat can only be extended by the PIC.

4.3.8 Operations Using Visual Flight Rules

PNNL aircraft shall not fly a VFR flight segment, unless the weather is currently and forecasted to have a ceiling of at least 5000 ft AGL and 5 miles visibility, and is forecasted to remain so until at least one hour after estimated time of arrival (ETA) at destination.

ATC communication should be maintained throughout the flight. An IFR or VFR flight plan must be filed for all flights.

- *VFR Fuel Supply (FAR 135.209)* - No PNNL pilot may begin a flight operation in a PNNL aircraft under VFR unless, considering wind and forecast weather conditions, the aircraft has enough fuel to fly to the first point of intended landing and, assuming normal cruising fuel consumption

  a. During the day, to fly after that point for at least 30 minutes or

  b. At night, to fly for at least another 45 minutes.

4.3.9 Operations Using Instrument Flight Rules

PNNL aircraft are normally required to operate on IFR flight plans. An IFR flight plan shall be filed and a clearance received for each flight segment of every passenger transport aircraft flight.

- *VFR Over-the-Top Carrying Passengers: Operating Limitations (FAR 135.211)* - No PNNL pilot may operate a PNNL aircraft carrying passengers under VFR over-the-top unless

  a. Weather reports or forecasts, or any combination of them, indicate the weather at the intended point of termination of over-the-top flight

     - Allows descent to beneath the ceiling under VFR and is forecast to remain so until at least 1 hour after the ETA at that point or

     - Allows an IFR approach and landing with flight clear of the clouds until reaching the prescribed initial approach altitude over the final approach facility, unless the approach is made with the use of radar under FAR 91.175(i).

  b. It is operated under conditions allowing

     - A multi-engine aircraft to descend or continue the flight under VFR, if an engine fails.

- *IFR Operating Limitations (FAR 135.215)* - No PNNL pilot may operate a PNNL aircraft under IFR outside of controlled airspace or at any airport that does not have an approved standard instrument approach procedure, except when it is necessary to

  1. Conduct an instrument approach to an airport for which a current approved standard or special instrument approach procedure is in use or

  2. Climb into controlled airspace during an approved missed approach procedure or

  3. Make an IFR departure from an airport having an approved instrument approach procedure.

- *IFR Takeoff Limitations (FAR 135.217)* - No PNNL pilot may take off a PNNL aircraft under IFR from an airport where weather conditions are at or above takeoff minimums, but are below authorized

IFR landing minimums. The exception is unless an alternate airport is within 1 hour flying time (at normal cruising speed, in still air) of the airport of departure.

- *Destination Airport Weather Minimums (FAR 135.219)* - No PNNL pilot may take off a PNNL aircraft under IFR or begin an IFR or over-the-top operation, depending on the weather, unless the latest weather reports or forecasts, or any combination of them, indicate that weather conditions at the ETA at the next airport of intended landing will be at or above authorized IFR landing minimums.

- *IFR Alternate Airport Weather Minimums (FAR 135.221)* - No PNNL pilot may designate an alternate airport, unless the latest weather reports or forecasts, or any combination of them, indicate that weather conditions will be at or above authorized IFR landing minimums for that airport at the ETA.

- *IFR Alternate Airport Weather and Fuel Requirements (FAR 135.223)* - No PNNL pilot may operate a PNNL aircraft in IFR conditions, unless it carries enough fuel (considering weather reports or forecasts or any combination of them) to

  a. Complete the flight to the first airport of intended landing

  b. Fly from that airport to the alternate airport

  c. After that time, fly for 45 minutes at normal cruising speed.

- *IFR Takeoff, Approach, and Landing Minimums (FAR 135.225)* - No pilot of a PNNL aircraft may begin an instrument approach procedure to an airport unless

  1. That airport has a weather reporting facility operated by the U.S. National Weather Service, a source of weather information approved by the U.S. National Weather Service or

  2. The latest weather report issued by that weather reporting facility indicates that weather conditions are at or above the authorized IFR landing minimums for that airport.

     No pilot of a PNNL aircraft may begin the final approach segment of an instrument approach procedure to an airport, unless the latest approved weather report indicates that weather conditions for that airport are at or above the authorized IFR landing minimums for that procedure.

     If a pilot has begun the final segment of an instrument approach to an airport, and a later weather report, indicating below minimum conditions is received after the aircraft is

     a. On an ILS final approach and has passed the final approach fix, or

     b. On an Airport Surveillance Radar (ASR) or Precision Approach Radar (PAR) final approach and has been turned over to the final approach controller, or

c. On a final approach using a VOR, non-directional beacon (NDB), or comparable approach procedure, and the aircraft has passed the appropriate facility or final approach fix, or where a final approach fix is not specified

And, if the pilot has completed the procedure turn and is inbound toward the airport on the final approach course within the distance prescribed in the procedure; then the approach may be continued and landing made if the pilot finds, upon reaching the authorized MDA or DH, that actual weather conditions are at least equal to the minimums prescribed for the procedure.

Each PNNL pilot making an IFR takeoff or approach and landing at a military or foreign airport shall comply with applicable instrument approach procedures and weather minimums prescribed by the authority having jurisdiction over that airport. In addition, at that airport no PNNL pilot may

a. Take off under IFR when the visibility is less than 1 mile or

b. Make an instrument approach when the visibility is less than **2** mile.

4.3.9.1 Alternate Airport Requirements

- A destination alternate airport shall be included in the IFR flight plan when the ceiling at the destination is forecast to be below 2000 ft and 3 miles visibility from 1 hour prior to scheduled arrival time to 1 hour after scheduled arrival.

- The weather forecast at the selected destination alternate shall meet the published air carrier alternate airport weather requirements on the back of the first approach plate for the alternate airport.

- An alternate airport shall also be selected when the destination airport is reporting one of the following:

  - Forecast thunderstorms or low level wind shear

  - One operational runway

  - Ice, slush, or snow on the runway.

- When visibility at the departure airport is reported as less than that required for an approach, an emergency alternate airport within 100 nautical miles of the departure airport shall be entered in the IFR flight plan.

- For aircraft with two engines, the emergency alternate shall be within **2** hour of flying time with one engine inoperative.

- The weather forecast at the selected emergency alternate shall meet the published air carrier alternate weather requirements on the back of the first approach plate for the alternate airport.

4.3.9.2 Limitations on the Use of Auto Pilot - Minimum Altitudes for Use (FAR 135.93)

- No PNNL PIC may use an auto pilot at an altitude above the terrain that is less than 500 ft or less than twice the maximum altitude loss, specified in the approved Aircraft Flight Operations Manual or equivalent, for a malfunction of the auto pilot, whichever is higher.

- When using an instrument approach facility other than ILS, no PNNL pilot may use an auto pilot at an altitude AGL that is

  - less than 50 ft below the approved minimum descent altitude for that procedure

  - or less than twice the maximum altitude loss, specified in the approved Aircraft Flight Operations Manual (or equivalent), for a malfunction of the auto pilot, whichever is higher.

- For ILS approaches, when reported weather conditions are less than the basic weather conditions defined in FAR 91.155, no PNNL pilot may use an auto pilot

  - with an approach coupler at an altitude that is less than 50 ft AGL

  - or the maximum altitude loss, specified in the approved Aircraft Flight Operations Manual or equivalent, for a malfunction of the auto pilot with approach coupler, whichever is higher.

4.3.9.3 Wind Restrictions

The PIC shall consider runway conditions and demonstrated crosswind components stated in the Aircraft Flight Operations Manual or this manual (whichever is most restrictive).

- PNNL aircraft will not depart or land when wind velocities exceed the following:

  - 55 kt headwind component

  - 30 kt crosswind component

  - 10 kt tailwind component.

4.3.9.4 Runway Requirements and Conditions

- The PIC shall be responsible for calculating the Gross Weight/Takeoff and Landing Performance Requirements for airports of intended use, as outlined in the Aircraft Flight Operations Manual.

- The PIC shall be responsible for meeting FAR 121.189 and FAR 121.195 Transport Category Turbine Engine Powered Airplanes Takeoff and Landing Limitations.

- PNNL aircraft shall not operate when braking action is reported as poor or nil.

- PNNL aircraft shall not depart when standing water, slush, or wet snow greater than **2** inch in depth covers an appreciable part of the runway.

- PNNL aircraft shall not depart when dry snow greater than 4 inches in depth covers an appreciable part of the runway.

- When takeoffs or landings are made on wet, slush-, or snow-covered runways and braking action reports are available, the following guideline shall be used:

  - Wet runways add 15% to the runway length required in this section.

  - Pilots are encouraged to consider a more conservative approach when operating on wet or slippery runways.

4.3.9.5 Clearance Readbacks

All flight plan clearances, ATC instructions, taxi instructions, ATC clearances, and instructions regarding active runways will be read back, including the aircraft registration number.

4.3.9.6 Jeppesen Revisions

It is the responsibility of both pilots assigned to ensure the aircraft's Jeppesen Revisions have been completed.

4.4 Post Flight Operations

4.4.1 Maintenance/Flight Forms and Records (Maintenance Status and Problem Notification)

All aircraft discrepancies discovered during flight will be substantiated by the PNF, using a complete and legible entry in the Aircraft Discrepancies form (see Appendix A, page A.12). Although verbal descriptions of the fault are helpful and should be provided to maintenance personnel performing the repair, these descriptions will not substitute for a written discrepancy report.

4.4.2 Post Flight Inspection

It is the responsibility of the PIC to ensure that a thorough post flight inspection of the aircraft is conducted.

4.4.3 Securing Aircraft

It shall be the responsibility of the PIC to park and secure the aircraft in a manner that is as free as possible from the hazards of weather, intrusion, or collision with service vehicles, or aircraft under tow/ taxiing. If doubts exist about the security of the aircraft, the PIC with the concurrence of the Director of Flight Operations or Chief Pilot shall be responsible for taking the steps necessary to ensure aircraft security. Some examples of these steps are taxiing to a better location, obtaining hangar space, obtaining guard, or flying the aircraft out of the hazard area. It shall be the responsibility of the PIC to determine the aircraft has been properly secured with chocks, pins, and covers.

Prior to deplaning, crew members shall empty all ashtrays, service the lavatory (if required), and remove all perishables and refuse. In subfreezing temperatures, it may be necessary to drain/remove items that freeze.

4.5 Adverse Weather Operations

Weather is the single most influential factor in the planning and execution of a flight operation. When conducting a flight operation away from the PNNL home base, it is the responsibility of the flight crew to monitor the FSS for severe weather warnings or forecasts. If severe weather (thunderstorms with large hail, strong winds over 50 kt, tornadoes, hurricanes, or any phenomenon that would endanger a PNNL aircraft left outside on the ramp) is forecast, the airplane must be moved. The flight crew is responsible for placing the aircraft in a hangar or repositioning it to a safe area until the danger has passed.

All pilots have their own limitations and know better than anyone what they should, or should not, do. A pilot must never allow external pressures influence a decision to permit a flight, if any doubt whatsoever is present concerning the safe outcome. A pilot must never push his or her limitations or exceed the limitations of the aircraft. After evaluating every practical source of weather information, it is the prerogative and responsibility of the PIC to make the *go/no go* decision for any flight. The provisions of this manual are to be used as aids to the pilot in making these decisions.

4.5.1 Cold Weather (FAR 135.227)

No PNNL PIC may take off an aircraft that has frost, ice, or snow adhering to any windshield, wing, stabilizing or control surface, to a power plant installation or to an airspeed, altimeter, rate of climb, or flight attitude instrument system. See Aircraft Flight Operations Manual for details on cold weather operations.

4.5.2 Hot Weather/Density Altitude Advisories

At airports with elevations of 2000 ft and higher, control towers and the FSS will broadcast the advisory “Check Density Altitude” when the temperature reaches a predetermined level. These advisories

will be broadcast on appropriate tower frequencies or, where available, ATIS. FSS will broadcast these advisories as a part of Local Airport Advisory and on a Transcribed Weather Broadcast (TWEB).

These advisories are provided by air traffic facilities, as a reminder to pilots that high temperatures and high field elevations will cause significant changes in aircraft performance characteristics. During these conditions, the PNNL PIC retains the responsibility to compute density altitude, as a part of preflight duties.

4.5.3 Clear Air Turbulence

Clear air turbulence (CAT) is a very serious operational factor for flight operations at all levels and especially to jet traffic flying over 15,000 ft. The best available information on CAT comes from pilots via the Pilot Reporting system (PIREP). All pilots encountering CAT conditions are urgently requested to report *time, location, and intensity* (light, moderate, severe, or extreme) of the turbulence to the FAA facility with which they are maintaining radio contact. If time and conditions permit, turbulence should be reported according to the standards for other PIREP and position reports. When operating PNNL aircraft above 15,000 ft, it is the responsibility of the PNNL PIC to monitor for CAT and give PIREP.

4.5.4 Turbulent Air Penetration

PNNL pilots will not intentionally fly through areas of reported severe turbulence and will give careful consideration to flying into areas of forecast moderate turbulence. If any turbulence is encountered in flight, a report of its duration and position should be given to the nearest FAA facility. The following terminology is to be used for reporting the degree of turbulence:

1. *Light* refers to a condition where occupants may be required to use seat belts, but objects in the aircraft remain at rest.

2. *Moderate* refers to a condition where the occupants require seat belts and are occasionally thrown against the belt. Unsecured objects in the aircraft may move about.

3. *Severe* refers to a condition where the aircraft may be momentarily thrown out of control. Occupants are thrown violently against the seat belt and objects not secured are tossed about.

4. *Chop* refers to a light or moderate condition of washboard-type fluctuations occurring at rapid and frequent intervals.

4.5.5 Wind Shear Conditions

- Whenever a cold front moving at 30 kt or more is going to arrive at the airport at the same time you are, expect significant wind shear as you fly through the frontal surface.

- A warm front with a temperature difference of 10°F or more may be a potential wind shear problem.

- Any time you are fighting a headwind or strong tailwind en route and the surface wind is reported calm, wind shear exists between your altitude and the ground.

- Expect serious wind shear encounters anytime a thunderstorm is in the immediate environs of the airport.

- VFR: If wind shear conditions exist, plan to fly down the final approach a little faster and a little higher than normal (if airspeed starts to bleed off, add power immediately). Watch out for overshoot!

- IFR: If the approach speed is 120 kt to make a 3-degree glide slope without wind, you will descend about 600 ft per minute (FPM). If it requires only 400 FPM to stay on the glide slope, a headwind of about 40 kt is present. If the surface wind is 10 kt, during descent you will lose 30 kt and need to get power on and scramble to keep from getting too low.

  If the necessary descent rate to stay on glide slope is near 800 FPM, a 40-kt tailwind is indicated, and it will be a scramble not to overshoot. The formula for descent rates vs. ground speed is half the ground speed times 10 equals the descent rate.

  Example: If you are coming down the glide slope at 900 FPM, divide that by 10 to get 90; multiply by 2 to get 180, which is the ground speed. If the normal air speed is 120 kt, you have a 60-kt tailwind!

  These numbers are true airspeed at sea level.

4.5.6 Thunderstorms

Flights will not be planned into areas where tornadoes or heavy thunderstorms are reported. It is permissible to conduct flights into areas of scattered thunderstorms where detours may be made around storms or heavy rain areas. Even under these conditions, the pilot should monitor available weather broadcasts to be aware of trends toward increased activity. When detouring around thunderstorms, the flight path should avoid the overhang of a cumulonimbus because it would be possible, even though flying in the clear, to encounter a hail shaft from the overhang.

4.5.7 Lightning and Static Discharges

Static discharges occur frequently in shower-type clouds at levels where the air temperature is close to freezing. Lightning and static discharges are usually preceded by sharp increases in radio static, especially in the low frequency range. The pilot should make the following checks for visible or functional indications of damage:

1. A check of the magnetic compass on as many cardinal headings as practical, using other cockpit indicators, such as heading indicator, radio magnetic indicator (RMI), and radios for known headings as references.

2. Operational checks of communications and navigation equipment for erratic or sluggish operations.

3. Upon landing, a visual check of the exterior of the aircraft should be made for possible structural or skin damage, with particular attention to trailing edges, control hinge points, visible bonding and wiring, and fuel tank vents and access ports.

4.5.8 Radar/Storm Scope Requirements

1. At altitudes less than FL230, echoes shall be avoided by at least: 5 miles if OAT is 0°C or higher, 10 miles if 0°C or lower. These distances are doubled, if radar indicates rapid increase in size or shape of hooks, fingers, or scalloped edges associated with the cell(s). (See subsection 4.3.1.10 for other requirements.)

2. Flights shall proceed with extreme caution through areas of forecast tornadoes. When flying through these areas, a listening watch shall be maintained on appropriate frequencies giving weather information. Radar shall be monitored carefully to avoid sharply defined echoes. (See subsection 4.3.1.9 for other requirements.)

4.5.9 Icing and Freezing Precipitation

When ice accumulation is encountered, an increase in power is required to maintain altitude or airspeed. If large increases in power are required, action should be taken immediately to change altitude or otherwise avoid the icing conditions that may abnormally tax the de-icing or anti-icing capability of the aircraft (FAR 91.209). All icing conditions will be reported to the FAA, using the following terminology:

1. Degree of Intensity

   a. *Light ice* is an accumulation of little or no consequence and does not affect the performance of the aircraft, but should be reported for meteorological reasons. Such accumulations can be handled safely by the normal de-icing or anti-icing equipment. The aircraft can be flown indefinitely in such conditions with use of this equipment.

   b. *Moderate ice* is a serious condition, one the aircraft de-icing or anti-icing equipment can handle, but it is a signal to the pilot to alter the flight to avoid further operation in that condition.

   c. *Severe ice* is an adverse and dangerous condition the aircraft de-icing or anti-icing systems cannot handle. Freezing rain is considered a severe icing condition, and immediate action should be taken to change the altitude or course of the plane or to take whatever action is required to ensure the safety of all passengers and crew members. If the icing condition continues, the pilot should land at the nearest suitable airport and wait for a weather change.

2. Types of Ice

   a. *Rime ice* is hard, porous, white, opaque ice consisting of small grains, air space, and frost-like crystals.

b. *Clear ice* is hard, clear, solid ice that is very heavy.

c. *Mixed ice* is a combination of rime and clear ice.

4.5.10 Flight Restrictions Due to Actual or Forecast Weather Conditions

PNNL aircraft do not operate under the following conditions:

- Take off or land in moderate or heavy freezing rain or sleet.
- Take off with frost, snow, or ice adhering to any windshield, power plant installation, airspeed, altimeter, rate-of-climb or flight-altitude instrument system.
- Take off with frost, snow, or ice adhering to any airfoil or control surface.
- Take off into known or forecast icing conditions that exceed the anti-icing or de-icing limitation of the aircraft.
- Take off into known or forecast conditions of severe turbulence or severe clear air turbulence.
- Take off into known areas where thunderstorms of moderate intensity or greater exist, unless the thunderstorms can be avoided using visual or radar guidance.
- Take off or land with a thunderstorm adjacent to or over the airport.

4.6 Security Procedures

In order to provide assurance the aircraft, cargo, and passengers meet the required security conditions, the following regulations shall apply:

- Passengers and crew carrying classified material must receive courier training and receive periodic certification, as required by originating agency directives, as applicable.
- Material designated as hazardous or radiological cargo must meet the applicable federal or state regulations relating to the interstate or intrastate transport of such material.
- Transport of materials designated as controlled substances and covered by federal or state statutes must comply with applicable PNNL policies, DOE or DoD policy or federal or state regulations relating to such transport.

- Non-PNNL, as well as PNNL, passengers must comply with PNNL, DOE, and DoD requirements for transport of classified, hazardous, toxic, or radiological material.

- Classified or Business Sensitive material shall be packaged and marked to meet the originating agency requirements for the appropriate classification level.

- All packages and cargo received for transport shall bear the identity of the sender and the receiver. Such material shall be packaged to permit visual examination of the package exterior to determine if the package has been opened or tampering has occurred.

- Firearms being transported shall be stored in the cargo area and must be unloaded. Ammunition shall be stored in containers approved for air transport. Possession of handheld firearms shall be excluded, except for persons authorized by applicable federal or state license to carry such weapons.

- Aircraft preflight inspection shall be performed to determine if clandestine explosive or incendiary devices have been secreted on board the aircraft. Such inspection shall be performed as part of the Research Aircraft Preflight Security Checklist (see Section 3 and Appendix A, page A.4).

- The Corporate Aircraft Preflight Security Checklist must be completed for each applicable package.

4.7 Accident Notification Procedures and Responsibilities

For detailed information on the notification/reporting of aircraft incidents/accidents or off-normal events and overdue aircraft, and the preservation of aircraft wreckage, mail, cargo and records, refer to Appendix E.

4.8 Incident/Accident or Off-Normal Event on Scene Procedures

4.8.1 Crew Member Responsibilities

In the event of an incident/accident or off-normal event involving an aircraft operated by an aviation staff member, the Senior Crew Member not incapacitated will coordinate the following procedures:

1. Remove all passengers to a safe distance, if fire or explosion is imminent.

2. Request medical assistance and initiate first aid as necessary. Arrange for medical examination of all passengers whether injured or not and secure a doctor's report on each one.

3. Secure the scene to allow accurate documentation of conditions associated with the event, and to allow an investigative team to observe those conditions.

4. Call the PNNL Emergency Number (509-375-2400) and notify the proper agencies and personnel as listed in the Emergency Notification Chart (Appendix A, page A.23).

5. All accidents involving Hanford associated aircraft shall be reported promptly to the PNNL ASPOC, RL Manager/Aviation Manager/ASO, the HQ Senior Aviation Management Official, the NTSB, and the FAA, as required. See Appendix D for names and telephone numbers.

6. Make no statements regarding the accident to anyone other than the FAA, the NTSB, the local police, and the FBI.

   If requested by an authorized representative of the FAA, NTSB, airport police, or other state or local police to issue a statement, REMEMBER: You are not required to say anything that might tend to incriminate you and you are entitled to legal counsel. You have these rights whether or not the person asking for the statement advises you of them. If you choose to assert your rights, you should affirmatively state them, or they may be considered as having been waived.

   Attempt to satisfy all such requests by referring the requesting party to the Director of Flight Operations/Chief Pilot, or PNNL Media Relations. Information for the general public, press, radio, TV, and company employees concerning accidents, emergencies, or bomb hoaxes is developed and released only by PNNL Media Relations.

7. Complete the Aviation Safety Incident/Accident or Off-Normal Event Operations Checklist (Appendix A, page A.22) after making a survey of the wreckage to determine and record factors that may have contributed to the cause of same; making sure not to enter, touch or disturb the aircraft, its controls, or parts.

8. After a doctor has examined them, assist the uninjured persons toward their destination, as necessary.

4.8.2 Emergency First Aid

First aid kits and survival equipment, as required, will be readily available for emergency uses, and each person on board must be briefed on its location and use. No person may operate a PNNL aircraft having a passenger seating configuration more than 19 (excluding any pilot seat), unless it is equipped with the following emergency materials:

- One approved first aid kit that meets the following requirements for treatment of injuries likely to occur in flight or in a minor accident:

  - Must be dust and moisture proof, and contain only materials that either meet the Federal Specifications GGK-319a, as revised, or approved by the FAA Administrator.

  - Must be readily available to the cabin flight attendants.

  - Gloves may be placed in the first aid kit or in a location readily accessible to crew members.

  - The contents of the kit must be checked prior to each deployment.

- A crash axe carried so as to be accessible to the crew, but inaccessible to the crew during normal operations.

- Unless otherwise indicated, the kit must contain at least the following items.

Contents	Quantity
Adhesive bandage compressors, 1 in.	16
Antiseptic swabs	20
Ammonia inhalants	10
Bandage compressors, 4 in.	8
Triangular bandage compressors, 40 in.	5
Arm splint, non-inflatable	1
Leg splint, non-inflatable	1
Roller bandage, 4 in.	4
Adhesive tape, 1-in. standard roll	2
Bandage scissors	1
Pair of protective latex gloves or equivalent	1

4.8.3 Incident/Accident or Off-Normal Event Operations Checklist

This checklist is found in Appendix A, page A.22.

4.9 Medical Emergencies

4.9.1 General

Medical aid shall be secured immediately for all injured persons. Notify the PNNL Emergency Number 509-375-2400 as soon as possible and, in the event of fatalities, also notify the coroner. Notification of relatives should be handled through PNNL Media Relations.

Physicians examining injured persons should be requested to submit a medical report covering each such person.

The full names and addresses of each injured person should be obtained, and also the names and addresses of the owners of damaged property.

4.9.2 Injury or Illness

The PIC should quickly obtain as complete and detailed a report as possible from the flight crew, then, after examining the person, decide whether the seriousness of his/her condition warrants the

quickest possible medical attention. If a physician is on board the plane, request his advice as to the necessity of securing immediate additional medical attention. If the decision is made to land, the PIC shall:

- Divert to the nearest suitable airport consistent with safe conduct of the flight, including return to point of origin.

- Announce the decision to land and radio a request that an emergency medical response team meet the aircraft.

Note: The PIC should use his judgment as to whether only an ambulance should be summoned, rather than a physician as well. With doctors in short supply, and with the possibility of critical time being lost waiting for the doctor to arrive, the best possible medical service might be obtained by calling only for the ambulance service.

4.9.3 Loss of Consciousness or Death in Flight

When a person loses consciousness, or breathing, or heart action appears weak or stopped, and the administration of ammonia, oxygen, or other unusual measures fail to bring about improvement, it is the responsibility of the PNNL flight crew to land the aircraft at a suitable airport and place the person in the care of a physician as quickly as possible. Request, through control tower or other agency, for public authorities (police, airport officials, coroner, and another doctor) to come to the airport, as a person on board has a life threatening condition or appears to be dead.

4.9.4 Radioactive Materials Involvement

In incidents involving aircraft transporting radiological materials and there is a fire, fight the fire from upwind, keeping out of any smoke, fumes, or dust arising from the accident. Do not handle suspected material until it has been released by monitoring personnel. Segregate clothing and tools used at the fire until radiological teams have checked them.

With as little contact as possible, remove injured persons from accident area. Take any measures necessary to save life, but perform only essential first-aid and surgical procedures until help is obtained from physicians familiar with radiation medicine. Segregate and detain those who have had possible contact with radioactive material until they can be examined further.

Do not eat, drink, or smoke in the area. Do not ingest food or drinking water that may have been in contact with material from the accident.

4.10 Aircraft Emergencies

Aircraft emergencies can be generally classified as either

- Planned - PIC has sufficient time to tell the crew of the nature of the emergency and what they should do.

- Unplanned - Happens unexpectedly, often during taxi, takeoff or landing, giving the PIC no time to coordinate a course of action with the crew. About 80 percent of emergency landings are unplanned.

Emergency procedures described in this manual were included only after repeated testing and thorough investigation. They represent the best known available facts about the subject. Pilots should follow these procedures as long as they fit the emergency. However, if they are at any time not adequate or not applicable, then the best judgment of the PIC should prevail. Only the flight crew operating the aircraft at the time the emergency occurs can evaluate the situation sufficiently to make the proper decision. Crew members should assume the worst in abnormal situations and emergencies and act accordingly. The procedures are essentially the same as those contained in the FAA-approved aircraft flight manual.

Although not all emergencies or malfunctions can be addressed, generally the PIC will make all landings whenever any problem with the aircraft arises unless, in his judgment, it would be safer for the First Officer to land the aircraft.

All crew members should be thoroughly familiar with emergency procedures and the location and use of emergency equipment. Any flight crew member should be equipped to handle the emergency duties of any other crew member.

All crew members must realize the PIC is in complete charge of the aircraft, and his orders are to be obeyed, even though they may be in variance with written instructions. Any potential or actual emergency situation should be immediately called to the attention of the PIC. Only the PIC shall initiate emergency procedures such as engine shutdown or fire extinguisher discharge. (If the PIC is absent from the cockpit, the First Officer is in command.)

Emergency checklists are used in the same challenge and response method as the normal checklists with one additional step: the pilot reading the checklist should read aloud BOTH the challenge and the response. Then, no doubt will exist in any flight crew member's mind as to the correct course of action. The pilot responding has the same responsibility for checking or accomplishing the item, and responding to the challenge, as if it were not being read aloud.

1. The PIC is to call out all memory items for completion by the First Officer.

2. Engine identification is accomplished by the Pilot Flying the aircraft and confirmed by the Non-Flying Pilot, prior to complying with emergency procedures.

Fires are obviously in the category of most urgent emergency and require the immediate action in the earliest stages for proper control. Any warning of fire must be treated as an actual fire and fire-fighting procedures initiated. Procedures may be terminated, if it can be definitely determined that no fire exists.

4.10.1 Engine Failure

In the event of an engine failure, the aircraft will be landed at the nearest practical airport in point of time. Request crash/fire-fighting equipment. See the Emergency Notification Chart in Appendix A, page A.23.

When an engine fails on an over-water flight and the aircraft is more than 100 miles from point of departure, destination, or other suitable landing area, the PIC should immediately notify ATC in the routine manner. ATC will then be responsible for alerting Search and Rescue.

4.10.2 Emergency Landings – Crew Duties

4.10.2.1 Captain/PIC Duties

The PIC must first determine the extent of the emergency. Next, he must notify ground station of emergency.

The PIC must also advise the Flight Deck Crew and issue necessary orders.

Other tasks regarding an emergency landing include:

- Warning passengers just prior to landing with public address system, or other prearranged signal.
- Position all switches and controls, as appropriate, just prior to touchdown.
- If possible, avoid landing until (a) emergency equipment and crews are standing by; (b) passengers are instructed in evacuation procedures; (c) aircraft emergency exits are ready for use.

4.10.2.2 First Officer Duties

The major duties of the First Officer during an emergency landing are to:

- Perform initial duties as directed by the PIC.
- Depressurize aircraft when directed.
- Secure all loose equipment in cockpit.
- Help prepare passengers, emergency exits, and equipment, if possible.

- Actuate all switches and controls, as appropriate, just prior to touchdown.

- Give pregnant women extra padding material to place between their knees and face when in brace position. Have pregnant women fasten seat belts tightly and as low as possible across their hips.

- Give passengers duties (able-buddy system):

  - How to open exits

  - Who goes out first, second, third, and so forth

  - Assist injured passengers

  - Secure main cabin door curtain OPEN.

- Make sure all passengers know how to unfasten their seat belts and give them the following instructions

  - In front-facing seats, to put their heads in their laps and firmly hold their arms under their knees just before touchdown.

  - In rear-facing seats, to clasp their hands firmly behind their heads and lean back in the seat just before touchdown.

  - If it is a wheels-up landing, two impacts will occur; the second one is more severe.

  - To remain seated in brace position until the aircraft stops all movement.

- Give passengers blankets, pillows, and coats for impact protection, if available.

- Instruct passengers to assume their proper brace position upon prearranged signal.

4.10.2.3 Emergency Ground Equipment Request

If the PIC wishes emergency equipment alerted for a landing, he will normally request this through ATC or the control tower at the airport of intended landing.

Before making a landing when emergency equipment has been requested, give the following information to the ATC, tower, or approach control:

1. Description of problem.

2. Whether the landing will be long, short, or normal.

3. Number of passengers on board.

4. Handicapped passengers and their locations on aircraft.

5. Type of cargo, if unusual.

6. Amount of fuel on board (in minutes).

When an emergency condition is reported to any FAA facility, the emergency equipment at the airport will be standing by. If there is the slightest doubt that the gear is not fully locked down, that a hydraulic failure or engine malfunction exists, or that any condition exists that might make the landing anything but normal, do not hesitate to request the tower to have emergency vehicles standing by.

4.10.3 Emergency Passenger Evacuation Procedures - Crew

Availability of various exits will differ from one situation to another. Crew members on the scene must make the decision as to which exit would be most preferable to use under the prevailing circumstances.

Bearing in mind that not all situations can be described, the following basic procedures best cover most incidents requiring the evacuation of an aircraft.

In Stage 1, securing the aircraft and initiating the evacuation, the Pilot Flying

- Stops the aircraft

- Makes the public address announcement
- Secures cockpit and engines as appropriate.

In this stage, the First Officer is responsible for

- Calling for assistance over radio

- Opening main door.

During Stage 2, the First Officer, after opening forward door, will proceed to mid-cabin to assist in evacuation of passengers.

The PIC will assist in passenger evacuation. After cockpit is secure, he will proceed to mid-cabin for a final check to see that everyone is out; then exit.

After evacuation, the PIC is responsible for determining all crew and passengers are accounted for.

4.10.4 Ditching

Ditching, a landing in water, can be divided into two categories, planned (time available for preparation) and unplanned (unexpected crash into water). Exact procedures and crew duties, as well as explanations, are outlined in the Aircraft Flight Operations Manual. These procedures and duties should be followed to the extent possible.

The following list is a general guide for flight crew duties in a planned ditching:

1. Communicate: The international distress frequencies are: 500 kHz, 2182 kHz, 8364 kHz, and 121.5 MHz.

2. Set transponder to Code 7700. Note: You may not be in radar contact.

3. Determine options. Communicate intentions and position to ATC and any nearby vessels.

4. Plan water landing. Evaluate sea and wind conditions, then determine best ditching heading.

5. Prepare cabin and passengers by accomplishing the following tasks:

    - Brief the flight crew
    - Stow and secure loose items
    - Locate rafts and survival equipment
    - Turn lights up to maximum intensity
    - Brief passengers
    - Pass out life vests.

6. Prepare yourself and the Flight Deck Crew by

    - Securing cockpit items
    - Donning life vest
    - Securing seat belt and shoulder harness
    - Securing flashlight nearby

- Turning on emergency exit lights
- Discussing duties and exit routes with crew.

7. Included in the preparation of the aircraft for ditching:
    - Dump fuel, if possible
    - Depressurize below 10,000 feet
    - Set heading bug to ditch heading
    - Turn on all lights
    - Silence gear warning system
    - Make final position check
    - Communicate new position and intentions again.
8. The PIC ditching procedure follows.
    - Set flaps to recommended setting
    - Hold minimum speed for wind conditions
    - Touch down slightly tail low
    - Maintain control as long as possible
    - Secure flight deck and start evacuation.
9. Evacuation:
    - Each crew member will carry out planned duties
    - Assure all crew members can evacuate
    - Do not open any exits below water level
    - Account for all passengers and crew.

In the event of an unplanned ditching, all crew members will assist in the evacuation procedures to the extent possible. Life vests should be handed out and every attempt made to position rafts and survival equipment for use. Do not attempt to open any exits below the water level.

4.10.5 Aircraft Decompression

Aircraft decompression can be divided into three categories: 1) slow decompression, 2) rapid decompression, 3) explosive decompression.

Exact procedures and crew duties, as well as explanations for each category, are outlined in the Aircraft Flight Operations Manual. These procedures and duties should be followed to the extent possible.

Slow decompression normally provides adequate time to cope with the problem and the resulting situation. Rapid or explosive decompression may require immediate action on the part of the PIC and Flight Deck Crew. The following list is presented as a general guide to this immediate action:

- Don oxygen mask and user oxygen.
- Establish cockpit communications.
- Initiate emergency descent.
- Contact ATC to advise of situation.
- Assure passenger oxygen is turned on.
- Make public address announcement to use your oxygen masks, fasten your seat belts, and no smoking.
- Level off aircraft at completion of descent.
- Assist any passengers with decompression problems.

4.10.6 Static Discharge on Aircraft

When an aircraft is subjected to static discharge, immediately check the airplane for any visible or functional indication of damage. If evidence of damage makes the airworthiness of the airplane questionable and the Captain/PIC deems it advisable, land at the nearest suitable airport.

If no damage to the airplane is apparent in flight and in the judgment of the PIC no hazard is involved, continue to the next scheduled stop and check:

1. Magnetic compass for accuracy - check against other cockpit indicators with gear up and gear down (nose gear magnetism cannot be readily detected by ground crews).

2. Communication and navigation equipment - check for normal operation.

3. Electrical instruments - monitor for erratic or sluggish operation.

Enter all available information in the aircraft logbook and, upon landing at the next scheduled stop, notify the Director of Maintenance of detailed information that may have a bearing on possible damage.

4.10.7 Special Precautions in Research Flying

When a PNNL pilot encounters a meteorological condition or any irregularity in a ground or navigational facility that may affect the safety of other flights, the pilot will provide a report to the appropriate ground stations, as soon as practical.

When research test functions are in progress and the pilot is required to concentrate on aircraft placement or has other additional duties, a second pilot or competent observer shall be in the cockpit to look for other aircraft or obstructions to flight. Maximum cockpit vigilance is especially important when maneuvering at low altitude.

The cabin seat belt sign will be lit whenever the aircraft is in motion on the ground, whenever the aircraft takes off or lands, and whenever the pilot suspects turbulent air conditions. Crew members will have their seat belts fastened at all times, except when moving from one station to another. When cabin signs are not operational, the pilot will ensure that passengers and crew know when they should have their seat belts fastened.

Without the permission of the PIC, passengers and crew members will not operate electronic devices (such as radios, computers, or scientific apparatus). These devices are never operated in IFR conditions, unless the PIC has determined the devices will not cause interference with the communication or navigation systems of the aircraft.

Due to the nature of research flying, single-pilot IFR operations are generally not recommended. However, instances may occur during single-pilot operations where it is safer or more practical to operate under IFR. The decision whether to operate under VFR or IFR (the FAR notwithstanding) is left to the discretion of the PIC. Single-pilot IFR operations during cross-country or non-research flights are permissible.

4.10.8 Other Precautionary Measures

When mechanical failure, such as gear or flap, occurs that may require alerting ground fire protection equipment, the PIC shall follow the same procedure as outlined in Section 4.10.2, giving the reason for the request.

4.11 Hijacking, Sabotage, or Bomb Threat

In the event of hijacking, hostage or bomb threat, the following philosophy will serve as a guide:

- An offender of this sort shall be considered dangerous, desperate, or unbalanced.
- The safety of the passengers shall be considered paramount.
- A calm attitude, coupled with good judgment, will do much toward calming the situation and attaining a safe outcome.
- If a landing site is considered unsafe, too short, or not surfaced, explain the facts to the hijacker.
- The aircraft shall be considered expendable, but every effort shall be made to safeguard the passengers and crew.

4.11.1 Hijacking

In the event of a hijacking on a PNNL aircraft, the following procedures should be executed to the extent possible.

No special effort should be made to notify the Laboratory directly when such action would antagonize the hijacker(s) or jeopardize the safety of the flight. Normally, if the hijacking starts in airspace controlled in the U.S. or its agencies, information to the Laboratory will be provided by the appropriate ATC facility as a result of your normal ATC communications, which will include response to the hijacking Code 7500 or the emergency code 7700.

4.11.1.1 Voice Communications

Should voice communications be permissible, the following procedures should be established:

1. If both pilots were already on headsets, attempt to establish a discrete communications system. Do not antagonize or alert the hijacker by donning headsets in his presence.
2. Assure the PIC's speaker is off.
3. Turn the #2 receiver to Corporate or Aeronautical Radio, Inc. (ARINC) for domestic operation and to 121.5 for overseas operation.
4. The First Officer is to monitor the #1 receiver for ATC with use of headphones at their discretion; the First Officer's speakers, when available, must be on at all times to maintain the impression for the hijacker(s) that he is in receipt of all radio communications. The intent is to allow the PIC to receive messages unmonitored by the hijacker(s).

Note: If verbal communications are possible, follow the outline under subsection 4.11.1.4.

4.11.1.2 Pilot/Controller/Transponder Code/Set Up

1. Pilot Message: AI AM BEING HIJACKED.@

   Pilot Signal: Set transponder to Code 7500. When unable to change the transponder setting or when not under radar control, transmit a radio message which includes the phrase, A(AIRCRAFT CALL SIGN) TRANSPONDER SEVEN FIVE ZERO ZERO.@

   Controller Signal: Acknowledge receipt of Beacon Code 7500 by transmitting A(AIRCRAFT CALL SIGN) (NAME OF FACILITY) YOU ARE SQUAWKING 7500. IS THIS INTENTIONAL?@ An affirmative reply from the pilot indicates confirmation and proper authorities will be notified.

   When an in-the-clear radio transmission of a hijacking is received, controllers shall assign Code 7500 to the aircraft. This announcement does not preclude a subsequent change to Code 7700 by the pilot, if necessary.

2. Pilot Message: ASITUATION APPEARS DESPERATE. WANT ARMED INTERVENTION.@

   Pilot Signal: After using Code 7500, change the transponder to Code 7700. When unable to change the transponder setting or when not under radar control, transmit A(AIRCRAFT CALL SIGN) TRANSPONDER SEVEN SEVEN ZERO ZERO.@ Pilots who change from Code 7500 to Code 7700 should remain on 7500 for at least 3 minutes or until a confirmation of Code 7500 has been received from the Controller, whichever is sooner, before changing to Code 7700.

   Controller Signal: Acknowledge receipt of Code 7700 by transmitting A(AIRCRAFT CALL SIGN) (NAME OF FACILITY) NOW READING YOU ON TRANSPONDER SEVEN SEVEN ZERO ZERO.@

   An aircraft squawking Code 7700 and not in radio contact with the ground will be considered by ATC to have an in-flight emergency (in addition to hijacking) and the appropriate emergency procedures designated shall be followed. In these cases, notification of concerned authorities shall indicate the aircraft displayed Code 7500, as well as Code 7700.

4.11.1.3 Pilot/Controller/Use of Flaps

1. Pilot Message: ASITUATION STILL DESPERATE, WANT ARMED INTERVENTION AND AIRCRAFT IMMOBILIZED.@

   Pilot Signal: Leave full flaps down while landing or lower full flaps after on the ground.

2. Pilot Message: ALEAVE ALONE - DO INTERVENE.@

Pilot Signal: Retract flaps after landing.

Note: Pilot who retracts flaps after squawking Code 7700 should return to Code 7500 for the next leg of the scheduled flight, unless the situation changes again. The pilot may transmit A(AIRCRAFT CALL SIGN) BACK ON SEVEN FIVE ZERO ZERO@ to emphasize the fact that intervention is no longer desired.

4.11.1.4 Hijacking in Foreign Airspace

By Transponder - In the event the PIC decides not to verbally report the hijacking or diversion, and he is in an area where transponder decoding equipment may be available, use transponder Code 7500, which means hijacking. ATC facilities receiving this code will not question the pilot, but will immediately be responsive to his requests. Switching from Code 7500 to Code 7700 will indicate the Asituation appears desperate, need all possible assistance." This message will be interpreted to mean that intervention from armed ground personnel or other appropriate emergency action is desired.

Verbal Communication - Should verbal communications be possible, the following procedures and information should be transmitted:

1. If circumstances permit, Distress or Urgency Radiotelephone procedures apply.

2. If conditions do not permit use of prescribed Distress or Urgency procedures, the message to be sent by the aircraft should be on the air/ground frequency in use at the time. It should also consist of as many as possible of the following elements spoken distinctly and, if possible, in the following order:

   a. Name of station addressed (time and circumstances permitting).

   b. Identification of the aircraft.

   c. Nature of the special emergency condition (circumstances permitting).

   d. If unable to provide *c*, use, if possible, code words for the indicated meaning as follows:

      - Spoken: ATRANSPONDER SEVEN FIVE ZERO ZERO.@ (Transponder beacon Code 7500 should be activated.)

      - Meaning I have been forced to divert to new destination. No immediate assistance required.

      - Spoken: ATRANSPONDER SEVEN SEVEN ZERO ZERO.@ (Transponder beacon Code 7700 should be activated.)

      - Meaning I am under extremely serious threatening constraint and require maximum assistance.

e. Indicate the intention of the PIC (circumstances permitting).

f. Present position, level (flight level or altitude, as appropriate) and heading (circumstances permitting).

g. Any other possibly useful information.

4.11.1.5 Special Procedures

Recommended procedures for PNNL aircraft hijacked to the People's Republic of China, to Vietnam, and North Korea follow.

If it is possible to do so without jeopardizing the safety of the flight, the pilot of a PNNL aircraft, after departing from the cleared route over which the aircraft was operating, will attempt one or more of the following actions, insofar as circumstances may permit:

1. Maintain a true airspeed of no more than 400 kt, and preferably an altitude of between 10,000 and 25,000 ft.

2. Fly a course toward the destination the hijacker has announced.

3. Transmit the international distress signal, MAYDAY, on any of the international distress frequencies available (121.5 MHz, 2182 kHz).

If these procedures result in either radio contact or air intercept, the pilot will attempt to comply with any instructions received that may direct him to an appropriate landing field. Additionally, if the aircraft is equipped with an operational transponder, the pilot may use transponder Code 7500 to indicate his aircraft has been hijacked or Code 7700 to indicate his aircraft is in distress. (See preceding "Spoken" and "Meaning" lists.)

4.11.2 Sabotage or Bomb Threat

Any aviation employee receiving a sabotage or bomb threat should use the Bomb Threat Checklist located near the phones and throughout the ground facility (see Appendix A, page A.5). Also, see the Emergency Notification Chart (Appendix A, page A.23).

When a sabotage or bomb threat is received, the Scheduler will immediately notify the flight crew involved. If the aircraft is in the air, Scheduler will contact ATC and advise them of the location of the aircraft and the nature of the situation. If the aircraft is on the ground, contact will be made through the FBO or ground handler.

Aviation personnel will call authorities and will not search for a device upon receipt of a threat. If a device is found, DO NOT TOUCH IT!

4.11.2.1 Sabotage/Bomb Threat Received on Ground

The following procedures reflect our policy of treating every threat as though it is real. Use of these procedures is recommended, but the judgment of the PIC shall be overriding in any specific instance.

If parked:

1. Notify the flight crew to evacuate passengers.
2. Notify ground control.
3. Maintain electrical power. Shut down engines.
4. Assist in evacuation.

If taxiing:

1. Do not return to terminal.
2. Proceed to designated or nearest safe area for evacuation.
3. Follow applicable flight or operations manual evacuation procedures.
4. Notify tower of intentions, and request them to keep vehicles away from doors/slides.
5. Notify the flight crew of evacuation plans. Keep the flight crew advised of any change in evacuation plan.
6. Make an announcement to the effect that "We have received a message that a sabotage threat has been made against one of our aircraft. We intend to take all possible precautions. Therefore, we are parking the aircraft and asking everyone to get off promptly. Do not take any personal belongings. Follow the flight crew's instructions."
7. Evacuate down the stairs. If no stairs, plan an evacuation utilizing doors. Use window exits only if necessary.

4.11.2.2 Bomb Threat Received in Flight

1. The flight crew should prepare for landing at the nearest suitable airport. When possible, advise ATC of estimated time of arrival.
2. Declare emergency - Transponder Code 7700. Request emergency equipment to stand by at intended airport.

3. Request ATC notify FBI/local law authorities at intended airport.

4. Notify ATC - Bomb on board. Request ATC to contact FAA bomb expert.

5. Move passengers away from the bomb and to a minimum hazard area.

6. Coordinate with FAA bomb expert. Follow his instructions on neutralizing the bomb.

7. Notify PNNL Flight Operations, if possible.

8. Turn No Smoking and Seat Belt signs - ON.

9. Airspeed - decrease to lessen stresses on aircraft.

10. Landing Gear - LOWER. Reduces possibility of damage.

11. Cabin Pressure Altitude - Maintain at existing cabin altitude. Minimizes possibility of detonating an altitude-sensitive device.

12. Descend - To same altitude as cabin. Maintain cabin altitude while decreasing aircraft altitude to establish a zero differential. This process will minimize blast effect.

13. Make an announcement to the effect: "We have discovered an explosive device on board and are taking all possible precautions. We will be landing at _____ airport in approximately _____ minutes. After landing, we will evacuate the aircraft. Listen carefully to the flight crew's instructions."

14. Have the flight crew brief passengers on planned emergency landing.

15. About 250 feet, announce: "Assume the braced position."

16. After landing, proceed to designated or nearest safe area for evacuation.

4.11.2.3 Bomb Threat Procedure Closeout

1. Qualified personnel must search and clear the aircraft and PNNL Flight Operations must be notified of the finding, prior to conducting any further flights.

2. Information requested by anyone other than the authorities immediately concerned must be cleared through the Director of Flight Operations or Chief Pilot.

4.12 Training Operations: Flight Crew and Maintenance Technicians

Initial and recurrent training for all aviation personnel is an essential element. Safety and efficiency depend on the proper training of all personnel.

Pilots will attend approved refresher training annually. This training will incorporate both simulator and academic training. Where possible, the PIC will simultaneously receive an FAA PIC proficiency check, as necessary. If possible, PNNL pilots will train together to fully develop their Cockpit Resource Management (CRM) skills. New-hire pilots will receive First Officer initial training, prior to flying in PNNL aircraft.

4.12.1 Flight Crew Training

All aviation personnel will receive the following training every 2 years:

- First aid, including cardiopulmonary resuscitation (CPR) and blood-borne pathogens
- Fire fighting
- Aircraft emergency evacuation techniques.

4.12.1.1 Documentation of Training

The Chief Pilot and the Director of Maintenance will maintain complete training records for all their assigned personnel. The Director of Flight Operations will keep the training records for all other personnel.

4.12.1.2 Pilot Initial Training

The initial training of pilots will be

- Accomplished prior to assignment as crew member.
- Conducted in accordance with FAR 61 standards. A typical syllabus includes aircraft systems, performance, simulator training, or flight training.
- Conducted by or either Simuflite International or FlightSafety International (FSI).

4.12.1.3 Pilot Recurrent Training

Recurrent training for pilots will be

- Accomplished at Simuflite or FSI, as directed by the Director of Flight Operations.
- At 6-month intervals, optimally; however, because of scheduling requirements, refresher training may at times be at intervals exceeding 6 months. Under no circumstances will intervals between refresher training exceed 12 months for any pilot.
- Conducted in the simulator, including proficiency checks, by an approved facility according to FAR Part 61 standards and monitored by the Chief Pilot.
- Required to satisfactorily complete every 12 months the FAR 61 24-month proficiency check in each type aircraft he/she is assigned (Captains and Type-Rated First Officers only).
- Required to complete every 12 months the FAR 61.55 pilot proficiency check from the right seat in each aircraft he/she is assigned (Non-Rated First Officers only).
- Provided by the Chief Pilot on an on-going basis.

4.12.2 Maintenance Technician Training

4.12.2.1 Initial Training

Aviation Maintenance Technicians shall possess a current FAA Airline & Power Plant (A&P) certificate and have a minimum of 2 years of practical experience working on aircraft, power plants, or accessories. In addition, each technician shall have a minimum of 1 year of experience working on turbine-powered aircraft or turbine engines.

Within 6 months of the date of hire, technicians will receive airframe and engine initial training in assigned aircraft from an approved training organization.

4.12.2.2 Recurrent Training

Technicians assigned to work on PNNL aircraft will receive recurrent training in each assigned aircraft once every 2 years. Manufacturer and vendor workshops will be attended on an as-needed basis to be determined by the Director of Maintenance.

4.13 Maintenance Operations

4.13.1 Inspection/Maintenance Program (FAR 91.409f(3))

PNNL aircraft shall be maintained in accordance with the FAA-approved manufacturer's recommended maintenance inspection program.

4.13.2 Maintenance and Inspection Documentation

4.13.2.1 Applicable FAR

Maintenance, inspection, modification, or any other work performed on PNNL aircraft will always be performed in strict accordance with applicable FAR. In the interest of safety, continuous airworthiness inspections will be performed in compliance with the appropriate FAR and PNNL inspection program(s).

4.13.2.2 Reporting and Recording of Mechanical Irregularities [FAR 135.23(f)]

Whenever a pilot detects a mechanical irregularity before flight, the pilot will not allow the aircraft to take off until the Director of Maintenance (or designee) is contacted and a determination made as to the safety of flight with the inoperative piece of equipment. Whenever a pilot detects a mechanical irregularity during or after flight, he or she will record the pertinent information on the PNNL Aircraft Discrepancies report (see Appendix A, page A.12). All mechanical irregularities discovered during a flight will be brought to the attention of the Director of Maintenance after the flight, whether or not the Director of Maintenance was notified previously.

4.13.2.3 Previously Deferred and Corrected Mechanical Irregularities [FAR 135.23(g)]

As part of preflight duties, the assigned PIC will review the previous PNNL Aircraft Discrepancies report in the aircraft to determine whether any write-ups have been deferred or corrected. If the PIC finds a mechanical irregularity that has not been either corrected or properly deferred, the pilot will not take off, but will contact the Director of Maintenance or, in his absence, the Director of Flight Operations for instructions.

4.13.2.4 Obtaining Maintenance Away from Home Base [FAR 135.23(h)]

If an aircraft sustains structural damage, malfunctions, or defects that affect the airworthiness of the aircraft while away from the main base of operation, the designated PIC will contact the Director of Maintenance or, in his absence, the Director of Flight Operations as soon as possible to inform them of the problem and obtain whatever help is required. Each pilot will carry a telephone list of current flight operations personnel, as provided by the Chief Pilot. If the maintenance work needed involves instruments, avionics, or other aircraft equipment that is not required for continuation of a flight (except under special conditions such as IFR, VFR, over-the-top, or night flying), the flight may proceed under VFR day conditions only. In this case, the faulty equipment must be isolated from the other systems, so as not

to be a hazard to the aircraft or occupants. If an appropriately rated, FAA-approved repair station is available at the research site, or at an en route waypoint, the PIC may be instructed to get time and cost estimates for repair. (These estimates will be considered in deciding whether to contract the repair work or to return to the base of operation for repairs.) The primary deciding factor is related to the type of malfunction and repair requirement. Should the decision be to contract the work, the PIC will determine whether or not the mechanic or repair station is properly certified and is competent to perform the required repairs. The PIC will use discretion in selecting the most qualified and competent maintenance facility available to do the work.

4.13.2.5 Logbook Entries

After maintenance work is completed, the PIC will review the logbook. The PIC is responsible for checking the recorded entry to ensure the mechanic has given a description of the work, the date and place where the work was done, and that a signature and certificate number were obtained from the person who did the work.

Any maintenance work performed by anyone other than PNNL contract maintenance personnel will be inspected by qualified personnel as soon as the aircraft returns to its base of operations.

4.13.2.6 Vendor Selection

Approval Process - The PIC may authorize maintenance while attempting to contact the approval authority.

Major Work - Request for Proposals: The Director of Maintenance, in association with the Director of Flight Operations, shall solicit proposals from qualified vendors. Vendors shall be approved FAA repair stations, factory-trained technicians, or factory-authorized service centers.

Evaluation of Proposals - The Director of Maintenance, in association with the Director of Flight Operations, will evaluate all proposals and make vendor selection.

4.13.3 Mechanical Irregularities

4.13.3.1 Defects Reported from Previous Flight

It is the responsibility of the PIC to check the discrepancy sheet prior to each flight departing from the flight operations base.

- In addition to systems and components listed in the Limitations Section of the Aircraft Flight Operations Manual and those components/items required by FAR, the Minimum Equipment List (MEL) is the guide that PNNL aviation personnel use to determine the airworthiness of PNNL aircraft.

- The MEL is located in the aircraft.

4.13.3.2 Defects Detected During Current Operations

- Any malfunction, failure, or discrepancy is to be recorded by the flight crew on the Aircraft Discrepancies sheet located at Flight Operations (Appendix A, page A.12). The PIC shall initial these discrepancies in the Noted By Column on the sheet.

- Maintenance problems that may affect the continuation of the trip should be coordinated with the Scheduler and the Director of Maintenance.

4.13.4 Aircraft Maintenance Records

PNNL currently operates a Gulfstream 159, a multi-engine aircraft. PNNL has an FAA-approved Maintenance and Inspection Program in accordance with FAR 91.409(f)(3). This current inspection program is the one recommended by the manufacturer.

All maintenance performed will meet or exceed the requirements of FAR Part 91 and, with few exceptions, will comply with the more stringent requirements of FAR Parts 121 and 135 for air-carrier aircraft. This maintenance philosophy is based on sound operating practices, experience, and the safety requirements defined by PNNL Flight Operations.

Responsibility - It shall be the responsibility of the Director of Maintenance to ensure that all aircraft log entries are accurate and current.

Record Entries - It shall be the responsibility of the FAA repair station, factory-trained technician, or factory-authorized service center, as appropriate, to record all log entries as required by the FAA, aircraft manufacturer, or PNNL company policy.

Computerized Tracking System - A Computerized Aircraft Maintenance Program (CAMP) will be maintained on each PNNL aircraft in order to assist the Director of Maintenance in tracking aircraft maintenance status.

4.13.5 Aircraft Maintenance Materials

Ordering - All maintenance materials, when ordered from home base, will be ordered by the Director of Maintenance or his designee (the maintenance technician).

Receiving - All maintenance materials shall be checked for condition and quantity, upon arrival at home base, by the Director of Maintenance.

Inspection - All maintenance materials will be inspected and accepted for use by the Director of Maintenance, upon arrival at home base.

Inventory Control - All maintenance materials rotate on a first-in-first-out-basis to ensure the timely usage of parts supplies.

4.13.6 Maintenance Test Flights

Certain maintenance actions are considered critical enough to warrant a test flight, prior to carrying passengers. These flights will be specifically authorized by the PNNL Chief Pilot and conducted during VFR weather conditions, preferably during daylight hours. Only necessary and authorized personnel will be carried on any test flight.

4.14 Appearance and Conduct

All full-time PNNL flight crew shall forego all outside interests or work that would interfere with availability for flight assignments or be in conflict with the best interests of PNNL. All flight crew members shall maintain a neat, well-groomed appearance while on duty. Uniforms are not required. However, if equipment is to be removed or installed, crew members will wear appropriate safety equipment.

Laxity in the cockpit, inattention to duty in any manner, or other unprofessional conduct cannot be tolerated. In the interest of safety, and efficient operation, pilots must observe proper cockpit vigilance and discipline at all times.

Flight crew members should remember they are representatives not only of PNNL and DOE, but also of our sponsors and the aviation community, as well. Accordingly, crew members should display the highest degree of professional conduct at all times. They shall rate high in personal habits, character, and deportment.

4.15 Punctuality

Domestic duty time for the flight crew is understood to commence 1 hour prior to scheduled takeoff and terminate **2** hour after final shutdown.

International duty time is defined as commencing 1**2** hours prior to scheduled takeoff and terminating **2** hour after final shutdown for flights that originate or terminate outside the continental United States or Canada.

4.16 Aircraft Modifications

PNNL aircraft are extensively modified to accommodate scientific measurement and research equipment. In order to retain a current airworthiness certificate (whether normal, special, restricted, or experimental) on this aircraft, all modifications are made in compliance with Parts 21 and 43.

Part 43 of FAA Form 337 covers major repair and alteration modifications (that is, antennas, internal non-frame changes, air samplers, camera windows) that can be approved by a local FAA field office. Sign-off for these modifications can be performed by an A&P mechanic who holds an FAA Inspection Authorization (IA) certificate.

Part 21.113, Supplemental Type Certificate (STC) covers major changes that affect the airframe requiring aeronautical engineering design and FAA regional office approval; it also includes modifications and installations that may be performed by a licensed A&P mechanic. However, FAA-certified engineering consultants must approve the required designs; the certified engineer and the FAA regional office perform the final inspection.