Flight Operations Manual



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Preamble

This Flight Operations Manual has been compiled for the use and guidance of personnel in the execution of duties related to aviation operations at SPEC Incorporated. It contains information and instructions on the manner in which SPEC Incorporated flight operations shall be conducted.

SPEC Incorporated is dedicated to highly professional flight operations. Safety will always be our first priority and we will be persistent in continuously demonstrating high safety consciousness in our flight operations. Our mission is:

To provide safe, reliable, high quality, and cost effective airborne research that meet the needs of our users.

It is the duty of all SPEC employees and contracted agents to openly and honestly report events and hazards. Any events and incidents will be thoroughly investigated in a non-punitive manner. SPEC Incorporated recognizes the value of operating to a well-recognized international standard. As company policy, we operate to the standards developed and adopted by the International Business Aviation Council and all of its Member Associations, including National Business Aviation Association. These standards were developed using 'best practices' used widely in the business aviation community and, as such, reflect the high standards of operational safety that we wish to achieve at SPEC Incorporated.

The Flight Operations Manual has been developed to satisfy the International Standards for Business Aircraft Operations (IS-BAO). The manual also incorporates specific requirements of Federal Aviation Administration (FAA) regulations and the International Civil Aviation Organization (ICAO) requirements for international operations.

All personnel involved in the aviation enterprise are to be familiar with this manual and are to comply with its provisions. Changes to the manual will be promptly disseminated to all personnel involved in SPEC flight operations.

I am personally assuming responsibility for keeping the Flight Operations Manual current and for the conduct of the operations in accordance with the manual.

Paul Lawson, Director of Flight Operations President, SPEC Incorporated

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MANUAL AMENDMENT PROCEDURES

- Manual amendments will be promulgated as required by the Flight Department Manager. They will be issued to each Manual holder.
- Each amended page shall record the appropriate amendment number and date.
- It is the responsibility of the Manual holder to insert all amendments issued to him/her in a timely
 manner and ensure all manual pages are consistent with the List of Effective Pages (LEP). Manuals
 issued to aircraft will be amended by the Chief Pilot.
- Any discrepancy between the LEP and the actual Manual pages will be brought to the attention of the Flight Department Manager immediately.

LIST OF MANUAL HOLDERS

Manual Copy Master Copy	Manual Holder President, Flight Department Manager	Address 3022 Sterling Circle, Suite 200 Boulder, CO 80301
Copy # 1	Chief Pilot	3022 Sterling Circle, Suite 200
Copy # 2	Chief of Maintenance	Boulder, CO 80301 3022 Sterling Circle, Suite 200
Copy # 3	Director of Engineering	Boulder, CO 80301 3022 Sterling Circle, Suite 200
Copy # 4	Research Pilot	Boulder, CO 80301 3022 Sterling Circle, Suite 200
Copy # 5	Aircraft N999MF	Boulder, CO 80301 3309 Airport Road Hangar B4
Copy # 6	Safety Officer	Boulder, CO 80301 3022 Sterling Circle, Suite 200
Copy # 7		Boulder, CO 80301
Copy # 8		
Сору # 9		

RECORD OF AMENDMENTS

Number	Date	Date Entered	Entered By
Original	03/09/13	03/09/13	Flight Department
Ammendment 1	07/14/13	07/14/13	Flight Department

LIST OF EFFECTIVE PAGES

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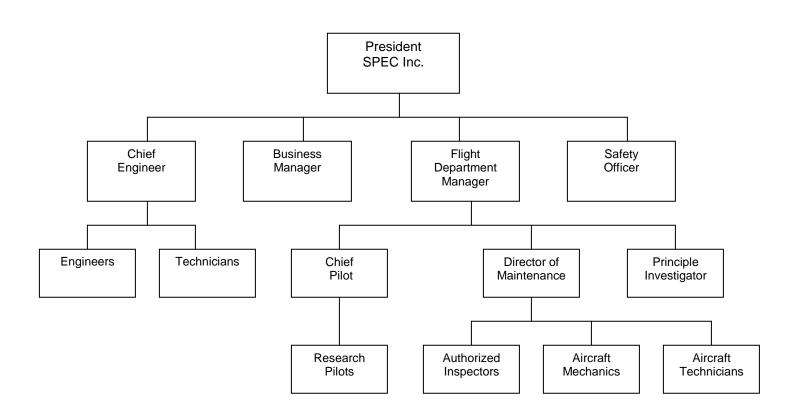
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1 Company Organization

1.1 FLIGHT DEPARTMENT MANAGEMENT STRUCTURE

Organizational Structure



Duties, Authorities, Accountabilities and Qualifications

The following are the duties, authorities and accountabilities of the management and operating personnel of the Flight Department and the qualifications required to hold those positions.

1.2.1 Flight Department Manager

Reports to:President, SPEC IncorporatedSupervises:Chief Pilot, Director of Maintenance, Principal Investigator

1.2.2.1 Qualifications

Education: Minimum of a Bachelors Degree

- **Experience:** Five years experience with aircraft management and operations (research operations preferred).
- Skills: Knowledge of safety management system, FAR's, management and financial control in small Part 91 aviation department setting.

1.2.1.1 Position Description

The Flight Department Manager is responsible for managing the Flight Department to support the atmospheric research mission. This Includes responsibility for carrying out all support of SPEC's mission and objectives while ensuring that safety is never compromised. He/she is responsible for the overall management, operations and implementation of the Flight Department Safety Program and procedures.

1.2.1.2 Duties and Responsibilities

- a. Lead Flight Department in a manner that maintains a culture of safety and creates efficient procedures that support the research missions of our customers.
- b. Ensure that operations are conducted in accordance with FAA and international regulations, as well as company operating policies.
- c. Coordinate with Research Project Manager and Project Scientists to schedule flights.
- d. Prepare budgets and ensure financial efficiency and control.
- e. Ensure that all Flight Department members are kept informed of any changes in regulations and/or operating standards.
- f. Work with Chief Pilot and Director of Maintenance to establish a policy regarding review of aircraft operational and maintenance accidents and incidents.
- g. Develop and implement appropriate aircraft enhancements and modifications to keep aircraft at a high level of readiness and utility.
- h. Liaises with external agencies and regulatory authorities which may affect research missions.
- i. Develop and maintain the Safety Management System and Flight Operations Manual.

1.2.2 Chief Pilot

Reports to:Flight Department Director of Operations**Supervises:**Research pilots, first officers and contract pilots

Qualifications

Education:Bachelor's degree or equivalent experienceLicenses:Air Transport Pilot Certificate (multi-engine land,) Learjet Type Rating, FAR
61.58 certificate from Flight Safety International or Simuflite in the past 12
months.Medical:FAA Class II medical certificate within last 12 monthsFlight Time:3000 hours Pilot-In-Command aircraft with 2000 hours multi-engine aircraft,
1000 hours Pilot-In-Command in Learjets.

Position Description

The Chief Pilot is responsible for the professional standards of the flight crews under his/her authority. He/she ensures that operations, training, and safety management goals are met.

Duties and Responsibilities

- a. Provide leadership and direction for flight crew and support staff to maintain a culture of safety and efficient operations.
- b. Develop and implement all required approved training programs for the SPEC's flight crews.
- c. Issues directives and notices to the flight crews as required.
- d. Takes action on and distributes accident, incident, and other occurrence reports;
- e. Assumes responsibilities delegated by Flight Department Manager.
- f. Ensures crew scheduling complies with FAA and SPEC flight and duty time limitations.
- g. Maintain a current operations library.
- h. Ensure that flight crew qualifications are current.
- i. Ensure that air operations are conducted in accordance with FAA and international regulations, as well as company operating policies.
- j. Acts as Pilot in Command of SPEC aircraft.

1.2.3 Chief of Maintenance

Reports to:Flight Department Director of Operations**Supervises:**Contract Maintenance Personnel

Qualifications

Experience: Demonstrated knowledge of FARs and standards relating to aircraft maintenance.

Education: Bachelor's degree or equivalent experience

Duties and Responsibilities

The Chief of Maintenance is accountable for ensuring that all aircraft are maintained in accordance with regulatory requirements and that all maintenance related safety management goals are met. The duties of the position include:

a. Planning and controlling all aircraft maintenance;

- b. Contracting with, and monitoring the work of, all non-company persons or Approved Maintenance Organizations (AMOs) performing maintenance on SPEC Inc. aircraft;
- c. Ensuring that research program engineering installation and alteration is properly documented, inspected and approved by the FAA.
- d. Ensuring that aircraft maintenance records as required by FAA regulations, manufactures and company policy are established and maintained;
- e. Ensuring that Airworthiness Directives and Service Bulletins that effect Flight Department aircraft are complied with appropriately;
- f. Removing from service any aircraft that are unsafe, or that do not comply with national regulatory requirements; and
- g. Establishing Flight Department safety policies and procedures for ground operation.

1.2.4 Safety Officer

Reports to: Flight Department Director of Operations

Qualifications

- a. Extensive operational experience, normally achieved as a flight deck crewmember or equivalent experience in aviation management; and
- b. Training or direct experience in flight safety philosophy, safety management systems and risk management.

Duties and Responsibilities

The Safety Officer shall be accountable for day to day administration of the flight department safety management system. In that role he/she has direct access to the President of SPEC and the Flight Department Manager and in safety matters. The duties of the position include:

- a. Monitoring and advising on all operator safety activities which may have an impact on flight and ground safety;
- b. Establishing and managing the operator hazard identification and tracking system;
- c. Developing and maintaining a safety awareness program;
- d. Monitoring industry flight safety concerns which may have an impact on operations;
- e. Developing and maintaining the operator emergency response plan;
- f. Investigating and reporting on incidents/accidents and making recommendations to preclude a recurrence;
- g. Making recommendations to the operator's senior management on matters pertaining to safety; and
- h. Monitoring the response and measuring the results of safety initiatives.

1.2.5 Captain

Reports to: Chief Pilot

Duties and Responsibilities

The Pilot-in-Command (PIC) is accountable to the Chief Pilot for the safe conduct of assigned flights. Specific duties include:

a. checking weather, all applicable NOTAMs where available, and determining fuel, oil and oxygen requirements;

- b. determining the aircraft weight and balance;
- c. ensuring that all flight planning requirements have been met;
- d. ensuring that the aircraft is airworthy, duly registered and that the documentation specified in section 3.1.2 are on board the aircraft.
- e. ensuring that aircraft crew members have valid licenses, medical certificates and passports and visas if and when required;
- f. ensuring that a flight will not be commenced, or will not be continued beyond the nearest suitable airport if a flight crew member is incapacitated;
- g. completing an aircraft pre-flight inspection before each departure;
- h. ensuring that only required crewmember, assigned by the P.I., are onboard for the mission;
- i. briefing the research crew in accordance with the requirements specified in section 4.3.3;
- j. operating the aircraft in accordance with operator procedures and aircraft limitations;
- k. ensuring compliance with customs, immigration and cabotage laws;
- notifying authorities of any accident, suspected communicable disease, acts of unlawful interference, or landing at an airport other than a State's international airport caused by circumstances beyond the control of the PIC;
- m. completing the journey log book or general declaration, when required;
- n. completing all post flight duties, including notification to the company of any deviation from the planned itinerary or overnight location; and
- o. recording flight times and aircraft defects.

The qualifications required to act as PIC are specified in chapter 7.

The PIC has the authority to refuse transportation of any person or object if their carriage poses any risk to the safety of the aircraft or its occupants.

Qualifications: The qualifications required to act as PIC are specified in chapter 7.

1.2.6 First Officer

Reports to: Chief Pilot administratively, PIC during flight operations

Duties and Responsibilities

The First Officer, as Second-in-Command (SIC), shall assist the PIC in the management of the flight and flying the aircraft in accordance with the directions of the PIC. The First Officer may carry out take-offs and landings under the authority of the PIC and shall take over control in the event of PIC incapacitation. The PIC may assign the First Officer those duties relating to the conduct of flight as he feels appropriate.

Qualifications: The qualifications required to act as SIC are specified in chapter 7

1.2.7 Research Crewmembers Serving Onboard the Aircraft

SPEC research missions require 2 or more research crewmembers to operate research systems and computers. These crewmembers may be technicians, engineers, or scientists. Research crewmembers will be trained on safety procedures (e.g. operation of emergency exits, fire extinguisher usage, cabin emergency oxygen, procedures for securing baggage and equipment, etc). Research crewmembers shall be instructed on the sterile cockpit procedures that SPEC has in place below 10,000 MSL.

Reports to: Principal Investigator administratively, PIC for during flight operations

Duties and Responsibilities:

- a. preparing and preflighting research equipment for the mission
- b. operating research equipment during the mission and advising flight crew of research equipment status
- c. advising flight crew of the nature of data being captured so that the flight crew may best position flight tracks to investigate the phenomena targeted by the Principal Investigator
- d. securing equipment and baggage in the cabin as directed by the flight crew

Qualifications: The flight operational training required to act as research crew member is specified in chapter 7

1.2.8 Principal Investigator

The Principal Investigator (P.I.) is responsible for planning, directing, scheduling and monitoring the scientific aspects of research projects.

Reports to: Flight Department Director of Operations (the Flight Department Director may hold both positions)

Duties and Responsibilities

The Principal Investigator works closely with the Flight Department Director to schedule research flights. The Principal Investigator's responsibilities include:

- a. Determining if conditions are suitable, from a scientific perspective, to schedule a mission;
- b. Allocation and tracking research flight hours;
- c. Flight following of research flights, and requesting minor changes in the aircraft's mission profile to meet the requirement of the project's scientific objectives;
- d. Assigning research crew to flight missions, briefing pilots and research crew on mission objectives and research methodologies;
- e. Instructing flight crews on project specific data and record keeping requirements;
- f. Administration of project specific records.

2 Safety Management System

Quality systems are the standard practice used in many industries to ensure that a process consistently produces a high quality product or service that meets customer expectations. The SPEC Inc. Flight Operations Safety Management System is composed of the elements described in this chapter.

2.1 SAFETY POLICY

SPEC Inc. regards an effective safety program as vital in achieving the mission of the Flight Department. In recognition of this fact, SPEC is committed to providing a safe and healthful working environment free of recognized hazards for its employees. In pursuit of this goal, an aggressive safety strategy shall be incorporated into all SPEC flight activities. Safety is also an individual responsibility and must exist in our thinking, planning, and actions. All SPEC personnel will be held accountable for fulfilling their responsibilities under this safety program. However, this should not remove an individual's right of choice. Employees always have the final choice with respect to refusal to fly in the company aircraft.

In one sense, if there is a breach in safe operations, someone is at fault. But, this point of view overlooks the central issue that is addressed by the need to have a safety program in the first place. This issue is that there may be unintentional organizational roadblocks or blind spots, which despite our best intentions, may adversely impact a safe operation and be difficult to identify. Thus, underlying all facets of the safety program is a need to open up lines of communication, to sensitize everybody to safety principles and issues, and to get as many people looking over our shoulders as possible.

The safety program does not replace or interfere with the day-to-day chain of command. Rather, the safety program has a strong element of oversight of the decision making process so that any organizational roadblocks or blind spots can be identified and eliminated.

The cornerstone of an effective safety program is an active accident prevention system. SPEC Inc. is committed to eliminating hazards and minimizing potential risks through the diligent practice of training and risk analysis. Hazards and incidents resulting from SPEC operations shall be identified at all levels. Conditions and acts posing unacceptable risk shall be eliminated or changed to prevent personnel injury or and property damage or loss. The scope of the Safety Program applies to all aviation-related activities at SPEC Inc. The primary missions of SPEC's Flight Department are conducting atmospheric research and the airborne testing of state-of-the-art atmospheric probes and instrumentation. Flights are conducted in a Learjet 25 that is currently certified in the Restricted (Atmospheric Research) Category.

The safety issues that SPEC manages, while not high, are substantially different from those encountered by a flight department that is limited to transportation. These risks are documented and mitigated in the following SMS. SPEC management and personnel understand, and are proud of, the unique nature of our program, and committed to an on-going proactive safety program.

2.1.1 Purpose

The purpose of the safety policy is to manage safety proactively and effectively. This is done by:

- a. Obtaining consistent and optimal aircraft and human performance.
- b. Identifying and managing safety risks specific to SPEC's flight operations.
- c. Actively seeking feedback on and improving SPEC's safety management activities.

2.1.2 Safety Responsibilities

The President of SPEC is responsible for:

- a. Sustaining conditions that advance the safe operation of SPEC aircraft.
- b. Providing the resources (in time and money) to assure the safe operation of the SPEC aircraft.
- c. Actively supporting the Safety Management System.

The Flight Department Director is responsible for:

- a. Ensuring that flight operations are conducted in compliance with all applicable safety regulations.
- b. Administering the safety management system.
- c. Validating and addressing safety-risk management deficiencies in an appropriate and timely manner.

The Chief Pilot, Director of Maintenance and Chief Engineer are responsible for:

- a. Sustaining conditions that advance the safe operation of SPEC aircraft.
- b. Actively supporting the Flight Department's Safety Officer and safety management system.
- c. Ensuring that flights, maintenance, engineering and research operations are conducted in compliance with all applicable safety regulations.
- d. Validating and addressing safety-risk management deficiencies in an appropriate and timely manner.

The Safety Officer is responsible for:

- a. Administering the Flight Department's Safety Management System.
- b. Ensuring that any safety issues are brought to the attention of the Flight Department Manager and/or President in a timely manner.

The company personnel, who fly, crew, work on or with the airplanes are responsible for:

- a. Adhering to directions contained in flight operations-related manuals, and related procedures.
- b. Participating proactively in the safety management system by:
 - i. Actively identifying, reporting and mitigating hazards and safety-risk management deficiencies.
 - ii. Providing timely input to management to ensure that the company's safety-risk profile is accurate and up-to-date.
 - iii. When appropriate, applying hazard checklists to make sound pre-flight and in-flight decisions.

2.1.3 Management Support

SPEC Inc. operational, technical and support staff will always have the full support of the President as long as they operate professionally in accordance with company manuals and procedures. All company personnel have a duty to openly and honestly report events and hazards. The President undertakes to ensure that all such reports will be thoroughly investigated in a non-punitive manner.

2.2 DESCRIPTION AND NATURE OF THE OPERATION

The SPEC flight program is a Part 91 single aircraft operation utilizing a Learjet 25 that is certificated in the Restricted (Atmospheric Research) Category. The SPEC research mission involves continuing engineering installation and alteration, and flight activities which are not part of a typical transportation mission. These missions include test flying new equipment configurations and executing pre-planned detailed flight patterns to collect atmospheric science data on studied cloud phenomenon. Areas of research may include building cumulus studies, widespread stratus studies and cirrus studies. Flights typically carry two or more scientists, engineers, or technicians who perform research duties at consoles and instrument racks mounted in the cabin. As a restricted category operation, no non-crew may be carried as passengers.

The SPEC Safety-Risk Profile is a map that charts the 'contours' of higher risk. It is the basis on which the SMS is developed, implemented and evaluated. SPEC uses the risk profiling methods as described in AMC 3.2 Safety Management System, of the International Standards for Business Aircraft Operations (IS-BAO).

Safety-Risk Profile form (Attachment 2-A) is used to develop the safety-risk profile. Safety-risk factors are rated as:

- a. Low L
- b. Medium low ML
- c. Medium M
- d. Medium high MH
- e.. High H

Based in the IS-BAO criteria and the Operator Safety-Risk Profile form within this chapter, SPEC's Global Assessment of Likelihood is **Medium**. The Global Assessment of Severity is **Medium low**.

The Safety Officer will review the risk profile at least annually, and any time SPEC undertakes significant change in its operations, or the aircraft it operates. When the new risk profile is completed it will be filed in the Safety Management filing system and the updated version will be issued as an amendment to the FOM.

2.2.1 SPEC Safety Risk Profile

A copy of the most recent SPEC Inc. Safety Risk Profile is attached as **Attachment 2-A**. It summarizes the hazards and associated risks identified by SPEC, and the mitigation that has been developed to manage the level of risk to as low as reasonably practical.

2.2.2 Key Hazards, Risks and Mitigation

Based on the safety risk profile, hazards judged to be "Medium" or higher are identified. The associated risks and mitigation are described in the table below.

Hazard	Associated Risks	Mitigation
Research Operations – Flights in IMC conditions may involve hand flying climbing and/or descending spirals, or other maneuvers, at up to 35 degrees of bank at IAS of 200 knots.	Aircraft upset due to accelerated stall or loss of situational awareness. (Medium Risk)	 Annual FSI simulator training shall include steep turns and accelerated stall and unusual attitude recovery Flight Crew is trained to include Angle of Attack Indicator in scan. PM shall call any trend toward AAI yellow arc. T.O. Weight and Balance shall be calculated and recorded prior to engine start. Enroute CG shall be monitored to ensure aircraft stability.
	Altitude violation when operating with rapidly changing block altitude assignments. (Medium Risk)	 SOP is to write down limits of block and set Alerter to top of block during climbs and reset to bottom during descents. Standard "1 thousand to go" callouts shall made <i>and acknowledged</i>. If there is any doubt of PF leveling at assigned altitude, PM will announce "Approaching Altitude".
 Fuel Management – Fuel usage in non-turbofan Learjets must be carefully planned, especially when operating below the flight levels. Research missions do not progress linearly from origin to destination, making fuel calculations difficult. When research conditions are good, flights often remain on-site as long as safely possible. 	 The risks include: Fuel exhaustion due to lack of situational awareness, miscalculation, or adversely changing conditions at landing airport. Unexpected Minimal fuel condition resulting in deviating to a sub-optimal recovery airport. (Medium Risk) 	 Per the FOM, Flight Crews will annually review FAR 91.167 and 91.169 (IFR fuel and alternate requirements. If a flight lands with less than 1200 pounds of fuel, the PIC must notify the Flight Department Manager of the circumstances. Flight Crew shall use XM satellite WX to monitor WX trends at primary and alternate airports. To verify fuel gauges, pilots will confirm that fuel needed to fill tanks agrees with expectations based on fuel gauge reading before and after refueling. PF and PM will jointly calculate and update "bingo fuel" based on distance trends ¹ from primary and

Fuel Management (cont)		secondary airports, as well as WX trends, and any
		conditions that may affect fuel needs (e.g. ATC delays).
		 During research operations, it is not unusual for the aircraft to be tracking away from the destination.
Convective Weather – Research missions may involve flights in close proximity to TRWs and actual penetration of TRW anvils.	The risks include encountering overshooting tops with turbulence, lightening and graupel. (Medium Risk)	 Flight crew will include either a trained meteorologist or pilot who has been trained on TRW hazards and patterns of development. Prior to cloud penetration within 10 nm of 35 dBZ echos, crew with study previous 5 minutes of echos for patterns of development. Prior to penetration, PIC will determine and brief planned escape maneuver should conditions warrant. All mitigations of In-flight Turbulence (below) must be met.
In-flight Turbulence – Research missions may involve penetrating varieties of clouds generally avoided by transport flights.	 The risks include: Injury to flight crew and/or research equipment, Possible aircraft upset and any resulting airframe damage Altitude Violations (Medium Risk) 	 Pilots are briefed by project meteorologists of expected hazards presented by clouds targeted for research Seat belts always fastened during cloud penetrations, and loose gear is carefully secured. Pilots will advise on-board engineers and scientists beforehand of suspected severity of turbulence and verify seatbelts fastened and gear secured. When possible, pilots will obtain block altitude assignments during research. Engine igniters shall be on during severe turbulence. Unusual attitude recovery will be emphasized during FSI simulator training.

2.2.3. Safety Performance Objectives

Safety is paramount in all SPEC Inc. operations and it is the joint responsibility of everyone connected with the operation.

The objective of SPEC Inc.'s SMS is to achieve a zero level of preventable injury or damage situations. To accomplish that objective SPEC has established a **strategic safety objective to manage all identified hazards to as low a level as reasonably practical**. In order to achieve the safety objective the following safety management principles will be followed:

- a. Safety will be recognized by management and employees as an integral and vital part of the successful performance of any job;
- b. Safety, being paramount to our operating practice, will be given priority at all times;
- c. Direct responsibility for the safety of an operation rests with the supervisor of each operation. During flights the designated Pilot-in-Command (PIC) is the supervisor of the operation and will seek to ensure that all operations are conducted without incident;
- d. Each individual employee will perform their duties giving primary concern for their own safety as well as that of their fellow employees, their customers, and the property and equipment entrusted to their care;
- e. The PIC is the final judge as to whether the aircraft shall take-off and where it shall land, taking into account all factors of equipment and weather conditions within the specifications of the Operations Manual and/or the N999MF Aircraft Flight Manual. He/she will exercise this responsibility effectively and will use all of the resources available to make appropriate and effective decisions;
- f. The PIC has ultimate authority to refuse or discontinue a research mission or reposition flight which, for reasons of safety or security, he feels should not be attempted or continued. He/she will exercise this responsibility effectively and will use all of the resources available to make appropriate and effective decisions;
- g. The SPEC Inc. FOM and SMS must be proactive, ongoing and fully integrated throughout the operation and all of its activities and is based on the following strategies:
 - i. All SPEC Inc. personnel will be involved in the flight department safety management system;
 - ii. Employee awareness, compliance, inspection, investigation and education programs will be incorporated into all aspects of the operation;
 - iii. All personnel will endeavor to identify, report and eliminate hazardous conditions;
 - iv. All reported hazardous events will be investigated to determine underlying causes;
 - v. All proposed new equipment acquisitions, facilities, operations and procedures will be reviewed with safety in mind; and
 - vi. All personnel will comply with all applicable laws and regulations.

2.2.4 Safety Management Goals

Based on the above Safety Performance Objectives, the following goals have been established for the year 2011. These are the achievable, measurable, policy-derived safety benchmarks of the Flight Department:

- 1. Demonstrate unqualified management commitment to safety by:
 - a. Creating and following our safety policy
 - b. Allocating sufficient money and resources in the pursuit of safety
 - c. Encouraging and enforcing safe behavior.
 - d. Documentation and distribution of the Flight Department's safety policy.

- 2. Conduct a safety meeting, chaired by the Safety Officer, typically once per quarter (or more often as a need is perceived). Rather than a formal safety committee, such meetings shall be open to all interested or affected personnel. The Safety Officer will report any issues identified in the meeting to the Flight Department Manager using the 'Hazard Identification and Tracking Form' (Attachment 2-C). Issues evaluated as having an adverse risk will be tracked (attachment 2-D) and mitigated as described in the SMS, Any risk judged as Medium or above shall cause the Safety Risk Profile to be updated.
- 3. Develop a clearly written and easily understood Flight Operations Manual (including an SMS), that will be reviewed at least annually for accuracy and improvement. The FC Director will maintain a list of personnel assigned FOMs. Personnel will acknowledge receipt of, and familiarity with, the contents. When the FOM is edited or updated, receipt of the new edition will be recorded.
- 4. Maintain a system of communications for collecting, analyzing and exchanging incident data related to safety (see Section 2.3 and Attachment 2-C). SPEC inc. will allow no retribution for submission of incident data.
- 5. The Safety Officer and Flight Department Manager will review the regulations and standards under which SPEC operates on annual basis. Any relevant changes will be addressed through the Change Management Process (see 2.4). Between these reviews, any know changes will be addressed though the regular safety meetings.
- 6. Retrain, without penalty or stigma, when safety is involved. The safety issue will be documented at the Safety Committee including the retraining conducted. Adherence to FOM safety procedures is required, and this objective does not apply to willful or egregious violations.
- 7. Demonstrate acceptance of the concept that accidents are preventable. We will report, analyze, and rank all hazards and not ignore them. We will mitigate all situations that are deemed to be unacceptable. Meeting this objective will be shown by a annual Safety Committee review of the hazard identification and risk analysis and mitigation efforts.
- 8. Create and maintain acceptance of the fact that safety is part of the Flight Department's mission and culture by:
 - a. Stating it in all operation and training manuals
 - b. Empowering all employees to stop any activity they consider hazardous.
 - c. Standing behind all employee decisions relating to safety.

2.2.5 Other Risk Management Tools

Prior to engine start, the Operational Risk Assessment Tool (Attachment 2-B) shall be completed. The Initial assessment will be conducted by the PIC. If the score exceeds 20 the proposed flight will be reviewed by the chief pilot to evaluate risk factors from the perspective of accepting the risk, rejecting the risk, or mitigating the risk. No flight will proceed if the score can not be mitigated to a value of 25 or lower. However, either the PIC or the Chief Pilot has authority to cancel the proposed flight without further consultation anytime that they deem it appropriate.

2.3 HAZARD IDENTIFICATION AND TRACKING SYSTEM

The hazard identification and tracking system is composed of two parts:

- hazard identification program; and
- hazard tracking system.

The purpose of the hazard identification program is to proactively identify and address potential deficiencies in safety management. All Flight Department employees and persons carried on SPEC Inc. aircraft are expected to participate in the hazard identification program. Reports/observations **can be**

made to the Flight Department Manger or Safety Officer verbally, but written reports are encouraged. Where verbal reports are provided, the Manager shall prepare a report containing the information. Written reports can be made on the Hazard Identification and Tracking Form (Attachment 2-C) in this section.

The Flight Department Manager, or person to whom he/she delegates the task, will analyze all hazard reports in accordance with the procedures identified in Appendix B to *Guidelines for the Conduct of Risk Analyses by Business Aircraft Operators* and a response will be provided to the person making the report. If it is determined that a modification to a procedure process or program is required, such information will be entered on the Hazard Identification and Tracking Form and tracked in the Risk Management Tracking Form (**Attachment 2-D**) until the remedial action has been completed. Written reports will be filed in the Company Safety Management filing system and reviewed on an annual basis to determine the effectiveness of the remedial measures.

Hazard identification and tracking will be an agenda item at each of the Flight Department quarterly staff meetings.

2.4 CHANGE MANAGEMENT PROCESS

When a report received through the Hazard Identification and Tracking System or information gained through any other process results in the decision to modify a process, procedure or program the proposed change will be reviewed by the Flight Department Manger. If the change is approved it will be implemented in accordance with the following procedures:

- a. the change process including the risk assessment, will be recorded,
- the amended process or procedure or information in the amended program, will be distributed to all flight department personnel by e-mail from the Flight Department Manager or person assigned the task, and
- c. the operations manual and other associated documentation will be amended and distributed to all document holders.

Prior to undergoing any significant change that could impact the Flight Department; a change management process will be undertaken. Events that will indicate the need for such a process are;

- a. the introduction of a new aircraft type;
- b. significant change in the nature of the operation (e.g. new research project or significant reconfiguring of aircraft's research instrumentation)
- c. changes to organizational structure;
- d. significant change in aircraft maintenance arrangements, etc.

As soon as it has been determined that the change event will occur, the Company Safety-Risk Profile will be reviewed. On the basis of that assessment, and any other available information, the Flight Department Manager, or the person to whom the responsibility is delegated, will develop a Change Management Plan. The Change Management Plan will include:

- a. a risk analysis of the change event and an assessment of the changes required to items such as:
 - i. operating and maintenance procedures and processes,
 - ii. personnel training and competency certification,
 - iii. Company Operations Manual,
 - iv. Maintenance Control Manual or Maintenance Procedures Manual,
 - v. aircraft SOPs, etc., and
- b. a plan for development of the required changes.

When the required changes have been developed, a Safety Management System Audit will be conducted before the change is implemented. After implementation of the change the Flight Department Manager will review system performance at regular intervals. If there is any doubt of the effectiveness of the

change management process, a more comprehensive post-implementation review or a Safety Management System Audit will be conducted.

2.5 SAFETY ASSURANCE AND SMS EVALUATION

2.5.1 Safety Assurance

The ongoing monitoring of operational systems, processes and procedures to ensure that they are appropriate and effective is an integral part of an SMS. SPEC Inc.'s safety assurance activities are used to:

- Ensure that operational systems, process and procedures and appropriate and effective,
- Ensure that identified problems have been resolved, and
- Assist in maximizing the efficiency of safety management activities.

Safety assurance activities include:

- a. Using the Compliance Monitoring Checklist to conduct assessments of the appropriateness and effectiveness of operational processes at least once a year,
- b. Using the forms and processes included in the operations manual to conduct safety evaluations ,
- c. Assessing the activities of contractors where their services may affect the safety of the operation,
- d. Having the safety assessments reviewed by the auditor who conducts our IS-BAO registration audits,
- e. Documenting the safety management assessment results, corrective actions and both positive and negative observations,
- f. Categorizing findings to assist in prioritizing corrective actions,
- g. Sharing the results and corrective actions with all personnel,
- h. Utilizing available technology such Flight Data Assessment to identify operational issues,
- i. Holding regular safety meetings,
- j. Keeping the CEO informed of safety issues, and
- k. Investigating incidents and providing feedback to management and staff,

2.5.2 SMS Evaluation

Regular evaluation of safety performance is an integral part of an SMS. SPEC Inc. will conduct internal evaluations of the SMS at least once per year and will have an audit by an Accredited IS-BAO Auditor at least once every three years. The internal SMS evaluation will be conducted in accordance with the chapter 5 of the *IS-BAO Internal Audit Procedures Manual*. The evaluation form contained in Attachment 2-F will be used to record the evaluation results. A Remedial Action Plan will be developed for any findings made during either the internal evaluation or the IS-BAO audit and will be tracked in the SMS Evaluation Tracking Form (Attachment 2-G) in order to ensure that the Finding has been rectified in an appropriate and effective manner.

When the evaluation is completed it will be analyzed to ensure that the agreed acceptable level of risk, the safety objectives and goals and related SMS expectations are being achieved. The results of evaluations, safety surveys and summaries of employee feedback on safety management activities, will be reviewed with the Accountable Executive. This information will also be shared with all employees.

2.5.3 Compliance Monitoring

In order to ensure compliance with all applicable regulations, standards, approvals and exemptions SPEC Inc. will conduct a compliance review at least one each year. The checklist in Attachment 2-H will be used for the review. The Flight Department Director, or his/her designee, will conduct the audit.

2.6 SMS COMMUNICATION AND TRAINING

SPEC Inc. will work diligently to ensure that a positive safety culture prevails throughout the organization. In order to achieve that objective open communication up and down the organization chain will be encouraged and safety information will be shared. In order to ensure that all employees understand the importance of open communication training and the framework within which the company SMS functions, the following training will be included in the company orientation training for all flight department personnel and new hires:

- Introduction to the IS-BAO
- Introduction to SMS,
- Spec Inc. SMS and Flight Operations Manual.

Attachment 2-A Current Operator Safety-Risk Profile

Со	MPANY	SPEC INC.	Assesso	H. Mertz Date 12/20/2012		
OR		UPDATE X	Reason for up			
	Post Project Safety Review					
	Rating Underlying Hazard, Related Mitigation and Reference					
Еx	POSURE -	Extent of loss to the	Low 🛛			
		company	Medium 🛛			
			High X	A key company officer/scientist often crews on research missions. Company reputation would be adversely affected.		
Ти	ELIHOOD					
	erational	Factors				
•	Air Traffic	Services – en-route	Low/Medium	Research flights require manoeuvring not typical of transport flights. Prior briefs and coordination is accomplished with affected ATC facilities. A distinct research flight ID is used.		
•	Air Traffic	Services – terminal	Low/Medium	A mix of terminal types - some complex high density terminal operations as well as smaller non-towered airports. Issues are addressed in Ops manual and training.		
•	Research	Operations	Medium	During cloud particle sampling, the aircraft is often hand flown at high altitudes. Manoeuvres may include climbing and/or descending spirals at up to 35 degrees of bank. Sampling must be done at relatively low IAS (200knots). Flights may operate in or near convective activity. Mitigation discussed in 2.2.2.		
•	Fuel Mana	agement	Medium	Fuel usage in non-turbofan Learjets must be carefully planned, especially when operating below the flight levels. Research missions do not progress linearly from origin to destination, making fuel calculations difficult. Issues are addressed in Ops manual and training. On-board XM Wx is provided to monitor primary/alternate airport Wx conditions.		
•	Approach	aids	Low	Ground based precision approaches are generally available. Aircraft is equipped, and crew trained, for LPV and LNav +V approaches.		
•	Weather I	nformation	Low	Pre-flight briefings include detailed analysis by professional meteorologist assigned to project. Aircraft is equipped with XM satellite weather.		
•	Airports		Low/Medium	Flights almost never operate from high risk airports. Refuelling after and during missions may utilize smaller non- towered airports. Issues are addressed in Ops manual and training.		
Те	chnical Fa	actors				
•	Type of po	ower plant	Low	Aircraft uses GE CJ610. Trend monitoring is done at least once per flight.		
•	Number o	f power plants	Low	2		
•	Pressuriza	ation	Low	Aircraft is pressurized and pressurization receives extra attention due to needs of on-board instrumentation.		
•	Aircraft Ma	aintenance	Low/Medium	Aircraft is maintained by a contract mechanic. Maintenance is tracked in-house by the Director of Maintenance.		
•	En-route s	service & maintenance	Low	Crew is usually able to select refuelling stops at locations that provide good support. Aircraft seldom overnights away from project home base.		
Hu	man Fact	ors				
	Flight crev	w qualifications	Low	All pilots are ATPs and type-rated in the Learjet.		
•	Number o		Low	Minimum of 2 fully qualified pilots on all flights. Some high workload flights utilize a third pilot as ACM/observer.		
•	Experienc	e	Low	All pilots have well over 1000 hours make and model. Additionally, all have prior experience in Wx research.		

Currency – aircraft	Low/Medium	Between projects, currency can be an issue. To maintain currency pilots attend FSI training and/or fly for other operators.
Currency – routes	Low/Medium	Although many mission profiles are repetitive, some may involve operations in unfamiliar areas. As mitigation, Mission Operational Domains are project-defined and limited.
Maintenance human performance	Low/Medium	Quality contract maintenance personnel are available for airframe and engines. Avionics issues, due to age of equipment, are monitored carefully.
Company culture	Low	Flight crew has total support from SPEC President in making safety of flight of paramount importance. Flight crew never pressured to make unsafe decisions.
 Fatigue 	Low/Medium	Projects limit crew duty time to Part 135 limits. Although some days may be long, rest periods between flying days typically are long, often more than 24 hours.
Global Assessment of Likelihood	Low/Medium	
SEVERITY		
Emergency Response Services	Low	Flight crew has ability to choose refuelling stops. Availably of ERS is used as a selection factor.
 Governing operations 	Low	All research operations are conducted under IFR flight rules.
 Location of operations 	Low/Medium	Most research missions are over inhabited areas where SAR and medical services are available. Some missions are flown over mountainous areas, but such flights are able to recover at non-mountain airports.
Weather extremes	Low/Medium	For the majority of missions, post-occurrence weather would likely be benign. Missions over mountainous terrain could subject survivors to hostile conditions.
 In-flight turbulence 	Medium	Research missions may involve penetrating varieties of clouds generally avoided by transport flights. Seat belts always fastened during cloud penetrations, and loose gear is carefully secured. Engineers/scientists are advised beforehand of suspected severity of turbulence.
Global Assessment of Severity	Low/Medium	

Attachment 2-B Operational Risk Analysis Tool

(SPEC modified version of FAA InFO 07015 AC 120-92))

Pilot Experience and QualificationsRisk ValueFlig1Captain with less than 100 hours last 90 days52First Officer with less than 100 hours last 90 days53Duty day greater than 12 hours44Flight time (Greater than 8 hours in the duty day)45Crew Rest (Less than 10 hours prior to the duty day)56VOR/GPS/LOC/ADF (Best approach available w/o vertical guidance)37Circling approach (best available approach)48No published approaches49Mountainous airport510Control tower not operational at ETA or ETD311Uncontrolled airport512Alternate airport not selected413Elevation of primary airport greater than 6500 ft. MSL)314Wet runway3315Contaminated runway316Winter operation317Stopping distance greater than 80% of available runway518Night operation519Stopping distance greater than 80% of available runway523No weather reporting at destination424Thunderstorms at departure and/or destination525Ceiling & visibility at destination less than 500 ft. / 2 sm326Ceiling & visibility at destination less than 500 ft. / 2 sm327Heavy rain at departure and/or destination528Frozen precipitation at departure and/or destination5<	
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27Heavy rain at departure and/or destination528Frozen precipitation at departure and/or destination329Icing (moderate-severe)530Surface winds greater than 30 knots4	
28 Frozen precipitation at departure and/or destination 3 29 Icing (moderate-severe) 5 30 Surface winds greater than 30 knots 4	
29 Icing (moderate-severe) 5 30 Surface winds greater than 30 knots 4	
30 Surface winds greater than 30 knots	
31 Crosswinds greater than 15 knots	
Orosswinus greater indit 15 Kilots 4	
32 Runway braking action less than good 5	
Total Score Section 2	
Additional Factors	
33 MEL Items (Flight Safety Related) 2	
34 Mission (Any unusual mission factors that may present a risk) 0 thru 5	

For values over 20: SPEC SOPs require the Chief Pilot to evaluate risk factors from the perspective of accepting the risk, rejecting the risk, or mitigating the risk.

For values over 25: Flights scored over this value shall not be initiated.

Attachment 2-C Hazard Identification and Tracking Form					
Describe the event you observed or potential risk you identified:		al risk	Date	Time	
Name		Date		Phone #	
Summary of Analyse	es e				
Name		_	Date	۱	
Proposed Remedial	Action				
Accepted	Rejected	If rejected	explain reason	and proposed	alternative action.
Flight Department M	anager			Date	
Remedial Action Imp	blemented			Date	
Post Implementation	Review conducted by			Date	

Attachment 2-D Risk Management Tracking Form

Assess ment Area	Report Number	Details	Initial Risk Rating	Risk Control Strategy	Impleme ntation Date	Review Date	Assessment of Effectiveness
Technical	909090A	In event of acft gen failure, high amp draw from Research Power could trip remaining gen Possible confusion from non-	Med/ High	Rewire system so that loss of either acft gen automatically sheds Research Power	10/15/09	7/15/10	Op Testing confirms reliable and effective
Human Factors	032210A	Possible confusion from non- standardized call-outs during T.O. roll	Low/ Med	Pilot meeting to agree on call-outs, FOM section to be updated for Version 2 release	03/22/10	5/15/13	Effective, no further issues

.

Attachment 2-F SMS Evaluation Form

Operator:		
Evaluator		
Date		
SMS Evaluation Objective:	Stage One	
	Stage Two	
	Stage Three	

Iter	m	Sound	Appropriate	Effective	Comments
1.	Policy				
2.	Authorities				
3.	Profile				
4.	Risk Management				
5.	Involvement				
6.	Technical Document Control				
7.	Training				
8.	Ops Manual				
9.	Safety data				
10.	Occurrence				
11.	Evaluation				
12.	Tracking				
13.	SMS Docs				

Comments:

Note: For information on using this SMS Evaluation Form see the SMS Evaluation Tool in the SMS Toolkit or Chapter 5 of the IS-BAO Internal Audit Manual

SPEC Inc.

2. Safety Management System

Attachment 2-G SMS Evaluation Tracking Form

Operator

Date	Evaluator/Auditor	Scope of Evaluation or Audit	Summary of Results

Finding and/or Observation Tracking

Functional Area	Number Details of Finding	Details of Finding or Observation	r Observation Remedial Action Plan	Dat		Assessment of
Functional Area	Number	Details of Finding of Observation	Remedial Action Flam	Implemented	Reviewed	Effectiveness
	-					

Accountable Executive Review

Date	Name	Signature	Comments

This form is intended to provide a means of tracking evaluations or audits, including findings and remedial action, and for reviewing the effectiveness of remedial action.

Amendment No. 1

Attachment 2-H Compliance Monitoring Checklist

Year:

		Subject	Date checked	Checked by	Comments / Deviation Report No.		
1.	Op	perations					
	a.	Aircraft checklists checked for accuracy and validity.					
	b.	Minimum of 5 flight plans checked and verified for proper and correct information.					
	c.	Flight planning facilities checked for updated manuals, documents and access to relevant flight information.					
	d.	Samples of flight operations records checked that operations are conducted in accordance with applicable approvals, exemptions, certificates and flight ops manual.					
	e.	Occurrence reports evaluated and reported to the appropriate competent authority					
	f.	Aircraft maintenance/operations interface procedures checked to ensure aircraft meet airworthiness requirements when dispatched.					
	g.	Aircraft maintenance/operations interface procedures checked to ensure aircraft meet airworthiness requirements when dispatched.					
2.	Ai	rcraft Maintenance					
	a.	Aircraft maintenance checklists, procedures and schedules checked that they continue to meet State regulatory requirements.					
	b.	Use of the maintenance checklists, procedures and schedules checked that aircraft continue to meet airworthiness requirements.					
	C.	Maintenance records checked for completeness and accuracy.					
	d.	Traceability of parts ordering, receiving, storage and usage records checked.					
3.	Gr	ound Handling					
	a.	Instructions regarding fuelling and de-icing issued and known by all relevant personnel					
	b.	Instructions regarding Dangerous Goods issued and known by all relevant personnel					
	C.	Security procedures and adherence to them checked					
4.	Lo	ad Control		r			
	a.	Min.5 load sheets checked and verified for proper and correct information.					
	b.	Aircraft fleet checked for valid weight and balance.					
	C.	Minimum one check per aircraft of correct loading and distribution.					
5.	Tra	aining		r			
	a.	Training records updated and accurate					
	b.	All pilot licenses checked for currency, correct ratings and valid medical check					

		Subject	Date checked	Checked by	Comments / Deviation Report No.	
	c.	All personnel received required recurrent training and training required by approvals etc.				
	d.	Training facilities & Instructors approved				
	e.	All pilots received Daily Inspection (D.I.) training				
6.	Do	ocumentation				
	a.	All issues of OM checked for correct amendment status				
	b.	All approvals and Operations Specifications checked for validity				
	c.	Aviation Requirements applicable and updated				
	d.	Crew flight and duty time record updated				
	e.	Flight documents record checked and updated				
	f.	Quality records checked and updated				

All Deviations are to be recorded in a Corrective Action Report and tracked to ensure that the corrective action has been effective.

Compliance Monitoring Corrective Action Report

Operator		Date	
Reported by		Report Number	
Subject Area	_		-
Flight Ops	Aircraft Maintenance	Ground Handling	
Load Control	Training	Documentation	Other
Description of Finding:			Reference
Reviewing Manager			
Name	Title		Date
Summary of Analyses			
Drepead Demodial Act	ion		
Proposed Remedial Act	lion		
Accepted Rej	ected If rejected	explain reason and proposed	d alternative action.
Flight Department Manag		Date	
Remedial Action Impleme	ented by	Da	nte
Post Implementation Rev	iew conducted by	Da	ate
-	-		

3 Operational Control

3.1 OPERATIONAL CONTROL SYSTEM

Operational control means the exercise of authority over the initiation, continuation, diversion or termination of a flight in the interest of the safety of the aircraft and the regularity and efficiency of the flight. It also includes any provisions for following of the flight until it arrives at its destination.

3.1.1 General Description

The majority of SPEC flight operations are conducted in support of defined scientific projects. During the preliminary project development, a research project is budgeted for specific amount of flight time. The Principal Investigator is the primary contact for allocation of these flight hours. The project's science team and project manager, based on atmospheric conditions and satellite and/or ground instrumentation availability, will request a research flight. Based on project flight hours remaining, the Principle Investigator will request the flight. The Flight Department Manager shall designate a Captain and First Officer for each flight. The Flight Department utilizes a spreadsheet to track currencies and qualifications of all crew that may be assigned flights.

Once a flight is authorized by the Flight Department Manager, SPEC uses a PIC self-dispatch system.

3.1.2 Responsibilities and Authorities

All flights or series of flights away from base must be authorized before departure from the home base by the Flight Department Manager. The operational control of a flight is delegated to the pilot-in-command.

SPEC Inc. uses a pilot self dispatch system. A flight release will be deemed to have been given when the pilot-in-command has determined that:

- a. the flight may be conducted in accordance with the FAA FARs and standards;
- b. the validity of all required licenses, permits, certificates, has been verified and the required equipment, documents and manuals are on board the aircraft;

The following is a list of documents that are to	The following is a list of documents that are to be carried on the aircraft							
Aircraft Certificate of Airworthiness	RVSM/RNP Letters of Authorization							
Aircraft Certificate of Registration	Company Flight Operations Manual							
Aircraft Flight Manual or Operating Manual	Aeronautical information publications							
Aircraft Weight/Balance	Aeronautical charts							
Aircraft Minimum Equipment List	SPEC Form 135-101 Flight Manifest							
SPEC Form 135-100 Maintenance Discrepancy								

- c. Forms 135-100 and 135-101 are reviewed to determine all required aircraft maintenance work has been completed, and sufficient time remains on the aircraft before the next required maintenance to complete the mission for which the aircraft is being released;
- d. the meteorological conditions are such that the flight can be conducted safely and within FAA FARs and International regulations and standards; and
- e. a pilot's flight plan has been completed.

3.1.3 Flight Planning

A flight shall not be commenced until all pertinent flight data has been compiled, including the Flight Manifest Form 135-101 (as specified in Chapter 12) and an ATC flight plan has been filed.

As SPEC Inc. uses a pilot self dispatch system, it is the pilot-in-command's responsibility to ensure that all flight planning documents required by the SPEC FOM have been prepared and filed prior to departure. The pilot shall also ensure that flight planning requirements of the FARs (or non U.S. aviation agency under whose authority the flight is conducted) have been met. For non-U.S. flights, the State AIP shall be consulted if there is any doubt as to the State requirements.

The PIC shall sign the Flight Manifest (Form 135-101) to signify acceptance and accuracy.

The names of the cabin flight crew conducting research are recorded in Form 135-101. If there is any unplanned enplaning or deplaning of cabin flight crew, the PIC shall ensure that the company is advised or a copy of the revised manifest is left at the point of departure.

Before each trip, the flight crew's pre-flight inspection will include a physical check of in-flight reference materials to determine if any materials will expire before the return to home station. Provisions will be made for the flight crew to obtain updated references while away from home station.

If the aircraft has been laid-up for 30 days or more, the PIC or Director of Maintenance shall conduct a Systems and Functional Check and complete Form 135-104.

3.1.4 Ferry Flights

A Flight Permit will be required whenever the Certificate of Airworthiness (C of A) is not in force (e.g. overdue inspection, airplane damage, unserviceability, etc.).

Essential crew only (no passengers) shall be carried on Ferry Flights. The flight shall be conducted in accordance with all conditions specified in the Flight Permit.

3.2 FLIGHT PLANNING REQUIREMENTS

General

Before commencing a flight the PIC shall be familiar with the available flight information that is appropriate to the intended flight. The PIC shall not commence a flight unless it has been ascertained that the facilities available and directly required for such flight and for the safe operation of the aircraft are adequate, including communication facilities and navigation aids.

Additionally, the PIC shall be familiar with all available meteorological information appropriate to the intended flight. Preparation for every flight under the instrument flight rules shall include:

- a. a review of available current weather reports and forecasts; and
- b. the planning of an alternative course of action to provide for the eventuality that the flight cannot be completed as planned, because of weather conditions.

3.2.1 VFR Flight

A flight, to be conducted in accordance with the visual flight rules shall not be commenced unless available weather information indicates that the meteorological conditions along the route, or that part of the route to be flown under the visual flight rules, will permit flight under visual flight rules and VFR charts for the route to be flown are carried on board the aircraft.

When VFR operations are to be conducted in high performance aircraft, risk factors related to the routes and traffic shall be assessed by the PIC and mitigation developed to ensure that the identified risks are reduced to an acceptable level.

In general, VFR flight is discouraged by SPEC. This does not preclude VFR departures from non-controlled airports with the intention of picking up an IFR clearance as soon as airborne and in contact with ATC. The PIC may also elect to cancel an IFR flight plan when landing at a non-controlled airport if the airport has VFR conditions and a visual approach can be safely made.

3.2.2 IFR Flight

3.2.2.1 Alternate Requirements

The following alternate requirements are based FAR 91.169. The FARs should be checked for exact wording, or to resolve any questions.

IFR Alternate Airport Required Unless;

- a. a standard instrument approach procedure is prescribed for the airport of intended landing; and
- b. appropriate weather reports or forecasts indicate that the following meteorological conditions will exist from one hour before to one hour after the estimated time of arrival:
 - i a cloud base of at least 2000 ft above the airport elevation with the instrument approach procedure; and
 - ii visibility of at least 3 statue miles.

Weather Minima Required at an Alternate Airport:

Appropriate weather reports or forecasts indicate the following meteorological conditions will exist at the estimated time of arrival at least the alternate minima specified in the procedure. If none are specified then:

- a. for a precision approach: ceiling 600 feet and visibility 2 statue miles
- b. appropriate weather reports or forecasts indicate that the following meteorological conditions will exist from one hour before to one hour after the estimated time of arrival:

3.2.2.2 Fuel Requirements

The following fuel requirements are based FAR 91.167. The FARs should be checked for exact wording, or to resolve any questions.

An IFR flight shall not be commenced unless, taking into account both the meteorological conditions and any delays that are expected in flight, the airplane carries sufficient fuel to ensure that it can safely complete the flight, and, as applicable, the following special provisions are complied with:

- a. when no alternate airport is required, to fly to the destination airport and thereafter for a period of 45 minutes; or
- b. when an alternate airport is required, to fly to the destination airport, then to the alternate airport and thereafter for a period of 45 minutes.

In addition, sufficient fuel shall be provided for:

- a. taxiing and foreseeable delays prior to take-off;
- b. meteorological conditions;
- c. foreseeable air traffic routings and traffic delays;
- d. landing at a suitable airport in the event of loss of cabin pressurization or, in the case of a multi-engine aircraft, failure of any engine, at the most critical point during the flight; and
- e. any other foreseeable conditions that could delay the landing of the aircraft.

3.2.3 Landing Distance Requirements

The PIC shall not conduct a take-off at a weight that, considering fuel consumption for the duration of the flight to the destination and alternate, would result in a required landing distance greater than the total landing distance available using the anticipated runway at the time of arrival at the destination or the alternate.

All operations will be conducted in accordance with takeoff and landing limitations and aircraft performance charts as specified by the Howard Raisbeck Supplement for the Learjet Model 25 Mark II wing found in the FAA-approved N999MF Aircraft Flight Manual.

For Wet or Contaminated Runways:

The runway requirements should be calculated according to the landing distances in the Aircraft Flight or Performance Manual for the runway conditions.

- a. For a wet runway, apply a 1.4 factor to the computed landing distance.
- b. For a wet runway in the process of freezing, apply a factor of at least 1.7
- c. Corrections for solid ice, snow, or slush are unknown.

3.2.4 Oxygen Supply Requirements

SPEC Inc. pilots may not operate the company aircraft unless the emergency oxygen bottle is turned on and the pressure reading in the cockpit gauge within the green arc (1550 to 1850 psi).

3.2.5 Flight Following and Flight Watch

During research missions, the SPEC Flight Department tracks the flight via www.FliteAware.com. The Principal Investigator, Research Project Manager and Project Scientists may also track the flight, and may occasionally request minor changes in the aircraft's mission profile. To avoid distractions to the flight crew, only the SPEC Flight Department Director is permitted to contact the aircraft via the on-board satellite phone. Any in-flight changes to the mission will be made conservatively and only with the PIC's concurrence.

3.3 AIRCRAFT WEIGHT AND BALANCE

The pilot-in-command is responsible for the proper loading, including load **security**, **weight** and **weight distribution**. All loadings (including fuel) shall be distributed using the current weight and balance report. The load shall be distributed to ensure that the Center of Gravity will remain within the prescribed limits throughout the entire flight, and shall be monitored during flight.

Aircraft take-off and landing weights shall not exceed that which would preclude the aircraft meeting performance requirements for take-off, en-route and landing at any airport used.

A company weight & balance calculation form will be completed for each flight and signed by the pilot-in-command. A single weight and balance calculation may be used for a series of consecutive flights carrying the same load. The SPEC preferred method is Vector Method, using the template and forms kept on-board the aircraft.

The pilot-in-command will ensure that all items carried that are not included in the equipment list that forms part of the weight and balance report have been included in the weight calculations.

Each aircraft shall have a current weight and balance report with an up-to-date equipment list. Using this information, the centre of gravity location and operational empty weight (OEW) shall be calculated.

Weights to be used when completing weight and balance calculations are as follows: (Actual weights are to be used when it is apparent that the weights below are not appropriate.)

Pilots and CrewAdult male 12 years of age Adult female 12 years of ageFreight/CargoActual (end		182 lbs – 8 135 lbs – 6	0
Freight/Cargo	Actual (determi	ined through ເ	use of scales)
Fuel (Standar		et A1 et B	1.85 lbs84 kg per lt 1.77 lbs80 kg per lt

When completing these calculations, always add the fuel last to confirm that at "Zero Fuel Weight", the centre of gravity for that weight is within the allowable envelope.

3.4 AIRWORTHINESS

It is the responsibility of the PIC to ensure that the aircraft Certificate of Airworthiness is in force before commencing a flight. The Certificate of Airworthiness of an aircraft is not in force unless the equipment, systems and instruments prescribed in the applicable airworthiness standard and all required equipment are functioning correctly.

The Certificate of Airworthiness of an aircraft is also not in force if the aircraft has any malfunction or defect, unless the details of the malfunction or defect are recorded in the aircraft log and unmistakable warning is given at the flight crew station by removing, placarding or tagging the affected item. In the case of deferred defects, the PIC shall assure him/her self that the affected equipment will still allow the flight to be completed safely.

Flight crews shall comply with MEL procedures approved for N999MF (see SPEC Op Spec 095). Flight crews shall ensure that all "Operations" and "Maintenance" (O and M) procedures are followed.

In cases where a discrepancy found that is not covered by the MEL, the PIC shall contact an approved maintenance facility to determine if the defect has rendered the Certificate of Airworthiness invalid, or it can be deferred. If the defect can be deferred, the information must be recorded in the aircraft log and the defective equipment is isolated or secured so as not to constitute a hazard to other aircraft systems or persons on board the aircraft. All defects shall be recorded by the PIC in the aircraft log at the termination of the flight during which they were detected. The Director of Maintenance shall be notified of any defects as soon as practical after the flight lands.

3.5 DISTRIBUTION OF OPERATIONAL INFORMATION

SPEC Inc. will disseminate operational information to pilots and other personnel through the use of Company Directives and Bulletins. Bulletins will be kept on a file with a "signed as having read" signature block. Pilots will check the file before each flight, read new items and sign as having read. Company Directives are included in chapter 12 of this manual.

The Flight Department Manager will ensure that any other SPEC Inc. personnel are aware of the latest information. The Flight Department Manager will also notify pilots who are operating away from the main base of pertinent new information.

3.6 DEVIATIONS TO COMPANY OPERATIONS MANUAL PROVISIONS

The Fight Department Manager may approve temporary amendments to the Company Operations manual or deviations to the provisions contained in it. Temporary amendments or deviations will be distributed in the same manner as other operational information. They will be also transmitted to all aircraft crew via e-mail or hardcopy along with information on the conditions related to the deviations.

4 Standard Operating Procedures

4.1 GENERAL

A Standard Operating Procedure (SOP) is an orderly plan for accomplishing a particular task and usually involves several steps. Standardization of crew duties is an absolute necessity to assure the high degree of safety, reliability, and efficiency that represent the goal of SPEC Incorporated. Standardization is not the substitute for sound judgment. Failure to apply knowledge of aircraft systems to prevent or minimize injury or damage is as serious as the failure to use standardized procedures. If there is any conflict in guidance with other procedural or regulatory directives, the more restrictive will apply.

These Standard Operating Procedures apply to all SPEC crewmembers. Standard callouts are listed in Chapter 13 of this manual.

4.1.1 Captain's Authority

The Pilot in Command (PIC) assigned to a flight, shall have exclusive and final authority in accordance with FAR 91.3 as to whether or not the aircraft shall proceed to any destination, or undertake any flight. The Pilot in Command shall not be overruled by any passenger or executive, nor disciplined for well-considered decisions having to do with weather, mechanical condition of the airplane or other hazards. He should utilize all available resources in making decisions related to flight. The other crewmembers will, except when immediate action is required, be brought into discussions concerning the operation of the aircraft as it relates to weather, mechanical condition or other hazards. The PIC has the final authority on all decisions relating to the operation of the aircraft.

4.1.2 Crew Resource Management (CRM)

Fundamental to safe flight operations is "Crew Resource Management" or the "total crew concept." Each crewmember is trained to do his job, to demand that other crewmembers do theirs, with each monitoring the other, and to give assistance on demand or solicit assistance as necessary.

In this regard, it is worthy of consideration that no one is incapable of making a mistake in judgment. No one is master of all emergencies. Then, for no other reason than these, the crew must monitor everything that goes on in the aircraft; they must speak up when dissent is necessary, and advise when advice is needed.

All SPEC crewmembers will operate as a coordinated and well-disciplined team, with the PIC responsible for team management. Crewmembers are not, however, required to comply with any procedure, technique, or other action that they believe is unauthorized or unsafe.

NASA and FAA studies have shown that a well-defined role structure in the Flight Deck reduces ambiguity and enhances each crewmember's performance. Each PIC must attempt to strike a balance between a command role that is too overbearing and one that is too passive. It has also been found that a PIC who is overly passive in his command role tends to detract from crew efficiency by causing an inordinate workload on other crewmembers.

4.1.3 Transfer of Aircraft Control

If a transfer of aircraft control becomes necessary, the Pilot Flying will state, "Your airplane" and the Pilot Monitoring will acknowledge by stating, "My airplane." One crewmember must be responsible

and therefore devote his attention to aircraft control whenever the aircraft is in motion. Both pilots should never have their attention diverted or be "heads down" at the same time.

4.1.4 Minimum Aircraft Crew - Research

The minimum crew in research configuration shall consist of a PIC and a SIC with the duties described in section 4.2.3. Normally, on research missions, the crew will also include one or two technicians or engineers and are assigned to the flight by the Principal Investigator. At times, scientists, engineers or other approved crewmembers may occupy seats in the cabin. The cabin can accommodate up to six crewmembers. Only necessary crewmembers are allowed to fly on missions. When it is necessary for the aircraft to be ferried from one location to another, or for the purpose of recurrency training, the minimum crew can be a PIC and SIC. In these cases, the scientific equipment will not be powered.

4.1.5 Flight Crew Qualifications

As part of their technical job qualifications, all pilots are expected to be knowledgeable of the provisions of the Federal Air Regulations (FARs) and the International Civil Aviation Organization (ICAO), the SPEC FOM, as well as the procedures outlined in the Aeronautical Information Manual (AIM) and the Aircraft Flight Manual (AFM). To the extent possible, this section will not repeat information contained in those regulations and procedural documents.

It is the responsibility of each individual to ensure that all required licenses, certificates and ratings are in force before acting as crew on SPEC aircraft. A copy of each license and medical shall to be submitted to the Chief Pilot. Any suspected or known medical condition that might affect an assignment is to be brought to the attention of the Chief Pilot or the Flight Center Director immediately.

4.1.6 Required Documents and Equipment

All flight crewmembers are required to report to work with the following:

- a. Pilot Certificate
- b. Medical Certificate
- c. Photo Identification

Crewmembers, including flight crew, will report with valid photo identification.

4.1.7 Use of Checklists

Checklists have been established for the SPEC Inc. aircraft. Each checklist contains the date of the last revision. The checklists prescribe the normal and emergency procedures to be followed for each aircraft type. Every aircraft crewmember shall follow the checklist in the performance of their assigned duties.

The pilot flying (PF) will call for the appropriate checklist at the time it is required. If the PF does not ask for the checklist at the required phase of flight, the pilot monitoring (PM) will advise the PF that he is "standing by the (title) checklist."

CHECKLIST BEFORE STARTING START BEFORE TAXI TAXI BEFORE TAKEOFF AFTER TAKEOFF CLIMB 18000 ft CHECK CRUISE DESCENT APPROACH BEFORE LANDING AFTER LANDING SHUTDOWN METHOD

Read and Do Read and Do Read and Do Challenge and Response Read and Do Read and Do

4.1.7.1 Read and Do

The pilot running the checklist reads the item and takes action as required to assure the item has been accomplished.

4.1.7.2 Challenge-and-Response Procedures

Normally, the pilot monitoring (PM) will run the checklist by issuing a "challenge" for each action to be accomplished by reading aloud the checklist item. The pilot who performs the action will call out the appropriate "response" when the action has been completed. The PM, in some instances, may call out both the challenge and the response as items in the checklist are completed. By verbally covering every item in the checklist, both pilots will remain aware of the progress of Flight Deck checks. At the completion of each checklist, whether performed verbally or silently, the PM will announce that "the (title) checklist is complete and the (title) checklist is next".

There may be times when checklist actions can be more efficiently performed before they are called for, such as items checked by the PF as he begins to taxi the aircraft (steering, brakes, anti-skid, etc.) or those that can be accomplished in a Flight Deck "flow pattern." Some checklist actions must be accomplished from memory, such as the initial after-take-off items (gear, flaps, etc.), when full attention is required by both pilots to fly the aircraft and clear for other traffic. Critical emergency situations often require certain immediate actions to be accomplished without taking time to read from a checklist. Whenever actions are accomplished early or from memory, however, the checklist will be "cleaned up" by verbally completing the entire challenge-and-response sequence. This procedure serves as a double-check on all required actions and ensures that no items were missed.

4.1.8 Pilot Incapacitation

Flight crews will use the "two communication" rule as a means of detecting and responding to

suspected subtle incapacitation. Any time the pilot flying the aircraft does not respond appropriately to two communications associated with a significant deviation from a standard operating procedure or a standard flight profile, the pilot monitoring will announce "My airplane" and assume command of the flight. The PF will immediately relinquish the controls at the call by the PM.

Below 300 AGL, SPEC pilots shall adopt a "one communication" rule for no response/deviation.

Flight crews must understand the necessity for the communication rules to avoid difficulties in the transfer of command responsibilities, and that compliance is MANDATORY.

4.2 PREFLIGHT

4.2.1 Flight Crew Reporting Time

The flight crew will report for duty a minimum of one hour prior to the scheduled departure time. Engineers and technicians attending the scientific instrumentation may be required to report earlier than the one-hour minimum, which will be determined by the Principal Investigator. It is the responsibility of the Principal Investigator to notify engineers and technicians via email and telephone if they are required to report sconer than one hour prior to the scheduled departure time. All engineers and technicians that are assigned to a research mission must monitor email for 4 hours prior to the schedule departure time.

4.2.2 Flight Crew Briefing

Prior to departure, the Pilot in Command is responsible for conducting a crew briefing (including research crew). This briefing may occur before or after completing safety checks and other cabin inspections. Items to be reviewed include but are not limited to the following:

- a. Taxi time (if appropriate)
- b. Sterile flight deck
- c. Ground and flight delays
- d. Unusual situations (e.g., MEL items)
- e. Enroute time
- f.. Enroute and destination weather
- g. Destination city, airport and FBO
- h. Turbulence location, intensity
- i. Planned research mission profile.

4.2.3 Flight Crew Duties

At the discretion of the Captain, PF normally occupies the left hand pilot seat and is expected to operate systems and switches located on the left hand side of the cockpit. The PM normally occupies the right hand pilot seat and is expected to operate systems and switches located on the right hand side of the cockpit.

The PF and PM shall coordinate with each other prior to initiating the following.

- a. Change in aircraft configuration
- b. Transferring aircraft control.
- c. A change of navigation equipment settings or frequencies.
- d. Checklist, initiation and completion.
- e. A change in altitude.

4.2.3.1 Pilot in Command

The PIC and SIC will be designated on SPEC Form 135-101 Flight Manifest The PIC is directly responsible for and is the final authority as to the operation of the aircraft.

The other major responsibilities of the Pilot in Command are as follows:

- a. Compliance with all FARs, applicable foreign counterparts, and SPEC Inc. policies and regulations.
- b. The safe and orderly conduct of flight.
- c. Encouraging and using effective CRM in the management of the crew.
- d. Briefing crewmembers prior to a flight on all aspects of the flight, especially on information in the applicable flight information publications; on departure routes, altitudes, obstructions, weather and turbulence, and air traffic control (ATC) procedures; on normal and emergency communication procedures; and on special instructions or procedures.
- e. Supervision of crewmembers throughout the flight including flight preparation and completion of flight documentation.
- f. Discussion with crewmembers regarding their duties and responsibilities.
- g. Monitoring the crew's professional behavior.
- h. Performing crewmember/passenger safety briefings.
- i. Communicating to crewmembers changes in weather, destinations and mission profile.
- j. Ensuring that maintenance service performed away from home base is coordinated with the Director of Maintenance (DOM).
- k. Informing the DOM of any aircraft write-ups.
- I. Ensuring all required records are maintained properly.

4.2.3.2 Second in Command

The Second in Command (SIC) is responsible to the PIC to assist in flight preparation and the proper execution of the flight. The Second in Command will be prepared to assume the duties of the Pilot in Command if that person becomes physically incapacitated and is unable to perform those duties. Effective CRM dictates that both pilots be made aware of any actions taken by the other pilot.

4.2.4 **Pre-flight Inspections**

It is the responsibility of the Director of Maintenance to ensure maintenance inspections are completed as required. The PIC is responsible for ensuring that the aircraft is released for flight by maintenance. The PIC shall check the Form 135-100 (Maintenance Discrepancy) to assure there are no open writeups and the Form 135-101 (Flight Manifest) to confirm there is adequate time available before an inspection is due.

The Pilot in Command will complete an initial exterior preflight as specified in the AFM. For subsequent legs of a trip, the PF for the departing leg will accomplish an abbreviated walk-around check of the aircraft.

The Flight Deck pre-flight checklist should be completed at least 30 minutes before the scheduled departure time.

4.2.5 Fuelling Procedures

It is the responsibility of the PIC to ensure the aircraft is properly fueled and serviced prior to departure. The following procedures will be used for fueling:

- a. The PIC and SIC will jointly calculate the amount of fuel required for the mission or transportation flight and will inform the fueling agent.
- b. The PIC (or SIC at the direction of the PIC) will ensure that the fuel is Jet-A and that it has been properly mixed with anti-ice fuel additive (e.g., Prist).
- c. If there is reason to question the quality of the fuel, a fuel sample shall be taken before fueling begins.
- d. The PIC (or SIC at the direction of the PIC) will ensure that there is not more than 125 gal imbalance between the wings. The crewmember shall monitor the weight of fuel in each wing from the cockpit.
- e. The PIC or SIC will monitor operations and, if required, transfer fuel from the wing tanks to the fuselage tank, confirming that the fuselage tank fuel "Fill" switch has been turned off before the aircraft electrical power is switched off (the crossflow valve will remain open if the Fill switch is not closed prior to power down and may lead to a fuel imbalance and "heavy wing" condition). He will confirm that the total amount of fuel pumped corresponds to the amount requested. He will also be responsible for monitoring personnel in the area and ensuring that all safety precautions are observed and all exits are clear of obstruction and available for evacuation.
- f. Smoking will not be permitted on board or within 100 feet of the aircraft during refueling operations. If personnel are on board, a crewmember will remain with them to enforce the no-smoking policy and ensure that exits of the aircraft remain unobstructed.
- g. Proper bonding procedures will be used. As a minimum, there must be a truck-to-aircraft ground wire attachment made prior to removing any fuel caps.
- h. Electrical power supplies shall not being connected or disconnected, and any equipment likely to produce sparks or arcs shall not be being used.
- i. Fueling is suspended when there are lightning discharges within 5 sm of the aircraft.
- j. Neither combustion heaters nor known high energy equipment shall be operated in the aircraft or in the vicinity of the aircraft.
- k. The amount of fuel added and the cost will be entered into the flight log. The fuel receipt will be checked for accuracy and included with trip records.
- I. Before takeoff, the flight crew will note the amount of fuel pumped and compare it with aircraft fuel quantity readings. The aircraft will not depart if the amount indicated is less than the flight-plan requirements.

4.2.6 Flight Clearance

The SIC or PM shall call for the flight clearance, copy the clearance and make the read-back. The crew will review the clearance and ensure complete understanding.

The navigation system will be programmed with the departure and route of flight. In addition, initial course, heading and altitude assignments will be entered. The Departure Procedure (DP) and instrument approach plates for the departure airport and take-off alternate airport should be kept immediately available to the pilots.

4.2.7 Aircraft Critical Surface Contamination

Crew will follow guidelines FAA Advisory Circular AC 23.1419-2D (Pilot Guide to Small Aircraft Ground Deicing). In particular, pilots must be knowledgeable of critical areas of the Learjet model 25 and ensure that these areas are properly deiced and anti-iced.

Where frost, ice or snow exists, the pilot-in-command shall not commence a flight unless the aircraft has been inspected to determine whether any frost, ice or snow is adhering to the critical surfaces as defined. Such inspection shall be carried out by either the PIC or SIC.

When any frost, ice, and/or snow is found adhering to any critical surface, the contaminant will be removed completely before any flight is attempted.

The methods for removing of frozen contaminant include:

- a. the application of heat; i.e. warm hangar, solar heat (the sun), or the use of a heater; or
- b. the application of a de-icing/anti icing fluid (hold over times for the fluid type and the environmental conditions should be consulted)
- c. brushing.

If a clean aircraft for departure cannot be assured, the only acceptable alternative is to cancel or postpone the flight until conditions are acceptable.

No SPEC Inc. pilot shall commence a flight in or continue a flight into known or expected icing condition where the formation of ice on the aircraft may adversely affect the safety of the flight. In all cases, the PIC will have the total responsibility in deciding whether or not a flight will operate in conditions of icing.

4.2.8 VOR Check

FAR 91.171 require that each VOR system be checked within the preceding 30 days prior to use under Instrument Flight Rules. This check must be documented with a minimum of the date of the test, place, bearing error, and signature of the person completing the check.

The VOR check can be performed on the ground using a designated VOT, a designated VOR checkpoint on the airport (maximum permissible error of ± 4 degrees), airborne using an FAA designated checkpoint (maximum permissible error of ± 6 degrees), or using the dual system VOR, checking one system against the other (maximum permissible error is ± 4 degrees).

Enter the results of the VOR check on Form 135-100.

4.3 CREWMEMBER AND CABIN SAFETY PROCEDURES

A primary objective of the Flight Department is to transport its crewmembers as safely as possible. Review with the crewmembers:

- a. Planned itinerary and Estimated Time Enroute (ETE).
- b. Requested altitudes.
- c. Enroute and destination weather, including anticipated turbulence.
- d. Alternative plans if destination weather is marginal.
- e. Time and distance to research area.

4.3.1 Stowage of Hand Luggage and Galley Equipment

Immediately prior to take-off and landing, the crew, will visually check that equipment is securely stowed and the cabin is secure.

In the event of moderate or greater in-flight turbulence, the crew will ensure that hand luggage, equipment, and other loose articles are securely stowed.

4.3.2 Firearms

No firearms are permitted aboard SPEC aircraft with the exception of those required by laws or regulations for survival purposes. The carriage of firearms requires that they be unloaded and are properly stowed in the baggage compartment.

4.3.3 Crewmember Safety Briefing

The PIC shall ensure that research crewmembers are given a safety briefing appropriate to the crewmember needs and cover at least the items specified in this section. As a minimum the briefings should address the following:

- a. Prior to take-off:
 - i. When, where, and how baggage and equipment is required to be stowed.
 - ii. The fastening, unfastening, tightening and general use of seat belts.
 - iii. When seat backs must be secured in the upright position and tables must be stowed.
 - iv. The use and location of the passenger oxygen system including the location and use of oxygen masks.
 - v. The location of the emergency exit window and how the main door and exit window operates.
 - vi. The location, purpose of, and advisability of reading the safety features card.
 - vii. The requirement to obey crew instructions regarding fasten seat belt signs and no smoking signs and the location of these signs.
 - viii. The location of any emergency equipment the crew may have a need for in an emergency situation such as the ELT, fire extinguisher, survival equipment, first aid kit, life jacket or flotation device and life raft.
- b. In-flight when the "Fasten Seat Belt" sign has been turned on for reasons of turbulence:
 - i. When the use of seat belts is required.
 - ii. The requirement to stow carry-on baggage and equipment.
- c. Prior to crew deplaning, the safest direction and most hazard-free route for movement away from the aircraft following deplaning, and any dangers associated with the aircraft type such as pitot tube locations, or engine intakes.

The standard safety briefing may be shortened or eliminated for regular/recurring research crewmembers who are familiar with the aircraft and have repeated exposure to the SPEC Learjet

4.3.4.1 Crewmember Information Card

A Crewmember Information Card shall be available at each crewmember seat containing, in printed or picture form, information on at least the following safety features of the aircraft

- a. The location of the main cabin door and emergency exit window.
- b. How to open the main cabin door and emergency exit window.
- c. The location of emergency equipment.
- d. The use of supplemental oxygen equipment

4.4 TAKEOFF

4.4.1 Definitions

<u>Critical Engine Failure Speed (V₁)</u>: The speed at which, due to engine failure, the pilot may elect to stop or continue the takeoff. If engine failure occurs at V₁, the distance to continue the takeoff to 35 ft will not exceed the usable takeoff distance. V₁ must not be less than V_{MCG} of greater than V_R.

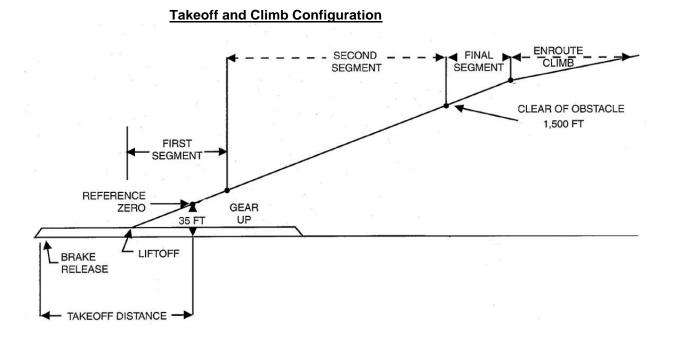
<u>Rotation Speed (V_R) </u>: The speed at which rotation is initiated during takeoff to attain takeoff performance.

<u>Takeoff Safety Speed (V₂)</u>: The actual speed at 35 ft above the runway surface as demonstrated in flight during single-engine takeoff. V₂ is maintained to 1,500 ft above the runway of until clear of obstacle to produce the maximum climb gradient. V₂ must not be less than 1.2 times the stalling speed, less than 1.1 times V_{MVA}, or less than V_R plus an increment in speed attained prior to reaching a 35 ft height above the runway.

<u>First Segment Climb</u>: The first segment climb begins from the point at which the aircraft becomes airborne and ends at the point at which the landing gear is fully retracted. Refer to Figure at the end of this subsection showing takeoff and climb configurations. Gross climb gradient with one engine inoperative and the other engine at takeoff thrust must be positive without ground effect. This requirement is satisfied by compliance with the applicable Takeoff Weight Limits chart.

<u>Second Segment Climb</u>: The second segment climb begins at the end of gear retraction and continues to height above the runway of 1,5000 ft and V_2 speed.

<u>Final Segment Climb</u>: Final segment climb begins at the end of the second segment and ends at a eight of at least 1,500 feet AGL. The gross climb gradient must be at least 1.2% with one engine not operating and the other engine at maximum continuous thrust. This requirement is satisfied by compliance with the applicable Takeoff Weight Limits chart. Airspeed for this segment is 1.25 VS. The final segment climb gradients are presented for pilot's reference and are not used in the takeoff path calculation.



4.4.2 Performance Data

The PIC is responsible for ensuring that aircraft performance parameters are satisfactory for safe operation. This includes operational limits published in the AFM.

The maximum allowable takeoff weight at the start of takeoff roll is limited by the most restrictive of the following requirements:

- Maximum certificated takeoff weight
- Maximum takeoff weight to meet minimum single-engine climb gradient requirements and not exceed brake energy limits (climb or brake energy limited)
- Maximum takeoff weight for runway length available
- Maximum takeoff weight for obstacle clearance
- Maximum landing weight for destination airport.

4.4.3 Takeoff Performance Data

Takeoff flight path performance charts provided in the AFM for 10°, 20° and 10° overspend flap settings are used in conjunction with the Takeoff Flight Path charts, which show required net gradients for obstacle clearance. The Howard-Raisbeck Mark II supplement performance charts do not show first segment climb performance and the Final Segment Climb Gradient chart is provided for reference only. Takeoff gross weight reduces climb gradient required and increases climb gradient possible. As a result, finding the maximum takeoff gross weight that allows obstacle clearance becomes an interpolative process. It is the responsibility of the PIC to use the Howard-Raisbeck Performance Supplement in the AFM to determine the maximum allowable takeoff weight that meets the obstacle clearance requirements for second segment climb.

Prior to take-off the PIC shall determine if any significant obstacles exist in the take-off and climb path and if so, determine by the use of the approved airplane performance charts and related information, that the airplane will safely clear such obstacles.

4.4.4 IFR Take-Off Minima

No SPEC aircraft will take off from an airport under IFR conditions unless ceiling and visibility are high enough to meet the landing minimums for the instrument approach the PIC expects to use in the event of an emergency return to the airport. In addition:

- a. for airports with Part 97 minimums, the weather shall be at or above those minimums
- b. for airports without Part 97 minimums, the visibility must be at least ½ SM.

A takeoff shall be delayed when:

- a. Thunderstorms are at or adjacent to the airport.
- b. Hail is observed.
- c. Moderate or greater wind shear is reported on the runway to 1,500 AGL in the departure path.
- d. Wind velocities above 45 kts or the demonstrated crosswind component for the Spec Learjet (28.5 kts)
- e. Braking action reported as "Nil".

Prior to take off from uncontrolled airports pilots shall ensure that there are no vehicles, aircraft or other obstructions on the runway. In case of reduced visibility it may be necessary to taxi the length of the runway to make this determination.

4.3.4.1 Takeoff Briefing

The PF will give a complete take-off briefing prior to the first flight of the day. A typical take-off briefing will include, at a minimum, the following items. The briefing may include additional information, as suggested below, depending on weather conditions, the familiarity of the crew, etc.

Subsequent briefings during the flight duty period may be abbreviated by making reference to the original "standard briefing" and stating any necessary changes due to airport location or other information peculiar to the flight.

- a. Take-off procedures
 - · EPR setting
 - V₁, V_R and V₂ speeds, review and set bugs
 - Call-outs
- b. Take-off Runway
- c. Initial clearance: headings and altitudes
- d. Navigation equipment settings
- e. Scientific Equipment status
- f. Abort Procedures
- g. Emergency procedures
- Initial actions
 - · Responsibility for checklists and radio calls
 - Sector altitudes
 - Approach procedure for immediate return
- h. Take-off alternate airport
- i. Additional information, questions and discussion

4.4.4.2 Abort Briefing

During the Take-Off Briefing, abort procedures will be discussed. "Normal Abort Procedures" will be followed unless the PIC decides to make a change from "Normal Abort Procedures" based on, aircraft performance as determined by weather conditions, runway length aircraft weight.

SPEC "Normal Abort Procedures" are as follows:

- From the start of takeoff roll up to V_1 speed, either the PF or the PM shall call "Abort, Abort, Abort" if they detect a condition that threatens the safety of the takeoff, such as a red light on the annunciator panel or another aircraft or vehicle on the runway.
- It is SPEC policy that the PF shall not question the "Abort" call of another flight crewmember at speed less than V1 but will immediately, retract the throttles to idle cutoff and apply brakes and spoilers as required.

• At and above V1 speed, any adverse flight condition, including engine fire and reduction of directional control (e.g., loss of thrust on one engine) shall be considered an in-flight emergency. The PF shall maintain directional control, keep the nose wheel on the ground and rotate when the PM calls "Rotate" at the VR speed. The PF shall then pitch up to 9° and fly at the V2 speed while maintaining directional control. The PF will maintain V2 until 1,500 ft AGL. The PM will analyze the situation, inform the PF, run the appropriate checklists and contact ATC.

4.5 ENROUTE

4.5.1 Flight Crewmembers At Station

The PIC is responsible for the flight crew complying with FAR 91.105, which addresses flight crewmembers at station.

4.5.2 Weather Considerations

It is the PIC's responsibility to circumnavigate dangerous weather conditions encountered. If areas of severe weather cannot be circumnavigated, the Captain will give serious consideration to holding until conditions improve or landing the aircraft at an alternate destination.

The Research Aircraft may be flying in areas of weather that will differ from the flights typical of corporate aircraft. Weather will be evaluated on a case-by-case basis and in accordance with the Project's Risk Assessment Tool.

4.5.2.1 Thunderstorms

This paragraph is not intended to restrict research flight operations.

Precautions must be taken to avoid hail and turbulence in the vicinity of thunderstorms (i.e severe radar returns). Hail can be encountered in all directions from a storm, but it is usually on the downwind side. Do not fly under the anvil tips of storm cells, where hail is most likely. If possible, route deviations should be made well to the upwind side of a storm.

a. The following minimum lateral separation should be considered:

- Above 20,000 feet MSL 20 miles
- Below 20,000 feet MSL 10 miles

b. Flights will not be flown into areas of known thunderstorm activity without a functioning weather radar system.

The aircraft will be operated at airspeeds recommended by the Aircraft Flight Manual. Flight crews will not operate the SPEC Learjet to or from an airport where severe thunderstorms (i.e. severe radar returns) are reported within 5 nautical miles of the airport or the intended approach or departure course.

4.5.2.2 Wind Shear

This paragraph is not intended to restrict research flight operations.

Wind shear may create a severe hazard for aircraft below 1,000 ft AGL in the vicinity of a "micro burst", particularly during the approach to landing and in the take-off phases. Because of the hazards associated with flying through and in the vicinity of these intense down draughts, which on reaching the surface spread outward from the down flow center in all directions, the best defense is to avoid it altogether as it could be beyond you or your aircraft's capability.

Pilots should heed wind shear PIREPs as a previous pilot's encounter may be the only warning you will receive. On receiving such notice, alternate action such as delaying a departure or an arrival until the phenomena has passed is recommended.

If wind shear is encountered, prompt action is required. In all aircraft, the recovery could require full power and pitch attitude consistent with the maximum angle of attack for the aircraft consistent with Flight Training and recommendations. In addition, warn others as soon as possible by sending a PIREP to the closest air traffic services facility.

4.5.2.3 Turbulence

This paragraph is not intended to restrict research flight operations.

The PIC should include any information about anticipated turbulence in the preflight briefing, using National Weather Service terminology (light chop, light turbulence, moderate chop, moderate turbulence, severe turbulence, and extreme turbulence). For descriptions of categories of turbulence see Airman's Information Manual Table 7-1-9. Whenever possible, the Captain should advise the research crew of the anticipated time until turbulence may be encountered and the expected duration. Flights shall not proceed through areas in which turbulence of more than moderate intensity exists unless the flight crew cannot avoid those areas by weather radar references.

If turbulence greater than light is encountered or expected, the flight crew will turn the Fasten Seat Belt sign on.

4.5.3 Icing and Freezing Precipitation

The flight crew shall give careful consideration to all factors involved when operating into areas of known or anticipated areas of icing and assure that the aircraft anti-icing systems are functioning properly. When icing conditions are anticipated prior to departure, the full anti-icing systems checks will be conducted by the flight crew. This includes 1) verifying that the alcohol reservoir is full on the preflight check and that the radome and windscreen anti-icing systems are functioning properly, 2) verifying the that the ice detection lights are operating after electrical power is available during the

cockpit preflight, 3) performing the nacelle heat after both engines have been started by individually selecting nacelle engine heat and verifying that the annunciator light goes out when the throttle is advanced past 70%, and 4) verifying that the wing anti-ice is functioning by selecting wing anti-ice and noticing that the cabin altitude increases momentarily. Note that proper functioning of the tail stab heat cannot be verified until the aircraft is airborne, and that proper functioning of the tail stab heat shall be verified prior to entering icing conditions.

The SPEC Learjet is designed to prevent ice from accumulating on airframe and engine surfaces that are critical to flight. For these systems to function properly and prevent airframe and ice build up, it is imperative that all anti-icing systems be activated PRIOR to encountering icing conditions. Ice will accumulate on unheated surfaces and this shall serve as a visual indication to the pilots of how much ice may be present on surfaces that cannot be seen from the cockpit. A good reference for estimating the amount of ice buildup on unheated airframe surfaces is to visually inspect the domes on the tip tanks, which are not heated and are good indicators of ice build up. Once a visual coating of ice has accumulated on the tip tank domes, the PM should contact the cabin crew and ask them to verify that ice has not accumulated on the leading edge of the wing and the nacelle inlets. This visual inspection serves to verify that these critical icing systems are operating properly. If the Learjet is in Transport mode, the PM shall select an appropriate situation, and after communicating his intentions with the PF and obtaining agreement, make the visual inspection of wing and nacelle surfaces himself. If ice has inadvertently built up on the nacelle and/or wing leading edge with the anti-icing heaters properly selected (i.e., indicating failure of an anti-icing system), the PM will notify the PIC (if not the PM) and a decision will be made as to how to handle the situation. If possible, the Learjet should be repositioned into a region without visible moisture and the ice should be allowed to sublimate off of the surfaces. If this cannot be accomplished and the anti-icing heaters have not activated, then the PIC may elect to activate the anti-icing heaters individually. This could result in ice breaking off and being ingested in an engine. There is no hard and fast rule for how much ice can be accumulated and safely removed without causing engine failure, because this is a function of ice density and the size of the ice chunk. However, in general, if the ice accumulation is greater than ½ inch, it is likely to cause damage. To minimize the possibility of engine damage, the throttles should be retarded to minimum allowable for proper anti-icing operation (about 80% RPM) before activating anti-icing equipment.

Continued flight into areas of icing greater than moderate should be avoided. If icing conditions are encountered that have not been reported or forecast, it should be reported to the nearest ATC facility. Because of the inherent dangers of flying in freezing precipitation, the SPEC Inc. Learjet will not perform extended operations into areas of reported severe icing.

4.5.4 Sterile Flight Deck

This paragraph is not intended to restrict essential crewmember communications on research aircraft. Crewmembers may not engage in, nor may any PIC permit, any activity during a critical phase of flight which could distract any flight crewmember from the performance of his duties or which could interfere with the proper conduct of those duties. Activities such as eating meals, engaging in nonessential conversations within the Flight Deck and nonessential communications between the cabin and Flight Deck crews, and reading publications not related to the conduct of the flight are not permitted.

For the purposes of this section, critical phases of flight include all ground operations involving taxi, takeoff and landing, and all other flight operations conducted below 10,000 feet, or 5000 ft AGL, (except cruise flight) after takeoff and before landing. Low level (< 500 ft.) operations in the research aircraft are also considered critical phase of flight.

4.5.5 No Smoking/Fasten Seat Belt Signs

The No Smoking and Fasten Seat Belt signs will be on whenever the aircraft is in motion on the ground and during takeoff and landing with passengers on board. It is the policy of SPEC Inc. that smoking is not permitted on the SPEC Learjet. Therefore, the No Smoking sign will remain illuminated for the

entire flight. After takeoff the Fasten Seat Belt sign should remain on until the Pilot in Command is satisfied that no significant turbulence will likely be encountered. On arrival after the engines have been shut down, the Fasten Seat Belt sign will be turned off. This will signify that the crewmembers may deplane.

4.5.6 Altitude Awareness

During change of assigned or selected altitude PM is expected to enter the new altitude in the altitude alerter. PM is then expected to announce the newly selected altitude for confirmation by PF. PM will normally leave his hand on the altitude alerter unit awaiting confirmation. If a block is assigned, the PM will write down the limits of the block and set the alerter to the top of the block when the aircraft is climbing or bottom during descents. If there is any doubt of PF leveling at assigned altitude, PM will announce "Approaching Altitude".

4.5.7 Fuel Management Awareness

During normal enroute flight operation fuel is transferred from the fuselage tank to the wing tanks, and if required, from one wing to the other in order to balance the fuel load. The PM will perform fuel transfer operations by first announcing the amount of fuel in each tank and requesting permission from the PF to transfer fuel. The PM will announce that fuel transfer is initiated and monitor the status of fuel transfer. If fuel is being transferred from one wing to the other, the PM will normally hold his finger on the crossflow valve until fuel transfer is complete. Whether transferring from the fuselage tank or the between wing tanks, the PM will announce when fuel transfer is complete and that the proper fuel switch (i.e., transfer valve or crossflow) is closed and that the indicator lights are showing proper illumination. The PM will continue to monitor fuel balance throughout the flight and notify the PF if the fuel load is becoming unbalanced.

PF and PM will jointly calculate and update "bingo fuel" based on distance trends ^{1.} from primary and secondary airports, as well as WX trends, and any conditions that may affect fuel needs (e.g. ATC delays).

1. During research operations, it is not unusual for the aircraft to be tracking away from the destination.

4.5.8 Flights Over Water

The PIC shall be responsible for ensuring that the survival equipment and radio communications requirements of FAR 91.509 and 91.511 are met for any flight over water and more than 50 NM from the nearest shore (these FAR sections impose addition requirements when the flight will be 100NM or 30 minutes from shore). See section 5.7 for list of required equipment.

4.5.9 Oxygen Equipment and Use

The SPEC Learjet is equipped with quick-donning oxygen masks for the flight crew.

Above FL 410, one pilot shall wear and use an oxygen mask that automatically supplies oxygen whenever the cabin pressure exceeds 14,000 MSL. In addition, if it is necessary for one pilot to leave the controls above FL 350, the remaining pilots shall put on and use an oxygen mask until the other pilot has returned (see FAR 91.211).

If research crewmembers are onboard, PASS OXY shall be set in the NORM position and PASS MASK set to the AUTO position.

4.6 APPROACH AND LANDING

4.6.1 Instrument Approach Procedures

4.6.1.1 Weather Restrictions

Approaches will not be flown when:

- a. Wind or gusts exceed 45 knots.
- b. Windshear greater than 20 knots is reported.
- c. Weather conditions are below the authorized IFR landing minimums for the approach used.

Note: Specific approaches may be used to support research operations such that (c) may not apply. For example, approaches to minimums are permitted for research purposes even if there is no intention of landing.

4.6.1.2 General Procedures

The PM will tune and verify all available navigation aids appropriate for the approach. This policy applies to either instrument or visual approaches.

Both members of the flight crew will monitor the performance of the aircraft and the actions of other crewmembers to ensure that all procedures are accomplished in a safe and effective manner.

4.6.1.3 Approach Category

The minimum approach category for straight in approaches in SPEC Learjet aircraft is Category C. However, during a circling approach category D minimums should be used if the aircraft will be maneuvered at speeds over 141 knots.

4.6.2 Approach Briefing

The approach briefing is a vital element in the safe completion of a flight. The briefing should be completed before the aircraft enters the high-density traffic area or begins maneuvering for the approach.

4.6.2.1 IFR Approach Briefing

A full IFR approach briefing will be conducted whenever the reported or forecasted weather conditions are below VFR minimums or if an instrument approach is expected or requested. The instrument approach plate will be used for reference during the approach briefing.

The approach briefing shall consist of, but not be limited, to the following items:

- a. ATIS information (if available) to include destination weather, runway and type approach in use and NOTAM data.
- b. Performance data and requirements.
- c. A review of airport data to include elevations, obstacle location and heights, runway dimensions, lighting systems, and runway exit plan.
- d. A review of the approach procedure to be performed including navigation aids and frequencies, courses to be flown, approach profile and descent angles, approach category, altitudes and minimums, times and sequence of waypoints displayed by the GNS systems.
- e. Aircraft speeds, configuration and level of automation to be used during the approach.

- f. Missed approach procedures with the courses and altitudes and confirmation the GNS displays the correct missed approach data.
- g. Additional information as required by conditions.

4.6.2.2 Circling Approach Briefing

In addition to the items included in the IFR Approach briefing described above, the following subjects will be briefed and discussed for circling approaches:

- a. Use Category D minimums
- b. Entry, direction and pattern of the circling maneuver.
- c. Aircraft configuration during the circling approach
- d. Speeds to be flown.
- e. Missed approach procedure, if instrument conditions are encountered during the circle.

NOTE: Special attention will be given to terrain and obstruction clearance altitudes, as shown on approach charts.

4.6.2.3 VFR Approach Briefing

A modified version of the IFR approach briefing can be used for visual approaches. Navaids should be set up for instrument approach conditions and approach plates will be available for reference.

4.6.3 Navigation Radio and Visual Approach Guidance

Available navigation radio facilities, if available, should be used during departure and approaches, in both IMC and VMC conditions. Marker beacons should be set to receive both visual and aural signals. Both electronic localizer and glideslope indications may be followed during VFR approaches and will be followed during IFR conditions. During IFR conditions, navigation station identifiers will also be verified by reception of the published aural identification signal.

4.6.4 GPS Approach Operations

Situational awareness, briefings and communication are critical to successful execution of GPS approaches.

- a. GNS programming for the IAP and the approach briefing should be completed prior to arrival into the terminal area, preferably prior to descent.
- b. The PM selects the database Instrument Approach Procedure (IAP), programs the GNS, and reviews the entries with the PF.
- c. Review should include crosscheck of individual leg course/distance as well as the vertical constraint and descent angle at each waypoint.

4.6.5 Stabilized Approach

All flights must be stabilized by the final approach fix in IMC conditions, and 500 feet AGL for VMC conditions. An approach is stabilized when the following criteria are met:

- a. The aircraft is on the correct flight path.
- b. Only minor changes in heading/pitch are required to maintain the correct flight path.
- c. The airspeed is not greater than 10 knots above the approach speed and not below Vref.

- d. The aircraft is in the correct landing configuration.
- e. Sink rate should be no greater than 1000 feet per minute.
- f. Power setting is appropriate for aircraft configuration.
- g. All briefings and checklists have been completed.
- h. ILS approaches must be within one dot of course and glideslope.

On non-precision approaches and during circling maneuvers, it may not be possible to establish final landing configuration until later in the approach. In such instances, the pilot will stabilize the approach as soon as possible before landing. During all types of approaches, de-selection of the Yaw Dampener and selection of Full Flaps for may be delayed until the landing is assured.

An approach that becomes destabilized below 1000 feet AGL under IMC conditions and 500 feet AGL for VMC conditions requires an immediate go-around.

4.6.6 Side-Steps and Circling Approaches

SPEC Inc. does not prohibit side steps or circling approaches, but they must be flown using a conservative philosophy. A side step or a circling approach will not be attempted in marginal conditions or if the crew has any reservations about the appropriateness or safety of the maneuver.

4.6.7 Precision Runway Monitor (PRM)

No SPEC flight crew will conduct a Precision Runway Monitor Approach (PRM) or Simultaneous Offset Instrument Approach (SOIA) unless the PIC and SIC have completed the required FAA training video: http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/nextgen/r esearch_tech_dev/at_sys_con_dev/sim_analysis_team/video/#ils.

In addition SPEC pilots shall review and be familiar with the ILS PRM and SOIA sections in AIM Section 4 paragraph 5-4-15 and 5-4-16.

4.6.8 Requirements for Landing

SPEC pilots may not operate an aircraft at any airport below the authorized MDA or continue an approach below the authorized DA unless:

- a. The aircraft is continuously in a position from which a descent to a landing on the intended runway can be made at a normal rate of descent using normal maneuvers.
- b. The flight visibility is not less than the visibility prescribed in the standard instrument approach being used.
- c. At least one of the following visual references for the intended runway is distinctly visible and identifiable to the pilot:
 - i. The approach light system, except that the pilot may not descend below 100 feet above the touchdown zone elevation using the approach lights as a reference unless the red terminating bars or the red side row bars are also distinctly visible and identifiable.
 - ii. The threshold.
 - iii. The threshold markings.
 - iv. The threshold lights.
 - v. The runway end identifier lights.
 - vi. The visual approach slope indicator.

- vii. The touchdown zone or touchdown zone markings. viii. The touchdown zone lights.
- ix. The runway or runway markings.
- x. The runway lights

SPEC pilots will immediately execute an appropriate missed approach procedure when either of the following conditions exists:

- a. Whenever the previously mentioned requirements of this section are not met at either of the following times:
 - i. When the aircraft is being operated below Minimum Descent Altitude (MDA).
 - ii. Upon arrival at the missed approach point, including a Decision Altitude (DA) where a DA is specified and its use is required, and at any time after that until touchdown.
- b. Whenever an identifiable part of the airport is not distinctly visible to the pilot during a circling maneuver at or above MDA, unless the inability to see an identifiable part of the airport results only from a normal bank of the aircraft during the circling approach.

4.6.9 Missed Approaches

4.6.9.1 Go-Around

Either pilot may call for a go-around for any reason at any time. The PF needs only to call, "Going Around," and do so. Should the PM call "Go Around," the PF must immediately begin to execute the published missed approach procedure or follow any miss instructions issued by ATC.

4.6.9.2 Missed Approach Procedures

Either pilot may be required to fly a missed approach, depending on when or for what reason the missed approach is initiated. The following procedures will apply, regardless of the seat the pilots are occupying.

- a. The missed approach will be reviewed during the approach briefing. Both pilots must understand the published procedures and be familiar with initial missed-approach headings and altitudes.
- b. Once the missed approach is initiated, the PF will fly the complete the procedure. Control should not be transferred during the missed approach, except for pilot incapacitation or a mechanical malfunction that requires the aircraft to be flown from the opposite side.
- c. The PM performs ATC communication, tuning and identifying navaids, and running checklists. The PM will monitor the missed approach procedures.
- d. Normal checklist call-outs concerning aircraft-configuration changes will be made by the PF and confirmed by the PM.

4.7 ARRIVAL

4.7.1 Flight Records and Expense Tracking Procedures

A complete record of all purchased maintenance actions and all available invoices (fuel and services) will be returned to SPEC Inc. following the completion of each trip. The Pilot in Command is responsible for completing the Flight Record Form and submitting it to the Business Manager.

4.7.2 Reporting Discrepancies

The Pilot in Command shall ensure that all mechanical discrepancies are entered in the Maintenance Discrepancy Form 135-101. These discrepancy records will remain in the aircraft until the affected part is repaired or replaced and an entry to that effect is made in the aircraft permanent maintenance records. An aircraft technician is responsible for writing any corrective action, then signs and dates the block, and removes any inoperative stickers.

When a discrepancy is discovered during flight the PIC may continue the flight in accordance with AFM and/or cockpit checklist procedures until the next scheduled stop (except in the event of an unsafe condition or emergency, in which case the aircraft should be landed at the nearest suitable airport).

4.7.2.1 Continuing Flight with Inoperative Equipment Listed in MEL

Upon landing the PIC shall conduct the following procedures:

- a. Verify that the discrepancy is covered by the MEL.
- b. If yes, fill is the DESCREPANCY section of Form 135-101. The top section shall be dated, numbered, and signed. A description of the discrepancy shall be entered space provided.
- c. Fill in the CORRECTIVE ACTION section of 135-101. In this section the pilot will write "Flight continued in accordance with MEL". In the DEFERRED ACTION section write the page number that corresponds to the MEL item. If required, enter a "repair due date".
- d. Inoperative equipment will be placarded with an "INOP" sticker. The sticker may be a piece of masking tape on which "INOP" is written. Write the MEL page and item number on the sticker and place the sticker on or near the switch controlling the defective system or component.
- e. The O (Operations) and M (Maintenance) Procedures developed by SPEC are in the M & O Procedures section of the RVSM/MEL Manual. These procedures must be followed to operate under the MEL Supplemental Type Certificate.

4.7.2.2 Discrepancies Not Covered BY the MEL

Items not covered by the MEL shall cause the aircraft to be grounded as un-airworthy until the defect is remedied and proper sign-offs are made. Upon landing, the PIC shall contact the Director of Maintenance to discuss options for either obtaining local repairs or a ferry permit. Any away-from-home maintenance will be contracted for per the requirements of Section 9.15 of this manual. Appropriate sections of 135-101 will be completed and faxed to the Director of Maintenance.

4.7.3 Securing the Aircraft

All crewmembers share responsibility for securing the aircraft and contents during all layovers and preparing for the next flight.

Parking brakes will normally be released after the aircraft has been chocked. If strong winds are expected, however, brakes should be reset after heat build-up has dissipated. Engine plugs, probe covers and gust locks may be installed during all layovers and at other times, when conditions require.

Crewmembers should restore the interior to pre-flight condition before leaving the aircraft.

All doors and access panels will be closed and/or locked before the crew departs the airport. Additional security precautions may be used, as described in Chapter 10 of this manual.

4.8 AIRCRAFT EQUIPMENT

4.8.1 Terrain Awareness System (TAWS)

The SPEC Learjet is equipped with, and the flight crew shall perform the system checks in accordance with the AFM before the first flight of the day. The crew shall also verify that the terrain database in use is current. It is the responsibility of the Director of Maintenance to order and install database revisions

Flight crews will immediately respond to a TAWS warning when terrain proximity cannot be instantly verified by visual observation. Maximum available thrust will be applied and the aircraft rotated to achieve best angle of climb without delay in accordance with the aircraft manufacturer's recommended procedures.

The TAWS shall not be deactivated unless there is an obvious electrical malfunction.

4.8.2 Cockpit Voice Recorder (CVR)

Where installed, the CVR shall be operated continuously from the time the electrical power is first applied to the time that the aircraft is shut down and the electrical power is removed.

No communications may be erased from the CVR from the time that the electrical power is applied for the purpose of flight.

The CVR is used exclusively for the purpose of investigating an accident or incident. Any information gathered from the CVR is to be used only for that purpose and will not be released to anyone not involved in such investigations.

4.8.3 Traffic Information Service

The SPEC Learjet is equipped with Traffic Information Service (TIS) displayed on the GNS. When in terminal areas, crews should set the display range on the GNS at 10 NM or under to enhance display resolution

Crews need to be aware that coverage for TIS is limited, and does not absolve the flight crew from responsibility for maintaining a constant visual scan for traffic.

The TIS shall not be deactivated unless there is an obvious electrical malfunction.

4.9 FLIGHT AND DUTY TIME LIMITATIONS

All aircraft crewmembers are expected to manage their personal time so as to be well rested when they report for work. SPEC Inc. pilots shall observe the flight and duty time limitations as described in

this section and shall not work when fatigued. Should operational contingencies require an extension of these limitations, such an extension can only be granted by the Flight Department Manager or Chief Pilot, with the specific concurrence of all members of the aircraft crew. Such extensions will be formally recorded on the Extension to Maximum Flight Duty Time form and retained on file in the Flight Department Office for two years.

Definitions:

Window of Circadian Low	The window of circadian low is best estimated by the hours between 0200 and 0600 for individuals adapted to a usual day-wake/night-sleep schedule. This estimate is calculated from scientific data on the circadian low of performance, alertness, subjective report (i.e., peak fatigue) and body temperature. For duty periods that cross three or fewer time zones, the window of circadian low is estimated to be 0200 to 0600 home-base/domicile time. For duty periods that cross four or more time zones, the window of circadian low is estimated to be 0200 to 0600 home-base/domicile time. For duty periods that cross four or more time zones, the window of circadian low is estimated to be 0200 to 0600 home-base/domicile, the window of circadian low is estimated to be 0200 to 0600 home-base/domicile, the window of circadian low is estimated to be 0200 to 0600 local time at the point of departure. Recommended guidelines related to the window of circadian low should be applied when any of the following operations occur: landing within the window; flight through both sides of the window; or duty period that starts at 0400 or earlier within the window.
Off Duty	is a continuous, predefined period of uninterrupted time during which a crewmember is free of all duties.
Duty	is any task a is required to perform by the operator, including flight time, administrative work, managerial duties, training and deadheading.
Duty period	is a continuous period of time during which tasks are performed for the operator, determined from report time until free from all required tasks.
Flight time	is the sum of all flight time, calculated from block to block for each flight segment.
Standby	A flight crewmember is on "standby" when he/she is required to be available to an operator (away from the airport) for assignment to a flight duty period.

	Off Dut	Off Duty			Duty Period		Flight Time		
	Per 24-hour Period	Per Week	Other	Per 24-hour Period	Weekly, Monthly, Annually	Per 24-hour Period	Per Week	Monthly, Annually	
Two Pilots	10 hours 12 hours (following extended flight time)	Minimum 36 continuous hours, including two consecutive recovery nights, in a seven-day period (calculated on a seven- day or 168-hour rolling basis) or minimum 48 continuous hours in a 10-day period	48 continuous hours on return home following duty period across multiple time zones	14 hours 14 hours	There is not sufficient scientific data to provide specific guidance in this area; nevertheless, maximum cumulative duty periods should be adjusted downward over increasing time frames.	10 hours Up to 12 hours (requires that landings, maximum cumulative hours be restricted, with compensa- tory off-duty time)		ta to provide dance in this theless, umulative hould be wnward	Extended * Standard
	Off Duty		Duty Period		Flight Time			tend	
Three Pilots	12 hours	Same as above	Same as above	Reclining seat 18 hours Supine bunk	Same as above	16 hours **	Same as at	pove	Ű
4T A				20 hours					

Table 1Flight and Duty Time Limitations Overview1

* Extended operations can involve duty/rest cycles longer than 24 hours.

** Each flight crew gets maximum sleep opportunity with minimum four hours total; maximum two consecutive duty periods with 18 hours off duty.

¹ Extract from *Principles and Guidelines for Duty and Rest Scheduling in Corporate and Business Aviation* published by the Flight Safety Foundation, February 1997.

Table 2Flight and Duty LimitationsDuring the Window of Circadian Low²

The "window of circadian low" is best estimated to be the hours between 0200 and 0600 for individuals adapted to a usual day-wake/night-sleep schedule. These limitations apply to the following operations within this window of circadian low:

- 1. Landing,
- 2. Flight through both sides of the window of circadian low, or
- 3. Duty period that starts at 0400 or earlier in the window of circadian low.

Off Duty			Duty F	Period	Flight Time			
Per 24-hour Period	Per Week	Other	Per 24-hour Period	Weekly, Monthly, Annually	Per 24-hour Period	Per Week	Monthly, Annually	
12 hours	48 continuous hours in seven-day period following multiple duty periods in circadian low (calcu- ated on a seven-day or 168-hour rolling basis)	48 continuous hours on return home following duty period across multiple time zones	14 hours	There is not sufficient scientific data to provide specific limitations in this area; nevertheless, maximum cumulative duty periods should be adjusted downward over increasing time frames.	10 hours	scientific da specific limit area; nevert maximum cu time should downward o	a to provide ations in this heless, umulative flight be adjusted ver increasing	Standard
Off Du	ıty		Duty F	Period	Flight	Time		*
12 hours	Same as above	Same as above	Reclining seat 18 hours Supine bunk 20 hours	Same as above	16 hours ** 18 hours **	Same as a	bove	Extended
	Per 24-hour Period 12 hours No two pike Off Du	Per Per 24-hour Week Period 48 12 hours 48 continuous hours in seven-day period following multiple duty periods in circadian low (calcu-ated on a seven-day or 168-hour rolling basis) No two pilot extensions Off Duty 12 hours	Per 24-hour Period Per Week Other 12 hours 48 continuous hours in seven-day period following multiple duty periods in circadian low (calcu- ated on a seven-day or 168-hour rolling basis) 48 continuous hours on return home following duty period across multiple time zones No two pilot extensions recomment Off Duty 12 hours	Per 24-hour Period Per Week Other Per 24-hour Period 12 hours 48 continuous hours in seven-day period following multiple duty periods in circadian low (calcu- ated on a seven-day or 168-hour rolling basis) 48 continuous hours on return home following duty period across multiple time zones 14 hours No two pilot extensions recommended 000000000000000000000000000000000000	Per 24-hour Period Per Week Other Per 24-hour Period Weekly, Monthly, Annually 12 hours 48 continuous hours in seven-day period following multiple duty periods in circadian low (calcu- ated on a seven-day or 168-hour rolling basis) 48 continuous hours on return home following duty period across multiple time zones 14 hours There is not sufficient scientific data to provide specific limitations in this area; nevertheless, maximum cumulative duty periods across multiple time zones There is not scientific data to provide specific limitations in this area; nevertheless, maximum cumulative duty periods scientific data to provide specific limitations in this area; nevertheless, maximum cumulative duty periods scientific data to provide specific limitations in this area; mevertheless, maximum cumulative duty periods scientific data to provide specific limitations in this area; nevertheless, maximum cumulative duty periods scientific data to provide specific limitations in this area; following scientific data to provide specific limitations in this area; following scientific data to provide specific limitations in this area; following scientific data to provide specific limitations in this area; following following following following following following following following following following following following following followi	Per 24-hour Period Per Week Other Per 24-hour Period Weekly, Monthly, Annually Per 24-hour Period 12 hours 48 continuous hours in seven-day period following multiple duty periods in circadian low (calcu- ated on a seven-day or 168-hour rolling basis) 48 continuous hours on return home following duty period across multiple time zones 14 hours There is not sufficient scientide specific limitations in this area; nevertheless, maximum cumulative duty periods should be adjusted downward over increasing time frames. 10 hours No two pilot extensions recommended Duty Period Reclining seat 18 hours 16 hours **	Per 24-hour Period Per Week Other Per 24-hour Period Weekly, Monthly, Annually Per 24-hour Period 12 hours 48 continuous hours in seven-day period following duty eduty periods in circadian low (calcu- ated on a seven-day or 168-hour rolling basis) 48 continuous hours on return home following duty period across multiple time zones 14 hours There is not sufficient scientific data to provide specific limitations in this area; nevertheless, maximum cumulative duty periods should be adjusted downward our increasing time frames. 10 hours There is not scientific data to provide specific limitations in this area; nevertheless, maximum cumulative duty periods should be adjusted downward over increasing time frames. 10 hours There is not scientific data to provide specific limitations in this area; nevertheless, maximum cumulative duty periods should be adjusted downward over increasing time frames. 10 hours There is not scientific data to provide specific limitations in this area; nevertheless, maximum cumulative duty periods should be adjusted downward over increasing time frames. 10 hours There is not scientific data to provide specific duty downward over increasing time frames. 10 hours There is not scientific data to time should downward over increasing time frames. No two pilot extensions recommended Reclining seat 18 hours 16 hours ** 16 hours **	Per 24-hour Period Per Week Other Per 24-hour Period Weekly, Monthly, Annually Per 24-hour Period Per Week Monthly, Annually 12 hours 48 continuous hours in seven-day period following multiple duty periods in circadian low (calcu- ated on a seven-day or 168-hour rolling basis) 48 continuous no return home following duty period across multiple duty periods should be across multiple duty periods should be adjusted downward over increasing time frames. 10 hours There is not scientific data to provide specific limitations in this area; nevertheless, maximum cumulative duty periods should be adjusted downward over increasing time frames. 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* Extended operations can involve duty/rest cycles longer than 24 hours.

** Each flight crew gets maximum sleep opportunity with minimum four hours total; maximum two consecutive duty periods with 18 hours off duty.

² Extract from *Principles and Guidelines for Duty and Rest Scheduling in Corporate and Business Aviation* published by the Flight Safety Foundation, February 1997.

4.10 Use of Alcohol and Other Psychoactive Substances

It is extremely important that all persons involved in aviation activities not be impaired in any manner. Therefore, Flight Department personnel shall not at any time be under the influence of any psychoactive substance that might in any way limit their ability to perform their duties in a safe and effective manner.

Aircraft crew and maintenance personnel shall not consume any alcoholic beverage within eight hours and no excessive consumption within 12 hours prior to reporting for duty and shall not use any **Personnel Records** that may impair the person's ability to perform their duties.

4.18 CABIN CREW AND CABIN SAFETY PROCEDURES

4.18.1 Cabin Crew Safety Briefing

The pilot-in-command shall ensure that cabin crew members are given a safety briefing as appropriate. A Safety Briefing need not be given if all cabin crew members have been certified as trained in Normal and Emergency Operations. If one or more crewmember has not been trained, a briefing, as described below, shall be given.

Normal Operations

The following briefing will be given by the PIC or the person designated by the PIC:

- a. Prior to take-off:
 - i. when, where, why and how carry-on baggage is required to be stowed;
 - ii. the fastening, unfastening, tightening and general use of safety belts or safety harnesses;
 - when seat backs must be secured in the upright position and chair tables must be stowed;
 - iv. the use and location of the passenger oxygen system including the location and use of oxygen masks;
 - v. the location and use of the portable oxygen bottle;
 - vi. the location of emergency exits and for passengers seated next to an exit, how that exit operates;
 - vii. the location, purpose of, and advisability of reading the passenger safety briefing card;
 - viii. the requirement to obey crew instructions regarding fasten seat belt signs and no smoking signs and the location of these signs;
 - ix. the location of any emergency equipment the passenger may have a need for in an emergency situation such as the ELT, fire extinguisher, survival equipment (including the means to access if in a locked compartment), first aid kit, life preserver or flotation device and life raft;
 - x. company procedures regarding the use of portable electronic devices, and
 - xi. any other considerations based on the configuration of the aircraft cabin and equipment.
- b. After take-off, if not included in the pre take-off briefing:
 - i. on flights where smoking is permitted, when and where smoking is prohibited on board the airplane; and
 - ii. the advisability of using safety belts or safety harnesses during flight.
- c. In-flight when the "Fasten Seat Belt" sign has been turned on for reasons of turbulence:
 - i. when the use of seat belts is required; and
 - ii. the requirement to stow carry-on baggage.

d. Prior to passenger deplaning, the safest direction and most hazard-free route for passenger movement away from the airplane following deplaning, and any dangers associated with the airplane type such as pitot tube locations, propellers, or engine intakes.

The standard safety briefing may be shortened for regular/recurring passengers who are familiar with the aircraft, route and have repeated exposure (e.g. company president) to that type of flight. Where the foregoing safety briefing is insufficient for a passenger because of that passenger's physical, sensory or comprehension limitations or because that passenger is responsible for the care of another person on board the aircraft, the pilot-in-command shall ensure that the passenger is given an individual safety briefing that meets their special needs.

Emergency Operations

The PIC shall ensure that, in the event of an emergency and where time and circumstances permit, all passengers are given an emergency briefing covering the following items:

- a. safety belts or safety harnesses;
- b. seat backs and chair tables;
- c. carry-on baggage;
- d. safety features cards;
- e. brace position (when to assume, how long to remain);
- f. if applicable, life preservers; and
- g. if applicable, evacuation procedures for an occupant of a child restraint system.

Passenger Safety Briefing Card

A Passenger Safety Briefing Card shall be available at each passenger seat containing, in printed or pictographic form, information on at least the following safety features of the aircraft:

- a. the location of emergency exits;
- b. how to open the emergency exits;
- c. the location of life jackets and life rafts; and
- d. the location of emergency equipment on board the aircraft.

4.11 CREW AND PASSENGER HEALTH ISSUES

When planning flights to destinations outside of the national borders and especially to destinations not frequently served, crew and passenger health issues shall be assessed. The PIC will consult the World Health Organization web site at <u>www.who.int/en/</u> for latest information. In the case where significant health risks prevail at the destination specialist advice shall be obtained on appropriate precautions.

In the event a crewmember or passenger becomes ill onboard the aircraft the procedures specified in section 5.5 shall be followed.

4.12 EXTENDED OPERATIONS OVER WATER

SPEC repositioning or research flights may involve extended operations over water. Any flight lasting 180 minutes or more over water shall be reviewed and approved by the Flight Department Manager prior to dispatch. Prior to dispatch, the information and recommendations of FAA Advisory Circular 135-42 shall be reviewed.

4.13 DISPOSAL OF INTERNATIONAL GARBAGE

Catering waste and garbage that contains, or is suspected of containing, animal products or byproducts, that originated outside the country of destination either as food taken on board, or as a result of transportation of animals in an aircraft, shall be bagged in red trash bags and disposed of in approved international garbage disposal facilities.

At home base the international garbage bags will be taken directly to the airport international garbage disposal depot and the disposal will be logged in the depot log. If the flight arrives when the disposal depot is closed, the garbage will be stored in a marked closed container and taken to the disposal depot at the earliest opportunity.

When planning for international operations the PIC shall ensure that approved international garbage handling facilities are available at the destination airports. If there is doubt regarding the status of ground handling facilities the garbage shall kept on board the aircraft in a marked closed container until approved handling facilities are available.

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5 Emergency Procedures and Equipment

5.1 AIRBORNE EMERGENCIES

5.1.1 Airborne Emergency Management

The PIC should declare an emergency when any abnormal situations affect the safety of flight. Management of the emergency will be in accordance with the aircraft SOP and well defined as to:

- who will fly the aircraft,
- who will accomplish the checklist, and
- who will navigate and communicate with ATC.

The Pilot-In-Command has the option for canceling the emergency if later developments so dictate.

5.1.2 Use of Transponder/Radar Assistance

Appropriate transponder codes will be selected for the flight area and situation.

5.1.3 **Protective Breathing Equipment**

The SPEC Learjet is equipped with protective breathing equipment. It shall be donned at the first sign of smoke in the aircraft, before any other action is taken to identify or isolate the source of the smoke.

5.1.4 Emergency Landing and Evacuation Procedures

The emergency briefing provided in the event of an emergency, where time and circumstances permit, shall consist of instructions pertaining to:

- a. Safety belts or safety harnesses:
 - i. lap belts must be fastened snug around the hips. If equipped shoulder harnesses must be used;
 - ii. seat belts must remain fastened until the aircraft comes to a complete stop.
- b. Seat backs and tables (as applicable):
 - i. seat backs and tables must be secured in the upright and locked position.
- c. Carry-on baggage:
 - i. all carry-on baggage including handbags or any other items of mass must be safely stowed in approved locations. Seat pockets may be used for smaller items.
- d. Safety features card:
 - i. advise passengers to review the safety features card and to pay particular attention to exit locations and operation;
 - ii. ensure that passengers seated next to emergency exits are willing and able to open that exit. If not, request the assistance of an able-bodied person;
 - iii. if possible assign an able-bodied person to assist young or special needs passengers;
 - iv. advise passengers of the safest direction and least hazardous route to move away from the aircraft once outside.
- e. Brace position (when to assume, how long to remain and considerations for side facing seats):
 - i. advise passengers that they will receive two verbal commands:

#1, Prior to Landing:

The command "Brace", will be given prior to impact / landing, at which time the passengers will assume and maintain the brace position illustrated on the safety features card until the aircraft has stopped and;

#2, After Impact / Landing:

If required, the command "Evacuate" will be given after the aircraft has stopped and the engines shut down. Passengers should then be instructed to immediately "release seat belts" and "get out" of the aircraft using the nearest useable exit.

If an evacuation is not required the command "Remain Seated" will be given.

f. Life preservers (as applicable):if an emergency landing is anticipated on water, advise passengers to immediately locate and don life preservers, secure with straps and to inflate only when outside the aircraft.

If possible, crew members should retrieve the first aid kit and emergency equipment prior to evacuating the aircraft.

5.2 **REPORTING AIRCRAFT OVERDUE**

The Principal Investigator (PI) is responsible for tracking flights of the research aircraft. In the event that the PI is onboard the flight, prior to departure the PI will assign this responsibility to personnel not flying.

During the pre-flight briefing, the PI will be informed of the approximate flight time. It is not uncommon for research flights to extend beyond the anticipated flying time. Whenever possible, personnel on the aircraft shall report via satellite phone to the PI if anticipated landing time becomes in excess of 30 minutes to the anticipated flight time. In cases where the aircraft is overdue by 60 minutes **and** the PI has not been contacted by personnel onboard the aircraft **and** the PI cannot confirm through other means that the aircraft is either still flying or landed safely at another location, the PI shall:

- a. Attempt to contact personnel on the aircraft via satellite phone. If the attempt to contact personnel on the aircraft is unsuccessful, the PI shall proceed to (b).
- b. Contact the Chief Pilot, or if unavailable the Flight Center Director. The information to be supplied includes approximate departure time, expected arrival time, mission plan, and crew onboard.

Upon being contacted in regards to an overdue aircraft by the PI, the Chief Pilot/Flight Center Director shall coordinate through the PI to:

- a. Contact the appropriate Air Traffic Control Unit.
- b. Continue communications search to determine fate of aircraft.
- c. Set into action the Emergency Response Plan (section 5.4)

5.3 ACCIDENT – INCIDENT REPORTING

All accidents/incidents will be reported to the Flight Department Manager or his delegate. The Flight Department Manager will report all accidents or incidents to the FAA and NTSB as required by NTSB Part 830 (see also AIM Para 7-6-1). When an accident occurs outside of the territory of the United States, accidents/incidents will be reported per the appropriate the international rules.

In the case of an accident, the aircraft, its components and contents shall not be moved or otherwise disturbed, (except to prevent destruction by fire or other cause, or to avoid danger to any person or property) without approval of the aviation accident investigation authority.

SPEC procedures:

- a. Flight Center Director, or a qualified representative will immediately travel to the scene of the accident/incident if the on-scene crewmembers are incapacitated or need assistance. He will serve as the SPEC Inc. representative to the NTSB, the FAA, serve as the SPEC Inc. representative to the NTSB, the FAA, or any other agency responsible for investigating the accident/incident.
- b. The Business Manager will collect and impound all records relating to the flight crew, the aircraft and the mission.
- c. The Flight Center Director or Director of Maintenance will immediately travel to the scene of the accident/incident and assume responsibility for movement, storage and protection of the aircraft.
- d. Each crewmember will prepare an individual statement setting forth the facts, conditions, and relating to the accident or incident as they circumstances appeared to that person. The statements will be submitted to the Flight Center Director.

The Emergency Response Plan will be activated in the case of an accident or as otherwise appropriate.

5.4 EMERGENCY RESPONSE PLAN

These Instructions and Checklists will be used by SPEC personnel to respond to an aircraft accident or overdue aircraft. They will be posted in clear view near a telephone, communications radio etc. that is likely to be used to report an emergency. The local phone numbers listed below must be filled in before posting.

- 1. **REPORT** EMERGENCIES **IMMEDIATELY** AS PER THE APPROPRIATE CHECKLIST
- 2. IF ALL INFORMATION IS NOT AVAILABLE DO NOT DELAY REPORTING WHILE INFORMATION IS BEING GATHERED.
- 3. UNLESS **ABSOLUTE** KNOWLEDGE TO THE CONTRARY EXISTS, ASSUME ALL PERSONS ON BOARD:

HAVE SURVIVED Are injured

- 4. REPORT BY THE FASTEST MEANS AVAILABLE.
- 5. **IF AT ALL POSSIBLE, REPORT BY THE MOST PRIVATE MEANS**. Think of the consequences to the victims and their families. If you have to use a radio, provide only as much specific information as is absolutely necessary to ensure a rapid response to the emergency, (i.e. do not give names etc.).
- 6. **DO NOT MAKE STATEMENTS TO THE MEDIA**. Once again consider the victims and their families. Media inquiries shall be directed to the Flight Department Manager.
- 7. Remember:
 - Keep calm **panic** or **undue haste** can cost lives.
 - Act in a responsible, professional manner.
- 8. KEEP COMMUNICATION LINES CLEAR FOR EMERGENCY PURPOSES ONLY
- 9. KEEP NOTES ON ALL COMMUNICATIONS, OBSERVATIONS AND ACTIONS

TELEPHONE NUMBERS

BOULDER POLICE:	(303) 441-3310 or 911
BOULDER COUNTY SHERIFF:	(303) 441-4444 or 911
HOSPITAL:	(720) 854-7000
AMBULANCE:	(303) 441-3350 or 911
FIRE DEPARTMENT:	(303) 441-3350 or 911
MOUNTAIN RESCUE COORDINATION:	(303) 441-4444 or 911
DENVER FSDO	(800) 847-3808
NTSB DENVER:	(303) 373-3500
FAA REGIONAL OPS CENTER (24 HR)	(425) 227-1839
DENVER TRACON:	(303) 342-1500
FLIGHT DEPARTMENT MANAGER:	(303) 449-1105
SITE LOCATION (WHERE CALLING FROM):	(303) 468-1169

10. IN CASE OF AN AIRCRAFT ACCIDENT THE PERSON MANAGING THE SITUATION (PIC, OTHER FLIGHT CREW MEMBER, FLIGHT FOLLOWER OR OTHER COMPANY PERSONNEL) WILL:

- a. Organize on-site assistance as necessary by contacting:
 - i. Medical Aid;
 - ii. Ambulance services;
 - iii. Fire Departments;
 - iv. Police.
- b. Contact the Flight Department Manager.
- c. Ensure that the aircraft, its components and contents are not moved or otherwise disturbed, except to prevent destruction by fire or other cause, or to avoid danger to any person or property) without approval of the State civil aviation accident investigation authority in which the accident occurred.

The Flight Department Manager or person next in line of succession will:

- a. Contact the accident investigation authority in the State that the aircraft accident occurred;
- b. Contact the Rescue Co-ordination Center; and
- c. Contact the Flight Service Station or ATC unit.

5.5 RESEARCH CREWMEMBER ILLNESS

If a cabin crewmember becomes ill, the other crewmember(s) will administer First Aid and oxygen as necessary. If the PIC determines that an occupant needs immediate medical assistance, he/she will divert the aircraft to the closest suitable airport. Suitability of an airport, military or civilian, will depend on the nature of the illness and the medical support available.

NOTE: If oxygen is necessary, the "walk-around" bottle or therapeutic oxygen supply will be used so that 100% oxygen is available to the person. (The aircraft's diluter demand oxygen system provides very little oxygen at normal cabin altitudes through a passenger mask.)

The ATC unit may be able to assist in providing information regarding medical services available at airports within their area. ATC should be utilized to relay requests for medical assistance to the airport of intended landing. Advise ATC of the medical emergency and the nature of support required on landing.

An emergency may be declared if the PIC believes that the situation demands priority handling.

If a crewmember is removed from a company aircraft for medical reasons, another crew member or other company employee should accompany the passenger to the hospital. The Flight Department Manager or Chief Pilot should be notified as soon as possible.

If the illness is other than airsickness the PIC shall advise the medical authorities the destination airport of the on-board illness prior to arrival. Such notification will normally be made through the air traffic control agency and should be done as soon as practical after the illness has been identified in order to facilitate provision for the presence of any special medical personnel and equipment necessary for medical assistance and health procedures on arrival. Upon arrival the relevant information shall be included in the General Declaration Form.

Cases of suspected death shall be handled in a similar manner.

5.6 FIRST AID KITS

SPEC aircraft will carry first aid kits for treatment of injuries likely to occur in flight or in minor accidents (see FAR 91.513). If the seal on the First Aid Kit has been broken, the kit must be inspected by a crewmember to confirm that all components are included. The kit will then be re-sealed using an approved, break-only seal and the condition and re-sealing date of the kit shall be entered on the First Aid Kit Log that is permanently attached to the kit.

5.7 EMERGENCY/SURVIVAL EQUIPMENT

For flights across land areas which have been designated as an area in which search and rescue would be difficult, or at the pilot's discretion, survival kits will be carried on SPEC aircraft so as in the event of forced landing the crew can be provided with fire, shelter, drinking water and a means of signaling.

The following basic kit will be carried when flying across land areas where search and rescue would be difficult:

- a. waterproof matches;
- b. means of providing shelter, a six-man dome tent or survival tarpaulin;
- c. water purification tablets;
- d. signal panel;
- e. signal mirror;
- f. hand axe;
- g. survival knife;
- h. survival manual; and
- i. instructions for use of the equipment.

For flights over water where a life raft is required to be carried the following survival equipment will also be attached to the life raft:

a. a pyrotechnic signaling device;

- b. a radar reflector;
- c. a life raft repair kit;
- d. a bailing bucket and sponge;
- e. a signaling mirror;
- f. a whistle;
- g. a raft knife;
- h. an inflation pump;
- i. a dye marker;
- j. a waterproof flashlight;
- k. a two day supply of water, calculated using the overload capacity of the raft, consisting of one pint of water per day for each person or a means of desalting or distilling salt water sufficient to provide an equivalent amount;
- I. a fishing kit;
- m. a book on sea survival; and
- n. a first aid kit containing antiseptic swabs, burn dressing compresses, bandages and antimotion sickness pills.

5.8 UNLAWFUL INTERFERENCE

For information see chapter 10 of this manual and reference material in Jeppesen Emergency Section (ICAO) and FAR AIM 6-3-4.

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6 International, RVSM, MNPS or RNP Operations

Flights that leave the United States may be subject to additional regulatory issues. There are numerous restrictions imposed by the countries that are within the range of the SPEC Learjet.

6.1 RESEARCH AIRCRAFT INTERNATIONAL FLIGHT

SPEC Normal Operating Domains

Canada - excluding Canadian MNPS airspace and the Area of Magnetic Unreliability as established in the Canadian AIP
Central America
Mexico, including the Gulf of Mexico
USA – the contiguous 48 states, District of Columbia, and Alaska
Caribbean – the islands and countries in the Caribbean area

Projects requiring flights out of the United States, and in particular flights outside of SPEC's Normal Operating Domain, require careful analysis of the regulations of the country in which it will be operated. The SPEC Learjet is equipped and certified to meet the RNP and RVSM requirements within the SPEC Normal Operating Domain.

6.1.1 Flight Crew Training and Authorization

All airspace outside the territory of the United States is international airspace. Crews must be familiar with the relationship between United States Regulations and the ICAO Rules of the Air when operating in international airspace.

SPEC pilots will attend an International Procedures Course (such as provided by Flight Safety Inc) for the area or region in which the operations are to be conducted. Such training will have been completed in the preceding two years prior to the subject international movement. Flights within the SPEC Normal Operating Domain are excluded from this training requirement. The training and authorization will be recorded on the crewmember's training record.

6.1.2 Customs

Customs must be handled in a professional manner, with a high level of respect for the country in which SPEC operates. It is imperative that all employees and contractors to SPEC Flight Operations become familiar with the rules and laws for countries the aircraft may be visiting.

The United States Customs Brochure, **"Know Before You Go"** is an important document that should be consulted by employees and contractors prior to international travel. Declaring the value of items purchased abroad should not be ignored or minimized to "save money". All employees and contractors should be familiar with this information and know that it has recently been updated.

Information relative to nationality dates of birth and passport data will be required. The securing of this accurate information shall be done by the Business Manager before the trip is confirmed.

6.1.3 International Procedures Standard Operations

6.1.3.1 Regulatory Compliance on International Flights:

- a. When conducting international flights, pilots of SPEC aircraft must adhere to the US Federal Aviation Regulations, ICAO rules and the regulations of the countries in which they land in or overfly.
- b. Flight crews must be familiar with and comply with relevant laws, regulations and procedures of the host country where operations are to be conducted. Where differences exist between the US Federal Aviation Regulations, ICAO rules and foreign regulations, the most restrictive of these regulations will apply.
- c. If a deviation in an emergency situation violates local regulations or procedures, the PIC will notify the appropriate local officials without delay. If required by the state where the incident occurs, the PIC shall submit a written report on any such violations to the appropriate authority in that state.
- d. In the event that SPEC operations need to be conducted outside of the SPEC Normal Operating Domain, the Flight Department Manager or his designee will review the requirements and amend Chapter 6 of this manual as required. Particular attention must be given to aircraft system requirements. Manual amendments, aircraft systems modifications and crew training shall be conducted prior to any such flight and must be in accordance with IS-BAO AMC 7.0

6.1.3.2 Crew Qualifications and Training

All flight crewmembers that fly flights outside of the SPEC Normal Operating Domain shall attend an International Procedures course approved by the Chief Pilot prior to said flight. The Flight Department Manager shall verify that flight crew meet medical and rating requirements for operating outside of the SPEC Normal Operating Domain. For a flight crewmember to be considered qualified for international operations that flight crewmember must be knowledgeable and trained per IS-BAO AMC 7.0 paragraph 3.

6.1.3.3 Required Documents for International Operations

In addition to all other documentation required on board the aircraft by FAR and this Manual, it is the PIC's responsibility to ensure all required documentation is up to date on:

- a. RVSM/RNP-10 Letter of authorization or other Performance Based Navigation (PBN) documentation
- b. Aviation Insurance Policies
- c. Mexican Insurance Policy
- d. Noise certificate
- e. Customs overflight permit
- f. Crewmember passports/visas and health requirements

6.1.3.4 Required Equipment for International Flights

The following equipment is required on all international flights:

- a. Emergency medical kits
- b. Survival equipment required for trip (i.e., polar, maritime, act.) as required by FAR 91.509.
- c. Radio equipment as required by FAR 91.511.
- d. PNB equipment and approval documents as required by the route flown and/or the country over flown.

6.1.3.5 Trip Planning

All international trip preparation is the responsibility of the Trip Captain. The Trip Captain shall assign flight crewmembers planning duties as he/she see fit. The Trip Captain shall keep all crewmembers informed of the status of the flight planning process. The use of outside planning and weather agencies will be used at the Trip Captain's discretion.

6.1.3.6 International Navigational Charts

Prior to departure on an international flight, the Trip Captain will ensure that an up to date coverage of all required navigation charts, including SID's, en route, STAR's, terminal and hi and lo altitude charts are on the aircraft. The International Flight Information Manual and the FAA International Notices to Airmen will be available prior to flight.

6.1.2 Reduced Vertical Separation Minima (RVSM) Procedures

The SPEC Learjet, N999MF, has been equipped and approved for RVSM operations. Complete details and approvals can be found in the SPEC RVSM Manual. Copies of the RVSM Manual are in the aircraft and on file in Flight Department Director's office. RVSM flight crew training requirements are detailed in this Manual, Chapter 7.

6.1.2.1 Flight Planning

SPEC Inc.

- a. Verify that the aircraft is approved for RVSM operations;
- b. Annotate the flight plan to be filed with the air traffic service provider to show that the aircraft and operator are approved for RVSM operations. (since the SPEC Learjet is GPS/WAAS equipped with enroute and terminal capability and RVSM capable, the suffix is /L)
- c. Check reported and forecast weather conditions on the route of flight;
- d. Check minimum equipment requirements pertaining to height-keeping systems; and
- e. if required for the specific aircraft group, account for any aircraft operating restrictions related to RVSM airworthiness approval.

6.2.4.2 Pre-flight Procedures at the Aircraft for Each Flight

The following actions should be accomplished during pre-flight:

- a. Review maintenance logs and forms to ascertain the condition of equipment required for flight in the RVSM airspace. Ensure that maintenance action has been taken to correct defects to required equipment;
- b. During the external inspection of aircraft, particular attention should be paid to the condition of static sources and the condition of the fuselage skin in the vicinity of each static source and any other component that affects altimetry system;
- c. Before takeoff, the aircraft altimeters should be set to the local altimeter (QNH) setting and should display a known elevation (e.g., field elevation) within the limits specified in aircraft operating manuals. The difference between the known elevation and the elevation displayed on the altimeters should be within the limits specified in the aircraft flight manual and must not exceed 75 ft. The two primary altimeters should also agree within limits specified by the aircraft-operating manual. An alternative procedure using QFE may also be used; and
- d. Before take-off, equipment required for flight in RVSM airspace should be operational, and indications of malfunction should be resolved.

6.2.4.3 Procedures prior to RVSM airspace entry

The following equipment should be operating normally at entry into RVSM airspace:

- a. two primary altitude measurement systems;
- b. one automatic altitude-control system;
- c. one altitude-alerting device; and
- d. should any of the required equipment fail prior to the aircraft entering RVSM airspace, the pilot should request a new clearance so as to avoid flight in this airspace.
- Note. In the case of transponder failure, the PIC should ascertain the requirement for an operational transponder in each RVSM area where operations are intended. The PIC should also ascertain the transponder requirements for transition areas adjacent to RVSM airspace.

6.2.4.4 In-flight Procedures:

- a. Flight crews should comply with aircraft operating restrictions (if required for the specific aircraft group) related to RVSM airworthiness approval;
- Emphasis should be placed on promptly setting the sub-scale on all primary and standby altimeters to 29.92 in. Hg/1013.2 (hPa) when passing the transition altitude and rechecking for proper altimeter setting when reaching the initial cleared flight level (CFL);
- c. In cruise flight it is essential that the aircraft be flown at the cleared flight level. This requires that particular care be taken to ensure that ATS clearances are fully understood and followed. Except in contingency or emergency situations, the aircraft should not intentionally depart from the cleared flight level without a positive clearance from ATS;
- d. During cleared transition between levels, the aircraft should not be allowed to overshoot or undershoot the cleared flight level by more than 150 ft (45 m);
- e. An automatic altitude-control system should be operative and engaged during level cruise, except when circumstances such as the need to retrim the aircraft or turbulence require disengagement. In any event, adherence to cruise altitude should be done by reference to one of the two primary altimeters;
- f. The altitude-alerting system should be operational;
- g. At intervals of approximately one hour, crosschecks between the primary altimeters and the stand-by altimeter should be made. A minimum of two primary altimeters should agree within 200 ft (60 m) or a lesser value if specified in the aircraft-operating manual. Failure to meet this condition will require that the altimetry system be reported as defective and ATC notified. The difference between the primary and stand-by altimeters should be noted for use in contingency situations:
 - i. the normal pilot scan of cockpit instruments should suffice for altimeter cross-checking on most flights,
 - ii. at least the initial altimeter crosscheck in the vicinity of the point where Class II navigation is begun should be recorded (e.g., on coast out). The readings of the primary and standby altimeters should be recorded and available for use in contingency situations;
 - iii.normally, the altimetry system being used to control the aircraft should be selected to provide the input to the altitude-reporting transponder that is transmitting information to ATC; and
 - iv. if the pilot is notified by ATC of an Actual Aircraft Deviation error which exceeds 300 ft (90 m) then the pilot should take action to return to the cleared flight level as quickly as possible.

6.2.4.5 Post Flight

In making maintenance log book entries against malfunctions in height-keeping systems, the pilot should provide sufficient detail to enable maintenance to effectively troubleshoot and repair the system. The pilot should detail the actual defect and the crew action taken to try to isolate and rectify the fault. The following information should be noted when appropriate:

- a. primary and standby altimeter readings;
- b. altitude selector setting;
- c. sub-scale setting on altimeter;
- d. autopilot used to control the aircraft and any differences when the alternate system as selected;
- e. differences in altimeter readings if alternate static ports selected;
- f. use of air data computer selector for fault diagnosis procedure; and
- g. transponder selected to provide altitude information to ATS and any difference if alternate transponder or altitude source is manually selected.

7 Qualifications and Training

7.1 FLIGHT CREW LICENSES AND RATINGS

SPEC research flights are commercial operations, but flights operate under FAR Part 91 and Part 91 Subpart F (per the exemptions of Part 119). Therefore, to act as Pilot-in-Command (PIC) or Second-in-Command of a research flight, the pilots must hold at least a valid Commercial Pilot License and a Second Class Medical Certificate or higher. The SPEC Learjet must be operated by a crew of at least two pilots. Both pilots must hold with LR-JET type ratings. Pilots shall demonstrate the ability to communicate effectively in the English language. Pilots must meet all currency requirements specified in FAR Part 61.56. PICs must additionally meet the requirements of Parts 61.57 and 61.58. SICs must meet the requirements of 61.55.

In some instances SPEC requirements exceed the FAR requirements listed above. SPEC and FAR qualifications are summarized in the following chart:

		Pilot-in-Command			Second-in-Command			
Aircraft Type	License	Type Rating	IFR	Flight Time	License	Type Rating	IFR	Flight Time
Learjet 25	ATP	LR-JET, 61.58 current	Current per 61.57	 2500 PIC 1500 Multi 500 LR-JET PIC 	ATP	LR-JET 61.58 current	Current per 61.57	 1500 PIC 1000 Multi 500 LR-JET SIC

7.2 FLIGHT CREW QUALIFICATIONS AND COMPETENCY

As well as holding current licenses and medical certificates listed above, SPEC flight crew must have successfully completed the training programs and competency checks as prescribed in this chapter. That training shall include:

- a. initial or annual recurrent training in:
 - i Company procedures,
 - ii Aircraft type, and
 - iii Aircraft Systems;
- b. Initial and every two years thereafter, training in:
 - i Emergency procedures,
 - ii Aircraft surface contamination, and
 - iii Crew Resource Management, and
 - iv RVSM Procedures, and
 - v Dangerous goods training;
- c. High altitude training for each aircraft operated above 10,000 feet

PICs must meet the currency requirement of FAR 61.56 for day and night takeoffs and landings. If the SIC meets the requirements of FAR 61.56, the PIC may allow the First Officer to takeoff and land the aircraft. The PIC may permit the First Officer to make such takeoffs landings from either the left or right pilot seat.

Flight crew members are not required to meet the above qualifications for ferry, training or positioning flights.

The Chief Pilot is responsible for ensuring that all Flight Crew are sufficiently fluent in English to meet ICAO requirements.

7.4 AIRCRAFT MAINTENANCE PERSONNEL QUALIFICATIONS AND COMPETENCE

Aircraft maintenance personnel shall hold valid aircraft maintenance licenses with ratings appropriate for the type of aircraft and nature of work being performed. The Director of Maintenance will conduct quality assurance reviews on the maintenance program and work of individual maintenance personnel. Should shortcomings be identified, he/she will either institute training programs aimed at rectification of identified deficiencies or cease contracting with the deficient maintenance personnel.

7.5 GENERAL TRAINING PROGRAM REQUIREMENTS

7.5.1 Instructional Staff

Flight instructors shall hold the license and ratings appropriate to the aircraft type and ground training instructor shall have relevant technical expertise.

All instructional personnel should receive initial and continuation training appropriate to their assigned tasks and responsibilities. Their training program will include

- a. the teaching/learning process,
- b. instructional technique,
- c. student/instructor relationship,
- d. training in knowledge and skills related to human performance.

7.5.2 Training Conducted on a Contract Basis

All individuals and training schools providing training to SPEC flight department personnel shall:

- a. Be conducted in accordance with the SPEC training programs;
- b. Be conducted using the manuals, publications, check lists and other relevant documents used by SPEC; and
- c. Be given on the same type and model aircraft or approved flight simulator of the same type and similar cockpit layout, as that used by SPEC.

Aircraft flight training is the responsibility of the Chief Pilot. He/she shall ensure that any person designated to conduct aircraft flight or simulator training is competent to do so.

7.6 INITIAL AND RECURRENT FLIGHT CREW TRAINING

7.6.1 Company Training

This training is required for all newly hired persons involved in control of flight operations as appropriate to their assigned duties and all new flight crew members. The purpose of this training is to ensure that those people have an adequate knowledge of procedures unique to the operations of SPEC. The training shall include:

- a. company organization, reporting relationships and communication procedures, including duties and responsibilities of flight crew members and the relationship of those duties to other crew members;
- b. flight planning and operating procedures;

- c. fuelling procedures including procedures for fuelling with research crew members on board and fuel contamination precautions;
- d. critical surface contamination and safety awareness program;
- e. research crew safety briefings and safe movement of research crew to/from the airplane;
- f. use of Company Operations Manual including maintenance release procedures and accident/incident reporting procedures;
- g. use of minimum equipment lists (if applicable);
- h. wind shear, airplane icing, and other meteorological training appropriate to the area of research operations;
- i. navigation procedures and other specialized operations applicable to the operator;
- j. CFIT training;
- k. accident/incident reporting and emergency response plan;
- I. SPEC operational control system.

7.6.2 Learjet Ground Training

Initial Training

This training is to ensure that each flight crew member is knowledgeable with respect to aircraft systems and all normal, abnormal, and emergency procedures. The following subjects should be included:

- a. aircraft systems operation and limitations as contained in the Aircraft Flight Manual or Aircraft Operating Manual and Standard Operating Procedures;
- b. operation of all the aircraft equipment;
- c. standard operating procedures for normal, abnormal and emergency procedures for the aircraft;
- d. aircraft performance and limitations;
- e. aircraft Minimum Equipment List;
- f. weight and balance system procedures; and
- g. aircraft servicing and ground handling.

Recurrent Training

Each flight crew member will complete the training program provided by the contract training school or conduct a review, under the supervision of the Chief Pilot, of the initial aircraft type training subjects.

7.6.3 Learjet Simulator Training

Initial Training Aircraft Type Learjet 25

SPEC utilizes only approved Level A and higher flight simulators for aircraft type flight training. Zero time flight training is permitted in a Level D flight simulator. In order to be permitted zero flight time training in a Level C flight simulator, candidates must have previous experience on a similar turbo-jet aircraft type.

Where the flight simulator has differences in performance, systems, avionics or cockpit layout and configuration, from the SPEC aircraft, additional training on these differences will be given.

All training will be conducted using SPEC checklists and SOPs.

The flight simulator training program will consist of:

- a. Procedures for normal, abnormal and emergency operation of the aircraft systems and components including:
 - i. use of aircraft checklists;
 - ii. flight and cabin crew co-operation, command and co-ordination;
 - iii. aircraft fire on the ground and while airborne;
 - iv. engine fire or failure;
 - v. effects of engine icing and anti-ice operation;
 - vi. take-off, landing and flight with critical engine inoperative including driftdown and engine inoperative performance capabilities;
 - vii. loss of pressurization and emergency descent (as applicable);
 - viii. flight control failures and degraded states of operation;
 - ix. hydraulic, electrical and other system failures;
 - x. failure of navigation and communication equipment;
 - xi. pilot incapacitation during take-off, landing and in-flight;
 - xii. approach to the stall (ground contact imminent and ground contact not a factor) (as applicable);
 - xiii. normal and abnormal flight characteristics applicable to the aircraft type. These may include such items as: dutch roll, buffet boundary onset, jet upset, steep turns, etc.;
 - xiv. aircraft performance for climb, cruise, holding, descent, landing and diversion;
 - xv. normal noise abatement and maximum performance take-off;
 - xvi. aircraft performance calculations, including take-off and landing speeds, weight and balance and centre of gravity;
 - xvii. rejected take-off procedures and rejected landings;
 - xviii. passenger and crew evacuation; and
 - xix. FMS, GPWS, TCAS, ACAS or other specialized equipment installed in the aircraft, as applicable.
- b. Aircraft handling including:
 - i. maneuvering of the aircraft on the ground;
 - ii. crosswind take-off and landings to 100% of the certificated crosswind component;
 - iii. contaminated runway and crosswind take-off and landings to published demonstrated crosswind component (as applicable);
 - iv. a mix of no electronic aids, day, night and dusk visual circuits, approaches and landings including:
 - A. normal and crosswind take-offs, visual circuits and landings with variable winds, runway illusion and surface conditions;
 - B. engine inoperative approaches and landings;
 - C. engine failure procedures during take-off and missed approach;
 - D. no electronic aids approaches and landings; and
 - E. approach and landings with degraded flight controls (as applicable); and
 - v. aircraft upset recovery.
- c. Flight planning and instrument flight procedures including:
 - i. departure, en-route, holding, arrival and in-flight diversion;
 - ii. precision, non-precision, and as applicable circling approaches, and missed approaches in minimum visibility conditions;
 - iii. precision, non-precision, and, as applicable, circling approaches, and missed approaches using automatic, flight director and degraded states of operation; and

- iv. Category II and Category III approaches as per the company Category II or III procedures, as applicable;
- d. Testing and reviews.

Annual Recurrent Training.

Flight crew will be given an annual flight simulator training program to ensure that they continue to maintain a high level of competency. The annual training program will cover critical emergency procedures and selected items from the initial training syllabus. The recurrent training program will be conducted so as to ensure that all items are covered over a three year period.

7.6.4 MNPS Training

SPEC does not currently operate in MNPS Airspace. Prior to any MNPS operations, SPEC pilots must complete the following training:

- a. normal operating procedures, including navigation system pre-flight data entry and periodic cross-checking of system position display against aircraft position;
- b. method of monitoring and cross-checking the system that is coupled to the auto-pilot;
- c. action in the event of discrepancy between systems, method of determining which is the most accurate or reliable system;
- d. MNPS contingency procedures;
- e. action in the event of single or multiple systems failure;
- f. procedure for manual updating of systems;
- g. airborne emergency procedures, including realignment (if applicable);
- h. procedure for regaining track after deliberate or inadvertent deviation from cleared track; and
- i. equipment monitoring requirements and flight procedures for Reduced Vertical Separation Minima (RVSM) if required.

7.6.5 RVSM Training

SPEC Flight Crews shall complete an initial RVSM training program. Pilots are required to attend a refresher course every two years. Training records will be maintained by the Flight Department Manager who is the RVSM Representative.

Initial and recurrent training will be conducted by Flight Safety International, CAE SimuFlight, or any other FAA Approved training facility. The training must cover the areas specified in the SPEC RVSM Manual, Tab 3 - RVSM OPS Procedures.

7.6.7 GPS Instrument Approach Training

Prior to conducting an instrument approach by use of Global Positioning System reference only pilots shall have completed a training program based on the type of GNS system(s) used in the SPEC Learjet. The training shall be repeated at two year intervals, or immediately upon the aircraft being equipped with a new GPS system.

a. General Training:

- i. Where pilots are required to use more than one type of GPS for approach, the training program should address the differences between the units, unless the units are essentially similar; and
- ii. The ground training should include "hands on" training using a desktop simulator, a computer based simulation of the unit to be used, a static in-aircraft unit, or other ground training device.
- B. Ground Training Non-integrated Receivers (Panel Mount Garmin GNS530 WAAS)
 Flight crew will be trained to proficiency in each of the elements associated with the following areas:
 - i. Knowledge with respect to the following:
 - A. the GPS system, including:
 - 1. GPS system components and aircraft equipment;
 - 2. the composition of satellite constellation;
 - 3. the minimum number of satellites required for 2-D and 3-D navigation;
 - 4. the basic concept of satellite ranging;
 - 5. factors affecting the accuracy of GPS signals; and
 - 6. the World Geodetic Survey 1984 (WGS 84) datum and the effect of using any other datum;
 - B. human factors applicable to the use of GPS and how errors may be reduced or eliminated;
 - C. company standard operating procedures for the use of GPS; and
 - D. procedures for reporting GPS problems and database errors;
 - ii. Ability to perform the following operational tasks:
 - A. select appropriate operational modes;
 - B. recall categories of information contained in the database;
 - C. predict RAIM availability;
 - D. enter and verify user defined waypoints;
 - E. recall and verify database waypoints;
 - F. interpret typical GPS navigational displays including latitude/longitude, distance and bearing to waypoint, course deviation indication (CDI), desired track (DTK), track made good (TMG), actual track (TK), cross track error and any other information appropriate for the equipment used;
 - G. intercept and maintain GPS defined tracks;
 - H. determine navigation information appropriate for the conduct of the flight including ground speed (GS), estimated time of arrival (ETA) for next waypoint and destination;
 - I. indications of waypoint passage;
 - J. use of 'direct to' function;
 - K. link en-route portion of GPS flight plan to approach;
 - L. conduct SIDs, STARs, terminal area procedures and holds;
 - M. retrieve, verify and conduct GPS stand alone approaches; and
 - N. conduct GPS missed approaches.
 - iii. Ability to conduct the following operational and serviceability checks:
 - A. database currency and area of operation;
 - B. receiver serviceability;
 - C. RAIM status;
 - D. CDI sensitivity;
 - E. position indication;

- F. number of satellites acquired and, if available, satellite position information; and
- G. ability to recognize and take appropriate action for all GPS warning and messages.
- c. Flight Training:
 - i. Pilots will complete flight training in the use of GPS for approach and other associated duties for each crew position they are authorized to occupy. Flight training may be completed in an aircraft, or in a level A or higher simulator that is equipped with the same model of GPS receiver that is installed in company aircraft or with one that is essentially similar to it; and
 - ii. Flight training will be conducted by a SPEC pilot who has completed the company training program and demonstrated proficiency in the use of the model of GPS or one essentially similar to it.

7.6.8 Upgrade Training for Pilots

Upgrade training to pilot-in-command for pilots who have qualified and served as a second-incommand on that aircraft type will include the following:

- a. command and decision making;
- b. train and demonstrate proficiency as a pilot-in-command from both left and right pilot seats, in all areas of aircraft handling and operation as outlined in the initial course; and
- c. special authorization qualification (e.g. lower take-off limits if not authorized, etc.).

7.6.9 Transportability of Pilot Proficiency Check

Pilots that have a current qualification (a valid pilot proficiency check from an operator or commercial operator that uses a similar training program and proficiency check) will be considered to meet SPEC training and proficiency requirement when they have completed training on the following:

- a. Company Operations Manual;
- b. Emergency procedures on each type of aircraft the pilot is assigned to fly;
- c. Pilot ground training on each type of aircraft the pilot is assigned, sufficient to cover the aircraft Standard Operating Procedures, equipment differences and special authorizations.

7.7 EMERGENCY PROCEDURES TRAINING

Emergency procedures training is required initially and every two years thereafter by all aircraft crew members and shall include instruction on the location and operation of all emergency equipment. During initial training and every two years thereafter, aircraft crew members shall perform the function or action, or obtain a suitable demonstration by other means e.g. audio-visual, for the following:

- a. fire in the air and on the ground;
- b. use of fire extinguishers;
- c. operation and use of emergency exits;
- d. passenger preparation for an emergency landing/ditching;
- e. emergency evacuation procedures;
- f. donning and inflation of life preservers;
- g. removal from stowage, deployment, inflation and boarding of life rafts;
- h. pilot incapacitation;
- i. hijacking, bomb threat and other security procedures;
- j. special emergency procedures when the aircraft is used on MEDEVAC operations including patient evacuation in emergency situations; and
- k. First aid and passenger health emergencies.

7.8 AIRCRAFT CRITICAL SURFACE CONTAMINATION TRAINING

http://aircrafticing.grc.nasa.gov/courses_ground.html#

All SPEC operating personnel will receive the following training prior to commencement of operational duties and then every two years thereafter as stated:

- a. Aircraft crew initial de-icing/anti-icing training;
 - i. the effect of contamination on a critical surface;
 - ii. aircraft de-icing/anti-icing procedures; and
 - iii. aircraft inspection procedures.
- b. Aircraft crew recurrent de-icing/anti-icing operational procedures training every two years.
- c. Maintenance and ground handling personnel initial de-icing/anti-icing, training; including:
 - i. the effect of contamination on critical surfaces;
 - ii. aircraft de-icing/anti-icing procedures; and
 - iii. aircraft inspection procedures.
- d. Maintenance and ground handling personnel recurrent de-icing/anti-icing procedures training on an annual basis.

7.9 HIGH ALTITUDE TRAINING

High altitude (HAI) training will be provided during initial type training to all aircraft crew members operating aircraft above 10,000 ft ASL. It will cover the following items:

- a. Physiological phenomena in a low pressure environment, including:
 - i. respiration;
 - ii. hypoxia;
 - iii. duration of consciousness at altitude without supplemental oxygen; and
 - iv. gas expansion and gas bubble formation.
- b. For crew members of pressurized aircraft, it will include the phenomena associated with rapid or explosive loss of pressurization including:
 - i. most likely causes;
 - ii. noise;
 - iii. cabin temperature change;
 - iv. cabin fogging;
 - v. effects on objects located near the point of fuselage failure; and
 - vi. actions of flight crew members immediately following the event and the likely resultant attitude.

Pilots should review AC 61-107A - OPERATIONS OF AIRCRAFT AT ALTITUDES ABOVE 25,000 FEET MSL AND/OR MACH NUMBERS (MMO) GREATER THAN .75

7.10 CREW RESOURCE MANAGEMENT

All SPEC Flight Crews will be trained in Crew Resource Management (CRM). CRM training will be conducted every two years and will generally cover the following items:

- a. Communication processes and decision behavior:
 - i. Briefings;
 - ii. Inquiry, advocacy and assertion;

- iii. Crew self-critique;
- iv. Conflict resolution; and
- v. Communications and decision making;
- b. Team building and maintenance:
 - i. Leadership, followership and concern for task;
 - ii. Interpersonal relationships and group climate; and
 - iii. Workload management and situational awareness:
 - A. preparation, planning and vigilance; and
 - B. workload distribution and distraction avoidance; and
- c. Individual factors and stress reduction.

Research Crew members will receive in-house CRM training covering the above topics, sterile cockpit requirements, and intercom procedures.

7.11 SIMULATED EMERGENCIES DURING RESEARCH FLIGHTS

Emergencies or abnormal situations shall not be simulated during research flights.

7.12 OVERVIEW OF PERSONNEL TRAINING REQUIREMENTS

TYPE OF TRAINING	APPLI	CABILITY	MIN TRAINING TIMES (HRS.)		
	Initial	Recurrent	Initial	Recurrent	
Flight Crew					
General Training					
Company Training (in-house)	Х	N/A	1	N/A	
Emergency Procedures (in-house)	Х	2 yr.	1	.5	
A/C Surface Contamination (FSI)	Х	2 yr.	1	.5	
High Altitude Training (FSI)	Х	N/A	N/A	N/A	
Crew Resource Management (FSI)	Х	2 yr.	1	1	
Dangerous Goods (self-study)	Х	2 yr.	self study	self study	
Aircraft Type - Learjet 25B					
Type Ground Training (FSI)	Х	1 yr.			
Type Simulator Training (FSI)	Х	1 yr.			
Servicing & Ground Handling (FSI)	Х	1 yr.			
MEL Training (in-house)	Х	2 yr.	.5	.5	
Special Flight Operations					
MNPS (FSI if required)	N/A	N/A	N/A	N/A	
RVSM (FSI)	Х	2 yr.	4	2	
GPS Approach (in-house)	Х	2 yr.	4	2	
Research Crew Member					
Company Training (in-house)	Х	N/A	1	N/A	
Emergency Procedures (in-house)	Х	2 yr.	1	.5	
A/C Surface Contamination	Х	2 yr.	.5	.5	
Crew Resource Management (in-house)	Х	2 yr.	.5	.5	
Research Equipment Installation Procedures	Х	2 yr.	2	2	

7.13 **PROFICIENCY CERTIFICATION**

All SPEC training will be done on the basis of "training to performance". That means that the person conducting or providing the training will not consider the training complete until the candidate can effectively perform the tasks that they are being trained to do. Upon completion of the training the person conduction or providing the training will ensure that the training has been recorded in each individual's training record. A copy of the individual training form is contained in chapter 12.

Pilots will complete an exam set by the training school or the Chief Pilot at the end of initial Aircraft Type Ground Training. The exam will be reviewed with the candidate to ensure that the correct answers to all of the questions are understood.

At the completion of initial and recurrent aircraft type flight training, pilots will be certified as proficient by one of the following:

- a. The Chief Pilot;
- b. A Company Check Pilot;
- c. An examiner in the flight training school that SPEC has contracted with to provide pilot aircraft type simulator flight training; or
- d. A civil aviation examiner approved by the FAA.

The proficiency certification will be done to the standard specified in the following schedule, which must be assessed as "Satisfactory" in order to constitute a completion of training. The Pilot Proficiency Check Form in section 12.5, or a similar form used by the flight training school, may be used to record the results of the training to proficiency. The form will then be retained in the individual's Training Record for a minimum of five years.

1. Pilot Knowledge of Equipment Examination

A practical oral equipment examination that is closely coordinated with and related to the flight procedures portion of the PPC and that covers:

- a. subjects requiring a practical knowledge of the aircraft, its powerplants, systems, components, and its operational and performance factors;
- b. normal, abnormal and emergency procedures, and the operating limitations relating thereto, and
- c. the appropriate provisions of the approved Aircraft Flight Manual.

2. Aircraft Inspection

The pre-flight inspection shall include:

- a. a discussion of the visual inspection of the exterior and interior of the aircraft; and
- b. the use of the pre-start check list, appropriate control system checks, starting procedures and checks of all radio and electronic equipment.

3. Taxiing

This maneuver includes taxiing (in the case of a second-in-command PPC, to the extent practical from the second-in-command crew position), procedures in compliance with instructions issued by the appropriate traffic control authority or by the check pilot.

4. Powerplant Checks

Powerplant checks will be conducted as appropriate to the aircraft type.

5. Normal Take-off

One take-off to be performed as follows: taxi the aircraft into position on the runway to be used for departure, take-off and fly the aircraft in the climbing configuration until the landing gear and flaps are fully retracted, or to the point where an altitude of 1500 ft above the airport elevation is reached, whichever occurs first.

6. Crosswind Take-off

One crosswind take-off if practicable under the existing meteorological, airport and traffic conditions.

7. Simulated Powerplant Failure on Take-off

One take-off with a simulated failure of the critical engine:

- a. in an approved aircraft type simulator:
 - i at a point after V1 and before V2 that in the judgment of the check pilot is appropriate to the aircraft type; or
 - ii at a point as close as possible after V1 when V1 and V2 or V1 and Vr are identical; or
- b. in an aircraft in flight, at a safe altitude, at an airspeed not less than V2 + 10 as is appropriate to the aircraft type under the prevailing conditions.

8. Rejected Take-off

One rejected take-off to be performed:

- a. in an approved aircraft type simulator with an approved visual system; or
- b. in an aircraft verbally prior to the first take-off unless an actual rejected take-off is required by the State civil aviation authority.

9. Approaches to Stalls

For the purpose of this procedure the required approach to a stall is reached when there is a perceptible buffet or other response to the initial stall entry, and except as provided below there shall be at least three approaches to stalls, one of which shall be performed while in a turn with a bank angle of between 15 and 30 degrees including:

- a. one in the take-off configuration (except where a zero-flap take-off configuration is normally used in that type and model of aircraft);
- b. one in a clean configuration; and
- c. one in a landing configuration.

10. Instrument Procedures

Instrument procedures will consist of IFR pre-flight preparation, departure and en-route procedures, terminal procedures and system malfunctions as follows:

- a. an area departure and an area arrival procedure shall be performed where the pilot:
 - i adheres to actual or simulated air traffic control clearances and instructions; and
 - ii properly uses the available navigation facilities;
- b. a holding procedure, which may be combined with an area arrival or area departure procedure and includes entry to, maintenance of and leaving a holding pattern;
- c. at least two instrument approaches (one asymmetric) performed in accordance with procedures and limitations in the approach charts used by the operator for the approach facility used and where practicable one of the approaches shall be a precision approach; and
- d. a circling approach, except where prohibited in the Company Operations Manual and or where local conditions beyond the control of the pilot prevent a circling approach from being performed.

11. Specific Flight Characteristics (required on an initial PPC only)

Recovery from specific flight characteristics that are peculiar to the aircraft type and which do not exceed the normal flight envelope of the aircraft type may be demonstrated.

12. Engine Failures

In addition to the specific requirements for maneuvers with simulated engine failure, the check pilot may cause a simulated engine failure at any time during the check consistent with established safety procedures. For the purposes of this proficiency check, at least two simulated engine failures, are conducted as follows:

- a. one simulated failure of critical engine, to be completed at altitude while the aircraft is in the normal take-off configuration and at a speed of not less than the take-off safety speed (V2) or more than V2 plus 10 knots; and
- b. one landing and maneuvering to that landing with simulated failure of the critical engine.

13. Normal Landing

One normal landing.

14. Crosswind Landing

One crosswind landing, if practical under existing meteorological, airport and traffic conditions.

15. Landing with Simulated Engine Failure

One landing and maneuvering to that landing with simulated failure of 50% of the available engines and the simulated loss of power shall be on one side of the aircraft, except that:

- a. the simulated loss of power shall be on one outboard engine on three-engine aircraft; and
- b. in the case of turbo-jet aircraft, the following may be substituted:
 - i in the case of a four-engine turbo-jet aircraft, maneuvering to a landing with simulated failure of the critical engine and performance of the maneuver either in an approved simulator or simulated in flight at altitude, with simulated failure to 50% of available engines, or
 - ii in the case of a three engine turbojet aircraft, maneuvering to a landing using an approved procedure that approximates the loss of two engines at a safe altitude.

16. Rejected Landing

One rejected landing that includes a normal missed approach procedure after the landing is rejected, and for the purpose of this maneuver the landing shall be rejected at a height not lower than 50 ft AGL.

Note: More than one type may be combined where appropriate.

17. Normal and Abnormal Procedures

The pilot shall demonstrate proper use of as many of the systems and devices listed below and other systems, devices or aids available as the approved check pilot deems necessary to determine that the pilot has practical knowledge of the use of the systems and devices (appropriate to the aircraft type):

- a. anti-icing and de-icing systems;
- b. auto-pilot systems;
- c. automatic or other approach aid systems;
- d. stall warning and avoidance devices, stability augmentation devices;
- e. airborne radar devices; and
- f. Flight Management Systems (FMS).

18. Emergency Procedures

The pilot shall demonstrate as many of the emergency procedures outlined in the appropriate approved Aircraft Flight Manual and as many of the emergency procedures for the following emergency situations as in the opinion of the check pilot are necessary to determinate that the pilot has an adequate knowledge of, and ability to perform, such procedures including:

- a. fire in flight;
- b. smoke control;
- c. rapid decompression;
- d. emergency descent;
- e. hydraulic and electrical system failures and malfunctions;
- f. landing gear and flap systems failure and malfunctions; and
- g. failure of navigation or communication equipment.

Emergency descents and hydraulic and electrical system failures and malfunctions may be simulated in an appropriate systems trainer.

Emergency procedures may be performed in an approved appropriate aircraft type simulator if the pilot's competency can be adequately determined.

19. Performance Criteria

When performing any of the procedures, a pilot shall demonstrate judgment commensurate with a high level of safety, and, in determining whether the pilot has shown such judgment the check pilot shall consider:

- a. the pilot's adherence to approved procedures;
- b. the pilot's actions in situations requiring a decision based on the pilot's analysis where there is no prescribed procedures or recommended practice;
- c. the pilot's qualities of airmanship in selecting a course of action; and
- d. the crew co-ordination when operating in the multi-crew concept.

7.14 FAILURE TO ACHIEVE OR MAINTAIN REQUIRED STANDARDS

Any person who fails to achieve the performance standard during initial or recurrent training will be removed from duties until the performance standard is met. Failures to meet performance standard shall be noted in the individual's Training Record.

Should the competency of any person in the fight department come into question, they shall receive remedial training to performance on the related subjects or processes. Should the person fail to achieve the performance standard during remedial training, he/she will be removed from duties until the performance standard is met. Failures to meet performance standard shall be noted in the individuals Training Record.

8 Record Keeping

8.1 EMPLOYEE TRAINING AND QUALIFICATIONS

The Chief Pilot shall maintain a file for each aircraft crew member. The file shall contain a copy of the Aircraft Crew Qualifications Sheet and a training record for each person. Copies of the forms used for the training records are contained in chapter 12.

The Flight Department Manager shall maintain employee records for Flight Department employees. These records will include copies of licenses, medicals, currency and other records and are to be retained for a period of 5 years. Employees who are terminated will have their records transferred to the SPEC Inc. archives to be kept with all personnel files following established record maintenance guidelines.

8.2 FLIGHT RECORDS

Copies of the operational forms, load sheets, maintenance discrepancies, and other flight records will be kept for each flight and retained by the Flight Department for 10 years.

Research flights flow for various scientific projects will have specific record keeping protocols dictated by the funding agency. The Principal Investigator will instruct flight crews on project specific record keeping requirements. Administration of project specific records will be the responsibility of the Principal Investigator and/or the Business Manager.

The following record retention schedule will be used by the Flight Department:

a.	Flight Log (Business Manager)	10 Years
b.	Aircraft Use Record (Business Manager)	
c.	Pilot Qualification/Training Records (Flight Center Director)	5 Years
d.	Deferred or Delayed Item Log (Director of Maintenance)	5 Years
e.	Maintenance Discrepancy Sheet (Director of Maintenance)	5 Years
f.	Aircraft Operating Expenses (Business Manager)	10 Years
g.	Hazard Reports (Flight Center Director)	10 Years
g.	Permanent Aircraft Records (Director of Maintenance)	Until aircraft is sold*

* Goes with aircraft

9 Aircraft Maintenance

Research and corporate aircraft maintenance involves a level of sophistication that requires a set of policies and procedures for basic administration and operations. SPEC maintenance personnel should refer to this manual for operational guidance in order to provide the highest degree of safety combined with the most consistent level of support.

9.1 **RESPONSIBILITIES OF THE DIRECTOR OF MAINTENANCE**

The Director of Maintenance is responsible for the planning and control of all maintenance, liaison with the civil aviation authority on maintenance topics, and liaison with all persons or Approved Maintenance Organizations (AMOs) performing maintenance on the SPEC Learjet aircraft. He shall have access to all applicable technical and regulatory publications necessary to perform these duties, and shall ensure that those publications are kept up to date. The Director of Maintenance shall remove from service any aircraft that are unsafe, or that do not comply with the regulatory requirements of the Federal Aviation Administration (FAA) or the guidelines set forth in this manual. In cases of absence, the duties of the Director of Maintenance may be assigned in writing to another qualified person.

9.1.1 Maintenance Policies and Responsibilities

The primary and direct responsibility of the Director of Maintenance is to ensure that the SPEC Learjet aircraft is maintained in an airworthy condition.

All repairs, overhauls and alterations to the Learjet must be made according to the standards set forth by the manufacturer's recommendations and/or pertinent FARs. All inspections, scheduled removal and overhaul/replacement of life-limited parts will be at intervals not exceeding those recommended by the manufacturer or approved by FAA. Overhaul/replacement of a life-limited part or assembly may be extended by written authorization from the manufacturer for a specific component. The SPEC Learjet shall comply with all mandatory service bulletins as deemed necessary by the Director of Maintenance or Service Bulletins attached to an Airworthiness Directive.

SPEC shall not allow any person in its employ and/or contract labor to perform a maintenance repair for which that person does not have the necessary experience or hold the applicable licenses unless that person is under the direct supervision of a licensed Airframe and Powerplant Aircraft Technician.

9.2 TECHNICAL RECORDS

Immediately upon finding a defect in an aircraft, or upon completing any maintenance on an aircraft, the person discovering the defect or performing the maintenance shall enter details of the event in the applicable technical records required by applicable Federal Aviation Regulations (FAR's). If the event occurs between scheduled maintenance checks, the entries shall be made in the aircraft log. The Director of Maintenance shall ensure that aircraft log entries are transcribed to the applicable airframe, engine or component records. Details of defects found during a scheduled maintenance check, or of maintenance performed during such a check, may be entered directly in the applicable airframe, engine, or component record, provided that any outstanding items remaining upon completion of the maintenance check are entered in the aircraft log upon certification of the maintenance event /check or prior to flight.

9.2.1 Maintenance Control Procedures

A record shall be made of all maintenance, performed on aircraft, engines, appliance or parts thereof, in accordance with appropriate Federal Aviation Regulations.

These records shall be preserved in aircraft and engine logs and on back-up spreadsheets to provide the following data to the Flight Center Director and to the Director of Maintenance so that aircraft and equipment performance reliability can be determined:

a. Current aircraft status.

- b. Maintenance history.
- c. Aircraft and equipment performance reliability.

Records in the form of Learjet Approved Chapter 5 spreadsheets and logbooks shall be maintained to accurately control the length of service life of all major components (equipment and structures).

These records shall reflect the complete service life of any component that could be interchanged from one aircraft to another thus shortening the overall aircraft service life.

Aircraft maintenance records shall be completed each time an aircraft component or part thereof is removed or installed. These records shall reflect the history and current disposition of such components and/or parts.

A permanent record file will be maintained for each aircraft until such time that the aircraft is transferred, sold or retired from service. This record file shall contain the aircraft flight log, airframe log, engine log, 337 forms, Airworthiness Directives compliance form, Service Bulletins compliance form, current weight and balance report, and maintenance history report compiled by a computerized aircraft maintenance program.

9.3 MAINTENANCE SCHEDULES

All aircraft shall be maintained in accordance with the Learjet Model 25 Maintenance Manuals acceptable by the FAA per FAR 91-409(f)3 regarding the aircraft type. Copies of these approved maintenance schedules are received periodically in electronic form and will be placed on a computer file monitored by the Director of Maintenance. Changes in operations, such as the introduction of RVSM, may require amendment of the maintenance schedules. This requirement will be assessed as part of the special flight authorities' application process.

9.3.1 Aircraft Maintenance Inspections

The SPEC Learjet will be maintained and inspected in accordance with Chapter Five factory-approved programs as written by the manufacturer and accepted by the FAA.. ATA Chapter Five requirements will be used to determine the maintenance and inspection intervals, along with overhaul period and life-limited parts retirement. Any maintenance action item that requires an Aircraft Mechanic signatures and/or initials should be inspected by a second person that holds an Airframe and Powerplant Certificate

A post flight inspection shall be performed on aircraft after each flight at the end of the day in accordance with the Maintenance Discrepancy Sheet designated for that type aircraft. Any discrepancies noted at this time will be corrected, scheduled permitting, or deferred per the aircraft MEL. Items of a serious nature will be reported to the Director of Maintenance for disposition.

Any aircraft that has been idle for 30 consecutive days or more shall have be inspected per SPEC form #135-104 (see Chapter 12). As part of the self-dispatch procedure, the PIC will review the completed form.

9.3.2 Maintenance Inspection Discrepancies

During post flight inspections and routine required maintenance inspections, discrepancies noted will be written up in the Maintenance Discrepancy Sheet. One copy being retained in the aircraft and the second copy maintained in the maintenance office. The discrepancy will note the item number and description of the discrepancy. When the item is corrected, it will be signed off by the Aircraft Mechanic and appropriate logbook entries made. If a flight is dispatched with discrepancies per the MEL, the procedures prescribed in the SPEC RVSM/MEL shall be followed.

After termination of a flight, the aircrew will enter any discrepancies into the aircraft flight discrepancy on the Maintenance Discrepancy form.

All MEL discrepancies shall be corrected prior to the next aircraft inspection. The Director of Maintenance will notify the Flight Department Director if any discrepancies may impact the flight schedule.

After the discrepancy has been corrected, operationally checked and inspected, it will be signed off by an Aircraft Mechanic holding an Airframe and Powerplant Certificate. Prior to the next flight the aircrew will review the Maintenance Discrepancy Sheet book for the current aircraft status. During the next flight, the aircrew will verify that the discrepancy has been cleared.

9.4 PREVENTATIVE MAINTENANCE & AIRCRAFT SERVICING

No person shall perform any preventative maintenance or aircraft servicing and ground handling without first being trained and authorized in accordance with section 9.12. Preventative maintenance and servicing shall be that provided for in Appendix A to CFR 14, Part 43 and performed in accordance with the methods and procedures recommended by the aircraft manufacturer.

9.5 AIRWORTHINESS DIRECTIVES AND SERVICE BULLETINS

The Director of Maintenance shall maintain a system to ensure that the SPEC Learjet is in compliance with all applicable airworthiness directives and other mandatory maintenance requirements. He/she shall review all new and revised airworthiness directives upon receipt and determine if they are applicable. Details of all applicable airworthiness directives shall be recorded in the appropriate airframe, engine, or component technical record. The Director of Maintenance shall determine the date, air time or operating cycles, when the actions specified in the directive must be taken. If the required actions are due before the next scheduled maintenance activity he/she shall make the necessary entries in the aircraft log in accordance with this chapter, section 9.10.

Upon receipt of all recommendations issued by the aircraft, engine, and component manufacturers in the form of Service Bulletins or equivalent documents, the Director of Maintenance shall review the recommendations to determine whether compliance is appropriate. Where necessary, he shall obtain technical advice from the qualified maintenance personnel/ external approved maintenance organization (AMO) currently responsible for maintenance of the operator's aircraft. The Director of Maintenance will keep a record of each such decision.

9.6 EVALUATION PROGRAM

The Director of Maintenance shall ensure that in implementing and maintaining the safety assurance program described in section 2.5., that all maintenance functions are included in this program.

9.7 DEFERRED RECTIFICATION OF DEFECTS (MEL PROCEDURES)

An MEL applies only to the takeoff of an aircraft with inoperative instruments or equipment. The pilot's operating handbook (POH) or the AFM indicates procedures to follow for instrument or equipment failure in flight. The pilot-in-command (PIC) should handle the in-flight failure in accordance with those procedures. As soon as possible after landing safely, the PIC must enter a notation of the inoperative equipment in Form 135-101. Before the next takeoff, the pilot must apply the MEL to inoperative equipment as per the procedures in paragraph 4.7.2 of this manual. An MEL allows the PIC to defer maintenance on items under the following conditions:

The aircraft is in condition for safe flight, and for the inoperative item, the pilot has followed the specific conditions, limitations, and procedures in the SPEC RVSM/MEL Manual.

The Federal Aviation Administration Letter of Authorization and the MEL constitutes a Supplemental Type Certificate for the aircraft and must be carried on board the aircraft as prescribed in 91.213 (a) (2) of the FAR's.

9.8 RECURRING DEFECT CONTROL

At intervals not to exceed one month, the Director of Maintenance shall review the aircraft technical records to detect any recurring defects. Any defect that has occurred three times or more within the past month or the past 15 flight segments shall be reported by the Director of Maintenance to the maintenance staff or AMO responsible for maintenance. If a defect that has been reported as a recurring defect occurs again within one month of receiving the report, the Director of Maintenance shall ensure that the corrective action includes a complete investigation of the affected system(s), taking into consideration all previous occurrences of the defect and the actions taken to correct them. The aircraft log entry for rectification of the defect shall indicate that a recurring defect investigation has been carried out.

9.9 SDR REPORTING

The Director of Maintenance shall submit Service Difficulty Reports (SDR) to the civil aviation authority in accordance with FAR 135.114 (further information is available at http://av-info.faa.gov/sdrx/. In the case of service difficulties discovered during maintenance, the maintenance person/AMO performing the maintenance will prepare the SDR and pass it to the Director of Maintenance. Between scheduled maintenance activities/visits to the AMO, any employee discovering a defect that may warrant submission of an SDR must immediately bring it to the attention of the Director of Maintenance, who will determine whether a report is required.

9.10 TECHNICAL DISPATCH

Technical dispatch of aircraft shall be by means of the aircraft log. The Director of Maintenance shall ensure that all items of deferred maintenance other than those recorded in the current page of the aircraft log are entered. Immediately following completion of any item scheduled maintenance specified by a maintenance schedule, airworthiness directive or other mandatory requirement, the Chief Aircraft Mechanic shall review the aircraft technical records to determine the date, aircraft time and or operating cycles when the next scheduled maintenance activity will become due, and make an entry to that effect in the log (aircraft log kept on airplane).

Before each flight of an aircraft, the PIC shall consult the aircraft log and take note of the next scheduled maintenance requirement and the current list of outstanding defects, to decide whether the flight may take place. If in doubt as to the time remaining to maintenance tasks, or the acceptability of defects, the PIC must contact the Director of Maintenance.

9.11 PARTS AND MATERIAL CONTROL

Parts required for preventative maintenance and servicing shall be held under the control of the AMO or Director of Maintenance. Fuels, oils, lubricants and cleaning supplies shall be kept in closed containers, clearly marked with the contents and handle in accordance with applicable industry recommendations. No fluids shall be dispensed from any unmarked container.

Aircraft parts and inventory shall be monitored by the Director of Maintenance to make sure all parts to be installed on the aircraft are certified and from approved distributor.

9.11.1 Minimum Standards For Equipment

SPEC Inc. shall follow the minimum performance and quality control standards for materials, parts or appliances used on the SPEC Learjet aircraft through Technical Standard Orders (TSO) that have been established by the FAA. That will ensure that the equipment will perform its intended purpose under specified conditions.

Approved flotation gear, safety belts and anti-collision lights are some items that will require approval. Any equipment not approved by TSO should be given careful consideration to equipment manufactures under voluntary minimum standards.

Replacement parts must be purchased from a source to insure that the product or parts were produced under a TSO or PMA as issued by the FAA. All SPEC personnel should report any major Aircraft Technical malfunctions and defects of parts or materials or appliances to the local FAA office or on FAA form 8010-4.

9.11.2 Spare Parts Inventory

A complete inventory spreadsheet of SPEC Inc. spares shall be maintained showing quantity, make, part number, and location. SPEC Inc. spare parts and equipment should only be purchased from manufacturers and authorized dealer or distributor, or a certified repair station. These items should be tagged to show manufacture part number and time since new, time since overhaul, serial number, whether new or repaired, or removed from service in serviceable condition or not, and the reason for removal. Any condemned parts should be destroyed so they cannot be used on an aircraft again. Parts being held for instruction purposes should be tagged so they cannot be returned to service.

9.12 TRAINING PROGRAM

The Director of Maintenance shall verify that all maintenance contractors and/or AMO personnel have received initial and update training on the FARs, and on the maintenance procedures, servicing and preventative maintenance tasks appropriate to their duties (see 9.15).

Pilots shall receive training in aircraft servicing procedures for the SPEC Learjet from Director of Maintenance or person designated by the AMO to provide such training. This training shall include refueling, oiling, de-icing, pre-flight inspection and aircraft ground handling. Personnel must perform each task under the direct supervision of the Director of Maintenance, before being authorized to perform the task unsupervised. Such training shall be part of the initial Company Training and carried out before any servicing or preventive maintenance authorization is granted.

9.13 RECENCY OF EXPERIENCE

In order to be eligible to sign a maintenance release, aircraft maintenance person must have within the preceding 24 months, at least six months experience in the inspection, servicing or maintenance of an aircraft of systems in accordance with the privileges granted by the licence held in relation to that maintenance release.

9.14 AIRCRAFT WEIGHT & BALANCE CONTROL

The Director of Maintenance shall maintain and retain weight and balance reports and amendments for all aircraft. Details of the empty weight and centre of gravity of each aircraft shall be kept in the aircraft log or on board the aircraft and related operational data will be updated whenever there is a change is the aircraft basic weight or centre of gravity.

9.15 MAINTENANCE ARRANGEMENTS

All aircraft maintenance shall be performed by qualified Aircraft Mechanics or an approved maintenance organization (AMO). An approved maintenance organization (AMO) shall hold proper license/ratings and scope for the work to be undertaken, authorized in writing in the form of a contract, purchase order or letter. Each request for maintenance shall specify that the work be performed and certified, in accordance with the applicable requirements of the Federal Aviation Regulations (FAR's) and this document. The Director of Maintenance shall make all planned maintenance arrangements.

In the case of unplanned maintenance away from main base, the PIC may request the maintenance. This may be done by completing a work order or similar document provided by the AMO. The Director of Maintenance shall be notified of all unplanned maintenance activities as soon as practical. The selection of any qualified Aircraft Mechanic or AMO to perform the maintenance is at the discretion of the PIC; however, he/she should confirm that they hold a certificate/license appropriate to the work to be done and that all the specific scope and limitations of the work to be done are covered under the work order. If there is any doubt, they should seek the advice of the Director of Maintenance.

A clause will be included in all planned and unplanned maintenance agreements requiring the maintenance provider to undertake that maintenance work will not be carried out by any maintenance personnel who are fatigued.

9.16 FLIGHT PERMITS OR SPECIAL FLIGHT AUTHORIZATIONS

The Director of Maintenance shall be responsible for all applications made to the FAA for flight permits or special flight authorizations, and is authorized to make any required declarations for this purpose on behalf of the company.

9.17 AIRCRAFT MODIFICATIONS FOR RESEARCH

All modifications made to the SPEC Learjet for purposes of Atmospheric Research shall be in compliance with the requirement of the SPEC Learjet Conversion Manual. This manual is on file at the offices of the Director of Maintenance and the Flight Department Director.

The aircraft hard points and wiring harnesses are modular and allow instrument probes and packages to be moved to various positions on the aircraft without new engineering studies. Per the Conversion Manual, trained SPEC technicians may install and remove these probes and packages under the supervision of a certified mechanic. The mechanic shall make appropriate aircraft logbook entries (including weight and balance amendments) after any aircraft reconfiguration. Each SPEC technician will be trained by the SPEC Director of Maintenance prior to being assigned duties requiring aircraft probe reconfigurations.

If a research program requires modifications to a hard point or wiring harness, a new engineering study shall be completed, and appropriate changes will be made to the Conversion Manual. Revisions will be submitted to the Denver FSDO for approval.

10 Security Procedures

10.1 Assessing the Threat and Vulnerabilities

The Security Environment for the SPEC Learjet is somewhat atypical. On the positive side, as a Restricted Category aircraft, the SPEC Learjet carries no passengers, and only required crew members. On the negative side, the nature of the external research packages the aircraft carries sometimes attracts considerable attention (some observers at airports have queried if the true nature of the operation is intelligence gathering). Particularly if research flights are conducted outside of the United States, flight crews must appreciate the need for security, and should not hesitate to share the true nature of our research flights to interested observers.

In developing and maintaining a current threat assessment for areas of operations, the Flight Department Manager will use the following resources as appropriate:

- a. national and local security officials;
- b. national and local law enforcement officials;
- c. the company security officer, if applicable;
- d. national and international trade associations;
- e. air security assessment and intelligence service providers;
- f. local and foreign media reports; and
- g. company officials posted in foreign locations, if applicable,

A SPEC Flight Department member (as designated by the Flight Department Director) will conduct an assessment of the Flight Department vulnerabilities at least once each year. The assessment will also be conducted immediately prior to operations outside of the SPEC Normal Operating Domain (as defined by Section 6.1 of this manual). The results of these assessments will be used to update the security program.

10.2 PREVENTIVE MEASURES

The focus of preventive security measures will be to:

- a. Prevent unauthorized access to company aircraft and facilities;
- b. Prevent the unauthorized introduction of weapons, explosives onto company aircraft and into company facilities; and
- c. Prevent the use of company aircraft to commit other unlawful acts, such as the transport of illicit drugs.

Preventive security measures will include:

- a. Global Considerations
 - i. Whenever possible avoid areas where there is an identified security risk;
 - ii. Have a security program that is specific to your location and operation;
 - iii. Ensure that all flight department personnel receive security program training;
 - iv. Make security an integral part of all aspects of the flight department and its operation;
 - v. Establish a Security Champion role, much like the Safety Officer role;
 - vi. Maintain a security information program; and
 - vii. Develop, resource, maintain, exercise, evaluate and update an Emergency Response Plan.
- b. People and Processes

- i. Require pre-employment screening of flight department personnel (not to include those employed prior to January 1, 2010);
- ii. Require that crew members display photo IDs at all times;
- iii. Limit the publication of aircraft itineraries;
- iv. Establish security threat alerting procedures, such as a code word for use by persons under duress;
- v. Require an accurate and accessible passenger manifest for all trip legs;
- vi. Ensure that only company personnel and authorized guests, identified in advance, are allowed to board a company aircraft;
- vii. Ensure that crew members maintain positive control of luggage; and
- viii. Positively identify all luggage and match luggage to specific crew members (color-coded bag tags can be helpful).

c. Aircraft

- i. Check lavatories, baggage compartments and all aircraft cavities for unauthorized people or objects prior to every departure;
- ii. Ensure that a flight department member is present at all times when the aircraft is being serviced (fuelling catering, etc.) at company facilities;
- iii. Ensure that an aircraft crewmember is present at all times when the aircraft is being serviced (fuelling, catering, etc.) at locations away from company aviation facility;
- iv. Use the aircraft's security system (locks and alarms) whenever it is unattended away from company facilities;
- v. Apply tamper evidence security tape on door, panels, etc.
- vi. Post a guard at the aircraft when away from company facilities at locations where security is a concern; and
- vii. Consider removing company identification from the aircraft and facilities. Consider removing the U.S. flag from the aircraft tail when operating outside of the U.S.

d. Facilities

- i. Ensure company facility perimeter security with effective fencing, lighting, security patrols (as appropriate), gates and limited access areas;
- ii. Ensure external gates and doors are closed and locked at all times ;
- iii. Require positive access control for all external gates and doors;
- iv. Close hangar doors when that area is unattended ;
- v. Secure all key storage areas (food and liquor, parts and tools, etc.);
- vi. Have an access control management system for keys and passes;
- vii. Confirm the identity and authority of each passenger, vendor and visitor prior to allowing access to facilities and aircraft;
- viii. Accompany all visitors away from secure areas (visitor lounge, etc.);
- ix. Require a picture ID of any unfamiliar or unaccompanied visitor or vendor;
- x. Post emergency numbers prominently around facility;
- xi. Ensure easy access to phones or "panic buttons" in various facility locations (break room, hangar bay, etc.); and
- xii. Confirm security of destination facilities.

10.3 RESPONSIVE MEASURES

In the case of a hijacking, the flight crew must attempt to make an assessment of the intent of the hijacker and follow the emergency procedures set out in section 10.4 of this manual. These

procedures will include the making of distress radio calls and transponder settings, to indicate that the aircraft has been hijacked and for adherence to the procedures that have been established and promulgated in ICAO Doc 7030 – *Regional Supplementary Procedures* in both the cases where the aircraft continues on the assigned track and cruising level or is forced to deviate there from.

In the case of bomb threats, the first step is to determine the legitimacy of the threat or whether it is likely to be a hoax. If considered to be legitimate, law enforcement officials should be notified. If the aircraft is in the air, ATS should be notified and the aircraft should land to be searched. If on the ground, the aircraft should be moved, for searching, to the designated isolated parking.

In the case of other unlawful acts, the PIC should contact the responsible law enforcement agencies.

10.4 SECURITY CHECKLISTS

Each destination will be assessed as presenting an insignificant, low, medium, high or critical security risk to travelers. The following guidelines describe the progressive measures that should be invoked to cater to each of these categories.

THREAT	Actions		
Low	Door/access panels	-	Locked
	Emergency Exits	-	Secured
	Aircraft Perimeter	-	Marked/Lighted
	Communications	-	Establish lines of communications between crew and passengers.
Medium	Parking	-	Avoid proximity to public 'rights' of way
		-	Non-remote
		-	Well-lighted
	Engine Covers	-	Fitted
	Physical Guarding	-	Available
	Communications	-	Establish lines of communications between crew and passengers.
	Pre-flight	-	Detailed check of aircraft cavities
High	Risk	-	Refer to local representative for assessment of business risk of not traveling vs. security risk of traveling
	Parking	-	Aircraft hangared
		-	Apply anti-tamper tape to doors/access panels
	Armed Guarding	-	Consider
		-	Local representative approved in accordance with local guidelines on the use of force
	Communications	-	Established lines of communications between crew and pax.

The Flight Department will also provide crews with local specialist assessments of the security situation in countries where there is a local presence.

10.5 EMERGENCY CHECKLIST

The following checklist will be used in the event of unlawful interference (hijack) or bomb threats.

UNLAWFUL INTERFERENCE

- THE SAFETY OF CREW IS PARAMOUNT AND THE OBJECTIVE IS TO SECURE THEIR SAFE RELEASE
- When possible, carry out the following:

TransponderA7500 ATC.....INFORM Fasten seat beltsON Cabin Crew MembersBrief - if possible

GENERAL ADVICE

In the air

- Assess the situation to try to determine the intent of the hijacker and modify response as appropriate.
- Comply with initial demands without prejudicing safety.
- Negotiate patiently. Do not antagonize.
- Avoid actions/movements that might appear hostile.
- Explain before moving any control, switch, etc.
- Consider passing information to controlling authorities.
- If forced to deviate from the assigned track and cruising level,
 - follow the procedures as specified in ICAO Doc 7030 *Regional Supplementary Procedures, or*
 - if no applicable regional procedures have been established, proceed at a level which differs from the cruising levels normally used for IFR flight by:
 - 500 feet (150m) in an area where a vertical separation minimum of 1,000 feet (300m) is applied, or
 - 1,000 feet (300m) in an area where a vertical separation minimum of 2,000 feet (600m) is applied.
- Land at a suitable airfield.

On the ground

- ♦ EXPECT THE AUTHORITIES TO TAKE CONTROL.
- Be guided by authorities. Do not take independent action.
- Make the hijacker do his own thinking.
- Establish endurance of food, water, sanitary supplies, APU and battery. Transfer to a ground power unit as soon as possible. If possible, obtain air conditioning cart.
- Maintain hygiene. Keep door, galley and aisle clear of rubbish and equipment.
- Look after Crew's health and comfort.

BOMB THREAT ON GROUND

ATC and operations/handling agent

ALERT

• Confirm parking area.

Cabin Crew (if carried)

BRIEF

- Prepare to disembark on PIC's command (PA).
- Disembarkation procedures established. Use entry door if practical.
- Suspicious objects should not be touched.
- If taxiing, stop and disembark immediately.

Research CrewEVACUATE PICENSURE THAT AIRCRAFT IS COMPLETELY VACATED

Research CrewASSEMBLE CLEAR OF AIRCRAFT (500m UPWIND)

BOMB THREAT IN FLIGHT

• If a suspicious article or explosive device had been found, the aircraft should be flown as normally as possible but in accordance with the following requirements.

EmergencyDECLARE

- Plan to land at the nearest suitable airfield.
- Consider high altitude airfield if appropriate.

TransponderSET A7700 if none assigned

Cabin Research Crew (if carried) BRIEF

- Advise that there is a bomb threat.
- Organize search of cabin (if bomb found see over).
- Land as soon as possible.
- Disembark as soon as possible after landing by fastest means.

PilotsSEARCH FLIGHT DECK

Pressure controller MAINTAIN CURRENT CABIN ALTITUDE

DescentCOMMENCE

- Reduce cabin differential pressure to zero by descending aircraft to cabin altitude. <u>Do not</u> raise cabin altitude.
- Descend without delay to below FL100 or MSA if higher.
- Minimize maneuvers / avoid turbulence.

SpeedREDUCE WHEN PRACTICABLE

CabinDEPRESSURIZE/AIR VALVES CLOSED

- When at cabin altitude: Man. Cabin Alt Control
 Dump Valve
 FULL INCREASE
 OPEN
- Leave outflow valve open for remainder of flight.

Landing Configuration ... ESTABLISH EARLY

After Landing:

APU	START
Engines	SHUT DOWN
Lighting	ALL ON EXCEPT LANDING LIGHTS
PĂ	"IT IS IMPERATIVE TO LEAVE THE A/C WITHOUT DELAY. KINDLY
	FOLLOW THE INSTRUCTIONS"
	(GIVEN BY THE CABIN ATTENDANT OR PILOT)
Research Crew	ÀSSEMBLE CLEAR OF AIRCRAFT (500m UPWIND)

SUSPICIOUS ARTICLE OR BOMB FOUND

- DO NOT MOVE, TOUCH OR OPEN.
- Move Research Crew as far away as possible, and instruct them to keep heads below top of seat backs.
- Obtain expert advice through ATC comms.
- Remove oxygen bottles and first aid kits from the immediate vicinity. Have fire extinguishers available.
- Secure article in place, pack around with pillows, blankets, coats and absorbent materials. Keep article dry but wet surrounding material.

Only consider moving the article if its position poses an immediate threat to the aircraft and expert advice recommends this course of action, in which case, handle GENTLY, keep in same attitude. The article should be fastened using adhesive tape and supported in seat cushions, blankets, etc.

11 Dangerous Goods

11.1 DEFINITION

The definition of Dangerous Goods is: A substance or material which has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety and property when transported in commerce and which has been so designated.

The SPEC Aircraft has unique missions and support for carrying hazardous materials for research purposes as outlined in section 11.2. This section is intended as a familiarization of what is considered dangerous goods, and the proper markings for transporting them. SPEC staff will probably not be exposed to the labeling of dangerous goods, but will most likely see it in the form of articles carried aboard the aircraft by crewmember/passengers.

11.1.1 Dangerous Goods Categories

Dangerous goods fall into nine (9) basic categories:

- a. Explosives.
- b. Gases.
- c. Flammable liquids.
- d. Flammable solids or substances.
- e. Oxidizing substances.
- f. Poisonous and infectious substances.
- g. Radioactive substances.
- h. Corrosives.
- i. Other Regulated Materials (ORMS).

Dangerous goods warning labels have been developed for each category.

11.1.1.1 Class 1 - Explosives

Any chemical compound, mixture or device, the primary or common purpose of which it functions by an explosion that is substantially instantaneous release of gas and heat. Example: Dynamite, blasting caps, fireworks, paper caps for toy pistols, and percussion caps. The markings for Class 1 materials are as follows:

11.1.1.2 Class 2 - Gases

Compressed, liquefied, or dissolved under pressure. Example: Carbon monoxide, hydrogen, oxygen, chlorine, carbon dioxide, and neon.



11.1.1.3 Class 3 - Flammable Liquid

A Flammable Liquid is defined as having a flash point below 100°F. A Pyroforic Liquid is any liquid that ignites spontaneously in dry or moist air at or below 130f. A Combustible Liquid is any having a flash point at or above 100f and below 200f. Examples: Kerosene, and butane.



11.1.1.4 Class 4 - Flammable Solids or Substances

Defined as any solid material (other than explosive), which is liable to cause fires through friction or retained heat, from manufacturing or processing. It can be ignited readily and burns so vigorously and persistently, as to create a serious transportation hazard. Example: Metallic Sodium, and Potassium.



11.1.1.5 Class 5 - Oxidizing Substances

A substance such as chlorate, inorganic peroxide, or nitrate, that yields oxygen readily. It accelerates the combustion on organic matter. Example: Hydrogen Peroxide, Chlorine Bleaching Powder, Ammonium Nitrate, Lauroyl Peroxide (bleaching agent), Succinic Acid Peroxide (antiseptic).



11.1.1.6 Class 6 - Poisonous and Infectious Substances

Poison-Substances are liquids or solids so toxic to man that they are a hazard to health during transportation. An Irritant is a substance that, upon contact with fire or air, gives off dangerous or intense fumes. Etiologic Agents are a living microorganism or its toxin that causes (or may cause) human disease. Examples: Nitric Oxide, Arsenic, Strychnine, and Cyanide irritants (tear gas and Chemical Mace).



11.1.1.7 Class 7- Radioactive Substances

Radioactive Substances are defined as any material or combination of material that spontaneously gives off ionizing radiation.



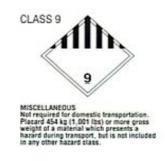
11.1.1.8 Class 8 - Corrosive

Corrosives are any liquid or solid that causes visible destruction or irreversible damage to human tissue. Also, it may be a liquid that has a severe corrosion rate on steel or aluminum. Examples: Paint remover, soda lime, and battery acid. (Wet spillable batteries, when properly packaged, are considered an acceptable item).



11.1.1.9 Class 9 - Miscellaneous Dangerous Substances

Other regulated materials (ORM) – These are defined as having the following characteristics: 1. Any material that may pose an unreasonable risk to health and safety or property when transported in commerce; and 2. does not meet any of the definitions of the hazard classes specified previously; or 3. has been re-classed an ORM. Examples: Carbon dioxide solid (dry ice), sodium fluoride, manganese dioxide (matches), and magnetized materials.



11.2 COMMON DANGEROUS GOODS

Any item or package that has a Dangerous Goods label, or marked ORM, cannot be accepted for transportation, unless the item is listed in the exceptions section. The following items are common items carried by the passenger that in small quantities are not considered dangerous:

Examples of common items:

- a. Personal toilet articles not to exceed 75 ounces per person (ex: hairspray, aerosol perfume).
- b. Alcoholic beverages.
- c. Aerosol containers.
- d. Small arms ammunition in checked luggage.
- e. Dry ice: (a) carry on not to exceed 4 lbs. per person

Suspicion of any dangerous goods present in authorized areas or shipment of such material must be reported to the PIC immediately.

11.3 DANGEROUS GOODS EMERGENCIES

Upon recognizing an inadvertent spill or release of dangerous goods aboard the aircraft; the following steps should be employed depending on the situation:

11.3.1 General procedures

- a. Notify the PIC.
- b. Assess situation (Fire is always a concern).
- c. Identify the material ASAP.
- d. Approach the "danger" area cautiously
- e. Avoid inhaling vapors and fumes.
- f. Do NOT assume gases and vapors are harmless due to lack of odor.
- g. Do NOT walk through contaminated area.

Once risk is determined, the substance identified, OR, if unable to accurately identify the material:

11.3.2 Notify Authorities

- a. Flight Center Director, Director of Maintenance, or Chief Pilot.
- b. Airport manager.
- c. Public safety personnel (Law enforcement, etc.)
- d. Request assistance.
- e. Do NOT attempt cleanup without the proper equipment.

11.3.3 If No Spill, Or No Fire

- a. Notify PIC.
- b. Attempt to identify material.
- c. Assess risks.
- d. Call CHEMTREC (if required) 800/424-9300.

11.3.4 Land to Remove Danger

11.3.4.1 Fire

- a. Extinguish fire.
- b. Do NOT use water without identifying substance.
- c. Notify PIC.
- d. Utilize respiratory protection (smoke hoods, wet towels, etc.).
- e. Move crewmember/passengers away from area.
- f. Contain the fire site.
- g. Attempt to identify the material.
- h. Emergency landing.
- i. Notify Fire Personnel ASAP.

11.3.4.2 Spillage Or Leakage

- a. Notify PIC.
- b. Move PAX away from area.
- c. Use respiratory protection (smoke hoods, wet towels, etc.).
- d. Do NOT allow contact with any spilled material.
- e. Do NOT spray with H 2O until material identified.
- f. Call CHEMTREC (if required).
- g. Land to remove hazard.

11.3.4.3 Other Resources

The following agencies are available to answer questions regarding a hazardous material and/or dangerous good incident or accident.

CHEMTREC (24 hour) 800-424-9300

NRC (National Response Center) 800-424-8802

Center for Disease Control 800-232-0124

Local: Boulder County Sheriff Department of Emergency Services (303) 441-4444 or 911

11.4 SPECIAL HAZMAT REQUIREMENTS FOR RESEARCH AIRCRAFT

This section pertains to the requirements for carrying hazardous materials on the SPEC Learjet research aircraft explicitly for research purposes. Research instruments at times require the use, in flight, of goods that are classified as hazardous and therefore would normally be subject to the Hazardous Materials Regulations (HMR; CFR 49, Parts 171-180) set forth by the US Department of Transportation (DOT). Normal requirements for instrumentation on board the SPEC Learjet may include, but are not necessarily limited too, nonflammable compressed gases, classified as Class 2.2 Hazardous Material.

Interpretation provided by the Department of Transportation pertaining to the regulations set forth in the aforementioned CFRs indicate that the SPEC Learjet is not bound by these CFR's. See the Director of the Flight Center for documentation supporting this interpretation.

It is recognized that the flight department must take responsibility of carrying hazardous materials on SPEC Learjet for research purposes. It is the responsibility of the PI and engineering groups to identify any materials that may be considered hazardous that will be used during research missions. Normally, this is identified during the project feasibility phase, well in advance of the project (6-18 mos.) Upon identifying possible hazardous materials, the flight operations and aircraft maintenance groups will be informed of the requirements for carrying such materials on board. The maintenance and engineering groups will devise a plan to mount/carry the materials in accordance with all pertinent FAA regulations. Dangerous Goods training will be provided for crew and techs for the specific Hazardous Materials carried on a particular flight. This will include specific applicable hazmat storage, (i.e. caps on bottles when possible); spill procedures (i.e. a flammable/corrosive spills and drips under floorboards); Specific procedures for fire; use of CHEMTREC and hazmat procedures for emergencies.

Safety-briefings for non-flight crew will include information pertaining to the carrying of hazardous material on board the aircraft for research purposes, when applicable.

12 SPEC Company Forms