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Chapter 1 - Introduction

Mission Statement: Smokejumpers primary mission is initial attack. While most effective at providing rapid initial response, smokejumpers are well equipped to respond to extended attack incidents and short-term critical need missions on large fires. Smokejumpers are normally configured by planeload, with each load ranging from 2 to 20 smokejumpers depending on aircraft type and smokejumper availability. Smokejumpers may be configured as crews (hand crew, engine crew, or helitack crew), as wildland fire use modules, or as single-resource overhead for Incident Command System positions. Concurrence with NICC must be obtained prior to configuring smokejumpers as crews or modules for extended attack operations.

I. Objective. This guide provides standards for the administration of all smokejumper units regarding personnel qualifications, organization, certification, standardization, training, equipment, and operating procedures. The guide includes specific direction for parachute management and paracargo delivery. Managers, specialists, and technicians shall use this guide in planning, administering, and conducting smokejumper and paracargo operations.

II. Scope. The procedures contained in this guide apply to smokejumper operations conducted by the seven Forest Service smokejumper bases. The level of standardization is determined by the Forest Service Smokejumper Base Managers Council.

While it is recognized that individual smokejumper bases have the authority to issue more restrictive guidance and directives than that contained in the Interagency Smokejumper Operations Guide, they are encouraged not to do so in the interests of the guide's objective of promoting standardization and interagency cooperation.

III. Policy. Regardless of size, smokejumper and paracargo delivery operations have similar administrative, technical, and safety requirements. Field organizations must provide adequate direction to ensure safe and efficient conduct of smokejumper and paracargo delivery operations.

IV. Authority. The Forest Service Manual 5700, Aviation Management contains the authority to publish this section of the interagency guide.

A. Line officers ensure that only qualified personnel supervise and administer smokejumper and paracargo operations. (FSM 5704).

B. Smokejumper Base managers ensure operational safety and compliance with standards, equipment, and procedures standardization.

V. Standardization of Equipment & Procedures. The total mobility and the interchange of personnel and equipment between units dictates that personnel

qualifications and training, equipment, smokejumper and paracargo delivery methods, and operating procedures must be uniform and standardized. This guide lists standardized training, equipment, and procedures for uniform Service-wide application. The Washington Office must approve new equipment and procedures before they are adopted for Service-wide use (FSM 5703.l7).

VI. Review and Revision. Users are encouraged to recommend changes to this document through their respective smokejumper base manager. The Forest Service Smokejumper Base Managers Council will conduct a general review annually. At this time, appropriate changes will be recommended by the council to the National Interagency Aviation Council with the revisions distributed by the National Smokejumper Program Manager.

VII. Disclaimer. The use of trade, firm, company, product, or corporation names is for information and convenience. Such use does not constitute an official evaluation, conclusion, recommendation, endorsement, or appraisal of any product or source to the exclusion of others that may also be suitable.

Chapter 2 - Administration

I. Organization, Personnel, Staffing, and Certification. To maintain high standards in equipment, operating procedures, organization, and safety, operational supervision by competent, well-qualified personnel supported by a properly staffed and trained organization is essential.

A. Unit Organization. Staff each smokejumper base to supervise the unit's activities adequately. The staff at permanent bases, shall include one base manager, one loft manager, one operations manager, and one training manager. Depending on the size of the base and complexity of the aviation/para-cargo operation, an optional loadmaster manager may also be needed to provide adequate staffing and oversight of aviation related functions. Regions may structure spike base organizations to meet specific needs. Organize and structure permanent and spike base facilities to provide an adequate ratio of managers and assistant managers to work leaders (i.e. spotters or squadleaders) and work leaders to smokejumpers. Each unit requires a minimum of one work leader for every six smokejumpers. Depending on the unit's size, workload, and responsibility, establish additional positions to ensure that all areas of responsibility receive the necessary supervision. Some or all of these positions may require full-time employees to obtain the skill levels necessary to accomplish the job. The number of qualified spotters should be sufficient to staff the available aircraft fleet. Organization structures should also strive to provide a clear and attainable career ladder whenever possible.

B. Overhead Personnel Staffing Requirements. National Standard Position Descriptions for Smokejumper Positions are available and should be used by all smokejumper units. While organizational structures may vary among smokejumper bases due to size and complexity, each organizational unit shall provide qualified personnel to serve in overhead positions. The following describes these key positions:

1. Smokejumper Base Manager. The smokejumper base manager must have administrative and smokejumping experience and must be thoroughly familiar with aircraft operation and all phases of smokejumping. This individual is responsible for all administrative, preparedness, and fire operations at the smokejumper base. If the incumbent enters into this position in non-active jump status, it is highly recommended that the incumbent become re-qualified and remain as an active jumper.

2. Loft Manager. Parachute technicians and loft managers must be certificated Federal Aviation Administration Master Parachute Riggers. The person in this position reports to the base manager for all technical equipment matters. The loft manager must be an experienced smokejumper and must be an active smokejumper. In most organizations, this individual performs the following duties:

a. Organizes and controls all loft activity.

b. Supervises equipment repair and manufacture.

c. Selects and trains riggers.

d. Provides technical assistance to the base manager.

e. Maintains loft supplies, smokejumping equipment, and loft records.

f. Annually inspects all personnel parachute assemblies for airworthiness.

g. Assists Smokejumper Equipment Specialist (MTDC) in testing and developing smokejumper equipment.

3. **Operations Manager**. The operations manager maintains standardized procedures in smokejumping operations, organizes project work, and keeps records for all jumper activities. In some organizations, this individual also may serve as training officer and/or loadmaster. The individual in this position reports to the base manager. The operations manager must be an experienced smokejumper and must remain an active jumper.

4. **Training Manager**. Larger organizations may need a training manager responsible for the various training activities of a smokejumper unit, with the exception of loft training. In most organizations, the training manager reports to base manager. This individual must be an experienced smokejumper and must remain an active smokejumper. Some bases may combine this position with the operations manager position.

5. **Loadmaster**. The loadmaster is responsible for loading and manifesting personnel, smokejumper gear, paracargo, and freight on aircraft and for coordinating loads carried with the pilot and spotter. Depending on the number of aircraft managed and the complexity of the aviation operation, not every base will require a dedicated loadmaster and these responsibilities may be assigned to another functional area manager. This individual must be an experienced and active smokejumper.

6. **Assistant Manager**. Each functional area (operations, training, loft, loadmaster) may have one or more assistant managers assigned. Assistants report directly to the functional area manager and assist in the overall management of the function as well as supervision of the spotters, squadleaders, and smokejumpers assigned to that area.

7. **Clerical Personnel**. Each organization should have clerical personnel assigned to it consistent with the unit's needs and administrative requirements.

C. **Basic Smokejumper Qualification Standards**. All smokejumpers, who participate in parachute jumping, must meet Office of Personnel Management Qualification Standards Handbook for positions under the General Schedule. In addition, these individuals must meet the following qualifications annually:

1. **Medical Examination**. All jumpers must pass a physician's medical examination. The examiner shall complete forms SF-78, Certificate of Medical Examination during the examination. The Forest Service will pay for this examination.

2. **Physical Fitness Test**. All jumpers must report in good physical condition and pass the test listed below to measure cardio-respiratory endurance and muscular fitness.

   a. 7 Chin-ups or pull-ups.

   b. 45 Sit-ups.

   c. 25 Pushups.

   d. 1.5-mile run in 11 minutes or less.

   e. The test must be passed before making the first training or refresher jump. Except for the 1 1/2 mile run, the test shall be performed during one established time period with a break of not less than 5 minutes, nor more than 7 minutes between events. Prior to the 1 1/2 mile run, employees shall be given a reasonable warm-up period. Experienced jumpers will be allowed up to 3 opportunities to pass the test during the time frame allotted for pre-jump training. The 1 1/2 mile run shall be performed on an accurately measured course that is reasonably level. Individuals need to satisfactorily complete the entire test before being authorized to perform parachute jumps. A failure of any one exercise will require retaking the entire test. Failure to meet the minimum performance standard for any required exercise disqualifies the individual from jumping. The base manager may allow re-testing in special cases, such as illness or injury.

3. **Basic Training Proficiency**. In addition to the above tests, new trainees must demonstrate minimum acceptable levels of proficiency in the following training units to qualify as a smokejumper. See the Interagency Smokejumper Training Guide for additional information.

   a. Aircraft procedures.

   b. Physical conditioning.

   c. Parachute landing techniques.

   d. Exit procedures.

   e. Timber letdowns.

   f. Parachute manipulation and emergency procedures.

   g. Tree climbing and parachute retrieval.

   h. Firefighting equipment.

4. **Medical Requirements For Smokejumper Positions**. The duties of these positions require sustained, arduous physical exertion under rigorous and unusual conditions. Persons appointed will be potentially subject to extreme physical danger and to irregular and protracted hours or work. The health of individuals must be such that they have the capacity to meet demands for performance in the position and for human reliability. Before entrance on duty

and periodically during employment, individuals must undergo a medical examination. Failure to meet any of the required medical qualifications will usually be considered disqualifying for employment or a basis for termination, except when substantial evidence is presented that the individuals can perform the essential functions of the job efficiently and without hazard to themselves or others, with or without reasonable accommodation. The following medical conditions must be met:

a. Eyes: Individuals must be free from acute or chronic eye disease. Corrected distant vision must test at least 20/20 (Snellen) in one eye and at least 20/30 (Snellen) in the other. Individuals must be able to read printed material the size of typewritten characters, correction permitted.

b. Ears: Individuals must not have acute or chronic disease of the external, middle, or internal ear. Using an audiometer for measurement, there should be no loss of 25 or more decibels in each ear at the speech frequency range. A hearing aid is not permitted.

c. Nose, Mouth and Throat: Individuals must be free from acute or chronic sinus disease or other nasopharyngeal conditions that interfere with distinct speech or with free breathing.

d. Teeth: Individuals must be free from any mouth or dental defect that interferes with proper incision and mastication of food.

e. Lungs: Individuals must not have any acute or chronic disease of the lungs that impairs pulmonary function.

f. Heart and Blood Vessels: Individuals must not have organic heart disease, compensated or not; valvular diseases; coronary heart disease; cardiac enlargement; angina pectoris; cardiac arrhythmia or irregularity other than sinus arrhythmia; arteriosclerosis; blood pressure readings that consistently exceed 150 systolic or 90 diastolic. High blood pressure that is regulated without side effects to no more than the above systolic and diastolic readings may be qualifying.

g. Abdomen: Individuals cannot have acute or chronic disease of the abdomen; significant enlargement of the liver or spleen; or hernia that interferes with lifting, stretching, bending, or working with tools.

h. Genitourinary/metabolic: Individuals cannot have acute or chronic genitourinary disease; acute or chronic prostatitis; large and/or painful varicocele or hydrocele with functional impairment; or unreconciled abnormal finding on urinalysis, including drug use. Diabetes mellitus may be disqualifying if means or extent of treatment and control are incompatible with working conditions.

i. Spine, Pelvis, Sacroiliac, and Lumbosacral Joints: Individuals must not have restricted mobility of the spine and pelvic joints that interfere with normal function. Individuals cannot have any significant

abnormal curvature of the spine or abnormal or deformity or malformation of the parts, spondylolisthesis, or a history of herniated nucleus pulposus, with or without surgery, that may be reinjured on impact landing.

j. Extremities: Individuals cannot have anomalies in the number, form, proportion, and movement of the extremities that interfere with function. This includes non-united fractures and reduced dislocations with incomplete restoration of function; amputation of arm, hand, leg, or foot; loss of any skeletal portion of the thumb of either hand; loss of more than the toe or distal phalanges of the ring or little fingers of either hand; ankylosed joints; pes cavus, weakfoot, or clubfoot; flatfoot with symptoms unresponsive to orthotics; loss or deformity of great toe or any two toes on the same foot; torn cartilage or loose foreign bodies within the knee joint; instability of the knee joint; or inadequately healed surgical procedure.

k. Nervous System: Individuals must not have mental, nervous, organic, or functional neuro-psychiatric disorders likely to interfere with performance; medical history or clinical diagnosis or a seizure disorder showing systems that are likely to recur or disturbance of consciousness without satisfactory explanation of the cause; paralysis or pareses; muscular atrophies or dystrophies that would interfere with proper functioning in the position.

l. Skin: Individuals cannot have debilitation acute or chronic skin disease or extensive scarring that interferes with function.

m. Other Conditions: Conditions or other diseases not included herein will not exclude an individual from consideration providing the condition is satisfactorily corrected.

n. Height: Height without shoes must not exceed 77 inches or be less than 60 inches.

o. Weight: Individuals must weigh no less than 120 pounds and no more than 200 pounds without clothes.

p. Immunization: A tetanus immunization or tetanus booster within the last 10 years is required.

D. GS-7 Smokejumper Squadleader. Each GS-7 smokejumper squadleader shall:

1. Obtain and maintain a Federal Aviation Administration senior parachute rigger certificate.

2. Remain current in first aid and emergency care.

3. Demonstrate good judgment and a willingness to accept responsibility as a smokejumper.

4. Instruct groups of 5 to 10 individuals in various phases of smokejumping.

5. Make decisions quickly and calmly under pressure.

6. Act as a workleader for squads of smokejumpers on fires and projects to ensure work is performed in a safe and efficient manner.

7. Meet basic qualification standards at the GS-7 level.

8. Be an active smokejumper.

9. Obtain a crew boss and IC Type IV rating through the National Interagency Incident Management System Qualification and Certification System.

E. GS-7/8 Smokejumper Spotter. A smokejumper spotter is an individual qualified to drop smokejumpers and paracargo from an aircraft. A smokejumper spotter shall:

1. Be an experienced and active smokejumper on their agency system. For single spotter mixed loads, must have received familiarization training on the other agencies system. (See spotter syllabus in appendix)

2. Obtain and maintain a Federal Aviation Administration senior parachute rigger certificate.

3. Act as a workleader for squads of smokejumpers on fires and projects to ensure work is performed in a safe and efficient manner. May also provide oversight for spike-base operations for small, typically single plane load, short duration operations.

4. Be safety conscious, cautious, careful, and thorough.

5. Successfully complete the basic spotter training course and obtain certification in all aircraft the unit uses.

6. Demonstrate competence as a spotter and express willingness to accept responsibility as a spotter and workleader.

F. Smokejumper Check Spotter. A fully qualified, experienced, and active smokejumper spotter who is designated annually by their home unit base manager to train and recommend smokejumper spotters for certification.

G. Assistant Spotter. An experienced active smokejumper who assists the smokejumper spotter with dropping smokejumpers and paracargo from an aircraft. The assistant spotter shall have, as a minimum, the training outlined in Chapter 3 of this guide.

H. Smokejumper Spotter Certification. Maintain a record on each individual passing the basic spotter's training course. As the trainee spotter obtains

certification and gains experience in various aircraft, update the record to reflect new qualifications. Each unit shall maintain a current file indicating qualifications, aircraft authorizations, and the currency of each spotter.

I. Parachute Rigger. A parachute rigger must work within the authority of an FAA parachute rigger certificate, or under the supervision of an appropriately rated FAA certificated parachute rigger.

J. Parachute Rigger Certification. Parachute rigger certification must be consistent with FAA regulations contained in Federal Aviation Regulations, part 65.

K. Smokejumper Pilot. An individual assigned to pilot smokejumper and paracargo aircraft shall complete specialized training and obtain certification to perform the required mission. The Standardized Smokejumper Aircraft Contract, FSH 5709.16, Flight Operations Handbook, Chapter 20, and Smokejumper Pilot Operations Guide provide direction for smokejumper pilot certification and training, including Mountain Flying technique and procedures.

L. Smokejumper Pilot Inspector Qualifications. Forest Service smokejumper pilot inspector qualifications are in FSH 5709.16, Chapter 20 and the Interagency Smokejumper Pilot Operations Guide.

II. Smokejumper Base Reviews. The National Smokejumper Program Manager will coordinate national level reviews to ensure that smokejumper operations comply with national and interagency standards. This level of review should be conducted at least once within a five year period. Equipment, training, facilities, and records must be reviewed to ensure that standardization requirements are met. Annual preparedness reviews should be conducted at the local level.

A. Unit, Facilities, and Procedures Inspection. Base managers or higher authorities shall conduct and document a review of each smokejumper unit, as scheduled, to ensure that operations are safely performed and conform to established standards.

B. Administration and Records Inspection. Inspections to examine management practices regarding planning, organization, staffing, controlling, supervising, and reporting. The inspection shall include, but not be limited to, the following:

1. Personnel staffing, management, and organization.

2. Operating plans, training schedules, and instructor assignments and qualifications.

3. Management practices, quality and timing of reports, records maintenance, work schedules, safety, and health.

4. Inventory management, procurement and replacement schedules, use practices, and security, including controlled substances management.

C. Facility Inspection. An annual inspection by the appropriate personnel of the facilities and associated equipment is recommended. This inspection is a review of the adequacy and safety compliance and use of the facility.

D. Procedures Inspection. Procedures inspections must review operating practices related to mission effectiveness and safety. Reviews shall examine operational areas for compliance and standardization with established procedures. Review shall include:

1. The structure and methodology of smokejumper training.

2. Parachute packing, inspection, maintenance, repair, and replacement.

3. Paracargo packaging, aircraft loading, and cargo restraint.

4. Dispatching, personnel, and load manifesting.

5. Preflight, in-flight, and exit procedures for smokejumpers.

6. Spotting procedures.

7. Other fire suppression and ground procedures.

E. Smokejumper Base Review Form. This form (see appendix D) contains information for conducting unit, procedures, facilities, and equipment inspections.

III. Controlled Substances Management. Some medical support equipment or materials require specialized handling, inventory, security, and accounting. This section

concerns the procedure for dealing with equipment, drugs, or medicines that individuals may not possess without a medical prescription or written authorization. Prepare, and update annually, a management plan that covers the following:

A. Justification for acquiring controlled substances.

B. Personnel training and the storage, distribution, security, and application (use) practices.

C. Accountability and review procedures to ensure proper substance management and control.

D. Controlled substance supply sources.

E. Procurement and use records.

F. Line officer authorization to procure, store, and administer controlled substances.

IV. Standardization Requirements. The safe and effective use of smokejumpers, requires standardized operational procedures.

A. Mandatory Training Requirements. Use of the Interagency Smokejumper Training Guide, is mandatory for smokejumper training and qualifications. Chapter 3 of this guide contains additional direction concerning standardized training requirements.

B. Equipment Standardization Requirements. The Forest Service has evaluated and approved specific items of smokejumping equipment for standard use Service-wide. Chapter 4 of this guide lists standardized equipment requirements, drawings, and specifications. The following smokejumping equipment categories include standardized items:

1. Smokejumping aircraft accessories.

2. Personnel parachutes and accessories.

3. Smokejumper protective gear.

4. Special smokejumping equipment.

5. Paracargo equipment.

Equipment fabrication, maintenance, inspection, installation, packing, and replacement must meet appropriate Federal Aviation Administration regulations or accepted practices or procedures that the equipment development centers have established and the Washington Office Director, Fire and Aviation Management, has approved. Chapter 4 of this guide provides a list of approved equipment and accessories. The Washington Office must approve in writing any deviations from this standardized equipment policy.

C. Parachute Training Standardization. Each unit shall conduct parachute training in accordance with the Interagency Smokejumper Training Guide. Personnel shall receive training in approved parachute systems and exit procedures.

D. Paracargo Packaging and Loading Requirements. Package paracargo for aerial delivery consistent with existing standards. Load, position, and secure paracargo on aircraft, consistent with the manufacturer's instructions concerning weight and balance limitations for each aircraft.

E. Paracargo and Smokejumper Restraint Requirements. Smokejumpers shall use safety belts and other restraint devices during critical phases of the smokejumper delivery mission. All smokejumper aircraft occupants shall wear safety belts, on all takeoffs and landings. Secure all paracargo and loose equipment aboard aircraft to ensure that it remains in place throughout the flight until released for delivery purposes. The minimum requirements for smokejumpers and paracargo restraint for takeoff and landings will be:

1. Nine (9) positive "Gs" longitudinal.

2. One and a half (1.5) "Gs" lateral.

3. Three "Gs" vertical.

4. Quick release by each individual jumper.

F. Pilot Training Requirements. Pilots shall receive training consistent with contract requirements and operating procedures. Smokejumper and paracargo pilot trainees must have specialized and standardized training. The National Smokejumper Aircraft Contract and FSH 5709.16, Flight Operations Handbook, and the Interagency Smokejumper Pilot Operations Guide provide the qualification and training requirements for smokejumper and paracargo pilots. Smokejumper base managers and designated spotters shall participate in the training and evaluation process. Also, each unit must provide a briefing and orientation to visiting pilots before any firefighting assignment. Chapter 5 of this guide provides a briefing outline. Training must include, but not be limited to, the following:

1. Orientation and unit operating procedures.

2. Smokejumper organization.

3. Smokejumper delivery mission.

4. Mountain flying and backcountry operations.

5. Streamer dropping and spotter responsibilities.

6. Smokejumper drop procedures.

7. Paracargo drop procedures.

8. Communications and dispatch organization.

9. Fire suppression organization.

10. Basic fire behavior.

G. Procedures Standardization. Each unit shall perform the following procedures in accordance with the information in this guide. The Interagency Smokejumper

Training Guide; FSH 5709.16, Flight Operations Handbook; Interagency Smokejumper Operations Guide, and Code of Federal Regulations:

1. Parachute packing requirements.
2. Spotter and streamer drop procedures.
3. In-flight aircraft procedures.
4. Aircraft emergency procedures.
5. Personnel restraint and cargo tie-down.
6. Cargo dropping procedures.
7. Smokejumper exit procedures.
8. Parachute maneuvering procedures.
9. Parachute landing procedures.
10. Timber letdown procedures.

V. Records and Reports. Record keeping is mandatory for administering smokejumper operations. Accurate records and reports on smokejumper activities, equipment use, training, and injury statistics shall be maintained.

A. Unit Records. Each unit shall maintain the following records to ensure effective smokejumper organization administration:

1. **Spotter Qualification Record**. Maintain and update records to indicate spotter training, currency, and qualification in various aircraft. Chapter 3 of this guide contains instructions on spotter qualifications. Annual spotter refresher training stating compliance with the Interagency Smokejumper Operations Guide will be documented and placed in the spotter's training file.
2. S**mokejumper Request**. The Smokejumper Request Form provides a detailed description of the fire location, size, suppression forces needed, and information to facilitate the delivery, effectiveness, and return of the smokejumping force. It also provides a record showing time of request, aircraft used, pilot, load description, takeoff time, arrival time at fire, and return time to base.
3. **Master Action Log**. The master action log includes, the requesting unit name, names of persons dispatched, request time, aircraft used, pilot, takeoff time, return time, name and location of fire, and other pertinent information.
4. **Individual Jump Log**. This log usually includes the jump number, date, and remarks, incident location, aircraft, etc. This form provides a record of each individual's jumps.
5. **Parachute Loft Records**. Chapter 6 of this guide contains information concerning records that each unit must keep on parachute use, rigging, maintenance, and loft operations.

6. **Fire Experience and Fire Training Records**. These records shall be maintained on all individuals at each unit in accordance with agency requirements.

B. Smokejumper Injury Reporting Form. The Smokejumper Injury Reporting Form is a national report that all units must submit to Missoula Technology Development Center each calendar year for every injury that is sustained by smokejumper personnel while parachuting. This report provides a comprehensive record of circumstances surrounding a smokejumper parachute injury. This information will be used for trend analysis and injury reduction. Each hiring unit shall account for all injuries and malfunctions of their assigned jumpers, regardless of where the accident occurs.

Chapter 3 - Training & Qualifications

I. Instructor Selection and Qualifications. Generally, select smokejumper squadleaders and overhead personnel with appropriate expertise as instructors for recruit training, refresher training, and spotter training. Occasionally, GS-6 smokejumpers with special skills or knowledge may conduct such training and, for some topics, personnel from outside the smokejumper organization may be instructors.

II. Recruit Training. Smokejumper recruit training includes, but is not limited to, parachute jumping techniques, physical conditioning, woodsmanship and firefighting techniques. Smokejumper units shall structure and schedule their recruit training programs to comply with qualifications and training standards in this guide and the Interagency Smokejumper Training Guide. The training guide reflects approved policies, standardized procedures, techniques, and methods in this guide and in FSM 5700.

A. Parachute Training. Each smokejumper unit shall develop training agendas for recruit training from topics contained in the Interagency Smokejumper Training Guide. Parachute training must combine classroom lectures and demonstration, pre-jump practical training on each of the parachute training units, the parachute maneuvering simulator, and actual parachute jumps.

B. Parachute Use Classroom Topics. Smokejumper classroom training must include topics outlined in the Interagency Smokejumper Training Guide supplemented by various training aids developed for smokejumper training. The following audiovisual programs are available:

1. Parachute maneuvering.

2. FS-14 parachute system.

3. Exit procedures.

4. Timber landing and letdown.

5. Parachute landing roll.

6. Paracargo and parachute retrieval.

7. Aircraft procedures.

8. Spotting procedures.

9. Water landing.

C. Pre-jump Training. Pre-jump training must include practical and field training outlined in the Interagency Smokejumper Training Guide. Each smokejumper unit conducting parachute training shall maintain the basic parachute training units required to simulate parachute landings, aircraft exit procedures, and timber letdown techniques. The various parachute units include the following:

1. **Parachute Landing Simulator**. A simulator provides the trainee with experience in executing a proper landing roll. Various training equipment is available to teach recruits correct landing techniques.

2. **Exit Tower**. The exit tower teaches smokejumpers how to attain proper body position while exiting the aircraft. It also simulates a parachute's opening shock. The tower should have a door and standard accessories to teach all types of aircraft exits.

3. **Letdown Simulator**. This simulator teaches smokejumpers correct timber letdown procedures and techniques.

4. **Mockup**. The mockup simulates loading, hookups, and routine and emergency exit procedures. Trainees may use an aircraft instead of a mockup.

5. **Parachute Maneuvering Simulator**. This computer simulator teaches smokejumpers correct parachute maneuvering procedures and can be used to correct improper procedures.

D. Training Jumps. Beginning smokejumpers shall make at least fifteen training jumps before they qualify for operational fire jumps. Jumpers must make at least four training jumps on each approved model of main parachute in use, before making operational jumps. Select training jump spots so that as jump training progresses, the jump spots simulate the terrain and conditions encountered in actual fire jump situations as closely as possible.

E. Physical Conditioning. Smokejumper training must include daily physical conditioning of stretching, strength development, and aerobic exercises during the entire employment period, as outlined in the Interagency Smokejumper Training Guide.

F. Pack Out Test - Recruits shall successfully complete a 110-pound 3 mile pack out on level terrain within 90 minutes before they qualify for operational fire jumps.

G. First Aid Training. First aid training must include between 8 and 24 hours of classroom and practical instruction consisting of a basic multimedia first aid course or equivalent basic emergency care course. The course must include emergency care for common firefighter or smokejumper-related injuries outlined in the Interagency Smokejumper Training Guide.

H. Aircraft and In-flight Emergency Training. Recruits shall receive training in ground and in-flight emergency procedures, crash procedures, and emergency exit procedures. Personnel shall learn to use emergency equipment and the locations of fire extinguishers on various jumper aircraft. Information concerning aircraft

and in-flight emergency equipment and procedures may be found in specific aircraft flight manuals and in the Interagency Smokejumper Training Guide.

III. Smokejumper Refresher Training. Each year experienced smokejumpers shall receive sufficient classroom and practical training to reestablish competency in the primary tasks related to smokejumping.

A. Mandatory Pre-jump Training. As a minimum, refresher training must include aircraft and exit procedures, parachute malfunctions, aircraft emergencies, parachute manipulation, parachute landings, jump spot hazards, tree climbing, water landing, letdown techniques, and physical fitness training. Smokejumper units shall structure refresher training programs to comply with qualifications and training standards in this guide and directions in the Interagency Smokejumper Training Guide. Finish ground and parachute training before authorizing individuals to perform operational jumps. Refresher training must inform experienced jumpers of changes in equipment, techniques, policies and procedures.

B. Optional Training. Refresher training also may include, helicopter long line, water handling, special fire suppression guidelines (such as wilderness fire suppression), safety, parachute rigger training, and cargo packaging.

C. Mandatory Training Jumps. Annually, each smokejumper shall make training jumps with each type of main parachute in use. A minimum of two training jumps with each approved parachute system is mandatory for experienced personnel re-qualifying for operational jump status. Three qualifying jumps are recommended.

D. New Parachute Training. Each smokejumper shall receive at least four actual training jumps to qualify to use a new parachute system on operational jumps.

E. Water Landing Training. Annually, each experienced smokejumper shall receive instruction in water landing techniques and procedures. Performing an actual water jump is optional.

F. Reserve Deployment Training. Twice during the fire season, each experienced jumper shall receive instruction in reserve parachute deployment techniques and procedures. Each smokejumper must demonstrate simulated parachute deployment. A live jump is not required or recommended to demonstrate this proficiency.

G. Agency Required Training. Certain types of training are required. This may include, but is not limited to; firefighter safety, ethics and conduct, civil rights, defensive driving, blood borne pathogen, first aid and CPR, chainsaw certification, hazardous materials, and aviation safety training.

IV. Spotter and Paracargo Training. Smokejumper spotters shall receive classroom and practical training in spotting, paracargo drop techniques, and in-flight procedures. Smokejumper spotters must receive base manager authorization to perform in specific aircraft before conducting solo training and operational spotter missions.

A. Classroom Training for New Spotters. Spotter trainees shall receive instruction in spotting and paracargo procedures, in-flight emergencies, and the duties and responsibilities identified in the Interagency Smokejumper Training Guide and the Interagency Mixed Load Procedures Document. Training must also include viewing "The Professional Smokejumper Pilot" and "The Professional Smokejumper Spotter" videos.

B. Practical Training for New Spotters. Spotter trainees must complete at least four actual spotter fire missions, including cargo dropping, under the supervision of a qualified spotter trainer before receiving base manager authorization for unsupervised operational missions. Practical training experience must include the following topics.

1. Preflight inspection of aircraft equipment and smokejumpers.

2. Aircraft radio communications.

3. Ground reference navigation.

4. In-flight training in jump spot selection.

5. In-flight training to determine wind drift and jumper release points.

6. Spotting of actual training jumps under the supervision of a qualified check spotter.

7. Serving as spotter on fire missions under the supervision of a qualified check spotter.

8. Cargo dropping.

C. Refresher Spotter Training. Every fire season, each spotter shall complete at least one training jump and one paracargo mission before spotting operational missions. In addition, each spotter shall review loading procedures and ground and in-flight emergency procedures annually for each aircraft model assigned to the unit, and mixed load procedures. Annually, spotters shall receive refresher training in dispatch procedures, communications, and cargo dropping procedures.

D. Assistant Spotter Training. The assistant spotter shall have, as a minimum, the following training annually before performing in this position.

1. Familiarization with aircraft avionics.

2. Aircraft load configuration.

3. Emergency parachute procedures.

4. Aircraft emergency procedures.

5. Crew coordination.

6. Static line monitoring and equipment visual checks.

7. Administrative responsibilities.

8. Cargo dropping procedures.

E. Operational Procedures. Experienced spotters must learn all standard and emergency operating procedures for each aircraft model assigned to their unit. Operational procedures related to spotting and cargo dropping are in the Interagency Smokejumper Training Guide and Chapter 5 of this guide and the Mixed Load Procedures document The Missoula Technology Development Center prepares aircraft evaluation reports, including spotting procedures, for new aircraft recently added to the approved smokejumper and paracargo aircraft listing. Before spotting an aircraft model that a spotter is not already qualified to use, the spotter must receive the following preparation.

1. A ground briefing and in-flight training, as necessary, from the pilot and a spotter qualified in that model aircraft.

2. The base manager's approval. See Chapter 2 for qualification procedures.

F. Smokejumper Aircraft Contract Familiarization. When applicable, base managers and smokejumper spotters shall be familiar with the smokejumper aircraft contract and their roles and responsibilities related to the Contracting Officer Representative/Inspector. See FSH 5709.16 (Flight Operations Handbook), and Interagency Smokejumper Pilot Operations Guide for information concerning smokejumper participation in evaluating and recommending pilots for smokejumper and paracargo certification.

G. Crew Resource Management (CRM) Training. All spotters should attend a Washington Office approved Initial CRM course. CRM training is required prior to beginning additional training required for the spotter to occupy the right seat of a single-pilot smokejumper aircraft as spotter or loadmaster on operational mission flights. Recurrent CRM training is required every 3 years. See FSH 5709.16; 20.5, (definitions), 21.1 paragraph 8, (CRM training) and 21.6 (CRM training).

V. Emergency Medical Training. Units should make emergency medical technician training, cardiopulmonary resuscitation (CPR), and other emergency medical training available to employees based on unit need.

VI. Smokejumper Proficiency Training Requirements. Once trained at the beginning of each fire season, jumpers must maintain peak parachuting skills. Base managers shall ensure that jumpers maintain parachuting proficiency throughout the fire season. Smokejumpers should make proficiency or operational parachute jumps every 14 days, if possible. Proficiency jumps are mandatory every 30 days if, there are no operational jumps during that period. It also may be desirable to keep key personnel jump proficient during the off-season.

VII. Smokejumper Pilot Training. The National Smokejumper Aircraft Contract, FSH 5709.16, and Interagency Smokejumper Pilot Operations Guide documents smokejumper and paracargo pilot qualifications. All smokejumper pilots not previously approved for smokejumping shall complete an initial course of formal training, following procedures outlined in the Smokejumper Paracargo Operations,

and Mountain Flying sections of the Interagency Smokejumper Pilot Operations Guide, and the Professional Smokejumper Pilot Video. Designated smokejumper spotters shall participate in the final evaluation check ride for qualifying pilots to perform the smokejumper and paracargo mission.

VIII. Parachute Rigger Training. This training must provide employees with exposure to basic parachute care procedures and provide the minimum knowledge and experience necessary for rigging. Practical training must include supervised rigging of at least 20 main backpack parachutes that the Forest Service uses. Such training must occur before employees may pack parachutes for operational use under the supervision of an appropriately rated FAA licensed rigger. Such training does not qualify trainees for a Federal Aviation Administration (FAA) parachute rigger certificate. Only appropriately rated FAA riggers shall pack emergency parachutes. Parachute riggers shall be certificated in accordance with Federal Aviation Regulations, part 65.

IX. Federal Aviation Administration Regulations. Parachute riggers must be familiar with the following parts of the Federal Aviation Regulations and Exemptions that pertain to parachute loft operations:

A. Part 65, Parachute Rigger Certificate.

B. Part 91, Parachute and Parachuting.

C. Part 105, Parachute Jumping.

D. Parts applicable to FAA Technical Standard Orders (FAA-TSO-C23d; AS-8015B).

E. FAA Grants of Exemption Numbers 392 and 392A (FSM 5716.11).

Chapter 4 - Equipment

I. Smokejumper and Paracargo Aircraft.

A. General Requirements. Aircraft used in smokejumper and paracargo operations must be the best available for efficiency, performance, and suitability for the specialized flying required. Each aircraft selected must meet certain performance and payload requirements, be compatible with safe use of smokejumper personnel and cargo parachutes, and be properly equipped with accessories to perform smokejumping and paracargo missions. Smokejumper aircraft are selected and approved through the well-defined and structured process described in this section.

B. Types of Suitable Aircraft. Use only aircraft for smokejumper and paracargo operations that the Forest Service has evaluated for that purpose and approved as qualified smokejumper and paracargo aircraft.

C. Smokejumper Aircraft Evaluation. Only aircraft "approved" using a formal evaluation process using prescribed procedures can be used for the smokejumper delivery mission. Field units usually request this evaluation when fire management planning indicates a need for an aircraft of a certain size, airspeed, or configuration, and existing approved aircraft that meet the needed requirement are not readily available. Field units also may request an evaluation when a new aircraft model enters the market that appears to provide favorable cost benefits compared to currently approved aircraft. The Washington Office, Fire and Aviation Management must approve aircraft evaluation requests and shall provide the necessary funding.

D. The Smokejumper Aircraft Screening and Evaluation Board (SASEB). The Smokejumper Aircraft Screening and Evaluation Board (SASEB) includes smokejumper and aviation management personnel from the USDA Forest Service, the USDI Bureau of Land Management, and the USDI Office of Aircraft Services. SASEB has been assigned responsibility to recommend policies for minimum smokejumping aircraft requirements to appropriate agency managers. SASEB then maintains documents that define minimum requirements for smokejumping aircraft. Smokejumping aircraft used by the Forest Service must meet the established SASEB minimum requirements.

E. Smokejumper Aircraft Evaluation Process. A smokejumper aircraft evaluation is structured to determine if a candidate aircraft meets the minimum SASEB requirements for smokejumping aircraft. Smokejumper aircraft evaluations must conform with the most current version of the September 1982 Missoula Technology and Development Center (MTDC) publication "Smokejumper Aircraft Evaluation Plan" (8251 2809) and subsequent revisions. This document is maintained by MTDC; periodic revisions of this document are reviewed by the SASEB group and approved by WO-F&AM. This evaluation plan insures that candidate aircraft meet the minimum SASEB requirements for a smokejumping aircraft.

F. Aircraft Sponsor's Preliminary Investigation. A smokejumper or aviation organization interested in sponsoring a specific aircraft for evaluation must conduct an investigation and prepare a preliminary investigation report using the outline in the MTDC "Smokejumper Aircraft Evaluation Plan."

G. Evaluation Director. The unit that the Washington Office, Fire and Aviation Management, assigns responsibility for the evaluation (usually MTDC) shall appoint the evaluation director. The evaluation director shall conduct the evaluation according to the evaluation plan, coordinate, schedule, select evaluation personnel, plan logistics, oversee the design of special smokejumping accessories, and prepare required reports. The evaluation director shall brief all evaluation personnel on their duties and responsibilities. The evaluation director has the authority to modify, extend, or terminate all testing.

H. Field Evaluation. The first season of a new smokejumper aircraft's operation is used as a field evaluation. The smokejumper base manager where the aircraft is assigned shall be the field evaluation conductor. The field evaluation conductor is responsible for operating the aircraft as the preliminary operational guidelines describe, and for refining or modifying those guidelines appropriately as experience is gained in operating the aircraft. After concluding the field evaluation, the field evaluation conductor shall provide the evaluation director with a report containing the following information:

1. Extent of aircraft use.

2. Smokejumper mission flight performance.

3. Accessory evaluation.

4. Optimum load configuration.

5. Optimum operational procedures.

I. Final Report. After completing all required evaluations, the evaluation director shall publish a final report, usually as a MTDC publication. This report provides aviation management with documentation concerning the evaluation aircraft's suitability to perform the smokejumper and paracargo mission. The report must include the following information:

1. Basic aircraft configuration and performance.

2. Preparation for airdrop.

3. Smokejumper flight performance data.

4. Operational and emergency procedures.

J. Final Approval. The Smokejumper Aircraft Screening and Evaluation Board shall review the final report after the aircraft evaluation and shall recommend to the Director, Fire and Aviation Management, Washington Office, and the Director, Office of Aircraft Services, Department of the Interior, whether to accept or reject the aircraft as an approved smokejumper platform. These directors are responsible for final aircraft and accessory approval. All essential information and procedures

developed for each new aircraft must become part of the Interagency Smokejumper Training Guide following Fire and Aviation Management, Washington Office approval.

K. Minimum Requirements for Smokejumper and Paracargo Aircraft. Smokejumping aircraft must meet minimum SASEB requirements for physical configuration, performance, compatibility with smokejumping procedures and parachutes, and the strength of various special smokejumping accessories.

L. SASEB Minimum Requirements for Smokejumper Aircraft. Minimum SASEB requirements for approved smokejumper aircraft are as follows:

1. All Aircraft:

a. FAA Certified as a Normal or Transport Category Aircraft.

b. FAA approved to fly with the jumper exit door open or removed.

c. Airspeed at 1.3 V stall (jump configuration) not to exceed 115 Kt.

d. Jumper exit door at least 25 inches wide and 36 inches high.

e. Maximum safe jump speed of less than 115 miles per hour.

f. Jumper exit door opening flush with the floor.

g. Acceptable pilot and spotter visibility for intended missions.

h. Compliance with Occupational Safety and Health Administration standards for acceptable exhaust fume levels with the jumper exit door removed.

i. Compatible with seats or benches suitable for seating and restraining fully suited smokejumpers. With fully suited smokejumpers, these seats or benches need to meet the strength requirements of CFR Part 23 and TSO 39a, Type II. (9 g's fore and aft, 7 g's down, and 3 g's sideways).

j. The following approved installations are required:

(1) Structural and functional static line anchor cable installation suitable for use with standard Forest Service (and BLM) personnel parachutes.

(2) Emergency exit static line anchor cable.

(3) Cargo dropper tether anchor system.

(4) Cargo static line anchor system compatible with standard Forest Service (and BLM) cargo parachutes.

(5) Cargo tie-down facilities.

(6) Door safety strap.

(7) Smokejumper exit step on multi-engine aircraft with a door height less than 52 inches.

(8) Protection from any sharp corners and projections that might snag smokejumpers, static-lines, parachutes, or cargo near the door and step, along the fuselage aft of the jump door, and under the fuselage.

(9) Standard audio and visual spotter-to-pilot communications system.

2. Multi-engine Aircraft:

a. Ability to achieve a single engine (critical engine inoperative) rate of climb of 50 ft/min at 9,000 feet density altitude at maximum gross weight, or at that lesser gross weight figure established to meet the requirements of paragraph (2) below.

b. Ability to achieve a single engine climb capability of +.6 per cent or better at 5,000 feet pressure altitude and at 81 degrees F, with 2 ½ hours fuel on board, with no more than a 25 per cent reduction in useful load. This ability shall be achievable with the aircraft in the following configuration: Critical engine inoperative and the propeller of that engine feathered (or pitch set to the minimum drag position) with landing gear retracted (if equipped with retractable gear).

3. Single Engine Aircraft:

a. Payload capability sufficient for two jumpers, their equipment, and a spotter, while carrying 2 1/2 hours fuel.

b. Power loading at maximum certificated gross weight of 13.2 lbs. per horsepower or less.

c. Supercharged, if equipped with a reciprocating engine.

M. Strength Requirements for Smokejumper Aircraft Accessories. To insure safety, strength requirements have been established by SASEB for smokejumping aircraft accessories. These requirements insure that accessory designs possess adequate strength for worst case scenarios. Note: In addition to being adequately strong, the configuration of smokejumper aircraft accessories must be compatible with standard smokejumper static-line hookup procedures, exiting procedures, and deployment of standard Forest Service personnel and cargo parachutes.

1. Primary Exit Static Line Anchor. The primary exit static line anchor requires a 2,000-pound Supplemental Type Certificate (STC). This requirement is based upon the loads anticipated if a smokejumper is taken into tow. Energy absorbing devices may be used to control cable slack, but are not used to reduce the STC strength requirement because a multiple load may

2. **Emergency Exit Static Line Anchor System**. An emergency exit static line anchor must be STC-certificated for 750 pounds unless using an equivalent energy-absorbing design. An energy-absorbing design must provide load absorption as follows. The emergency exit anchor system must be STC-certificated for at least 500 pounds, when using an appropriate energy-absorbing design. The strength requirement for an emergency exit anchor anticipates that the worst case load likely to occur during an emergency exit is a static-line misroute, not a jumper taken into tow.

Energy to be absorbed:

STC load	Pull test load	By shock absorber
750 lbs.	1,125 lbs.	0 ft. lbs.
700 lbs.	1,050 lbs.	25 ft. lbs.
650 lbs.	975 lbs.	44 ft. lbs.
600 lbs.	900 lbs.	62 ft. lbs.
550 lbs.	825 lbs.	78 ft. lbs.
500 lbs.	750 lbs.	93 ft. lbs.

3. **Cargo Static Line Anchor System**. A cargo static line anchor system must withstand a 1,125-pound pull unless using an energy absorbing design. Load requirements for equivalent energy-absorbing designs are shown in the following table. The cargo static line anchor system must withstand at least 750 pounds of pull with an equivalent energy-absorbing design. Use the FAA 337 procedure to install these systems. A pull test to demonstrate strength is not mandatory if an engineering structural analysis of the design is prepared. The strength requirement for a cargo static line anchor is based upon the strength needed to exceed the strength of the standard weak link included in all smokejumper cargo parachute static lines.

Energy to be absorbed:

Load requirements	By shock absorber
1,125 lbs.	0 ft. lbs.
1,050 lbs.	25 ft. lbs.
975 lbs.	44 ft. lbs.
900 lbs.	62 ft. lbs.
825 lbs.	78 ft. lbs.
750 lbs.	93 ft. lbs.

4. **Cargo Dropper Tether Anchor System**. A cargo dropper tether anchor system must be STC-certificated for 750 pounds unless using an energy absorbing design. An energy-absorbing design provides load absorption as follows. The cargo dropper tether anchor system must be STC- certificated for at least 400 pounds when using an appropriate energy-absorbing design. The strength requirement for a tether anchor is based upon worst-case loads measured in tests that simulated a cargo dropper falling and putting a maximum load on a tether anchor.

   Energy to be absorbed:

STC Load	Pull test load	By shock absorber
750 lbs.	1,125 lbs.	0 ft. lbs.
700 lbs.	1,050 lbs.	25 ft. lbs.
650 lbs.	975 lbs.	44 ft. lbs.
600 lbs.	900 lbs.	62 ft. lbs.
550 lbs.	825 lbs.	78 ft. lbs.
500 lbs.	750 lbs.	93 ft. lbs.
450 lbs.	765 lbs.	106 ft. lbs.
400 lbs.	600 lbs.	118 ft. lbs.

5. **Number of Anchor Systems**. All smokejumper aircraft shall have at least two designated anchor systems, and personnel shall not be tethered to anchor points used for routine personnel or cargo delivery. An exception to this is operations involving ram air parachutes.

6. **Jump Step**. Jump step installations in smokejumper aircraft must withstand 2 g forces during an exit by a 300-pound jumper.

7. **Jump Step Ladder**. When a stepladder is suspended from the jump door sill or step for loading passengers, it must withstand 1-1/2 g forces by a 300-pound jumper.

N. Drawings that Control Smokejumper and Paracargo Aircraft Accessories. The Forest Service has approved certain smokejumper aircraft accessory designs for use in smokejumping aircraft. Approved items are identified by drawings or specifications prepared and maintained by the Missoula Technology & Development Center (MTDC), or specified by directives that the Director, Fire and Aviation Management, issued for this purpose. Do not use any alternate equipment for smokejumper or paracargo delivery other than the equipment shown in these drawings and specifications unless the Forest Service has evaluated and approved it for that purpose or unless it has the Washington Office, Fire and Aviation Management's written approval for field use (FSM 7120).

1. **Twin Otter**.

   a. **Primary Vertical Anchor**: MEDC 650- Anchor cable for Twin Otter 100, 200, 300 Series Aircraft (STC Strength 2,000 pounds, STC # SA210RM).

b. Secondary Horizontal Anchor: MEDC-753- Twin Otter Tether/Emergency Horizontal (STC Strength 750 pounds, STC # SA2751NM).

c. Jump Step & Step Attachment and Other Accessories: MEDC-759- Step Basket (universal) Smokejumper Aircraft. MEDC-794- Universal Step Strut. MEDC-784- Smokejumper Equipment for Twin Otter A/C. MEDC-805- Aft track Segment for Twin Otter.

d. SJ Restraint Bench Adapter: Simula Inc. dwg 101649 (available from MTDC).

e. Special Use Twin Otter Accessories (not required for SJ Configuration): MEDC-681- Anchor Cable, Horizontal, Twin Otter (STC Strength 750 pounds, STC # SA1615NM).

2. Beech 90.

a. Primary Floor Anchor: MEDC-617- Anchor cable for Beech 90, 99, 100, & 200 & Nomad N24A Series Aircraft (STC Strength 2,000 pounds, STC # SA566NW) Note: There is no secondary anchor design for the Beech 90.

b. Other Accessories: MEDC-643- Handrail & Wind Deflector for Beech 90, 99, 100, & 200 Series Aircraft, MEDC-644 Floor Panels for Beechcraft 90, 99, 100 & 200 Series Aircraft.

c. Jump Step & Attachment: Jump step not used on Beech 90.

d. SJ Restraint Bench Adapter: Simula Inc. dwg 101649 (available from MTDC).

3. Beech 99a.

a. Primary Floor Anchor: MEDC-617- Anchor cable for Beech 90, 99, 100, & 200 & Nomad N24A Series Aircraft (STC Strength 2,000 pounds, STC # SA566NW).

b. Secondary Anchor: MTDC-809- Horizontal Anchor Track for Beech 99A (STC Strength 750 pounds, STC # SA4047NM).

c. Other Accessories: MEDC-643- Handrail & Wind Deflector for Beech 90, 99, 100, & 200 Series Aircraft, MEDC-644 Floor Panels for Beechcraft 90, 99, 100 & 200 Series Aircraft.

d. Jump Step & Attachment: MEDC-759- Step Basket (universal), Smokejumper Aircraft, MEDC-794- Universal Step Strut, MEDC-785 Jump Step Attachment Points, Beech 99.

e. SJ Restraint Bench Adapter: Simula Inc. dwg 101649 (available from MTDC).

f. Door Brace: The Beech 99 requires a door brace between the aft air stair door and the forward jump door. Contact MTDC for information about this accessory.

4. King Air 200.

a. Primary Floor Anchor: MEDC-617- Anchor cable for Beech 90, 99, 100, & 200 & Nomad N24A Series Aircraft (STC Strength 2,000 pounds, STC # SA566NW).

b. Secondary Anchor: Pending.

c. Other Accessories: MEDC-643- Handrail & Wind Deflector for Beech 90, 99, 100, & 200 Series Aircraft (MEDC-644 Floor Panels for Beechcraft 90, 99, 100 & 200 Series Aircraft).

d. Jump Step & Attachment: MEDC-759- Step basket (universal), Smokejumper Aircraft (MEDC-794- Universal Step Strut). Contact MTDC for information about step attachment configuration for the King Air 200.

e. SJ Restraint Bench Adapter: Simula Inc. dwg 101649 (available from MTDC).

5. DC-3TP.

a. Primary Overhead Anchor Cable: MTDC-884- Horizontal Anchor Assembly (Primary Strength 2,000 pounds, STC # ST00372DE).

b. Secondary Overhead Anchor Cable: Basler Turbo Conversions *dwg #5130 (15 sheets, Strength 750 pounds, STC # ST00372DE NA, *Basler Turbo Conversions, Inc., P.O. Box 2305, Oshkosh, WI 54903-2305, (414)-236-7820).

c. Cargo Floor Mount Anchor Cable: MTDC-883- Cargo Anchor Assembly Floor DC-3 (STC Strength 750 pounds, STC # ST00372DE).

d. Handrails: MTDC-885- Handrail & Communication Box Guard.

e. SJ Restraint Bench Adapter: Simula Inc. dwg 101649 (available from MTDC).

6. Volpar.

a. Primary Vertical Anchor & Floor Platform: MEDC-747- Primary Vertical Static-line Anchor (STC Strength 2,000 pounds, STC # SA1599NM).

b. Secondary Horizontal Anchor: MEDC-758- Volpar Horizontal Anchor Track (STC Strength 750 pounds, STC # SA2740NM).

c. Jump Step & Attachment: MEDC-799- Volpar Step, MEDC-794- Universal Step Strut.

d. SJ Restraint Bench Adapter: Simula Inc. dwg 101649 (available from MTDC).

7. CASA 212.

a. Primary Vertical Anchor: MEDC-760- Vertical Anchor Cable Casa 212 Aircraft (STC Strength 2,000 pounds, STC # SA3888NM), MTDC-836- Secondary Support Strut for Casa 212 Vertical Anchor Cable.

b. Secondary Horizontal Anchor: Casa Factory Design.

c. SJ Restraint Bench Adapter: Simula Inc. dwg 101649 (available from MTDC), SJ Restraint Bench Adapter: MTDC 894.

8. Embraer Bandeirante (Emb 110).

a. Primary Vertical Anchor: MEDC-732- Vertical Anchor Cable for Bandeirante (An identical anchor to MTDC-732 can be provided as an Embraer factory installation. This anchor is shown on Embraer drawing 110K1-948-11-05 (6 sheets, No Rev.). (STC Strength 2,000 pounds, STC # SA1577NM).

b. Secondary Horizontal Anchor: The approved anchor is an Embraer design that is available as an Embraer factory option. This anchor is shown on Embraer drawings (Sheet 1 of 3, 110K1-948-10 Rev.N; Sheet 2 of 3, 110K1-948-10 Rev.N; Sheet 3 of 3, 110K1-948-10 Rev.L; (Strength 750 pounds, STC # NA - Factory Installation).

c. Floor Platform & Handrails.

d. Jump Step & Attachment: MEDC-739- Floor, Platform & Smokejumper Step & Bracket for Bandeirante Aircraft.

e. SJ Restraint Bench: Simula Inc. dwg 101649 (available from MTDC).

f. SJ Bench Adapter (reserved).

9. Cessna 208 Caravan.

a. Primary Vertical Anchor: MEDC-804- Vertical Anchor Cable for Cessna 208 (STC Strength 2,000 pounds, STC # pending).

b. Secondary Horizontal Anchor: MEDC-791- Horizontal Cable Shock Absorber for Cessna 208, MEDC-808- Cessna 208 Caravan Horizontal Anchor cable--Forward attachment Point (STC Strength 750 pounds, STC # Pending).

c. Jump Door, Jump Step, & Step Attachment: MEDC-759- Step basket (universal), Smokejumper Aircraft, MEDC-794- Universal Step Strut, MEDC-792-Cessna 208 Jump door (STC # Pending).

d. SJ Restraint System: (reserved).

10. Dornier 228.

a. Primary Vertical Anchor: MTDC-833- Vertical Anchor, Dornier 228 (STC Strength 2,000 pounds, STC # SA5221NM).

b. Secondary Horizontal Anchor: MTDC-854- Dornier 228 Horizontal Anchor (STC Strength 750 pounds, STC # SA5241NM).

c. Step & Step Attachment: MTDC-871- Dornier Step & Hand-hold Ass'y, MTDC-872- Step Basket Dornier 228, MEDC-794- Universal Step Strut.

d. Handrails: MTDC-873- Dornier 228 Door Guard & Secondary Forward Handrail.

e. SJ Restraint Bench Adapter: Simula Inc. dwg 101649 (available from MTDC).

11. C-23.

a. Primary Vertical Anchor: MTDC-877- Vertical Anchor for C-23 (Strength 2,000 pounds, STC # NA) (C-23 is not a certified A/C).

b. Secondary Horizontal Anchor: MTDC-896 C-23 Horizontal Anchor Ass'y, MTDC-895 C-23 Anchor & Shock Absorber Ass'y (Strength 750 pounds, STC # NA) (C-23 is not a certified A/C).

c. Handrails: MTDC-868- C-23 Handrails.

d. Tailgate Gear Box: MTDC-881- C-23 Cargo Bin.

e. SJ Restraint Bench: Simula Inc. dwg 101649 (available from MTDC).

f. SJ Bench Adapter: MTDC 891.

12. Universal Accessories.

a. MEDC-759- Step basket (universal), Smokejumper Aircraft.

b. MEDC-794- Universal Step Strut.

c. Simula Inc. 101649 - Smokejumper Restraint Bench (available from MTDC).

O. SASEB Approved Smokejumper and Paracargo Aircraft. The Forest Service and the Department of the Interior, Office of Aircraft Services, use a common list of approved smokejumper aircraft. This list is maintained by the Smokejumper Screening and Evaluation Board (SASEB). For an aircraft to be on this interagency approved list, it must have been formally evaluated using the process described above, and have successfully demonstrated suitability for the smokejumper mission. Approved accessories necessary to configure the aircraft for smokejumping must be available. Within the Forest Service, only approved smokejumper aircraft may be used for paracargo operations. Following is the SASEB list of approved smokejumping aircraft;

1. Douglas DC-3 and Basler Conversion Turbine DC-3.

2. DeHavilland Caribou, DHC-4A.

3. Short, SC-7 Skyvan, series 3.

4. Beech, 99A and subsequent series.

5. Beech, King Air 200.

6. Beech, King Air 90B and subsequent series.

7. DeHavilland Twin Otter, DHC-6, 100, 200, and 300 series.

8. Volpar Turbo liner, II.

9. Casa 212.

10. Embraer, Bandeirante 110.

11. Dornier 228.

12. Shorts C23A.

P. Approval Revocation. When necessary the Smokejumper Aircraft Screening and Evaluation Board (SASEB) shall recommend removing specific models of aircraft from the approved list. The SASEB procedure for removing an aircraft from the approved list is shown below;

1. Written documentation from a user agency to SASEB indicating they have a specific problem with an aircraft. Following this notification, all user groups shall receive a letter asking for information about the proposed revocation.

2. Document contract availability problems, lack of contract competition, operational deficiencies, maintenance history, accident information, and airworthiness considerations that indicate aircraft unreliability.

3. Review of historical, contracting, and use records to determine actual user reliance on each aircraft and to ensure that an aircraft to be removed is not essential to the program or is so cost prohibitive that approval continuation is impractical and unrealistic.

4. Consider the possible modification potential of the aircraft, such as a turbine engine installation, that might make it more effective and attractive to users with documented results.

5. Evaluate the utilization and operational effectiveness of the aircraft related to current agency safety and use policies with documented results.

6. Provide recommendations to agency directors.

II. Smokejumper and Paracargo Equipment.

A. General Requirements. For personnel safety and easy interchange of smokejumpers among units, smokejumper and paracargo delivery equipment and procedures must be standard among all units. It must be functional, technically sound, and essential to the task.

B. Standards and Requirements for Smokejumper and Paracargo Equipment. To insure safety, strength, and operational suitability, standards and requirements have been established for various items of smokejumping equipment. Standards and requirements that apply to smokejumping equipment;

1. **Main Parachute**. A main parachute must be a military design manufactured under a military quality assurance system, or an approved Forest Service design manufactured under a Forest Service quality assurance system.

2. **Reserve/Emergency Chest Pack Parachute**. This parachute must be FAA certified, a military design manufactured under a military quality assurance system, or an approved Forest Service design manufactured under a Forest Service quality assurance system.

3. **Emergency Backpack Parachute**. This parachute must be FAA certified, a military design manufactured under a military quality assurance system, or an approved Forest Service design manufactured under a Forest Service quality assurance system. The Forest Service FS-12R canopy may be installed in the Strong Enterprises ParaCushion harness and container system for use as a Forest Service emergency backpack parachute.

4. **Cargo Parachutes**. All cargo parachutes must include the following features: A 15-foot yellow static-line with approved weak link stitching at the snap end, a MS-70120 static-line snap, and a lines-first deployment configuration.

5. **Smokejumper Helmet**. The helmet must be a high-impact type meeting one of the following standards: Snell RS-98, Protective Headgear for Recreational Skiing and Snowboarding; ASTM F2040, Standard Specification for Helmets Used for Recreational Snow Sports; or USA Standards Institute Z90.1-1966 Impact and Penetration Requirements. The helmet must have a chinstrap with a quick release and a wire mesh face shield.

6. **Boots**. Western logger-style leather boots with minimum 1-inch heels, 8- inch tops. Built-in arch supports, and nonskid composition or rubber soles are required. Steel toed, caulked or hobnailed soles are not permitted.

7. **Gloves**. Personnel shall wear snug, pliable leather and nomex aviation-style gloves on all parachute jumps and letdowns.

8. **Letdown Line**. The letdown line must be constructed of nylon tubular webbing, specification MIL-W-5625, with a minimum width of 3/4 inch and a minimum tensile strength of 2,300 pounds when new. Permanently mark the length in feet; use letters at least 1/2-inch high within 6 inches from the end. Dye at least 20 feet of one end yellow or red to alert the jumper that the end is approaching when making letdowns.

9. **Tree Climbing Spurs**. The spur gaff length depends on the major timber type. The minimum gaff length is 1-1/2 inches.

10. **Tree Climbing Rope**. A steel core rope is necessary for larger trees when a chain saw or chopping tools are used.

11. **Ankle Braces**. Aircast over the boot ankle braces are required on all parachute jumps. The braces come in three different sizes, Small, Medium , and Large, and can be ordered from Aircast Inc.

C. Drawings that Control Smokejumper and Paracargo Equipment. The Forest Service has approved certain items of specialized smokejumper equipment for Forest Service use. Approved items are identified by either drawings or specifications prepared by the Missoula Technology and Development Center (MTDC), or by directives that the Director, Fire and Aviation Management issued for this purpose. Do not use any alternate equipment for smokejumper or paracargo delivery other than the equipment shown in these drawings and specifications unless the Forest Service has evaluated and approved it for that purpose, or unless it has the Washington Office, Fire and Aviation Management's written approval for field use (FSM 7120). List of the Forest Service drawings and specifications that control smokejumper equipment;

1. MEDC 756 - FS-14 parachute system assembly.

2. MEDC 734 - Parachute canopy, type FS-14.

3. MEDC 648 - Riser, FS-14 parachute.

4. MEDC 555 - Riser connector, FS-10 main parachute assembly and instructions.

5. MEDC 425 - Toggle, control line, personnel steerable parachute.

6. MEDC 763 - FS-14 pack-tray waist strap modification.

7. MEDC 381 - Static line, SJ personnel parachute (FS-10).

8. MEDC 382 - Deployment bag, SJ personnel parachute (FS-10).

9. MEDC 376 - Container assembly, Smokejumper personnel parachute (FS-10).

10. Butler Parachutes Lopo 550 Reserve Parachute.

11. MTDC 992 - Container, chest pack parachute, model FS-14R.

12. MEDC 723 - Curved closing pin (FS-12R).

13. MEDC 764 - Harness assembly, model H-5.

14. MEDC 399 - Mask and helmet assembly.

15. MEDC 398 – Mask, smokejumper.

16. MEDC 754 - Patterns, trousers, smokejumper suit, sizes: XS, S, M, L.

17. MEDC 755 - Patterns, jackets, smokejumper suit, sizes: XS, S, M, L.

18. MTDC 812 - Spotter tether, H-5.

19. MTDC 813 – ParaCushion tether harness.

20. MEDC 762 - Wind drift indicator for FS-14 parachute.

21. MEDC 740 - Cargo static line weak link

22. MTDC 922 – Parachute Canopy Type, FS-14.

23. MTDC 926 – FS-14 Riser and Riser Cross-Connector.

24. Specification 5100 542f--suit, Smokejumper, Protective, SJ.

25. Deployment Bag. US Air Force drawing 56D6276.

26. Pack Tray. US Air Force drawing 52E6269.

D. Standard Smokejumper and Paracargo Equipment Products. Certain equipment items used for smokejumper and paracargo missions are products of military or industrial design. Although not controlled by Forest Service drawings or specifications, the use of this equipment is mandatory and standardized Service-wide. Do not use any alternate equipment for smokejumping or paracargo delivery other than these standardized products unless the Forest Service has evaluated and approved it for that purpose or unless it has Washington Office, Fire and Aviation Management's written approval for field use. List of standardized smokejumper and paracargo equipment products;

1. Emergency Backpack Parachute. The Strong Enterprises ParaCushion and the Butler XTC 500 are approved emergency backpack parachutes for the smokejumper and paracargo program.

2. Reserve Knife. Personnel shall use Jack the Ripper hook knife Service-wide. It is available from Para-Gear at the following address: Para-Gear 3839 West Oakton Street Skokie, IL 60076 (312) 679-5905 1-800-323-0437.

3. Smokejumper Parachute Maneuvering Simulator. This computer simulator is available from System Technology, Inc., 13766 South Hawthorne Boulevard, Hawthorne, California 90250-7083.

E. Equipment Development. Because of the inherent risks associated with smokejumper and paracargo delivery, and the need for Service-wide standardization of equipment and operating procedures, professional development work is essential to provide optimum smokejumping equipment. Proper evaluation, testing, and controlled development have resulted in standardized smokejumper and paracargo equipment designs. This has significantly reduced the risks associated with parachute delivery of personnel and equipment. The Missoula Technology and Development Center (MTDC) develops smokejumper and paracargo equipment for the Forest Service at the request of, and under the authority of, the Washington Office, Fire and Aviation Management.

F. Equipment Development Committee. The Director, Fire and Aviation Management recognizes the smokejumper base managers as a smokejumper equipment development committee that performs the following functions:

1. Reviews all equipment innovation and proposals for development. The Smokejumper Council will forward recommendations to the National Smokejumper Program Manager for further consideration.

2. Provides field input and recommends priorities for smokejumper equipment development projects.

3. Provides field involvement and participation in an equipment development program, including serving as a contact point for equipment questionnaires and equipment review processes.

4. Provides input for identifying operational and technical requirements for new equipment.

5. Identifies problems resulting from field use of equipment.

6. Identifies standardization requirements for equipment and procedures to facilitate the interchange of personnel between units.

7. Reviews and recommends new smokejumper equipment for adoption.

G. Equipment Development Process. See FSM 7120, Equipment Development, for a detailed description of the equipment development process. A simplified description of the smokejumper and paracargo equipment process follows:

1. Recognition of equipment needs comes from many sources. It is possible to develop ideas or identify needs through accident reports, base manager meetings, the Smokejumper Aircraft Screening and Evaluation Board, employee suggestions, equipment committees, program and activity reviews, and management input from all levels.

2. Equipment ideas that receive Fire and Aviation Management approval, meet established objectives, and do not require significant funding are usually developed under the Smokejumper Technical Services Project, an ongoing project at the Missoula Technology and Development Center (MTDC). The MTDC Smokejumper Project Leader provides technical direction.

3. Development of equipment that requires significant funding is a more complicated process and must follow consistent criteria provided by the Division of Engineering. The Director, Fire and Aviation Management, also must review and approve these ideas. Development must comply with a project proposal that several organizational units review before development work begins. The WO-F&AM Management specialist responsible for the smokejumper program shall provide technical direction.

4. After projects receive funding and approval, the Missoula Technology and Development Center (MTDC) initiates development work. The actual work may occur in various ways, such as through MTDC personnel, field units under MTDC supervision, or contracts with industry or consultants. Work may take from a few months to several years to complete.

H. Smokejumper Equipment Development Files. A file of materials accumulated during smokejumper equipment development work is maintained at MTDC. This material includes reference documents, technical and operational requirements, test data, and a development history that enumerates information pertinent to the development of specialized equipment.

I. Field Development Work. Smokejumping units may accomplish some equipment development work when implementation of new equipment does not replace a standard equipment design controlled by an MTDC drawing, does not adversely affect safety, and does not conflict with standard operating procedures in service-wide or interagency smokejumping operations. The purpose of field development work may be to meet a local need; to meet a request for support of an ongoing development project at the Missoula Technology and Development Center (MTDC); or to accomplish a special development task when assigned with coordination and prior approval from WO-F&AM. Such work must comply with direction in FSM 7120, Equipment Development. This procedure ensures that the following conditions exist

1. Development objectives progress toward an established national goal for improved smokejumping equipment.

2. That smokejumper units have personnel who can accomplish the work safely; that the technical expertise needed to produce professional results is available at the smokejumping unit.

3. Duplication does not occur.

4. Ongoing work complies with funding available for Service-wide implementation.

5. Appropriate controls are maintained and appropriate data and records are kept.

6. Workloads assigned to field units comply with other project activities and assigned workloads.

Chapter 5 - Operating Procedures

I. Smokejumper Mission Requirements. Safe and efficient smokejumper delivery missions depend upon the proper execution of standardized procedures. Management of these procedures is the responsibility of various personnel in the smokejumper organization whose detailed instructions and close supervision are essential to safe mission accomplishment.

A. Assigned Spotter Responsibilities. The spotter shall perform a number of activities before takeoff. The spotter in charge of each mission should be clearly identified. The Interagency Smokejumper Pilot Operations Guide, provide additional detailed instructions on spotter responsibilities. These duties include the following:

1. Inventory and inspection of spotter's equipment.

2. Preflight inspection of aircraft equipment, door latches, static line anchor cables, cargo, load placement, restraint, and jump door edge and boot to insure a smooth surface.

3. Pilot briefing and avionics checks.

4. Ensure that jumpers are familiar with the aircraft, equipment, and procedures.

5. Perform spotter checks or assure buddy checks have been completed, personnel equipment inspection, loading, and restraint.

6. Load manifesting.

B. Pilot and Spotter Briefing. When a unit receives a fire call, designated personnel shall brief the pilot and spotter on the mission and flight hazards; provide them with area maps; inform them of flight routes and communications requirements; and furnish them with fire locations and other information regarding the mission. This information is often transmitted in written form; i.e., a Resource Order. The spotter shall ensure that the pilot is briefed on these items.

C. Aircraft Loading and Smokejumper and Paracargo Restraint. Each aircraft shall be loaded according to a plan that the local smokejumper unit formulates and the pilot approves. The following are the spotter's responsibilities and general considerations for performing the mission.

1. To ensure that the necessary cargo, emergency parachutes, and aircraft accessories are in place and functional and that spotter kits and miscellaneous equipment are on board and secure.

2. Spotters check shall be conducted of each jumper's equipment before jumpers board the aircraft.

3. To load jumpers into the aircraft in reverse order, so the first smokejumper to jump is nearest the door.

4. To ensure that cargo, personnel and P. G. bags are secure and that personnel and cargo locations maintain the aircraft's center of gravity during the entire flight.

5. To ensure that the pilot-to-spotter communications system functions.

6. To ensure that, when flying with the door off, smokejumpers wear protective jump suit and/or nomex pants and shirt, parachute, and boots.

	Door Off		Door On	
	Without FAA Seats	With FAA Seats	Without FAA Seats	With FAA Seats
Smokejumper Suit with Emergency Chute	X			
Smokejumper Harness and Emergency Chute		X		
Complete Smokejumper Suit			X	
Seatbelts and Cargo Restraint Utilized	X	X	X	X

7. During takeoffs, landings, and paracargo operations, jumpers shall wear gloves, and helmet with mask down and fastened. Spotters in the rear of the aircraft shall wear approved fire resistant clothing, gloves, and helmet. Approved seats and seat belts are mandatory for everyone on board the aircraft.

D. Spotter Emergency Equipment. Each spotter, and assistant spotter, shall wear an emergency parachute with tether or an approved tether harness with provisions for attaching an emergency chest pack parachute which shall be on board the aircraft.

1. Each spotter shall “pin check” the spotters emergency chute before use.

2. Each person wearing or having available to them an emergency parachute shall be thoroughly briefed in its use and hazards.

3. Each spotter shall wear an approved tether harness during spotting and cargo dropping operations. The tether harness should be attached only to adequate anchor points or auxiliary cables (see Chapter 4).

E. Spotter Footgear. Smokejumper spotter’s footgear must have uppers constructed of leather, be of a lace up design and have nonskid soles. The height of the footgear shall be such that there is a 2 inch overlap between the footgear and the fire resistant clothing in both the sitting and kneeling positions.

II. In-flight Procedures. The spotter shall be responsible for in-flight procedures, as outlined in the FSH 5709.16 (Flight Operations Handbook), Interagency Smokejumper Pilot Operations Guide, Professional Smokejumper Pilot and Spotters videos and the Interagency Smokejumper Training Guide.

A. Jump and Cargo Drop Spot Selection. The safety of jumpers and aircraft must be the primary consideration when the spotter selects jump spots and cargo drop zones. Fire behavior and safety shall be considered when selecting jump spots. The spotter also shall coordinate with the pilot to establish the flight pattern and location for dropping smokejumpers and paracargo. A low pass should be considered whenever there is any question as to the suitability of the jump spot. The pilot shall be the final authority on flight procedures and patterns. Before performing personnel jumps, the spotter shall brief the jumpers on jump spot selection, cargo drop zones, and fire safety.

B. Flight Patterns and Jump Altitude Determination. The spotter, with the pilot's concurrence, shall determine the flight pattern and initial altitude. Initial pattern altitude must be the estimated altitude that provides at least 1,500 feet of terrain clearance over the anticipated exit point.

C. Simultaneous Aircraft Operation. The spotter shall ascertain and confirm if other aircraft are assigned to the incident, will be operating in close proximity to each other, or will be traveling over the same route. Aircrews of the involved aircraft shall establish radio communication. If this is not possible, smokejumper operations must cease until the airspace is clear of other aircraft.

D. In-flight Door Removal. If an aircraft is equipped with an in-flight door, spotters shall receive training in its use. Specific aircraft may require an airspeed reduction before opening or removing the door. Opening or removal of the in-flight door shall be done with pilot approval and coordination.

E. Wind Drift and Altitude Determination. The spotter shall drop streamers to determine wind drift and to check aircraft altitude. The spotter shall use approved drift streamers and shall time their descent to determine that the aircraft is at least 1,500 feet above the exit point.

F. Incident Briefing. The spotter shall inform the jumper in charge of the radio frequency to use and the radio contact point on the ground (lookout, District Office); the route to the fire, fire tactics, and demob should also be discussed. The spotter shall provide the Smokejumper Request to the jumper in charge.

G. Hook-Up Procedures. Procedures prior to exiting should occur in the following order.

1. The spotter shall inform the pilot that the jumpers are ready to begin live drops.

2. The spotter shall signal jumpers to hook up.

3. Each jumper in the stick shall attach the parachute static line snap to the anchor cable, insert the safety pin and check to see that the static line is clear and properly routed.

4. The spotter shall conduct a visual check to ensure that each jumper's static line is stowed and routed properly, that the snap is attached correctly to the anchor cable, and that the snap safety pin is in place.

5. The spotter will release and stow the door strap and tell the first jumper to get in the door.

6. The spotter will conduct a pre-jump briefing. The briefing shall include as a minimum: jump spot location, wind information, jump pattern information and any identified hazards. The spotter shall ask each jumper if they have any questions.

7. The spotter shall conduct a final visual check of each jumper's harness snaps, the reserve parachute attachment, P.G. bag attachment and all protective equipment, ensuring that all is properly in place.

8. The spotter shall make a final visual check and verbally confirm with the jumper that the static line is clear.

H. Static Line Monitoring and Spotter Requirements. Closely monitoring jumper static lines during exits is essential to eliminate the potential for static line mis-routes. The following requirements shall apply.

1. Static line monitoring requires an a assistant spotter or a static line monitoring device on each smokejumper exit. This requirement only applies when two or more persons jump in a stick.

2. Each aircraft using standup exit procedures or approved for more than two jumpers per stick, shall have a spotter and assistant when dropping two or more jumpers.

I. Exit Signals.

1. Only the first jumper in each stick will receive a slap as the exit signal. The signal for the remaining jumpers in each stick will be the exit of the jumper immediately proceeding them.

2. The pilot will inform the spotter when they are turning final.

3. The spotter will give a verbal “get ready” command prior to signaling the first jumper in each stick to exit.

4. When the jump is from a standing position, the exit signal for the first jumper shall be a sharp slap on the leg or shoulder.

5. Only the lead jumper in a stick should receive the exit signal; all others follow in sequence unless aircraft or other requirements, such as the Smokejumper Mixed Load document, dictate using individual exit signals.

6. If a spotter does not want a jumper to exit, the spotter blocks the door with an arm or covers the jumper's face mask. This action informs the jumper that the jump is canceled for that pass.

III. Exit Procedures. Proper exit procedures are essential to successful smokejumper parachute delivery. Detailed instructions concerning exit procedures are found in the Interagency Smokejumper Training Guide. Compliance with established procedures is mandatory.

A. Standard Smokejumper Exits. All jumpers shall use the standard smokejumper exit approved for the specific aircraft being used.

B. Approved Exit/Maximum Number of Jumpers Exiting within a Stick. The door size and aircraft accessories determine the maximum number of jumpers per stick on all jumps. Operational, training, and emergency jumps shall conform with the following:

1. Large-door aircraft may use up to a three-person stick on operational and training jumps. The approved exit is a standing exit.

2. Small-door aircraft (less than 52 inches high) with an approved step may use up to two-person sticks on operational and training jumps. The approved exit is a step position exit.

3. In all aircraft, emergency jumps progress in a continuous fashion, as the spotter in charge directs.

IV. Emergency Procedures. Situations that require an emergency exit vary. The spotter shall be responsible for maintaining control during an emergency. Detailed instructions concerning emergency procedures are in the Interagency Smokejumper Training Guide.

A. Non-critical Emergency Exit. The pilot shall inform the spotter concerning the nature of the emergency and course of action. If an emergency exit is necessary, the spotter shall be responsible for maintaining control over the jumpers and for ensuring that the emergency exit is orderly and timely. Emergency exit procedures in a non-critical emergency usually are the same as those for a operational jump. In some cases, the spotter may even select a jump spot.

B. Critical Emergency Exit. The spotter must assume control in a critical emergency to ensure that exits proceed as smoothly and quickly as possible. The following sections discuss considerations and procedures for an emergency exit in a critical emergency.

1. **Center of Gravity Limitations**. A pilot cannot maintain adequate control of an aircraft with an aft center of gravity; therefore, spotters must not allow jumpers to rush toward the aircraft door, if they anticipate an emergency exit.

2. **Decision To Initiate Emergency Exit**. The pilot shall be the primary authority in matters pertaining to the aircraft's condition and the necessity for

an emergency exit. The pilot shall notify the spotter to initiate an emergency exit. Before initiating an emergency exit, the spotter must be certain that a crash is imminent and that the aircraft is high enough for a parachute to open. During a critical emergency exit from a smokejumper aircraft, gloves, helmets, and other protective equipment may be left behind.

3. **Critical Emergency Exit Procedures with Main Parachute**. If jumpers are wearing main parachutes when the pilot or spotter orders an exit, the jumpers shall use the designated emergency cable. They must not attempt to fasten the static line safety pin. Depending on the aircraft accessories, jumpers may need to keep one hand on the static line snap to guide it along the cable while moving toward the door. This prevents the main parachutes from opening accidentally in the aircraft.

4. **Exit Procedures with Reserve Parachute**. Jumpers shall jump with their emergency parachute when it is impractical to hook their static lines to the emergency cable or if they are not equipped with backpack parachutes.

C. Aircraft Crash on Takeoff. All personnel shall be prepared for an aircraft crash on takeoff. Jumpers and spotters shall use proper seating arrangements for the model aircraft used in the operation and must know where all the emergency exits are located and how to use them. If the aircraft crashes on takeoff, personnel shall evacuate the aircraft as soon as the aircraft stops moving. Be alert to jumpers and crewmembers who may have been hurt or incapacitated in the crash, and get them out quickly. Evacuate away from any fire that exists, depart the crash upwind, and account for all personnel.

D. Crash Landing Procedures. Whenever possible, follow the procedures below when a crash landing is imminent.

1. Put on helmet and gloves. Assume a fetal position, arms close to the body, with seat belt or restraint device snugly attached. Occupants of side-facing seating shall attempt to face 45 degrees to the front of the aircraft.

2. Restrict unnecessary movement in the aircraft, because the pilot's control of the aircraft may be very limited in an emergency situation.

3. Locate emergency escape hatches and equipment.

4. After a crash, vacate the aircraft quickly and in an orderly manner. Be alert to jumpers or crewmembers who may have been hurt or incapacitated in the crash, and get them out quickly. Evacuate and depart the aircraft upwind account for all personnel.

E. Aircraft Fire in Flight. The spotter and pilot shall make a coordinated decision concerning appropriate action if a fire occurs in flight. The spotter must maintain control of the situation and take aggressive action to control the fire. If the fire becomes uncontrollable, begin emergency evacuation procedures.

F. Other In-Flight Emergencies. Although the potential for a jumper in tow, or an inadvertent opening is extremely remote, procedures are addressed in the Interagency Smokejumper Training Guide.

V. Ground Procedures. Maintaining safe, efficient, and effective incident operations and post fire operations is imperative. Prior to taking action on any incident the jumper in charge shall ensure a thorough safety briefing is conducted. The briefing should take place at the jump spot and should include, travel route safety precautions (LCES).

A. Radio Communications. The jumper in charge shall have a radio. It is recommended that all jumpers be issued a radio.

1. Upon landing, the first jumper shall immediately contact the aircraft and inform the spotter whether conditions remain acceptable. If jump conditions differ from those originally anticipated, the spotter will reevaluate the conditions.

2. The jumper in charge shall inform the spotter when all jumpers are safely on the ground and ready to receive cargo.

3. As soon as possible, the jumper in charge shall establish communication with the local contact, provide a fire situation report and schedule check in times.

B. Ground-to-Air Signals. Each jumper shall carry at least two signal panels to signal the aircraft. If radio communication is not available, signal panels will be used for air to ground communication. Ground-to-air signal cards shall be placed in all packing data pocket of each parachute. The card must include both the Forest Service and Federal Aviation Administration ground-to-air signals. If jumpers land outside the established jumpspot, they will place an individual "L" signal panel to signal safety.

C. Jump Injury Procedures. If a jump injury occurs, the spotter will stop jump operations, assess the situation and take appropriate action.

1. Jumper in Charge Responsibilities.

a. Notify spotter.

b. Coordinate first aid, helispot construction and incident activities.

2. Spotter Responsibilities.

a. Maintain communication with jumper in charge, dispatch, and medivac transport.

b. Aircraft will remain on scene. If necessary, the pilot will land the aircraft to refuel, then return to the scene.

c. Drop all requested first aid supplies and medical personnel.

d. Direct medivac transport to scene.

3. Responsibilities of Medical Personnel.

   a. Assess patient.

   b. Render First Aid.

D. **Smokejumper Packout and Gear Retrieval**. Once jumpers are on the ground, they are a resource of the ordering unit. The jumper in charge shall coordinate demob with the ordering unit and follow their direction.

E. **Post Fire Reports**. The jumper in charge shall complete all required agency documentation including an Incident Organizer with Fire Report, Fire Time Reports, Injury Report, and Smokejumper Master Action Report and submit to the proper authority on completion of each fire assignment. The jumper in charge shall sign the time reports of all jumpers assigned to the incident and shall have their time report signed in accordance with local policy.

VI. Briefing and Use of Booster Aircraft, Pilots, Smokejumpers

In order to facilitate the mobility and use of smokejumpers, aircraft and pilots, the following procedures shall be followed.

A. **Aircraft Familiarization**. Smokejumpers shall receive an operational briefing on aircraft types they have not had training on during the current season. This briefing shall include but not be limited to the following items:

1. Personnel loading and restraint.

2. Hook-up and exit procedures.

3. Aircraft ground evacuation procedures.

4. Aircraft in-flight emergency hook-up and exit procedures.

5. Aircraft safety and emergency procedures briefing from pilot.

B. **Pilot Orientation and Operational Familiarization**. All new pilots shall receive a briefing before conducting flight operations from any given base. The briefing shall include, but not be limited to the following items.

1. Unit organization, staffing, and operation.

2. Dispatching, communications, and operational controls.

3. Aircraft loading, restraint, and manifest requirements.

4. Spotter coordination, cargo dropping commands and communications.

5. Operating area familiarization including local hazards and flight safety information.

6. Requirements and limitations on using backcountry airfields.

C. Smokejumper Orientation and Operational Familiarization. Each unit shall prepare an orientation package. Smokejumpers shall receive a briefing before being assigned to any incident. The briefing shall include information about the following areas.

1. Unit organization, staffing and operations.

2. Current fire situation and status and fire weather forecasts.

3. Smokejumper aircraft.

4. Fire call procedures.

5. Jump procedures.

6. Radio systems and communications procedures.

7. Fire management procedures and standards.

8. Equipment return procedures.

9. Work and PT schedules.

10. Timekeeping procedures.

11. Meals and lodging and transportation arrangements.

12. First aid equipment and procedures.

13. General policies.

VII. Reporting Parachute Malfunctions and Aircraft Incidents. Report all accidents and injuries to the base manager and complete documentation as requested. Report all aviation accidents and incidents on a SAFECOM form, and submit to the smokejumper base manager. The matrix below shall be used to determine responsibility for technical investigation of accidents and incidents.

	Accident		Incident	
	Fatality, 3 Or More Serious Injuries	Serious Injury, Fewer Than 3	With Potential	Lost Time Injury
*Investigation Responsibility (team assignments)	Chief	Deputy Chief, State and Private Forestry	National Director, Fire & Aviation Mgmt.	Regional Forester
Team Leader	Deputy/Associate Deputy Chief	Regional Forester	Regional Forester or QTI	I or S
**Chief Investigator	QTI	QTI	QTI	I or S
**Addition Team Members	QTI, I, S, Others as needed	QTI, S, Others as needed	As required	As required

* Regional Forester may appoint Regional members to the team.

** QTI = Qualified Technical Investigator assigned to investigation full time and responsible for final report.
I = Investigator.

S = Specialist, selected as appropriate for type of accident or incident.

Definitions for Incident With Potential and Serious Injury are found in FSM 5720.5.

Chapter 6 - Parachute Management & Loft Procedures

I. Parachute Loft Administration. Successful and safe smokejumper and paracargo delivery depends on proper parachute equipment management, including storage, packing, and maintenance. Units performing personnel and cargo delivery operations must adhere to special equipment requirements and standardized loft operating procedures. Operating properly supervised parachute lofts is a requirement for field units engaged in packing, repairing, and maintaining parachutes and parachute assemblies used for personnel and cargo delivery.

A. Loft Operating Requirements. Field units operating Forest Service parachute lofts must comply with the following requirements:

1. Supervision. Operate lofts under the direct administration of a full-time employee in each Region who meets the qualification requirements in Chapter 2 (B) of this guide concerning loft technicians.

2. Federal Aviation Administration (FAA) Regulation, Part 65. Operate all smokejumper base lofts according to the Federal Aviation Administration regulation, part 65.

3. Records Maintenance. Maintain loft records on all parachute equipment repaired, maintained, manufactured, modified, altered, or packed according to procedures that Federal Aviation Regulations and this guide specify. A master rigger shall supervise all major repair work performed.

4. Manufacturer Instructions. Pack, maintain, repair, or alter parachutes to comply with the manufacturer's instructions.

5. Industry Standards. Ensure that all repairs or other work accomplished in Forest Service lofts not covered in the above instructions comply with best industrial practice, and when applicable, with Federal Aviation Regulations.

B. Federal Aviation Administration Requirements. FAA Regulation, Part 65, establishes the personnel ratings authorized to maintain or alter parachutes, records of work accomplishment, personnel performing work, and other maintenance and materials standards. No work shall occur in Forest Service parachute lofts unless it complies with this regulation.

1. Personnel Authorization. The only personnel authorized to maintain or alter parachutes are listed below. Maintenance and alteration must be performed in accordance with approved manuals and specifications.

a. Personnel authorized by FAR Part 65.

b. The manufacturer.

2. Parachute Loft Equipment and Facilities. Requirements for parachute lofts include; having personnel appropriately certificated under FAR Part 65; and having the facilities, materials and necessary equipment. Necessary equipment

includes suitable housing that is adequately heated, lighted and ventilated, an adequate inspection system, adequate drawing equipment, and adequate facilities for segregating and storing parts and materials.

3. **Records and Reports**. Each parachute loft shall maintain the following records and reports:

   a. **Records**. Make an adequate record of all work performed, including the names of the persons doing the work. These records shall be kept for at least two years after the work is performed.

   b. **Reports**. Report any recurring or serious defect, or other un-airworthy conditions that are found in any parachute or parachute component to the smokejumper base manager.

4. **Maintenance and Alteration Standards**. Each parachute loft shall perform maintenance and alteration operations in a manner so as to maintain the article worked on in, or restore it to, an airworthy condition.

5. **Material Standards**. Each parachute loft shall use materials of proper strength and quality for the maintenance or alteration operation being performed.

6. **Drop Testing**. Drop testing may be conducted for any of the following reasons:

   a. **After Major Repairs**. Whenever a parachute or component has received a major repair or alteration, including the canopy, harness, container, accessory or any combination of them. When a Certificated Master Parachute Rigger who inspected it considers that the repair or alteration may have affected the structural, functional, or airworthiness characteristic of the article.

   b. **Functional Determination**. Whenever it is necessary to determine the functional characteristics of an entire parachute assembly, the loft shall drop test it at the appropriately determined weight, airspeed, and altitude.

   c. **Material Strength Determination**. Whenever it is necessary to determine the material strength values of an entire parachute assembly, or the material airworthiness of the entire assembly before maintenance, the loft shall drop test it at the appropriately determined weight, airspeed and altitude.

   d. **Field Development**. Any drop testing done for field development purposes must be approved by the NAASS and will be conducted in accordance with established equipment development procedures outlined in Chapter 4 of this guide.

C. **Record Keeping Requirements**. All Forest Service parachute lofts shall maintain, display, and have available the following records in proper order:

1. Master Parachute Log.

2. Individual Parachute Repair Records.

3. Certificated Rigger List.

4. Rigger's Logbook.

5. Parachute Inventory and Service- Life Records.

II. Parachute Management. Proper parachute inventory management and control is essential to safe personnel and cargo delivery. Loft personnel shall follow special procedures and administrative practices to ensure high quality parachute management.

A. Parachute and Equipment Procurement.

1. **Consolidated Procurement**. Procuring parachutes and specialized equipment by consolidating purchase requests reduces costs to the Government. Whenever possible, parachute procurement between units should be consolidated.

2. **Procurement Process**. The contract for procurement of parachute canopies and related equipment from commercial sources can be processed through Region 1, Administrative Services. Fire and Aviation Management personnel from the Washington Office shall coordinate procurement activities.

B. Parachute Service Life and Condemnation Standards.

1. **Manufacture Date**. The manufacture date of each parachute is stamped on the canopy data panel.

2. **In-Service Date**. The service life of all smokejumper personnel parachute canopies starts on the date the Forest Service places them in service. When placed in service, the in-service date is stamped next to the manufacture date on the canopy data panel.

3. **Main Canopies**. Main canopies can have no more than a 4.5 year shelf life prior to being put into service. Main canopies have a 12 year or 100 jump service life, whichever occurs first.

4. **Reserve and Emergency Canopies**. Reserve and emergency canopies can have no more than a 1.5 year shelf life prior to being put into service. Reserve and emergency canopies have a 13.5 year service life. In addition, if a reserve or emergency parachute is deployed in the last 1.5 years of its service life, then it should be removed from service.

5. **15 Year Limitation**. Remove all Forest Service personnel parachute canopies from service within 15 years of the manufacture date indicated on the canopy data panel, regardless of the above service life limitation.

6. **Airworthiness**. If, for any reason, the loft supervisor or a master rigger determines that a Forest Service personnel parachute canopy is not airworthy, then it must be immediately condemned for personnel use.

C. Parachute Cleaning and Storage. Loft personnel shall clean and store parachutes according to the following guidelines:

1. Cleaning. Normally, wash or clean only those parachutes with canopies that are pitchy or extremely muddy. Remove grease or oil with any commercial cleaning agent known to be harmless to parachute fabric.

a. Harnesses and Containers. Muddy containers and harnesses should be allowed to dry, then brushed clean.

b. Canopies. Wash canopies in a large tub or container with smooth sides and bottom. Use lukewarm water and mild soap. The amount of soap depends on the type and volume of foreign matter on the fabric. Canopies containing large amounts of sticky pitch require a heavy concentration of suds and often require several changes of soapy water. Wash by gently kneading the entire canopy, and follow by gently kneading the pitchy sections. Continue kneading until the water color indicates no more foreign matter is being dislodged. Thoroughly rinse the canopy, changing the water often enough to remove all traces of soap. Place the rinsed canopy in a seamless sack and suspend above the tub for one-half hour to drain. Do not wring. Then suspend the damp canopy by the apex from the tower ceiling, and dry with the lines fanned out to give a partially inflated appearance. When the canopy is dry, gently manipulate each pitchy section until the pitch, which should now look dry and dusty, dislodges. Pitchy sections may require several days of drying.

c. Lines. Washing the nylon suspension lines follows the same method as washing the canopy. Give special attention to the lines when drying to prevent kinks or waves in individual lines when dry. Straighten lines for drying, preferably by suspending them vertically. This procedure is necessary only in short towers, otherwise, let lines hang straight down. Do not add extra tension to the lines other than their own weight, and hang lines free of the floor.

2. Storage. Store parachute equipment to comply with the practices specified by Federal Aviation Regulations, part 65.127. Protect canopies and harnesses from dust and heat extremes. Most Forest Service lofts have storage bins or lockers, and it usually is possible to protect the canopies by placing them loosely in a seamless sack. Any parachute containers must be sufficiently porous to permit air circulation, particularly during long storage periods. Protect nylon canopies from direct sunlight. Store nylon fabrics in cool, dark places, including thread and repair fabric as well as canopies. For winter storage, canopies should be stored in an unpacked condition with the canopy fluffed. Harnesses and containers require the same storage treatment as canopies. Cotton and linen materials are more subject to deterioration under improper storage than nylon. Thoroughly dry the entire parachute before storing it, and take preventive measures to ensure that the stored parachutes

are not exposed to dampness. Protect the parachute against rodents and insects while in storage.

D. Parachute Stocking Levels. Loft supervisors shall stock repair materials and maintain a parachute inventory to reflect the unit's smokejumper staffing level and cargo delivery workload. Guidelines for inventory control are as follows:

1. Main Backpack Parachutes. Three per jumper.

2. Reserve Parachutes. Two per jumper.

3. Emergency Parachute. Determine stocking levels for emergency parachutes by the number of aircraft and the number of spotters and droppers expected during peak operational periods.

4. Cargo Parachutes. No stocking requirement.

III. Materials Quality Assurance. Follow appropriate quality assurance procedures to procure textile materials and hardware used in critical safety equipment fabrication or repair. Quality assurance procedures are necessary to ensure that materials and hardware conform to the requirements of appropriate military or Forest Service specifications. Follow appropriate in-process and end product inspection procedures to fabricate critical safety equipment.

A. Parachute Loft Manufacturing Quality Assurance. The Forest Service routinely manufactures parachute equipment items, such as harnesses, in its parachute lofts. Quality assurance procedures must be prescribed in writing for the manufacture of parachute equipment exempted from an FAA Technical Standard Order (TSO) certification. Specific quality assurance procedures vary for each item of equipment. Typical procedures include the following:

1. Drawings. Forest Service drawings control parachute equipment materials, construction, dimensions, and configuration.

2. Test Data and Certificates of Compliance. Suppliers' test data and verification testing required by Mil-Std-1525 ensure that component materials conform to appropriate material specifications. Certificates of compliance also ensure material conformance to specification requirements.

3. Inspections. Forest Service loft technicians shall provide in-process and end-item inspections to ensure drawing conformance.

4. Parachute Development. When the Forest Service designs and develops a new parachute, the Forest Service shall test it to demonstrate that the parachute design conforms to appropriate performance standards. The National Director, Fire and Aviation Management shall establish appropriate tests on a case-by-case basis for each parachute design.

B. Contract Procurement Quality Assurance. The Forest Service shall require a prescribed quality assurance system during the manufacture of Forest Service auxiliary and emergency parachutes that are not FAA approved. The quality assurance procedures must be prescribed in Forest Service parachute procurement contracts. Typically, these procedures include the following:

1. Drawings. Forest Service drawings and specifications control Forest Service parachute materials, construction, dimensions, and configuration.

2. Military Specification Mil-P-6645. Military Specification Mil-P-6645 (Parachutes, Personnel, General Specifications for), and other military specifications referenced in this document control sampling procedures and tables for inspection by attributes, inspection requirements, defect definitions and classifications for parachutes, and provide basic manufacturing quality assurance requirements.

3. Verification Testing. The requirements of appropriate Forest Service or military specifications control the quality and characteristics of specific lots of component materials used to fabricate Forest Service parachutes, such as cloth, cord, tape, webbing thread, and parachute hardware. In addition, the Forest Service routinely applies U.S. Air Force Mil-Std-1525, Verification Testing of Component Materials, and requires verification test data for comparison to prescribed test data from material suppliers. Normally, the Brooks Air Force Base textile laboratory conducts this verification testing. Certificates of compliance may be accepted for non-critical materials.

4. First Article. All Forest Service parachute procurement contracts require the contractor to provide a first article item for inspection by Forest Service personnel. These first article inspections are routinely conducted at the contractor's plant. Inspection of the contractor's facilities and of the contractor's in-house quality assurance system is accomplished at this time.

5. Manufacturer Quality Assurance. All Forest Service parachute procurement contracts use the services of a Defense Contract Administration Service (DCAS) Quality Assurance Representative (QAR). This DCAS QAR works in the contractor's plant during the course of a Forest Service parachute procurement contract to provide in-process visual and dimensional examinations of Forest Service parachutes and to ensure correct materials selection.

6. End Item Inspection. Forest Service personnel conduct an end item inspection of each parachute before accepting it from the contractor.

IV. Equipment Inspection.

A. Responsibility. The following personnel shall inspect all equipment used in parachute operations:

1. Loft Supervisor. The loft supervisor shall ensure annual inspection of all personnel parachute assemblies for airworthiness.

2. Master Rigger. The master rigger shall inspect damaged or used equipment before repair or disposal, and approve repairs to personnel parachutes.

3. Senior Rigger. The senior rigger is responsible for the airworthiness of each parachute packed. During packing, the rigger shall conduct a visual inspection of the canopy, container, and other accessories.

4. Spotter and Cargo Dropper. The spotter and cargo dropper shall inspect personnel and cargo parachute assemblies before their use.

5. Smokejumper. The smokejumper shall inspect harnesses, parachutes, and other equipment before use to ensure airworthy condition, proper attachment, adjustment, and packing date.

B. Canopy Inspection and Repair.

1. Suspending. Suspend all canopies by the apex in the tower to inspect before packing. Shake out or remove by hand all twigs, grass, and debris. Thoroughly check the inside of the canopy for foreign objects.

2. Drying. Hang damp canopies until thoroughly dry. Lines should hang straight while drying.

3. Inspecting. Starting at the stamped gore, examine the entire canopy, gore by gore, from perimeter to apex. Remove twigs and tree needles lodged in the cloth. Lower the apex to within 6 feet of the floor to allow close examination of the upper sections, apex bridle cords, and vent hood. Inspect for damage, rips, tears, line burns, frayed spots, or any foreign substance such as mud, grease, pitch, or fire retardant, that may affect the parachute's serviceability. Inspect the top of each slot closely for damage from tree landings. Inspect the anti-inversion net for damage after every use. Inspect the net carefully for broken stitching and torn or badly frayed net cords.

4. Tagging. List all damage or required cleaning on the parachute inspection tag, and attach the inspection tag to the parachute riser.

5. Storing. Most parachute loft personnel perform minor repairs and cleaning throughout the year. Parachutes requiring major repairs usually are removed from service by a master rigger and repaired during the winter.

6. Condemning. Loft supervisors shall examine canopies with extensive damage, make a determination of condemnation or major repair, and make an estimate of materials needed for repair. The loft supervisor shall decide the economic repair limitation of damaged canopies.

C. Container Inspection. Closely inspect each container for damage or wear affecting air-worthiness.

D. Harness Inspection. Because the harness is the most important single item worn by the parachutist, make a detailed examination of the harness. Carefully check the following items:

1. **All stitching**. For excessive wear.
2. **Webbing Members**. Leg, back, chest, and main sling for excessive wear.
3. **Hardware**. For corrosion, damage, and proper functioning.
4. **Canopy Releases**. For corrosion, damage, and proper functioning.

E. Packed Parachute Inspection. Inspect the condition of all packed reserve and emergency chutes after use in jumping, spotting, and cargo missions for the following:

1. **Dampness**. Not damp.
2. **Ripcord Safety Thread and Seal.** Intact**.**
3. **Pin Seating**. Fully seated, not bent, loose, or jammed.
4. **Ripcord Handle**. Placement, and pocket condition.
5. **Flaps**. Arrangement and general tidiness.
6. **Tacking**. Not broken.
7. **Packing Date**. Not expired.

V. Equipment Repair Standards. Maintaining and repairing smokejumper parachute equipment requires high standards, detailed instructions, qualified personnel, and adherence to specified procedures. Maintain these high standards through close supervision by qualified personnel and the development and use of specifications and instructions pertinent to the equipment being maintained.

A. General. Maintain smokejumper equipment according to the following standards:

1. **Original Condition**. Use materials and construction techniques defined in the manufacturer's specifications.
2. **Airworthiness Condition**. A master rigger shall determine airworthiness consistent with FAA governing parachute equipment and accepted industry practices when FAA specifications do not provide specific instructions.
3. **Economic Repair Limitations**. A master rigger shall determine when parachute equipment is beyond economical repair.
4. **Parachute Alteration or Modification**. Obtain approval from the Chief, Forest Service, before altering or modifying Forest Service personnel parachute equipment or procedures.

B. Repair Authority. Federal Aviation Regulations (FARs) define the Chief, Forest Service, as a parachute manufacturer. The FARs state that the Forest Service must repair and maintain parachutes according to the manufacturer's instructions. This guide contains instructions on maintaining and repairing Forest Service personnel parachutes. Use these instructions to train Forest Service parachute riggers and as a reference for quality of parachute loft work. The prescribed methods have been field-tested and meet Forest Service safety and efficiency standards. Repairs or other work not covered in these instructions shall conform with the best industrial practice or, in the case of military equipment, shall conform with military instructions provided with the equipment. The parachute master rigger is responsible for inspecting and approving major repairs on personnel parachutes.

C. Minor Repair Standards. Minor repair of parachute assemblies shall conform to the following standards:

1. **Small Tears**. Small rips and tears with no material missing may be darned. Six inches is the maximum linear tear that may be darned. Adhesive repair tape may be used for temporary repair of minor canopy damage. The edges of adhesive tape must be stitched.

2. **Suspension Lines**. Minor repair is limited to re-stitching of broken thread and whipping of small area of damaged sheath. Sheath damage not exceeding 1-inch in length may be repaired by whipping. Replace any line requiring such repair at more than three places.

3. **Anti-Inversion Net**. The braided nylon anti-inversion net is a 3-3/4-inch mesh net, 18 inches wide. It is sewn to the inside of the lower lateral band and suspension lines of a canopy to prevent complete canopy inversions and partial inversions. Repair anti-inversion netting using instructions in Equipment Development Booklet 8051-2604, Anti-Inversion Net Repair, dated June 1980.

D. Major Repair Standards. Repair smokejumper parachute assemblies according to the following general limitations. In addition, follow the specific repair standards and procedures determined by the manufacturer for specific equipment.

1. **Component Replacement**. Make every replacement of a parachute component in a manner to restore the parachute assembly to an airworthy condition. Use procedures and facilities described in FAR, Part 65.127.

2. **Canopy Sections**. Patch tears more than 6 inches long with new fabric that conforms to the same specifications as the original material. Replace parachute sections and gores whenever the amount of damage indicates that replacement is more economical than patching and darning. Usually, replacing complete sections or gores is less costly than several small patches and darns.

3. **Mesh Sections**. Generally, the same standards are used for mesh repair as are used for canopy section repair.

4. **Suspension Lines**. Do not whip-stitch lines when the inner core of the suspension line is damaged. Such damage requires replacing the entire line. Any damage to solid braided suspension lines requires line replacement.

5. **Risers**. Limit riser repair to re-sewing damaged stitching and replacing filler webbing. Remove all broken sewing threads before re-stitching. Use new thread and stitching that corresponds to the original. Ensure that the filler webbing replacement is the same type as the original. Replace risers that have damaged webbing.

6. **Containers and Deployment Bags**. Inspect parachute containers and deployment bags for holes, tears, broken stitching, burns, abrasions or other damage before each packing. If defective, remove the part from service until repaired to original construction standards. When damage to a part is extensive and costly to repair correctly, condemn and replace it.

7. **Ripcord Pockets**. Confine repair to re-stitching around the pocket. Re-stitching must ensure firm positioning of the handle so that it can be withdrawn with a pull not exceeding 22 pounds.

8. **Harness Repairs**. Make only limited repairs to the harness, which is a critical piece of equipment. Limit repair to replacing defective hardware, such as leg, chest, and back straps, and to re-stitching. Replace parts or condemn the entire harness if appreciably damaged.

9. **Hardware**. Replace damaged hardware with new or known-serviceability equipment. Use extreme care when removing stitching on webbing.

10. **Equipment Repair Manuals and Instructions**. Each parachute loft must keep or have available for reference the following documents:

11. **Federal Aviation Regulations**. Parts 21, 37, 65, 91, and 105.

12. **Federal Aviation Administration Grant of Exemption**. Nos. 392 and 392A.

13. **Federal Aviation Administration Advisory Circulars**. Circulars affecting parachutes are listed below:

    AC 00-1
    AC 00-2
    AC 00-41
    AC 00-44
    AC 20-62
    AC 20-90
    AC 20-100A
    AC 21-9
    AC 21-11
    AC 43.9-1
    AC 65-5A
    AC 105-2
    AC 183-31
    Copies are available from the Department of Transportation at;

    Distribution Requirements Section
    TAD 482.3

Federal Aviation Administration
U.S. Department of Transportation
Washington, DC 20590

14. **The Parachute Manual (Dan Poynter)**. Copies of the latest edition are available from the publisher at the following address:

    Parachute Publications
    P.O. Box 4232
    Santa Barbara, CA 93103

15. **Forest Service Packing and Maintenance Instructions**. Apply to each piece of equipment designed and manufactured for or by the Forest Service.

16. **Military Packing and Maintenance Instructions**. Apply to each piece of equipment manufactured for or by the military services and used by the Forest Service.

17. **Manufacturer's Packing and Maintenance Instructions**. Apply to each piece of commercial equipment that the Forest Service uses.

VI. Parachute Packing Instructions. Follow the direction given below for proper procedure in regards to packing main, emergency, and reserve chutes. Pack and maintain all commercial and military parachutes according to manufacturer's instructions and Federal Aviation Administration regulations.

A. FS-14 Main Parachute. Use individual packing instructions for the FS-14 parachute system found in the Technology and Development Booklet 0357-2806-MTDC, Packing Instructions for the FS-14 Parachute, dated April 2003.

B. FS-14R Reserve Parachute. Use individual packing instructions for the FS-14R reserve parachute found in the Technology and Development Booklet 0257-2814-MTDC, FS-14R Parachute Packing Instructions. Reserve and emergency parachute systems approved for smokejumper spotters and cargo droppers to use on smokejumper and paracargo missions, are military and commercial models that meet the requirements of Federal Aviation Administration Technical Standard Order (TSO) C23c for aircraft in the standard category (over 150 MPH).

C. Butler XTC-500 Parachute Packing Instructions. The Butler XTC-500 uses a 26 foot diameter, tri-conical parachute. It is a bias constructed, diaper deployed, 24-gore, steerable canopy. The XTC-500 has been approved by the FAA under TSO C23b, category B. Use packing instructions for the Butler found in the owner’s manual for the Beta Emergency System. This manual must be used with the current Addendum (January 1, 1989) and with the General Canopy Folding and Packing Instruction (July 15, 1994).

D. Strong Enterprise Paracushion Model 1045-2 Parachute Packing Instructions. The Strong Enterprise emergency backpack parachute model 1045-2 uses a 26-foot-diameter, conical, steerable parachute constructed of low-porosity

rip-stop nylon material. It uses a pilot chute and is equipped with soft cones, flexible container, and quick-fit harness. Use packing instructions for the Strong Enterprises Parachute Model 1045-2 found in the undated Strong Enterprises Booklet, The Para-Cushion Back Service Manual.

E. Cargo Chute Packing Instructions. Cargo parachute failures can cause serious injury to personnel in the aircraft and on the ground. The cargo loss may seriously affect ground operations efficiency. To ensure parachute reliability, exercise care in cargo parachute packing operations. The loft supervisor will maintain and make available instructions for all types of cargo chutes in use at a particular smokejumper base.

Chapter 7 - Paracargo Operations

I. Oganization, Personnel and Staffing. Safe and efficient paracargo delivery depends on qualified personnel and equipment management. Units shall adhere to standardized equipment and procedural requirements. Each unit will maintain a sufficient organization to support delivery of paracargo.

A. Loadmasters. Responsible for loading and manifesting personnel, smokejumper gear, paracargo and freight on aircraft and for load coordination with the pilot and spotter.

B. Smokejumper Spotter. All paracargo missions will be conducted under the supervision of a qualified smokejumper spotter. Other smokejumpers may be utilized as directed by the spotter to assist.

C. Pilots. Only qualified pilots as defined in Chapter 2 of this guide and the Interagency Smokejumper Pilot Operations Guide shall fly paracargo missions.

D. Personal Protective Equipment. Personal protective equipment is required for mission personnel, It includes the following:

1. Nomex clothing.

2. Gloves.

3. An approved backpack emergency parachute and tether or an approved harness/tether and quick attach emergency parachute.

4. An approved helmet.

5. Leather lace up footwear with non-skid soles.

II. Standardization of Equipment and Procedures. Mobility and safety requires that equipment and procedures identified in this chapter are standardized.

A. Aircraft. Only SASEB approved aircraft will be utilized as paracargo platforms. See Chapter 4 for details. All aircraft will have:

1. Approved seats and seat belts for all personnel.

2. In-flight door, safety strap, or other bar device to secure the aircraft doorway.

3. A sharp sheathed knife near the door.

4. An approved cargo restraint system is required for all aircraft cargo loads.

B. Paracargo Delivery Operations.

1. Drop Zones. On most smokejumper missions, the drop zone will be selected by the spotter and the smokejumper incident commander, in conjunction with the mission pilot. The drop zone should have a safety area and be clear of all personnel during the drop. When necessary, qualified personnel will be at the drop zone to provide control during paracargo operations. At a minimum,

communications must be established with a pre-identified contact. During large incident support and heavy paracargo operations, the drop zone should be established prior to aircraft arrival and should meet the following requirements.

a. 200 feet on each side of the flight path of the aircraft.

b. 300 feet in the direction of the approach.

c. 1300 feet in the direction of departure.

d. The drop zone will be at least 600 feet from all populated areas.

Large incident drop zones should be marked with a white or orange "T" at least seven feet long. It should be placed so that, as the plane is flying into the wind, it can be easily read.

2. **Cargo**. All aircraft shall be loaded within the specific manufacturer's weight and balance limitations.

a. Each aircraft will have a load calculation completed to determine the useful load and the pilot shall approve it.

b. All cargo must be properly restrained prior to takeoff. Minimum restraint requirements are as follows:

9 G's forward.
3 G's lateral and vertical.
1.5 G's aft.

c. The weight of cargo bundle must be compatible with the capacity of the cargo chute being used.

d. All cargo chutes shall incorporate the following features:

Line first deployment.

Standard personnel static line snap (MS 70120).

Standard 14 foot 10 inch static line with MTDC weak link and with the words "weak link" stenciled on the line.

Red risers.

Protective flap over static line stows.

Cargo loops used on all bundles.

Method for securing chute to bundle.

The canopy, size, type, and weight range will be stenciled on the container and the riser.

e. Package density, or ratio of weight to volume must be considered for all bundles being dropped. The critical factor is not weight to volume, but weight to square footage of the largest side of the bundle.

f. Each base shall establish unit specific cargo packaging and strapping instructions.

3. Delivery. The pilot shall have final authority over all flight decisions.

a. Use a standard left hand pattern when possible.

b. Prior communication with other aircraft in area must be established before starting the mission. Mission priorities will be established by the Air Tactical Group Supervisor or in their absence the spotter/cargo dropper.

c. Drops will be at a minimum of 150 ft AGL.

d. Stacked cargo delivery is only acceptable for rear door aircraft.

e. Communication must be maintained between the spotter /cargo dropper and the pilot. The spotter will notify the pilot of bundle type and number and when they are ready to deploy the cargo. The pilot will notify the spotter when the plane is turning final. The signal for deploying the cargo will be:

- "On Final"
- "Standby"
- "Kick"

III. Emergency Procedures. Emergency procedures for paracargo missions are standard for smokejumping missions. Reference the Interagency Smokejumper Training Guide and Chapter 5 of this guide, for critical and non-critical emergency procedures.

Glossary

Accessory. For a parachute, the part of a parachute assembly necessary to complete the unit as designed by the manufacturer; for example, a parachute pack retaining belt. For an aircraft, a device that smokejumpers use, such as a step or static line cable, to facilitate the delivery mission.

Accordion Folding. The act of folding the pleated parachute canopy into the container or deployment bag.

Active Smokejumper. An individual who meets all of the current smokejumper training requirements and maintains parachute jumping currency throughout the season.

Anti Inversion Net. Nylon netting sewn onto the skirt of the parachute canopy to prevent inversion related malfunctions during parachute deployment.

Apex. The uppermost part of a parachute canopy.

Approved Exit. A standardized body position that the jumper assumes immediately before and when exiting the aircraft. Approved exit positions vary, depending on the type of aircraft and the accessories used.

Assistant Spotter. A qualified smokejumper who assists the smokejumper spotter.

Auxiliary Parachute. A reserve parachute that is part of a dual parachute system. It is used for an emergency when the main parachute malfunctions or cannot be used.

Booster Crews. Smokejumper crews temporarily assigned to a smokejumper base as reinforcements during periods of high fire activity.

Breakcord. A thread or tape tied between parachute components and intended to break during deployment under a desired load.

Burned Line. A section of a parachute suspension line partially fused or melted by friction caused by the line being pulled rapidly across an object or another piece of material. The burned portion of the line usually is hard and looks glossy and discolored.

Canopy. The part of a parachute assembly involving the suspension lines which supports the load to be delivered.

Cargo Parachute. A parachute used to drop materials such as tools, food, water, and supplies.

Cargo Static Line Weak Link. A tab or stitching incorporated between a cargo static line snap and the static line, designed to break or release at an established load.

Container. The part of a parachute assembly that contains a folded canopy and suspension lines.

Critical Emergency. An emergency requiring immediate action to prevent or reduce the loss of life, limb, or property.

Deployment Bag. A container that provides sequential parachute deployment, retaining the canopy until the suspension lines are fully deployed.

Detail. A prearranged assignment to another base or facility.

Door Boot. An aircraft accessory that provides an unobstructed and smooth surface around the door of a jumper aircraft.

Door Fairing (Wind Deflector). An aircraft accessory installed on the forward side of a smokejumper door to deflect airflow.

Drift Streamer. A weighted device dropped from an aircraft to predict wind drift and to estimate aircraft altitude above the drop zone.

Drop Zone. A specified landing area on which personnel or cargo intend to land. See also "Jump Spot."

Emergency Parachute. A parachute intended for emergency use only.

Exit Point. A point determined by the spotter where the smokejumper receives the signal to exit the aircraft. It is sometimes referred to as the "Release Point."

Exit Tower. The exit tower is utilized to teach smokejumpers how to attain proper body position while exiting the aircraft. It also simulates a parachute's opening shock. The tower should have a accessories to teach all types of aircraft exits.

Floor Panels. Durable materials installed over standard aircraft flooring to provide additional protection from heavy cargo and operational abuse.

Gore. The area of a parachute canopy surrounded by two adjacent radial seams, the apex band, and the skirt band.

Handrail. An aircraft accessory around the exit door that jumpers and spotters use as a handhold.

Hardware. All metal parts associated with parachutes, parachute assemblies, and suspended loads.

Harness. The part of a parachute assembly designed to carry the body or object and to attach the canopy to its load.

Helmet. Protective headgear that jumpers and spotters wear.

High-Impact cargo. A method of paracargo delivery using a parachute with a rate of descent that exceeds conventional delivery methods but does not reach the terminal velocity achieved in free fall.

"Hook Up." A signal for jumpers to attach static line snap to the aircraft static line cable.

In-flight Door. An aircraft door that can be opened and/or removed and secured in-flight to accommodate smokejumping and paracargo operations.

Injury. MTDC injury definitions used for compiling smokejumper injury data. These definitions of "injury " are used for smokejumper statistical data only.

SERIOUS INJURY - Any injury which requires hospitalization for more than 48 hours; results in a bone fracture except simple fractures of toes or fingers; causes severe hemorrhage, nerve, muscle or tendon damage; involves an internal organ; second or third degree burns or burns over more than 5% of the body.

MINOR INJURY – Any injury less evere than a Serious injury.

PRECAUTIONARY REPORT – Any incident that results in the completion of a CA-1 but is less severe than minor injury (not off the jump list as fully functioning smokejumper)

Interagency Mixed Load Document. Developed as a reference guide for use by BLM and USFS smokejumper programs in order to provide guidelines for mixed load parachute operations.

Interagency Smokejumper Training Guide. Developed for the interagency training of smokejumpers and supervisory personnel in smokejumping operations, techniques, procedures, principles, and policies.

Inversion. A parachute deployment in which the canopy has turned inside out.

Jump Spot. A specified landing area in which personnel intend to land.

Letdown Line (Tape). Tubular nylon webbing that suspended smokejumpers use to execute a letdown or rappel from a tree landing.

Letdown Simulator. An apparatus used to teach smokejumpers correct timber letdown procedures.

Loadmaster. Works closely with the pilot of each aircraft and is the person responsible for aircraft manifesting including; weight, balance, loading, and unloading of personnel, equipment and paracargo.

Loft. A facility used for storing, rigging, and maintaining parachute assemblies.

Low Pass. The act of flying low over a incident or jump spot for the purpose of reconnaissance and/or identifying hazards.

Main (Backpack) Parachute. The principle parachute of a dual parachute system that is worn on a smokejumper's back and used for intentional jumping.

Maintenance. The inspection, overhaul, repair, and replacement of parachute equipment.

Major Repair. Extensive repair or replacement of parachute equipment that may affect air worthiness if done improperly. Major repair includes replacing panels, lines, and hardware.

Malfunction. Any parachute system abnormality that requires a reserve parachute activation.

Master Parachute Rigger. A Federal Aviation Administration certificated parachute rigger who has the experience, knowledge, and skill required for a master rigger in Federal Aviation Regulations, part 65.

Minor Repair. A parachute repair task that is less demanding and serious than a major repair, including stitching and repairing small tears and holes in canopies.

Mixed Load(s). Smokejumper flights that contain personnel equipped with a mix of square and round parachutes.

Mockup. A simulated aircraft fuselage used to practice loading, hookups and emergency exit.

Modification. A change in a parachute assembly configuration.

National Smokejumper Program Manager. Responsible for programmatic oversight of aerial delivery systems.

Non-Critical Emergency. A situation that can be solved or mitigated without immediately resorting to extraordinary measures.

"On Final." For smokejumping**,** a term used to describe the final leg of an aircraft pattern when dropping smokejumpers or paracargo.

Paracargo. Equipment and supply items intentionally dropped from an aircraft by parachute, drag chute, or free fall.

Parachute Assembly. A device consisting of a canopy, harness, container, and accessories that retard the descent of a falling body.

Parachute Landing Fall (PLF). A maneuver executed by a parachutist to distribute impact forces during a parachute landing.

Parachute Landing Simulator. A apparatus that provides the trainee experience in executing a proper PLF.

Parachute Maneuvering Simulator. A computer simulator that is used to teach smokejumpers correct parachute maneuvering procedures and techniques.

Parachute System. Term used to describe an overall parachute delivery system.

PG Bag. (Personal Gear Bag). A bag attached to the smokejumper's harness during parachute jumping that usually converts to a gear pack for operational use on the ground.

Pilot Chute. A small spring-loaded or hand-deployed parachute that accelerates the opening of a larger parachute.

Pin Check. A safety check performed on emergency parachutes to ensure they are in safe usable condition. This includes checking the ripcord pins, re-pack date and over all appearance of the parachute.

Radial Seam. A seam in a parachute canopy running radially from the circumference to the apex.

Release Point. See Exit Point.

Reserve Knife. A hook blade knife carried on top of the reserve parachute that the jumper uses for emergencies and letdowns.

Reserve (Auxiliary) Parachute. The secondary parachute that a person making an intentional jump wears.

Rigging. The inspection, minor repair, and re-packing of parachutes, which includes fitting and adjusting harnesses.

Riser. The part of a parachute assembly connecting the suspension lines to the harness. Risers usually are made from a length of webbing and are attached using connector links or canopy releases.

Roller Track System. A mechanical roller device installed in the door of paracargo aircraft that facilitates cargo delivery.

Section. The area of a parachute canopy surrounded by diagonal and radial seams. Sections are numbered upward from the skirt to the apex. The section adjacent to the skirt is number one.

Senior Parachute Rigger. A parachute rigger certificated by the Federal Aviation Administration as having achieved the experience, knowledge, and skill required for a senior rigger in Federal Aviation Regulations, part 65.

Signal Panels. An orange colored length of material displayed on the ground in various patterns to convey a ground-to-air message.

Skirt (Lower Lateral Band). The reinforced hem surrounding the lower edge of the canopy.

Smokejumper Aircraft Screening and Evaluation Board (SASEB). An interagency board of Forest Service and Department of the Interior aviation managers responsible for reviewing and recommending smokejumper and paracargo aircraft and aircraft accessories for evaluation and approval. Representatives from fire and aviation management organizations and smokejumper units are on the board. Missoula Technology Development Center personnel serve as technical advisors to the board.

Smokejumper Aircraft Step. An aircraft accessory (a platform) the jumper uses when exiting the aircraft.

Smokejumper Base Manager. The person who oversees and is responsible for all phases of a local smokejumper program including; administration, operations, loft operations, training, fire operations, aircraft, etc.

Smokejumper Loft Foreman. The person responsible for loft administration including; parachute rigging and training, manufacturing of equipment, maintaining of loft supplies, parachute records, etc.

Smokejumper Operations Foreman. The person responsible for the daily operational functions of a local smokejumper program (including staffing, priorities, organizing work projects, and record keeping).

Smokejumper Spotter. An aircraft crew member responsible for selecting jump spots, drop zones, directing delivery of personnel and cargo, navigating, and managing smokejumper and paracargo delivery missions. The spotter must be an active jumper, and hold a squadleader position or above.

Smokejumper Check Spotter. An experienced smokejumper spotter designated by their unit's base manager to train and qualify smokejumper spotters.

Smokejumper Squadleader. Supervises smokejumpers on fires, project and other base activities and assignments as directed. Squadleaders often serve as smokejumper spotters.

Smokejumper Suit. Protective clothing worn by smokejumpers. Sometimes called a "Jump Suit."

Smokejumper Training Foreman. The person responsible for planning and implementation of all training activities of a smokejumper program with the exception of parachute maintenance, rigging and repair.

Spike Base. A site for conducting smokejumping operations on a temporary basis. Spike base operations may range from the pre-positioning of a crew of smokejumpers with aircraft and equipment on a one day assignment at a designated airstrip to the seasonal assignment of smokejumpers on a recurring schedule at predetermined locations.

Spotter's Check. A pre-jump equipment safety check performed for each jumper by a spotter.

Spotter Communications Panel. An accessible aircraft audio panel that enables the spotter to communicate with the pilot, other aircraft, and ground personnel over intercom, FM, and VHF radio frequencies.

Spotting. The act of determining wind drift, altitude, jump hazards, jump spot, exit point, and signaling the smokejumper to exit the aircraft.

Static Line. A line attached to an anchor point or cable in an aircraft and to the parachute, which initiates deployment of the parachute as the load falls away from the aircraft.

Static Line Anchor. An aircraft accessory, usually a cable or ring, to which static lines are attached to deploy personnel and paracargo parachutes. Static line anchors also restrain tethered personnel working near the open door of an aircraft.

Static Line Monitoring Device. A device used to keep smokejumper static lines free and clear of entanglements during smokejumper aircraft exiting procedures.

Stick. One to three smokejumpers who exit an aircraft during a single pass over the exit point.

Supplemental Type Certificate (STC). A Federal Aviation Agency term for modification, addition, or deletion to an aircraft appliance or structure that affects the original type certificate and requires supplemental approval.

Suspension Lines. Nylon cord or webbing or other fabric that connects the parachute canopy to the risers or harness.

Tether Harness. A harness that spotters and cargo droppers wear from which a line or tape is attached to an anchor point or auxiliary cable to keep personnel from falling out of the open door of an aircraft.

Tree Climbing Gear. Equipment consisting of a belt, spurs, and rope that smokejumpers use to retrieve cargo and parachutes from trees.

Vent. The opening at the top or apex of a parachute canopy.

SPOTTER TRAINING AND FAMILIARIZATION

SYLLABUS FOR

BLM SPOTTERS SPOTTING FOREST SERVICE ROUND CANOPY JUMPERS

OBJECTIVE:

The objective of this training syllabus is to familiarize BLM spotters with the equipment operational procedures, and essential information to safely and efficiently spot US Forest Service smokejumpers in mixed load operations. Agency specific policy including equipment, jump criteria, and smokejumper spotter qualifications may be found in the Interagency Smokejumpers Operations Guide (ISOG).

As a minimum, the following topics will be covered:

1. Spotter currency and proficiency requirements
2. USFS parachute system equipment familiarization including mock-up and equipment safety checks.
3. USFS jump parameters including drop considerations.
4. Jump operation spotting procedures and spotter duties including static line monitoring.
5. Emergency procedures.

SPOTTER CURRENCY AND PROFICIENCY REQUIREMENTS:

To be certified as mixed-load single spotters, BLM spotters must participate annually in a course provided by a US Forest Service spotter trainer which includes Forest Service round spotting procedures, static line monitoring, mock-up, and gear familiarization. (This class).
In addition, BLM spotters will need to successfully spot at minimum a 2-person stick of round jumpers under the supervision of a Forest Service Check Spotter at least once every two years.

USFS spotters must participate annually in a course provided by a BLM spotter trainer that includes BLM ram-air spotting procedures, static line monitoring, mock-up, and gear familiarization. Forest Service spotters are **not required** to spot BLM ram-air jumpers to be certified as mixed-load single spotters.

USFS PARACHUTE SYSTEM EQUIPMENT FAMILIARIZATION:

Harness: H-5 Harness assembly with capewell fittings.

Main Canopy: FS-14

- Static line operated backpack
- Polyconical canopy available in three canopy sizes
  - Small: 28' diameter- recommended exit weight range@ 5000' and 85 degrees: 180->225 lbs.
  - Medium: 30' diameter recommended exit weight range@ 5000' and 85 degrees: 225->255 lbs.
  - Large: 32' diameter recommended exit weight range@ 5000' and 85 degrees: 255->285 lbs.
  - Size ranges vary with density altitude. It's common to jump one size but spotter should question a jumper bumping two sizes.
- Riser and chest strap on harness is color-coded.
  - Small is blue, medium is olive drab, large is gold.
- Average airspeed at full run: 9 to 11 mph.
- Average rate of descent: 15 ft/sec
- Turn rate at full toggle throw: 360 degrees in 4 to 5 seconds.
  - Capable of reverse flight at 2 to 3 mph.

Reserve Canopy: FS-14R

- 26' conical emergency canopy with vent steering system and soft toggles.
- Center pull activated, manually deployed chest pack with pilot chute.

Ankle Braces & Reserve Knife:

- Aircast over the boot ankle braces are required on all parachute jumps. The braces come in three sizes, small, medium, & large.
- Jack the Ripper hook knife located on top of reserve chest pack.

"Mock up" with Equipment Checks:

Even though BLM spotters will not be doing equipment checks, a full "mock- up" demonstration of this procedure and a break down demonstration of the deployment sequence of each canopy will help with equipment familiarization.

Each USFS Smokejumper will receive a pre-jump equipment check by a qualified USFS Smokejumper prior to boarding the aircraft. The spotter will verify the completion of this check. Any jumper may

request that safety checks be done by a qualified USFS Spotter in addition to a safety check done by a jumper.

The Pre-jump Equipment Safety Check or "buddy check" includes:

- Boots and ankle braces – on & snug?
- Stirrups under insteps & adjustment ends on suit correctly buckled, no loose ends?
- Leg pockets securely closed and cord ends stowed, letdown rope in leg pocket?
- Jump suit zippers secured and working properly?
- Harness leg straps twist free, snaps cleanly secured to V-ring, excess strap stowed ?
- O-rings with locking carabineer for letdowns?
- PG bag attachments – straps cleared & fastex not broken?
- Reserve attached properly, seal & pin check, handle secure, date checked, knife checked?
- Pack tray belt fastened & snug?
- Chest Strap on Harness correctly routed through buckle & secured?
- Capewells seated properly. (Ears, slider, release cable, cover)?
- Jacket collar up and clear, zipper works, fire shirt on?
- Risers straight & clear to main parachute (check canopy size & verify with jumper)?
- Harness on correctly, check shoulder straps, and look for "X" on back?
- Main parachute back tray closed properly?
- Static line routed correctly through break tape, rubber band stows, over left shoulder is stowed correctly with a functioning static line clip and safety pin. (Newer double action clips will not have a safety pin).
- Check for PG bag, helmet, gloves, radio, letdown rope, and other appropriate gear (pack-out bag, fire shelter, PPE, wind indicator, etc.)
- Inspection sequence should not be interrupted, if distracted, begin again.
- If a problem is found and can be immediately corrected, the sequence may be restarted at the sequence step that preceded the one uncovering the problem.

USFS JUMP PARAMETERS AND DROP CONSIDERATIONS:

During jump operations, jump / no jump decisions will be up to the judgment of the spotter. If the spotter feels uncomfortable with the jump conditions, back off to a larger spot, consider landing at a nearby airport and arranging alternative transportation, or dry run the fire.
All jumpers also retain the right to turn down a jump assignment if they feel it is unsafe.

Jump Parameters:

- Only SASEB (Smokejumper Aircraft Screening & Evaluation Board) approved aircraft may be used for dropping smokejumpers.
- Minimum Drop altitude for USFS Jumpers is 1,500' AGL over the exit point. Be aware of rising terrain.
- Standard 20' drift streamers of traveling 500 yards equals about 15 mph (with 75 seconds on streamers). This is a "red flag" for dropping rounds and dependant on quality of jump spot, jumper experience, and the wind profile, especially the ground winds.
- Winds in excess of 12 mph should be approached with caution. Again, jump spot and Jumper experience are critical factors to consider.
- Wind cones for jumpers on FS-14 canopies are considerably smaller and the glide slope is steeper. Ratio is about 1.2 : 1.

Drop considerations:

- The wind line and getting the jumpers out over the specific exit point is more critical.
- Vertical separation is very limited. Consider single person sticks in tight spots or spots with only one approach
- With 2-person sticks, imaginary middle jumper exits directly over exit point.

- In challenging jump spots, consider bumping up a more experienced jumper.

- With 2 to 3 mph reverse flight characteristics, jumpers may face the spot more and use reverse, which from spotters standpoint, may look like they are running all the way and may not necessarily be the case.

- Malfunctions are very infrequent with the FS-14 but most often include broken steering lines or slow opening canopies.

- On all jumps, communicate well and wait for the first jumper to radio up information about jump conditions.

Jump Spot Considerations:

- Use a conservative approach, (larger spot nearby), and consider size, hazards, safety zones alleyways and access. Basically no different than with ram airs with a few exceptions:

- Alternate spots need to be in closer proximity to the jump spot and the wind line than with ram airs since the FS-14 canopy cannot cover as much ground and spends less time in the air.

- Steep approach spots are not as much of a problem, but be cautious of vegetation-induced turbulence.

- Topographical feature and funnel winds, which cause turbulence, should be avoided.

- Ridge top winds may be too strong, leaving no safety margin from going lee side.

- Low passes and single sticks are encouraged.

JUMP OPERATION SPOTTING PROCEDURES, AND SPOTTER DUTIES:

Both agencies jump operation procedures and spotting duties are similar. Some points to highlight include:

- When smokejumpers from one agency arrive at another agency's base, the receiving base will be responsible for conducting a refresher on mixed load operations with all available spotters and pilots. Include review or familiarization with aircraft, radios, and paracargo ops.

- Each jumper shall have a pre-jump safety equipment check by a qualified spotter or a qualified jumper. The mission spotter has the responsibility to ensure that this check has been performed prior to boarding the aircraft.

- The spotter needs to check routing and **monitor static lines** from each jumpers parachute container to secure attachment on the appropriate cable. When jumpers exit small door aircraft, spotter monitors static lines to door edge, insuring clear path for next jumper. In large door aircraft assistant spotter actually guides each static line to the door edge, releases it and guides the next. **DEMONSTRATE** with static line and D-Bags. (This may also be done during the equipment mock-up).

Jump Operation Spotting Procedures:

- Duel agency spotting of mixed loads is not required but may be advantageous in order to qualify BLM spotters during a boost or provide expertise and input into spotting decisions for their respective systems. The spotter representing the home base will be the spotter-in-charge unless otherwise agreed upon by the host base.

- Load configuration may be adjusted to for efficiency. It is usually most efficient to drop USFS jumpers "rounds" before the BLM jumpers "Squares". Exceptions may be necessary when conditions warrant and the mission coordinator if operating with two spotters will make the determination of the jump order. It is advantageous to sort this out as early as possible.

- As with both agencies, helmets, gloves, fastened seatbelts, and secured PG bags are required for take-offs, landings, and cargo drops.

- Notify jumpers ten minutes out from fire to allow time for personal equipment readiness and situation awareness.

- A low observation pass is over the incident is recommended for identification of hazards, low-level turbulence, fire information, access, safety zones, and escape routes.

- Standard streamer drops are timed using 20' drift streamers from 1,500' AGL. Again, for dropping round jumpers, winds in excess of 12 mph should be approached with caution and 500 yards of drift is always a "red flag" and the spotter must weigh all factors and exercise sound judgment. Clear and open communication with jumpers is important. Wind line and exit point are more critical to round jumpers, and we all are cautious of possible down air.

- All spotters use the "INTERAGENCY SPOTTER COMMANDS JUMP DOOR CHECKLIST". **REVIEW** the checklist at this point. (See attached).

- Two person sticks are the recommended standard size. Single sticks are accepted and at times, highly recommended. Standard stick size for USFS smokejumpers is a 2-person stick for training and operational jumps. Exceptions allow a 3-person stick to be used from large door aircraft that allow a standing exit when conditions are favorable.

- Obtain jump condition input back from USFS jumpers on the ground prior to dropping 2nd stick of jumpers.

- Jumpship altitude transitions either up or down should allow both the pilot and the spotter to monitor any jumpers still in the air and stay oriented with the jump spot. This is usually best accomplished with a comfortable orbit around the spot versus a long "out and back" leg.

Spotter Duties:

Pre- Taxi:

- Ensure proper number of jumpers is on board, seated, and belted.
- Check that ramp, APU, etc. are clear.
- Door strap or in-flight door properly secured.
- Establish commo with cockpit and inform ready to taxi.
- Observe sterile cockpit for take-off and climb out. Monitor radio traffic.

Enroute:

- Provide info to jumpers, especially JIC. Have them on second commo station in back if possible. Give a heads up 10 minutes out.
- Issue any base specific items, i.e. GPS, cell phones, camera, etc. Record property numbers if applicable.
- Issue map, resource order, radio frequencies and contact info, etc.
- Make sure 2nd jumper has a wind indicator. Most all carry one.

Over Incident:

- If possible, coordinate with pilot and jumper(s) in discussing jump spot selection, alternatives, hazards, patterns and altitude.
- Discuss current and expected fire behavior, LCES, resources need, additional air support, road access, water sources, equipment needs, and IC qualifications if applicable.
- Wait for assistant spotter to come back prior to beginning drop operations (Large door aircraft)
- During jumper briefings and post hook-up, visually inspect each jumper for equipment problems or irregularities.
- **Post hook-up, check static line clip, check and monitor static line for misroute and inform jumper(s) they are clear.**
- Follow the Interagency Spotter Commands Jump Door Check list (see attached), which should be posted by the exit door of all smokejumper aircraft. Only the first jumper of each USFS stick receives a slap, the others will follow. (Approximately a 2 second cadence from "Get Ready" to the exit of 1st and then exit of second round jumper.)
- Upon exit, guide static line to door edge, release and guide next static line. (Discuss 3-person stick monitoring).
- Check to see if jumpers are clear of the aircraft (not in tow).
- Retrieve static lines and D-bags (there will be a bit more resistance with round D-bags that with ram air static line retrieval), unhook from cable and stow. Next stick of jumpers should not hook up until told to.
- Secure strap across door after retrieving d-bags from last stick of jumpers.

Paracargo:

- Pre-operational briefing and CRM is critical. Assistant is usually the cargo hauler. Spotter gets rear of A/C set up for cargo while asst. spotter gets cargo.
- Asst. spotter helps kick cargo. Know the cadence and signal for kicking.
- Spotter normally retrieves d-bags
- Make sure spotters (you) are tethered.
- Use caution around a roller track and never leave cargo unattended sitting on the roller track.
- Post cargo, clean up the rear of the aircraft, secure roller track secure remaining cargo, and get ready for next mission.

Post Mission:

- Make the time to do a good debriefing with all crewmembers.
- Complete any paper work and ensure readiness for next mission.

EMERGENCY PROCEDURES:

Standard procedures for emergency exits documented in the Interagency Smokejumper Training Guide will be used for emergency exits with all parachute systems.

- The pilot is the primary authority in matters pertaining to the aircraft's condition and the necessity for an emergency exit.

- Spotter maintains positive control during an emergency and does everything he can to insure all jumpers get out of the aircraft safely.

- If jumpers are wearing main parachutes when the pilot or spotter orders an exit, the jumpers shall use the designated emergency cable. Before initiating the emergency exit, the spotter must be certain that the aircraft is high enough for a parachute to open. 500' AGL is the minimum altitude for reliable main or reserve deployment.

- Jumpers shall jump with their emergency parachute when it is impractical to hook their static lines to the emergency cable, or if they are not equipped with backpack parachutes.

- Jumper in tow uses standard signals. Jumper has both hands on helmet looking at reserve handle and is prepared to be cut away. Spotter maintains communication with pilot and may either retrieve jumper or cut jumper away.

QUESTIONS?

INTERAGENCY SPOTTER COMMANDS
JUMP DOOR CHECKLIST

The spotter in charge of each mission should be clearly identified.

Note: When dropping ram-airs, spotter should request from pilot any noticeable wind changes at 3,000' AGL, prior to dropping ram-airs. Adjust exit point accordingly.
Although rarely necessary, streamers thrown from 3,000' AGL are always an option.

Spotter signals to the jumpers the number in the stick.

1. "ARE YOU READY?" & "LEG STRAPS TIGHT?"

These two questions are asked of the jumper in the first stick, who then answers for the entire stick. Being ready means you have been checked, PG bag is hooked up, and helmet is on.

2. "HOOK UP"

This command is given to the entire stick. Round jumpers hook-up to the appropriate cable (vertical/horizontal/floor). Ram-airs hook to appropriate extender handed them by the spotter.

PRE-JUMP BRIEFING:

Pre-jump briefing should include as a **minimum**: jump spot confirmation, jump spot hazard identification (if any), estimated streamer drift and windline, type of drop pattern, jump spot elevation, and pertinent wind info at 3,000' AGL (ram-airs only). End briefing by asking **"ANY QUESTIONS?"**

3. "WE ARE AT 3,000 FEET, ACTIVATE YOUR AAD"

This command is for ram-air jumpers only and will always be given prior to the jumper getting in the door. This command prompts ram-air jumpers to activate their Cypress AAD's. (Before giving this command, the spotter will confirm with the pilot that the aircraft has leveled off at 3,000 feet AGL)

4. "GET IN THE DOOR"

This command is given before or after pre-jump briefing for round jumpers, and after the briefing for ram-air jumpers, to the first jumper in the stick. This command also prompts ram-air jumper's 4-point check. All ram-air exits will be sitting. Round exits will be using the step or standing, depending on the aircraft type.

5. "TURNING FINAL 1500'/3000', STATIC LINES CLEAR"

Confirmation given so that each jumper in the stick can hear. The spotter may have notified the jumper that their static line is clear and confirmed the jump altitude, but this is a final check.

6. " Get Ready"

Command given just prior to slapping first jumper out the door.
ROUNDS: Slap only the first jumper in the stick.
SQUARES: Slap each jumper, spacing jumpers a minimum three seconds apart.

Exiting square jumpers static lines can be effectively cleared for following jumpers in the stick by sliding it towards the upper left corner of the door, after the drogue has deployed from the D-bag.