Chapter 4

PARACHUTE MALFUNCTIONS & OTHER EMERGENCY PROCEDURES

LESSON PLAN OUTLINE

PROGRAM: SMOKEJUMPER

LESSON: PARACHUTE MALFUNCTIONS

OBJECTIVES: Upon completion of this lesson, the student will be able to recite the correct procedures for identifying parachute malfunctions, describe the two classes of parachute malfunctions, apply reserve parachute deployment procedures and identify the proper techniques for dealing with other emergency procedures.

INTRODUCTION: While parachute malfunction in Forest Service smokejumper operations are not common, **they can and do happen**. To successfully avoid disastrous consequences when a malfunction or emergency develops, every smokejumper must be trained to recognize **all** malfunctions and **to correctly apply** the appropriate emergency procedures.

1. PARACHUTE MALFUNCTIONS AND OTHER EMERGENCY PROCEDURES.

A. Exit procedures.

1. The possibility of a malfunction should be anticipated each time a jumper exits the aircraft.

2. Exit counting procedure.

a. To correctly estimate the time of deployment.

b. Correct procedure is:

1. Commencing immediately upon exiting the aircraft:

Count... One thousand...two thousand...
three thousand...four thousand...
Look thousand.

2. Looking up on the count of "Look thousand" the jumper should perform the canopy check.

3. It is important that all jumpers perform the count at the correct tempo. Counting too fast, the canopy will still be deploying and the jumper will be performing canopy checks out of order. Counting too slow will use precious time that would be needed to correct a potential malfunction of the system.

3. Parachute malfunctions are logically divided into three classes:

a. Total, full streamers, and partial malfunctions.

1. Total Malfunctions

A total malfunction is a malfunction in which the parachute canopy does not deploy at all. The parachute canopy remains with the parachute container or D-bag and the jumper essentially free falls.

There are 3 ways that a total malfunction may occur with an FS14.

1. A total malfunction will occur if a jumper exits without hooking up the static line.

2. If the static line snap comes off the static line cable on exit, a jumper will have a total malfunction.

3. If the static line cable in the aircraft breaks, or the static line is cut on exit, the jumper may have a total malfunction.

Correct procedures to reduce total malfunctions.

1. Jumpers must hook up their own static

line to the static line cable. The spotter will check to see that the static lines are properly hooked up as a safety check, but it is every jumpers responsibility to ensure their static lines are correctly hooked up.

2. Each jumper must correctly insert the safety wire through the hole in the static line snap to prevent the snap from being pulled off the cable during the exit.

3. Each smokejumper unit must ensure that the components of each parachute system (D-bags, static lines, etc.) are in air worthy condition, the static line anchor cables in the aircraft are properly installed and that there are no exposed sharp edges in the aircraft door area which could cut a static line.

2. Full Streamers

A full streamer is a malfunction in which the parachute canopy is deployed but fails to inflate. A full streamer will look as if a pole like tail of material is trailing above the jumper. The descent rate is essentially the same as a free fall.

Full streamers are uncommon in Forest Service smokejumper operations.

Time available for reserve deployment in a total malfunction or full streamer.

Time	Distance
1 Second	16 total feet
2 Seconds	48 total feet
3 Seconds	96 total feet
4 Seconds	160 total feet
5 Seconds	240 total feet

Earliest chance to pull reserve handle

6 Seconds	336 total feet
7 Seconds	448 total feet
8 Seconds	576 total feet
9 Seconds	720 total feet
10 Seconds	880 total feet
11 Seconds	1056 total feet

Last chance to deploy reserve parachute and have it be effective.

12 Seconds	1232 total feet
13 Seconds	1408 total feet

Ground

14 Seconds	1584 total feet

3. Partial malfunctions.

Anti inversion netting has greatly decreased partial malfunctions and the occurrence of partial inversions has been non existent in Forest Service smokejumping operations.

a. Malfunctions in which the parachute canopy has opened partially.

b. Slows the descent rate of the jumper.

c. More time to deal with the emergency than in full streamer or total malfunction.

d. Rate of descent can be great enough to cause serious injuries or death if emergency procedures are not initiated.

e. **Types of partial malfunctions**:

Note: Anytime the canopy is not fully opened properly or is not fully intact but is holding some amount of air, it is considered a partial.

Blown Canopies.

1. A canopy with holes or tears.

2. Check your rate of descent against your jump partner. Deploy your reserve if your rate of descent is judged to be too great.

Line-Over.

1. One or more suspension lines pass over the top of the canopy and remain there after inflation.

2. May be cleared by the jumper reaching up and pulling on the line(s) to cause it to slip off.

3. After one attempt to clear the line(s), deploy the reserve.

Partial Inversion.

1. One or more sections of the canopy slip under the skirt and become inverted during opening.

2. Similar in appearance to line over.

3. Probably not able to clear the malfunction.

4. Check your rate of descent against your jump partner. Deploy your reserve if your rate of descent is judged to be too great.

Total Inversions.

1. The main canopy opens inside out due to a rigging error or material going through a canopy modification.
2. Though this is considered a malfunction, it does not require

deployment of the reserve because the canopy is complete and the rate of descent is not affected.

3. Modifications in the parachute will now be reversed. This will cause the canopy to drive backwards and for the steering to be reversed.

4. Toggle pull may be more difficult due to twist in the riser groups.

Line Twists.

1. Line twists are not normally considered to a partial malfunction unless they are excessive.

2. Caused by the movement of the D-bag outside of the airplane or poor body position of the jumper.

3. Not a serious problem. The main problem is the canopy is not Steerable with the line twists and this increases the probability of missing the jump-spot.

4. Procedure for clearing line twists are to reach up and put tension on the twisted lines by spreading the risers. Scissor kicking the legs will help unwinding.

5. The best avoidance is to perform a vigorous, tight exit out the door.

4. Report of Malfunctions.

All malfunctions and inversions will be reported to the loft supervisor or their assistant immediately and the appropriate forms completed.

B. Reserve deployment procedures.

1. Deploying your reserve.

a. Checking the rate of descent against that of your jump partner is a good way to determine if the rate of descent is significantly increased over what it should be. If there is any doubt in the jumpers mind as to the integrity of the canopy or the rate of descent is excessive, the reserve should be deployed.

b. Feet together.

This will eliminate as much as possible, the chance of the jumper's legs becoming entangled in the reserve as it' deploys. It is especially important if the jumper is tumbling during the malfunction.

c. Look at the handle.

a. Note the color of the handle to identify.

b. Look at the handle to locate it, otherwise the jumper will be clutching and clawing the harness, reserve and suit, wasting valuable seconds trying to find it.

c. The center pull handle (red) can be pulled by either hand.

d. One hand should be on the handle and the other at the jumpers side.

d. Pull the handle.

Pull the handle out and away to open the reserve, then move the hand to the side of the body, arm extended.

e. Head to the side.

Falling at a high rate of descent, the jumper can avoid the rush of canopy material by turning the head to the side.

C. Reserve main entanglements with a full streamer.

1. In a full streamer malfunction, there is a possibility that the reserve canopy will entangle in the streamered main canopy.

a. Clearing procedure.

1. Watch the reserve deployment closely.

2. If the reserve is entangled, quickly pull the reserve down, hand over hand and let it re-deploy by throwing it back out.

D. Reserve fails to inflate.

1. If the reserve will not inflate after opening the chest pack, the descent rate is probably not great enough to need the reserve.

2. The reserve may not pull all of the line stows and the skirt may remained closed out perpendicular to the jumpers. Grab the lines and shake to open the skirt and to facilitate inflation.

3. If after a couple of attempts the reserve still does not inflate, pull the canopy material back in, gather it up as best as possible and release from the harness or tuck it between the jumpers legs.

E. Both parachutes open.

1. This would occur if the jumper deployed the reserve parachute for a malfunction and the deployment cleared the malfunction, usually a partial malfunction.

2. Each parachute will be offset approximately 15 degrees as each parachute will spill some air that it would normally hold. The amount of air spilled is compensated by the additional canopy support.

3. Rate of descent is about normal.

4. There will be no canopy steering control.

5. If the main canopy clears the malfunction, it may be desirable to release the reserve. Once the reserve is released from the harness rings, the ability to steer the main parachute is restored.

6. Do not become so task focused in releasing the reserve that you lose situational awareness. If you are unable to release reserve, it is vitally important that you do a good PLF due to body attitude with the reserve out.

7. At 250 ft. altitude, abandon the attempt to release the reserve and prepare for a normal PLF. Releasing the reserve below 200 ft. will

cause oscillations due to the main straightening and vacating the space left by the reserve.

F. Other problem situations in jumping.

1. Static line fouled.

   a. This would occur if the jumper exited the aircraft with the static line mis-routed and fouled in some way.

   b. The jumper would be "in tow" and trailing along behind the aircraft.

   c. Emergency procedure is to signal the aircraft that you are conscious and unhurt. The signal is to put your hands on the top of your helmet.

   d. This is also the signal that you are prepared for the possibility that the spotter will cut the static line freeing you from the "in tow" situation. You must be prepared to deploy your reserve immediately after being cut away.

   e. If the jumper is incapacitated and cannot be cut away, the spotter will attempt to retrieve the jumper. This will take some time and the jumper must guard against deploying the reserve.

   f. A reserve that is deployed during a jumper "in tow" would result in catastrophic damage to the jumper and probably the aircraft.

II. PARACHUTE MALFUNCTIONS AND OTHER EMERGENCY PROCEDURES EVALUATION PARAMETERS.

A. Upon completion of this training unit, the student must show:

1. The ability to correctly recite procedures for identifying parachute malfunctions.

   a. The student will respond to a trainer that will present the different malfunction types by description verbally or by slide.

2. The ability to describe the two classes of malfunctions.

    a. The student will verbally describe the malfunction.

3. The student will correctly apply the reserve deployment procedures during exit training and be able to describe those procedures verbally.

4. The student will correctly identify other emergency procedures and describe the techniques to deal with them.

B. Trainers must continually instill in the students the need to review malfunction and emergency procedures.