

Chapter 2

PARACARGO OPERATIONS



LESSON PLAN OUTLINE

PROGRAM: SMOKEJUMPER

LESSON: PARACARGO OPERATIONS

OBJECTIVES: Given the components and procedures of a smokejumper paracargo operation, the trainee will be able to successfully identify these and be able to assist in packaging equipment and supplies for smokejumper operations.

INTRODUCTION: Paracargo is an integral part of smokejumping operations. A safe and efficient paracargo operation depends on utilizing qualified personnel and maintaining equipment to very high standards. Paracargo operations consist of three main components: Packaging of cargo, cargo parachutes, and delivery of paracargo. Each smokejumper unit maintains, as a core component of its operations, a paracargo operation capable of supporting normal smokejumping operations and larger, heavy paracargo operations.

I. PARACARGO OPERATIONS

A. Packaging

1. All paracargo will be packaged within a container with a harness constructed to withstand the forces of aerial delivery from a low flying aircraft.

a. Types of paracargo

1. Firepacks – cardboard boxes containing firefighting equipment such as fire handtools, food, sleeping bags, water, and miscellaneous equipment.

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2. Chainsaw – usually cardboard boxes containing a power saw, chainsaw chaps, fuel and oil. Some bases maintain their own chainsaws and others order this equipment from the cache system.
3. Cubie – 5 and 2 ½ gallon water containers inside a cardboard box which may be cargoed with a harness and individual cargo chute.
4. Pumps – Mark III and smaller pumps which are pre-packaged in cardboard boxes with accessory gear and mix-oil. 1 ½ and 1 inch hose is usually packaged separately in boxes or hose packs with parachute attached.
5. Climber box – one of the few items free fell. Climbers are usually packaged in cardboard boxes and configured to withstand ground impact.
6. Rescue equipment – all bases have rescue/first aid trauma kits which consist of keds & skeds and other equipment essential for first responder emergencies. Some of this equipment is in boxes and others are packaged within specifically designed containers, however all are delivered by air via parachute.
7. Other cargo is utilized at each base depending on specific needs. Some examples are:
 - a. Heavy PC – usually used in Alaska to support inaccessible incidents. All bases support large fires to some extent and utilize heavy PC.
 - b. Some bases use a high impact system to minimize risk of hanging cargo in trees.

b. Preparation

1. All paracargo will be securely packaged and contained within either a pre-fabricated harness or a harness constructed from a “no-cut” webbing strap.
2. All paracargo containers will meet the minimum density requirements to minimize “floating”

of cargo after kicking. A weight to volume ratio must be maintained at a “safe minimum density” when throwing cargo. An in depth discussion is included at the end of this lesson plan.

B. Cargo Parachutes

1. All cargo parachutes shall incorporate the following features:
 - a. They shall be constructed and rigged for a line first deployment.
 - b. They will utilize a standard personnel static line snap (MS 70120).
 - c. The static line shall be 14’10” in length with a MTDC weak link incorporated and with the words “Weak Link” stenciled on the static line.
 - d. The riser color will be red.
 - e. The container will have a protective flap over the static line stows.
 - f. Cargo loops should be used on all bundles.
 - g. The cargo chute will be secured to the bundle, usually done with velcro tabs or using break tape.
 - h. The canopy size, type, and weight use range will be stenciled on the container and the riser.

C. Delivery

1. On most smokejumper missions, the drop zone will be selected by the spotter and the smokejumper incident commander, in conjunction with the mission pilot.
 - a. The drop zone should have a safety area and be clear of all personnel during the drop.
 - b. If necessary, insert qualified smokejumpers at the drop zone to provide control and safety measures during paracargo operations. At a minimum, communications shall be established with a pre-identified contact before dropping cargo.

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- c. During heavy PC operations, the drop zone should be established prior to aircraft arrival and should meet the following criteria:
 1. 200' wide on each side of the flight path of the aircraft.
 2. 300' long in the direction of approach.
 3. 1300' long in the direction of departure.
 4. The drop zone will be at least 600' from all populated areas.
 5. Large drop zones should be marked with a white or orange 'T' at least seven feet long. It should be placed so as the plane is flying into the wind, it can be easily read.
2. After selecting the drop zone, the spotter shall choose the cargo to be dropped.
 - a. Inform the pilot of the cargo type.
 - b. Hook up the static line snap to the same static line cable used in personnel deployment
 1. Avoid stacking bundles...if necessary use the roller track, if available.
 - c. Inform the pilot that you are hooked up and ready in the back.
 - d. Command from the pilot to kick bundles, will be:
 1. "On final"
 2. "Standby"
 3. "Kick"
 - e. Upon the "kick" command, the spotter should vigorously push the cargo out the door, using arms to guide and the legs to supply the force.
 - f. The spotter should watch the cargo to the ground to give the pilot feedback on accuracy.

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3. All smokejumpers will be in seats with restraint, helmet and gloves on during cargo runs.

II. MINIMUM DENSITY

A. The problem of light, bulky cargo bundles striking the tail of an aircraft during aerial cargo delivery is a very real concern. Tail strike problems are not new, nor are they confined to rear exit aircraft. The possibility of light weight cargo contacting the tail control surfaces has long been recognized, although actual occurrences have been fairly uncommon. In an effort to prevent tail strike incidents, smokejumper paracargo programs will adhere to packaging standards of safe minimum density for aerial delivery. Bundles of sleeping bags, characterized by low weight and high volume, exhibit a tendency to veer upward toward the tail of the aircraft upon ejection into the slipstream. Other cargo, similar in volume to sleeping bag bundles but heavier, drop cleanly away from the ship upon ejection. The difference in behavior between sleeping bags, and other cargo, is attributed to the relationship of cargo weight to volume, or technically speaking, cargo density.

1. Density is the ratio of weight to volume.

$$\text{Density} = \frac{\text{Weight}}{\text{Volume}}$$

2. For an object of fixed weight, density decreases as volume increases; conversely, density increases as volume decreases.
3. A sphere contains the most volume for the least surface area. For flat sided objects, a cube contains the most volume for the least surface area. As surface area increases, the likelihood of floating increases for a bundle of fixed weight.
4. For instance, a cube measuring 1' x 1' x 1' has a volume of 1 cubic foot and a surface area of 6 square feet. A rectangular box measuring ½' x 1' x 2' also has a volume of 1 cubic foot but its surface area is 7 square feet. If each box weight 10 pounds and this weight is evenly distributed, the density of both the cube and the rectangle would be 10 pounds per cubic foot. However, the cube would be less likely to “float” since the surface area it presents on the slipstream is less than that of the

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rectangular box. Consequently, the cube would be the preferred container shape.

5. In bundles characterized by “heavy” weight or “high” density, the weight is the overriding force at the moment of ejection, and the box proceeds earthward without floating with the slipstream into the tail of the aircraft. A “light-weight” or “low” density bundle, however, presents enough surface area to the slipstream that the weight is not the predominate force, and the box is held aloft in the slipstream from the point of ejection to the tail of the aircraft. Ideally, there exists a safe minimum density that cargo can be packaged and will drop cleanly away from the ship upon ejection under normal cargo dropping conditions. Conversely, bundles below the safe minimum density will show a tendency to “float” in the slipstream toward the tail of the ship.

Critical density = the density at which a cargo bundle is first observed to float in the slipstream of the jump ship.

Safe minimum density = the lowest cargo density safe for aerial cargo delivery in a specified aircraft.

6. Safe minimum density is invariably greater than critical density, providing a margin of safety sufficient to ensure positive cargo separation from the jump lane under normal conditions.

III. PARACARGO EVALUATION PARAMETERS

- A. At the completion of this training unit, the trainee will be able to:
 1. Recite the proper techniques and methods for packaging paracargo.
 2. Recite the proper components and features of the cargo parachute.
 3. Identify the features of a paracargo drop zone and recite drop zone safety measures.

IV. NARRATIVE OR REVIEW

- A. Safety is of foremost consideration in any paracargo operation. All personnel and aircraft must have the necessary equipment and training to safely accomplish the mission. Cargo dropping personnel and pilots must meet the minimum requirements for training and experience, and show competence and knowledge with standard

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paracargo operating procedures. Total mobility and interchange between units in a paracargo operation dictates that delivery methods and operating procedures be as standard as possible to ensure safety and efficiency in delivery.

V. SMOKEJUMPER BASE INSERT

A. Each base will insert photos of their standard cargo bundles and packaging instructions, specifically for:

1. Fire Packs
2. Chain Saw Packs
3. Cubitainers
4. Rescue equipment to include trauma kit with ked/sked
5. Tree Climbing Equipment
6. Fedcos
7. Cross-cut Saws
8. Any other equipment that might be tied on to boxes

B. Each base will insert rigging instructions for their cargo parachutes including photos.