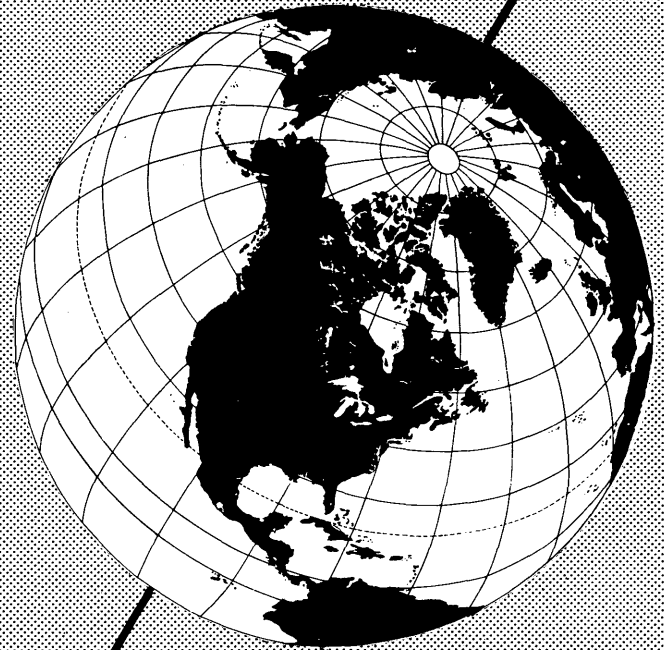


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**U. S. ARMY  
SNOW ICE AND PERMAFROST  
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# **Resupply of Ice-Cap Expeditions by Air Drop**

**by Carl S. Benson**

**U. S. ARMY SNOW ICE AND PERMAFROST  
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**Corps of Engineers  
Wilmette, Illinois**

## RESUPPLY OF ICE-CAP EXPEDITIONS BY AIR DROP

### Air-drop procedure.

1. The system described was effectively used on SIPRE Ice-cap Expedition "JELLO" 1955 on the Greenland Ice Cap. The entire air-drop resupply operation worked extremely well and 100% recovery was obtained from all fuel and food drops. Layout of the drop zone underwent a process of evolution during the season, using P. E. Victor's\* system as a starting point. A sketch of the drop zone which became standard for JELLO is included (Fig. 1).

Two rows of flags, spaced 150 ft between rows, were laid out parallel with the wind. The pilot always flew into the wind with the camp on his left. When winds were shifting during preparation of the drop zone, the rows were laid out so that any cross wind would come from the pilot's left.

The flags outlined the actual drop zone and extended before and beyond, in line with the drop zone. The end result was a pair of rows long enough to be clearly visible while the plane was making a low pass. The flags which were in front of the drop zone aided the pilot's depth perception and provided reference for distance measurements on the surface. The flags beyond the drop zone also aided in depth perception and the pilot did not climb until he passed the pair of crossed flags placed 0.2 mile beyond the drop zone. A weasel was also placed 0.2 mile beyond the drop zone.

The camp, weasels, and any other objects used for depth perception were to the left of the drop zone. This was for the pilot's convenience, as his seat is on the left: These objects were in a line parallel to the rows of flags and 150 ft to the left. The drop aircraft flew between the two rows of flags. In general, it is wise to lay out a large number of markers, since there are no other features which can be used for depth perception and estimating distances on the surface.

As the pilot approached the drop zone he flew first over closely spaced flags. The interval between these flags was 100 ft, with black ones on the left and red ones on the right. After the closely spaced flags, three pairs of flags at 0.1-mile intervals outlined the actual drop zone. The center of the drop zone was marked by crossed flags in the left row and was opposite the main camp. The beginning and end of the drop zone were also indicated by weasels on the left, and by smoke bombs at the actual boundaries (Fig. 1).

Free-drops (material dropped without parachutes) must be made from as low an altitude above the snow surface as possible. Successful drops for Expedition JELLO, and in previous years, have been from elevations of 15 to 20 ft. Breakage is to be expected in drops from higher elevation. Low flying, of course, demands extreme caution. Under such conditions, it is easier to judge an aircraft's height above the snow surface from the ground than from the air.

In all of the air drops for Expedition JELLO, constant communication was maintained between pilot and the expedition leader on the surface. The pilot was talked through each drop run by voice procedure similar to that used in GCA. The plane's altitude was estimated by comparison with the height of the flag markers. The tops of the flagpoles were 10 ft high. The pilot was guided down to about 10 (not more than 15) ft above the flag tops as he passed over the closely spaced flags at the head of the drop zone. If he was either too high or too low, the drop was not attempted and another run was made.

A shortage of time or equipment may make it necessary to lay out a drop zone of less detail. If such is the case, the most important markers are the weasels and the camp itself. These objects should be spaced on the left as shown. If the number of available flags is less than

\* Paul-Emile Victor, "The supply of expeditions by aircraft," *Polar Record*, vol 7, no. 47 (1954), pp 24-31. (This reference is highly recommended.)



the 25 recommended, the number in the right-hand row should be reduced first. The flags at the beginning and end of the drop zone should be placed if at all possible; several flags before and after the drop zone are next in importance.

Locating a small group on the ice cap is sometimes difficult even with excellent visibility, and is generally unsuccessful when visibility is poor. Smoke bombs may help the pilot find the surface party and are usually better than flares for this purpose. They also give the pilot an excellent indication of surface wind speed and direction when he has located the expedition's camp site.

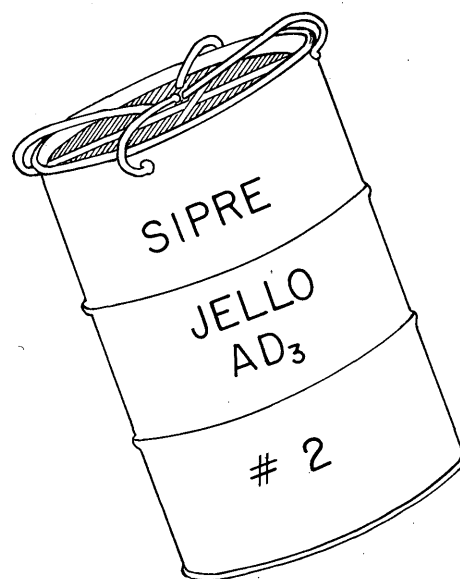
#### Packaging of supplies for air drops.

2. All fuel was dropped in heavy-gage drums. There are two types of fuel drums available; the lighter one weighs 50 lb and the heavy-gage one weighs 67 lb. The light-gage drum will not survive a free-drop. The capacity of the fuel drums is 55 gal but they were filled to 45 gal only for free-drops. This is an important consideration when breaking down the fuel requirements into the number of barrels to be dropped.

All food to be dropped was packed in 55-gal drums. The top of each drum was cut off, and four holes spaced 90 deg apart were made just below the rim. The food boxes were then placed in the drum and the cover put on. The drum was sealed by putting lengths of 3/8-in. or 1/2-in. steel concrete-reinforcing rod through the holes and bending the ends in to the center of the cover. It is important that the rods be long enough to bend all the way in to the center; this makes them easier to remove in the field (see Fig. 2).

Each barrel was labelled as shown in Figure 2. In this case the "AD<sub>3</sub>#2" indicates that this is barrel #2 on Air Drop 3 for SIPRE Expedition JELLO. An itemized list was prepared for each barrel, and a complete breakdown of the supplies on each air drop was made prior to departure of the expedition from Thule. This made it possible to adjust any shortage or over-supply as it arose in the field. As an example, the initial delay in JELLO's time schedule cut over 78 man-days of food from the requirements. These changes were easily made with the system of prepacked barrels. It merely meant cancellation of barrels 3, 4, and 7 from AD<sub>3</sub> and barrels 1 and 3 from AD<sub>4</sub>.

Such details on air-drop resupply must be prepared by the expedition members before leaving the base of operations. This cannot be urged too strongly. However, it is essential that there be a contact man on the base to handle requests and communication from the expedition, since it is impossible to foresee every detail.



The tops of fuel drums were cut off and ration boxes were packed inside. The tops were then replaced and the drums sealed with steel rods which passed through holes burned in the barrel just below the rim.

Figure 2. Packaging of food into 55-gal drums.