AG(SHAEF/G-5/751) 16 Oct 1943

SUBJECT: Procurement of Aircraft for Airborne Operations.

FROM : SHAEF Command Post, Personal from General Eisenhower

TO : Air C-in-C, Allied Expeditionary Force,
     Allied Naval Commander, Expeditionary Force.

Shortly we will be fighting our way across the Continent of Europe in battles designed to preserve our civilization. This effort will require the safe delivery of our men behind enemy lines through use of air support vehicles. IX Troop Carrier Command, under the command of Maj. Gen. Lewis H. Brereton, requires a redesigned aircraft for use in airborne operations and delivery of paratroopers to specified drop zones.

The current aircrafts utilized for airborne operations are C-47 transports. It has been observed in practice operations that the C-47 has an insufficient loading level as well as severe stability issues related to center-of-gravity location shifts. In order to have a successful mission, it is desired to design a new aircraft to adequately address these issues.

The newly designed aircraft should be able to deliver troops safely to a specified drop zone and have a sufficient range to return to the original point of departure. To demonstrate these abilities, prototypes should be built for each proposed design and tested according to the attached specifications.

The lives of our men are paramount. I am hopeful that you will consider their safety in the creation of your designs.

Enc. Prototype Requirements

Copies to:
The Under Secretary of State, The War Office,
Commanding General, European Theater of Operations, U.S. Army (copies for FECZ),
The Under Secretary of State, The Air Ministry.
Prototype Requirements

In order to demonstrate the capability of each proposed design, a small-scale prototype should be constructed. Presented here are the quantities with which the worthiness of each design prototype will be measured.

To model the transport of paratroopers, each prototype aircraft will be required to carry a payload, drop the payload at a designated drop zone, and return to the original departure point. For the purposes of this test, the payload will consist of standard-sized golf balls, each representing a single paratrooper. The range of each aircraft will be evaluated through completion of laps of a set course.

Designs will be ranked in quality by scoring parameter $S$:

$$S = (NT-1) \times NL.$$  \hspace{1cm} (Eqn. 1)

Here, $NT$ is the number of troops safely delivered to the drop zone and $NL$ is the number of laps completed both before and after the drop. The most desirable designs will maximize $S$, resulting in an aircraft that can deliver as many troops as possible from a large range of starting locations.

The evaluation process will consist of three parts as follows:

1. Flight worthiness test – Each prototype will complete three (3) laps of the flight course within five (5) minutes. In this mission, laps are completed with no paratroopers loaded.
2. Loading and stability test – Each design team will demonstrate a stable center-of-gravity (CG) location for both unloaded and loaded
configurations. This ground mission must be completed within five (5) minutes.

3. Scoring mission – Each prototype aircraft will be loaded with the chosen number of troops. After safely taking off, the aircraft will complete the chosen number of course laps (NL), drop the paratroopers in the designated zone, and complete an additional set of laps (NL). This mission must be completed within a time limit of five (5) minutes.

The prototype aircraft and design team must complete the first two test missions prior to attempting the scoring mission. The first mission will demonstrate the prototype aircraft’s flight characteristics in the unloaded configuration.

The second mission will be used to establish aircraft stability for both unloaded and loaded configurations. While the aircraft is on the ground and powered off, members of the design team will first lift the unloaded prototype at the center-of-lift location to demonstrate a stable center of gravity. Then, the team will load all paratroopers into the aircraft and again demonstrate that the aircraft is stable. The entire process must be completed within five (5) minutes.

Once both of these missions are completed, the design team may attempt the final scoring mission. In this mission, each design team will determine how best to optimize the scoring parameter (S).

The number of troops safely delivered to the drop zone (NT) will be determined as follows. The drop zone consists of a circular area with a radius of 50’. A flag placed on the flight path will designate the center of this area. Each aircraft will attempt to drop as many troops as possible in this zone. NT will be given by the maximum number of paratroopers in any 3’ diameter circle fully contained in the drop zone. This scoring value emphasizes not only the aircraft’s ability to accurately drop troops, but also to minimize the scatter among each group of troops. The design team may choose any number of troops to carry in the aircraft.

The number of laps (NL) estimates the range of the designed prototype. During the scoring mission, the aircraft will take off loaded with troops and complete NL laps before dropping the paratroopers. To model a return flight, the aircraft will then complete NL laps before landing. If the aircraft is unable to complete the same number of laps before
and after the troop drop, the minimum of the two values will be taken as NL.

Several design requirements exist for the prototype aircraft as follows:

1. All prototypes must take off from the ground, i.e. no hand launches allowed, to be consistent with realistic conditions.
2. The same propulsion system will be provided for each design team. An electric motor, battery pack, and propeller will be supplied. The propeller configuration can be chosen to be either pusher or tractor type.
3. All electrical components must be carried internally, including: the battery pack, radio control receiver, and data recorder. Further, all troops must also be carried internally.

Additionally, there are safety requirements for the prototypes. Each aircraft must have/pass the following safety considerations to be considered for evaluation:

1. An easily accessible arming fuse mounted to the outside of the aircraft. This fuse will keep the motor battery disengaged until ready for flight.
2. Wingtip markings that show the location of the CG (both unloaded and loaded). These markings will allow for on-site determination of static stability of the aircraft.
3. Pass a pre-flight inspection given by a designated pilot. The inspection document is attached here for reference.
Diagram of flight course with designated drop zone.

Scoring example in drop zone; here NT = 13.
Each paratrooper will be modeled by a standard-sized golf ball, weighing 1.62 ounces.