

will have to be picked up from the receiver and dead-headed to the shipper's plant where it will be dropped and an already loaded glider picked up. If more than one glider is going to be towed, then the total number of gliders needed for a one-glider operation will have to be multiplied by two, or three, depending on how many are going to be towed at the same time; and as more points are added to the proposed line, more gliders will have to be added. Each point must have a glider for unloading while the towship is away and each must have one for loading while waiting for the towship to arrive. Obviously, unless the cargo glider route is planned in advance with the greatest care possible, the investment in the gliders will far exceed the investment in a cargo plane of the same capacity.

Just as the cargo glider will make possible packaging economies as compared with trains and trucks, it will make packaging economies as compared with the plane. A plane trip requires loading on the truck at the shipper's plant, unloading at the airport, loading onto the plane, unloading at the destination airport, reloading on a truck, and finally unloading at the receiver's plant. The glider requires only one loading—at the shipper's plant, and only one unloading—at the receiver's plant.

Here again, we should not oversimplify the glider operation. Direct loading at the shipper's plant and unloading at the receiver's plant may not always be possible. Where the plant is located in the middle of a city the cargo glider cannot land alongside the loading platform. Perhaps a landing by the platform is possible at only one end of the journey. Then the advantage of the cargo glider is diminished, although it need not be eliminated entirely.

Finally, the elimination of the slow truck hauls required in the cargo plane operation reduces the ice or other refrigerants required by the latter.

Theorizing about the economic place of the cargo glider is a radically different thing from getting shippers to sign on the dotted line. Very few shippers are interested in promoting glider technique or pioneering in air transportation. When you approach them on cargo glider transportation they invariably get out a pencil and paper and figure whether you are going to save them money or not. Unless you can save them money they are not interested.

I would now like to describe a cargo glider route which we laid out for All American. It is the best that we were able to lay out under existing conditions. It is an example of a shipping situation which can better be served by cargo glider than by any other form of existing transportation.

The southbound trip would cover 336 miles from shipper to receiver. From the receiver to the nearest shipper having a suitable return load would require a run of 89 miles empty. The return trip would cover 292 miles. Twenty-five additional miles would be required to get from the receiver at the north end of the route to the return shipper at the same end. Since we anticipated dropping off loaded gliders and circling while they were unloaded, then picking them up empty and dropping them at the shipper's plant for reloading while we circled, we came out with a total of 1078 miles for the round trip, of which 42% was non-revenue. As the gliders we planned to use were small,

very little time was allowed for unloading and reloading, so that this 42% non-revenue miles could not be reduced very much by adding gliders. In other words, on the best worked-out glider routes, a very high percentage of non-revenue mileage must be anticipated. We estimated that one round trip per day would require 11 hours and 27 minutes. Nevertheless, the shippers at both ends of the route could supply products in quantities required to fill a glider train of two tons payload capacity and at price higher than air express rates. With suitable equipment it is hard to see how this route could lose money. Unfortunately, such shipping situations are not found at every turn, although they do exist.

I hope I have made two things clear so far: that the cargo glider has a chance of success, but that its place is specialized and must be studied very carefully before the glider train is put into operation.

This is my appraisal of the present outlook for the cargo glider. Its future outlook may be different, primarily because of one development: the helicopter.

It has been pointed out that the glider has roughly four advantages over the cargo plane: (1) a time advantage by eliminating the truck haul at both ends of the air journey; (2) a cost advantage for the same reason; (3) a cost advantage by providing packaging and refrigerating economies, and (4) a cost advantage by allowing higher utilization of equipment and employing less costly equipment.

The helicopter also has the first three advantages over the plane. It eliminates the truck haul and it allows packaging and refrigerating economies. Its advantages in these three respects are, furthermore, greater than those of the cargo glider. Where a glider requires a field at least five wingspans long and free from obstructions, the helicopter requires only a space a little bigger than the machine itself. It can fit into far more places than the glider can. The commercial application of the Brodie System of landing the glider on a cable may offset this advantage to some extent, however. The helicopter cannot provide the fourth advantage, allowing higher utilization of equipment and utilizing less costly equipment. This is an advantage which nothing on the horizon promises to outmode yet. Even when the helicopter is perfected so as to be commercially useful, the cargo glider will still have a useful place. The helicopter should be kept firmly in mind as cargo glider operations are established, nevertheless.

This paper has been devoted to an analysis of the inherent characteristics of the cargo glider which make it commercially acceptable, but the paper would not be complete if it did not at least touch on something else: the men who design the gliders, the men who make the gliders and the men who operate them. On the ability and perseverance of these men will depend, to an enormous extent, the success or failure of the commercial cargo glider. If intelligent, business-minded, hard-working men inaugurate cargo glider service, the success of the idea is more than half assured at the outset; and if those who perform the initial experiments haven't these characteristics, the cargo glider project has two strikes against it before it starts. The commercial cargo glider is not, by its nature, assured of success. The idea is not willy-nilly a money maker; but the cargo glider has a good chance of success in the hands of the right managers.