

SOME COMMENTS ON SAILPLANE DESIGN—PART 2

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(Note: This paper is one of those presented in Los Angeles on Sept. 16, 1961, at the SSA Technical Symposium on Soaring. Part 1 was printed in the October issue. It contained two printing errors which should be corrected: in the 4th paragraph of the introduction, "tiller's" should be "flier's"; and in the 1st paragraph of "Human Factors," "Darling" should be "Daring.")

INTRODUCTION

The 1st part of this paper emphasized safety, visibility, utility and comfort. This installment continues the theme that the man is more important than the machine, it discusses various sides of a number of detail subjects and calls for strict designer responsibility for every detail whether the concept is accepted by tradition or not.

CONTROLS, HANDLES AND PARAPHERNALIA

Neglecting the "local airport circler" and training gliders, no motorless aircraft of good or high performance is worth constructing if it cannot be equipped to approach the distance record of 535 miles. Such long flights are hard work, take hours of concentrated effort, may involve breathing oxygen, radio, good navigation . . . the works. Compare this to a long day at the office with decisions being made at 60 per minute and by the hour. It is even more difficult, for there is less chance to stretch, or to take a coffee break to relax for a few seconds. Any executive who pays good money for an uncomfortable seat, potentially dangerous equipment and awkwardly arranged facilities could be considered incapable of good judgment when he chooses to work hard and for long hours under these conditions. The soaring pilot should be critical of his surroundings rather than to rationalize away their inadequacies. Among the points to demand of designers are:

Adequate and accessible map, glove, upchuck cup and jacket storage; a well thought-out instrument panel; places in easy reach for water, perhaps a snack, certainly tie-downs, first aid, signalling mirror, relief tube, two barographs, cameras,

oxygen mask and regulator, note pad and pencil, a good ventilator, tools, radio, etc.

If this requires a larger cockpit, so be it!

It is hoped that designers will not try too hard for "snugginess" so that the pilot "feels like a part of his machine." Such feelings are understandable but impossible in general practice as human sizes vary so much. Perhaps more attention to many other cockpit details will bring equal advantages while satisfying the wide divergences of individuals and their personalities.

Personal preferences are acceptable in the selection of some arrangements and instruments, for example: wheel instead of stick control, but in some aircraft, "release" pulls are next to "spoiler" pulls, brake handles are hidden, there is restricted access to door or hatch releases because the aircraft designer-builder was too excited to figure it out beforehand, or too addicted to tradition. Then, when the pilot gets excited this may cause him to pull the release instead of spoiler or vice-versa, crunch into a parked aircraft because he cannot find the brake, or take added seconds to bail out, or get his sleeve tangled with some piece of sloppy engineering.

In two-place powered training airplanes of tandem configuration the throttles are always rigidly interconnected, as are the switches, etc. Yet, some tandem seated training gliders may operate with simple cable connections between the forward and rear release and spoiler handles. This renders the instructor helpless if the student, in either seat, actuates the wrong control at the right time or the right control at the wrong time.

All persons in all gliders should be able to wear 'chutes comfortably. The parachute in the front seat of a tandem two-place should not interfere *ever* with the rudder pedals of the rear occupant. One should get into and out of gliders wearing his parachute so that he always practices for that emergency for which he wears it.

Fortunately, gliders are slow enough and instructors, if present, capable enough to avoid danger—

almost all of the time. But, economically and humanly speaking, one crash for avoidable cause is more costly than the time and effort required to do it right. Loss of a tiny bit of aerodynamic performance is usually justified if overall advantages accrue.

It is difficult for the FAA to legislate all design items, and it is not particularly desirable, either for the FAA or for the glider people, that every such detail be written down. Yet to use this degree of freedom from law as an excuse for insufficient design effort need not be condoned.

MANHANDLING

European sailplanes are now vying for honors in reducing the frustrations of assembly, disassembly and maintenance. With few exceptions American gliders are inconsiderate in this area, resulting in predictably less enthusiasm for this part of the activity. On the other hand, most American machines tend to be less complex and delicate, but this does not excuse them from being awkward to manhandle, which is particularly important in competitive flying. A well thoughtout machine of *any* kind is always more of a pleasure to own than a piece of crude hardware.

It is well understood that design effort is expensive and with the poor economics of the soaring situation today this cost has been used as an excuse for many of the aforementioned inadequacies. There may, however, be good reason to consider that effort expended now may develop new and larger markets in the near future and *reduce* the cost.

POINTS TO BE CONSIDERED REGARDING SAFETY

A number of gliders are deficient in one or more of the following: where possible, corrective action should be taken, or the situation clearly recognized and dangerous combinations avoided:

(a) Failures in flight will occur under certain circumstances, for atmospheric conditions of such violence that nothing man-made could survive them do exist. Yet it is possible to design aircraft so strong that occupants would be killed in their seats! Accordingly, design judgment in these extreme cases is called for. Perhaps failure or partial failure of the horizontal tail surfaces may give the occupant the best chance to escape or break-away of the cabin in