A NEW FABRIC MATERIAL FOR COVERING AIRCRAFT

by ROBERT FORKER

(Editor's note: this paper was presented by the author at SSA's Technical Symposium on Soaring, September 12, 1959, at Los Angeles, Calif.)

Summary

A new material is available for recovering aircraft that promises greatly increased life, and in the case of light aircraft and sailplanes, reduced weight. The material, with the trade name of Ceconite, is applied in the usual manner but the shrinking operation is done with the application of heat. The shrinkage can be highly controlled and once the heat source has been removed the cover does not tighten further, even with the application of dope.

Introduction

Probably the greatest single worry to the owner of a fabric covered aircraft coming up for relicensing is the condition of the cover. If the fabric will not meet the minimum strength requirements of the FAA, it must be removed and replaced with new material. This is an expensive process and also removes the aircraft from active use for sometimes extended periods.

Until recently cotton and linen were the only acceptable materials for re-covering aircraft. However, due to limited life, these materials are being discarded in favor of recently developed materials and processes. With the several new aircraft covering processes now available it is deemed advisable to compare their various features. Basically the new materials for re-covering aircraft are: metal, glass, or "Ceconite." A comparison follows:

Cotton and linen: Light weight, easy to repair, but not durable and on the way out.

Metal: Costs more, usually heavier, resulting in CG shifted aft; often subject to "Oil Canning;" due to extremely thin gages required cannot stand rough handling; often develops cracks around high stress areas.

Fiberglass with resin over fabric: Usually costs more, much heavier, resulting in CG shifted aft; control surface CG disturbed with possibility of flutter. Often develops fatigue cracks around high stress areas; difficult to repair; must be replaced when underlying fabric deteriorates to ½ strength; reduced baggage allowance.

Fiberglass with resin over plastic or other covering: Usually costs more. (Additional labor involved as airplane is covered twice.) Fatigues easily and often develops cracks around high stress areas; difficult to repair.

Fiberglass with dope: Not as durable as alleged. (No more durable than weakest point, i.e., rib lacing cord; hand threads are cotton and when deteriorated the covering will come free from the ribs and apart at the seams.)

CECONITE

A newly developed synthetic fabric which, for the same weight, is twice as strong and outlasts cotton three to one. Contains no glass and has fatigue and flexural qualities superior to cotton. Will not mildew or absorb moisture and is not affected by climatic changes. Gasoline and oil have no effect nor do chemicals used for dusting.

Fabrication and repairs: May be accomplished by any A & E.

Time required: Fastest method, not dependent upon proper weather for fabric shrinking. "Aircraft out of commission" time and "Shop tied up with an Aircraft" time reduced to a minimum. It is probable that two "Ceconite" jobs could be accomplished in the same calendar time as for a glass job.

Labor: Much less. Very little sanding required. Few coats of dope and enamel. Not a messy operation. Note: Labor is the major cost in recovering.

Materials: Substantial reduction in amount of dope and enamel offset additional cost of fabric.

Application: Anyone with experience in aircraft fabric work should be able to install Ceconite with little difficulty. After the old cover has been removed and the usual cleaning and chromating has been completed, all rough edges are smoothed and the chafe pads installed. On sailplanes and low speed powered aircraft, Ceconite can be attached to the longerons and outline tubes with Airlac adhesive. The fabric should be applied with the same or somewhat lower tension than cotton. Wrinkles can be removed later so they should cause no concern. The fabric is now ready for tightening.

Ceconite is shrunk by heat. In general, Ceconite shrinkage is in direct proportion to the degree of applied heat. 400°F will shrink unrestricted Ceconite approximately 10% or 5″ in a 50″ width. Coverings for sailplanes and light frame aircraft should provide approximately 1″ slack per 50″ to preclude structural warpage. Nitrate dope will only shrink unrestricted Ceconite approximately 1″ in a 50″ width and generally does not increase envelope tautness over that produced by the heat shrinking process. Ceconite 101 when subject to heat (225°F) shrinks to a satisfactory degree of tautness-such as produced by approximately four coats of dope on a cotton fabric. Discontinue the heat process when the envelop has acquired approximately the desired degree of tautness. *Do not over-tauten.* Since Ceconite fabric shrinks immediately, only two seconds of heat application are required. Longer application of heat does not generally produce further shrinkage. Furthermore, damage to wooden members, other fabrics and electrical wiring could result from prolonged (10 seconds) application of heat above 248°F. On shrinking large surfaces (i.e. fuselage and wings) best results are obtained using two or three applications of heat - tautening on the initial go around with final tautening on the second coverage. This is similar to painting using two coats rather than a single massive coat. On rare cases where satisfactory tautness is not produced by this degree of heat, the temperature may be raised up to a limit of 400°F. Temperature steps of 25°F should be applied - up to 400°F maximum - until desired results are obtained. An ironing type of motion at approximately five inches (5″) per second is most satisfactory; i.e., the ironing motion should cover the area twice, first side to side, then up and down, in order to thoroughly cover the area. Wrinkles and sagging spots are often removed - without temperature increase - by momentarily pausing for approximately two seconds over the wrinkled area. Wrinkles in Ceconite fabric will vanish as the fabric is shrunk. Ordinary dope has but little shrinking effect on Ceconite and is used primarily as an adhesive for surface tapes, and as a flexible filler and as a binder for aluminum powder. Since Ceconite is heat shrunk at a temperature higher than can be attained by leaving the airplane ex-