DESIGNEE NEWSLETTER

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The DESIGNEE NEWSLETTER is a forum for the exchange of information and ideas of interest to aircraft and ultralight builders, restorers, and flyers. The sources of the materials published are EAA Designees, readers, Chapter newsletters, and other publications. Readers are encouraged to submit manuscripts, drawings, and black/white photos for consideration. Every effort is made to select accurate materials of interest to a majority of readers. Opinions expressed and responsibility for accuracy rests entirely with the contributor. All materials submitted become the property of EAA - no remuneration will be made. Materials should be sent to Chuck Larsen, EAA Designee Director.

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VIBRATION

Chuck:

Going over some notes and thought one of them might make a paragraph in the DESIGNEE NEWSLETTER. Many years ago, when I was working Stearmans in the dusting business, we had an airplane come in for engine change. After run in, one of the pilots started a test flight but had power loss problems on take-off. He taxied back and ran the airplane up thinking it may have been water. He again tried to take-off but had a power loss again. After the mechanics had spent several hours going over everything and checking fuel flow, we fired up and again showed a power loss on take-off. Pulling the power back to about 1750 on take-off the engine ran fine and when once in the air ran fine at full power. After this test flight we loaded up with dust and again suffered power loss on take-off at full power.

By this time the carburetor had been changed, mags again checked, tail wheel tire pumped up and several mechanics had lost a couple of nights sleep. One of the mechanics sat on the wing alongside the fuselage and went for a test flight. Sure enough, just as the engine reached full RPM, and the aircraft was about to lift off, the power loss showed up. This time the problem was solved. As the engine reached full RPM the fuel line from the gascolator to the carburetor disappeared due to vibration. A quick tie-off with a leather booth shoe string solved the problem.

About three weeks ago, we had the same kind of problem with a Skybolt at Arlington so I took a look and sure enough the fuel line had about 18" of unsupported area. After tieing it up with Koraseal we had no more problem. Don't know if anyone else has run into this or not, but it might be worth a mention in the letter.

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AIRWORTHINESS OF OLDER AIRPLANES

As the owner of an early Piper tube and fabric plane, I recently received a mailing from Piper that included a copy of F.A.A. Advisory Circular 91-60/THE CONTINUED AIRWORTHINESS OF OLDER AIRPLANES.

This A/C outlines maintenance areas for special concern for the continued airworthiness of aircraft. Its message applies to homebuilt and not-so-old planes as well. Check with your local F.A.A. facility for your copy. Ed.

DESIGNEES AND SUBSCRIBERS:

The winter holidays bring a time of joy and fellowship with friends and family. The EAA Headquarters staff wish you the happiest of Holidays and the hope that the new year will bring peace and prosperity to all.

When you return to your shop after the rush of the holidays, take a "safety inventory" before you go to work. Are power and hand tools in good repair? . . . guards in place? Are safety glasses handy? . . . do you use them? Is ventilation adequate and have fire hazards been minimized? Is the shop neat and clean? Clutter in a workshop is a definite safety hazard, as well as reducing efficiency while working. When you have completed your inventory invest some time for the shop safety . . . it could save hours, days or even years of the consequences of an accident. THERE IS ALWAYS TIME TO WORK SAFELY!

For a safe and happy New Year.

Chuck Larsen, Editor

SCORPION I AND SCORPION II HELICOPTERS — NOT AIRWORTHY

Headquarters, and I'm sure Designees, are periodically asked about the status of these helicopters and their suitability as a project to complete. The best answer comes from a letter released by Rotorway Aircraft, Inc. in July of 1983.

". . . . Many components in these ships have **outlived their useful life** . . . ."

". . . . The Rotorway position is that no **pre 1975 production Scorpion rotor system presently existing in the field should be run up to RPM or operated for any reason under any circumstances.** Be apprised that rotor blade failure **may occur** if this warning is ignored."

" . . . . both the first and second generation Rotorway rotor systems are to be permanently grounded."

In our (Rotorway's) opinion the purchase of a Scorpion I or Scorpion II helicopter in any form should be considered a **static display only".**

A DESIGNEE REVALIDATION must be completed each year. Revalidation may be accomplished on Chapter Status Reports or the form provided in the October, 1984 issue of this publication.

TECHNICAL TOPICS

POSSIBLE ADVERSE INTERACTIONS BETWEEN EPOXY, RESORCINOL AND AEROLITE ADHESIVES

A report from Jerry Schindler, CHEM-TECH, INC. (Manufacturers of T-88) as printed in S.H.A.P. Talk the Newsletter of the Sailplane Homebuilders Association. The S.H.A.P. can be contacted at 3425 John Street, San Diego, CA 92106.

INTRODUCTION

It is not unusual for wooden boats and homebuilt aircraft to be assembled using several different types of adhesives, most commonly epoxy, resorcinol, and urea-formaldehyde (Aerolite). Under certain circumstances it is possible for epoxy adhesives to be markedly affected by contact with ingredients of other types of adhesives. Quoting from a recent British publication, "Chiltern Motorgliders advised that the formic acid attacks and weakens epoxy, plastic resin, and casein glues, and a long-standing airworthiness directive in England prohibits the use of formic acid hardeners near such glues."

In order to assess possible adhesive interactions, a series of tests were performed recently by a retired DuPont engineer who is presently constructing a Falco high-performance homebuilt aircraft. The tests were designed to highlight potential trouble spots, and though test specimen preparation and testing were carefully performed, the gauge of the hydraulic test apparatus was not recently calibrated and slightly different results might have been obtained from research-grade equipment. Consequently more emphasis should be given to data trends and relative values than to individual absolute numerical values. Nevertheless, quantitative data reported here are consistent with data generally regarded as rigorous.

EXPERIMENTAL

Adhesives used were:

1. epoxy — CHEM-TECH T-88
2. resorcinol — Weldwood
3. urea-formaldehyde — Aerolite

Wood specimens were aged, dry, clear white pine, surfaces planed and sanded. Veneer, where used was aircraft-grade birch. Adhesive preparation and bonding were performed in accordance with manufacturer's recommendations.

Preliminary tests and their results were as follows:

(1) A drop of Aerolite hardener in a freshly made T-88 mixture prevented curing of the T-88. Since the T-88 hardener is alkaline, it is not surprising that the strong formic acid solution would have the observed effect.

(2) An Aerolite joint was made and shortly thereafter an adjacent T-88 joint was made on the same piece. The T-88 joint failed to cure completely in 24 hours at room temperature.

(3) Twenty-four hour soaking of cured T-88 in liquid Aerolite hardener softened the T-88.

(4) Painting liquid Aerolite hardener on fully cured T-88 joints did not measurably reduce the strength of the joints.

From these results it seemed probable that the greatest likelihood of producing unsatisfactory T-88 joints would occur when one or more of the following conditions pertain:

(1) The epoxy joint is made shortly after an Aerolite joint is prepared on the same piece.

(2) Excess Aerolite hardener was used.

Consequently, thirteen additional samples were made under conditions similar to those typically encountered.

(1) Ambient temperature was maintained at 70°F.

(2) Aerolite and resorcinol joints were cured for at least 24 hours.

(3) T-88 joints were always made after adjacent Aerolite and resorcinol joints.

Tests 1 through 9 were block shear tests with loading illustrated in test 4 sketch. Tests 10 through 13 were cross-bar tension tests; all were loaded as shown in test 12 sketch. Test results and observations are shown in Table 1.

CONCLUSIONS

(1) The highly acidic (formic acid) Aerolite hardener can inhibit curing of T-88 when intermixed or in close contact.

(2) Cured T-88 will be softened by 24-hour immersion in Aerolite hardener.

(3) Exposure of curd T-88 joints to painted-on Aerolite hardener had no measurable effect on bond strength.

(4) T-88 joints made adjacent to Aerolite or resorcinol joints which had cured for 24 hours or more at 70°F were not adversely affected, i.e., T-88 in all cases produced wood-tearing joints in both tension and shear.

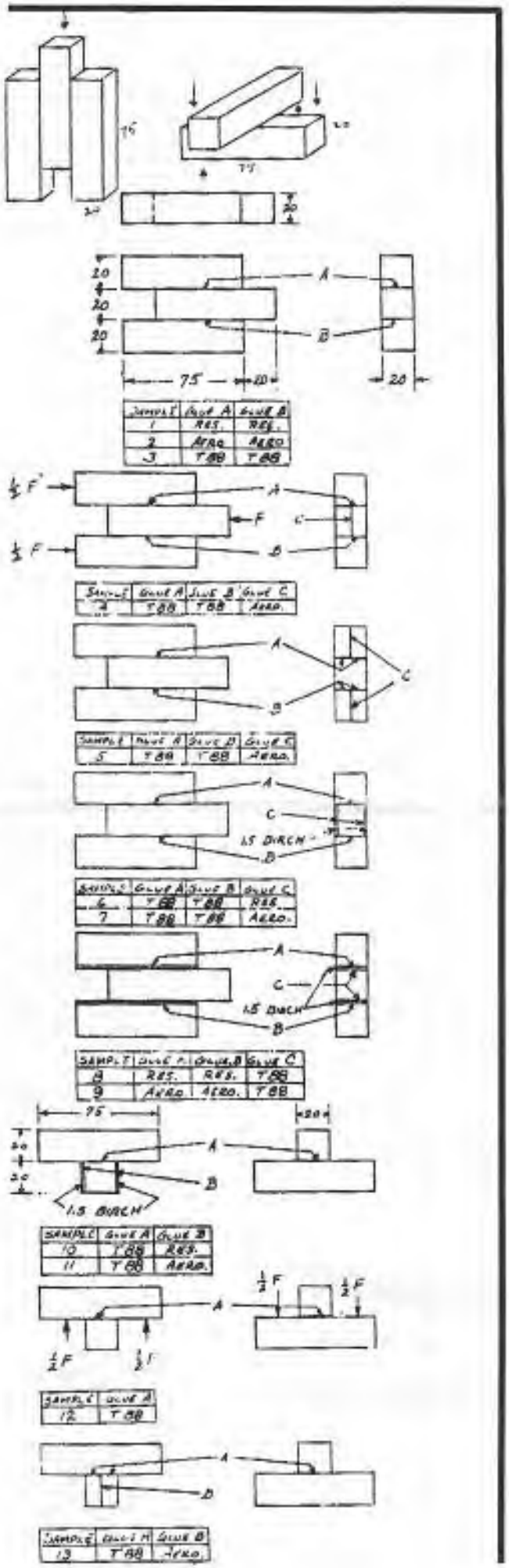
SUMMARY

Expoxy adhesives, whether uncured or fully cured, may be adversely affected by the formic acid constituent of Aerolite hardener and, to a lesser degree by the acidic resorcinol adhesive.

Tests performed on a CHEM-TECH T-88 Epoxy Adhesive indicated that it is acceptable for use in conjunction with Aerolite and resorcinol provided that these adhesives have fully cured. Similarly, normal use of Aerolite and resorcinol do not interfere with previously-cured T-88. These considerations should apply to other brands of epoxy adhesives as well, however, the user should satisfy himself regarding the suitability of any other epoxy adhesive, particularly in critical structural applications.

Table 1. **ADHESIVE SHEAR AND TENSION TEST RESULTS**

Test No.	Stress, lb/sq in.	Description	Fracture Mode
1	1570	Resorcinol only	Wood tore apart
2	2370	Aerolite only	Wood tore apart
3	2600	T-88 only	Wood tore apart
4	3070	T-88 at 90° to a cured Aerolite joint	Identical to Tests 1, 2, & 3
5	2770	T-88 at 90° to a cured Aerolite joint	Identical to Tests 1 thru 4
6	2520	T-88 joints parallel to 2 resorcinol wood veneer joints at 90°	Wood tore apart over 95% of interface
7	2620	T-88 joints parallel to 2 Aerolite wood veneer joints at 90%	Identical to Test 6
8	2620	T-88 joints separated from resorcinol joints by 1.5 mm birch plywood	Plywood sheared apart; resorcinol and T-88 joints intact
9	2730	T-88 separated from Aerolite joints by 1.5 mm birch plywood	Wood of center piece failed identical to 1 thru 5. One Aerolite wood/plywood joint failed 32% in glue joint and 68% in wood. T-88 joint was intact
10	5890	T-88 w/2 resorcinol wood/plywood joints	Wood tore apart 95% +
11	3680	T-88 w/2 Aerolite wood/plywood joints	Identical to Test 9
12	4340	T-88 only	Identical to Test 10 & 11
13	4110	T-88 w/Aerolite joint in middle of 1 cross-piece	Maximum wood failure at the Aerolite joint



LETTERS 'N SHOP TALK

VIBRATION CHECKLIST

From A Recent FAA Publication, As Reproduced In EAA Chapter 64's Newsletter FLYING WIRE

Vibration can be transmitted from the engine to the aircraft structure from points of contact between engine compartments and the cowl, firewall, or engine mount. The following is a list of areas to be checked to insure the engine is isolated from the aircraft structure or to minimize the effect from components which must bridge between engine and structure. The list also includes engine conditions for smooth operation which affect airframe vibration.

BATTLE TO COWL CLEARANCE — Check inside of cowl for chafing; trim metal baffle as required. Repaint effective area and reinspect next flight.

EXHAUST TO COWL — Check exhaust stack for clearance where it extends through cowl. Check stack and cowl for signs of interference. Enlarge cutout in cowl as required.

COWL TO FIREWALL INTERFERENCE — On models utilizing shock mounted cowls, positive clearance should be insured between the cowl and the firewall. Typical clearances where the cowl overlaps the fuselage run on the order of .06 to .13.

INDUCTION HOSE CLAMPS — Check induction hose clamps for clearance with the engine mount structure. Look for marks on engine mount. Rotate clamps as required.

BREATHER AND OVERBOARD DUMP LINES — Check all overboard dump lines from the engine for clearance with the firewall, cowl and/or cowl flap openings. Check cowl flap in both the open and closed positions. Reposition and reclamp to clear.

ENGINE ISOLATORS — (A) Check engine isolator bolt lengths. Bolts which are too long will shank out and will not apply the correct pressure to the isolator. Bolts must be removed to be properly checked. Replace with next size shorter bolt if barrel nut has shanked out. (B) Check isolators for aging and deterioration. Replace if rubber is separated from metal pad, there is cracking of the rubber, and/or pronounced set of the rubber pad.

PROPELLER TRACK — (A) Check Propeller track; set up reference point at tip of propeller, rotate blades past this point. Blades should not be more than 1/16" out of track. (B) Check propeller for loose or binding blades, loose or missing attach bolts. (C) Check propeller spinner for loose, damaged, or deformed parts and visual wobble. (D) Balance suspected prop if roughness continues.

ENGINE CONTROLS — (A) Engine controls should be routed to provide a gentle curve between engine and firewall. They should not be stretched tight. Pull control through firewall and reclamp. (B) Check engine controls behind engine for contact with engine. Reroute and reclamp controls, as required, to clear.

STARTER CABLE — Check starter cable for clearance with cowl and that a loop is provided for flexing.

ENGINE CONDITION — (A) Check spark plugs for fouling, improper gap, and for proper type. (B) Check condition of ignition wiring. (C) Check condition of points. (D) Check magneto timing. (E) Check engine compression. (F) Check fuel injection engines/ check fuel injector nozzles for restriction and correct size. Check fuel pump and mixture unit settings; check distributor valve for calibration and proper flow. (G) On turbocharged engines, check nozzle shrouds for leakage; check air induction ducting for leaks, and/or rubber couplings for proper seal. (H) On turbocharged engines, check turbocharger for foreign object damage, binding, and worn bearings.

ANTENNA VIBRATION — Check antenna if vibration tends to be related to airspeed rather than power setting.

WHEEL BALANCE AND BRAKE DISC TRUENESS — Wheel balance and brake disc trueness can be sources of vibration during the ground run on some aircraft. These should be checked as a part of the vibration diagnostic process if conditions indicate that they may be a problem.

DESIGNEE VISITS

One of the important services provided by our DESIGNEES is visiting aircraft building/restoration projects to discuss and offer suggestions about them. The DESIGNEES in the following listing are to be commended for their efforts in helping to make sport aviation a safer activity by providing this service. Comments for publication are selected for the purpose of providing guidance or assistance to builders and the DESIGNEES visiting them. DESIGNEES are requested to note problems or procedures observed in their project visits in the comment's section of the Designee Visit Report.

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