UNITED STATES ARMY AVIATION BOARD
Fort Rucker, Alabama

ATBG-DT-AVN-3458

SUBJECT: Report of Test, Project Nr AVN 3458, "Evaluation of the 'Sierracote' Electrically Heated Windshield in an L-23D"

27 Mar 59

TO: Commanding General
United States Continental Army Command
Fort Monroe, Virginia
ATTN: ATDEV

12 4p.

1. AUTHORITY. Letter, ATDEV-6 452/106 (17 Sep 58) Headquarters, USCONARC, 17 September 1958, subject: "Evaluation of the Sierracote Electrically Heated Windshield in L-23D Aircraft."

2. PURPOSE. To conduct an evaluation of the "Sierracote" electrically heated windshield to determine if this equipment is suitable for Army use in aircraft under light-to-severe icing conditions.

3. SCOPE. Evaluation of the prototype "Sierracote" electrically heated windshield, installed by Beech Aircraft Corporation at Wichita, Kansas, in an Army L-23D Airplane, was conducted in accordance with test procedures as outlined by the Directorate of Flight and All-Weather Test, WADC, Wright-Patterson Air Force Base, Ohio. A B-29 spray tanker, supplied by the US Air Force (WADC), was utilized to produce windshield ice on the test aircraft at flight attitudes.

4. GENERAL INFORMATION.

a. Background.

(1) As the all-weather capabilities of the L-23 airplane were increased by the addition of de-icer boots on the wing and empennage leading edges, the aircraft now operates in icing conditions beyond the capabilities of the installed windshield defrosters.

(2) In an effort to overcome this problem, various methods of applying heat to the windshield have been tried. One of these methods is a transparent conductive coating manufactured by the Sierracin Corporation. This coating can be applied to either tempered plate glass or conventional plastics in single or laminated sheets.

b. Description of Materiel. The electrically-heated Sierracote panel consists of a transparent, coated material approximately 12 inches high and 17 inches wide which is bonded to the windshield. Two parallel bus-bars extending along opposite edges of the coated area carry the electrical current to and from the coating. The power was furnished by a 750 v.a., single phase, 115-volt, 400 c.p.s. inverter installed in the aft electronics compartment of the aircraft. A temperature control unit was used to keep radio interference to a minimum. The weight of the installation was approximately 50 pounds. For evaluation purposes only, a variable transformer was used to vary the power supplied to the windshield from 2.0 to 3.5 watts per square inch. (For further details about the equipment see the Final Plan of Test, reference 10k.)

5. TESTS.

a. Operational Characteristics. Evaluation tests consisted of two flights using a B-29 water spray tanker, a T-28 photo chase aircraft, and an L-23D as an observer aircraft.

(1) Anti-Icing.

(a) The first flight was flown at 15,000 feet with an outside air temperature (OAT) of -7°C. The windshield anti-icing system kept the windshield clear. Accumulated rime and glaze ice measured 3/8 inch.

(b) The first run of the second flight was flown at 9000 feet with an OAT of -4°C. The unheated surfaces accumulated 1½ inches of rime ice. At 87 v. a. approximately 10 percent of the heated portion of the windshield remained clear. At 425 v. a. the windshield anti-icing system was successful in keeping the heated portion of the windshield clear of ice. However, such electrical power can be provided only by additional equipment on Army command type aircraft.

(2) De-Icing. The second run of the second flight was flown at 9000 feet with an OAT of -4°C. and was begun with the system "off" to allow ice accretion. After five minutes in the icing spray and an accumulation of 3/4 inch of rime ice on the windshield, the aircraft was removed from the icing spray and the anti-icing system was turned "on" to full power. At the end of five minutes, a film of water was between the windshield and the ice. After 15 minutes, noticeable melting had occurred but it was insufficient to form even a "peep" hole.

b. The windshield had a yellowish tint which reduced pilot visibility approximately 15 percent.

c. Equipment Failures. There was one failure of the equipment during the testing period. Shortly after the test on the original installation began, the entire panel failed. This panel was replaced without charge by the contractor.

6. SUMMARY. The equipment provided anti-icing capabilities, but the weight and power requirement can be provided only by a disproportionately large increase in aircraft weight and electrical installation complexity. The yellow color of the windshield cuts down visibility in some conditions of haze.

7. CONCLUSION. The "Sierracote" electrically heated windshield is unsuitable for use in present Army command-type aircraft.

8. RECOMMENDATION. It is recommended that no further consideration be given the "Sierracote" electrically heated windshield for use in present Army command-type aircraft.

9. COORDINATION. This report has been informally coordinated with the US Army Aviation School.

10. REFERENCES.

a. Letter, ATBG-DG, Board No 6, USCONARC, 12 December 1956, subject: "Request for Electrically Heated Plastic Windshield," with 2nd indorsement, CRD/R 978(12 Dec 56), OC of R&D to Chief of Transportation, 31 January 1957.

b. US Army Aviation Board Report of Project Nr AVN 6456, "Service Test of the L-23D Airplane," December 1957

c. Letter, 9012-191 Beech Aircraft Corporation, 13 Dec 1957, subject: "Engineering Change Proposal, BE A-L-23-75P-1, Windshield Anti-Icing Provisions for L-23D Aircraft."

d. Technical Bulletin No. 503, the Sierracin Corporation, Burbank, California, 23 January 1956, subject: "Sierracote Type 1."

e. Technical Bulletin No. 506, the Sierracin Corporation, Burbank, California, 23 December 1956, subject: "Sierracote 3 - Engineering Handbook."

f. Technical Bulletin No. 507, The Sierracin Corporation, Burbank, California, subject: "Sierracote Electrically Heated All Glass Laminated Windshields."

g. US Army Aviation Board, Project Nr AVN 3258, "Service Test of the 'Sierracote' Electrically Heated Windshield in an L-23D."

h. Wright Air Development Center, Air Research and Development Command, United States Air Force, Wright Patterson Air Force Base, Ohio; Flight test plan WCTET 5819, 4 August 1958; Test Engineering Division, Directorate of Flight and all-weather testing; "Proposed Windshield Anti-Icing System Evaluation for the L-23 Aircraft."

i. Development Guidance Division, United States Army Aviation Board, ATBG-DG-PLN AVN 3458, 25 August 1958, Memorandum for Record, subject: "Service Test of the 'Sierracote' Electrically Heated Windshield in L-23D Aircraft."

j. WCTE Directorate of Flight and all-weather testing, 20 November 1958; L-23D Windshield Icing Flight Test Data.

k. Final Plan of Test, Project Nr AVN 3458, US Army Aviation Board, 9 January 1959.

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