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Avro
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C-105

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UNCLAS

PRELIMINARY WIND TUNNEL TESTS

By authority of

on

Date THE EFFECT OF ICING

Signature
J.A. Chamberlin

Feb. 1/55.

Unit / Rank / Appointment

ANALYZED

UNCLAS

C-105 PRELIMINARY WIND TUNNEL TESTS ON THE EFFECT OF ICING

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SUMMARY

Severe ice formations were simulated on a model of a delta wing with plasticine. The wing was tested in a wind tunnel before and after the application of the plasticine. No change was found in the stability parameters due to the simulated ice. From this, it was concluded that icing would have no effect on the stability and control of the aircraft.

INTRODUCTION

The icing problem on the C-105 was studied in some detail and reported on in Ref. 1. It was shown in this report that icing would only be a hazard during the approach. Furthermore, it was argued that the ice that could form on the wings and tail in this time would not be such as to interfere with the safe operation of the aircraft. Accordingly it was concluded that a de-icing system was unnecessary for the wings and tail.

In order to substantiate these conclusions, a visit was made by the R.C.A.F. and Avro personnel to the Lewis Laboratories of the N.A.C.A. This visit was reported in Ref. 2. The N.A.C.A. had done icing tests on a wing very similar to the C-105 wing and had established the character of the ice accretions. They had noted large increases of drag and accordingly felt that the effects were serious, although they could not measure any of the stability and control parameters. They, however, agreed that icing would only occur in the approach when very large excesses of thrust would be available and hence that drag was not an important criterion. Accordingly, if it could be established that there was no effect on stability and control, they agreed that a deicing system would be superfluous.

TESTS

In order to reach a preliminary conclusion as quickly as possible, it was decided to conduct tests on a reflection plane delta wing which resembled the C-105 wing quite closely and which the N.A.E. were already using on another program. The only modification required was to add an aileron at the tip.

Severe icing was simulated by placing plasticine on the wing in accordance with pictures taken in the N.A.C.A. icing tunnel. When in doubt, the plasticine formations were made more severe than the ice.

Tests were then made in the low speed tunnel of the N.A.E. with the clean wing and subsequently with two different configurations of icing represented. Lift, pitching moment, rolling moment and drag were measured for various aileron angles. The tests are reported in Ref. 3.

RESULTS

The tests showed that there was no change in lift, pitching moment or aileron effectiveness. The only change was in profile drag, which, although substantial, was of no consequence when the large excess of thrust available was considered.



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CONCLUSIONS

These tests showed that no adverse effects would be experienced by ice accumulations on the wing and tail. This conclusion is supported by Ref. 4. The use of wing and tail de-icing is hence regarded as unnecessary.

REFERENCES

1. P/Icing/8 - Icing Protection - March 1954 - by Nigel Money
2. Summary of a discussion held at The Lewis Flight Propulsion Laboratory, Cleveland, Ohio on the Icing Problem of the C-105 - September 9th and 10th, 1954 - by John Morris
3. Misc. N.A.E. No. 17 - N.A.E. No. 6 Delta Half Wing Aileron Model Icing Tests - W. E. Laundry
4. Convair Report - Summary of Additional Low Speed Wind Tunnel Tests to determine the Effects of Simulated Glazed Icing on the Aerodynamic Characteristics of the F-102 Airplane - Aero Memo. No. A-8-61 - 18 December 1953

Convair Report - Effects of Wing Icing on the Aerodynamic Characteristics of the F-102 Airplane - Aero Memo. A-8-56 - 17 October 1953

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