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**OBSERVATIONS ON THE IN-FLIGHT EFFECTIVENESS
OF FC-30 WINDSHIELD RAIN REPELLENT**

FOR LIMITED DISTRIBUTION

by

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OBSERVATIONS ON THE IN-FLIGHT EFFECTIVENESS OF FC-30 WINDSHIELD RAIN REPELLENT

SUMMARY

This report describes the results obtained from an in-flight evaluation of the Dow Corning FC-30 aircraft windshield rain repellent when applied to the pilot's windshield of a DC-3 airplane.

For comparative purposes, the pilot's windshield was cleaned and then treated with FC-30 as recommended. The copilot's windshield was cleaned, but no further treatment was applied. The aircraft was flown in areas of light, moderate, and heavy rain. Visual observations were made, and photographs were taken to record the results.

Observations were made with and without the windshield wipers in operation. It was determined that the visibility through the treated section of the windshield was considerably better than through the untreated section in an environment of light to moderate rain. In moderate to heavy rain, the water was present in such quantities that very little benefit was gained from the treatment.

INTRODUCTION

In March 1958, the Dow Corning Corporation of Midland, Michigan, submitted a sample of their FC-30 rain repellent to the CAA Technical Development Center for trial use on airplane windshields. This report describes some observations made through a DC-3 windshield during a wide variety of rain conditions.

FLIGHT OBSERVATIONS

Several flights were made in order to test the FC-30 treatment under a wide variety of rain conditions. Airport surveillance radar (ASR) was employed as an advisory vectoring service to direct the DC-3 aircraft into areas where the greatest amounts of precipitation were present.

Several different photographic procedures were used to obtain pictures which clearly displayed the results.* An example of the difference in appearance of the two windshields is shown in Fig. 1. The left (pilot's) section, which was treated with FC-30, shows the ability of this treatment to repel water and reduce the tendency of the water to become a film. Conversely, the right (copilot's) section shows the familiar situation where a distorting, semitranslucent film of water is present.

*All illustrations in this report are reproductions of unretouched photographs.

Additional pictures were taken during instrument approaches. The aircraft had descended beneath the overcast but still was in light to moderate rain throughout the remainder of the approach. Figure 2 shows the runway as viewed through the treated windshield approximately 3/4-mile from touchdown. Figure 3 shows a picture taken through the untreated section very shortly thereafter for comparison from approximately the same range and under the same meteorological conditions. This comparison was repeated 1/4-mile from touchdown, as shown in Figs. 4 and 5. Figure 6 shows a direct comparison of both windshields just prior to landing. The windshield wipers were not operated during the time when the pictures were taken. At other times, windshield wipers were used to make visual observations and comparisons. Wipers improved visibility through the untreated section considerably, but they made little or no change in the appearance of the treated section. The wipers then were stopped perpendicular to the base of the windshield. In this position, an eddy developed on the lee side of the wiper blade in each case. On the treated section, moisture was virtually eliminated in the vicinity of the eddy. On the untreated side, the eddy had very little beneficial effect.

An increase in droplet size as a result of heavier rainfall increased the lens effect and hence, the distortion, when viewing through the treated section. As the rainfall became heavier, a limit was reached when the droplets were so large and so close together that little, if any, benefit was derived from the treatment.

Contaminants proved to be another factor which reduced the FC-30 effectiveness. Insects, crushed by impact with the windshield, created a base film for a continuous "bead" of water extending from the point of impact to the extremity of the windshield in the direction of the airflow. These beads of water provided additional sources of distortion. Untreated surfaces were affected similarly under the same conditions.

Instructions must be followed carefully when applying the FC-30 repellent. Also, the treated windshield must be cleaned with clear water and soft cloths only. Detergents or cleaning compounds will damage or completely remove the FC-30. Contaminants can be removed as easily from the treated section with clear water as from the untreated section with proprietary cleaners. The treatment has retained its effectiveness up to three months. However, a difference in any of several variables could reduce or increase this time considerably.

CONCLUSIONS

From these observations, it is concluded that

1. In light to moderate rain, visibility through the windshield was improved by the treatment.

2. In moderate to heavy rain, little benefit was gained from the treatment.

3. Windshield wipers improved the visibility through the untreated section, as would be expected, but they were unnecessary where the FC-30 was used.

4. With the wipers stopped perpendicular to the base of the windshield, moisture was virtually eliminated on the treated section in a small area on the lee side of the wiper blade. Very little improvement was noted on the untreated section.

5. Distortion increased with increase in size of droplets when viewing objects through a windshield treated with FC-30.

6. Additional sources of distortion resulted from crushed insects which created a base film for accumulation of beads of water streaked across the windshield in the direction of the airflow. For the FC-30 treatment to be most effective, the windshield must be kept free of all contaminants.

7. In general, the windshield treated with FC-30 repellent provided a clearer view of the terrain and other objects than the small wiped portion of the adjacent untreated windshield.

8. The life of the treatment is satisfactory if it is applied and the windshield cleaned according to instructions.



FIG. 1 COMPARISON OF FC-30 TREATED (LEFT) AND UNTREATED (RIGHT)



FIG. 2 VIEW OF RUNWAY THROUGH TREATED WINDSHIELD 3/4-MILE
FROM TOUCHDOWN

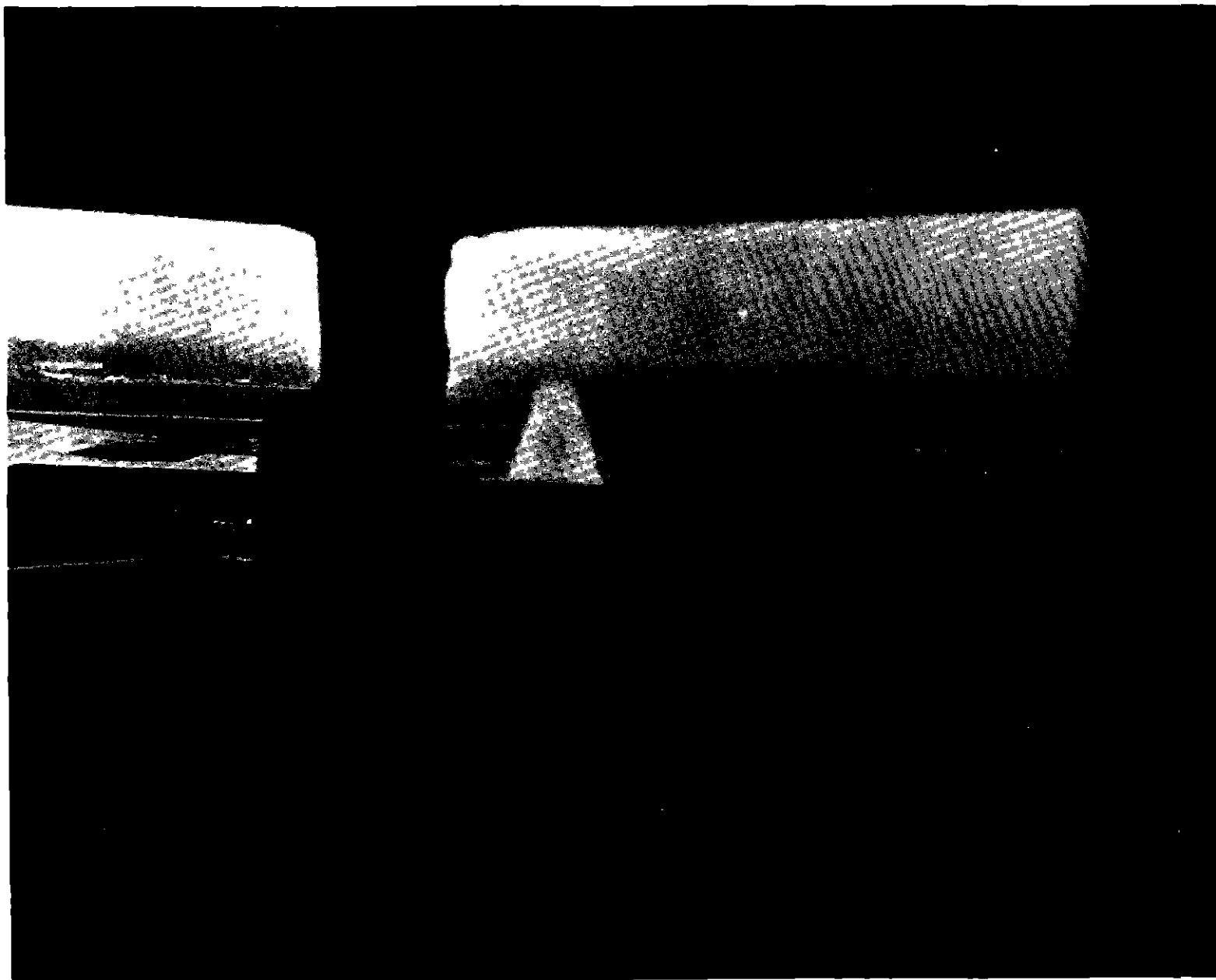


FIG. 3 VIEW OF RUNWAY THROUGH UNTREATED WINDSHIELD 1/2-MILE



FIG. 4 VIEW OF RUNWAY THROUGH TREATED WINDSHIELD 1/4-MILE
FROM TOUCHDOWN

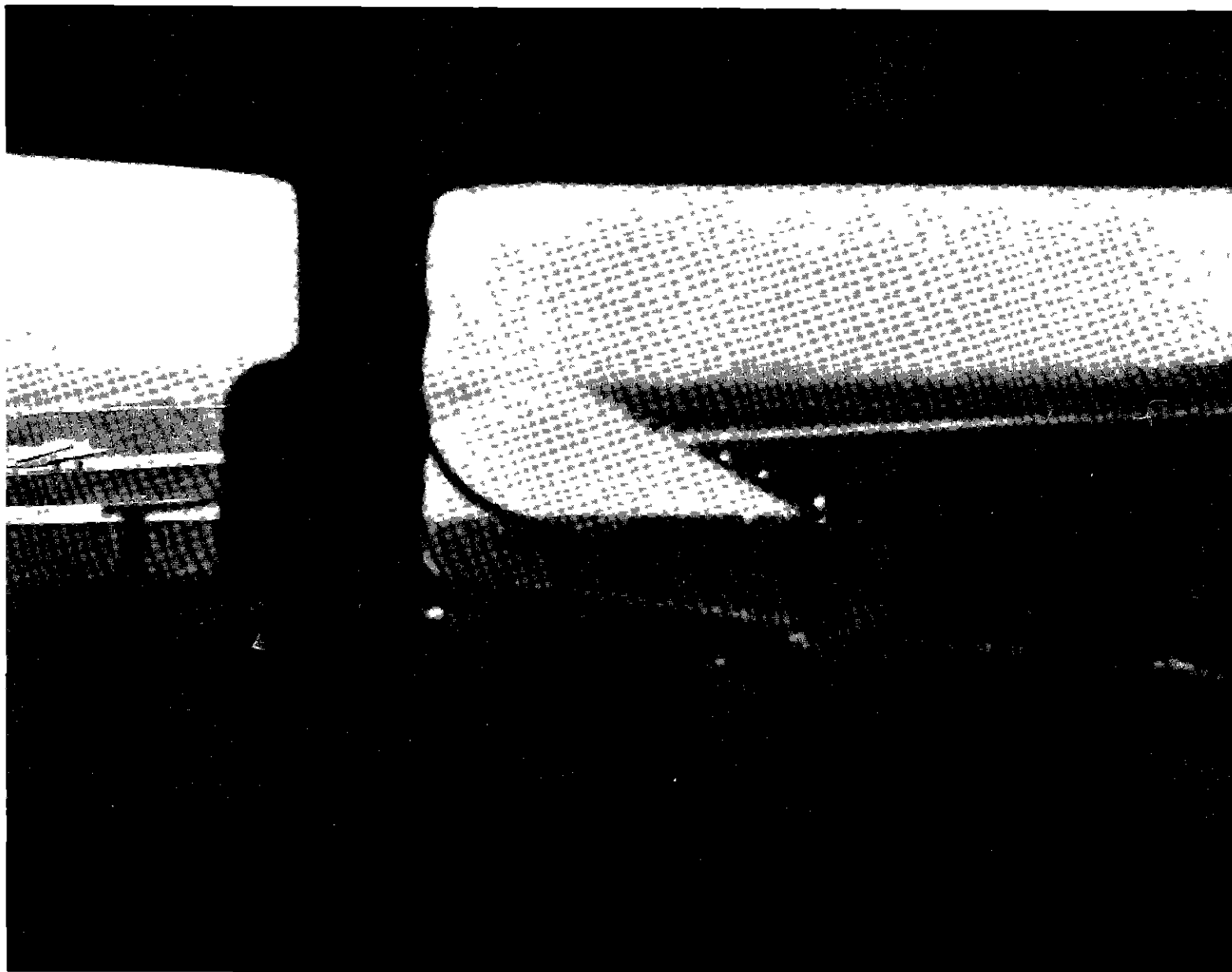


FIG. 5 VIEW OF RUNWAY THROUGH UNTREATED WINDSHIELD 1/4-MILE
200 TOUGHEN

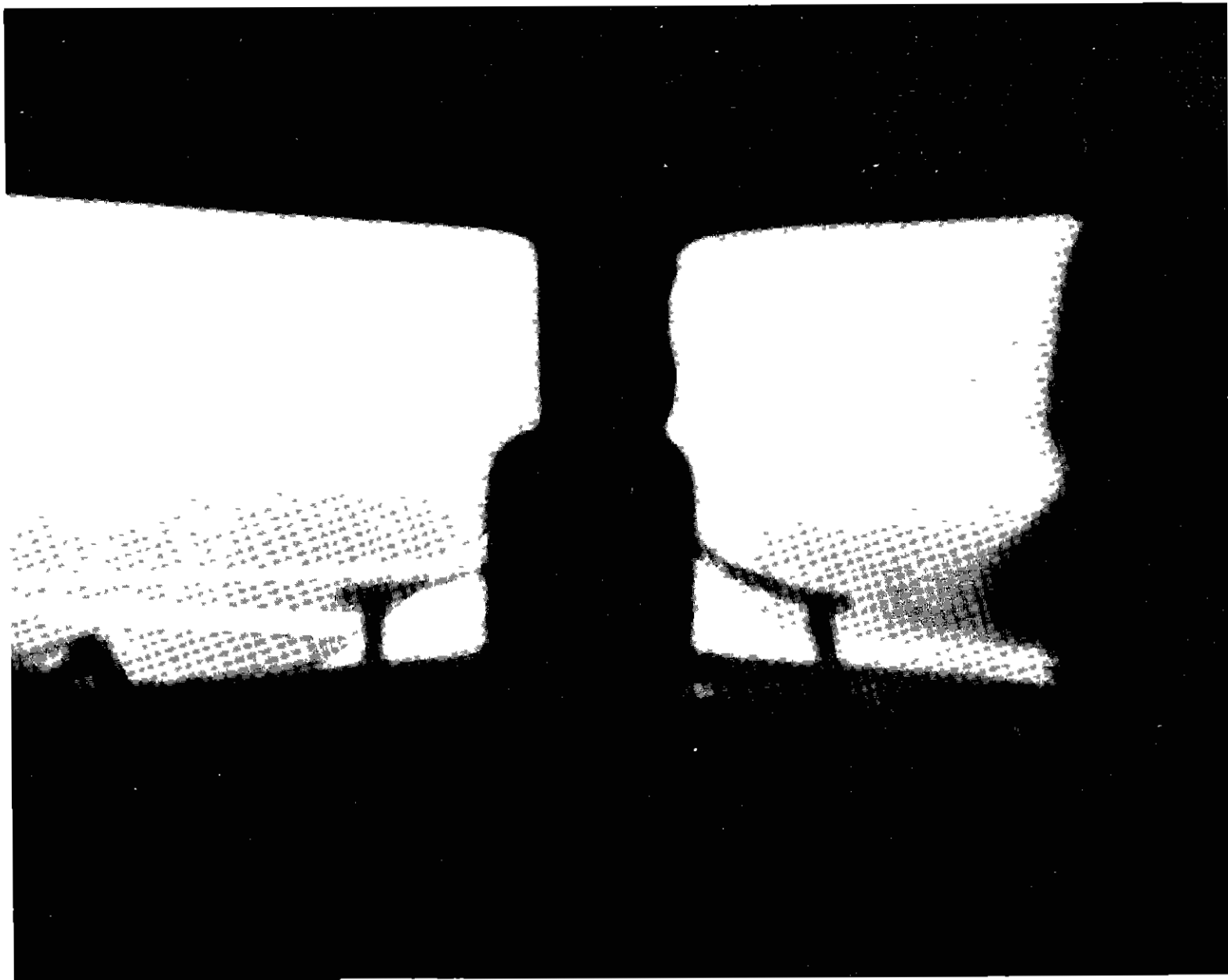


FIG. 6 COMPARISON OF TREATED AND UNTREATED SECTIONS OF THE WINDSHIELD SHOWING VISIBILITY JUST PRIOR TO TOUCHDOWN