NATIONAL BUREAU OF STANDARDS REPORT

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Development, Testing, and Evaluation of
Visual Landing Aids

Consolidated Progress Report

to the

Airborne Equipment Division
Bureau of Aeronautics
Department of the Navy

For the Period
October 1 to December 31, 1953

for
Bureau of Aeronautics Projects

TED No. NBS-AE-10002
TED No. NBS-AE-10006
TED No. NBS-AE-10007
TED No. NBS-AE-10008
TED No. NBS-AE-10011

NBS

U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Development, Testing, and Evaluation of Visual Landing Aids

October 1 to December 31, 1953

I. REPORTS ISSUED

Report No.	Title
21P-18a/53	Qualification Tests of One Fused Connector
21P-18b/53	Qualification Tests of One TEE Connector
2975	Development and Testing of Visual Landing Aids, July 1 to September 30, 1953

II. TED No. NBS-AE-10002. MISCELLANEOUS SERVICES IN CONNECTION WITH FOG MODIFICATION AND VISIBILITY STUDIES

Connectors. Two connectors, a fused connector and a TEE connector, being procured for use in wiring the Navy composite approach-light system, were tested for conformance to Specification MIL-C-7192A (Aer) and CAA L-823. The connectors met the electrical requirements but failed to meet some of the mechanical requirements. (NBS Tests 21P-18a/53 and 21P-18b/53).

Beam Setting of Type C-1 Runway Light. Candlepower distribution measurements have been made of a type C-1 runway light using a 500-watt, 6.6-ampere lamp as a source. Two positions of the lamp were used to obtain different beam settings. These measurements, together with similar measurements made using a standard 200-watt, 6.6-ampere lamp in three different positions, have been analyzed to determine the effectiveness of the various combinations of lamps and beam settings in providing guidance on wide runways during periods of low visibility. The 200-watt lamp in its normal position appears satisfactory for runways up to 200 feet in width. A 6-coil, 300-watt, 6.6-ampere lamp appears desirable for 300-foot runways. A report covering this work is in the rough draft stage.

Lights for Night Carrier Landing Practice. Tests have been made of the performance of various combinations of size D flashlight cells in supplying power for night carrier landing practice lights. Three size D dry cells will operate neither 0.5- nor 0.3-ampere flashlight lamps for a sufficient length of time (4 hours). However, three type RM-42 mercury cells will operate an 0.5-ampere flashlight lamp satisfactorily for approximately 20 hours. A report describing the work is in preparation.

Characteristics of Retroreflectors. Measurements of the specific intensity of retroreflectors of different types have continued. Fifteen colored retroreflectors were tested for specific intensity distribution and a study of the effects of angle of orientation was made on one clear corner-cube type reflector. The data are now nearly complete and are being reduced. A report is expected to be issued next quarter.

Miscellaneous. Three trips have been made to Wright Field with representatives of the Visual Landing Aids Section to discuss engineering problems in airfield lighting and the coordination of Navy and Air Force sponsored projects. Particular attention was given to taxiway markers, field maintenance and cable-fault locating, and runway lighting for jet aircraft.

III. TED No. NBS-AE-10006. DEVELOPMENT OF TRANSMISSOMETER-CEILOMETER INTENSITY CONTROL SYSTEM.

Special Ceilometer. The selsyn scanning drive for the special ceilometer has been installed and tested. Housings for the drive are now being constructed.

Addenda to Instruction Manual. NBS Report 2588, Instruction Book for Transmissometer Set AN/GMQ-10, was written to cover a particular model of the transmissometer. Five addenda to this instruction book have been prepared to adapt it to the operation and servicing of modifications of the AN/GMQ-10 Set. These addenda are being duplicated and will be issued as an NBS Report.

Miscellaneous. Recently a number of old cold-cathode thyratrons in the transmissometer receivers developed an irregular pulse rate when operating near the maximum pulse rate. This was traced to a grid-to-cathode discharge which did not initiate the normal plate-to-cathode discharge. It was eliminated by changing the time constant of the plate circuit of the tube to the value used in 300 pulse-per-second receivers.

IV. TED No. NBS-AE-10007. RESEARCH ON VISIBILITY AND INTENSITY CONTROL OF VISUAL LANDING AIDS.

A brief study has been made of the problem of marking high radio and television towers. One solution appears to be the use of beacons to mark the area surrounding a tower as a hazardous area. Such a beacon should have a flash repetition rate of at least one flash in two seconds; should be color coded; and should have a vertical beam spread of at least 10 degrees. Four 24-inch projectors,

one white and three red, with spread covers on a 12-rpm beacon base, will meet these conditions and are expected to have a visual range in daylight significantly greater than the visual range of the tower itself. The utility of such a beacon is based on the assumption that a pilot flying under a low ceiling in poor visibility will be looking at the ground at about the limit of his visual range. Thus it is not necessary (nor desirable) to mount the beacon at an appreciable height.

V. TED No. NBS-AE-10008. DEVELOPMENT AND TEST OF SEALED-REFLECTOR APPROACH-LIGHT LAMPS.

The final shipment of 350-watt, 25-volt approach-light lamps on the development order placed in September 1951 has been received. The lamps of this group have a shielded filament to reduce the stray light and hence the background brightness of the approach zone. The lamps, except those reserved for photometric tests, have been sent to the Naval Air Test Center for field use. When the photometric tests have been completed, a report covering this project will be prepared.

VI. TED No. NBS-AE-10011. FIELD SERVICE OPERATION.

During this period the establishment of office, laboratory, shop, and field facilities was completed. A 4-wheel drive "pick-up" truck was delivered. Radio communication equipment was installed in the station vehicles, the laboratory, and at the visibility test site. The remainder of the shop and laboratory equipment were delivered and installed.

Field Maintenance Manual for Airfield Lighting Systems. An outline of the complete manual has been prepared and informally submitted for comment. Rough drafts of the step-by-step trouble-shooting procedure and of the trouble-shooting charts have been prepared.

Tests in Fog.

a. Approach Beacons. The ground testing of the approach beacons has been completed. These tests indicated that the optimum flash rate was about 70 per second and that the optimum flash duration was about 0.5 second. Six of the new 399-watt approach-light lamps on a 12-rpm beacon base will produce a unit meeting these conditions. Approach beacons are now being installed in the approach zone at distances of 1000 and 2000 feet from the runway threshold.

b. Effective Intensity of Flashing Lights. The apparent intensity of a Sylvania "Strobeacon" has been observed in fogs of different densities by day and by night. These tests indicate that the apparent intensity is about 30,000 candles. A Westinghouse "Krypton" approach light has been obtained and will be tested as weather conditions permit.

c. Apparent Intensity of Slopeline Unit. Measurements of the apparent intensity of six- and ten-light slopeline units have been made by determining the intensity of a single light which will produce the same visual range.

d. Brightness Measurements. Brightness measurements in the approach and runway areas have been continued. In general, they have been limited to measurements under special conditions.

e. Transmissometry. In order to study the errors in transmission measurements introduced by scattered light, two transmissometers have been installed on parallel paths 20 feet apart. Baffles have been installed along the line-of-sight of one instrument to restrict the light beam and the field of view of the receiver, thereby eliminating the effects of scattered light on this instrument. Results to date have shown no significant differences in the readings of the two instruments.

f. Studies of Thresholds. A study is being made of the difference in visibility measurements produced by using recognition instead of detection as a criterion.

Future Work. The frequency of fog during the next reporting period is expected to be low. Emphasis will, therefore, be placed upon the analysis of the test work and the preparation of reports. Work on the maintenance manual will occupy a considerable portion of the time. Tests will be continued when suitable weather conditions occur.