

The National Severe Local Storms Research Project

DANSY T. WILLIAMS, *U. S. Weather Bureau,
Kansas City, Missouri*

OPERATIONS of the National Severe Local Storms Research Project (NSLSRP) began on March 24th of this year, when the Weather Bureau's leased P-38 made its first flight of the season into a thunderstorm area. It is one of several aircraft being used this year in a concentrated assault on the problem of severe local storms.

Organization of the NSLSRP has evolved from a number of conferences in which the nation's experts have gathered. The project will operate for the three-year period, 1960 through 1962, and possibly longer. It is being conducted by the U. S. Weather Bureau in cooperation with several other agencies. These include the National Aeronautics and Space Agency (NASA); the Federal Aviation Authority (FAA); the U. S. Air Force's Wright Air Development Division (WADD), Geophysical Research Directorate (GRD), Air Defense Command (ADC), and Air Weather Service (AWS); and the U. S. Navy's Office of Naval Research (ONR) and Weather Research Facility at Norfolk, Virginia. C. F. Van Thullenar, U. S. Weather Bureau, is director of the project, and the operational office is at Will Rogers Field, Oklahoma City, Oklahoma.

Since the severe local storm is meteorologically rather small, relatively short in duration, and excessively proportioned in the vertical, conventional methods of observation are apt to miss most of it. Detailed observations at frequent intervals and numerous points are required, and the project is meeting this need through the use of aircraft, special surface networks, special rawinsonde observations, and rocket photography. Basic objectives include isolation of mechanisms that generate, maintain, and dissipate the severe local storm; identification of those parameters that determine its severity; and the application of this knowledge to minimize its hazards. Since most severe local storms are associated with squall lines, the primary target in 1960 is a study of squall lines.

Flight planning and dispatching of aircraft is accomplished from the operational base at Oklahoma City, Oklahoma, utilizing forecast information from the Severe Local Storms Center, Kansas City, Missouri. Individual aircraft are dispatched on the basis of their observational capabilities and the objectives that might be achieved for that day. Normally all of the aircraft do not fly the same mission.

The T-33 used by the National Aeronautics and Space Authority and the Wright Air Development Division, USAF, for thunderstorm and squall line turbulence measurements in coordination with the National Severe Storms Research Project. NASA photo.



Two DC-6's and a B-57 of the National Hurricane Research Project have been assigned to the NSLSRP for the months of March, April, and May. A T-33, F-102, and F-106 are being provided by WADD. Also on call are an A-3D from the Navy Weather Research Facility, and a C-130 from GRD.

The P-38 is used primarily for taking soundings. Temperature, humidity, and pressure are recorded as the aircraft makes spiral ascents or descents through a layer. A typical flight plan, shown in Figure 1, provides soundings on either side of a squall line.

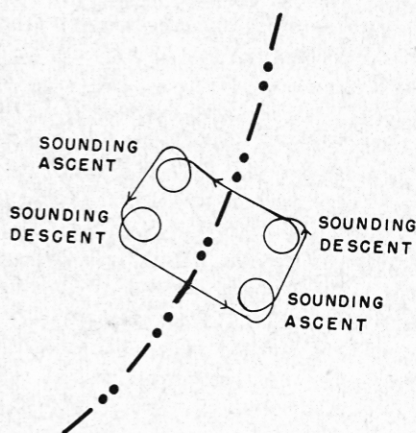


FIG. 1. A flight plan for the P-38. The soundings, shown as loops in the figure, are made from the surface to 500 mbs or higher. Useful data are also gathered on the traverses between soundings.

The DC-6s are used primarily in level flight. A simple plan, shown in Figure 2, consists of horizontal traverses along rectangles on either side of a front or squall line. Observations from this plan are used to detail small-scale horizontal gradients of temperature, moisture, and wind relative to the front or squall line.

The B-57 is used in level flight at high altitude. A typical flight plan, shown in Figure 3, employs a saw-toothed pattern designed to provide areal measurements of wind and temperature in the vicinity of the jet stream. Similar plans will be flown by the A-3D, and in some instances both aircraft will probe the same area. Instrumentation of the A-3D is designed to measure clear air turbulence that may be encountered in the vicinity of the jet stream.

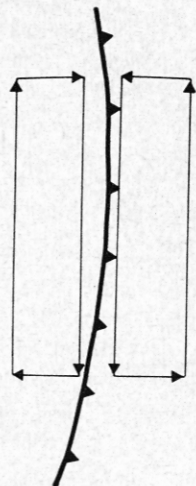


FIG. 2. A flight plan for the DC-6's. Each DC-6 flies one of the rectangles. Observations provide an areal representation of data on both sides of a front or squall line without requiring penetrations of the line.

The T-33, F-102, and F-106 are being used by WADD and NASA to study turbulence and flame-out associated with thunderstorms. Liquid water content of thunderstorm tops will also be measured. Flight plans for these aircraft require actual penetration of the storms at many levels. First penetrations were made west of Oklahoma City on the afternoon of 28 April 1960. Cells penetrated were part of a storm system which produced

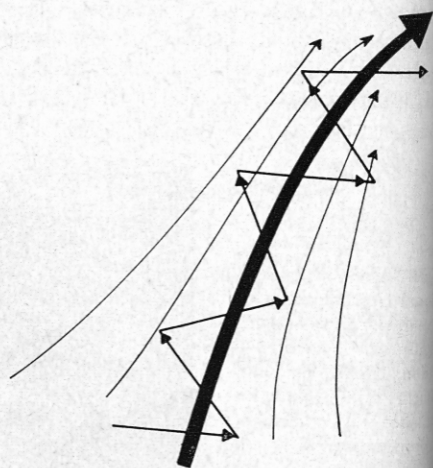


FIG. 3. A flight plan for the B-57. The saw-tooth path is designed to provide wind and temperature measurements that can be used to describe the jet stream in the vicinity of several local storms.

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tornadoes and damaging winds in the Oklahoma City vicinity later that evening.

Since the objective of the project is an investigation of severe local storms, the code name, "Rough Riders," is used for FAA and Weather Bureau communications with the aircraft.

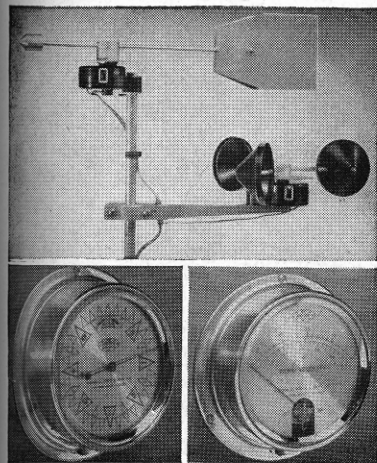
The Severe Local Storms Research Network of surface stations in Kansas, Oklahoma, and Texas is also being used to supplement conventional surface observations. Over 200 stations of this network record pressure on expanded 12-hour barographs; and temperature, humidity, and rainfall are also recorded at many of the stations. Plans for 1961 and 1962 provide for a dense internal network of similar stations southwest of Oklahoma City as a supplement to the present network.

During the severe local storm season regular rawinsonde stations are augmented by mobile upper-air stations of the Air Weather Service. Five of these trucks are located in Texas, Oklahoma, and Arkansas. Addi-

tional upper-air observations are provided by scheduling serial observations at one-to-two hour intervals from selected regular and mobile rawinsonde stations. The first set of serial observations was made from five stations on 4 May 1960. Observations were made at 90 minute intervals for the period 1200 to 1800C and covered the incipient and early activity stage of the many tornadoes and hailstorms that occurred in Oklahoma and Texas that day.

Rockets fired from the Fort Sill Military Reservation, Oklahoma, will be used for high-level photography of squall lines. The New Mexico State University, under contract with ONR, will conduct the firings.

The cooperation of several agencies in the conduct of the project is an indication of their serious interest in severe local storms. Through these agencies immediate and long-term needs that are both operational and research in nature are being met. The detailed measurements of many parameters in time and space by the "Rough Riders" of NSLSRP will provide a better understanding of severe local storms.



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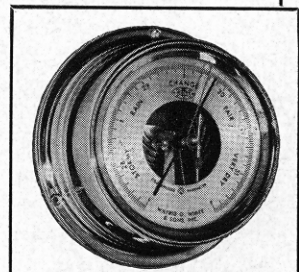
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