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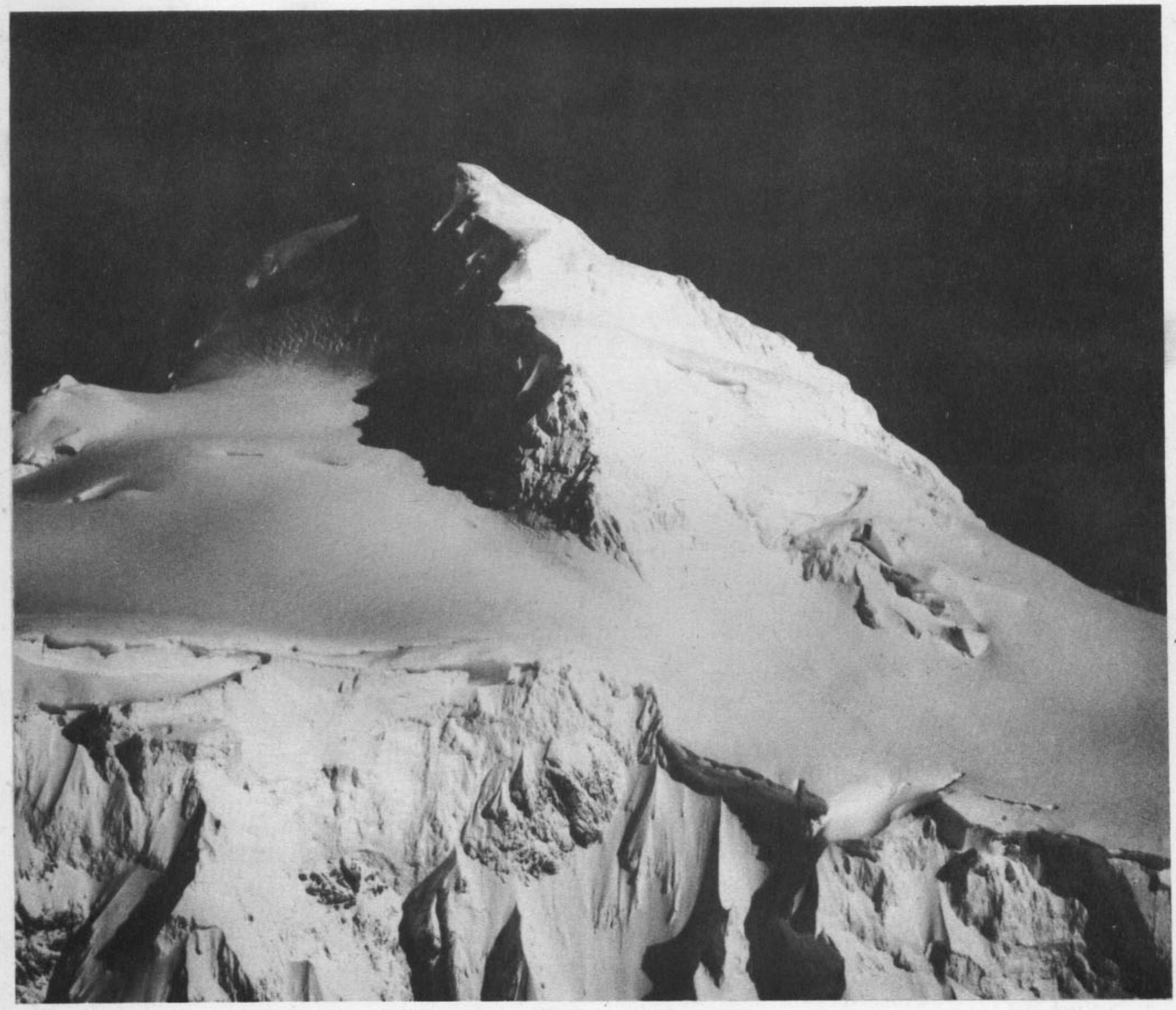
WEATHER SERVICE BULLETIN

1949, No. 9



MILITARY AIR TRANSPORT SERVICE

HEADQUARTERS, AIR WEATHER SERVICE

WASHINGTON, D. C.

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HEADQUARTERS, AIR WEATHER SERVICE
ANDREWS AIR FORCE BASE
WASHINGTON 25, D. C.
15 December 1949

TO ALL CONCERNED:

The Weather Service Bulletin No. 9, 1949, is published for dissemination of important information to all echelons of the Air Weather Service.

It is believed that much of the material in the Weather Service Bulletin is of enduring value, and therefore each USAF weather installation should maintain a permanent file of this publication for reference.

BY COMMAND OF BRIGADIER GENERAL YATES:

LEWIS L. MUNDELL
Colonel, USAF
Chief of Staff

OFFICIAL:

W. A. WEST
Lt. Colonel, USAF
Adjutant General

Distribution:

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WEATHER SERVICE MESSAGE

CAREER OPPORTUNITIES (U)

The career opportunities available within the Air Weather Service must be a subject of considerable concern to every individual in our organization. I should like to discuss these opportunities with you and state a few plain facts of which you should be aware.

Our basic mission and the purpose of our organization is to provide a weather service to the Air Force and to the Army. In order to do this job efficiently we have insisted during past years upon having well-qualified personnel, and we have encouraged the further training of officers and airmen in civilian and military schools. As a result, we have an organization probably second to none in the Air Force with respect to technical and educational qualifications.

Of the Air Weather Service officers, 44.1 percent have had four or more years of college training, whereas a considerably lower percent of Air Force officers as a whole have such educational qualifications. A study conducted during the war showed that among the graduates of technical courses at Chanute AFB, enlisted men in the Air Weather Service were superior, as a group, in GCT score to any other. I have no doubt but that the present group of airmen in the Air Weather Service would again rate relatively high.

The qualifications of our personnel and the nature of our existing operations were important factors considered by Air Force Headquarters in selecting our organization to perform special technical but non-weather functions of considerable importance and interest. Moreover, these functions, involving several related sciences, have provided challenging fields of work which continue to broaden the career opportunities of our personnel.

From time to time I am approached on the possibility of the Air Weather Service taking on the responsibility for new projects associated with, but not directly a part of, our basic responsibility. Inefficiency in the performance of our basic job causes me no little apprehension in considering the assumption of these added programs. The business of providing accurate and complete observations strictly in accordance with schedules; in preparing these reports for transmission, and in some cases of actually transmitting them; and of providing the best possible forecasts for the using agencies is not now being accomplished in a satisfactory manner throughout the Air Weather Service. (There are, of course, noteworthy exceptions.)

We have carried, as subjects for special attention, various phases of these particular problems. For example, in the upper-air program we have emphasized, more or less separately, the following distinct phases:

(a) completion of the scheduled observations, (b) attainment of the maximum heights consistent with the limitations of the equipment, and (c) better accuracy in the observations.

These three projects together practically constitute the upper-air program, and weakness therein should have been apparent to the officers and airmen directly responsible. Lack of knowledge and, what is even worse, lack of interest in these and other basic observation and forecast procedures prevail among far too many of our supervisory personnel. A real desire on the part of each individual and an exploitation of the technical resources within our organization could surely have solved such problems without the necessity for instituting special programs. Most of our routine work is straightforward, and while not simple, can be accomplished satisfactorily if every member of the Air Weather Service participates to the best of his ability.

Contrary to the impression of some of our personnel, AWS support to USAF and the Army, in the form of ordinary weather observations and forecasts, steadily becomes a more, rather than a less, critical responsibility. We are an operating agency, and although we are capable of providing many varied types of scientific and technical service, we must first establish a routine excellence in our observing and forecasting responsibilities. Broader career opportunities are obviously open to us; however, their realization depends upon the proof of our ability to do the jobs assigned -- beginning, of course, with our basic job of providing weather service. Everyone's participation is necessary. The opportunities for aggressive leadership are unrestricted.

D. N. YATES
Brigadier General, USAF
Chief, Air Weather Service

RESEARCH and DEVELOPMENT REPORTS

NEW CHART DEVELOPED FOR ESTIMATING JET TAKE-OFF ROLL(U)

The problem of estimating the take-off distance for various types of jet aircraft has been giving much concern to the Air Force units operating them. Several jet aircraft accidents have been attributed, at least in part, to a failure to fully take into consideration the effect of the air density, a primary factor in determining take-off distance. The take-off problem becomes more important as newer and faster aircraft are developed.

Most take-off charts now in use by pilots and operations personnel are not safe, for the take-off distance requirement is given as a function of temperature and runway elevation only, omitting consideration of the effect of pressure changes at runway level. Certain existing charts attempt to take into account the effect of the pressure changes by using station pressure-altitude as an argument. As most pilots are not familiar with the computations required to determine pressure altitude, there is a need for more efficient graphical presentation.

Hq., AWS, has investigated this problem and designed a simple, easy-to-use prototype of a chart for determining the take-off distance requirement for jet aircraft. This design takes into account the effect of temperature, field elevation, atmospheric pressure, gross weight of the aircraft, and the headwind component at take-off. This type of chart is being recommended to Hq., USAF, as a definite improvement over existing methods for determining take-off distance requirements. It should entirely eliminate the possibility of aircraft accidents due to sub-normal air densities on take-off.

Requests for the new-type charts should not be forwarded to this headquarters prior to issuance of instructions from USAF pertaining to their distribution.

LAUNCHING REEL DEVISED FOR RAOB RELEASES (U)

All raob personnel who have fumed over balloon releases in high winds will now have something to ease their task. Available for issue is Launching Reel ML-367/AM developed by Evans Signal Laboratories upon request of AWS and USAF.

Designed to prevent the radiosonde from being damaged by dragging along the ground after release in high winds, the device permits initial launching to be effected with the radiosonde instrument suspended close to and immediately below the parachute at time of release and a gradual lowering of the instrument to normal distances below the balloon as it ascends. Before release of the balloon the complete length of cord between the parachute and balloon is wound around the reel. Then, as the balloon rises, the reel unwinds and lowers the radiosonde and parachute at the rate of 25 ft/min.

Launching Reel ML-367/AM is constructed of aluminum, weighs 80 gm, and consists of a frame, a reel, a 60-ft cord, and a governor, and is to be used when the surface wind at time of launching is over 15 mph. A balloon release using a launching reel is possible with one operator, but in very high winds two operators are recommended.

All upper-air stations having a need for the expendable reels are authorized to procure them through normal supply channels on the basis of anticipated need. AWS stations in northern U.S., Alaska, and Greenland, for example, naturally will require a greater number than stations in tropical areas. SWO's must therefore make an estimate of the number needed in light of the frequencies of surface wind speeds reported at their stations during past seasons. The minimum required number of launching reels may then be requisitioned.

EASTERLY-WAVE TRACKING PROGRESSES (U)

Preliminary results of the easterly wave-tracking project being conducted by AWS personnel at the North Guam Weather Central (ref. WSB No. 8, p.38) are rather encouraging. The evidence so far confirms and amplifies Dr. C. E. Palmer's basic ideas regarding the nature of deformations in the easterly trade-wind flow. Winds at Southwest Pacific atolls were observed veering from east-southeast through south to west-northwest, then backing to east-southeast over periods averaging about 18 hours. During these wind shifts, the easterly flow persisted southward and westward in the regions still north of the Equator, thus eliminating the hypothesis that the southerly and westerly winds were the result of the recurvature of southeasterly trades of the Southern Hemisphere as a result of the reversal of direction of the Coriolis effect in crossing the Equator. Clouds and weather patterns attending the wind shifts indicated lifting due to convergence in the lower levels of the atmosphere.

Assuming, then, that the wind shifts were caused by deformations in the easterlies and that the deformations were moving westward at 8 to 12 knots, the wind observations were plotted along a line at intervals of 10 nautical miles per hour of time differential between observations and used as space reports in the streamline analysis. This method of analysis revealed regular trains of vortices first passing Kwajalein, and subsequently Eniwetok, weather ship Bird Dog, and Guam. It can be demonstrated that the typhoons Faye, Gloria, and Hester of 1948 developed from specific unstable vortices of the type mentioned above and that in each case the vortex was detected as far east as Kwajalein and tracked to the point of its development into a typical tropical storm.* Other vortices have been tracked into the Philippines, southern China, and along parabolic paths recurving through the Iwo Jima area and off to the northeast.

The majority of the vortices remained stable, never developing into storms, but nevertheless causing low ceilings and shower activity during passage. Unfortunately, the majority did not appear to be associated with deformations of the isobaric field significant enough to permit their detection through analysis of the synoptic or 24-hour tendency fields of atmospheric pressure. Likewise synoptic stream-line charts analyzed twice daily (0300Z and 1500Z) either failed to reveal these deformations or were unsuited for tracking them from day to day with any regularity. These limitations of the analysis are not surprising in view of the small average size of the vortices (100 to 250 nautical miles in diameter) compared to the large distances between the observing stations (300 to 500 nautical miles even in the areas of best coverage). The majority of the vortices will, therefore, probably escape detection by any ordinary methods of synoptic analysis. It would appear that the problem requires a more dense network of reporting stations and a more intensive utilization of reports from particular stations by time-line analysis.

Even under present conditions, as indicated above, the time-sequence analysis makes possible the detection and study of trains of small vortices long before any of the individual deformations amplify and develop winds of destructive force. A few empirical hypotheses for forecasting vortex development have already been derived and are being tested. The development and subsequent track of typhoon Hester, for example, was forecast 5 days in advance of the first observation of winds of typhoon intensity. Through study of all the vortices rather than just those that grow to storms, it is felt that much can be learned about forecasting the most dangerous ones - typhoons. (Based on a report by WOJG D. Morgan in 30th Wea. Sq. publication "The Weather Record," Vol. II, No. 7. Detailed information is contained in a preliminary report released by the North Guam Weather Central through CO, 2143d AWW and published in 2143d AWW Technical Bulletin No. 4.--Ed.)

*See also H. Riehl, "On the Formation of Typhoons," J. of M., Vol. 5, No. 6, Dec. 1948.--Ed.

514TH MODIFIES AIRBORNE RADAR (U)

In order to record the conformation of the cloud patterns surrounding the center of typhoons, the 514th Recon. Sq. recently modified the radar equipment installed in their RB-29's by attaching an automatic camera which, at 3-second intervals, takes pictures of cloud patterns as they appear on the scope of the radar set. In this manner facts concerning the structure of the typhoon are brought to light for the immediate use of the forecaster and the future use of research technicians. A complete series of scope pictures of the "eye" can be obtained as the aircraft approaches it, showing in quite clear detail areas of heaviest rain and turbulence.

THE MOTION OF TROPICAL STORMS (U)

This review of "The Motion of Tropical Storms under the Influence of a Superimposed Southerly Current" by Tu Cheng Yeh, a technical report to the Office of Naval Research (Project NR 082 004), should be of practical interest to AWS forecasters. The results would seem to have a bearing on the erratic tracks indicated by the reconnaissance "fixes" on tropical storm centers -- a phenomenon which has become very disconcerting to hurricane forecasters and to the public.

Dr. Yeh is connected with the Department of Meteorology, University of Chicago; the report is dated June 1949.

A tropical storm is compared to a Rankine vortex and its motion is studied from theoretical considerations. Dr. Yeh points out that Rev. Deppermann (1947) has also compared the tropical storm to a Rankine vortex, that is, a core rotating as a solid, surrounded by a ring in which the angular momentum is constant. If $\underline{v}$ represents the air speed and $\underline{r}$ the distance from the center to the ring of strongest winds, then the central portion (of radius $\underline{r}$) follows the law:

$$\frac{v}{r} = \text{constant},$$

while in the portion outward from the strongest winds:

$$rv = \text{constant}.$$

Considering the interaction between the storm and a steady easterly current (trade wind), Yeh finds the motion of the center to be:

$$x = A \cos(at + e) + ut,$$
$$y = A \sin(at + e), \qquad (1)$$

where x = coordinate of storm center along $\underline{u}$,
y = coordinate of storm center perpendicular to $\underline{u}$,
A = constant determined by initial conditions,
t = time,
e = constant determined by initial conditions,
u = velocity of basic (trade-wind) current, and
a = the maximum wind speed in the storm times the distance from the center to the ring of greatest speed divided by the square of the radius within which the air is assumed to move with the vortex.

This approximation of the storm-path is a trochoid described by a fixed point on a circle of radius $\underline{A}$ which rotates with an angular speed $\underline{a}$, while its center moves with the same speed and in the same direction as the general stream $\underline{u}$. The storm moves in the direction of the general stream with the <u>mean</u> speed of that stream, but the path <u>oscillates</u> laterally with a period

$$T = \frac{2\pi}{a} = \frac{2\pi R^2}{r_o v_o},$$

where R = the radius over which air is assumed to move with the vortex,
r_o = the distance from the storm center to the ring of greatest wind speed, and

v_0 = the maximum wind speed.

Hence, in intense storms of small size, oscillation will be more rapid; but as the storm grows in size and diminishes in intensity, oscillation becomes slower.

The amplitude of the oscillation is, from (1):

$$A = \frac{1}{a}\sqrt{\left[\left(\frac{dx}{dt}\right)_0 - u\right]^2 + \left(\frac{dy}{dt}\right)_0^2}$$

$$= \frac{T}{2\pi}\sqrt{\left[\left(\frac{dx}{dt}\right)_0 - u\right]^2 + \left(\frac{dy}{dt}\right)_0^2}$$

where $\left(\frac{dx}{dt}\right)_0$ and $\left(\frac{dy}{dt}\right)_0$ are the components of the initial velocity of the storm in the x- and y-directions, respectively.

The amplitude of the oscillation varies directly with the period as well as with the speed of movement of the center. Fig. 1 illustrates the trochoid described by equations (1).

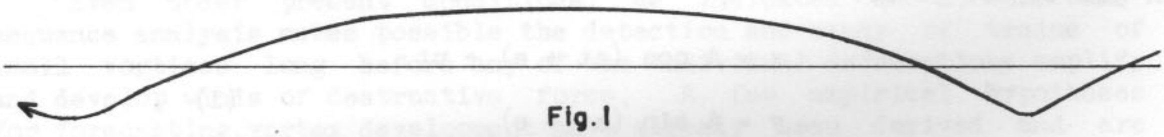

Fig. I

Theoretical path of a tropical storm in an easterly current.

Two examples of actual hurricane paths are discussed: the one of 12-15 August 1947 which originated in the western Caribbean, and the one of 11-20 September 1947 which crossed the southern tip of Florida and entered the continent near New Orleans. Both clearly show oscillations of the above type.

Dr. Yeh is careful to point out some limitations to the above conclusions:

1. Due to the assumption of steady state, the analysis is hardly applicable to very large storms.

2. Since the values of R and some other parameters are difficult if not impossible to determine in synoptic practice, prediction of the oscillations appears more feasible on the basis of persistence.

Tropical storms ordinarily suffer major changes in their direction of motion as they approach or enter a trough in the mid-latitude westerlies. The east side of such a trough deflects the trade winds from northeast or east to southeast. This change in direction of the basic current causes a hurricane to "recurve." The amplitude of its oscillation may increase threefold and its phase angle change, depending on the

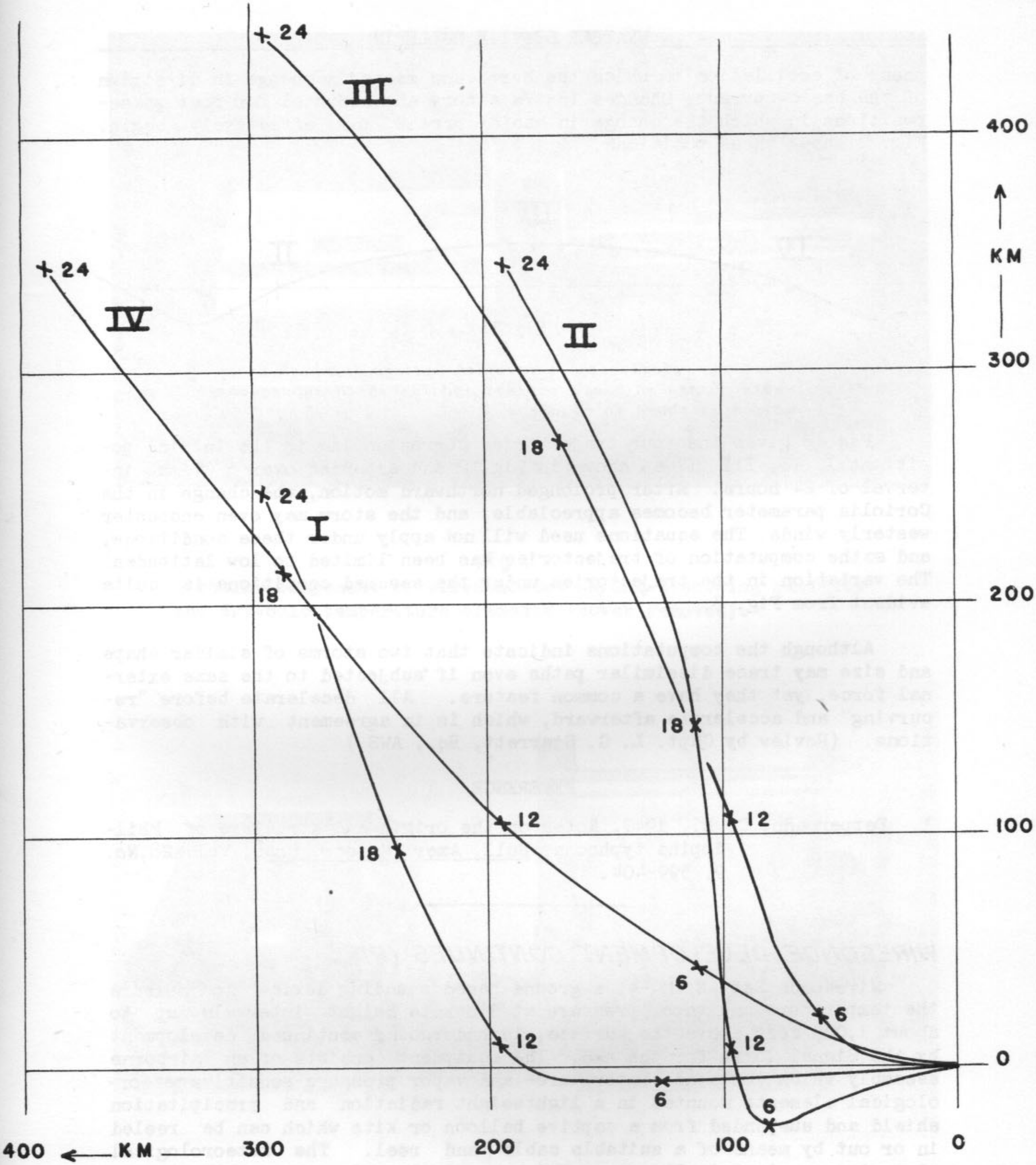

Fig. 3

Dependence of the trajectory of a tropical storm (after entry into a southerly current) on the oscillation phase in which basic current changes. The numbers (Arabic) are hours from onset of southerly current. See Fig. 2 for phases I, II, III, IV.

phase of oscillation in which the hurricane meets the change in direction of the basic current. Changes in trajectory are computed for four phase-positions in which the change in basic current may effectively begin. Fig. 2 shows these positions.

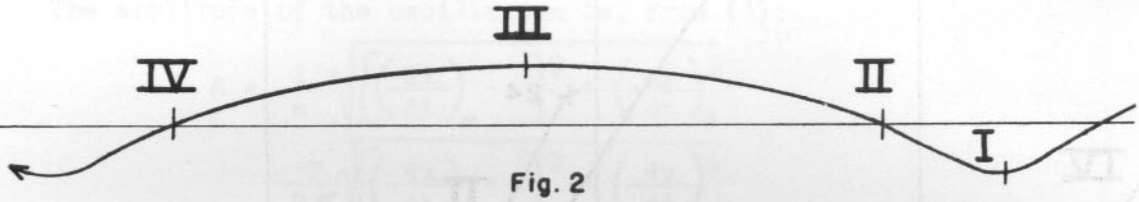

Fig. 2

Positions relative to oscillation pattern in which storm meets change in basic current and for which subsequent motion is shown in Figure 3.

Fig. 3 gives the four trajectories corresponding to the initial positions I, II, III, IV as shown in Fig. 2 and extended over a time interval of 24 hours. After prolonged northward motion, the change in the Coriolis parameter becomes appreciable, and the storm may even encounter westerly winds. The equations used will not apply under these conditions, and so the computation of trajectories has been limited to low latitudes. The variation in the trajectories under the assumed conditions is quite evident from Fig. 3.

Although the computations indicate that two storms of similar shape and size may trace dissimilar paths even if subjected to the same external force, yet they have a common feature. All decelerate before "recurving" and accelerate afterward, which is in agreement with observations. (Review by Capt. L. G. Starrett, Hq., AWS.)

REFERENCE

1. Deppermann, C. E., 1947, Notes on the origin and structure of Philippine typhoons, Bull. Amer. Meteor. Soc., Vol. 28, No. 9, 399-404.

WIRESONDE DEVELOPMENT CONTINUES (R)

Wiresonde Set AN/UMQ-4, a ground-based sounding device to measure the temperature and vapor pressure at discrete height intervals up to about 1,000 feet above the surface, is undergoing continued development by the Signal Corps for the AWS. The equipment consists of an airborne assembly which contains temperature- and vapor pressure-sensitive meteorological elements mounted in a lightweight radiation and precipitation shield and suspended from a captive balloon or kite which can be reeled in or out by means of a suitable cable and reel. The meteorological elements are electrically connected by conductors in the cable to an evaluating unit on the ground and are adequately ventilated to provide rapid, accurate readings which can be converted to temperature and vapor-pressure values. Some difficulty has arisen with operation of the cable

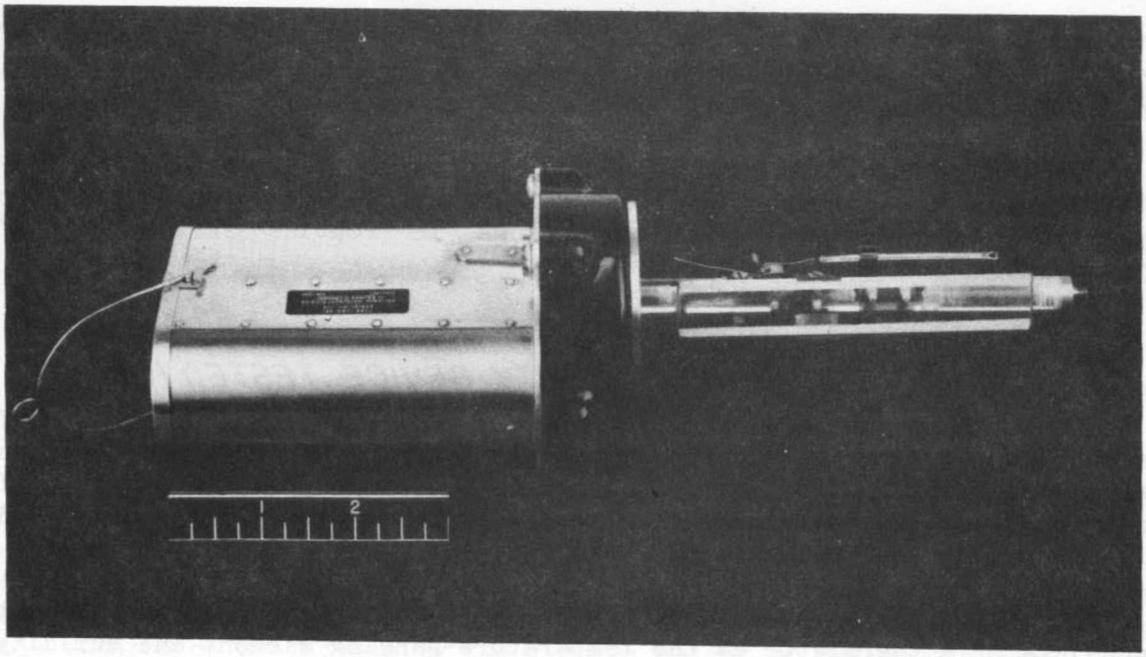

Fig. 1
Airborne component of WiresondeSet AN/UMQ-4 showing humidity and dry-bulb temperature elements (cover removed).

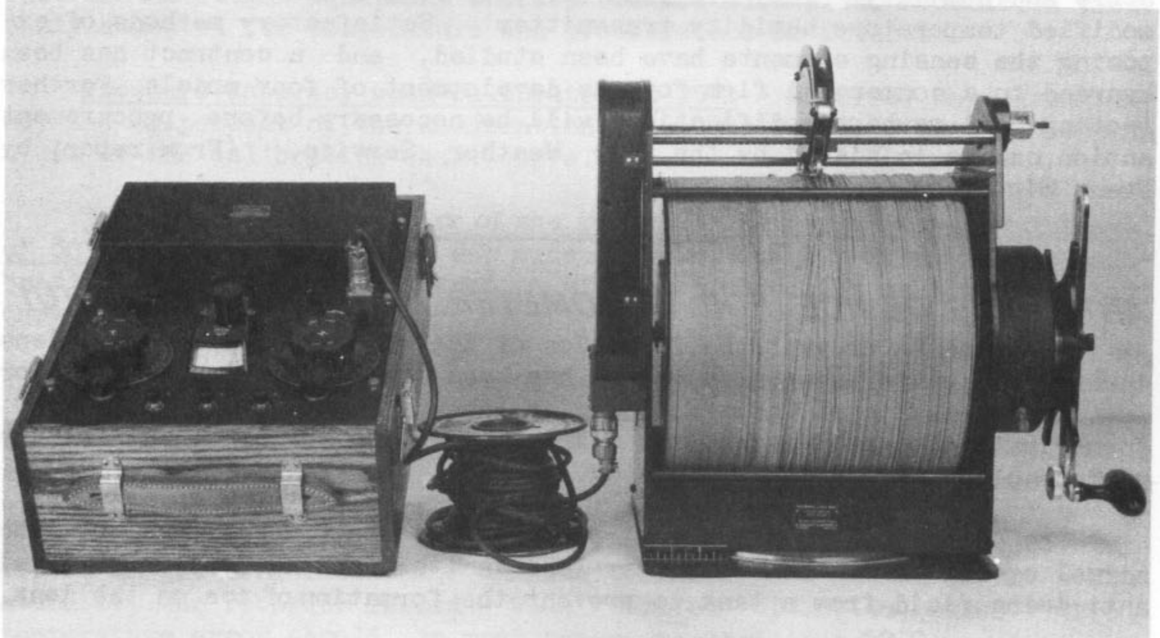

Fig. 2
Ground equipment of Wiresonde Set AN/UMQ-4 showing evaluator (left) and long cable on wire reel.

during periods of persistent cold temperature, but this is being remedied, and the equipment is expected to be field-tested very shortly.

The wiresonde, when perfected, will become an invaluable tool in obtaining data for support of various research projects. There are also possibilities of using low-level soundings in routine forecasting of phenomena such as fog and stratus.

IMPROVED TEMPERATURE-HUMIDITY DEVICE TESTED (U)

Weather reconnaissance personnel have long appreciated the need of a much-improved humidity and temperature-measuring instrument for use aboard reconnaissance aircraft. Such a device, incorporating a number of new features, has been under development by Evans Signal Laboratory and is now undergoing preliminary laboratory testing.

Labelled the AN/AMQ-7, the new Humidity-Temperature Measuring Set consists of a thermistor as the temperature-sensing element and Humidity Element ML-379/AM (lithium-chloride strip) as the corresponding humidity-sensing element. From the four available experimental items of equipment for measuring the resistance of these elements, the self-balancing bridge type was chosen as being most satisfactory.

Personnel who will actually operate the instrument will be particularly interested in the method utilized to present the values of temperature and humidity. They are read directly from a dial through use of a modified temperature humidity transmitter. Satisfactory methods of exposing the sensing elements have been studied, and a contract has been awarded to a commercial firm for the development of four models. Further testing (and perhaps modification) will be necessary before procurement action can be initiated by the Air Weather Service. (From report by Evans Sig. Lab.)

ANTI-ICING DEVICE FOR CEILOMETER LENS DEVELOPED (U)

Designed to prevent the formation of ice on the ceilometer lens during the winter season, a device has been completed and submitted for testing to the Signal Corps Engineering Labs by Capt. John A. Planey, formerly Assistant SWO at Holloman AFB, N. M., and now at USAF Institute of Technology for further schooling.

The device, of relatively simple construction, makes use of the normal operation of the ceilometer lens in its scanning motion to feed anti-icing fluid from a tank to prevent the formation of ice on the lens.

Word has been received from the Signal Corps Engineering Lab at Fort Monmouth, N.J., that the device is undergoing winter testing at its experimental station on Mt. Washington in New Hampshire.

• TECHNICAL CONTRIBUTIONS •

AWS personnel are encouraged to experiment in their daily work in an effort to improve existing techniques and report on the results. Such reports received by Hq., AWS, and considered worthy of publication appear in this section of the WSB.

ON ERRORS IN RAWINSONDE COMPUTATIONS (U)

DETERMINATION OF MAXIMUM ALTITUDES

Recently a few AWS rawinsonde sections have tracked runs to remarkably low indicated pressures, ranging from zero to -5 mb (!). In addition, for some of the runs, computed heights as high as 190,000 feet have been indicated in the evaluations. Headquarters, AWS, has been stressing the importance of increasing the average height of rawinsonde runs, but it is equally important that AWS personnel understand the limitations of the equipment with which they are working.

Each lot of radiosondes (AN/AMT-2) is accepted from the manufacturer when the instruments meet certain accuracy specifications. The accuracy which AWS will accept determines, to some extent, the cost of expendable equipment, and it is not desirable to require extreme precision if the cost of the flight equipment thereby becomes excessive. Accuracies presently accepted for temperature and pressure are as follows:

Pressure accuracy when calibrated at 25°C - No error may exceed ±5 mb, and 80 percent of the calibration point observations must be within ±3 mb of the calibration-chart curve.

Temperature compensation of the pressure instrument over an interval of 80°C - No pressure error may exceed ±5 mb, and 60 percent of the calibration-point observations must be within ±3 mb of the calibration-chart curve.

Temperature element - Accuracy of the element must be ±0.5°C.

Experience indicates that the pressure accuracy may decrease while the instrument is in storage and that instruments more than 12 months old will probably have an average error of ±3-5 mb with errors in a few instruments as large as ±10 mb. There are other sources of temperature errors in the transmission of the radiosonde signal to, and in the evaluation of, the recorder record. With careful operation, the over-all temperature error should, in most cases, be less than ±2°C.

The calculated height of the radiosonde instrument may be determined at any time during the run. This is accomplished by use of the cumulative-thickness method based on the mean virtual temperature of each layer; from this, a pressure height curve is constructed on the adiabatic chart.

The principal errors in mean virtual temperature determination result partly from errors in temperature and humidity measurements and partly from pressure-element errors which cause the temperature to be plotted at an incorrect pressure on the adiabatic chart. The errors in the computed height of the indicated pressure (surface) due to incorrect measurement of pressure by the instrument, are relatively small, especially in near-isothermal layers. The magnitude of the sum of all errors in the calculations of the height of the pressure indicated by the rawinsonde is discussed later under "Evaluation of the Height of Constant-Pressure Surfaces."

When we are considering the accuracy of the calculated height of a pre-selected pressure surface, only the errors mentioned above are applicable. However, when we wish to know the true altitude of the rawinsonde instrument at any time (e.g., its maximum height) or the actual level at which the calculated winds occurred, an additional error must be considered. This error results from the fact that the instrument may not be at the indicated pressure level because of errors in the pressure element. For example, if the pressure element indicates 1 mb higher than the actual pressure, the following additional errors in computed altitude result (assuming a standard atmosphere):

True Pressure (mb)	Indicated Pressure (mb)	Altitude in Standard Atmosphere (ft)	Error of Computed Altitude (ft)
50	51	67,692	415
40	41	72,363	518
30	31	78,386	.685
20	21	86,876	1,022
10	11	101,389	1,966
5	6	117,000	4,760
1	2	167,000	21,500
0.5	1.5	192,000	40,000

If a run terminates at 5.5 mb (actual pressure) and the pressure error is not greater than ±5 mb, the calculated height of the sounding could lie anywhere in the range from 100,000 feet to 192,000 feet. With a pressure error of -7 mb, the indicated pressure at termination of the flight would be -1.5 mb. However, when the actual pressure is 30 mb and there is a maximum error of ±5 mb, the indicated height could be anywhere between 75,000 and 82,000 feet. At lower altitudes the error in height determination will, of course, be much smaller.

To illustrate the errors discussed above, a simplified sounding has been plotted on the adiabatic chart (see Fig. 1). The solid line represents the sounding as obtained from the radiosonde data; the dashed line is the same sounding corrected for instrumental error (we have assumed we know the errors of the instrument during this flight). Relative humidity has been neglected in the computation.

Using the standard method for height computation, the height of the termination of the flight (500-mb indicated pressure) is computed to be 18,350 feet. Since we do not normally know the errors of each individual instrument, we must assume this is the height of the 500-mb pressure surface, and also the height of the instrument. To find the true height of the 500-mb surface, we use the corrected sounding (dashed line) and the same method of computation. We find the true height is 18,410 feet, indicating an error of 60 feet in the calculated height of the 500-mb pressure surface.

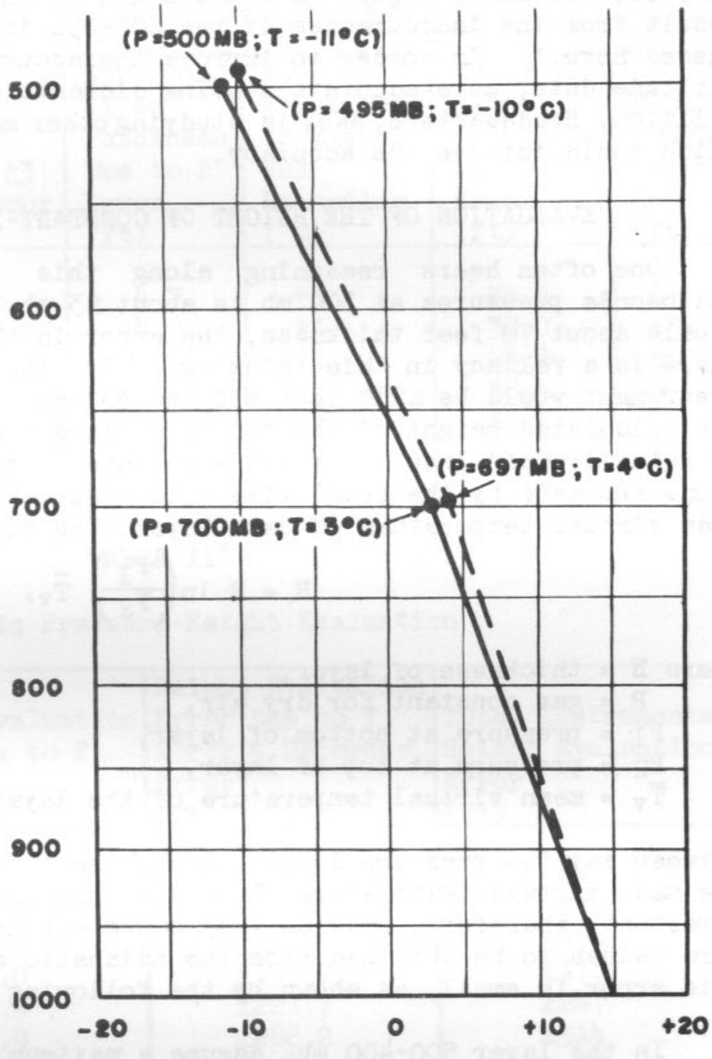

Fig. I

In determining the true height of the instrument, we see that the instrument is actually at 495 mb when it indicates 500 mb. We must, therefore, add the thickness of the layer between 495 mb and 500 mb to the true height of the 500-mb pressure surface. This thickness is 250 feet; the true height of the instrument is therefore 18,660 feet. The instrument, then, is actually 310 feet higher than the height computed without considering the correction for errors of the instrument.

This difference between true and "indicated" altitude of the <u>radiosonde instrument</u> results from errors in both (a) the calculated height of the indicated pressure of the instrument and (b) pressure errors which cause the instrument to be at a pressure level which is different from the indicated pressure. The total error is the algebraic sum of the two errors. At pressures lower than 50 mb, the total error in height determination (of the instrument) due to pressure inaccuracies increases rapidly and, at pressures below 10 mb indicated pressure, computation by the present method is of little value in determining the height of the instrument.

From the above discussion, it can be seen that, at very low pressure, the calculated height of termination of the flight is very questionable.

Also, the calculated winds may be assigned to an altitude which is considerably different from that which has been computed for the instrument. However, the major errors in computation of the wind speed and direction result from the inaccuracies of the SCR-658 itself and will not be discussed here.* In order to improve the accuracy in computation of high altitude data, more accurate sensing elements are under development. In addition, Headquarters, AWS, is studying other methods of height evaluation which could improve the accuracy.

EVALUATION OF THE HEIGHT OF CONSTANT-PRESSURE SURFACE

One often hears reasoning along this line: "Since the error in radiosonde pressures at 300 mb is about ±3 mb, and at that altitude 1 mb equals about 70 feet thickness, the error in the contours is ±210 feet." There is a fallacy in this thinking. It is true that the radiosonde instrument would be ±210 feet off the 300-mb surface, but the error in the calculated height of the 300-mb surface due to the pressure element is actually much less. Pressure-surface (contour line) height calculations are made by the cumulative thickness method, which depends on the mean virtual temperature of each layer. The equation for this method is:

$$H = R \ln\left(\frac{P_1}{P_2}\right) \bar{T}_v,$$

where H = thickness of layer,
R = gas constant for dry air,
P_1 = pressure at bottom of layer,
P_2 = pressure at top of layer,
$\bar{T}_v$ = mean virtual temperature of the layer (°K).

Between any two pressure levels, then, the thickness varies directly as the mean virtual temperature. Errors of the pressure-sensing element are important, therefore, only as they cause erroneous mean virtual temperature values to be obtained from the adiabatic chart. The magnitude of this error is small, as shown by the following example.

In the layer 500-400 mb, assume a maximum lapse rate equal to the dry adiabatic. Then,

$$\frac{(-19°C) - (-35°C)}{500 \text{ mb} - 400 \text{ mb}} = 0.16°C/\text{mb}.$$

Therefore, an error of ±3 mb in pressure readings would cause directly about ±0.48°C error in the mean virtual temperature of that layer. For an isothermal lapse rate there would be no error. Actually the temperature element and recorder errors are much more significant than the pressure error. As shown in Tables I and II, the cumulative errors throughout the sounding become appreciable at high altitudes.

*See: Kirkman, R.A., and J. M. LeBedda, "Meteorological Radio Direction Finding for Measurement of Upper Winds," Journal of Meteorology, Vol.5, 1948, pp. 28-37.

TABLE I*

Errors in Slice-Thickness Evaluation

Slice (mb)	Assumed Pressure Element Error (mb)	T Error Due to ±3 mb P Error (°C)	Error in Slice Thickness Due to P Error (ft)	Assumed T Error Due to Element and Recording (°C)	Error in Slice Thickness Due to T Error (ft)	Total Instrumental Errors (ft)
1013-700	±3	±0.25	4.7	±1	35.5	±40
700-500	±3	±0.30	4.9	±1	32.0	±37
500-300	±3	±0.35	7.5	±1	49.2	±57
300-200	±3	±0.50	5.9	±1	38.5	±44
200-100	±3	±0.10	2.9	±1	66.5	±69
100-50	±3	0	0	±1	66.5	±67

TABLE II*

Errors in Pressure-Height Evaluation

Pressure Surface (mb)	Height Evaluation Error Due to P Error (ft)	Height Evaluation Error Due to T Error & Recorder Error (ft)	Total Instrumental Height Evaluation Error (ft)
700	±4.7	±35.5	±40
500	±9.6	±67.5	±77
300	±17.1	±116.7	±134
200	±23.0	±155.2	±178
100	±25.9	±221.7	±247
50	±25.9	±288.2	±314

*Radiosonde accuracies considered in the computation are those mentioned under "Determination of Maximum Altitudes." Calculations are based on a standard-atmosphere sounding, and to indicate maximum possible error, all errors are assumed additive rather than cancelling.

From the tables it can be seen that, assuming a pressure error of ±3 mb and a temperature error of ±1°C, the height-evaluation error for the 300-mb surface can be as large as ±134 feet; for the 200-mb surface ±178 feet; for the 100-mb surface ±247 feet; and for the 50-mb surface ±314 feet.

The errors discussed and shown in the accompanying tables are due to instrument limitations and are obviously beyond the control of personnel utilizing the equipment. However, another error of comparable or even greater magnitude is often introduced by personnel through carelessness in making the base-line check. If, for example, the base-line check is off by ±1°C, the total thickness error in each "slice" (layer) may be increased to double the amount shown for the ±1°C errors listed in the tables. The error in the 200-mb computed height which may be attributed to temperature errors alone could thus be increased to ±310 feet.

The need for extreme caution on the part of personnel operating the equipment is readily apparent. SWO's are encouraged, therefore, to give added impetus to their existing drive for improved accuracy of base-line checks and all rawinsonde computations. (Maj. A. M. Longacre and Capt. G. A. Guy, Jr., Hq., AWS.)

THE USE OF DEW POINT IN UPPER AIR ANALYSIS (U)

Queries received by Hq., AWS indicate that some doubt exists as to the relative convenience of dew point values and mixing ratio values for upper-air analyses. This article points out the reasons for the recent change to reporting dew point in the radiosonde code and some methods for utilizing that data in analysis.

The present radiosonde code (introduced 1 January 1949) gives humidity information in the form of dew-point temperatures rather than in mixing-ratio and relative humidity values as was done formerly. The use of dew point was chosen by the International Meteorological Organization because, when plotted with temperature on a thermodynamic or upper-air chart, it provides an indication of the moisture on a linear scale and thereby obviates the relatively compressed scale indications of relative humidity and wet-bulb depression at low temperature. Thus, around 0.2°/oo (parts per mille; customarily expressed in meteorology as grams per kilogram), a change in the mixing ratio of 0.1°/oo extends over a length of 7°C on a diagram, while in the vicinity of 17.0°/oo, an equal change extends over a length of but 0.1°C. As sounding instruments are gradually improved to give greater accuracy in the low humidity region, the use of dew point will become of even greater practical importance.* The impending introduction of instruments measuring the dew point directly promises to give the new code a special advantage.

ANALYSIS OF THE SOUNDING

To enable the most efficient use of the data as reported in the new code, a slight amount of re-orientation is required on the part of the user.

In the AWS one or more of the following have been used, mandatorily or optionally, for plotting humidity data from raob soundings on thermodynamic charts:

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*An example of a sounding in which apparently accurate dew-point measurements were made by a dew-point hygrometer at very high levels, where, because of their excessively low values, changes in mixing ratio could neither be obtained nor plotted accurately, is given by E. Barrett, L. Herndon, and H. Carter (Ref. 2).

a. The numerical values of mixing ratio and/or relative humidity were merely plotted beside the significant points.

b. The wet-bulb temperatures were computed on the diagram and the wet-bulb vs. pressure (height) curve plotted ("estegram" of Normand, 1931).

c. The dew-point temperatures were computed on the diagrams and the dew point vs. pressure curve ("depegram" of Shaw, 1921) plotted.

d. The characteristic (moisture) points were computed and the characteristic curve (mixing ratio vs. potential temperature) plotted on Rossby diagrams (Rossby, 1932).

Under the present code conditions, all of these methods can still be performed, though in some cases with less convenience. However, since the dew-point values are now transmitted in the raob code and the dew point curve plotted in the facsimile transmission of raobs, the analyses based on the dew point are more convenient than analyses of any other moisture quantity. Because the standard texts do not specifically illustrate uses of the dew point, many personnel have been slow to accept the facts.

The relative humidity varies inversely and logarithmically with the distance between the ascent curves of temperature and dew point; in the region of aerological interest ($p<950$ mb) and of climatological probability ($T<+15°C$) and in the region in which humidity observations are now reliable ($T>-10°C$), this relationship involves a maximum error of but 6% relative humidity. For the purpose of rapidly but qualitatively "visualizing" the relative humidity at different levels, then, the distance between the dew point and temperature curves on the diagrams serves very well. It also shows directly, at all levels, the number of degrees of temperature by which the air, at any given pressure, must be cooled to reach saturation. However, since saturation is probably more often or predominantly accomplished by adiabatic vertical motions than by non-adiabatic cooling, a more practical method may be desired for showing on the diagram the liability to saturation through instability and the resultant vertical motion. The wet-bulb curve, plotted on the adiabatic diagram (see Fig. 1) and used to advantage in place of the dew point curve, will accomplish the purpose.*

It will be recalled that potential instability in unsaturated air exists where there is a very rapid decrease of the water vapor content with height, and that to find it on the adiabatic diagram, one can compare the slope of the wet-bulb curve with the slope of the saturation adiabats. If that curve between any two points is steeper than the saturation adiabat, potential instability exists and can be set off by sufficient lifting of the layer. The dew-point curve, however, <u>cannot</u> be used for this purpose.

*Under consideration by the WBAN Analysis Center is the substitution of the wet-bulb curve for the dew-point curve on raobs transmitted over the facsimile circuit; however, the dew point values might still be plotted or written on the diagram for reference in cross checking with the upper-air charts.

TABLE I

RADIOSONDE DATA
Buffalo, 0300Z, 6 January 1949

Level	p	T	T_d	w	θ	Δθ	$θ_w$	$Δθ_w$
A	975	2.0	-1.0	3.7	277	+1	2.0	-0.5
B	950	1.2	-5.8	2.6	278	+1	1.5	-1.1
C	930	0.5	-12.5	1.6	279	+2	0.4	0.0
D	900	0.0	-19.5	0.9	281	+6	0.4	+3.2
E	875	3.2	-18.5	1.0	287	+2	3.6	+4.0
F	860	3.2	-4.0	3.4	289	0	7.6	+0.1
G	850	2.5	-3.5	3.5	289	+4	7.7	+3.8
H	820	3.2	+2.2	5.6	293	+6	11.5	+0.5
I	700	-3.8	-6.5	3.6	299	+3	12.0	-0.8
J	605	-11.5	-18.5	1.5	302		11.2	
K	560	-13.5	-27.5					

Only a little more inconvenient to use, but of additional utility, is the characteristic curve which may also be substituted for the dew-point curve. This can be drawn on the adiabatic chart in a fashion quite analogous to the use of the Rossby diagram. One locates (refer to Fig. 1) the intersection, *g*, called a characteristic point, by first going at constant pressure from the significant point, G, to the dew point, G", and then along the vapor line of saturation (mixing ratio isoline) to its intersection with the dry adiabat through G. Likewise, points a, b, c, d, e, f, h, i, and j are plotted to correspond with the significant points A, B, C, etc. Connecting the points represented by the lower case letters gives a curve which is termed the characteristic curve.

As with the wet-bulb curve, if the slope of the characteristic curve between any two points is greater than that of the saturation adiabat, potential instability exists (in Fig. 1 the layers AB, BC, and IJ possess slight potential instability, while the layers DE, EF, FG, and GH have great potential stability). However, the characteristic curve has an added advantage. The vertical distance between the height of a characteristic point and the height of the corresponding significant point on the sounding is a measure of the adiabatic lifting required to reach saturation, while the isobaric distance between them is an approximation (close enough for practical forecasting work) of the relative humidity. For the latter purpose alone, of course, the dew-point curve is more easily used because the corresponding points on the sounding are at the same level (or isobar) and thus require no special notation. The characteristic curve, however, is more conclusive for identifying air masses and fronts in the manner first demonstrated by Rossby on the Rossby diagram.

ANALYSIS OF THE UPPER-AIR CHARTS

Constant pressure maps are now customarily analyzed by utilizing lines of constant height (contours), lines of constant temperature (isotherms), and lines of constant dew point. Referring to a pseudo-adiabatic

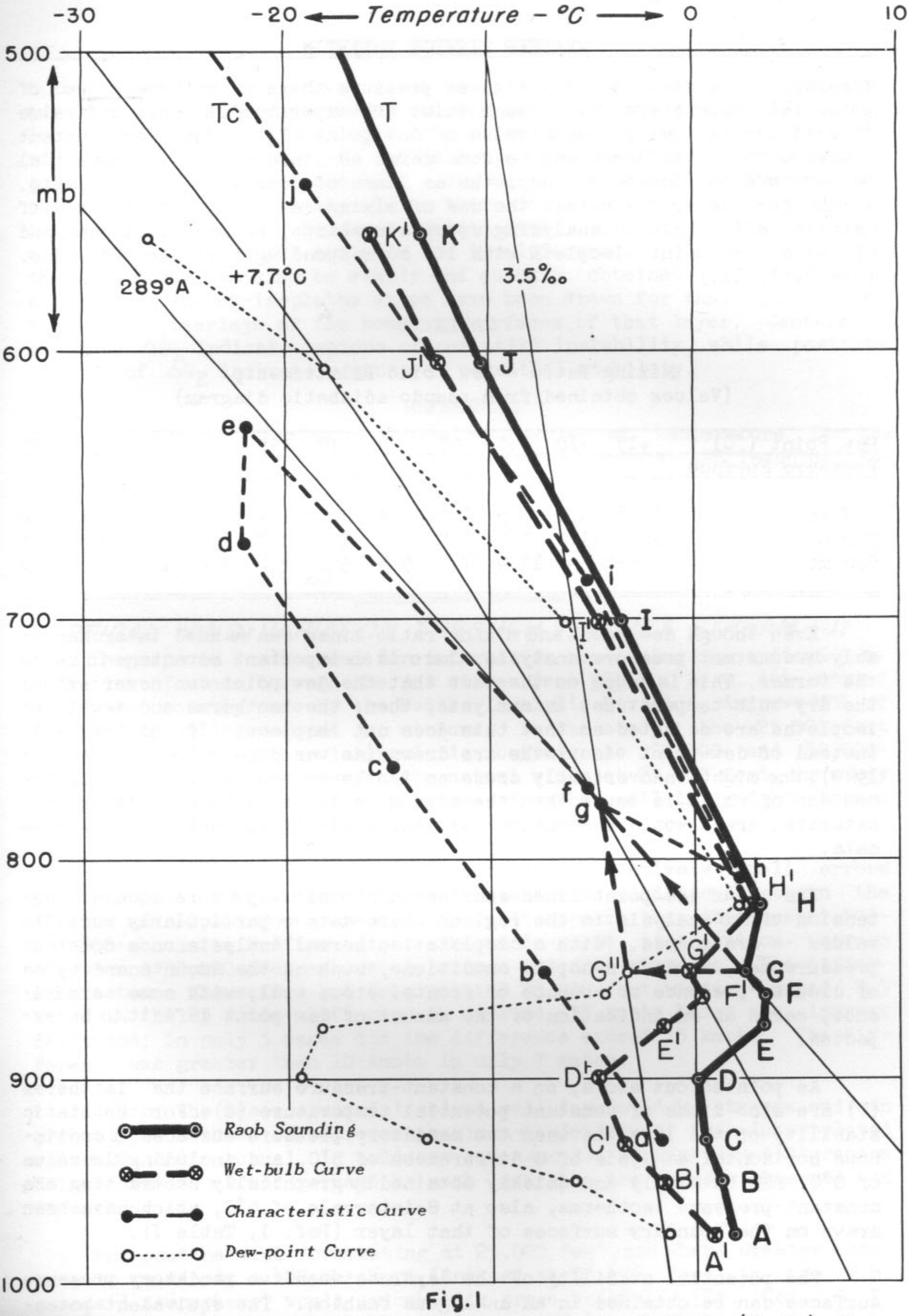

Fig.I

Raob sounding and characteristic moisture curve for Buffalo (N. Y.) plotted from data in Table I accompanying this article. The arrows show method of obtaining characteristic point, *g*, for the significant level, G. Other characteristic points are found in a like manner. The dew-point and wet-bulb curves are shown for purposes of comparison.

diagram, it is seen that for a given pressure there is but one value of potential temperature (θ) for each value of temperature, and but one value of mixing ratio (w) for each value of dew point (T_d). Thus, on constant pressure maps, isotherms can be considered as lines of constant potential temperature and dew-point isopleths as lines of constant mixing ratio. If the forecaster feels that the use of mixing-ratio values will be of material aid to him in analyzing upper-air charts, he may label one end of each dew-point isopleth with its corresponding mixing-ratio value. (See Table II.)

TABLE II

Mixing Ratio - Dew Point Relationship
(Values obtained from pseudo-adiabatic diagram)

Dew Point (°C)	+15	+10	+5	±0	-5	-10	-15	-20	-25	-30	-35
Pressure Surface											
850 mb	12.8	9.2	6.5	4.5	3.2	2.1	1.4	0.9	0.6	0.4	0.2
700 mb	15.6	11.2	7.9	5.5	3.8	2.6	1.7	1.1	0.7	0.5	0.3
500 mb	--	--	11.0	7.7	5.3	3.6	2.4	1.6	1.0	0.6	0.4

Even though dew-point and mixing ratio lines can be used interchangeably in constant-pressure analysis, there is an important advantage in using the former. This is based on the fact that the dew point can never exceed the dry-bulb temperature. In analysis, then, the isotherms and dew-point isopleths are adjusted so that this does not happen. If mixing-ratio instead of dew-point isopleths are drawn (as was done prior to 1 January 1949), one might inadvertently cross an isotherm, the saturation moisture content of which is lower than the mixing-ratio line. Thus, false supersaturated areas would be constructed, particularly in regions of sparse data.

The use of dew-point lines enables in another way a more accurate extension of the analysis in the regions where data -- particularly humidity values -- are scarce. With a complete isothermal analysis on a constant pressure map, various synoptic conditions, such as the amounts and types of clouds, presence or absence of fronts, etc., will, with some experience, serve as an indication of the amount of dew-point deficit to be expected.

As pointed out above, on a constant-pressure surface the isotherms (T) are also lines of constant potential temperature (θ). For the static stability of the layer between two mandatory pressure surfaces, a continuous horizontal analysis of θ-differences of 5°C, and including the value of 0°C, can be simply and quickly obtained by graphically subtracting the constant-pressure isotherms, also at θ-intervals of 5°C, which have been drawn on the boundary surfaces of that layer (Ref. 1, Table I).

The potential stability of the layer between two mandatory pressure surfaces can be obtained in an analogous fashion. The equivalent-potential temperature (θ_E) of any point is fixed by the value of the temperature (or potential temperature) and dew-point temperature of the point. Considered, therefore, as lines of constant $\theta_E - \theta$, dew-point isopleths at intervals of $\theta_E - \theta = 5°C$ can be drawn directly from the reported dew-point values (Ref. 1, Table II). The θ_E-isopleths at 5°C intervals are then obtained by graphically adding these dew-point ($\theta_E - \theta$) lines and the temperature (θ) lines. For the potential stability analysis of the layer, a continuous horizontal analysis for θ_E-differences of 5°C, and including the 0°C value, can also be simply and quickly obtained by graphically subtracting the θ_E-isopleths which have been drawn for that purpose on transparent overlays of the boundary surfaces of that layer. Centers of negative $\Delta\theta_E$ indicate regions of potential instability, while positive centers of $\Delta\theta_E$ indicate regions of potential stability.

REFERENCES

1. Bundgaard, R., Tables of equivalent potential temperature for the standard constant pressure surface, AWS Technical Report 105-5, May 1946.
2. Barrett, E., Herndon, L., Carter, H., A preliminary report on the measurement of water-vapor content in the middle stratosphere, Journal of Meteorology, October 1949, pp. 367-368.

VERTICAL WIND VARIATION THROUGH THE JET STREAM (U)

In response to the need for information concerning the vertical distribution of winds through the jet stream (see WSB No. 7, p. 16), a brief study was recently made by the Weather Analysis Division, Andrews AFB, of a number of well-developed jet streams. In the study, the 25,000-foot winds obtained by linear interpolation between the 20,000- and 30,000-foot levels were compared with the actual winds at 25,000 feet, the study being based on 9 different occurrences of rather well-defined jet streams and a total of 27 different winds-aloft reports.

The results indicate that, in most cases, relatively small errors are introduced by assuming a linear variation in wind speed between the 20,000- and 30,000-foot levels. Thus, it appears that the present 500- and 300-mb charts suffice to give the winds-aloft distribution between 20,000 and 30,000 feet accurately enough for most purposes. The difference between the actual and interpolated 25,000-foot winds averaged 7.3 knots in the 27 winds-aloft reports studied, 35 knots being the largest deviation; in only 3 cases did the difference exceed 15 knots. The difference was greater than 10 knots in only 7 cases.

All of the cases studied involved well-developed jet streams and can probably be assumed to represent maximum deviations of the interpolated values from the actual. In ordinary cases (no jet streams) the differences between the two would perhaps be much less than the values observed in this study.

For routine wind forecasting at 25,000 feet, and where greater accuracy is required, a 400-mb chart (located at 23,600 feet in the U.S. standard atmosphere) would undoubtedly prove helpful. (Lt. Col. G. F. Taylor, Chief, Weather Analysis Division, AWS.)

MODEL FORECAST STUDY UNDER DEVELOPMENT (U)

Forecasters have long appreciated the difficulty of presenting data for a local forecast study in a logical and standardized form. In an effort to evolve a good model forecast study which may be recommended to the field, Hq., AWS, has, through the Reserve Program, assigned the task of developing such a study to a group of reserve officers under the direction of Brig. Gen. J. J. George,* USAFR, at Atlanta, Georgia. Completion date is tentatively scheduled for October 1950.

General George proposes to change the method of presenting forecast studies. Each portion of the world having stations for which local forecast studies are desired would, under his plan, be divided into regions, each of which is similarly affected throughout by various synoptic situations. A regional forecast study would be completed for each such region; local forecast studies supplementing the regional study would then be prepared for each station in that region to explain the strictly local variations in weather phenomena to be expected at the station when it is under the influence of synoptic situations discussed in the regional study. Although detailed planning is not yet complete, groups or squadrons will presumably be responsible for preparing the regional studies, while each forecasting station will undoubtedly be asked to prepare its own local study after receiving a copy of the completed regional study.

The model forecast study now under development by General George (and which it is planned will be forwarded to wings and independent groups for further dissemination) will include a study of the region made up of those portions of the states of Maryland, District of Columbia, Virginia, North Carolina, South Carolina, and Georgia east of the Appalachian Mountains. Three stations have been chosen in that region -- Andrews AFB, Langley AFB, and Turner AFB -- to illustrate the presentation of material of a local nature.

The solutions to local forecasting problems of the type presented in most existing studies will still form an essential part of the future studies, regardless of even drastic changes in prescribed manner of presentation. Therefore, Hq., AWS, desires that increased emphasis be placed on preparation of local forecast studies in accordance with existing regulations so that accurate and sufficient data will be available at each station as a basis for a revised study written in conformance with the forthcoming model.

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*General George, Superintendent of Meteorology, Eastern Airlines, is exceptionally well-qualified for this job, having had considerable military and civilian experience as a forecaster and as the author of no small number of original weather papers.

ARCTIC WEATHER CENTRAL BEING ORGANIZED (R)

Another of the barriers to an understanding of global weather will be pushed back a little further when the present plans for an Arctic weather central are fully implemented. Weather reconnaissance flights and the establishment of additional weather stations in the North Polar regions during the past few years (see WSB No. 1, item 19) have provided an increasing amount of weather data with which to work. Since proper support of operations in the high northern latitudes requires an Arctic weather central, the AWS is establishing such a central at Elmendorf AFB, Alaska. This Arctic weather central will absorb the responsibilities of the original Elmendorf Weather Central, and will be expanded to include forecast and investigation responsibility for all Arctic areas without geographic limitation.

In order to carry out its mission, the Central is to be composed of an analysis division and an evaluation division. Personnel in the analysis division will analyze surface and upper-air charts and prepare forecasts as required anywhere in the Arctic; the evaluation division, including sections for special projects, climatological data, and snow and ice analysis (see WSB No. 8, p. 31), will conduct synoptic investigations and develop Arctic forecasting techniques. Special studies, such as an Arctic Historical Map series, an Arctic Forecasting Manual, and correlation of meteorological elements with related geophysical phenomena, are to be given priority consideration.

Full staffing of the central with qualified personnel probably will not be feasible for some time, but the work of organizing the central is already underway by the 2107th Air Weather Group and the 11th Weather Squadron.

FLYING SAFETY EMPHASIZES REPORTING "NEAR MISSES" (U)

Many of Flying Safety's educational publications are concerned with summaries of accidents which have occurred, their causes, and methods by which they might have been prevented. If this type of material brings to the attention of field personnel weaknesses and accident-producing situations at their own bases so that timely preventative action may be taken, then it has served a worth-while purpose. On the other hand, there is another field of material which has been exploited only slightly and which should be equally as effective in the safety program: Giving adequate publicity to "near misses" -- possible accidents which were prevented by positive action of personnel involved.

Valuable lessons can be learned from hearing how superior airmanship has averted accidents. All Air Weather Service personnel are urged to exploit these possibilities and forward such narratives through channels to Hq., AWS, Attn: Flying Safety, so that Air Force-wide publicity may be given. Examples of good airmanship and alertness will always be morale boosters and incentives to all who fly.

AIRMAN WEATHER CAREER PROGRAM CLARIFIED (U)

Tentative plans for implementation of the AWS Enlisted Career Program were published in WSB No. 5, item 150. Meanwhile AF Letter 35-425 has appeared. It introduces and describes warrant officer and airman jobs in the weather career field, including a graphical presentation of the career development program and a detailed breakdown of each weather specialty, including job description, job requirements, and job progressions. Although this AF Letter is now being revised to make the program more workable, considerable discussion will still be required to clarify the details and answer all the questions that arise.

There are no school requirements for entrance into the Weather Career Field, for either by self-study and/or attending service schools the airman will receive training as he needs it in his upward progress.

To fully understand the program, let's follow the career of an airman in the AWS, pointing out the choices open to him at various levels.

FIRST PHASE

As indicated in Fig. 1, the basic airman who, having the necessary AGCT score and aptitudes for weather, selects weather for a career, becomes a weather trainee and attends the Basic Weather Service Course. Should he have to defer start of this course because others are ahead of him in the pipeline, he may be assigned to a weather station to begin familiarization with his future job.

The Basic Weather Service Course is the Observer Course as it is known today, with one exception: In addition to the course of study given in the present Weather Observer Course, the trainee will receive an overall picture of the various weather careers he may pursue. For example, he will be introduced to all types of weather equipment (such as those used in making rawinsonde runs, sferics observations, etc.).

Upon successful completion of the Basic Weather Service Course, the airman becomes an Apprentice Weather Observer and is immediately given the AFSC of 25250. AFSC stands for Air Force Specialty Code, and it replaces what we know as SSN. (For an explanation of this code as it pertains to the AWS, see Table I.) For example, in the AFSC 25250, the 25 identifies the airman as a member of the AWS, the 2 identifies him as being in the forecasting division, the 5 means he is semi-skilled (having just graduated), and the 0 indicates the specific job of observing.

It is possible that, in exceptional cases, the graduate of the Basic Weather Service Course could first become an Apprentice Ground Weather Equipment Operator with the AFSC of 25150, the 1 identifying him with the equipment division. However, the policy of the AWS is, and will be, to have every airman first serve as an Apprentice Weather Observer, AFSC 25250. The reasons for this policy are as follows:

a. Knowledge of observing techniques and procedures is essential to, and part of, the operation of ground weather equipment. For

TABLE I

Breakdown of Air Force Specialty Code, AFSC,
As It Pertains to Air Weather Service

First and Second Digits Define the Career Field	Third Digit Means Division of Career Field	Fourth Digit Means Grade Authorized or Degree of Skill	Fifth Digit Identifies Different Jobs in the Same Division
25	1 Equipment Division	0 Warrant Officer	Differentiates between Meteorological Technician (0) and Climatological Technician (1) in the Forecasting Division.
Weather Field	2 Forecasting Division	1 Master Sergeant	
		2 Technical Sergeant	
		3 Staff Sergeant	Differentiates between Supervisor (0) and Technician (1) in the Equipment Division.
		4 Sergeant (not used at present)	
		5 Semi-skilled	Differentiates between Special Weather Equipment (0) and Airborne personnel (1) in the Equipment Division.
		6 Not used at present	
		7 Unskilled	Differentiates between an Apprentice Weather Observer (0) and a Climatographer (1).

Note: MOS means Military Occupational Specialty and is being replaced by AFS, Air Force Specialty;

SSN means Specification Serial Number and is being replaced by AFSC, Air Force Specialty Code.

example, the Ground Weather Equipment Operators making a rawinsonde run not only take a weather observation prior to the run but are responsible for observing weather changes during the run. This could mean many observations during a single run, all of which must be accurate and complete.

b. Such knowledge will give airmen the appreciation of observing techniques and procedures they will need to progress upward in the equipment division and to make it possible for them to return to the forecasting division later in their career if they so desire.

Only on rare occasions, then, will airmen graduating from the Basic Weather Service Course go first into the equipment division and become

Apprentice Ground Weather Equipment Operators before serving as Apprentice Weather Observers. This could happen if an unforeseen need arose for many equipment operators which could not be filled by Weather Observer volunteers. In such cases, those desiring to go immediately into the equipment division upon graduating from the Basic Weather Service Course could do so.

Let's follow the career of an airman who has graduated from the Basic Weather Service Course and who has become an Apprentice Weather Observer, AFSC 25250.

As such the airman is assigned to a weather station and performs duties similar to those of our newly graduated observers today. However, while he is becoming more skilled as an observer, he is also given an opportunity to observe and work with Ground Weather Equipment Operators in order to increase his familiarization with equipment previously introduced to him in the Basic Weather Service Course. Thus, as an apprentice, AFSC 25250, authorized the grade of corporal,* he has some experience to help him decide whether he wants to go directly into the equipment division, 25<u>1</u>xx, or stay in the forecasting division, 25<u>2</u>xx.

Eventually our Apprentice Weather Observer, AFSC 25250, will become sufficiently skilled to be classified as a Weather Observer as indicated in Fig. 1. As a Weather Observer he is eligible for promotion to the grade of sergeant. Note that he carries the same AFSC, 25230, as a Senior Weather Observer who is authorized the grade of staff sergeant. (Whenever an AFSC is omitted from a box in Fig. 1, the omitted AFSC is the same as that for the next higher box.) A Weather Observer becomes a Senior Weather Observer by virtue of his experience and proficiency; therefore, there may be more than one Senior Weather Observer in a weather station (the Senior Weather Observer is not to be confused with the position of Chief Weather Observer at a station).

If the skilled observer desires, he may still choose the equipment division instead of continuing up the forecasting-division ladder. If he does so, he is reclassified to a 25150, Apprentice Ground Weather Equipment Operator. The 1 means the equipment division, the 5 means semi-skilled, and the 0 identifies the specific job. This may seem like a backward step, but actually it is not. If he has attained the grade of sergeant as a Weather Observer, AFSC 25230, he will not be demoted just because his new AFSC is 25150. If a vacancy exists in the Basic Weather Equipment Course, he will be sent to it immediately. If not, he may continue to work at his weather station for a short while, either as a skilled Weather Observer, 25230, or as an on-the-job Apprentice Ground Weather Equipment Operator, 25150, until he is able to attend the school. Immediately upon graduation from the Basic Weather Equipment Course, he is given the AFSC of 25130 which, like the 25230, authorizes the grade of staff sergeant.

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*The system of promotion will be discussed in a subsequent issue of the <u>WSB</u> as soon as firm plans are announced by Hq., USAF.

We've now reached the end of the first phase of a weatherman's career. Let's assume our man is a Weather Observer, AFSC 25230, and that he has definitely chosen the forecasting division as his career.

FORECASTING DIVISION

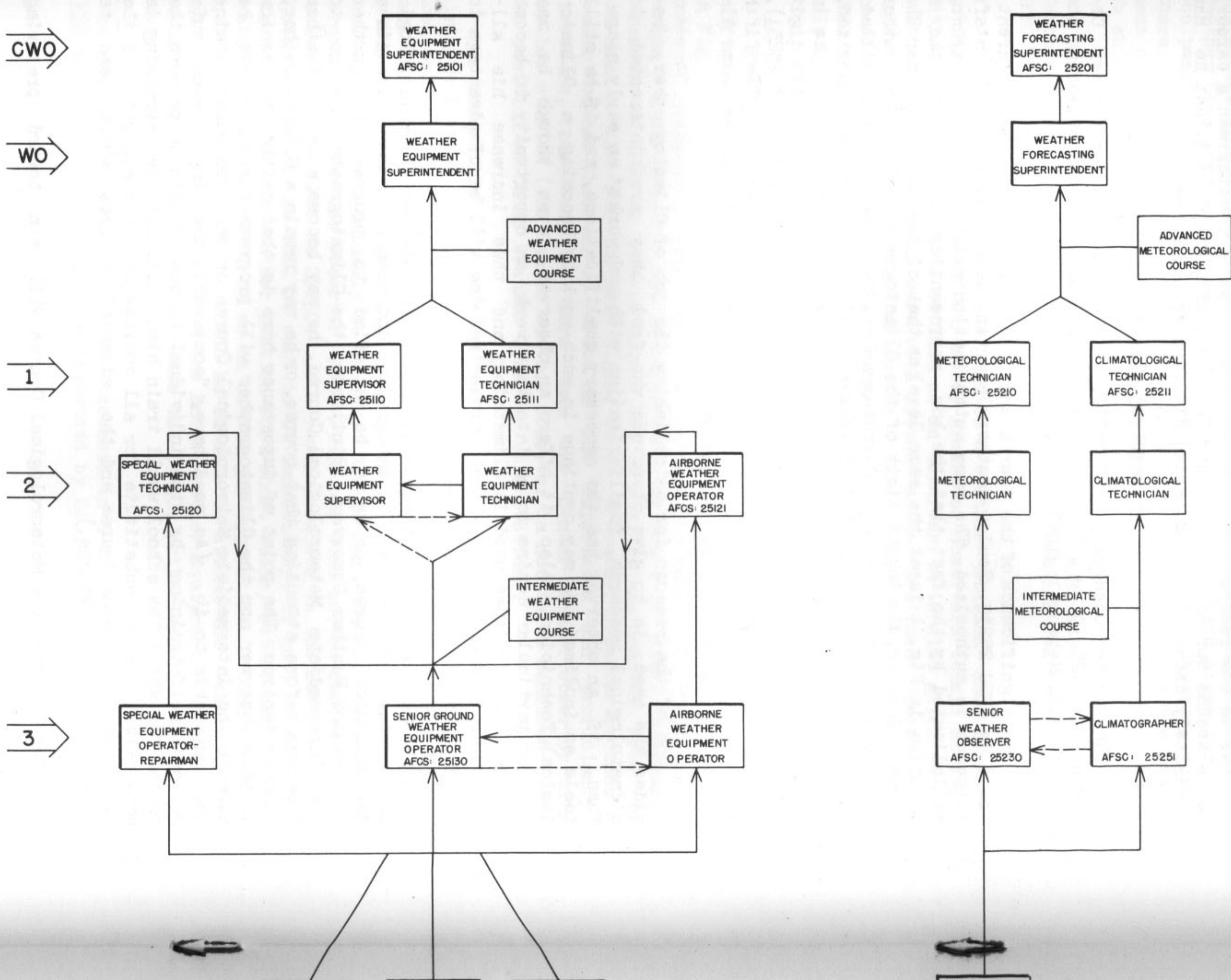
The Weather Observer, AFSC 25230, will become a Senior Weather Observer, AFSC 25230, or a Climatographer, AFSC 25251, before attending the Intermediate Meteorological Course.

The significance of the fourth and fifth digits now becomes apparent. The 3 in AFSC 25230, Senior Weather Observer, means the grade of staff sergeant is authorized. The same authorization exists for Climatographer, as indicated by the fact that the box representing a Climatographer's position in Fig. 1 is at the same level as that of the Senior Weather Observer. However, the fourth digit of the Climatographer AFSC is 5, rather than 3, to indicate that as a Climatographer, the airman is semi-skilled. The rule is that the fourth digit always indicates the grade authorized, unless it is a 5 or a 7. A 5 always means semi-skilled, and a 7, as in the case of the Basic Airman, always means unskilled. If the fifth digit for the Climatographer were a 0 instead of a 1 (2525<u>0</u> instead of 2525<u>1</u>), he'd have the same AFSC as an Apprentice Weather Observer. The fifth digit is used, therefore, to differentiate between jobs in the same division and, in most cases, at the same level.

One of the reasons for establishing the job of Climatographer, besides the need, is to give observers who feel they are interested in climatological research, familiarization with such work at an early stage. Then, if an observer has the necessary qualifications, and if he still feels so inclined, he may continue in such work by becoming a Climatological Technician. Also, it offers an observer, even though he may have no particular desire to go into that work, an opportunity to become trained in techniques used in climatology and thus increase his all-around weather knowledge. Such cross-training will be of advantage to him as a Meteorological Technician.

The Senior Weather Observer may go to the Intermediate Meteorological Course, he may become a Climatographer and then go to the Intermediate Meteorological Course, or he may be satisfied to progress no further than Senior Weather Observer. Similarly, the Climatographer may go to the Intermediate Meteorological Course, he may become a Senior Weather Observer before attending that course, or he may remain a Climatographer, if he so desires. The point of importance here is that neither the Senior Weather Observer nor the Climatographer will progress further unless he attends the Intermediate Meteorological Course or receives other training comparable to it. (As used here, "comparable training" means sufficient self-training by the individual to qualify him to perform the duties for which the school would train him. Similar self-training is permissible as a substitute for all courses with the exception of the Basic Weather Service Course and the advanced courses which lead to warrant officer positions.)

The Intermediate Meteorological Course will aim toward preparing



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WEATHER EQUIPMENT SUPERINTENDENT AFSC: 25101
WEATHER EQUIPMENT SUPERINTENDENT
ADVANCED WEATHER EQUIPMENT COURSE
WEATHER EQUIPMENT SUPERVISOR AFSC: 25110
WEATHER EQUIPMENT TECHNICIAN AFSC: 25111
SPECIAL WEATHER EQUIPMENT TECHNICIAN AFCS: 25120
WEATHER EQUIPMENT SUPERVISOR
WEATHER EQUIPMENT TECHNICIAN
AIRBORNE WEATHER EQUIPMENT OPERATOR AFCS: 25121
INTERMEDIATE WEATHER EQUIPMENT COURSE
SPECIAL WEATHER EQUIPMENT OPERATOR-REPAIRMAN
SENIOR GROUND WEATHER EQUIPMENT OPERATOR AFCS: 25130
AIRBORNE WEATHER EQUIPMENT O PERATOR
WEATHER FORECASTING SUPERINTENDENT AFSC: 25201
WEATHER FORECASTING SUPERINTENDENT
ADVANCED METEOROLOGICAL COURSE
METEOROLOGICAL TECHNICIAN AFSC: 25210
CLIMATOLOGICAL TECHNICIAN AFSC: 25211
METEOROLOGICAL TECHNICIAN
CLIMATOLOGICAL TECHNICIAN
INTERMEDIATE METEOROLOGICAL COURSE
SENIOR WEATHER OBSERVER AFSC: 25230
CLIMATOGRAPHER AFSC: 25251

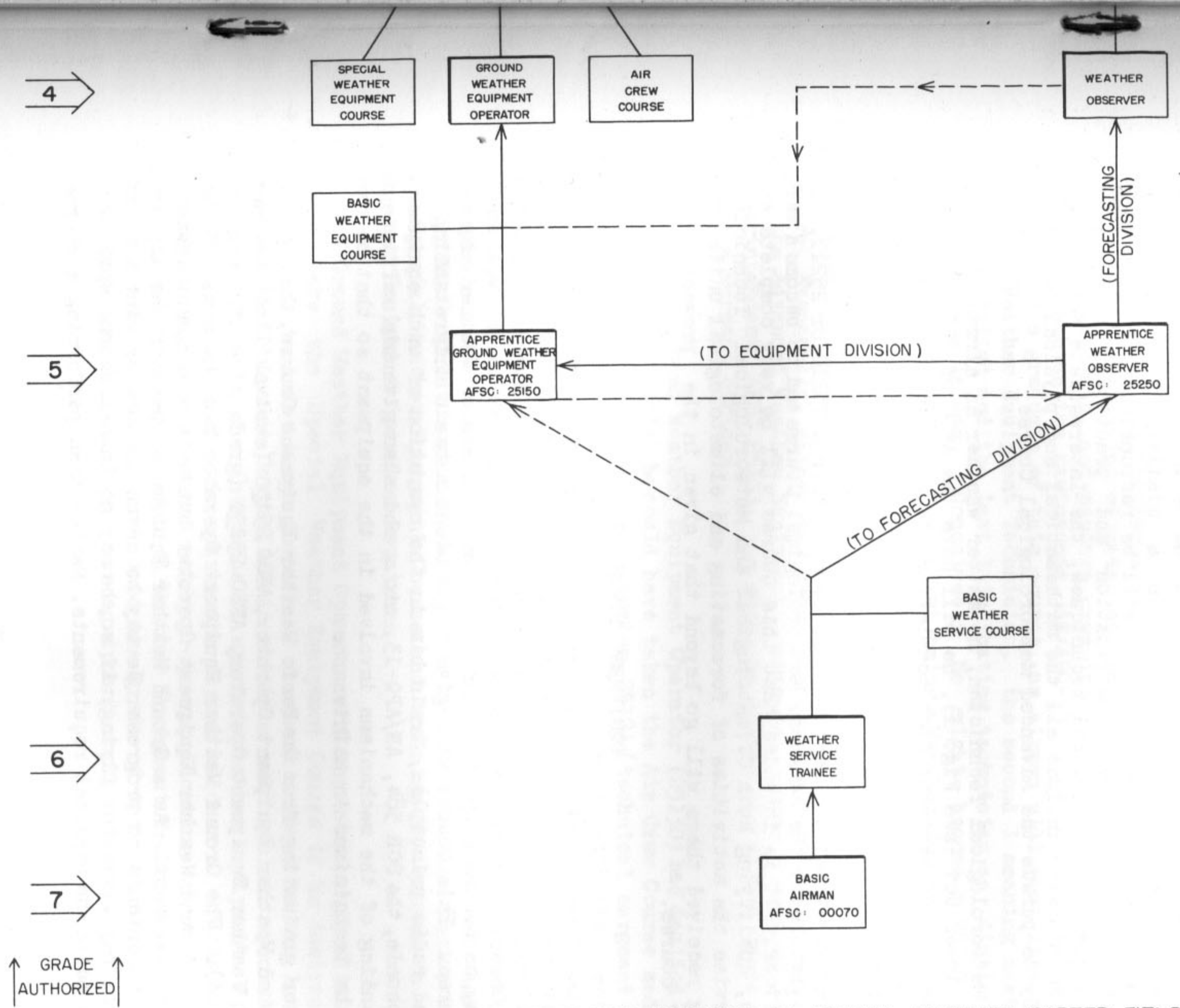


FIG. 1. CHART INDICATING PROGRESSION IN AIRMAN WEATHER CAREER FIELD
(SOLID CONNECTING LINES INDICATE THE NORMAL FLOW, DASHED LINES LESS COMMON FLOW UNDER CERTAIN CONDITIONS SPECIFIED IN THE TEXT)

personnel for the jobs of Climatological Technician and Meteorological Technician. At present, the belief is that personnel entering this Course will take subjects common to both jobs and also additional courses required in their choice. Upon gradaation, then, personnel will be qualified to do the jobs indicated in the job descriptions of AF Letter 35-425, but they will not be forecasters as we know them in the AWS at present. For example, though the Meteorological Technician may analyze maps, assist in the preparation of forecasts, etc., the Forecasting Superintendent or the Weather Officer will be the official forecaster, the one who signs forecasts and clearances. In a similar light, the Weather Officer or Forecasting Superintendent will be responsible for Climatological Technicians. Besides indoctrination and practices in analyses, forecasting, and climatological techniques, the Intermediate Meteorological Course will also include all the mathematical and physical background necessary to pursue the Advanced Meteorological Course.

As Meteorological Technician, no matter whether an airman is in the upper or lower box (see Fig. 1), he will have the AFSC of 25210. Though he may be a staff sergeant upon completing his schooling, he can still rise to master sergeant (indicated by the number 1 in 252<u>1</u>0). The same is true for the Climatological Technician.

After an airman has reached the top as either a 25210 or 25211, he may be eligible for the Advanced Meteorological Course and to become a warrant officer. It is intended that this course will be very complete and thorough, qualifying both Climatological and Meteorological Technicians to supervise the activities of forecasting and climatological units. The training received there will go beyond that given in the present forecasters' course.

EQUIPMENT DIVISION

We had taken an airman and made him an Apprentice Ground Weather Equipment Operator, 25150, the 1 meaning equipment division, 5 meaning semi-skilled, and 0 identifying his specific job. As either an Apprentice Weather Observer or Weather Observer desiring a career in the equipment division, he became a 25150 waiting to attend the Basic Weather Equipment course. This course will give the student a basic understanding of radar and radio principles, train him in the operation of such equipment as rawinsonde, the SCR 584, AN/APQ-13, etc., and also give him sufficient understanding of the mechanisms involved in the equipment so that he can assist the technicians in maintenance.

After graduating from the Basic Weather Equipment Course, the Apprentice Ground Weather Equipment Operator, AFSC 25150 (semi-skilled) becomes a Ground Weather Equipment Operator, AFSC 25130 (grade of staff sergeant authorized). The Ground Weather Equipment Operator has the same AFSC as the Senior Ground Weather Equipment Operator but he is a sergeant instead of a staff sergeant. As a Ground Weather Equipment Operator, he may decide how he intends to progress. He may be adventuresome or want some of that extra pay given for flying; if so, he may go into airborne work provided he meets the physical requirements. Rather than performing airborne duties, he may prefer to work with special weather equipment or to become more skilled as an operator and attain the position of Senior Ground Weather Equipment Operator and the grade of staff sergeant.

If he becomes a Senior Ground Weather Equipment Operator, he still has a choice: remain a Senior Ground Weather Equipment Operator; go into the airborne or special weather equipment fields he passed up earlier; or take the Intermediate Weather Equipment Course to qualify for supervisor or technician positions.

The Intermediate Weather Equipment Course will give students a comprehensive understanding of radar and radio principles and prepare them to install, operate, and perform organizational and field maintenance on equipment such as the rawinsonde, AN/APQ-13, sferics equipment, and ceilometer. As a graduate of this course, an airman will most likely become a 25111, Weather Equipment Technician, the second 1 meaning master sergeant authorized and the last 1 indicating technician as distinct from the supervisor ladder. Conceivably he might become a 25110, Weather Equipment Supervisor, without first being a Weather Equipment Technician, but this is not likely before receiving field experience as a technician.

Having been a technician for some time, he can make a lateral step to supervisor unless he lacks supervisory qualifications or has no such desire. Eventually, either as a technician or a supervisor, he may qualify for the Advanced Weather Equipment Course and become a Weather Equipment Superintendent, AFSC 25101. As such, he leaves the airman ranks and becomes a warrant officer.

If the Ground Weather Equipment Operator (25130) had decided that he preferred aerial duty, he could have taken the Air Crew Course and become an Airborne Weather Equipment Operator, 251<u>2</u>1 (technical sergeant authorized). The Air Crew Course will familiarize him with the airplane and his responsibilities as a member of the crew plus training him to operate the aerial counterpart of the ground weather equipment in which he is qualified. The 25121 may stay in aerial work or go back to ground work. If he goes back into ground work, however, he will most likely attend the Intermediate Weather Equipment Course immediately, but he may again work as a ground operator before taking this course. Another choice would be the Special Weather Equipment Course and training to become a Special Weather Equipment Operator-Repairman.

A Ground Weather Equipment Operator with the necessary qualifications could take the Special Weather Equipment Course if he desires. This course will include a large portion of the work covered in the Intermediate Weather Equipment Course, and in addition will include specialization in the operation and maintenance of special weather equipment. Upon successful completion of this course the airman becomes a Special Weather Equipment Operator-Repairman and by proper application to his new job can rise to the position of Special Weather Equipment Technician. Both have the same AFSC of 251<u>2</u>0 (authorized the grade of technical sergeant). The 25120 may stay in special weather equipment work, take the Air Crew Course and go into aerial work, or receive the additional schooling or training he needs, and which was not included in his Special Weather Equipment Course, to qualify as a Weather Equipment Technical or Supervisor.

Airborne Weather Equipment Operators and Special Weather Equipment Technicians who have attained the grade of technical sergeant and who desire to become Weather Equipment Technicians will be given an opportunity to receive the training they lack. Thus, no penalty in grade should result if an airman leaves his specialized career ladder in order to progress further on another one in the same division.

We have followed a basic airman upward to the parallel jobs of Weather Equipment Superintendent and Weather Forecasting Superintendent; he has risen from a private, first class, to the grade of warrant officer. Certain conclusions may now be drawn:

a. The Airman Weather Career Field is constructed so that a program selected by an airman will permit him to progress in a logical manner.

b. The program of upward progression is rather flexible and not quite as restricted as the graph implies. There is not just one channel to follow. This is especially true in the earlier stages where an individual may need more time and experience to determine his weather career.

c. The selection of a career ladder and successful progression upward, although monitored by the AWS, is largely the responsibility of each individual airman and will require considerable effort, interest, initiative, aggressiveness, self-analysis, and careful study on his part.

Although AF Letter 35-425, "Airman Weather Career Field," has been published, full implementation of the Airman Weather Career Program cannot be accomplished immediately. Too many problems are involved which must be solved individually and then integrated into a workable program. Examples of existing problems are the promotion system, development of courses, and the cross-training required for qualifying present weather airmen for their new specialty. Another is the conversion from the present MOS-SSN to the AFS-AFSC designations which, it is believed, will be started on 1 January 1950. For about six months thereafter, both SSN and AFSC designations will be used. During that period, a skilled Weather Observer, for example, will be carried on the records by both his SSN of 784 and his AFSC of 25230. It is planned that both MOS and SSN designations will be dropped completely by the end of the six months period.

After reading the job descriptions of equipment operators and technicians in AF Letter 35-425, many equipment airmen will undoubtedly wonder if they qualify for their present grade and job (specialty). Every airman will be given ample opportunity to qualify for his present grade under the new program. He will either be sent to school or given time for self-study, with consideration being given airmen who are overseas and to whom any formal training will not be available. Thus, no reductions in grade are foreseen except for those few who fail to qualify for an AF Weather Specialty after having had the chance to do so. This, by itself, is indicative of the fact that full implementation of the Airman Weather Career Program cannot be accomplished quickly.

In order to more clearly explain and represent the various successions of steps possible within the Airman Weather Career Field, the graphic portrayals used in this article are different from those in AF Letter 35-425 and the revision thereof which is to be published. The need for standardization among all career fields has necessitated the establishment of certain rules in their portrayal and description. These rules plus the inherent difficulties of graphically illustrating the many possible channels of progression account for the differences between the graphic portrayals given in this article and those in both the present AF Letter and the expected revision. The descriptions given in this article do not contradict those given in the AF Letter, but instead amplify them.

One false conclusion that may be drawn from a study of Fig. 1 is that an airman will have to attend all the courses which lie along his chosen path of ascent. The only course all airmen in the Weather Career Field must attend is the Basic Weather Service Course. After having taken the Basic Weather Service Course, an airman can rise up to and including the grade of master sergeant, without additional service schooling, by passing qualifying examinations and being recommended favorably by his commanding officers. No formal civilian schooling is necessary to rise up to and including the grade of master sergeant or the warrant grades. The Intermediate Meteorological Course and the Intermediate Weather Equipment Course will give airmen the necessary mathematical and scientific background they may lack to pursue successfully the Advanced Weather Equipment Course or the Advanced Meteorological Course, either of which will be required of all airmen desiring to become warrant officers.

All AWS personnel are encouraged to write directly and informally (to Chief, Air Weather Service, Andrews Air Force Base, Washington 25, D. C., ATTN: Training Division) regarding this program or any of its phases. Questions may be asked and ideas contributed for improvement of your Weather Career Program. Now, while it is still in the developmental stage, is the time to bring forth new ideas. Although it will not be possible to reply to each individual letter, comments, questions, and ideas received will be discussed in subsequent issues of the Weather Service Bulletin.

"GULL" TAKE-OFF TIMES CHANGE (U)

In order that the time of high-level observations by Atlantic Ocean area flights may bracket upper-air map time, the 373rd Recon. Sq. has instituted changes in take-off times of two GULL flights out of Bermuda.

GULL Able is departing, as formerly, at 1000Z; but flights Baker and Charlie are scheduled for 1545Z daily.

The 1000Z take-offs were originally set up so that the maximum number of observations could be made during daylight hours. With the change in time to 1545Z for flights Baker and Charlie, the time of high-level data coincides rather well with that of 0300Z upper-air charts. Upper-air data from the Able flights are similarly utilized on the 1500Z charts.

Although it is desirable to have observations made from aircraft during daylight hours, the advantage gained by having all the high-level data from each mission for one upper-air chart, with the middle observation at approximately map time, outweighs the advantage of making the maximum number of observations between sunrise and sunset.

"TIME OUT" CALLED ON ANALOGUE TRANSMISSION (U)

Inquiries received from AWS field personnel indicate that the reason for the cessation of analogue weather-map transmissions in April 1949 is not generally understood. Long experience with the method of analogue selections in use prior to that time had shown that it was quite unsatisfactory for AWS requirements. Since it is not possible to develop a new method of selection with facilities available within Hq., AWS, a request has been submitted to Hq., USAF, asking that AMC establish a research project on selection of analogues. Transmission of analogues over teletype networks will be resumed when a better method of selection is developed.

EXTENSION COURSES OFFERED REGULARS AND RESERVES (U)

Of special interest to all personnel of the Air Force, whether regular or reserve (or, in certain cases, civilian), is AFR No. 50-12 which contains information pertaining to USAF extension courses.

The mission of the courses is five-fold: to assist military personnel who are seeking commissions as officers in any component of the Air Force in obtaining the required knowledge; to prepare officers of any component of the Air Force for courses at Air Force schools and for performing duties commensurate with present and higher grades; to meet the proficiency and promotional requirements of officers of the Air Force civilian components; to provide a basis for coordinate instruction in ANG and AFR units; and to provide individual instruction for Air Force civilian employees whose duties require knowledge of certain subjects.

Consisting of four phases, the extension courses correspond to, and include courses parallel to, those taught at Air Force schools (see Table I).

The Commanding General, Air University, Maxwell AFB, Alabama, monitors and supervises the preparation of extension courses and publishes an

TABLE I

USAF Extension Courses

PHASE I. - Pre-commission and Indoctrination:	PHASE II. - Air Tactical School Extension Courses:
Part A. Courses and subjects corresponding to those taught in ROTC, OCS, and USMA curricula. Designed for the education of applicants, prior to receiving commissions, who are not graduates of the above-mentioned programs or Air Force schools of similar level.	Part A. Courses and subjects corresponding to those taught at the Air Tactical School. Designed to prepare officers for the command of squadrons and for staff duties appropriate to the squadron grades.
Part B. Courses and subjects corresponding to the curricula of Air Force schools which prepare officers for a job specialty after commission. Consists of courses paralleling those normally taught in Air Force schools of the Air Training Command.	Part B. Specialties. Specialized courses paralleling other such courses conducted within the Air Force at the Air Tactical School level or specially prepared courses as dictated by requirements.
PHASE III. - Air Command and Staff School Extension Courses:	PHASE IV. - Air War College Courses:
Part A. Courses and subjects corresponding to those taught at the Air Command and Staff School level. Designed to prepare officers for the command group and wings and for staff duties appropriate to those grades.	Subjects and courses corresponding to those taught at the Air War College, designed to prepare selected officers for higher command and staff duties with large Air Force units and to promote sound concepts on the broad aspects of air power in order to assure the most effective development and employment of the air arm.
Part B. Specialties. Specialized courses conducted within the Air Force at the Air Command and Staff School level or specially prepared courses as dictated by requirements.	

annual announcement which contains detailed descriptions and eligibility requirements for each course. Generally, all officer and enlisted personnel in the Air Force or Army (and certain civilians in the employ of these services) may be enrolled in the course or phase that is appropriate -- normally the pre-commission and indoctrination course of Phase I for enlisted personnel, and for officers the phase appropriate to their grade and/or level of experience.

Reserve personnel on inactive duty interested in taking extension courses are encouraged to write directly to Commanding Officer, 2220th Extension Group, Continental Air Command, Fort Benjamin Harrison, Indiana (ATTN: ConAC Publications Depot), for the annual AF Extension Course Catalog published by the Air University. Station Weather Officers are urged to write to the same address for a copy of the publication so information will be available to interested personnel in their detachments. The catalog contains all the necessary information, including application blanks, for potential enrollees in the extension course program, the cost of which is borne by the agency to which the individual is assigned.

Applications of Air Force Research personnel not on active duty but assigned to the AWS in a corollary unit, mobilization assignment, or mobilization designation status will be forwarded to the Director, USAF Extension Course Department, Fort Benjamin Harrison, through the AWS unit to which the applicant is assigned. The AWS detachment commander will, after appropriate endorsement, forward the application direct to Fort Benjamin Harrison. Reservists not assigned to an AWS unit will submit applications through the AF Research Training Center to which assigned. Military personnel on active duty will forward applications through their immediate Commanding Officer.

After completion of training, appropriate certificates indicating the number of credit hours acquired during any phase, course, or part thereof will be added to the individual's 201 file. For reserve personnel, paragraph 4b (7) of AFR 45-7 dated 27 September 1949 provides that one point accrues toward retirement for each rated three hours of work satisfactorily completed during a year in Air Force Extension courses above the pre-commissioning and indoctrination course level.

AWS ACTIVITIES

"OPERATION HARVEST" SUPPORTED BY 18TH WEATHER SQ. (U)

During the period 7-16 September 1949 the United States Air Forces in Europe, participating in the combined autumn maneuvers in Germany, required weather service support from the 2105th AWG. The mission was assigned to the 18th Weather Sq. which subsequently organized 5 field units consisting of a total of 12 officers and 39 airmen to perform the job. Joint Maneuver Headquarters for "Operation Harvest" was at Furth.

The major problems encountered by the Squadron concerned the effort to attain mobility of the weather units. As only one mobile weather van was available for use, the other 4 units had to be equipped with "packaged" weather stations (AN/TMQ-1) designed for portability rather than mobility.

Responsibility for providing all communications required by AWS units was assumed by the 1807th AACS Wing. A mobile radio-intercept van provided the necessary communications facilities for operation of the one weather van, but land lines were laid to the other operating sites prior to the beginning of the maneuvers.

Since land-line teletype facilities cannot be utilized by a highly mobile weather station except in very rare instances, the CO, 2105th AWG, has received authorization for 2 more mobile weather vans and requested 1807th AACS Wing to furnish 3 mobile radio vans and package units (each equipped with a radio facsimile receiver) in addition to enough package radio intercept equipment to operate 9 positions simultaneously.

Thus, the experience gained in "Operation Harvest" will result in better preparations for weather support to future U. S. maneuvers of this type in the European theater.

TINKER GETS THE PIREPS (U)

As an indication of what can be done on an important phase of a forecaster's job is the accomplishment of the nine-man forecaster staff at the Tinker AFB weather station in obtaining more pilot weather reports for a one-month period than were received by all other ZI stations combined. According to information from the 2059th AWW, 1378 PIREPS were monitored and disseminated by SWO Major Robert A. Taylor and his forecasters during August 1949. When compared with the previous one-month record of 250, the achievement is very commendable.

AWS PERSONNEL ATTEND CANADIAN GEOGRAPHY SCHOOL (U)

During the past summer, McGill University, Montreal, Canada, offered a series of 5-week courses at its Geography Summer School at Stanstead, Quebec, to which a small number of U. S. military personnel were invited. Of particular interest to the AWS personnel attending the school, Major A. M. Longacre, Hq.,AWS, Capt. Daryl Moyer, 8th Weather Squadron, and Lt. Benny Hall, 11th Weather Squadron, were the courses in Polar Problems, Geography of Agriculture, and Geography of Europe. In addition, courses were offered in geomorphology (land forms and changes), population problems, and exploration.

In those courses pertaining to the polar regions, the visiting lecturers, noted specialists in their field, placed emphasis on climatology, transportation, and adaptation of the individual to arctic conditions. Sir Hubert Wilkins, for example, participated in polar exploration with Stefansson and is a pioneer in arctic aviation, having made one of the first landings on arctic sea ice. His discussions at the school were primarily concerned with transportation in the Arctic.

The lectures by Dr. Paul Siple, environmental protection expert and member of Byrd's Antarctic expeditions, dealt mainly with logistics, especially clothing requirements. Another speaker, Dr. Dugal of Laval University, is a medical research worker in physiology of humans and animals in cold environments. Mr. P. D. Baird, glacial explorer and geologist, Montreal Director of Arctic Institute, and head of the Canadian Army's exercise "Operation Muskox," also lectured in the Polar Problems Course in addition to acting as instructor in the course on Geography of the Arctic. Climatology was taught by Mr. F. K. Hare, meteorologist and geologist, with special emphasis on the northern regions of Canada, Greenland, and Alaska. Geography of the USSR included a study of topography, climate, geology, inhabitants, history, transportation, agriculture, natural resources, and the economy of the Soviet Union.

It is contemplated that some AWS personnel will attend the 1950 session of the McGill Summer School, personnel probably being chosen from among those in Hq.,AWS, concerned with operations and plans in the Arctic and from among newly-assigned personnel in the 2107th and 2108th Air Weather Groups.

373RD ESCORTS JET AIRCRAFT TO ENGLAND (R)

Two F-84 aircraft departed Wright AFB on 21 October 1949 en route to England via the North Atlantic route. Accompanying the 2 jets was an RB-29 of the 373rd Recon. Sq., Kindley AFB, Bermuda, assigned to the flight to perform weather reconnaissance support.

A similar flight of 16 F-80's was made over the same Westover--Goose Bay--BW-1--Meeks--Stornoway route in the summer of 1948 and a report written by Maj. L. J. Pickett, 12th Weather Sq., later published in WSB No. 6 (item 18). For that flight, too, an RB-29 of the 373rd Recon. Sq. accomplished the required weather reconnaissance.

AWARDS AND COMMENDATIONS (U)

SOLDIER'S MEDALS AWARDED TWO AWS AIRMEN

S/Sgt Rex C. Grace

S/Sgt Rex C. Grace, former NCOIC of the Cape Harrison Weather detachment, 8th Weather Squadron, was the recipient recently of the Soldier's Medal presented by the Department of the Air Force. The citation issued by the Air Force in General Order No. 21, 1949, read as follows:

"Staff Sergeant Rex C. Grace, AF 15222822, United States Air Force, distinguished himself by an act of heroism on 17 October 1947 at Cape Harrison, Labrador. By maneuvering an MT Boat in near darkness and rain for over two hours through rough and icy waters, Sergeant Grace effected the rescue of a critically injured pilot of a drifting and disabled aircraft. The outstanding courage and tenacity displayed by Sergeant Grace by disregarding his own safety to save a life reflects great credit upon himself and the United States Air Force."

Sergeant Grace joined the 8th Weather Squadron as a corporal in March 1947 from the 18th Weather Squadron in Wiesbaden, Germany. After serving briefly at Harmon AFB and Goose Bay, Sergeant Grace was assigned to Cape Harrison in July 1947 and served as NCOIC at that station until 6 October 1948. While serving with the organization, he received promotions to the grade of sergeant and staff sergeant on 1 August 1947 and 1 March 1948, respectively. After his tour of duty in the 8th Weather Squadron, Grace was assigned to the 19th (now the 10th) Weather Squadron, McClellan AFB, California. (From "Behind the Eight Ball," 8th Wea. Sq. publication.)

T/Sgt H. L. Pinnell

Saturday morning, 17 September 1949, the 375th Recon. Sq. (VLR) Weather turned out in review for presentation of the Soldier's Medal to T/Sgt Harold L. Pinnell of Bakersfield, Calif. Sgt Pinnell, who was commended for meritorious service above and beyond the call of duty, survived the crash of an RB-29 aircraft at Shemya AFB, Alaska, on 28 September 1948, and, with disregard for his own safety, re-entered the burning aircraft to rescue an injured radio operator on the crew. The radio operator was the last member to escape from the burning plane.

Col. John L. Nedwed, CO of Eielson AFB, and Col. Karl T. Rauk, CO of the 375th Recon. Sq., reviewed the troops. Col. Rauk make the presentation.

Sgt Pinnell has been a member of the Air Force since Feb. 1941 and was an aerial gunner in the European theater. He was awarded the Air Medal and the European Theater Ribbon with nine Battle Stars for participation in aerial combat missions.

He attended grammar and high school at Bakersfield, Calif., and is now serving as an aerial engineer in the 375th Recon. Sq. (VLR) Weather.

LETTERS OF COMMENDATION

Hq., AWS, is pleased to list the organizations and names of personnel who have performed their duties in a manner so as to merit the recognition of officers in other organizations during the past few months It is by no means a complete list, but does include those letters of commendation brought to the attention of this headquarters.

375TH RECONNAISSANCE SQUADRON
(Col. Karl T. Rauk, Commanding)

From Admiral Louis Denfeld, Chief of Naval Operations; for the outstanding work performed in visually and photographically observing sea ice from the air during Ptarmigan flights to the North Pole throughout the past year (work performed at request of U. S. Navy).

MAJOR ROBERT B. SYKES, JR.
(Hq., Air Weather Service)

From Major General W. F. McKee, Asst. Vice Chief of Staff, USAF; for service to the U. S. Delegation to the ICAO conference on Joint Financing & Operation of Air Navigation Service in England.

CAPTAIN IRVING L. KUEHNAST
W/O JAMES R. SCHAEFFER
SGT CLARENCE A. WATLEY
(19th Weather Squadron)

From Dr. Thomas L. Shipman, UCLA, Los Alamos Scientific Laboratory, Los Alamos, New Mexico; for special forecasting work associated with the conduct of technical tests.

1ST LT. RICHARD T. BROWN
(8th Weather Squadron)

From Captain B. N. Rittenhouse, USN, Commander Resupply Group (Arctic Weather Stations); for excellent performance of meteorological duties while assigned to Resupply Project.

S/SGT DONALD E. NAGEL
(formerly with 30th Weather Squadron)

From Major General C. V. Haynes, MATS Deputy Commander for Services; for assistance in installation and maintenance of equipment used in two classified projects.

CPL JOHN J. DAWSON
(1st Weather Squadron)

From Major General C. V. Haynes, MATS Deputy Commander for Services; for supervising electronics unit for two classified projects.

During September an estimated 85,000 to 100,000 people at the California State Fair in Sacramento--among them Gen. and Mrs. H. H. Arnold--were treated to an eye-appealing and informative display of weather instruments and equipment, movies, and various charts and graphs. Sponsored by the 2078th Weather Recon. Sq., the exhibit aroused a great deal of public interest in weather and in the equipment used for weather reconnaissance.

375TH MAKES NON-ROUTINE "ROUTINE" FLIGHT (U)

A short time ago a crew of Flight "B" of the 375th Weather Reconnaissance Squadron took off from Shemya AFB, Alaska (near the end of the Aleutian chain) on a routine weather reconnaissance mission. They planned to fly their RB-29 south from Shemya from 1,050 miles and return, with 12 hours as the estimated time in flight. Nineteen hours and fifteen minutes later they made a three-engine landing at Elmendorf AFB with only two hours' fuel remaining and anything but a "routine" mission behind them.

Because of severe headwinds and ailing communications they decided to turn back to Shemya when 900 miles out on their proposed track. Immediately after the turn the number two engine failed and was feathered.

During the letdown for a GCA run at Shemya the ceiling dropped below 500 feet indefinite, visibility decreased to three-quarters of a mile, and the wind increased to 55 knots with gusts to 65 from a direction 80 degrees across the runway. Since altitude was already lost in descending, it was deemed advisable to try one ground-controlled approach. A landing out of this approach, however, was rendered impossible by the low visibility (for Shemya) and the accompanying crosswinds. A successful three-engine go-around was made and the crew decided to proceed to Elmendorf AFB, the only field within some 1600 miles reporting favorable weather conditions.

En route to Elmendorf heavy clear icing forced the aircraft down to 6500 feet, but precise radar navigation enabled the pilot to avoid higher mountainous terrain. After a 3700-mile flight, of which 2700 miles were made battling Aleutian weather on three engines, a successful landing was made at Elmendorf. Another "routine" weather reconnaissance flight was over.

375TH ASSISTS DR. SMILEY IN REFRACTION MEASUREMENTS (U)

The 375th Recon. Sq. in September was host to Dr. Charles H. Smiley, Director of the Ladd Observatory, Brown University, on two regular Ptarmigan flights. Dr. Smiley, who is well-known for recent solar eclipse work conducted in Brazil and Siam, took approximately 80 measurements of the sun's vertical and horizontal diameters from an open window of an RB-29 flying at 18,000 feet over the Arctic ice pack. These were made at low sun elevations to study refraction effects, and are needed measurements in conjunction with the preparation of new navigation tables to be utilized by crew members of high-speed aircraft.

Air Weather Service participation in the Atmospheric Refraction Project began in May 1947 when the 2078th Recon. Sq. (308th Recon. Group) was assigned to aid Dr. Smiley in obtaining the first series of celestial observations on weather reconnaissance flights terminating at Fairfield-Suisun AFB. Because of the low priority assigned the project at that time, the first year and one-half was spent in working up types of mountings for installation of the measuring equipment in the aircraft, in flying experimental missions, and in testing various types of glass for the plane windows in an attempt to find one which would not affect the readings. Several officers were indoctrinated in use of the equipment with a view towards eventual routine use of the equipment on all reconnaissance flights.

Although Dr. Smiley's recent Arctic readings give much valuable information concerning refraction in the north polar region, many thousands of readings must yet be obtained at various altitudes before certain indicated trends can be stated with certainty.

KNOW YOUR COMMANDERS (U)

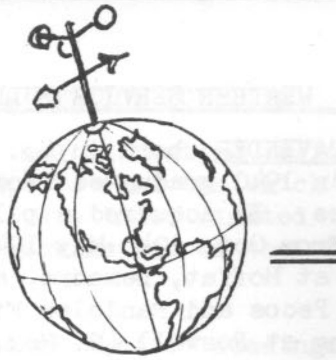
COL. NORMAN L. PETERSON, CO, 2108th AWG, was born in Houston, Texas, attended high school in San Antonio, and then went on to graduate from Yale with a B.A. degree and take post-graduate work at the U. of Texas. His army career began in 1934 as an aviation cadet, and after graduation as a pilot in Feb. 1936, he was assigned at Brooks Field (Tex.), Godman Field (Ky.), and Ft. Sill (Okla.) before attending CIT as a meteorology student in 1939. Upon completion of the course, Col. Peterson was made SWO at Langley Field and in Nov. 1941 at Bolling Field. A year later he became RCO, 2nd Weather Region (Patterson Field); Sept. 1943 found him as RCO, 17th Weather Squadron, in the Pacific. In Oct. 1944 he was appointed Executive Officer and later Special Projects Officer, Hq., AAFPOA, and in Aug. 1945 returned to the ZI to become CO, 400th AAFBU, San Francisco. Col. Peterson was made CO, 465th AAFBU, MacDill Field (Fla.) in Oct. 1946, being transferred to Hq., CWW (Tinker Field), as Chief of Staff and Deputy Commander in June 1947. Fourteen months later he attended the Air War College at Maxwell Field (Ala.), thereafter being assigned as CO, 2108th AWG. He is a Lt. Col. in the regular Air Force.

LT. COL. ARTHUR A. McCARTAN, now commanding the 2078th AW Recon. Sq., Fairfield-Suisun AFB, was born in Minnesota but attended school in Superior, Wis. In 1936 he received notice of his appointment to West Point. Graduating in 1940 as a 2d Lt., he spent the following 7 months in pilot training and followed that up with the meteorology course at U.C.L.A. He was subsequently assigned to the 34th Bomb Group as Group Weather Officer. In Sept. 1942 Col. McCartan, as CO, organized and trained the 1st Weather Recon. Sq. (the first unit of its kind) at Patterson Field. In July 1943 he was made Staff Weather Officer to Hq, 2d AF in Colorado. His overseas tour to Natal, Brazil, began in Jan. 1944 when he was made RCO of the 22nd Weather Region. In May 1945 he was transferred to the 2d Weather Recon. Sq. in India as its CO and 5 months later was made RCO in the 10th Weather Sq. Col. McCartan served as Asst. A-3 and Staff Weather Officer in Nanking, China, from May-Dec. 1946 before returning to the ZI in Jan. 1947 and assuming weather reconnaissance duties in the A-3 section, Hq., AWS. He became Director of Operations, Hq., AWS, in June 1948 and a year later served briefly as Deputy CO, 308th Recon. Group (Calif.) before becoming CO, 2078th Weather Recon. Sq., Fairfield-Suisun AFB, on 1 June 1949.

MAJOR JOHN P. K. CAVENDER, born in So. Fulton, Tenn., attended high school in Memphis and in 1940 graduated from Southwestern College, Memphis, with a B.A. degree. He acquired a pilot's rating by attending A/C school at Kelly Field from Oct. 1940-May 1941, and until Aug. 1942 served as an instructor pilot at Moffat, Lemoore, and Mather Fields (Calif.). He became a Sq. CO at Pecos and Randolph Field (Tex.) before undergoing B-29 transition training at Roswell (N. Mex.) from Mar. to Oct. 1945, after which he went on inactive service. Recalled to active duty in May 1947, he attended the military management course at Craig Field (Ala.) and then proceeded to the U. of Chicago for the meteorological course. Upon completion, Major Cavender was made SWO of a 30th Weather Squadron detachment, Guam, followed by positions as S-3 officer, Hq., 30th Weather Sq., Operations Officer and Executive Officer, 514th Recon. Sq., and finally on 6 July 1949, his present position, CO, 514th Recon. Sq. Major Cavender is a Captain in the regular Air Force.

A New Yorker by birth, MAJOR LAWRENCE COMETH graduated from high school there and then attended NYU, majoring in engineering. In Oct. 1941 he was accepted for A/C training, graduating as a pilot in May 1942. After advanced training in S. Car. and Mass., Maj. Cometh was transferred to England and then Africa, being assigned to the 310th Bomb. Group as a Sq. Operations Officer and later Sq. CO. He returned to the U.S. in May 1944 with duty assignment at Greenville AAB (S.Car.) and a year later attended the aircraft maintenance officer's course at Chanute Field. After graduation he became SWO at Bedford AFB, taking time out in 1948 to attend the Air Tactical School. On 5 July 1949 he became CO, 12th Weather Sq., Mitchel AFB (N.Y.).

INTERNATIONAL INTERSERVICE ASPECTS



INTERNATIONAL ICE PATROL (U)

Where are the major arctic iceberg concentrations each year? How long does it take them to travel from their source regions in Greenland down into the shipping lanes of the North Atlantic?

These are questions which the International Ice Patrol, conducting an iceberg census in Baffin Bay in accordance with Articles 36 and 37 of the International Convention for the Safety of Life at Sea (London, 31 May 1929), has endeavored to answer by photographing and then counting icebergs found in large concentrations in Baffin Bay west of Greenland.

Captain John A. Glynn, USCG, Commander of the International Ice Patrol, dispatched the Coast Guard Cutter Winnebago and two patrol-type aircraft into that area during August and September 1949 to perform the iceberg census for 1949. The Winnebago steamed up to 73°N 65°W (the middle of Baffin Bay) to provide surface support by maintaining aircraft guard and a weather station for the two aircraft based at BW-8 (Sondrestromfjord), Greenland. Weather forecasts for the aerial observation and photography were provided by 8th Weather Squadron personnel at BW-8.

Results of this year's survey have not been completely summarized and evaluated, but preliminary results combined with information from previous expeditions indicate that icebergs calving from glaciers on the west coast of Greenland generally travel north to winter in Melville Bay, proceed around the northern edge of Baffin Bay during the summer, spend the following winter in the vicinity of Cape Dier, and finally arrive in the Grand Banks area off Newfoundland the second spring after the calving. According to past surveys, less than 20% of the bergs leaving Greenland reach the Grand Banks area; future surveys will attempt to solve this and other problems dealing with arctic ice and its movement. The ice-patrol observations on ice conditions in the Baffin Sea region will incidentally contribute valuable data for the USAF and Navy ice-research programs. (Based on Operation Order, ComIntIcePat No. 2-49.)

ACC/MET APPROVES RASON RECOMMENDATIONS (U)

In its 137th meeting in Washington, D. C., the Subcommittee on Aviation Meteorology of the Air Coordinating Committee agreed that the U. S. weather services would implement the recommendations of the Joint RASON Standardization Conference to the fullest extent practicable (see WSB No. 7, item 48, for details of those recommendations). Beginning 1 January 1950 and every six months thereafter, each of the three weather services is to report on its progress of implementation and present recommendations to ACC/MET for improvement of the program.

NORTH ATLANTIC OCEAN STATIONS: HOW AND WHY (U)

In Dublin in 1946 the Meteorological Committee of the Regional Air Navigation meeting (a sub-division of what is now the International Civil Aviation Organization*) recommended that States of the North Atlantic Region determine whether the recommendations of that group pertaining to the establishment and maintenance of 13 ocean-going vessels as weather stations in the North Atlantic could be implemented. Use of such stations in the North Atlantic was neither new nor untried, for ships were used extensively for that purpose during the recent war, to a number reaching a maximum of 20. However, after the war the number decreased to 4 by June 1946.

Recommendations of the Dublin Meeting were considered by an ICAO Conference in September 1946, resulting in agreement that the North Atlantic States would jointly participate in the operation of 13 ocean stations. The agreement was reflected in a Final Act which stipulated the obligations each State would assume. Additionally, it carried a proviso that the agreement would be reviewed in 1949. This was done in April 1949 when a meeting was convened in London for the purpose. It was generally agreed at that time that the number of stations could be decreased from 13 to 10. Pertinent extracts of the agreement follow:

ARTICLE I

1. The Contracting Governments named in this Article shall provide, maintain, and operate, subject to the conditions prescribed in this Agreement, suitable ocean station vessels (hereinafter referred to as "Vessels") at weather stations in the North Atlantic (hereinafter, together with such additional stations as may be provided under Article II, referred to as "the Stations") as specified in the following table and in paragraph 2 of this Article:

Station	Location	Governments Responsible	Number of Vessels to Be Operated
A	(62°00'N (33°00'W	(Netherlands (United States	1 2
B	(56°30'N (51°00'W	(Canada (United States	1 2
C	(52°45'N (53°30'W	United States	3
D	(44°00'N (41°00'W	United States	2 1/2

*For a complete discussion of the organization and functions of ICAO, see WSB No. 3, item 79.

Station	Location	Governments Responsible	Number of Vessels to Be Operated
E	(35°00'N (48°00'W	United States	2 1/2
H	(36°00'N (70°00'W	United States	2 1/2
I	(59°00'N (19°00'W	United Kingdom	2
J	(52°30'N (20°00'W	United Kingdom	2
K	(45°00'N (16°00'W	France	2
M	(66°00'N (02°00'E	Norway	2

2. The Government of the Netherlands shall provide one vessel to be operated at Station J in relief of the United Kingdom vessels and at Station K in relief of the French vessels, in accordance with paragraph 3 of this Article.

3. The operation of Stations I, J, and K shall be shared among the vessels of France, Netherlands and United Kingdom, as the authorities of the Governments of those countries shall arrange, on the following basis:

France (at station K)	15 patrols annually;
Netherlands (at stations J and K)	7 patrols annually;
United Kingdom (at stations I and J)	30 patrols annually.

4. Since the number of vessels to be provided under this Article by the Governments of France, Netherlands and United Kingdom to maintain Stations I, J, and K is more than is operationally necessary for this purpose, those Governments shall, if necessary and practicable, arrange to provide relief vessels to assist the Government of Norway in operating Station M in case of emergency. In such event, the Government of Norway shall reimburse the Government providing the relief vessel at the rate £7,500 for each patrol.

5. For the purposes of this Article a patrol shall consist of 21 days on station.

ARTICLE II

1. The location of any of the Stations may be changed:

(a) by the Contracting Government or Governments responsible

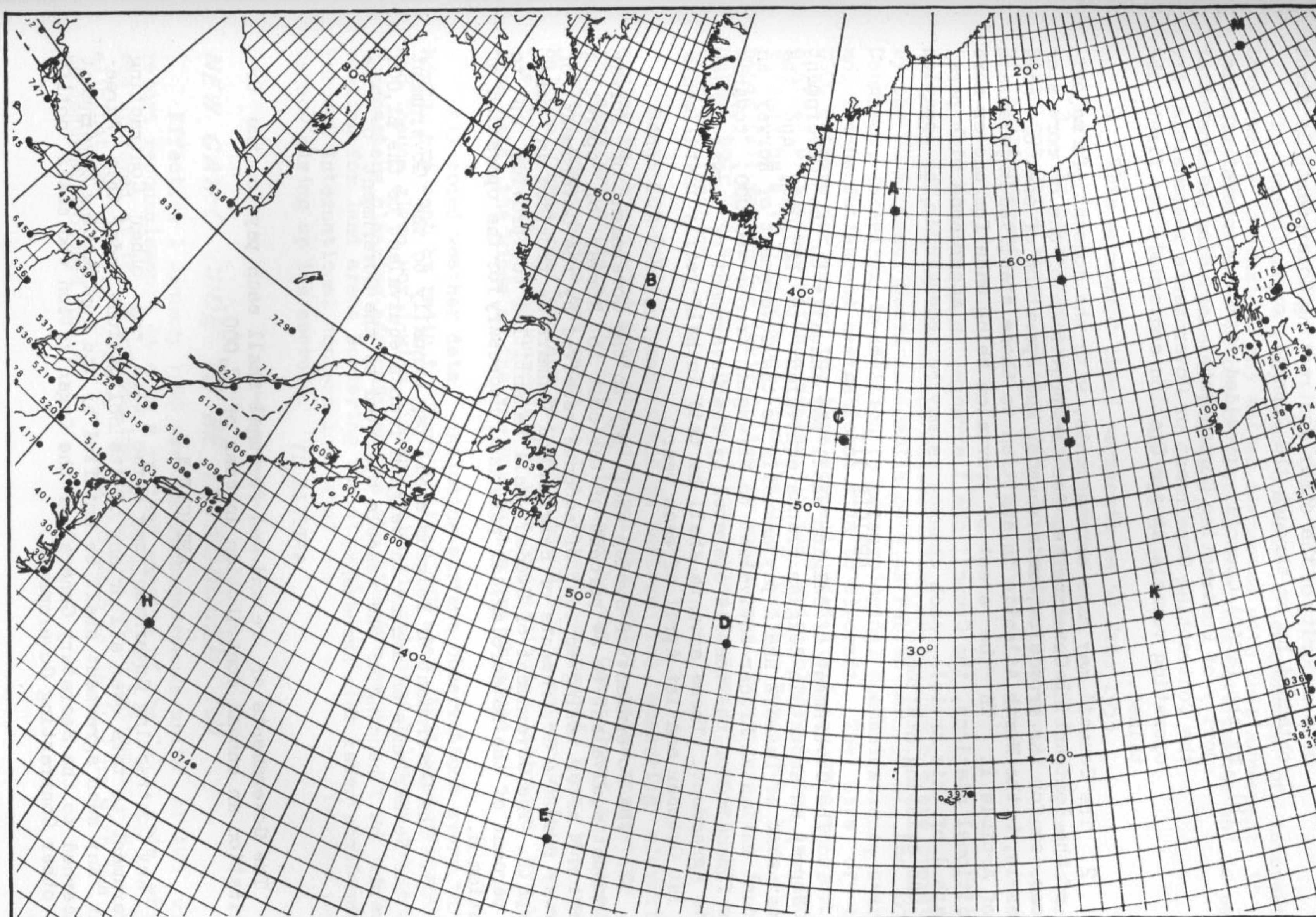


Fig. I

Weather Stations in the North Atlantic

for operating vessels thereat, provided that the consent of a majority of the other Contracting Governments is first obtained by or through the Council, or

(b) by the (ICAO) Council, provided that the consent of a majority of Contracting Governments, including the consent of the Contracting Government or Governments responsible for operating vessels at the Station concerned, is first obtained.

2. The Council may make arrangements, with the consent of a majority of the Contracting Governments, for the provision of one or more stations, or for the provision, maintenance, and operation of one or more vessels, in the North Atlantic in addition to those specified in paragraph 1 of Article I. In the event of provision being made for one or more additional stations, the Council shall arrange, in accordance with paragraph 1 of this Article, such changes as may be necessary in the location of the existing Stations.

ARTICLE III

1. The Government of Belgium shall pay annually to the Government of Norway an amount in Belgian francs equivalent to £25,000, and the Government of Denmark shall pay annually to the Government of Norway an amount in Danish Kroner equivalent to Norwegian Kroner 460.000, towards the financing of the vessels operated by the Government of Norway under this agreement. These amounts shall be paid in half-yearly installments on 1st October and 1st April of each year.

2. The Government of Sweden shall pay to the Government of Norway an amount equivalent to 64 percent of the cost to Norway of operating Station M after taking account of amounts received by the Government of Norway from the Governments of Belgium and Denmark as provided in paragraph 1. The Government of Sweden shall be entitled to provide up to 50 percent of the meteorological personnel necessary for the operation of Station M.

3. The Government of Belgium shall pay annually to the Government of the Netherlands an amount in Belgian francs equivalent to the £1,000 towards the financing of the vessels operated by the Government of the Netherlands under this Agreement.

ARTICLE IV

The Governments of Ireland and Portugal shall each pay to the Organization an annual contribution in cash of £1,000.

ARTICLE X

Any Contracting Government may agree with any other Contracting Government to take over all or any of its obligations under this Agreement. Any such agreement shall be notified by the Contracting Government concerned to the Secretary General of the Organization who shall notify the other Contracting Governments.

ARTICLE XIII

The Council may at any time convene a conference of interested Governments to consider any matter connected with this Agreement if it is requested to do so by one or more Contracting Governments and is satisfied that a conference is necessary.

ARTICLE XVII

1. This Agreement shall terminate on 30 June 1953.

2. The Council shall convene a conference of all interested Governments not later than 1 October 1952, to consider the revision and renewal of this Agreement.

***

All vessels for which the United States is responsible are operated by the U. S. Coast Guard in compliance with Public Law 738 of the 80th Congress, including, in addition to meteorological communications, search and rescue duties and navigational aids to aircraft. The size of the USCG cutters varies, but the type normally used displaces 2200 tons and is staffed with a crew which averages 115 men. Meteorological work is accomplished by 4 to 6 personnel from the U. S. Weather Bureau who have their hands full performing their duties in rough seas. Twenty-one days is the normal tour "on station," but additional time is spent in going to and from the location.

Since SCR-658 equipment would be useless for measuring elevation angles to obtain wind data aboard a rolling ship, radar operating on the same principle as the SCR-584 is used by the Coast Guard to measure azimuth angle and slant range to the target suspended from the raob balloon. These readings are relayed to the U.S.W.B. meteorologists aboard the cutter, and, after correlation with the altitudes indicated by the raob data, the winds at the various levels are obtained.

All coded weather data, including surface observations every three hours, are sent by radio to Navy station NMH near Arlington, Virginia, and thence given world-wide dissemination via radio and teletype networks. Forecasters clearing aircraft across the Atlantic as well as those forecasting for land areas bordering the Atlantic find these data priceless. Through international cooperation, what was once an unknown weather area is now giving up its secrets.

NEW CAW-C CODE TO BE INTRODUCED (U)

Effective 1 January 1950 weather reconnaissance units of AWS will report reconnaissance data in a revised version of the CAW-C code which was approved at the 143rd Meeting of ACC/MET on 30 September 1949. The elimination of the old CAW-C code (AFRWX 5-D) is in line with the new procedures proposed by IMO.

The AWS revised version contains the FM412 CAW-C code plus either the FM35-TEMP (for aircraft vertical ascents) or the FM36-TEMP SHIP code (for dropsonde data).

In order to insure full field familiarization, AWS Manual 105-6 (CAW-C code) was distributed to all AWS stations early in November. AWS Letter 96-14 will be revised and the current AWS Form 96-14 replaced by AWS Form 21 which specifies the plotting models to be used for POMAR and the New CAW-C codes.

AACS AND AWS (U)

This article inaugurates a series treating the inter-relations of the Air Weather Service with other military agencies. Subsequent issues of the WSB will present similar discussions of other organizations on which the Air Weather Service depends or to which it gives support.

Air Weather Service and Airways and Air Communications Service are more alike than perhaps any of the other various specialty services within the Air Force. Their points of similarity include:

1. Each performs a clock-round, year-round, highly technical service to expedite safe flying on a global scale.

2. Each always plays for "keeps," for faulty work on their part can kill a pilot just as thoroughly today as it could during the height of the war. Most military organizations revert almost entirely to a training status in peace time, but that is not the case with AACS, AWS, and the other MATS organizations. Their job today is the same -- and just as exacting -- as it was during the war.

3. Each is a relatively small group of skilled technicians thinly-spread in small units around the Northern Hemisphere. Almost invariably they are "tenants" of other Air Force organizations; they are at every air base occupied by the Air Force and at a number of isolated spots in between.

4. Each is keenly interested in the latest scientific developments in its field and maintains close liaison with other organizations performing related functions.

5. In following the interests of a far-ranging Air Force around the world, each has a relatively high proportion of its personnel overseas. The AACS proportion is somewhat higher than that of AWS, slightly over half of its personnel being outside the continental limits.

AACS was 11 years old 15 November 1949, having originated as an organization of 3 officers, 300 airmen and 33 stations within the United States. It expanded rapidly when war came, and on V-J Day included 4,500 officers, 46,000 airmen, and more than 5,000 facilities and 819 stations spread around the world. Like many other military organizations, it almost fell apart at the end of the war. Its hard core of communications veterans stayed on, however, to give it a post-war start.

During the war, AACS was a separate command reporting directly to Air Force. Greatly reduced in strength after the war, it was placed under the Air Transport Command (now the Military Air Transport Service) along with Air Weather Service, Air Rescue Service, and Flight Service.

AACS has the mission of providing the Air Force with its "flying signals": communications and navigational and landing devices necessary in direct support of flying. Weather is of prime importance to a pilot and therefore is carried at high priority on AACS circuits.

Currently AACS is transmitting about 853 million words a year on its point-to-point circuits, and about half of them are in weather messages. Weather data to the tune of 21 million words a year are broadcast from various AACS radio facilities, while more than a million copies of weather maps are sent and received yearly on AACS-operated facsimile equipment. So it can readily be seen that weather traffic constitutes a sizable part of the AACS job. Weather and aircraft-movement messages together form the bulk of the high priority traffic on AACS point-to-point circuits.

Contrary to a growing impression, AACS is not the "Signal Corps of the Air Force." It is primarily that type of specialized, rapid communications system needed to inform and control the military pilot aloft and on the ground. It is not concerned with base telephones or administrative teletype systems. (AACS does handle some administrative traffic, but this is an expedient and is not in line with its primary job.) AACS is the communications link between the Air Force know-how on the ground and the pilot aloft, and it includes the ground network of communications necessary for the rapid relay of flight and weather information.

In performing 19 different kinds of service for the Air Force, AACS operates 1,123 facilities from 191 strategic sites around the Northern Hemisphere. It has 14,286 military personnel of whom 1,309 are officers.

The services it provides include: ground-air radio, control towers, high-frequency direction finders, very-high-frequency direction finders, direction finder evaluation, ground-controlled approach (radar

AACS is commanded by Brigadier General Wallace G. Smith, who has been continuously with aviation and communications since he entered World War I as a private first class in the Aviation Section of the Signal Corps (ref. WSB No. 6, item 29).

Major General H. M. McClelland, former Commanding General of AACS (ref. WSB No. 5, item 123), recently was appointed Director of Communications-Electronics for the Department of Defense. As such, he is chairman of the Joint Communications-Electronics Committee which includes the signal chiefs of the Army, Navy, and Air Force as members. Immediately prior to this assignment, Gen. McClelland was MATS Deputy Commander for Services: AWS, AACS, Air Rescue Service, and Flight Service. He was a weather officer as well as communications officer on the noted Alaskan flight of B-10's headed by Gen. Arnold - the flight credited with giving the Air Force its "long legs." Gen. Ivan Farman, who headed AACS during the War, is also a former weather officer.

"blind landing"), instrument landing system (beam landings), Loran (long range navigation), radio ranges, fan markers, radar beacons, homing beacons, "Z" markers, air traffic control, surveillance radar, point-to-point circuits, facsimile, message centers, code rooms.

During the past fiscal year, AACS aircraft contacts from 157 control towers were up 36 percent to 19,115,000. That amounts to a tower contact every two seconds during the year. In the same period, traffic was sent on point-to-point circuits at a rate of 1,342 groups per minute -- for every minute during the year.

AACS operators at ground-air stations handled 3,419,258 contacts with aircraft, an increase of 60 percent over the previous year. This was six a minute, or one every ten seconds during the year. GCA radar "blind-landings" totaled 244,308 for the year, an increase of 41 percent over the previous fiscal year. In other words, AACS gave a GCA letdown to an aircraft an average of every two minutes during the year.

These sizable increases, due in large part to "Operation Vittles," were handled with virtually no increase in personnel.

Perhaps the most significant development of the year was the use of surveillance radar for controlling the three crowded air corridors leading to Berlin. This radar enabled positive spacing of aircraft for almost 100 miles over Russian-held territory and could turn the aircraft on their final GCA approach at three air bases in Berlin simultaneously. Flight control for military aircraft within the U. S. is a function of Flight Service and CAA, but overseas most of the military flight control is exercised by AACS.

In order that aircraft may be utilized both efficiently and safely, the Air Force wants weather observations collected and forecasts given to the men who fly them. AWS makes the observations and issues the forecasts; AACS collects and disseminates them via its wide-flung communications system. AWS and AACS team up, then, to do a job on the pilot's worst enemy -- the weather.

AACS and AWS offer, perhaps, the best example of complete cooperation found anywhere among service units.

WEATHER ANALYSIS SYMBOLS STANDARDIZED (U)

The establishment of standard analysis symbols for entries on weather maps and charts has been recommended by the Coordinating Committee of the Weather Bureau-Air Force-Navy Analysis Center and approved by ACC/MET. The implementation date is to be 1 February 1950.

The final tabulation of symbols reflects the views of analysts of all U. S. weather services, the AWS contributing a service-wide poll of opinion. AWS Letter 96-5 is currently being revised, and a sheet depicting the standardized symbols will be attached to that publication.

On The Lighter Side

A HISTORY OF METEOROLOGY (U)

Man has always been a curious animal or, in the vernacular, nosey. So it is little wonder that, at a very early period in history, he expressed concern and curiosity over both today's and tomorrow's weather. This early interest in weather can be verified by reference to the crude drawings found on the walls of caves dating back to the year 12,000 BC. One such documentary drawing shows an early weather prophet being stoned by a group of cave men. (We have always considered this picture to be in poor taste -- even for cave men.)

After this early beginning with its unfortunate ending (if the cave picture can be considered as authentically reflecting the opinion of the time), man's interest in weather understandably lagged. It was not until the time of Julius Caesar that man's dormant interest in weather again flared forth. A sergeant in the early Roman Legion, Bodemus the Greek, is credited with making the first military weather observation, but it remained for the mighty Caesar himself to make tactical use of weather in warfare. The following conversation is taken verbatim from the Roman records:

> Bodemus: "The rain's coming down like Niagara Falls, Emperor."
> Caesar: "Let's get under that tree."

But the phenomena of weather were always such vast manifestations that man was unable even to begin to unravel nature's secrets of how and when. Thomas Cloud, an Englishman (1451-1463), was the first person to seriously undertake the science of forecasting and classifying the clouds. He is famous chiefly for his discovery that rain is associated with clouds, but unfortunately his brilliant research was cut short: he died at the age of twelve, having been struck by lightning one day at a picnic.

Through the years, step by step, the present-day techniques of modern forecasting were developed side by side with other sciences. One can scarcely mention a scientific discovery that was not made use of by, and incorporated into, modern prognostication. The telegraph and radio made it possible for weathermen to send and receive their observations. The invention of the electric light made it easier to plot and draw the 0630Z map. Central heating now keeps the weather station warm in winter. The automobile helps the weatherman to get around -- or make a quick getaway. The bullet-proof vest affords him a margin of safety during unusual synoptic situations, and even the strait jacket provides a certain amount of leisure during off-duty hours. What with the many post-war inventions, the weatherman's life is certainly one of scientific ease and pleasure. (From "Weather Lore," 6th Weather Sq. publication.)

AIR WEATHER SERVICE STATISTICS

RAWINSONDE PERFORMANCE, JULY-AUGUST 1949 (U)

Statistics on AWS rawinsonde performance during July and August 1949 are provided in the accompanying table and graphs. For purposes of comparison the table also gives performance figures for August 1948.

The practice of rating performances on a world-wide basis (as done in the past) has been abandoned in this issue in favor of a system of ranking by geographical regions. The method of determining relative ranking as described in WSB No. 5, item 137, has been retained, however. The factors governing a station's rating are still the heights attained and the percentage of scheduled runs completed. Regional ranking tends to neutralize many of the inequities inherent in this method by minimizing the effects of such variable factors as climate, maintenance, supply, and the use of different types of equipment. All stations within each of the regional groupings used in this issue of the WSB operate under approximately the same conditions with respect to these factors. Relative performance comparison is therefore more equitable when confined to these groupings than when established on a world-wide basis.

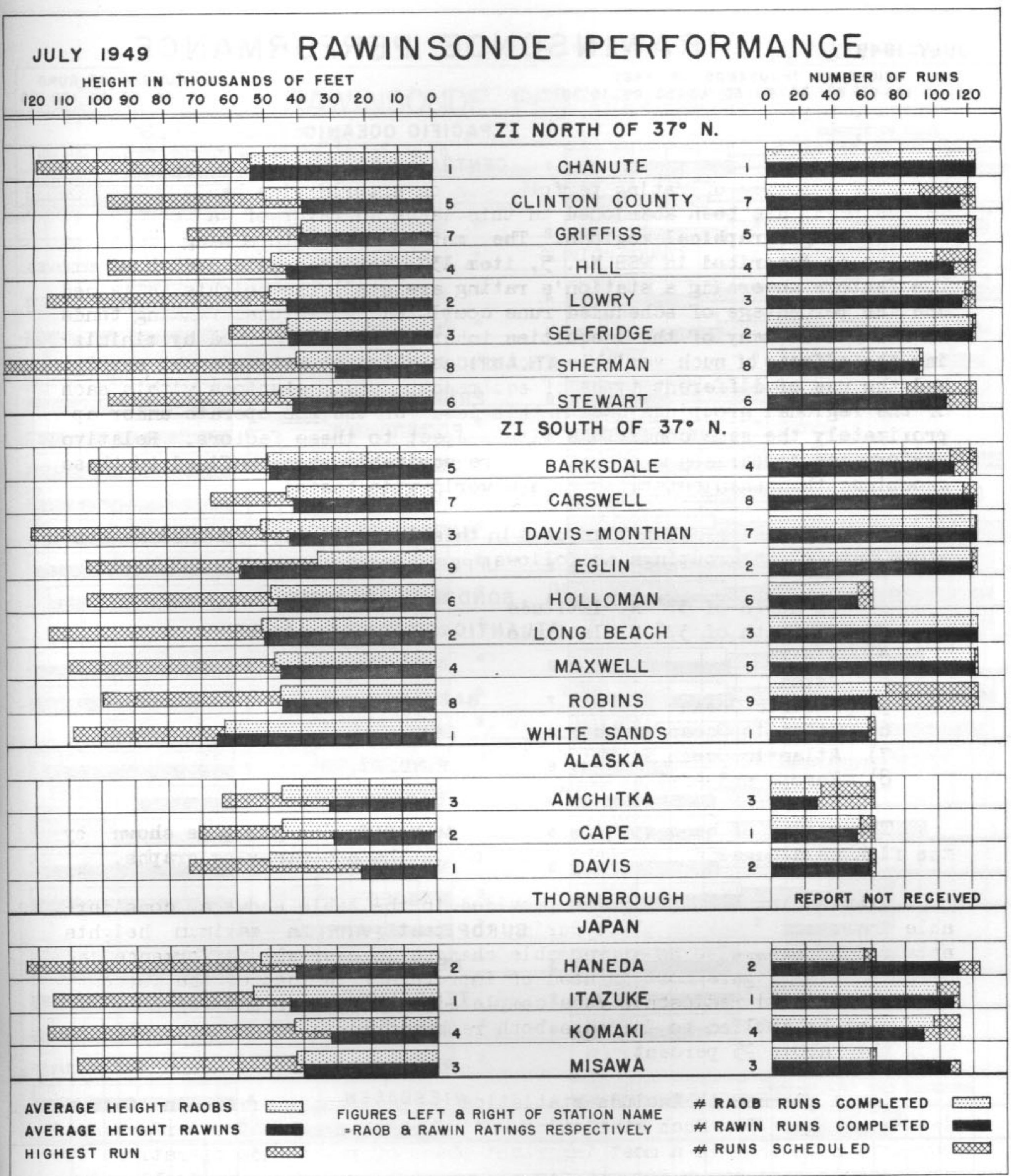
The regional ranking plan used in this issue divides rawinsonde stations into eight groupings as follows:

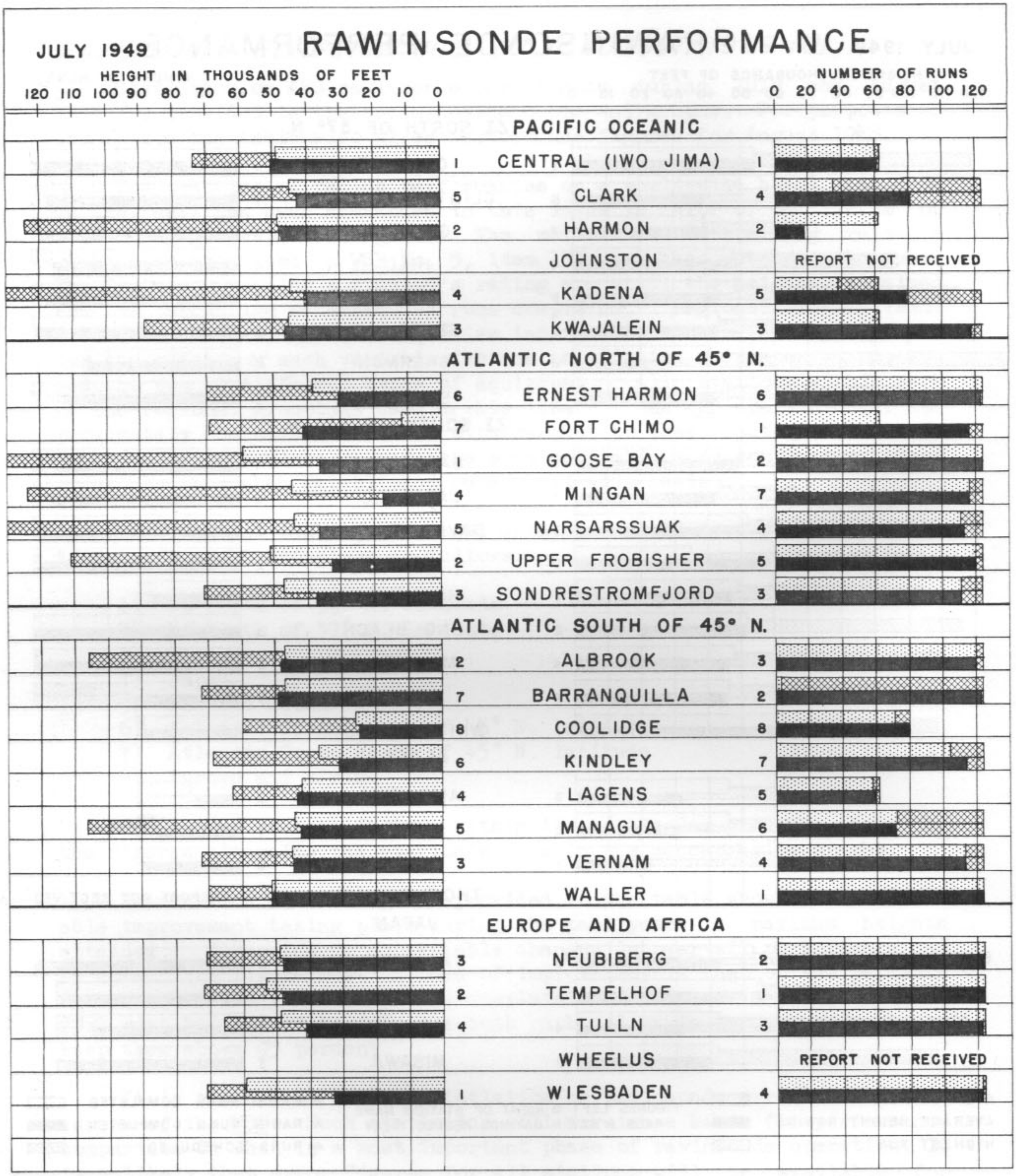
1) ZI north of 37° N. latitude
2) ZI south of 37° N. latitude
3) Alaska
4) Japan
5) Pacific Ocean
6) Atlantic Ocean north of 45° N. latitude
7) Atlantic Ocean south of 45° N. latitude
8) Europe and Africa

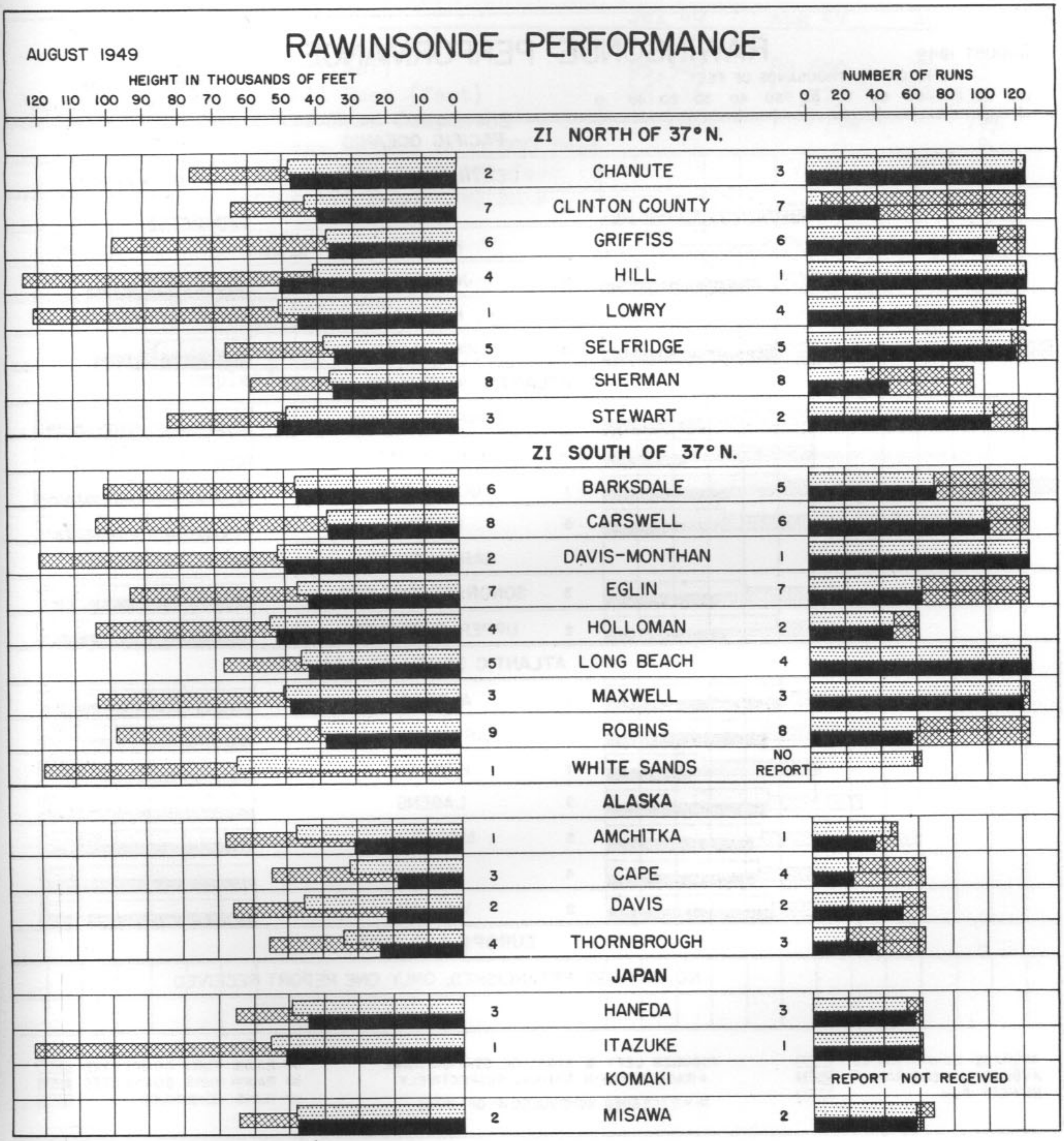
The rating of each station within its particular group is shown by the figures alongside the station's name in the accompanying graphs.

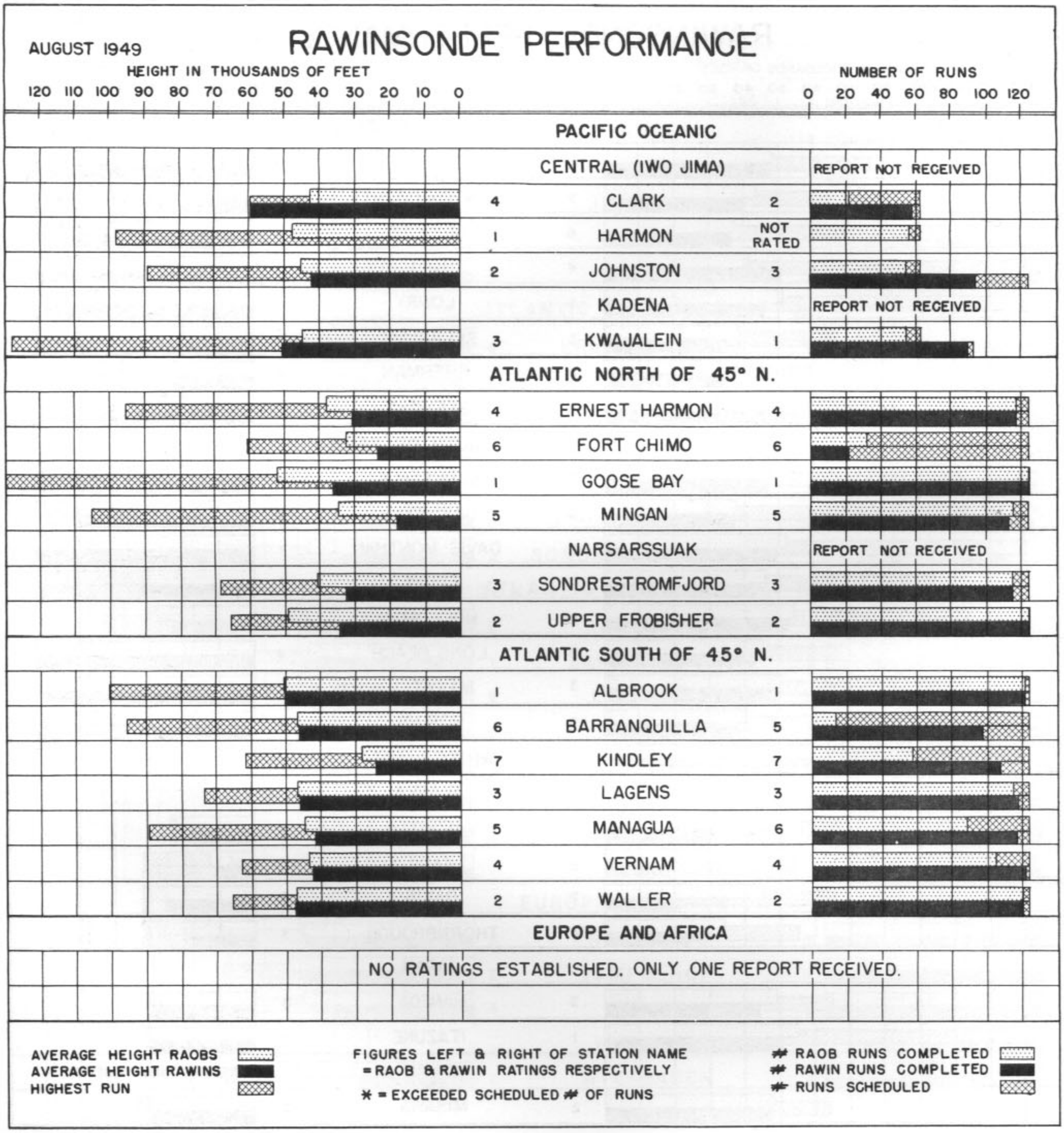
Examination of the figures provided in the table shows a considerable improvement taking place during the past year in maximum heights attained. Otherwise no appreciable changes in over-all performance can be noted. The figure most in need of improvement is that of the percentage of scheduled radiosonde runs completed. Continuous and vigorous effort must be applied to increase both raob and rawin percentages and to keep them above 95 percent.

It is planned to include statistics on radiosonde errors in future issues of the WSB. Such statistics will furnish a basis for performance comparison in what is a most important phase of rawinsonde operation. It is unlikely that error figures for all stations will be available for publication in any one WSB in the near future, but, in the course of several issues, figures for all stations will be published.


JULY 1949
RAWINSONDE PERFORMANCE
HEIGHT IN THOUSANDS OF FEET
120 110 100 90 80 70 60 50 40 30 20 10 0
NUMBER OF RUNS
0 20 40 60 80 100 120
ZI NORTH OF 37° N.
1 CHANUTE 1
5 CLINTON COUNTY 7
7 GRIFFISS 5
4 HILL 4
2 LOWRY 3
3 SELFRIDGE 2
8 SHERMAN 8
6 STEWART 6
ZI SOUTH OF 37° N.
5 BARKSDALE 4
7 CARSWELL 8
3 DAVIS-MONTHAN 7
9 EGLIN 2
6 HOLLOMAN 6
2 LONG BEACH 3
4 MAXWELL 5
8 ROBINS 9
1 WHITE SANDS 1
ALASKA
3 AMCHITKA 3
2 CAPE 1
1 DAVIS 2
THORNBROUGH REPORT NOT RECEIVED
JAPAN
2 HANEDA 2
1 ITAZUKE 1
4 KOMAKI 4
3 MISAWA 3
AVERAGE HEIGHT RAOBS
AVERAGE HEIGHT RAWINS
HIGHEST RUN
FIGURES LEFT & RIGHT OF STATION NAME =RAOB & RAWIN RATINGS RESPECTIVELY
RAOB RUNS COMPLETED
RAWIN RUNS COMPLETED
RUNS SCHEDULED


JULY 1949
RAWINSONDE PERFORMANCE
HEIGHT IN THOUSANDS OF FEET
120 110 100 90 80 70 60 50 40 30 20 10 0
NUMBER OF RUNS
0 20 40 60 80 100 120
PACIFIC OCEANIC
1 CENTRAL (IWO JIMA) 1
5 CLARK 4
2 HARMON 2
JOHNSTON REPORT NOT RECEIVED
4 KADENA 5
3 KWAJALEIN 3
ATLANTIC NORTH OF 45° N.
6 ERNEST HARMON 6
7 FORT CHIMO 1
1 GOOSE BAY 2
4 MINGAN 7
5 NARSARSSUAK 4
2 UPPER FROBISHER 5
3 SONDRESTROMFJORD 3
ATLANTIC SOUTH OF 45° N.
2 ALBROOK 3
7 BARRANQUILLA 2
8 COOLIDGE 8
6 KINDLEY 7
4 LAGENS 5
5 MANAGUA 6
3 VERNAM 4
1 WALLER 1
EUROPE AND AFRICA
3 NEUBIBERG 2
2 TEMPELHOF 1
4 TULLN 3
WHEELUS REPORT NOT RECEIVED
1 WIESBADEN 4


AUGUST 1949
RAWINSONDE PERFORMANCE
HEIGHT IN THOUSANDS OF FEET
120 110 100 90 80 70 60 50 40 30 20 10 0
NUMBER OF RUNS
0 20 40 60 80 100 120
ZI NORTH OF 37° N.
2 CHANUTE 3
7 CLINTON COUNTY 7
6 GRIFFISS 6
4 HILL 1
1 LOWRY 4
5 SELFRIDGE 5
8 SHERMAN 8
3 STEWART 2
ZI SOUTH OF 37° N.
6 BARKSDALE 5
8 CARSWELL 6
2 DAVIS-MONTHAN 1
7 EGLIN 7
4 HOLLOMAN 2
5 LONG BEACH 4
3 MAXWELL 3
9 ROBINS 8
1 WHITE SANDS NO REPORT
ALASKA
1 AMCHITKA 1
3 CAPE 4
2 DAVIS 2
4 THORNBROUGH 3
JAPAN
3 HANEDA 3
1 ITAZUKE 1
KOMAKI REPORT NOT RECEIVED
2 MISAWA 2


AUGUST 1949
RAWINSONDE PERFORMANCE
HEIGHT IN THOUSANDS OF FEET
120 110 100 90 80 70 60 50 40 30 20 10 0
NUMBER OF RUNS
0 20 40 60 80 100 120
PACIFIC OCEANIC
CENTRAL (IWO JIMA)
REPORT NOT RECEIVED
4 CLARK 2
1 HARMON NOT RATED
2 JOHNSTON 3
KADENA
REPORT NOT RECEIVED
3 KWAJALEIN 1
ATLANTIC NORTH OF 45° N.
4 ERNEST HARMON 4
6 FORT CHIMO 6
1 GOOSE BAY 1
5 MINGAN 5
NARSARSSUAK
REPORT NOT RECEIVED
3 SONDRESTROMFJORD 3
2 UPPER FROBISHER 2
ATLANTIC SOUTH OF 45° N.
1 ALBROOK 1
6 BARRANQUILLA 5
7 KINDLEY 7
3 LAGENS 3
5 MANAGUA 6
4 VERNAM 4
2 WALLER 2
EUROPE AND AFRICA
NO RATINGS ESTABLISHED. ONLY ONE REPORT RECEIVED.
AVERAGE HEIGHT RAOBS
AVERAGE HEIGHT RAWINS
HIGHEST RUN
FIGURES LEFT & RIGHT OF STATION NAME
= RAOB & RAWIN RATINGS RESPECTIVELY
* = EXCEEDED SCHEDULED # OF RUNS
# RAOB RUNS COMPLETED
# RAWIN RUNS COMPLETED
# RUNS SCHEDULED

AIR WEATHER SERVICE OVER-ALL RAWINSONDE FIGURES
July and August 1949*

Radiosonde	Jul 49	Aug 49	Aug 48
Average Highest Run (feet)	95,348	89,650	70,013
Average Height of All Runs (feet)	46,416	44,775	44,015
Percent of Scheduled Runs Completed	80%	79%	79%
Stations with Average Height >50,000 feet	12	8	8
Stations with Highest Run >70,000 feet	38	25	22
Stations Completing All Scheduled Runs	8	7	8
Rawin			
Average Height of All Runs (feet)	41,614	41,464	40,383
Percent of Scheduled Runs Completed	91%	82%	91%
Stations with Average Height >50,000 feet	6	7	4
Stations Completing All Scheduled Runs	7	7	13

*July, 48 stations reporting; August, 42 stations.