DEPARTMENT OF COMMERCE National Oceanic and Atmospheric Administration

FEDERAL COORDINATOR FOR METEOROLOGICAL SERVICES AND SUPPORTING RESEARCH

NATIONAL PLAN FOR ROCKETSONDE SUPPORT FOR SPECIAL EVENTS

FCM 74-4

WASHINGTON, D.C.
February 1974

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
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National Plan for Rocketsonde Support for Special Events

I. Introduction

The purpose of this Plan is to outline the procedure for coordinating and obtaining rocketsonde support from the Cooperative Meteorological Rocket Network (CMRN) stations during a special event. A special event may be described as any environmentally related occurrence that is of interest to the scientific community or the investigation of an occurrence which would be beneficial to the U.S. Government. Rocketsonde observations, with their conjunctive rawinsonde observations, will provide some or all of the needed environmental data for the analysis of the event. Stratospheric warming is an example of a special event.

II. Background

At the March 1969 meeting of the Interdepartmental Committee for Applied Meteorological Research (ICAMR) Scientific Advisory Group (SAG) on Upper Air Observations (above 30 kilometers), it was agreed that the initial task for the newly formed Operational Working Group (OWG) of the SAG would be to prepare a Plan establishing the procedures to be followed by the CMRN stations during special events. Such a Plan would coordinate the efforts of participating agencies to optimize the observation program and provide maximum support. A Plan was prepared and issued in January 1971. This document revises the one issued in 1971.

III. Implementation Procedure

A. When any department or agency of the U.S. Government or a Federally recognized scientific group determines that CMRN support is needed for the proper investigation of a special event, a detailed request will be submitted to the Chairman, OWG, with as much lead time as practicable. For recurring special events such as the stratospheric warming, the requestor is encouraged to provide a standard annex to this Plan which itemizes in detail the desired support for such a future event. The following information should be included in each request and will constitute the initial support plan for the special event.

1. Type of Special Event: a stratospheric warming, solar eclipse, solar flare activity, International Geophysical Year (IGY)/ International Years of the Quiet Sun (IQSY) experiment, or other specified research problem.

2. Recommended Launch Sites: the recommended geographical area coverage may be requested in place of the actual launch sites.

3. Recommended Launch Schedule: a request should include the desired sounding frequency as well as the minimum frequency of data collection that is considered essential to the success of the experiment.

4. Required Rocketsonde Observational Data: the inclusion of such items as wind, temperature, and density.

5. Vertical Strata Needed: the range of minimum and maximum altitudes from which data are required.

6. Recommended Minimum Acceptable Data Objective From Each Launch: a statement necessary to determine the requirement for backup soundings.

B. Procedure for Coordination, Approval, and Implementation. The Chairman, OWG, will forward all requests with his recommendation to the Chairman, SAG, who will poll the designated points-of-contact in each Federal Agency involved in providing support for indications of support for each request. The Chairman, SAG, will then inform the designated points-of-contact in each Federal Agency and the Chairman of OWG about the results of his poll and the level of support that can be provided to that request. The Chairman, OWG, will notify the requestor concerning what support can be provided.

IV. Resources

Each agency will be responsible for providing the necessary resources at each of its launch sites to support the special events as indicated in the annex of each agency. It is recommended that each site maintain sufficient resources to launch as many as two rockets per day for a 2 week period (35 complete systems are recommended, allowing for a success rate of 80 percent).

V. Communications and Data Distribution

Normal weather communications circuits, codes, and procedures will be used for transmission of all data unless otherwise specified. Distribution of data records will also follow the established mode of operation for each site unless other specific instructions are issued. It will be the responsibility of each OWG member to advise the Chairman, OWG, of the normal communications procedures or facilities and any alternative means for the expeditious distribution of data, if needed, for each of his launch sites.

VI. Reports

Each OWG member that had launch sites participating in a special event should submit a report to the Chairman, OWG, within 1 week after the last support firing. This report will be in a standard letter format and should include as a minimum the following information for each launch site:

A. Total number, type of systems, and date and time of launches.

B. Type and quality of data gathered to include the vertical limits for the gathered meteorological data.

C. Estimate of when the standard level of resources will be reinstated, if practicable.

D. Any difficulties that prohibited complete support.

E. Individual launch report sheets for each launch conducted (standard individual range reports).

F. Number of teletypewriter data transmissions made and designation of circuits.

G. Any additional remarks which will describe (or summarize) the support provided.

The Chairman, OWG, will submit a consolidated report to the Chairman, SAG, within 2 weeks after the last support launch.

VII. Annexes

A. A-Series. These annexes to this Plan (A-1, A-2, etc.) will be used to outline the method and extent of specific agency participation (for example, Department of Defense, Department of Commerce, and the National Aeronautics and Space Administration), setting forth commitments, exclusions, lines of authority, and designated points-of-contact, all of which are valid only for the execution of, or parts to, this Plan.

B. B-Series. These annexes to this Plan will be used to describe support to those unique special events which recur or can be anticipated with sufficient surety to permit advanced planning.

A-SERIES ANNEXES

ANNEX A-1

Department of Defense

The Department of Defense intends to support the provisions of this Plan within the limitations of its resources, managerial restraints, and operational considerations. Designated points-of-contact for committing support are as indicated below:

Station	Contact	Address & Tele. No.
Cape Canaveral, Fla.	AFERSS Manager	Hq 6th Wea. Wg (MAC) Andrews AFB, Md 20331 301-981-4772, commercial
Antigua Island	" "	"
Ascension Island	" "	"
Thule, Greenland	" "	"
Shemya, Alaska	" "	"
Eglin AFB, Fla.	" "	"
Cold Lake, Canada	" "	"
Fort Churchill, Canada	" "	"
White Sands Missile Range N. Mex.	SAG Army Advisor	U.S. Army Materiel Command AMCRD-TV Washington, D. C. 20315 202-697-2468, commercial
Fort Greely, Alaska	" " "	"
McKenzie Battery, C.Z.	" " "	"
Kwajalein Missile Range	" " "	"
Point Mugu Pacific Missile Range (PMR), Calif.	SAG Navy Advisor	Hq Naval Wx Svc Cmd Bldg 200 Washington Navy Yard Washington, D. C. 20390 202-693-2720
Barking Sands PMR, Hawaii	" " "	"

ANNEX A-2

Department of Commerce

The Department of Commerce intends to support the National Plan for Rocketsonde Support for Special Events within its available resources, subject to managerial restraints. Each request for support will be considered on an individual basis. Principal point of contact will be:

DOC Member SAG
Office of Federal Coordinator for Meteorology
6010 Executive Blvd
Rockville, Md 20852

Telephone: AC 301-496-8951

ANNEX A-3

National Aeronautics and Space Administration

The National Aeronautics and Space Administration (NASA) intends to support the provisions of this Plan within the limitations of its resources, managerial restraints, and operational considerations.

The NASA currently schedules approximately three meteorological rocket launches weekly from Wallops Island, Va. Additional launches are made as necessary to meet special support requirements and to obtain meteorological data during special events such as stratospheric warmings, solar eclipses, and satellite comparisons.

Limitations

The NASA may not be able to support requests for additional launches when:

1. Rockets to be used are programmed for other purposes.
2. The range would be used on an overtime basis.
3. Launches would interfere with higher priority missions.
4. Weather conditions are not suitable.
5. The range is not operating.

NASA Agency Contact for Approval

Requests for support of all special events other than stratospheric warmings should be directed to:

NASA Member SAG
ERM, Room 254
NASA Headquarters
600 Independence Ave., S.W.
Washington, D.C. 20546

Telephone: AC 202-755-8584

B-SERIES ANNEXES

ANNEX B-1

STRATWARM--Stratospheric Rocketsonde Analysis of Wintertime Warmings
Department of Commerce

I. Introduction

The concept of a midwinter stratospheric warming pertains to the relatively infrequent, dramatic warmings and circulation breakdowns that extend throughout the deep atmospheric layer from the tropopause to at least 55 kilometers above the earth's surface. However, several studies of Northern Hemisphere meteorological rocket data have shown that relatively frequent and significant warmings occur above 30 kilometers throughout the entire winter, but in some instances these events are reflected only to a minor degree at 30 kilometers and below.

Unfortunately, the distinction between these major and minor events and, indeed, the entire sequence of circulation changes during any warming period are not clear at this time. This is due, in part, to the relatively sparse geographical coverage provided by the existing meteorological rocketsonde sites, but also to the fact that both wind and temperature data are generally not available several times per week from all sites on the same days. Analysts are then forced to use data extending over several days in their construction of synoptic analyses, thereby losing much of the desirable detail.

The rocketsonde information must be available to permit the construction of synoptic analyses with the necessary resolution in time. Toward this goal, a launch schedule is proposed below that will not only increase the data resolution during a major warming event but also during the entire winter period that might normally include at least one minor warming.

It is anticipated that the resultant analyses will not only reveal the sequence of events during a warming episode, but will also allow computations of the energy and momentum budgets to be made so that further insight into the dynamics of the warming can be realized.

II. Proposed Schedule

Based upon current analysis experience using rocketsonde information, it is recommended that the following launch schedule be adopted at all Cooperative Meteorological Rocket Network (CMRN) sites in operation during winter. From November through the spring transition (April), the stations should launch temperature-wind payloads on every Monday, Wednesday, and Friday, using only the completely successful criterion for the employment of a backup rocket. This schedule will ensure complete data coverage three times a week and should enable the construction of synoptic analyses for these same days. At the same time, those sites that plan to launch on a more frequent schedule during this period should do so, as these data will be extremely useful in analyses. These additional launches, however, need not follow the above criteria in terms of type of payload or backup requirement.

In the event of a major midwinter stratospheric warming, it is recommended that these same stations should increase their launch schedule to one per day, including weekends, following the above criteria for the type of payload and successful launch. This schedule, followed for the course of the event (usually lasting approximately 2 weeks), should delineate the variability inherent in this phenomenon and allow the drawing of daily analyses. After the warming has diminished in amplitude and the appropriate notification has been transmitted by the Scientific Advisory Group (SAG), the stations should revert to the schedule of three launches per week as outlined above. While the actual time of launch is normally controlled by local factors, it is recommended that for compatibility every attempt should be made to launch near local noon. In addition, the customary conjunctive rawinsonde observation should be made within the time limits that are presently accepted.

In the event that no warming of sufficient magnitude occurs during the winter to warrant the STRATWARM alert, it is recommended that the launch schedule for the midwinter warming be adopted during the final warming that is an integral part of the spring transition. In addition, because no definitive comparison costs between various instrument types have been made yielding conclusive results, it is recommended that comparable instruments be used at all sites, especially during the warming event.

III. Data Processing

Because these data are ultimately to be published in the monthly World Data Center A (WDC-A) publication in a format that is completely compatible with scientific investigators' requirements, it is recommended that all data be routed through the standard data processing channels for reduction and qualification before being made available to users. The final data in the standard WDC-A format for each month should then be made available to users on magnetic tape as soon as possible. Data available within 60 days after the last day of a given month are to be published in that month's issue of Data Report--High Altitude Meteorological Data by the WDC-A. Data received more than 60 days after the end of that month are to be published as "late data" in a subsequent month's issue.

At the same time, it must be recognized that an integral part of this experiment is the accurate depiction of the beginning and ending of a warming situation as well as its magnitude. To do this task effectively, investigators require all available high-altitude data as quickly as they can be disseminated. Accordingly, every effort should be made to ensure that complete temperature and wind data are sent from all sites by Rocketsonde Observation (ROCOB) teletypewriter messages as expeditiously as possible.

In support of this plan, the Department of Commerce will do the following:

1. The Upper Air Branch of the National Meteorological Center (NMC), National Weather Service, will be responsible for notifying the Chairman, OWG, to implement the STRATWARM proposal.

2. When conditions warrant, the Upper Air Branch of the NMC will issue STRATWARM alert warnings once per day.

3. The Upper Air Branch of the NMC will analyze and publish the results of analyses as soon as possible.

Queries about the analyses to be done at the NMC should be directed to:

Chief, Upper Air Branch
Development Division
National Meteorological Center
Telephone Commercial: 301-899-1081

ANNEX B-2

Upper Air Data Comparison, Satellite/Rocketsonde/Rawinsonde

I. Introduction

There is a national need for global atmospheric data from the surface up to about 100KM altitude. The meteorological community has long recognized that remote satellite sensors are the most economical and feasible vehicles which have the potential of determining the character of our earth's atmosphere in this altitude region on a global basis. Daily, global vertical temperature profiles are now being obtained from radiance measurements retrieved from NOAA, NASA, and DOD operational research satellite sensors, with varying degrees of success at different altitudes, from the surface up to about 60KM altitude. Recent requests from satellite projects and upper atmospheric research personnel indicate there are operational, engineering, and research requirements for near-real time radiosonde-rocketsonde-satellite comparison data, for basic satellite sensor calibrations to solve practical or engineering problems and for meteorological research uses.

During the period May - September, 1970, data were collected at Wallops Island, Va., from high altitude sounders, such as rocketsondes, pilot probes, rocket grenades, and satellite instruments, for the purpose of cross-comparing the resulting temperature profiles. The results of this intercomparison were discussed in March, 1971, at a workshop meeting comprised of the principal investigators. The conclusions reached indicated that considerable incompatibility among the various sounders existed; however, recommendations were made that suggested the meteorologist should develop new concepts in treating the data rather than continuing to use the classic methods used for years. For example, satellite information can provide gross features of the temperature profile but in situ measurements are needed to describe the detail and small scale structure, and, instead of considering profiles based on point measurements, a volumetric profile (measurements obtained through a layer with uncertainties) should be considered. Some of the recommendations were: a) use satellite radiance data with conventional maps by, possibly, using isolines of radiance values rather than of temperatures; b) continue development of methods to use both in situ and satellite remote sounding-type data for analysis and research, but future sounding techniques should be considered; and c) the Wallops comparison should be extended and/or the present data studied further--extension could mean more observations at the same location or sampling at other locations and over all seasons.

The primary source of upper air data up to approximately 30KM continues to be the hundreds of daily, world-wide cooperative radiosonde observations. Although much fewer in number, rocketsonde observations from 20 to 60KM, and occasionally to 90KM, are being taken by CMRN stations. Thus, it is natural to consider the extent to which satellite remote soundings may supplant or perhaps replace radiosonde and rocketsonde observation programs. However, this question cannot be addressed until such time as the satellite sensing

and data reduction techniques are fully refined. It is obvious, therefore, that derived meteorological data from current and future satellite sensors must be validated by comparison in near-real time with radiosonde and rocketsonde observational data and in sufficient quantity to make a proper statistical analysis possible. CMRN rocketsonde and corawinsonde observations scheduled to coincide with the satellite overpass time are the only feasible and economical way to obtain these required "ground-truth" data.

II. Concept of Operation

This annex provides the means to coordinate the scheduling of rocketsonde/rawinsonde observations so as to be compatible with overpass observations taken by meteorological satellites. Data from these observations will be provided to appropriate satellite investigators. Satellite overpass times for CMRN stations will be provided to the Chairman OWG by each specific satellite project investigator requiring support with at least 15 days advance notice if possible. Each satellite investigator will also provide specific requirements as outlined in IIIA., 1 through 6 of the basic plan. The Chairman OWG will coordinate CMRN support in accordance with IIIB. of the basic plan. Each agency will provide support required by this annex to the extent that local constraints permit.

The routine launch schedules of all CMRN stations will be adjusted on normal launch days to coincide with overpass time of the specific satellite. Night launches will be scheduled at as many CMRN stations as possible when required. CMRN launches to support this annex (other than the special night launches) will normally be accomplished between 0800 and 1600 hours local at each station. With the present CMRN schedule of local noon ± three hours this program will require very little change in normal operating hours. Each rocketsonde launch must be conducted at the satellite overpass time ± 30 minutes.

III. CMRN Data Processing and Dissemination

Rawinsonde/rocketsonde data processing will be accomplished using current CMRN procedures. Data dissemination to satellite investigators will be provided in standard WMO rawinsonde/rocob code using established weather teletype systems for near-real time use. In addition, data in WDC-A format will be forwarded to specific satellite investigators via mail within seven days subsequent to each observation. Each station will complete WDC-A formatted data to the extent of local capabilities. Each station is also requested to provide Relative Humidity values for each rawinsonde data level presented in their WDC-A formatted data. Specific addresses for WDC-A formatted data and any other special data (i.e. cloud data, etc.) will be provided at time of execution of this annex.