GLOBAL ATMOSPHERIC RESEARCH PROGRAM
GATE
ATLANTIC TROPICAL EXPERIMENT

GATE INFORMATION BULLETIN

Editor: Stan Ruttenberg
NCAR. P.O.Box 3000
Boulder, COL 80303
Tel: 303 494 5151 Ext 238
FTS: 303 494 5238

Number 3 10 January 1975

GATE DATA AVAILABILITY

Summary of Aircraft Missions in the GATE has been submitted to the World Data Centers:

World Data Center A
NOAA/EDS
National Climatic Center
Federal Building
Asheville, N.C. 28801 U.S.A.

World Data Center B/GATE Archive
Chief Administration of Hydrometeorological
Service of the U.S.S.R.
Pavlik Morozov Street
12, Moscow, D-376 U.S.S.R.

This volume, consisting of about 200 pages, contains introductory material and a concise summary of each aircraft mission, as executed, in the field phase of GATE, i.e., mission type, names of primary scientists involved, description of flight patterns and altitudes flown, weather encountered, and a field evaluation of the mission.

Contents No.3:

Detailed catalog of GATE aircraft missions available; additional information on GATE data available at WDC-A
Revised summary of GATE B-scale 5-cm radar coverage
USA policy statement on GATE data processing and availability
One Day in the Life of Phase I - 10 July 1974

The National Center for Atmospheric Research (NCAR) is operated by the private, nonprofit University Corporation for Atmospheric Research (UCAR) under sponsorship of the National Science Foundation

The 16-mm microfilm reels described in the GATE INFORMATION BULLETIN No.2 may now be ordered from WDC-A, at the address shown on the previous page, at a cost of $11/reel postage included. They are referred to as "Preliminary Data Set on 16-mm Microfilm," and are enumerated 16-1 through 16-7

"Special Analysis Products on 35-mm Microfilm" are now also available from WDC-A, also at a cost of $11/reel postage included:

- Reel 35-1 A-series Synoptic Charts, 25 June - 11 July
- Reel 35-2 " 12 July - 28 July
- Reel 35-3. " 29 July - 17 August
- Reel 35-4 " 18 August - 6 September
- Reel 35-5 A-series Synoptic Charts, 7 September - 19 September; selected time-height sections of wind, temperature and humidity; data on 700-mb waves.
- Reel 35-6 B-series Synoptic Charts; catalog and tracks of cloud clusters.

A detailed catalog is being prepared that will be published and distributed soon by WDC-A. It will contain descriptions of the various GATE data holdings available and explicit ordering information; this catalog will be updated as new data holdings become available. It is expected that information on the availability of this catalog will be contained in an imminent issue of this BULLETIN.

REVISED SUMMARY

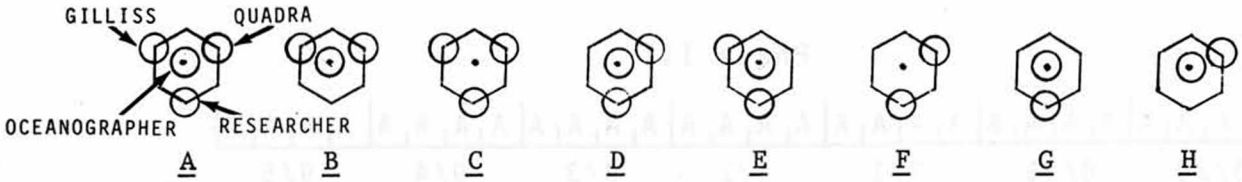
GATE B-SCALE 5-cm RADAR COVERAGE

The summary of 5-cm radar coverage for Phases I and II, as presented in GATE INFORMATION BULLETIN No.1, categorized a radar as being inoperative for a given six-hour period if there was any known gap in the recorded data during this time interval. It was subsequently pointed out by some readers familiar with these observations that this criterion was more stringent than most studies would require. The suggestion was made, and adopted in the Phase III summary in GIB No.2, that a radar be classified as "up" if data were recorded for at least four hours of a six-hour period.

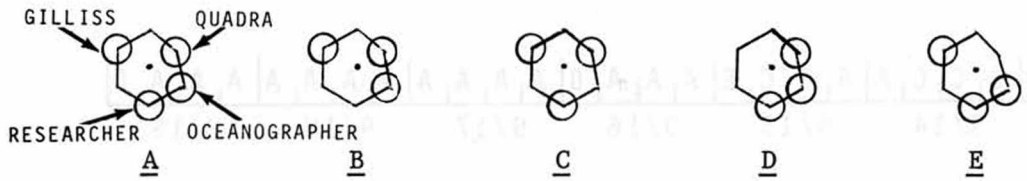
It seems useful at this time to present one complete summary of GATE B-scale 5-cm radar coverage for all three Phases, using the standard that four hours of data for a six-hour period are sufficient to classify a system as "up." To maintain the homogeneity of this summary, a specific coverage classification is now the same throughout the three Phases, with the following code convention for various combinations of operational radars:

A - OCEANOGRAPHER, QUADRA, RESEARCHER, GILLISS
B - OCEANOGRAPHER, QUADRA, GILLISS
C - QUADRA, RESEARCHER, GILLISS
D - OCEANOGRAPHER, QUADRA, RESEARCHER
E - OCEANOGRAPHER, RESEARCHER, GILLISS
F - QUADRA, RESEARCHER
G - OCEANOGRAPHER, RESEARCHER
H - OCEANOGRAPHER, QUADRA

For Phases I and II the following ship distribution was in effect with the resultant "code letter" coverages as shown below:



During Phase III, the OCEANOGRAPHER moved from the center of the array to the southeastern corner, and the QUADRA moved in toward the center. The resultant "code letter" coverages for this phase are shown below (NOTE: coverages F, G and H did not occur):



Phase I

D D D D	D D F D	D D D D	D D D D	D D D D	D D D D	G D G D
6/28	6/29	6/30	7/1	7/2	7/3	7/4

D D D D	D G A A	A A A A	A A A A	A E E E	A A A A	A A A A
7/5	7/6	7/7	7/8	7/9	7/10	7/11

A A A A	A A A A	A A A A	A A A A	A A A C
7/12	7/13	7/14	7/15	7/16

Phase II

D D D D	D D D D	D D D D	F F F F	F F F F	F F F D	G D D D
7/28	7/29	7/30	7/31	8/1	8/2	8/3

D D D D	D D D D	D D H D	A A A B	B B B B	B B B B	B B A A
8/4	8/5	8/6	8/7	8/8	8/9	8/10

A A A A	A A A A	A A A A	A A A A	A A A A
8/11	8/12	8/13	8/14	8/15

Phase III

A A A A	A A A A	A A A A	A A A A	A A A A	A A A A	A A A A
8/30	8/31	9/1	9/2	9/3	9/4	9/5

A B A A	A A A A	A A A A	A A A A	A A A A	A A A A	A A A A
9/6	9/7	9/8	9/9	9/10	9/11	9/12

A A A A	B C C A	A C C E	A A A B	A A A A	A A A A	A A A D
9/13	9/14	9/15	9/16	9/17	9/18	9/19

GATE B-Scale 5-cm Radar Coverage
NOTE: The days are divided into quarters - 00Z-06Z, etc.

STATEMENT REGARDING GATE DATA PROCESSING RESPONSIBILITIES, DATA ACCESS, PUBLICATION OF GATE RESULTS, AND THE SYNTHESIS OF GATE STUDIES AND RESULTS*

INTRODUCTION

During the field phase of GATE, meteorological and oceanographic data were taken from a large international array of highly instrumented observational platforms. These data then will be processed and archived by an international network of processing and data centers. Subsequent scientific analysis should lead to the publication of GATE results from a large collection of sources. For this entire sequence to proceed efficiently and equitably, a high degree of coordination will be required. In addition, the broad goals of GATE will be reached only through the synthesis of a broad spectrum of individual studies. Innovative mechanisms are needed to accomplish this synthesis.

With respect to acquisition, processing and archiving of data, the groundwork for this coordination has been established in the form of the GATE International Operations Plans (GATE Reports 9-12) and the GATE International Data Management Plan (GATE Report 13), respectively. It is apparent, however, that further planning is necessary to clarify the responsibilities of an individual principal investigator, funded to collect GATE or related data, with regard to furnishing these data. Also, guidelines to the recommended access route to GATE data for members of the scientific community require definition. Finally, a general statement of policy with regard to the publication of results must be adopted.

This paper attempts to tackle the aforementioned problem areas. The concepts presented are intended to supplement the GATE International Data Management Plan. Appendix A, to this statement consists of selected sections of the international plan, and should be referred to for definitions of the functions and responsibilities of the national and international data archiving/processing centers. Appendix B shows the locations of the respective Subprogram Data Centers (SDCs) and the various U. S. National Processing Centers (NPCs) and diagrammatically shows paths data will take in moving from the platform through these elements to the user.

---

* This statement describes the general USA policy on these subjects: it was developed jointly by the U.S. GATE Project Office, NOAA and the NSF GARP Program Director, and is also supported by the U.S. Committee for GARP, National Academy of Sciences. Specific mechanisms for implementing this policy for individual investigators are being developed as part of the USA GATE data management activity. Further details regarding data access and processing responsibilities may be obtained from Dr. J. Rasmussen, U. S. GPO, NOAA, Rockville, MD 20852; telephone: 301-496-8841.

1. Responsibilities of Principal Investigators* to Provide Observational Data

1.1 DISCUSSION: Some GATE data will be acquired by Principal Investigators or research groups. These Principal Investigators have, in general, been funded to acquire these data, and have been supported logistically by the GATE Project, because of the anticipated contribution to the overall GATE data set. Consequently, it is important that these data are not treated as personal property and "salted away."

1.2 GUIDELINES:

- The data collected during the GATE will be made available to the scientific community at large. Principal Investigators will have no long term proprietary rights to data collected during GATE. A number of mechanisms and procedures have been developed to facilitate the timely transfer of data of general interest from individual investigators to the broad community of users, while minimizing unnecessary impacts on the data producers. It is the responsibility of each investigator to cooperate in the implementation of these procedures.

- The U. S. GATE Project Office, GATE Data Manager, is responsible for developing inventory forms and guidelines. In addition, the U. S. GATE Data Manager will distribute completed inventories to the appropriate SDCs and to the World Data Centers (WDCs).

- Principal Investigators on board each U. S. ship, including U. S. GATE oceanographic ships, must ensure that their data inventories are included in the general inventories of data taken aboard that vessel. The Chief Scientists will be responsbile for their respective ships' data inventories, and it will be incumbent on the Principal Investigators to see that their data inventories are included. Copies of the inventories are to be submitted to the U. S. GATE Project Office GATE Data Manager.

- Principal Investigators on board U. S. aircraft have the responsibility to see that their data inventories are included in the general data inventories associated with each aircraft. The aircraft scientist for each mission will be responsible for submitting the inventory for each mission to the U. S. GATE Aircraft Data Manager.

- Principal Investigators with sensors that are not mounted on the above national data collection platforms will be responsible personally for submitting an inventory of all data taken to the U. S. GATE Project Office Data Manager. This procedure would pertain, for example, to an investigator taking measurements from an array of recording buoys or on an island station.

---

* NOTE: The term Principal Investigator refers to the scientifist responsible for the individual research project.

• Principal Investigators, in addition to furnishing a data inventory according to the prescribed guidelines, are required to take an active role in processing and validating their data to the point required by the GATE Data Set* and within the internationally agreed to GATE time frame. This activity will be accomplished by the Principal Investigator working directly with the appropriate NPC. The U. S. GATE Project Office will be responsible for coordinating this activity with the scientists, the NPCs and with the appropriate funding agencies. Principal Investigators should plan for, and request, sufficient funding for this task.

2. Access to GATE Data by Scientific Users

2.1 DISCUSSION: The primary GATE data sources for scientific investigators will be WDC A and WDC B, located in the USA and the USSR, respectively. The WDCs will each contain the complete set of internationally agreed to validated GATE data, which we shall call the "GATE Data Set," inventories and data catalogues, and reference data (e.g., instrument descriptions, exposure details, observation and processing methods, etc.). In addition to the GATE Data Set, other GATE data will exist, including both unprocessed or unvalidated data and processed data not considered essential to the GATE Central Program Objectives. For purposes of this discussion, the term "raw" data includes both of these last categories.

2.2 GUIDELINES:

• The policy guiding the U. S. GATE Data Management activity will be to make data available through the WDC A or the U. S. National Climatic Center (NCC) as quickly as possible within the practical restraints of available funding and manpower. As far as practical, intermediate data, (i.e., not fully validated data) will be archived for early access by users. These intermediate data will be replaced by nationally validated data as soon as the validation tasks are completed.

• U. S. users will obtain inventories and GATE data from either WDC A or the U. S. NCC. The user will pay the cost of copying (includes materials and postage).

• The NPCs and SDCs are not designed to function as data sources for scientific users. The basic task of the NPCs will be to process, nationally validate and format the national data. The basic task of the SDCs will be to perform an international validation and merge the data elements that are essential to the scientific objectives of the particular subprogram. Participation that advances and contributes to the work of the NPCs and SDCs is encouraged by individual scientists and groups of scientists from outside the NPC and SDC organizations. Special arrangements for this participation will be made at the discretion of the individual NPCs and SDCs.

---

* See discussion under 2.1.

• "Raw" data will be retained for at least five years either at the U. S. NCC or by Principal Investigators. Should scientific users require the raw data, arrangements to obtain them will be made on a bilateral basis. It is necessary that Principal Investigators holding raw data have the right to negotiate their specific response to these requests. Inventories of all "raw" data held at the various NPCs and by Principal Investigators will be on file at both WDCs.

• As national resources permit, the SDCs will accommodate visiting scientists. Such visits will be arranged bilaterally by the scientist and the SDC. The scientist may either assist the SDC in its necessary validation tasks or receive advice and assistance from the SDC in relating the characteristics of the data sets to his/her research plans. The U. S. GATE Project Office is available to provide a coordinating function for these arrangements.

3. Publication of Results from GATE

3.1 DISCUSSION: The principal mechanism for dissemination of scientific results, as opposed to data, is to be publication in reviewed journals; however, in view of the importance of such publications to the professional recognition of most scientists, some special mechanisms may be needed to facilitate equitable allocation of credit for work which is inherently a group effort. It is necessary to have a broad spectrum of research projects working on all aspects of the GATE program so that the overall GATE objectives can be met. Consequently, the U. S. GATE Project Office will monitor and communicate to the scientific community the status of the GATE data analysis programs.

3.2 GUIDELINES:

• The preferred medium for dissemination of results will be reviewed publications.

• Scientific meetings, workshops and symposia also will provide a useful forum for the dissemination of the results of GATE.

• Some work may be needed that requires scientific expertise but which may lack sufficient originality or is too voluminous for conventional journal publication, e.g., analyses. Special atlases or monographs therefore might be undertaken, by institutions, individuals, or groups. Projects of this type will be coordinated nationally by the U. S. GATE Project Office. International cooperative efforts also will be coordinated through the Project Office.

• The U. S. GATE Project Office will maintain and disseminate a compilation of publications related to GATE and provide systematic inputs into international compilations of GATE publications.

• The U.S. GATE Project Office does not plan to develop a GATE publication series.

• In order to facilitate timely distribution of research results, many organizations have pre-publication report series. The U. S. GATE analysis program will benefit by studies presented in these reports. The U. S. GATE Project Office will provide a distribution and coordination service for organizations participating in the GATE studies that have informal publication series.

4. Synthesis of GATE Studies and Results

4.1 DISCUSSION: The post-field experiment analysis phase of GATE in the U. S. will be accomplished by a myriad of individuals and groups from institutions all across the country. The broad central objectives of GATE are impossible to be treated adequately by individuals or groups working alone. Consequently, some mechanisms leading to syntheses of the GATE studies are required. It is envisioned that the scientists actually involved in the planning and execution of the experiment and in the subsequent analyses of the data will do these syntheses.

4.2 GUIDELINES:

• The U. S. GATE Project Office, working with the GATE Advisory Panel, will have the responsibility to develop and foster mechanisms involving the U. S. GATE scientific community in the collective syntheses and evaluation of individual studies, leading to a general statement of the "Results of GATE" as they relate to the central objectives of the program. Such mechanisms will include national coordination of agency funding for GATE research programs.

• Funding agencies, as appropriate and consistent with agency policy, will provide stability in this effort through use of long-term* commitments and funds designated to carry out meaningful syntheses and analyses of results.

---

* NOTE: In this context "long-term" is defined as not less than one year and not more than 5 years.

APPENDIX A

EXTRACTED FROM THE INTERNATIONAL
GATE DATA MANAGEMENT PLAN

NATIONAL PROCESSING CENTER (NPC) FUNCTION

(1) Plan and implement the necessary further processing and the national validation of data.

(2) Collect observational data, after possible initial processing, and inventories and reports describing the data from national observation platforms.

(3) Assemble nationally validated intercomparison data sets and distribute to SDCs (within 6 months after the experiment) for use in the international validation task and to GATE Archives (WDCs).

(4) Prepare nationally validated observations according to the demands of subprogramme data centre requirements (i.e. as specified for input to SDCs and GATE Archives and in agreed standard formats on standard technical media).

(5) Prepare documents containing explanations to (2), (3) and (4) and an inventory of processed and validated data.

(6) Send all data (containing the processed and validated data), documents and inventory to SDCs (as required by their tasks) and to each GATE Archive (WDC) as specified in the GATE International Data Management Plan.

(7) Send documents and inventories describing data sets and periodic reports on the status of data management tasks to ISMG.

(8) Arrange for retention of raw data for five years following the end of the GATE field phase and provide each GATE Archive (WDC) with an inventory of such raw data including the responsible authorities to whom requests for each type of raw data should be referred.

1.5.5 Functions of Subprogramme Data Centres (SDCs)

A. From NPCs, assemble the appropriate nationally validated data into generally useful data sets designed to facilitate necessary subprogramme applications. NPC data accepted by SDCs would be in agreed formats and standard technical media.

B. Analyze intercomparison data and develop possible corrections to the data from the various national measurement systems which will eliminate relative biases and provide data in an uniform time/space coordinate system.

C. Verify that prepared data sets are of sufficient quality and arranged suitably for anticipated scientific applications (i.e. International Validation).

D. Send verified data sets to each GATE Archive (WDC) for access by users. Data sets would be in agreed formats on standard technical media.

E. In addition to intercomparison data analyses and trial analyses carried out to demonstrate the scientific suitability of the data sets, some products of a synoptic type (such as representation of data fields graphically or by values interpolated at regular grid points) may be prepared by SDCs to meet specific requirements of their subprogramme or other subprogrammes.

F. Prepare and send along with data sets documentation describing processing methods, validation methods and results, analysis results, and descriptions of data formats.

G. Accommodate visiting scientists participating in the work of the SDC or to advise and assist them in their respective scientific work according to agreed arrangements and as national resources permit.

H. Send periodic status reports to the ISMG.

1.5.6 Functions of the GATE Archives (WDCs)

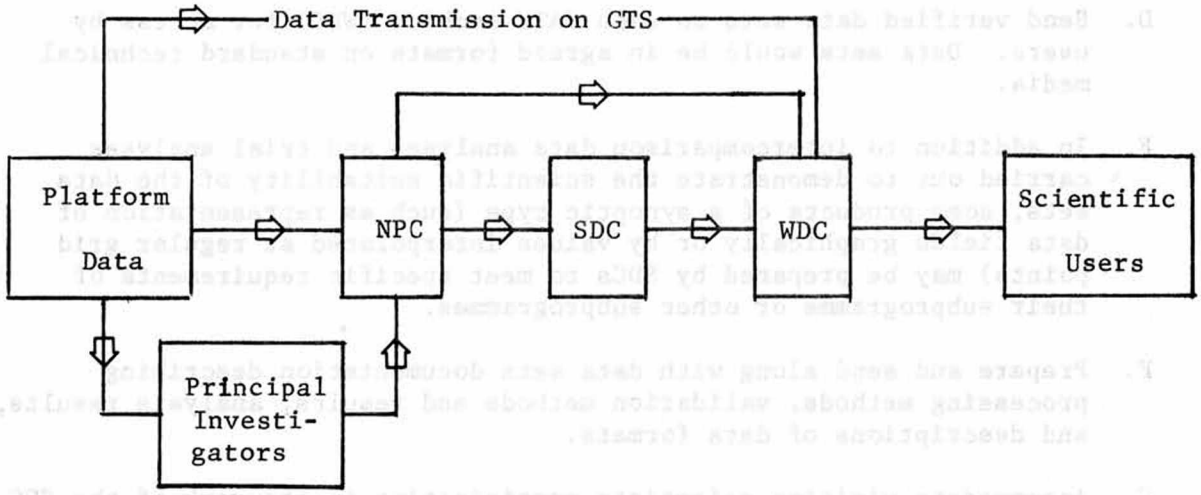
A. Inventory, store and archive national data (coming from NPCs and GOCC) and international data (coming from SDCs) and documents and distribute them to any user on request according to procedures set out in each WDC....

B. Compile and publish inventories, catalogues, and periodic bulletins notifying potential users of the GATE data available for distribution and to explain the relevant procedures for request of data from the WDCs.

C. Prepare and send periodic reports on the status of data management tasks to the ISMG.

APPENDIX B

BASIC GATE DATA FLOW



U.S. NPC's	SDC's	WDC's
Ship - CEDDA (Dr. Wayne Fischer)	Convection - U. S. A.	WDC A - U. S. A.
	Synoptic - U. K.	WDC B - U.S.S.R.
Aircraft - NCAR (Mr. Al Miller)	Radiation - U.S.S.R.	
Satellite - NESS	Boundary Layer - F. R. G.	
Buoy - CEDDA	Oceanography - France	

ONE DAY IN THE LIFE OF PHASE I 10 July 1974 Julian Day 191

This day was selected to illustrate a good ITCZ aircraft mission, in which five aircraft participated. We also had good A-scale maps for that day; however, no B-scale maps were prepared since the mission took place essentially outside of the B array. The material that we include here for 10 July 1974, Julian Day 191, consists of:

- A general discussion of how aircraft mission selection, planning and implementation processes were carried out at Dakar, with a typical time schedule of the various events.
- Minutes of the Mission Selection Team meeting of 9 July.
- Three cloud cover images from the geostationary satellite to illustrate this sort of input information to mission planning.
- A-scale maps for 1200Z map time: surface wind over the sea and 500/600-m winds over land; 700- and 200-mb winds. A legend and explanation is included to clarify the reading of the plotted data. In reproducing these maps for the BULLETIN, we had to crop them slightly owing to limitations in our photo-reproduction equipment. They are, of course, reproduced uncropped in the ISMG microfilms of preliminary data.
- Report of the Mission Scientist, including his sketch of the flight patterns.
- Report of the Airborne Mission Scientist, including his sketch of the flight patterns.
- Detailed flight tracks for each aircraft, with some data plotted. These were constructed at GOCC, Dakar, based on the navigators' logs and other available data. Here we have combined the individual sheets of the tracklines into composites to show the entire track on one page. Owing to the conical projection used, and the fact that the map sheets for regions south of the B array were merely repeats of those drawn for more northerly regions, the sections do not match perfectly for flights extending further south than $6\frac{1}{2}^{o}$N. The trackline charts are contained in the ISMG microfilm series in their full size, one sheet per frame.
- Summary of aircraft missions executed on 10 July 1974, extracted from the complete catalog of aircraft missions, *Summary of Aircraft Missions in the GATE*; see page 1 of this issue for a description of this volume and where to get it.

Schedule of Aircraft Mission Planning and Implementation

The daily routine generally followed this pattern:

Mission Day Minus 1:

1600 - Meeting of the subprogram scientists (convective, radiation, boundary layer, oceanographic, synoptic). At this meeting the following factors were taken into account: status of how well the scientific objectives have been met to date, weather outlook, availability of aircraft, any other limitations arising from operational matters. The subprogram scientists then agreed on a recommended mission for each aircraft for the following day, and on an alternate mission should the expected weather patterns not develop as forecast.

1630 - Meeting of the Mission Selection Team (MST). This was a formal body constituted to advise the Director of GATE as to the best use of the aircraft each day. Its members were the Director of GATE, and national representatives of each country operating aircraft and B-scale ships. The MST meetings were open and generally attended by most of the aircraft scientists available that day at GOCC, and by visiting scientists, operations and support personnel.

The MST meeting opened with a briefing from aircraft operations as to which research aircraft were available for duty that day, what systems, if any, were down or not functioning to specification, and a look ahead to anticipated schedules for crew rest or maintenance. A report was given by the ship operations group on the location of each ship (some ships were off station at times for medical evacuations or for maintenance or other operational purposes), and on the status of the major observing systems in the B-scale array. Consideration was also given to the status of those nearby A/B and A-scale ships which might affect aircraft mission decisions. The forecasting group, with the cooperation of the satellite group, then gave a briefing on the nature of the weather systems in the area, and offered a forecast for the following day - degree of convective activity expected, location of the ITCZ, possibility of squall lines, etc. An outlook was also given for the second following day - which was necessarily much more general and guarded than the previous forecast. During the weather briefings the latest available satellite pictures and film loops were displayed to give the MST an idea of how the cloud patterns had been evolving.

The MST then considered the recommendations of the subprogram scientists, decided on the primary and alternate missions, and designated the Airborne Mission Scientist (AMS) (sometimes several if there were different missions for that day) and the Mission Scientist (MS).

1730 - Initiation of detailed planning. The AMS and MS met with air operations personnel to lay out the general plan for the next day's operation, including flight tracks and altitudes for each aircraft, coordination of ships and aircraft, and communication times. This procedure lasted from about one-half to two hours, depending on the complexity of the mission and the prolixity of the planners. Even with the detail required at this stage in the mission planning, however, it was always understood that the plans were provisional, pending a look at current weather early the next morning and either a confirmation of the plan or modification of the plan necessitated by weather conditions.

2000 - Air operations personnel prepared and distributed alert notices to the various crews of the aircraft designated to participate in the mission(s) the following day. These alerts indicated the briefing and take-off times for each aircraft.

2030 - During Phase III, communication was established regularly with the DALLAS, to discuss the status of the tethered-balloon system and to coordinate the next day's mission as closely as possible with the observational program planned for the balloon systems.

Mission Day

0500 - Early in the day, the MS and AMS went to GOCC to review satellite pictures and current weather. Some of the non-scientific problems encountered at times during this phase of the planning included securing transportation from the hotels to GOCC, occasionally having to communicate in French with the personnel at the airport weather/radar stations, making sure that transportation would be available later for getting the aircrews and scientists to the GOCC in time for briefings and pre-flight preparations. There were many examples during GATE of rather imaginative improvisations to overcome some of the logistical difficulties involved in this complex operation.

0630 - 0800 - Flight briefings were held for all aircrews and participating scientists. Weather conditions were described, the latest forecasts reviewed, and the pre-take-off mission plan was confirmed or modified as required by any changes in weather or aircraft operational conditions. In most cases, briefings were held two hours prior to flight time.

0830 - 1000 - The lead aircraft, carrying the AMS, took off at this time in order to arrive at the Initial Point (IP) in time to make a survey of the on-site weather conditions and to communicate with the ships as needed to ascertain their status and inform them of the latest mission plan. The other aircraft took off later on a staggered schedule which permitted rendezvous at the IP at the agreed time, (usually between a half hour and an hour after arrival of the lead aircraft) and a coordinated start of the mission.

1130 - 1200 - At about this time the AMS in the lead aircraft was in contact with the MS at GOCC and made a decision as to whether the primary mission should be flown as planned, or modified, or whether the alternate missions should be flown. If the last decision were taken, appropriate aircraft were contacted by radio and notified that they could leave the main stack and head for their areas for such alternate missions as radiation or cloud physics studies.

1700 - 1900 - The aircraft returned to Dakar having completed their assigned work.

1900 - 2000 - All aircraft crews and aircraft scientists were debriefed by the MS as to details of their flight and their comments on the success of the mission as judged by how well the data systems performed and how well the mission objectives were met. At the end of each mission, the personnel from the GATE Aircraft Data Management Group (GADMAP) of NCAR participated in these debriefings and prepared summary sheets for all aircraft. GADMAP personnel and UCAR students prepared detailed flight tracks for each aircraft for all major missions, plotting on the track lines selected observations of wind and atmospheric state parameters.

MISSION SELECTION TEAM SESSION No. 22 9 July 1974 16:30

Report by AIRCRAFT OPERATIONS:

Available for tomorrow's mission are: UK C-130, DC-7 (inertial platform inoperative), CV-990 (weather radar inoperative), ELECTRA and IL-18M.

Report by SHIP OPERATIONS:

There are no changes in the position or observational programmes of the ships.

The Operations is exploring the possibility of implementing the decision made yesterday for intercomparison between ENDURER (22) and CHARCOT (18) at the end of the first phase.

No winds are being received from LOMONOSOV and two other oceanographic ships on trackline near the Equator; details will be requested.

WEATHER Report:

The [weather in the] B-scale array is currently quite suppressed. The middle cloudiness present this morning in the array dissipated about noon and little or no cloudiness is observed on the 1500 GMT visual picture. The ITCZ is currently located about 5-6°N east of 25N and about 7.5°N west of there.

The inverted V is located about 35-40°W at 1500 GMT and moving westward [at] about 5° longitude/day. The next trough in the easterlies is located near 0° longitude at 1200 GMT. Once again the ITCZ cloudiness is pushed farthest south in the ridge between the two troughs.

The squall line that was described this morning decayed as it reached the coast. At 0300 GMT this morning the northern edge of the squall line convection was at 13°N. At 0900 GMT the northern edge of the cloudiness was at 12°N and at 1500 GMT the northern edge was at 10.5°N. As the squall line moved toward the coast, a convective cluster developed south of the squall line and west of the coast. It is difficult to separate the cluster convection from the squall line convection since the two systems have merged. Dave Martin estimates that the cluster covers an area of 40° latitude square. The satellite statistics indicate that the cluster will have a total lifetime of 24-36 hours. Since the cluster formed at 0300 this morning, it will probably be decaying tomorrow afternoon. At its present rate of motion of 6-8° long/day toward the west, the cluster, which is near 10-17.5W and 5-10N at 1500, should arrive at the longitude of the B-scale array tomorrow morning.

OUTLOOK:

The difficulty in forecasting this cluster is to determine the northern-most latitude covered by the cluster. It appears that the part of the cluster north of 8°N may well be the result of the merger of the cluster

with the squall line since the northern limit of the bright area of the clouds has moved steadily southward since 0300. It thus seems likely that the convective activity north of 8°N may well be a temporary result of the merger and that little or no convection will be present north of 8°N.

The cluster will continue to move westward and affect only the southern and eastern part of the array. The northern 2/3 of the array should be mostly open during tomorrow afternoon.

There should be a well-developed ITCZ around 5-7°N from at least 25°W to the African coast.

SUBPROGRAMME SCIENTISTS Recommendation (Cox):

Considering the possibility of convection in the southern edge of the B-scale [we recommend a] primary mission 1A type, and alternatives a) dust (type 7) exploring in the direction of Cape Verde Islands by CV-990, ELECTRA and IL-18M or b) type 2 mission with all 5 aircraft.

COMMENTS:

- Eventually the CV-990 may perform a reconnaissance mission and if the weather is not appropriate, for 1A, should inform the other aircraft and alone deviate toward Sal for [a] dust mission.

- When there is doubt from the forecast and satellite that tomorrow's weather would be suitable for 1A type, why not use four of the aircraft for massive sea temperature mapping between the continent and the B-scale and south from ITCZ?

- Some doubts were expressed on the use of a/c [i.e., aircraft] for sea surface temperature in [this] time when the plan for the basic GATE mission is not yet fulfilled.

- Although some relationship is being observed between the zone of higher sea surface temperatures and the convection activities and/or ITCZ, it is not clear what the direct impact of sea surface temperature measurements has on the main objectives of GATE. There is quite a good picture of sea surface temperatures obtained from ship observations and some similar data are available from the satellite.

- There is a significant difference between the satellite-obtained data and the temperatures measured by the ships and aircraft. In our wish to execute basic type missions, we are hearing proposals for type 1 missions more frequently than the weather situation will justify.

MST DECIDED:

- 1A type mission by DC-7, UK C-130, ELECTRA, CV-990 and IL-18M
- MS Dr. Betts
- AMS Dr. Zipser (assisted by Mr. Alt for ITCZ if necessary)
- Alternate mission
  a) ITCZ by the same five a/c
  b) Dust mission by ELECTRA, CV-990 and IL-18M
     with AMS - Dr. Prospero
     and MS - Dr. Kraus
     sea surface temperature in ITCZ by UK C-130 and DC-7.
- No change in the ship observation programme.

MISSION 191/1 CROSS ITCZ MISSION TYPE 2

Report by Mission Scientist: A. K. Betts

Airborne Mission Scientist: E. J. Zipser on the UK C-130

Summary	CV-990	IL-18M	DC-7	UK C-130	L-188
◊ Take-off	1145	1102	1041	1019	1109
* IP (METEOR)	~1300	~1300	1245	~1215	~1300
◊ Landing	1720	1704	1953	2009	1745
Flight time	5hr 45min	6hr 2min	9hr 12min	9hr 50min	6hr 36min
Research Altitude	20,000' 30,000'	15,000'	4,000'	1,300'	500'
Southern Point	1°N	3°N	0°N	0°N	1½°N
Self-calibrations		0		3	1
♦ System failures	-	-	(No INS on this flight) [DC-7] Radiometer failure 1510-1540 [DC-7]		
Aircraft Scientist	Petersen	Vasiliev	LeJeune	Cockerell	LeMone

Assessment:

This mission appears to have been successful. All aircraft (except the IL-18M which was range limited) penetrated past the southern boundary of the ITC at about 2°N. Good low-level profile data including a sounding to 5000' by the UK C-130 were obtained south of the ITC. The CV-990 flew two patterns to about 1°N.

The ITC appear to be passing the growth stage, and to consist mostly of stratiform clouds and rain by the time of passage of the low-level aircraft. The CV-990 reports some active Cb towards the eastern end. The precipitation area was about 100 nm wide.

[* Initial Point]
[◊ Times given in GMT]
[♦ Note: There were other systems down on other aircraft but this information was not available at the time the MS report was prepared.]

Other remarks:

1. The type 2 mission was the alternate. It was flown because there were insufficient active convection in the B-array for the 1A primary. Communications and the decision making process between MS and AMS went smoothly. The AMS assumed responsibility at 1200Z and the decision to fly the alternate was made at 1220Z. The MS concurred with the decision.

2. Time checks should be made at the briefing for all future aircraft missions. The aircraft clocks may not be coordinated for this flight.

3. Communications with ATC went smoothly on this mission.

4. The [tethered] balloons - down order (planned for ships 1, 3, 4, 5 at 1230Z) was cancelled for ships 1, 3 at 1130, for ship 4 at 1230, but we do not know if ship 5 (RESEARCHER) received the message. It was not guarding 122.9 MHz.

5. No aircraft reported any turbulence which necessitated deviations from the planned track.

6. No navigation problems were encountered, even by the DC-7 whose INS was not working. They reported seeing the QUADRA radar transponder from 10,000' at 170 nm.

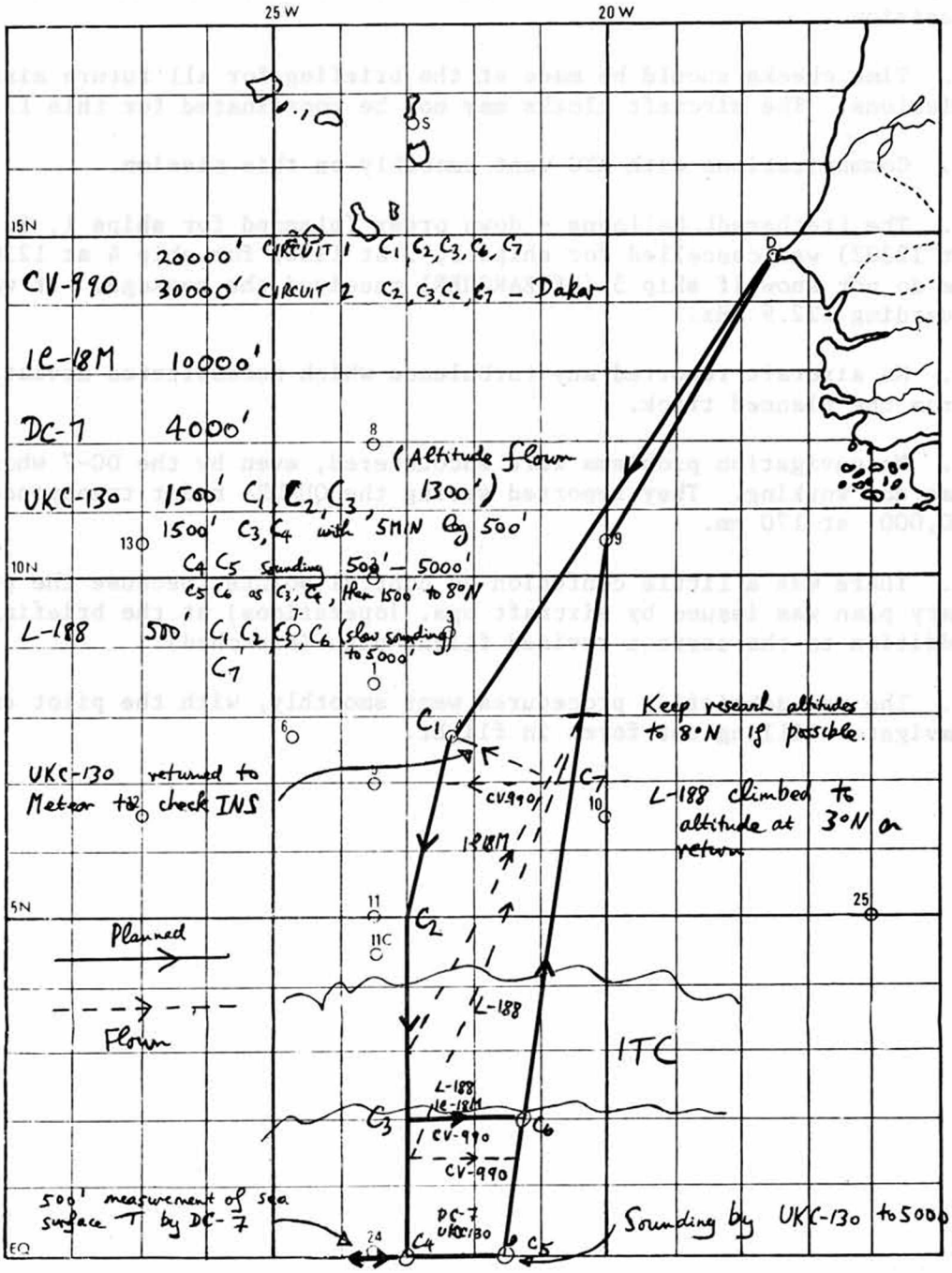
7. There was a little confusion on control points, because the preliminary plan was issued by aircraft ops. [operations] at the briefing in addition to the correct revised flight plan (attached).

8. The new debriefing procedures went smoothly, with the pilot and navigator filling out forms in flight.

METEOROLOGIE NATIONALE
E. E. R. M.
EXPERIENCE TROPICALE DU GARP

191/1 TYPE 2 ITCZ
VOL ~~DC7~~ n°.....

Décollage ..... BRIEFING SHEET .....
Atterrissage ..... WITH ADDITIONS AFTER FLIGHT



Airborne Mission Scientist Report

10 July 1974 — E. J. Zipser
Mission Type 2 - ITCZ — Mission 191-1
Mission to Equator

This was a successful mission of type 2 through the ITCZ to the equator. The principal band was along the southern edge between 1½°N and 2°N, with secondary band near 5°N. Scattered convection in between, scattered light to moderate rain showers. Max tops probably below 20,000', most 10-12,000' or lower. Considerable layer cloudiness especially between 8-20,000' and some rain from this.

Surface winds were light in and north of the southern band, but became about 150° at 12 knots to the south, near the equator. Definite suppression of convection south of the band, to and across the equator. Preliminary indications are of colder water over the equator than at 1-2°N. Also preliminary are the indications that the cross-equatorial flow near the surface was confined to the lowest few thousand feet with possible wind reversal as low as 4,000'.

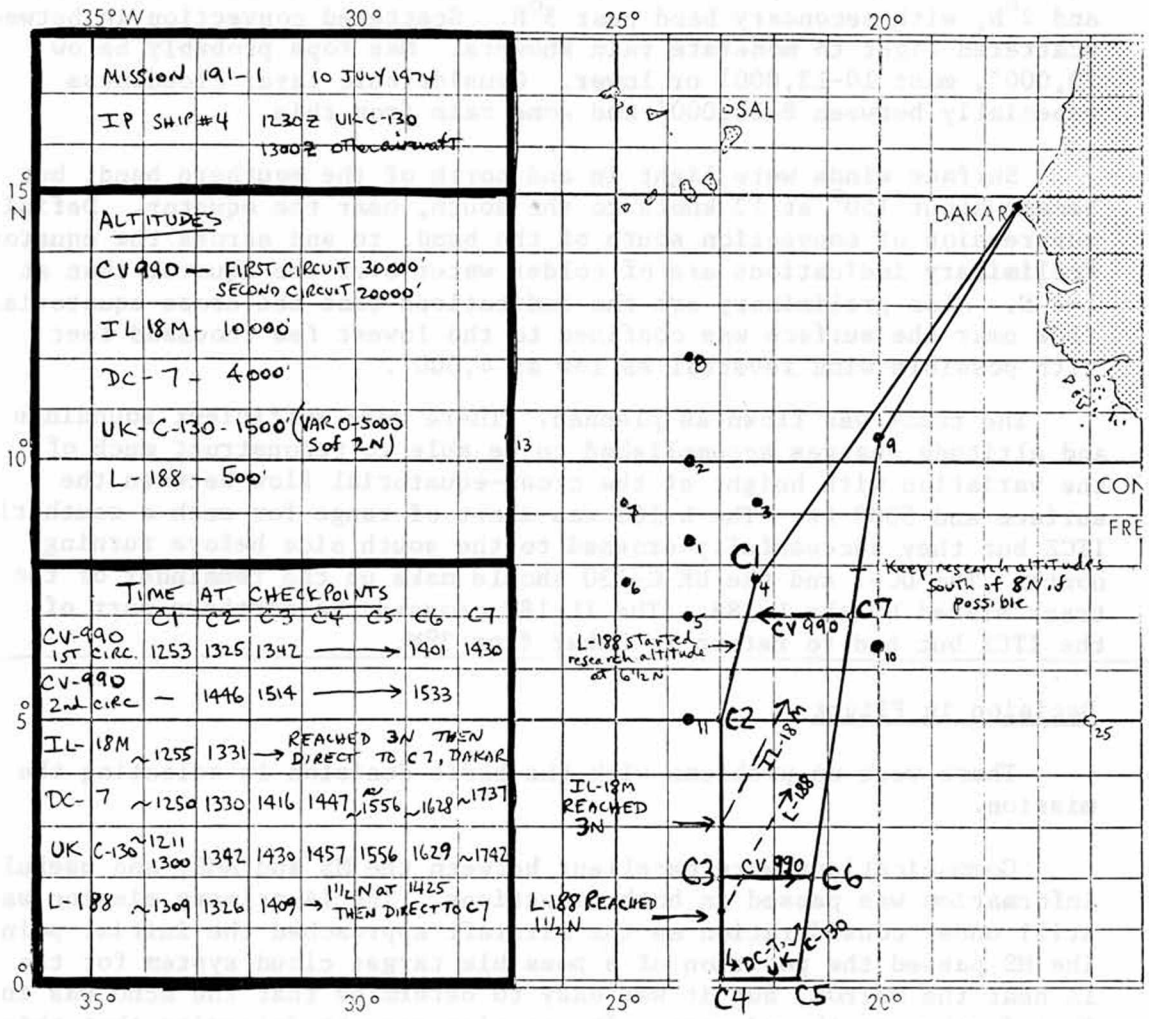
The track was flown as planned. There were sufficient soundings and altitude changes accomplished to be able to reconstruct much of the variation with height of the cross-equatorial flow between the surface and 5000 ft. The L-188 was short of range for such a southerly ITCZ but they successfully crossed to the south side before turning north. The DC-7 and the UK C-130 should make up the remainder of the track missed by the L-188. The IL-18M crossed the northern part of the ITCZ but had to return to Dakar from 3°N.

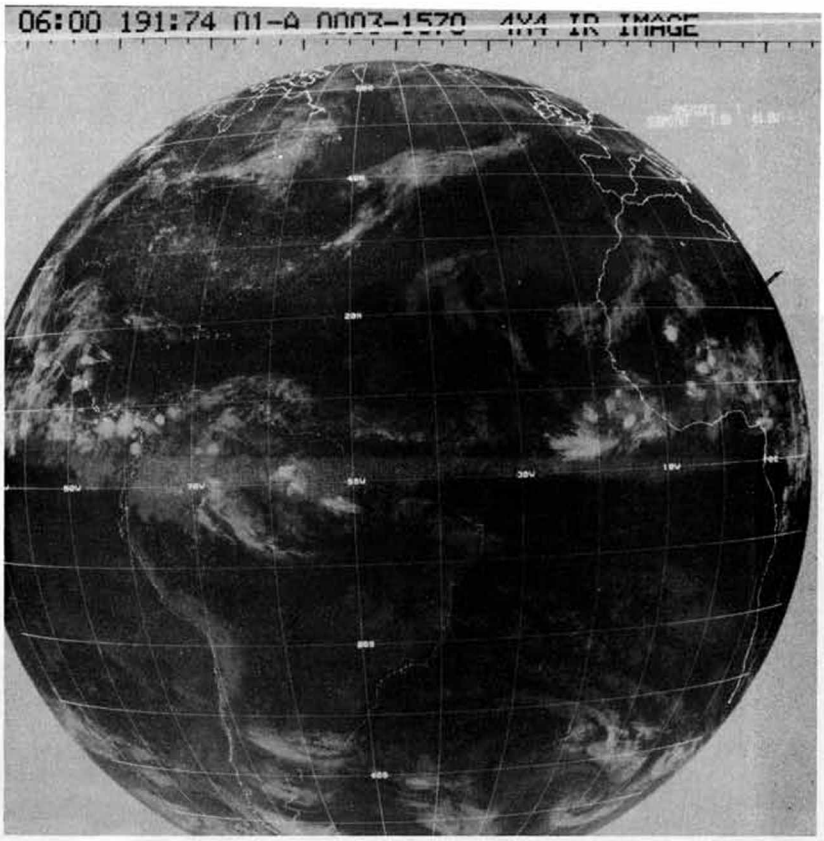
Decision in Flight

There were no problems with the basic decision in selecting the mission.

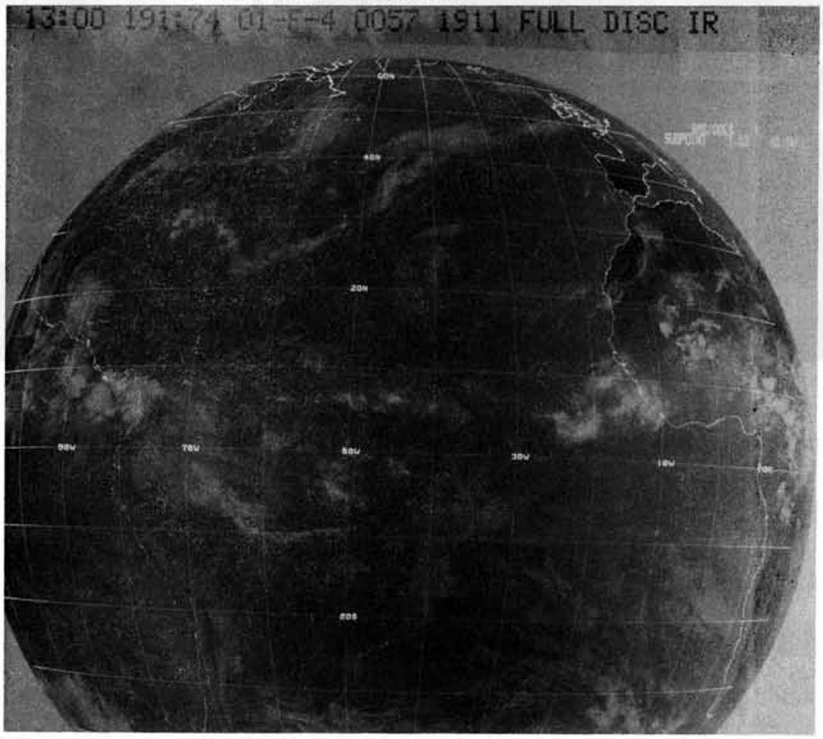
Communications were excellent between the MS and AMS, and useful information was passed in both directions. The 1A primary mission was still under consideration as the aircraft approached the initial point. The MS passed the position of a possible target cloud system for the 1A near the METEOR, but it was easy to determine that the echo was in fact further south and west. It was also easy to determine that this echo region was too weak, old and disorganized to be considered as a useful target. The MS agreed. The decision could have been made even earlier than it actually was to switch to the alternate. No problems were encountered in informing other aircraft, Dakar, and ships of the decision. It is believed that all ships except RESEARCHER were notified in time to resume tethered balloon operations with little data loss. Contact with the METEOR was difficult - they were unreadable beyond 10 miles.

All altitude changes and track changes made by other aircraft were minor or within expectations as learned from information available at the morning briefing concerning range limitations. There were no communication problems with other aircraft.

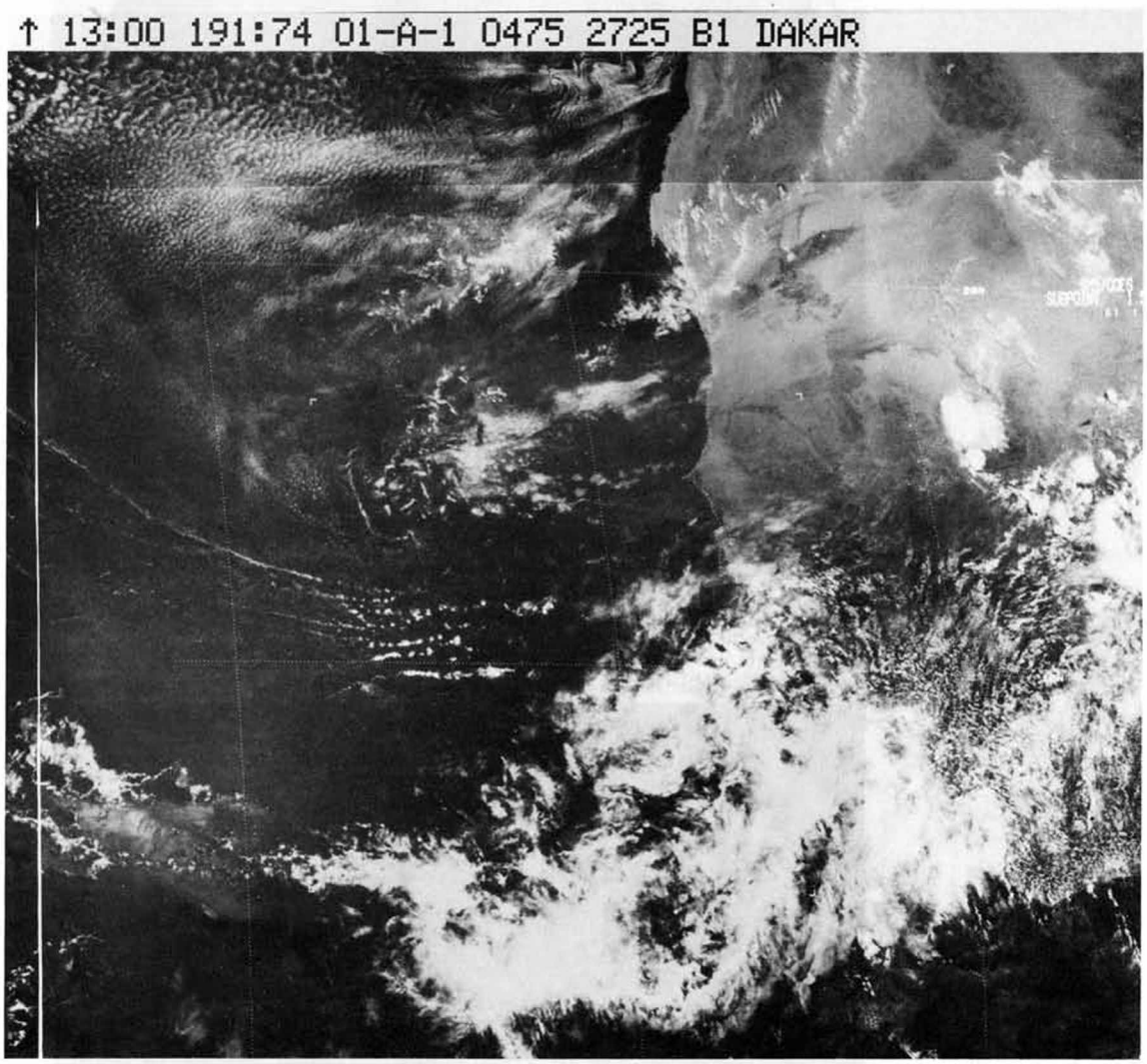

35°W
30°
25°
20°
15°N
10°
5°
0°
MISSION 191-1 10 JULY 1974
IP SHIP #4 1230Z UK C-130
1300Z off aircraft
ALTITUDES
CV990 — FIRST CIRCUIT 30000'
SECOND CIRCUIT 20000'
IL 18M - 10000'
DC-7 - 4000'
UK-C-130 - 1500' (VARO-5000 S of 2N)
L-188 - 500'
TIME AT CHECKPOINTS
C1 C2 C3 C4 C5 C6 C7
CV-990 1ST CIRC. 1253 1325 1342 → 1401 1430
CV-990 2nd CIRC — 1446 1514 → 1533
IL-18M ~1255 1331 → REACHED 3N THEN DIRECT TO C7, DAKAR
DC-7 ~1250 1330 1416 1447 ~1556 ~1628 ~1737
UK C-130 ~1211 1300 1342 1430 1457 1556 1629 ~1742
L-188 ~1309 1326 1409 → 1½N AT 1425 THEN DIRECT TO C7
DAKAR
SAL
C1
C2
C3
C4
C5
C6
C7
CV990
IL-18M
L-188
DC-7
UK C-130
Keep research altitudes South of 8N, if possible
L-188 started research altitude at 6½N
IL-18M REACHED 3N
L-188 REACHED 1½N



SMS-A Infrared Image 0600Z



SMS-A Infrared Image 1300Z



SMS-A 1-Mile Resolution 1300Z

EXPLANATION OF SYMBOLS USED ON A-SCALE MAPS

SURFACE WIND CHART (OCEAN ONLY)

D_s	Ship's course (true) made good during the three hours preceding the time of observation. See Code 0700 WMO No. 306.
v_s	Ship's average speed made good during the three hours preceding the time of observation. See Code 4451 WMO No. 306.
$T_w T_w T_w$	Sea-surface temperature in tenths of a degree Celsius.
$3P_w P_w H_w H_w$	Wind wave group. 3 is group indicator; period of waves in seconds; height of the waves in units of 0.5 m.
$d_w d_w P_w H_w H_w$	Swell group. True direction, in tens of degrees, from which waves are coming; period of waves (Code 3155 WMO No. 306); and height of the waves in units of 0.5 m.
dddff	Direction and speed of wind in mps or kt as reported; nevertheless, barbs on shaft always indicate speed in kt.

600-METER CHART

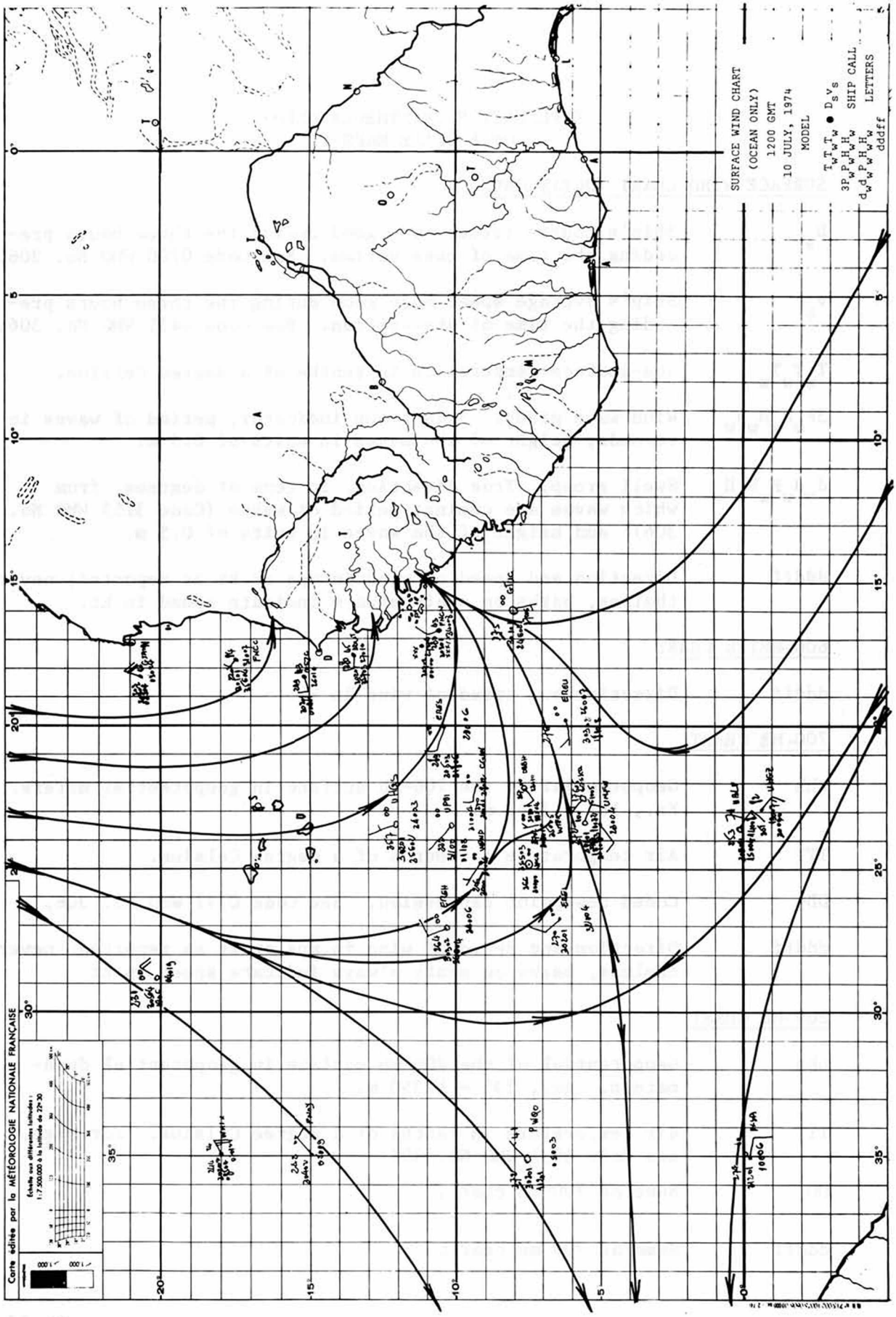
dddff	Direction and speed of wind in kt.

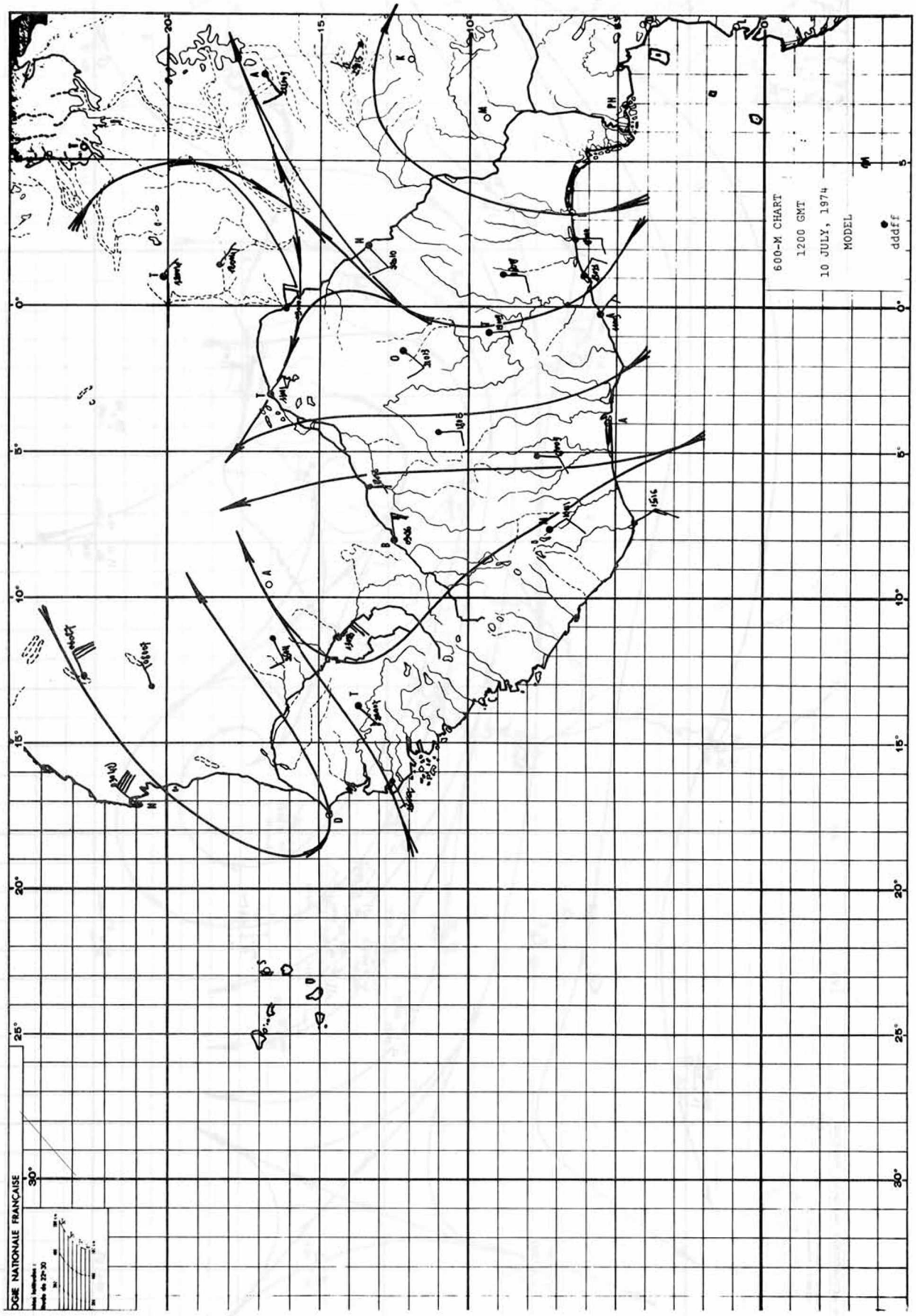
700-MB CHART

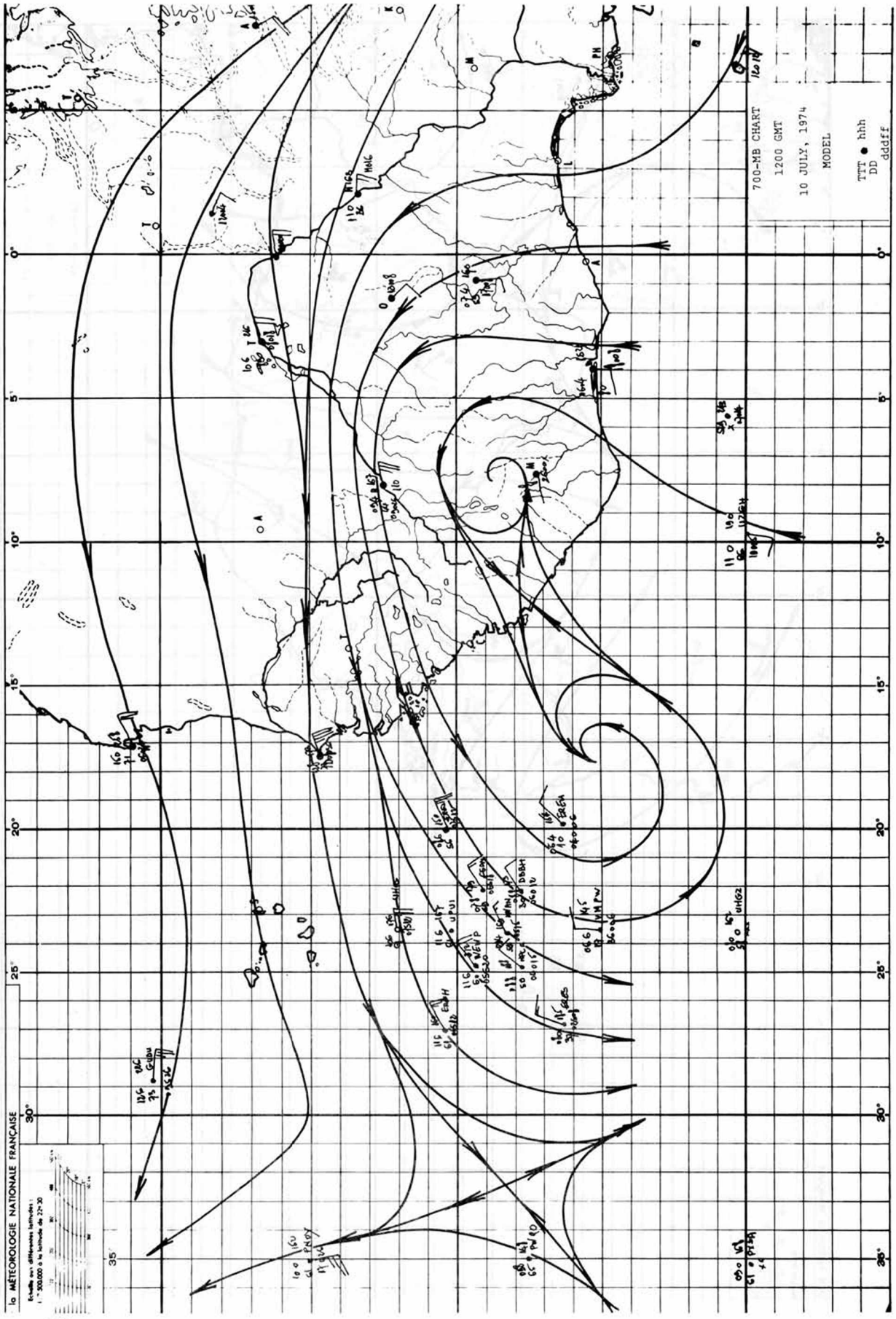
hhh	Geopotential of the 700-mb surface in geopotential meters. Ex., 163 = 3163 m.
TTT	Air temperature in tenths of a degree Celsius.
DD	Coded dew-point depression. See Code 0777 WMO No. 306.
dddff	Direction and speed of wind in mps or kt as reported; nevertheless, barbs on shaft always indicate speed in kt.

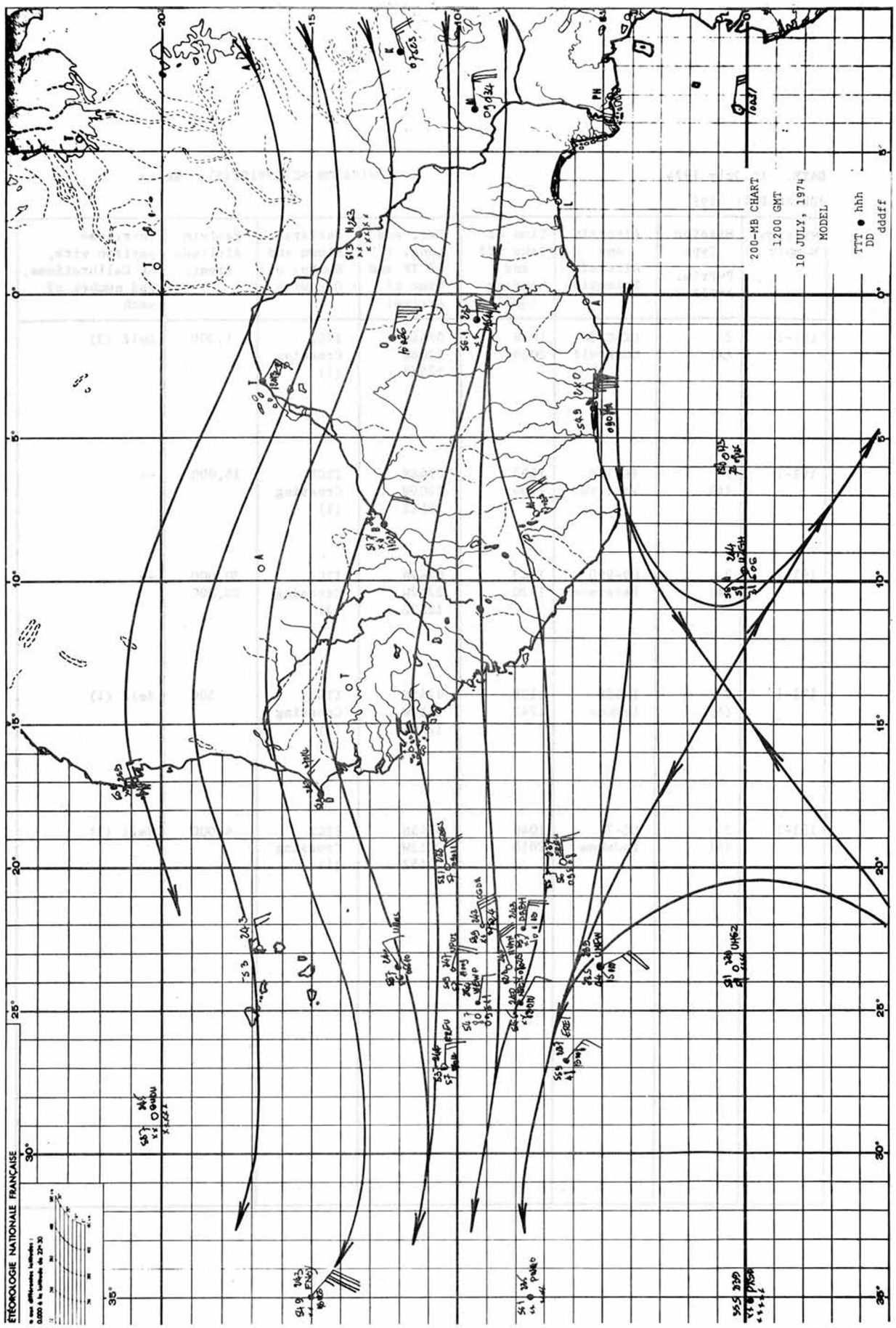
200-MB CHART

hhh	Geopotential of the 200-mb surface in geopotential decameters. Ex., 235 = 12350 m.
TTT	Air temperature in tenths of a degree Celsius. For sign, see Code 3931 WMO No. 306.
DD	Same as 700-mb chart.
dddff	Same as 700-mb chart.


SURFACE WIND CHART
(OCEAN ONLY)
1200 GMT
10 JULY, 1974
MODEL
$T_wT_wT_w \bullet D_sV_s$
$3P_wP_wH_wH_w$ SHIP CALL
$d_wd_wP_wH_w$ LETTERS
ddfff
Carte éditée par la MÉTÉOROLOGIE NATIONALE FRANÇAISE


600-M CHART
1200 GMT
10 JULY, 1974
MODEL
dddff
DGIE NATIONALE FRANCAISE


700-MB CHART
1200 GMT
10 JULY, 1974
MODEL
TTT • hhh
DD dddff
la MÉTÉOROLOGIE NATIONALE FRANÇAISE


200-MB CHART
1200 GMT
10 JULY, 1974
MODEL
TTT • hhh
DD dddff
ÉTÉOROLOGIE NATIONALE FRANÇAISE

DATE: 10 July 1974 MISSION SCIENTIST(S): Betts

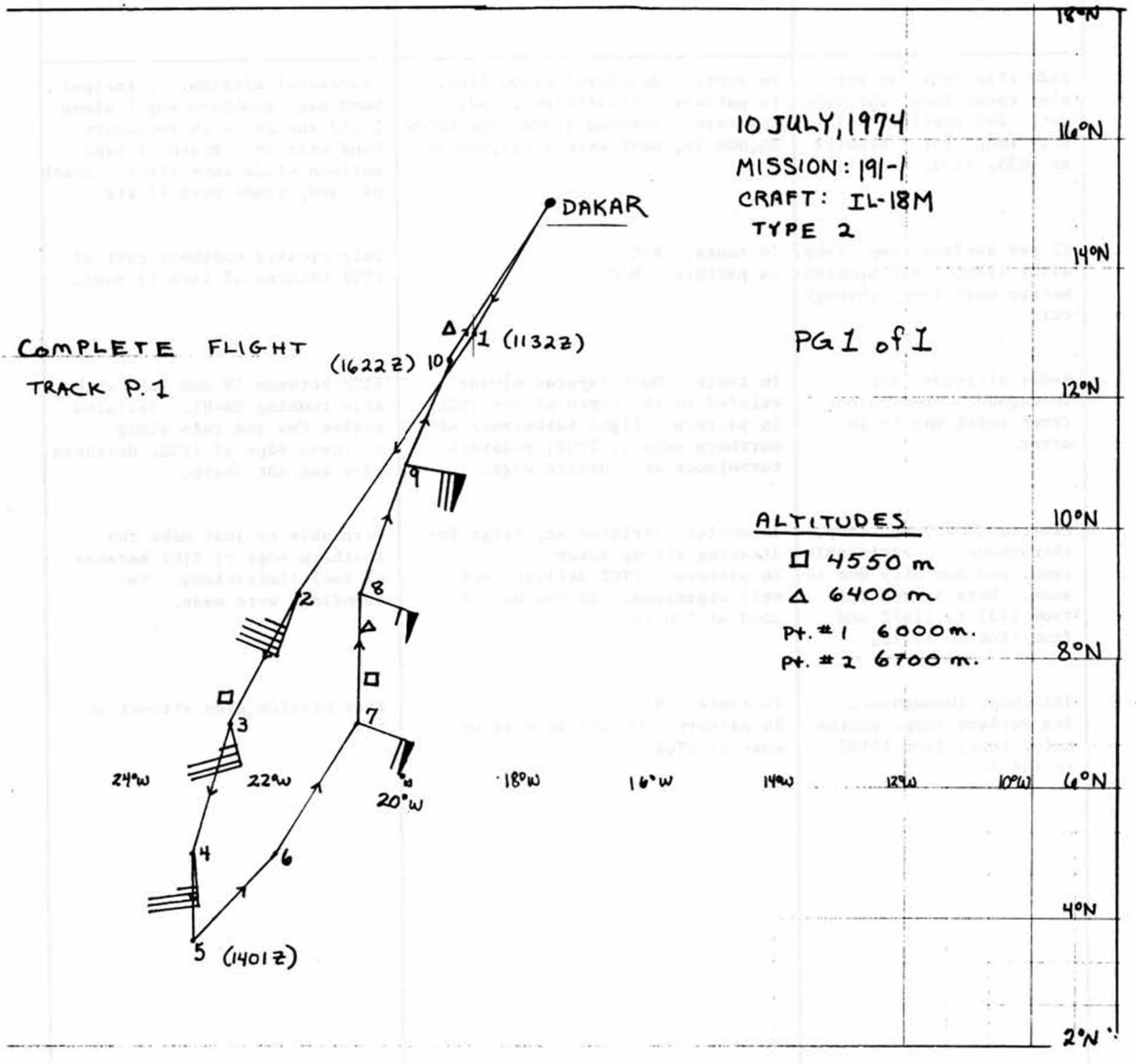
JULIAN DAY: 191

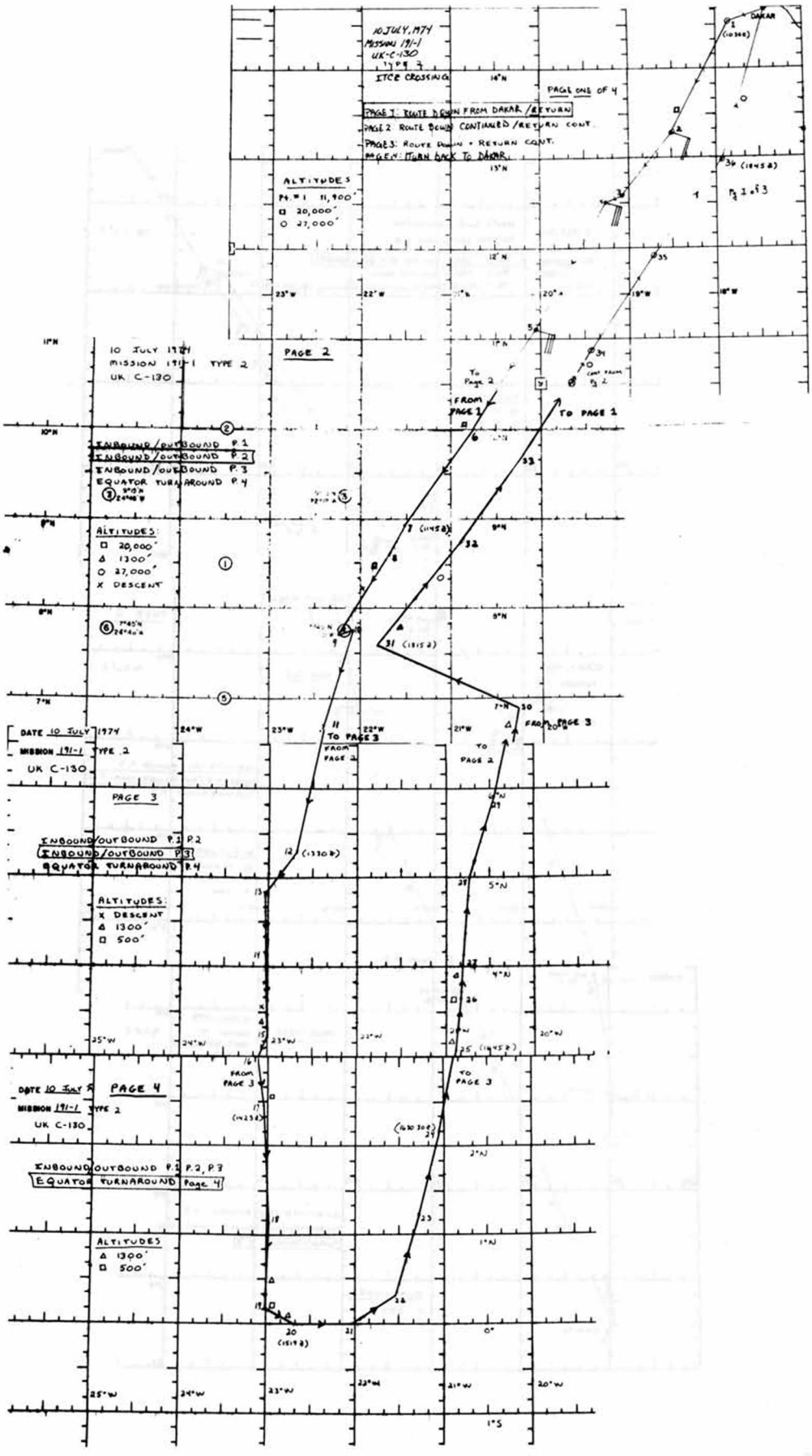
Mission Number	Mission Type P=Prim. A=Alter.	Aircraft and Aircraft Scientist	Time of Take Off and Landing (GMT)	Lat. and Long. (°) of IP and Time of Arrival	Pattern Flown and Number of Circuits	Pattern Altitude (feet)	Intercomparison with, or Calibrations, and number of each
191-1	2 (A)	UK-C130 Cockrell	1018 2009	0746N 2206W 1258Z	ITCZ Crossing (1)	1,300	Self (3)
191-1	2 (A)	IL-18M Vasilyev	1103 1704	0746N 2206W 1252Z	ITCZ Crossing (1)	15,000	--
191-1	2 (A)	CV-990 Peterson	1143 1720	0745N 2212W 1253Z	ITCZ Crossing (2)	30,000 20,000	--
191-1	2 (A)	L-188 LeMone	1108 1742	0745N 2212W 1250Z	ITCZ Crossing (1)	500	Self (1)
191-1	2 (A)	DC-7 LeJeune	1040 2010	0745N 2212W 1245Z	ITCZ Crossing (1)	4,000	Self (2)

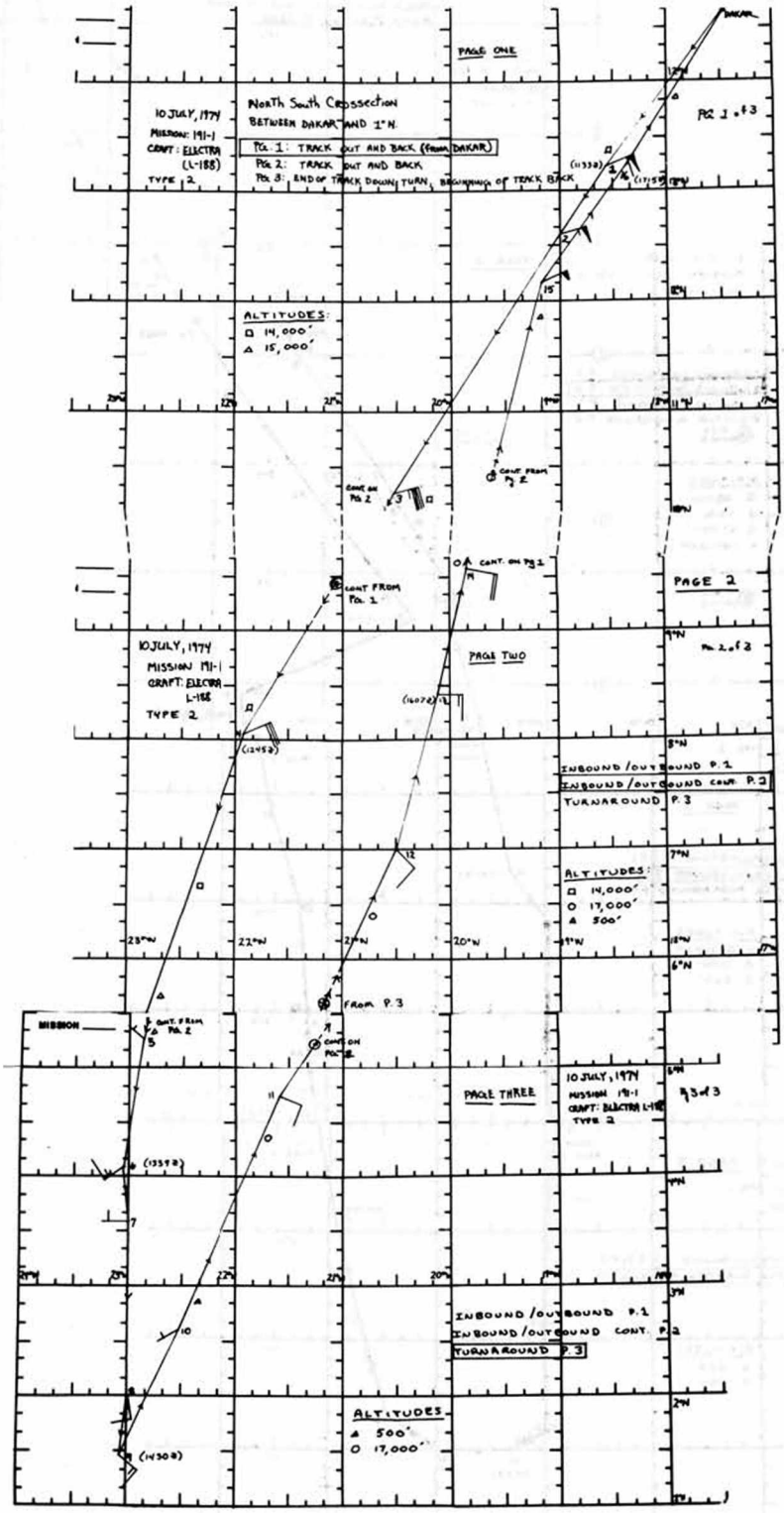
AIRBORNE MISSION 191-1 Zipser (UK-C130)

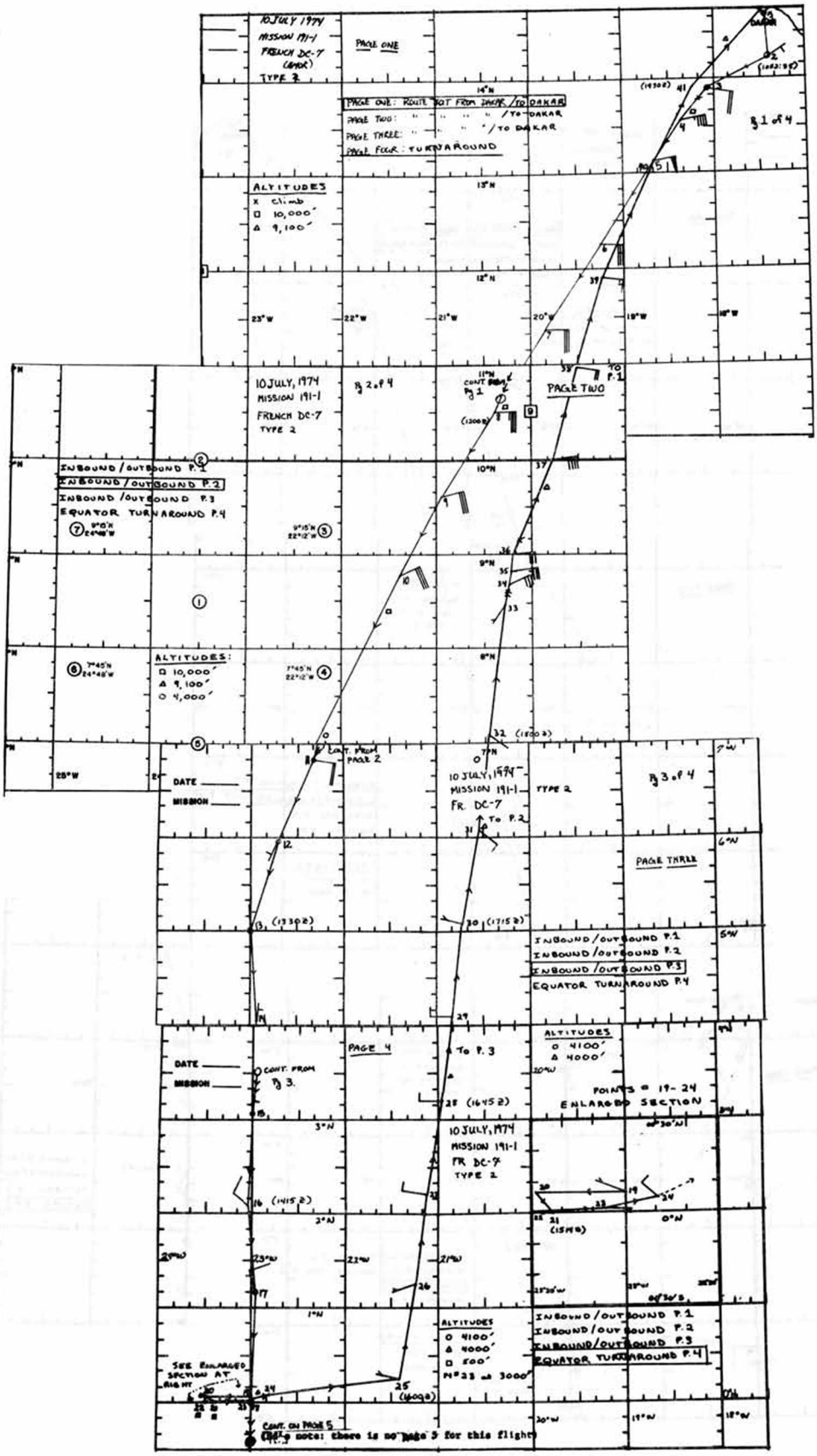
SCIENTIST(S):

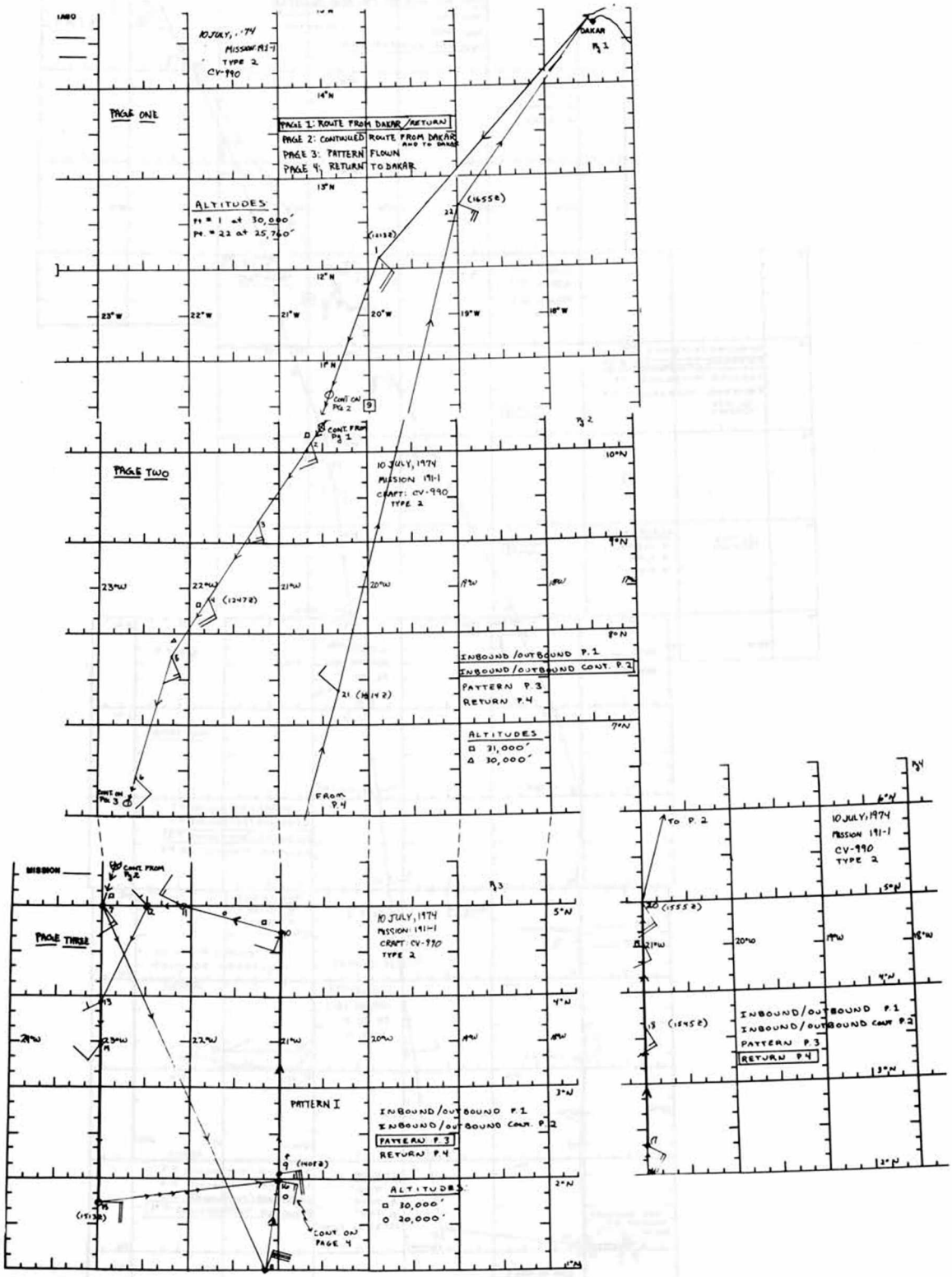
Down Systems	Weather Encountered in Route and in Pattern	Summary and Evaluation
Side slip vane and doppler radar inop. throughout. INS vertical velocity inop. for 3 minutes at 1035, 1104, and 1517Z.	In route: Scattered convection. In pattern: Stratiform clouds and rain. Maximum cloud tops below 20,000 ft, most were 10-12,000 ft.	Successful mission. Principal band was (southern edge) along 1 1/2 and 2N, with secondary band near 5N. North of band surface winds were light. South of band, winds were 12 kts.
IR sea surface temp. inop. after 1230Z. All spectrometers were inop. throughout.	In route: N/C In pattern: N/C	Only crossed northern part of ITCZ because of lack of fuel.
Radar altitude inop. throughout. Dew point/ frost point may be in error.	In route: Multilayered clouds existed to the north of the ITCZ. In pattern: Light turbulence at northern edge of ITCZ; moderate turbulence at southern edge.	ITCZ between 4N and 1.5N with axis running SW-NE. Isolated active Cbs and rain along southern edge of ITCZ. Northern edge was not sharp.
Reverse flow temp. inop. throughout. Questionable temp. and humidity due to sand. Data system off from 1137 to 1147Z and from 1646 to 1651Z.	In route: Striated Ac, virga indicating strong shear. In pattern: ITCZ diffuse, not well organized. In and out of scud at 500 ft.	Were able to just make the southern edge of ITCZ because of fuel limitations. Two soundings were made.
INS inop. throughout. Sea surface temp. radiometer inop. from 1510Z to 1540Z.	In route: N/C In pattern: Cu and Ac made up most of ITCZ.	Easy mission even without an INS.


10 JULY, 1974
MISSION: 191-1
CRAFT: IL-18M
TYPE 2
PG 1 of I
COMPLETE FLIGHT TRACK P. 1
DAKAR
1 (1132Z)
(1622Z) 10
ALTITUDES
□ 4550 m
Δ 6400 m
Pt. #1 6000m.
Pt. #2 6700 m.
18°N
16°N
14°N
12°N
10°N
8°N
6°N
4°N
2°N
24°W
22°W
20°W
18°W
16°W
14°W
12°W
10°W
5 (1401Z)


10 JULY 1974
MISSION 191-1
UK-C-130
TYPE 2
ITCZ CROSSING
PAGE ONE OF 4
PAGE 1: ROUTE DOWN FROM DAKAR / RETURN
PAGE 2: ROUTE DOWN CONTINUED / RETURN CONT.
PAGE 3: ROUTE DOWN + RETURN CONT.
PAGE 4: TURN BACK TO DAKAR.
ALTITUDES
Pg. 1 11,900'
20,000'
27,000'
DAKAR
PAGE 2
FROM PAGE 1
TO PAGE 1
TO Page 2
CONT FROM Pg 2
INBOUND/OUTBOUND P.1
INBOUND/OUTBOUND P.2
INBOUND/OUTBOUND P.3
EQUATOR TURNAROUND P.4
ALTITUDES:
20,000'
1300'
27,000'
X DESCENT
DATE 10 JULY 1974
MISSION 191-1 TYPE 2
UK C-130
PAGE 3
INBOUND/OUTBOUND P.1 P.2
INBOUND/OUTBOUND P.3
EQUATOR TURNAROUND P.4
ALTITUDES:
X DESCENT
1300'
500'
FROM PAGE 2
TO PAGE 3
FROM PAGE 3
TO PAGE 2
DATE 10 JULY
MISSION 191-1 TYPE 2
UK C-130
PAGE 4
INBOUND/OUTBOUND P.1, P.2, P.3
EQUATOR TURNAROUND Page 4
ALTITUDES
1300'
500'
FROM PAGE 3
TO PAGE 3


PAGE ONE
10 JULY, 1974
MISSION: 191-1
CRAFT: ELECTRA (L-188)
TYPE 2
North South Crossection
BETWEEN DAKAR AND 1°N.
PG. 1: TRACK OUT AND BACK (FROM DAKAR)
PG. 2: TRACK OUT AND BACK
PG. 3: END OF TRACK DOWN, TURN, BEGINNING OF TRACK BACK
ALTITUDES:
14,000'
15,000'
PAGE 2
PAGE TWO
10 JULY, 1974
MISSION 191-1
CRAFT: ELECTRA L-188
TYPE 2
INBOUND/OUTBOUND P.1
INBOUND/OUTBOUND CONT. P.2
TURNAROUND P.3
ALTITUDES:
14,000'
17,000'
500'
FROM P.3
MISSION
PAGE THREE
10 JULY, 1974
MISSION 191-1
CRAFT: ELECTRA L-188
TYPE 2
INBOUND/OUTBOUND P.1
INBOUND/OUTBOUND CONT. P.2
TURNAROUND P.3
ALTITUDES
500'
17,000'


10 JULY 1974
MISSION 191-1
FRENCH DC-7
(CARGO)
TYPE 2
PAGE ONE
PAGE ONE: ROUTE DOT FROM DAKAR / TO DAKAR
PAGE TWO: " " " " / TO DAKAR
PAGE THREE: " " " " / TO DAKAR
PAGE FOUR: TURNAROUND
ALTITUDES
x climb
□ 10,000'
△ 9,100'
§ 1 of 4
10 JULY, 1974
MISSION 191-1
FRENCH DC-7
TYPE 2
§ 2 of 4
PAGE TWO
TO P. 1
INBOUND/OUTBOUND P. 1
INBOUND/OUTBOUND P. 2
INBOUND/OUTBOUND P. 3
EQUATOR TURNAROUND P. 4
ALTITUDES:
□ 10,000'
△ 9,100'
○ 4,000'
DATE
MISSION
CONT. FROM PAGE 2
10 JULY, 1974
MISSION 191-1
FR. DC-7
TYPE 2
§ 3 of 4
To P. 2
PAGE THREE
INBOUND/OUTBOUND P. 1
INBOUND/OUTBOUND P. 2
INBOUND/OUTBOUND P. 3
EQUATOR TURNAROUND P. 4
PAGE 4
CONT. FROM § 3.
To P. 3
ALTITUDES
○ 4100'
△ 4000'
POINTS = 19-24
ENLARGED SECTION
10 JULY, 1974
MISSION 191-1
FR DC-7
TYPE 2
ALTITUDES
○ 4100'
△ 4000'
□ 500'
N°23 at 3000'
INBOUND/OUTBOUND P. 1
INBOUND/OUTBOUND P. 2
INBOUND/OUTBOUND P. 3
EQUATOR TURNAROUND P. 4
SEE ENLARGED SECTION AT RIGHT
CONT. ON PAGE 5
Ref's note: there is no page 5 for this flight


10 JULY, 1974
MISSION 191-1
TYPE 2
CV-990
PAGE ONE
PAGE 1: ROUTE FROM DAKAR/RETURN
PAGE 2: CONTINUED ROUTE FROM DAKAR AND TO DAKAR
PAGE 3: PATTERN FLOWN
PAGE 4: RETURN TO DAKAR
ALTITUDES
Pt. = 1 at 30,000'
Pt. = 22 at 25,760'
DAKAR
PAGE TWO
10 JULY, 1974
MISSION 191-1
CRAFT: CV-990
TYPE 2
INBOUND/OUTBOUND P.1
INBOUND/OUTBOUND CONT. P.2
PATTERN P.3
RETURN P.4
ALTITUDES
□ 31,000'
△ 30,000'
FROM P.4
PAGE THREE
10 JULY, 1974
MISSION 191-1
CRAFT: CV-990
TYPE 2
PATTERN I
INBOUND/OUTBOUND P.1
INBOUND/OUTBOUND CONT. P.2
PATTERN P.3
RETURN P.4
ALTITUDES
□ 30,000'
○ 20,000'
CONT ON PAGE 4
TO P.2
10 JULY, 1974
MISSION 191-1
CV-990
TYPE 2
INBOUND/OUTBOUND P.1
INBOUND/OUTBOUND CONT P.2
PATTERN P.3
RETURN P.4