

## 2 Operations Coordination

*as of 1 September 1999*

### 2.1 Introduction

This chapter describes the process by which the MAP operations will be coordinated, in order to provide the best chances to achieve the scientific objectives described in the MAP Science Plan, and summarized in the above Chapter 1. This involves the following main items:

- The concentration on all information concerning the status of measuring systems, the weather situation, the previous achievements or failures during the field phase, and the proposals of the PIs.
- The decision to start an IOP and to finish an IOP. This must be based on consideration of the interest of the upcoming weather, and availability of measuring platforms and resources.
- The selection of the most promising flight missions for the following days. It must occur approximately midday on the day before the mission, and must be based on the opportunities presented by the predicted weather situation, and on a precise record of previous achievements and agreed apportionment of resources to the various scientific objectives. Full consideration must be given to the coordination and overall balance of flight missions for any given day.
- The selection of the most appropriate operation modes and timing of some other measurement systems (radiosondes, constant level balloons, radars, etc...).
- The notification of the above decisions to whom it may concern.
- The pre-flight ATC contacts by the MOC, and in-flight aircraft coordination by the POC.

Generally speaking, the operations will be coordinated from the MOC, where the Science Director, the Operations Director, and most of the members of the Mission Selection Team will reside. However, the MOC will remain routinely in contact with the POC and the COC, and will transfer to these centres the responsibility of coordination at specific times and for specific activities. One member of the Mission Selection team will reside in the POC in order to facilitate the coordination between the centres.

The decision process is represented in Fig. 2-1 as a logical diagram, that will be extensively discussed in the next sections of this chapter.

### 2.2 Description of the main functions and responsibilities

The functional description of the main positions during the SOP is given below. and the staffing of these positions is listed in Table 2-1 for the MOC, in Table 2-2 for the POC and in Table 2-3 for the COC.

**The Principal Investigators (PIs):** Each scientific team will designate a PI, who will speak for the team in the discussions and formulate the proposals for the next few days. The PIs will stay in contact with each others by internet and personal phone calls, in order to formulate joint mission proposals during the daily planning meeting, inasmuch as possible. The PIs may be located at the MOC, POC or COC.

*as of 1 September 1999*

**Schematic of MAP Interactions and Decision Sequences**

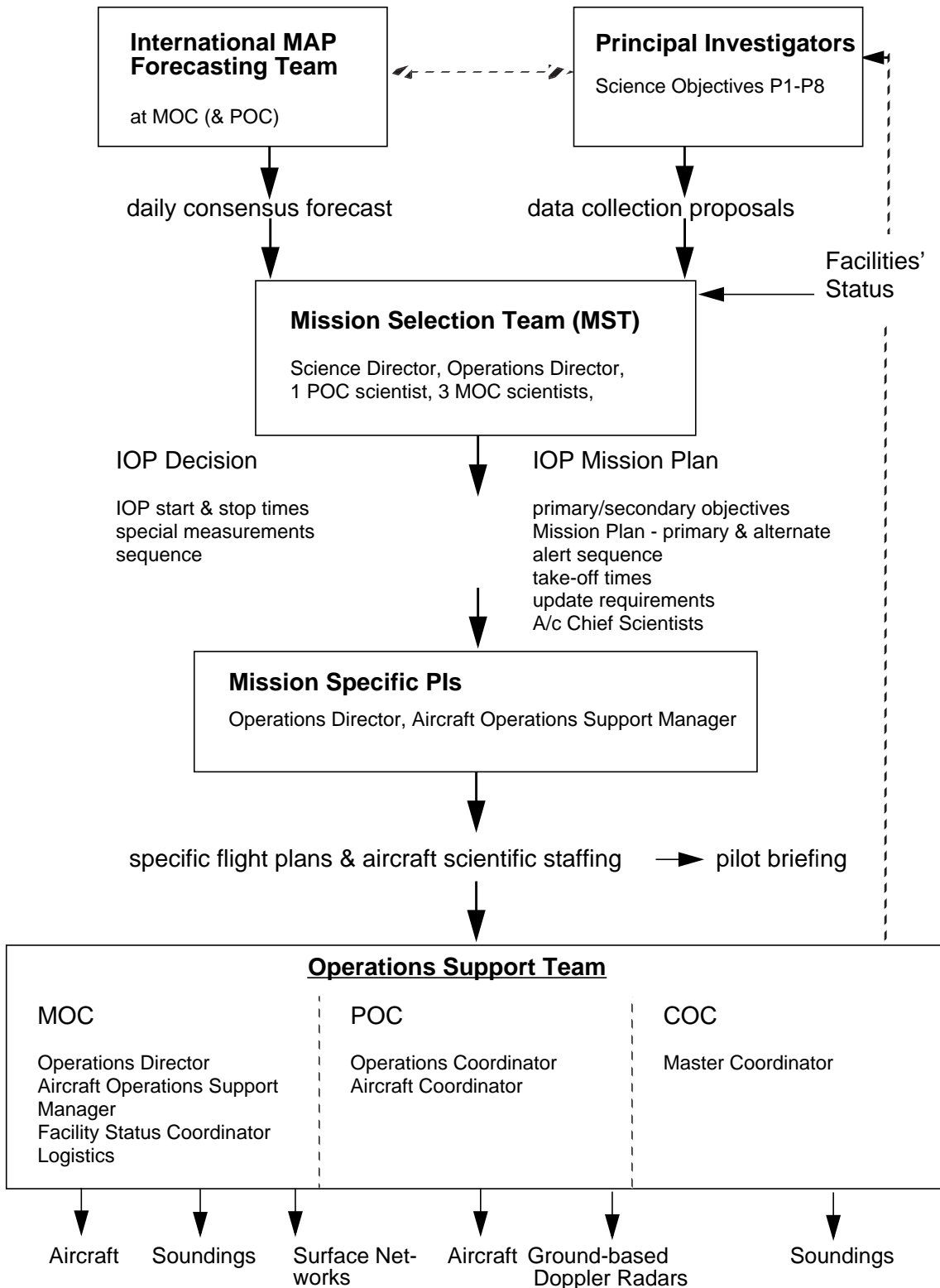


FIGURE 2-1. Functional diagram for decision finding and implementation

**The MOC Director:** The MOC Director is responsible for the overall activity of the MOC and the staffing of various support positions at the MOC. He will also liaise with the Innsbruck airport authorities and local service suppliers.

The MOC Director carries the responsibility that the contacts to the (international) media are properly handled. At least part of the time a dedicated person will be on-site to do all the necessary work to ensure an active public information policy and to accommodate incoming requests.

**The Science Director (SD):** The SD will bear the overall responsibility of the planning process. He will convene and chair the meetings of the Mission Selection Team (MST) and co-chair with the Operations Director the Daily Planning Meeting. He will have the responsibility for assuring that input from all PIs is received and considered for the purpose of mission planning. He will interface with the weather forecasting teams to insure that a consensus forecast is available for the daily planning meeting. The SD will be located at the MOC.

**The Operations Director (OD):** The OD will bear the primary responsibility of the conduct of the IOPs, following the directives of the MST. He may alter the MST mission directives as dictated by operational restrictions, safety, equipment failures, etc.

He will also bear the responsibility of concentrating the information on the status of observing systems and providing this information during the daily planning meeting. He will coordinate the support activities, and assign duties to the systems coordinators.

The OD co-chairs the Daily Planning Meeting with the Science Director and chairs the Morning Briefing.

The OD will be located at the MOC.

**The Facility Status Coordinator (FSC):** This person will bear the responsibility of keeping track of the status of all key measurement systems involved in MAP. He will report to the OD, prepare the daily update for presentation during the various briefings, and keep in touch with facility managers. He will also keep regular updates of the use of consumable resources (flight hours, dropsondes, radiosondes, etc...). He will assist the OD with the notification procedures. He will be located at the MOC.

**The Aircraft Operations Support Manager (AOSM):** This person will be in charge of facilitating all relations with the Air Traffic Controllers (ATC), with the various airfields involved in MAP operations, and with other subjects which are related to aircraft operation during the MAP-activities, like opening of airports outside of normal operating hours.

- Inform all involved ATC-units by pre-ahead information with strawman and/or master-flight-plans of the MAP-aircraft.
- Inform all ATC-units about dropsonde operations and ask if special clearances for this type of operation are mandatory. Collect information about the local procedures and inform A/c-operators and MST of individual status.
- Obtain proper clearances by providing 24 hours notification to involved ATC-units in Europe.
- Coordinate and if necessary adjust the planned flights with the MST, aircraft operators, pilots and ATC.
- Support and assist the aircraft-operators / pilots for filing the individual flight plans.
- Evaluate on pre-alert information from the MST, if certain areas are free for MAP. Provide to the MST useful information from ATC-centres about suggested alterations and timing / periods for certain routings.
- Stay in close contact with EUROCONTROL headquarters in Brussels for high-altitude

operations which are carried out during MAP to find out, if the requested airspace is under slot-regulation and evaluate alternate routings.

**Head of Forecasting Office:** The Head of the Forecasting Office leads the international forecasters team at the MOC Forecasting Office and is responsible for the staffing of the shifts. He has to ensure the smooth and continuous forecasting support to the MAP scientists and OD.

**Student Assistance:** A crew of 2 students will be routinely available at the MOC for support of the MAP operations. Specific duties of these assistants include:

- update weather display walls;
- production of overview (standard) products from extra-surface data (via MAVIS);
- support OD and FSC with notification procedures;
- support Facility Status Coordinator with gathering and displaying facility status;
- acquire and process METEOSAT-6 rapid scans at the MARF ftp-site;
- provide technical and logistical support for meetings (Morning Briefing, Daily Planning Meeting, Science Review Meeting, etc.).

**The POC Director:** The POC Director is responsible for logistic support and general coordination of POC operations and activities: He is supported by two IAF Officers (a flight security expert and an ATC coordinator), for verification of flight security procedures in Italy. Decision for specific aircraft operations cannot be taken without their agreement, in order to guarantee the highest possible level of in flight safety and the full respect of flight rules. The presence of a Flight Security Expert has been requested by IAF.

He will also ensure the staffing of the forecasting centre at POC and will liaise with the Linate airport authorities and with local service suppliers.

**The POC Science Coordinator (PSC):** The PSC will be responsible for ensuring that the scientific objectives of Wet MAP are achieved. He will chair the daily meetings at POC and participate in the daily conference call with MOC and the MST. The POC Science Coordinator is a member of the MST.

**The POC Operations Coordinator:** The POC Operations Coordinator will be responsible for the coordination of activities of MOC and POC, for the daily deployment and operation of ground-based research radars, as well as for ancillary instruments (soundings, raingauges). He will be responsible for the day-to-day logistics and staffing of the scientific personnel at POC.

**The POC Aircraft Coordinator:** This person will communicate with airborne mission scientists during flights to coordinate and optimize the flight tracks of the NCAR Electra, the NOAA P-3, the DLR Falcon, and the Fokker 27 aircraft with respect to Wet-MAP Science Objectives, and in Dry MAP PV banner studies. This direction and coordination will be based on real-time radar and satellite data available at the POC. The objective will be to place the aircraft in one of the target areas. The "Lago Maggiore" target area will have the highest priority since it is the location of the ground-based radars. Once the aircraft are committed to one of these regions, the aircraft coordinator (working closely with the local liaison to the air traffic control system) will advise the aircraft mission scientist on tracks that will best optimize the aircraft radar and microphysical measurements in relation with the ground-based radar observations.

**Further functions at the POC :** The following functions are staffed by local officials and coordinated by the POC Director:

- flight security expert (Italian Air Force Pilot Officer), requested by IAF
- ATC coordinator (Italian Air Force ATC Officer)
- HW and SW engineers (team of CMR and POC scientific group experts)
- forecasters and nowcasters

**The COC Master Coordinator:** The COC Master Coordinator will bear the overall responsibility of operations in the Rhine Valley. He will remain in contact with the MOC and will forward specific proposals of the COC to the MST.

On a local level, he is responsible for calling in the necessary meetings for any decision making regarding the local organization, the suggestion of IOPs (to the MOC), as well as any special activity.

He ensures that requests from the MOC for special activities in the Target Area Rhine Valley (e.g. additional radiosoundings, special information and/or observations by individual research projects within the Target Area) are understood and fulfilled whenever possible.

He is responsible for keeping close contact with the PIs of the individual research projects carried out in the Target Area Rhine Valley, supplying them with the basic information required for their operations.

**COC Data Coordinator:** A Data Coordinator will be permanently present at the COC, transmitting quick-look data to the MDC from where it can be retrieved for use in the MOC and POC. Data from some upper air stations will be fed directly to the GTS.

**COC staff:** The Terms of Reference of the COC staff include:

- overall coordination within FORM
- information exchange with MOC
- decision making with respect to local organization
- suggestion of IOPs
- other special activities
- technical-scientific coordination of military and civilian sounding activities
- assisting the military in technical-scientific as well as organizational matters
- represent the interest of the FORM projects via the MOC
- collect and formally check data from all sounding stations in the TA
- ensure data exchange between COC, POC and MOC
- assist data exchange between individual projects and COC
- calibrate reference instruments of sounding stations ( $x, y, z, p_0, T_0, U_0, dd_0$ )
- assist calibration of instruments used in FORM.

This coordination is realized in daily briefings. In addition to the key persons of FORM projects who are asked to participate, anybody is welcome.

**Summary of MOC, POC and COC functions:** The above functions will be staffed as described in Table 2-1 for MOC functions, Table 2-2 for POC functions and Table 2-3 for COC functions.

TABLE 2-1. Staffing of MOC functions (as of 15 July)

<b>week # date</b>	<b>MOC Director</b>	<b>SD (alternate)</b>	<b>OD (alternate)</b>	<b>Facility Status Coordinator (FSC) (alternate)</b>	<b>Aircraft Operations Support Manager (alternate)</b>	<b>Head of Fore- casting Office (alternate)</b>	<b>MAP Data Cen- tre and MAP Network Manager</b>
35: 31.8.	Pümpel					Parson	Hirter (Guy)
36: 7.9.	Pümpel	Bougeault (Schär)	Dirks (FSC)	Rossa (I. Steinacker)		Parson	Hirter (Guy)
37: 14.9.	Pümpel	Bougeault (Schär)	Dirks (FSC)	Rossa (I. Steinacker)	Finkenzeller (Pümpel)	Parson	Hirter (Guy)
38: 21.9.	Pümpel	Bougeault) (Schär)	Dirks (FSC)	Skubis (19.9) (I. Steinacker)	Finkenzeller (Pümpel)	Parson	Hirter (Guy)
39: 28.9.	Pümpel	Bougeault	Dirks (FSC)	Skubis (I. Steinacker)	Finkenzeller (Pümpel)	Parson	Hirter (Guy)
40: 5.10.	Pümpel	Bougeault / Smith (arr. 10.10.)	Dirks (FSC)	Skubis (I. Steinacker)	Finkenzeller (Pümpel)	Parson	Hirter
41: 12.10	Pümpel	Bougeault / Smith	Dirks / Binder (FSC)	Skubis / I. Steinacker (16.10.)	Finkenzeller (Pümpel)	Parson	Hirter
42: 19.10	Pümpel	Smith	Binder (FSC)	I. Steinacker (student assist- ant)	Austrocontrol (Pümpel)	Parson	Hirter
43: 26.10.	Pümpel	Smith	Binder (FSC)	I. Steinacker (student assist- ant)	Austrocontrol (Pümpel)	Parson	Hirter
44: 2.11.	Pümpel	Smith	Binder (FSC)	Rossa (1.11.) (I. Steinacker)	Austrocontrol (Pümpel)	Parson	Hirter
45: 9.11.	Pümpel	Smith	Binder (FSC)	Rossa (I. Steinacker)	Austrocontrol (Pümpel)	Parson	Hirter
46: 16.11.	Pümpel						Hirter
47: 23.11.	Pümpel						Hirter

TABLE 2-2. Staffing of POC functions (as of 15 July); shift plan to be established

week #	POC Director	POC Science Coordinator (alternate)	POC Operations Coordinator (alternate)	POC Aircraft Coordinator (alternate)
35: 31.8.	Frustaci			
36: 7.9.	Frustaci	POC MST member	Moore	
37: 14.9.	Frustaci	POC MST member	Moore	Houze (Moore)
38: 21.9.	Frustaci	POC MST member	Moore	Houze (Moore)
39: 28.9.	Frustaci	POC MST member	Moore	Houze (Moore)
40: 5.10.	Frustaci	POC MST member	Moore	Houze (Moore)
41: 12.10	Frustaci	POC MST member	Moore / Meitin (16.10.)	Houze (Moore)
42: 19.10	Frustaci	POC MST member	Meitin	
43: 26.10.	Frustaci	POC MST member	Meitin	
44: 2.11.	Frustaci	POC MST member	Meitin	
45: 9.11.	Frustaci	POC MST member	Meitin	
46: 16.11.	Frustaci	POC MST member	Meitin	
47: 23.11.	Frustaci	POC MST member		
candidates		R. Houze R. Rotunno A. Buzzi (M. Steiner) (J. Wilson)	J. Moore R. Houze (R. Rotunno) (M. Steiner) (J. Wilson)	J. Moore R. Houze R. Rotunno M. Steiner J. Wilson

TABLE 2-3. Staffing of COC functions (as of 15 July); shift plan to be established

week #	COC Master Coordinator (alternate)	Soundings Coordinator (alternate)	permanent staff	Data Coordinator (alternate)
35: 31.8.				
36: 7.9.				
37: 14.9.	Richner (Steinacker)	Häberli (Fabri)	Gubser	Häller
38: 21.9.	Richner (Steinacker)	Häberli (Fabri)	Gubser	Häller
39: 28.9.	Richner (Steinacker)	Häberli (Busenhart)	Gubser	Häller
40: 5.10.	Richner (Steinacker)	Häberli (Busenhart)	Gubser	Häller
41: 12.10	Richner (Steinacker)	Häberli (Franz)	Gubser	Häller
42: 19.10	Richner (Steinacker)	Häberli (Franz / Burkhalter)	Gubser	Häller
43: 26.10.	Richner (Steinacker)	Häberli (Burkhalter / Frischknecht)	Gubser	Häller
44: 2.11.	Richner (Steinacker)	Häberli (Frischknecht)	Gubser	Häller
45: 9.11.	Richner (Steinacker)	Häberli (Frischknecht)	Gubser	Häller
46: 16.11.	Richner (Steinacker)	Häberli	Gubser	
47: 23.11.				

**The Mission Selection Team (MST):** The MST bears the responsibility of the final decision about the operations.

The MST is composed of 4 PIs, in addition of the SD and the OD. It is chaired by the SD. The PIs rotate by periods of 15 days. The staffing of the MST as decided by the IGP is given in Table 2-4. It will be fine-tuned in order to represent the MAP scientific community, scientific projects, and funding agencies in a balanced way. One of the PIs of the MST is the POC Science Coordinator, and the MST meets in audioconference between Milano and Innsbruck. One of the MST members represents the interests of the COC.

The MST will meet in principle once a day, at the end of the daily planning meeting, in order to take the main decisions for the next few days. Between MST meetings, the SD and the OD will act on behalf of the MST. Extraordinary meetings of the MST may be convened by the SD when needed.

TABLE 2-4. Staffing of the Mission Selection Team. The MST Member at MOC labelled (C) is responsible to take care of the interests of the COC.

week #	SD	OD	MST MOC	MST POC	remarks
35: 31.8.					
36: 7.9.	Bougeault	Dirks	Schär Steinacker (C) Malguzzi	Cassardo	
37: 14.9.	Bougeault	Dirks	Schär Mayr (C) Malguzzi	Cassardo	
38: 21.9.	Bougeault	Dirks	Benoît Jorgensen Steinacker (C)	Houze	
39: 28.9.	Bougeault	Dirks	Benoît Jorgensen Mayr (C)	Houze	
40: 5.10.	Bougeault	Dirks	Davies Durrán (C) Smull	Rotunno	Smith arr. 10.10. Binder arr. 6.10.
41: 12.10	Smith	Binder	Davies Durrán (C) Smull	Rotunno	Dirks dep. 12.10.
42: 19.10	Smith	Binder	Richard (C) Volkert Armi	Houze	
43: 26.10.	Smith	Binder	Richard (C) Volkert Armi	Houze	
44: 2.11.	Smith	Binder	Roux Broad Hoinka (C)	Buzzi	
45: 9.11.	Smith	Binder	Roux Broad Hoinka (C)	Buzzi	

### 2.3 The IOP planning and execution process

The special observations of MAP will be concentrated during Intensive Observing Periods (IOPs). The MST will be responsible to define a series of IOPs throughout the field phase in order to address all scientific objectives of the MAP Science Plan with adequate resources, inasmuch as it will be allowed by the weather. An IOP may vary in length from several hours to several days depending on the weather conditions and the status of observing systems.

The basis for the discussion of the IOP planning by the MST will be the PI proposals, the weather forecast and the status of the observing facilities. This process is described in a logical way by Fig. 2-1. The daily schedule is described in Fig. 2.2. This applies equally during IOP and non-IOP periods. However, the schedule during IOPs may feature various additional briefings, as required by the MST for update of the situation, as well as pilot briefings and debriefings.

### **2.3.1 Morning Briefing**

The Morning Briefing chaired by the OD and starting at 0615 UTC in the briefing room will be open to the PIs and their assistants, and will take place simultaneously at MOC and POC, after consultation of the forecasters to reach consensus. The purpose of these short briefings is to update their information on:

- the current MAP operations (during IOPs, latest flight planning, or flights in progress; responsibility of OD)
- the status of observing systems (especially aircraft and research radars; responsibility of FSC)
- the weather forecast (responsibility of lead forecaster)

In-depth weather discussions can be continued in the Forecasting Office, but the number of persons attending must be limited to the SD, OD and main potential PIs for the day (to come).

The information received by the PIs during these meetings will be the basis of the subsequent planning phase.

Note that there will be no forecasting capability at the COC. The COC PIs will therefore rely on one of their representative at the MOC to obtain information on the weather. In case that there is no representative of the COC present at the MOC, a telephone call by one MOC forecaster to the COC could be arranged after the Morning Briefing.

### **2.3.2 Preparation of science proposals**

At a designated time following the Morning Briefing, the POC Science Coordinator and the COC Master Coordinator will discuss the current situation with the PIs at the MOC. The purpose of these discussions is to focus on possible proposals for the next 24-48 hours. Topics will include: the weather situation, the facilities status and availability, the pressing scientific requirements, and the trade-off of facilities among Wet and Dry MAP objectives.

All investigators that are interested in conducting data gathering activities will then prepare short science mission proposals for consideration at the daily planning meeting. The proposals should contain the following information:

- Science objective to be accomplished
- Responsible PIs
- Resource requirements (flight duration, dropsondes)
- Timing of facility use (aircraft take-off time, sounding times, etc.)
- Other special requirements (rapid scan satellite, etc.) or special features of the missions

# MOC/POC/COC Daily Coordination

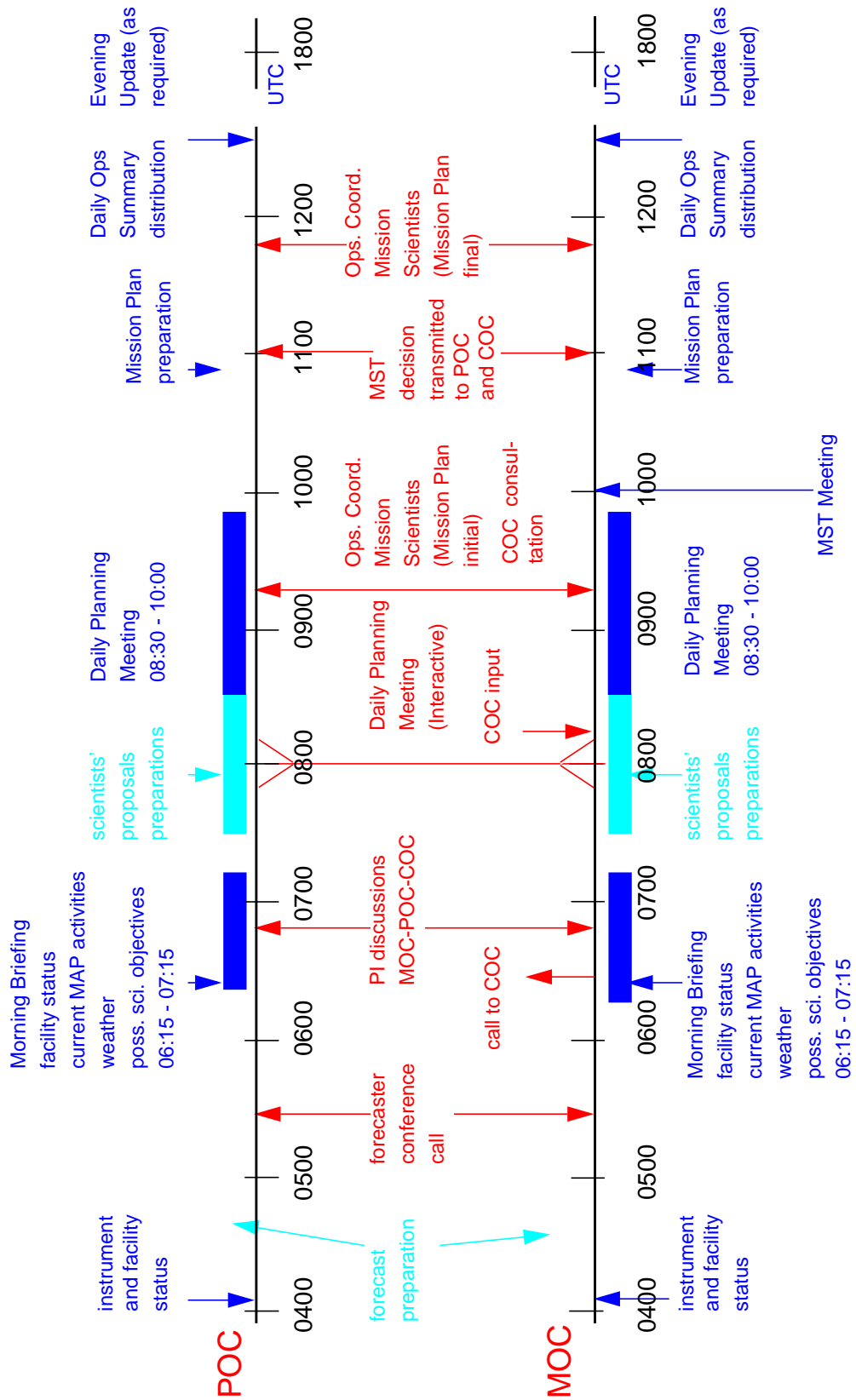


FIGURE 2-2. POC and MOC: schedule of the daily coordination. Hours are in UTC. .

### **2.3.3 Daily Planning Meeting**

The Daily Planning Meeting will occur every day at 0830 UTC. It will be co-chaired by the SD and the OD, and will take place in audio-conference with the POC, using the Timbuktu system on Internet (cf. Section 9.1.3). The agenda for the meeting will be consistent each day and will include the following items:

- Status of aircraft and ground systems (to be presented by the Facility Status Coordinator and/or the OD)
- Weather discussion (MOC and POC forecasters) (24-96 hours)
- Report on the status of scientific objectives and recent results (SD and PIs)
- Presentation and discussion of mission proposals by PIs for the next 24-48 hours
- Logistics or administrative matters, other announcements

### **2.3.4 Daily MST meeting**

Immediately after the daily planning meeting (around 1000 UTC), the MST will meet in order to decide about IOP start, continuation, end, and specific mission selection for the next 24-48 hours. The MST may invite some PIs for further discussion before the final decision. However, mission decisions are taken by the MST alone. The MST meeting will be chaired by the SD. The following items will be addressed during this meeting:

- Selection of primary and alternate missions, including brief discussion of objectives and strategy, and criteria for proceeding to the alternate missions
- Assignment of staffing for IOP support for the next 24-48 hours
- Schedule of facility operations:
  - Aircraft pre-flight briefing time
  - Flight plans
  - Aircraft take-off time
  - Special sounding and balloons launch times
  - Time of the next planning meeting for update

In any case, the decisions should be made before 1100 UTC.

These information will be combined with others from the daily planning meeting for the preparation of the Daily Operations Summary (see below).

### **2.3.5 Notification procedures**

All decisions taken during the MST meeting are notified to the MAP PIs through the MAP field catalogue and through a recorded phone message containing the Daily Operations Summary. This document will be prepared by the OD and the Operations Staff within an hour of the daily MST meeting end, and reviewed by the SD, before being posted. Key facility managers will be notified directly by the Operations Staff.

### **2.3.6 Preparation of Mission Plans**

The afternoon is used for technical preparation of the missions of the following day. The execution of the MST decisions is under the leadership of the OD.

Precise flight plans will be designed by the aircraft mission scientists in coordination with the AOSM for both primary and alternate missions. The AOSM will contact ATC centres to coordinate flight plans for the next day including coordination with the IAF Flight Security Officer at the POC. Research radar scanning schedules and strategies will be prepared at the POC under leadership of the POC Science Coordinator.

Specific mission plans will be prepared for the Rhine Valley operations (COC Master Coordinator), Brenner Pass / Wipp Valley operations (gap flow PI), hydrology watershed operations (hydrology PI), and orographic PBL operations (PBL PI).

### **2.3.7 Special updates**

The MST, the SD, or the OD can request special update briefing at just about any time during an IOP. Evening updates are the most likely, when new model outputs become available. During these update briefings, the evolution of the weather situation will be assessed, and a final choice concerning the flight missions will be made.

### **2.3.8 Pre-flight briefing and flight debriefings**

The aircraft crew and scientists will receive their instructions during a pre-flight briefing presented 1-2 hours before scheduled take-off. The detail of these pre-flight briefings will vary from one airplane to the other. Flight debriefings will be organized in a similar way, shortly after a flight is completed.

These briefings will be convened by the OD and/or POC Operations Coordinator, and attended by the pilots and the scientists of the mission.

### **2.3.9 Science Review Meeting**

Science Review meetings will be organized to evaluate the achievements of the scientific projects and the overall utilization of expendable resources. They shall be held every 3 to 4 weeks during the SOP and convened by the SD. Attendance is open to all MAP scientists.

## **2.4 Aircraft Coordination**

### **2.4.1 Regional Air Traffic Control contact**

The pre-flight coordination will be the responsibility of the Aircraft Operations Support Manager (AOSM). During the afternoon prior to each IOP day, the AOSM will contact the relevant ATC centres for all missions planned for the next day, explain the specific constraints, and negotiate flight clearances.

Based on the existing master flight plans (Fokker 27, Merlin IV, P-3, Electra, Falcon, UK C-130) the following ATC-Units have received pre-information of MAP and of individual flight-plans.

TABLE 2-5. ATC contacts for MAP aircraft operations

Country	Flight Information Region (FIR)	contact (tel / fax)	Senior Controller (last minute information) (tel / fax)	remarks
Italy	Milano			
	Padova			
Switzerland	ACC Zurich			delegated to ACC's
	Geneva ACC			
Austria	Vienna			for lower flight levels until FL 170
	ACC Innsbruck			
France	Marseille			
	Reims			
Germany	Munich			
	Frankfurt			
Croatia	Zagreb			
Slovenia	Ljubljana			

*Heinz Finkenzeller writes:*

*Details with contact persons (normal pre-ahead procedure) and last-minute information (Senior-Controller) with telephone and fax numbers will be issued and released during the first week of operations at Innsbruck and distributed to all involved participants.*

*At the moment I don't have a complete feed-back from all ATC-units and to avoid any incorrect information I have to re-check with some of the ATC-units before the MAP-SOP.*

Aircraft notification requirements are summarized in Table###.

#### **2.4.2 In-flight coordination on the southern Alps from the POC**

For wet-MAP missions on the southern side of the Alps, the local in-flight coordination will be done from the POC, in order to take advantage of the ground radar composite and the direct radio link. The take-off time will be decided in consultation between the OD and the POC Operations Coordinator, during the Morning Briefing, within the window allowed by the aircraft operational rules. In-flight coordination is assumed by the POC Aircraft Coordinator, once he is in contact with the aircraft by radio.

The protocol for air-ground scientific communication will be the following:

- i) A dedicated air traffic control frequency (136.8 MHz) will be used for all communications between the POC and MAP aircraft. This frequency will also be used for communications between airborne chief scientists to coordinate flight patterns or to discuss the evolving weather and flight planning strategies. A secondary communication frequency will be established as a backup, and will probably be one of the NOAA Aircraft Operation Centre's frequencies (e.g. 122.925 MHz).*
- ii) All scientific information will be passed from the POC aircraft coordinator to the individual aircraft chief scientists over the dedicated air traffic control frequency. The use of this frequency by other personnel should be minimized. The passing of information*

(e.g., suggested flight tracks) must be in latitude and longitude coordinates (degrees, minutes, and seconds). The altitudes will be passed as feet above the mean sea level (MSL). Critical precipitation information to be passed to the aircraft will include:

- location of high reflectivity cells (>40dBZ), their maximum echo tops, and motion vector
- end point locations and orientation of reflectivity bands, as well as motion vector of bands as a whole
- any observer report of severe weather such as hail, damaging surface winds, or lightning
- areas of new storm growth

This information should be passed to the aircraft at least once every 15 minutes. Changes in flight tracks must be given with at least 15 minutes lead time.

All communications with ATC to coordinate aircraft flight tracks (and changes to flight patterns) will be done only by the pilots of each aircraft. All final decisions regarding penetrations of precipitating areas will rest with the individual aircraft pilots and are not subject to debate.

For dry-MAP missions the POC Aircraft Coordinator will be also asked to relay the latest information from the MOC to the aircraft in-flight scientists, if direct communication is not possible from the MOC.

Flight planning for dry-MAP missions over Italy will be coordinated with the IAF Flight Security Officer at the POC (especially important to MAP aircraft based at the POC).

### **2.4.3 POC support activities**

The POC has defined six positions that must be supported during the SOP. These positions are defined as follows:

- PCD: POC Centre Director;
- PSC: POC Science Coordinator;
- POCOC: POC Operations Coordinator;
- PAC: POC Aircraft Coordinator'
- PES: POC Radar Engineers;
- PRS: POC Radar Scientists.

Appendix J A-F shows activities for each position throughout a typical SOP day. The day has been divided into four six-hour blocks. The six different daily schedules represent likely scenarios ranging from non-IOP down days to fully supported wet- or dry-MAP operations. The required activities for each position are shown for each six-hour time block for a given day. These activities are consistent with support and documentation requirements described elsewhere in this MIP. Adjustments to these activities are possible as conditions warrant.

### **2.4.4 NCAR Electra in-flight coordination**

The NCAR Electra aircraft will also have a satellite telephone link, allowing for direct communications from any telephone in the greater MAP domain. This may be used for transmitting real-time information with special arrangements.

### 2.4.5 POC Coordination in dry-MAP

The Coordinative function of the POC in dry-MAP aircraft operations includes

- contribute to flight planning over Italy
- pre-flight briefing for the French pilots
- communications

## 2.5 Radar Coordination

TABLE 2-6. Contacts and minimum notification time to research radar stations (### to be completed).

responsible person	instrument	min. notification time	SOP tel	SOP fax	SOP email
C. Capsoni	radar	24h	+3902-23993572	+3902-23993413	capsoni@elet.polimi.it
E. Barthazy	vert. radar (X) on van	2h	number not yet known	no fax	eszter@atmos.umnw.ethz.ch, goeke@atmos.umnw.ethz.ch
G. Scialom	Ronsard Doppler radar	6-12h	at radar or hotel or cellular phone	no fax	at radar site
J. Wilson	S-Pol radar	12h	probably cell phone	no fax	no email
M. Loeffler-Mang	vert. pointing Doppler radar (K)	not req.	private: +49-721-621369, +41-91-7562304 (Ulrich Blahak)	no fax	no email
M. Steiner, B. Smull	DOW-Doppler radar on wheels (X)	3-6h	no phone	no fax	no email
R. Cavalli	radar Monte Lema	1h	+41-91-756 23 18, +41-79-667 69 06 (mobile)	+41-91-756 23 10	jjo@sma.ch, cav@sma.ch, gga@sma.ch, uge@sma.ch, mbc@sma.ch
R. Houze	UW radar	unknown	unknown	unknown	unknown
W. Schmid	ETH Doppler Radar	2h	+41-1-633 68 05 (office), +41-79-451 56 56 (mobile), +41-1-262 61 78 (H. Schiesser)	+41-1-633 10 58 (office), +41-1-700 10 02 (home)	schmid@atmos.umnw.ethz.ch

## 2.6 Sounding Coordination

For France, the order to start enhanced soundings and to stop enhanced soundings must be transmitted to the head of the central forecasting office, telephone and fax number to be supplied shortly.

TABLE 2-7. Contacts to operational radiosounding stations (### to be completed).

Station	WMO #	responsible person	email	tel	fax	p: pre-alert a: alert n: notif.
Payerne	06610	J.-M. Clerc A. Pittet H. Berger D. Ruffieux	met@sap.sma.ch AND cle@sap.sma.ch AND api@sap.sma.ch AND hbe@sap.sma.ch AND dcr@sap.sma.ch	+41 26 662 62 62 +41 26 662 62 17 +41 26 662 62 44 +41 26 662 62 47	+41 26 662 62 12	p: 60h a: 36h n: 12h
Trappes	07145	chief forecaster, Toulouse	no	+33 5 6107 8220	+33 5 6107 8232	n: 24h
Nancy	07180					
Lyon	07481					
Nimes	07645					
Ajaccio	07761					
Palma de Mallorca	08301		cmtibal@inm.es gpvpm@ formentor.inm.es			n: 24h
Stuttgart	10739	Mr. Leisner	no	+49 711 550352 140/142	+49 711 550352 144	n: 24h
München	10868	Mr. Schwemmer	no	+49-89 3156180	49-89 3154220	n: 24h
Wien	11035	Dipl.-Ing. K. Zimmermann	kurt.zimmermann@ zamg.ac.at AND tawes@zamg.ac.at	+43 1 36026 2702 / 2708	+43 1 36026 2720	n: 24h
Innsbruck	11120	Herbert Pümpel; ACG forecaster on duty	herbert.puempel@ austrocontrol.at	face to face; +43-676-5074681	+43-512-1703 46 46	n: 24h
Ljubljana	14015	forecaster on duty	map@rzs-hm.si AND metprog@rzs-hm.si	+386 61 178 42 49	+386 61 132 0088	n: 24h
Zagreb	14240	Vlasta Tutis Branka Ivancan- Picek Forecaster Office	tutis@cirus.dhz.hr picek@cirus.dhz.hr sinop@cirus.dhz.hr	+385 1 4565 678 +385 1 4565 678 +385 1 434 289	fax. +385 1 431 026	n: 24h
Cuneo	16113	via POC Renata Pelosini Roberto Cremonini	renata.pelosini@csi.it roberto.cremonini@csi.it	+39-011-3168702 +39-011-3168565	+39-011-3181709	n: 24h
Udine	16044	via POC				n: 24h
Milano	16080	via POC				n: 24h
San Pietro	16144	via POC Sandro Nanni	s.nanni@smr.arpa.emr.it	+39 051284559	+39 051284664	n: 24h
Cagliari	16560	via POC				n: 24h

TABLE 2-8. Contacts to experimental radiosounding stations (### to be completed).

Station	WMO #	data on GTS	responsible person	notification procedure
Genova	16121	yes		by POC
Verona	16087	yes	Renato Santangelo	by POC; fax +39 45 573 497 AND fax +39 59 373 180
Nice	07690	yes	chief forecaster, Toulouse	by MOC (analogous to French stations in Table 2-7)
Diepoldsau	06842	yes	Ch. Häberli	by COC
Masein	06843	yes	Ch. Häberli	by COC

## 2.7 Ground systems Coordination

See Chapter 6:

- Lago Maggiore target area: Section 6.1.1 for Po, Toce and Riviera Valley
- Rhine Valley target area: Section 6.2.1
- Brenner Pass target area: Section 6.3.1

## 2.8 Rapid Scan Image Operations by METEOSAT-6

### 2.8.1 Introduction

To support MAP, EUMETSAT has agreed to make the stand-by spacecraft – METEOSAT-6 at 9°W – available for rapid scan imaging for the duration of the SOP. In this special imaging mode the radiometer will scan a reduced latitude range, centred on the Alps, every five minutes. Each rapid scan will consist of 228 lines of image data covering the latitude range at the sub-satellite point of approximately 36.6° - 52.2°N. However, after rectification the number of usable lines will be reduced to about 170.

The decision to activate rapid scans will be taken by the MST, with due regard to the various constraints.

### 2.8.2 MAP-EUMETSAT Operations Interface

Requests for rapid scan imaging of the Alps will be initiated by the MAP Operations Centre. **Notification Requirement:** At least **twelve hours** are needed to configure and initialise the Meteosat-6 spacecraft and image processing system. Therefore requests for a period of rapid scanning should be sent as early as possible, and at least twelve hours before the requested start time.

Requests should be made via a telephone call, backed up by an email.

TABLE 2-9. METEOSAT rapid scan notification

EUMETSAT Mission Control Centre (MCC)	responsible Person	phone	email	
METEOSAT rapid scan	MCC shift leader	0049-6151-807 503 or 0049-6151-807 509	map@eumetsat.de	phone and email mandatory. Minimum notification time: 12 hours

This telephone as well as the accompanying email request should indicate:

1. The initiating centre (i.e. MOC)
2. The name of the initiator
3. A contact telephone number
4. The time at which rapid scan imaging should start
5. The time at which rapid scan imaging should stop

This information will be used by the MCC operators to plan the rapid scan imaging operations.

Once EUMETSAT operations personnel have generated a plan of the intended rapid scan imaging operations (the Rapid Scan Plan), taking account of the necessary start-up period and any interruptions for eclipse operations (see below), an e-mail will be sent to the sender of the alert and the following e-mail addresses:

- map@atmos.umnw.ethz.ch
- mocibk@zamg.ac.at
- pbi@sma.ch
- v.levizzani@isao.bo.cnr.it

This e-mail will indicate the planned rapid scan start time, end time, and expected outages.

Note that EUMETSAT will only perform rapid scan imaging when the requested operations do not conflict with other operational activities planned to take place at that time. The initiator will be informed by EUMETSAT if the requested rapid scan operations cannot be supported.

The responsibility to initiate rapid scans is with the OD at the MOC.

### 2.8.3 Rapid Scan Imaging Constraints

During the SOP, rapid scan imaging operations can be requested at any time (24 hours per day, 7 days a week), however, the following constraints apply:

**Duration of Rapid Scan Imaging Operations:** Rapid scan imaging may be requested for periods up to 24 hours. Under certain circumstances, it may be possible to image in rapid scan mode for up to 48 hours, but the geometric accuracy of the rectified images is likely to deteriorate somewhat after 24 hours.

**Eclipse Season Operations:** During the spacecraft eclipse season (3rd September - 15th October 1999) it will not be possible to image with Meteosat-6 for a few hours around local midnight. Therefore any ongoing rapid scan imaging will be interrupted for a few hours at these times.

#### **2.8.4 Access to Rapid Scan Image Data**

The rapid scan image data will be rectified and placed on a Meteorological Archive and Retrieval Facility (MARF) FTP server. The data will be stored in files in the OpenMTP format (ref.: EUM Format Guide No 1). Each file will contain one rectified rapid scan for one channel. So for the nominal MAP rapid scan imaging mode of 6 scans per half-hour, there will be 18 OpenMTP files available (6 IR, 6 WV, 6 VIS). These files will be available on the MARF ftp-server for a period of 7 days, after which they will be deleted (it is possible to re-generate these files at a later date if necessary). Operations staff at MOC will retrieve the rapid scan files regularly after each rapid scan period in order to make it available on the MAP network to the MAP scientists.

### **2.9 Documentation**

It will be very important for all MAP participants to provide complete documentation on all aspects of the data collection. The documentation will be organized in the following documents, and accessible through the MAP field data catalogue:

#### **2.9.1 Daily Operations Summary**

This report will be prepared using information and decisions from the daily planning meeting, status reports, and the MST decisions. It will include:

- The status of all MAP observing facilities
- Forecast summary for MAP domain as prepared by the MAP forecast team including any special charts and graphs
- The alert status (IOP in progress or scheduled start of the next IOP)
- Summary of primary and alternate mission plans for the next 24-36 hours and criteria for adopting the alternate plan
- Special activities under coordination of MOC, POC and COC
- Schedule of facility operations including pre-flight briefing times, proposed debriefing times, and any planned schedule changes (day-night operations)
- Named staffing assignments for critical positions (airborne mission scientists)

The daily operations summary will be prepared by the operations staff and coordinated by the OD.

#### **2.9.2 Data summaries**

Aircraft mission scientists will prepare summaries of each flight along with the aircraft flight track.

Summaries of the dual-Doppler radar data from the NCAR Electra aircraft will be posted on the MAP Field Catalogue as follows: A “mpeg” movie of ELDORA scans at approximately one-minute intervals will be made for every flight by the NCAR Electra scientists at the MOC. This movie will be also posted on the MDC and archived at NCAR. It consists of images, not raw data, and will serve as “metadata” for the archive of numerical data and thus allow for extremely easy selection of data of interest for research. The data summary for NCAR Electra flights will also include the airborne mission scientist write-up and the flight tracks.

Summaries of the data from the P3 aircraft will include the following items:

- i) Within several hours after the mission end: Chief scientist flight event logs, descriptive summaries, radar and cloud physics operator logs; ASCII files of aircraft data including time, aircraft GPS position, radar altitude, temperature, dewpoint, etc... at 1 sec resolution.
- ii) Within approximately two days after the mission end: Radar composites of the lower fuselage C-band radar sweeps for each straight and level flight leg segment; plots of P3 flight tracks, relative to ground topography, IR satellite imagery, and country borders; selected vertical sweeps images of tail Doppler velocities and reflectivity.
- iii) As time permits: selected pseudo-dual-Doppler analyses for interesting cases.

Data summaries as gif images of the Merlin IV will be available a few hours after the flight and will include the following:

- i) aircraft track,
- ii) time series over the entire flight of aircraft altitude, ground profile, downward visible radiation flux and sideslip.

Preprocessed Merlin IV data will be available one month after the SOP.

We anticipate data summaries from each aircraft following each flight.

A daily summary of radar observations from the POC will be prepared daily.

### list of data summaries to be included

### **2.9.3 Scientific summaries**

The SD, the POC Science Coordinator, and the PIs will prepare summaries of the science achievements at the end of each IOP. These reports will contain a preliminary evaluation of the advancement of the various scientific projects of MAP, and will be used as a basis for future IOP planning.