CGMS-XXX
WMO WP-5
Prepared by WMO
Agenda item: WG IV/1

CGMS WORKING GROUP ON GLOBAL CONTINGENCY PLANNING

(Submitted by WMO)

Summary and purpose of document

To inform CGMS Members on the status of activity related to the CGMS Working Group on Global Contingency Planning.

ACTION PROPOSED

(1) CGMS-XXX to note the report from the CGMS Working Group on Global Contingency Planning, held in Geneva, Switzerland on 20 February 2002;

(2) Change Working Group II/8 agenda to GCOS Requirements;

(3) CGMS to consider reviews of the status of contingency planning at all future CGMS Plenaries;

(4) CGMS to discuss the set of regional contingency plans that can be consolidated into an overarching global contingency plan;

(5) CGMS consider developing an outline of the content for a “standard” regional contingency plan.

Appendix: Final report of the CGMS Working Group on Global Contingency Planning

DISCUSSION

Background

1. At CGMS-XXIX, it was agreed that WMO would host a meeting of the CGMS Working Group on Global Contingency Planning, in February 2002 following the Consultative Meeting on High Level Policy, in preparation for further discussions at CGMS XXX.

2. The CGMS Working Group on Global Contingency Planning, met at WMO Headquarters, Geneva, Switzerland on 20 February 2002.

3. The Working Group reviewed the background to Global Contingency Plans and also reviewed and discussed geostationary contingency planning; polar orbiting contingency planning; and climate requirements. The final report of the Working Group is attached as an Appendix to this document

WMO Executive Council

4. The fifty-fourth session, (June 2002) of the Executive Council of WMO (EC-LIV) was informed that the meeting of the CGMS Working Group on Global Contingency Planning had occurred immediately following the second session of the Consultative Meetings. Since WMO requirements for satellite data for climate purposes as contained in the GCOS principles, were relevant to both geostationary and especially polar-orbiting satellites and could involve significant resources to meet, the CGMS Working Group felt it would be appropriate if such requirements could be formulated as a resolution by the WMO Congress. The Executive Council agreed and requested the Global Climate Observing System (GCOS) Programme to prepare the necessary draft resolution for consideration by the fourteenth WMO Congress**. (See WMO WP-24)**

Geostationary Contingency Planning

5. EC-LIV Council was pleased to note that NOAA/NESDIS and the Japan Meteorological Agency (JMA) had begun discussions of a short-term back up agreement whereby NOAA/NESDIS would be in a position to move the GOES-9 satellite to back up GMS-5 if required prior to the launch of JMA's MTSAT-1R. Concurrently, NOAA/NESDIS and JMA intended to begin discussions on a long-term contingency back up agreement. Such a long-term agreement would take effect once both agencies had established their planned baseline configuration. This baseline configuration, planned to be in place sometime in the next decade would provide for a robust national programme and would also have some capability to back up the other agency's programme in an emergency situation.

6. EC-LIV was informed that the China Meteorological Administration (CMA) intended to launch FY-2C by the end of 2003. CMA's intentions were to launch a geostationary satellite every three years but would have the capability to launch a satellite, if required, with only one year's notice. CMA noted that it planned to maintain a nominal two satellite configuration, one at 86 and one at 105 degrees East longitude with the contingency to use an "on-demand launch" if required.

7. EC-LIV also noted that ROSHYDROMET intended to maintain its nominal one geostationary satellite configuration at 76 degrees East longitude. ROSHYDROMET indicated that GOMS N2 was an approved programme with a planned launch date in 2005. The imager, MSU-GS, on GOMS N2 would be similar in capabilities to SEVIRI on the MSG series of EUMETSAT satellites.

8. EC-LIV agreed that a major milestone had been achieved in the discussions on geostationary contingency planning. First, most CGMS satellite operators had either in place, were developing or would consider when nearing nominal configuration, regional contingency plans. Secondly, the satellite operators would follow the principles of "help your neighbour" and be willing

to be “helped by your neighbour”. Thirdly, nominal configurations for most satellite operators included either an “in-orbit spare” or an “on-demand launch”. The Executive Council noted that the set of regional contingency plans would constitute a global contingency plan in response to the WMO requirements.

Polar orbiting contingency planning

9. With regard to polar orbiting contingency planning, the EC-LIV noted that the CGMS Working Group had first discussed the principles for such plans. The CGMS Working Group had noted that the basic WMO requirement for the polar orbit was for two satellites - one in the AM and one in the PM orbit. The CGMS Working Group had agreed that in order to meet WMO’s requirement for contingency planning a constellation of four polar-orbiting satellites would be required, two in the AM orbit capable of serving as backup to the other and two in the PM orbit also capable of serving as backup to the other.

10. The EC-LIV was pleased to note that both ROSHYDROMET and CMA, taking into account their respective national requirements, would be willing to consider the possibility of using the PM orbit for their future Meteor 3M and FY-3 series to assure the necessary redundancy in order to meet WMO’s contingency requirements.

Climate Requirements

11. In recalling that it had requested WMO to seek formal statements of the requirements for climate, the Working Group felt it appropriate to suggest that future CGMS meetings include an appropriate agenda item where climate issues could be discussed. It is felt that the present agenda item for Working Group II/8 should be reworded as “GCOS Requirements” and would include discussions on climate principles and requirements.

Future Activities

12. In order to have a complete overview of all CGMS satellite operator plans, the Working Group suggested that the CGMS Secretariat contact India to obtain its latest plans for geostationary orbit.

13. Furthermore, the Working Group noted that it would meet again at the next CGMS Plenary to review the status of contingency planning and that such reviews should occur at all future meeting of Plenary. Thus, it is suggested that CGMS-XXX discuss the set of regional contingency plans that can be consolidated into an overarching global contingency plan. CGMS-XXX should consider the development of the outline of the content for a “standard” regional plan. Such an outline should identify all possible aspects of the space and ground segment backups to assist the user community in making its necessary preparations.

14. Finally, it suggested that the next CGMS Plenary consider the issue of geostationary positions especially over the Indian Ocean as the present plans indicated the potential for radio frequency interference between satellites. At present, and according to satellite operators’ plans, the possibility exists for five geostationary satellites over the Indian Ocean in 2005 (Meteosat, METSAT, GOMS N-2, FY-2 and GIFTS).

15. As requested at the Working Group meeting, the fifty-fourth WMO Executive Council was informed of CGMS satellite operators contingency plans for geostationary and polar-orbits.

FINAL REPORT OF THE CGMS WORKING GROUP ON GLOBAL CONTINGENCY PLANNING

1. ORGANIZATION OF THE MEETING

1.1 Opening of the meeting *(Agenda item 1.1)*

The CGMS Working Group Meeting on Global Contingency Planning was held at the World Meteorological Organization (WMO) Headquarters in Geneva, Switzerland on 20 February 2002. The meeting was opened at 09:00 hours.. The list of participants is attached as Annex II.

1.2 Adoption of the Agenda *(Agenda item 1.2)*

The agenda for the meeting was adopted and is reproduced in Annex I.

1.3 Working arrangements for the meeting (*Agenda item 1.3*)

The working arrangements for the meeting were agreed upon.

2. ELECTION OF CHAIRMAN

The Working Group unanimously elected Dr Tillmann Mohr, Director-General of EUMETSAT, as chairman.

3. GLOBAL CONTINGECY PLANNING

Background

3.1 The Working Group recalled that the CGMS Consolidated Report contained the following information related to Global Contingency Plans:

> *In 1991, the forty-fourth Executive Council of WMO recommended the development of contingency plans by the satellite operators to increase the reliability of the space-based global observation system. WMO considered that space segment contingency planning was the core of the statement of WMO requirements for system continuity. It was anticipated that CGMS would continue its role of coordination and standardisation such that ground receiving equipment would be able to receive and process services from any contingency satellite provided by another operator, e.g. by using standardised down-link broadcasts and data formats. In 1992, the statement of WMO requirements for continuity was subsequently endorsed by the satellite operators, who subsequently established a CGMS Working Group on Global Contingency Planning.*
>
> *However, at the first meeting of this Working Group in October 1992, CGMS concluded that no single satellite operator could be expected to guarantee satellite availability in all circumstances and that the establishment of joint contingency plans was essential in order to achieve a reliable global system at a realistic cost. A proposal for a contingency concept, which could meet global needs, was thus established. This concept was based upon a philosophy of assisting neighbouring satellite operators by using data transfer techniques similar to that already developed for the Europe-USA Extended Atlantic Data Coverage scheme mentioned above.*
>
> *In 1994, the CGMS Working Group on Global Contingency Planning agreed a technical strategy based upon the "help your neighbour" concept. This strategy assumes that each satellite operator tries, with its best efforts, to maintain its nominal configuration, in accordance with its own constraints. Any CGMS satellite operator faced with a contingency situation, whereby priority satellite based services cannot be supported,*

should immediately discuss the situation with other satellite operators who, in good faith, should try to find a solution.

In 1997, CGMS considered that it would be beneficial for the user community to develop similar arrangements to cover unexpected contingencies affecting services provided by the satellite operators.

In 1998, Japan and China looked into possible contingency arrangements to support each other's services. The GMS and FY-2 satellite systems have a high level of compatibility with regard to area of the globe covered and transmission characteristics. However, it was decided that long-term contingency arrangements could only be considered if respective launch schedules allowed sufficient in-orbit redundancy. A constraint to the provision of a back-up of MTSAT or FY-2 was the incomplete overlap (70%) in the fields of view of GMS/MTSAT and FY-2.

Bearing this in mind, the Working Group on Global Contingency Planning considered that in the event of a major system failure, back-up in areas such as product generation might be an appropriate solution. As a consequence, the satellite operators are currently actively studying such possibilities for support to product generation using data from neighbouring satellite systems.

Additionally, in 1998, discussions were initiated between EUMETSAT and the ROSHYDROMET with a view to investigating possibilities for the use of Meteosat-5 at 63°E to relay ROSHYDROMET DCP messages and provide a temporary WEFAX image dissemination service in the region.

Also in 1998, India agreed to transmit to its higher authorities the need for regional contingency planning as stipulated in the CGMS Contingency Strategy. To this end, EUMETSAT has concluded an Agreement with ISRO for the possible relay of some INSAT imagery and products via the Meteosat system. In return, India will have access to imagery provided by Meteosat-5 located at 63°E.

3.2 The Working Group also recalled that at CGMS-XXIX (October 2001), the Working Group on Global Contingency Planning had convened and discussed the need to further develop CGMS contingency plans.

3.3 The Working Group (WG) at CGMS-XXIX had reviewed the status of the current contingency plans existing amongst the satellite operators. It had noted that a formal contingency agreement existed between EUMETSAT and NOAA/NESDIS that could be activated when both satellite operators were in a defined nominal configuration. The WG had noted that other plans, similar to contingency plans, existed between some other CGMS satellite operators. The WG also had recalled that in 1991, the forty-fourth Executive Council of WMO had recommended the development of contingency plans by satellite operators to increase the reliability of the space-based global observation system. WMO had considered that space segment contingency planning was the core of the statement of WMO requirements for system continuity. It was anticipated that CGMS would continue its role of coordination and standardization, such that ground receiving equipment would be able to receive and process services from any contingency satellite provided by another operator, e.g., by accessing standardized down-link broadcasts and data formats.

3.4 In 1992, the statement of WMO requirements for continuity was, subsequently, endorsed by the satellite operators who then established a CGMS Working Group on Global Contingency Planning. At CGMS-XXIX, the satellite operators also noted that they were presently processing and disseminating other satellite operators' imagery and products and thus they relied on each other to maintain a global satellite system. A main strength in such a system was through contingency and reliability. It also acknowledged that the concept of "help your neighbour" also implied that a satellite operator would be willing to be "helped by its neighbour". The duality of the

concept, i.e., to help and be helped, would allow sets of regional contingency plans to be the foundation for a global contingency plan for both the geostationary and polar-orbits.

3.5 At CGMS-XXIX, each satellite operator indicated a willingness to discuss regional contingency plans with its neighbours and within CGMS. With regard to the polar-orbiting satellites, a global plan should be developed with respect to the morning and afternoon orbits. It also agreed that a nominal configuration should be a basis for the activation of any regional contingency plan.

Discussion

3.6 The Working Group then agreed that it would be appropriate to structure the present meeting in two parts, geostationary contingency planning and polar-orbiting planning. In doing so, the Working Group agreed that it would be appropriate to take into consideration the recent discussion at the second session of the Consultative Meetings on High-Level Policy on Satellite Matters on equator crossing times for polar-orbiting satellites since that discussion was also relevant to contingency planning. It recalled the second session of the Consultative Meetings had stressed that WMO should formally articulate its requirements for satellite data for climate purposes as contained in the GCOS principles. Since the requirements were relevant to both geostationary and especially polar-orbiting satellites and could involve significant resources to meet, it would be appropriate if such requirements could be formulated as a resolution at the highest level within WMO preferably by the WMO Congress.

Geostationary Contingency Planning

3.7 In following the CGMS agreed philosophy to “help your neighbour”, the Working Group noted that there were six CGMS geostationary satellite operators and considerable progress had already been achieved towards the development of regional contingency plans. The Working Group noted the already established contingency plan between NOAA/NESDIS and EUMETSAT. It also recalled that a bilateral cooperation agreement existed between EUMETSAT and the ROSHYDROMET part of which related to contingency planning.

3.8 NOAA/NESDIS and JMA have begun discussions of a short-term back up agreement whereby NOAA/NESDIS will be in a position to move the GOES-9 satellite to back up GMS-5 if required prior to the launch of JMA’s MTSAT-1R. Concurrently, NOAA/NESDIS and JMA will begin discussions on a long-term contingency back up agreement. Such a long-term agreement would take effect once both agencies had established their planned baseline configuration. This baseline configuration, planned to be in place sometime in the next decade will provide for a robust national programme and will also have some capability to back up the other agency’s programme in an emergency situation.

3.9 CMA noted that it currently had three registered positions (86, 105 and 123 degrees East longitude) that it intended for use by the FY-2 series. At present, it intended to launch FY-2C by the end of 2003 with plans that it would become operational by March 2004 before the monsoon season. Meanwhile, FY-2B would remain operational except during the eclipse seasons. CMA’s intentions were to launch a geostationary satellite every three years but would have the capability to launch a satellite, if required, with only one year’s notice. It noted that this form of contingency was an “on-demand launch” instead of an “in-orbit spare”. CMA noted that if the lifetime of the satellites could be extended, then it planned to maintain a nominal two satellite configuration, one at 86 and one at 105 degrees East longitude with the contingency to use an “on-demand launch” if required. Its ground segment would allow simultaneous operation of two geostationary satellites. Thus with its present launch schedule, it was possible that CMA could achieve its full nominal configuration by 2006 or partial nominal configuration by 2003.

3.10 ROSHYDROMET noted that it will maintain its nominal one geostationary satellite configuration at 76 degrees East longitude. ROSHYDROMET indicated that GOMS N2 was an

approved programme with a planned launch date in 2005. The imager, MSU-GS, on GOMS N2 would be similar in capabilities to SEVIRI on the MSG series of EUMETSAT satellites. The data will be disseminated in standard HRIT, LRIT, WEFAX formats.

3.11 CMA, JMA and ROSHYDROMET will start discussions on development of regional contingency plans to be implemented when achieving a nominal configuration for their geostationary satellite systems.

3.12 The Working Group felt that a major milestone had been achieved in the discussions on geostationary contingency planning. First, most CGMS satellite operators had either in place, were developing or would consider when nearing nominal configuration, regional contingency plans. Secondly, the satellite operators would follow the principles of “help your neighbour” and be willing to be “helped by your neighbour”. Thirdly, nominal configurations for most satellite operators included either an “in-orbit spare” or an “on-demand launch”. The Working Group agreed that the set of regional contingency plans would constitute a global contingency plan in response to the WMO requirements.

3.13 In order to have a complete overview of all CGMS satellite operator plans, the Working Group suggested that the CGMS Secretariat contact India to obtain its latest plans for geostationary orbit. Furthermore, the Working Group noted that it would meet again at the next CGMS Plenary to review the status of contingency planning and that such reviews should occur at all future meeting of Plenary. Finally, it suggested that the next CGMS Plenary consider the issue of geostationary positions especially over the Indian Ocean as the present plans indicated the potential for radio frequency interference between satellites.

Polar orbiting contingency planning

3.14 With regard to polar orbiting contingency planning, the Working Group first discussed the principles for such plans. It noted that the basic WMO requirement for the polar orbit was for two satellites - one in the AM and one in the PM orbit. It agreed in order to also meet WMO’s requirement for contingency planning that a constellation of four polar-orbiting satellites would be required, two in the AM orbit capable of serving as backup to the other and two in the PM orbit also capable of serving as backup to the other.

3.15 The Working Group recalled the discussions at the second session of the Consultative Meetings on equator crossing times. It noted that at present four satellite operators (EUMETSAT, CMA, NOAA/NESDIS and ROSHYDROMET) had plans to fly satellites in the AM orbit while only one satellite operator (NOAA/NESDIS) had plans to fly in the PM orbit.

3.16 The Working Group was pleased to note that both ROSHYROMET and CMA, taking into account their respective national requirements, would be willing to consider the possibility of using the PM orbit for their future Meteor 3M and FY-3 series to assure the necessary redundancy in order to meet contingency requirements. The Working Group recalled that ROSHYDROMET and CMA had already made preliminary indications at CGMS-XXIX of such a willingness and looked forward to future CGMS meetings for progress in this area.

Climate requirements

3.17 With regard to climate applications, the Working Group noted that there were several issues to be considered for the utility of data from polar-orbiting satellites and their continuity. There was compelling evidence that the climate is changing. The Working Group agreed that one could argue about the degree, nature and cause of the climate variations and whether there was in fact a change, but the only way to settle these arguments would be with solid information. This required improved global observations of the state variables and the forcings, the means to process these and understand them, and the ability to set them in a coherent physical (and chemical and biological) framework with models. Meanwhile, the information that helped settle

these arguments and reduce uncertainties was also extremely valuable for many other practical applications for business, industry, government, and the general public. The implications are given for the climate observing system. The Working Group noted the word "system" meant a comprehensive approach that included:

> Climate observations from both space-based and *in situ* platforms that were taken in ways that addressed climate needs and adhered to the ten principles outlined by the National Research Council (NRC, 1999).

3.18 The Working Group noted that a major effort would be required to produce satisfactory climate data records from operational data. Over the past decade a number of basic principles had been developed for the delivery of long-term data with minimal space- and time-dependent biases (NRC, 1999) including:

> Continuity of Purpose: Maintain a stable, long-term commitment to the observations, and develop a transition plan from serving research needs to serving operational purposes.

3.19 Hence for space-based platforms, climate monitoring requirements could be more stringent than weather requirements. As a consequence the following were recommendations from the climate communities:

- Satellites intended for monitoring should be launched into stable orbits designed to minimize drift in time of observation to within 2 hours over the lifetime of the satellite, or boosters are required to stabilize the orbit;
- Sufficient satellites should be operating to enable the diurnal cycle to be adequately sampled;
- Satellites should be launched on schedule, rather than on failure of the previous mission, as is the case today, to ensure overlap of measurements which is essential for the climate record;
- All instruments must be calibrated and extensive ground truth validation should be sustained.

3.20 In recalling that it had requested WMO to seek formal statements of the requirements for climate in this area, the Working Group felt it appropriate to suggest that future CGMS meetings include an appropriate agenda item where climate issues could be discussed.

3.21 The Working Group, in recognizing the need to keep WMO informed of progress for contingency planning, requested WMO to inform its next Executive Council of the important progress made by CGMS satellite operators as recorded in this report.

ANNEX I

AGENDA

1. ADOPTION OF THE AGENDA

1.1 Opening of the meeting

1.2 Adoption of the agenda

1.3 Working arrangements for the session

2. ELECTION OF CHAIRMAN

3. GLOBAL CONTINGENCY PLANNING

ANNEX II

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