

### **CGMS Contingency Plan**

In response to CGMS action/recommendation A45.02  
HLPP reference: 1.1.7

In CGMS-45, Working Group III agreed to hold a review of the CGMS Contingency Plan to serve as a reference for CGMS satellite operators in the planning and implementation of satellite missions; outline a process for risk assessment against the CGMS Baseline; and a process for mitigating and coping with capability degradation or loss against the baseline. Working Group III coordinated a new draft following CGMS-45 and discussed updates in the Working Group III intersessional meetings. WMO held a CGMS Baseline and Contingency Plan Workshop to discuss the documents with representatives from the CGMS Secretariat, CMA, EUMETSAT, KMA, JMA, JAXA, NOAA, and the WMO.

The appendix to this working paper serves as the CGMS Contingency Plan as agreed to following resolution of comments out of the workshop.

Action/Recommendation proposed:

**ACTION:** CGMS to adopt the Appendix of CGMS-46-CGMS-WP-28 as the new baseline for the contributions of CGMS Members.

**ACTION:** WMO to take into account the new baseline in forthcoming updates of the Manual on the Global Observing System and related materials.

**ACTION:** CGMS to hold Risk Assessment Workshop with the dual purpose of (i) Performing the initial risk assessment against the CGMS Baseline, and (ii) Establishing a process for including an annual such risk assessment in the regular programme of CGMS in general and Working Group III in particular.

## CGMS Contingency Plan

### 1 INTRODUCTION

In CGMS-45, Working Group III agreed to initiate a review of the CGMS Contingency Plan to serve as a reference for CGMS satellite operators in the planning and implementation of satellite missions; outline a process for risk assessment against the CGMS Baseline; and a process for mitigating and coping with capability degradation or loss against the baseline. Working Group III held intersessional meetings as a working group to discuss the CGMS Baseline. The Working Group III Co-Chair developed a draft to be shared with all members of Working Group III. Following these initial drafts, WMO hosted a CGMS WGIII Baseline and Contingency Plan Workshop attended by representatives from the CGMS Secretariat, CMA, EUMETSAT, KMA, JMA, JAXA, NOAA, and the WMO. Significant progress was made at the workshop that resulted in this working paper.

Working Group III is presenting this paper to the CGMS Plenary for endorsement at CGMS-46.

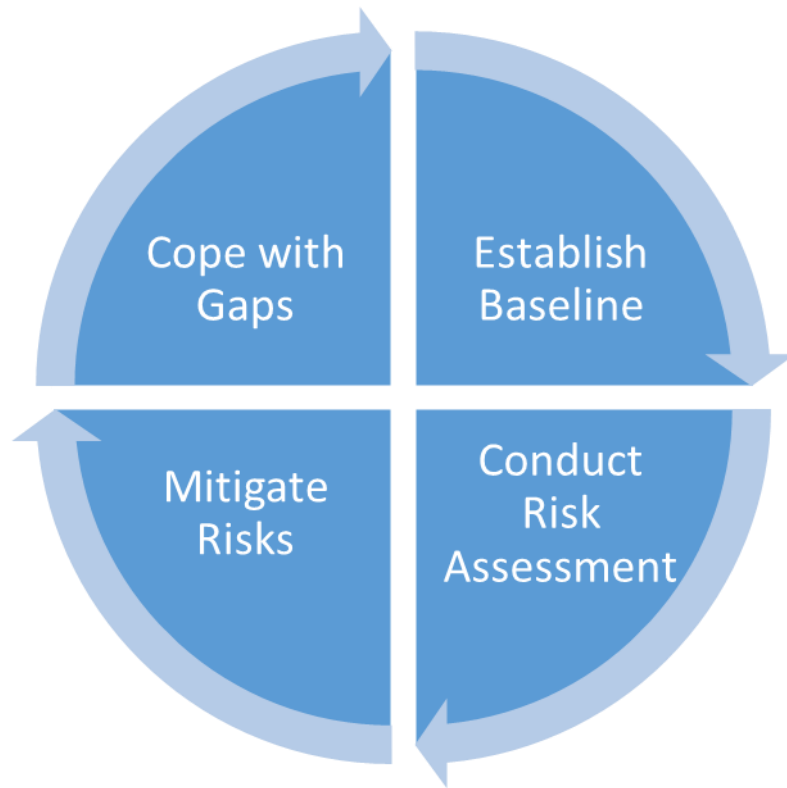
### 2 CGMS CONTINGENCY PLAN

The CGMS Contingency Plan provides guidance and processes for identifying, mitigating, and coping with capability loss against the CGMS Baseline. This plan provides guidance to Members to ensure continuity of their missions, discusses steps Members can take to coordinate continuity among themselves, and steps CGMS can take to monitor and respond to losses.

The CGMS Contingency Plan defines the key terms as follows:

- **Contingency:** Within the context of the CGMS, a contingency arises when CGMS is no longer in a position to provide certain satellite-based observations, measurements, and services that are part of the CGMS Baseline or when the group anticipates that such a situation is likely to occur in the near future.
- **Contingency Planning:** The development of strategy, analysis, planning, development of capabilities, and processes necessary to assure continuity of established baseline observations, measurements, and services in the event of unforeseen circumstances.
- **Mitigation:** Proactive attempt by a Member or CGMS to ensure continuity of observations, measurements, and services in support of the CGMS Baseline; an effort to anticipate and thereby reduce or eliminate the probability of a risk materializing or risk avoidance.
- **Coping:** Steps taken by a Member or by CGMS to reduce the impact of a materialized risk or capability loss against the CGMS Baseline. For the remainder of this document, these will generally be referred to as “capability losses” or simply “losses.”

Overall, The CGMS level contingency planning follows a traditional risk management framework in order to avoid degradation or loss of service, and to minimize the impacts of any potential losses. The process can be seen in the figure below.



### **3 CONCLUSIONS**

The CGMS Contingency Plan, as contained in the appendix, represents a large change since the last CGMS Contingency Plan from 2007. CGMS Members are invited to adopt the proposed revision of the baseline as contained in the Appendix. Once agreed by CGMS, WMO will take this revised baseline into account for forthcoming updates of the Manual on the Global Observing system and related materials.

## **CGMS Contingency Plan**



**Coordinating Group on Meteorological Satellites**

**June 5, 2018**

## **1. Introduction**

This Contingency Plan addresses one of the major objectives of the Coordinating Group on Metrological Satellites (CGMS) as stated in its charter:

*“CGMS encourages complementarity, compatibility, and possible mutual backup in the event of a system failure through cooperative mission planning, compatible meteorological data products and services, and the coordination of space and data related activities, thus complementing the work of other international satellite coordinating mechanisms.”*

The Eleventh World Meteorological Organization (WMO) Congress (1995) recognized the need to ensure the continuing operation of the environmental satellite systems. The Congress appealed to satellite operators to ensure continuity, quality and coverage of their satellite programmes in furthering WMO Members operational and research programmes. In its Resolution 5 (CgXI), Congress urged its concerned Members to maintain the polar-orbiting and geostationary satellite systems to ensure the continuity of operation and to *“develop contingency plans to ensure the continued use and utility of satellite data and products.”*

The plan was initially established by CGMS in response to its Actions 31.39 and 32.20 in order to consolidate the conclusions of numerous contingency related discussions, guidance received from World Meteorological Organization (WMO) bodies, and the lessons of experience.

### **1.1 Document Purpose**

The purpose of the Contingency Plan is, to the extent possible, develop guidance and a process for identifying, mitigating, and coping with risks to the continuity of the CGMS Baseline. The CGMS Baseline documents the commitments and plans of CGMS Members to provide observations and measurements in support of the WMO Global Observing System. This plan aims to serve two purposes. First, serve as a reference for CGMS satellite operators in the planning and implementation of satellite missions. Second, outline a process for risk assessment against the CGMS Baseline, and a process for mitigating risk to and coping capability degradation or loss against the baseline. This plan also serves to inform the user community such as WMO and Intergovernmental Oceanographic Commission (IOC) of these processes.

### **1.2 Scope**

The scope of this CGMS Contingency Plan includes the observations, measurements, and services included in the CGMS Baseline. All risk assessments as well as capability loss mitigation and coping actions will be in reference to the CGMS Baseline. Further, this document will establish:

1. Guidelines to Members on ensuring continuity
2. Guidelines for developing inter-member cooperation to ensure continuity
3. The CGMS risk management process to help ensure continuity

#### 4. Possible approaches to responding to capability loss

### 1.3 Definitions

Contingency: Within the context of the CGMS, a contingency arises when a CGMS is no longer in a position to provide satellite-based observations, measurements, and services corresponding to the CGMS Baseline or when the CGMS Member anticipates such a situation in the near future.

Contingency Planning: The development of strategy, analysis, planning, development of capabilities, and processes necessary to assure continuity of established baseline observations, measurements, and services in the event of unforeseen circumstances.

Mitigation: Proactive attempt by a Member or CGMS to ensure continuity of observations, measurements, and services in support of the CGMS Baseline; an effort to anticipate and thereby reduce or eliminate the probability of a risk materializing or risk avoidance.

Coping: Steps taken by a Member or CGMS to reduce the impact of a materialized risk or capability loss against the CGMS Baseline. For the remainder of this document, these will generally be referred to as “capability losses” or simply “losses.”

## 2. Guidelines to CGMS Member Organizations

In order to ensure continuity of observations and services in support of the CGMS Baseline, CGMS Members should adopt the following guidelines in the management of their satellite and ground systems.

### 2.1 Risk Analysis

CGMS Members should conduct proactive risk analyses on their own satellite and ground systems, and adopt a risk management framework to identify, track, mitigate and cope with risks. Members should update and share schedule assessments to inform the community of potential slips in satellite launches. Members should also conduct satellite reliability analysis on a regular basis, comprising random and wear-out analysis, and projections of consumable resources (e.g., fuel) to inform satellite mission life times. The updated mission lifetimes should be shared with CGMS.

### 2.2 Mission Planning

When planning the development of missions, CGMS Members should take steps to ensure continuity when planning their missions. These steps include:

- Long-term planning of satellite missions allowing on-orbit redundancy and launch schedule flexibility to quickly recover from a launch or on-orbit failure.
- Designing a resilient space segment architecture, including disaggregation as appropriate.
- Securing financial resources to implement these plans.
- Securing the availability of the required expertise for the whole lifecycle.
- Monitoring the implementation of the plans through project management practices.

- Addressing technological risk through adequate feasibility studies, tests, and demonstrations.
- Identifying the risk areas in: the overall system design; the space segment; space ground interfaces and ground systems, including telecommunications, network and computer security; and mitigating these risks through adequate measures such as redundancy or alternative means.
- Monitoring the risk over the whole life cycle, including maintenance aspects and subsystems becoming obsolete.

## **2.3 Operational Management**

CGMS members should take steps during operations to ensure continuity of observations, measurements, and services.

For the space segment, this can involve:

- Ensuring the availability of in-orbit backup satellites to assume primary responsibilities as required.
- Considering the relocation of a satellite, which could include the possibility of merging two missions with reduced coverage.
- Splitting a mission over two satellites (e.g., primary and secondary) in case of partial payload failure.

For the ground segment or the space-ground interface this can include:

- Development and use of backup satellite data acquisition, command and control, and processing facilities.
- Development and use of alternative, lower bandwidth telecommunications to broadcast and disseminate data.
- Production of a reduced set of prioritized products.

## **3. Inter-Member Coordination**

In the event of an extended satellite outage where the satellite operator has no standby satellite available, cooperative contingency plans jointly developed by the operators are essential. Cooperative contingency strategies may involve satellite as well as ground facilities or alternative derived product processes.

The CGMS joint contingency strategy is primarily based on the possible use, through bilateral arrangements, of any spare capacity available to other CGMS Members. Part of the strategy is to act preventively, e.g. via:

- Agreeing on Member responsibilities in the implementation of the CGMS Baseline, including temporal and geographical (coverage) overlap;
- Regularly reviewing its status of implementation and assess the potential risk;
- Improving commonalities among the systems, facilitating mutual support;
- Considering jointly establishing in orbit capability serving as a backup for another Member.

Members should also consider establishing backup arrangements for the ground system to allow other Members to provide data acquisition and routing capabilities.

## **4. CGMS Coordination in Ensuring Continuity**

### **4.1 Establishing the Baseline**

The CGMS Baseline constitutes the commitments and plans of CGMS Members to provide specific observations, measurements, and services. The CGMS Baseline thus defines the scope of the Contingency Plan.

### **4.2 Risk Assessment**

CGMS will monitor Members' implementation of the CGMS Baseline through an annual risk assessment. CGMS Members will provide the information necessary to compare current capabilities against the CGMS Baseline including CGMS Members providing the output of the risk analyses of their own satellite systems.

Working Group III, with dedicated support from the CGMS Secretariat, will analyze the current and planned missions supporting the Baseline to identify losses and potential losses relative to the baseline. The Observing Systems Capability Analysis and Review (OSCAR)/Space database is the primary source of information for this Risk Assessment as a reference for CGMS. The process for this Risk Assessment is outlined in Appendix A.

### **4.3 Mitigating Risks**

Working Group III will assess the impact of potential losses, in consultation with the other working groups or CEOS as necessary. Working Group III will recommend mitigation actions to CGMS plenary for endorsement.

### **4.4 Coping with a Sudden Loss in Continuity of the CGMS Baseline**

In the event of a sudden loss of capability, Members should inform Working Group III about any actions they will take to cope with the loss after they complete their internal decision making process. If a Member does not have an internal solution, Members can request assistance from Working Group III to identify methods to cope with the loss. Working Group III, in coordination with the other working groups, will then recommend actions to cope and send this recommendation to the CGMS Plenary for endorsement.

## **5. Possible Approaches to Respond to Capability Losses**

Each loss is unique, ranging from capability degradation to complete capability loss, and will require unique solutions. Working Group III and Members should consider the following possible alternatives when determining solutions and acknowledge that these solutions will likely only partially mitigate the loss.

### **5.1 Utilizing Alternative Infrastructure to Respond to Capability Losses**

CGMS Members should consider what is causing the loss and work among the members to determine if resources from other organizations can assist in mitigating or coping with the

loss. Examples include, additional ground station support to meet data latency needs or back-up missions that can be adjusted to fill losses in the observing system.

## **5.2 Guidance to Satellite Operators on Using Research Missions to Respond to Losses**

CGMS Members should also coordinate with research agencies to identify missions that, if necessary, can be pressed into operational service. When conducting risk analyses, WMO and CGMS members should consider these missions as loss mitigation. CGMS Members should consider the following factors when leveraging research missions for operational use:

- Partnering with research agencies early in the development life-cycle to: allow users to access data for operational use, lower latency to meet operational needs, and encourage use of common data formats to ease ingest into operational data processing centers
- Investing in ground infrastructure to acquire, relay and process data from research missions
- Partnering with research agencies to calibrate and validate research data products to accelerate their use in operational data processing centers

## **5.3 Identify Scientific Solutions to Respond to Capability Loss**

Within CGMS, Working Group III will engage with Working Group II in order to identify approaches to mitigating or coping with the loss of observations and measurements. For example, radio occultation measurements can help to mitigate or cope with the loss of microwave or infrared sounders and infrared sounders can help mitigate the loss of long-wave infrared measurements necessary for climate monitoring and prediction.

APPENDIX A: CGMS Risk Assessment

