

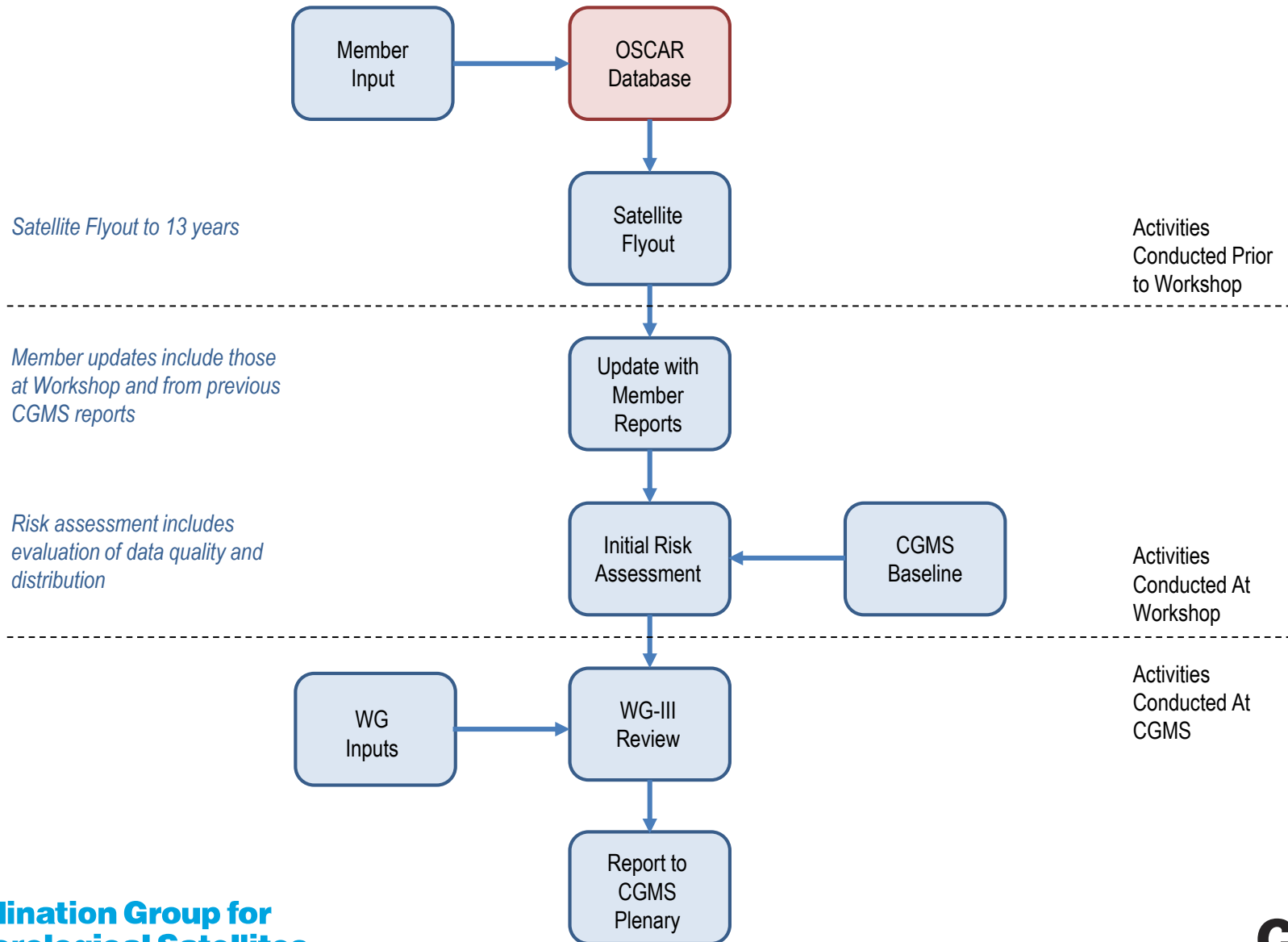
Outline

- Updated Terms of Reference
- Risk Assessment
 - Background
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 - Results
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- Outcomes and Recommendations Resulting from WG-III Discussions

Risk Assessment - Background

- The CGMS Baseline constitutes the CGMS response to the WIGOS 2040 Vision to document what missions are currently being, or planned on being flown. The CGMS baseline will be included in the WMO Manual on WIGOS.
- WMO will conduct a **Gap Analysis** between the WIGOS 2040 Vision Tier 1 and the CGMS Baseline to review implementation of WIGOS.
- CGMS will conduct a **Risk Assessment** against the baseline to ensure CGMS is meeting its commitments.
- The CGMS Baseline will be revised every four years to match the update cycle for the Manual on WIGOS.
- The WMO Gap Analysis will occur every four years, serving as an input to the definition of the revised CGMS Baseline.
- The CGMS Risk Assessment will be completed every year forming the basis for CGMS actions to ensure continuity.

Risk Assessment - Approach



Risk Assessment - Approach

- Objective:
 - Convey CGMS's posture with respect to its baseline commitment
 - Provide a high-level assessment designed to allow members to assess the current contribution to the user community as well as coordinate future planning to meet current and future baseline commitments
- Working Group III held a workshop 27 Feb – 1 Mar, hosted by EUMETSAT and attended by EUMETSAT, NOAA, JMA, CMA, WMO, and CGMSSEC
- Working Group III reviewed how CGMS current and future missions match the commitments made in the CGMS Baseline
- The findings from this Workshop were sent to the other Working Groups for review and discussed at Working Group III Intersessional #3
- The results of the Risk Assessment were reviewed by other Working Groups at CGMS-47

Risk Assessment - Approach

- The final risk assessment for each sensor/observation was based on a qualitative analysis of all the orbits from which the observation is provided.
- This assessment is given from a CGMS Member prospective and does not currently include non-CGMS member, nor commercial contributions to the global observing system, or incorporate all WMO requirements (which are covered by the gap analysis).
- CGMS Members are going to operate satellites based on their national priorities.
- Resiliency was not specifically addressed in each observation and the first risk assessment focused on the probability or likelihood of a gap in service or performance, and not the consequence.
- Lack of a satellite in geostationary orbit is more likely to cause a gap in observations, while a lack of a satellite in low-Earth orbit may only degrade system performance.
- Quality and availability was not analysed in detail for all measurements, but was considered in some specific cases.
- The assessment is based on planned launch dates, design life, and updated by operational experience.

Risk Assessment – Results / Top Level Legend

- CGMS Risk Assessment uses green, yellow, and red to graphically represent the overall status of that observation. The criteria for each color is as follows:
 - **Green:** CGMS Baseline met with a low risk of a gap.
 - **Yellow:** The CGMS Baseline is at moderate risk of not being fully met. Some mitigation by CGMS Members may be required.
 - **Red:** There is a high risk of not meeting the CGMS Baseline without CGMS Member action
 - **No Color:** Observation is not planned to be available until a later date



Risk Assessment – Results / Top Level Overview

Sensor	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Microwave Sounder	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Infrared Sounder	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Radio Occultation	Yellow	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Multi-purpose Imager	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Narrow Band Imager	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
High Resolution Imager	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Microwave Imager	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Radar Altimetry	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Scatterometer	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Lightning Mapper	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Visible/IR Radiometer	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Visible/UV Radiometer	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Coronagraph	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
EUV Imager	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
X-ray Spectrograph	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Ion/Electron/Proton Spect	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Magnetometer	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Plasma Analyzer	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Precipitation Radar	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Ice Cloud Imager	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Synthetic Aperture Radar	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green

Risk Assessment – Results



Sensor	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Microwave Sounder	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
LEO Orbit:														
Early Morning	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Mid-Morning	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Afternoon	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green

Risk Assessment – Results / Individual Sensor Legend

CGMS Risk Assessment uses green, yellow, and red to graphically represent the overall status of that orbit. The criteria for each color is as follows:

- **Green:** At least one mission flying that meets the CGMS baseline principles for that specific observation in that specific orbit with a low risk of a gap.
- **Yellow:** It is uncertain if there will be a mission flying that meets all the CGMS Baseline principles for that specific observation in that specific orbit with expected mission performance. There is at least a moderate risk of a gap; some mitigation by CGMS Members may be required.
- **Red:** There is a high risk of no mission that meets the CGMS Baseline principles for that specific observation in that specific orbit. There is a high risk of a gap or an actual gap without CGMS Member action.
- **No Color:** Observation is not planned to be available until a later date

Risk Assessment – Results / MW Sounder Risk Assessment

Sensor	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Microwave Sounder	[Color gradient from green to yellow]													
LEO Orbit:														
Early Morning	[Color gradient from green to red]													
Mid-Morning	[Green]													
Afternoon	[Green]													

- The CGMS Baseline commitment is microwave sounder observations in LEO from three sun synchronous orbits, nominally early morning, mid-morning, and afternoon.
- Both mid-morning and afternoon orbits have observations through 2032.
- The early morning orbit has observations through 2025. There is a risk of a gap after 2025.

WGIII Assessment:

Microwave sounding observations meet the CGMS Baseline with the risk of a gap in the early morning orbit after 2025.

Risk Assessment – Results / IR Sounder Risk Assessment

Sensor	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Infrared Sounder	[Green to Yellow gradient bar]													
LEO Orbit:														
Early Morning	[Red]	[Green]	[Green]	[Green]	[Green]	[Green]	[Green]	[Green]	[Green]	[Green]	[Green]	[Green]	[Green]	[Red]
Mid-Morning	[Green bar]													
Afternoon	[Green bar]													
GEO Orbit:														
0°						[Green]	[Green]	[Green]	[Green]	[Green]	[Green]	[Green]	[Green]	[Green]
105° E	[Green bar]													

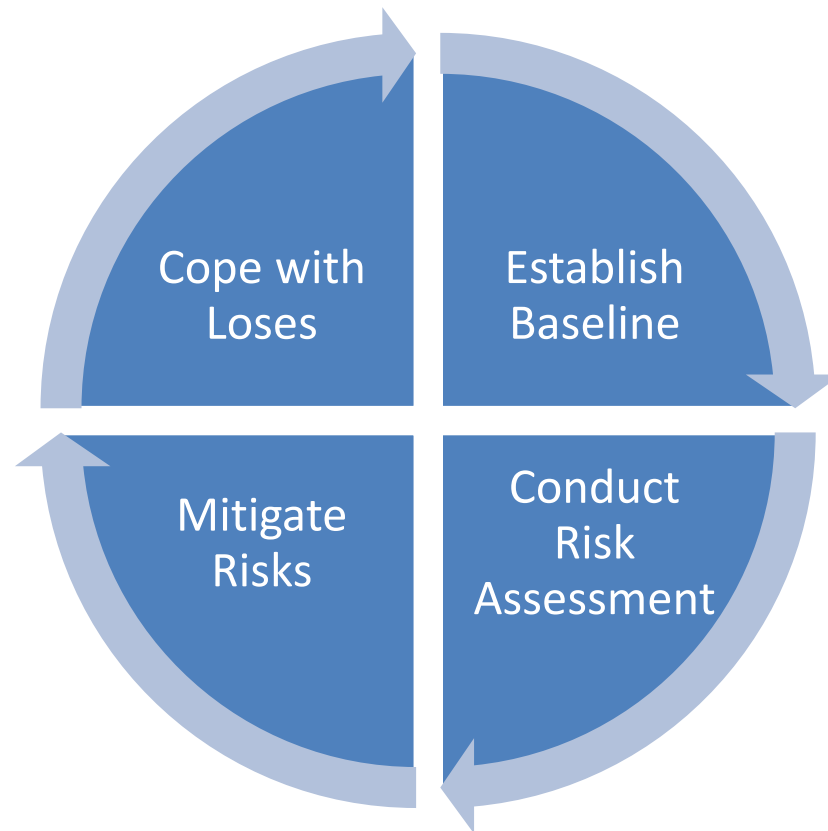
- The CGMS Baseline commitment is hyperspectral sounding observations in LEO from three sun synchronous orbits, nominally early morning, mid-morning, and afternoon as well as GEO at orbital positions 0° and 105°E.
- For LEO, both mid-morning and afternoon orbits have observations through 2032. The early morning orbit will have observations from 2020-2025. There is a gap in the early morning in 2019-2020 and there is a risk of a gap beyond 2025.
- For GEO, there observations at orbital position 105°E from 2019-2032. At orbital position 0°, the observation is not supported until 2024.

WGIII Assessment:

Infrared Sounder observations meet the CGMS Baseline with the risk of a gap in the early morning orbit after 2025.

CGMS Contingency Plan

- The CGMS level contingency planning follows a traditional risk management framework in order to avoid risks to service, and to minimize the impacts of any potential losses



Risk Assessment – Results / Mitigation Actions

- Working Group III recognized the need for continuity in the Early Morning Orbit and the gap it creates on microwave sounding, infrared sounding, multi-purpose imaging, visible/IR radiometer, ion/electron/proton spectrometer, and scatterometer observations.
 - **Recommended Mitigating Action #1: WMO to reconvene a WMO-CGMS Tiger Team on the impact of the Early Morning orbit. It is premature to convene this Tiger Team until an assessment of FY-3E is conducted.**
- Working Group III recognized that Radio Occultation does not meet the CGMS Baseline after 2025.
 - **Recommended Mitigating Action #2: IROWG and 7th WMO Impact Workshop needs to validate the current Baseline in terms of the coverage, number, quality and sampling of RO.**
- Working Group III recognized the gap in overall resilience and coverage of GEO in the IODC region.
 - **Recommended Mitigating Action #3: Conduct a study on the GEO imager coverage, data quality, availability and resilience in IODC region.**

Risk Assessment – Results / Mitigation Actions

- Working Group III recognized the need for a long term plan for ~6Ghz frequency microwave imaging in at least one LEO orbit for all weather Sea Surface Temperature observations.
 - **Recommended Mitigating Action #4: EUM to ensure data availability for HY-2B MWI. (WGIV).**
 - **Recommended Mitigating Action #5: CGMS Members to continue to support High Level Priority Plan 1.2.2.**
 - **Recommended Mitigating Action #6: NOAA to provide an update on SSMI status and possible follow-on.**
- Working Group III recognized that there is adequate coverage of microwave imaging, but operational usefulness is limited because they imagers are not cross calibrated.
 - **Recommended Mitigating Action #7: GSICS to continue cross calibration progress of microwave imagers. (WGII)**
- Working Group III recognized that there is no radar altimetry data availability in the early morning orbit in the short term and that there are no plans in the long term for coverage.
 - **Recommended Mitigating Action #8: EUM to ensure data availability for HY-2B ALT. (WGIV).**

Risk Assessment – Results / Mitigation Actions

- Working Group III recognized scatterometer observations are at risk of a gap in the early morning and afternoon orbits after 2025.
 - **Recommended Mitigating Action #9: ISRO to provide an update on its plans for follow-on mission to Oceansat-3A.**
- Working Group III recognized the risk of a gap in observations at L1 in the short term for coronagraph, ion/electron/proton spectrometer, magnetometer, and plasma analyser observations.
 - **Recommended Mitigating Action #10: ISRO to confirm data latency for Aditya-L1 mission.**
- Working Group III recognized the lack of magnetometer observations in the LEO in both the short and long term.
 - **Recommended Mitigating Action #11: ISES to provide rationale and need for operational magnetometer observations in LEO. (SWCG)**
- Working Group III recognized the risk of a gap in precipitation radar after 2028
 - **Recommended Mitigating Action #12: NASA and JAXA to confirm future plans for the Global Precipitation Measurement Mission (GPM).**