Report from CGMS WGI Task Group on Space Environment Sustainability

Presented to CGMS-54 WG-I session, agenda item 5.1

Coordination Group for Meteorological Satellites

EUMETSAT CGMS

Executive summary of the WP

This document reports on the background, content of the Terms of Reference and progress achieved for the CGMS WGI Task Group on Space Environment Sustainability, relevant to CGMS member current and planned missions.

The members of the Coordinated Group for Meteorological Satellites (CGMS) rely on the sustainability of the space environment to ensure their satellite missions remain able to deliver meteorological and space weather data to global forecasting services. In this regard, safety on Earth is very much intertwined with safety in space. CGMS has therefore established a Task Group on Space Environment Sustainability which shall address all aspects of operations in the space environment where CGMS member coordination can help improve the safety and sustainability of space operations for all space actors. The objectives include establishing best practices covering Space traffic coordination, lifetime extensions, end-of-life disposal and space weather mitigation of risks and effects. It is foreseen that a proposal on acceptable space traffic coordination practices can be submitted for consideration by UN COPUOS.

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TASK GROUP BACKGROUND

- Started TG meetings prior to CGMS-52 to establish the Terms of Reference

- Built upon the preliminary work initiated by its predecessor, the Space Debris and Collision Avoidance Task Group established in 2019
  - Had no activities since 2022
  - activities conducted were limited to bilateral interactions between NOAA and EUMETSAT
  - references to the documentation / reports are in the SES TG Terms of Reference

- The name of this revived Task Group was changed in recognition of the broader scope of activities, dealing not only with debris but also with safe operations in increasingly congested orbits and additionally taking into account potential impacts from space weather

- Furthermore, the objectives and actions from the CGMS Future Directions Project SSA theme were considered in the scope of this Task Group

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SCOPE OF THE TASK GROUP TERMS OF REFERENCE

- The Terms of Reference is addressed to all CGMS participants and is relevant for all management, engineering and legal functions responsible for ensuring the definition, implementation and operation of CGMS agency space-based systems is compatible with the space environment and its sustainability
- The Task Group objectives and activities defined by the Terms of Reference are therefore applicable across all satellite-based programmes in all mission phases
- The Terms of Reference includes all SSA aspects associated with the Short-, Medium- and Long-term Goals for CGMS* and split into the following categories:
  - Space Traffic Coordination
  - Space Weather
  - Space Sustainability
- There has been a minor update to specifically include the development of practical approaches for pre-launch conjunction assessment as required by the UN Long-Term Sustainability Guidelines

** CGMS future direction 2022+ Position paper theme: Space Situational Awareness*

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Call for Members

Membership of the Task Group has been sufficient to allow a meaningful exchange to take place, but would still benefit from the participation of currently unrepresented agencies (particularly in the domain of space safety and situational awareness).

Identification of experts from member organisations who can support offline analyses of the Task Group is key to progressing on the objectives of the Task Group

- Active participation of experts from ESA, EUMETSAT and NOAA has been very helpful

A broader participation of agencies remains critical to achieving the goals of this Task Group however.

Due to the extensive scope of the Task Group, a secretarial function supporting the Co-Chairs has not yet become available, which slows progress of the activities.

The current status of membership is provided on next slide.

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TG membership status

Important to obtain wide agency membership across all domains of SSA

Colour coding:

Participants confirmed

Participants to be nominated

Nomination of Experts also required

Role	Organisation	Function	Names
Co-Chair	EUMETSAT	Space Environment Sustainability Coordinator	Andrew Monham Andrew.Monham@eumetsat.int
Co-Chair	ESA	Head of Space Weather CGMS Future Project SSA lead	Juha-Pekka Luntama Juha-Pekka.Luntama@esa.int
Secretary	TBC		
Member	CMA	Space Weather	Cong HUANG huangc@cma.gov.cn
Member	CNES		
Member	CNSA		
Member	IMD		
Member	ISRO		
Member	JAXA	JAXA STCC (Satellite Tracking and Communications Center	Shinichi Nakamaru
Member	JMA		
Member	KASA	Head of Space Weather (KASA/KSWC)	Kichang Yoon Kangjin Lee
Member	KASI	Chief Manager / Principal Researcher Space Hazards Program Office Center for Space Situational Awareness	Dr. Eun-Jung Choi eunjung@kasi.re.kr
Member	KMA	Senior Researcher of Satellite Operation Divison	Jaeyoung Byon jybyon@korea.kr

Role	Organisation	Function	Names
Member	NASA	Head of Space Weather Space Comms & Navigation	Jamie Favors james.e.favors@nasa.gov John Hudiburg john.j.hudiburg@nasa.gov
Member	NICT	Executive Researcher Space Environment Laboratory	Tsutomu Nagatsuma tnagatsu@nict.go.jp
Member	NOAA	Deputy Director of NOAA Satellite Operations	Scott Leonard scott.leonard@noaa.gov
Member	ROSCOSMOS		
Member	ROSHYDROMET		
Member	WMO		Heikki Pohjola hpohjola@wmo.int
Member	ISES	Deputy Director of ISES (http://www.spaceweather.org/)	Sergio Dasso sergio.dasso@gmail.com
Expert	ESA	Space Debris Office	Klaus Merz
Expert	EUMETSAT	Flight Dynamics	Pier Luigi Righetti
Expert	EUMETSAT	Mission Analysis	Jose Maria de Juana Gamo
Expert	EUMETSAT	Programme Development	Remy Chalex /Alberto Za
Expert	EUMETSAT	Legal Affairs	Rachelle Antal-Wokes
Expert	NOAA	LEO	Paul Apostolopoulos
Expert	NOAA	GEO	Ian Ross
Observers	SANSA	Space Weather	Mpho Tshisaphungo Rendani Nndanganeni

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Task Group Priorities

a) Top priority is to produce best / acceptable practices for Space Traffic Coordination (collision avoidance, active on active satellite coordination practices)

b) 2nd priority are the tasks/actions related to space weather observation requirements for improved STC services and space sustainability and reviewing current usage of space weather data for spacecraft operations and goals for improvement

Progress on CGMS-53 Actions: Action Overview

Action	Description	Status
WGI/A50.07	Deliver a Best Practice document on Space Environment Sustainability, with supporting presentation to CGMS WGI, for recommendation for endorsement in CGMS-54	Open
WGI/A53.04	Define the requirement for supplying owner/operator orbit and manoeuvre information to TraCCS and identify steps for implementation	Propose Closed
WGI/A53.05	Identify steps to coordinate modelling of thermospheric density impacts and perform inter-comparison of model results	Open
WGI/A53.06	Discuss in intersessionals and prepare highlight presentations in next year's Task Group intersessionals and CGMS-54 WGs on: • The overall landscape of work on SES topics and where the CGMS TG on SES fits in it. • Agencies experience and practices on collision avoidance • Agencies experience and practice on Debris removal	Propose Closed
WGI/A53.07	Andrew Monham to develop a paper on CGMS work on SES for presentation at IAC in 2026.	Open
WGI/A53.08	Review current usage of space weather data for spacecraft operations and goals for improvement.	Open
WGI/A53.09	Produce a report of space weather observation requirements for improved STC services and space sustainability.	Open

Progress on CGMS-53 Actions: WGI/A50.07

Action	Description	Status
WGI/A50.07	Deliver a Best Practice document on Space Environment Sustainability, with supporting presentation to CGMS WGI, for recommendation for endorsement in CGMS-54	Open

The Task Group has continued compiling a matrix of currently used practices in the different domains of space traffic coordination and debris mitigation. This covers various orbital domains used to support the activities of the CGMS members: LEO, GEO, HEO, Extraterrestrial.

Inputs have been received from CMA, ESA, EUMETSAT, JAXA, NASA and NOAA.

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WGI/A50.07 : Space Traffic Coordination Agency Inputs (Example LEO Satellites 1 of 2)

Collision Avoidance / Space Traffic Coordination	NOAA Approach	EUMETSAT Approach	ESA Approach (during operations)	CMA Approach	JAXA Approach	NASA
Situational awareness data sources	Prime: CARA Sec: Commercial	Prime: 18th SPCS moving to TraCCS (DoC) Sec: EUSST	prime: 18th SPCS, EUSST, commercial under test, TraCCS followed	NCSW, CMA	18th/19th SPCS, JMOD	USSF Delta 2 (w/NASA contractors onsite at Vandenberg)
Risk assessment: LEO	CARA + Commercial Static Hard Body Radius	CARA + EUSST + Internal Dynamic Hard Body Radius	Internal, static HBR, worst case assessment when needed https://conference.sdo.esoc.esa.int/proceedings/sdc9/paper/391/SDC9-paper391.pdf https://conference.sdo.esoc.esa.int/proceedings/sdc8/paper/296/SDC8-paper296.pdf	Static Hard Body Radius		CARA (FOD for HSF missions)
Manoeuvre decision: LEO	If Pc risk ≥ 4.4e-4 and operational concerns	If Pc risk ≥ 1.0e-4 for EPS If Pc risk ≥ 3.0e-5 for S3/6	Mission specific, 10-4 or lower driven by 90% risk reduction overall. Req for new missions: ESSB-ST-U-007 Issue 1 requires the acceptable collision probability threshold shall be below 10-4 per conjunction.	If Pc risk ≥ 1e-4	A RMM is recommended If 1.0e-3>Pc≥1.0e-4. A RMM is requested if Pc≥1.e-3.	If Pc risk ≥ 1e-4 for non-HSF HSF If Pc risk ≥ 1e-5 pending operational impact to mission (different thresholds needed during prox ops, EVA, …)
Manoeuvre Timing Consider constraint on latest CAM decision	As late as possible	As late as possible, but anticipation considered	As late as possible, considering operational constraints.	As late as possible, but anticipation considered	As late as possible, considering operational constraints.	as late as possible given spacecraft constraints (ISS ~2.5 hrs prior to TCA)
Mitigating nominal mission impact	Optimization of satellite maneuver ops	Usage of routine maneuvers if possible	Optimisation and consideration of routine orbit control manoeuvers	Usage of routine maneuvers	Optimisation and consideration of routine orbit control manoeuvers	
Background risk analysis Consider residual risk after CAM on other objects	Mitigation target: 1.0e-7	Mitigation target: 3.0e-6 Less acceptable	Typical mititgation target: reduce the collision probability by at least two orders of magnitude below the threshold.	Mitigation target: 1.0e-6	Mitigation target: 1.0e-6	Mitigation target of 3e-6 (HSF 1E-7)
Non-Manoeuvrable satellites	Monitoring for high risk Notification: Pc ≥ 1.0e-3	Not applicable	Support coordination with other operators via space-track and status/ephem exchange New missions: Manoeuvre capabilities are required for GEO, LEO with>5year orbital lifetime, constellations, CPOs, and when cumulative collision probability with space objects larger than 1 cm is above 10−3 through to its end of [orbital] life.	Not applicable	Monitoring for high risk Notification: Pc ≥ 1.0e-3	Monitor, report remaining risk to management at TCA-24 hours, ask for Headcount from USSF

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WGI/A50.07: Space Traffic Coordination Agency Inputs (Example LEO Satellites 2 of 2)

Collision Avoidance / Space Traffic Coordination	NOAA Approach	EUMETSAT Approach	ESA Approach (during operations)	CMA Approach	JAXA Approach	NASA
Active on Active conjunctions	No case experienced: one to one coordination	Several cases observed: one to one coordination	mutual coordination, bilateral working-level arrangements, coordination platforms under evaluation	No case experienced: one to one coordination	Several cases observed: one to one coordination	work with secondary operator to coordinate who will maneuver
EOL Debris Mitigation	Direct de-orbit of maneuverable satellites Passivation otherwise	Uncontrolled de-orbit except for next EPS generation (controlled)	Controlled re-entry if casualty risk above threshold 10^-4 (may not be feasible for legacy missions). Else max 5 years lifetime or and max cumulative collision probability of 10^-3 with objects larger than 1 cm	Direct de-orbit of maneuverable satellites Passivation otherwise	Minimize release of objects, prevention of breakup and minimize orbital lifetime 25 years or less after disposal.	Direct de-orbit of maneuverable satellites Passivation otherwise
Experience with In-Orbit Servicing and Maintenance (ISAM) incl. Active Debris Removal (ADR)		Current and planned EUM satellites not prepared for ISAM. Future EU operated satellites will be fitted with interface devices. Studies with ESA supported on potential ADR of Metop first generation.				
Applicable Space debris mitigation standards and guidelines		ISO 24413 operationally, ESA SD requirements alignment for missions to be developed in the future. Supporting ECSS WG on SD and STM	ESA Space Debris Requirements ESSB-ST-U-007 Issue 1.1 (goes beyond ISO24113) https://sdup.esoc.esa.int/documents/download/ESSB-ST-U-007_Issue_1_Revision_1_23_October_2025.pdf		Space Debris Mitigation Standard (JMR-003E) [JAXA]	NPR 8715.6, NPR 8079.1
Applicable International and regional regulations		Potential impact from foreseen EU Space Act under discussion Support to EU DEFIS STM WG			Act on Launching of Spacecraft, etc. and Control of Spacecraft (Act No. 76 of 2016) [GOJ] *Guidelines on License Related to Control of Spacecraft *Guidelines for preventing collisions with satellites, etc.(Only Japanese)	
Usage of Space Weather Data in orbit prediction		NOAA SWPC predictions (averaged)	NOAA SWPC and ESA S2P	CMA NCSW predictions	NOAA SWPC predictions	each spacecraft operator makes this decision individually

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WGI/A50.07: Space Traffic Coordination Analysis of Current Practices (1)

Overall, a good alignment of operational practices is seen, driven by similar guidelines and standards used by the respective agencies. Examples of alignment are:

- USSF data are used by operators (ESA, EUMETSAT, JAXA, NASA and NOAA), plus some delta (CARA, EUSST, JMOD, commercial). CMA source of SSA data to be confirmed. It is noted that TraCCS will replace the USSF SSA data provision function (see separate action)
- In terms of manoeuvre timing, all operators target a collision avoidance manoeuvre (CAM) as late as possible
- To mitigate impact on the operational mission, all operators foresee optimising CAMs considering planned routine manoeuvres

WGI/A50.07: Space Traffic Coordination Analysis of Current Practices (2)

Some variation in the details of how standards and guidelines are implemented has been identified, which the Task Group is following up for discussion and potential identification of a best practice. For example:

- **Collision risk assessments**: different methods used in the calculation of the Hard-Body Radius of primary and secondary objects. Pros and cons and the potential for alignment being discussed
- **Manoeuvre decision criteria:** most operators use a reference of 1E-4, ESA and EUMETSAT use more stringent values for some missions to achieve a proportionate reduction in background risk. NASA's human spaceflight missions use more stringent values
  - TG considering whether more stringent thresholds should apply if collision would have severe consequences to the space environment
  - Also considering for **active-on-active** conjunction at around 1E-5, with coordination starting with identified risks of 3E-6 (to ensure operators have more time to establish communications)
  - Also for **active-on-active** conjunctions, should a simplified HBR approach be used, to aid a common understanding of the collision risk between the operators involved
- **Background risk management**: two orders of magnitude below the intervention threshold being considered OK for mitigation (ESA, CMA, Jaxa, NASA HSF), whereas NOAA reduce background risk much more and EUMETSAT and NASA a little less

WGI/A50.07: Implementation of the UN Long-Term Sustainability Guidelines

Given the objective of compiling a report towards UN COPUOS, the Task Group has started compiling a matrix of how the TG is addressing the UN Long-Term Sustainability Guidelines (Section B on Space Safety) and how each member agency is implementing their approach to these. So far, inputs from EUMETSAT and NOAA have been received which indicate good alignment overall.

As part of this analysis, it was noticed that pre-launch post-separation conjunction analyses for satellite payloads has not been considered in the scope of TG activities and this has now been added to the Terms of Reference. A presentation of the EUMETSAT approach newly implemented in support of MTG-S and Metop-SG-A1 launches was made. It was noted that:

- The EUMETSAT approach is mathematically proven to provide a real risk reduction despite uncertainties
- Launcher authorities were reluctant to consider – possible actions were limited to altering launch window, not aborting launch
- NOAA are working with NASA to implement a similar assessment
- Other agencies encouraged to review and comment

WGI/A50.07: Implementation of the UN Long-Term Sustainability Guidelines

Coverage example vs LTS Guidelines.

Full table provided in the document.

LTS Guideline	CGMS Coverage in Objectives	CGMS Member Supporting Activities	
		NOAA Approach	**EUMETSAT Approach**
B. Safety of space operations			
Guideline B.1: Provide updated contact information and share information on space objects and orbital events			
1. States and international intergovernmental organizations should exchange, on a voluntary basis, and/or make readily available regularly updated contact information on their designated entities authorized to engage in exchanges of appropriate information on on-orbit spacecraft operations, conjunction assessments and the monitoring of objects and events in outer space, in particular those entities that are responsible for processing incoming incident reports and forecasts and adopting precautionary and response measures. This may be achieved either by providing such information to the Office for Outer Space Affairs so that the Office can make it available, within its standing mandate and existing resources, to other States and international intergovernmental organizations and/or by providing it directly to other States and international intergovernmental organizations, with the understanding that contact information for national focal points, at a minimum, will likewise be communicated to the Office.	Full	Situational awareness data sources: Prime: CARA/18 SDS moving to TraCSS (DoC). Sec: Commercial (+EUSST/SDA for GEO) LEO Active-on-active: No case experienced: one to one coordination GEO Active-on-active: Coordination via 19 SDS/EUSST or SDA	Registration with UNOOSA Situational awareness data sources: Prime: 18 SDS moving to TraCSS (DoC) Sec: EUSST (+SDA for GEO) Contact, orbit and manoeuvre data sharing with all above. LEO Active-on-active: Several cases observed: one to one coordination GEO Active-on-active: Coordination via SDA
2. States and international intergovernmental organizations should establish appropriate means to enable timely coordination to reduce the probability of and/or to facilitate effective responses to orbital collisions, orbital break-ups and other events that might increase the probability of accidental collisions or may pose a risk to human lives, property and/or the environment, in the case of uncontrolled re-entries of space objects.	Addressing definition of criteria to flag potential events requiring coodinated mitigation	Yes: Reporting to above mentioned data exchange partners. NOAA follows best practise to inform community, EUSST and 19 SDS of any breakups / uncontrolled reentries.	Yes: Reporting to above mentioned data exchange partners - have lower threshold to start risk assessment process. EUM foresees to inform EU SST, ESA SDO and US SpaceTrack of any breakups / uncontrolled reentries.
3. States and international intergovernmental organizations should exchange, on a voluntary basis and as mutually agreed, relevant information on space objects and information related to actual or potential situations in near-Earth space that may affect the safety of outer space operations. The information exchanged should, to the extent practicable, be reliable, accurate and complete, and be concluded to be so by the providing entity. The information to be exchanged, including time reference and period of applicability and other relevant information, should be provided in a timely manner and on a mutually agreed basis.	Full: Development of an active-on-active coordination data sheet for CGMS	LEO Active-on-active: No case experienced: one to one coordination GEO Active-on-active: Coordination via 19 SDS/EUSST or SDA	LEO Active-on-active: Several cases observed: one to one coordination GEO Active-on-active: Coordination via SDA Stakeholders to be informed if a satellite loses manoeuvre capability (also temporarily), as well as inform in advance if manoeuvre is planned / executed.

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WGI/A50.07: Compilation of Active-on-Active Contact Points and Information Exchange

The Task Group has continued to promote the listing of contact points to handle active-on-active satellite conjunctions, together with additional information on the formats of data etc.

- Requested to identify if the named contact for a given member can be used as an intermediary to distribute information concerning such conjunctions to national or regional third-party operators who may otherwise not be contactable
- Although contact point listings are also available in Space Track, this spreadsheet has the potential to include value-added information and further contributions are encouraged

EUMETSAT and NOAA noted recent positive experiences concerning active-on-active conjunctions with Chinese space assets and information has been recorded in the LTS mapping concerning the contact point used (CASS@bittt.cn conjunction assessment service of Beijing Institute of tracking and telemetry technology)

- **CNSA** is invited to confirm the scope of missions being managed by the CASS@bittt.cn contact point
- CMA have provided a separate contact point applicable to their satellites (lits@cma.gov.cn) which is recorded in the active-on-active sheet

WGI/A50.07: Compilation of Active-on-Active Contact Points and Information Exchange

CGMS SES TG Active-on-Active Conjunction Contact List					
CGMS Agency	Nominal Contact Points	Emergency Contact Point	Own satellite orbital state vector available?	Own satellite manoeuvre plan available?	Ability to contact other national/regional operators?
SES TG agency			Public / On-request	Public / On-request	List operators
			Format (OEM recommended)	Format (OPM recommended)	For each operator, analogous info on orbit and manoeuvre
EUMETSAT	Pier Luigi Righetti Email: PierLuigi.Righetti@eumetsat.int	CA on-call engineer Email: FDYN.LEO@eumetsat.int Tel (Control Room): (To request to inform CA on-call engineer)	Available on request Format: OEM	Available on request Format: EUM specific (effect included in orbit)	Contact with SDA Members can SDA Members share orbital information (various formats)
JAXA	JAXA CA Team Z-JAXA.STCC_CA-OPERATORS@ml.ja	JAXA CA Team Z-JAXA.STCC_CA-OPERATORS@ml.jaxa.jp	Available on request Format: OEM (ver 2)	Available on request Format: JAXA Own Format (Now) OPM (near future, Summer	Only JAXA
CMA	lits@cma.gov.cn	lits@cma.gov.cn			Yes, CNSA

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WGI/A50.07: Conclusion

The Task Group has been able to gather sufficient information from a subset of CGMS members to allow meaningful comparisons and analyses towards a best practices definition.

A draft Best Practice document at CGMS-55, with mapping to UN Long-Term Sustainability Guidelines should be achievable but requires:

- Further offline analysis with the support of member agency experts
- Additional CGMS member inputs to ensure the BPs are representative and feasible for the wider membership

It is recommended to keep the action open until CGMS-55, noting that UN LTS Guideline mapping shall also be included in the deliverable document.

Progress on CGMS-53 Actions: WGI/A53.04

Action	Description	Status
WGI/A53.04	Define the requirement for supplying owner/operator orbit and manoeuvre information to TraCCS and identify steps for implementation	Propose Closed

NOAA have provided detailed information based upon their own experience, using publicly available TraCSS document links and example files from the NOAA GOES mission (a TraCSS pilot user). This should help other CGMS operators with example OCM and CDM formats before the service enters the production/public phase at a TBD date.

- Goal is to transition all (non-US military) users of Spacetrack to TraCCS
- Access to the TraCCS should be unrestricted – it is an international platform
- Data will be fully public, including uploaded ephemeris

WGI/A53.04 : Status and supply of owner/operator orbit and manoeuvre information to TraCCS

TraCSS Status:

- NOAA's Office of Space Commerce (OSC) is developing the Traffic Coordination System for Space (TraCSS) to provide basic space situational awareness (SSA) data and services to civil and private space operators, supporting spaceflight safety
- As the TraCSS user interface matures, OSC will migrate users from SpaceTrack to TraCSS.gov
- TraCSS is currently undergoing testing and development with a set of pilot users in various orbits
- Public release for all operators on a date to be announced

Supplying owner/operator orbit and manoeuvre information to TraCSS:

- TraCSS has developed its own unique CDM and OCM orbit data formats which are detailed on the public facing site and continues to be refined
- Operators are to generate OCM files containing details such as orbit data, physical properties, covariance data, maneuver data, OD information and other perturbation parameters along with meta data such as points of contact
- Links to all relevant information can be found in the SES TG report document
- Examples of NOAA GOES data files ingested into TraCCS and CDM output files made available to the TG

WGI/A53.04 : Status and supply of owner/operator orbit and manoeuvre information to TraCCS

Implementation Steps:

- Operators currently interfacing with TraCSS via APIs to upload and download orbit data and access CDMs automatically, without manually using the portal
- Because the service and portals are currently in development, information will be shared with new operators as they are onboarded
- Operators will need to create accounts on TraCSS when the service enters the production/public phase and set up their fleet details, any third-party partners and relevant operations details
- **This addresses the point highlighted in the CGMS-53 Task Group report:**
  - *"The TG noted that currently good propagation products using space weather inputs come from US 18th Squadron. However, their starting point (knowledge of operator orbit) is based on their own measurements, rather than operator supplied orbit. If the owner/operator orbit and future manoeuvres could be supplied, then the propagation may be more accurate. TG members are requested to consider the requirement for this and steps for implementation. Recommended to follow up with TraCSS (US DoC)"*
  - Since TraCCS can accept the owner/operator orbit and manoeuvre information, this should provide a more accurate propagation that previously possible, helping to improve the risk assessment accuracy

WGI/A53.04 : Conclusion

Action WGI/A53.04 is proposed to be closed.

Progress on CGMS-53 Actions: WGI/A53.05

Action	Description	Status
WGI/A53.05	Identify steps to coordinate modelling of thermospheric density impacts and perform inter-comparison of model results	Open

Modelling of thermospheric density is essential to better understand the drag environment of our satellites and the debris field around them, leading to more effective collision risk assessments.

- The Task Group is working on building a table of thermospheric density models and related studies to facilitate intercomparison
- ESA have provided a first input which is reproduced in Annex VI of the Task Group Report.
- It is expected that CCMC (Community Coordinated Modeling Center) expert inputs can be made via NASA, (https://science.gsfc.nasa.gov/674/ccmc-landing-page.html)
- Inputs from other agencies are requested

Conclusion

- Action WGI/A53.05 remains open, pending inputs from other agencies to the thermospheric density model table and subsequent intercomparison and recommendations for coordination.

Coordination Group for Meteorological Satellites

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Progress on CGMS-53 Actions: WGI/A53.06

Action	Description	Status
WGI/A53.06	Discuss in intersessionals and prepare highlight presentations in next year's Task Group intersessionals and CGMS-54 WGs on: • The overall landscape of work on SES topics and where the CGMS TG on SES fits in it. • Agencies experience and practices on collision avoidance • Agencies experience and practice on Debris removal	Propose Closed

The overall landscape of work on SES topics and where the CGMS TG on SES fits in it:

- Significant review of the overall landscape of SES topics is presented in the September 2024 European Space Policy Institute report: "A Party for Everyone? Analysing international efforts in space debris mitigation". *https://www.espi.eu/reports/a-party-for-everyone-analysing-international-efforts-in-space-debris-mitigation/*
  - Comparative analysis of key international instruments aimed at mitigating space debris, enhanced by detailed insights on their evolution. It is noted that "*the report highlights a lack of broad international alignment on concrete implementation pathways and a fragmented landscape of a multitude of frameworks with heterogenous involvement*"
  - CGMS SES Task group part of the "*fragmented landscape*", but valuable as experienced operators with global scope have a direct forum to discuss and improve the implementation pathways to meet ever stricter debris mitigation standards and regulations

WGI/A53.06 : The overall landscape of work on SES topics and where the CGMS TG on SES fits in it (cont'd)

Comparative evaluation mechanisms identified in ESPI report.

TG members and experts involved in evolving other mechanisms in this list (such as the ISO 24113 standard, the ESA SD requirements etc.)

Selected Mechanisms (incl. date of first release)		Content				Structure			Representation		
		I. Design & Architecture	II. Collision avoidance	III. Orbital Clearance	IV.Compliance & Monitoring	V. Type of commitment	VI. Centralisation degree	VII. Adaptability & Evolution	VIII. Number of partners	IX. Type of partners	X. Ease of access
IADC Space Debris Mitigation Guidelines	2002	Yes	Yes	Yes	No	Imprecise	Decentralised	Flexible	Internal	Public	Accessible
European Code of Conduct for Space Debris Mitigation	2004	Yes	Yes	Yes	No	Concrete	Decentralised	Partial	Internal	Public	N/A
UN COPUOS Space Debris Mitigation Guidelines	2007	Yes	Yes	Yes	No	Imprecise	Partial	Partial	High	Public	N/A
Rec ITU-R S.1003-2 (Geostationary)	2010	No	No	Yes	No	Concrete	Centralised	Partial	High	Public	Undefined
ISO 24113 Space debris mitigation requirements	2010	Yes	Yes	Yes	Yes	Imprecise	Centralised	Flexible	High	Pub.-priv	Accessible
UN LTS Guidelines	2019	Yes	Yes	Yes	Partial	Imprecise	Partial	Partial	High	Public	N/A
SIA Principles of Space Safety	2019	Yes	Yes	Yes	No	Imprecise	Partial	Partial	High	Private	Accessible
Space Safety Coalition's Best Practices	2019	Yes	Yes	Yes	No	Imprecise	Decentralised	Partial	High	Private	Undefined
CONFERS' Recommended Design & Practices	2019	Partial	Partial	No	Partial	Imprecise	Partial	Flexible	High	Pub.-Priv.	Undefined
PPF's Net Zero Space Initiative	2021	Partial	Partial	Partial	No	Imprecise	Decentralised	Flexible	High	Pub.-Priv.	Accessible
G7 Science and Technology Ministers' Communiqué	2023	Partial	Partial	Partial	No	Generic	Decentralised	Partial	Internal	Public	N/A
WEF's Space Industry Debris Mitigation Recommendations	2023	No	Yes	Yes	No	Concrete	Decentralised	Partial	Low	Private	Accessible
ESA Space Debris Mitigation Requirements	2023	Yes	Yes	Yes	Yes	Concrete	Centralised	Flexible	Internal	Public	N/A
GSOA Code of Conduct on Space Sustainability	2023	Yes	Yes	Yes	Partial	Imprecise	Decentralised	Flexible	High	Private	Accessible
Zero Debris Charter	2023	Yes	Yes	Yes	Partial	Concrete	Decentralised	Partial	High	Pub.-Priv.	Accessible

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WGI/A53.06 : The overall landscape of work on SES topics and where the CGMS TG on SES fits in it (cont'd)

The STC matrix presented under action WGI/A50.07, includes information on space debris guidelines, standards and regulations used within CGMS member agencies:

- Inputs provided by ESA, EUMETSAT, JAXA and NASA

The implementation approach to fulfilling the UN LTS Guidelines is requested from all agencies:
Inputs provided by EUMETSAT and NOAA.

Of the mechanisms indicated in the ESPI report, it is considered that the Space Safety Coalition's Best Practices most closely aligns with the objectives of the CGMS SES Task Group.

Although this concerns a group of private, commercial operators, it is felt valuable to share lessons learned. To this end, an invitation has been made to the Chair of this Space Safety Coalition to present their work at an upcoming SES TG meeting. Scope for further cooperation will be examined.

WGI/A53.06 : Agencies experience and practices on collision avoidance & debris removal

Information has been requested through the STC matrix presented under action WGI/A50.07. Please refer to the discussion of experience and practices under that action point.

- NOAA, NASA and CMA consider direct de-orbit for manoeuvrable LEO satellites, ESA if the on-ground risk too high, EUMETSAT for new satellites
- 25 years for uncontrolled re-entry considered by EUMETSAT and JAXA for existing satellites
- EUMETSAT, in partnership with ESA, has been investigating the potential of In-Orbit-Servicing / Active Debris Removal in terms of mission lifetime benefits for existing missions and possible application to new missions

WGI/A53.06 : Conclusion

The SES TG is one of many groups focussing on space safety and traffic management.

However, most are aimed at defining requirements rather than exchanging experience in implementation of those requirements and aligning implementation methods.

The closest body in terms of scope and objectives would appear to be the Space Safety Coalition (SSC).

An invitation has been made for the SSC to present their work at an upcoming SES TG meeting.

Scope for further cooperation will be examined.

It is proposed to close WGI/A53.06 and raise a new action:

- *WGI/A54.XX: Assess overlap and scope for coordination with the Space Safety Coalition*

Progress on CGMS-53 Actions: WGI/A53.07

Action	Description	Status
WGI/A53.07	Andrew Monham to develop a paper on CGMS work on SES for presentation at IAC in 2026.	Open

The Abstract: “Coordination of Space Environment Sustainability Approaches in the Coordinated Group for Meteorological Satellites (CGMS)” has been accepted for presentation at the 77th IAC in the Space Debris Symposium.

Conclusion

Action to remain open until paper developed / presented at the IAC (Antalya, Turkey, 5-9 October) and feedback provided to the SES TG for reporting at CGMS-55.

Progress on CGMS-53 Actions: WGI/A53.08

Action	Description	Status
WGI/A53.08	Review current usage of space weather data for spacecraft operations and goals for improvement.	Open

Space weather information is split on two tables separating the Space Traffic Coordination needs from the "safety of space operation" related information (see Annex VII of SES TG Report)

- Only ESA inputs, no further inputs made since CGMS-53
- ESA will provide more details to facilitate comparison with other agencies' approaches and achieved accuracies
- Inputs from other agencies are expected soon

Advances in assessing thermospheric density models and in improving space weather propagation from the space debris data provider (soon to be TraCCS) have progressed and are dealt with in separate actions.

Conclusion:
Action remains open.

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Progress on CGMS-53 Actions: WGI/A53.09

Action	Description	Status
WGI/A53.09	Produce a report of space weather observation requirements for improved STC services and space sustainability.	Open

To be produced following delivery and analysis of inputs from WGI/A53.08

Conclusion:
Action remains open.

Meetings Held / Planned

Since CGMS-53, the following 3 TG meetings have taken place:

- 10 October 2025, 21 January 2026, 10 March 2026 - (Nov. 2025 meeting had to be cancelled)
- An **additional TG** meeting prior to the CGMS-54 plenary is **proposed for 20 May 2025**

Proposed CGMS-54-55 TG Meetings (all virtual, starting 12:00 UTC)

- 7 July 2026 ,3 Sept 2026, 15 Oct 2026, 2 Dec 2026, 26 Jan 2027, 11 Mar 2027

Opportunities for face-to-face discussions as side meeting in other conferences shall also be considered.

Foreseen outreach activities include the presentation of the CGMS SES TG activities at the 77th IAC in Antalya, Turkey, 5-9 October 2026.

Consideration shall also be made for an abstract for the SpaceOps2027 event which will take place in Munich, Germany, 10-14 May 2027.

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Key issues of relevance to CGMS:

- The Space Sustainability Task Group addresses the following aspects of the HLPP:
  - 2.5 Operational issues related to space weather
  - 2.6 Space traffic coordination
  - 2.7 Space Sustainability

- UN COPUOS has visibility to this Task Group Effort from the UN-Space Special Report on Space Debris presented in Vienna in June 2024.
- International Astronautical Congress 77 will have visibility to this from paper/presentation planned in October 2026.

To be considered by CGMS:

- **Due dates for the following actions are requested for extension to the CGMS-55 WGI meeting:**
  - WGI/A50.07, WGI/A53.05, WGI/A53.07, WGI/A53.08, WGI/A53.09
- **Proposed to close the following actions**: WGI/A53.04, WGI/A53.06
- **New action proposed:**
  - Action WGI/A54.XX: Assess overlap and scope for coordination with the Space Safety Coalition

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Spare Slides – Additional Information

Objectives / Deliverables Highlights (abridged)

1. **Objective**: Stay abreast on the status, current events and foreseen evolutions of the space environment, together with related regulations, guidelines, approaches, tools and services with the potential to constrain or inform in-orbit and planned CGMS mission services

   Deliverable: Accessible Resource database

2. **Objective:** Establish a Best Practice on Space Environment Sustainability aspects for CGMS member's missions covering:
   i. Space Traffic Coordination
   ii. Lifetime extensions and end-of-life disposal
   iii. Break-up and atmospheric re-entry notification process
   iv. Space weather forecast usage and mitigation of risks and effects

   Deliverables:
   a) A best practice document on Space Environment Sustainability based primarily on existing practices, but also with a view to emerging technologies and concepts for long-term, system lifecycle sustainability
   b) A gap analysis on global Space Traffic Coordination capabilities and alignment
   c) Updated proposal for best practices based on outputs from (a), (b), targeting approval by CGMS for submission to UN COPUOS, with focus on Space Traffic Coordination

3. **Objective:** Identify and act upon risks to sustained operations

   Deliverable: A space environment sustainability SWOT analysis, with identified actions

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TASK GROUP ROLE

- The following description has been included in UN-Space** Special Report on Space Debris and presented at UN-COPUOS*** in June 2024.

N. Meteorology

86. The members of the Coordination Group for Meteorological Satellites (CGMS), of which WMO is one, rely on the sustainability of the space environment to ensure their satellite missions remain able to deliver meteorological and space weather data to global forecasting services. In this regard, safety on Earth is very much intertwined with safety in space. CGMS has therefore established a Task Group on Space Environment Sustainability which shall address all aspects of operations in the space environment where CGMS member coordination can help improve the safety and sustainability of space operations for all space actors. The objectives include establishing best practices covering space traffic coordination, lifetime extensions, end-of-life disposal and mitigation of space weather risks and effects. It is foreseen that a proposal on acceptable space traffic coordination practices may be submitted for consideration by the Committee on the Peaceful Uses of Outer Space.

Coordination Group for Meteorological Satellites

* *United Nations Office for Outer Space Affairs*
** *Inter-Agency Meeting on Outer Space Activities*
*** *Committee on the Peaceful Uses of Outer Space*

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