

International Academy of Astronautics IAA Space Debris Committee March 29th, 2023



Agenda

- 1. IAC Administrative part
 - 1.1. IAA Space Debris Committee
 - 1.2. Lessons learned from Paris 2022
 - 1.3. General statistics concerning Space Debris Symposium A6
 - 1.4. Status of Space Debris Symposium for Baku 2023
 - 1.5. Preparation of Space Debris Symposium for Milan 2024

2. Exchanges

- 2.1. Past events: workshops, conferences, congresses, ...
- 2.2. On the Agenda
- 2.3. General information
- 2.4. Round table Open discussion
- 3. IAA Study Groups
 - 3.1 SG 5.17 IAA Situation Report on Space Debris



1.1 IAA Space Debris Committee

General frame:

- Officially created within IAA in 2012
 - Independent Committee
 - Permanent Committee
 - Attachment to Commission V. Could be independent if it would present any interest
- Actions of the Committee:
 - Position Paper on Orbital Debris in 1993, revised in 2000
 - Position Paper SG 5.1 on Space Debris Mitigation in 2006
 - Position Paper SG 5.5 on Space Debris Remediation in 2013
 - Participation to SG 5.10 on Orbital Debris Removal: Policy, Legal, Political and Economic considerations
 Participation to SG 4.23 on Post-Mission Disposal for Micro and Smaller Satellites: Concepts and Trade Studies
 - Review of the SG 5.15 on Space Traffic Management, finished and published
 - Situation Report Paper 2016 SG 5.14 finished and distributed
 - Situation Report Paper 2019 SG 5.17 on going
 - Numerous presentations (UNCOPUOS, ...)



International Academy of Astronautics

1.1 IAA Space Debris Committee

Membership:

No need to be member of IAA !

- Members of the IAA A6 Symposium Program Committee (chairs & rapporteurs)
 - ⇒ Note that the IAC Program Committee is exclusively selected among the IAA SDC members
- Members of the Program Committee of other IAA sponsored conferences with Space Debris concerns
- Members of Space Debris related working groups (IADC, UNCOPUOS, COSPAR, ISO ...)
- Academics, Labs, Universities, Industrials... working on the topic

However, it is requested to be "active":

- Participation to the meetings
- Debriefing of activities during the meetings
- Cross information with other members
- Contribution to studies and reports
- To see the work which is done, visit our web page

https://iaaspace.org/about/permanent-committees/#SA-PERMCspacedebris

Two meetings per year:

- One during IAC ⇒ Includes the status of the sessions, workshops, round tables... of the week
- One during IAC March Meeting Includes the pre-selection of the abstracts for the following IAC



International Academy of Astronautics

1.1 IAA Space Debris Committee

Current membership:

Agapov Vladimir Aglietti Guglielmo Agueda Alberto Ailor William **Alary Didier** Alby Fernand Anilkumar A.K. Anselmo Luciano **Anz-Meador Philip** Auburn John Bastida-Virgili Benjamin Berend Nicolas Bevilacqua Riccardo **Brachet Gerard** Christiansen Eric L Colombo Camilla Cordelli Emiliano **Crowther Richard**

Dasgupta Upasana **Faucher Pascal Finkleman David** Fitz-Coy Norman G. **Flohrer Tim** Forshaw Jason Francesconi Alessandro Francillout Laurent Gong Zizheng Grishko Dmitriy Hanada Toshiya Howard Diane Hyde James Jah Moriba K. Jankovic Marko Kawamoto Satomi Kelso T. S. Kerr Emma **Kibe Seishiro**

Kim Hae-Dong Dolado Perez Juan-Carlos Kitazawa Yukihito Klinkrad Heiner Krag Holger Lemmens Stijn Letizia Francesca Liou Jer-Chyi Martinez Peter Martinot Vincent Marzioli Paolo Masson-Zwaan Tanja McKnight Darren S. Metz Manuel Nassisi Annamaria Oltrogge Daniel L. **Opromolla Roberto** Pardini Carmen Piergentili Fabrizio **Plattard Serge** Rossettini Luca L. Rossi Alessandro

Sanchez-Ortiz Noelia Santoni Fabio Schaefer Frank Schildknecht Thomas Seitzer Pat Shen Lin Singh Balbir Siminski Jan Skinner Mark Smith Lesley-Jane Somma Gian Luigi Sorge Marlon E. Spencer David B. **Stokes Hedley** Traineau Jean-Claude Tung Helen Usovik Igor Wiedemann Carsten Yasaka Tetsuo

Chairs & Secretary: **Bonnal Christophe**

Omaly Pierre

New members already approved

Del Campo Lopez Borja Nitta Kumi bid you receive invitation from IAA

To be removed ??

Synthesis:

79 + 2 = 81 members

See appendix 1 for today's list of participants : To be circulated / online presence ?



1.2 General evolution of IAC

Number of IAC abstracts since 2008





1.2 General statistics concerning A6 up to Paris

Globally healthy symposium:

Average 206 papers submitted every year these last 10 years: large variations (standard deviation = 47.2) Very good rejection rate: average last 10 years $51\% \Rightarrow$ Evolution in 2022 due to the very high number of IPs Very good presentation rate: average (2012-2019) = 81%





Rejection rate



Academy of 1.2 General statistics concerning A6 up to Paris

9					rap sub	Pap Acc	Pap Pres	Pap No-Sh	Up Manu	Up Pres	% Pap Rej	% Pap Acc	% Pap Pres	% Pap No-Sh	Pres vs Acc	Manu vs Pres
					211											
10	604	1019	801	80,1	306	99	93	9	88	(68%	32%	94%	9%	0%	95%
10	339	454	397	35,3	194	100	82	11			48%	52%	82%	1196	0%	0%
10	0	0	0	0,0	239	105	90	4	97		56%	4496	86%	4%	0%	108%
10	390	654	475	47,5	170	107	98	.3	96	1	37%	63%	92%	3%	0%	98%
10	547	809	691	69,1	239	105	90	4	97		56%	44%	86%	4%	0%	108%
10	505	698	602	60,2	208	94	82	5	84		55%	45%	87%	5%	0%	102%
9	365	531	448	49,8	154	91	76	3	75	74	41%	59%	84%	3%	81%	99%
10	374	521	448	44,8	165	96	72	4	73	69	42%	58%	75%	4%	72%	101%
9	492	653	572,5	63,6	223	95	77	4	74	1	57%	43%	81%	4%	0%	96%
8	360	521	440,5	55,1	164	79	67	4	63		52%	48%	85%	5%	0%	94%
7	270	348	309	44,1	167	55	41	4	55		67%	33%	75%	7%	0%	134%
б	285	375	330	55,0	105	58	47	1	48	54	45%	55%	81%	2%	93%	102%
9,1	357,0	505,8	428,4	47,7	194,5	90,3	74,7	4,3	76,2	65,7	51%	49%	81%	4%	35%	104%
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1.3. Lessons learned from Paris 2022

Thank you Myriam... 🕲

cnes

Status of the Technical Programme Image: Status of the Technical Programme <

16/09/2022 www.iac2022.org



1.3. Lessons learned from Paris 2022

Thank you Myriam... 🕲

Status Report – Accepted abstracts (Regional Group Distribution)







1.3. Lessons learned from Paris 2022

Thank you Myriam... 🥲





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1.3. Lessons learned from Paris 2022

Thank you Myriam... 🕲

SESSION ID	TECHNICAL SESSIONS	Min	Max	Avg	Avg per	Papers	Papers	Papers	Notified Withdrawa	No	% Doners	%	%	%
SESSIONID	TECHNICAL SESSIONS	Au	Au	All	56551011	Suom	Scheu	FICS	WILLIAWI	SHOW	Selected	Present.	Withdrawn	Show
2022	A6. SPACE DEBRIS		i i											
A6.1.	Space debris detection, tracking and characterization	70	100	85		73	10	9	0	1	14%	90%	0%	10%
A6.2.	Modeling and risk analysis	60	130	95		29	10	10	0	0	34%	100%	0%	0%
A6.3.	Impact induced mission effects and risks assessments	35	134	84,5		10	9	8	0	1	90%	89%	0%	11%
A6.4.	Mitigation and Standards	54	96	75		21	11	10	0	1	52%	91%	0%	9%
A6.5.	Post mission disposal and space debris removal (1)	60	80	70		39	10	9	0	1	26%	90%	0%	10%
A6.6.	Post mission disposal and space debris removal (2)	45	63	54		25	10	9	0	1	40%	90%	0%	10%
A6.7	Operations in Space Debris Environment, Situational Awareness	97	151	124		37	10	7	3	0	27%	70%	30%	0%
A6.8-E9.1	(Joint Session with Space Security Committee): Political, Legal, Institutional and Economic Aspects of Space Debris Detection, Mitigation and Removal	90	110	100		51	13	12	1	0	25%	92%	8%	0%
A6.9	Orbit determination and propagation	68	125	96,5		14	10	9	0	1	71%	90%	0%	10%
A6.10-E10.2	Joint Technical Session: "Near-Earth Objects & Space Debris"	25	30	27,5		7	6	5	0	1	86%	83%	0%	17%
A6.IP	Interactive presentation					6					2			
	TOTAL without IP	604	1019	812	81,2	306	99	88	4	7	32%	89%	4%	7%
2019	A6. SPACE DEBRIS													
A6.1.	Space debris detection, tracking and characterization	50	87	57		23	10	9	1	0	43%	90%	10%	0%
A6.2.	Modeling and risk analysis	45	85	60		17	12	11	1	0	71%	92%	8%	0%
A6.3.	Impact induced mission effects and risks assessments	32	41	35		13	11	7	1	3	85%	64%	9%	27%
A6.4.	Mitigation and Standards	30	36	33		18	10	9	1	0	56%	90%	10%	0%
A6.5.	Post mission disposal and space debris removal (1)	40	85	55		19	10	10	0	0	53%	100%	0%	0%
A6.6.	Post mission disposal and space debris removal (2)	50	70	60		17	10	10	0	0	59%	100%	0%	0%
A6.7	Operations in Space Debris Environment, Situational Awareness	38	71	40		23	10	9	1	0	43%	90%	10%	0%
A6.8	(Joint Session with Space Security Committee): Political, Legal, Institutional and Economic Aspects of Space Debris Detection, Mitigation and Removal	37	69	44		16	12	12	0	0	75%	100%	0%	0%
A6.9	Orbit determination and propagation	24	41	32		12	10	9	1	0	83%	90%	10%	0%
A6.10-B4.10	Joint Small Satellite/Space Debris Session to Promote the Long-Term Sustainability of Space	44	69	59		14	9	8	1	0	64%	89%	11%	0%
A6.IP	Interactive presentation					35	35	30	0	5	100%	86%	0%	14%
	TOTAL without IP	390	654	475	47,5	172	104	94	7	3	60%	90%	7%	3%



Connecting @ll Space People







Thank you Myriam 😳





211 abstracts submitted to A6 this year - #4 of the congress





Number of A6 abstracts, Space Debris Symposium, since 2008





1.4. Space Debris Symposium for Baku 2023 Initial list, as per the website

A6: Space Debris Symposium: Bevilacqua – Bonnal – Omaly - Skiner

The Symposium will address the complete spectrum of issues associated to space debris, including orbital sustainability and operations in debris dominated environment.

It will cover every aspect of Space Environment Management (SEM) including Mitigation and Remediation measures, Space Surveillance and Tracking (SST), Space Situational Awareness (SSA), Space Traffic Management (STM), including all aspects of measurements, modelling, risk assessment in space and on the ground, re-entry, hypervelocity impacts and protection, mitigation and standards, post-mission disposal, remediation, debris removal, Space Surveillance, collision avoidance as well as non-technical topics associated to space debris dominated environment.

A6.1: Space Debris Detection, Tracking and Characterization - SST: Skinner - Agapov Piergentili - Schildknecht

This session will address every aspect of SST (Space Surveillance and Tracking), advanced ground and space-based measurement techniques, relating processing methods, and results of space debris characterization.

A6.2: Modelling and Risk Analysis: Sorge - Oltrogge - Pardini

This session will address the characterization of the current and future debris population and methods for in-orbit and on-ground risk assessments. The in-orbit analysis will cover collision risk estimates based on statistical population models and deterministic catalogues, and active collision avoidance.

A6.3: Impact-Induced Mission Effects and Risk Assessments: McKnight – Gong – Traineau -Kitazawa

This session addresses disruptions of spacecraft operations induced by hypervelocity impacts including spacecraft anomalies, perturbation of operations, component failures up to mission loss, and spacecraft fragmentations. It includes risk assessments for impact vulnerability studies and corresponding system tools. Further topics are spacecraft impact protection and shielding studies, laboratory impact experiments, numerical simulations, and on-board diagnostics to characterize impacts such as impact sensors, accelerometers, etc.



1.4. Space Debris Symposium for Baku 2023 Initial list, following last meeting

A6.4: Mitigation - Tools, Techniques and Challenges - SEM: Omaly – Kawamoto – Krag Colombo

This session will focus on the Mitigation part of the SEM (Space Environment Monitoring), implementation of debris prevention and reduction measures; vehicle passive protection at system level including end of life strategies and tools to verify the efficiency of the implemented measures. The session will also address practical experiences in the planning and verification of measures and issues and lessons learnt in the actual execution of mitigation actions.

A6.5: Post Mission Disposal and Space Debris Removal 1 - SEM: Singh - Opromolla - Prevereaud

This session will focus on the Remediation part of the SEM, dealing with ADR (Active Debris Removal), JCA (Just in time Collision Avoidance), LDTM (Large Debris Traffic Management) among solutions. It will address post-mission disposal and active removal techniques "ground and space based", review potential solutions and identify implementation difficulties.

A6.6: Post Mission Disposal and Space Debris Removal 2 - SEM: Jankovic – Grishko – Forshow

This session will focus on the Remediation part of the SEM, dealing with ADR (Active Debris Removal), JCA (Just in time Collision Avoidance), LDTM (Large Debris Traffic Management) among solutions. It will address post-mission disposal and active removal techniques "ground and space based", review potential solutions and Identify implementation difficulties.

A6.7: Operations in Space Debris Environment, Situational Awareness - SSA: Martinot – Kelso – Sanchez-Ortiz

This session will address the multiple aspects associated to STM (Space Traffic Management) and SSA (Space Situational Awareness) including safe operations in space dealing with Space Debris, operational observations, orbit determination, catalogue build-up and maintenance, data aggregation from different sources, relevant data exchanges standards and conjunction analyses.



A6.8 / E9.1 (joint with Space Security Committee): Political, Legal, Institutional and Economic Aspects of Space Debris Mitigation and Removal - STM Security

Spencer – Plattard – Masson-Zwaan – Capurso – Samson – Kerr

This session will address all non-technical aspects of Operations and Security in a Debris Dominated Environment. This STM session will mainly include the non-technical aspects of space debris mitigation and removal. Political, legal and institutional aspects include role of IADC and UNCOPUOS and other multilateral bodies. Economic issues include insurance, financial incentives and funding for space debris mitigation and removal. The role of international cooperation in addressing these issues will be considered

A6.9: Orbit Determination and Propagation - SST

Siminski Cordelli – Dolado-Perez – Marzioli

This session will address every aspect of orbit determination coming from the SST (Space Surveillance and Tracking), related to assessment of raw and derived data accuracy, optical measurements processing and modelling and risk analysis of space debris

A6.10 / E10.2: No session this year...

A6.IP: Interactive Presentations, Kerr – Bhatia– Marzioli – Opromolla – Jankovic – Sanchez-Ortiz



A6.1	38	
A6.2	21	
A6.3	12	
A6.4	26	
A6.5	34	
A6.6	16	
A6.7	29	
A6.8	28	
A6.9	7	
A6.10	1	Need to be processed
A6.IP	9	
To	tal : 221	—

Updated: current situtation



International Academy of

1.4. General organization of Baku 2023





1.5. Space Debris Symposium for Milan 2024

General messages on A6 Space Debris:

- 2 constraints
 - 9 Sessions over 9 time slots ⇒ no A6.10 this year
 - IADC: Wednesday? Who manages? A room shall be booked and the list of participants established
 - Joseph P. Loftus Jr. Invited Lecture
 - Decision not to redo in Milan: can be discussed
- Discussion
 - What is the order of our sessions?

2021: Mo.pm A6.1 – Tu.am A6.9 – Tu.pm A6.4 – We.IADC – We.am SPS – We.am A6.3 – We.pm A6.2 – Th.am A6.5 – Th.pm A6.6 – Fr.am A6.8 – Fr.pm (A6.7 & A6.10) 2022: Su.pm A6.7 – Mo.am A6.9 – Mo.pm A6.4 – Tu.am A6.3 – Tu.pm A6.2 – Tu.pm SPS – We.am A6.5 – We.pm A6.6 – Th.am A6.8 – Th.pm (A6.1 & A6.10) 2023: Mo.pm A6.1 – Tu.am A6.9 – Tu.pm A6.4 – <u>We.IADC</u> – We.am SPS – We.am A6.3 – We.pm A6.2 – Th.am A6.5 – Th.pm A6.6 – Fr.am A6.8 – Fr.pm (A6.7)

2023: Mo.pm A6.7 – Tu.am A6.1 – Tu.pm A6.9 – <u>We.IADC</u> – We.am SPS – We.am A6.4 – We.pm A6.3 – Th.am A6.2 – Th.pm A6.5 – Fr.am A6.6 – Fr.pm (A6.8)



1.4. General organization of Baku 2023

Selection of abstracts:

- Technical Sessions last 2.5 hours
 - An oral presentation should not be below 15 minutes, Q&A and Transfer included
 - No strict rule from IAF Decision of the Chairs and Rapporteur
 - But, please do not go down to 10 minutes or so, as we will get plenty of complaints (quite usual...)
 - ✤ Typically 10 Oral per Session
 - We can select up to 5 Back-ups per Session
 - Automatically "promoted" in case of Withdrawn
 - Automatic transfer to IP for the non promoted (except if explicitly asking for Oral)
 - We can have as many IPs as we want: no limit in number of screens: Probable need for additional Chairs for A6.IP
 - But an author asking explicitly for Oral can not be selected as IP (some exceptions are possible)
 - And an author asking explicitly for IP can not be selected as Oral
 - When proposing a transfer from an Oral session to IP, please check quality:
 - The IP chairs do not want to redo the selection
 - If a paper is transferred to IP, it will be selected
 - Please make sure to keep a good "IAF 3G" balance, but no strict rules of course
 - Generation: Select some student papers
 - Geography: Usually too many Europeans and US
 - Gender



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1.4. General organization of Baku 2023

Typical selection file (classical, in your "IPC Responsibility Area" on the web site):

Selection process:

One excel file per session

Coordinate among chairs & rapporteurs

For instance: rating form 0 to 5 (bad to excellent),

then average

Stick to Excel sheets as long as the process is not over

- Transfer: contact the others before proposing, except if transfer to A6-IP
- Reject: must explain briefly why
- Paper order for the session
- Paper length = 150 minutes / Number

IP: lets wait until everyone is finished Formalization on the web site:

Classical under "Responsibility areas"

Same information requested:

Easy if well prepared in advance - I can do

Beware: operation cannot be undone

Selected Technical Session	Abstract	Abstract Title	Author Last Name	Accepted Session	Paper Order	O=Oral I=Interactive R=Rejected T=Transferred B=Back-up	Oral Presentation length	Comments/Reasons for rejection
A6.9.	69035	Lunar observer efficacy for NRHO target tracking	Fedeler					
A6.9.	69305	SSA observation campaign of the ELSA-d mission	Harris					
A6.9.	69365	Applying Graph-based Clustering to Tracklet-Tracklet Correlation	Schmitz					
A6.9.	69481	Polynomial Algebra for Uncertainty Propagation in Equinoctial Orbital Elements	Hallgarten La Casta					
A6.9.	69683	A cython bound tracklet-tracklet correlation for resident space objects	Rack					

SELECTION OF PAPER 80166

"ANALYSIS AND DESIGN OF A SPACE DEBRIS CHARACTERIZATION SYSTEM'

Main author

Contreras Venegas, Julietth Fernanda

Country

Mexico

Selected technical symposium/session

A6/IP Transfer paper (a paper should be located in the most appropriate session)

Review status

○accepted ○rejected ○back-up ⊙work

Paper order

Length of oral presentation

(default 10 minutes if empty)

Comments or Reasons for rejection

(not required)

Back Reset Make Selection



International

Academy of Astronautics

1.5. Space Debris Symposium for Milan 2024

67th	2016	Guadalajara	D Oltrogge [C] T Schildknecht [C] V. Agapov [R]	C. Pardini [C] M. Sorge [C] B. Bastida-Virgili [R]	N. Fitz Coy [C] F. Schaefer [C] A. Francesconi [R]	H. Krag [C] C. Cazaux [C]	S. Kibe [C] F. Piergentill [C] F. Santoni [R]	N. Berend [C] L. Innocenti [C] G. Haussmann [R]	T.S. Kelso [C] J-C. Dolado-Perez [C] C Wiedemann [R]	S. Plattard [C] D. Finkleman [R]	M. Jah [C] H. Klinkrad [C]		T. Yasaka D. McKnight C. Bonnal
68th	2017	Adelaide	F DiPentino [C] T Schildknecht [C] V. Agapov [R]	C. Pardini [C] D. Oltrogge [C] M. Sorge [R]	F. Schaefer [C] N. Fitz Coy [C] A. Francesconi [R]	C. Cazaux [C] D. Finkleman [C] H. Krag [R]	B. Bastida-Virgili [C] F. Santoni [C] F. Piergentili [R]	N. Berend [C] L. Innocenti [C] B. Singh [R]	T.S. Kelso [C] J-C. Dolado-Perez [C] C Wiedemann [R]	D. McKnight [C] S. Plattard [C] A. Soucek [R]	H. Klinkrad [C] M. Jah [C] H. Lewis [R]	D. Oltrogge [C] L. Rossettini [C] C. Cazaux [R]	T. Yasaka D. McKnight C. Bonnal
69th	2018	Bremen	F DiPentino [C] T Schildknecht [C] V. Agapov [R]	L Anselmo [C] D Oltrogge [C] M Sorge [R]	N. Fitz Coy [C] F. Schaefer [C] D. McKnight [R]	H. Krag [C] P. Omaly [C] Y. Usovik [R]	F. Piergentili [C] B. Bastida-Virgili [C] F. Santoni [R]	N. Berend [C] B. Singh [C] L. Rossettini [R]	C Wiedemann [C] T.S. Kelso [C] J-C. Dolado-Perez [R]	D. Spencer [C] S. Lemay [R]	S. Kibe [C] H. Lewis [C] H. Klinkrad [R]	M. Jah [C] Anilkumar [C] Kitazawa [R]	T. Yasaka D. McKnight C. Bonnal
70th	2019	Washington	M. Skinner [C] T. Schildknecht [C] V. Agapov [R]	M. Sorge [C] C. Pardini [C] D. Oltrogge [R]	JC Traineau [C] M. Jah [C] N. Fitz Coy [R]	H. Krag [C] S. Kawamoto [C] P. Omały [R]	F. Santoni [C] A. Nassisi [C] L. Francillout [R]	L. Rossettini [C] E. Kerr [C] N. Berend [R]	C Wiedemann [C] N. Sanchez-Ortiz [C] TS. Kelso [R]	D. Spencer [C] S. Lemay [R]	H. Klinkrad [C] J-C. Dolado-Perez [I F. Piergentili [R]	U. Dasgupta [C] Y. Usovik [C]	T. Yasaka D. McKnight C. Bonnal
71st	2020	Cyber	T. Schildknecht [C] M. Skinner [C] V. Agapov [R]	C. Pardini [C] D. Oltrogge [C] M. Sorge [R]	Z. Gong [C] E. Kerre [C] JC Traineau [R]	S. Kawamoto [C] P. Omaly [C] H. Krag [R]	B. Singh [C] L. Francillout [C] R. Opromolla [R]	J. Auburn [C] N. Berend [C] C. Wiedemann [R]	T.S. Kelso [C] N. Sanchez-Ortiz [C] V. Martinot [R]	S. Plattard [C] S. Lemay [C] A. Soucek [R] D. Spencer [R]	H. Klinkrad [C] J-C. Dolado-Perez [I F. Santoni [R]	D. McKnight [C] H. Tung [C] A. Anilikumar [R]	T. Yasaka D. McKnight M. Jankovic
72nd	2021	Dubai	M. Skinner [C] M. Jah [C] T. Schlidknecht [R]	M. Sorge [C] D. Oltrogge [C] C. Pardini [R]	D. McKnight [C] Z. Gong [C] JC Traineau [R]	P. Omaly [C] S. Kawamoto [C] H. Krag [R]	B. Singh [C] R. Opromolia [C] L. Francillout [R]	M. Jankovic [C] C. Wiedemann [C] J. Auburn [R]	V. Martinot [C] T.S. Kelso [C] N. Sanchez-Ortiz [R]	D. Spencer [C] T. Masson-Zwaan S. Lemay [R]	H. Klinkrad [C] F. Santoni [C] J-C. Dolado-Perez [I	V. Agapov [C] H. Tung [C] A. Anilkumar [R]	E. Kerr S. Lemay F. Santoni R. Opromolia M. Jankovic
73rd	2022	Paris	M. Skinner [C] V. Agapov [C] T. Schildknecht [R]	M. Sorge [C] D. Oltrogge [C] C. Pardini [R]	D. McKnight [C] Z. Gong [C] JC Traineau [R]	P. Omaly [C] S. Kawamoto [C] H. Krag [R]	B. Singh [C] R. Opromolia [C] L. Francillout [R]	M. Jankovic [C] D. Grishko [C] J. Auburn [R]	V. Martinot [C] T.S. Kelso [C] N. Sanchez-Ortiz [R]	D. Spencer [C] T. Masson-Zwaan E. Kerr [R]	J. Siminski [C] [J-C. Dolado-Perez [I P. Marzioli [R]	T. Schildknecht [C] D. McKnight [C] C. Colombo [R]	E. Kerr F. Letizia F. Santoni R. Opromolia M. Jankovic
74th	2023	Baku	M. Skinner [C] F. Piergentili [C] T. Schildknecht [R]	M. Sorge [C] D. Oltrogge [C] C. Pardini [R]	D. McKnight [C] Z. Gong [C] JC Traineau [R]	P Omaly [C] S. Kawamoto [C] C. Colombo [R]	M Jankovic [C] R Opromolia [C] L Francillout [R]	M. Jankovic [C] D. Grishko [C] J. Auburn [R]	V. Martinot [C] T.S. Kelso [C] N. Sanchez-Ortiz [R]	D. Spencer [C] T. Masson-Zwaan E. Kerr [R]	E. Cordelli [C] [·J-C. Dolado-Perez [I P. Marzioli [R]	र]	P. Marzioli E. Kerr F. Letizia R. Opromolia M. Jankovic P. Marzioli



1.5. Space Debris Symposium for Milan 2024 Evolutions of the text – Evolutions of the Chairs & Rapporteurs

A6: Space Debris Symposium: Bonnal – Bevilacqua – Omaly

The Symposium will address the complete spectrum of issues associated to space debris, including orbital sustainability and operations in debris dominated environment.

It will cover every aspect of Space Environment Management (SEM) including Mitigation and Remediation measures, Space Surveillance and Tracking (SST), Space Situational Awareness (SSA), Space Traffic Management (STM), including all aspects of measurements, modelling, risk assessment in space and on the ground, re-entry, hypervelocity impacts and protection, mitigation and standards, postmission disposal, remediation, debris removal, Space Surveillance, collision avoidance as well as non-technical topics associated to space debris dominated environment.

A6.1: Space Debris Detection, Tracking and Characterization - SST: Skinner - Agapov - Schildknecht

This session will address every aspect of SST (Space Surveillance and Tracking), advanced ground and space-based measurement techniques, relating processing methods, and results of space debris characterization.

A6.2: Modelling and Risk Analysis: Sorge - Oltrogge - Pardini

This session will address the characterization of the current and future debris population and methods for in-orbit and on-ground risk assessments. The in-orbit analysis will cover collision risk estimates based on statistical population models and deterministic catalogues, and active collision avoidance.

A6.3: Impact-Induced Mission Effects and Risk Assessments: McKnight - Kitazawa - Gong

This session addresses disruptions of spacecraft operations induced by hypervelocity impacts including spacecraft anomalies, perturbation of operations, component failures up to mission loss, and spacecraft fragmentations. It includes risk assessments for impact vulnerability studies and corresponding system tools. Further topics are spacecraft impact protection and shielding studies, laboratory impact experiments, numerical simulations, and on-board diagnostics to characterize impacts such as impact sensors, accelerometers, etc.



1.5. Space Debris Symposium for Milan 2024

A6.4: Mitigation - Tools, Techniques and Challenges - SEM: Omaly – Kawamoto – Krag

This session will focus on the Mitigation part of the SEM (Space Environment Monitoring), implementation of debris prevention and reduction measures; vehicle passive protection at system level including end of life strategies and tools to verify the efficiency of the implemented measures. The session will also address practical experiences in the planning and verification of measures and issues and lessons learnt in the actual execution of mitigation actions.

A6.5: Post Mission Disposal and Space Debris Removal 1 - SEM: Singh – Opromolla – Francillout

This session will focus on the Remediation part of the SEM, dealing with ADR (Active Debris Removal), JCA (Just in time Collision Avoidance), LDTM (Large Debris Traffic Management) among solutions. It will address post-mission disposal and active removal techniques "ground and space based", review potential solutions and identify implementation difficulties.

A6.6: Post Mission Disposal and Space Debris Removal 2 - SEM: Jankovic – Grishko – Forshaw

This session will focus on the Remediation part of the SEM, dealing with ADR (Active Debris Removal), JCA (Just in time Collision Avoidance), LDTM (Large Debris Traffic Management) among solutions. It will address post-mission disposal and active removal techniques "ground and space based", review potential solutions and Identify implementation difficulties.

A6.7: Operations in Space Debris Environment, Situational Awareness - SSA: Martinot – Kelso – Sanchez-Ortiz

This session will address the multiple aspects associated to STM (Space Traffic Management) and SSA (Space Situational Awareness) including safe operations in space dealing with Space Debris, operational observations, orbit determination, catalogue build-up and maintenance, data aggregation from different sources, relevant data exchanges standards and conjunction analyses.



1.5. Space Debris Symposium for Milan 2024

A6.8 / E9.1 (joint with Space Security Committee): Policy, Legal, Institutional, Economic and Security Aspects of Debris Mitigation, Debris Remediation and STM

From SDC: Spencer – Masson-Zwaan – Kerr From SSC: Plattard – Capurso - Samson

This session will address all non-technical aspects of debris mitigation, debris remediation and STM. Papers may focus on aspects of responsibility, liability and registration, on the role of bodies such as UNCOPUOS or IADC, as well as on insurance, financial incentives and funding. In addition, security-related aspects and the role of international cooperation in addressing these issues may be considered.

A6.9: Orbit Determination and Propagation - SST

Siminski – Dolado-Perez – Marzioli

This session will address every aspect of orbit determination coming from the SST (Space Surveillance and Tracking), related to assessment of raw and derived data accuracy, optical measurements processing and modelling and risk analysis of space debris

A6.10 / XXX: Joint XXX / Space Debris Session

From SDC: Schildknecht – McKnight – Colombo From XXX:

A6.IP: Interactive Presentations, Kerr – Letizia – Marzioli - Opromolla – Jankovic – Bonnal



2. Exchanges

2. Exchanges

- 2nd NEO and Space Debris Detection Conference that we held at ESOC 24-26 January
- Presentation of the Technical Committee on satellite registration
- 9th Satellites End of Life and Sustainable Technologies Workshop CNES Headquarters January 18 and 20, 2023
- Upcoming workshop in Milan on "Allocation of the space orbital capacity open to everybody in the community"
- Short presentation :On the space capacity management (loaded in the IAF website).
- Session proposal (for a technical session in milan 2024). 1 slide.
- Current Status to Reduce Slag Generated from Solid Rocket Motors in Japan
- 12th IAASS Conference in OSAKA Japan 22-25 May 2023
- 72th Aeroballistic Range Association Meeting in Tokyo Japan 10th-15th Septembre 2023



Agenda

3. IAA Studies

- 3.1 SG 5.17 IAA Space Debris Report Who can take the lead?
- **3.2 SG 5.20** Establishing "Rules of the Road" for Satellite Collision Avoidance Maneuver Planning (Dave Spencer)
- 3.3 Others