



International Academy of Astronautics
IAA Space Debris Committee
October 24th, 2021



Agenda

1. IAC – Administrative part
 - 1.1. IAA Space Debris Committee
 - 1.2. Lessons learned from Cyber IAC 2020
 - 1.3. General statistics concerning Space Debris Symposium A6
 - 1.4. Status of Space Debris Symposium for Dubai 2021
 - 1.5. Preparation of Space Debris Symposium for Paris 2022
2. Exchanges
 - 2.1. Past events: workshops, conferences, congresses, ...
 - 2.2. On the Agenda
 - 2.3. New achievements
 - 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, ...)



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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 /](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



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1. IAA Space Debris Committee

Current official membership (as per web site):

Agapov Vladimir	Fitz-Coy Norman G.	Krag Holger	Schildknecht Thomas
Aglietti Guglielmo	Flohrer Tim	Le May Samantha	Seitzer Pat
Ailor William	Flury Walter	Lemmens Stijn	Shen Lin
Alby Fernand	Francesconi Alessandro	Liou Jer-Chyi	Singh Balbir
Anilkumar A.K.	Francillout Laurent	Martinez Peter	Skinner Mark
Anselmo Luciano	Gong Zizheng	Martinot Vincent	Smith Lesley-Jane
Anz-Meador Philip	Gorman Alice	Masson-Zwaan Tanja	Somma Gian Luigi
Auburn John	Hanada Toshiya	McKnight Darren S.	Sorge Marlon E.
Berend Nicolas	Howard Diane	Metz Manuel	Spencer David B.
Bevilacqua Riccardo	Hyde James	Nassisi Annamaria	Stokes Hedley
Brachet Gerard	Jah Moriba K.	Oltrogge Daniel L.	Traineau Jean-Claude
Christiansen Eric L	Jankovic Marko	Omaly Pierre	Tung Helen
Crowther Richard	Kaliapin Mykhailo	Opromolla Roberto	Usovik Igor
Dasgupta Upasana	Kawamoto Satomi	Pardini Carmen	Wiedemann Carsten
Dolado Perez Juan-Carlos	Kelso T. S.	Piergentili Fabrizio	Yasaka Tetsuo
Faucher Pascal	Kerr Emma	Plattard Serge	
Finkleman David	Kibe Seishiro	Rossettini Luca L.	
	Kim Hae-Dong	Sanchez-Ortiz Noelia	
	Kitazawa Yukihito	Santoni Fabio	
	Klinkrad Heiner	Schaefer Frank	

Chairs & Secretary:

Bevilacqua Riccardo
Bonnal Christophe
Omaly Pierre

To be removed:

Alice Gorman
Mykhailo Kaliapin
Samantha Le May

New members:

Camilla Colombo
Dmitriy Grishko
Francesca Letizia
Jan Siminski
Paolo Marzioli

Synthesis:

75 members – 3 + 5 = 77 members

See appendix 1 for today's list of participants

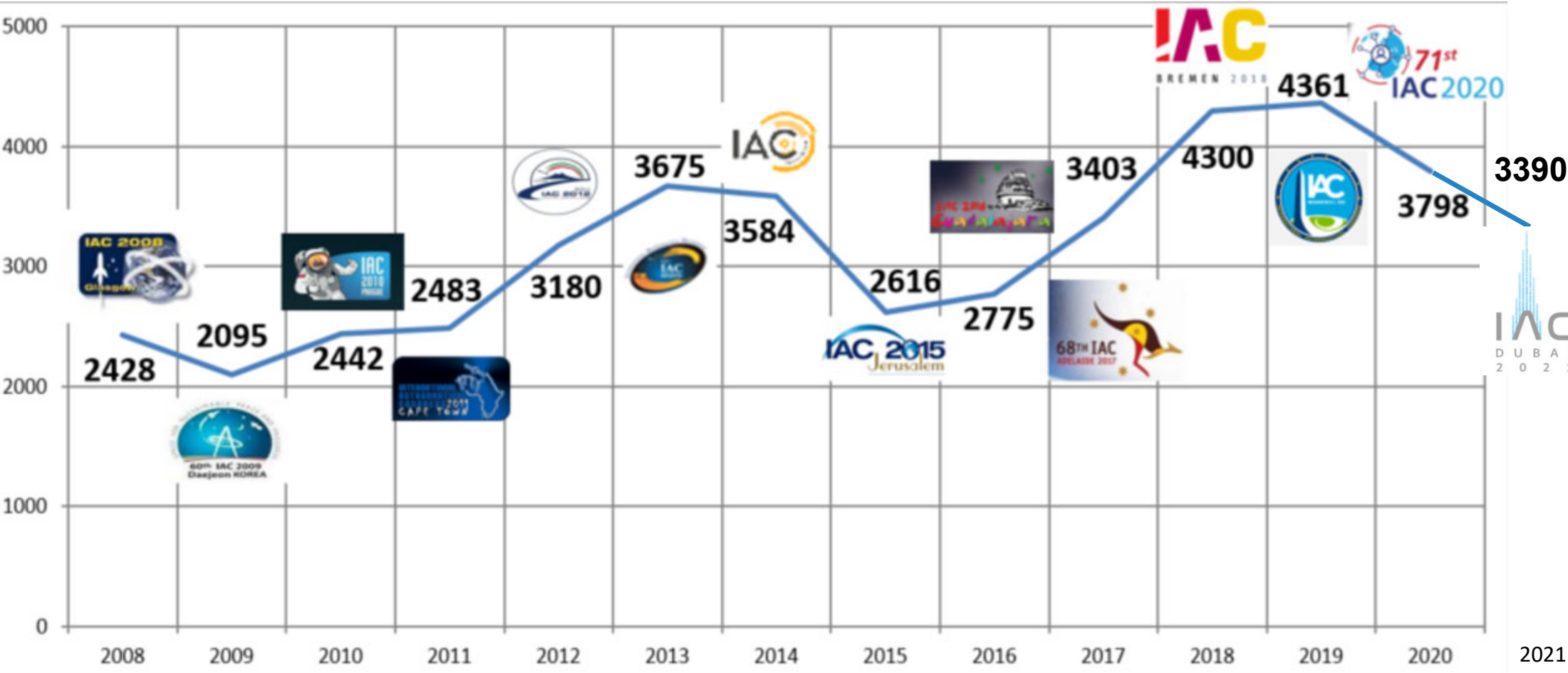
It is reminded that Program Committee (Chairs + Rapporteurs) is selected among members only



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1.2 Feedback from Cyber IAC 2020

Number of IAC abstracts since 2008





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1.2 Feedback from Cyber IAC 2020



71st International Astronautical
Congress
- The CyberSpace Edition 12 - 14 October 2020

IAC 2020 – Technical Presentation Statistics



- Abstracts in total: **3798**
- Abstracts accepted: **2707**
- Abstracts rejected: **1091**

- Abstracts accepted: **2707**
- Abstracts confirmed: **1478**
- Withdrawn: **697**
- Unreplied: **532**

- Confirmed among accepted: **1481**
- Video lectures uploaded: **1301 (87,8%)**
- Confirmed/Not uploaded: **180**

- High percentage of withdrawals (**697**) (= **28% of accepted**) to be re-submitted for IAC 2021 in Dubai, U.A.E. And undergo review process again

Impressive, and totally unexpected

IAF Connecting @ll Space People





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1.2 Feedback from Cyber IAC 2020



**71st International Astronautical
Congress**
– The CyberSpace Edition 12 – 14 October 2020



Video Lectures per Regions

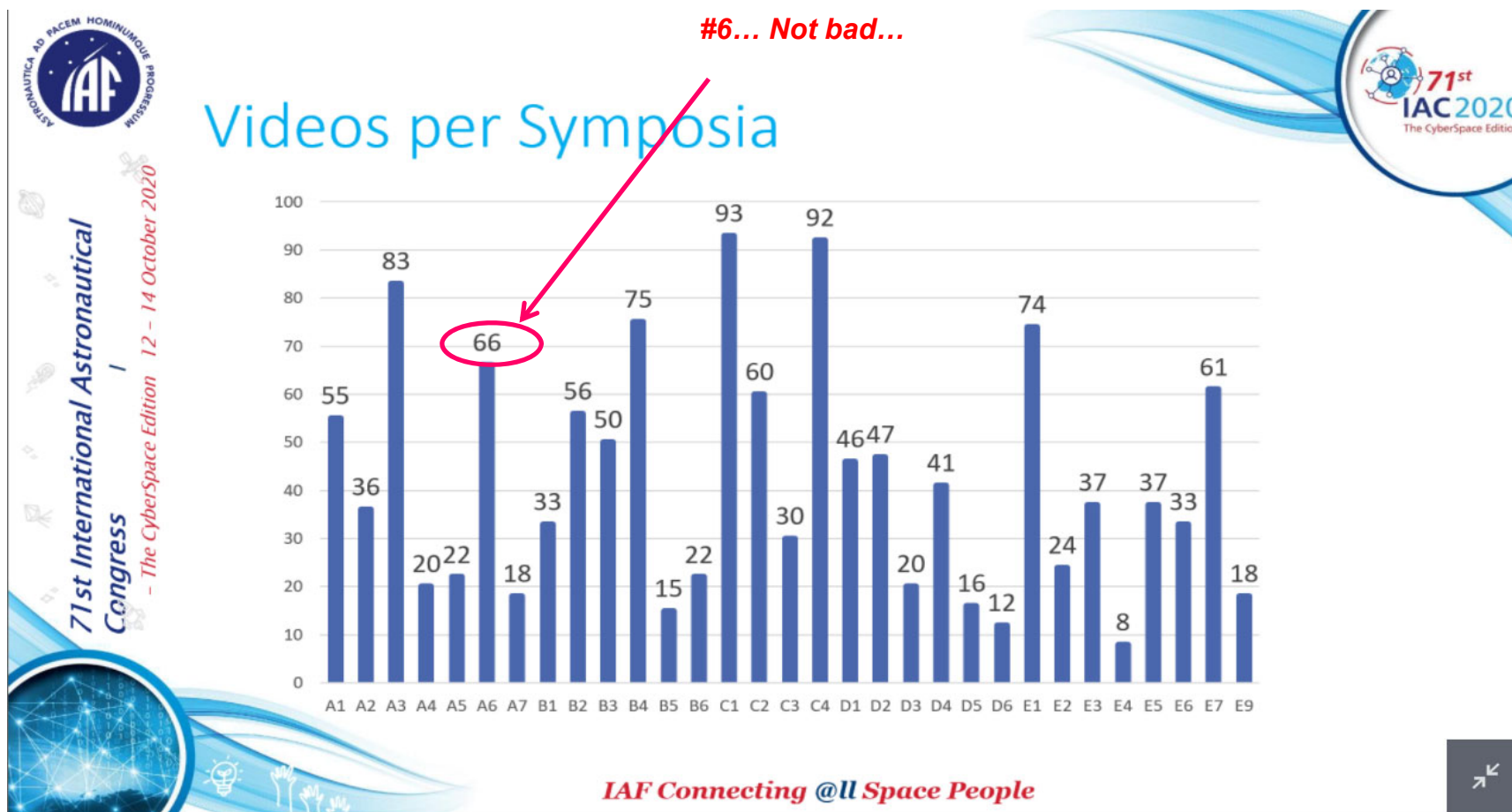


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1.2 Feedback from Cyber IAC 2020





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1.2 Feedback from Cyber IAC 2020





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1.2 Feedback from Cyber IAC 2020



**71st International Astronautical
Congress**

- The CyberSpace Edition - 12 - 14 October 2020

IAC 2020 - Virtual Technical Presentations

- Video lecture of 10 minutes
- Size max 500 MB
- 16:9 landscape
- Displayed in a Technical Gallery
- Ordered by Symposium



IAF Connecting @ll Space People





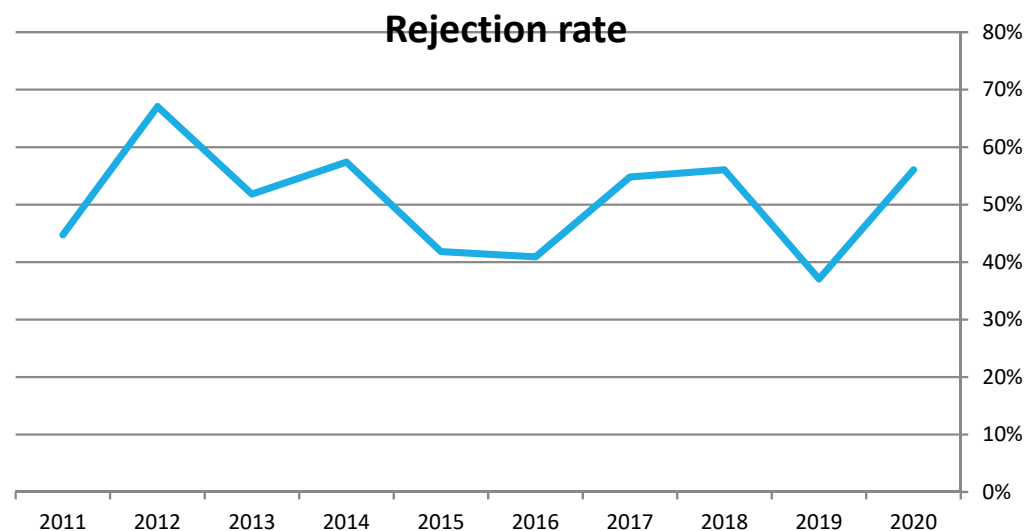
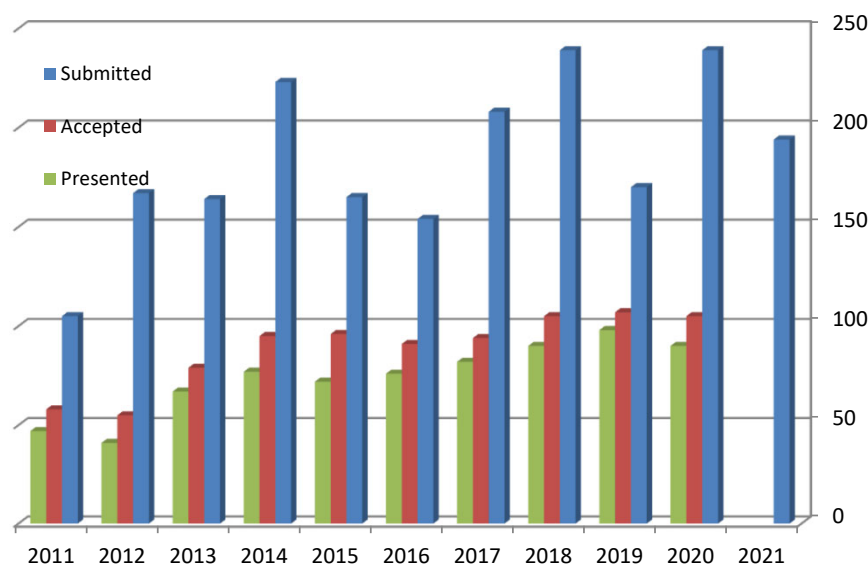
1.3 General statistics concerning A6

Globally healthy symposium:

Average 184 papers submitted every year: large variations (standard deviation last 10 years = 40)

Very good rejection rate: average last 10 years 52%

Very good presentation rate: average (2012-2019) = 84%



1.3 General statistics concerning A6

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

Very health session over the years

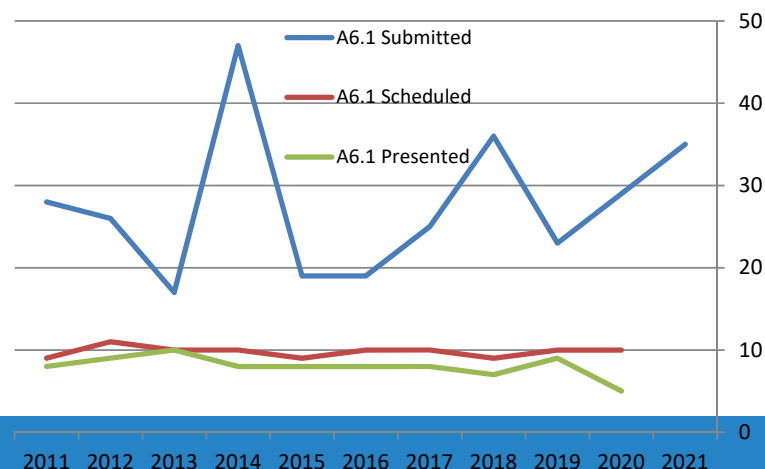
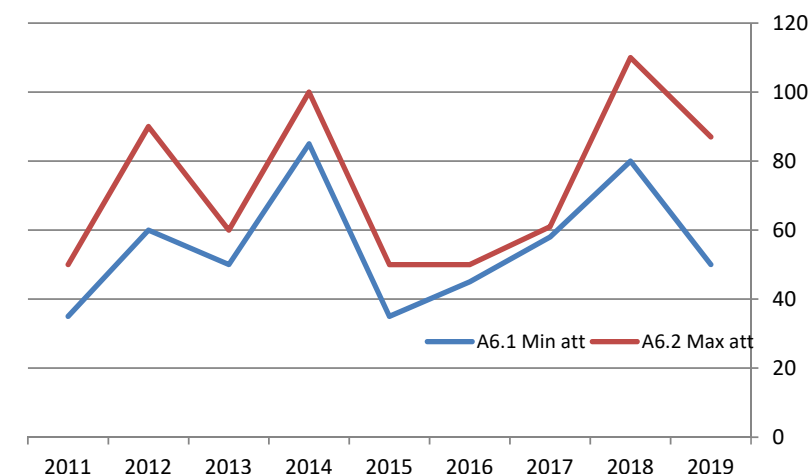
28 papers submitted in average

64% rejection rate

64.7 average average attendance

15% withdrawn (wo 2020). 2% no show in average

SESSION YEAR	Min Att	Max Att	Avg Att	Papers Subm	Papers Sched	Papers Pres	Notified Withdraw	No Show	% Papers Selectec	% Papers Present	% Notified Withdrawn	% No Show
A6.1. 2021				35								
A6.1. 2020				29	10	5	5	0	34%	50%	50%	0%
A6.1. 2019	50	87	67	23	10	9	1	0	43%	90%	10%	0%
A6.1. 2018	80	110	100	36	9	7	2	0	25%	78%	22%	0%
A6.1. 2017	58	61	60	25	10	8	2	0	40%	80%	20%	0%
A6.1. 2016	45	50	47,5	19	10	8	2	0	53%	80%	20%	0%
A6.1. 2015	35	50	42,5	19	9	8	1	0	47%	89%	11%	0%
A6.1. 2014	85	100	92,5	47	10	8	1	1	21%	80%	10%	10%
A6.1. 2013	50	60	55	17	10	10	2	0	59%	100%	20%	0%
A6.1. 2012	60	90	75	26	11	9	1	1	42%	82%	9%	9%
A6.1. 2011	35	50	42,5	28	9	8	1	0	32%	89%	11%	0%
A6.1. Average	55,3	73,1	64,7	27,6	9,8	8,0	1,8	0,2	35%	82%	18%	2%





1.3 General statistics concerning A6

A6.2: Modeling and Risk Analysis

Good “classical” session

23 papers submitted in average but steadily declining (14 in 2021)

50% average rejection rate but declining (29% in 2019)

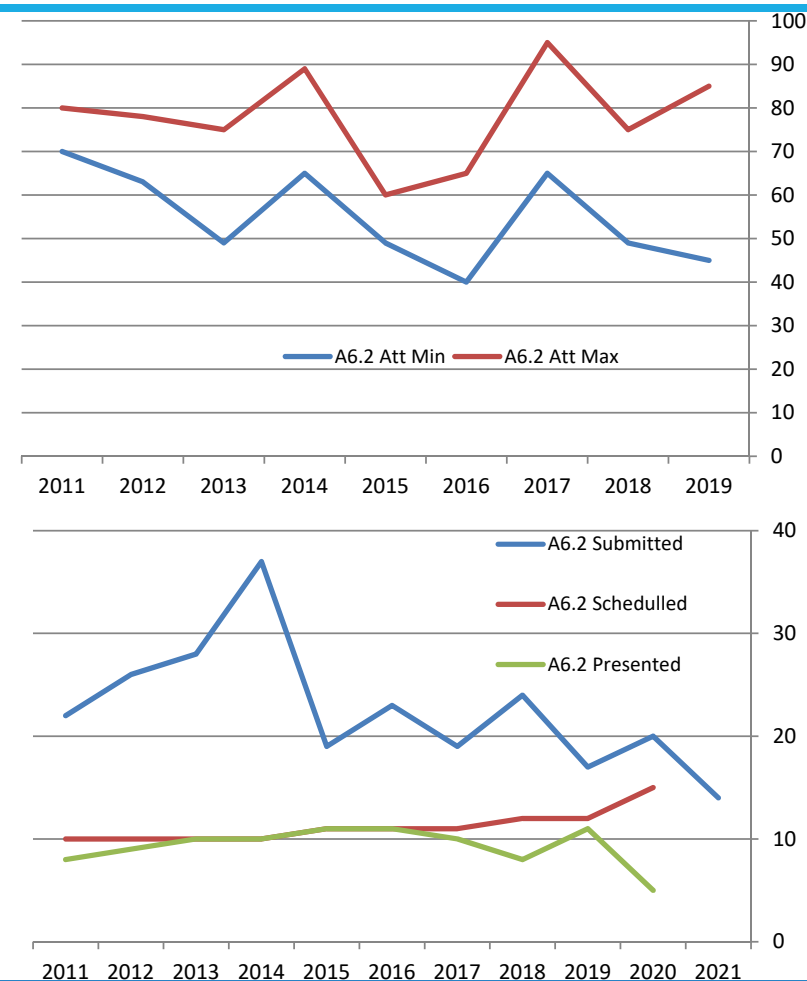
But very good average average attendance 66 participants

6% withdrawn (wo 2020). 2% no show in average (wo 2020)

➡ Potential action to improve the submission number

➡ Potential rewording of the call

SESSION	YEAR	Min Att	Max Att	Avg Att	Papers Subm	Papers Sched	Papers Pres	Notified Withdrawn	No Show	% Papers Selected	% Papers Present	% Notified Withdrawn	% No Show
A6.2.	2021				14								
A6.2.	2020				20	15	5	6	4	75%	33%	40%	27%
A6.2.	2019	45	85	60	17	12	11	1	0	71%	92%	8%	0%
A6.2.	2018	49	75	62	24	12	8	3	1	50%	67%	25%	8%
A6.2.	2017	65	95	80	19	11	10	1	0	58%	91%	9%	0%
A6.2.	2016	40	65	52,5	23	11	11	0	0	48%	100%	0%	0%
A6.2.	2015	49	60	54,5	19	11	11	0	0	58%	100%	0%	0%
A6.2.	2014	65	89	77	37	10	10	0	0	27%	100%	0%	0%
A6.2.	2013	49	75	62	28	10	10	0	0	36%	100%	0%	0%
A6.2.	2012	63	78	70,5	26	10	9	0	0	38%	90%	0%	0%
A6.2.	2011	70	80	75	22	10	8	1	1	45%	80%	10%	10%
A6.2.	Average	55,0	78,0	65,9	22,6	11,2	9,3	1,2	0,6	49%	83%	11%	5%





1.3 General statistics concerning A6

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

Still a problematic session...

Low number of submission: 16 but only 6 in 2021, 10 in 2020, 11 in 2019...

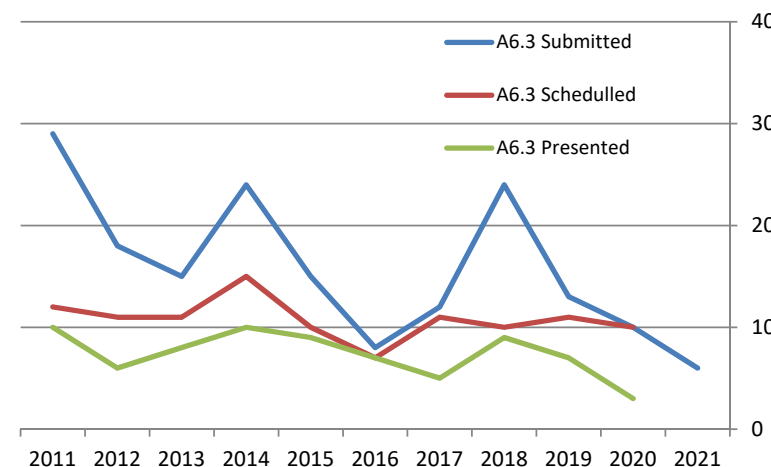
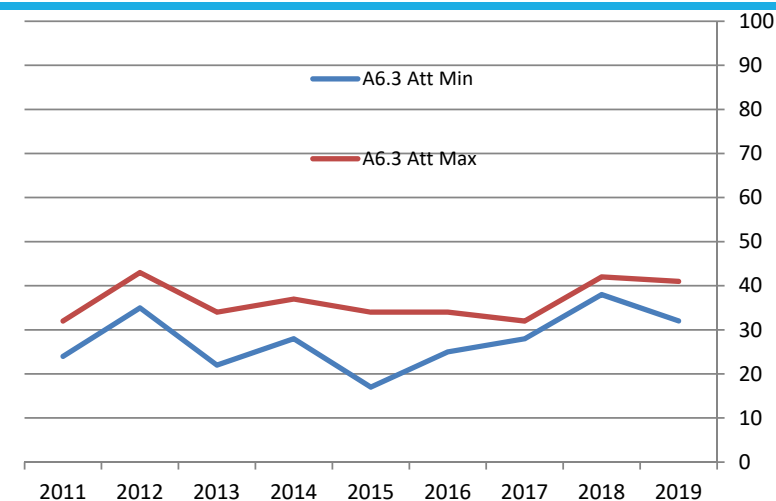
31% average rejection rate but declining (15% in 2019, 0% in 2020)

Rather good average average attendance 32 participants

16% withdrawn (wo 2020). 10% no show in average (wo 2020)

➡ Potential action to redefine this session

SESSION	YEAR	Min Att	Max Att	Avg Att	Papers Subm	Papers Sched	Papers Pres	Notified Withdrawn	No Show	% Selectec	% Papers Present.	% Notified Withdrawn	% No Show
A6.3.	2021				6								
A6.3.	2020				10	10	3	2	5	100%	30%	20%	50%
A6.3.	2019	32	41	35	13	11	7	1	3	85%	64%	9%	27%
A6.3.	2018	38	42	40	24	10	9	0	1	42%	90%	0%	10%
A6.3.	2017	28	32	30	12	11	5	4	2	92%	45%	36%	18%
A6.3.	2016	25	34	29,5	8	7	7	0	0	88%	100%	0%	0%
A6.3.	2015	17	34	25,5	15	10	9	1	0	67%	90%	10%	0%
A6.3.	2014	28	37	32,5	24	15	10	5	0	63%	67%	33%	0%
A6.3.	2013	22	34	28	15	11	8	0	3	73%	73%	0%	27%
A6.3.	2012	35	43	39	18	11	6	4	1	61%	55%	36%	9%
A6.3.	2011	24	32	28	29	12	10	2	0	41%	83%	17%	0%
A6.3.	Average	27,7	36,6	31,9	15,8	10,8	7,4	1,9	1,5	68%	69%	18%	14%





1.3 General statistics concerning A6

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

Good classical session with strong variations

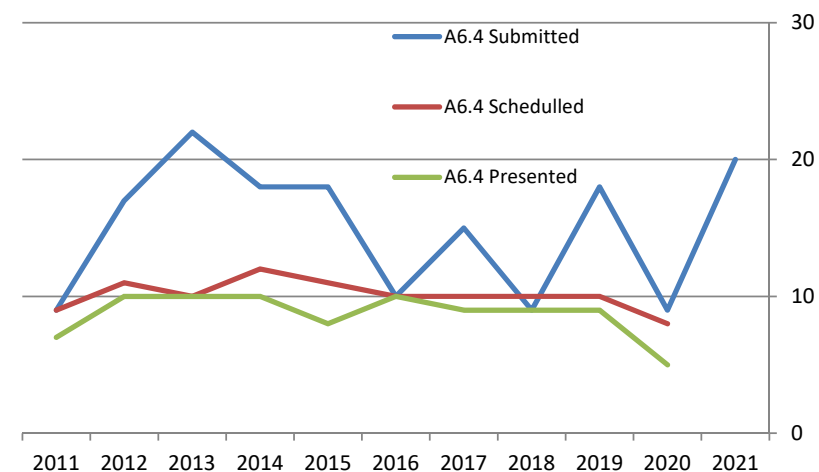
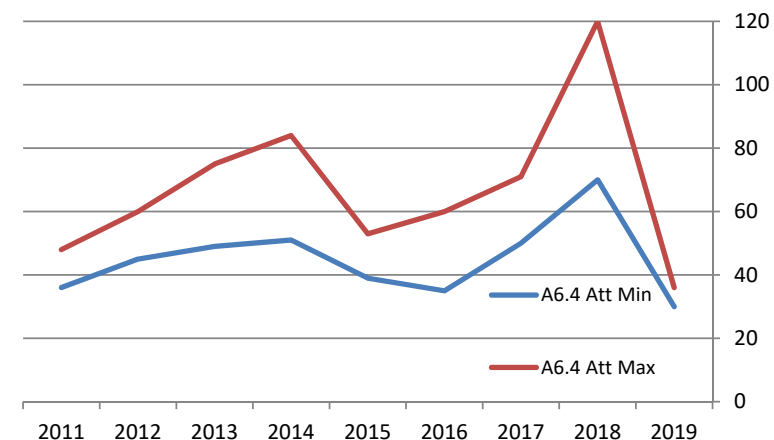
Low number of average submission: 15, slightly better in 2021

33% average rejection rate but declining (but 11% in 2020)

Good average average attendance 56 participants, but only 33 in 2019

10% withdrawn (wo 2020). 2% no show in average (wo 2020)

SESSION	YEAR	Min Att	Max Att	Avg Att	Papers Subm	Papers Sched	Papers Pres	Notified Withdrawn	No Show	% Papers Selectec	% Papers Present.	% Notified Withdrawn	% No Show
A6.4.	2021				20								
A6.4.	2020				9	8	5	3	0	89%	63%	38%	0%
A6.4.	2019	30	36	33	18	10	9	1	0	56%	90%	10%	0%
A6.4.	2018	70	120	90	9	10	9	1	0	111%	90%	10%	0%
A6.4.	2017	50	71	62	15	10	9	0	1	67%	90%	0%	10%
A6.4.	2016	35	60	47,5	10	10	10	0	0	100%	100%	0%	0%
A6.4.	2015	39	53	46	18	11	8	3	0	61%	73%	27%	0%
A6.4.	2014	51	84	67,5	18	12	10	2	0	67%	83%	17%	0%
A6.4.	2013	49	75	62	22	10	10	0	0	45%	100%	0%	0%
A6.4.	2012	45	60	52,5	17	11	10	0	1	65%	91%	0%	9%
A6.4.	2011	36	48	42	9	9	7	2	0	100%	78%	22%	0%
A6.4.	Average	45,0	67,4	55,8	15,0	10,1	8,7	1,2	0,2	67%	86%	12%	2%





1.3 General statistics concerning A6

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

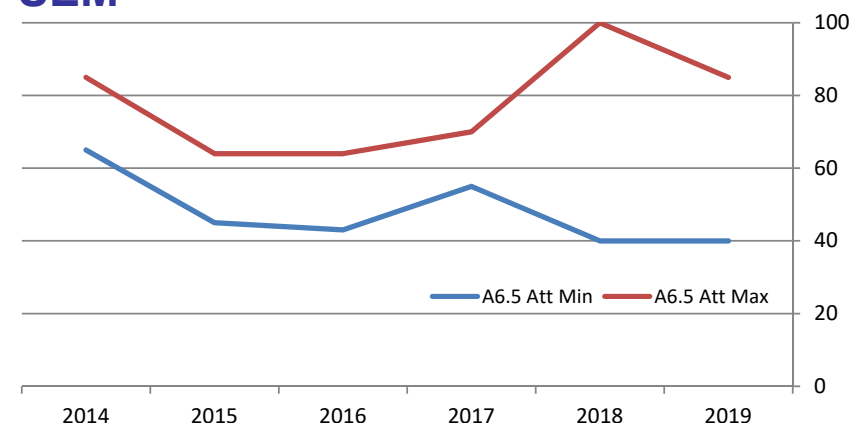
Very good classical session (dual session with A6.6)

Some significant variations over the years

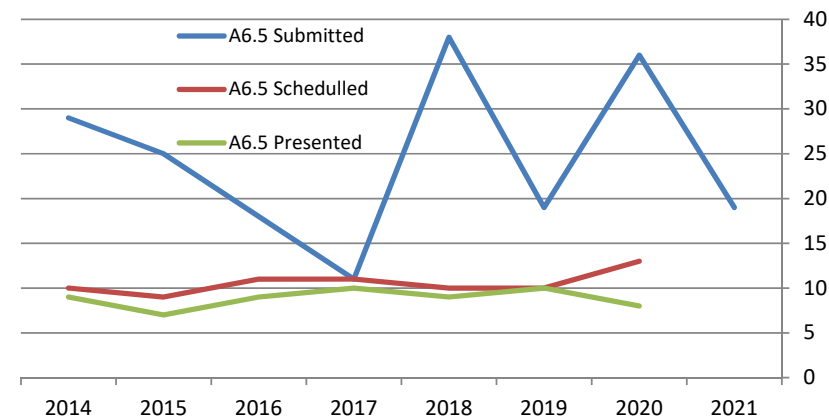
Good number of average submission: 24 (= 52 for A6.5 + A6.6)

Good rejection rate 57% (64% in 2020)

Very good average average attendance 65 participants, with high max 8% withdrawn (wo 2020). 3% no show in average (wo 2020)



SESSION	YEAR	Min Att	Max Att	Avg Att	Papers Subm	Papers Sched	Papers Pres	Notified Withdrawn	No Show	% Papers Selected	% Papers Present	% Notified Withdrawn	% No Show
A6.5.	2021				19								
A6.5.	2020				36	13	8	3	2	36%	62%	23%	15%
A6.5.	2019	40	85	55	19	10	10	0	0	53%	100%	0%	0%
A6.5.	2018	40	100	90	38	10	9	0	1	26%	90%	0%	10%
A6.5.	2017	55	70	63	11	11	10	1	0	100%	91%	9%	0%
A6.5.	2016	43	64	53,5	18	11	9	2	0	61%	82%	18%	0%
A6.5.	2015	45	64	54,5	25	9	7	2	0	36%	78%	22%	0%
A6.5.	2014	65	85	75	29	10	9	0	1	34%	90%	0%	10%
A6.5.	Average	48,0	78,0	65,2	24,4	10,6	8,9	1,1	0,6	43%	84%	11%	5%





1.3 General statistics concerning A6

A6.6: Post Mission Disposal and Space Debris Removal 2 - SEM

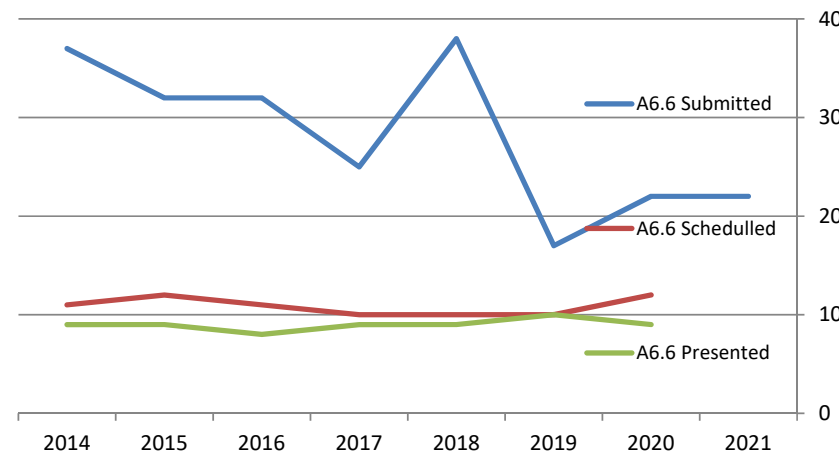
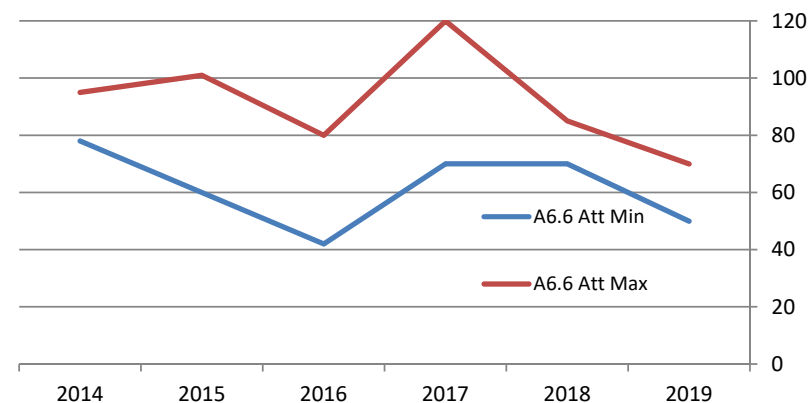
Very good classical session (dual session with A6.5)

Good number of average submission: 28 (= 52 for A6.5 + A6.6)

Good rejection rate 61%

Very high average average attendance 76 participants, with very high max 14% withdrawn (bad year in 2016). 3% no show in average (wo 2020)

SESSION	YEAR	Min Att	Max Att	Avg Att	Papers Subm	Papers Sched	Papers Pres	Notified Withdrawn	No Show	% Papers Selected	% Papers Present	% Notified Withdrawn	% No Show
A6.6.	2021				22								
A6.6.	2020				22	12	9	3	0	55%	75%	25%	0%
A6.6.	2019	50	70	60	17	10	10	0	0	59%	100%	0%	0%
A6.6.	2018	70	85	75	38	10	9	1	0	26%	90%	10%	0%
A6.6.	2017	70	120	95	25	10	9	1	0	40%	90%	10%	0%
A6.6.	2016	42	80	61	32	11	8	3	1	34%	73%	27%	9%
A6.6.	2015	60	101	80,5	32	12	9	2	1	38%	75%	17%	8%
A6.6.	2014	78	95	86,5	37	11	9	2	0	30%	82%	18%	0%
A6.6.	Average	61,7	91,8	76,3	28,1	10,9	9,0	1,7	0,3	39%	83%	16%	3%





1.3 General statistics concerning A6

A6.7: Operations in Space Debris Environment, Situational Awareness - SSA

Good classical session since 2014

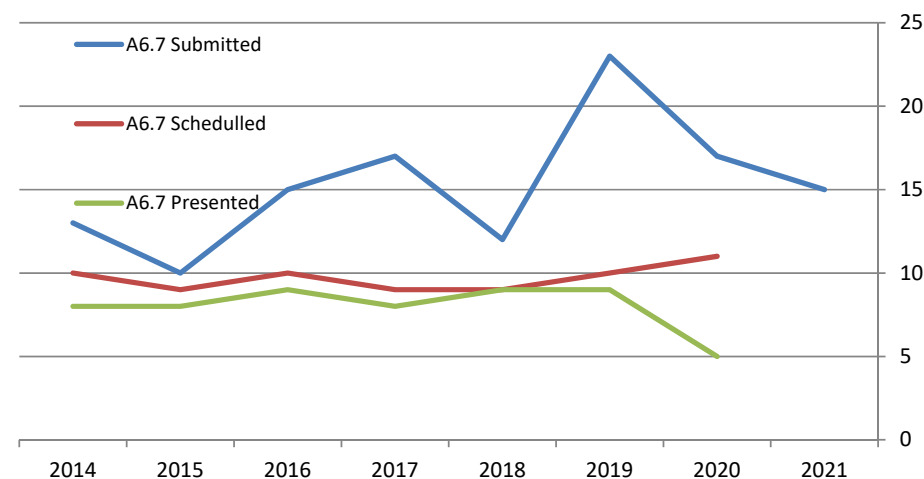
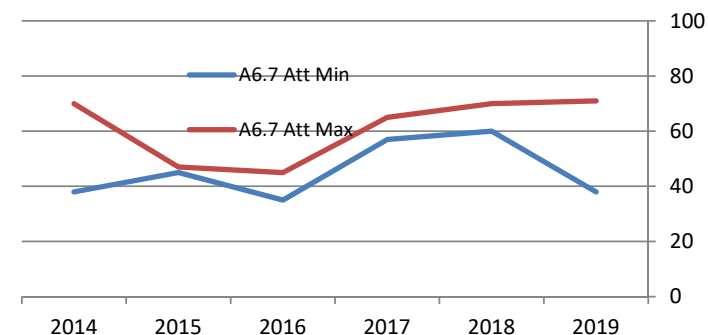
Average submission is rather low: 15

Rejection rate is correct: 37%

Good average average attendance: 51 participants

7% withdrawn (wo 2020). 3% no show in average (wo 2020)

SESSION	YEAR	Min Att	Max Att	Avg Att	Papers Subm	Papers Sched	Papers Pres	Notified Withdrawn	No Show	% Selectec	% Papers Present.	% Notified Withdrawn	% No Show
A6.7	2021				15								
A6.7	2020				17	11	5	4	2	65%	45%	36%	18%
A6.7	2019	38	71	40	23	10	9	1	0	43%	90%	10%	0%
A6.7	2018	60	70	65	12	9	9	0	0	75%	100%	0%	0%
A6.7	2017	57	65	61	17	9	8	1	0	53%	89%	11%	0%
A6.7	2016	35	45	40	15	10	9	0	1	67%	90%	0%	10%
A6.7	2015	45	47	46	10	9	8	1	0	90%	89%	11%	0%
A6.7	2014	38	70	54	13	10	8	1	1	77%	80%	10%	10%
A6.7.	Average	45,5	61,3	51,0	15,3	9,7	8,0	1,1	0,6	64%	82%	12%	6%





1.3 General statistics concerning A6

A6.8-E9.1: Political, Legal, Institutional and Economic Aspects of Space Debris Mitigation and Removal - STM Security

Very good session with increasing success

Average submission rate: 17 (but 26 since 2018)

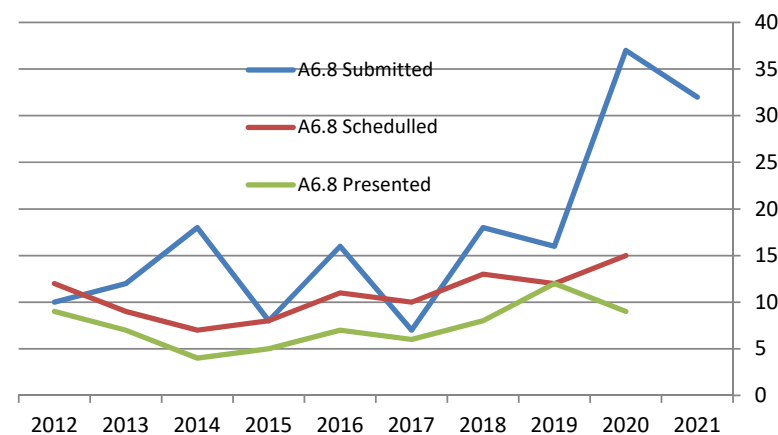
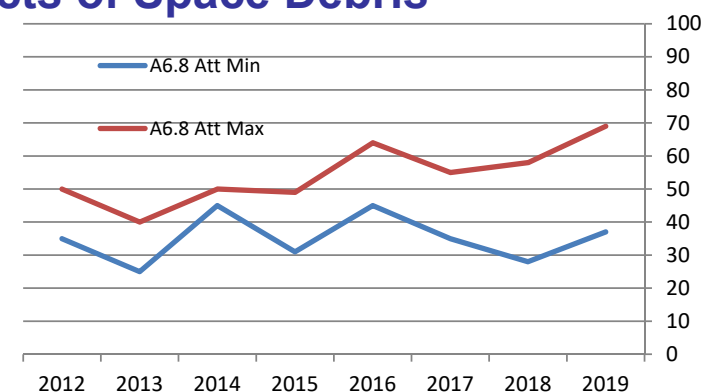
Rejection rate is correct: 38% (but 59% in 2020)

Good average average attendance: 43 participants

High withdrawn ratio 24% (wo 2020). High no show 6% (wo 2020)

↪ Potential need to improve contact with authors

SESSION	YEAR	Min Att	Max Att	Avg Att	Papers Subm	Papers Sched	Papers Pres	Notified Withdrawn	No Show	% Papers Selected	% Papers Presented	% Notified Withdrawn	% No Show
A6.8.	2021				32								
A6.8.	2020				37	15	9	3	3	41%	60%	20%	20%
A6.8.	2019	37	69	44	16	12	12	0	0	75%	100%	0%	0%
A6.8.	2018	28	58	44	18	13	8	4	1	72%	62%	31%	8%
A6.8.	2017	35	55	45	7	10	6	3	1	143%	60%	30%	10%
A6.8.	2016	45	64	54,5	16	11	7	3	1	69%	64%	27%	9%
A6.8.	2015	31	49	40	8	8	5	3	0	100%	63%	38%	0%
A6.8.	2014	45	50	47,5	18	7	4	2	1	39%	57%	29%	14%
A6.8.	2013	25	40	32,5	12	9	7	2	0	75%	78%	22%	0%
A6.6.	2012	35	50	42,5	10	12	9	2	1	120%	75%	17%	8%
A6.8.	Average	35,1	54,4	43,8	17,4	10,8	7,4	2,4	0,9	62%	69%	23%	8%





1.3 General statistics concerning A6

A6.9: Orbit Determination and Propagation - SST

“Similar definition with A6.1”

Low submission rate: 14, stable over the years

Low rejection rate: 25%

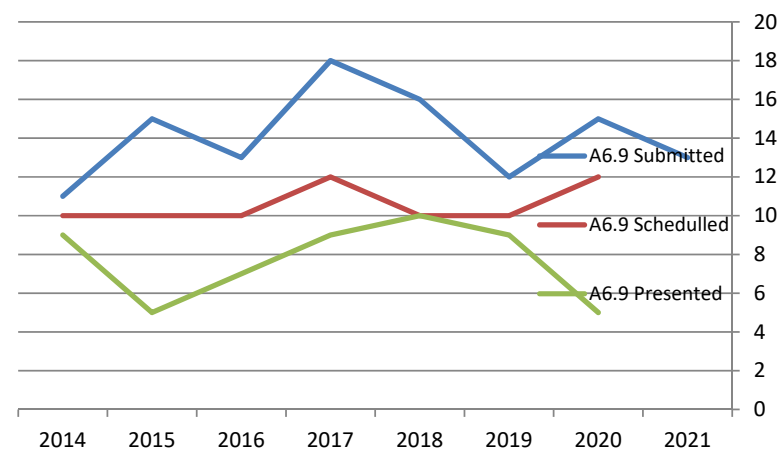
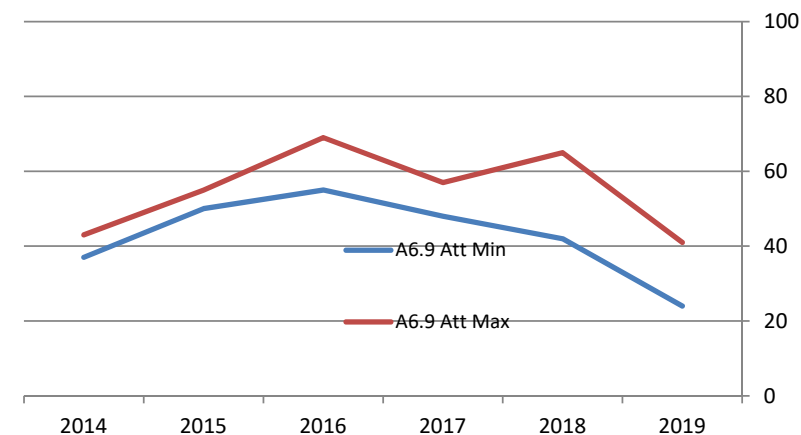
But good average average attendance: 48 participants

High withdrawn ratio 21% (one anomaly in 2015!).

No no show!: 0% (wo 2020)

↪ Potential need to redistribute with A6.1

SESSION	YEAR	Min Att	Max Att	Avg Att	Papers Subm	Papers Sched	Papers Pres	Notified Withdrawn	No Show	% Selecte	% Papers Present.	% Notified Withdrawn	% No Show
A6.9.	2021				13								
A6.9.	2020				15	12	5	4	3	80%	42%	33%	25%
A6.9.	2019	24	41	32	12	10	9	1	0	83%	90%	10%	0%
A6.9.	2018	42	65	48	16	10	10	0	0	63%	100%	0%	0%
A6.9.	2017	48	57	53	18	12	9	3	0	67%	75%	25%	0%
A6.9.	2016	55	69	62	13	10	7	3	0	77%	70%	30%	0%
A6.9.	2015	50	55	52,5	15	10	5	5	0	67%	50%	50%	0%
A6.9.	2014	37	43	40	11	10	9	1	0		90%	10%	0%
A6.9.	Average	42,7	55,0	47,9	14,1	10,6	7,7	2,4	0,4	75%	73%	23%	4%





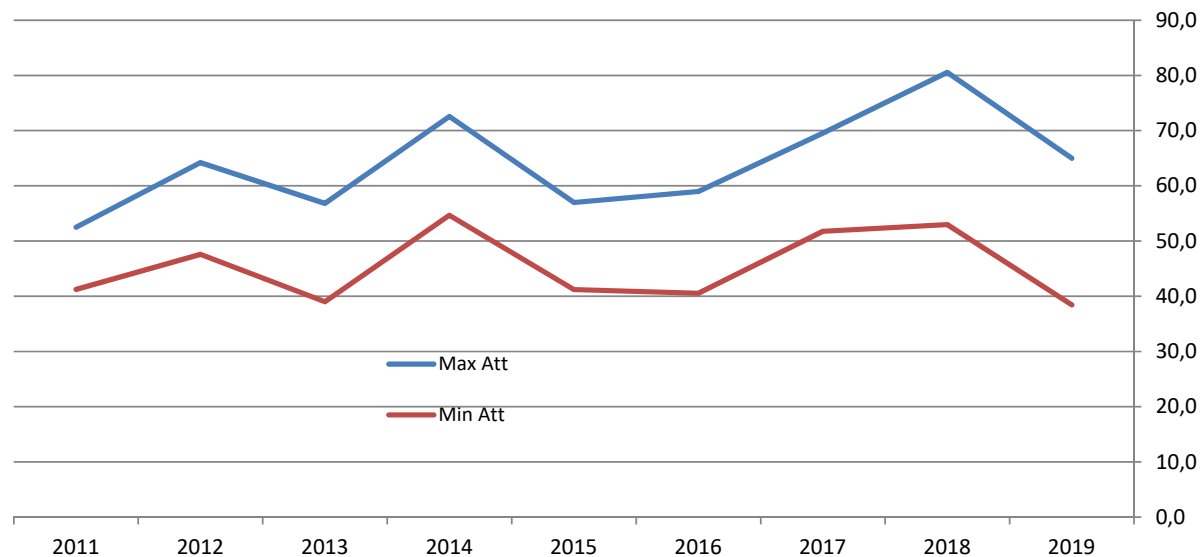
1.3 General statistics concerning A6

Synthesis of A6:

Good symposium, steady over the years

Very good participation rate, with a global average over the years of 55.8 per session

Some slight room for improvement for some session definitions for Paris 2022





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1.4. General information Dubai 2021

Thank you Myriam...

72nd INTERNATIONAL ASTRONAUTICAL CONGRESS
25-29 October 2021 | Dubai

Technical Programme



- Abstracts in total: **3390**
- Abstracts accepted: **2358**
 - 2045 Oral Presentations
 - 313 Interactive Presentations
- Abstracts rejected: **782**

- Papers uploaded: **1358**
- Interactive Presentations submitted: **152**

- Confirmed presentations: **1809**
- Registered speakers: **1442**



مركز محمد بن راشد
للفضاء
MOHAMMED BIN RASHID SPACE CENTRE



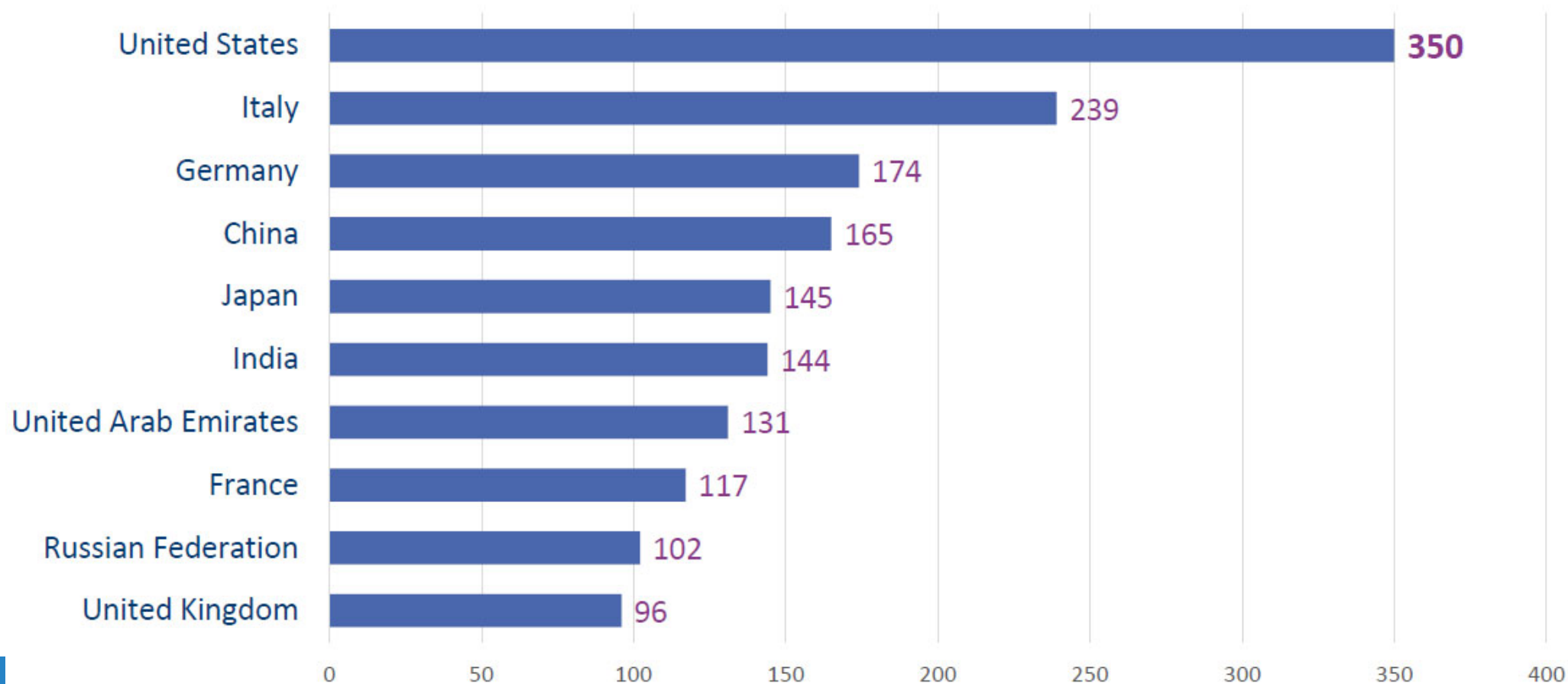
Inspire, innovate & Discover for the Benefit of Humankind

Technical Sessions

Date	25/10/2021	26/10/2021	26/10/2021	27/10/2021	27/10/2021	28/10/2021	28/10/2021	29/10/2021	29/10/2021
Time / Room Number	15:15-18:15	09:45-12:45	14:45-17:45	09:45-12:45	14:45-17:45	09:45-12:45	14:45-17:45	09:45-12:45	13:30-16:30
Sheikh Maktoum A	A3.1	A3.2A	A3.2B	A3.3A	A3.3B	A3.4A	A3.5	A3.2C	A3.4B
Sheikh Maktoum D	D2.1	D2.2	D2.3	D2.4	D2.5	D2.6	D2.7	D2.8/A5.4	D2.9/D6.2
Sheikh Maktoum C	C1.1	C1.2	C1.3	C1.4	C1.5	C1.6	C1.7	C1.8	C1.9
Sheikh Rachid C	A6.1	A6.9	A6.4	A6.3	A6.2	A6.5	A6.6	A6.8/E9.1	A6.7
Sheikh Maktoum B	B3.1	B3.2	B3.3	B3.4/B6.4	B3.5	B3.6/A5.3	B3.7	B3.8	A6.10/B6.5
Sheikh Rachid D	B4.2	B4.1	B4.3	B4.4	B4.5	B4.6A	B4.7	B4.8	B4.6B
Abu Dhabi B	B5.1	E7.1	E7.2	E7.3	E7.4	E7.6/E3.5	E6.3	E7.5	E7.7
Ajman D	C4.1	C4.3	C4.5	C4.2	C4.6	C4.7	C4.8/B4.5A	C4.9	C4.10/C3.5
Rais Al Khaimah	C2.1	C2.2	C2.3	C2.4	C2.5	C2.6	C2.7	C2.8	C2.9
Umm Al kwain	A1.1	A1.2	A1.3	C4.4	A1.4	A1.5	A1.6	A1.7	A1.8
Sheikh Rachid A	A2.1	A4.1	A4.2	A2.2	A2.3	A2.4	A2.5	A2.6	A2.7
Al Ain J	D1.1	D1.2	D1.3	A5.1	A5.2	D1.4A	D1.4B	D1.5	D1.6
Abu Dhabi A	B1.1	C3.1	C3.2	B1.2	B1.3	B1.4	B1.5	C3.4	E8.1
Al Ain A	A7.1	E3.1	E3.2	A7.2	A7.3	E3.3	E3.6	E3.4	D5.4
Al Ain B	E5.1	D5.1	E5.2	D5.2	E5.3	D5.3	E9.2	E5.4	E5.5
Al Ain F	D6.1	B2.1	B2.2	B2.3	B2.4	B2.5	B2.6	D6.3	B2.7
Sharja A	E1.1	E1.2	E1.3	E1.4	E1.5	E1.6	E1.7		E1.9
Sharja D	D4.1	D4.2	D4.3	D3.1	D3.2A	D4.4	D4.5	D3.2B	D3.3
Dubai C	E2.1	E6.4	B6.1	E6.2	B5.2	B5.3	B6.2	B6.3	E6.1
Dubai D GTS	B2.8/GTS.3	E2.2	E2.3/GTS.4	E2.4	E6.5/GTS.1	C3.3	B4.9/GTS.5	B1.6	B3.9/GTS.2
Ajman A						E4.1	E4.2	E4.3	
ISZ								E1.8	

183
Technical
Sessions

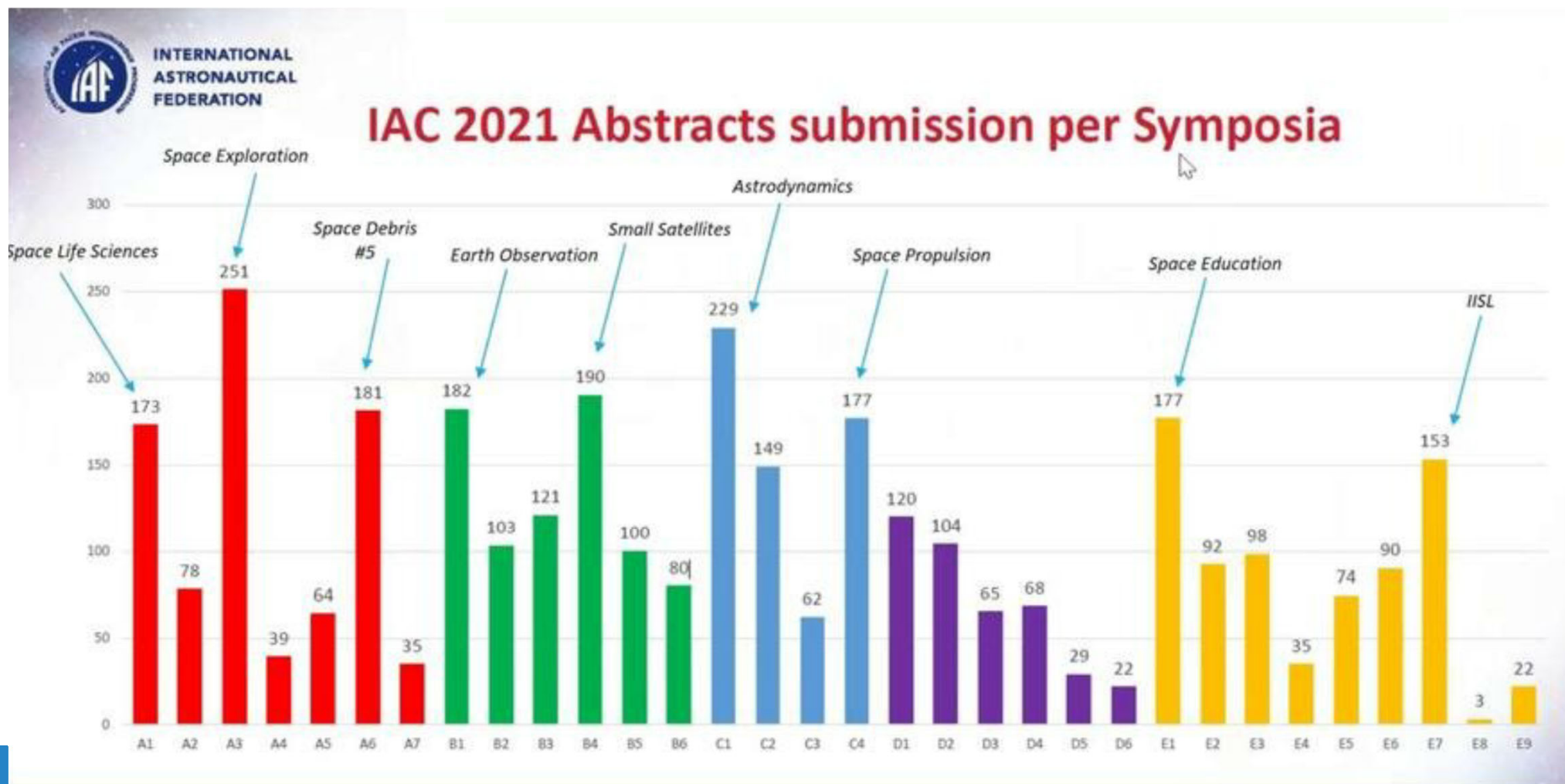
Accepted Abstracts by Country (Top 10)





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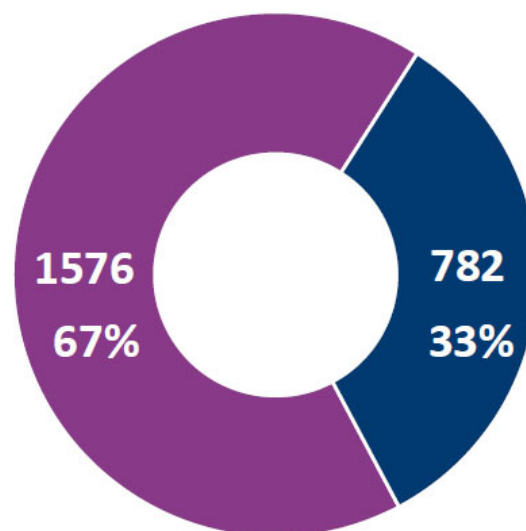
1.4. Space Debris Symposium for Dubai 2021





1.4. General information Dubai 2021

Abstract Distribution Professionals and Students

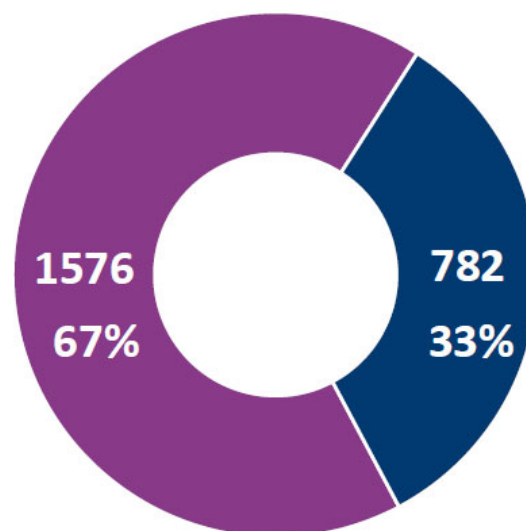


■ Professionals ■ Students



1.4. General information Dubai 2021

Abstract Distribution Professionals and Students

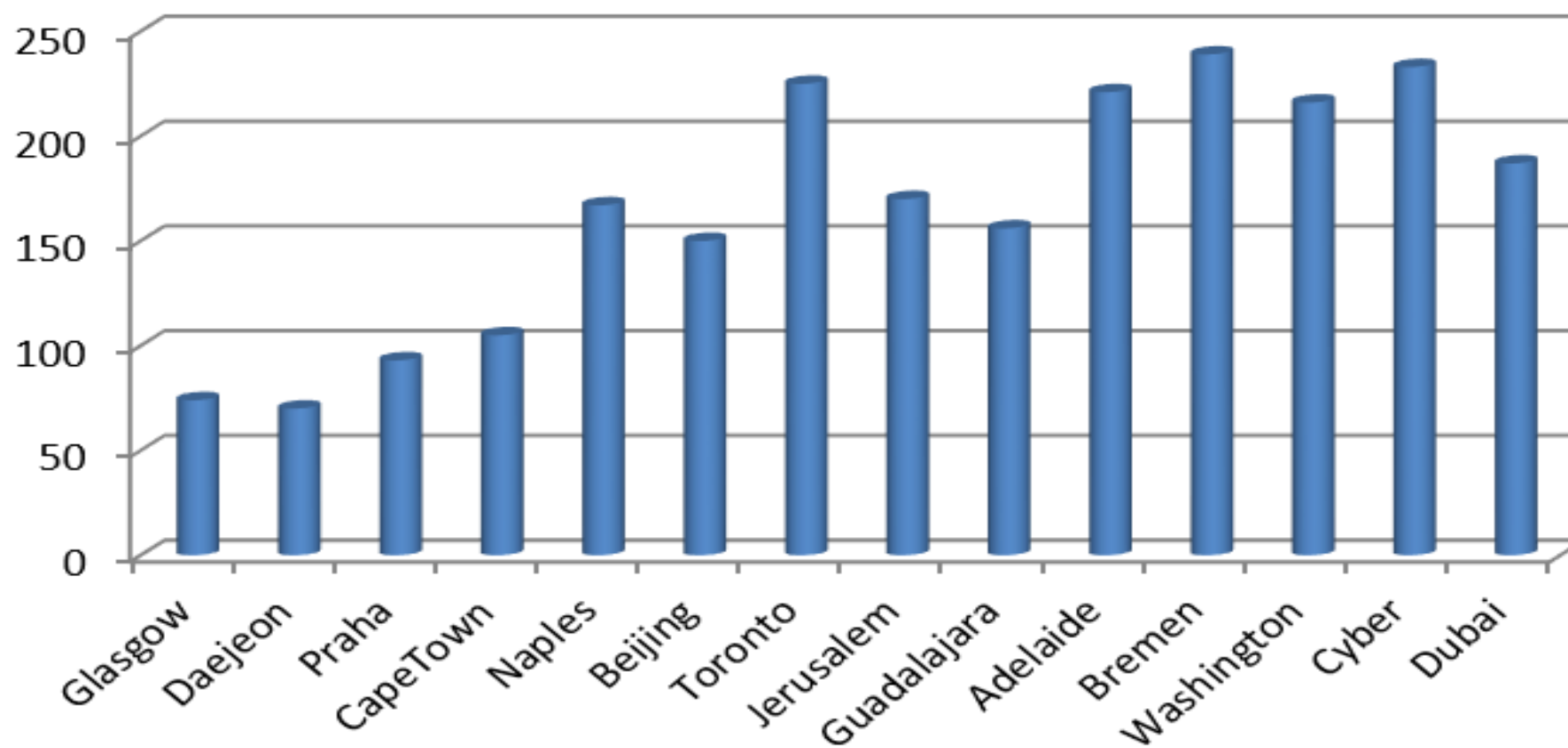


■ Professionals ■ Students



1.4. General information Dubai 2021

Number of abstracts, Space Debris Symposium, since 2008





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1.4. Space Debris Symposium for Dubai 2021

Initial list, as per the website

A6: Space Debris Symposium: Bevilacqua – Bonnal

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 – Jah – 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

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.



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1.4. Space Debris Symposium for Dubai 2021

Initial list, as per the website

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 – Wiedemann – Auburn

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.



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1.4. Space Debris Symposium for Dubai 2021

Initial list, as per the website

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

From SDC: Spencer – Masson-Zwaan – LeMay *From SSC: Plattard - Soucek*

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

Klinkrad – Santoni – Dolado-Perez

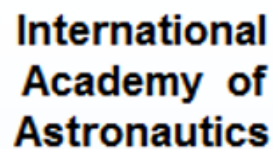
This session will address every aspect of orbit determination coming from the SST (Space Surveillance and Tracking), related to assessment of raw and derived data accuracy, optical measurements processing and modelling and risk analysis of space debris

A6.10 / B6.5.: Joint Space Operations / Space Debris Session – STM Operations

From SDC: Agapov – Tung – Fitz-Coy – McKnight *From SOC: Auburn – Anilkumar – Ohndorf*

This joint session will deal with every aspect of STM Operations and Security. It facilitates discussions between Space Operations and Space Debris communities for shared understanding of the challenges/issues in operating in a debris-rich environment. Lessons learned from CAM operations, HSF and PMD are especially welcome. Looking into the future: improved STM, automated CAM, and large constellation operations in LEO are key challenges for the community and require the appropriate regulatory environment.

A6.IP: Interactive Presentations, Kerr – Le May – Santoni – Opromolla – Jankovic – Bonnal



Updated list, real time

[illegible]



1.4. Space Debris Symposium for Dubai 2021

Updated list, real time

					Selected	Confirmed	Withdrawn	No news	Pap uploaded	Pres up
dbs9@psu.edu				8	13	12	1	0	11	8
s.plattard@ucl.ac.uk							USA			
t.l.masson@law.leidenuniv.nl										
alexander.soucek@esa.int										
samantha.lemay@rmit.edu.au										
H.Klinkrad@t-online.de				9	11	9	1	2	8	7
H.Klinkrad@tu-braunschweig.de							McGill	China		
fabio.santoni@uniroma1.it								McGill		
Juan-Carlos.DoladoPerez@cnes.fr										
christophe.bonnal@cnes.fr										
vladimir.agapov@gmail.com				10	10	8	1	1	6	7
darren@leolabs.space							TUBrauns	Brian Weed		
helentung.tlc@gmail.com										
nfc@ufl.edu										
j.auburn@astroscale.com										
ak_anilkumar@isro.gov.in										
akanil2007@gmail.com										
andreas.ohndorf@dlr.de										
samantha.lemay@rmit.edu.au				IP	25	16	6	3	9	2
fabio.santoni@uniroma1.it							Marko J	Sapienza		
roberto.opromolla@unina.it							Japan x 2	Portugal		
marko.jankovic@dfki.de							India	ESA		
							Israel			
							Brazil			

1.4. Space Debris Symposium for Dubai 2021

A6.IP: Interactive Presentations

Eduard	Kuznetsov	63400	Orbital flips due to solar radiati	Ural Feder	Russian Fe	A6	19th IAA SYMPOSIUM ON SPACE DEBRIS	n/a	
Jing	Yuan	63479	Ground test of visual servoing f	National K	China	A6	19th IAA SYMPOSIUM ON SPACE DEBRIS	n/a	
Ze	Zhu	64049	COLLISION STUDY OF SPACE DE	National K	China	A6	19th IAA SYMPOSIUM ON SPACE DEBRIS	n/a	
Luis	Sanchez	64861	Constrained Optimal Collision A	Univeristy	United Kin	A6	19th IAA SYMPOSIUM ON SPACE DEBRIS	34	13:15 - 13:25
Timothy	Peterson	64936	Optimisation of Debris Intercept Manoeuv	United Kin	United Kin	A6	19th IAA SYMPOSIUM ON SPACE DEBRIS	34	13:25 - 13:35
Zhong	Ma	65035	small spacecraft recogniton usi	Xi'an Micro	China	A6	19th IAA SYMPOSIUM ON SPACE DEBRIS	n/a	
Chris	Brunskill	66634	ION SCV as a space surveillance	[unlisted]	United Kin	A6	19th IAA SYMPOSIUM ON SPACE DEBRIS	n/a	
Amit	Chowdhar	66620	Design and analysis of novel me	SRM Unive	India	A6	19th IAA SYMPOSIUM ON SPACE DEBRIS	34	13:35 - 13:45
Niki	Sajjad	66306	Conceptual Design and Flight Si	K. N. Toos	Iran	A6	19th IAA SYMPOSIUM ON SPACE DEBRIS	34	13:45 - 13:55
Mohamed	Farissi	65638	Hardware implementation of th	Sapienza	Italy	A6	19th IAA SYMPOSIUM ON SPACE DEBRIS	n/a	
Valeria	Trozzi	66198	Analysis of possible definitions	Politecnico	Italy	A6	19th IAA SYMPOSIUM ON SPACE DEBRIS	34	13:55 - 14:05
Sergio	Parra	66108	Design of an Optical Space-base	Graz Unive	The Nethe	A6	19th IAA SYMPOSIUM ON SPACE DEBRIS	n/a	

IP Screen #34, but probably only 1 to 5 presentations...

2 volunteers out of the 4 for A6-IP?

Thursday 13h15 – 14h45? (or much earlier end...)



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1.4. Space Debris Symposium for Dubai 2021

TS Key Performance Indicators



محمد بن راشد
القاسبي
MOHAMMED BIN RASHID SI

- IAC 2021 will serve as a DRY DRUN

To be TESTED in 2021:

- The audience satisfaction survey (7 questions - please remind the delegates to complete the survey during/after your session, instructions will be on a screensaver)
- The online IPC evaluation form to be submitted by 29 October (NO MORE FOLDERS)

The screenshot shows a mobile app interface for a survey. At the top, there is a blue header with a menu icon, the text 'A3.1', and a user profile icon. Below the header, the first question is 'How would you rate the Technical Session' with a subtext 'Give your rating'. This is followed by a row of ten empty star icons. The second question is 'What did you like most about this Technical Session?' with four radio button options: 'Expanding your knowledge', 'Presenting your ideas and work to others', 'Networking opportunities', and 'Other'. The third question is 'Have you attended this Technical Session before?' with two radio button options: 'Yes' and 'No'. The fourth question is 'Did this Technical Session meet your expectations?' with a single radio button option.

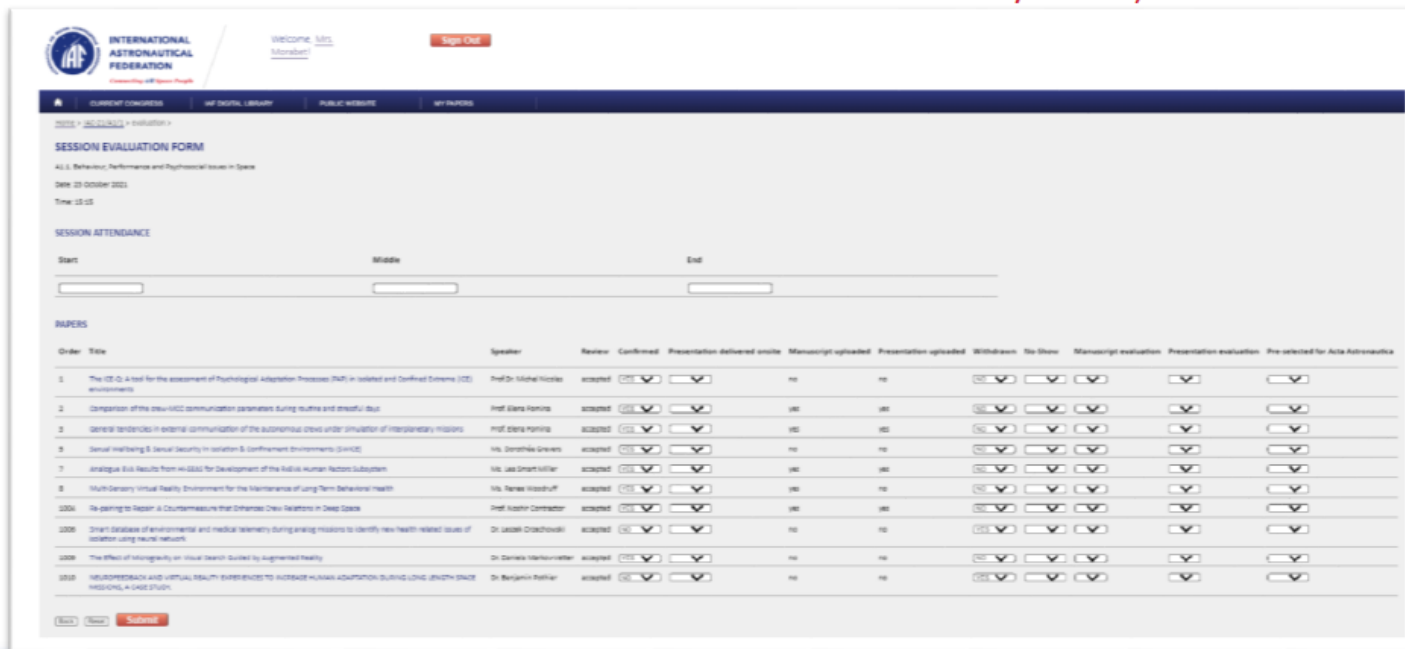
The image shows a promotional card for the 'Assess the Session!' survey. On the left, vertical text reads '72nd INTERNATIONAL ASTRONAUTICAL CONGRESS 25-29 October 2021 | Dubai'. The main heading is 'Assess the Session!'. Below it, the text says 'Join through www.slido.com and put #iac2021tp or scan the QR code to tell us what you think about this session'. A large QR code is centered below the text. In the top right corner is the IAA logo, and in the bottom right corner is the IAC DUBAI 2021 logo.



1.4. Space Debris Symposium for Dubai 2021

TS Key Performance Indicators

TS attendance form + TS evaluation form + preselection for Acta Astronautica have been combined into a single online form to be completed by ONE IPC Member
(Please coordinate with your Co-Chairs/Rapporteurs so you submit it only once.
Detailed instructions have been sent out by email)



SESSION EVALUATION FORM
42nd Session: Performance and Psychological Issues in Space
Date: 29 October 2021
Time: 18:00

SESSION ATTENDANCE

Start: Middle: End:

PAPERS

Order	Title	Speaker	Review	Confirmed	Presentation delivered on-site	Manuscript uploaded	Presentation uploaded	Withdrawn	No Show	Manuscript evaluation	Presentation evaluation	Pre-selected for Acta Astronautica
1	The ICF-Q: A tool for the assessment of Psychological Adaptation Processes (PAP) in isolated and confined environments (ICE)	Prof Dr Michael Nicolas	accepted	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	no	no	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2	Comparison of the crew-VCC communication parameters during routine and stressful day	Prof Elena Morina	accepted	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	yes	yes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3	General tendencies in external communication of the autonomous crew under simulation of interplanetary missions	Prof Elena Morina	accepted	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	yes	yes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
4	Sexual Wellbeing & Sexual Security in isolated & confinement environments (SWECC)	Ms. Samantha Green	accepted	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	no	no	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
5	Analogous Risk Results from H2020 for Development of the Sub-Human Factors Subsystem	Ms. Lea Smart-Jeffrey	accepted	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	yes	yes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6	Multi-Sensory Virtual Reality Environment for the Maintenance of Long-Term Behavioral Health	Ms. Rana Woodruff	accepted	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	yes	no	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1004	Re-planning to Repair: A Countermeasure that Enhances Crew Relations in Deep Space	Prof. Victor Comptor	accepted	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	yes	yes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1008	Smart Database of environmental and medical telemetry during analog missions to identify new health-related issues of isolation using neural network	Dr. Lucile Crochovski	accepted	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	no	no	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1009	The effect of telepresence on visual search guided by augmented reality	Dr. Daniela Vankov-Vetter	accepted	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	no	no	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1010	NEURORESEARCH AND VIRTUAL REALITY EXPERIMENTS TO INCREASE HUMAN ADAPTATION DURING LONG-TERM SPACE MISSIONS: A CASE STUDY	Dr. Benjamin Pothier	accepted	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	no	no	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Back Cancel Submit

Suggest first « green » chair per Session from the previous list, or clear change notification to me please

1.4. Space Debris Symposium for Dubai 2021

[Home](#) > [IAC-21/A6/9](#) > [evaluation](#) >

SESSION EVALUATION FORM

A6.9. Orbit Determination and Propagation - SST

Date: 26 October 2021

Time: 09:45

SESSION ATTENDANCE

Start

Middle

End

Order	Title	Speaker	Review	Confirmed	Presentation delivered onsite	Manuscript uploaded	Presentation uploaded	Withdrawn	No-Show	Manuscript evaluation	Presentation evaluation	Pre-selected for Acta Astronautica
1	Assessing accuracy of different atmospheric models through orbital predictions for near real time applications	Mr. Angel Gallego	accepted	<div>YES</div> <div>NO</div>	<div>YES</div> <div>NO</div>	yes	yes	<div>YES</div> <div>NO</div>	<div>YES</div> <div>NO</div>	<div>0</div> <div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div>	<div>0</div> <div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div>	<div>YES</div> <div>NO</div>



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1.4. Space Debris Symposium for Dubai 2021

TS Running Order - Guidelines



In each TS Room, the presentations will be grouped in two folders:

- **A set of in-person presentations** (confirmed and registered by 4 October deadline)
- **Followed by a set of video presentations** (from authors who could not attend but have registered by 4 October) – these can be displayed at the end of the session. You can use the spare time for Q&A and discussion with the audience.
- There will be a technician in each room to help you and follow your instructions

B4.2. Small Space Science Missions

October 25 2021, 15:15 – Sheikh Rashid D

Co-Chair(s): Larry Paxton, The John Hopkins University Applied Physics Laboratory, United States; Norbert M.K. Lemke, OHB System AG - Munich, Germany; Rapporteur(s): Roberto Mugellio-Dow, European Space Agency (ESA), United Kingdom; Oana van der Togt, TNO, The Netherlands;

IAC-21.B4.2.2 (CONFIRMED) 15:15 – 15:27

SCIENTIFIC CONTRIBUTION OF SHARUAH-SAT-1 TO X-RAY OBSERVATIONS

Emrah Kalemcı, Sabanci University, Turkey

IAC-21.B4.2.5 (CONFIRMED) 15:27 – 15:39

PRELIMINARY MISSION DESIGN OF CUBESAT FOR HIGH ENERGY ASTROPHYSICS POLARIMETRY

Jorge Bordalo Monteiro, Centre for Mechanical and Aerospace Science and Technologies (C-MAST), Portugal

IAC-21.B4.2.6 (CONFIRMED) 15:39 – 15:51

LESSONS LEARNED AS THERMAL SUBSYSTEM LEAD FOR A STUDENT-DRIVEN CUBESAT PROJECT

Stéphanie Fiore, Concordia University, Canada

IAC-21.B4.2.7 (CONFIRMED) 15:51 – 16:03

CUBESAT MISSION CONCEPT FOR ENVIRONMENTAL ANALYSIS IN LOW EARTH ORBIT

Marco Paolo Brenna, Politecnico di Milano, Italy

IAC-21.B4.2.9 (CONFIRMED) 16:03 – 16:15

PROJECT APTAS - USING CUBESAT DESIGN AND DEVELOPMENT TO BRING STUDENTS INTO NORTHERN SWEDEN'S SPACE ECOSYSTEM

Mathias Rittatore Texeira, Luleå Technical University, Sweden

IAC-21.B4.2.10 (CONFIRMED) 16:15 – 16:27

LAUNCH, OPERATIONS, AND FIRST EXPERIMENTAL RESULTS OF THE SATELLITE FOR ORBITAL AERODYNAMICS RESEARCH (SOAR)

Nicholas H. Crisp, The University of Manchester, United Kingdom

IAC-21.B4.2.11 (VIDEO)

ON-ORBIT OBSERVATION OF TOTAL ELECTRON CONTENT IN THE IONOSPHERE BY UHF RANGING SIGNAL FROM THE GROUND

Makiko Kishimoto, LaSEINE, Kyushu Institute of Technology, Japan

IAC-21.B4.2.12 (VIDEO)

DESIGN CHALLENGES AND OPPORTUNITIES OFFERED BY THE LUMIO SPACECRAFT: A CUBESAT FOR OBSERVING AND CHARACTERIZING MICRO-METEOROID IMPACTS ON THE LUNAR FAR SIDE

Angela Cervone, Delft University of Technology (TU Delft), The Netherlands

72nd INTERNATIONAL ASTRONAUTICAL CONGRESS
25-29 October 2021 | Dubai





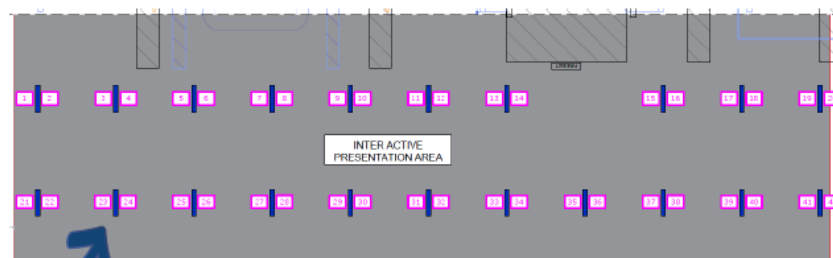
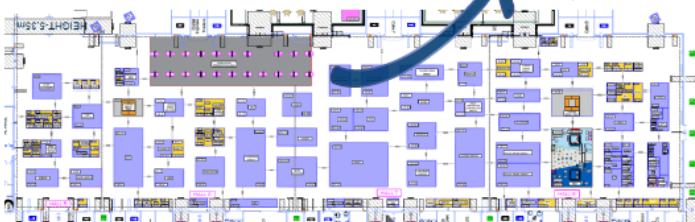
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1.4. Space Debris Symposium for Dubai 2021

72nd INTERNATIONAL ASTRONAUTICAL CONGRESS
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Interactive Presentations

152 Interactive
Presentations
submitted

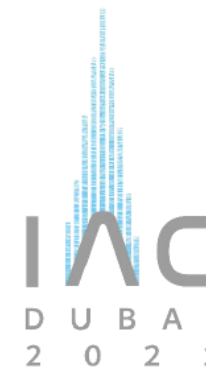


42 screens in the
Exhibition area to
browse among
all the IPs

Thursday 28 October
12:45 – 13:15 IP Award Ceremony
13:15 – 14:45 IP Session



مركز محمد بن راشد
للكفضاء
MOHAMMED BIN RASHID SPACE CENTRE





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1.4. Space Debris Symposium for Dubai 2021

72nd INTERNATIONAL ASTRONAUTICAL CONGRESS

25-29 October 2021 | Dubai

Interactive Presentations Lightning Talks



Tuesday 26 October
12:45-13:30
Lightning Talks



IAC 2021 will also feature a new dynamic and engaging Interactive Presentations Session called “Lightning Talks”. This new session format is an excellent way to rapidly and compellingly share the latest information about diverse topics from presenters in an engaging and snappy style.

No IP Lightning Talk from IAA SDC this year...



1.5. Space Debris Symposium for Paris 2022

IAC	Year	Location	Session 1	Session 2	Session 3	Session 4	Session 5	Session 6	Session 7	Session 8	Session 9	Session 10	Interactive Presentations
66th	2015	Jerusalem	F. DiPentino [C] T. Schildknecht [C] V. Agapov [R]	C. Pardini [C] M. Sorge [C] S. Flegel [R]	N. Fitz Coy [C] F. Schaefer [C] A. Francesconi [R]	H. Krag [C] C. Cazaux [C] A. Kato [R]	MYS. Prasad [C] F. Piergentili [C] F. Santoni [R]	N. Berend [C] S. Kibe [C] JC. Liou [R]	T.S. Kelso [C] J-C. Dolado-Perez [C] D. Finkleman [R]	B. Biddington [C] D. McKnight [C] C. Mathieu [R]	M. Jah [C] H. Klinkrad [C] H. Lewis [R]	C. Mathhieu [C] K. Stube [C] C. Bonnal [R]	T. Yasaka D. McKnight C. Bonnal
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. Piergentili [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
69th	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. Omaly [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] T.S. Kelso [R]	D. Spencer [C] S. Lemay [R]	H. Klinkrad [C] J-C. Dolado-Perez [C] F. Piergentili [R]	U. Dasgupta [C] Y. Usovik [C]	T. Yasaka D. McKnight C. Bonnal
70th	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 [C] F. Santoni [R]	D. McKnight [C] H. Tung [C] A. Anilkumar [R]	T. Yasaka D. McKnight M. Jankovic
71 h	2021	Dubai	M. Skinner [C] M. Jah [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. Opromolla [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 [C] S. Lemay [R]	H. Klinkrad [C] F. Santoni [C] J-C. Dolado-Perez [C]	V. Agapov [C] H. Tung [C] A. Anilkumar [R]	E. Kerr S. Lemay F. Santoni R. Opromolla M. Jankovic



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1.5. Space Debris Symposium for Paris 2022

Proposals for changes were requested before April 15th

A6: Space Debris Symposium: Bonnal – Bevilacqua

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 – 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

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.



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1.5. Space Debris Symposium for Paris 2022

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 – Auburn

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.



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1.5. Space Debris Symposium for Paris 2022

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

From SDC: Spencer – Masson-Zwaan – **Kerr** From SSC: Plattard - Soucek

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 – 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 / A8.2.: Joint Near Earth Objects / Space Debris Session

From SDC: Schildknecht – McKnight - **Colombo** From NEO: Mazanek – Wolfson - Maier

This symposium, organized by the International Astronautical Federation (IAF), will address all topics related to planetary defense from near-Earth objects (NEOs), including remote observation, characterization, modeling and simulation, and methods for mitigating the effects of an impacting asteroid or comet. Additionally, synergistic areas of investigation, such as space debris mitigation, asteroid mining, and robotic and human exploration of these small bodies are particularly welcome., simulation and robotic. Synergistic and joint aspects with other areas of investigation, such as space debris, asteroid resources are particularly welcome. Lessons learned and advances in fields that may be applicable to planetary defense and vice-versa are encouraged. The symposium will also be open to contributions on the legal and policy aspects associated with planetary defense and consider how to communicate relevant information to decision-makers. Finally, we welcome contributions regarding educational and public communication initiatives and programs. Synergistic and joint aspects between asteroid and comet impact mitigation and other fields, as well as innovative approaches to planetary defense, are particularly welcome. Lessons learned and advances in any area (such as in-situ science missions) that may be applicable to planetary defense and vice-versa are encouraged..

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



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1.5. Space Debris Symposium for Paris 2022

General messages on IAC 2022:

Beware: IAC Paris from Sunday 18 to Thursday 22 September, instead of Monday to Friday

Everything is advanced by one day

IAA SDC and IAF TC.26 Committee could take place on Friday 16th

General messages on A6 Space Debris:

Joseph P. Loftus Jr. IAC A6 lecture

- Very good idea in terms of attractiveness
- Was already decided before the "big mess"
- Who, on which precise topic and when? Has to be 40 minutes or more = 2 - 3 papers at the beginning of one session
- Can NASA invite Don Kessler?



2. Exchanges

2. Exchanges

2.1. Past events: workshops, conferences, congresses, ...

- Number of webinars and on-line events IAASS. Cubesats confusion (Mark – see Appendix 2)
- AMOS 2021. Mostly actual observations.
- Darmstadt conference 400+ participants – Proceedings available at <https://conference.sdo.esoc.esa.int/proceedings/list>
- Cleanspace conference 200+ participants, no public proceedings. Please contact Holger
- Marko Stardust (see Appendix 3)
- Marko Period (see Appendix 4)



2. Exchanges

2. Exchanges

2.2. On the Agenda

- Working Group on the impacts of constellations on astronomy – IAF Special Session on Tuesday 26th October from 11:30 to 13:00 in room Sheikh Rashid B
- LEO Kinetic Space Safety Workshop Sponsored by LeoLabs, ClearSpace, and AXA XL (see Appendix 5)
- 6th WS modeling & remediation – CNES HQ, Paris – 18-20 May 2022 (see Appendix 6)
- 9th WS satllits end-of-life and sustainable technologies – CNES HQ, Paris, 25-27 January 2022 (see Appendix 7)
- 3rd IAA Conference on Space Situational Awareness – Madrid – 4-6 April 2022 (see Appendix 8)
- Marko Stardust-R (see Appendix 3)
- 44th COSPAR Scientific Assembly - Athens, Greece, 16-24 July 2022.
Papers on space debris should be submitted to the COSPAR Panel PEDAS.1 'The science of human-made objects in orbit: space debris and sustainable use of space'.
The abstract submission deadline is 11 February 2022.
- 8th EUCASS Conference – Lille, France, 3-8 July 2022. <https://eucass-3af-2022.eu/> .
Debris sessions (Luciano Anselmo) in Space Sustainability Symposium.
Abstracts submission deadline 15 January 2022



2. Exchanges

2. Exchanges

2.3. New achievements

- ISO: next meeting 7-8-9 November
 - New version of 24113 just approved. Main modification §6.3.4.3.: 10^{-4} on-ground casualty risk threshold
 - 23312 and 20893 ongoing
 - New Working Draft Item NWIP
- ECSS Mirror Group on STM

2.4. Round table – Open discussion

- Dan LCOLA (Appendix 9)
- Pierre Evolution of the French Law (Appendix 10)
- Oral information from Vladimir on the evolution of the Breakup clouds of 2200 debris > 7-8 cm from Atlas V stages crossing GNSS orbits



Agenda

3.1 SG 5.17 IAA Situation Report on Space Debris – Update

- ✚ Proposal to have a fast-track action in order to progress, at last
- Based on the existing Report 2016
 - <https://iaaspace.org/wp-content/uploads/iaa/Scientific%20Activity/sg514finalreport.pdf>
- ✚ I propose not to change significantly the structure of the document (will do for the following one...)
- Identification, chapter per chapter, of what exactly is needed to update, correct, complement, renew references
- ✚ Need to have small teams of 3 - 4 volunteers per chapter
 - Have to be good experts of the topic, of course!
 - But help from younger members is welcome!
 - Preferably from diverse countries
 - Continuity with previous authors would be perfect
- Appendix 3 is the zip of all 14 chapters in Word format

Let's produce rapidly an updated version with minimal effort and highest efficiency



Agenda

2016 version number of pages for information

3.1 SG 5.17 IAA Situation Report on Space Debris – Update

- 0. Executive Summary & Table of Contents ⇒ Darren and I
- 1. Introduction ⇒ Darren and I
- 2. Current status (12 pages) ⇒ Need for someone who masters MASTER-ORDEM or equivalent, so preferably ESOC + NASA + Russia ? Japan ?
- 3. Measurements (13 pages) and 4. SSA (16 pages)
 - Could be merged into a unique chapter explaining the “how it works”
 - Description of the SSA systems themselves placed in an Annex
 - Strong wish to have extra systems, mainly ESA, EUSST, China, Australia, ...
 - Personal opinion: no significant effort to update, fundamentally structure of the chapter
- 5. Collision Avoidance (6 pages) ⇒ Easy to update, potentially to be completed with new techniques and modern examples
- 6. HVI and Protection (13 pages) ⇒ Only minor points to update
- 7. Reentering Space Objects (16 pages) ⇒ Only some statistics to update
- 8. Future Orbital Debris Environment (11 pages) ⇒ Obviously a bit more work to do ☺
 - Updates of statistics
 - Inclusion of Small-sats and Constellations
 - However, most of the IADC WG2 derived work can be reused, unchanged



3.1 SG 5.17 IAA Situation Report on Space Debris – Update

- 9. Mitigation (9 pages) ⇒ Mostly update,
 - Well known to members of International Standards Working Groups
 - Important to update the summaries of PMD practices
- 10. Debris Remediation (12 pages) ⇒ Roberto, Marko, Darren and I
- 11. Legal (9 pages) ⇒ Update already done last year by Tanja; to be re-read
- 12. International (6 pages) ⇒ To be restructured, easy. Christophe
- 13. Synthesis & Further References (7 pages) ⇒ To be restructured, partially merged with §12, some can be deleted due to duplications... Christophe
- Appendix (3 pages) ⇒ Currently
 - Appendix 1 List of Contributors, Authors and Reviewers
 - Appendix 2 List of Acronyms and Abbreviations
 - Proposal to have one major Appendix with all the SSA systems: we need additional contributions, and colleagues must not complain afterwards if they are not in; if they did not provide anything 😊