International Academy of Astronautics

IAA Space Debris Committee

March 22nd, 2021

International Academy of Astronautics

Agenda

1. IAC
   - 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

International Academy of Astronautics

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. 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 somehow “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. IAA Space Debris Committee

Current official membership (as per web site):

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

Klinkrad Heiner
Liou Jer-Chyi
Bonnal Christophe

To be removed: ?

Please indicate whether you would like to be removed from the SDC and/or the distribution list

No news since long time from:
- Alice Gorman
- Mykhailo Kaliapin
- Luca Rossettini

Please confirm interest before next meeting

New members:

Synthesis:

73 members

Please send your name today for the list of participants

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

International Academy of Astronautics

1. IAA Space Debris Committee

Election of the chairs:

Currently 3 chairs of IAA SDC, among which 2 coordinators of A6 Symposium

↳ Will be reduced to 2, potentially with a Secretary

Typically 4 functions:

- Coordinator of the IAC A6 Space Debris Symposium
- Global coordination of the IAA Space Debris Committee: communication with members
- Preparation of the general yearly synthesis for IAA
- Coordination of the “exchange” among members during our meetings

Election of one chair for 4 years, every 2 years

Potential re-election once for a departing chair. Both Heiner and Jer-Chyi are departing.

First election in October 2021 in Dubai to elect a new co-chair:

↳ Please inform me if you wish to candidate before end of May

Voters are limited to members of Space Debris Committee

If possible, not two chairs from the same geographic region

↳ As I do not quit yet, new chair shall not be French, preferably not European

Confirmed by IAA that candidates shall be Full or Corresponding Members of IAA

Transparent process with secret ballots sometimes in June (final procedure still tbd, maybe though IAA secretariat)

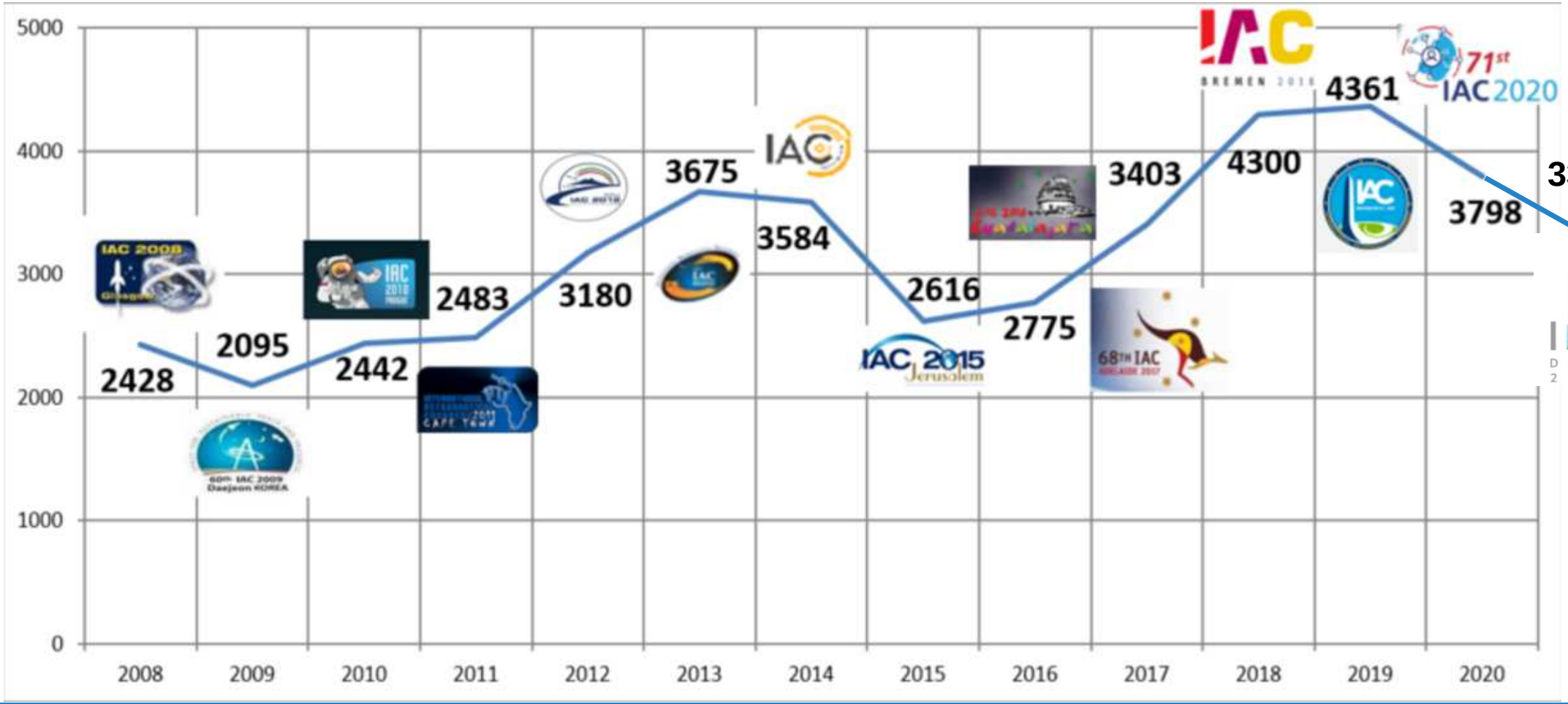
⇨ Newly elected chair will have to be formally confirmed by IAA SAC

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

International Academy of Astronautics

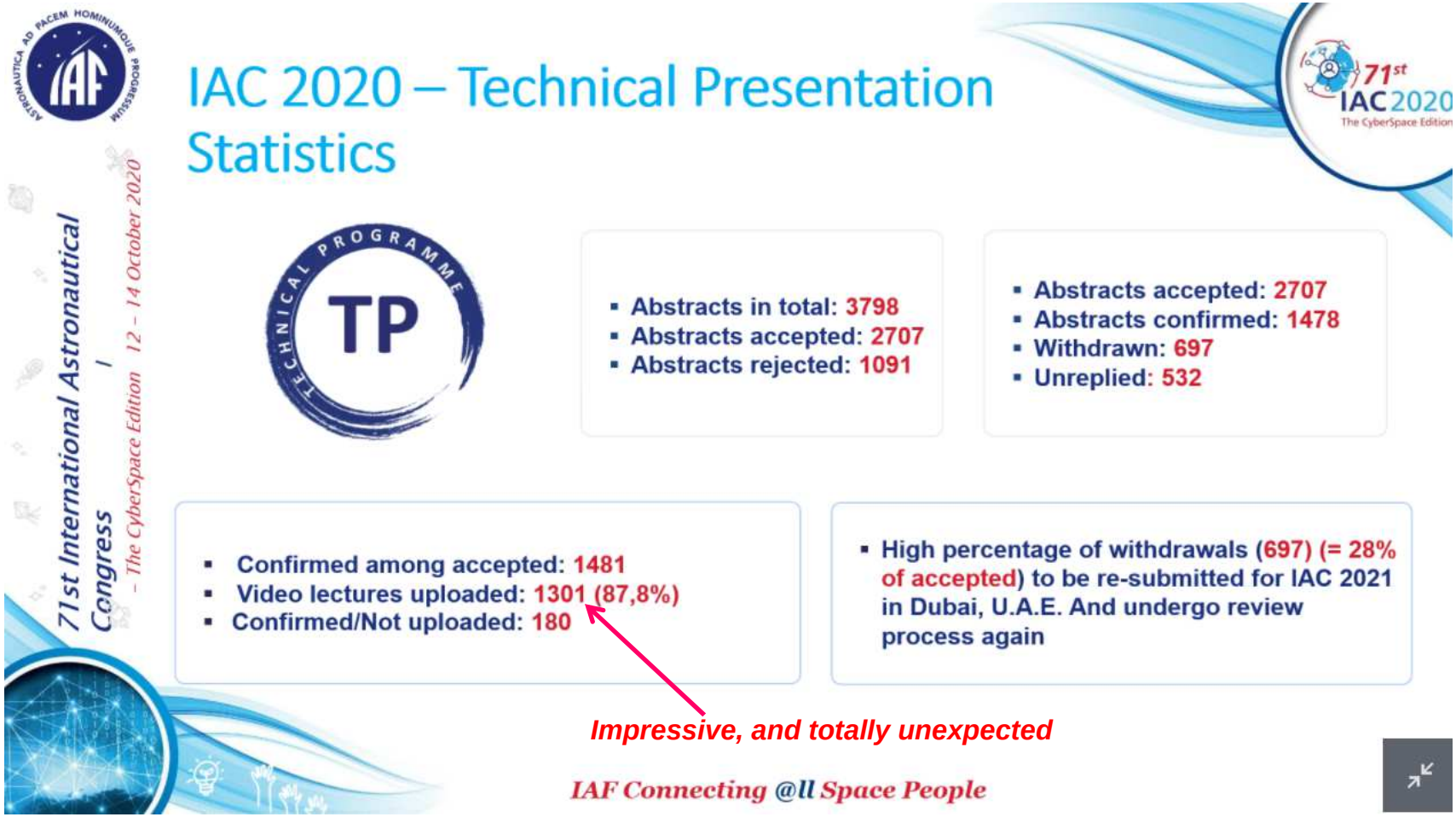
1.2 Feedback from Cyber IAC 2020

Number of IAC abstracts since 2008



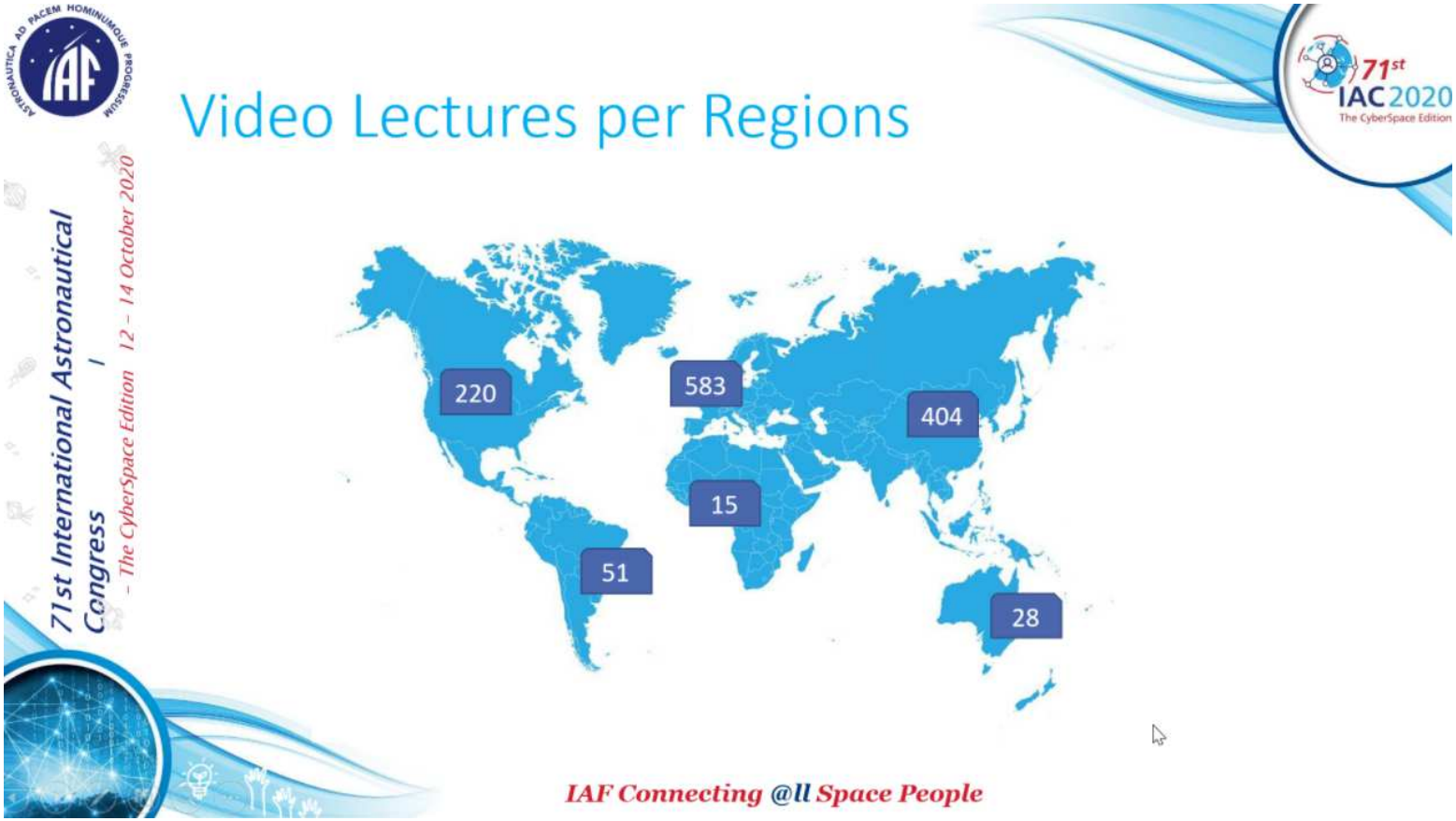
International Academy of Astronautics

1.2 Feedback from Cyber IAC 2020



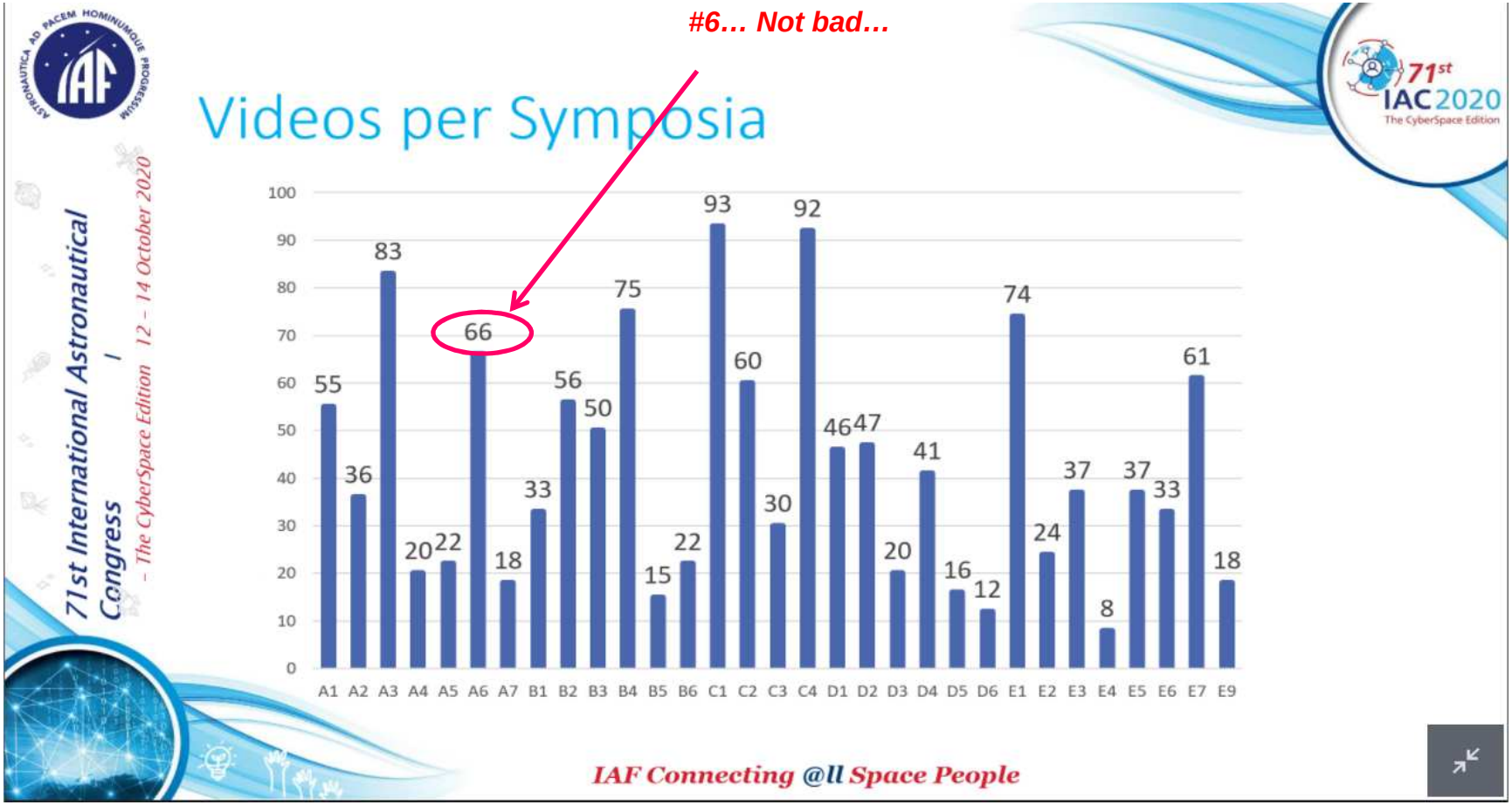
International Academy of Astronautics

1.2 Feedback from Cyber IAC 2020



International Academy of Astronautics

1.2 Feedback from Cyber IAC 2020



International Academy of Astronautics

1.2 Feedback from Cyber IAC 2020

International Academy of Astronautics

1.2 Feedback from Cyber IAC 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

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

International Academy of Astronautics

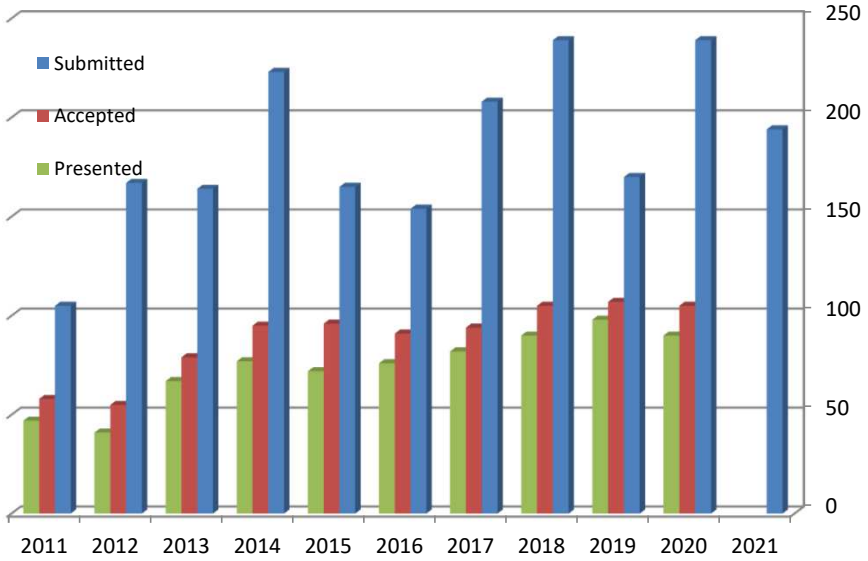
1.3 General statistics concerning A6

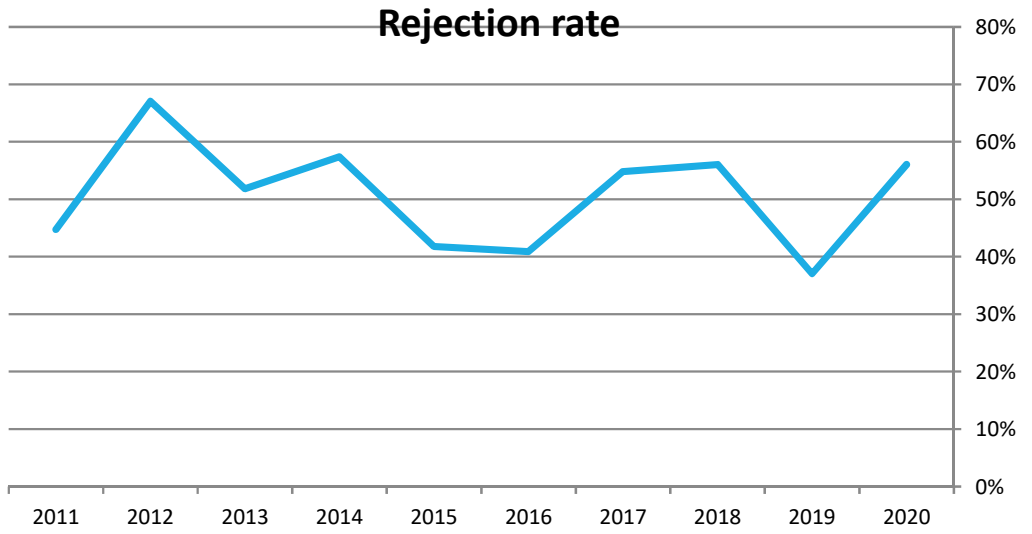
Globally healthy symposium:

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%





International Academy of Astronautics

1.3 General statistics concerning A6

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

Very health session over the years

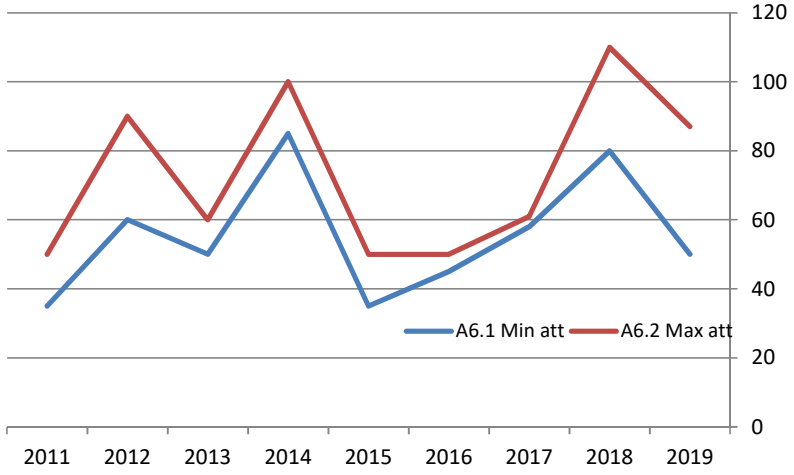
28 papers submitted in average

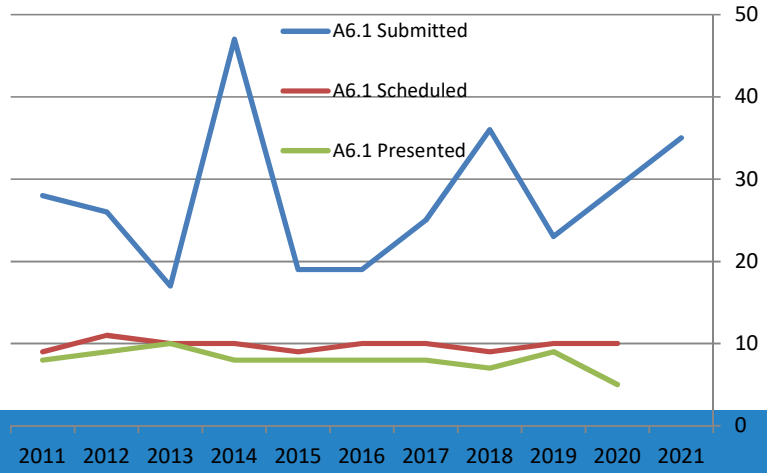
64% rejection rate

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 Withdrawn	No Show	% Papers Selected	% 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%





International Academy of Astronautics

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)

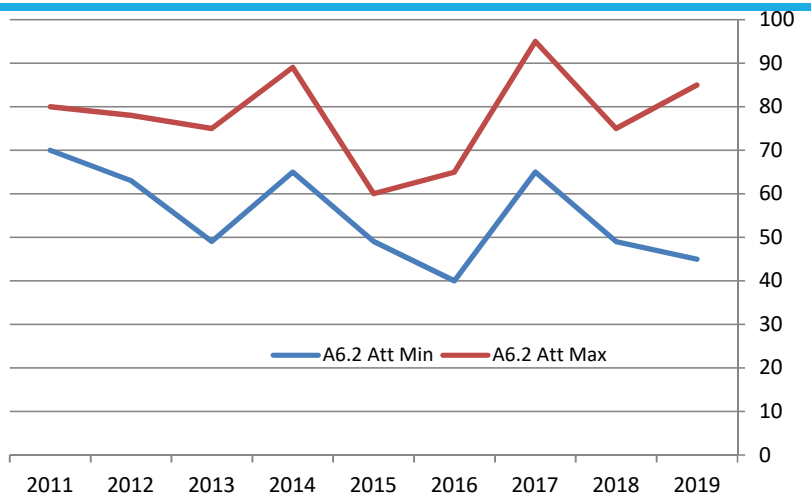
50% average rejection rate but declining (29% in 2019)

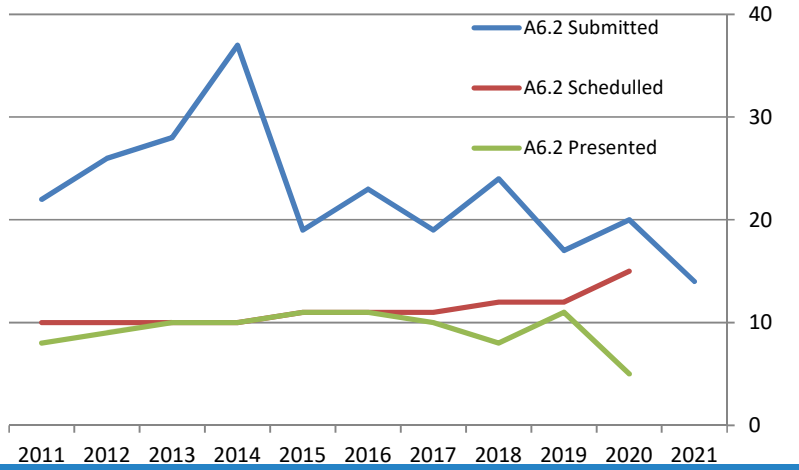
But very good average average attendance 66 participants

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%





International Academy of Astronautics

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…

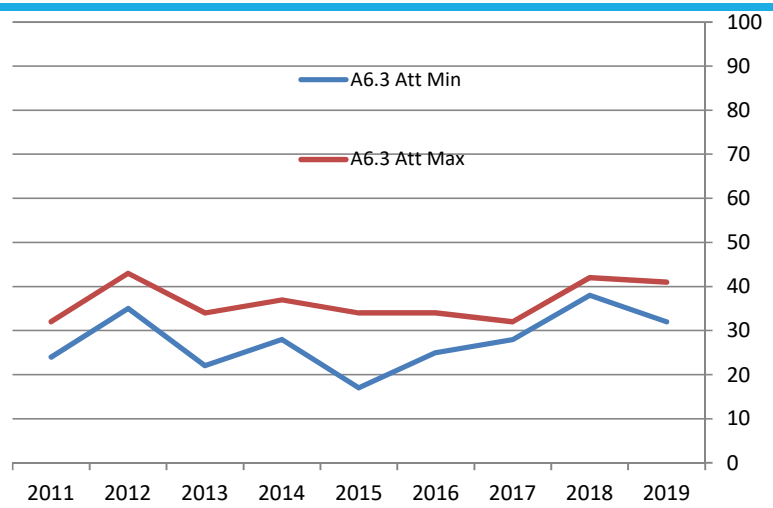
31% average rejection rate but declining (15% in 2019, 0% in 2020)

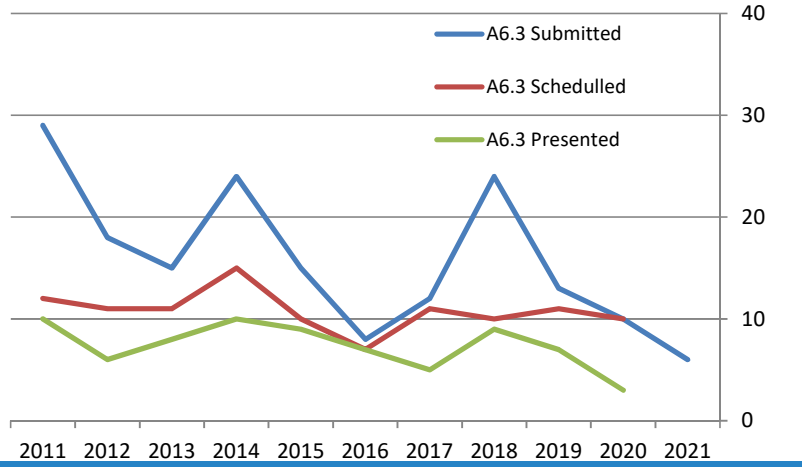
Rather good average average attendance 32 participants

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	% Papers Selected	% 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%





International Academy of Astronautics

1.3 General statistics concerning A6

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

Good classical session with strong variations

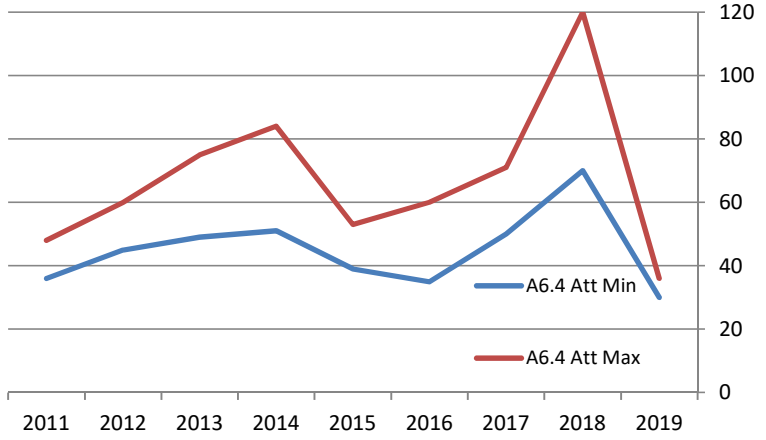
Low number of average submission: 15, slightly better in 2021

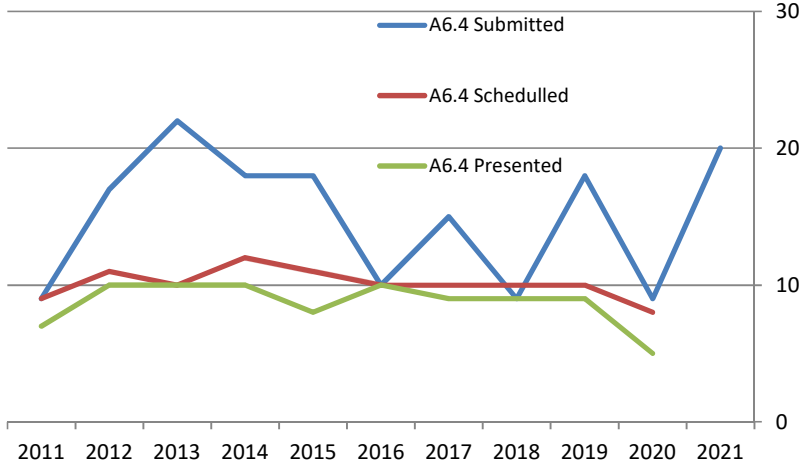
33% average rejection rate but declining (but 11% in 2020)

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 Selected	% 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%





International Academy of Astronautics

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)

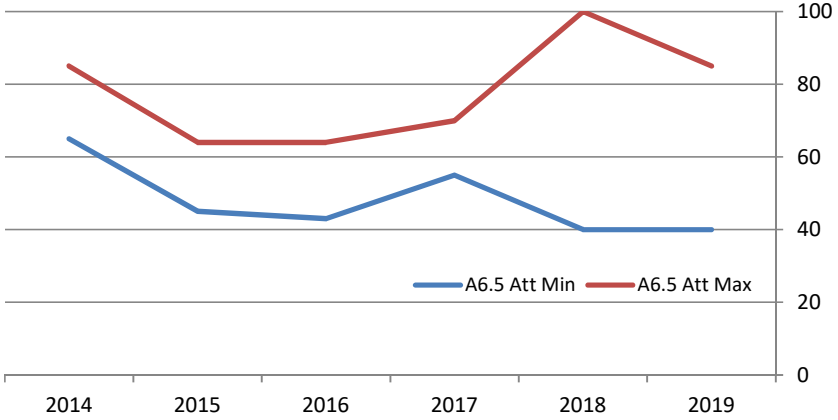
Some significant variations over the years

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

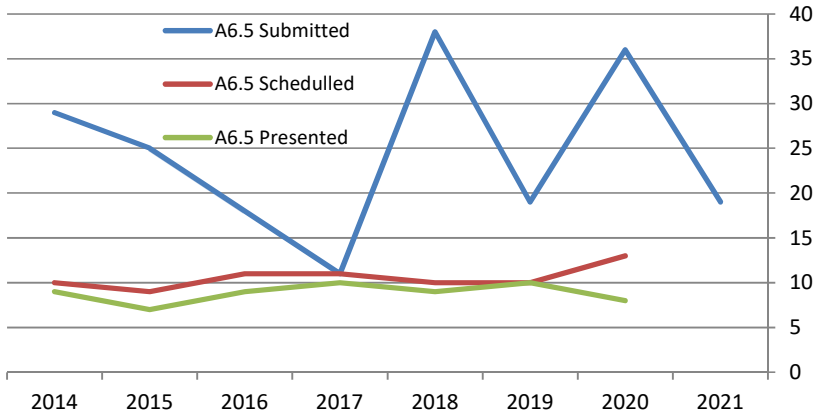
Good rejection rate 57% (64% in 2020)

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 Withdrawr	No Show	% Papers Selecte	% 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%



International Academy of Astronautics

1.3 General statistics concerning A6

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

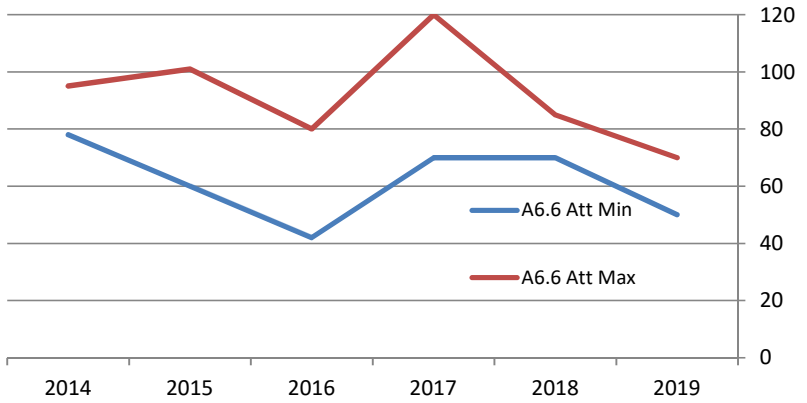
Very good classical session (dual session with A6.5)

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

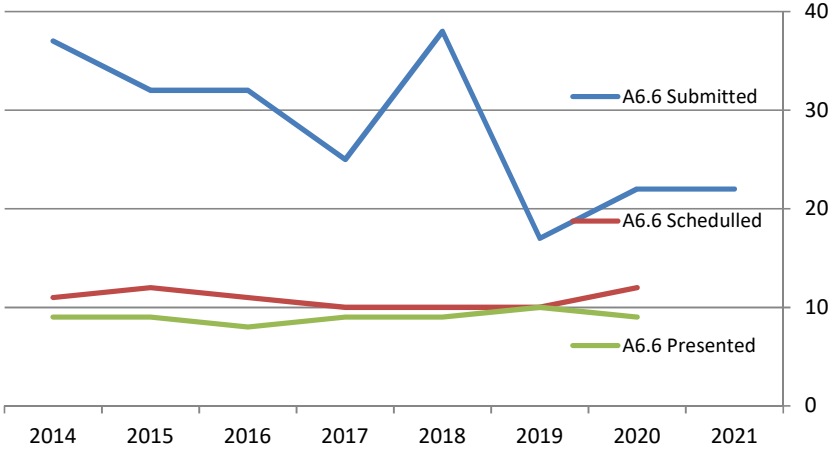
Good rejection rate 61%

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%



International Academy of Astronautics

1.3 General statistics concerning A6

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

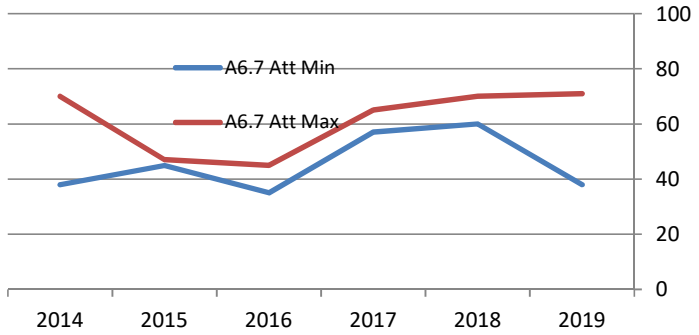
Good classical session since 2014

Average submission is rather low: 15

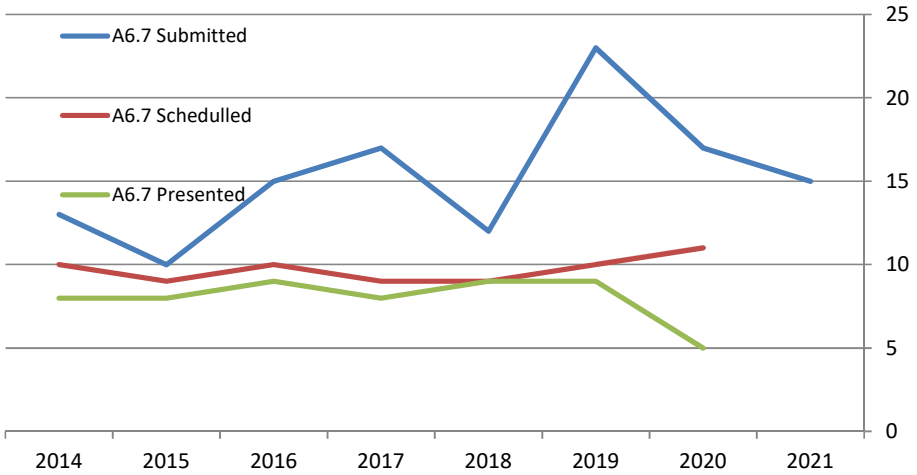
Rejection rate is correct: 37%

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	% Papers Selected	% 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%



International Academy of Astronautics

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)

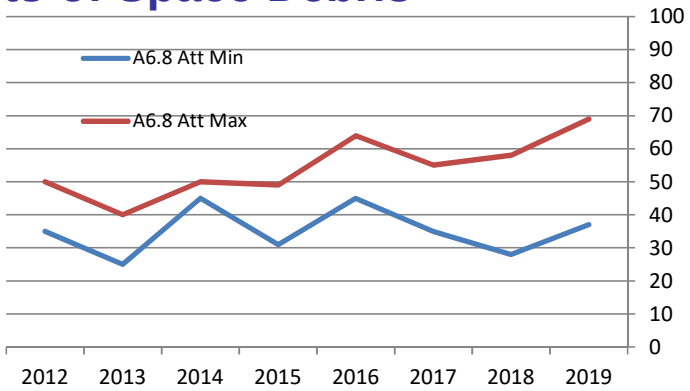
Rejection rate is correct: 38% (but 59% in 2020)

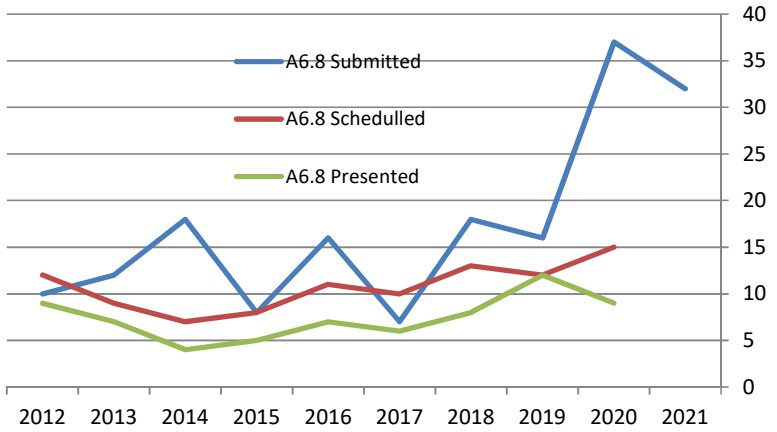
Good average average attendance: 43 participants

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 Present.	% 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%





International Academy of Astronautics

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%

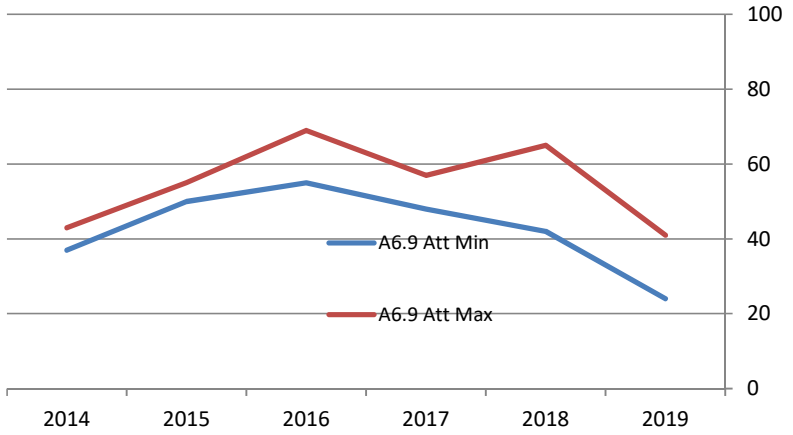
But good average average attendance: 48 participants

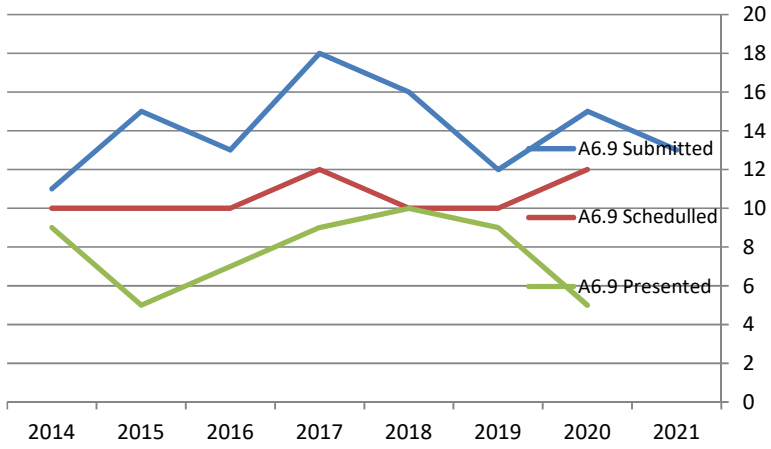
High withdrawn ratio 21% (one anomaly in 2015!).

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	% Papers Selected	% 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%





International Academy of Astronautics

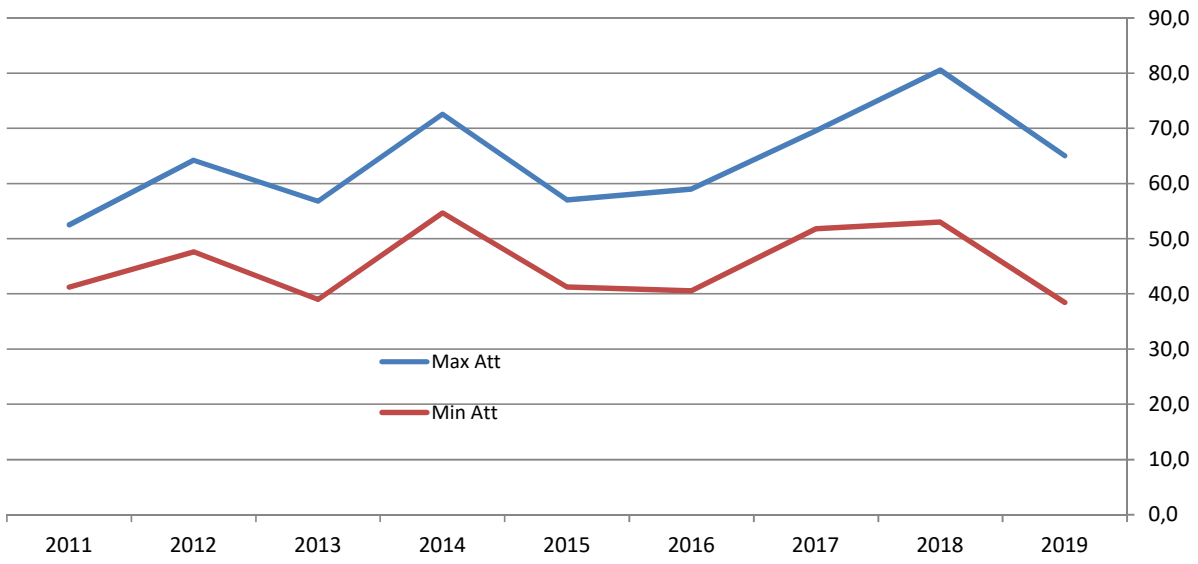
1.3 General statistics concerning A6

Synthesis of A6:

Good symposium, steady over the years

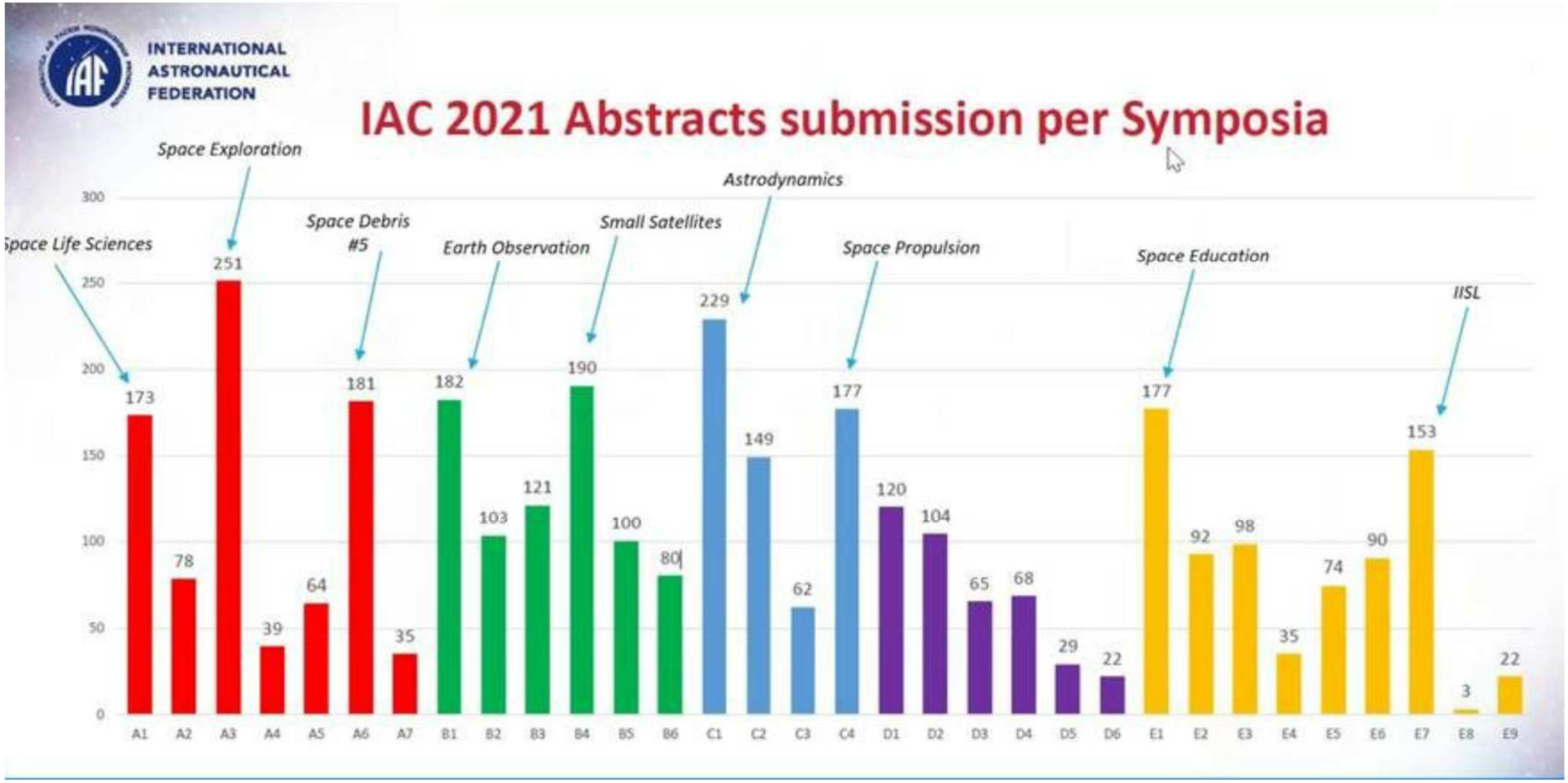
Very good participation rate, with a global average over the years of 55.8 per session

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



International Academy of Astronautics

1.4. Space Debris Symposium for Dubai 2021



International Academy of Astronautics

1.4. Space Debris Symposium for Dubai 2021

General planning for Dubai:

If you have some coordinated suggestions of permutations, it is doable within A6

Some constraints: IADC is Wednesday – IAF TC.26 STM Special Session is Wednesday morning

Date	12/10/2020	13/10/2020	13/10/2020	14/10/2020	14/10/2020	15/10/2020	15/10/2020	16/10/2020	16/10/2020
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
	A3.1	A3.2A	A3.2B	A3.3A	A3.3B	A3.4A	A3.5	A3.2C	A3.4B
	D2.1	D2.2	D2.3	D2.4	D2.5	D2.6	D2.7	D2.8/A5.4	D2.9/D6.2
	C1.1	C1.2	C1.3	C1.4	C1.5	C1.6	C1.7	C1.8	C1.9
	A6.1	A6.9	A6.4	A6.3	A6.2	A6.5	A6.6	A6.8/E9.1	A6.7
	B3.1	B3.2	B3.3	B3.4/B6.4	B3.5	B3.6/A5.3	B3.7	B3.8	A6.10/B6.5
	B4.2	B4.1	B4.3	B4.4	B4.5	B4.6A	B4.7	B4.8	B4.6B
	B5.1	E7.1	E7.2	E7.3	E7.4	E7.6/E3.5	E6.3	E7.5	E7.7
	C4.1	C4.3	C4.5	C4.2	C4.6	C4.7	C4.8/B4.5A	C4.9	C4.10/C3.5
	C2.1	C2.2	C2.3	C2.4	C2.5	C2.6	C2.7	C2.8	C2.9
	A1.1	A1.2	A1.3	C4.4	A1.4	A1.5	A1.6	A1.7	A1.8
	A2.1	A4.1	A4.2	A2.2	A2.3	A2.4	A2.5	A2.6	A2.7
	D1.1	D1.2	D1.3	A5.1	A5.2	D1.4A	D1.4B	D1.5	D1.6
	B1.1	C3.1	C3.2	B1.2	B1.3	B1.4	B1.5	C3.4	E8.1
	A7.1	E3.1	E3.2	A7.2	A7.3	E3.3	E3.6	E3.4	D5.4
	E5.1	D5.1	E5.2	D5.2	E5.3	D5.3	E9.2	E5.4	E5.5
	D6.1	B2.1	B2.2	B2.3	B2.4	B2.5	B2.6	D6.3	B2.7
	E1.1	E1.2	E1.3	E1.4	E1.5	E1.6	E1.7	E1.8	E1.9
	D4.1	D4.2	D4.3	D3.1	D3.2A	D4.4	D4.5	D3.2B	D3.3
	E2.1	E6.4	B6.1	E6.2	B5.2	B5.3	B6.2	B6.3	E6.1
	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
						E4.1	E4.2	E4.3	

Category A: Science & Exploration	A1--> A7	Category C: Technology	C1--> C4
Category B: Applications & Operations	B1--> B6	Category D: Infrastructure	D1--> D6
		Category E: Space & Society	E1--> E9

International Academy of Astronautics

1.4. Space Debris Symposium for Dubai 2021

A6: Space Debris Symposium: Liou – 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.

International Academy of Astronautics

1.4. Space Debris Symposium for Dubai 2021

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.

International Academy of Astronautics

1.4. Space Debris Symposium for Dubai 2021

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*

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 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

International Academy of Astronautics

1.4. Space Debris Symposium for Dubai 2021

A6: Space Debris Symposium: Liou – Bonnal

A6.1: Space Debris Detection, Tracking and Characterization - SST: Skinner – Jah – Schildknecht ⇨ 35 abstracts

A6.2: Modelling and Risk Analysis: Sorge – Oltrogge – Pardini ⇨ 14 abstracts

A6.3: Impact-Induced Mission Effects and Risk Assessments: McKnight – Gong – Traineau ⇨ 6 abstracts

A6.4: Mitigation - Tools, Techniques and Challenges - SEM: Omaly – Kawamoto – Krag ⇨ 20 abstracts

A6.5: Post Mission Disposal and Space Debris Removal 1 - SEM: Singh – Opromolla – Francillout ⇨ 19 abstracts

A6.6: Post Mission Disposal and Space Debris Removal 2 - SEM: Jankovic – Wiedemann – Auburn ⇨ 22 abstracts

A6.7: Operations in Space Debris Environment, Situational Awareness - SSA: Martinot – Kelso – Sanchez-Ortiz ⇨ 15 abstracts

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: Le May – Spencer From SSC: Plattard – Soucek ⇨ 32 abstracts

A6.9: Orbit Determination and Propagation: Dolado-Perez – Klinkrad – Santoni ⇨ 13 abstracts

A6.10 /B6.5: Joint Space Operations / Space Debris Session – STM Operations From SDC: Agapov – Tung – Fitz-Coy From SOC: Auburn – Anilkumar – Ohndorf ⇨ 13 abstracts

A6.IP: Interactive Presentations, Kerr – Le May – Santoni – Opromolla – Jankovic – Bonnal ⇨ 5 abstracts

↳ Grand total 194 abstracts

International Academy of Astronautics

1.4. Space Debris Symposium for Dubai 2021

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: explain briefly why
- Paper order for the session
- Paper length = 180 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

Beware: operation cannot be undone

Selected Technical Session	Abstract ID	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
A6.5.	62952	Space Debris Eradication	Jain					
A6.5.	63162	Propulsion for Direct Deorbitation – Solid Rocket Motor with Thrust Vector Control Development	Nowakowski					
A6.5.	63344	A Detumbling Scheme of Eddy Brake based Space Debris Removal	Wang					
A6.5.	63617	A Simulation Tool for robotic Active Debris Removal with minimum reaction space manipulator	Basana					
A6.5.	64097	Optimal control of the space tethered tug-debris system with fuel residuals during deorbit	Wang					
A6.5.	64130	experimental study on penetration	Tamaki					

SELECTION OF PAPER 63400

"ORBITAL FLIPS DUE TO SOLAR RADIATION PRESSURE FOR ORBITAL DEBRIS IN MEO AND GSO"

Main author
Kuznetsov, Eduard

Country
Russian Federation

Selected technical symposium/session
A6/IP [Transfer paper]
(a paper should be located in the most appropriate session)

Review status
○ accepted ○ rejected ◉ work

Paper order

Length of oral presentation
(default 10 minutes if empty)

Comments or Reasons for rejection
(not required)

[Back] [Reset] [Make Selection]

The operation can not be undone, although the selection result can be changed again.

International Academy of Astronautics

1.5. Space Debris Symposium for Paris 2022

General messages:

It is proposed to keep the same structure:

- 10 Oral sessions including one joint with E9, and one joint A6.10 with TBD
- Interactive Presentations

What can be A6.10

- IAF TC.21 Near Earth Objects expressed interest to have a joint session with us ⇨ Definitely a good and rich idea
- Other possibilities?
  - 2021: B6.5 Space Operations 13 abstracts
  - 2020: B6.5 Space Operations 11 abstracts
  - 2019: B4.10 Small Satellites 14 abstracts, 59 participants
  - 2018: C1.7 Astrodynamics 12 abstracts, 60 participants
  - 2017: B4.10 Small Satellites 12 abstracts, 55 participants
  - 2015: YPVF Young Professionals Virtual Forum 7 abstracts, 5 participants (2 presenters + 2 chairs + 1 lost in the room…)
  - Globally low amount of submissions, but good interest with more than 50 participants

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

International Academy of Astronautics

1.5. Space Debris Symposium for Paris 2022

63rd	2012	Naples	P. Seitzer [C]	L. Anselmo [C]	J. Hyde [C]	F. Alby [C]	H. Klinkrad [C]	M. Yakovlev [C]	N. Johnson [C]				
			V. Agapov [C]	C Wiedemann [C]	A. Francesconi [C]	J. Hussey [C]	D. McKnight [C]	*K. Suzuki [C]*	C. Bonnal [C]				
			T. Schildknecht [R]	T. Hanada [R]	F. Schaefer [R]	F. Piergentili [R]	S. Kibe [R]	*C. Mathieu [R]*	M. Rudolph [R]				
64th	2013	Beijing	T. Schildknecht [C]	C. Pardini [C]	D. McKnight [C]	F. Alby [C]	V. Adimurthy [C]	P. Anz-Meador [C]	D. Finkleman [C]	*K. Suzuki [C]*			D. McKnight
			V. Agapov [C]	P. Krisko [C]	A. Francesconi [C]	H. Klinkrad [C]	J. Hussey [C]	S. Kibe [C]	D. McKnight [C]	P. Krisko [C]			C. Bonnal
			P. Seitzer [R]	C Wiedemann [R]	M. Rudolph [R]	M. Yakovlev [R]	F. Santoni [R]	M. Rudolph [R]	H. Krag [R]	*C. Mathieu [R]*			
65th	2014	Toronto	T. Schildknecht [C]	L. Anselmo [C]	A. Francesconi [C]	C. Cazaux [C]	VIP. Prasad [C]	F. Di Pentino [C]	T.S. Kelso [C]	*B. Biddington [C]*	M. Jah [C]		C. Bonnal
			V. Agapov [C]	J-C. Liou [C]	Sen Liu [C]	H. Klinkrad [C]	F. Piergentili [C]	S. Kibe [C]	D. Finkleman [C]	D. McKnight [C]	S. Flegel [C]		
			J. Carroll [R]	T. Hanada [R]	F. Schaefer [R]	M. Yakovlev [R]	N. Berend [R]	C. Bonnal [R]	JC. Dolado-Perez [R]	*C. Mathieu [R]*	H. Lewis [R]		
66th	2015	Jerusalem	F. DiPentino [C]	C. Pardini [C]	N. Fitz Coy [C]	H. Krag [C]	MYS. Prasad [C]	N. Berend [C]	T.S. Kelso [C]	*B. Biddington [C]*	M. Jah [C]	C. Mathhieu [C]	T. Yasaka
			T. Schildknecht [C]	M. Sorge [C]	F. Schaefer [C]	C. Cazaux [C]	F. Piergentili [C]	S. Kibe [C]	J-C. Dolald-Perez [C]	D. McKnight [C]	H. Klinkrad [C]	*K. Stube [C]*	D. McKnight
			V. Agapov [R]	S. Flegel [R]	A. Francesconi [R]	A. Kato [R]	F. Santoni [R]	JC. Liou [R]	D. Finkleman [R]	*C. Mathieu [R]*	H. Lewis [R]	C. Bonnal [R]	C. Bonnal
67th	2016	Guadalajara	D. Oltrogge [C]	C. Pardini [C]	N. Fitz Coy [C]	H. Krag [C]	S. Kibe [C]	N. Berend [C]	T.S. Kelso [C]	*S. Plattard [C]*	M. Jah [C]		T. Yasaka
			T. Schildknecht [C]	M. Sorge [C]	F. Schaefer [C]	C. Cazaux [C]	F. Piergentili [C]	L. Innocenti [C]	J-C. Dolado-Perez [C]		H. Klinkrad [C]		D. McKnight
			V. Agapov [R]	B. Bastida-Virgili [R]	A. Francesconi [R]		F. Santoni [R]	G. Haussmann [R]	C Wiedemann [R]	D. Finkleman [R]			C. Bonnal
68th	2017	Adelaide	F. DiPentino [C]	C. Pardini [C]	F. Schaefer [C]	C. Cazaux [C]	B. Bastida-Virgili [C]	N. Berend [C]	T.S. Kelso [C]	D. McKnight [C]	H. Klinkrad [C]	D. Oltrogge [C]	T. Yasaka
			T. Schildknecht [C]	D. Oltrogge [C]	N. Fitz Coy [C]	D. Finkleman [C]	F. Santoni [C]	L. Innocenti [C]	J-C. Dolado-Perez [C]	*S. Plattard [C]*	M. Jah [C]	L. Rossettini [C]	D. McKnight
			V. Agapov [R]	M. Sorge [R]	A. Francesconi [R]	H. Krag [R]	F. Piergentili [R]	B. Singh [R]	C Wiedemann [R]	A. Soucek [R]	H. Lewis [R]	C. Cazaux [R]	C. Bonnal
69th	2018	Bremen	F. DiPentino [C]	L. Anselmo [C]	N. Fitz Coy [C]	H. Krag [C]	F. Piergentili [C]	N. Berend [C]	C Wiedemann [C]	D. Spencer [C]	S. Kibe [C]	M. Jah [C]	T. Yasaka
			T. Schildknecht [C]	D. Oltrogge [C]	F. Schaefer [C]	P. Omaly [C]	B. Bastida-Virgili [C]	B. Singh [C]	T.S. Kelso [C]	S. Lemay [R]	H. Lewis [C]	Anilkumar [C]	D. McKnight
			V. Agapov [R]	M. Sorge [R]	D. McKnight [R]	Y. Usovik [R]	F. Santoni [R]	L. Rossettini [R]	J-C. Dolado-Perez [R]		H. Klinkrad [R]	Kitazawa [R]	C. Bonnal
69th	2019	Washington	M. Skinner [C]	M. Sorge [C]	JC Traineau [C]	H. Krag [C]	F. Santoni [C]	L. Rossettini [C]	C Wiedemann [C]	D. Spencer [C]	H. Klinkrad [C]	U. Dasgupta [C]	T. Yasaka
			T. Schildknecht [C]	C. Pardini [C]	M. Jah [C]	S. Kawamoto [C]	A. Nassisi [C]	E. Kerr [C]	N. Sanchez-Ortiz [C]	S. Lemay [R]	J-C. Dolado-Perez [C	Y. Usovik [C]	D. McKnight
			V. Agapov [R]	D. Oltrogge [R]	N. Fitz Coy [R]	P. Omaly [R]	L. Francillout [R]	N. Berend [R]	TS. Kelso [R]		F. Piergentili [R]		C. Bonnal
70th	2020	Cyber	T. Schildknecht [C]	C. Pardini [C]	Z. Gong [C]	S. Kawamoto [C]	B. Singh [C]	J. Auburn [C]	T.S. Kelso [C]	*S. Plattard [C]*	H. Klinkrad [C]	D. McKnight [C]	T. Yasaka
			M. Skinner [C]	D. Oltrogge [C]	E. Kerre [C]	P. Omaly [C]	L. Francillout [C]	N. Berend [C]	N. Sanchez-Ortiz [C]	S. Lemay [C]	J-C. Dolado-Perez [C	H. Tung [C]	D. McKnight
			V. Agapov [R]	M. Sorge [R]	JC Traineau [R]	H. Krag [R]	R. Opromolla [R]	C. Wiedemann [R]	V. Martinot [R]	*A. Soucek [R]*	F. Santoni [R]	A. Anilkumar [R]	M. Jankovic
										D. Spencer [R]			
71 h	2021	Dubai	M. Skinner [C]	M. Sorge [C]	D. McKnight [C]	P. Omaly [C]	B. Singh [C]	M. Jankovic [C]	V. Martinot [C]	D. Spencer [C]	H. Klinkrad [C]	V. Agapov [C]	E. Kerr
			M. Jah [C]	D. Oltrogge [C]	Z. Gong [C]	S. Kawamoto [C]	R. Opromolla [C]	C. Wiedemann [C]	T.S. Kelso [C]	T. Masson-Zwaan [C	F. Santoni [C]	H. Tung [C]	S. Lemay
			T. Schildknecht [R]	C. Pardini [R]	JC Traineau [R]	H. Krag [R]	L. Francillout [R]	J. Auburn [R]	N. Sanchez-Ortiz [R]	S. Lemay [R]	J-C. Dolado-Perez [F	A. Anilkumar [R]	F. Santoni
													R. Opromolla
													M. Jankovic

International Academy of Astronautics

1.5. Space Debris Symposium for Paris 2022

Program Committee for IAC 2022 in Paris:

Proposal to start from the same list as for IAC 2021 Dubai (see below)

But open to changes proposals…

- Please send requests – proposals within 3 weeks (before April 15th)
- Proposed final selection based on the requests
- Then proposed for approval by the Committee members
- Reminder: Chairs and Rapporteurs shall potentially act as Reviewers for Acta Astronautica (IAA Journal)

A6: Space Debris Symposium: XXX – Bonnal
A6.1: Space Debris Detection, Tracking and Characterization - SST: Skinner – Agapov – Schildknecht
A6.2: Modelling and Risk Analysis: Sorge – Oltrogge – Pardini
A6.3: Impact-Induced Mission Effects and Risk Assessments: McKnight – Gong – XXX
A6.4: Mitigation - Tools, Techniques and Challenges - SEM: Omaly – Kawamoto – Krag
A6.5: Post Mission Disposal and Space Debris Removal 1 - SEM: Singh – Opromolla – Francillout
A6.6: Post Mission Disposal and Space Debris Removal 2 - SEM: Jankovic – Wiedemann – Auburn
A6.7: Operations in Space Debris Environment, Situational Awareness - SSA: Martinot – Kelso – Sanchez-Ortiz
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: Le May – Spencer From SSC: Plattard – XXX
A6.9: Orbit Determination and Propagation: Dolado-Perez – Klinkrad – Santoni
A6.10 /XXX: Joint XXX / Space Debris Session From SDC: Jah – Tung – Fitz-Coy From XXX: XXX
A6.IP: Interactive Presentations, Kerr – Le May – Santoni – Opromolla – Jankovic – Bonnal

2. Exchanges

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

. JAXA workshop – Feb. 2021

. 7th IAA Space Traffic Management Conference – January 2021

. IAASS-Aerospace STM Webinar – Sept. 2, 2020

. Cubesat confusion industry day

. MASTER Modelling workshop – March 2-4, 2021

. 5th International Space Debris Re-entry Workshop, 2 December 2020, virtual over 130 participants in 5 sequential sessions: all presentations are available; https://conference.sdo.esoc.esa.int/proceedings/list

5th International Space Debris Re-entry Workshop
2 December 2020, virtual event (https://reentry.esoc.esa.int/home/workshop)

This workshop aimed to address the side effects of the increased traffic to orbit which triggered a renewed interest in the practicalities of having objects, large and small, re-entering uncontrolled after the end of their mission. The symposium style for the past events made place for a workshop around the open problems burgeoning by the increase in uncontrolled re-entry "traffic“

- 5 sessions (materials, aerothermodynamics, break-up simulations, orbital predictions and observations, and missions) with 3-5 presentations each and Q&A session following.
- Programme with 20+ contributions and 100+ participants

Proceedings available via
https://conference.sdo.esoc.esa.int/

From Measurements to Understanding: MASTER Modelling Workshop
2-4 March 2021

Workshop to initiate the discussion on how collaborative approaches can be established within the community to facilitate exchange related to the MASTER model on the data and measurement collection, its interpretation and application in the modelling context, the use-cases of the model and its relevance in mission design, the latter usually relying on an accepted future scenario of the space debris environment.

→ Programme with 20+ contributions and 100+ participants

→ Discussion in thematic break-out sessions

→ Workshop outcome to be summarised in a paper at the 8th ECSD

→ Upcoming user survey towards stakeholder participation

Proceedings will be available via
https://conference.sdo.esoc.esa.int/

2. Exchanges

2.2. On the Agenda

. European Conference on Space Debris (see following pages)

. 3rd IAA ICSSA - Early 2022 at GMV in Tres Cantos, Madrid,

https://iaaspace.org/event/3rd-iaa-conference-on-space-situational-awareness-icssa-2021/

The University of Florida will also provide a remote participation option, just in case the pandemic will not be resolved by then.

. 8th IAA Space Traffic Management Conference – End of January 2022

. Space Traffic Management and Resilient Space Environment (13-17 September 2021)
URL: http://www.stardust-network.eu/training/the-global-virtual-workshop-ii/

. 11th China National Space Debris Conference – Nov. 2021, Wenchang, Hainan, China

8th European Conference on Space Debris

Abstract Submission

Authors are invited to submit their abstracts according to the procedure described below. Each Abstract (approximately 500 words) should clearly outline major achievements and innovative ideas.

Papers will be selected on the basis of:
- interest in the subject by the target audience
- relevance to the conference topics
- originality of the ideas presented
- quality and clarity of the content

Papers must be submitted in English, according to the "instructions to authors". English will also be the working language at the conference.

Abstracts must be submitted by 15 November 2020.

A "No Paper – No Podium & No Podium – No Paper" rule applies.

Proceedings from the previous conferences are available via https://conference.sdo.esoc.esa.int/

Target Audience

The conference will provide a unique forum for information exchange, technical discussions and networking between space debris researchers, engineers & decision takers of industry, policy makers & space lawyers, insurance underwriters, space & ground system operators, institutional organizations (e.g. space agencies, EU, UNCOPUOS, IAA, COSPAR), academia, and the defense sector.

Important Dates

1 Oct 2020	Abstract submission starts
1 Nov 2020	Registration opens
15 Nov 2020	Deadline for abstracts
15 Jan 2021	Notification of authors
1 Mar 2021	Final program
10 Apr 2021	Deadline for full papers
20 - 23 Apr 2021	8th European Conference on Space Debris
July 2021	Publication of proceedings

Conference Venue

The conference will be organised in a **virtual format**. On-site participation at the European Space Operations Centre ESA/ESOC, Robert-Bosch-Strasse 5, 64293 Darmstadt, Germany, may still be possible and will be confirmed by 1 March 2021 at the latest.

Registration Fees

Registration fees for both, the virtual conference and for a on-site participation, will be published at the conference website during October 2020.

Point of Contact

Conference Website
https://space-debris-conference.sdo.esoc.esa.int/

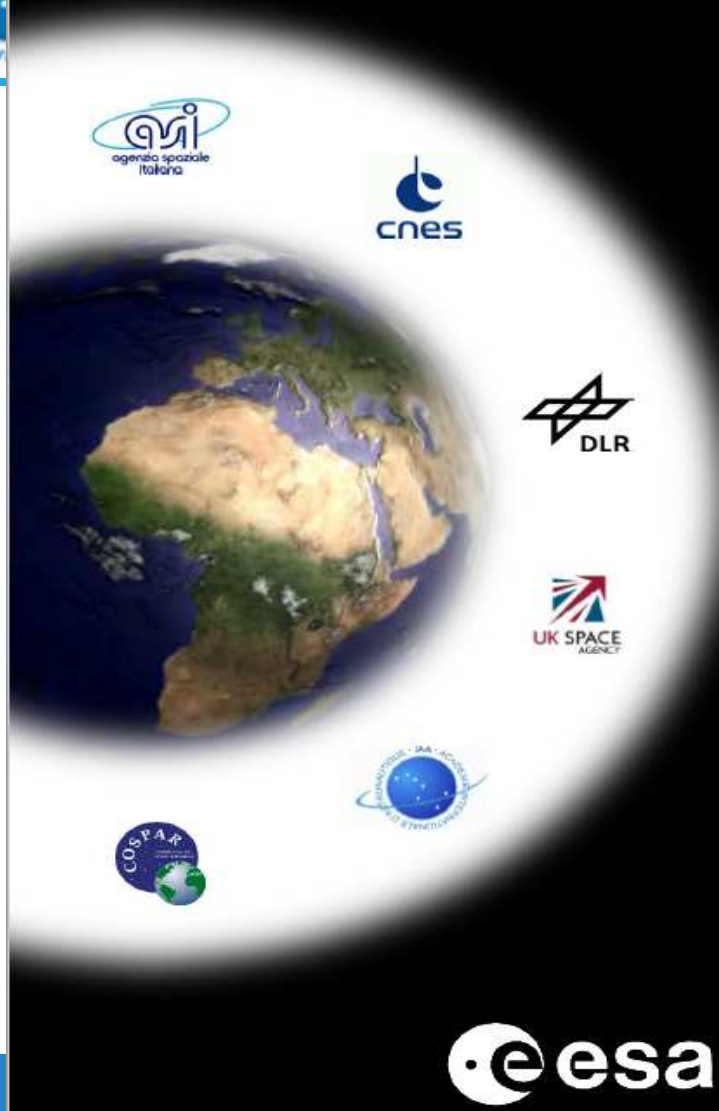
Genius GmbH – science & dialogue
Darmstadt, Germany

Tel.: +49 (0) 6151- 6 27 23 20
Fax: +49 (0) 6151- 6 27 23 21

E-mail: contact@space-debris-conference.com

Virtual conference
20 – 23 April 2021

esa



Debris Background

Since 1957, nearly 6,000 space launches have led to an on-orbit population today of about 26,000 trackable objects. Large constellations are being deployed. Today, a total of about 3000 objects are functional spacecraft. The remaining are space debris, i.e. objects which no longer serve any useful purpose. Most of the routinely tracked objects are fragments from about 550 break-ups, explosions, collisions, or anomalous events resulting in fragmentation of satellites or rocket bodies. In addition, there is evidence of a much larger population of debris that cannot be tracked operationally. An estimated number of 900,000 objects larger than 1 cm and 128 million objects larger than 1mm are expected to reside in Earth orbits. Due to relative orbital velocity of up 56,000 km/h, centimetre-sized debris can seriously damage or disable an operational spacecraft, and collisions with object larger than 10 cm will lead to catastrophic breakups, releasing hazardous debris clouds of which some fragments can cause further catastrophic collisions that may lead to an unstable debris environment in some orbit regions ("Kessler syndrome").

Space debris mitigation measures, if properly implemented by spacecraft designers and missions operators, can curtail the growth rate of the space debris population. Active removal of large intact objects has been shown to be necessary to reverse the debris increase. In addition, it becomes important for each and every mission, whether a large constellation or a single 1U CubeSat, to quantify the impact it has on the space environment and other operators in order to achieve a sustainable space environment.

Facing the challenges set by a rapidly growing population of space objects requires a better understanding of the space debris environment as well as strategies to handle the related risks. A sustained use of space as a scarce resource needs the collaboration of a multitude of technical disciplines. The active exchange among recognized experts is the aim of the conference..

Conference Scope

Focussing at scientific exchange the European Conference on Space Debris is the largest dedicated gathering on the subject. Since 1993 internationally renowned scientists, engineers, operators, industry experts, lawyers and policy makers meet here every four years and discuss different aspects of space debris research, including measurement techniques, environment modelling theories, risk analysis techniques, protection designs, mitigation & remediation concepts, and standardi-sation, policy, regulation & legal issues.

During four days the Eighth European Conference on Space Debris will provide a forum to define future directions of research based on latest findings and results. Panels and special sessions will be devoted to space safety topics, e.g. environment impact, mitigation and regulation technology and tools, novel services and servicing, as well as concepts for operations in a congested environment.

The conference program will highlight all classical disciplines of space debris research:

- radar, (active) optical and in-situ measurements
- debris environment modelling and prediction
- orbit prediction, determination, and cataloguing
- operational collision avoidance and services
- space situational awareness systems & applications
- debris aspects of large constellations
- on-orbit and re-entry risk assessments
- debris mitigation techniques and processes
- active removal, servicing, remediation concepts
- environmental impact assessments
- regulatory aspects, standardisation, policies
- hypervelocity impacts, protection and shielding

International Academy of Astronautics

2. Exchanges

2.3. New achievements

ISO 24113 – 23312 – 20893

2.4. Round table – Open discussion

Presentation from Fabrizio Piergentilli (see following pages)

WildTrackCube-SIMBA Launch

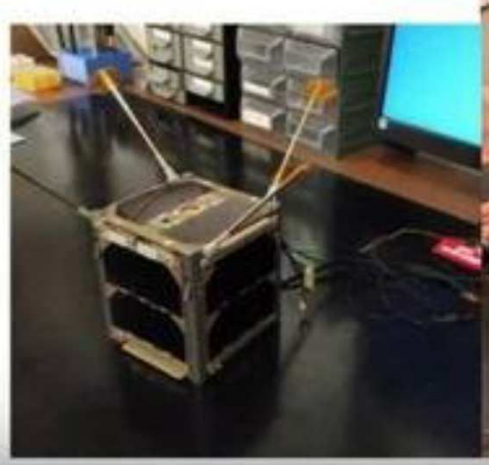
- Winner of the **IAF/GK Launch Opportunity contest** in 2019
- **Launched on 22 March 2021 at 6:07:12 UTC, Beacon received at first pass (10:49UTC over Rome)!**
- Primary payload: **wildtrack monitoring system** (in collaboration with Kenya)
- Among secondary payloads: **LED boards**

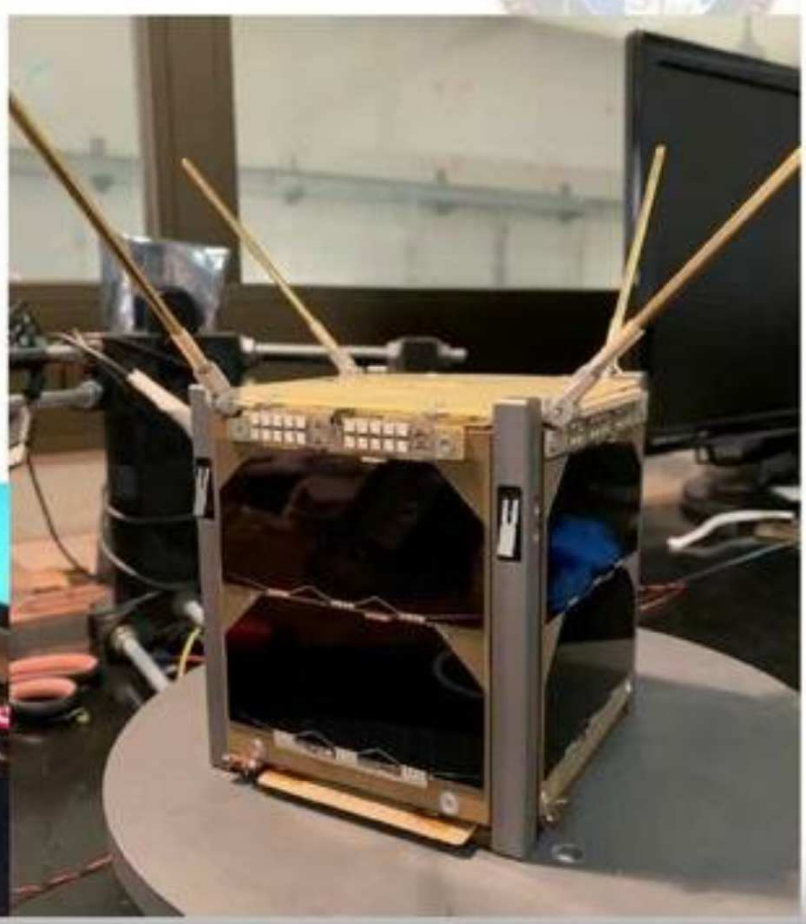
Wildlife tracking antenna

Blue LED boards for preliminary in-orbit testing

LEDSAT: Launch in Summer 2021

- Flight acceptance with the Fly Your Satellite! ESA Programme on-going
- **Expected launch in June-July 2021**
- Mission objective: Demonstration of a LED-based payload for VIS observatories tracking at ground
- Payload: 6 LED boards in 3 colors – every CubeSat face has a LED board





International Academy of Astronautics

3. IAA Study Groups

SG No	IAA Study Groups as of March 11, 2021 ongoing IAA Studies	Chair/Co-Chair/Secretary	1 Proposal	2 Com. ok	3 SAC ok	4 Appoint.	5 1st Draft	6 Final Draft	7 Peer Review	8 Final Report	9 SAC ok	10 BOT ok	11 Edition	12 Publication	Comments
	Commission 1														
1.9	Satellite remote sensing of aerosols in the Earth atmosphe	Yatskiv/Milinevsky													
1.13	Planetary Science Enabled by the New Generation of Sma	Baker/Vane/Bousquet													Final report expected
1.14	Integrated Precursor Distinguish in Multi-Geophysical Fiel	ao Weimin/Contant/Kuznetsov/Zhang													
1.15	International Cooperation on Space Weather	McKenna-Lawlor													
	Commission 2														
2.12	Effectiveness of physiological countermeasures for space	Charles/Kozlovskaya/Norsk													
2.14	Medical Support for an International Human Expedition to	Fomina/Doarn/Kussmaul													
2.15	Immersion Model: Importance for Space Life Sciences Stu	Mano/Tomilovskaya													
2.17	Dynamic Assessment and Management of Astronauts' Ph	Haignere/Prunariu													
2.18	Sleeping Brain in Space and Analog Environments	Kourtidou/Bamidis													Final report expected
	Commission 3														
3.19	Feasibility study of Standardized Career Dose Limits in LE	Mckenna-Lawlor													
3.21	Space Disposal of Radioactive Waste	*TBC (Degtyarev)*													
3.22	Next-Generation Space System Development Basing on C	Razoumny/Agrawal/Ji Simei													
3.25	The Maintainability and Supportability of Deep Space Man	Yang Hong/Zhang Dapeng													
3.26	Space Mineral Resources #2	Dula/Zhang Z./Lenard													Law section to be added
3.27	Towards the utilization of the Moon, Preparing for Mars Ex	Genta/Ventskovsky													First draft received
3.28	Strategy of Low Cost and Large Scale Access to Space in	Lu Yu/Reibaldi													BOT / Publication process
3.29	Strategy and Feasibility Assessment of Collision Protectio	Bao Weimin													
3.31	Solar Energy from Space: a Decadal Revisit to the first Int	Mankins													
3.32	Autonomous Dynamic Trajectory Optimal Control of Laun	Zhengyu Song/Razoumny													
3.33	The Space Transportation System of Human Mars Explora	Wang Xiaojun/Wang Xiaowei													First draft expected

International Academy of Astronautics

3. IAA Study Groups

	IAA Study Groups as of March 11, 2021		1	2	3	4	5	6	7	8	9	10	11	12	
SG No	ongoing IAA Studies	Chair/Co-Chair/Secretary	Proposal	Com. ok	SAC ok	Appoint.	1st Draft	Final Draft	Peer Review	Final Report	SAC ok	BOT ok	Edition	Publication	Comments
	Commission 4														
4.17	Space Systems for Biomedical Research	Cappelletti/Graziani/Massimiani													
4.19	Promoting Global Space Knowledge & Expertise in Develc	Horikawa/Coradini													
4.20	Space Information Application in Earthquake Emergency F	Bao Weimin/Contant													
4.21	Distributed, Networked, Smart, Cooperating Small Satellite	Belokonov/Schilling													
4.22	Through Optimization of Aerospace Trajectories	Teofilatto/Filatyev													
4.24	Disseminating knowledge and experiences of satellite app	Mugellesi-Dow													
4.25	Global Satellite Data Sharing Mechanism	Xue Huifeng													
4.26	Cubesat Interface	Cho Mengu													
	Commission 5														
5.10	Orbital Debris Removal: Policy, Legal, Political and Econo	Williamson/Smith LJ.													
5.16	International Legal and Policy Regimes for Space Natural	Liu Jizhong													
5.17	Space Debris Situation Report - 2019	Bonnal/McKnight													
5.18	Space & disasters management: new systems, new usage	Denis/Jorgenson													
	Commission 6														
6.16	STEM/STEAM for Space - Grand Challenges	Regel/Harris													
6.17	Multicultural foundations and influences of human space e	Arnould/Laidet													
6.19	Apollo 11 Landing Anniversary	Liepack/Lieberman													

International Academy of Astronautics

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

International Academy of Astronautics

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

International Academy of Astronautics

Agenda

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) ⇨ Darren and I + any volunteer !
- 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 ☺