



International Academy of Astronautics

IAA Space Debris Committee

Paris, March 26th, 2019



Agenda

1. IAC
 - 1.1. IAA Space Debris Committee
 - 1.2. Lessons learned from Bremen 2018
 - 1.3. General statistics on Symposium A6
 - 1.4. Status of Space Debris Symposium for Washington 2019
 - 1.5. Preparation of Space Debris Symposium for Dubai 2020

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 (dedicated meeting on Wednesday 27th)
 - 3.1 SG 4.23 Practical Solutions for Post Mission Deorbit for Micro/Nano/Pico Satellites in Low Earth Orbit
 - 3.2 SG 5.10 Orbital Debris Removal: Policy, Legal, Political and Economic Considerations
 - 3.3 SG 5.17 IAA Situation Report on Space Debris – 2019

Agenda

1. IAC
 - 1.1. IAA Space Debris Committee
 - 1.2. Lessons learned from Bremen 2018
 - 1.3. General statistics on Symposium A6
 - 1.4. Status of Space Debris Symposium for Washington 2019
 - 1.5. Preparation of Space Debris Symposium for Dubai 2020



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, ...)



1.1 IAA Space Debris Committee

Terms of reference (recall):

- The IAA Permanent Committee on Space Debris is in charge of the coordination of all activities related to Space Debris within the Academy, covering the complete span of related topics including but not limited to: measurements, modeling, risk assessment in space and on the ground, reentry, hypervelocity impacts and protection, mitigation and standards, legal and policy, Active Debris Removal and Space Surveillance.

As such, its main tasks are:

- Organization of the IAA Symposium on Space Debris A6 for the International Astronautical Congress, mainly identification of the proposed sessions including scope, chairs and rapporteurs, proposals for joint sessions with other symposia, proposals for Keynote Lectures within the A6 Symposium, or Highlight Lectures in the more general IAC frame,
- Organization of any stand-alone conference on Space Debris on behalf the Academy, including nomination of the Program Committee,
- Coordination of the Academy sponsoring, participation and contribution to selected conferences dedicated to Space Debris, such as for instance the ESA Conference on Space Debris in Darmstadt, or the NASA International Orbital Debris Conference in Houston,



1.1 IAA Space Debris Committee

Terms of reference ctd. (recall):

- Coordination of the Space Debris contribution in conferences not dedicated to Space Debris, but where some sessions may be devoted to the topic, sponsored by the Academy,
- Identification of potential studies on Space Debris within Commission V or coordinated with any other Academy Commissions, proposals of associated Cosmic Studies and proposals for the corresponding Study Group Memberships,
- Dissemination of information among the members of the Committee, mainly during regular meetings taking place twice a year, before the IAC and during the IAA March meetings in Paris.

During these meetings, general information concerning past activities at international level on Space Debris shall be shared among the members, including debriefings from past conferences and major related actions (for instance IADC, COSPAR...).

Practical aspects of the preparation of the upcoming Conferences, Symposia, Sessions are also dealt with during these meetings.



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Academy of
Astronautics**

1.1 IAA Space Debris Committee

Membership:

No need to be member of IAA !

- Members of the IAA A6 Symposium Program Committee (chairs & rapporteurs)
- 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

<http://iaaweb.org/content/view/487/655/>

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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Astronautics**

1.1 IAA Space Debris Committee

Current official membership (as per web site):

Agapov Vladimir	Francillout Laurent	Omaly Pierre
Aglietti Guglielmo	Gong Zizheng	Opromolla Roberto
Ailor William	Hanada Toshiya	Pardini Carmen
Alby Fernand	Howard Diane	Piergentili Fabrizio
Anselmo Luciano	Hyde James	Rossettini Luca L.
Anz-Meador Philip	Jah Moriba K.	Santoni Fabio
Berend Nicolas	Jankovic Marko	Schaefer Frank
Brachet Gerard	Kaliapin Mykhailo	Schildknecht Thomas
Christiansen Eric L	Kawamoto Satomi	Seitzer Pat
Crowther Richard	Kelso T. S.	Shen Lin
Dolado Perez Juan-Carlos	Kibe Seishiro	Singh Balbir
Faucher Pascal	Kim Hae-Dong	Skinner Mark
Finkleman David	Kitazawa Yukihito	Somma Gian Luigi
Fitz-Coy Norman G.	Krag Holger	Sorge Marlon E.
Flohrer Tim	Le May Samantha	Spencer David B.
Flury Walter	Masson-Zwaan Tanja L.	Stokes Hedley
Francesconi Alessandro	McKnight Darren S.	Traineau Jean-Claude
	Metz Manuel	Usovik Igor
	Nassisi Annamaria	Wiedemann Carsten
	Oltrogge Daniel L.	Yasaka Tetsuo

Chairs:

Klinkrad Heiner
Liou Jer-Chyi
Bonnal Christophe

Not members yet:

Inducted today:

See following page

To be removed: None

Attendance list today:

See **Appendix 1**

Synthesis:

60 members + New + Removed

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



1.1 IAA Space Debris Committee

New members inducted in September:

Emma Kerr	emelkerr@gmail.com	Agreed, but not yet included in the official list
Noelia Sanchez-Ortiz	noelia.sanchez@deimos-space.com	Agreed, but not yet included in the official list
Upasana Dasgupta	upasana.dasgupta@mail.mcgill.ca	No answer yet from Upasana to the invitation

New members proposed today

Helen Tung	helen.tung@eu-japan.gr.jp
Vincent Martinot	vincent.martinot@thalesaleniaspace.com
Stijn Lemmens	stijn.Lemmens@esa.int
AK Anilkumar	ak_anilkumar@vssc.gov.in or akanil2007@gmail.com

Meetings:

Accepted proposal to keep the IAC meeting on the Saturday just before the congress, 10 to 13

Accepted proposal to shift the Spring meeting to the Wednesday in order to avoid a hole between Tuesday and Thursday

Election of the chairs:

Will be done in September, secret ballots in order to have a bit more democracy in our Committee...☺

Process still to be defined, under discussion as no specific rules in the Terms of Reference

Potential candidates: please inform us (a current chair can be candidate...☺)

- Typically 3 roles:
- Global coordination
 - Preparation of the general yearly synthesis for IAA
 - Coordination of the “exchange” among members during our meetings

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

1.2 Feedback from Bremen IAC 2018

GENERAL STATISTICS	IAC 2018 – Bremen	
Abstracts submitted	4319	
Abstracts rejected	1462	34% of submitted
Accepted	2765	64% of submitted
Including Interactive Presentations	581	13% of submitted
Papers confirmed	2249	81% of accepted
Papers withdrawn	488	18% of accepted
Papers with manuscript	1991	89% of confirmed 72% of accepted
Papers presented	1776	79% of confirmed 64% of accepted 41% of submitted
Including presented as Interactive Presentations	170	29% of Accepted
Total number of attendees	6200	

1.2 Feedback from Bremen IAC 2018

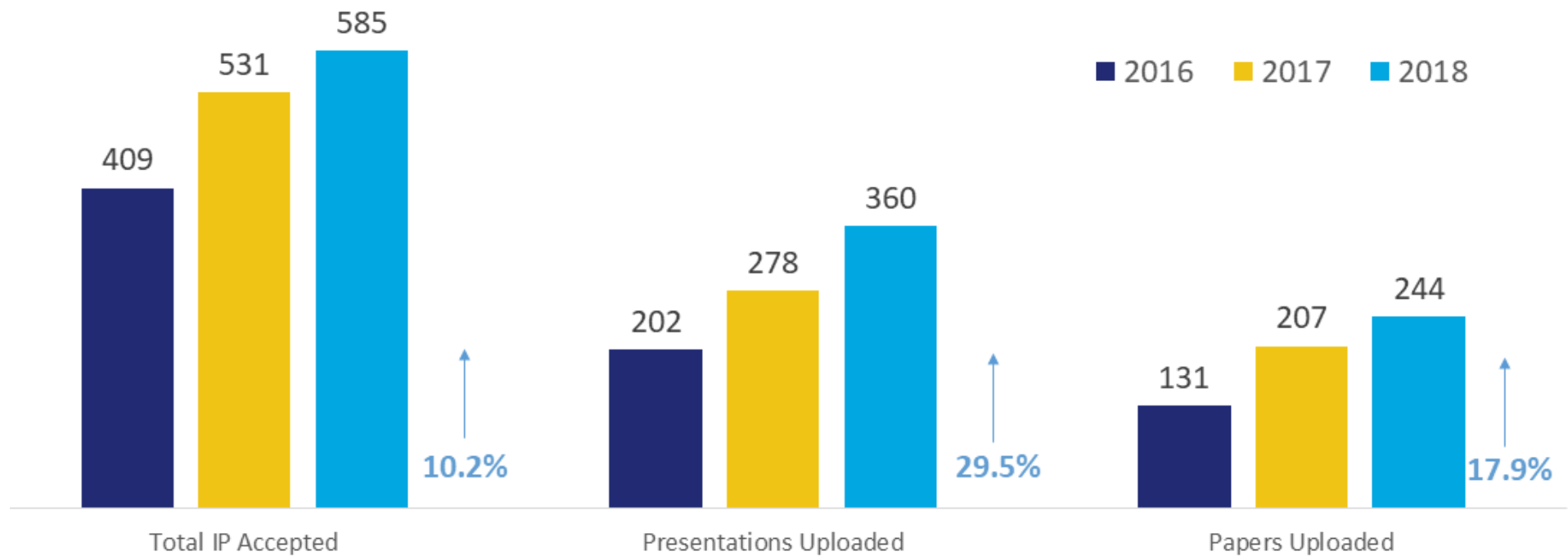
Sessions	2012	2013	2014	2015	2016	2017	2018
	Naples	Beijing	Toronto	Jerusalem	Guadalajara	Adelaide	Bremen
Number of abstracts submitted	3212	3657	3584	2669	2775	3440	4319
Number of papers selected	2184	2320	2392	2130	2199	2529	2765
Number of papers confirmed	1600	1640	1558	1448	1523	1810	2249
Number of papers presented	1374	1304	1256	1149	1167	1360	1776
Ratio Presented / Submitted	43%	36%	35%	43%	42%	40%	41%
Ratio Paper Not Presented/ papers selected	37%	43%	47%	46%	47%	46%	36%

- Globally only 40% of the submissions are finally presented
- Significant variations on the number of papers selected but not presented: 36% was good



1.2 Feedback from Bremen IAC 2018

Interactive Presentations





1.2 Feedback from Bremen IAC 2018

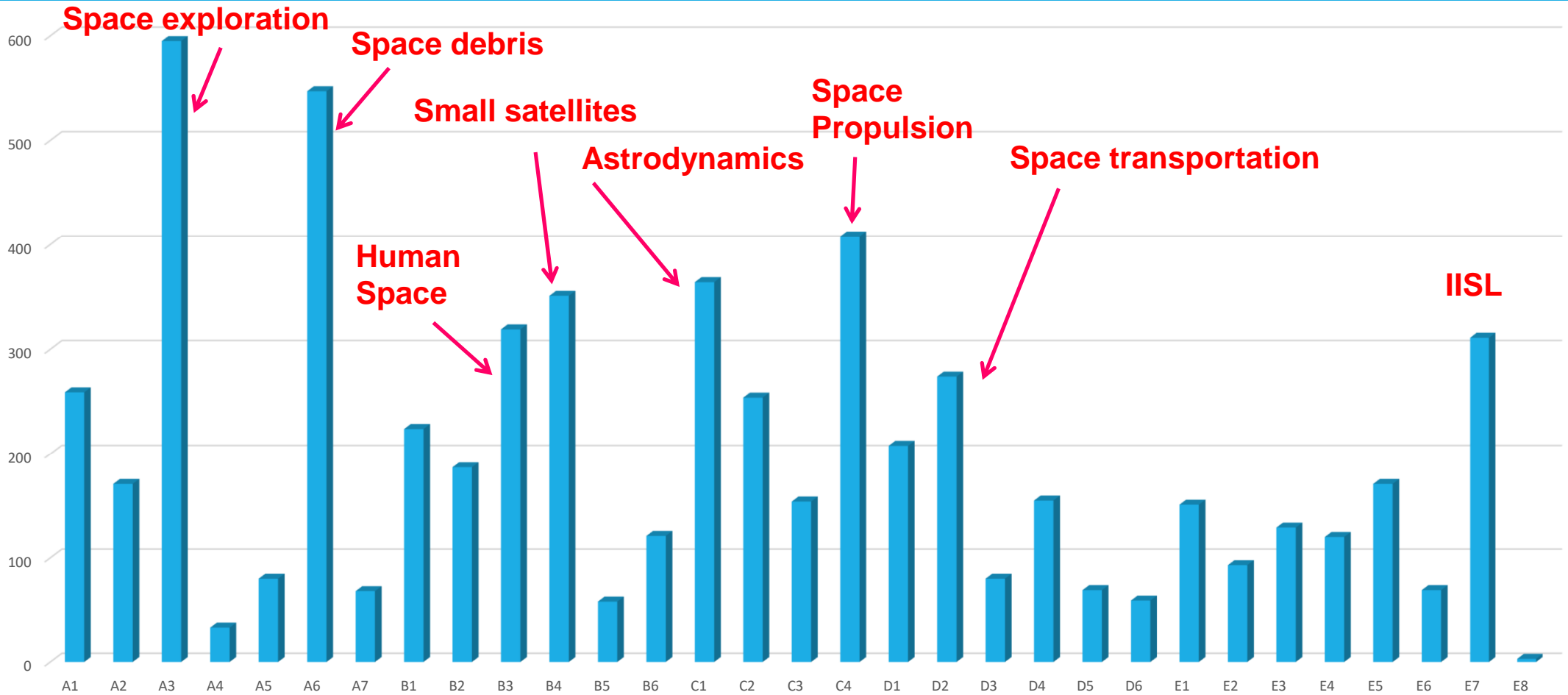
#2 on attendance

Top 5 in % Presented

TECHNICAL SESSIONS	Min Att	Max Att	Papers Sched	Papers Pres	Notified withdrawr	No Show	% Papers Present.	% Notified Withdrawn	% No Show
A1. SPACE LIFE SCIENCES	239	396	108	90	9	9	83%	8%	10%
A2. MICROGRAVITY SCIENCES AND PROCESSES	171	310	105	90	7	8	86%	7%	6%
A3. SPACE EXPLORATION	595	1126	85	68	9	9	80%	11%	11%
A4. 45th SYMPOSIUM ON THE SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE (S)	33	65	11	9	2	0	82%	18%	0%
A5. HUMAN EXPLORATION OF THE SOLAR SYSTEM SYMPOSIUM	80	130	15	9	3	3	60%	20%	20%
A6. SPACE DEBRIS	547	803	105	90	11	4	86%	10%	4%
A7. SYMPOSIUM ON TECHNOLOGICAL REQUIREMENTS FOR FUTURE SPACE ASTRONAUTICS	68	127	30	26	4	0	85%	15%	0%
B1. EARTH OBSERVATION	224	383	70	52	14	4	74%	21%	7%
B2. SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM	187	335	91	68	16	7	75%	17%	8%
B3. HUMAN SPACE ENDEAVOURS	319	521	92	71	17	4	77%	18%	4%
B4. 23rd SYMPOSIUM ON SMALL SATELLITE MISSIONS	351	660	108	85	18	5	79%	17%	5%
B5. SYMPOSIUM ON INTEGRATED APPLICATIONS	58	82	39	29	6	4	74%	16%	10%
B6. SPACE OPERATIONS SYMPOSIUM	121	166	43	32	11	0	74%	24%	2%
C1. ASTRODYNAMICS	364	485	88	62	13	1	70%	15%	1%
C2. MATERIALS AND STRUCTURES	254	376	99	78	17	4	78%	17%	4%
C3. SPACE POWER	154	224	59	43	11	5	72%	20%	8%
C4. SPACE PROPULSION	408	721	141	96	23	14	74%	13%	13%
D1. SPACE SYSTEMS	208	372	78	66	6	6	85%	8%	8%
D2. SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM	274	685	91	73	15	3	81%	15%	4%
D3. SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND DEVELOPMENT	80	159	51	42	6	3	82%	12%	6%
D4. SYMPOSIUM ON VISIONS AND STRATEGIES FOR THE FAR FUTURE	155	254	83	63	15	5	76%	18%	6%
D5. 49th SYMPOSIUM ON SAFETY AND QUALITY IN SPACE ACTIVITIES	69	142	41	32	5	4	78%	12%	10%
D6. SYMPOSIUM ON COMMERCIAL SPACEFLIGHT SAFETY ISSUES	59	108	31	25	5	1	81%	16%	3%
E1. SPACE EDUCATION AND OUTREACH	151	304	114	80	22	13	70%	20%	11%
E2. 46th STUDENT CONFERENCE	93	135	43	32	8	3	75%	18%	7%
E3. 31st IAA SYMPOSIUM ON SPACE POLICY, REGULATIONS AND ECONOMICS	129	205	54	38	14	2	72%	25%	3%
E4. 52nd IAA HISTORY OF ASTRONAUTICS	120	177	34	21	11	2	56%	38%	6%
E5. 29th IAA SYMPOSIUM ON SPACE ACTIVITY AND SOCIETY	171	244	57	45	8	4	78%	14%	7%
E6. BUSINESS INNOVATION SYMPOSIUM	69	131	32	28	3	1	89%	8%	3%
E7. 61st IISL COLLOQUIUM ON THE LAW OF OUTER SPACE	311	498	92	74	15	3	83%	15%	2%
E8. MULTILINGUAL ASTRONAUTICAL TERMINOLOGY	3	4	2	2	0	0	100%	0%	0%



1.2 Feedback from Bremen IAC 2018 Symposium attendance - minimal





1.2 Feedback from Bremen IAC 2018

SESSION ID	TECHNICAL SESSIONS	Min Att	Max Att	Papers Sched	Papers Pres	Notified Withdrawn	No Show	% Papers Present.	% Notified Withdrawn	% No Show
	A6. SPACE DEBRIS									
A6.1.	Measurements	80	110	9	7	2	0	78%	22%	0%
A6.2.	Modeling and Risk Analysis	75	90	12	8	3	1	67%	25%	8%
A6.3.	Hypervelocity Impacts and Protection	38	42	10	9	0	1	90%	0%	10%
A6.4.	Mitigation and Standards	70	120	10	9	1	0	90%	10%	0%
A6.5.	Space Debris Removal Technologies	40	100	10	9	0	1	90%	0%	10%
A6.6.	Space Debris Removal Concepts	70	85	10	9	1	0	90%	10%	0%
A6.7.	Operations in Space Debris Environment, Situational Awareness	60	70	9	9	0	0	100%	0%	0%
A6.8.	(Joint Session with Space Security Committee): Policy, Legal, Institutional and Economic Aspects	28	58	13	8	4	1	62%	31%	8%
A6.9.	Modelling and Orbit Determination	42	65	10	10	0	0	100%	0%	0%
A6.10-C1.7	Joint Astrodynamics/Space Debris Session "Orbital Safety and Optimal Operations in an Intergalactic Environment"	44	69	12	12	0	0	100%	0%	0%
	TOTAL	547	809	105	90	11	4	86%	10%	4%

- Rather well equilibrated among sessions with A6.3 a bit weak
- Good attendance globally: average Max 81 per session, average Min 55 per session, average average 68 per session
- A6.8 is improvable, with high level of Withdrawn: potential redefinition to be discussed
- Fair success of the A6.10-C1.7 session with Astrodynamics
- 86% papers presented wrt selected: good figure compared to IAC level (64%)



1.3 General statistics of A6 Symposium

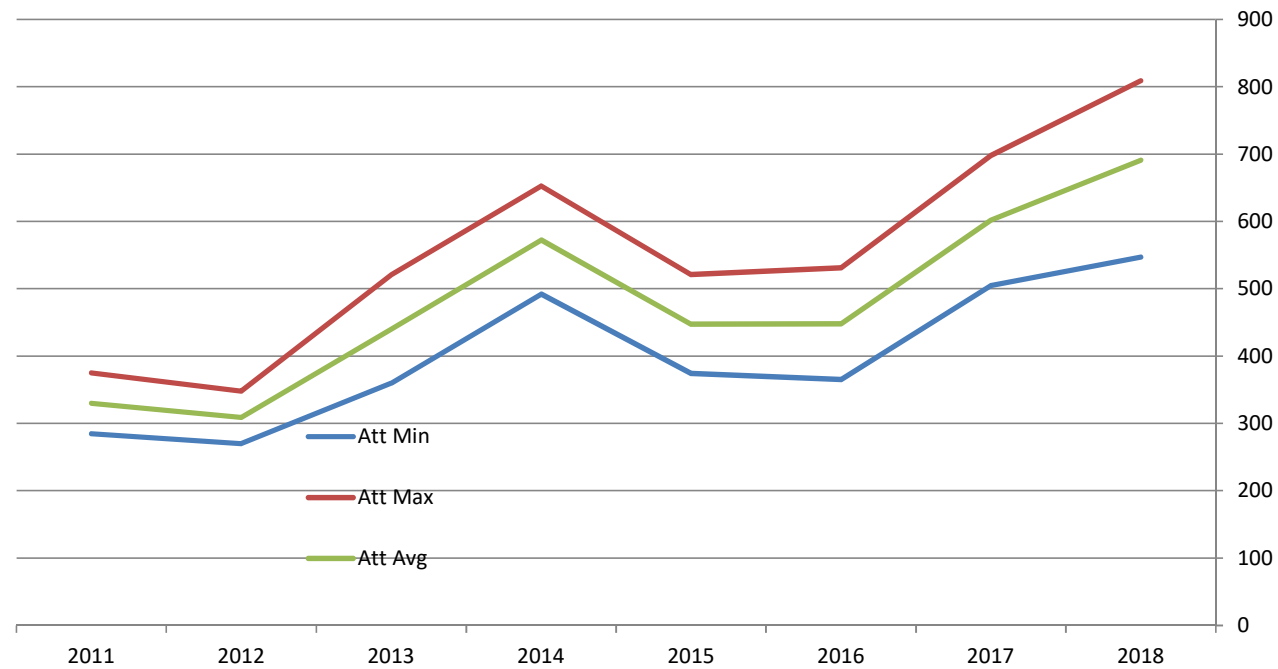
Dedicated document in Appendix 2:

- Evolution of the number of sessions
- Attendance evolution per year
- Attendance per session
- Rejection rate
- Ratio of presented papers
- Analysis per session
 - ⇒ Attendance
 - ⇒ Submitted, Selected, Presented
- Synthesis



1.3 General statistics of A6 Symposium

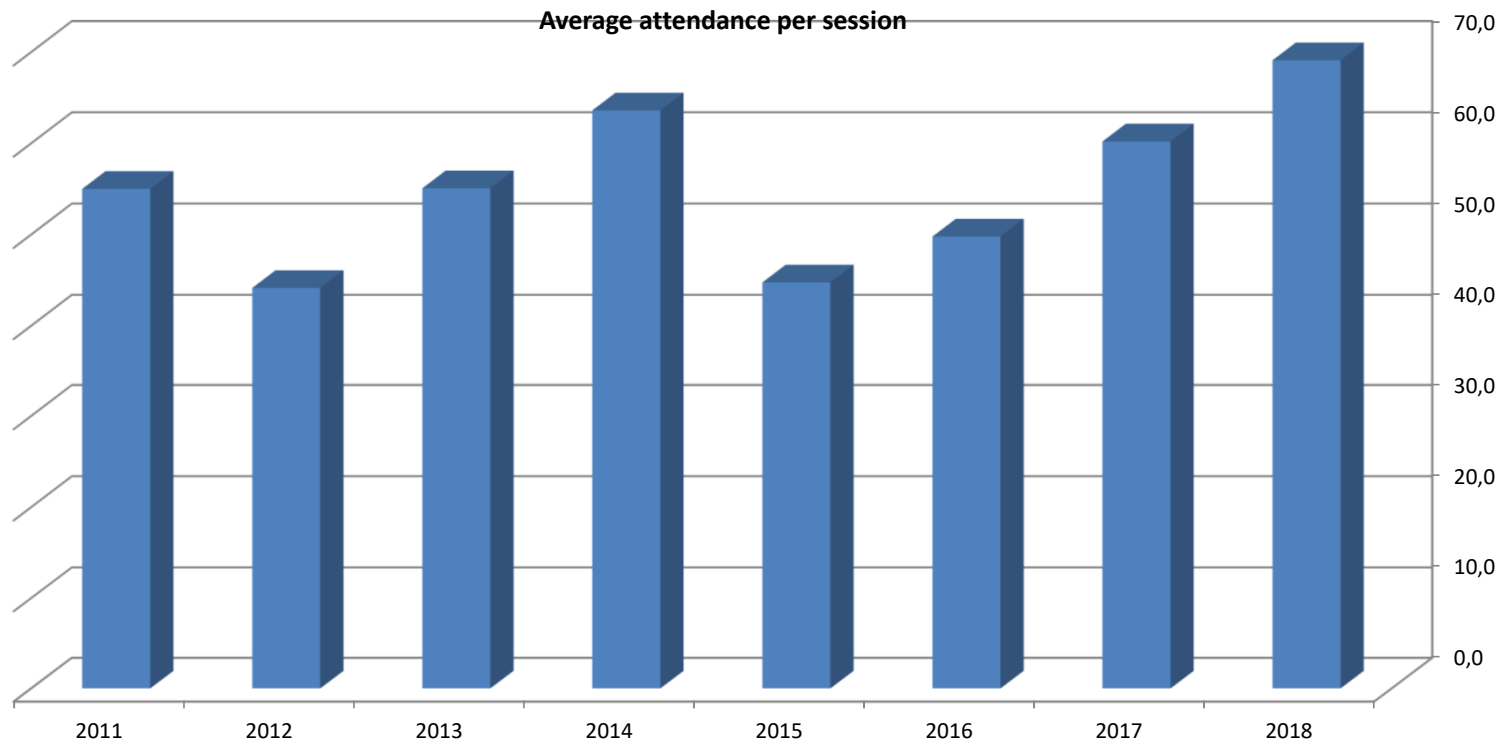
Attendance over the years





1.3 General statistics of A6 Symposium

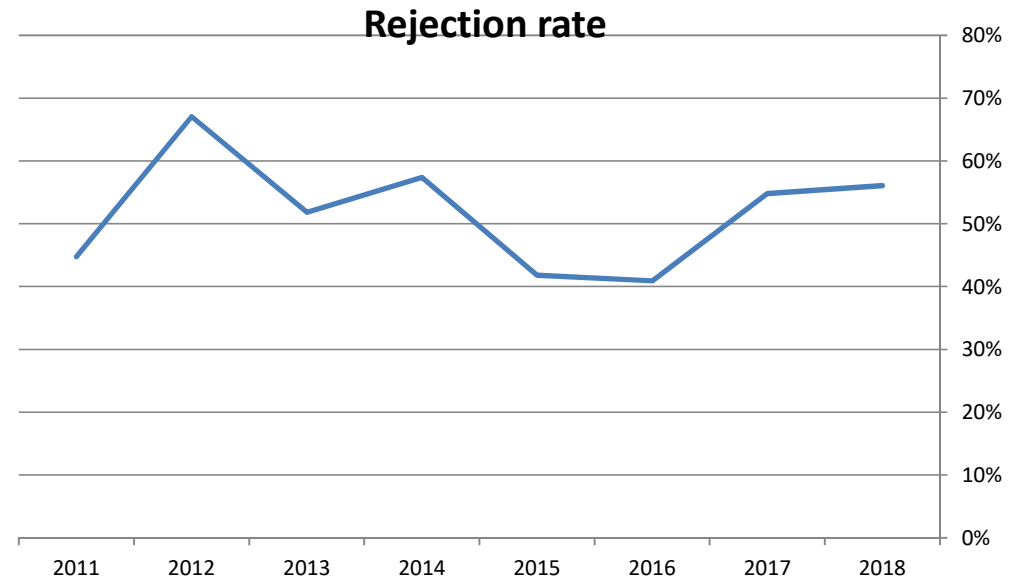
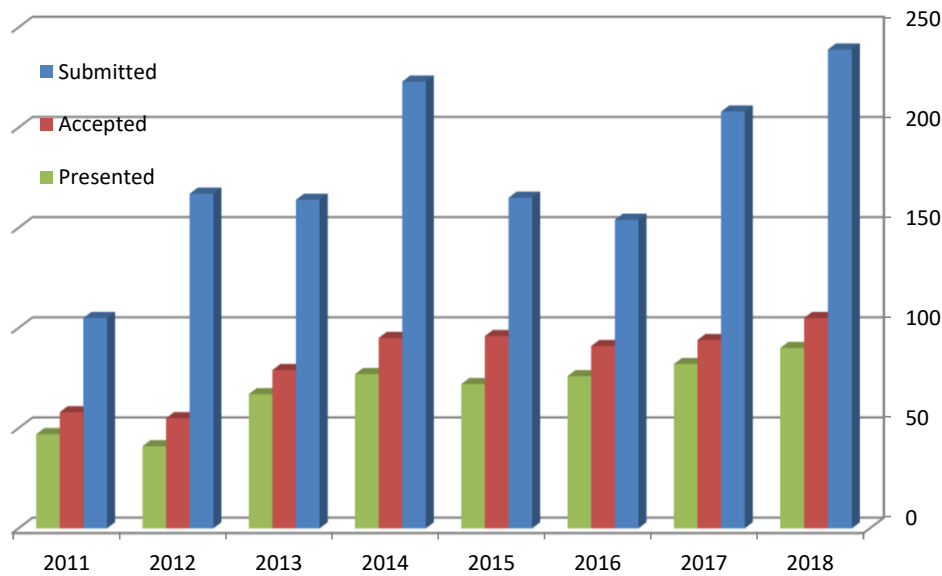
Average attendance per session





1.3 General statistics of A6 Symposium

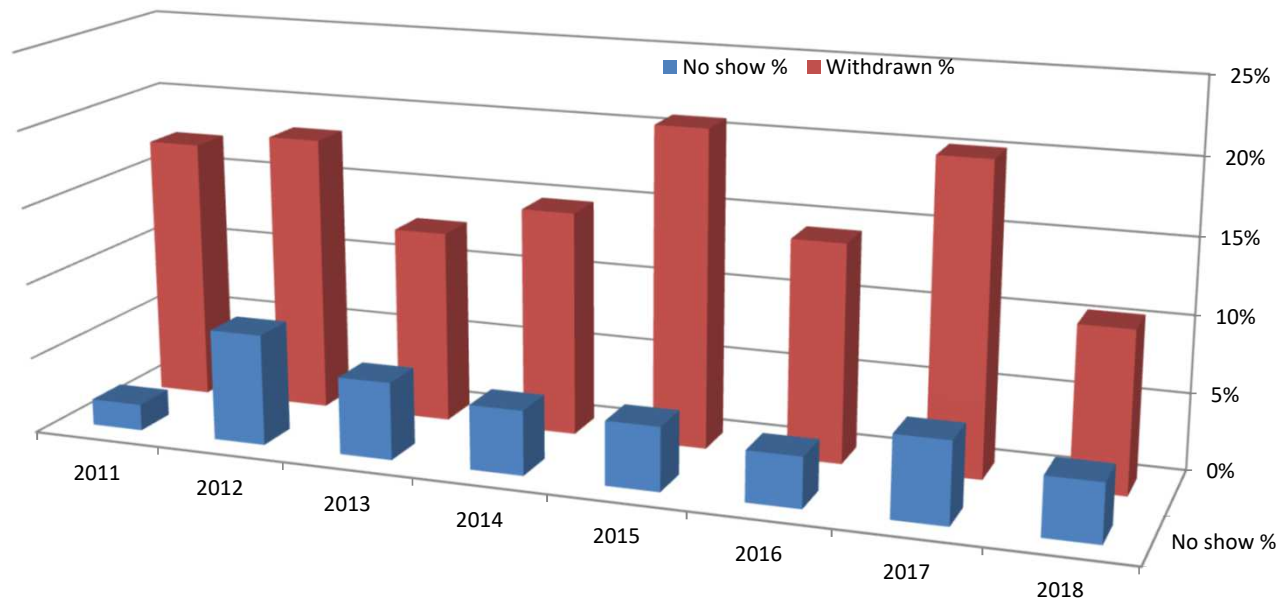
Submissions and Rejections





1.3 General statistics of A6 Symposium

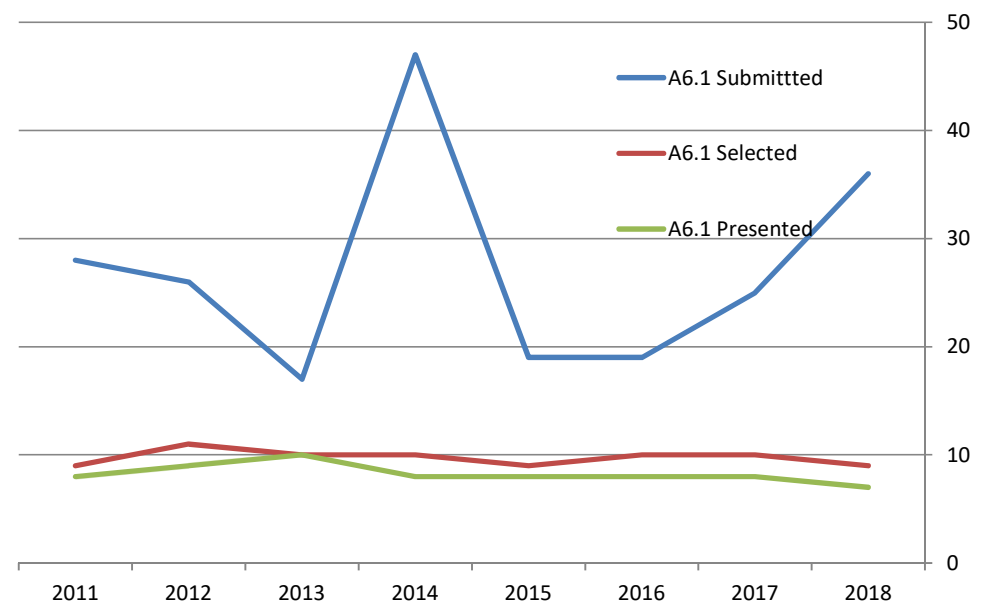
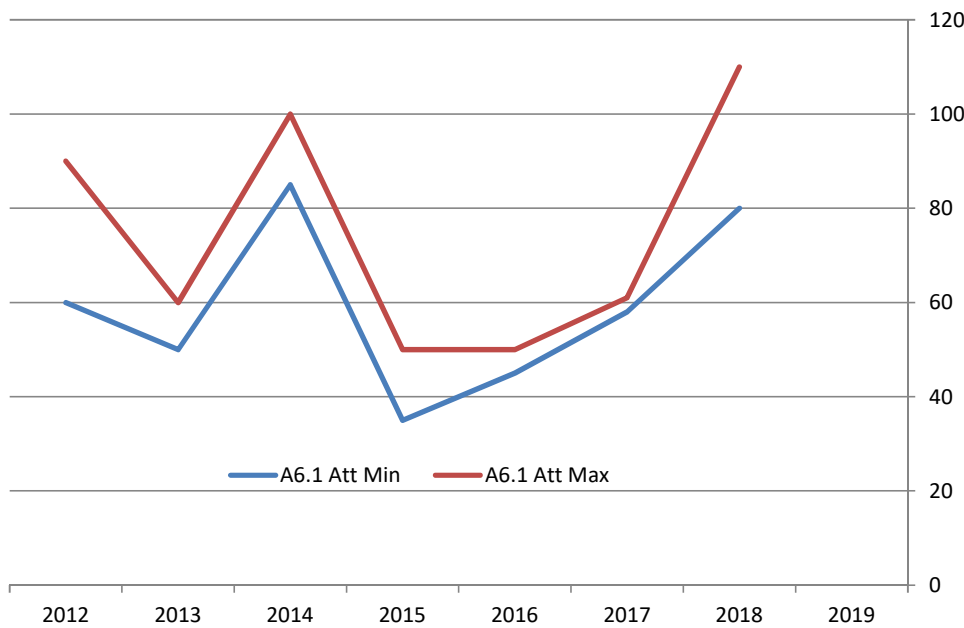
Withdrawns – No-Shows





1.3 General statistics of A6 Symposium

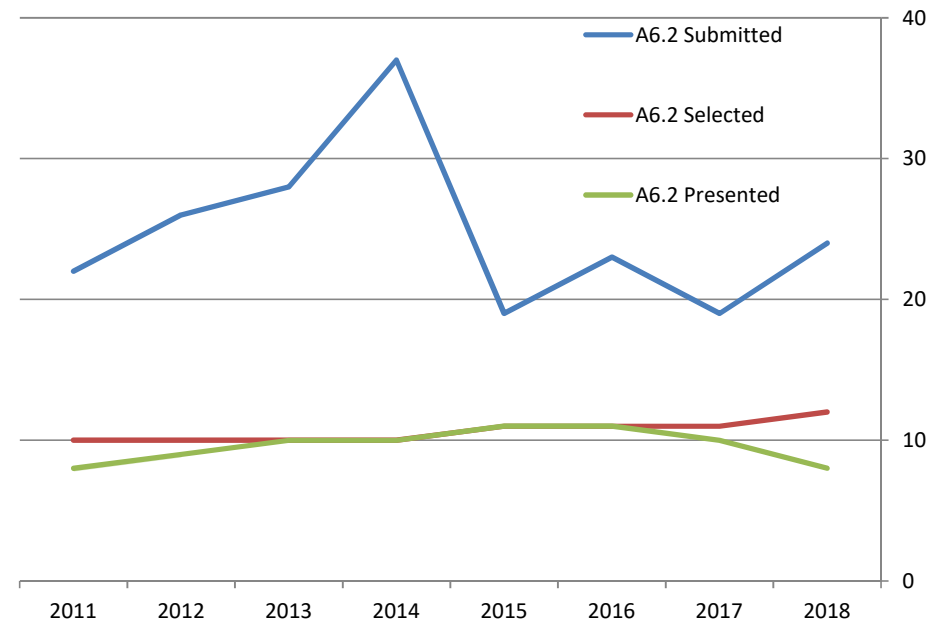
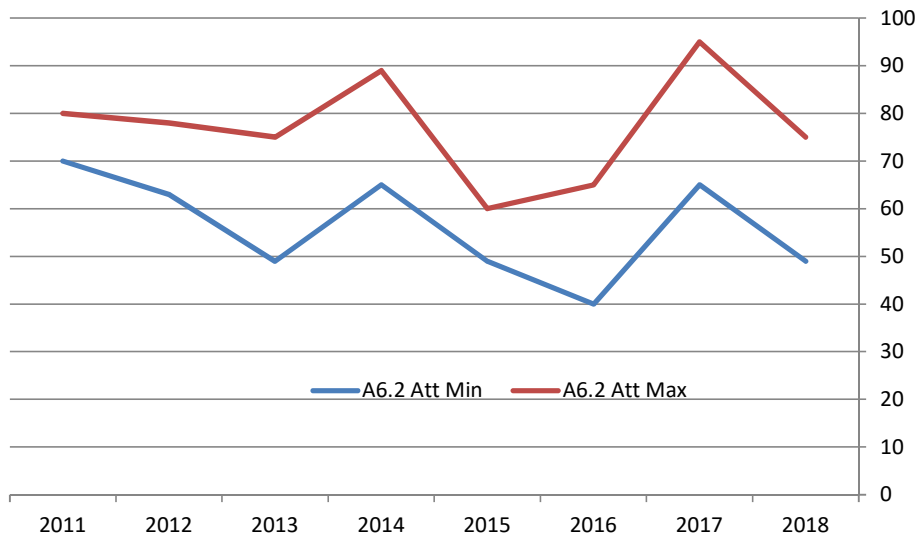
A6.1





1.3 General statistics of A6 Symposium

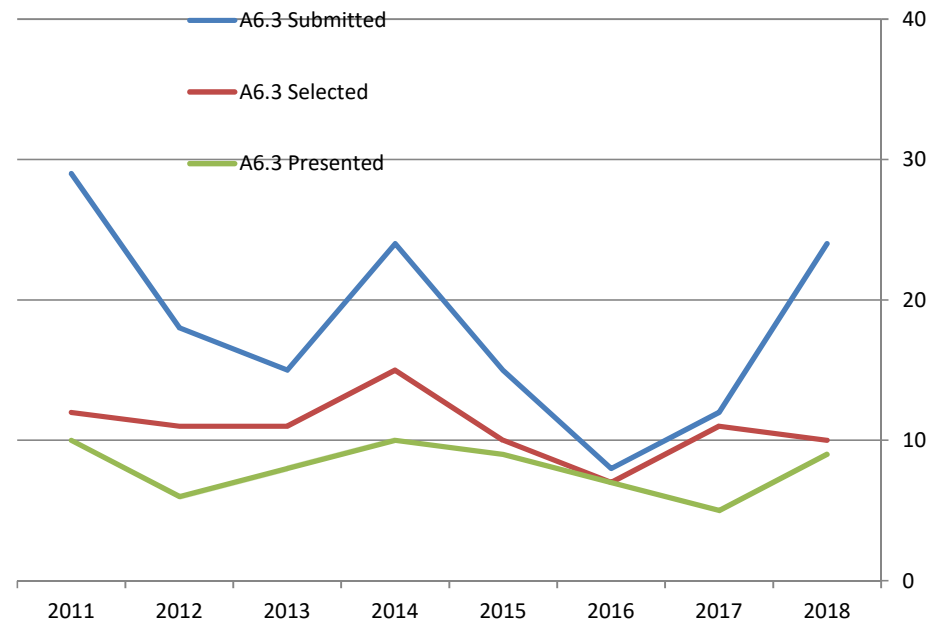
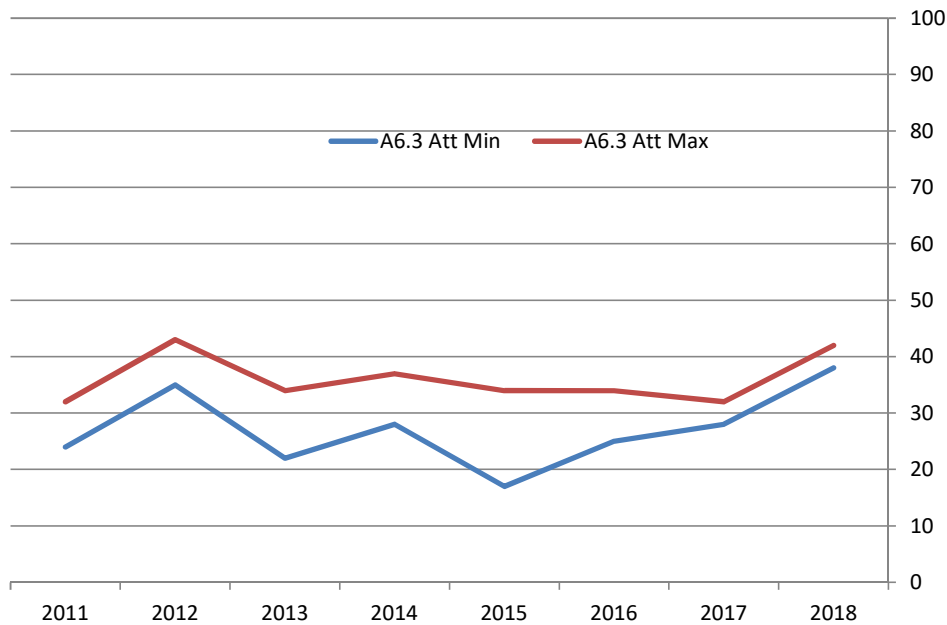
A6.2





1.3 General statistics of A6 Symposium

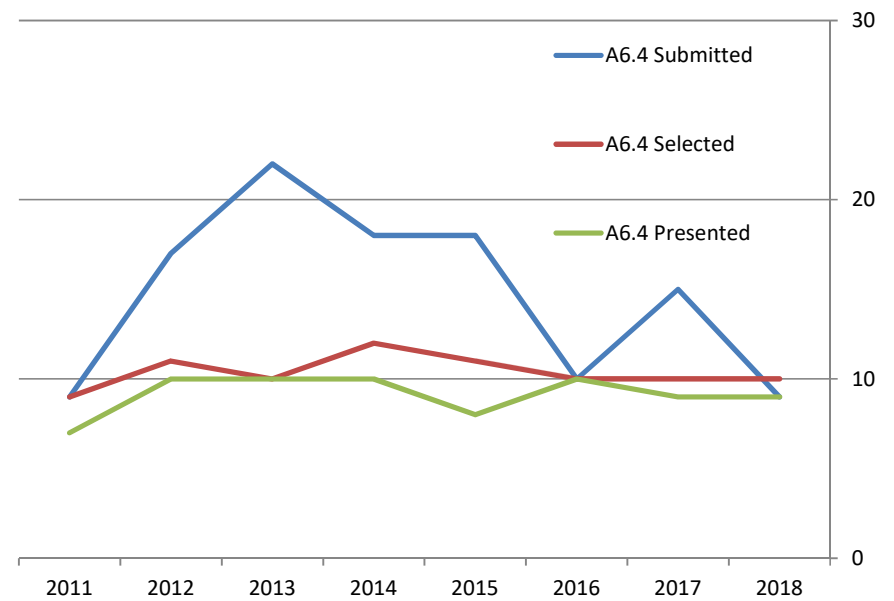
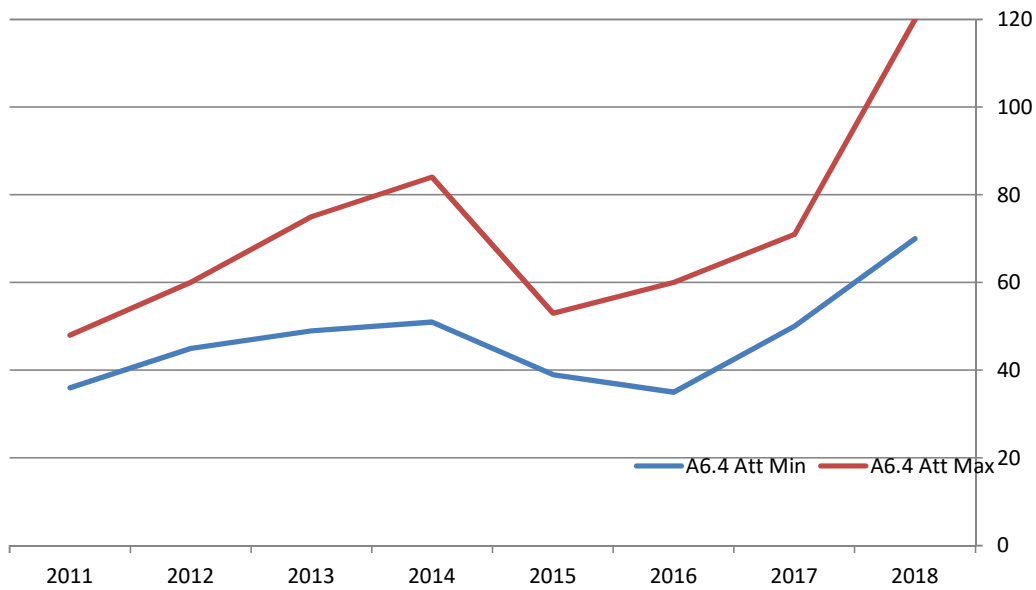
A6.3





1.3 General statistics of A6 Symposium

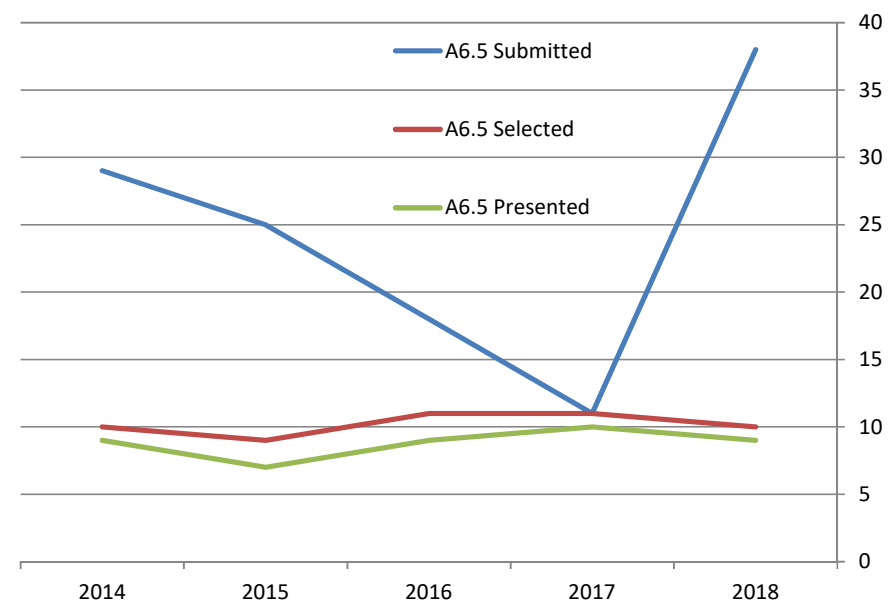
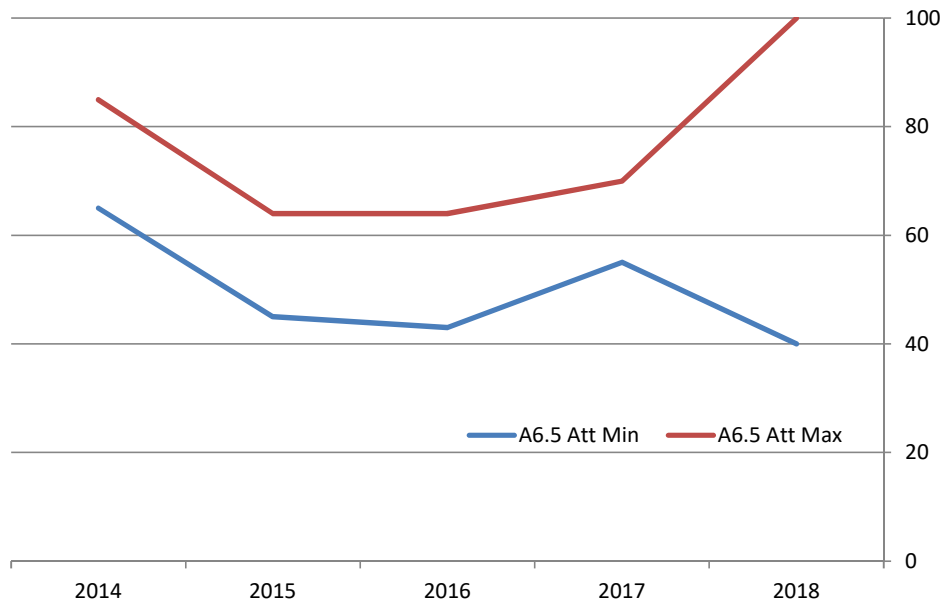
A6.4





1.3 General statistics of A6 Symposium

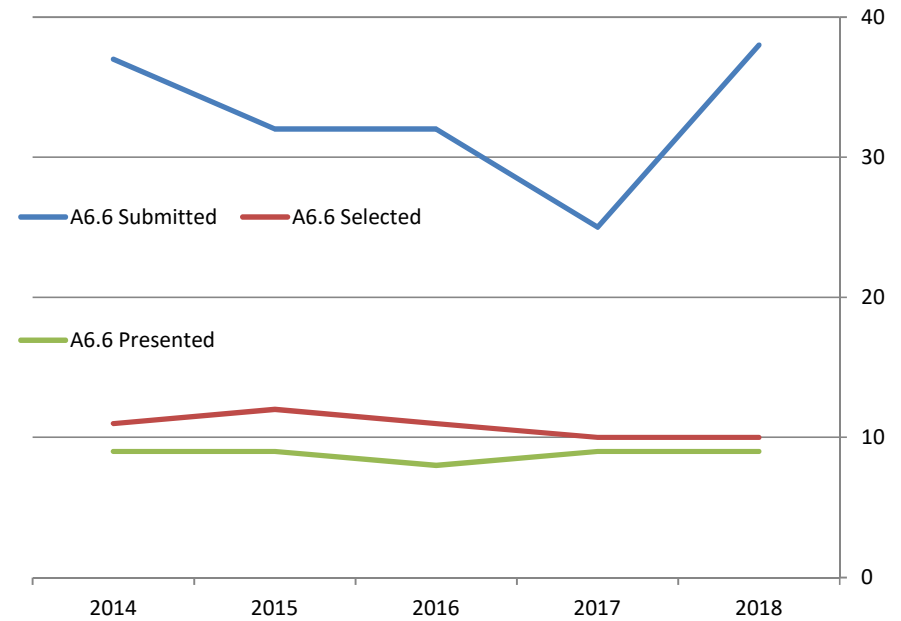
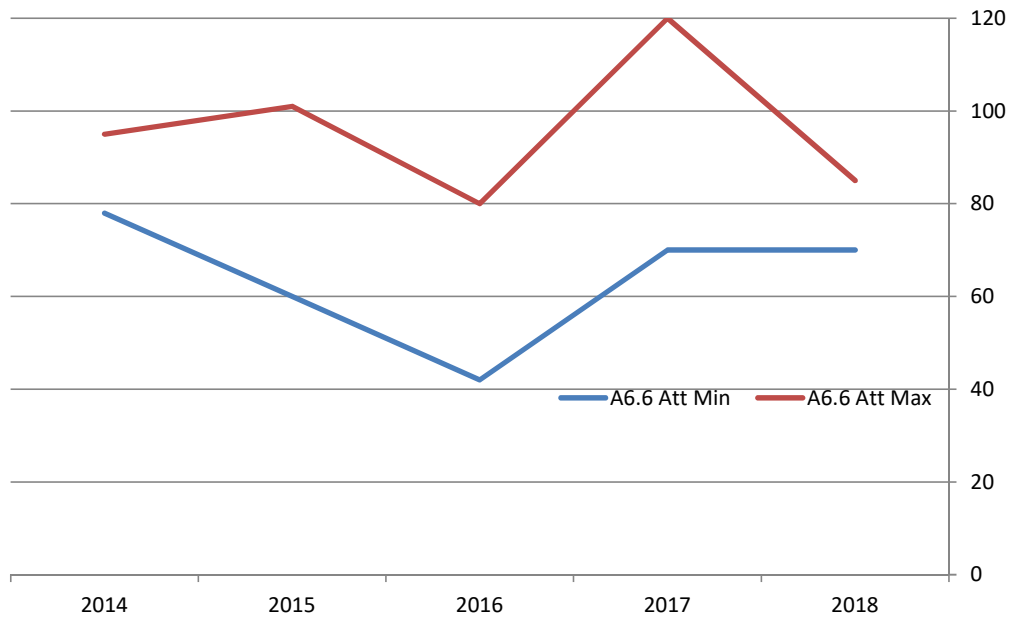
A6.5





1.3 General statistics of A6 Symposium

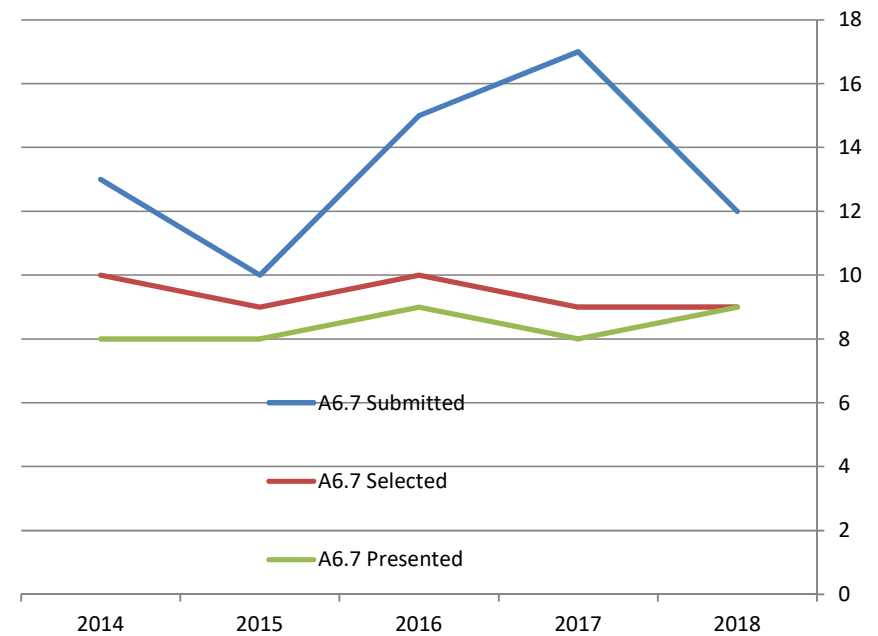
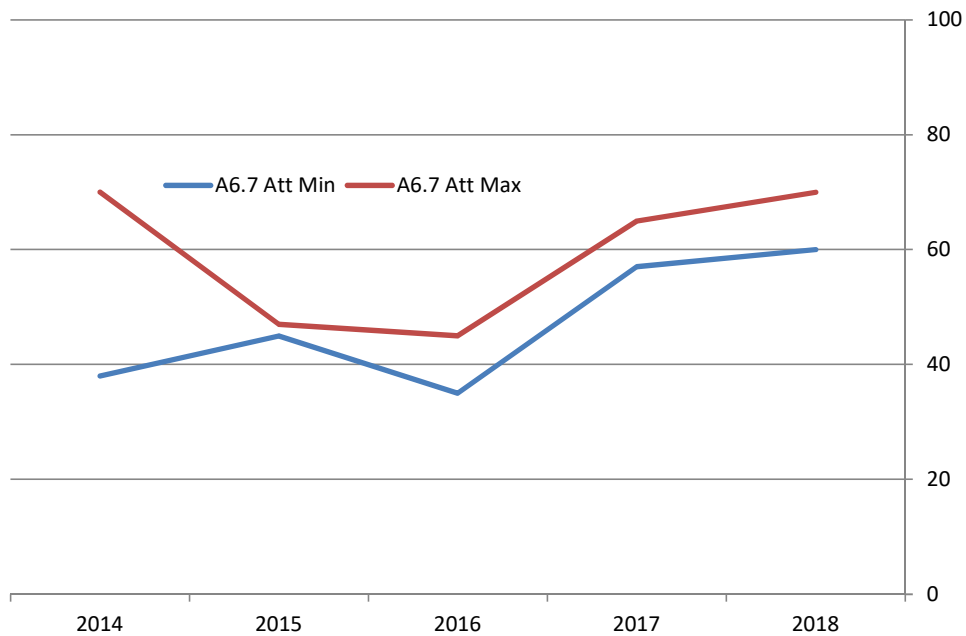
A6.6





1.3 General statistics of A6 Symposium

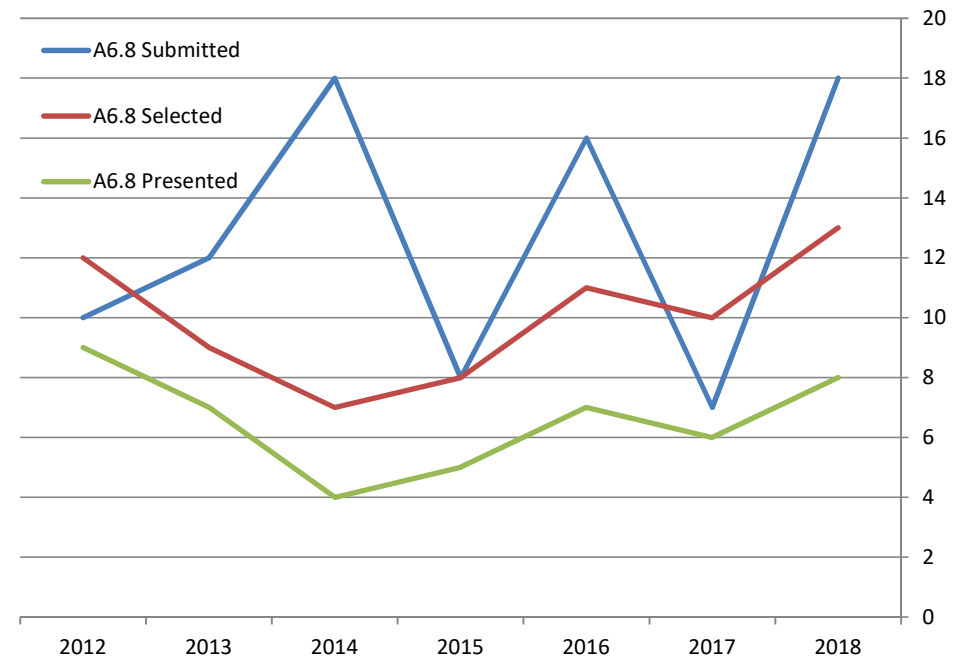
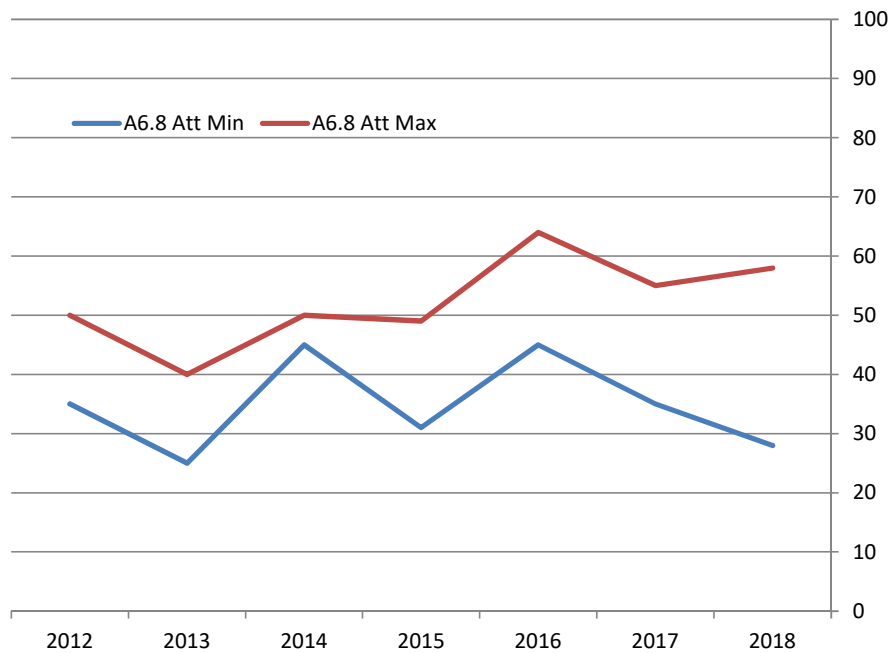
A6.7





1.3 General statistics of A6 Symposium

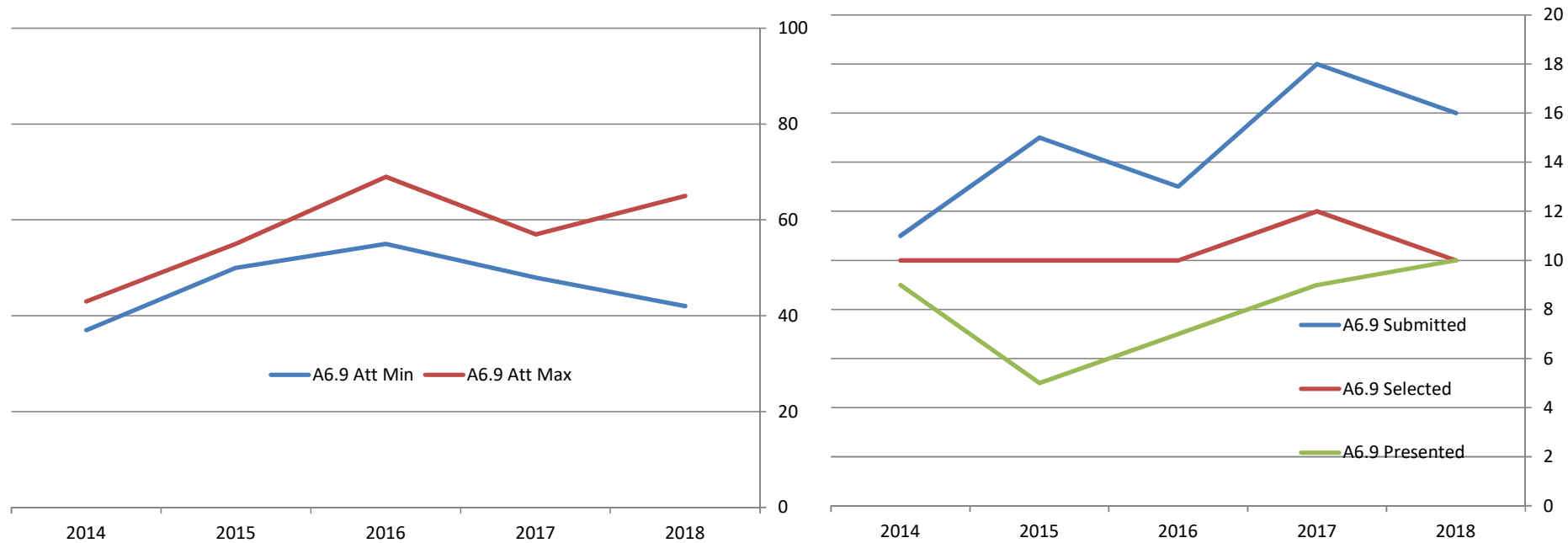
A6.8





1.3 General statistics of A6 Symposium

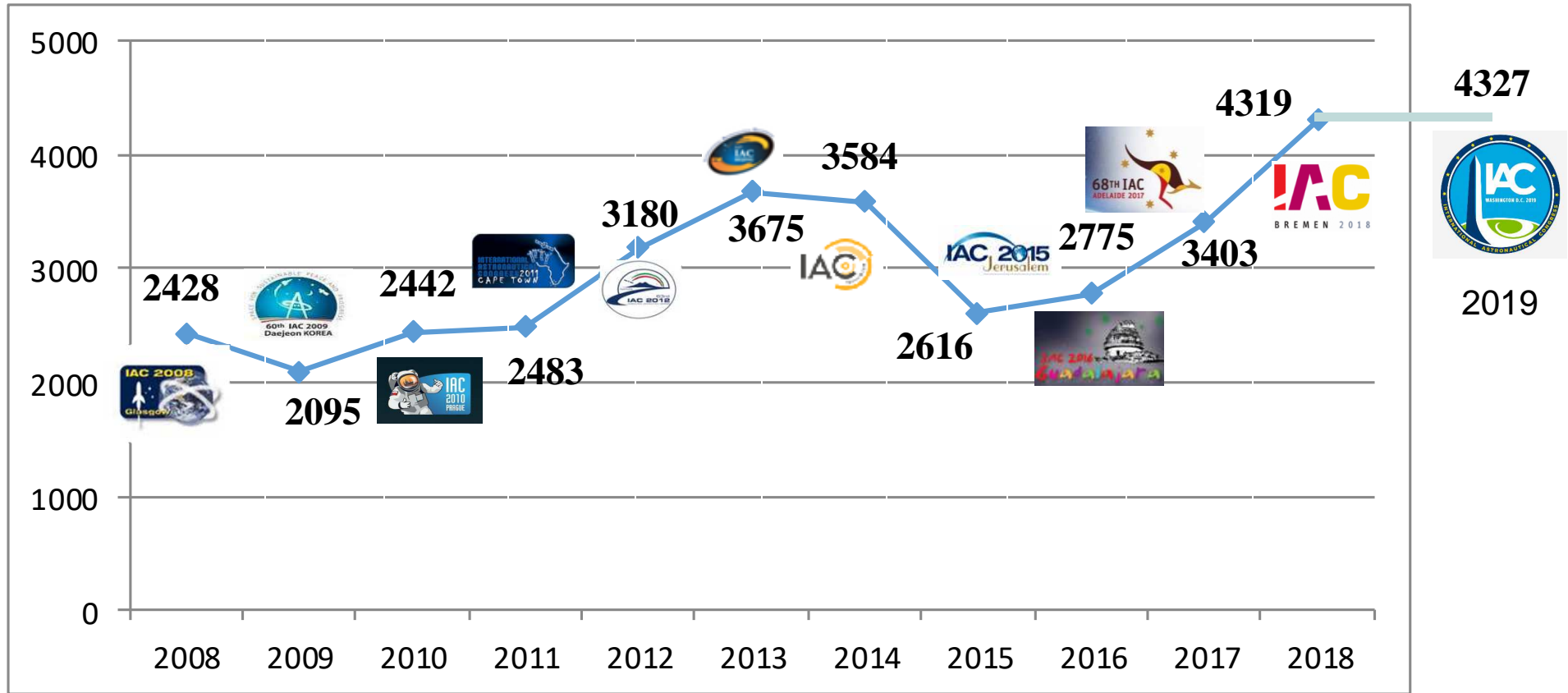
A6.9





1.4 Washington IAC 2019

Number of IAC abstracts since 2008

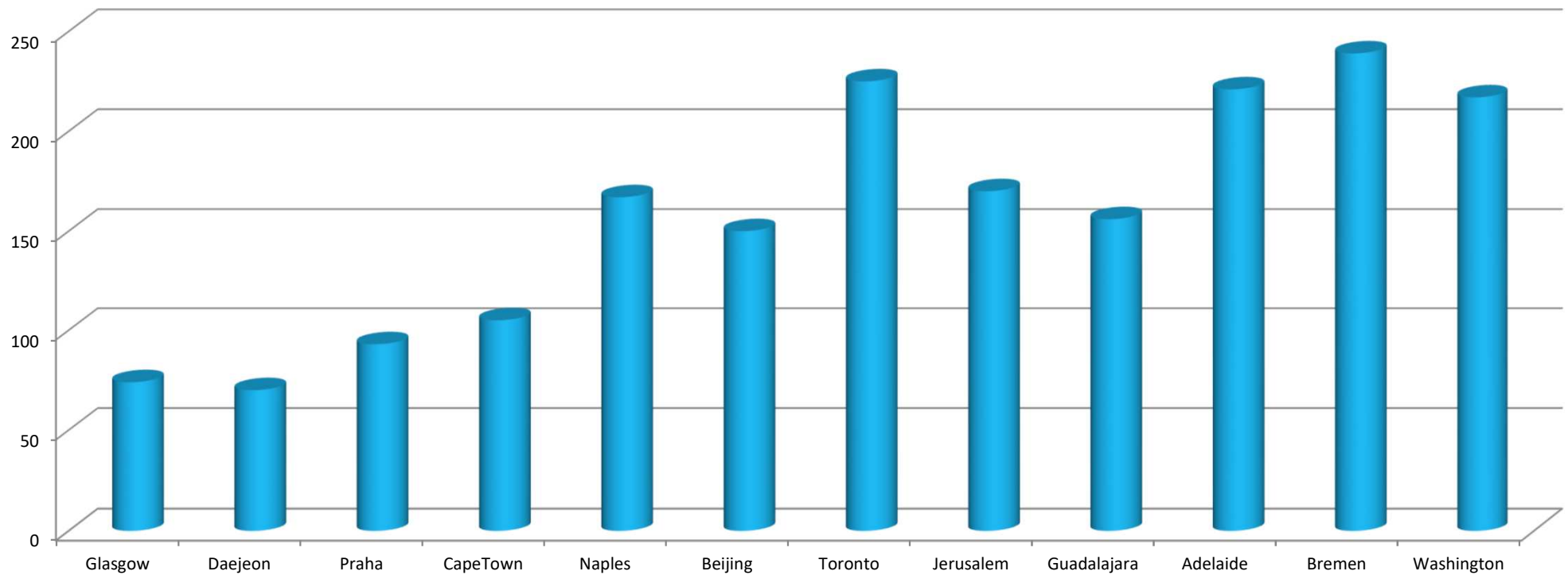


Washington: 4320 abstracts (to be confirmed...)



1.4 Washington IAC 2019

Number of abstracts, Space Debris Symposium, since 2008



1.4 Washington IAC 2019

Number of Oral sessions, Space Debris Symposium, since 2000 + Interactive Presentation session,

IAC	Year	Location	Session 1	Session 2	Session 3	Session 4	Session 5	Session 6	Session 7	Session 8	Session 9	Session 10
51st	2000	Rio de Janeiro										
52nd	2001	Toulouse										
53rd	2002	Houston										
54th	2003	Bremen										
55th	2004	Vancouver										
56th	2005	Fukuoka										
57th	2006	Valencia										
58th	2007	Hyderabad										
59th	2008	Glasgow										
60th	2009	Daejeon										
61st	2010	Praha										
62nd	2011	Capetown										
63rd	2012	Naples						Joint				
64th	2013	Beijing										
65th	2014	Toronto								Joint		
66th	2015	Jerusalem								Joint		Joint
67th	2016	Guadalajara								Joint		
68th	2017	Adelaide								Joint		Joint
69th	2018	Bremen								Joint		Joint
70th	2019	Washington								Joint		Joint

- 11 sessions including IP
- 2 joint sessions with Space Security and Small Satellites



1.4 Washington IAC 2019

A6: Space Debris Symposium: Liou – Bonnal

The Symposium will address the complete spectrum of technical issues of space debris:

measurements, modelling, risk assessment in space and on the ground, re-entry, hypervelocity impacts and protection, mitigation and standards, post-mission disposal, debris removal, Space Surveillance, collision avoidance as well as non-technical topics.

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

This session will address advanced ground and space-based measurement techniques, relating processing methods, and results of space debris characterization.

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

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 avoidance.

A6.3: Impact-Induced Mission Effects and Risk Assessments: Traineau – Jah – Fitz-Coy

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



1.4 Washington IAC 2019

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

This session will focus on the implementation of debris prevention and reduction measures and 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: Santoni – Nassisi – Francillout

This session 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: Kerr – Rossetini – Berend

This session 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: Wiedemann – Sanchez-Ortiz – Kelso

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



1.4 Washington IAC 2019

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

From SDC: Le May – Spencer *From SSC: Plattard – Soucek*

This session will deal with the non-technical aspect of space debris mitigation and removal. Political, legal and institutional aspects includes role of IADC and UNCOPUOS and other multilateral bodies. Economic issues including 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

Dolado-Perez – Klinkrad – Piergentili

This session will address aspects of space debris orbit determination related to assessment of raw and derived data accuracy, optical measurements processing and modelling and risk analysis of space debris

A6.10 /B4.10: Joint Small Satellite/Space Debris Session to promote the long-term sustainability of space

From A6: McKnight – Usovik – **Dasgupta*** *From B4: ? - ?*

This session facilitates bilateral discussions between Small Satellite and Space Debris communities for shared understanding of the challenges/issues and to promote practical small satellite solutions for the long-term sustainability of space. It will include topics such as: - Orbital debris mitigation solutions for small satellites and mega constellations - Small satellite orbital debris mitigation lessons learned, best practices and expected norms of behavior (including minimization of post-mission orbit lifetime, trackability) - Orbital debris mitigation compliance statistics and monitoring methods (for both small and large satellites) - Stakeholder education (bilateral) - Collision and warning risk assessment techniques and resulting estimates - Mitigation of risks to other operational spacecraft (ISS, etc.) - Small satellite propulsive requirements, methods and technology - Small satellite orbit regulation concepts - Small satellite deorbit technologies and lessons learned - Small satellite mission assurance, reliability and lessons learned - Small satellite deployment best practices and lessons learned - Tracking organization and small satellite operator interplay - Orbit, maneuver, and scenario data exchange.

A6.IP: Interactive Presentations, Yasaka – McKnight – Bonnal +...

***only if IAA SDC member by then**



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1.4 Washington IAC 2019

A6: Space Debris Symposium Number of Abstracts

Total number of abstracts: 217

A6.1: Space Debris Detection, Tracking and Characterization: 37

A6.2: Modelling and Risk Analysis: 21

A6.3: Impact-Induced Mission Effects and Risk Assessments: 14

A6.4: Mitigation and Standards : status, lessons learnt and future with smallsats and constellations: 21

A6.5: Post Mission Disposal and Space Debris Removal (1): 21

A6.6: Post Mission Disposal and Space Debris Removal (2): 18

A6.7: Operations in Space Debris Environment, Situational Awareness: 23

A6.8 (joint with Space Security Committee): Political, Legal, Institutional and Economic Aspects of Space Debris Mitigation and Removal: 18

A6.9: Orbit Determination and Propagation: 16

A6.10/B4.10: Joint Small Satellite/Space Debris Session to promote the long-term sustainability of space : 18

A6.IP: Interactive Presentations: 10



1.4 Washington IAC 2019

Recall of a few selection rules

⇒ ***Avoid the No-shows from Bremen (black list):***

- ⇒ A6.2: Labutkina
- ⇒ A6.3: Shi Jiawei
- ⇒ A6.4: Wei-Yu Feng
- ⇒ A6.8: Nair

⇒ ***Be cautious with withdrawn (grey list); try to make sure they will come:***

- ⇒ A6.1: Cegarra Polo, Cordelli
- ⇒ A6.2: Drouet, Zhkhvatkin, Donaldson
- ⇒ A6.3: Suchantke
- ⇒ A6.6: Usovik
- ⇒ A6.8: Stotler, Popova, Verspleren



1.4 Washington IAC 2019

Recall of the basic rules for the selection

- Check completeness of web site if you started preselection
 - Check equilibrium of your session
 - Check 3G (Gender, Geography, Generation)
 - Not too many Americans, Europeans or Chinese
 - No duplication of subject, at least within one given session
 - Beware the “risky papers” or choose one more than recommended
 - Selection of up to 3 backups noted B1, 2, 3 in the Comments field
 - Avoid “political” papers or very general roadmaps
 - A6.5 and A6.6: please do a joint selection and see if you can transfer some to A6.4
 - A6.1: please see if you can give some to A6.7
 - Interactive Presentations: Maximum **XX* + XX*** Back-ups noted B1 to **BXX**
 - Dedicated zone: 40 screens during the complete week **To be detailed during IPC meeting on 28 maMarch*
 - Dedicated IP session during 90 minutes on Thursday
 - Competition for best Interactive Presentation Award
 - Be careful to follow the request of an author: O, IP, or open
 - Beware: some manuscripts may be asked as Interactive Presentation, although not in IP session
 - ⇒ To be transferred to IP session
 - Numerous students : keep a good equilibrium and select only if promising
- ✉ **I collect all the inputs for the reference file. Make sure you don't leave before giving me your information. Can be hand written, or electronic.**



1.4 Washington IAC 2019

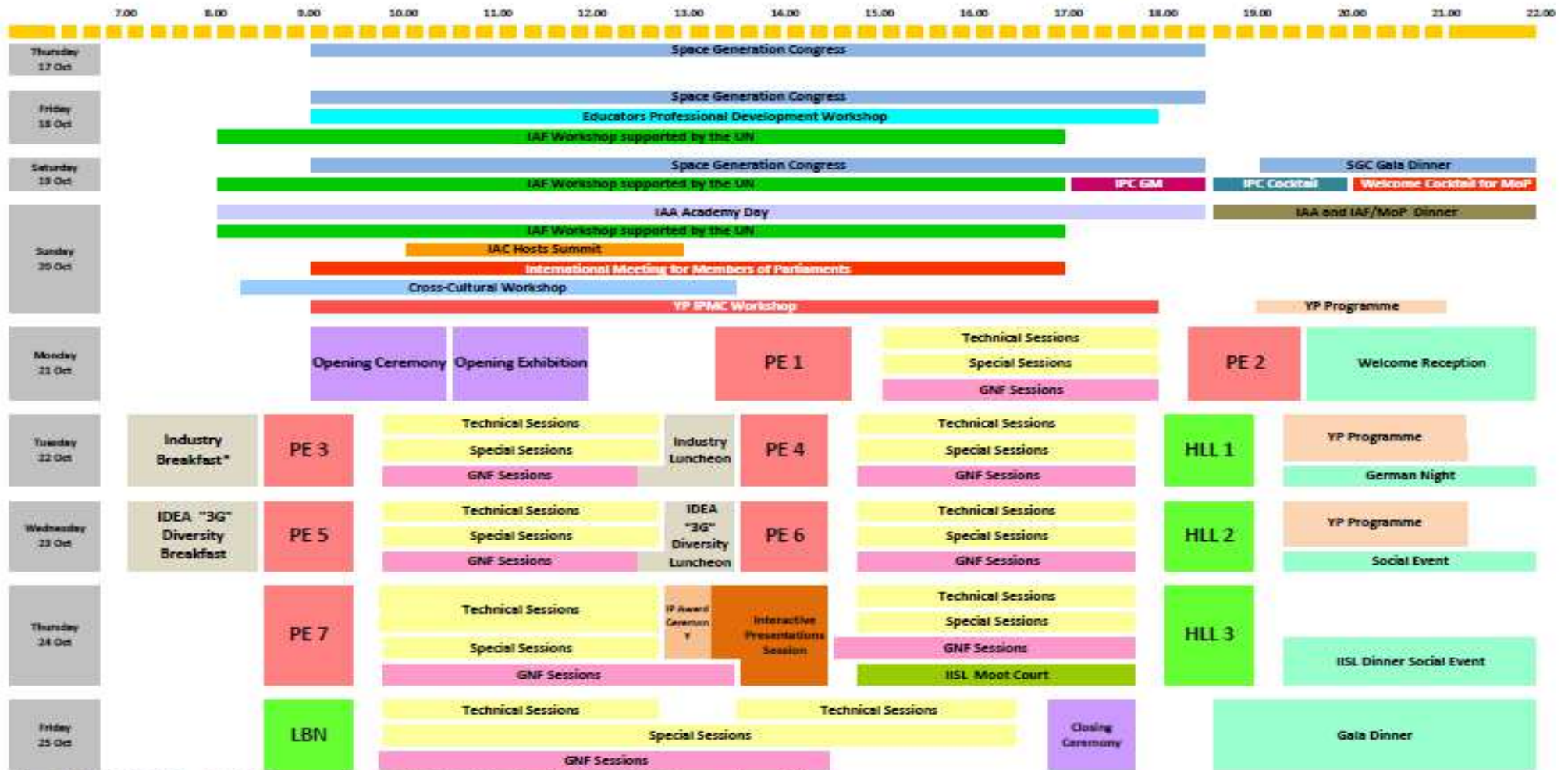
Recall of a few basic rules: how to fill the table Thursday morning

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
Symposium: A6.								
A6.1.	42094	Utilization of BROADBAND ARRAY SPECTROGRAPH SYSTEM (BASS) THERMAL IR OBSERVATIONS OF GEOSYNCHRONOUS EARTH ORBIT (GEO) OBJECTS in the creation of an observation-based model of their thermal emission	Skinner					
A6.1.	42593	Surveying space debris in high Earth orbital region	Sun					
A6.1.	43267	Acquiring Observations for Test and Validation in the Space Surveillance and Tracking Segment of ESA's SSA Programme	Jilete					
A6.1.	43325	Laser ranging solution for reliable collision prediction in LEO	Esmiller					
A6.1.	43336	Perturbations in the Optimized Boundary Value Initial Orbit Determination approach	Mann					
A6.1.	43767	Improved Space Object Observation	Molotov					

- Normally 9 papers per session, but 10 is recommended considering one or more “risky” papers, not more than 11
- In case of “merger”, identify the “prime”
- Be sure that all abstracts submitted to your session are finally allocated or rejected
- Comment when rejection a manuscript
- Once finished, give to Christophe, please, and do not leave prior to cross-check.



1.4 Washington IAC 2019



Please Note: *By invitation only; Pre-Congress events as well as the IISL Moot Court are dedicated to the respective participants



1.4 Washington IAC 2019

General organization, for information

1. Plenary Events PE + Highlight Lectures HLL

26 PE proposals for 5 free slots organized by 4 thematic + 1 free

18 HLL for 3 slots

↳ As usual problem of selection, criteria, diversity...

2. Special Sessions SpS

Aimed at promoting multidisciplinary sessions, not normally found in “classical” symposia

80 proposals

Selection process is unknown, and no apparent limit in number, as these SpS are held in parallel to the

Technical Sessions

3. Global Network Forum GNF

No selection rules: any IAF member can propose a GNF

Held in parallel to the Technical Sessions and the Special Sessions



1.5. Space Debris Symposium for Dubai 2020

IAC	Year	Location	Session 1	Session 2	Session 3	Session 4	Session 5	Session 6	Session 7	Session 8	Session 9	Session 10	Posters
64th	2013	Beijing	T. Schildknecht [C] V. Agapov [C] P. Seitzer [R]	C. Pardini [C] P. Krisko [C] C Wiedemann [R]	D. McKnight [C] A. Francesconi [C] M. Rudolph [R]	F. Alby [C] H. Klinkrad [C] M. Yakovlev [R]	V. Adimurthy [C] J. Hussey [C] F. Santoni [R]	P. Anz-Meador [C] S. Kibe [C] M. Rudolph [R]	D. Finkleman [C] D. McKnight [C] H. Krag [R]	K. Suzuki [C] P. Krisko [C] C. Mathieu [R]			D. McKnight C. Bonnal
65th	2014	Toronto	T. Schildknecht [C] V. Agapov [C] J. Carroll [R]	L. Anselmo [C] J-C. Liou [C] T. Hanada [R]	A. Francesconi [C] Sen Liu [C] F. Schaefer [R]	C. Cazaux [C] H. Klinkrad [C] M. Yakovlev [R]	VIP. Prasad [C] F. Piergentili [C] N. Berend [R]	F. Di Pentino [C] S. Kibe [C] C. Bonnal [R]	T.S. Kelso [C] D. Finkleman [C] JC. Dolado-Perez [R]	B. Biddington [C] D. McKnight [C] C. Mathieu [R]	M. Jah [C] S. Flegel [C] H. Lewis [R]		C. Bonnal
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. Mathieu [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. Rossetini [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. Omalý [C] Y. Usovik [R]	F. Piergentili [C] B. Bastida-Virgili [C] F. Santoni [R]	N. Berend [C] B. Singh [C] L. Rossetini [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. Omalý [R]	F. Santoni [C] A. Nassisi [C] L. Francillout [R]	L. Rossetini [C] E. Kerr [C] N. Berend [R]	C Wiedemann [C] N. Sanchez [C] TS. Kelso [R]	D. Spencer [C] S. Lemay [R]	H. Klinkrad [C] J-C. Dolado-Pe F. Piergentili [R]	U. Dasgupta [C] Y. Usovik [C]	T. Yasaka D. McKnight C. Bonnal

- Need to rotate a bit, and to find “fresh blood”: Priority to new members
- Basic rule proposed: at least one experienced IPC member per session, then potentially open, but need to find key experts who will effectively attend and will effectively work... 😊



1.5. Space Debris Symposium for Dubai 2020

A6: Space Debris Symposium: Liou – Bonnal

The Symposium will address the complete spectrum of technical issues of space debris:

measurements, modelling, risk assessment in space and on the ground, re-entry, hypervelocity impacts and protection, mitigation and standards, post-mission disposal, debris removal, Space Surveillance, collision avoidance as well as non-technical topics.

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

This session will address advanced ground and space-based measurement techniques, relating processing methods, and results of space debris characterization.

A6.2: Modelling and Risk Analysis: Anselmo – Oltrogge – Sorge

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 avoidance.

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

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



1.5. Space Debris Symposium for Dubai 2020

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

This session will focus on the implementation of debris prevention and reduction measures and 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: Singh – Francillout – Opromolla

This session 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: Auburn – Berend – Wiedemann

This session 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: Sanchez-Ortiz – Kelso – Martinot

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



1.5. Space Debris Symposium for Dubai 2020

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

From SDC: Le May – Spencer From SSC: Plattard – Soucek

This session will deal with the non-technical aspect of space debris mitigation and removal. Political, legal and institutional aspects includes role of IADC and UNCOPUOS and other multilateral bodies. Economic issues including 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

Dolado-Perez – Klinkrad – Piergentili

This session will address aspects of space debris orbit determination related to assessment of raw and derived data accuracy, optical measurements processing and modelling and risk analysis of space debris

A6.10 /B6.X: Joint Space Operations / Space Debris Session: Title ?*

From A6: Anilkumar – Tung From **XX***: ? - ?

This session xxx*

**Action to define details with B6*

A6.IP: Interactive Presentations, Yasaka – McKnight – Jankovic – Bonnal

1.5. Space Debris Symposium for Dubai 2020

- ***Any ideas for Dubai 2020***
 - Accepted proposal to have a Joint Session with B6 Space Operations
- ***Other ideas***
 - Keynote lecture (Joe Loftus Keynote Lecture) at the beginning of one of our sessions
 - Principle is decided; action to check legal acceptability. Christophe to write to John Loftus (son of...)

Agenda

2. Exchanges

- 2.1. Past events: workshops, conferences, congresses, ...
- 2.2. On the Agenda
- 2.3. New achievements
- 2.4. Round table – Open discussion



2. *Exchanges*

- General information – round table
- Appendix 3: IAA-IISL-IAF working group on STM (Bonnal) – Draft ideas – For discussions only.
 - Please comment
 - Please indicate whether you would like to participate to the WG
 - Typical outcome: Report including recommendations in 2 years time
- Appendix 4: Fragmentation of Atlas 5 Centaur upper stage 2009-047B (SSN #35816) (Agapov)
 - Happened on March 25th...
 - Thank you Vladimir for such a timely Late Breaking News...
- Appendix 5: Status of Stardust Reloaded (Jankovic)
- Appendix 6: ESA-ECSL Space Debris Mitigation and Space Law Workshop (Lemmens)
- Appendix 7: ESA NEO and Debris Conference 2019 (Lemmens)
- Appendix 8: ISO status (Oltrogge)
- Appendix 9: IAASS 2019 (Skinner): to be noted, dedicated STM WG
- Appendix 10: 15th Annual STM Conference (Jah)
- Appendix 11: COSPAR Next in Sydney 2020 (Schildknecht)



2. Exchanges

- AMOS 16 September 2019, same place as usual... (Kelso)
- Spacecraft Anomalies and Failures Workshop: <http://iaass.space-safety.org/workshops/> (McKnight)
- KePASSA conference end of April 2019 <https://kepassa.unirioja.es/en/node/1> (Dolado-Perez)
- International Conjunction Workshop end of June in Paris (Dolado-Perez)
- 2019 EUCASS: www.eucass2019.eu , Madrid 1-4 July 2019, 932 papers from 48 countries, devoted to Science and R&, including 2 sessions on Space Debris chaired by Luciano Anselmo (Bonnal)
- 2019 IOC, December 9-12, Houston chaired by JC Liou
<https://www.hou.usra.edu/meetings/orbitaldebris2019/>
- Asia-Pacific Regional Space Agencies Forum: <https://www.aprsaf.org> (Singh)
- Status of Astroscale <https://astroscale.com> Launch of ELSA-1D on Soyuz April 2020 (Auburn)

Agenda

3. IAA Study Groups (Wednesday 27 March 2019)

- 3.1 SG 4.23 Practical Solutions for Post Mission Deorbit for Micro/Nano/Pico Satellites in Low Earth Orbit
- 3.2 SG 5.10 Orbital Debris Removal: Policy, Legal, Political and Economic Considerations
- 3.3 SG 5.17 IAA Situation Report on Space Debris – 2019



3. IAA Study Groups

IAA Study Groups as of March 22, 2019			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 1															
1.6	Protected Antipode Circle on Lunar Farside	Macone/Shuch													09- BOT approval
1.9	Satellite remote sensing of aerosols in the Earth atmosphere	Yatskiw/Milinevsky													03-status report received
1.11	Comparative Climatology - Studying Planetary Climate to Understand Earth's	Ramachandran/Ocampo													03-
1.13	Planetary Science Enabled by the New Generation of Small Satellites	Baker/Vane/Bousquet													02- Final report expected
1.14	Integrated Precursor Distinguish in Multi-Geophysical Fields	Bao Weimin/Contant/Kuznetsov/Zhang													03-status report received
1.15	International Cooperation on Space Weather	McKenna-Lawlor													02-
Commission 2															
2.12	Effectiveness of different physiological countermeasures to spaceflight	Charles/Kozlovskaya/Norsk													03- Commission pre-review
2.14	Medical Support for an International Human Expedition to Mars	Orlov/Doam/Kussmaul													03-status report received
2.15	Immersion Model: Importance for Space Life Sciences Studies	Mano/Tomilovskaya													03-status report received
2.17	Dynamic Assessment and Management of Astronauts' Physiological Health	Haignere / Prunariu													03-new study group
2.18	Sleeping Brain in Space and Analog Environments	Kourtidou/Bamidis													02-
Commission 3															
3.18	Possible International Protocol to handle Crisis/Emergency in Space	Ramakrishnan/Unnikrishnan Nair													02- Publication process
3.19	Feasibility study of Standardized Career Dose Limits in LEO	McKenna-Lawlor													02-
3.21	Space Disposal of Radioactive Waste	Degtyarev													03-status report received
3.22	Next-Generation Space System Development Basing on Orbital Architecture	Razoumny/Agrawal/Ji Simei													02-
3.24	Road to Space Elevator Era	Tsuchida/Raitt/Swan/Takahashi													03- BOT approval
3.25	The Maintainability and Supportability of Deep Space Manned Missions	Yang Hong/Zhang Dapeng													03-status report received
3.26	Space Mineral Resources #2	Dula/Zhang Z./Lenard													02-
3.27	Towards the utilization of the Moon, Preparing for Mars Exploration	Genta/Ventskovsky													03-status report received
3.28	Strategy of Low Cost and Large Scale Access to Space in Future	Lu Yu/Reibaldi													03-status report received
3.29	Strategy and Feasibility Assessment of Collision Protection in Space	Bao Weimin													03-status report received
3.30	Space and its Utility in Forecasting Climate Change	Lenard													03-status report received
3.31	Solar Energy from Space: a Decadal Revisit to the first International Space Station	Mankins													02-Membership list TBC



3. IAA Study Groups

IAA Study Groups as of March 22, 2019		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													03-status report received
4.19	Promoting Global Space Knowledge & Expertise in Develop	Horikawa/Coradini													03-
4.20	Space Information Application in Earthquake Emergency Res	Bao Weimin/Contant													03-status report received
4.21	Distributed, Networked, Smart, Cooperating Small Satellite I	Belokonov/Schilling													03-status report received
4.22	Through Optimization of Aerospace Trajectories	Teofilatto/Filat'yev													03-status report received
4.23	Post-Mission Disposal for Micro and Smaller Satellites: Con	McKnight/Hanada/da Silva/Martinez													03-status report received
4.24	Disseminating knowledge and experiences of satellite applic	Mugellesi-Dow													03-status report received
4.25	Research on Space Information Sharing Technology with S	Xue Huifeng													03-new study group
Commission 5															
5.10	Orbital Debris Removal: Policy, Legal, Political and Econom	Williamson/Smith LJ													03-status report received
5.12	Dynamics of Space Exploration Strategies and Future Outlo	Ehrenfreund/Peter													02- Pending
5.13	Space Systems as Critical Infrastructure	Piso/Ivanescu/Neagu													02- SAC & BOT approval
5.16	International Legal and Policy Regimes for Space Natural R	Liu Jizhong / Impallomeni													03-status report received
5.17	Space Debris Situation Report - 2019	Bonnal/McKnight													03-membership TBC
Commission 6															
6.16	STEM/STEAM for Space - Grand Challenges	Regel/Harris													03-status report received
6.17	Multicultural foundations and influences of human space ex	Arnould/Laidet													03-new study group
6.19	Apollo 11 Landing Anniversary	Liepack/Lieberman													03-status report received



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3.3 SG 4.23 Practical Solutions for Post Mission Deorbit for Micro/Nano/Pico Satellites in Low Earth Orbit

- **SG 4.23** (for information)

<http://iaaweb.org/content/view/742/975/>

Post-Mission Disposal for Micro and Smaller Satellites: Concepts and Trade Studies

https://drive.google.com/file/d/1wsqgo_EskL4dJ4ReiRiK7hYhNuQyNJnC/view?usp=sharing

Short Description of Scope of Study

Overall Goal: Provide framework for a practical implementation to assure compliance with Space Debris Mitigation guidelines for micro and smaller satellites.

Motivation is to provide easy to use design tradeoff information to small satellite community including university satellite community. The final report will be disseminated through the UNISEC-Global network and other small satellite communities and networks.

Summary

-Explain that mitigation guidelines, the technologies, and space system operations will all evolve over time to apply this document as a framework to continue to assess how your satellite may act responsibly and efficiently to minimize risks to other satellites from your operations.

Co-Chair: da Silva Curiel Alex

Co-Chair: Hanada Toshiya

Co-Chair: Martinez Peter

Co-Chair: McKnight Darren

Secretary: Kawashima Rei

IAA-SG 4.23 Meeting

A Handbook for Post Mission Disposal of satellites
less than 100kg

MARCH 27, 2019

IAA/IAF SPRING MEETING IN PARIS



Agenda

Progress report –Completion of the handbook

Publication

- **Timeline for publication**
- **Way of publication**
 - **Electrical version**
 - **Hard copy version**
 - **short version**
 - **full version**
 - **Cost and Funding**

Distribution Plan

Future Plan (optional)

- **Education (Manual or PPT for educators?)?**
- **Revision?**

Timeline for publication (need to discuss)

IAA Meeting in March – IAA SAC approval for publication

Final Check –April?

E-version publication on the IAA website – May or June?

- For follow up, can we make a registration site (Only those who registered can download it)?

Hard-copy of short version – May or June?

- Distribution of hard-copy at UNCOPUOS in June

Hard-copy of full version - ?

Distribution Opportunities

April: GLEC2019 (Morocco) **Rei**

May: IAA EO Small satellite (Berlin) **Alex**

Keynote at IAASS Space Safety Conference (Los Angeles) **Darren**

June: UNCOPUOS (Vienna) **Rainer, Peter, Rei**, ISTS(Japan) Alex, RAST(Istanbul)Rustem, Russian small satellite conference (Samara) TBD

July: UK Space conference **Alex**

August: Small Satellite Symposium (Utah) **Alex**

September: 12th PINA Workshop (Germany) Klaus

October: Session Keynote at IAC (DC) **Darren**

November: IAA Latin (Argentina) Rene, Rainer, Livio, Alex

COSPAR Small Sat (Israel) Rene?

APRSAF **Alex**

December: UNISEC-Global Meeting (Tokyo) TBD

International Conference on Innovative Research in

Engineering and Management (ICIREM) (Bangalore) **Rei**



**International
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Astronautics**

3.2 SG 5.10 Orbital Debris Removal: Policy, Legal, Political and Economic Considerations

- **SG 5.10** (*for information*)

<http://iaaweb.org/content/view/446/607/>

Orbital Debris Removal: Policy, Legal, Political and Economic Considerations

- **Current Status: Finished**
- **Please clarify the status with IAA secretariat**



3.5 SG 5.17 IAA Situation Report on Space Debris – 2019

- **SG 5.17** <http://iaaweb.org/content/view/710/935/>
IAA Situation Report on Space Debris – 2019

- Update and improvement of the 2016 report <http://www.iaaweb.org/iaa/Scientific%20Activity/sg514finalreport.pdf>
- Proposal to change the title to 2020, no real hurry
- Need to identify the reference list of contributors
- Need for new contributors (Chinese, Indian, Ukrainian, Korean, more Russians...)

Current list of contributors (tentative) :

- Shall include new countries: China, Ukraine, India, Korea, Australia, EU, ...
- Need for a continuity in the initial authors, but
- Need for new blood also
- Avoid too many authors as we work by consensus
- Avoid too many from same countries
- Agreed so far (random order...): Tanja Masson-Zwaan, Manuel Metz, Mykhailo Kaliapin, Holger Krag, Shen Lin, Moriba Jah, Eric Christiansen, Juan-Carlos Dolado-Perez, Frank Schäfer, Carmen Pardini, Dave Finkleman, Marlon Sorge, Dan Oltrogge, Nicolas Bérend, Samantha Le May, Hae-Dong Kim, Igor Usovik, Zizheng Gong, Michel Doyon, Balbir Singh, Thomas, Vladimir, Marko, Roberto Opromolla (sorry if I forgot someone...)



3.5 SG 5.17 IAA Situation Report on Space Debris – 2019

- ***SG 5.17 Proposed Table of contents:***

- Basis is the IAA Report 2016, of course
- Excellent report 😊, but highly improvable, at the table of contents level and in terms of completeness
- See list of open actions in Appendix 18
- Current table of contents and contributors recalled in Appendix 19
- First draft sent by Darren, see following page

Three principles:

- Update, including title of chapters
- Correct (following list of comments from reviewers)
- Slightly modify the structure

First Draft expected by September 2019, just before our next meeting



- **SG 5.17 Proposed Table of contents:**

- 1.Sources of Space Debris**

- Include counts, mass, types, breakup events, deterioration of surfaces, etc

- ⇒ Current §2 – to be updated Holger – Mark Matney

- 2.Monitoring Space Debris**

- Optical, radar, in-situ, and returned samples and uncertainties

- ⇒ Current §3 – to be updated and optical systems to be placed in Appendix

- Thomas, Vladimir, Moriba, Balbir, Nicolas

- 3.Risks from Space Debris** *(Not sure to agree with the proposed structure... To be discussed)*

- Ground casualties from reentry Marlon, Dave, Pierre,

- ⇒ Current §7 – to be updated

- Collisions, Destruction of objects, Disrupt satellite operations Structure to be clarified Darren, Moriba

- ⇒ HVI Current §3 – to be updated and optical systems to be placed in Appendix

- Frank, Eric, Zizhen

- ⇒ Current §6.2



4. Debris Risk Management

Debris mitigation

- ⇒ description Current §9 Christophe
- ⇒ compliance levels Juan-Carlos, Stijn, Manuel to be updated,

Collision Avoidance Dan, Nicolas

- ⇒ Current §5 – to be updated

Shielding and design Frank, Eric, Zizhen

- ⇒ Largest part of Current §6 – to be updated

Debris remediation Roberto, Marko, Liang

- ⇒ Current §10 – to be updated and completed

D4D

Risks associated to Debris mitigation and remediation

5. Debris Population Evolution Juan-Carlos, Marlon

Key parameters: launch rates, fragmentations (explosions and collisions), longevity without mitigation, etc - just a baseline of the past and extrapolate to future

- ⇒ Current §8 – to be updated Special issues: satellite servicing, constellations, and cubesats

X. Space Traffic Management (STM)

<Discuss current SDA ops and future STM concepts

- ⇒ New Dan – Vladimir - Laurent



6. Legal, Policy, and Regulatory Issues and Opportunities

⇒ Current §11 & 12 – to be updated Tanja, Olga (via Vladimir)

7. Synthesis and further references Christophe

⇒ Current §13 – to be updated

Appendix

SST-SSA capabilities exhaustively described in Appendix Thomas, Moriba

⇒ Current §4

Existing + India Balbir, China Shen Lin, Commercial Dan, ESA to be improved Holger, European countries, EU Vera, Skorea Hae-Dong, Canada Michel, Brazil, Australia