



International Academy of Astronautics
IAA Space Debris Committee
Washington, October 19th, 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
 - 3.1 SG 5.17 IAA Situation Report on Space Debris – 2019



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Agenda

1. IAC
 - 1.1. IAA Space Debris Committee
 - 1.2. Lessons learned from Bremen 2018
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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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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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1.1 IAA Space Debris Committee

Current official membership (as per web site):

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

Attendance list today:

See **Appendix 1**

Synthesis:

61 members

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



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1.1 IAA Space Debris Committee

New members already inducted but not registered by IAA:

| | |
|----------------------|--|
| Stijn Lemmens | stijn.Lemmens@esa.int |
| Emma Kerr | emelkerr@gmail.com |
| Noelia Sanchez-Ortiz | noelia.sanchez@deimos-space.com |
| Helen Tung | helentung.tlc@gmail.com |
| AK Anilkumar | ak_anilkumar@vssc.gov.in or akanil2007@gmail.com |

Apparently all acceptance letters were properly sent to IAA

New members proposed today:

| | |
|-------------------|--|
| Serge Plattard | serge.plattard@ucl.ac.uk |
| Lesley-Jane Smith | smith@leuphana.de or smith@weber-steinhaus.com |
| John Auburn | j.auburn@Astroscale.com |
| Alice Gorman | alice.gorman@flinders.edu.au |

Don't forget to answer positively to the IAA invitation letter

Meetings:

Accepted proposal to keep the IAC meeting on the Saturday just before the congress, 10:00 to 13:00

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

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



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1.1 IAA Space Debris Committee

Election of the chairs:

Currently 3 chairs, but only 2 coordinators of A6 Symposium

No precise respective roles

Could be reduced to 2

Typically 3 functions:

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

Dedicated Terms of Reference to prepare

Potential election of one chair for 4 years, every 2 years

Process will be defined and voted for during next Spring Meeting

First election in March 2020 (or Dubai?): please inform us if you wish to candidate

Potential re-election once of a departing chair

Voters are limited to members of Space Debris Committee

Transparent process with secret ballots

A priori candidates have to be Full Members of IAA (or CM ? To be checked with IAA)

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 | |

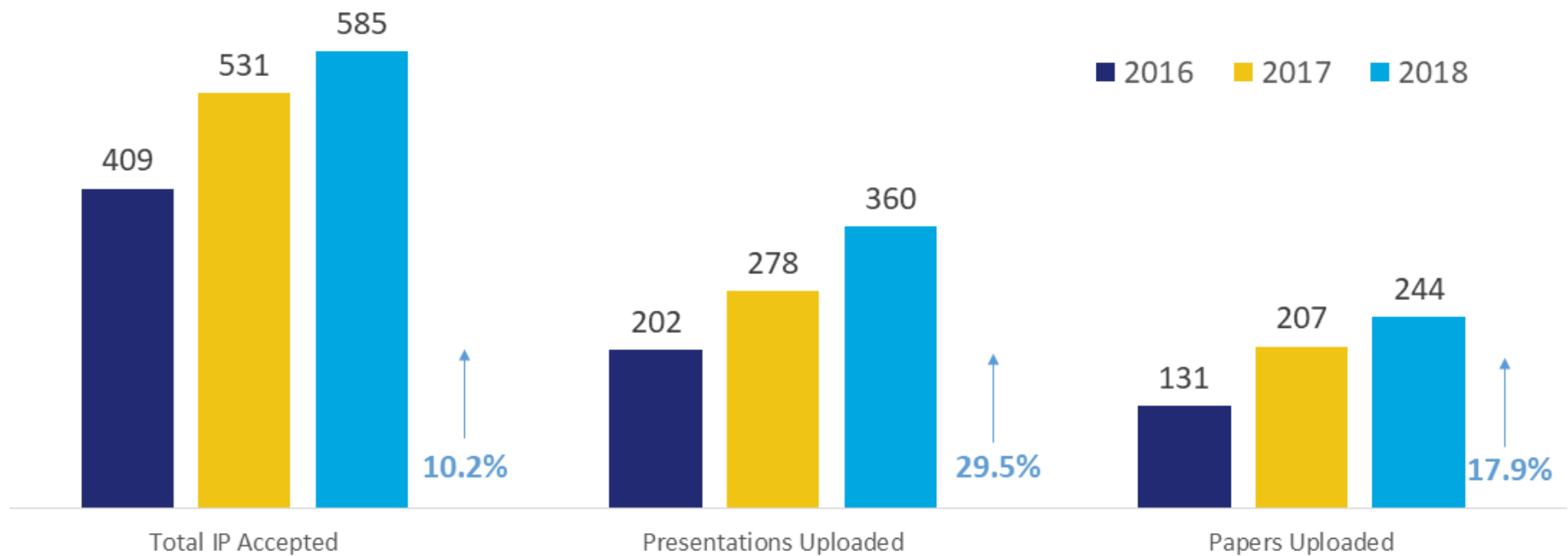
1.2 Feedback from Bremen IAC 2018

| Sessions | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|--|--------|---------|---------|-----------|-------------|----------|--------|------------|
| | Naples | Beijing | Toronto | Jerusalem | Guadalajara | Adelaide | Bremen | Washington |
| Number of abstracts submitted | 3212 | 3657 | 3584 | 2669 | 2775 | 3440 | 4319 | 4361 |
| Number of papers selected | 2184 | 2320 | 2392 | 2130 | 2199 | 2529 | 2765 | 2507 |
| Number of papers confirmed | 1600 | 1640 | 1558 | 1448 | 1523 | 1810 | 2249 | 2139 |
| 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





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#2 on attendance

Top 5 in % Presented

1.2 Feedback from Bremen IAC 2018

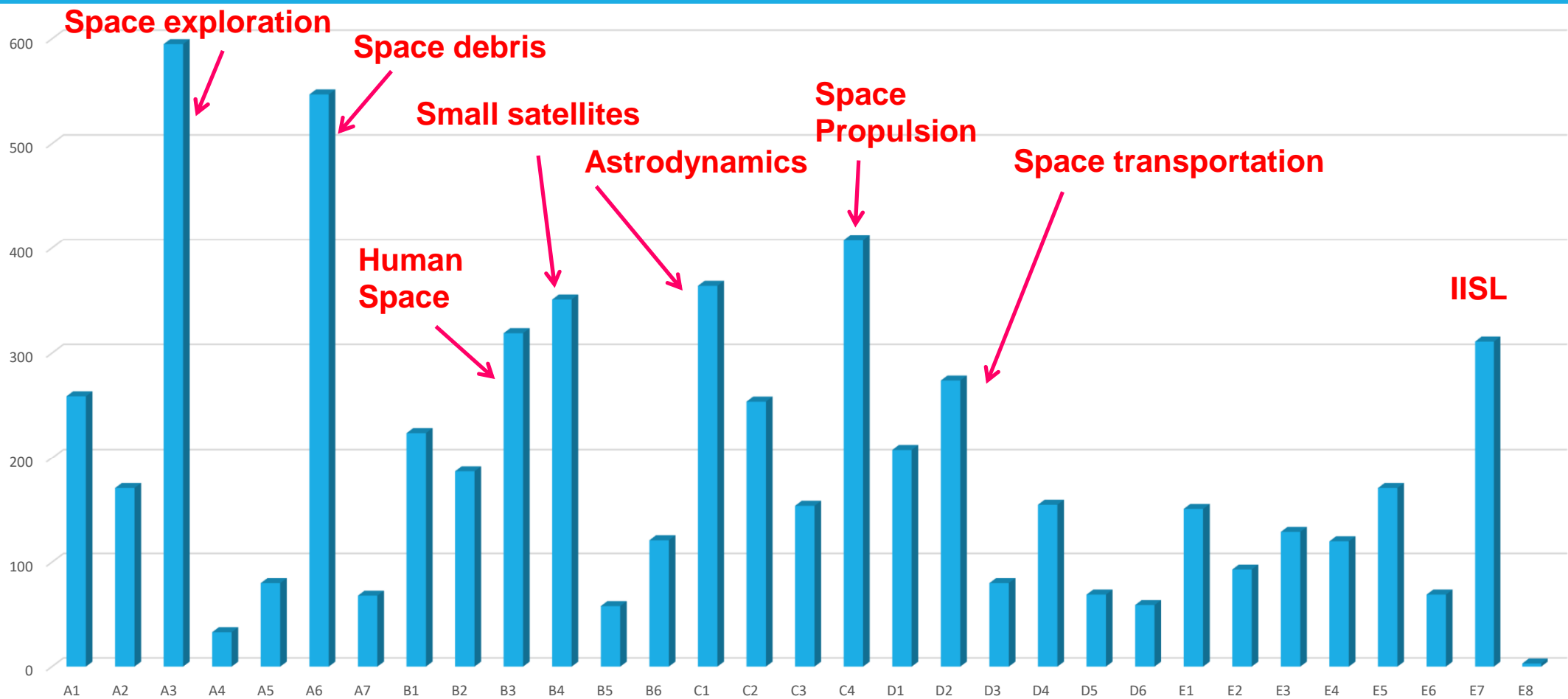
| TECHNICAL SESSIONS | Min Att | Max Att | Papers Sched | Papers Pres | Notified withdrawn | No Show | % Papers Present. | % Notified Withdrawn | % No Show |
|---|------------|------------|-----------------|----------------|-----------------------|------------|-------------------------|----------------------------|-----------------|
| A1. SPACE LIFE SCIENCES | 259 | 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 | 809 | 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% |



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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 Integrated Environment" | 44 | 69 | 12 | 12 | 0 | 0 | 100% | 0% | 0% |
| | TOTAL | 547 | 809 | 105 | 90 | 11 | 4 | 86% | 10% | 4% |

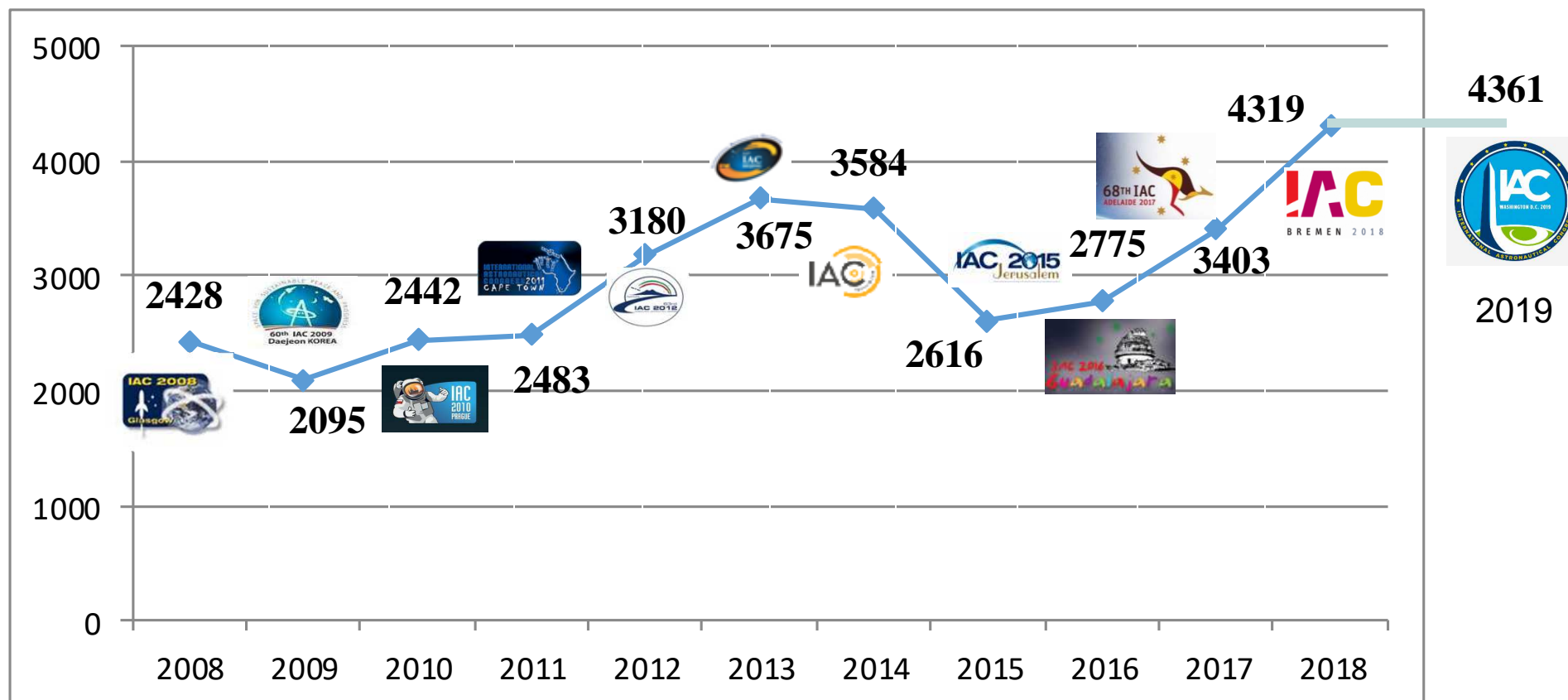
- Rather well equilibrated among sessions with A6.3 a bit weak
- Good attendance globally: average Max 81 per session, average Min 55 per session, average average 68 per session
- A6.8 is improvable, with high level of Withdrawn: potential redefinition to be discussed
- Fair success of the A6.10-C1.7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



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1.3 Washington IAC 2019

Number of IAC abstracts since 2008





70th INTERNATIONAL ASTRONAUTICAL CONGRESS
21-25 October 2019 | Washington, D.C.

Technical Sessions at a Glance



| Date | 21/10/2019 | 22/10/2019 | 22/10/2019 | 23/10/2019 | 23/10/2019 | 24/10/2019 | 24/10/2019 | 25/10/2019 | 25/10/2019 |
|--------------------|---------------|--------------|-------------|--------------|-------------|--------------|--------------|---------------|--------------|
| Time / Room Number | 15:00-18:00 | 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 |
| 146B | A3.1 | A3.2A | A3.2B | A3.3A | A3.3B | A3.4A | A3.5 | A3.2C | A3.4B |
| 146C | D2.1 | D2.2 | D2.3 | D2.4 | D2.5 | D2.6 | D2.7 | D2.8 / A5.4 | D2.9 / D6.2 |
| 150A | C1.1 | C1.2 | C1.3 | C1.4 | C1.5 | C1.6 | C1.7 | C1.8 | C1.9 |
| 150B | A6.1 | A6.2 | A6.3 | A6.4 | A6.5 | A6.6 | A6.7 | A6.8 | A6.9 |
| 151A | B3.1 | B3.2 | B3.3 | B3.4 / B6.4 | B3.5 | B3.6 / A5.3 | B3.7 | A6.10 / B4.10 | |
| 151B | B4.2 | B4.1 | B4.3 | B4.4 | B4.5 | B4.6A | B4.7 | B4.8 | B4.6B |
| 152A | B5.1 | E7.1 | E7.2 | E7.3 | E7.4 | E6.3 | | E7.5 | E7.7 |
| 152B | C2.1 | C2.2 | C2.3 | C2.4 | C2.5 | C2.6 | C2.7 | C2.8 | C2.9 |
| 143A | C4.1 | C4.3 | C4.5 | C4.2 | C4.6 | C4.7 / C3.5 | C4.8 / B4.5A | C4.9 | C4.10 |
| 143B | A1.1 | A1.2 | A1.3 | C4.4 | A1.4 | A1.5 | A1.6 | A1.7 | A1.8 |
| 143C | A2.1 | A4.1 | A4.2 | A2.2 | A2.3 | A2.4 | A2.5 | A2.6 | A2.7 |
| 145B | D1.1 | D1.2 | D1.3 | A5.1 | A5.2 | D1.4A | D1.4B | D1.5 | D1.6 |
| 147A | B1.1 | C3.1 | C3.2 | B1.2 | B1.3 | B1.4 | C3.3 | C3.4 | B1.5 |
| 144A | A7.1 | E3.1 | A7.2 | E3.2 | A7.3 | E3.3 | E3.4 | E6.4 | E3.6 |
| 145A | E5.1A | D5.1 | E5.2 | D5.2 | E5.3 | D5.3 | E5.4 | D5.4 | E5.1B / E5.5 |
| 147B | E4.1 | B2.8 / GTS.3 | E6.1 | E2.3 / GTS.4 | E4.2 | B4.9 / GTS.5 | E4.3 | B3.8 / GTS.2 | E6.5 / GTS.1 |
| 144C | E1.1 | E1.2 | E1.3 | E1.4 | E1.5 | E1.6 | E1.7 | B1.6 | E1.9 |
| 144B | D4.1 | D4.2 | D4.3 | D3.1 | D3.2A | D4.4 | D4.5 | D3.2B | D3.4 |
| 140B | B6.2 | E2.1 | E2.2 | E6.2 | E2.4 | B5.2 | B6.3 | B6.1 | B5.3 |
| 140A | B2.1 | D6.1 | B2.2 | B2.3 | B2.4 | B2.5 | B2.6 | B2.7 | D6.3 |
| ISZ | Not available | | | | | | | E1.8 | |
| 153 | | | | | | E.3.5 / E7.6 | | | |

Category A:
Science &
Exploration

A1--> A7

Category B:
Applications &
Operations

B1--> B6

Category C:
Technology

C1--> C4

Category D:
Infrastructure

D1--> D6

Category E:
Space & Society

E1--> E8



70th INTERNATIONAL ASTRONAUTICAL CONGRESS
21-25 October 2019 | Washington, D.C.



AIAA
SHAPING THE FUTURE OF AEROSPACE

Abstract Status



- Abstracts in total: **4361**
- Abstracts accepted: **2507**
2122 Oral Presentations
382 Interactive Presentations
- Abstracts rejected: **1554**



- Papers uploaded: **1798**
1676 Oral Papers
122 Interactive Papers
- Interactive Presentations submitted: **240+**

- Confirmed presentations: **2139**
- Withdrawn presentations: **324**
- Unconfirmed: **44**



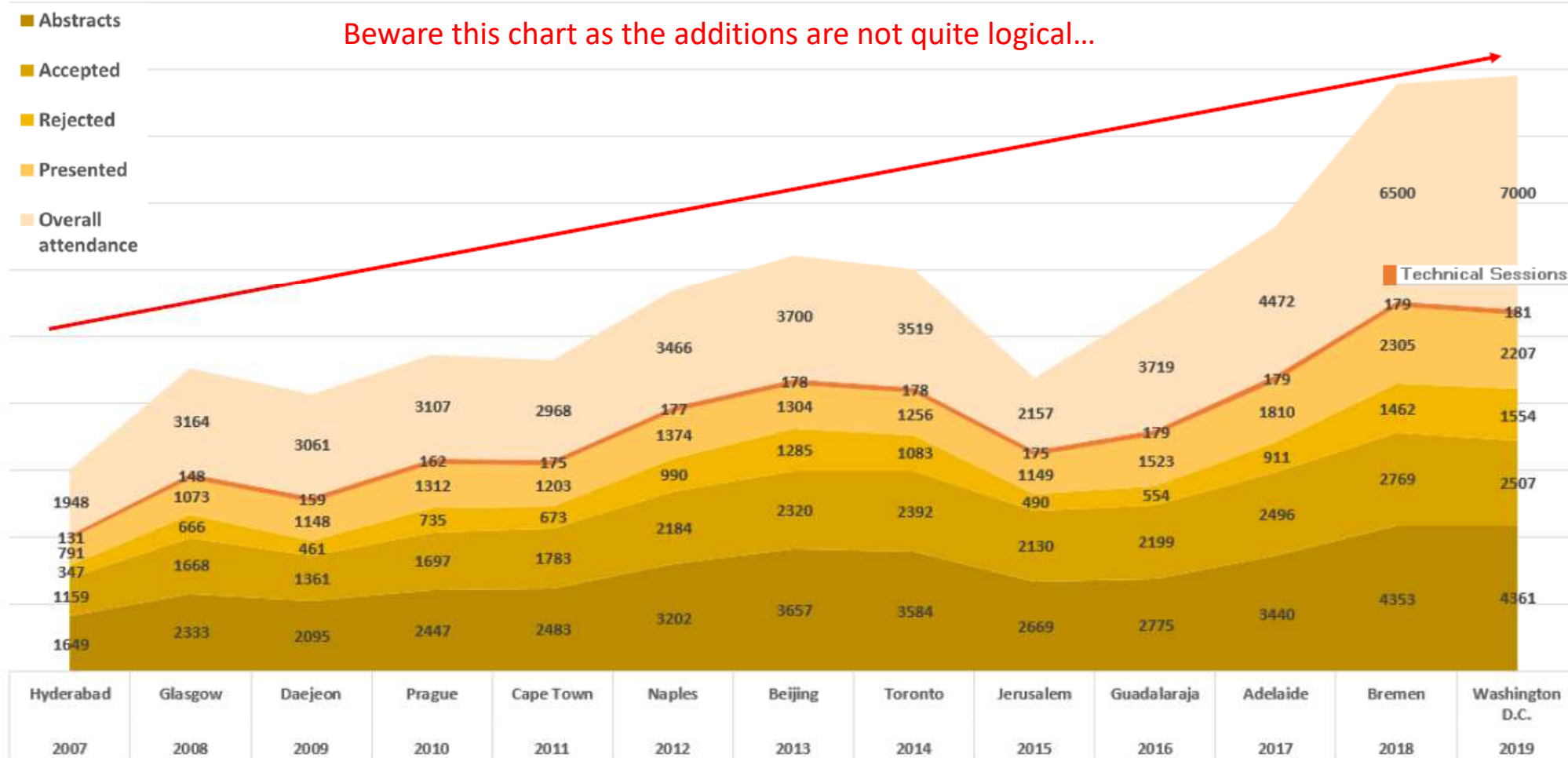
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AIAA
SHAPING THE FUTURE OF AEROSPACE

Technical Sessions Evolution

Beware this chart as the additions are not quite logical...



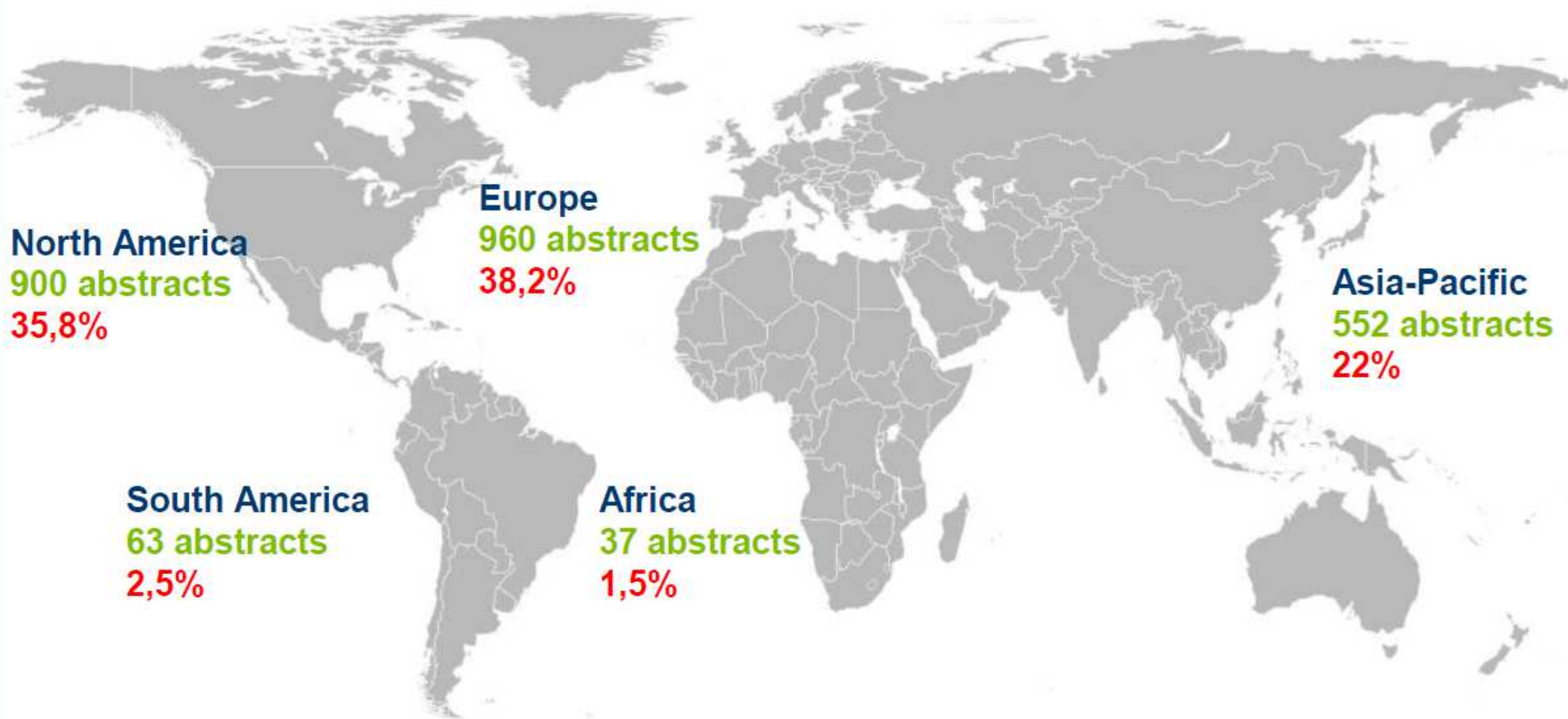


70th INTERNATIONAL ASTRONAUTICAL CONGRESS

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Accepted Abstracts Regional Group Distribution

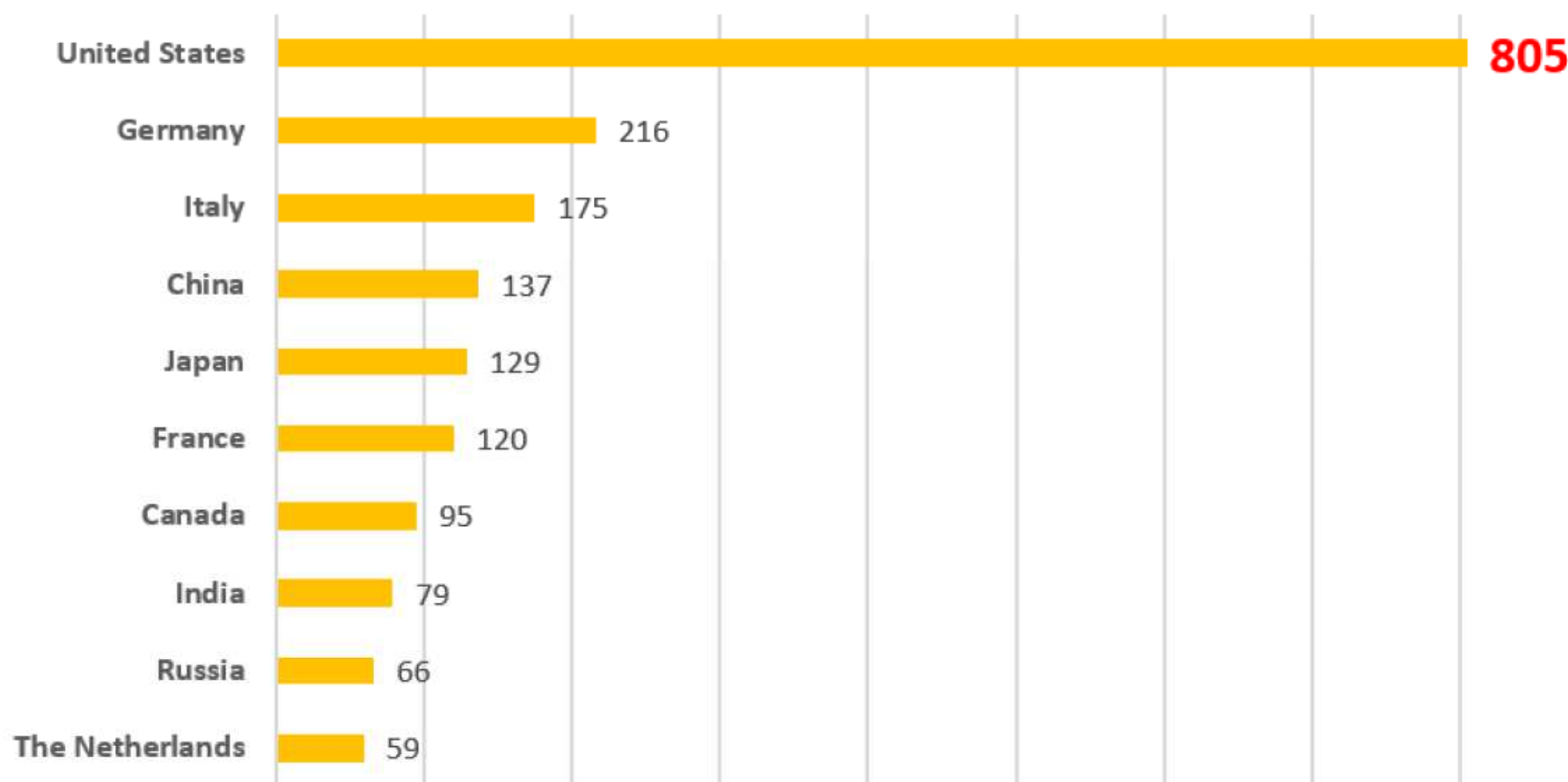




70th INTERNATIONAL ASTRONAUTICAL CONGRESS
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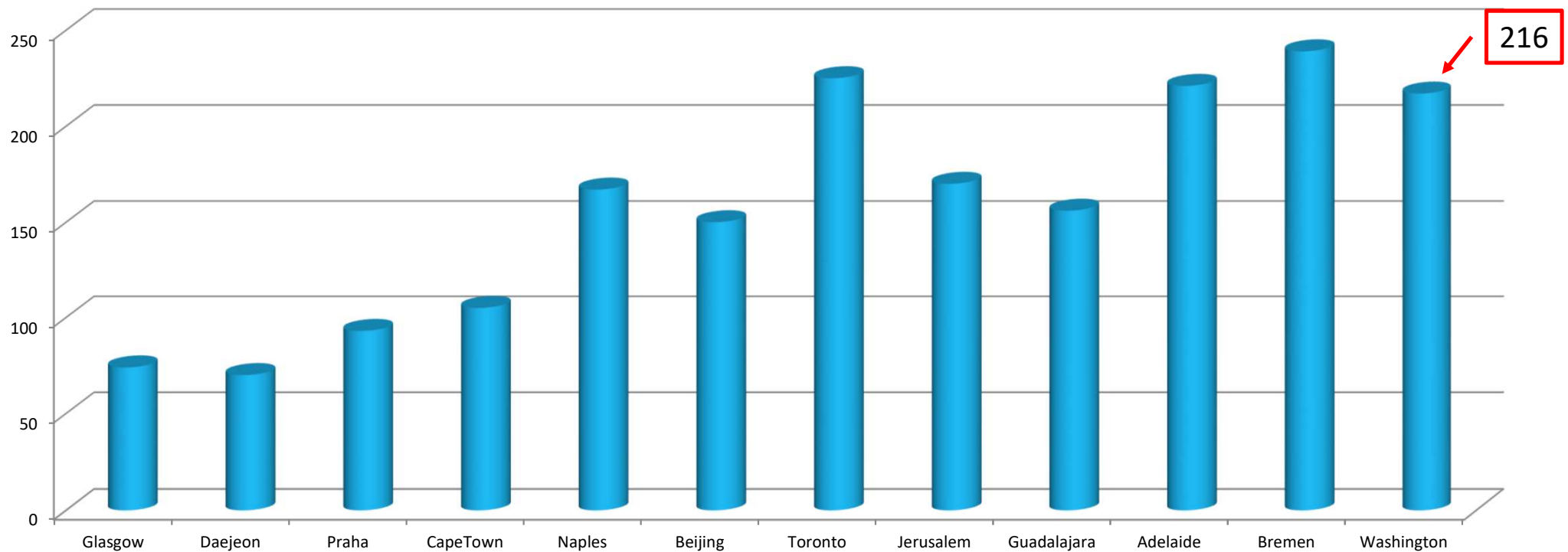


Accepted Abstracts by Country (Top 10)



1.3 Washington IAC 2019

Number of abstracts, Space Debris Symposium, since 2008



1.3 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



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1.3 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 – Dolado-Perez

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: 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 – 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.



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

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 –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: Kerr – Rossettini – 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: Francillout – 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.



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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

Sanchez-Ortiz – Klinkrad

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

McKnight – Skinner

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, Kerr – Le May – Santoni – Opromolla – Bonnal



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A6: Space Debris Symposium Number of Abstracts

Total number of abstracts: Submitted – Selected – Withdrawn - Uploaded: 172 = 104 – 5 – 93

Including IPs: 214 – 126 – 8 – 105

A6.1: Space Debris Detection, Tracking and Characterization: 23 – 10 – 1 – 9

A6.2: Modelling and Risk Analysis: 17 – 12 – 1 – 11

A6.3: Impact-Induced Mission Effects and Risk Assessments: 13 – 11 – 1 – 8

A6.4: Mitigation and Standards : status, lessons learnt and future with smallsats and constellations: 18 – 10 – 1 – 8

A6.5: Post Mission Disposal and Space Debris Removal (1): 19 – 10 – 0 – 10

A6.6: Post Mission Disposal and Space Debris Removal (2): 17 – 10 – 0 – 10

A6.7: Operations in Space Debris Environment, Situational Awareness: 23 – 10 – 0 – 8

A6.8 (joint with Space Security Committee): Political, Legal, Institutional and Economic Aspects of Space Debris Mitigation and Removal: 16 – 12 – 0 – 12

A6.9: Orbit Determination and Propagation: 12 – 10 – 1 – 9

A6.10/B4.10: Joint Small Satellite/Space Debris Session to promote the long-term sustainability of space : 14 – 9 – 0 – 8

A6.IP: Interactive Presentations: 42 – 22 – 3 – 12



1.4 Washington IAC 2019

Recall of a few basic rules

- ⇒ **No paper, no show:**
 - Check that the paper is effectively loaded before the session
- ⇒ **No show, no paper:**
 - If the author doesn't present, the paper will be removed from proceedings
- ⇒ **Status of the presenters:**
 - Are we sure the authors will show up ?
 - Do we have their short bios ?
 - Try to contact them and ask to come 15' in advance to check that everything is OK, Powerpoint, Videos...
- ⇒ **Timing may be critical !**
 - Please, do not overpass the standard 3 hours, except if there is nothing after
 - Have clear rules explained to speakers in advance
 - Keep time for Q&A
 - ↳ **What do we do in case of a hole in the session: decision of the chairs and rapporteur**
- ⇒ **The synthesis session sheets shall be given back to IAF secretariat, but please keep a copy and send it to JC, Heiner and me, or just hand them directly to me**

Guidelines for Chairs and Rapporteurs of Technical Sessions

GENERAL GUIDELINES

- Session Chairs and Rapporteurs are members of the International Programme Committee and must register to attend the IAC.
- Session Chairs and Rapporteurs are responsible for contacting presenting authors prior to the congress, managing session time, introducing speakers, limiting presentations to the allotted time, and allowing time for questions and answers.
- Traditional Technical Sessions are 180 minutes in length and involve oral presentations focused on specific topics and are designed to share information with Q&A.
- Technical Sessions have audiovisual equipment available, consisting of a laptop computer, LCD panel, screen, and the appropriate sound equipment for room size.
- Technical Sessions do not have telephone conferencing equipment, telephone lines, or internet lines available.

14 IMPORTANT DATES

Paper submission: 17 September
Presentation submission: 24 September

QUESTIONS

Contact the IAF Secretariat at iafsecretariat@iaf-aeronautics.org if you have questions that are not addressed in the guidelines or the IAF website.



PRESENTATION TIME

In order to respect presenters and the audience, all presentations must not exceed their allotted timeslides.

Presenting author presentation times will vary depending on the session. Presentation times can be accessed through the IAF App and the IAF Restricted Area.

BEFORE THE CONGRESS



Review. Access your IAF Restricted Area to review the session details, including presentation titles, presenting authors, and abstract information.



Confirm. Approximately three to four weeks prior to the congress, moderators need to contact presenting authors to discuss the session and coordinate presentations. If a presenting author cannot attend, inform the IAF Secretariat staff immediately.



Remind. Presenting authors must upload presentation slides online at www.iafaeronautics.org by the advance on 24 September, by 11:59 PM. After the advance deadline, presentations may only be uploaded or updated online in the speaker preparation room no later than 15 minutes prior to the start of your session.



BEFORE THE SESSION STARTS

- Session Chairs and Rapporteurs need to pick-up their Session folder at the IAF Secretariat office. The Session folder contains guidelines, paper scoring sheet, attendance sheet, Acta Astronautica Form and other helpful information.
- Arrive at your designated session room 15 minutes prior to the scheduled session to meet presenting authors.
- The computer in your room will be preloaded with presentations submitted online by the advance deadline and all presentations uploaded or updated in the speaker preparation room 15 minutes before the start of your session.
- Encourage presenting authors to sit at the front of the room for quick transitions.
- Ask the technical to show you how to use the timer device with presenting authors that will indicate a presentation should conclude.
- Prepare emergency questions. If there are no questions from the audience, most speakers will appreciate if the chair asks a question. You can also ask the speakers directly if there are any questions that they would like to receive after their talk.
- If you need a technician onsite, you can seek assistance at the speaker preparation room.

DURING THE SESSION



Start the session on time. This is extremely important to ensure each presenting author has time for the presentation as well as questions and answers with the audience.



Encourage attendees to sit in seating and ask that cell phones are silenced.



Presenting authors should present in the order listed in the agenda. If a presenter is a no-show readjust the order accordingly and allow other presenting authors more time or promote discussion at the end of the presentations.



Keep presenting authors on time. If a presenter author is going over time, then stand next to the person as yet another visual cue. If this doesn't work, it is perfectly acceptable and respectful to other presenting authors, to interrupt the presenting author. You may say something to the effect that you have to cut such an interesting presentation short, but in fairness to the other presenting authors, you must.



If an attendee is being disruptive, ask that questions/comments be held until the end so that the session does not fall behind time.



End the session on time. Close the session by thanking presenting authors and encouraging attendees to complete a session evaluation on the IAF App.

REGISTRATION & WITHDRAWALS

- All Session Chairs and Rapporteurs are expected to register for the congress and pay related fees.
- If you can no longer moderate a session, then contact your Symposium Coordinators immediately so we can find a replacement. Technical Session Information can be found [here](#) and on the IAF App. Any attempts to locate a replacement moderator will be greatly appreciated.

AFTER THE SESSION

Verbally Thank Presenting Authors.

Share Feedback about the session with your Symposium Coordinators.

Complete the Session Folder and leave it at the IAF Secretariat Office.



1.4 Washington IAC 2019

IAA Rapporteur Guidelines

The rapporteur should report the main concepts and results given by the speakers, and keep track of the questions and answers of the symposium / conference.

The rapporteur report is a short synthesis report (typically 1 page) with the most significant conclusions of the session, in terms of ideas, concepts, results, scientific questions and problems, debates, etc.

The rapporteur should read the papers before the day of the conference / session. During each presentation, the rapporteur should extract the most significant information, and should look carefully at information which is given during the presentation but which was not written in the paper. This occurs frequently, as new results have been obtained by the authors between the time they wrote the paper for the conference proceedings and the time of the presentation.

The report should be based on the papers, on the presentations and on the track of the questions and answers, but should focus only on the main elements, and not report all details. The aim of the report is to highlight and consider the main themes, issues and discussion points rather than to just summarize the proceedings.



1.4 Washington IAC 2019

A session report must be prepared within one or two weeks after the event. The report should include:

1. Title of the session or conference, dates and venue
2. Names of the chairs attending the event
3. Agenda / program of the event
4. Main scientific questions and problems (key issues, significant new data and results, new knowledge, new contributions, possible conflicts between data, doubts, interpretation, etc.)
5. Priorities and recommendations (the rapporteur may add some personal conclusions but they shall clearly appear as such).

Reports to be sent to J-C or me who will do the concatenation of all sessions

1.4 Washington IAC 2019

Session synthesis sheet

| Order | Title | Speaker | Presentation Type & Length | Presentation Confirmed | Withdrawal | No-Show | Paper uploaded | Presentation uploaded | Manuscript evaluation | Presentation evaluation |
|-------|---|----------------------|-------------------------------|---------------------------|------------|---------|-------------------|--------------------------|--------------------------|----------------------------|
| 1 | configuration schemes of active spacecrafts for reorbiting large size space debris | Dr. Georgy Shcheglov | | | | | | | | |
| 2 | How on Orbit Fueling Supports the Deorbit Tug Business Case | Mr. Jeremy Schiel | | | | | | | | |
| 3 | Space Station Concept for Active Debris Removal Applying EcoDesign Principles | Mr. Moacir Becker | | | | | | | | |
| 4 | ReDSHIFT disposal module for the design of end-of-life disposal trajectories for LEO to GEO missions | Dr. Camilla Colombo | | | | | | | | |
| 5 | Modular and Low Cost Expansion Resistance Increasing de-Orbiting Device for small Satellite and large constellation | Prof. Zizheng Gong | | | | | | | | |
| 6 | In-orbit Performance of Deorbiting Sails | Dr. Ben Taylor | | | | | | | | |

- Please prepare a bit in advance
- Evaluations (2 last columns) are not important; inform us only in case of very bad oral presentation



INTERNATIONAL ASTRONAUTICAL FEDERATION

Technical Session's Report

70th International Astronautical Congress
21–25 October 2019, Washington, D.C., USA

Session A6.7 Operations in Space Debris Environment, Situational Awareness

Co-Chairs T.S. Kelso
Noelia Sanchez Ortiz

Rapporteur(s) Vincent Martinot

Date 24/10/2019

Time 14:45

Session Room 1508

Start **Middle** **End**

Session Attendance: _____

Date: _____

Signature(s): _____



INTERNATIONAL ASTRONAUTICAL FEDERATION

Comments:





1.4 Washington IAC 2019

Specific case of the Interactive Presentations

⇒ **16 currently planned**

Spread over 2 screens

Screen # 7: A6.IP.1, 2, 4, 5, 6, 7, 8, 9

Screen #8: A6.IP.10, 11, 12, 13, 18, 20, 21, 22

Session length is 90 minutes, 13:15 – 14:45

Each IP lasts 10 minutes

⇒ **We need one chair per screen during the complete session to manage transitions, Q&A, solve problems...**

Not necessarily the same chair. Could be 30 - 40 minutes slot as in Bremen

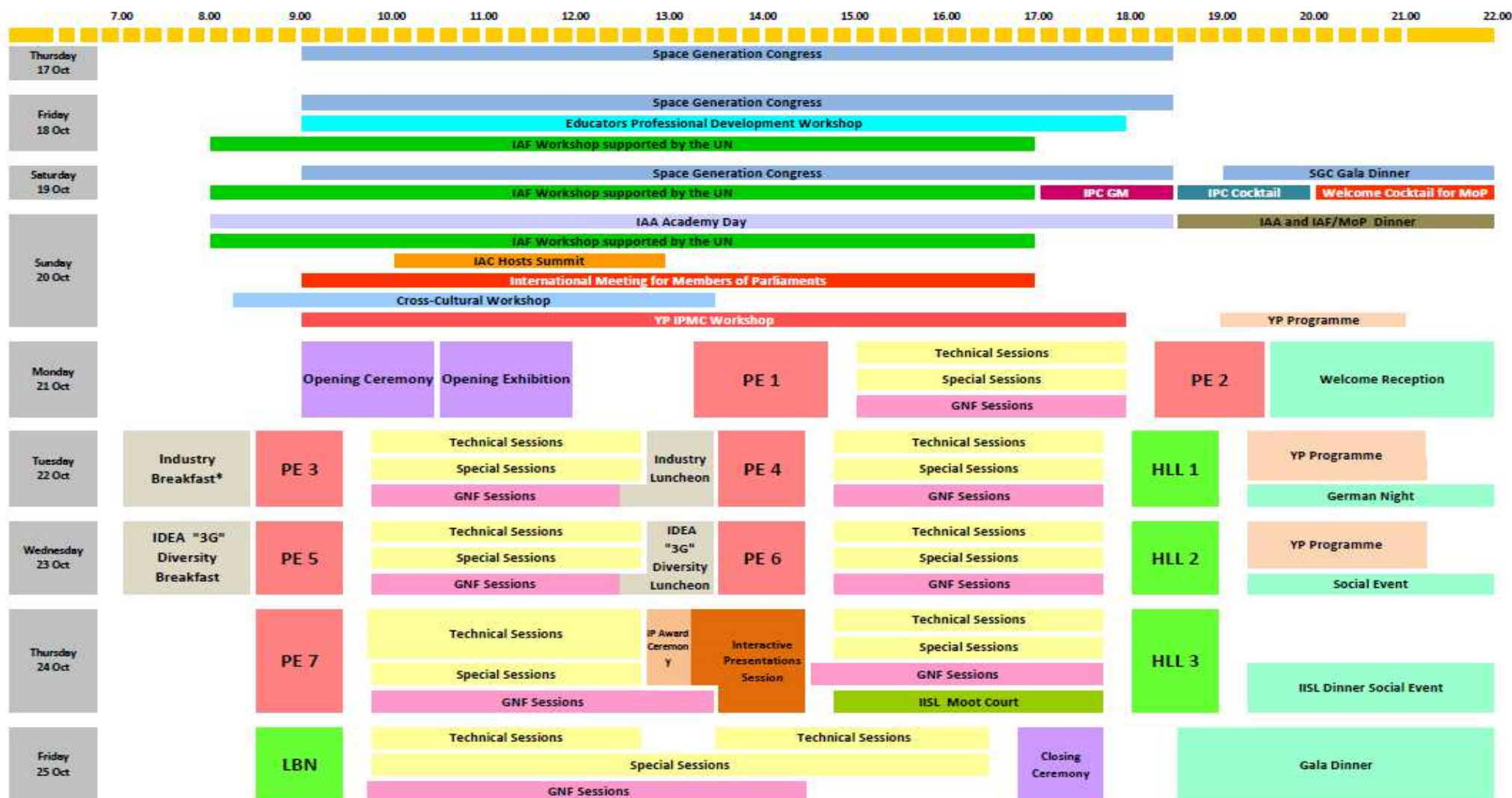
Dedicated report to fill as for the other sessions

👉 **Volunteers ? Thank you to Emma, Samantha, Roberto and Fabio**



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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



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1.4 Washington IAC 2019

General organization, for information

1. Plenary Events PE



PE1: Heads of Space Agencies: Challenges and Opportunities in a Changing Space Environment

PE2: Host Plenary: Evolving Apollo: The Next 50 Years in Human Spaceflight

PE3: The Long-Term Sustainability of Outer Space: Advancing the Space Economy and Sustaining Space Industry Through Solutions to Space Security Issue

PE4: Inspiring by Leading: Building and Sustaining the Global Space Workforce for the Future

PE5: Heads of Emerging Agencies

PE6: Europa Clipper: Making a Mission to Understand Our Place in the Universe

PE7: 10th Anniversary Next Generation Plenary: “Harnessing Citizen Science for the Future of Earth Observation”



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General organization, for information

2. Highlight Lectures HLL



HLL1: MARSIS: The Successful Search for Liquid Water on Mars

HLL2: The Challenge of Exploring Our Sun – the 60-Year Odyssey to Parker Solar Probe

HLL3: Monitoring Coastal Waters from Space – Highlighting the Chesapeake Bay Region – Dramatic Advances Enable Better Understanding and Protection of these Vital Ecosystems, and their Immense Coastal Populations and Infrastructure

3. Late Breaking News LBN



LBN1: OSIRIS-REx Dancing with Asteroid Bennu

LBN2: Introduction to the United Arab Emirates Astronauts Program



1.4 Washington IAC 2019

General organization

4. Special Sessions

19 Special Sessions

You may note this one



IAC 2019 SPECIAL SESSIONS (SpS)

| | | | | | | | | | | 10.00 | 11.00 | 12.00 | 13.00 | 14.00 | 15.00 | 16.00 | 17.00 | 18.00 | | | | | | | | | | |
|----------------------------|--|---|--|-----------------------|---|--|-----------------------|---|--|-----------------------|--|---|---|-------|-----------------------|--|-----------------------|--|---|--|--|------|------|--|--|--|--|--|
| MONDAY 21 OCTOBER | | | | | | | | | | | | Get ready to protect Earth from asteroids - Planetary Defense in your hands | | | | | B R E A K | ISS-Moon-Mars: Using spaceflight platforms to study and simulate future missions | | | | | 146A | | | | | |
| TUESDAY 22 OCTOBER | | Home Planet 2030 – The Role of Earth Observations in Studying Our Planet | | B R E A K | Global Launch SpaceBuzz: Launching Millions of Children into Space | | B R E A K | Life's Journey Through the Universe | | | | | | | | EO+AI - The Game Changer in the Way We See the World | | B R E A K | Artificial Intelligent in Space: Are Intelligent Space Objects the Promise of the Future? | | | 146A | | | | | | |
| WEDNESDAY 23 OCTOBER | | Space Traffic Management: Working Together to Enhance Safety and Sustainability | | B R E A K | Futures Past and Present: Space Architecture in Imagination and Reality | | | | | | | | Young minds meet space leaders: words into action | | B R E A K | The future of space operations across industries | | | 146A | | | | | | | | | |
| THURSDAY 24 OCTOBER | | The Immortal Spaceship: A discussion on the use cases and value of persistent platforms | | B R E A K | Planetary Protection for the Future: Science, Exploration, and Commerce | | | | | | | | Using Open Space Data in Developing Countries | | B R E A K | Space Applications of Machine Learning and Artificial Intelligence | | | 146A | | | | | | | | | |
| FRIDAY 25 OCTOBER | | Atomic Test Masses and Atom Interferometry for Inertial Sensing and Gravity Measurements in Space | | B R E A K | Launch Tower Not Necessary: Could Responsive Launch Revolutionize Spaceport Infrastructure Needs? | | B R E A K | Transforming Future Mission Design Through In-Space Manufacturing | | B R E A K | Interstellar Probe: Humanity's First Deliberate Step into the Galaxy by 2030 | | | | | | | | 146A | | | | | | | | | |



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1.4 Washington IAC 2019

General organization, for information

5. Global Networking Forum GNF

50 GNF !

Complete program on the IAF website



You may note:

Space Traffic Management is Needed Now! IAA, IISL, and IAF Join Their Forces to Propose Long Term Sustainability of Space Operations

Thursday 24 October 2019, 10:45 – 11:35

Grand Ballroom A

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. Rossettini [C] C. Cazaux [R] | T. Yasaka D. McKnight C. Bonnal |
| 69th | 2018 | Bremen | F. DiPentino [C] T. Schildknecht [C] V. Agapov [R] | L. Anselmo [C] D. Oltrogge [C] M. Sorge [R] | N. Fitz Coy [C] F. Schaefer [C] D. McKnight [R] | H. Krag [C] P. Omalý [C] Y. Usovik [R] | F. Piergentili [C] B. Bastida-Virgili [C] F. Santoni [R] | N. Berend [C] B. Singh [C] L. Rossettini [R] | C Wiedemann [C] T.S. Kelso [C] J-C. Dolado-Perez [R] | D. Spencer [C] S. Lemay [R] | S. Kibe [C] H. Lewis [C] H. Klinkrad [R] | M. Jah [C] Anilkumar [C] Kitazawa [R] | T. Yasaka D. McKnight C. Bonnal |
| 69th | 2019 | Washington | M. Skinner [C] T. Schildknecht [C] V. Agapov [R] | M. Sorge [C] C. Pardini [C] D. Oltrogge [R] | JC Traineau [C] M. Jah [C] N. Fitz Coy [R] | H. Krag [C] S. Kawamoto [C] P. Omalý [R] | F. Santoni [C] A. Nassisi [C] L. Francillout [R] | L. Rossettini [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-Perez [R] 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...😊



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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: Pardini – 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: Kerr – Gong – Traineau

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.



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1.5. Space Debris Symposium for Dubai 2020

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



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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 – Santoni

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

From SDC: McKnight – Tung – Fitz-Coy – Anilkumar – From SO: Auburn

This session 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, Yasaka – McKnight – Jankovic – Bonnal



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1.5. Space Debris Symposium for Dubai 2020

- ***Any ideas for Dubai 2020***
 - Keynote lecture (Joseph P. Loftus Jr. Keynote Lecture) at the beginning of one of our sessions
 - Principle is decided and agreed by family
 - Refer to exchange with John Loftus (son of...) in Appendix 2
 - Any proposal for this first one? Duration ?



**International
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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

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

- AMOS: see Appendix 3
- COPUOS: see Appendix 4
- KEPASSA: see Appendix 5
- ICSSA Past and Future: see Appendix 6
- Anomalies and Failures: see Appendix 7
- ISO: see Appendix 8



2. Exchanges

2.2. Upcoming events

- End of Life workshop: see Appendix 9
- IAA/UT Space Traffic Management (STM) conference
CALL FOR PAPERS: IAA/UT Space Traffic Management (STM) conference, to be held at The University of Texas at Austin on February 19th and 20th of 2020. It's where space science, technology, policy, law, anthropology, etc.
Become one...the annual "Hogwarts" meeting of STM! <https://iaaweb.org/content/view/787/1037/>
- IADC 2020 (for information only, restricted participation): see Appendix 10
- IOC NASA





2. Exchanges

2.2. Upcoming events (ctd)

- CREAM: see Appendix 11
- ESA Reentry Workshop: see Appendix 12
- 6th Workshop on Space Debris Modeling & Remediation
CNES HQ – June 15-17 2020 – Please contact Juan-Carlos or Christophe
- IAASS: see Appendix 13

2.3. New achievements

- Updates on Centaur fragmentations: see Appendix 14
- SSA/STM/SEM: see Appendix 15
- Space Safety Coalition: see Appendix 16
- Mega constellations and Astronomy: see Appendix 17



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Agenda

3. IAA Study Groups (Wednesday 27 March 2019)

3.1 SG 5.17 IAA Situation Report on Space Debris – 2019



3. IAA Study Groups

| IAA Study Groups as of October 17, 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 | | | | | | | | | | | | | | | |
| 1.9 | Satellite remote sensing of aerosols in the Earth atmosphere | Yatskiv/Milinevsky | | | | | | | | | | | | | 09-status report received |
| 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 | | | | | | | | | | | | | 07-status report received |
| 1.15 | International Cooperation on Space Weather | McKenna-Lawlor | | | | | | | | | | | | | |
| Commission 2 | | | | | | | | | | | | | | | |
| 2.12 | Effectiveness of physiological countermeasures for spaceflight | Charles/Kozlovskaya/Norsk | | | | | | | | | | | | | 03- Commission pre-review |
| 2.14 | Medical Support for an International Human Expedition to Mars | Orlov/Doarn/Kussmaul | | | | | | | | | | | | | 09-status report received |
| 2.15 | Immersion Model: Importance for Space Life Sciences Studies | Mano/Tomilovskaya | | | | | | | | | | | | | |
| 2.17 | Dynamic Assessment and Management of Astronauts' Performance | Haignere / Prunariu | | | | | | | | | | | | | 03-new study group |
| 2.18 | Sleeping Brain in Space and Analog Environments | Kourtidou/Bamidis | | | | | | | | | | | | | |
| Commission 3 | | | | | | | | | | | | | | | |
| 3.19 | Feasibility study of Standardized Career Dose Limits in Low Earth Orbit | McKenna-Lawlor | | | | | | | | | | | | | |
| 3.21 | Space Disposal of Radioactive Waste | Degtyarev | | | | | | | | | | | | | |
| 3.22 | Next-Generation Space System Development Basing on Commercial Space | Razoumny/Agrawal/Ji Simei | | | | | | | | | | | | | |
| 3.24 | Road to Space Elevator Era | Tsuchida/Raitt/Swan/Takahashi | | | | | | | | | | | | | 03- BOT approval |
| 3.25 | The Maintainability and Supportability of Deep Space Missions | Yang Hong/Zhang Dapeng | | | | | | | | | | | | | 10-status report received |
| 3.26 | Space Mineral Resources #2 | Dula/Zhang Z./Lenard | | | | | | | | | | | | | 10-status report received |
| 3.27 | Towards the utilization of the Moon, Preparing for Mars Exploration | Genta/Ventskovsky | | | | | | | | | | | | | 10-status report received |
| 3.28 | Strategy of Low Cost and Large Scale Access to Space in the 21st Century | Lu Yu/Reibaldi | | | | | | | | | | | | | 07-status report received |
| 3.29 | Strategy and Feasibility Assessment of Collision Protection in Space | Bao Weimin | | | | | | | | | | | | | |
| 3.30 | Space and its Utility in Forecasting Climate Change | Lenard | | | | | | | | | | | | | 10-status report received |
| 3.31 | Solar Energy from Space: a Decadal Revisit to the first International Space Station | Mankins | | | | | | | | | | | | | 02-Membership list TBC |
| 3.32 | Autonomous Dynamic Trajectory Optimal Control of Launch | Zhengyu Song | | | | | | | | | | | | | 10-status report received |



3. IAA Study Groups

| IAA Study Groups as of October 17, 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 |
| 3.33 | The Space Transportation System of Human Mars Exploration | Wang Xiaojun/Wang Xiaowei | | | | | | | | | | | | | 07-status report received |
| | Commission 4 | | | | | | | | | | | | | | |
| 4.17 | Space Systems for Biomedical Research | Cappelletti/Graziani/Massimiani | | | | | | | | | | | | | |
| 4.19 | Promoting Global Space Knowledge & Expertise in Development | Horikawa/Coradini | | | | | | | | | | | | | |
| 4.20 | Space Information Application in Earthquake Emergency | Bao Weimin/Contant | | | | | | | | | | | | | |
| 4.21 | Distributed, Networked, Smart, Cooperating Small Satellites | Belokonov/Schilling | | | | | | | | | | | | | |
| 4.22 | Through Optimization of Aerospace Trajectories | Teofilatto/Filatyeu | | | | | | | | | | | | | |
| 4.23 | A Handbook for Post-Mission Disposal of Satellites Less Than 1000 kg | McKnight/Hanada/da Silva/Martinez | | | | | | | | | | | | | 06-e-version available |
| 4.24 | Disseminating knowledge and experiences of satellite applications | Mugellesi-Dow | | | | | | | | | | | | | |
| 4.25 | Global Satellite Data Sharing Mechanism | Xue Huifeng | | | | | | | | | | | | | 03-new study group |
| 4.26 | Cubesat Interface | Cho Mengu | | | | | | | | | | | | | 09- new study group |
| | Commission 5 | | | | | | | | | | | | | | |
| 5.10 | Orbital Debris Removal: Policy, Legal, Political and Economic | Williamson/Smith LJ | | | | | | | | | | | | | 10-status report received |
| 5.12 | Dynamics of Space Exploration Strategies and Future Outlook | Ehrenfreund/Peter | | | | | | | | | | | | | 02- Pending |
| 5.13 | Space Systems as Critical Infrastructure | Piso/Jivanescu/Neagu | | | | | | | | | | | | | 02- SAC & BOT approval |
| 5.16 | International Legal and Policy Regimes for Space Natural Resources | Liu Jizhong / Impallomeni | | | | | | | | | | | | | 10-status report received |
| 5.17 | Space Debris Situation Report - 2019 | Bonnal/McKnight | | | | | | | | | | | | | 07-status report received |
| 5.18 | Space and disasters management: new systems, new uses | Denis/Jorgenson | | | | | | | | | | | | | 08-new study group |
| | Commission 6 | | | | | | | | | | | | | | |
| 6.16 | STEM/STEAM for Space - Grand Challenges | Regel/Harris | | | | | | | | | | | | | 10-status report received |
| 6.17 | Multicultural foundations and influences of human space exploration | Arnould/Laidet | | | | | | | | | | | | | 03-new study group |
| 6.19 | Apollo 11 Landing Anniversary | Liepack/Lieberman | | | | | | | | | | | | | 07-status report received |



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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 2021, 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

First Draft was expected by September 2019, but globally late

Updated table of contents: see Appendix 18

Not enough time to deal with it today...