International Academy of Astronautics

IAA Space Debris Committee

October 9th, 2020

International Academy of Astronautics

Agenda

1. IAC
   1.1. IAA Space Debris Committee
   1.2. Lessons learned from Washington 2019
   1.3. Status of Space Debris Symposium for Cyber IAC 2020
   1.4. Preparation of Space Debris Symposium for Dubai 2021

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

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Agenda

1. IAC
   1.1. IAA Space Debris Committee
   1.2. Lessons learned from Washington 2019
   1.3. Status of Space Debris Symposium for Cyber IAC 2020
   1.4. Preparation of Space Debris Symposium for Dubai 2021

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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, …)

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1. IAA Space Debris Committee

Membership:

No need to be member of IAA !

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

However, it is requested to be somehow "active":

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

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

Two meetings per year:

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

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1. IAA Space Debris Committee

Current official membership (as per web site):

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

Chairs:

Klinkrad Heiner
Liou Jer-Chyi
Bonnal Christophe

To be removed: ?

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

New members:

Bevilacqua Riccardo
Dasgupta Upasana (elected in 2018)
Martinez Peter

Invitations have been sent by IAA
Don't forget to answer!

Synthesis:

73 members

Please send your name today for the list of participants

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

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1. IAA Space Debris Committee

Election of the chairs:

Currently 3 chairs, but only 2 coordinators of A6 Symposium
No precise respective roles
Will be reduced to 2, potentially with a Secretary
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 for Spring Meeting 2021
Potential election of one chair for 4 years, every 2 years
First election in October 2021 in Dubai to replace one of the chairs: please inform us if you wish to candidate
Potential re-election once for a departing chair
Voters are limited to members of Space Debris Committee
If possible, not two chairs from the same geographic region
Transparent process with secret ballots
Confirmed by IAA that candidates shall be Full or Corresponding Members of IAA

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

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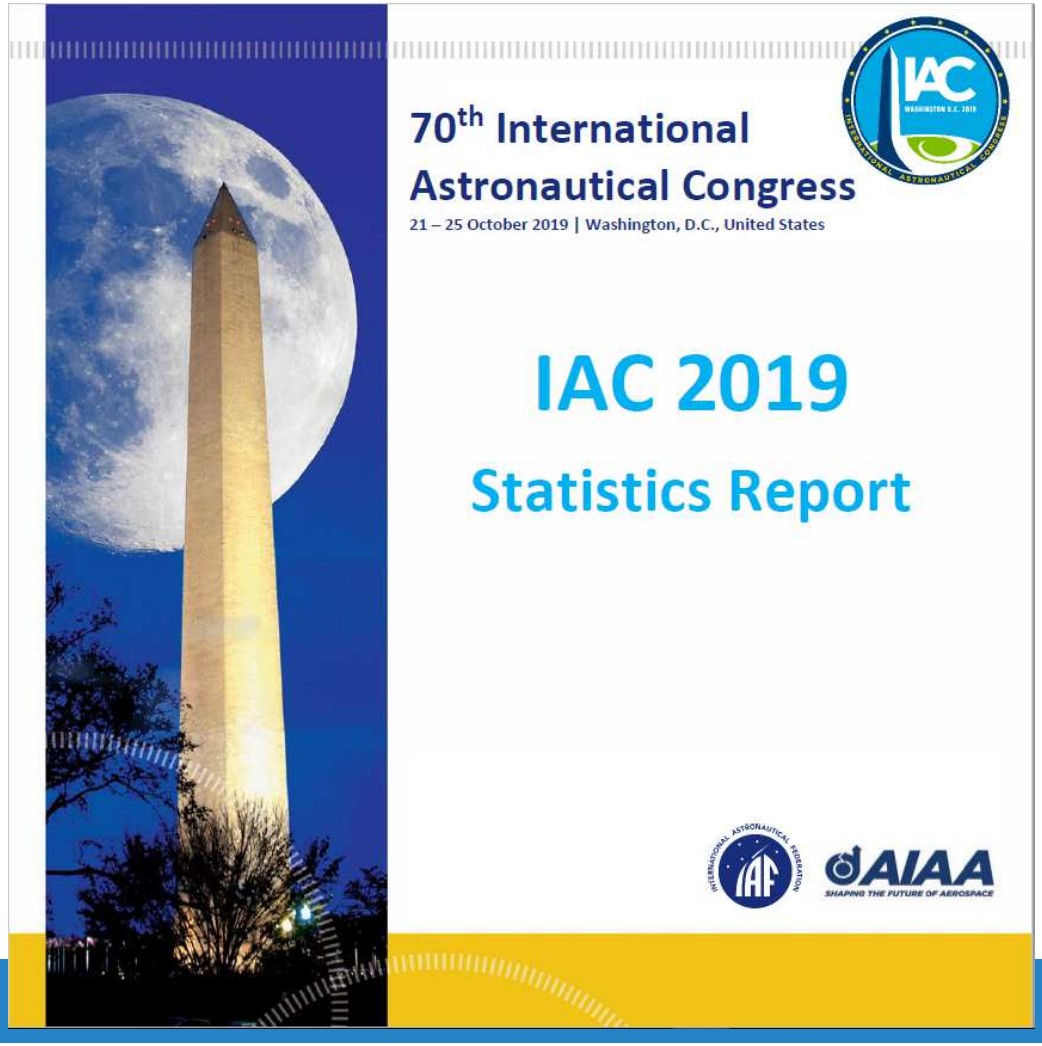
1.2 Feedback from Washington IAC 2019

General statistics prepared by IAF secretariat



See Appendix 2.

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1.2 Feedback from Washington IAC 2019

General statistics prepared by IAF secretariat

14 Press Conferences

6949 Delegates

7 Plenaries

+ 1200 General Public

1 Billion #IAC2019 Users

272 Exhibitors

52 IAF GNF Sessions

181 Technical Sessions

+1800 Technical Papers

80 Countries

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1.2 Feedback from Washington IAC 2019

General statistics prepared by IAF secretariat

Technical Programme

Technical Programme Abstracts

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

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

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

Accepted = 57% (Submitted)
Confirmed = 85% (Accepted)
Uploaded = 72%(Accepted)

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1.2 Feedback from Washington IAC 2019

#2 on min attendance

A6: Good scores among top 5

TECHNICAL SESSIONS	Min Att	Max Att	Papers Sched	Papers Pres	Notified Withdrawn	No Show	% Papers Present	% Notified Withdrawn	% No Show
A1. IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM	305	549	120	97	17	6	81%	14%	5%
A2. IAF MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM	160	285	80	56	10	14	70%	13%	18%
A3. IAF SPACE EXPLORATION SYMPOSIUM	600	1012	94	74	16	4	81%	16%	4%
A4. 48th IAA SYMPOSIUM ON THE SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE (SETI) – The Next Steps	79	126	15	12	2	1	80%	13%	7%
A5. 22nd IAA SYMPOSIUM ON HUMAN EXPLORATION OF THE SOLAR SYSTEM	180	380	50	38	7	5	77%	13%	9%
A6. 17th IAA SYMPOSIUM ON SPACE DEBRIS	**371**	**632**	**104**	**94**	**7**	**3**	**90%**	**7%**	**3%**
A7. IAF SYMPOSIUM ON FUTURE SPACE ASTRONOMY AND SOLAR-SYSTEM SCIENCE MISSIONS	75	155	32	23	3	6	72%	8%	19%
B1. IAF EARTH OBSERVATION SYMPOSIUM	170	370	67	48	9	10	71%	13%	16%
B2. IAF SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM	170	306	94	71	15	8	75%	16%	9%
B3. IAF HUMAN SPACEFLIGHT SYMPOSIUM	350	807	87	68	13	6	78%	16%	6%
B4. 26th IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS	321	753	167	130	29	8	78%	18%	4%
B5. IAF SYMPOSIUM ON INTEGRATED APPLICATIONS	62	101	32	21	6	5	65%	19%	16%
B6. IAF SPACE OPERATIONS SYMPOSIUM	68	121	36	31	4	1	86%	11%	3%
C1. IAF ASTRODYNAMICS SYMPOSIUM	358	623	108	92	14	2	85%	13%	2%
C2. IAF MATERIALS AND STRUCTURES SYMPOSIUM	259	461	105	78	14	13	74%	14%	12%
C3. IAF SPACE POWER SYMPOSIUM	127	227	48	37	3	8	77%	6%	17%
C4. IAF SPACE PROPULSION SYMPOSIUM	303	539	131	102	22	7	78%	17%	5%
D1. IAF SPACE SYSTEMS SYMPOSIUM	180	371	64	56	6	2	87%	10%	3%
D2. IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM	366	684	100	77	17	6	77%	17%	6%
D3. 17th IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND DEVELOPMENT	107	185	46	40	6	0	87%	13%	0%
D4. 17th IAA SYMPOSIUM ON VISIONS AND STRATEGIES FOR THE FUTURE	132	265	63	47	13	3	74%	21%	5%
D5. 52nd IAA SYMPOSIUM ON SAFETY, QUALITY AND KNOWLEDGE MANAGEMENT IN SPACE ACTIVITIES	65	140	44	38	2	4	86%	4%	9%
D6. IAF SYMPOSIUM ON COMMERCIAL SPACEFLIGHT SAFETY ISSUES	60	140	30	28	1	1	94%	3%	3%
E1. SPACE EDUCATION AND OUTREACH	203	356	104	86	14	4	84%	13%	3%
E2. 47th STUDENT CONFERENCE	49	115	43	33	3	7	78%	6%	16%
E3. 32nd IAA SYMPOSIUM ON SPACE POLICY, REGULATIONS AND ECONOMICS	170	264	56	49	5	2	88%	9%	3%
E4. 53rd IAA HISTORY OF ASTRONAUTICS SYMPOSIUM	90	197	30	27	3	0	91%	9%	0%
E5. 30th IAA SYMPOSIUM ON SPACE AND SOCIETY	156	276	61	48	12	1	80%	19%	1%
E6. IAF BUSINESS INNOVATION SYMPOSIUM	84	134	63	46	11	6	75%	12%	12%
E7. IISL COLLOQUIUM ON THE LAW OF OUTER SPACE	284	592	78	60	15	3	76%	20%	4%
FINAL STATISTICS	**163**	**308**	**2272**	**1804**	**316**	**152**	**80%**	**13%**	**7%**
	AVERAGE	AVERAGE	TOTAL	TOTAL	TOTAL	TOTAL	AVERAGE	AVERAGE	AVERAGE

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1.2 Feedback from Washington IAC 2019

SESSION ID	TECHNICAL SESSIONS	Min Att	Max Att	Papers Sched	Papers Pres	Notified Withdrawn	No Show	% Papers Present.	% Notified Withdrawn	% No Show
	A6. 17th IAA SYMPOSIUM ON SPACE DEBRIS									
A6.1.	Space Debris Detection, Tracking and Characterization	50	85	10	9	1	0	90%	10%	0%
A6.2.	Modeling and Risk Analysis	45	85	12	11	1	0	92%	8%	0%
A6.3.	Impact-Induced Mission Effects and Risk Assessments	32	41	11	7	1	3	64%	9%	27%
A6.4.	Mitigation - Tools, Techniques and Challenges	30	36	10	9	1	0	90%	10%	0%
A6.5.	Post Mission Disposal and Space Debris Removal (1)	40	85	10	10	0	0	100%	0%	0%
A6.6.	Post Mission Disposal and Space Debris Removal (2)	50	70	10	10	0	0	100%	0%	0%
A6.7	Operations in Space Debris Environment, Situational Awareness	38	71	10	9	1	0	90%	10%	0%
A6.8	Policy, Legal, Institutional and Economic Aspects of Space Debris Detection, Mitigation and Removal	37	69	12	12	0	0	100%	0%	0%
A6.9	Orbit Determination and Propagation	20	37	10	9	1	0	90%	10%	0%
A6.10-B4.10	Joint Small Satellite/Space Debris Session to promote the long-term sustainability of space	29	53	9	8	1	0	89%	11%	0%
	TOTAL	**371**	**632**	**104**	**94**	**7**	**3**	**90%**	**7%**	**3%**
A6.IP	Interactive Presentations			22	15	6	1	68%	27%	5%

A6 Statistics:

Globally well equilibrated among the 10 sessions: no weak session anymore

Very low Withdrawns and No-Shows

Fairly good IP (thanks for the Chairs!)

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1.2 Feedback from Washington IAC 2019

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	1798
Ratio Presented / Submitted	43%	36%	35%	43%	42%	40%	41%	41%
Ratio Paper Not Presented/ papers selected	37%	43%	47%	46%	47%	46%	36%	28%

- Globally only 40% of the submissions are finally presented
- Very low number of papers selected but not presented: 28% was good

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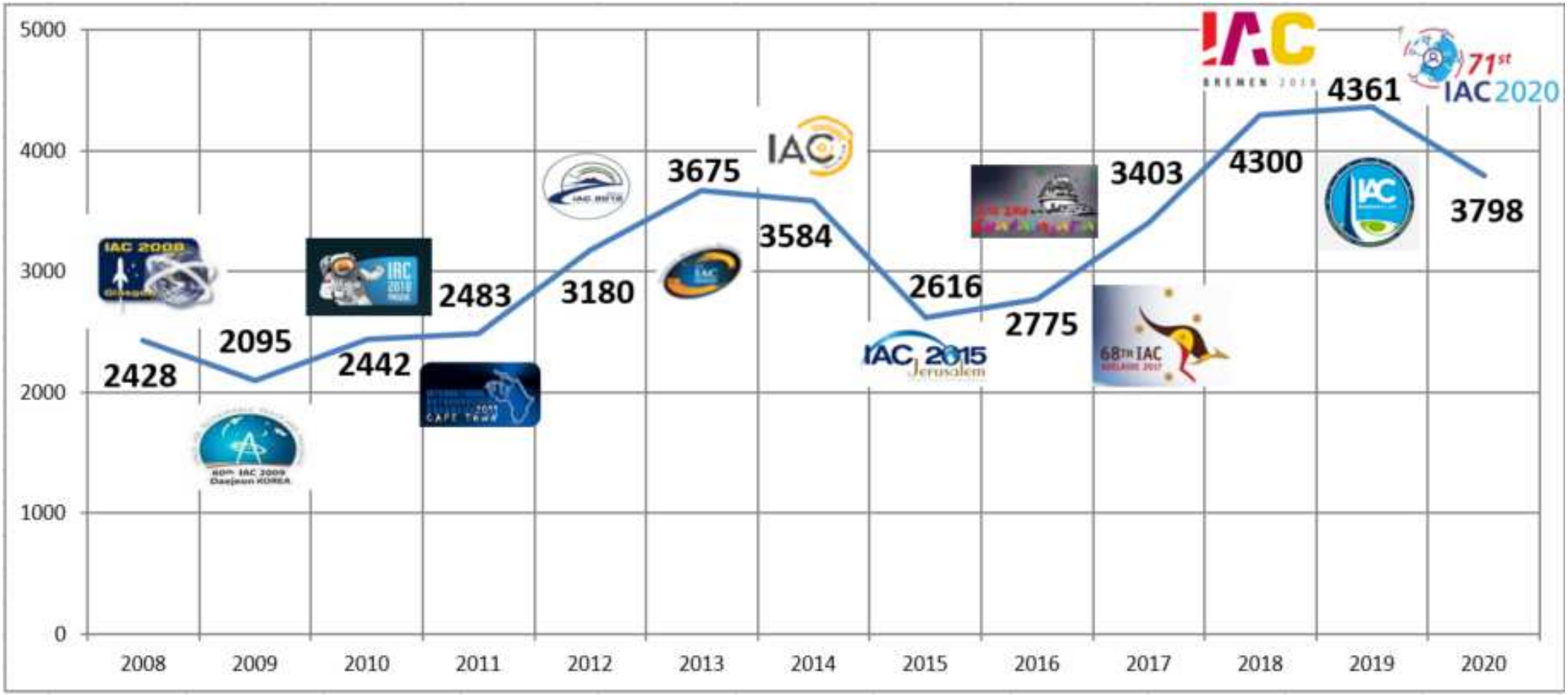
1.3 Cyber IAC 2020

Number of IAC abstracts since 2008



1.3 Cyber IAC 2020

IAC 2020 – Technical Presentation Statistics

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

71st IAC 2020 The CyberSpace Edition

TP TECHNICAL PROGRAMME

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

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

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

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

Impressive, and totally unexpected

IAF Connecting @ll Space People

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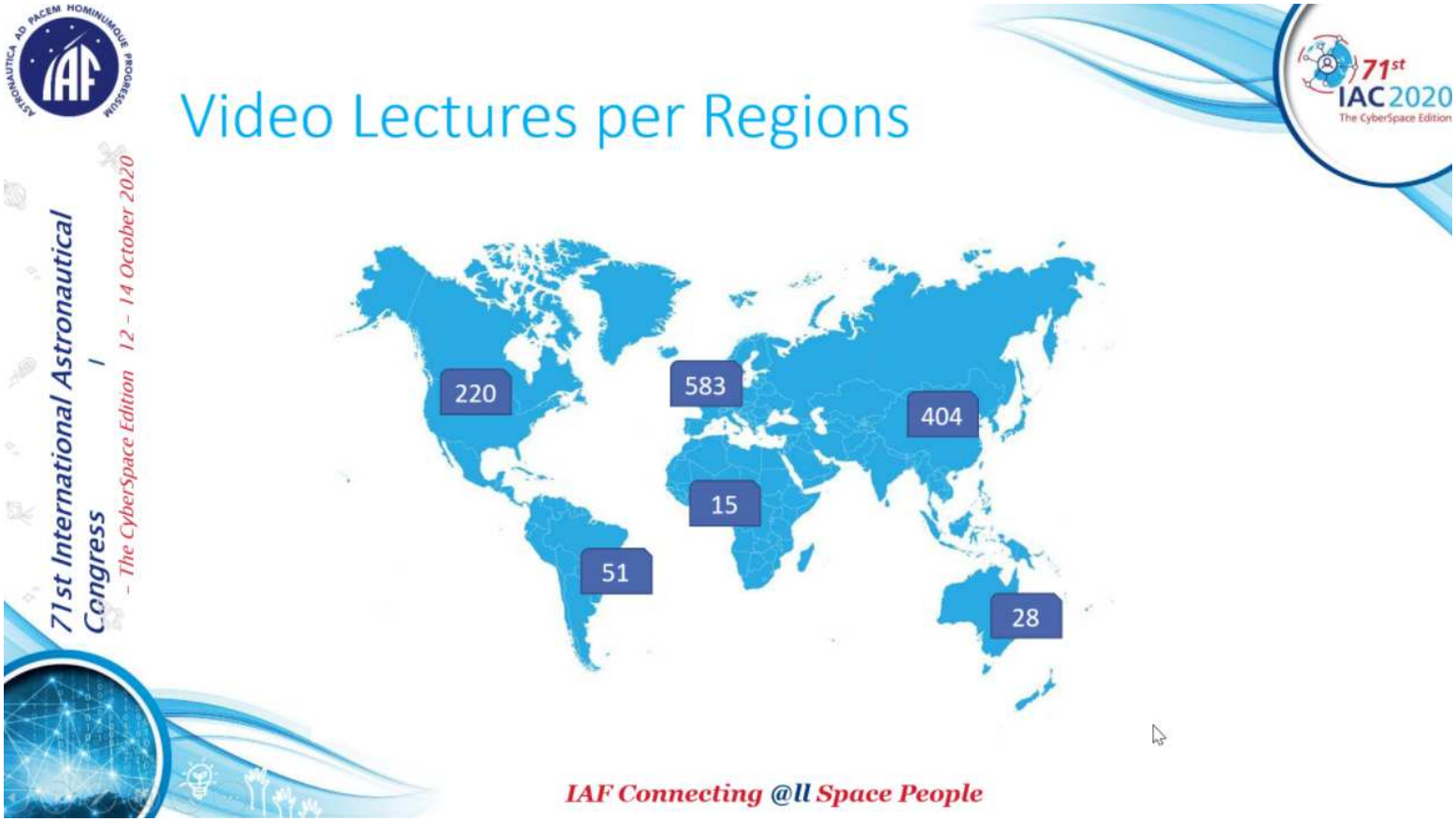
1.3 Cyber IAC 2020



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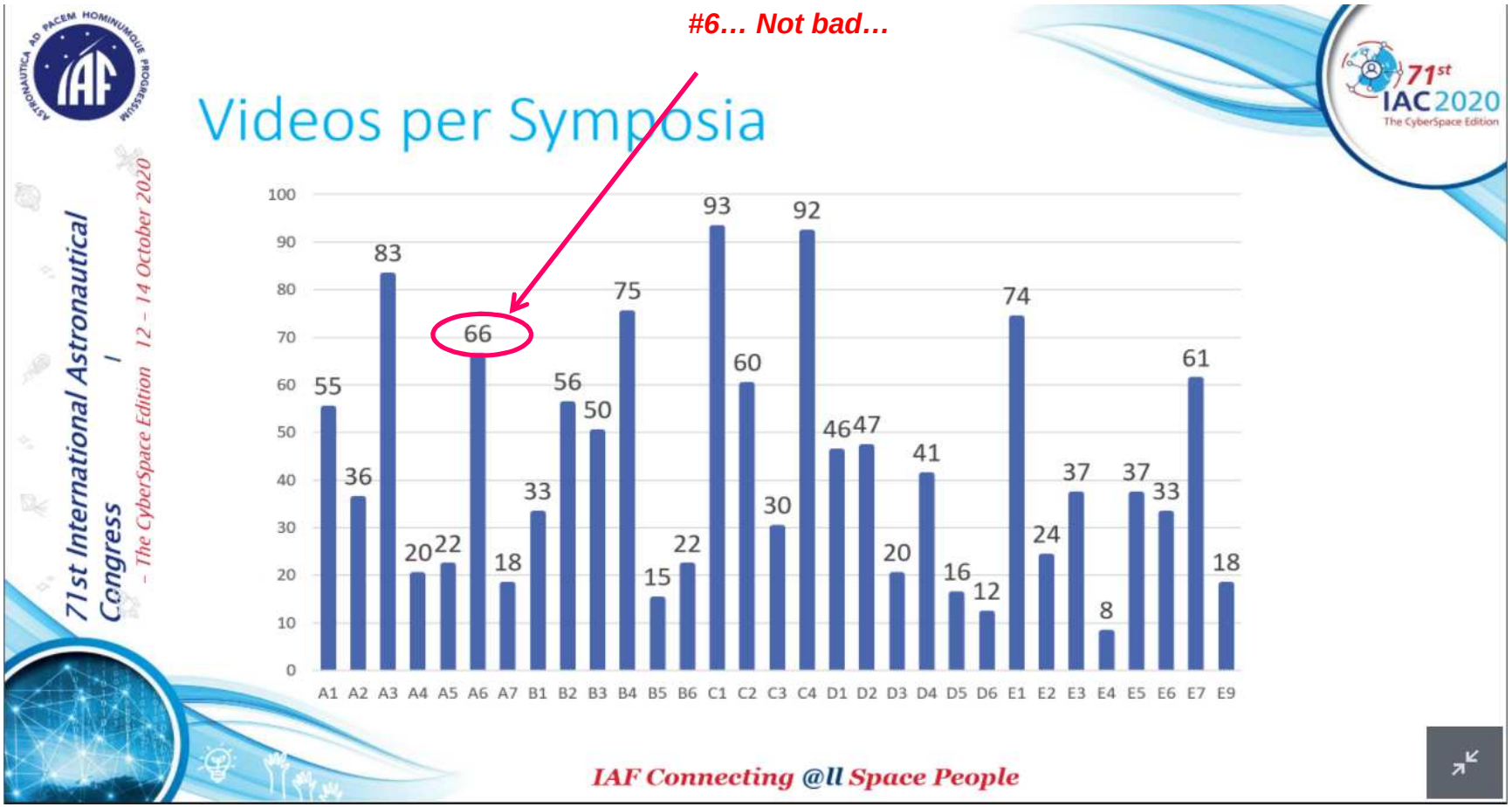
1.3 Cyber IAC 2020



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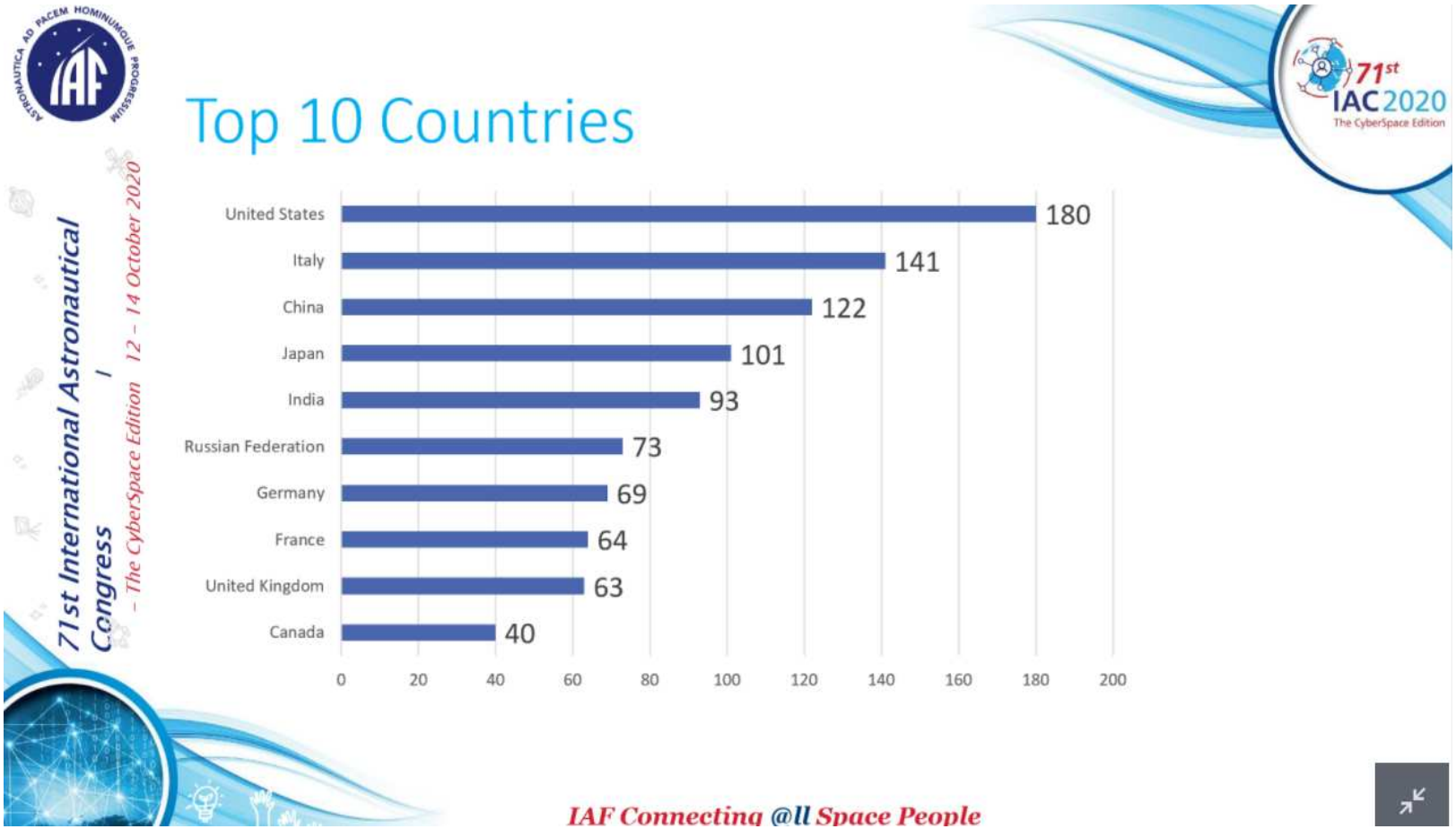
1.3 Cyber IAC 2020



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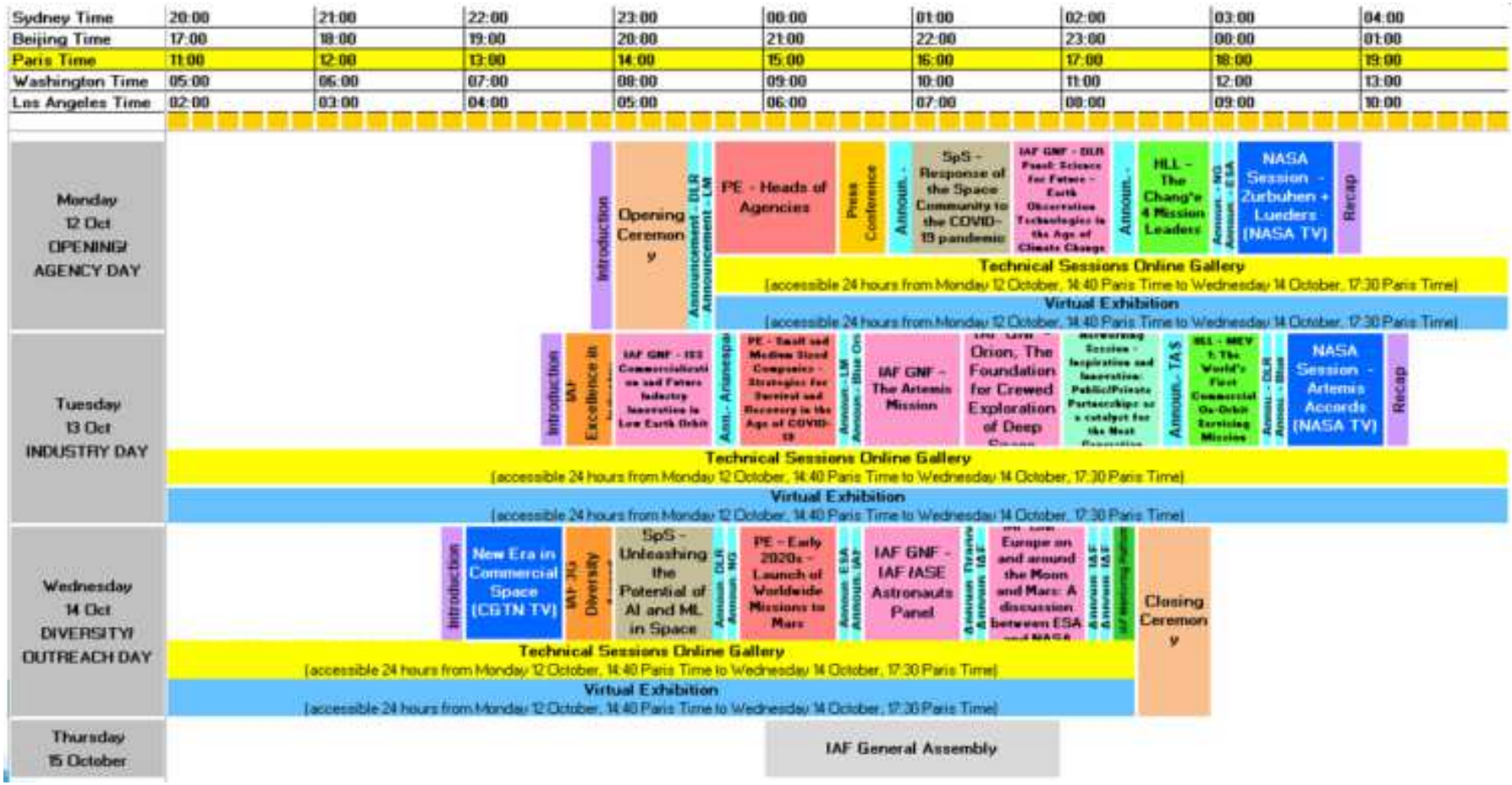
1.3 Cyber IAC 2020

Congress at a glance

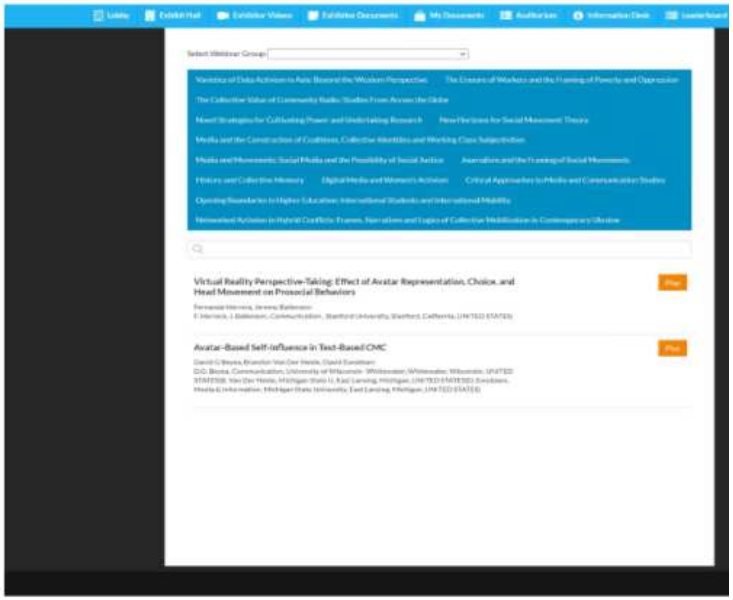


1.3 Cyber IAC 2020

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

1. IAC 2020 - Virtual Technical Presentations

- **The Technical Gallery hours:**
  Monday 12 Oct 14:40 (CET) - Wednesday 14 October 16:30 (CET)
- Accessible from the platform iac2020.vfairs.com
- In addition the TP will include two livestreamed Special Sessions (SpS)
  - **STATE AND RESPONSE OF THE GLOBAL SPACE SECTOR DURING COVID-19**
  - **UNLEASHING THE POTENTIAL OF ARTIFICIAL INTELLIGENCE & MACHINE LEARNING INTO SPACE**



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1.3 Cyber IAC 2020

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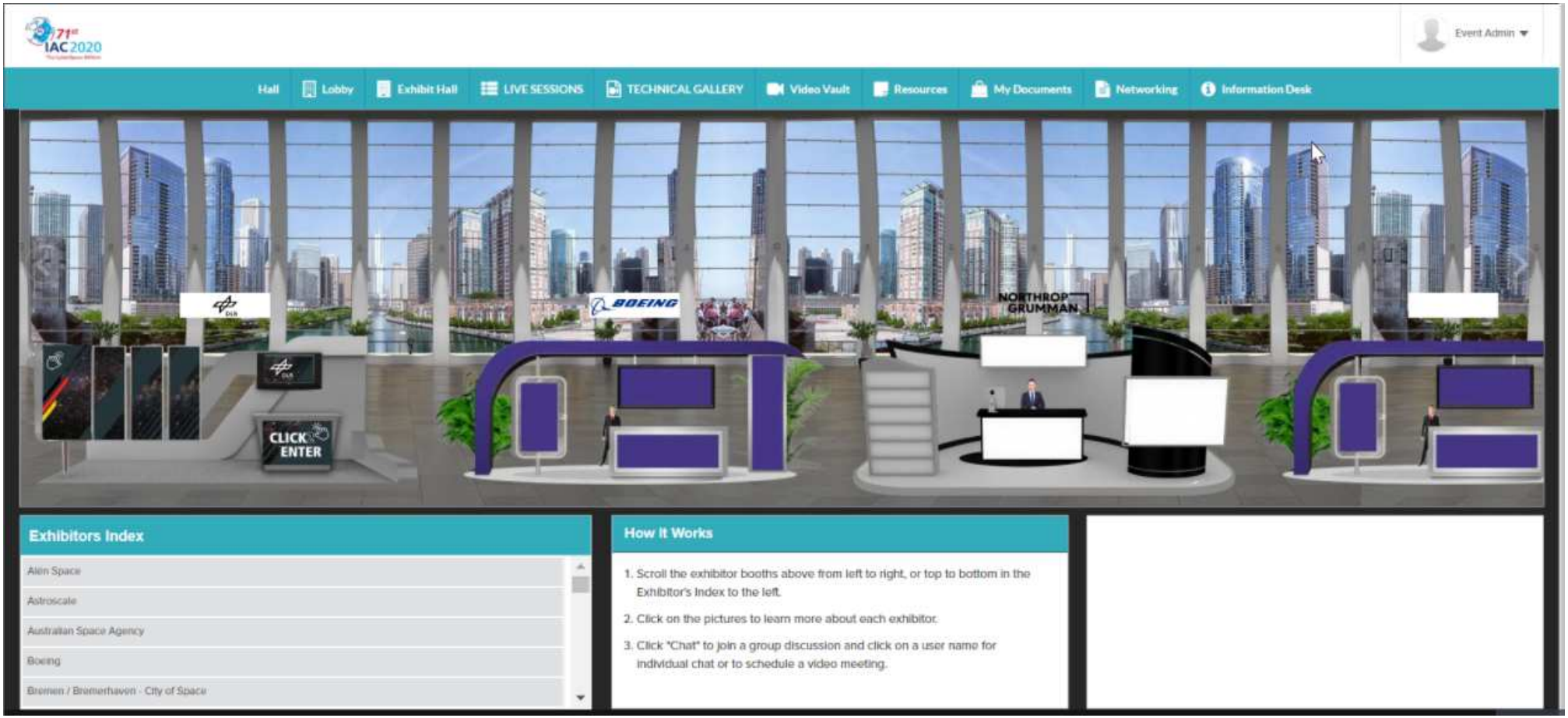
1.3 Cyber IAC 2020



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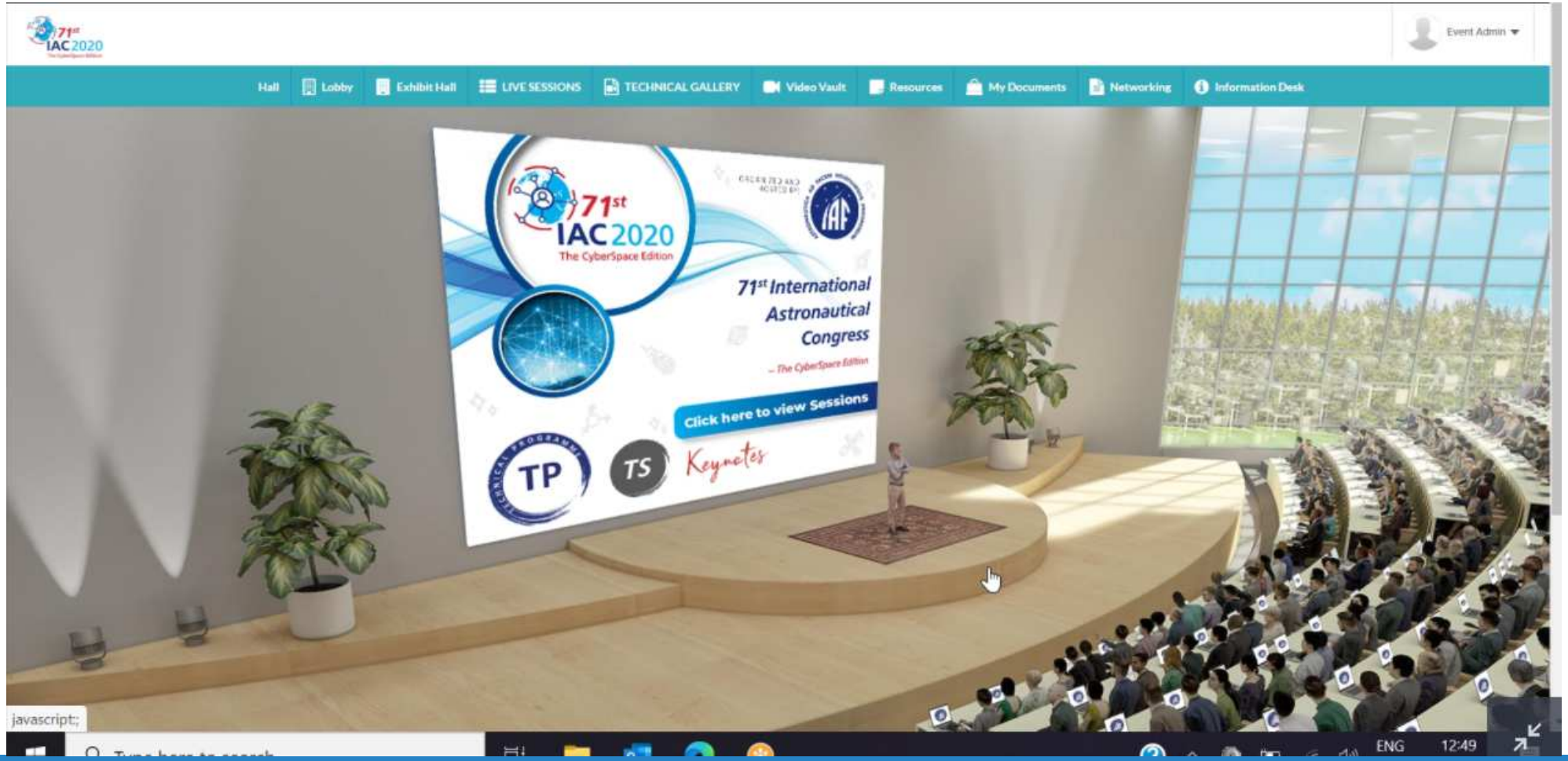
1.3 Cyber IAC 2020



1.3 Cyber IAC 2020

IAC 2020 - Virtual Technical Presentations

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

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

IAF Connecting @ll Space People

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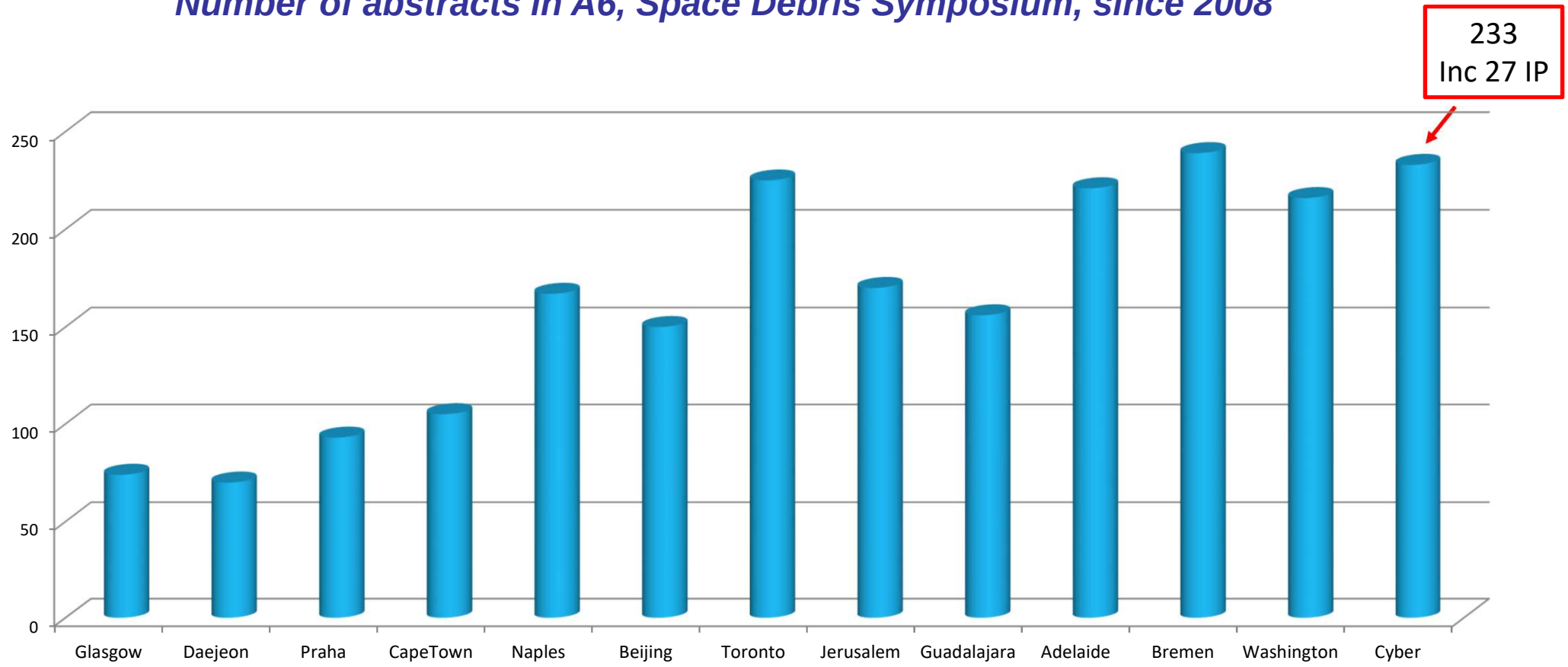
1.3 Space Debris Symposium Cyber IAC 2020

Number of abstracts in A6, Space Debris Symposium, since 2008



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1.3 Space Debris Symposium Cyber IAC 2020

A6: Space Debris Symposium: Liou – Bonnal

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

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

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

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

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

A6.6: Post Mission Disposal and Space Debris Removal 2: Auburn – Berend – Wiedemann

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

A6.8 /E9.1: (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

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

A6.10 /B6.X: Joint Space Operations / Space Debris Session: From SDC: McKnight – Tung – Fitz-Coy – Anilkumar – From SO: Auburn

A6.VP: Virtual Presentations: Yasaka – McKnight – Jankovic – Bonnal

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1.3 Space Debris Symposium Cyber IAC 2020

Status of the A6 Symposium

03/10/2020	Accepted	Withdrawn	No news	Remaining	Remaining % over Acc.	Presentations	Missing	Papers	Missing
A6.1	10	5	0	5	50,0	5		5	
A6.2	15	6	1	8	53,3	7	#11 - Peddakotla	7	#11
A6.3	10	2	2	6	60,0	3	#1 - Olivieri; #4 - Gong; #7 - Wang	3	#1, #4, #7
A6.4	8	3	0	5	62,5	5		5	
A6.5	13	3	1	9	69,2	8	#4 - Wan	8	#4
A6.6	12	3	0	9	75,0	9		9	
A6.7	11	4	2	5	45,5	5		5	
A6.8	15	3	1	11	73,3	9	#12 - Rapp; #15 - Svarovska	8	#5, #12, #15
A6.9	12	4	2	6	50,0	5	#11 - Nevmerzhitskiy	5	#11
A6.10	9	3	0	6	66,7	6		6	
A6.VP	20	6	1	13	65,0	12	#10 - Labutkina	11	#10, #12
Total	**135**	**42**	**10**	**83**		**74**	**9**	**72**	**11**
% over accepted		*31,1*	*7,4*	*61,5*		*54,8*		*53,3*	
% over remaining						*89,2*		*86,7*	

Chairs and Rapporteurs: 3 roles

- Report on your session using the template downloadable from you session page on the web-site:

  Example:

Order	Title	Speaker	Presentation Type & Length	Presentation Confirmed	Withdrawal	No-Show	Paper uploaded	Presentation uploaded	Manuscript evaluation	Presentation evaluation
1	Investigation of the radar parameter subspace for different beam-park simulations with the TIRA system	Mr. Matteo Budoni								
2	Research on space debris observation with multi telescopes in Antarctica	Mr. Gongqiang Li								
3	Approach on the Tracklets Association of CHES	Dr. Ting-Lei Zhu								
4	Justification of the need to develop means of panoramic survey of the sky	Dr. Igor Molotov								
5	Detection and Tracking of Space Debris from Low-Earth Orbit	Dr. Mathias Benn								
6	Correlation between light curve observations and laboratory experiments using a debris scale model in an optical simulator	Dr. Toshifumi Yanagisawa								
7	bistatic optical measurements for dynamic characterization of LEO objects	Mr. lorenzo mariani								
8	Automated light curve analysis for the determination of space debris	Mr. Heinrich Dirks								

- Recommendation for Submission to Acta Astronautica, either following the template also on the web-site, or directly by mail to me
  - 3 maximum per session (except if exceptional!)
  - Suggest 2 or 3 reviewers
- Short report just for us, as usual, 2 pages max, with general feeling of the session selection and recommendations for the future

1.4. Space Debris Symposium for Dubai 2021

Program Committee

- As Dubai 2020 was cancelled and replaced by CyberSpace 2020, the role of Chairs and Rapporteurs this year was exceptionally low

➪ It is propose to keep the same selection for Dubai 2021 than the one done for Dubai 2020

- However:
  - Need to identify those who already know they will not attend Dubai 2021
  - Potentially some changes if you decide so…

Open points to be discussed and decided

- Joint Sessions A6.8 and A6.10
- Keynote lecture (Joseph P. Loftus Jr. Keynote Lecture) at the beginning of one of our sessions
  - Any proposal for this first one? Duration ? In which session?

1.4. Space Debris Symposium for Dubai 2021

A6: Space Debris Symposium: Liou – Bonnal

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

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

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

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

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

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

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

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

1.4. Space Debris Symposium for Dubai 2021

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

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

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

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

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

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

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

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

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1.4. Space Debris Symposium for Dubai 2021

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

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

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

A6.9: Orbit Determination and Propagation - SST

Klinkrad – Santoni – Dolado-Perez

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

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

From SDC: Fitz-Coy – Tung - Agapov From SOC:

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

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

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Agenda

2. Exchanges
   - 2.1. Past events: workshops, conferences, congresses, …
     - 2nd IAA ICSSA
     - 1st IODC
   - 2.2. On the Agenda
     - European Conference on Space Debris (see following 2 pages)
     - 3rd IAA ICSSA
       - September 13-15, 2021 at GMV in Tres Cantos, Madrid,
       - The University of Florida will also provide a remote participation option, just in case the pandemic will not be resolved by then.
   - 2.3. New achievements
     - ISO 24113 – 23312 – 20893
   - 2.4. Round table – Open discussion

8th European Conference on Space Debris

Abstract Submission

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

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

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

Abstracts must be submitted by 15 November 2020.

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

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

Target Audience

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

Important Dates

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

Conference Venue

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

Registration Fees

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

Point of Contact

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

Genius GmbH – science & dialogue
Darmstadt, Germany

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

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

Virtual conference
20 – 23 April 2021

esa

Debris Background

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

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

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

Conference Scope

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

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

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

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

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Agenda

The 8th Satellites End of Life Workshop and Space sustainability technologies has been organized by CNES in January 2020 22nd and 23th.
This WS is takes place each 2 years since 2006. Initially it was only dedicated to the geostationary satellites end of life operations but progressively it was natural to extend the scope to all orbit and not only to operation but also the technologies needed to perform End Of Life activities.
The first objective of this workshop was to present the status of the on-going discussions concerning the mitigation rules and their evolution since the first versions issued some years ago.Our goal is of course to promote these rules and to encourage their implementation to preserve this region in space. Our goal is also to prepare the future: tomorrow these rules evolution will become mandatory and we have to be prepared.
In the mean time, several operators have already performed such operations.
The second objective of the workshop is to take benefit of your experience when performing these operations and to get your feed-back. These are the 2 main objectives of the workshop: to inform and to get your feed-back.

For the first time this year it lasted 2 days in order to allow our colleagues outside Europe to participate. It give the opportunity to setup round table to add
Thanks European, US, Russian, Chinese and Japan colleagues to have travelled to us.

Next session in 2022

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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 atmosphe	Yatskiv/Milinevsky													09-status report received
1.13	Planetary Science Enabled by the New Generation of Sm	Baker/Vane/Bousquet													02- Final report expected
1.14	Integrated Precursor Distinguish in Multi-Geophysical Fiel	ao 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 space	Charles/Kozlovskaya/Norsk													03- Commission pre-review
2.14	Medical Support for an International Human Expedition to	Orlov/Doarn/Kussmaul													09-status report received
2.15	Immersion Model: Importance for Space Life Sciences St	Mano/Tomilovskaya													
2.17	Dynamic Assessment and Management of Astronauts' Ph	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 LE	Mckenna-Lawlor													
3.21	Space Disposal of Radioactive Waste	Degtyarev													
3.22	Next-Generation Space System Development Basing on (	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 Mar	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 E	Genta/Ventskovsky													10-status report received
3.28	Strategy of Low Cost and Large Scale Access to Space in	Lu Yu/Reibaldi													07-status report received
3.29	Strategy and Feasibility Assessment of Collision Protectio	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 In	Mankins													02-Membership list TBC
3.32	Autonomous Dynamic Trajectory Optimal Control of Laun	Zhengyu Song													10-status report received

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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 Explor	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 Devel	Horikawa/Coradini													
4.20	Space Information Application in Earthquake Emergency	Bao Weimin/Contant													
4.21	Distributed, Networked, Smart, Cooperating Small Satellit	Belokonov/Schilling													
4.22	Through Optimization of Aerospace Trajectories	Teofilatto/Filatyev													
4.23	A Handbook for Post-Mission Disposal of Satellites Less T	McKnight/Hanada/da Silva/Martinez													06-e-version available
4.24	Disseminating knowledge and experiences of satellite app	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 Econo	Williamson/Smith LJ													10-status report received
5.12	Dynamics of Space Exploration Strategies and Future Ou	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	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 usa	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 e	Arnould/Laidet													03-new study group
6.19	Apollo 11 Landing Anniversary	Liepack/Lieberman													07-status report received

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Agenda

3.1 SG 5.17 IAA Situation Report on Space Debris – Update

- Proposal to have a fast-track action in order to progress, at last

- Based on the existing Report 2016
  https://iaaspace.org/wp-content/uploads/iaa/Scientific%20Activity/sg514finalreport.pdf
- I propose not to change significantly the structure of the document (will do for the following one…)

- Identification, chapter per chapter, of what exactly is needed to update, correct, complement, renew references

- Need to have small teams of 3 - 4 volunteers per chapter
  - Have to be good experts of the topic, of course!
  - But help from younger members is welcome!
  - Preferably from diverse countries
  - Continuity with previous authors would be perfect

- Appendix 3 is the zip of all 14 chapters in Word format

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

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Agenda

2016 version number of pages for information

3.1 SG 5.17 IAA Situation Report on Space Debris – Update

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

Agenda

3.1 SG 5.17 IAA Situation Report on Space Debris – Update

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