33RD CONGRESS OF THE INTERNATIONAL COUNCIL OF THE AERONAUTICAL SCIENCES STOCKHOLM, SWEDEN, 4-9 SEPTEMBER, 2022



After four years, the ICAS community will meet again in-person to discuss Aeronautics Research and Innovation for Future Generations

PRELIMINARY PROGRAMME

HOSTED BY THE SWEDISH SOCIETY OF AERONAUTICS AND ASTRONAUTICS (FTF) IN COOPERATION WITH THE SWEDISH STRATEGIC INNOVATION PROGRAMME FOR AERONAUTICS (INNOVAIR)





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Welcome from the ICAS President



Dr. Joao Luiz Azevedo President, International Council of the Aeronautical Sciences

On behalf of the International Council of the Aeronautical Sciences (ICAS), it is my pleasure to welcome you to the 33rd ICAS Congress in Stockholm, Sweden. ICAS was established in 1957 under the leadership of Professor Theodore von Kármán and ICAS biennial congresses have been providing a forum for an open discussion of current and relevant topics in aeronautics since 1958. The collaborations and partnerships that have become a reality as a result of the opportunities provided by ICAS congresses demonstrate the value of such a high-level forum.

In 2022, the ICAS Congress is returning to Stockholm after 32 years. The last time that an ICAS Congress was

held in Sweden was in 1990. Our Swedish colleagues have been hard at work, for quite some time now, and they are striving to uphold the ICAS tradition of bringing together a global array of topics and participants as ICAS Congresses constitute the only true international forum that covers the world of aeronautics. All of us at ICAS are very grateful for their efforts that will give us the opportunity to meet again, in-person, after the several difficulties generated by the Covid pandemic. We are also grateful to our sponsors for this year's congress, whose names will be prominently displayed in this program and throughout the congress venue.

The scientific portion of the congress will take place at the Stockholm Waterfront Congress Centre, which is a world-class facility, extremely conveniently located and that affords beautiful views of the Stockholm waterfront. I believe that our ICAS Program Committee has been able to put together an extremely strong and interesting technical program. As usual with our congresses, the technical program includes the award and general lectures as well as the parallel technical sessions. For the present Congress, there was a definite effort to also invite keynote talks for the various technical panels and, even, invite complete sessions that would address current topics of interest for our industry. Several of these invited sessions will allow for further in-depth discussion of issues addressed in the general lectures. Hence, topics such as certification by analysis, validation of computational tools, sustainable aviation and clean aviation, among other subjects, have all been included as invited sessions. In order to accommodate these additions to the technical program, 14 parallel sessions are being planned throughout the week. I am confident that you will find the technical program for the 33rd ICAS Congress to be insightful and relevant for the current needs of the aeronautical industry.

It is, therefore, with great pleasure that I extend to you my warmest welcome to Stockholm. I encourage you to actively participate in this year's ICAS Congress, taking advantage of the very encompassing technical, networking and cultural opportunities that have been prepared by our Swedish colleagues in the Local Organizing Committee and by the ICAS Program Committee. I am sure that the 2022 ICAS Congress will be a memorable experience.



Welcome by FTF & Innovair

Dr. Anders Blom Program Director, Innovair



Dr. Roland Karlsson President, The Swedish Society of Aeronautics and Astronautics

Dear Colleagues,

On behalf of the Swedish Society of Aeronautics and Astronautics (FTF) and the Swedish Strategic Programme for Aeronautics (Innovair), we are proud to invite professionals from academia and industry, as well as governmental representatives, to attend the 33rd Congress of the International Council of the Aeronautical Sciences (ICAS).

ICAS 2022 shall be held at the Stockholm Waterfront Congress Centre in Sweden on 4-9 September 2022, and FTF and Innovair will host the event.

ICAS was established in 1957 as a non-government, non-profit scientific organisation with the mission to advance knowledge and facilitate collaboration in aeronautics. Today ICAS gathers members from 30 countries from five continents. One of the essential activities of ICAS is the biennial international Congress. Since the first ICAS Congress in Madrid in 1958, this has become the world's primary forum for aeronautical technology. The Congress attracts leading experts and leaders of top aerospace research centres, industries, universities, and representatives from governments. The topics of the Congress in clude the most recent scientific achievements in aeronautics and top priorities in the design of future generation aircraft, engines, and systems to cater for the greening of sustainable aviation. Moreover, the Congress is a unique platform for companies to showcase products and services and network with professionals worldwide. An essential part of the gathering is introducing and encouraging young people to enter the aeronautics sector via higher education and research activities.

Sweden has a long and successful tradition of designing and producing aircraft and propulsion systems, both for the civil and military markets, which are unique for a small country. Furthermore, the Swedish industry, and society, are wellknown for efficient, innovative, and non-hierarchical organisations. Besides our big companies, there is a structured innovation system including academia, research institutes, and an increasing number of sub-contractors available in Sweden.

A large number of papers will be presented at ICAS 2022 Congress in Stockholm, together with an exhibition of products and services from world-leading companies, and we anticipate more than 800 delegates from some 40 countries to attend.

We very much look forward to welcoming you to ICAS 2022 in Stockholm.



ICAS Organization and Committees

THE INTERNATIONAL COUNCIL OF THE AERONAUTICAL SCIENCES

ICAS was founded by Theodore von Karman in 1957 as a non-governmental, not-for-profit scientific organization to encourage the free international exchange of information on aeronautical research and technology.

The mission of ICAS is to provide regularly scheduled events and publications that enable a better understanding of engineering science and practice and an improved level of cooperation among aeronautical engineering professionals from around the world. ICAS currently serves as the only international support organization to representative aeronautical engineering professional societies and their members in 30 countries.

ICAS functions under three primary bodies: Council (meets biennially), Executive Committee (meets at least twice each year) and Programme Committee (meets annually). ICAS holds an International Congress in the fields of Aeronautical Sciences on a biennial basis. The venue is chosen by the Council and changes from Congress to Congress. Furthermore ICAS organizes a thematic workshop in the year between the congresses in connection with the meeting of the Program Committee.



THE ICAS COUNCIL

Representatives of Member Societies

- C. Bil, Australia
- H. Deconinck, Belgium
- L. Alves, Brazil
- G. Languedoc, Canada
- J. Yao, P.R. of China
- J. Juracka, Czech Republic
- M. Kanerva, Finland
- B. Stoufflet, France
- E. Stumpf, Germany
- D. Rohacs, Hungary
- H. Bhatia, India
- H. Djojodihardjo, Indonesia
- O. Rand, Israel
- A. Viviani, Italy

- K. Rinoie, Japan
- S. Lee, Korea
- J. Melkert, The Netherlands
- T. Goetzendorf-Grabowski, Poland
- L. Campos, Portugal
- F. Zaganescu, Romania
- A. Mirzoyan, Russia
- B. Rasuo, Serbia
- J. Monk, South Africa
- A. Blom, Sweden
- L. Manfriani, Switzerland
- F. Haselbach, United Kingdom
- T. Irvine, U.S.A.



THE ICAS EXECUTIVE COMMITTEE

Officers

President: J. Azevedo, Brazil P.C. Chair: D. Mavris, U.S.A. Treasurer: G. Holmberg, Sweden Past President: S. Suzuki, Japan Executive Secretary: A. Probst, Germany

Members

- C. Atkin, United Kingdom
- M. Peters, The Netherlands
- M. Scott, Australia
- S. Remy, France
- X. Zhang, China
- R. Gerhards, Germany
- S. Bagassi, Italy
- F. Collier, U.S.A.
- S. Chernyshev, Russia

R. Mange, US

A. Gustafsson (ICAS 2022)

THE ICAS SECRETARIAT

The ICAS Secretariat is hosted by the Deutsche Gesellschaft für Luft-und Raumfahrt (DGLR) and located in Bonn, Germany. Axel Probst is the ICAS Executive Secretary and is assisted by Bodo Heinrichs as the ICAS Coordinator. Address: ICAS Secretariat, c/o DGLR, D-53175 BONN, Germany

Phone: +49-(0)228-30805-0, Fax: +49-(0)228-30805-24, E-mail: icas@icas.org

THE ICAS PROGRAMME COMMITTEE

All members of ICAS Programme Committee are listed on the ICAS Web-Site. Below are listed those who took part in the preparation meeting for ICAS 2022.

| A. Alaimo , IT |
|------------------------------|
| L. Alves, BR |
| G. A. Amiryants, RU |
| K. Anderson, AU |
| A. Andreeeva-Mori, JP |
| C. Atkin, UK |
| J.L.F. Azevedo, BR |
| S. Bagassi, IT |
| J. Bayandor, AU |
| E. Belo, BR |
| C. Bil, AU |
| A. Blom, SE |
| Ch. Breitsamter, DE |
| P. Camanho, PT |
| L. Campos, PT |
| Y. C. Chen , CN |
| F. Collier, US |
| M. Consiglio, US |
| S. Conway, US |
| H. Djojodihardjo , ID |
| B. Fredriksson, SE |
| S. Fu , CN |
| Y.L. Fu , CN |
| Z.H Gao , CN |

R. Gerhards, DE T. Gibson, UK T. G.-Grabowski, PL Z. Goraj, PL E. Gowree, UK D. Gu, CN G. Halila, BR J.H. Han, KR M. Harigae, JP F. Haselbach, UK G. Holmberg, SE T. Ikeda, JP A. Isikveren, FR E. Itoh, JP L.P. Jiang, CN J. Juracka, CZ M. Kanerva, FI Y. Kim, KR B. Kimmel, US L. Kiszkowiak, PL A. Krein, DE P. Krus, SE M. Lott, BR L. Manfriani, CH

F. Marulo, IT F. Mastroddi, IT D. Mavris, US J. Melkert, NL J. Mieloszyk, PL A. Mirzoyan, RU J. Monk, ZA R. Mori, JP D. Mueller-Wiesner, DE B. Nagel, DE J. Nairus, US P. Oliveira, PT M. Padulo, FR M. Peters, NL O. Pinon-Fischer, US P. Prakasha, DE O. Rand, IL B. Rasuo, RS K. Rein-Weston, US S. Remy, FR S. Ricci, IT K. Rinoie, JP D. Rohacs, HU

T. Rogalski, PL C. Mari, FR M. Scheidt, US P. Schmollgruber, FR M. Scott, AU Y. Shang, CN P. Stezycki, PL B. Stoufflet, FR E. Stumpf, DE S. Suzuki, JP H. Toebben, DE P. Vijgen, US N. Viola, IT A. Viviani, IT N. Voevodenko, RU R. Wahls, US T. Wan, TW Y. Watanabe, JP I. Yimer, CA S. Ying, US X.G. Zhang, CN Y. Zhang, CN D. Zingg, CA



THE ICAS 2022 Local Organizing Committee





Chair: Dr. Roland Karlsson, FTF President

Vice Chair: Dr. Anders Blom, Innovair Programme Director

Secretary: Björn Jonsson, Defence Materiel Administration

Budget/Finances: Anders Gustafsson, FTF/Innovair

Partnership/Exhibition/Events: Olle Bååthe, Systecon AB

ICAS Liaison & Webmaster: Anders Gustafsson, FTF/Innovair

Other members: Göran Bengtsson, Saab Aeronautics Robert Lundberg, GKN Aerospace Sweden Fredrik Olofsson, Aerospace Cluster Sweden Christina Ahremark, Swedish Armed Forces Mats-Olof Olsson, Swedish Armed Forces Prof. Petter Krus, Linköping University, Linköping Louise Fischer, KTH Aerospace student

Caroline Knies, Meetagain Konferens AB (Congress Secretariat)

THE LOCAL ORGANISING COMMITTEE CAN BE CONTACTED AT: info@icas2022.com



ICAS Member Societies & Associates

THE ICAS MEMBER SOCIETIES

<u>Australia</u> **The Royal Aeronautical** Society - Australian Division PO Box 1583 Crows Nest, NSW 2065

Belgium VKI - Von Karman Institute for Fluid **Dvnamics** Chaussée de Waterloo 72 1640 Rhode - St. Genese

Brazil

ABCM - Associação Brasileira de Engenharia e Ciencias Mecanicas Praça Tiradentes, 10, 9º andar Centro 20060-070 Rio de Janeiro, RJ

<u>Canada</u> CASI – Canadian Aeronautics and Space Intstitute 350 Terry Fox Drive Suite 104 Kanata, Ontario, K2K 2w5

People's Republic of China **CSAA - Chinese Society of** Aeronautics and Astronautics No.2 Beiyuan, Andingmenwai Chaoyang District, Beijing 100012 Post Box 761-2, Beijing

Czech Republic CSM - Czech Society for Mechanics c/o Brno University of Technology Institute for Aerospace Engineering

Engineering Technicka 2896/2

616 69 Brno

Finland The Finnish Association of Israel Society of Graduate Engineers TEK Ratavartijankatu 2 00520 Helsinki

France AAAF - Association Aéronautique et Astronautique de France 6, rue Galilée 75782 Paris Cedex 16

Germany **DGLR - Deutsche** Gesellschaft für Luft und Raumfahrt Godesberger Allee 70 53175 Bonn

Hungary **GTE - Scientific Society of Mechanical Engineers** PO Box 433 1371 Budapest

India AeSI - Aeronautical Society of India 13-B, Indra Pasthra Estate New Dehli - 110002

Indonesia IAAI - Institute of Aeronautics and Astronautics Indonesia Institut Teknologi Bandung Jalan Ganesha 10 40132 Bandung

Israel Aeronautics and Astronautics P.O. Box 15524 Rishon Le-Zion 7505401

Italy **AIDAA - Associazione** Italiana Di Aeronautica e Astronautica Casella Postale 227 00187 Roma V. R.

Japan JSASS - Japan Society for **Aeronautics and Space Sciences** 4-1-21 Nihonbashi-Muromachi, Chuo-ku, Tokyo 103-0022

<u>Korea</u> **KSAS - Korean Society for** Aeronautical and Space Sciences #635-4, Yeogsam-dong, Gangnam-gu, Seoul 135-703

Poland Polish Society of

Aerospace Sciences c/o Warsaw University of Technology ul. Nowowiejska 24 00-665 Warsaw

Portugal

Ordem dos Engenheiros Avenida António Augusto de Aguiar, N.º 3-D 1069-030 - Lisboa



Romania for Aerospace Research "Elie Carafoli"

220 Iuliu Maniu Blvd., Sector 6 061126, Bucharest

Russian Federation TsAGI - Central Aerohydrodynamic Institute

1, Zhukovski Street Zhukovski Moscow Region 140160

Republic of Serbia

Serbian Aerospace Society c/o Faculty of Mechanical Aeronautical Engineers Engineering, University of Belgrade, Kraljice Marije 16, 11120 Belgrade 35

Republic of South Africa **AeSSA - Aeronautical** Society of South Africa P.O. Box 14717 Sinoville 0129

Sweden

INCAS - National Institute FTF - Swedish Society of Aeronautics and Astronautics c/o SSC PO Box 4207 SE-17154 SOLNA

Switzerland

SvFW - Schweizerische Vereinigung Für Flugwissenschaften c/o RUAG Aerospace CH-6032 Emmen

The Netherlands NVvL - The Netherlands Association of Anthony Fokkerweg 2, 1059 CM, Amsterdam

United Kingdom **RAeS** - Royal

Aeronautical Society 4 Hamilton Place London W1J 7BQ

United States AIAA - American Institute of Aeronautics and Astronautics 12700 Sunrise Valley Drive Suite 200 Reston, VA 20191-5807

THE ICAS ASSOCIATE MEMBERS

Australia Department of Defence - Science and Technology 506 Lorimer Street, Fishermans Bend, Victoria 3207

Brazil Embraer S.A. Av. Brigadeiro Faria Lima, 2.170 12227-901 – São José dos Campos – SP

<u>Canada</u> Aerospace NRC Montreal Road Ottawa, Ontario, K1A 0R6

<u>China</u> AASRC - Taiwan, China Room R3-211,No.300, Jhongli City, Taoyuan County 320

CAE - Chinese Aeronautical Establishment P.O. Box 761 No.2 Anwai Beiyuan Beijing 100012

COMAC - Commercial Aircraft Corporation of China, Ltd. Zhang Yang Road 25 Shanghai 200120

Tsinghua University, School of Aerospace Engineering No.1 Qinghuayuan, Haidian District Beijing 100084, China

Czech Republic VZLU - Aeronautical Research and Test Institute Beranovych 130 199 05 Praha - Letnany France ONERA - French Aeronautics and Space Research Center BP 72 92322 Chatillon Cedex

SAFRAN 2 bd du Général Martial Valin 75724 Paris Cedex 15

<u>Germany</u> Bauhaus Luftfahrt e.V. Willi-Messerschmitt.Str. 1 82024 Taufkirchen

DLR - German Aerospace Center Linder Höhe 51147 Köln

Technical University of Munich Arcisstraße 21 80333 Munich

Italy C.I.R.A.-Italian aerospace research centre Via Maiorise 81043 Capua (CE)

University of Naples "Federico II" Department of Aerospace Engineering Via Claudio, 21 80125 Napoli

Japan JADC - Japan Aircraft Development Corporation Hibiya Kokusai Bldg.7F 2-2-3, Uchisaiwai-cho, Chiyoda-ku, Tokyo, 100-0011



JAXA - Institute of Aeronautical Technology (IAT) 7-44-1 Jindaijihigashimachi, Chofu, Tokyo 182-8522

Mitsubishi Aircraft Corporation Nagoya Airport, Toyoyamacho, Nishikasugai-Gun Aichi 480-0287

<u>Lithuania</u> Vilniaus Gedimino technikos universitetas - VGTU Saulėtekio alėja 11, Vilnius 10223

Pakistan Institute of Space Technology 1, Islamabad Highway, Islamabad 44000

Poland ILOT - INSTITUTE OF AVIATION Al. Krakowska 110/114 02-256 Warsaw

Instytut Techniczny Wojsk Lotniczych -Polish Air Force Institute of Technology 6 Ks. Boleslawa Street 01-494 Warsaw



4 - 9 September Stockholm, Sweden



Russia CIAM - Central Institute of Aviation Motors 2, Aviamotornaya St. 111116 Moscow

MAI - Moscow Aviation Institute 4 Volokolamskoye shosse 125993 Moscow

Republic of South

Africa CSIR - DPSS PO Box 395 Pretoria 0001

Sweden FOI - Swedish Defence Research Agency SE-16490 Stockholm

SAAB AB SE-58188 Linköping The Netherlands Airbus S.A.S. 2 Rond Point Maurice Bellonte 31700 – Blagnac

NLR – Netherlands Aerospace Centre PO Box 90502 1006 BM Amsterdam

United Kingdom Poll Aerosciences 114 High Street Cranfield - Bedfordshire -MK43 0DG

Rolls-Royce PO Box 31 Derby DE24 8BJ United States Aerospace Systems Design Laboratory Georgia Institute of Technology Atlanta, GA 30332-0150

Boeing Company WEO&T Enterprise Technology Strategy, External Technical Affiliations P.O. Box 3707, MC 03-FR Seattle, WA 98124-2207

Honda Aircraft Company 6430 Ballinger Rd Greensboro, NC 27410

Lockheed Martin Corporation 6801 Rockledge Drive Bethesda, Maryland 2081



Detailed Technical Programme

For the current version of the Detailed Technical Programme please use the following link: https://icas.dglr.de/icas2022/programme.html



List of Reserve Papers

For the current version of the List of Reserve Papers please use the following link: https://icas.dglr.de/icas2022/reserves.html



List of Interactive Presentations

For the current version of the List of Interactive Presentations please use the following link: https://icas.dglr.de/icas2022/interactive.html





Social Events

Welcome Reception Sunday 4th September

The welcome reception on **Sunday evening 18:00-20:00** will be held at the Stockholm Waterfront Congress Centre, where the **registration desk will be opened from 16:00 to 19:00**.

(This event is included in the registration fee for congress participants and accompanying persons.)

Congress Reception Monday 5th September

The Congress Reception on Monday evening 19:00-21:00 is hosted by the City of Stockholm and will be held at the Stockholm City Hall.

This symbol of Sweden's capital city is located just across the water from the Congress Centre (5 min walk).

(This event is included in the registration fee for congress participants and accompanying persons.)



About the City Hall

The City Hall hosts a large variety of activities and is the seat of the City Council of Stockholm. The Blue and Golden Halls, among the world's finest banquet premises, are what people most frequently associate with the City Hall. Naturally the highlight of every year is the Nobel Banquet held in December (picture above). <u>international.stockholm.se/the-city-hall/</u>

Student Party Tuesday 6th September 20:00-23:00. - 100 SEK (= 10 EUR) VAT included

The student party will be held at the Waterfront Congress Center. In the bar area at level 5 you will enjoy a magnificent view of Stockholm and Lake Mälaren while networking with your peers from all over the world. Food and drinks will be served and there will be music and a great friendship party! **Please confirm your intention to participate when you register online.**



Congress Banquet Thursday 8th September – 950 SEK (= 95 EUR) VAT included

The ICAS 2022 Congress Banquet will be held at the **Vasa museum**, which is a magnificent setting for a banquet with dinner tables set up under the prow of the old ship. A truly unique experience – leaving you with everlasting memories. A guided tour of the Vasa and the exhibitions is included. **Please book and pay your banquet ticket when you register online.**



About the Vasa Museum

In 1961, the Vasa was raised from the depths of Stockholm harbour where she had lain for 333 years. Now housed in an award-winning museum, seeing this Royal flagship up close is a never-to-be-forgotten experience. Vasa is a real treasure from the 17th century that offers us a rich history, from the work at the shipyard to life on board a warship. This is the most visited museum in Sweden. **Location:** 10-15 minutes by public transport from the Central Station. <u>www.vasamuseet.se/en</u>



Accompanying Persons Programme

Stockholm with surroundings has a lot to offer visitors. Magnificent art, dynamic culture, ornate palaces, medieval history or unspoilt nature. Read www.icas2022.com/stockholm/ about all this under more or on www.visitstockholm.com.

Some accompanying persons may wish to visit attractions on their own and can find numerous suggestions on the links above. For those who prefer organized tours one tour per day is offered Monday through Thursday - see some details below.

Prices for these tours are expected to be available in April or May and will then be included on the website. When we get closer to the congress an email with more details and a special booking link will be sent to registered accompanying persons.



Drottningholm Castle

Archipelago Tour

ABBA museum

Monday 5th September

Old Town walkabout (lunch included)

Gamla Stan (Old Town) is one of Europe's best preserved. This is where Stockholm was originally founded in the 13th century and the medieval atmosphere is still evident, with narrow cobbled streets, low-rise old-style houses, squares, workshops, and boutiques. We walk around with an experienced guide and conclude with joint lunch.

Time: 10-12 plus lunch

Price: TBD

Suggestions for individual visits after lunch: Livrustkammaren (500 years of Royal History) or the Nobel Museum.

Tuesday 6th September

Drottningholm Palace by boat (lunch included)

Drottningholm Palace, situated on Lake Mälaren just 15 km from Stockholm, dates from the 17th century. The palace, which is Sweden's Royal Residence, was built along the lines of Versailles in breath-taking grounds. The 18th century Royal Court Theatre is the world's oldest playhouse still in use and its original scene-changing machinery is still intact. The palace - along with the court theatre, park and Chinese Pavilion - is one of the UNESCO cultural heritage sites in Sweden.

Time: 11-16 Price: TBD



Wednesday 7th September Art museum tour (including lunch)

There are several art museums in Stockholm like Nationalmuseum, Moderna Museet, Waldemarsudde, The Thiel Gallery and Millesgården, with its vast sculpture garden. Based on what is planned to be exhibited in September the tour will start with Moderna museet <u>www.modernamuseet.se/stockholm/en/</u> and then Nationalmuseum <u>www.nationalmuseum.se/en/</u> where we also will have lunch. Time: 10-16

Price: TBD

Thursday 8th September Archipelago Tour to Vaxholm

The Stockholm archipelago has about 30,000 islands and many different tours are on offer. For ICAS accompanying persons we suggest a tour to the archipelago capital town Vaxholm. This is the perfect tour if you're looking to experience a picturesque archipelago town. The small town is idyllic with narrow alleys, shops and galleries, the Vaxholm citadel and much more.

Time: To Vaxholm with lunch onboard: 10:30-12:00. Return directly with the same boat 12:00-13:15 or stay in Vaxholm for some hours and return with the next boat 15:30-16:45.

Price: TBD



Technical Tours

Technical tours are planned to be arranged on Friday 9th September as outlined below.

Saab in Linköping including a visit to the Air Force Museum A full-day tour with bus travel to Linköping (2 hours from Stockholm), including a visit to the Saab facilities in Linköping and the Air Force Museum located near Linköping. Saab is well known for developing many generations of military aircraft and its commuter aircraft Saab 340 and Saab 2000. Saab has, together with Boeing, developed the new T-7A Red Hawk trainer. Saab Aeronautics today offers advanced airborne systems, related subsystems, Unmanned Aerial Systems (UAS), aerostructures, and services to defense customers and commercial aerospace industries worldwide. Read more about Saab in the chapter Aeronautics in Sweden.

The number of visitors is limited to about 100, in two buses.



More about the Air Force Museum: https://www.flygvapenmuseum.se/languages/engelska/

ATC Arlanda – Remote Tower Centre

A half-day tour to Visit Arlanda Remote Tower Centre at the Stockholm main airport – located 40 km north of Stockholm. The Remote Tower Centre Stockholm remotely controls four Swedish airports. The Swedish Air Navigation Service Provider (LFV) and Saab were the first in the world to put remote air traffic control towers into operation. Saab Digital Air Traffic Solutions developed the system LFV operates at Arlanda. A second Remote Tower Centre is located at Sundsvall Airport, where Saab Digital Air Traffic Solutions, SDATS, is the service provider and operates two Swedish airports. **Only available for a small group.**





Please indicate your interest in the technical tours to Linköping and Arlanda ATC when you register. Please note that participation may be restricted for security reasons.

The participants will be selected after the Early Bird deadline June 15 and will then receive an email with more information and a link for final confirmation and payment.

GKN Aerospace Engine Systems in Trollhättan

Trollhättan is located 400 km west of Stockholm at the lake Vänern. GKN Aerospace Engine Systems, located in Trollhättan, Sweden (formerly Volvo Aero) develops and manufactures components for aircraft, gas turbines and rocket engines with high technology content in cooperation with the world's leading producers. Read more about GKN Aerospace Engine Systems in the chapter <u>Aeronautics in Sweden</u>.



Important information about the possibility to visit GKN:

The tour to GKN Aerospace in Trollhättan, originally planned as a day trip on Friday 9th September, has for various reasons become difficult to arrange.

For congress participants who have professional contacts with GKN and want to visit, a post-congress tour can be arranged. You may then for example travel to Gothenburg by train (3 hours) during the weekend. The visit to GKN in Trollhättan can be arranged on Monday September 12. On the way to Trollhättan, from Gothenburg (a one-hour drive) a stop could be made at Brogren Industries <u>www.brogrenindustries.com/en</u>, an SME company that is a GKN supplier.

The visit to GKN will comprise presentations of aerospace activities at GKN Aerospace Engine Systems as well as a visit to PTC Innovatum, a research arena for industrial production processes R&D on metallic and composite aerospace products also located in Trollhättan.

If you are interested to take part in such a post-congress tour to Trollhättan please send an email to <u>gknvisit@icas2022.com</u>.



ICAS 2022 Registration fees

EARLY BIRD REGISTRATION 1 MARCH – 15 JUNE 2022.

Registration fees are presented in SEK. Exchange rate 1,00 EUR \approx 10,00 SEK

| | ICAS 2022 registration fees in SEK – incl. VAT (excl. VAT) | | | | |
|--------------------|--|---------------------|--------------------|-----------------|--|
| CATEGORY | Very Early Bird <31 dec. 2021 | Early Bird <15 June | Regular <31 August | On-site | |
| Members* | 8 750 (7 000) | 9 250 (7 400) | 10 500 (8 400) | 11 500 (9 200) | |
| Non-Members | 9 875 (7 900) | 11 000 (8 800) | 12 375 (9 900) | 13 500 (10 800) | |
| Students** | 2 000 (1 600) | 2 000 (1 600) | 2 000 (1 600) | 2 500 (2 000) | |
| Retired (> 65) | 5 000 (4 000) | 5 000 (4 000) | 5 000 (4 000) | 5 000 (4 000) | |
| Accomp. Persons*** | 750 (600) | 750 (600) | 750 (600) | 1 250 (1 000) | |

The Swedish VAT rules for a physical congress imply that all delegates will be charged 25% VAT, but the **VAT can in most cases be reclaimed**.

If you would you like to read more about this, please check the page <u>VAT</u> rules and applicability.

Conditions

* Member = Member of any <u>ICAS Member Society</u> or <u>ICAS Associate Member</u>

** Student = undergraduate or full-time graduate students at the time of the Congress

*** All accompanying persons must be registered

Registration fees include:

Regular Delegates – Attendance at the Congress sessions, Welcome Reception on Sunday, Congress Reception on Monday, lunches Monday to Thursday, coffee/tea and water through the days, and Congress bag.

Students – Same as for Regular Delegates plus Student Party on Tuesday.

Retired Persons – Same as for Regular Delegates.

Accompanying Persons – Attendance at the Welcome Reception on Sunday, and the Congress Reception on Monday evening, possibility to book an organized Accompanying person tour.

EARLY BIRD REGISTRATION IS OPEN FROM 1 MARCH UNTIL 15 JUNE

To be eligible for a VAT refund you must have the VAT or tax registration number for your company/organization available when you register.

Before you proceed to the online registration, please also check the different options for Technical tours, Social events and Accompanying persons programme.

PROCEED TO THE ONLINE REGISTRATION LINK



Cancellation – registration fee

The registration can be cancelled until July 15, 2022. However, a cancellation fee of 500 SEK will be charged. After this date, no refunds are possible. Should you be unable to attend, you may, however, be substituted by a colleague. Cancellation or name changes must be made in writing and sent to: <u>icas2022@meetagain.se</u>.

Accommodation

Hotels for ICAS 2022 in Stockholm, Sweden

Please check the congress website for a list of hotels within walking distance from Stockholm Waterfront Congress Centre (the venue) and the Central Station. Two examples are noted below.

Stockholm's hotels are at the forefront when it comes to sustainability. In fact, hotels simply can't survive in the Swedish hotel market without credible, well-documented sustainability efforts. You are encouraged to book your hotel room via our online links shown below as "*Book Now*". Please book early to ensure a room at one of these preferred hotels.

Radisson Blu Waterfront Hotel – adjacent to the Stockholm Waterfront Congress Centre (the venue) and Central Station

Situated in the heart of the Swedish capital, the Radisson Blu Waterfront Hotel Stockholm, is an ideal spot for both business and leisure travelers. **Address:** Nils Ericsons Plan 4 111 64 Stockholm

Prices (including VAT, breakfast and complimentary WiFi):

Standard single: 2 395 SEK per night Standard double: 2 595 SEK per night



Book Radisson Blue Now



Generator (a cheap alternative for student participants)

Generator Stockholm is located in central Stockholm, just 5 minutes' walk from the Central station. Generator Stockholm unites the city's strong sense of design and patterning with inspired art, great food and drinks, on trend music and the best events.

It's a Stockholm hot spot loved by both locals and tourists. Here you can book a single or a double room but also a shared room in 4 or 6-bed dorm. **Address:** Torsgatan 10, 111 23 Stockholm

Prices (including VAT, breakfast and complimentary WiFi):

Double room for single use – 1450 SEK/night including breakfast. Twin room (2 persons) – 1500 SEK/night including breakfast. Four-bed room (4 persons) – 2140 SEK/night including breakfast. **Note: only 535 SEK/person in shared four-bed room!**



Rooms that have not been booked will be released from 30 days before arrival. Rooms can still be booked after this date, but to ordinary rates. Free cancellation up until 24 hours upon arrival, thereafter 100 % payment.

Book Now – BOOKING CODE: ICAS 2022

Participants book their rooms by sending an email

to groups.gesto@staygenerator.com or call +46 (0)8 505 323 70.

Please email the following details:

- First and last name
- Telephone number
- Email
- Arrival and departure date
- Room type (double room for single use OR twin room (2 persons)

Booking links to other hotels are provided on the congress website.



Transportation to/from airports

Wherever you are in the world, you'll find Stockholm easily accessible. It's a key hub with direct flight-connections to and from many destinations.

Stockholm Arlanda Airport

Stockholm Arlanda Airport is the primary gateway to Stockholm and is located 40 kilometers (25 miles) north of Stockholm City. Many airlines serve non-stop routes to international destinations to/from Arlanda.

Once you arrive, it's just a 20-minute journey into the city center with the Arlanda Express train. You are then only an escalator away from the Stockholm Waterfront Congress Center! <u>Airport link to Stockholm city center</u>

The Arlanda Express Train provides a shuttle service between Stockholm Arlanda Airport and Stockholm Central Station. The journey takes 20 minutes with trains departing every 15 minutes. The train platform is easily accessible, underneath the arrivals terminal. The ordinary price for a one way ticket is **299 SEK (reduced price if you are below 25 or above 65)**. However Arlanda Express offers special rates for congress delegates. Book your ticket online at <u>www.arlandaexpress.com</u> or via the QR-code below.



PLEASE NOTE:

The discount code ICAS22 is only valid from June 6 to September 16.

In addition, there is a coach-service departing every 10-15 minutes between Arlanda Airport and the CityTerminal – located next to the Central Station. The travel time is 35-40 minutes. A typical coach service price from Arlanda to downtown is **119 SEK**.

Taxi and limousine services are available at fixed rates. Travel time: 35-50 minutes, depending on time of day.



Please note: Taxi fares in Sweden aren't regulated, which means that prices can vary significantly between companies. With this in mind, we recommend that you use the services of well-known firms like Taxi Stockholm, Sverigetaxi/Taxi 020 or Taxi Kurir. A typical fixed price fare for taxi from Arlanda to downtown is **575 SEK** (but may depend on time of arrival).

More information Arlanda: www.swedavia.com/arlanda/

Bromma Stockholm Airport

Bromma Airport is a smaller airport offering domestic flights as well as flights to selected European destinations. It's located conveniently close to central Stockholm, and waiting times are generally short.

Airport link to Stockholm city center

Bromma Airport offers coach-services with departures timed with arrivals and departures at the airports. Travel time: 20 minutes. More information Bromma: <u>www.swedavia.se/bromma/</u>

Stockholm Skavsta Airport

Stockholm Skavsta Airport is located 100 km south of Stockholm – right next to the main E4-highway. Budget airlines, like Ryanair and Wizz Air offer cheap flight connections to/from many places in Europe.

Airport link to Stockholm city center

Skavsta Airport offers coach-services with departures timed with arrivals and departures at the airports. Travel time: 80 minutes. More information Skavsta: www.skavsta.se

Travel times

- Stockholm Arlanda Airport City center: 20 min by express
- Bromma Stockholm Airport City center: 20 min by airport coach.
- Stockholm Skavsta Airport City center: 80 min by airport coach.



Useful hints and answers to questions you might have

Climate

The climate in Stockholm during September can be summarized as mild and reasonably dry. September is in the fall / autumn in Stockholm and is typically the 4th warmest month of the year. Daytime maximum temperatures average around a cool 15°C (59°F), whilst at night 9°C (48°F) is normal.

Currency

Sweden is one of few EU countries that opted to keep their currency and not use the Euro. The currency in Sweden is called the Swedish crown, or the krona (SEK). Bank notes come in the following values 500 SEK, 200 SEK, 100 SEK, 50 SEK and 20 SEK. If you still need cash, there are many ATM machines available in central Stockholm. For money exchange, the companies "Forex" and "X-change" have offices at the airports and in the city.

Can I pay cash or with credit card?

Most stores handle cash but it is more common to pay by credit card today and please note that some shops and restaurants do not accept cash! Major credit cards are accepted in hotels, restaurants and shops. It is advisable to carry an identity card or other form of photo identification.

Am I expected to leave a tip?

Tips are not used in hotels and taxis but in restaurants it is common to show your appreciation for good service by leaving a little extra.

What time zone is it in Sweden?

The time zone in Stockholm is GMT + 1 hour. Daylight Saving Time is used until October 31st.

Can I drink the tap water?

The drinking water quality in Stockholm is of high and consistent quality, which means that you can drink it directly from the tap.

What about electricity?

The standard voltage is 230 V, and the frequency is 50 Hz. The power plugs and sockets are of type F, also known as "Schuko". This socket also works with plug C and plug E.





Mobile phones

Visitors from within European Union do not have to pay any additional charges to use your mobile phone in Sweden. Visitors from outside of Europe are recommended to check with your service provider before your trip to Sweden. Maybe they offer some special (data) plan for going abroad and have a deal with any of the main Swedish brands: 3, Tele2, Telenor and Telia.



Partners & Exhibitors

