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IFAR - INFRASTRUCTURE DATABASE

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Abstract

The IFAR (International Forum for Aviation Research) [1] has agreed in 2017 to develop and populate an advanced Infrastructure Database that would contain R&D testing facilities data from 26 member countries. The intent is to gather and maintain the data and public information regarding R&D testing facilities from those 26 international research centers in order to facilitate 1) international collaboration on R&D projects and 2) to share R&D testing facilities between members based on availability. This is even more important now than ever, as national governments seem more and more hesitant to entertain large infrastructure investments for R&D purposes thus sharing facilities is no longer a nice to have intention but a necessity.

In its first four development phases the IFAR Infrastructure Database will cover: Wind Tunnels, Propulsion Facilities, Research Aircraft, and Structural Testing Facilities.

Keywords: Infrastructure Database, Wind Tunnels, Propulsion Facilities, Research Aircraft, Structural Testing Facilities

1. IFAR – International Forum for Aviation Research

IFAR, the International Forum for Aviation Research, is the world´s only aviation research establishment network. IFAR is established on a voluntary, non-binding basis. IFAR aims to connect research organisations worldwide, to enable the information exchange and communication on aviation research activities and to develop among its members a shared understanding on challenges faced by the global aviation research community.

IFAR develops views and recommendations, e.g. the IFAR Framework Document on future research strategies and facilitates opportunities for networking and partnerships. The focus of IFAR is on low TRL (Technical Readiness Level) non-competitive aviation research and development related to global technical challenges such as those pertaining to

- emission.
- noise,
- security,
- safety,
- efficient operations,

and steps to reduce the impact of aviation on climate and the environment. Beyond the scientific and technical activities via its working groups IFAR aims also on facilitating exchange at the academic level and the promotion of young scientists and engineers by the development of an action plan and specific measures including frequent face to face workshops.

1.1 Objectives

IFAR aims to realize its purpose inter alia by the following activities:

- Connecting the global aviation research community worldwide,
- Serving as a venue for information exchange and communication, e.g. by its Summits, by conducting meetings, workshops and conferences, hosting internet forums, etc.),
- Developing among its Members a shared understanding on a common set of key challenges faced by the global aviation research community,
- Organizing working groups to advance specific key challenges identified above, e.g. the current IFAR Infrastructure data base is a result of the effort of such an IFAR lead international working group,
- Developing views and recommendations, to inform on future research strategies and – where appropriate – to develop a combined research strategy for the future;
- Publishing and disseminating information (e.g. via webpage, flyers, publications, conferences),
- Issuing IFAR views and recommendations and give advice on aviation topics; the purpose of issuing such views and recommendations is to define trends in aeronautics research and/or inform emerging regulations; views and recommendations are not meant as binding guidance to individual IFAR members,

Within IFAR, IFAR members aim to exchange information and plans concerning aviation research activities, and identify and evaluate options for new opportunities for cooperation and applying the results of aviation research. Specific cooperative activities in bi-lateral mode as possible and will be implemented through specific separate agreements between the concerned members.

1.2 Organisational Structures

IFAR Summit meetings

- Annually, principals from IFAR member countrie convene at an IFAR Summit meeting. This event promotes the networking and information exchange of members as well as sets and endorses the IFAR goals and activities for the coming year. A summit may establish technical and non technical expert groups for IFAR activities of high interest. These are also called working groups.

IFAR Leadership team

- The IFAR Leadership team consists of IFAR Chair, IFAR Vice-Chair, IFAR Past Chair (rotating members with a term of two years), IFAR Founding member organisation (DLR) and IFAR Founder.
- Every two years the IFAR Chair and IFAR Vice-Chair are elected by the IFAR Summit.

IFAR Secretariat

- IFAR activities are supported by the IFAR Secretariat.

IFAR Steering Committee

- For technical and organizational matters supporting the activities between Summits and reporting to the members of the Summit.
- Membership: a representative from each IFAR members, including the the IFAR Secretariat.

IFAR Working Groups (WG) and initiatives

- There are several technical and non technical working groups and initiatives where interested members collbaorate. A list of them is published at www.ifar.aero [1].
- IFAR Infrastructure database is one working group which is of focus in this paper

1.3 IFAR Members

IFAR connects 26 international research organisations (see Figure 1). Each country is reprepresented by one organisation.

1. Australia, CSIRO – Autonomous Systems Laboratory CSIRO ICT Centre
2. Austria, Vienna University
3. Belgium, von Karman Institute for Fluid Dynamics
4. Brazil, IAE – Institute of Aeronautics and Space
5. Canada, NRC – Aerospace Portfolio
6. China, CAE – Chinese Aeronautical Establishment
7. Czech Republic, VZLU – Aeronautical Research and Test Institute
8. Finland, VTT – Technical Research Centre of Finland
9. France, ONERA – French Aerospace Lab
10. Germany, DLR – German Aerospace Center
11. Hungary, Budapest University of Technology and Economics
12. India, CSIR-NAL – National Aerospace Laboratories
13. Italy, CIRA – Centro Italiano Ricerche Aerospaziali
14. Japan, JAXA – Aerospace Exploration Agency
15. Korea, KARI – Korea Aerospace Research Institute
16. Netherlands, NLR – Netherlands Aerospace Centre
17. Poland, ILOT – Polish Institute of Aviation
18. Portugal, CEiiA – Centre for Innovation and Creative Engineering
19. Romania, INCAS – National Institute of Aerospace Research “Elie Carafoli” of Romania
20. Russia, TsAGI – Central Aerohydrodynamics Institute of Russia
21. South Africa, CSIR – Council for Scientific and Industrial Research
22. Spain, INTA – National Institute of Aerospace Technology of Spain
23. Sweden, FOI – The Swedish Defence Research Agency
24. Turkey, METU – Middle East Technical University Ankara
25. United Kingdom, ATI – Aerospace Technology Institute
26. USA, NASA – U.S. National Aeronautics and Space Administration

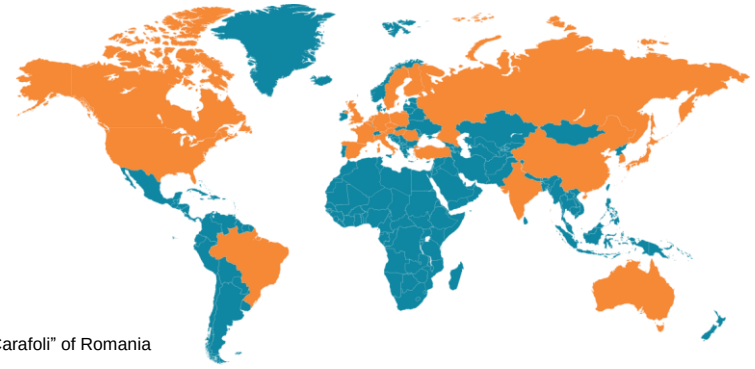

Figure 1 – IFAR Members.

1.4 IFARLink

IFARLink www.ifarlink.aero is a communication and database platform for the use of IFAR members and affiliated universities. It aims to improve the international interaction among students, PhD students and scientists in the field of aviation. The IFAR Infrastructure Database as one of the IFAR working groups is embedded in IFARLink and requires a registration to this platform.

IFARLink informs about

- worldwide news in aviation research
- ongoing research in aeronautics around the globe
- job opportunities
- competitions / awards
- research funding calls
- research infrastructures (presented in this paper)

One can engage in

- virtual conferences
- technical working groups
- discussion groups

Registration in IFARlink

- IFAR member or already included university

  Register at www.ifarlink.aero
- New university affiliated to aviation

  Express interest to info@ifarlink.aero

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2. IFAR Infrastructure Database

In 2018 IFAR started the development of an Infrastructure Database regarding R&D testing facilities from its 26 international member research organisations (see Figure 1). Four types of categories are considered: Wind Tunnels, Propulsion Facilities, Research Aircraft, and Structural Testing Facilities (see Figure 2). The objective is to gather and maintain the data in order to facilitate 1) international collaboration on R&D projects and 2) to share R&D testing facilities between members based on availability.

This Infrastructure Database in its current state is available on-line to all its IFAR members through www.ifarlink.aero. This is deemed practical for reviews in order to receive feedback but also to populate the date. Experts from NRC and DLR are designing the structure of the database for these four corresponding categories. The final database is discussed among all IFAR members before it is approved and then programmed to be included in the online version of the database. To date, as of June 2021, the IFAR Infrastructure Database is considered complete for two categories of facilities: Wind Tunnels and Propulsion Facilities. The development on Research Aircraft is ongoing and the Structural Testing Facilities are foreseen to start next year in 2022.

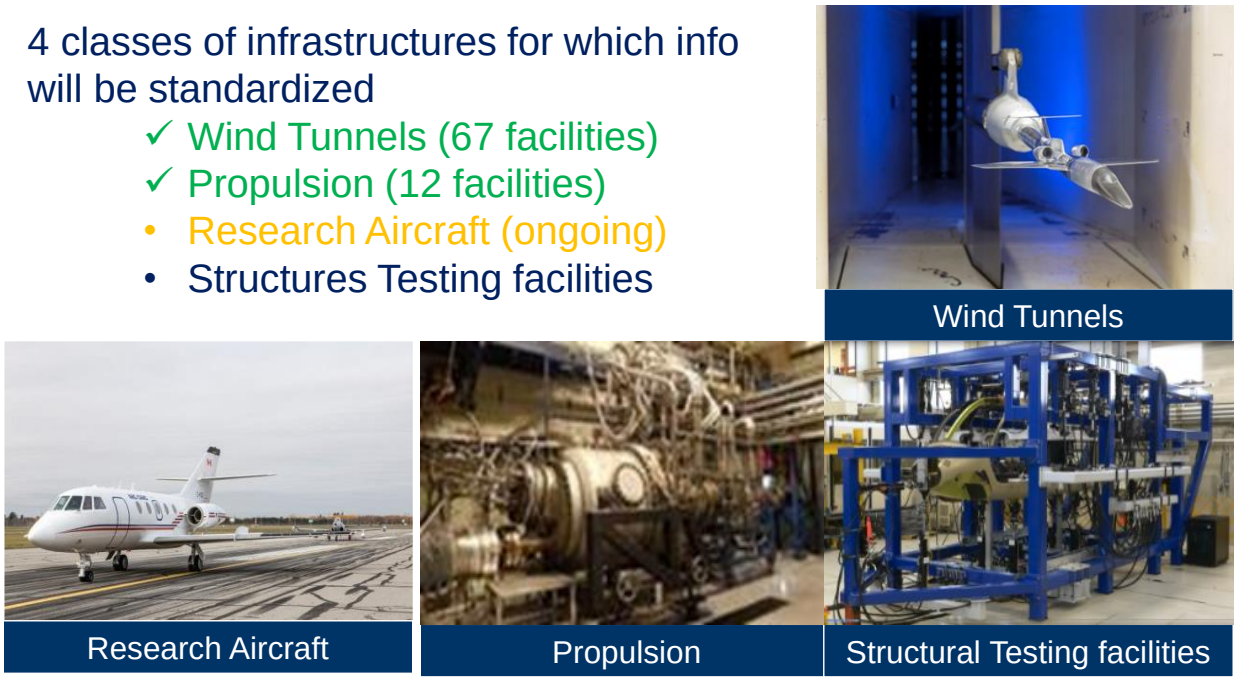

Figure 2 – Classes of infrastructures.

As mentioned above the IFAR Infrastructure Database is embedded in the online platform IFARLink www.ifarlink.aero. Figure 3 illustrates a print screen of the website showing also some other additional features. To access the database a registration in IFARLink is required. IFARLink is open to all IFAR member organizations, universities affiliated to aviation and other associated organizations. The database gives the user several search options (e.g. dimensions, operating properties like speed, temperature, pressure, etc.) which allows finding a specific facility in an efficient way. Each IFAR member can administer the own data by themselves.

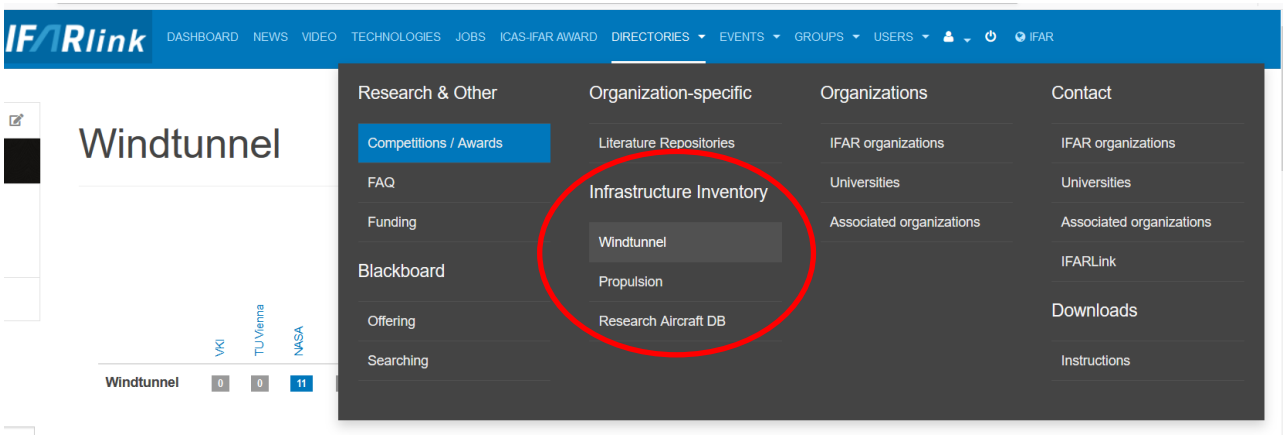

Figure 3 – Infrastructure data bases within IFARLink www.ifarlink.aero

2.1 Wind Tunnels

Wind Tunnels (WT) was the first category of the IFAR Infrastructure Database that was addressed and developed by NRC and DLR experts. To date, 14 IFAR organizations have entered WT data accounting for 67 WT facilities worldwide. It is expected that more WT data will be entered in the near future. The experts have designed the database to include specific information such as: Tunnel Type, Tunnel Test Section, Main Operating Range, Typical Testing and Unique Capabilities. Figure 4 shows the overview page of the WT in IFARLink highlighting the IFAR Members with the corresponding number of WT already included.

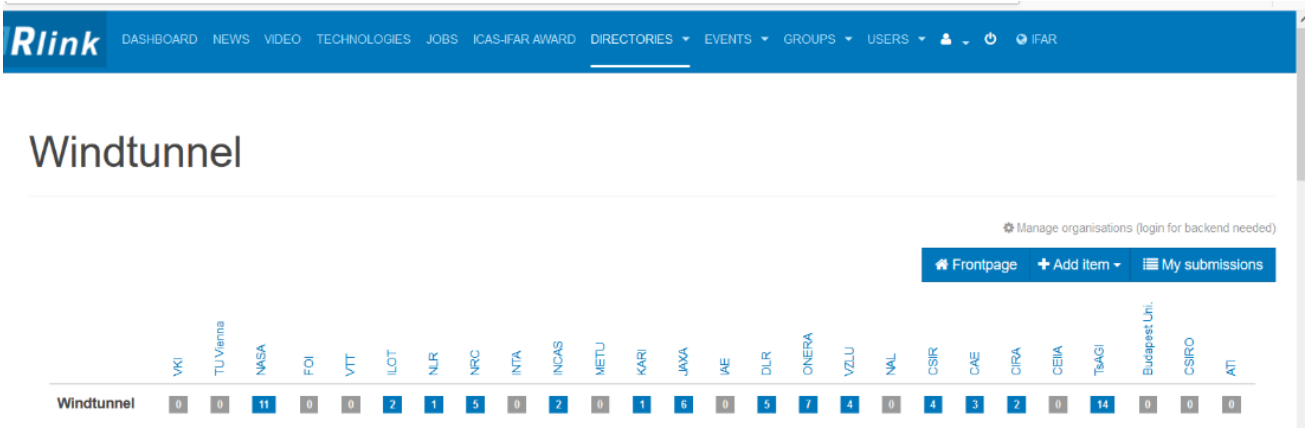

Figure 4 – Wind tunnels data base within IFARLink www.ifarlink.aero

2.2 Propulsion

The Propulsion category of the IFAR Infrastructure Database was developed by the NRC and DLR experts just recently and is now ready to be populated for the inclusion of the data. The experts have designed the Propulsion database to address 7 different types of facilities including: Engine Test Facilities/Turbofan & Turbojet, Engine Test Facilities/Turboshaft & Turboprop, High Pressure Spray Test Facilities, Combustion Test Facilities, Research Altitude Test facilities, Aerodynamic test facilities/Turbomachinery Linear Cascade Wind Tunnel and Aerodynamic test facilities/Turbomachinery Rotating Rig. Figure 5 shows the overview page of the Propulsion facilities in IFARLink highlighting the IFAR Members with the corresponding categories and number of included facilities so far.

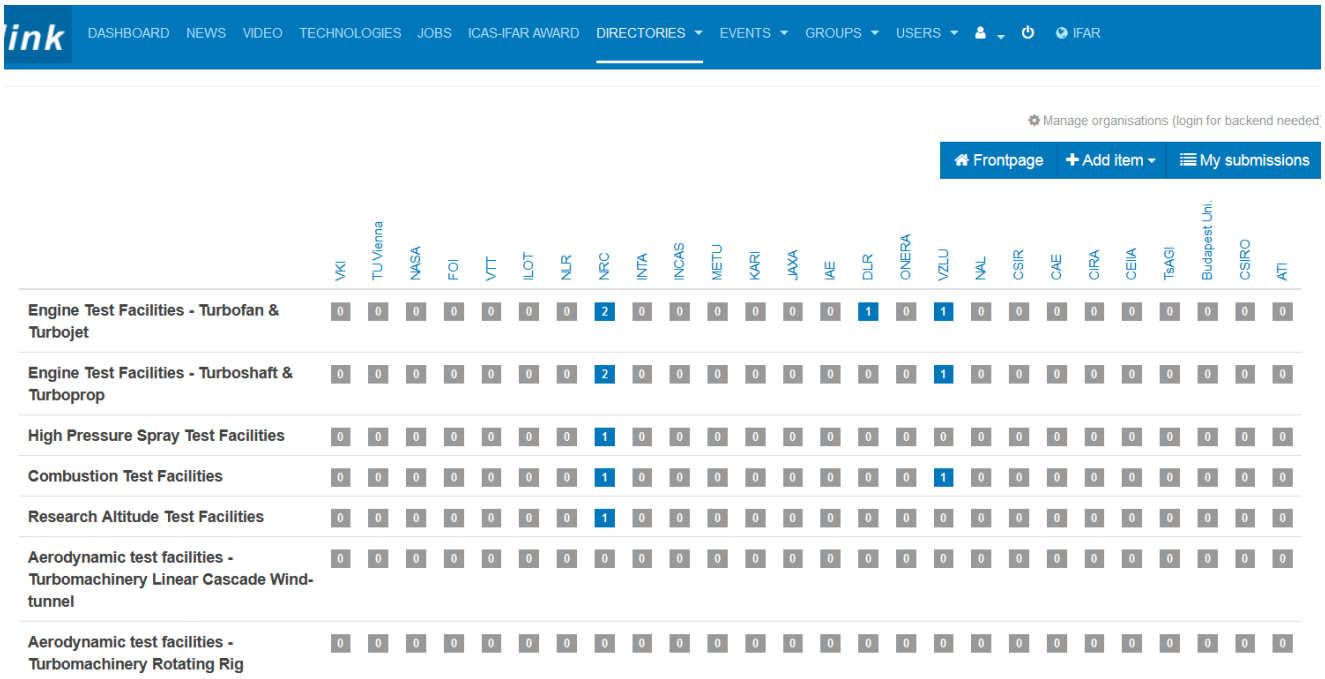

Figure 5 – Propulsion data base within IFARLink www.ifarlink.aero

2.3 Research Aircraft

The Research Aircraft (RA) category of the IFAR Infrastructure Database is currently under development and is expected to be finished by end of 2021. It is anticipated that the RA database will include as a minimum, information such as: Aircraft Type and Mission Type. Of course, that will be supplemented with aircraft specific parameters including performance (max/min speed, max altitude, max take/off weight, max range…).

Regarding the current status of the RA category; it can be stated that several algorithms have been discussed and reviewed by NRC and DLR pilots and that we have reached a consensus on both content and features. This proposal for RA will be submitted for approval at the next IFAR summit in Poland in fall 2021 before the data is entered by member countries.

2.4 Structural Testing Facilities

The Structural Testing Facilities database of the data base will be designed, developed and possibly populated in 2022.

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4. Copyright Statement

References

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