

2023 PACE Future Innovators Awards in Aircraft Preliminary Design

Regulation

1. Motivation

PACE Aerospace & IT, a leading aerospace engineering software development company, values innovation, quality and passion in aviation. For more than 20 years, the company has promoted these values around the world at exhibitions, conferences and corporate events.

PACE has also promoted these values at universities, research institutes and government institutions. These promotional activities have been centred around the unique capabilities of the company's software solutions, which include aircraft preliminary design, aircraft interior configuration, flight profile optimization, and extended reality training.

Through these activities, PACE has realized that the future software developers and aerospace engineers of the world are a great source of inspiration not only for the company, but for the rest of the industry as well as the world. PACE would like to facilitate the empowerment of these future innovators by providing them with a stage upon which they can showcase their skills, talents, and dedication to the values they share with the company.

To that end, PACE has created the Future Innovators Awards program, and is proud to herein announce the *2023 PACE Future Innovators Awards in Aircraft Preliminary Design*, organized in collaboration with EUROAVIA - *the European Association of Aerospace Students*.

2. Vision

2023 PACE Future Innovators Awards in Aircraft Preliminary Design (hereinafter *PACE Contest*) is a competition in which Teams composed of university students confront each other on the preliminary design of an aircraft that better fulfils the requirements defined in the *PACE Contest Design Topic*.

Such preliminary design (the *Design Project*) shall be carried out by Teams using PACELAB APD, the aircraft multi-disciplinary Analysis and Optimization tool developed by PACE Aerospace & IT and used by the design organizations of the most relevant aircraft OEMs and research centres around the world.

A fully featured PACELAB APD software suite will be made available to every team member for the whole duration of the contest.

3. Teams

3.1. Composition

Teams shall be composed of a minimum of 3 (three) and a maximum of 4 (four) students regularly enrolled in the same University at application time.

3.2. Eligible students

Only B Sc and M Sc students are eligible to join a team. PhD candidates are excluded.

3.3. Leader

Every team shall appoint its Team Leader and communicate their name.

Team Leaders will be the one and only contact point with PACE Contest organisation.

3.4. Member substitution

Teams' composition shall not change throughout the duration of the competition. Therefore, no team member substitution will be accepted after the finalisation of the application procedure.

3.5. Minimum number of members per team

Any team member can withdraw their membership from a team, but should the number of active team members fall below 3 (three), the team will be decommissioned.

3.6. Maximum number of participating teams

A maximum number of fifteen (15) participating teams is established.

4. Design Topic

4.1. Background

Two regions in northern Italy (Lombardia and Veneto) will host the Winter Olympic games in 2026.



The sites involved in this event are illustrated in the picture above.

Among the different airports involved in the event, consider the following:

- Milano Malpensa (LIMC)
- Milano Linate (LIML)
- Verona Villafranca (LIPX)
- Venezia Tessera (LIPZ)
- Sondrio Caiolo (LILO)
- Cortina d'Ampezzo (LIDI)

It is expected that most of the foreign athletes will arrive in Italy landing either at Milano Malpensa (LIMC) or at Venezia Tessera (LIPZ) international airport.

These persons need to be transferred to the venues where the games will take place.

4.2. Design Topic definition

Design topic is divided in two parts. An *Objective Design Topic*, which sets the characteristics of the machine to be conceived by the Teams, will be complemented by a *Creative Design Topic*, in which Teams will show how the Aircraft designed for the Objective Design Topic could benefit from technological advancements.

4.2.1. Objective Design Topic

Design an all-electric aircraft and size it with respect to the most demanding mission, which has been identified as LIMC to LIDI.

Benchmark the performance of the designed aircraft towards the other missions.

- Aircraft should be capable of carrying non less than 4 PAX (85 kg + 15 kg luggage) + Pilot.

- Consider as baseline 2022 technology maturity level for electrical powertrain components, as shown in Table 1. Should you judge it necessary/suitable, adopt of 2035 levels motivating your decision.
- Obey CS-23 MTOM limitation.
- LIDI airport is currently closed, but pretend it is operative and get its data from [here](#).
- Design the route and, accordingly, your A/C so that it guarantees non less than 1000 ft of vertical separation from the highest overflown obstacle.
- Total energy per payload mass unit used for performing a return flight shall be assessed and minimised.
- Adoption of methods (e.g., mass estimation, aerodynamic estimation) not natively implemented in APD is a viable option but shall be documented and justified.

Table 1: Estimates for technology maturity level for electrical powertrain components

Component	Units	2022	2035	2050
Battery Energy Density	[Wh/kg]	210	350	1873*
Battery Power Density	[W/kg]	1365	2275	5619*
Motor Power Density	[W/kg]	5750	11100	16450**

*Li-ion

**Li-S

4.2.2. Creative Design Topic

Consider technology maturity level for electrical powertrain components foreseen for an Enter In Service (EIS) in 2050, as shown in Table 1.

Unleash your imagination and show how, potentially applying slight modifications to the aircraft you have designed for the objective topic, the technology advancements will impact as enabler of novel possibilities in terms of usage, mission, configuration, etc.

4.3. Design Project requirements

The following aspects shall be covered in the submitted objective design project.

- Evidence of the capture of the design topics requirements or motivation for the non-satisfaction.
- Justification for the adopted technical approach.
- Description of the trade-off studies that led to the proposed configuration.
- Assessment of areas potentially problematic from a technical standpoint and identified mitigation strategies.

5. Application

5.1. Application window

For information on application window opening and closing dates, please refer to section 14.

5.2. Method

Once the application window opens, Teams can apply following the instructions provided on the contest page <http://pace-contest.euroavia.eu/>

5.3. Acceptance policy

Teams will be accepted applying a first-come, first-served policy.

Additionally, variety of participating universities will be privileged, so the available places will first be assigned to the first applying team of every university. Should any place remain available, it will be granted to the second team(s) from and already accepted university(ies), and so forth.

5.4. Acceptance notification

Teams will be notified whether they have been accepted by means of an email sent to the Team Leader.

6. Participation fee

6.1. Amount

The participation fee amount for every team shall be calculated taking in consideration the number of team members and their affiliation to EUROAVIA according to the following scheme:

- EUROAVIA members: €15 per person.
- Non-EUROAVIA members: €25 per person.

The amount will shall be paid by the Team Leader for the whole team.

Important remarks:

- EUROAVIA International will verify the membership status for every member in every team and reserves the right to issue the extra fee in to each non-EUROAVIA or inactive EUROAVIA member.
- Participation fee is non-refundable. Shall, for whatever reason, any team member resign, the participation fee will not be reimbursed.

6.2. Due date

Participation fee is due by every accepted Team within 72 hours from acceptance notification. Failure to obey this deadline will cause the Team to be excluded from the contest.

6.3. Payment method

All details about the payment method will be provided in the acceptance notification email.

7. Design Project submission

7.1. Submission window

For information on submission window opening and closing dates, please refer to section 14.

7.2. Procedure

Design Project should be sent by the Team Leader to the official address of the organization of the contest: pace-contest@euroavia.eu.

A confirmation email will be received by the team within 24h from the submission.

7.3. Submission content

Teams Design Project submission shall contain the following items.

For the Objective Design Topic:

- The APD project file.
- If applicable, Knowledge Designer and any other file that will permit the commission to load the design project and solve it with Pacelab APD.
- A pdf report file written using the official template. Maximum length (all included): 20 pages.

Detailed instructions on what to upload and report template will be given at proper time.

For the Creative Design Topic:

- Power Point presentation pitching the conceived (5 slides max).

7.4. Participation fee reimbursement

All Teams that will submit a valid proposal will be reimbursed their participation fees.

8. Commission

8.1. Composition

The evaluation commission will be nominated by PACE.

Its members will be selected from aircraft preliminary design experts among PACE specialist(s) and Pacelab APD professional users' community.

A Commission observer member will be designated by EUROAVIA.

9. Evaluation

9.1. Objective Design Topic grading

Teams' projects will be graded by the commission with respect to the following subjects:

- Requirements capture
- Technological feasibility
- Innovation introduced
- Report quality

9.2. Creative Design Topic grading

Teams' projects will be evaluated by the commission with respect to the following subjects:

- Breadth, originality and potentiality of the proposed innovations.
- Feasibility with relevant EIS year technology level.

9.3. Overall grade

Overall grade will be obtained combining the two design topic grades with these weights:

Design Topic	Weight
Objective	75%
Creative	25%

10. Prizes

PACE contest provides for prizes for the three shortlisted teams as well as additional prizes for the winning team.

10.1. For all three shortlisted teams

- Teams' design projects and members bio will be published on PACE and EUROAVIA websites.
- Up to a total of 600 € per team of reimbursement of travel + accommodation costs to come Berlin for the concluding event. Reimbursement will be granted upon submission of all relevant receipts.

10.2. For the winning team

In addition to what mentioned above, for the winning team:

- Up to a total of 1000 € (for the whole team) of reimbursement of travel + accommodation + entry ticket costs for visiting a relevant aeronautical event during 2023. Reimbursement will be granted upon submission of all relevant receipts.

11. Intellectual Property

All IP developed by teams within the competition will solely be property of PACE.

Should any patent be deposited, authors' contribution will be rewarded recognising them as inventors with no further remuneration.

Should any part of the teams' projects be included in any of the PACE products, authors' names will be explicitly recognised within the software accompanying documentation.

12. Fair use of software license

Every team member will receive a license that will unlock a fully featured version of Pacelab APD.

Such license will be time-limited to the end of the concluding event.

By applying to the Contest, team members commit to a fair usage of the Pacelab APD software.

Fair usage implies that Pacelab APD shall exclusively be used for developing the design project for PACE contest. Any other use, including but not limited to use for any other academic purposes, in third party contracts, in research activities, is considered to be NOT fair.

13. Organisation

For the sake of clarity, in the following paragraphs a recap of the whole PACE Contest organisation is presented.

The entire initiative will be constituted of the following phases:

- Prologue
- Application
- Design project development
- Evaluation
- Concluding event

13.1. Prologue

This phase will start with the publication of the PACE Contest regulation and the associated promotion.

Prospective team members shall read thoroughly the regulation. Should any clarification be needed, questions may be directed to the email pace-contest@euroavia.eu.

All questions received and their replies will be available in the dedicated FAQ page

<http://pace-contest.euroavia.eu/faq/>.

13.2. Application

Teams shall apply as specified on the contest page on Euroavia website:

<http://pace-contest.euroavia.eu/application>

within the application window timeframe.

The mere application does not grant the right to participate to the contest, since when application window will close, acceptance policy will be applied to produce the accepted applicants list.

Once a team receives the acceptance notification it shall proceed with the payment of the participation fee within 72 hours, as described in paragraph 6, otherwise the acceptance will be voided and a new team from the list will be accepted (if any).

13.3. Design project development

All participating team members will receive a time-limited license for Pacelab APD that will unlock the fully featured development environment that shall be used for the design project development.

All participants will have access to Pacelab APD initial training.

For the entire duration of the design project development phase, technical support from PACE will be available via email. All requests received and their replies will be available in the dedicated FAQ page

<http://pace-contest.euroavia.eu/faq/>.

Design project development phase will be concluded by the submission of the design project by each team, that shall be performed according to the instructions given in paragraph 7.

13.4. Evaluation

Submitted design projects will be evaluated by the commission according to the metrics specified in paragraph 9, and the teams that developed the three top graded design projects will be admitted to the concluding event.

13.5. Concluding event

Concluding event will be held during the 2023 edition of PACEdays.

PACEdays is yearly event held in Berlin when PACE customers get together to share experiences, network and be informed on the company products roadmaps. 2023 edition will be held from May 3rd to May 4th 2023.

As far as PACE Contest is concerned, the concluding phase will consist in two different moments that will take place during the second day of PACEdays 2023.

At first, the three shortlisted teams will give a 15-minute presentation of their work in front of the audience and the commission.

After the three presentations, the commission will decide on the final teams ranking.

During a dedicated moment within a plenary session, the winning team will be revealed.

14. Schedule

DATE	MILESTONE
28/09/2022	OPENING OF APPLICATION WINDOW
21/10/2022	CLOSING OF APPLICATION WINDOW
26/10/2022	NOTIFICATION OF ACCEPTANCE
31/10/2022	CONFIRMATION OF ACCEPTANCE
03/11/2022	KICKOFF EVENT
20/02/2023	OPENING OF SUBMISSION WINDOW
28/02/2023	COSING OF SUBMISSION WINDOW
15/04/2023	NOTIFICATION OF THE THREE SHORTLISTED TEAMS
04/05/2023	CONCLUDING EVENT

15. Amendments

The present regulation may be subject to amendments, that will be promptly notified to all participants.