

NEBULA-X: Education through a real mission

A European training platform using a real X-ray mission as the showcase

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Shortlisted in the first round of ESA mini-F;
preparing for the next round

Education through a real mission

NEBULA-X is designed so that education is embedded in the mission itself. Students do not simply learn about missions — they contribute to a genuine scientific programme, alongside researchers and industry partners, across the full mission lifecycle.

Training scale

Potential to involve
~500 students

Learner levels

Vocational, BSc,
MSc and PhD

Working model

Universities + research
institutes + industry

Long-term aim

Grow into a wider
ESA-facing model

Illustrative student pathways through the mission lifecycle

1. Science case

- science goals
- source classes
- observing use cases

2. Systems engineering

- requirements
- trade-offs
- design reviews

3. Payload & electronics

- optics
- detectors
- readout prototypes

4. Software, I&T and operations

- planning
- testing
- pipelines and archive

5. Student project formats

- theses
- internships
- team design projects

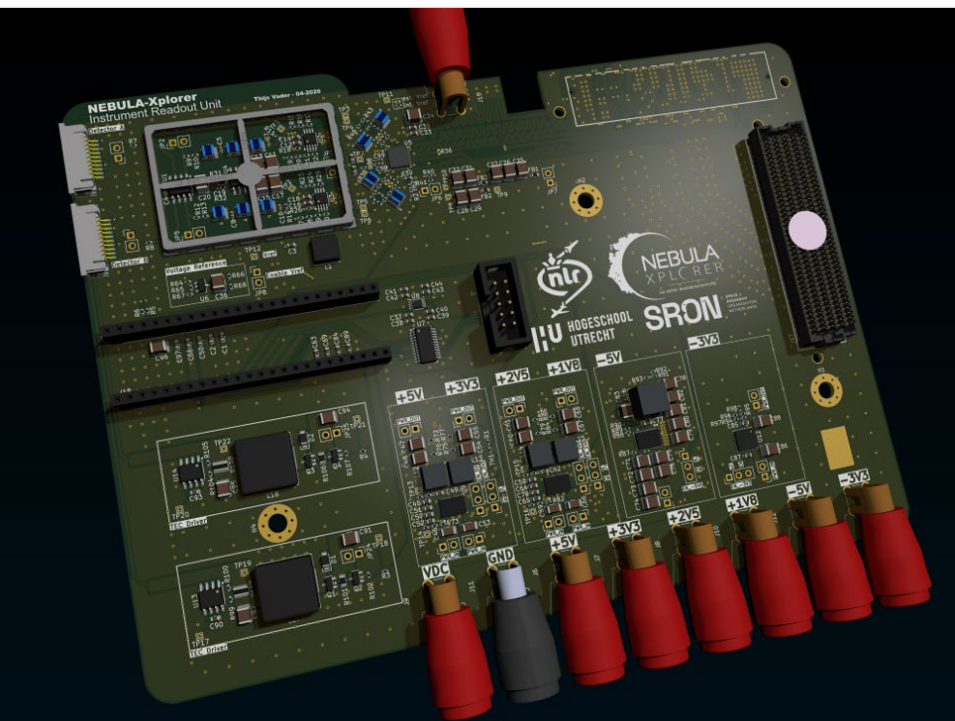
6. Skills developed

- technical depth
- systems thinking
- mission culture

7. Workforce outcome

- future scientists
- engineers
- mission specialists

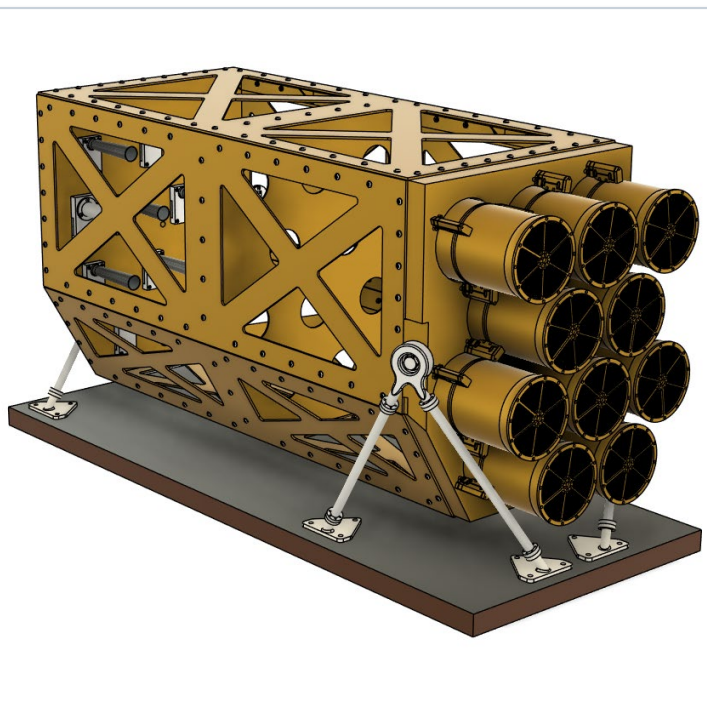
Examples of student-linked work already associated with the concept



Instrument readout board / electronics development



Mechanical prototype component

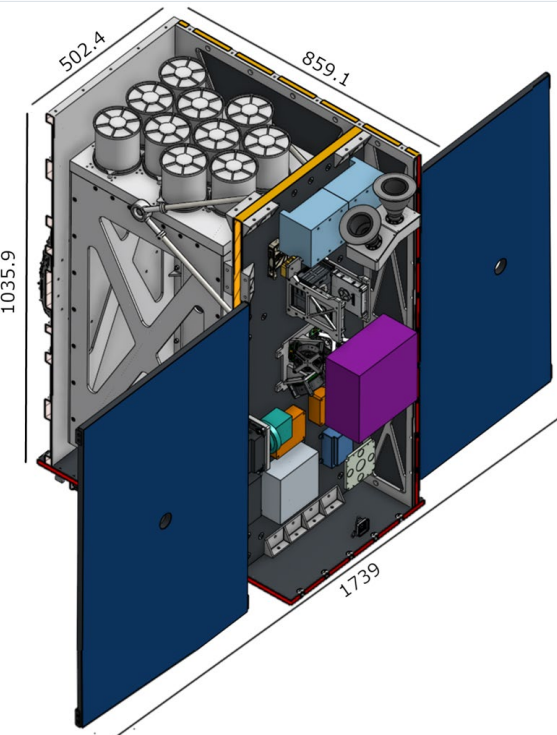


Payload concept / instrument structure

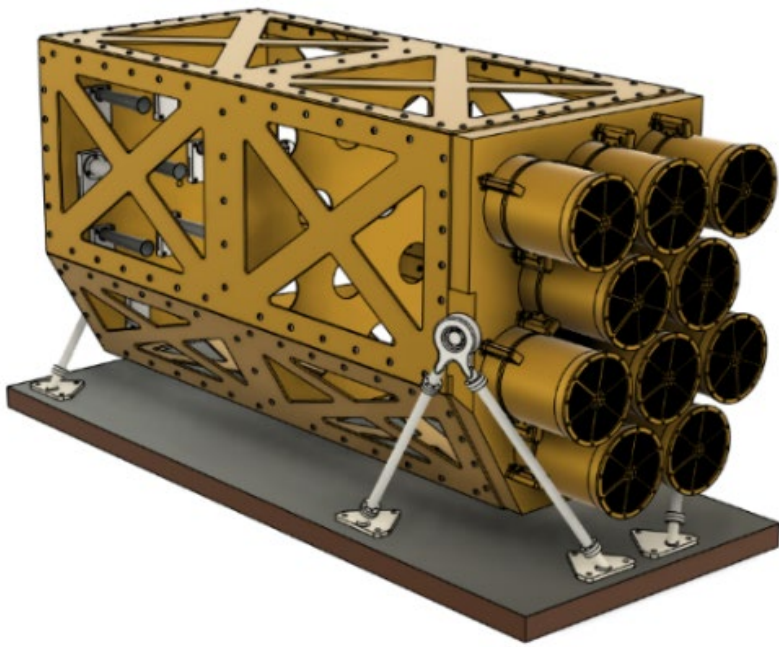
Why this matters?

The deeper goal is not only to build an instrument, but to create a scalable way to train future scientists and engineers within a real mission environment.

NEBULA-X as a showcase mission



Spacecraft cutaway and instrument concept adapted from the uploaded NEBULA-X material



- A dedicated X-ray timing mission with strong heritage from NICER and a high-TRL, low-risk philosophy.
- Designed for long, dense monitoring of compact objects and strong coordination with other facilities.
- The X-ray instrument is the showcase mission element: scientifically compelling, technically credible, and educationally rich.

Why NEBULA-X is timely

It addresses the emerging X-ray timing gap in the early 2030s while supporting the next generation of multi-wavelength facilities and observing campaigns.

Looking for collaborators

We would like to hear from people interested in:

- science use cases and observing programmes
- payload, spacecraft or systems-engineering collaboration
- student projects, placements and educational partnerships
- future ESA / member-state / industrial collaboration

Come and talk to me

We are actively looking for collaborators and future partners.

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Take-home message

NEBULA-X is one mission concept, but also a broader proposition: use a real, high-impact X-ray mission to train the next generation of scientists and engineers, strengthen university–industry collaboration, and build a model that can grow across Europe and the wider ESA ecosystem.