



ETH zürich

aris
space to grow



ASTREA Sponsoring Brochure

ETH Zürich Focus Project

Hybrid Rocket Engine Team 2021/2022

www.aris-space.ch/astrea-2022

ARIS: SPACE TO GROW

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SPACE TO GROW

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Mission Statement

ASTREA HRE



ASTREA is the fourth Hybrid Rocket Engine developed at ARIS in the scope of an ETH Focus Project. This year we will develop the most powerful engine yet.

In a team of 8 mechanical engineering students and under the supervision of Prof. Dr. Lino Guzzella at the Institute of Dynamic Systems and Control (IDSC) at the ETH Zurich we're designing and building a rocket engine that will fly us to first place at the Spaceport America Cup in 2022. This project was launched on September 20th 2021 and will have its first test firing in Q1 2022.

Our predecessors laid the groundwork for us by gathering testing data and creating the fundamentals needed in

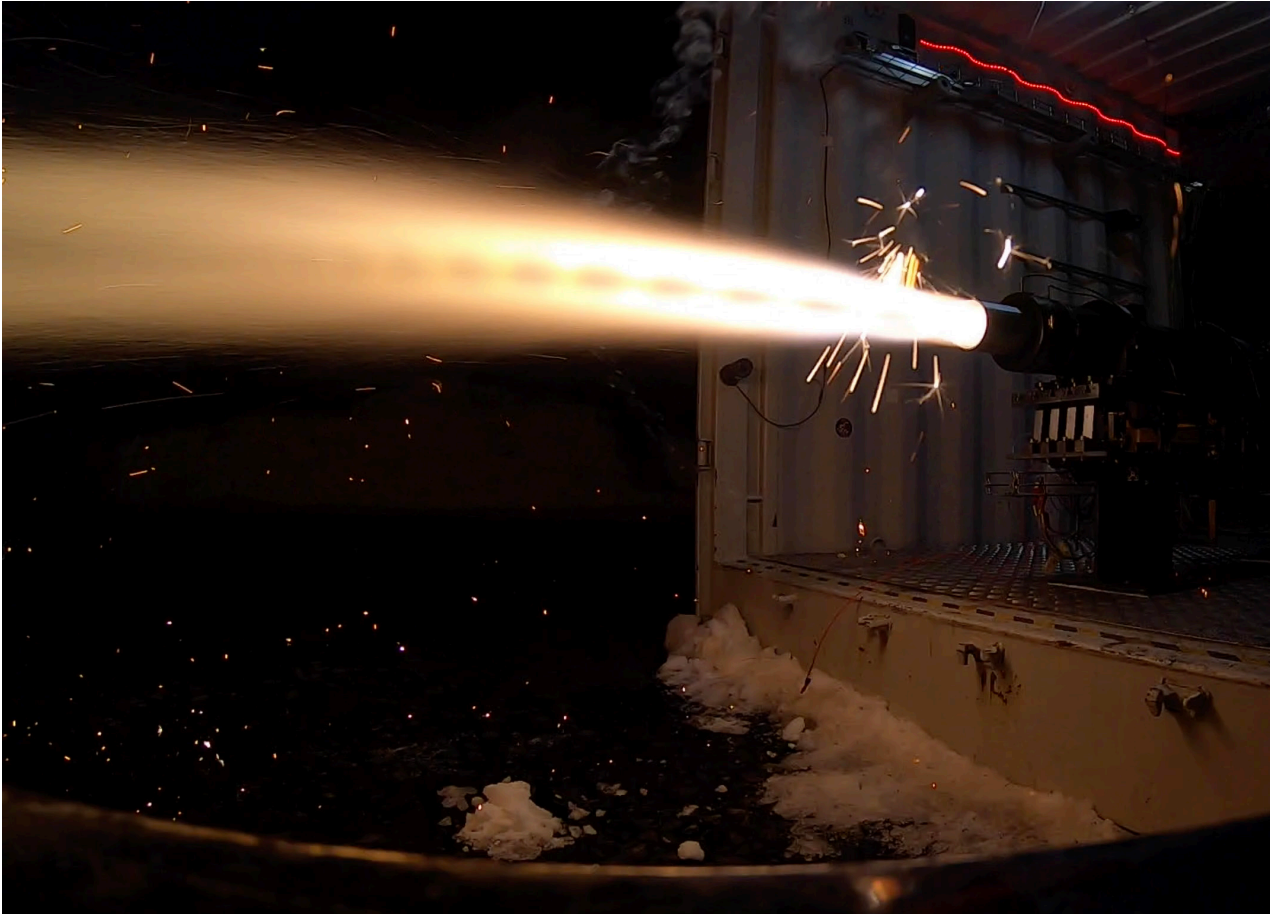
order to reach new heights. Now we're taking the next leap by making the lightest engine so far while also increasing the thrust by improving the chemical reactions in our combustion chamber.

Our goals are to build a reliable and safe rocket engine which can be integrated into our competition rocket. During this process we will create thorough documentation and strive for technical excellence.

Max Zappe, **Systems Engineer**



About ASTREA



Test firing of our Hybrid Rocket Engine, 2021

ARIS has been developing Hybrid Rocket Engines for **three years**. Now it's time to show how far we've come.

Where are we headed?

Goals



Integrate our Rocket Engine into the HELVETIA sounding rocket



Provide enough thrust to deliver a 4kg payload to 30'000ft

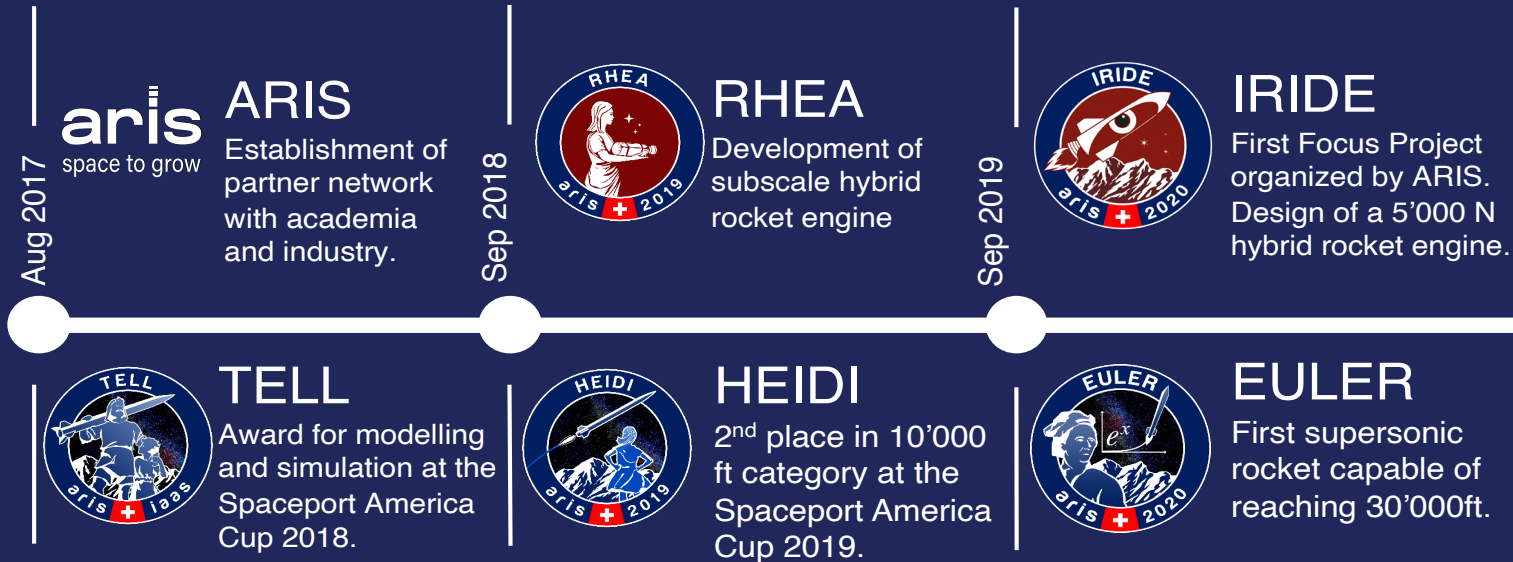


Win the 15th Spaceport America Cup in new Mexico



Thoroughly document the design process

Roadmap



What is an HRE?

ASTREA is focused on building a Hybrid Rocket Engine. A Hybrid engine means that the fuel of the rocket consists of a solid part and a liquid part which combine to create the combustion reaction necessary to propel a rocket.

These types of engines are inherently safer than fully liquid engines while delivering comparable performance.

Our engine uses ABS and Nitrous Oxide to deliver a theoretical specific impulse of more than 220s.





PHOENIX

Focus Project organized by ARIS. Design of the first guided recovery system.



PERIPHAS

Focus Project organized by ARIS. Design of the first guided recovery system.



DAEDALUS

Focus Project organized by ARIS. Integration of a lightweight hybrid engine into a rocket.



ASTREA

Focus Project organized by ARIS. Development of altitude compensating engine



PICCARD

Development of a rocket with integrated hybrid engine for the SPAC 2021 30'000ft category.



HELVETIA

Development of a supersonic rocket with altitude compensating engine for the SPAC 2022 30'000ft category.

Basics of Rocket Science

Our engine functions by mixing Nitrous Oxide (NOX) with Acrylonitrile butadiene styrene (ABS) in the combustion chamber which burns at over 3000 degrees.

As the combustion gases expand they are directed out the back of the engine around the nozzle, which converts thermal energy into kinetic energy.

Engine Subsections

The structure of the rocket engine from top to bottom is as follows:

- Runtank
- Fluid Supply Section & DACS
- Injector
- Combustion Chamber
- Nozzle



ASTREA Team

The Engineering Team



Chris Häberli

Project Manager &
Grain Engineer



Carolyn de Oliveira Baumann

Finances, Sponsoring,
Remote Filling &
Thermal Control



Mathieu Sandoz

Data Acquisition &
Control Systems



Giorgio Tonetti

Test Engineer & Nozzle



Max Zappe

Systems Engineer &
Ignition Engineer



Dino Fassino

Safety Officer &
Fluid Supply System



Elias Schwarb

Combustion Chamber &
Sealings Engineer



Visnusuthan Vairavipillai

Injector & Decoupling
Engineer

ASTREA Team

The Experts & Coaches



Prof. Lino Guzzella
Project Supervisor
Professor of thermotronics



Bruno Berger
Technical Expert
CEO at Swiss Propulsion Lab



Alex Brandes
Technical Expert



Aaron Ehrat
Technical Expert



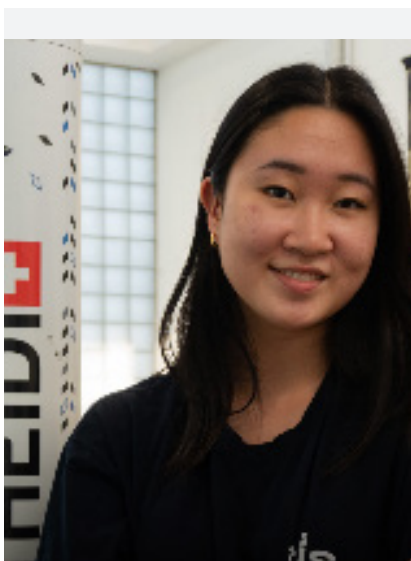
Julian Frei

Coach



Severin Meyer

Coach



Leona Guo

Coach



Adrian Fuhrer

Coach



180+
**Members
and Alumni**



95+
**Industry
Partners**



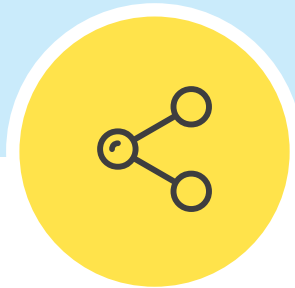
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**Full scale
launches**

ARIS is a future **astronaut's** space to grow.



A SPACE TO GROW

ARIS (Akademische Raumfahrt Initiative Schweiz) brings together students from Swiss universities fascinated by space exploration. Together we build rockets but also support the personal development of each member.



NETWORKING

ARIS offers members unparalleled access to industry partners and experts. Our collaboration efforts are the key factors that allow us to set ourselves such ambitious goals and also achieve them.



COMMON GOALS

What unites members of ARIS is their common goal to build and fly a rocket. Only by combining our talents in a common direction can we win championships and technical awards.

Spaceport America Cup

The Largest Rocketry Competition

The Spaceport America CUP (SA Cup) , held in New Mexico, USA, is the world's largest university rocket engineering competition. Each year more than 1'700 students gather in over 150 teams from around the world and compete to reach an altitude of either 10'000ft or 30'000ft. Additionally the competition is split into different categories: Commercial Off The Shelf engines (COTS) or Student Researched And Developed engines (SRAD).

Only the most technically advanced rockets in the world have a chance at winning this Cup.

ARIS in 2022

In 2022 we will compete in the Spaceport America Cup in the highest category:

Hybrid SRAD 30'000ft

For this we will integrate our engine ASTREA into a student developed sounding rocket named HELVETIA. This brings together an engineering team of more than 50 students with a combined passion for rocketry.



Past Success

Taking on this challenge couldn't be done without being able to build on past success of our rocket.

Since 2018 ARIS rockets have repeatedly won awards and competitions like the Spaceport America Cup or the European Rocketry Championship.

Previous Awards

- Charles Hoult Award for Modeling and Simulations 2018
- 2nd Place in 10'000ft Category at SA Cup 2019
- 1st Place in 30'000ft Hybrid SRAD at EuRoc 2021

How can **you** help us?



Our projects would never be possible without the generous support from our sponsors. Only with your help will we be able to bring our ideas to life at the 15th Spaceport America Cup 2022

Project Sponsoring



	PLATINUM FROM 20'000CHF	GOLD FROM 10'000CHF	SILVER FROM 5'000CHF	BRONZE FROM 1'000CHF	WHITE
LOGO ON PROJECT WEBSITE	XL	L	M	S	XS
LOGO ON PROJECT POSTERS	XL	L	M	S	XS
LOGO ON ARIS WEBSITE	M	M	S	S	
LOGO ON ROCKET	L	M	S		
CUSTOM SOLUTION	YES	YES			
VISIT FIRING	YES*				

* Attendees are subject to Safety concept

This table summarizes our standard sponsoring packages.

Let us know if there is something that would create more value for you!

Carolyn de Oliveira Baumann

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Project ASTREA

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