REXUS/BEXUS

EXPERIMENT PROPOSAL FORM.

Your text should be intelligible to scientists of various fields and engineers with a general scientific background.

Before you submit your proposal, please ensure that you have read the **REXUS/BEXUS User Manuals** and **Esrange Safety Manual** for more detailed information.

To submit your proposal to DLR, please download the **Letter of Intent** (pdf file) for registration and this **Experiment Proposal Form** (as word file).

Forms and Manuals are available at www.rexusbexus.net.

The completed forms have to be sent electronically before their deadlines to rexusbexus@dlr.de

Team/Short experiment name	*E.g. the acronym of the full experiment title* **AeroSonic**
Full experiment title	**Measuring of infrasound/aerosonic in the atmosphere.**

☐ **REXUS** ☒ **BEXUS**

- ☐ spinning with 4 Hz
- ☐ despun with Yo-Yo to about 0.08 Hz
- ☐ not of importance for our experiment

Science & Organisation

Team Information	
Student team leader:	*Include name, nationality, university, field of study, level of study (bachelor, master, diploma or PhD), academic year, date of birth and any additional team roles of the leader if applicable.* Niclas Bierwisch, german, University of Applied Sciences – Nordhausen, Automation and electronics engineering, Bachelor of Engineering, 3rd semester, April 8th 2004, Software Developer
Contact information of team leader:	*Include at least the phone number, email address and postal address.* 0176 45874008, niclas.bierwisch@hs-nordhausen.de, 99734 Nordhausen, Jahnstr. 68, Germany
Members of your team:	*Include name, nationality, university, field of study, level of study (bachelor, master, diploma or PhD), academic year, date of birth, and expected team role(s).*

	Ria Bele Pohley, german, University of Applied Sciences – Nordhausen, Renewable Energy, Bachelor of Engineering, 3rd semester, January 3rd 2003, Public Outreach
	Johann Stiebritz, german, University of Applied Sciences – Nordhausen, Automation and electronics engineering, Bachelor of Engineering, 3rd semester, December 16th 2003, Hardware Engineer
	Sabine Köhler, german, University of Applied Sciences - Nordhausen, Renewable Energies, Bachelor of Engineering, 3rd semester, September 9th 2003, Documentation
	Sven Malag, german, University of Applied Sciences – Nordhausen, Automation and electronics engineering, Bachelor of Engineering, 3rd semester, January 15th 2003, Software Developer

What is the scientific and/or technical objective of your experiment?	*This description should outline the scientific/technical question addressed, the assumptions made and the research methods chosen to solve the question. Expected results should be stated.* We aim to measure infrasound events using diverse recording equipment. Our objective is to document events on the surface beforehand that we want to localize later during the flight. Additionally, we plan to compare measurements between the Earth and the stratosphere, as well as between the recording devices. Furthermore we aim to determine the level of correlation between the signal paths of AEROSONIC and ELFI. Our goal is to confirm the nacelle system's oscillation within the 0.3 to 0.4 Hz range, detected at ELFI through the magnetic field signal.

Are you planning to fly an existing REXUS/BEXUS experiment?	*If yes, what will be the improvements?* No, we do not fly an existing BEXUS experiment.
Why do you need a rocket / a balloon?	*Clarify, why your experiment cannot be done on ground and needs rocket or balloon flight environment.* It is advantageous to conduct our research in the stratosphere as it reduces the risk of exposure to disturbing sounds such as those found on Earth. Moreover, we anticipate detecting sounds that are exclusively measurable in the stratospheric environment.
What flight characteristics do you require?	*If you need a rocket:* - *Does your experiment require a reduced gravity environment?* - *What are the expected duration of the phenomenon and the minimal acceptable duration of the reduced gravity period?* *Note: Maximum 120 seconds of reduced gravity conditions of approximately 10^{-2} g may be available depending on the composition of the payload.* - *What is the optimal altitude or altitude range for your experiment? - Specify if you require any other flight characteristics.* *If you need a balloon:* - *What is the optimal altitude for your experiment?* - *What is the minimum float time to perform your experiment?* - *Does your experiment require daylight, if so for what duration/part of the flight? If part of the flight should be in the night/dawn/dusk, please also state this but note that these flight conditions cannot be guaranteed.* - *Specify if you require any other flight characteristics.* *Note: Ejections from the BEXUS balloons are not allowed.* -the optimal altitude for our experiment is between 20 and 30km -the minimum float time is between one and two hour(s) (while in stratosphere) -daylight is not required for our experiment -ideally there are little to no vibrations and sound sources
Where did you get the idea from?	*E.g. research programme at your university, already performed similar experiment, scientific publications, books, …* Newspaper article: Mysterious rumblings were recorded in Earth's stratosphere Source: https://edition.cnn.com/2023/05/11/world/stratosphere-sounds-scn/index.html

Describe your experiment	*This part should link the scientific objective(s) to the experiment itself. Explain how you are going to fulfil the scientific goal.*
What data do you want to measure?	Pressure, temperature, sonic frequencies, position data (altitude, speed, velocity)

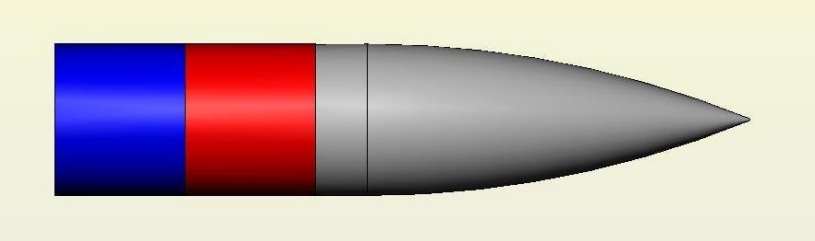
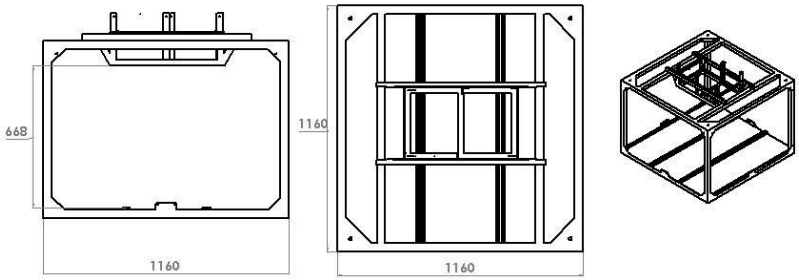
How do you want to take measurements?	Before launching our structure into the atmosphere, we collect the frequency spectrum of various objects on Earth. These are stored in a database. Post-flight, we compare the recorded frequencies with those stored in our database to assign the recorded frequencies.
Describe the process flow of your experiment.	Within a specified time frame, our recording devices capture a range of frequencies that are subsequently processed and stored by our computing unit. At a fixed interval, these data are sent to the ground. Post-flight, we analyze the data with the assistance of our database.
What do you plan to do with your data after the flight?	After the flight, we evaluate the recorded frequency spectra by comparing and assigning the pre-assigned frequencies from our database with those from the flight.

Organisation of your project	*How will you organise/distribute work within your team? Please note that you are responsible for all aspects of your experiment (science, mechanical & electrical engineering, software, etc.)*
Are you scientifically and technically supported by institutes and/or senior scientists?	*Please indicate the name of the institute(s) and senior scientist(s).It is mandatory for every experiment to have an endorsing professor.* Prof. Dr.-Ing. Klaus-Peter Neitzke and Prof. Dr.-Ing. Matthias Viehmann from the University of Applied Sciences, Nordhausen
Do you have access to a workshop or a laboratory that meets the fabrication and testing needs of your experiment?	Yes, we have a laboratory equipped with all the necessary equipment, and we have access to it at any time.
Do you have all the material and equipment that is needed for your experiment? If not, how do you plan to obtain it?	We have all the necessary materials, if additional things will be needed, these will be purchased.
How do you plan to finance your expenses?	We prepare a list of material requirements, after comparing the prices of the offers, this list of required materials is submitted.
Who else will support you (sponsors, others)?	We will probably have some sponsors.

Outreach Programme	
Describe your outreach programme for before, during and after the REXUS/BEXUS flight campaign.	*How are you planning to present your experiment to the public? E.g. newspaper, local radio, webpage, social media, presentation at the university, … The execution of an outreach programme is mandatory!* Throughout the experiment, we will showcase our progress on various social media channels, including Instagram, Facebook and X (formals Twitter). We plan to announce our participation in the BEXUS program through a post in our university newsletter. We will also contribute to a lecture and may consider publishing an article in a local newspaper. Furthermore, we will create a homepage for our experiment like Elfi and Imufusion did. Our outreach plan is constantly evolving.

Experimental Set-up & Technical Information

Mechanics	
Describe your experimental set-up.	*Describe and outline the preliminary set-up of your experiment. Include at least a sketch or block diagram of the experiment (CAD drawings are optional).* The infrasound is picked up by a acoustic recording system and then sent through an AFE. The AFE consists of a low-pass filter and an amplifier, and is then passed through an ADC to the controller, which receives the telemetry data and other sensor data such as temperature and pressure. This data is stored and also sent to the ground.
Estimate the dimensions and the mass of your	*For REXUS: Do not include the rocket structure (module and bulkhead) into the mass budget.*
experiment (kg and m).	Between 3 and 5kg.

Indicate the preferred position of your experiment:	*REXUS:* *Indicate the orientation of your experiment and the preferred position in the rocket: module or nosecone section. Do you need access to the outside environment? Holes? Hatches?*  *BEXUS:* *Define preferred position in the gondola, inside units, external units? Do you need access to the outside environment?*  *Front view of a gondola* *Top view of with mounting rails* Our preferred position in the gondola is as low as possible. To make our measurements, our external units e.g. microphones need access to the outside environment.

Electrics / Electronics	
Will you need the 28 V DC power supply from the REXUS service system or power from the BEXUS gondola, respectively?	Yes, we need the power from the gondola.
Will you need (additional) batteries? What do you need for charging?	*Qualified batteries are listed in the REXUS and BEXUS User Manuals.* No, we do not need additional batteries.
Estimate the electrical consumption of your experiment (Ah or Wh).	We will need around 60Wh, maybe more.
Do you use any equipment with high inrush currents? If so estimate the current (A).	*E.g. Motors may need high inrush currents which exceed the nominal allowed current limit.* No, we do not use equipment with high inrush currents.
Do you need auxiliary power? Do you need a separate umbilical?	*Auxiliary power for charging or consumption before launch is not standard. Mention here whether you need auxiliary power and why.* No, we do not need auxiliary power or a separate umbilical.

Use of uplink and downlink:	*Please indicate expected data rates for uplink and downlink.* *Please note: In addition to on-board storage, it is mandatory that you downlink housekeeping/scientific data during flight.* *On BEXUS, an uplink is also available throughout the flight. On REXUS, an uplink is not normally available during flight but should be used during ground testing.* The downlink is needed for the measurement data we take to send to the ground, plus we might need uplink for one to three commands if necessary.
REXUS only: Do you need to use the REXUS TV Channel?	*There is one TV channel available, so only one experiment can use it at any one time and a maximum of three experiments can be connected. Why should one be your experiment? At what stage of the flight do you need it and for how long?* /
Provide an event timeline, including the experiment actions during flight, such as timer or telecommand events.	*Describe your event timeline from start of countdown..* We measure at the start of the flight, then continuously during the flight until the return. As we fly, we steadily send data to the ground station.

Environmental Questions & Safety Issues	
Does the experiment use wireless devices?	*E.g. Wifi (WLAN), Bluetooth, infrared, data transmitters... Describe the type of devices and frequencies used.* No, the experiment does not use a wireless device.
Does the experiment create any disturbing magnetic or electrical fields?	No, the experiment does not create disturbing electrical or magnetic fields.
Do you expect to use high voltages in any part of your experiment?	*Please indicate the voltage, its use within the experiment and any expected protection devices.* No, we do not expect high voltages.
REXUS only: Does your experiment eject anything from the rocket?	*Note: number and size of holes/hatches in a module are limited. Please refer to the REXUS User Manual.* /
Is the experiment sensitive to light?	No, it is not sensitive to light.
Is the experiment sensitive to vibrations?	Yes it is sensitive to vibrations, especially to low frequencies.

Does the experiment generate vibrations?	*e.g. vacuum pump, rotating devices …* No, the experiment does not generate vibrations.
Will you use any flammable, explosive, radioactive, corrosive, magnetic or organic products?	*Specify any products you will use with any of these characteristics.* No, we will not use one of these products.
Will you use a laser?	*Which class? Is the laser path securely contained?* No, we will not use a laser.
Is your experiment airtight? Are parts of your experiment airtight?	*Yields to a pressurized experiment (1 bar) when the vehicle reaches higher altitude with lower pressure values.* *This question should remind you that there will be a very low ambient pressure environment for your experiment.* No, our experiment is not airtight.
Are there any hot parts (> 60°C)?	*Mention any parts besides electronics that heat up.* No, only electronics and heat sinks.
Are there any moving parts? Are the moving parts reachable?	*This is important for the preparation before launch. Access to the experiment will be discussed with EuroLaunch. E.g. a tappet is used for a moving part.* We may reposition our measuring equipment.
Do you need any pressure systems from EuroLaunch before launch?	*If you know that you need for example a pressurized nitrogen-bottle for your experiment before launch, please mention it here. All pressurized bottles will be handled by EuroLaunch personnel.* No, we do not need pressure systems.
Is there any aspect in your experiment which you believe may be viewed as a safety risk by others (regardless of whether you will mitigate this risk in your design)?	No, we do not see any security risk caused by our experiment.

Additional comments	*Is there any information that is of importance for your proposal and not addressed above* /

Drawings can be inserted below and referenced in the above tale.