A R E X
S U P P O R T

This AREx Support Agreement is executed on _____ by the following entities.

Open Research Institute, Inc.
#1873 3525 Del Mar Heights Road
San Diego, CA 92130
USA

Open Research Institute (ORI) is a non-profit research and development organization which provides all of its work to the general public under the principles of Open Source and Open Access to Research.

ARISS-USA
909 METFIELD RD
TOWSON MD 21286
USA

Amateur Radio on International Space Station (ARISS) lets students worldwide experience the excitement of talking directly with crew members of the International Space Station, inspiring them to pursue interests in careers in science, technology, engineering and math, and engaging them with radio science technology through amateur radio.

The AREx Support Agreement (the agreement) is a research and development contract (the contract) between ARISS-USA and ORI.

The contract enumerates commitments required for the successful completion of the mutually beneficial activities within the Amateur Radio Exploration (AREx) project.

Those activites include but are not limited to Lunar Orbiting Platform Gateway project (Gateway).

Additional mutually benficial activities may be added to this contract as AREx progresses.

Activities may include interactions and collaborations with, and deliverables to, ARISS-USA and other organizations in the consortium lead by ARISS-USA.

Definitions, Program Duties, Techincal Duties, and Educational Duties are addressed. (Rules of Engagement TBD)

DEFINITIONS
USED IN THE AGREEMENT

Consortium: the contracted members formally supporting AREx.

Interaction: written record of communication between individuals or organizations that are members of the consortium.

Collaboration: where two or more members of the consortium contribute their expertise for the benefit of a shared objective.

Deliverables: quantifiable goods or services (tangible or intangible) that must be provided upon the completion of a sprint, project, collaboration or other defined process.

Mutually Beneficial: the work is of benefit to the parties in collaboration in addition to being for the benefit of a shared objective.

Open Source: ORI is an affiliate member of Open Source Initiative and uses their Open Source Definition. This definition is found at

https://opensource.org/docs/osd

Default licenses for ORI open source work are GPL 3.0 for software and CERN OHL for harware.

https://www.gnu.org/licenses/gpl-3.0.en.html

ORI uses the strong variant of CERN OHL when possible, and weak otherwise.

https://www.ohwr.org/project/cernohl/wikis/Documents/CERN-OHL-version-2

Program Duties

ORI supports the programmatic goals of ARISS-USA. Competent ORI volunteers agree to assist in their areas of expertise in a supporting role to carry out programmatic duties.

All work created by ORI will be published as it is made, as soon as possible, and will be available free of charge to the general public, in compliance with open source definitions and licenses.

ORI commits to maintaining a current and up-to-date Product Backlog, a roster of volunteers and their role in the current Agile sprint, and will regularly report progress, challenges, and risks at AREx meetings.

ORI uses an Agile management process. The values of Agile are as follows.

Individuals and interactions over processes and tools
Working software over comprehensive documentation
Customer collaboration over contract negotiation
Responding to change over following a plan

That is, while there is value in the items on the right, we value the items on the left more.

There are team members, team leaders, and product owners. Teams work in short sprints to create product increments. Sprints iterate towards complete products. There is a retrospective review at the end of each sprint. Requirements are expected to change and evolve. Projects are

managed by the team. Work is carried out by the team. Team leaders remove roadblocks for the team. Product owners manage the Product Backlog.

The Product Backlog is visible, transparent, and clear to all, and shows what the team will work on next.

Product owners maintain the conceptual and technical integrity of the incremental products for the team.

Given the above, product owners commit to product increments of clear mutual benefit to ORI and AREx.

All ORI volunteers must comply with the Developer and Participant Policy and Code of Conduct.

https://openresearch.institute/developer-and-participant-policies/

In the event of a violation of the ORI Code of Condut by an ORI volunteer that involves any other consortium volunteer, ARISS-USA will report it to the ORI Board of Directors at:

board@lists.openresearch.institute.

Documentation for engineering designs is published to ORI GitHub repositories. Product owners will coordinate publication to AREx repositories after each sprint retrospective.

In the case of controlled information, product owners will work with ARISS-USA to sanitize necessary data and information for open source use by the team. If the controlled information cannot be sanitized by any reasonable effort, then it will not be used by the team.

It is understood that
1) There is likely to be a Gateway carve-out that will allow easier sharing of information.
2) There will be clarity of some kind from the Commodity Jurisdiction Request filed by ORI for digital, broadband, microwave amateur radio satellite service work.
3) Training in ITAR and EAR policies and procedures may be necessary even for volunteers that work solely on open source.

Mutual benefit is maintained through regular programmatic communications, review, and retrospectives.

It is understood that
1) Perceived or actual benefits may change over time from events beyond the control of ARISS-USA and ORI.
2) Changes to benefits will be accommodated in good faith and with the best efforts of ORI and ARISS-USA.
3) Disagreement about a benefit does not end the contract, it simply provides an opportunity for cooperative and congenial negotiation.

ORI has successfully funded Phase 1 of the digital multiplexing transponder. ORI has raised a substantial amount of funding for ground mechanical development. Fundraising continues in Phase 2.

ORI will spend Phase 1 funds as needed for mutually beneficial technical activities in support of AREx.

The source and amount of ORI funds are published. Expenses are published.

This is a no-cost contract. ARISS-USA does not pay ORI for goods or services.

It is understood that
1) ORI funding may not be sufficient for all AREx activities despite best efforts to raise, conserve, and extend the funds.
2) There will be active fundraising from ARISS-USA through a business development process lead by ARISS-USA.
3) ORI may be asked by ARISS-USA to help with AREx business development in a supporting role.

This agreement shall become effective when signed by both entities. It shall continue in effect from the date of execution until either party gives written notice of at least 30 days to terminate the agreement, or until an event causing termination occurs, or until this agreement is superseded by another one.

This agreement may be updated or modified by the parties as needed to reflect needed programmatic adjustments or changes in availability of resources.

Any dispute between the parties regarding their respective rights and obligations hereunder shall be to the extent reasonably possible resolved through compromise and/or non-binding mediation.

Each party will take all necessary steps to maintain customary insurance or self-insurance coverages for its directors, officers, and volunteers working on implementing this agreement. Each party agrees to indemnify, hold harmless and defend the other from and against any and all claims, suits, damages and injuries which were caused by the negligence, breach of contract or other culpable misconduct of the directors, officers, or volunteers of the indemnitor arising from AREx activities.

Technical Duties

ORI supports the technical goals of ARISS-USA. Competent ORI volunteers agree to provide research and development to meet the mutually beneficial goals of the AREx project.

Remote access is a design requirement where applicable.

Accessibility is a design requirement for all ORI work.

Areas of technical work are as follows.

System definition, system architecture, subject matter expertise, component engineering, requirements, specifications, purchasing, printed circuit card layout, FPGA development, lab calls, verification, validation, user experience, and user interface.

The product is the open source hardware, software, and firmware required to design, build, and test amateur radio satellite service communications systems for fault-tolerant multiple-access use.

Deliverables are product increments leading to complete space and ground equipment along with the documentation required to re-create the product increments and the completed products.

The communications systems are digital, as broadband as possible, and microwave or above.

Technical roadmaps and statements of work, which drive the Product Backlog, will be publicly available.

Here is a set of milestones from the ORI transponder statement of work

as an example. Statements of work will change and be superseded over time. This is a reference for the scope and level of detail that will be delivered.

Phase 1 Milestones

Phase 1 will produce a small number of Engineering articles for the digital multiplexed transponder. Each article will be a two board (90mm x 90mm) set consisting of a Baseband Processor Board and a Radio Board. The two boards will communicate via JESD204B SERDES links. The BBP will be based on a Xilinx Zynq Ultrascale+ device with 2 ARM A53 64-bit cores and 2 ARM R5 32-bit lockstep cores. The boards will have 200K - 500K logic elements in the FPGA fabric depending on the particular FPGA that is fitted. The Radio Board will be based on an AD9371 device with low power RF output in a suitable amateur UHF/Microwave band (23cm).

The Phase 1 Software/Firmware load for the milestone will provide a complete DVB-S2 transmitter with a relatively low-level RF power. The data input to the transmitter will be a combination of fixed demonstration data and external data from a host. DVB-S2 QPSK AND FEC rates from ¼ to 8/9 will be supported at symbol rates from 80kHz to 8MHz (RF output of 100kHz to 10MHz). The output can be received by any compliant DVB-S2 GSE receiver. It should be noted that the engineering articles will include receive as well as transmit hardware. However, the Milestones will be limited to the DVB-S2 Transmitter.

The signatures below acknowledge that each party has read and understands and agrees to this contract, and that they are authorized to execute this agreement on behalf of the named entity.

Entity:

Name:

Printed Name:

Date:

Entity:

Name:

Printed Name:

Date: