AMSAT builds and operates satellites and related resources for the purpose of educating youth and adults in how to use this technology in the public interest.

The Radio Amateur Satellite Corporation

2021 Annual Report

AMSAT 2021 Annual Report V.1.0 December 31, 2022.

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President's Letter

"We have a strong fiscal foundation, an excellent governance and management team, generous volunteers who freely donate their time and expertise, and a diverse membership base who truly care about keeping Amateur Radio in space."

Greetings to our members and stakeholders. The year 2021 has been a remarkable year, one of transitions and accomplishments, one that positions AMSAT for a year of growth and accomplishments in 2022.

The AMSAT Engineering team has been making significant progress on our highly elliptical orbit program GOLF (Greater Orbit, Larger Footprint). Under the leadership of our VP, Engineering, Jerry Buxton, N0JY, our volunteer engineers have worked tirelessly to develop its test bed satellite GOLF-TEE (Test Engineering Environment) for launch.

At the December 7, 2021, Board of Directors meeting, Jonathan Brandenburg, KF5IDY, presented a plan for a sustained presence of "easy sats" in low Earth orbit. "Easy sats" are low earth orbit satellites with single channel FM repeaters that play a critical role in introducing new comers to Amateur Radio in space. So, I was both excited and impressed with Jonathan's proposal. Fox-Plus, as the new program will be called, is based on the original Fox bus design but will develop a new transceiver and power system in an open-hardware and open-source environment. In addition, Fox-Plus CubeSats will host student science, technology, engineering, and mathematics (STEM) experiments and AMSAT radio experiments.

Not to be outdone, our Educational Relations team completed its beta testing on the CubeSat Simulator, a plug-and-play device for students to study and analyze simulated CubeSat telemetry.
Dr. Alan Johnston, KU2Y, and his team have done a phenomenal job. In addition, They have not only developed and released the new CubeSatSim Lite version, but Dr. Johnston and his team have begun to experiment with high altitude balloon launches to take the CubeSatSim concept to the next level of educational initiatives. I am also excited that we are ready to launch the AMSAT Youth Initiative, a wide ranging program to encourage youth to explore satellite and communications technologies in their application to study and manage the breadth of issues of life on earth such as climate change, pollution control, meteorology, natural resources preservation as well as others. This program is designed to bring the seemingly remote and far-out world of aerospace technologies into the real world of meaningful daily issues.

Behind the scenes, we have been busy modernizing back-office tasks, finding ways to more efficiently do business, and ensuring the AMSAT machine runs smoothly. Our modernization efforts, which really began with the May 2020 launch of our online member management system, have been the key to our overall success this year. Transforming a 52 year-old organization from brick and mortar to virtual was no easy task and not without a few hiccups along the way, but we are better positioned moving forward. It was a sad day packing up the AMSAT office in Kensington, Maryland, in May and putting everything in storage. To touch all that history reaffirmed why we do what we do.

Financially, AMSAT is on a solid footing, with over $950,000 in cash and liquid investments. Our revenues are down from last year, as is the rest of the U.S. economy; however, we are on track to exceed our profitability margin over last year because of the cost-cutting measure we implemented. In 2020, $0.82 of every dollar went to pay overhead. In 2021, that amount was reduced to $0.56 for every dollar we brought in – a 31% reduction. This means much more of membership dues and revenues are going towards building satellites and expanding our educational efforts. With the increasing cost of flying satellites, it is obvious that revenue sources outside of the traditional Amateur Radio community are necessary. It is the responsibility of Frank Karnauskas, our VP, Development to communicate our educational and engineering goals to external corporate and philanthropic organizations to identify and secure the funds needed to accomplish our goals. This is not an easy task and will require the support of all AMSAT areas to ensure our success.

AMSAT membership has consistently been over 4,000 the past year, with 4,045 current members as of this writing. AMSAT's membership is diverse, representing 76 countries. While each comes for varied reasons (builders and operators, scientists and educators, HEO and LEO), we all come together for a single purpose: to keep amateur radio in space. So, what's next? With over 52 years of success, what are we going to do now?

We have an ambitious, forward-thinking plan that's ready to be put into action. We will focus our efforts on new communication systems that more efficiently allow us to communicate in space and spacecraft which will take us towards and beyond the next space horizon. At the same time, we will establish and maintain a path of sustainability that not only introduces space communications using Amateur Radio to the public but also nurtures them to be the next generation of satellite builders and operators.

I look forward to both the challenges and opportunities that lie ahead. AMSAT is in a very solid position from both a financial and a membership perspective. We have a strong fiscal foundation, an excellent governance and management team, generous volunteers who freely donate their time and expertise, and a diverse membership base who truly care about keeping Amateur Radio in space.

Sincerely,

Robert Bankston, KE4AL
President

AMSAT Leadership, 2021-2022

Board of Directors

Joseph Armbruster, KJ4JIO
President, 0Lat, Inc.
Orlando, FL

Robert Bankston, KE4AL
Principal, C.P.A., Bevis, Eberhart, Browning, Walker & Stewart, P.C.
Dothan, AL

Gerald W. Buxton III, N0JY
Senior Manager
BNSF Railway (retired)
Granbury, TX

Mark Hammond, N8MH
VP, Academic Affairs and Provost
Campbell University
Coats, NC

Zach Metzinger, N0ZGO
Principal Software Engineer
METECS
Southlake, TX

Paul Stoetzer, N8HM
Communications Specialist
Federal Election Commission
Washington, DC

Bruce Paige, KK5DO
Deputy
Harris County Sheriff's Office (Retired)
Roman Forest, TX

Board members are elected annually for a two-year term by AMSAT membership.

Senior Officers

Robert Bankston, KE4AL
President
Dothan, AL

Paul Stoetzer, N8HM
Executive VP and Secretary
Washington, D.C.

Jeff Davis, KE9V
Secretary
Yorktown, IN

Steve Belter, N9IP
Treasurer
West Lafayette, IN

Gerald W. Buxton III, N0JY,
VP, Engineering
Granbury, TX

Drew Glasbrenner, KO4MA
VP, Operations
Brooksville, FL

Alan Johnston, KU2Y
VP, Educational Relations
Philadelphia, PA

Frank Karnauskas, N1UW
VP, Development
Tucson, AZ

Senior Officers are elected for one-year terms at the AMSAT Annual Meeting. The AMSAT Annual Meeting and Symposium is held in the month of October in various cities around the United States

(The phrase after each person's name is their Federal Communications Commission issued Amateur Radio callsign.)

Strategic Plan 2021-2035

Organization

Our Vision

- To deploy satellite systems with the goal of providing wide-area and continuous coverage communications.
- To continue active participation in human space missions, and
- To support a stream of LEO satellites developed in cooperation with the educational community and other Amateur Radio satellite groups.

Our Mission

- AMSAT is a non-profit volunteer organization which designs, builds, and operates experimental satellites and promotes space education.
- We work in partnership with government, industry, educational institutions, and fellow Amateur Radio societies.
- We encourage technical and scientific innovation and promote the training and development of skilled satellite and ground system designers and operators.

Our Core Values

- We lead by example.
- We respect the individual.
- We work collaboratively towards a common purpose and shared goals.
- We embrace change and innovation to help our members, our partners, and ourselves.
- We are committed to the Amateur Radio satellite community.
- We are open and honest in our communication. Above all, we act with integrity.

Strategic Satellite Objectives and Organization Goals

Highly Elliptical Orbits

Upward to HEO. Develop and deploy a series of spacecraft capable of providing wide-area and continuous coverage from high-Earth and geostationary transfer orbits.

Greater Orbit, Larger Footprint

GOLF. Develop and deploy a series of increasingly capable spacecraft through a program to learn skills and systems for which we do not yet have the necessary low-risk experience, including active attitude control, deployable/steerable solar panels, radiation tolerance for commercial off the shelf (COTS) components in higher orbits, and propulsion.

Amateur Radio on the International Space Station

AREx-A. Partner with ARISS and ARISS-USA to advance Amateur Radio's presence aboard NASA's International Space Stations, Deep Space Gateway and Artemis missions and provide opportunities to engage with astronauts in lunar and deep space operations.

Low Earth Orbit

LEO. Support a stream of LEO satellites developed in cooperation with the educational community and other Amateur Radio satellite groups.
FM Operations. Develop, deploy, and support a series of 1U spacecraft to support continued FM amateur satellite operations in low Earth orbit.
Partnerships. Develop a plug-and-play communications solution for educational and other Amateur Radio CubeSat programs, providing a VHF/UHF telemetry beacon, command receiver, and linear transponder or FM repeater communications module.

AMSAT STEM Initiatives

AMSAT Education. Support science, technology, engineering, and mathematics (STEM) initiatives and training programs for satellite and ground system designers and operators.
CubeSat Simulator. Continue development of AMSAT's CubeSat Simulator Program.
High Altitude Ballooning. Develop program to support and sponsor the use of amateur radio in high-altitude balloon (HAB) launches.
Youth Initiative. Develop an educational outreach program that encourages youth to pursue STEM interests in space science and communication technology.

Educational Relations

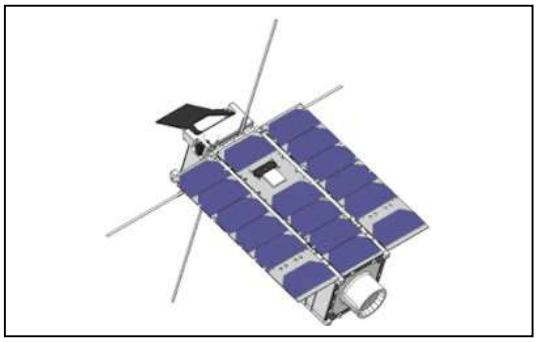
University Partnerships

AMSAT partners with major research universities and colleges to fly experiments in space such as those with Virginia Tech, Vanderbilt University, Penn State University and the University of Washington. AMSAT partners with these research universities who provide the experiments while AMSAT provides the basic spacecraft, control and communications. At the end of the primary mission the university turns the satellite over to AMSAT for communication purposes.

AMSAT's AO-92 has a Virginia Tech camera experiment and the University of Iowa's High Energy CubeSat Radiation Instrument (HERCI) experiment that is intended to provide a mapping of radiation in a low earth orbit. The instrument consists of a digital processing unit derived from processors currently in orbit around Saturn on Cassini and on the way to Jupiter on the Juno spacecraft.

AMSAT's AO-95 flew a Vanderbilt University Low Energy Proton (LEP) radiation experiment and a Penn State University–Erie gyroscope experiment. In addition, Virginia Tech provided a VGA resolution camera experiment for pictures of the earth.

The University of Washington's **HuskySat-1** embodies aspects of future spacecraft design and how AMSAT collaborates with educational institutions. The spacecraft and experiments were designed and built by the University of Washington Husky Satellite Lab while primary communications and control hardware were provided by AMSAT.



Besides AMSAT's ability to help universities gain access to space, AMSAT's worldwide network of ground stations provides the ability to capture data that is downloaded while its satellites orbit the earth day and night.

Educational Relations*...continued*

Besides working at the university level, AMSAT is wholly engaged in working with teachers in Science, Technology, Engineering and Mathematics (STEM) education.

Classroom Satellite Simulators

The AMSAT Educational Relations team designs and builds simulators to demonstrate certain functions and environmental effects of satellites in space. CubeSat Simulators are low-cost satellite emulators that run on solar panels and batteries, transmit radio telemetry and can be extended by additional sensors and modules. They can be used in a variety of classroom settings including grades 6-12 STEM and undergraduate engineering and science classes. The AMSAT CubeSat Simulator helps bridge the gap between High Altitude Balloons (HAB's) and actual orbiting CubeSats. The CubeSat Simulator is a low-cost, functional educational model of a CubeSat that can be built with a few hundred dollars in a few weeks. Students can learn soldering, 3D printing, Raspberry Pi computing and testing skills. In addition, receiving and decoding telemetry in the classroom can be useful training for either a HAB or CubeSat mission.

High Altitude Balloons

The AMSAT Educational Relations team is actively developing teaching programs for the design and development of High Altitude Balloons for educational use. STEM payloads range from simple to very complex. An example of a simple payload may be just a location tracker so that students can observe the balloon's altitude and flight path in real-time. Very complex payloads carry an array of science experiments using multiple sensors or sensor packages coupled with radio transmitters to return the data in real-time via custom-built ground station receivers. In addition, most payloads record data from the sensors on board to be retrieved and analyzed after the flight and when ground chase teams recover the payload.

Youth Initiative

The AMSAT Youth Initiative is designed to put learning resources for space-bound education directly in the hands of youth, their parents and youth group leaders. It is unique because its approach to youth is to put the sometimes-forbidding sounding topic of aerospace or astronautics into the perspective of our everyday lives – how we study climate change, protect natural resources, listen to music and navigate our way around city streets as well as other things we take for granted.

Two trademarked brand names focus on two age groups – KidzSat for grades 5-7 and BuzzSat for grades 8-12.

Also unique in this program is its partnership with local media outlets. Participating local television stations in up to 210 major markets provide the Youth Initiative with an invaluable local presence through promotion and local technical support. Television stations in return are provided with a unique way for their on-the-air personalities to further engage with their audiences and boost viewership.

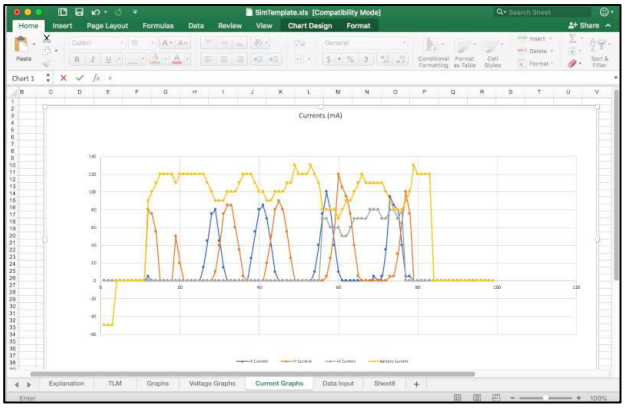
The Youth Initiative provides four primary opportunities in which youth can participate.

Online Lessons and Experiments

Presented through the websites KidzSat.com for grades 5-7 and BuzzSat.com for grades 8-12, youth have direct access to a wealth of resources, lessons and experiments. The content is designed for self-directed learning, preferably with the guidance and encouragement of a parent, teacher or youth group leader. The content approaches youth's interest in earth sciences, careers and other paths by showing how satellites in space can help us improve our lives here on earth. By completing self-directed lessons and performing experiments students can earn certificates of completion.

Youth Initiative*...continued*

Earth Science CubeSat Simulators
Referred to as our Non-Orbiting Earth Science Experiments (NOESE), these self-contained, solar powered satellite simulators are to be hosted at participating local television stations. NOESE devices collect climate change data such as particulate matter, carbon dioxide, methane, nitrogen and sulfur oxides, ozone and ultra-violate radiation (UV). Using online simulated ground stations, youth can download the telemetry and convert it into usable data for study. The NOESE "satellites" provide youth with a realistic experience that closely resembles the process that scientists follow when tracking and collecting telemetry from live satellites.



Online Satellite Ground Stations
Youth participants can experience the thrill of satellite communication through the KidzSat network of satellite ground stations accessible with their tablet or laptop. The platform anticipates a ground station in each of the 210 television marketplaces. This means virtually every young person in the U.S. has the ability to interact with satellites as they pass overhead in their own hometown. With these live stations, youth can download and analyze NOAA weather pictures, a variety of satellite telemetry and educationally oriented experiments from live satellites. This experience will encourage students to take the next step and set up their own ground stations with readily accessible, low-cost radios that connect to their tablet or laptop.

Easily Accessible Satellites for Youth Interaction
AMSAT has 50+ years of experience designing, building and operating amateur satellites carrying educational, scientific and communications payloads. AMSAT is currently designing and building a new generation of low earth orbiting satellites (FOX-PLUS) that will provide more easily received signals and advanced educational and experimental payloads.

Engineering

While all senior officers and members of the Board of Directors contribute to the educational and scientific definition and conceptual designs of AMSAT satellites, the Engineering team is responsible for the hardware and software design of its satellites, their construction, testing and launch.

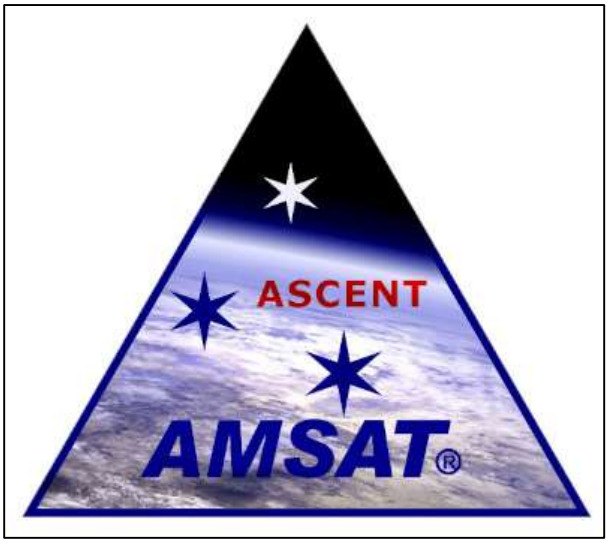
The Engineering team is composed entirely of unpaid volunteers, most of whom are electronic engineers or software programmers with extensive experience in the aerospace industry. At any given time, approximately 60 or more professionals are donating their time, energy and expertise to bring AMSAT satellites from the drawing board to reality.

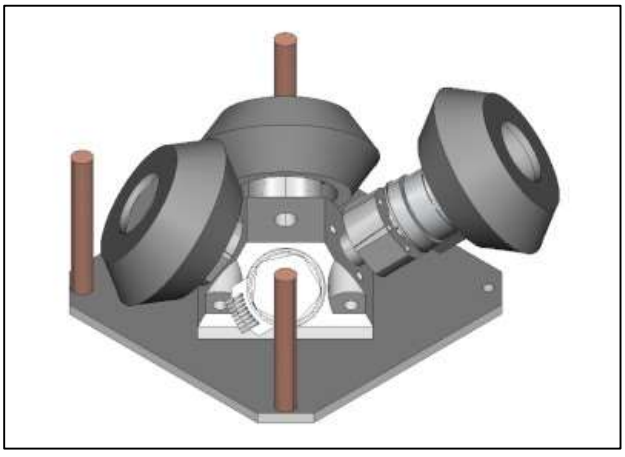
In keeping with AMSAT's strategic plan, the Engineering team is responsible for continuing to provide a series of low earth orbit (LEO), easily accessible satellites to support its educational purposes. It must also press ahead to design, build and launch satellites in highly elliptical orbits to support the research needs of advanced users to further the cutting edge of satellite communications technologies.

ASCENT

The **A**dvanced **S**atellite **C**ommunications and **E**xploration of **N**ew **T**echnology program lies at the core of AMSAT's engineering efforts. It is from within the ASCENT team that cutting edge communications technologies are explored and strategic decisions are made to guide the overall direction of AMSAT's satellite design and engineering efforts.

Central to ASCENT's interests is the rapidly evolving technology for software defined radios, or SDR's. This new frontier of radio technology offers unprecedented flexibility in the bands in which radios can operate, the modes of operation that can be utilized and the almost unlimited range of educational experiences and scientific experiments that can be supported.





Engineering*...continued*

FOX-PLUS

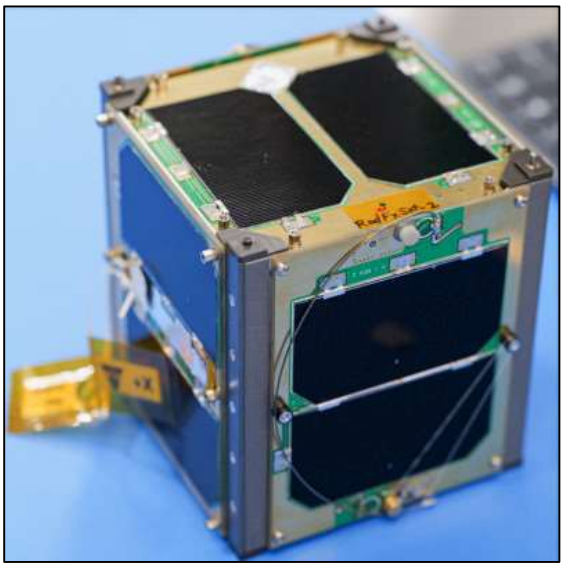
AMSAT's FOX-1 series of low earth orbit satellites beginning in 2015 became an immediate hit by providing easy access to space communications via Amateur Radio. This breakthrough design gave countless students and adult experimenters their first taste of communications via satellite. With the FOX-1 satellites reaching the end of their life expectancy, AMSAT begins the development of the FOX-Plus satellites.

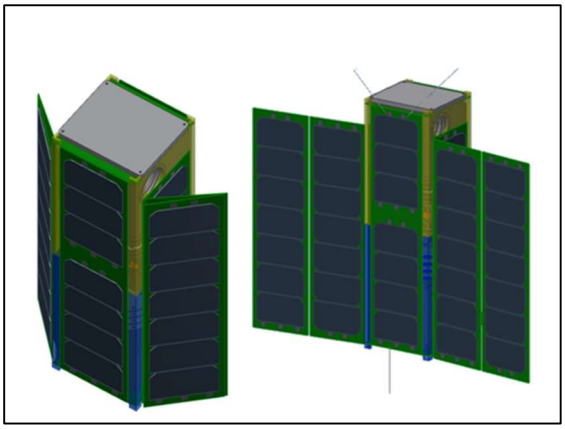
The FOX-Plus satellites will continue the tradition of providing easy access to two-way communications for experimenters with inexpensive radios and simple antennas. These satellites are designed with advanced software defined radios that will provide high flexibility to support advanced educational and scientific experiments. Improved computing power will offer the possibility of more interactive, multimedia experiences.

GOLF

The **G**reater **O**rbit for **L**arger **F**ootprint program means flying satellites in extended orbits in order to provide wider geographical coverage for users on earth. Besides the usual challenges of designing radios to operate over longer distances, building satellites for these far-out orbits means constructing them to survive the increased rigors of outer space. The GOLF series of satellites are the ultimate test for AMSAT's engineering efforts for operating software defined radios across microwave frequencies, solar power generation and battery management, attitude detection and control for antenna steering, and systems hardening to increase survivability in space's harshest environment.

All AMSAT engineering designs are published as openly available documents to be shared among all interested in amateur satellite operation.



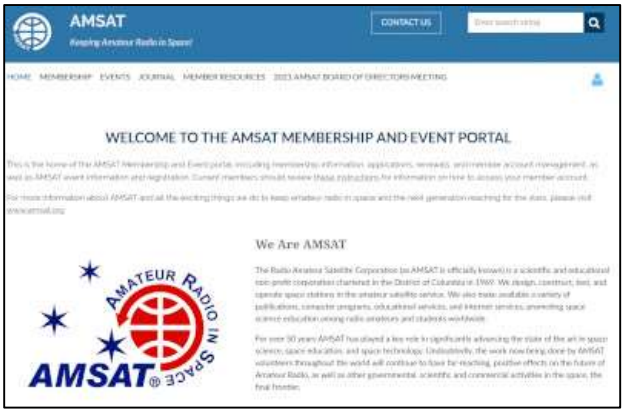


Member Services

Membership Portal

The Membership Portal is the gateway to AMSAT member features and benefits. Here, members can renew their membership, update their contact information, make additional donations and register for events.

The portal also provides members with exclusive access to the archives of the *AMSAT Journal* and Symposium Proceedings as well as other member benefits.



AMSAT.org Website

AMSAT maintains a comprehensive website with pages of information about the organization itself, educational offerings, beginner tutorials, satellite information, projects, events, and member services. The website has links to pages that answer almost any question concerning amateur satellite operation.

AMSAT News Service

The AMSAT News Service (ANS) bulletins are a free, weekly news and information service of AMSAT. The ANS bulletin publishes a variety of news related to Amateur Radio in space, including reports on the activities of Amateur Radio operators worldwide who share an active interest in designing, building, launching and communicating through analog and digital Amateur Radio satellites.

ANS bulletins are distributed via email to a list of more than two thousand subscribers worldwide. While most subscribers are radio amateurs, the subscription list also includes academic researchers, journalists, and scientific organizations who desire a regular capsule summary of Amateur Radio satellite activities.

Member Services*...continued*

AMSAT Bulletin Board

The Bulletin Board is an email mailing list available free to any who subscribe. The Bulletin Board offers users the opportunity to post questions, share observations, and exchange technical aid or opinions about satellite radio operating procedures. With approximately 3,000 subscribers at present, the Bulletin Board is a lively forum for discussion about satellite technology and operation with participants from around the world.

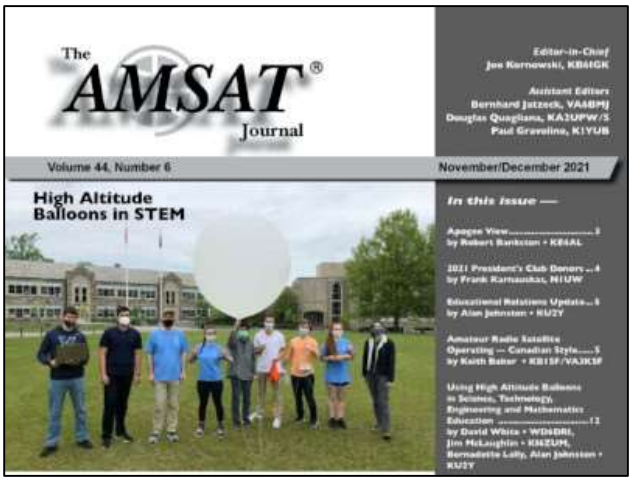
AMSAT Symposium

Since the early 1990s, AMSAT has held an annual gathering at various locations around North America. Modeled upon an academic conference, the Symposium features presentations on technical projects, software, and future satellite plans. Also included are also presentations of interest to beginners, and a good measure of informal chat between sessions and at the closing banquet.

Written versions of the Symposium presentations are collected in an edited volume of *Proceedings* that are published electronically for distribution at no charge to AMSAT members and registered Symposium attendees, and sold at modest cost to those requesting them.

The AMSAT Journal

The AMSAT Journal is a bi-monthly digital magazine for Amateur Radio-in-space enthusiasts. It is available to members, along with archived issues, on the membership portal of the AMSAT website. Each issue is a source for hardware and software projects, technical tips, STEM initiatives, operational activities, and news from around the world. *The AMSAT Journal* is professionally edited with assistance from a team of volunteers with expertise in publishing and technical writing. Articles range from introductory projects for beginners to advanced scientific research reports.



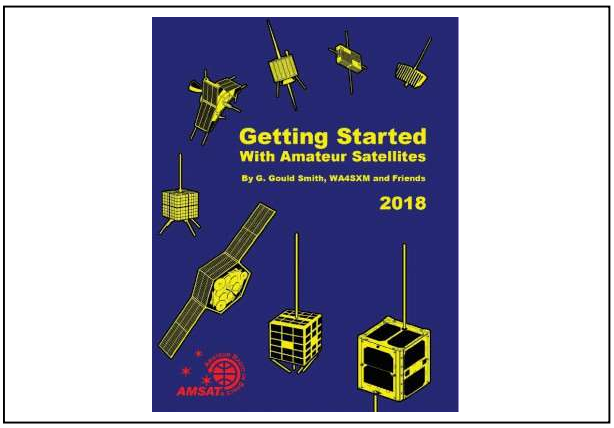
Member Services...continued

Publications

AMSAT supports all interested parties with publications ranging from a beginner's guidebook to collections of advanced technical articles.

Getting Started with Amateur Satellites is the definitive reference written for the new satellite operator and includes discussions for the experienced operator.

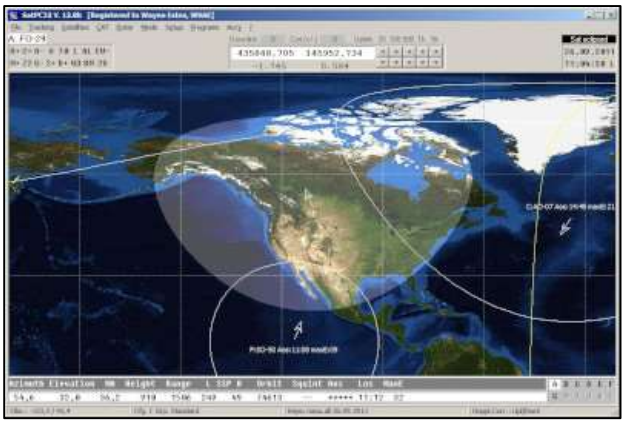
In it, the new operator is introduced to the basic concepts and terminology unique to this mode of communications. Also included is information on satellites that are expected to be launched in the coming years.



Satellite Tracking Software

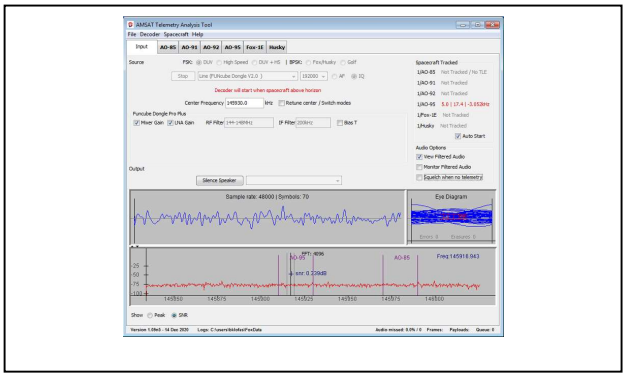
AMSAT offers for sale tracking software for both Windows and Apple platforms. With these sophisticated apps, enthusiasts can plan their communications with dozens of available amateur satellites from anywhere on the globe.

In addition to the software-based applications, anyone can use the online satellite prediction tool on the AMSAT.org website to predict the orbit of any working amateur satellite.



Telemetry Collection Software

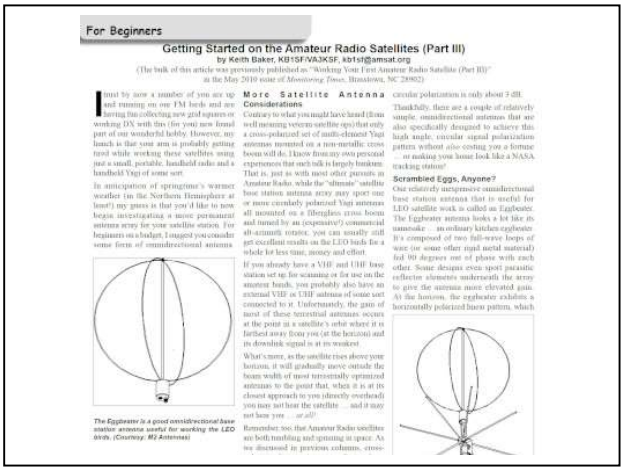
Downloading and capturing telemetry from satellites is a critical function performed by amateur satellite enthusiasts around the world. Telemetry is essential for control operators to maintain the health of satellites and is the conduit for capturing the results of the scientific payloads that many AMSAT satellites support. AMSAT published FOX-TELEM software to capture this telemetry and forward it to a data warehouse where control operators and experiment principals can access this essential information.



Member Services…continued

Training and Education

Education has always been part of AMSAT's mission. Sharing our passion for Amateur Radio and space is an excellent way to advance educational outreach for STEM (Science Technology Engineering and Math) education. AMSAT educational outreach takes many different forms including:


For Beginners

Getting Started on the Amateur Radio Satellites (Part III)

by Keith Baker, KB1SF/VA3KSF, kb1sf@amsat.org

(The bulk of this article was previously published as "Working Your First Amateur Radio Satellite (Part II)" in the May 2010 issue of *Monitoring Times*, Brasstown, NC 28902)

I trust by now a number of you are up and running on our FM birds and are having fun collecting new grid squares or working DX with ease (or you) new found part of our wonderful hobby. However, my hunch is that your area is probably getting hired while working these satellites using just a small, portable, handheld radio and a handheld Yagi of some sort.

In anticipation of springtime's warmer weather (in the Northern Hemisphere at least!) my guess is that you'd like to now begin investigating a more permanent antenna array for your satellite stations. For beginners on a budget, I suggest you consider some form of omnidirectional antenna.

More Satellite Antenna Considerations

Contrary to what you might have heard (from well meaning veteran satellite ops) that only a cross-polarized set of multi-element Yagi antennas mounted on a non-metallic cross boom will do, I know from my own personal experiences that such talk is largely bunkum. That is, just as with most other pursuits in Amateur Radio, while the "ultimate" satellite base station antenna array may sport one or more circularly polarized Yagi antennas all mounted on a fiberglass cross boom and turned by an (expensive?) commercial alt-azimuth rotator, you can usually still get excellent results on the LEO birds for a whole lot less time, money and effort.

If you already have a VHF and UHF base station set up for scanning or for use on the amateur bands, you probably also have an external VHF or UHF antenna of some sort connected to it. Unfortunately, the gain of most of these terrestrial antennas occurs at the point in a satellite's orbit where it is farthest away from you (at the horizon) and its downlink signal is at its weakest.

What's more, as the satellite rises above your horizon, it will gradually move outside the beam width of most terrestrially optimized antennas to the point that, when it is at its closest approach to you (directly overhead) you may not hear the satellite … and it may not hear you … *at all!*

Remember, too, that Amateur Radio satellites are both tumbling and spinning in space. As we discussed in previous columns, cross-

The Eggbeater is a good omnidirectional base station antenna useful for working the LEO birds. (Courtesy: M2 Antennas)

Thankfully, there are a couple of relatively simple, omnidirectional antennas that are also specifically designed to achieve this high angle, circular signal polarization pattern without also costing you a fortune … or making your house look like a NASA tracking station!

Scrambled Eggs, Anyone?

One relatively inexpensive omnidirectional base station antenna that is useful for LEO satellite work is called an Eggbeater. The Eggbeater antenna looks a lot like its namesake … an ordinary kitchen eggbeater. It's composed of two full-wave loops of wire (or some other rigid metal material) fed 90 degrees out of phase with each other. Some designs even sport parasitic reflector elements underneath the array to give the antenna more elevated gain. At the horizon, the eggbeater exhibits a horizontally polarized beam pattern, which

circular polarization is only about 3 dB.

- **Operational Aids and Plans**
  AMSAT provides beginning satellite communicators with a wide assortment of articles and brochures detailing how to assemble their first station and how to make their first satellite contact.

- **AMSAT Ambassadors**
  Outreach within the educational, experimental and public communities and the public is provided by AMSAT Ambassadors. These volunteers provide instructive presentations on space communications, stage live demonstrations of satellite communications and host displays at various events and conferences.

- **International Space Station**
  AMSAT volunteers provides technical and operational support for radio contacts between school students and astronauts onboard the International Space Station organized by ARISS (Amateur Radio on the International Space Station).

RADIO AMATEUR SATELLITE CORPORATION (AMSAT)

FINANCIAL STATEMENTS

DECEMBER 31, 2021 AND 2020

RADIO AMATEUR SATELLITE CORPORATION (AMSAT)

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McDANIEL
PO Box 6356
Dothan, Alabama 36302

Independent Accountant's Review Report

To the Board of Directors
Radio Amateur Satellite Corporation (AMSAT)
Washington, D.C.

We have reviewed the accompanying financial statements of Radio Amateur Satellite Corporation ("AMSAT") (a not-for-profit organization), which comprise the statement of financial position as of December 31, 2021 and 2020, and the related statements of activities, functional expenses, and cash flows for the years then ended, and the related notes to the financial statements. A review includes primarily applying analytical procedures to management's financial data and making inquiries of company management. A review is substantially less in scope than an audit, the objective of which is the expression of an opinion regarding the financial statements as a whole. Accordingly, we do not express such an opinion.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of these financial statements in accordance with accounting principles generally accepted in the United States of America; this includes the design, implementation and maintenance of internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement whether due to error or fraud.

Accountant's Responsibility

Our responsibility is to conduct the review engagement in accordance with Statements on Standards for Accounting and Review Services Committee of the AICPA. Those standards require us to perform procedures to obtain limited assurance as a basis for reporting whether we are aware of any material modifications that should be made to the financial statements for them to be in accordance with accounting principles generally accepted in the United States of America. We believe that the results of our procedures provide a reasonable basis for our conclusion.

We are required to be independent of Radio Amateur Satellite Corporation ("AMSAT") and to meet our other ethical responsibilities, in accordance with the relevant ethical requirements related to our review.

Basis for Qualified Conclusion

Accounting principles generally accepted in the United States of America (U.S. GAAP) requires that the financial statements include and disclose the value of the specialized services provided by volunteers. Management has elected not to record and make this disclosure due to the impractibility of developing the information. The effect of this departure from U.S. GAAP basis of accounting on financial position and change in net assets has not been determined.

Qualified Conclusion

Based on our review, except for the issue noted in the Basis for Qualified Conclusion paragraph, we are not aware of any material modifications that should be made to the accompanying financial statements in order for them to be in accordance with accounting principles generally accepted in the United States of America.

McDaniel & Associates, P.C.

Dothan, Alabama
October 11, 2022

RADIO AMATEUR SATELLITE CORPORATION (AMSAT)

STATEMENTS OF FINANCIAL POSITION

DECEMBER 31, 2021 AND 2020

	2021	2020
ASSETS		
Current Assets:		
Cash and cash equivalents	$ 467,432	$ 183,734
Other receivables	19,875	20,405
Prepaid expenses	9,589	7,581
Total Current Assets	496,896	211,720
Property and equipment, net	-	-
Long-Term Investments		
Mutual funds	746,227	637,894
Corporate stocks	75,886	79,934
Total Long-Term Investments	822,113	717,828
Other Assets		
Licenses	3,000	3,000
Total Assets	$ 1,322,009	$ 932,548
LIABILITIES AND NET ASSETS		
Current Liabilities:		
Accounts payable	$ 5,079	$ 18,877
Accrued payroll	-	4,931
Note payable, CARES Act	-	17,700
Total Current Liabilities	5,079	41,508
Net Assets		
Without donor restrictions	1,292,299	824,954
With donor restrictions subject to purpose restrictions	24,631	66,086
Total Net Assets	1,316,930	891,040
Total Liabilities and Net Assets	$ 1,322,009	$ 932,548

The accompanying notes to the financial statements are an integral part of these statements.

RADIO AMATEUR SATELLITE CORPORATION (AMSAT)

STATEMENT OF ACTIVITIES

YEAR ENDED DECEMBER 31, 2021

	Without Donor Restrictions	With Donor Restrictions	Total
Revenues, Gains, and Other Support:			
Contributions - cash and in-kind	$ 350,115	$ 18,622	$ 368,737
Dues	107,886	-	107,886
Federal assistance	17,700	-	17,700
Interest and dividends	9,738	-	9,738
Gain on sale of investments, net	89,749	-	89,749
Unrealized gain on investments, net	(33,732)	-	(33,732)
Product-related income	22,387	-	22,387
Publications	2,876	-	2,876
Other	3,162	-	3,162
Net released from restrictions	60,077	(60,077)	-
Total Public Support and Revenue	629,958	(41,455)	588,503
Expenses and Losses:			
Program Services:			
Information and symposia	59,596	-	59,596
Satellite Operations	67,040	-	67,040
Publications and software	5,238	-	5,238
Satellite development	13,888	-	13,888
Total Program Expenses	145,762	-	145,762
Supporting Services:			
Management and general	11,185	-	11,185
Fundraising	5,666	-	5,666
Total Supporting Services	16,851	-	16,851
Total Expenses and Losses	162,613	-	162,613
Change in net assets	467,345	(41,455)	425,890
Net assets, beginning of year	824,954	66,086	891,040
Net assets, end of year	$ 1,292,299	$ 24,631	$ 1,316,930

The accompanying notes to the financial statements are an integral part of these statements.

RADIO AMATEUR SATELLITE CORPORATION (AMSAT)

STATEMENT OF ACTIVITIES

YEAR ENDED DECEMBER 31, 2020

	Without Donor Restrictions	With Donor Restrictions	Total
Revenues, Gains, and Other Support:			
Contributions - cash and in-kind	$ 63,807	$ 109,796	$ 173,603
Dues	151,840	-	151,840
Interest and dividends	32,550	-	32,550
Gain on sale of investments, net	6,329	-	6,329
Unrealized gain on investments, net	51,849	-	51,849
Product-related income	33,271	-	33,271
Publications	9,705	-	9,705
Advertising	2,000	-	2,000
Net released from restrictions	141,586	(141,586)	-
Total Revenue, Gains and Other Support	492,937	(31,790)	461,147
Expenses and Losses:			
Program Services:			
Information and symposia	91,582	-	91,582
Satellite Operations	55,777	-	55,777
Publications and software	55,400	-	55,400
Satellite development	103,264	-	103,264
Total Program Expenses	306,023	-	306,023
Supporting Services:			
Management and general	25,895	-	25,895
Fundraising	11,481	-	11,481
Total Supporting Services	37,376	-	37,376
Total Expenses and Losses	343,399	-	343,399
Change in net assets	149,538	(31,790)	117,748
Net assets, beginning of year	675,416	97,876	773,292
Net assets, end of year	$ 824,954	$ 66,086	$ 891,040

The accompanying notes to the financial statements are an integral part of these statements.

RADIO AMATEUR SATELLITE CORPORATION (AMSAT)

STATEMENT OF FUNCTIONAL EXPENSES

YEAR ENDED DECEMBER 31, 2021

	PROGRAM SERVICES					SUPPORTING SERVICES			TOTAL EXPENSES
	Satellite Development	Publications and Software	Information and Symposia	Satellite Operations	Total Program Services	Management and General	Fundraising	Total Supporting Services	
Bank and processing fees	$ 236	$ 164	$ 3,820	$ 123	$ 4,343	$ 369	$ 189	$ 558	$ 4,901
Components	7,363	-	-	-	7,363	-	-	-	7,363
Insurance	-	-	-	-	-	1,499	-	1,499	1,499
IT and web services	863	465	5,519	348	7,195	465	465	930	8,125
Legal and accounting	2,297	2,297	12,060	1,723	18,377	2,297	2,297	4,594	22,971
Meetings and seminars	532	-	3,000	-	3,532	-	-	-	3,532
Outside Services	613	613	24,816	63,571	89,613	4,341	613	4,954	94,567
Postage and shipping	290	5	683	4	982	5	5	10	992
Rent	1,638	1,638	9,406	1,229	13,911	1,638	1,638	3,276	17,187
Supplies	4	4	21	3	32	4	407	411	443
Taxes - other	-	-	-	-	-	136	-	136	136
Telephone	52	52	271	39	414	52	52	104	518
Travel	-	-	-	-	-	379	-	379	379
Total Functional Expenses	$ 13,888	$ 5,238	$ 59,596	$ 67,040	$ 145,762	$ 11,185	$ 5,666	$ 16,851	$ 162,613
Percent of Functional Expenses	8.54%	3.22%	36.65%	41.23%	89.64%	6.88%	3.48%	10.36%	100.00%

The accompanying notes to the financial statements are an integral part of these statements.

RADIO AMATEUR SATELLITE CORPORATION (AMSAT)

STATEMENT OF FUNCTIONAL EXPENSES

YEAR ENDED DECEMBER 31, 2020

	PROGRAM SERVICES					SUPPORTING SERVICES			TOTAL EXPENSES
	Satellite Development	Publications and Software	Information and Symposia	Satellite Operations	Total Program Services	Management and General	Fundraising	Total Supporting Services	
Bank and processing fees	$ 43	$ 87	$ 3,518	$ 152	$ 3,800	$ 45	$ 40	$ 85	$ 3,885
Components	22,826	-	4,954	-	27,780	-	-	-	27,780
Depreciation	-	-	-	-	-	558	-	558	558
Insurance	640	1,109	3,453	582	5,784	848	530	1,378	7,162
IT and web services	687	674	4,662	1,252	7,275	-	433	433	7,708
Legal and accounting	1,581	2,695	8,135	2,479	14,890	3,139	1,536	4,675	19,565
Meetings and seminars	350	-	150	-	500	250	-	250	750
Miscellaneous	-	-	-	-	-	60	-	60	60
Outside Services	64,099	25,312	351	38,791	128,553	5,064	53	5,117	133,670
Pension plan	1,013	1,721	5,161	202	8,097	1,012	1,012	2,024	10,121
Postage and shipping	31	3,695	2,802	1,570	8,098	1,066	23	1,089	9,187
Printing and Xerox	-	2,931	2,526	-	5,457	-	-	-	5,457
Rent	2,066	3,582	12,279	2,190	20,117	4,154	1,662	5,816	25,933
Salaries	6,884	11,952	37,459	2,873	59,168	7,775	5,460	13,235	72,403
Supplies	93	166	728	2,264	3,251	237	56	293	3,544
Taxes - other	-	-	-	-	-	136	-	136	136
Taxes - payroll	609	1,057	3,312	254	5,232	687	483	1,170	6,402
Telephone	241	419	1,315	558	2,533	864	193	1,057	3,590
Travel	2,101	-	777	2,610	5,488	-	-	-	5,488
Total Functional Expenses	$ 103,264	$ 55,400	$ 91,582	$ 55,777	$ 306,023	$ 25,895	$ 11,481	$ 37,376	$ 343,399
Percent of Functional Expenses	30.07%	16.13%	26.67%	16.24%	89.12%	7.54%	3.34%	10.88%	100.00%

The accompanying notes to the financial statements are an integral part of these statements.

RADIO AMATEUR SATELLITE CORPORATION (AMSAT)

STATEMENTS OF CASH FLOWS

YEARS ENDED DECEMBER 31, 2021 AND 2020

	2021	2020
Cash flows from operating activities:		
Change in net assets	$ 425,890	$ 117,748
Adjustments to reconcile change in net assets to cash flows provided by operating activities		
Depreciation	-	558
Debt forgiveness	(17,700)	-
(Gain) loss on sale of investments	(89,749)	(6,329)
Unrealized (gain) loss on investments	33,732	(51,849)
Changes in assets and liabilities		
Other receivables	530	(8,412)
Prepaid expenses	(2,008)	(19,574)
Accounts payable	(13,798)	(4,705)
Accrued payroll	(4,931)	(2,974)
Net cash flows provided by operating activities	331,966	24,463
Cash flows from investing activities:		
Purchase of investments	(812,811)	(30,503)
Proceeds from sale of investments	764,543	37,809
Net cash flows provided by (used in) investing activities	(48,268)	7,306
Cash flows from financing activities:		
Issuance of debt	-	17,700
Net cash flows provided by financing activities	-	17,700
Net change in cash and cash equivalents	283,698	49,469
Cash and cash equivalents - beginning	183,734	134,265
Cash and cash equivalents - ending	$ 467,432	$ 183,734

The accompanying notes to the financial statements are an integral part of these statements.

Note 1—Organization and business

Nature of Activities – Radio Amateur Satellite Corporation ("AMSAT") is a non-profit educational and scientific organization that designs and produces satellites for world-wide amateur radio communication and experimentation, encourages the development of skills and the advancement of knowledge in the field of amateur radio communications, and disseminates scientific, technical, and operational information derived from such communications and experimentation. The organization is supported primarily through membership dues and contributions from members.

Note 2—Summary of significant accounting policies

Basis of Accounting and Presentation – The financial statements of AMSAT have been prepared on the accrual basis of accounting, in accordance with generally accepted accounting principles in the United States of America ("U.S. GAAP"). AMSAT reports information regarding its financial position and activities according to two classes of net assets: net assets without donor restrictions and net assets with donor restrictions.

Net Assets Without Donor Restriction – Net assets without donor restriction are not subject to donor-imposed stipulations. These net assets are available for the overall operations at the discretion of the Board of Directors.

Net Assets With Donor Restriction – Net assets with donor restriction are subject to donor-imposed stipulations that will be met either by actions of the organization and/or the passage of time. Other restrictions are those which are contributed with donor restrictions requiring that they be held in perpetuity.

Cash and Cash Equivalents – AMSAT considers highly liquid debt investments with an original maturity of less than or equal to three months to be cash equivalents. AMSAT places its cash and cash equivalents on deposit with financial institutions in the United States. The Federal Deposit Insurance Corporation covers $250,000 for substantially all depository accounts. AMSAT from time to time may have amounts on deposit in excess of the insured limits. As of December 31, 2021 and 2020, AMSAT had an amount of $200,717 and $0, respectively, on deposit in excess of these insured amounts. AMSAT's management does not believe AMSAT is exposed to any substantial risk.

Fair Value Measurement – The carrying amounts reflected in the statements of financial position for current assets and current liabilities approximate their respective fair values due to the short maturities on those instruments.

Investments – Investments in marketable securities with readily determinable fair values and all investments in debt securities are valued at their fair values in the statement of financial position. Investment income or loss (including realized and unrealized gains and losses on investments, interest, and dividends) is included in the statement of activities as increases or decreases in net assets without donor restrictions unless the income or loss is restricted by donor or law. Realized gains and losses on securities sold during the year and held at the beginning of the year are recognized to the extent sales proceeds exceed the security's fair market value at the beginning of the year.

Note 2—Summary of significant accounting policies (continued)

Recognition of Dues and Contributions – AMSAT recognizes annual dues as income when earned. Contributions are not generally pledged in advance of collection and are recognized upon receipt.

Accounting Estimates – The preparation of financial statements in conformity with U.S. GAAP requires management to make certain estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of any contingent assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the reporting period. Actual results could differ from those estimates.

Functional Expenses – The costs of providing program and other activities have been summarized on a functional basis in the statements of activities. The statements of functional expenses present the natural classification detail of expenses by function. Accordingly, certain costs have been allocated among program services and supporting services benefited. Such allocations are determined by management on an equitable basis, which is based on time spent on the various program services and supporting services by the manager.

Contributed Services – Volunteers worked for AMSAT in various capacities for the years ended December 31, 2021 and 2020. Volunteers and their contributed services are essential to all aspects of AMSAT's mission. They provide services including the writing, editing, and publishing of various educational materials including the Journal. Volunteers mentor university students on satellite projects and assist schools with contacts between the International Space Station and students. Volunteers design, build, and test AMSAT's satellites. They provide outreach and support for hams and potential hams. U.S. GAAP requires management to record and disclose services that create or enhance non-financed assets or those that require special skills. Management has elected not to record and disclose the information. The valuation of their work and its effect on the financial statements has not been determined.

Income Taxes – AMSAT is exempt from income taxes under Section 501(c)(3) of the Internal Revenue Code. In addition, AMSAT has been determined by the Internal Revenue Service not to be a private foundation within the meaning of Section 509(a) of the Code. AMSAT evaluates uncertainty in income tax positions based on a more likely than not recognition standard. If that threshold is met, the tax position is then measured at the largest amount that is greater than 50% likely of being realized upon ultimate settlement. As of December 31, 2021, AMSAT has evaluated its material tax positions and determined that no accruals for uncertain tax positions are required on AMSAT's financial statement as AMSAT has no tax obligation at this time. If applicable, AMSAT records interest and penalty expense as a component of income tax expense. Returns filed for tax periods ended after December 31, 2018 are open to examination and any changes by the taxing authorities may affect AMSAT's income tax liability.

Adopted Pronouncements – In May 2014, the FASB issued ASU 2014-09, Revenue from Contracts with Customers (Topic 606), requiring an entity to recognize the amount of revenue to which it expects to be entitled for the transfer of promised goods or services to customers. The updated standard rep most existing revenue recognition guidance in U.S. GAAP when it becomes effective and permits the use of either a full retrospective or retrospective with cumulative effect transition method. In August 2015, the FASB issued ASU 2015-14, which defers the effective date of ASU 2014-09 one-year making it effective for annual reporting periods beginning after December 15, 2018, for all non-SEC filers, including not-for-profit entities. The standard had no effect on the financial statements.

Note 2—Summary of significant accounting policies (continued)

In June 2018, the FASB issued ASU 2018-08, Clarifying the Scope and Accounting Guidance for Contributions Received and Contributions Made. ASU 2018-08 provides a more detailed framework for determining whether a grant or similar contract should be accounted for as a contribution or as an exchange transaction. ASU 2018-08 also provides additional guidance to help determine whether a contribution is conditional, and better distinguish between a donor-imposed condition and a donor-imposed restriction. The ASU has been applied on a modified prospective basis.

Future Pronouncements – In February 2016, the FASB issued ASU 2016-02, Leases (Topic 842), requiring lessees to recognize lease assets and liabilities on the balance sheet for all arrangements with terms longer than 12 months. Lessor accounting remains consistent with current U.S. GAAP. This ASU is effective for fiscal years beginning after December 15, 2021. AMSAT is currently evaluating the effect the ASU will have on the financial statements.

Note 3—Liquidity

The table below represents financial assets available for general expenditures within one year at December 31:

	2021	2020
Financial assets at year-end		
Cash	$ 467,432	$ 183,734
Investments	822,113	717,828
Total financial assets at year-end	1,289,545	901,562
Less amounts not available to be used for general expenditures within one-year:		
Donor restricted with purpose restrictions	24,631	66,086
Financial assets available to meet general expenditures within one-year:	$ 1,264,914	$ 835,476

General expenditures include general and administrative and fundraising expenses expected to be paid in the subsequent year. As part of AMSAT's liquidity management plan, cash in excess of monthly expenditure requirements is invested in corporate stocks and mutual funds. AMSAT solicits general contributions on an ongoing basis to maintain an operating reserve.

Note 4—Cash and cash equivalents

Cash and cash equivalents as of December 31 are summarized as follows:

	2021	2020
Eagle Bank Checking account	$ 450,717	$ 140,118
River Bank and Trust Checking	-	1,195
Merrill Lynch Cash account	16,715	42,421
	$ 467,432	$ 183,734

Note 5—Net assets with donor restrictions

AMSAT received net assets with donor restriction contributions during the years ended December 31, 2021 and 2020 as follows:

	2021	2020
Information and Symposia	$ 6,900	$ -
Publications	-	-
Satellite Development	10,505	97,740
Satellite Operation	1,217	8,556
Management	-	3,500
Total with donor restriction contributions	$ 18,622	$ 109,796

Net assets with donor restrictions as of December 31, 2021 and 2020 are available for the following:

	2021	2020
Satellite Development	$ 13,014	$ -
Satellite Operations	1,217	62,586
Education and Youth Initiatives	6,900	-
Legal Defense Fund	3,500	3,500
Total with donor restriction contributions	$ 24,631	$ 66,086

Note 6—Pension Plan

AMSAT sponsored a simplified employee pension plan (SEP IRA) that covered all employees with five years of service. The plan was terminated in 2020 with the retirement of its sole employee. The amount of pension expense was $0 and $10,121 for the years ended December 31, 2021 and 2020, respectively.

Note 7—Program services

Satellite Development – AMSAT designs, constructs, and launches satellites for amateur radio communication, research, and education in the space sciences. AMSAT owns and controls some of the orbiting satellites under license by the Federal Communications Commission. Some satellites are designed, constructed, and operated in collaboration with similar amateur satellite groups in other parts of the world.

Publications and Software – AMSAT develops, publishes, prints, and distributes educational materials related to communication satellites, amateur radio, and scientific, educational, and technological programs. Included are the AMSAT Journal, Proceedings of the AMSAT-NA Space Symposium, a series of beginners and satellite information guides, and a variety of computer programs and related hardware for computing and tracking orbiting satellites.

Information and Symposia – AMSAT distributes world-wide regular and special information bulletins about amateur satellites and space science activities using amateur packet radio networks, amateur radio voice networks by way of amateur satellite and high frequency radio, and the internet. AMSAT sponsors and promotes technological discussions on amateur spacecraft and space science on all of its networks. AMSAT also sponsors technical symposia and provides telephone information services. Information services are available to over 700,000 licensed amateur radio operators and to educators and students.

Note 7—Program services (continued)

Satellite Operations – AMSAT, through members who are licensed amateur radio operators, takes care of the day-to-day operation of its satellites. These satellites are available for use by any properly licensed amateur radio operator world-wide. Satellite operations involve the technical command and control of on-board systems to insure proper operation and its long-term well-being. AMSAT operations personnel disseminate data and information to users for effective and timely use of satellite systems.

Note 8—Long-term investments

AMSAT classifies its investments in marketable equity securities and mutual funds as available-for-sale investments and are shown at fair market values. The cost basis method used by the investment company is average cost for open-end mutual funds and first-in, first-out for all other securities. The gross proceeds from sales of mutual funds and other marketable securities for the years ended December 31, 2021 and 2020 were $764,543 and $37,809, respectively.

The following tables summarize the available-for-sale investments:

	December 31, 2021			
	Cost	Gross Unrealized Gains	Gross Unrealized Losses	Fair Value
Publicly Traded Corporate Stocks:				
Communications	$ 1,719	$ 74,167	$ -	$ 75,886
Exchange-Traded Equity Funds:				
Equity Large Cap Blend	241,334	20,441	(6,416)	255,359
Equity Large Cap Growth	108,387	21,777	-	130,164
Equity Large Cap Value	9,147	1,176	-	10,323
Equity Multi-Cap Blend	54,326	3,869	-	58,195
Equity Multi-Cap Growth	74,636	458	(3,123)	71,971
Equity Multi-Cap Value	6,712	421	-	7,133
Preferred Stock Micro-Cap Blend	5,040	-	-	5,040
Exchange-Traded Real Estate Funds:				
Real Estate Multi-Cap Blend	3,676	261	-	3,937
Real Estate Multi-Cap Growth	3,590	262	-	3,852
Exchange-Traded Bond Funds				
Emerging Market Bonds	8,008	-	(498)	7,510
Corporate Bonds	31,248	-	(734)	30,514
Government Bonds	10,796	-	(7)	10,789
High Yield Bonds	15,026	179	(45)	15,160
Inflation protected bonds	6,525	65	-	6,590
Short-Term Bonds	44,988	-	(1,670)	43,318
Intermediate-Term Bonds	2,990	124	-	3,114
Long-Term Bonds	85,241	-	(1,983)	83,258
Total Marketable Securities	$ 713,389	$ 123,200	$ (14,476)	$ 822,113

Note 8—Long-term investments (continued)

	December 31, 2020			
	Cost	Gross Unrealized Gains	Gross Unrealized Losses	Fair Value
Publicly Traded Corporate Stocks:				
Communications	$ 1,719	$ 78,215	$ -	$ 79,934
Publicly Traded Stock Funds:				
Bank loan	37,838	-	(897)	36,941
Commodities	36,427	-	(9,230)	27,197
Convertibles	46,848	15,798	-	62,646
Emerging markets	32,643	781	-	33,424
Large growth	44,188	16,860	-	61,048
Large Value	50,346	-	(3,752)	46,594
Long/Short equity	37,939	8,385	-	46,324
Managed futures	20,564	-	-	20,564
Pacific/Asia stock	88,133	38,894	-	127,027
World allocation	42,380	4,175	-	46,555
World stock	51,279	1,539	(3,627)	49,191
Publicly Traded Bond Funds				
World bond fund	45,978	-	(7,906)	38,072
Multisector bond	43,014	18	(721)	42,311
Total Marketable Securities	$ 579,296	$ 164,665	$ (26,133)	$ 717,828

The following table presents the gross realized gains and losses as of December 31:

	2021	2020
Gross realized gains	$ 113,892	$ 6,329
Gross realized losses	(24,143)	-
Total	$ 89,749	$ 6,329

Note 8—Long-term investments (continued)

Fair Value Measurements – The fair value of financial assets and liabilities is measured according to the Fair Value Measurements and Disclosures Topic of the FASB Accounting Standards Codification. Fair value is required to be evaluated and adjusted according to the following valuation techniques.

Level 1 – Fair value is determined using quoted market prices in active markets for identical assets and liabilities.

Level 2 – Fair value is determined using quoted market prices in active markets for similar assets and liabilities.

Level 3 – Fair value is determined using unobservable market prices in a market that is typically inactive.

The following table sets forth by level, within the fair value hierarchy, marketable securities at fair value as of December 31, 2020:

	December 31, 2021			
	Level 1	Level 2	Level 3	Total
Publicly Traded Corporate Stocks:				
Communications	$ 75,886	$ -	$ -	$ 75,886
Exchange-Traded Equity Funds:				
Equity Large Cap Blend	255,359	-	-	255,359
Equity Large Cap Growth	130,164	-	-	130,164
Equity Large Cap Value	10,323	-	-	10,323
Equity Multi-Cap Blend	58,195	-	-	58,195
Equity Multi-Cap Growth	71,971	-	-	71,971
Equity Multi-Cap Value	7,133	-	-	7,133
Preferred Stock Micro-Cap Blend	5,040	-	-	5,040
Exchange-Traded Real Estate Funds:				
Real Estate Multi-Cap Blend	3,937	-	-	3,937
Real Estate Multi-Cap Growth	3,852	-	-	3,852
Exchange-Traded Bond Funds				
Emerging Market Bonds	7,510	-	-	7,510
Corporate Bonds	30,514	-	-	30,514
Government Bonds	10,789	-	-	10,789
High Yield Bonds	15,160	-	-	15,160
Inflation protected bonds	6,590	-	-	6,590
Short-Term Bonds	43,318	-	-	43,318
Intermediate-Term Bonds	3,114	-	-	3,114
Long-Term Bonds	83,258	-	-	83,258
Total Marketable Securities	$ 822,113	$ -	$ -	$ 822,113

Note 8—Long-term investments (continued)

	December 31, 2020			
	Level 1	Level 2	Level 3	Total
Publicly Traded Corporate Stocks:				
Communications	$ 79,934	$ -	$ -	$ 79,934
Publicly Traded Stock Funds:				
Bank loan	36,941	-	-	36,941
Commodities	27,197	-	-	27,197
Convertibles	62,646	-	-	62,646
Emerging markets	33,424	-	-	33,424
Large growth	61,048	-	-	61,048
Large Value	46,594	-	-	46,594
Long/Short equity	46,324	-	-	46,324
Managed futures	20,564	-	-	20,564
Pacific/Asia stock	127,027	-	-	127,027
World allocation	46,555	-	-	46,555
World stock	49,191	-	-	49,191
Publicly Traded Bond Funds				
World bond fund	38,072	-	-	38,072
Multisector bond	42,311	-	-	42,311
Total Marketable Securities	$ 717,828	$ -	$ -	$ 717,828

Note 9—Debt

On April 24, 2020, AMSAT received loan proceeds in the amount of approximately $17,700 under the Paycheck Protection Program ("PPP"). The PPP, established as part of the Coronavirus Aid, Relief and Economic Security Act ("CARES Act"), provides for loans to qualifying businesses for amounts up to 2.5 times of the average monthly payroll expenses of the qualifying business. The loans and accrued interest are forgivable after 24 weeks, as long as the borrower uses the loan proceeds for eligible purposes, including payroll, benefits, rent and utilities, and maintains its payroll levels. The amount of loan forgiveness will be reduced if the borrower terminates employees or reduces salaries during the eight-week period. The unforgiven portion of the PPP loan is payable over two years at an interest rate of 1%, with a deferral of payments for the first six months.

On October 9, 2020, AMSAT satisfied and submitted its application for full PPP loan forgiveness to the U.S. Small Business Administration ("SBA"). On May 7, 2021, AMSAT received notification from the SBA that AMSAT's PPP loan had been fully forgiven.

Note 10—Lease commitments

On April 11, 2014, AMSAT entered into a five-year lease at a new location for its office. The lease agreement provides for additional rent to be paid for increases in common building expenses and taxes. On February 7, 2019, AMSAT entered into an amendment to this lease, extending the lease with existing space to March 31, 2024. On November 18, 2020 the lease was further amended to a month-to-month lease and terminated without penalty on May 31, 2021.

Office rent expense for the years ended December 31, 2021 and 2020, including building expenses and taxes, was $8,820 and $20,589, respectively. Additional rent of $4,887 and $5,344 was paid for storage facilities in Florida, Ohio, and Virginia for the years ended December 31, 2021 and 2020, respectively. The rental for storage facilities in Florida and Ohio are paid six months in advance and Maryland and Virginia on a month-to-month basis. Management has determined that the deferred rent is immaterial as of December 31, 2021 and 2020.

On March 20, 2019, AMSAT entered into a five-year rental agreement of a postage metering machine with quarterly rent payments of $438. At the end of the rental period, the equipment must be returned. Postage machine rent expenses for the years ended December 31, 2021 and 2020, was $1,752 and $1,752, respectively.

Future minimum lease commitments are as follows:

2022	1,752
2023	1,752
2024	438
Thereafter	-
Total	$ 3,942

Note 11—Net product-related income

Net product-related income is comprised of the following:

	2021	2020
Product related revenues	$ 71,424	$ 88,926
Cost of revenues	(49,037)	(55,655)
Total	$ 22,387	$ 33,271

Note 12—Property and equipment

Furniture and equipment are recorded at cost or at fair market value at the time of purchase or donation, respectively. Assets are depreciated using the straight-line method over their estimated useful life of 5 to 7 years. Software is recorded at cost and is amortized using the straight-line method over 3 years.

Property and equipment is comprised of the following:

	2021	2020
Furniture	$ -	$ 32,267
Equipment	1,962	61,006
Software	-	3,745
	1,962	97,018
Less accumulated depreciation and amortization	(1,962)	(97,018)
Total	$ -	$ -

Note 13—Commitments and contingencies

AMSAT is subject to legal proceedings and claims, which arise in the ordinary course of business. In the opinion of management, there is no pending or threatened litigation or administrative proceeding that is expected to have a material adverse impact on AMSAT's financial position or change in net assets.

Note 14—Subsequent events

The date to which events occurring after December 31, 2021, the date of the most recent statement of financial position has been evaluated for possible adjustment to the financial statements or disclosure is October 11, 2022, which is the date on which the financial statements were available to be issued.