

Driving Innovation + Collaboration



2013

ANNUAL REPORT



PRESIDENT'S LETTER

Driving Innovation + Collaboration

The aerospace industry is built upon innovation and collaboration. Succeeding where others had failed, two innovative brothers from Dayton, Ohio, collaborated to achieve the world's first controlled, powered flight of a heavier-than-air machine 110 years ago. Their short test flight at Kitty Hawk culminated many years of hard work designing, engineering and testing their flying machine. The Wright Brothers' accomplishment led to the growth of the modern aerospace industry.

Thanks to the numerous innovators and collaborators who followed in the Wrights' footsteps, aerospace has grown to be America's leading manufacturing export industry, with \$95 billion in exports and a positive trade balance of more than \$63 billion in 2012. As the leading supplier state to both Boeing and Airbus, and as the home of NASA Glenn Research Center, Air Force Research Laboratory, and world-class research universities and aerospace companies, Ohio is a leader in aerospace. By driving innovation and collaboration, the Ohio Aerospace Institute (OAI) helps to ensure Ohio's leadership role in the future.

OAI faced several significant challenges in 2013. Federal budget sequestration and the federal government shutdown adversely impacted revenue from our biggest customer: the federal government. Even though OAI's overall revenue dropped in 2013, we increased our non-federal revenue and improved our bottom line.

We participated in, and won, important competitions for federal research and educational services. We diversified our customer base, increased revenue from our industry membership program and grew our international services. We developed and implemented a new university membership program and forged partnerships with several Ohio educational institutions to provide student internship opportunities at Ohio aerospace companies. We held our biggest and best OAI Industry Forum ever in 2013, doubling attendance from 2012. In addition, our researchers continued to receive national and international acclaim for their accomplishments. With our strong and stable business base, growing collaborative network and innovative capabilities in research, project management and workforce development, OAI's future is bright.

Through their innovation and collaboration, the Wright Brothers changed the world and paved the way for America to become the world leader in aerospace. OAI is committed to build upon their legacy and to help our partners in industry, academia and government achieve success in aerospace.

Sincerely,



Dr. Michael L. Heil
President and CEO



COLLABORATION + PARTNERSHIPS



Driving Innovation and Collaboration has expanded OAI's industry membership activities to **engage industry** and launch a new OAI **university membership initiative**.

HIGHLIGHTS INCLUDE:

- Reaching record industry membership highs by adding Cobham and 11 Small Business Network members, including: Art & Logic Inc.; Balance Inc.; Catacel Corporation; Ellison Surface Technologies; Info Solution; ITAC, LLC; Lakewood Controls, Inc.; Mohawk Innovation Technology, Inc.; The Champion Company; The Mifsud Group; and Rhinestahl Corporation
- Hosting the OAI Industry Roundtable with topics that included: the 2012 OAI Forum & Innovation Awards; new online AeroWeb market research service; FAA Production Certification for aerospace manufacturers; Aerospace Business, Global Approach primer; America Makes, and National Additive Manufacturing Innovation Institute overview
- Conducting a successful workshop on *Market Access – Ohio's Mega-Billion-Dollar Aerospace, Aviation and Defense Industry*, with featured speaker Pierre Chao, managing partner, Enlightenment Capital and Renaissance Strategic Advisors. Panel members included representatives from Fifth Third Bank, KeyBank Capital Markets Inc., JumpStart, Inc., North Coast Angel Fund, MAR Systems and a special presentation by Lee & Hayes, PLLC.
- Experiencing a banner year for the OAI Innovation Committee. This group focused on implementing ideas to accomplish bottom-line growth in its respective businesses. The committee encouraged all members to take action to create, innovate and implement ideas that will advance the competitiveness of manufacturing activities in the United States. This committee is led by Don Deptowicz, director of technical excellence, PCC Airfoils LCC.
- Conducting more than 70 industry Voice of the Customer (VOC) meetings with OAI members. For the first time, OAI implemented three joint VOC industry visits with NASA GRC at The Timken Company, GrafTech and The Materion Company
- Meeting in Washington, D.C. with key members and staff of the Ohio Congressional Delegation to discuss areas of interest. The group conferred with staff of the House Armed Services Committee and met with The Department of Commerce and the Pentagon's Small Business office. OAI attended a joint workforce development conference hosted by Senator Rob Portman and sponsored an in-district meeting with Congressman David Joyce
- Concluding the 13th successful year of OAI's Aeroacoustics Research Consortium, bringing together Boeing, Honeywell, NASA GRC, Pratt & Whitney, and Rolls-Royce to sponsor cutting-edge efforts in jet noise prediction and mitigation



- Hosting OAI's 3rd Annual OAI Industry Members' Forum that centered on the theme of *Creating our Future through Innovation in Global Supply Chains: Building Partnerships for Growth*. More than 100 attendees, exhibitors and presenters met with statewide and national leaders in commercial aviation, aerospace and government programs and networked with industry peers. Featured presenters included representatives from JobsOhio, NIST MEP, The National Science Academies, Airlines for America, Cleveland Hopkins Airport, Embry-Riddle Aeronautical University-Worldwide, and G2 Solutions. The OAI Innovation, Supply Chain, Government Affairs and International committees also held meetings. The OAI Innovation Awards were presented to PCC Airfoils and Valtronic (USA), Inc.

"The 2012 forum was a wonderful venue to network, share best practices, uncover new opportunities, and quickly capture the pulse of the aerospace sector from thought leaders in industry, academia and government."

Les McFawn | Director of Tec'Edge | Wright Brothers Institute

- Engaging board members to develop a new approach to work with universities. Approved in June 2013, OAI's new university program will work with many new universities, colleges and community colleges interested in aerospace and aviation. The program will launch in December 2013 with a series of research, job fair and workshop programs to be developed with new OAI academic members. OAI will prepare a capability survey instrument for new member universities to better connect to the global aerospace industry and provide business development assistance and commercialization support
- Announcing a new hosting agreement between OAI and the University Clean Energy Alliance of Ohio (UCEAO)
- Establishing collaboration agreements with Lorain County Community College, Sinclair Community College, and Embry-Riddle Aeronautical University-Worldwide (ERAU-W)

COLLABORATION + PARTNERSHIPS *CONTINUED*



Technology and Innovation Partnership (TIP) activities also continued to build and grow throughout the year and included:

- Launching a new Cluster Innovation Model to grow partnership activities with a focus on innovation and new collaborative projects. The developed clusters are to include Propulsion and Power, Materials and Manufacturing, Green Aviation, Small Business and Entrepreneurship and International Markets

Propulsion and Power Cluster

- Developing projects under its Versatile, Affordable Advanced Turbine Engine (VAATE) contract. The Propulsion Instrumentation Working Group (PIWG) completed its Gas Turbine Engine Instrumentation Development technical effort. PIWG team members have developed a series of white papers for areas of interest to the propulsion community and will create prioritized strategic technology roadmaps for continued work
- Joining forces with General Electric Company, Honeywell International, Pratt & Whitney, Rolls-Royce North American Technologies (LibertyWorks), BAE Systems Controls and Hamilton Sundstrand Corporation (UTAS) to form the Distributed Engine Controls Working Group (DECWG) consortium. AFRL will provide funding to establish the joint collaboration agreement for the consortium and will be a core member along with NASA GRC. The consortium will focus on pre-competitive research and development and standards development for communication protocols and certification methods

Materials and Manufacturing Cluster

- Being selected by the National Additive Manufacturing Innovation Institute (NAMII) as a subcontractor to develop membership agreements, IP policy, practices and agreements, self-sustainability planning, and aerospace supply chain engagement
- Providing technology commercialization assistance to Alcoa Forgings and Extrusions to evaluate the commercial market potential of a new surface treatment technology for aircraft components
- Working with Nastec, Inc. on a NASA Phase II SBIR award to commercialize a technology that significantly advances aircraft engine health monitoring

Green Aviation Cluster

- Establishing and managing the Ohio Jet Biofuel Working Group (OJBWG), a joint initiative with the Ohio Farm Bureau Federation, to build a coalition of Ohio stakeholders to advance the renewable aviation fuel industry
- Serving as an advisor to the Midwest Aviation Sustainable Biofuels Initiative (MASBI). MASBI's final report is available at www.masbi.org
- Examining the renewable jet fuel market, logistics, infrastructure and policy on a USDA Value-Added Producer Grant, which studied the feasibility of a new venture that would connect Southwest Ohio's alternative jet fuel supply chain, opening up a new market for Ohio

soybeans. The project team includes the Ohio Soybean Council, Ohio Bioproducts Innovation Center, Mercer Landmark and Peter Cremer NA.

- Presenting at the 2013 National Advanced Biofuels Conference and Expo, highlighting renewable jet fuel activities in Ohio
- Signing an MOU with Sierra Lobo, Inc. that will promote a Liquid Hydrogen Energy Innovation Center of Excellence

Small Business & Entrepreneurship Cluster

- Providing numerous training sessions on SBIR/STTRs, grant writing assistance, and access to either supply chain partners or customers to support Northeast Ohio technology-driven businesses, as a member of the JumpStart Entrepreneurial Network
- Conducting SBIR/STTR outreach activities and commercialization services for technology-driven businesses across Ohio under the Small Business Administration's Federal and State Technology Partnership Program (FAST). OAI supported more than one dozen companies on SBIR/STTR proposals and helped foster multiple collaborative partnerships
- Hosting an Ohio SBIR/STTR showcase and industry matchmaking event to forge partnerships for Ohio-based companies. Twenty-five SBIR/STTR awardees shared their technology and experience with 94 attendees, who represented innovative small businesses, universities, and large industry members
- Hosting a NASA SBIR/STTR workshop. Nine NASA representatives presented on the NASA SBIR program, the NASA Small Business Office, space communication, aeronautics, chemical propulsion, human performance and solar energy. OAI provided the opportunity for one-on-one meetings with the NASA representatives
- Continuing to grow small-business projects with Valtronic (USA), Inc. OAI began a new collaboration with Art & Logic to develop new industry consortia focused on delivering innovative software platforms

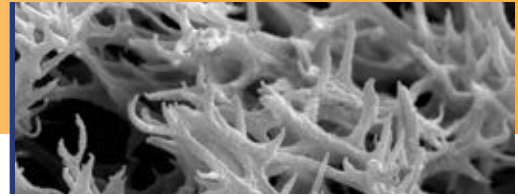
International Markets Cluster

International activities at OAI grew with the first year of our new partnership award from the Department of Commerce's Market Development Cooperator program and included:

- Signing two agreements with Aéro Montréal and The Consortium for Research and Innovation in Aerospace in Quebec (CRIAQ). OAI organized a trade mission with eight Ohio participating companies and organizations to the Quebec region, one of the three largest aerospace capitals in the world
- Organizing a trade mission with seven participating U.S. companies to Aeromart Toulouse, France, the home of Airbus
- Organizing and conducting a successful Ohio-Canada Summit in February 2013 with more than 40 companies, universities and partners from Aéro Montréal and CRIAQ
- Conducting training seminars on U.S. Export Control Reform and Aerospace Products



SPONSORED RESEARCH



OAI's researchers represent a **strategic asset** to our partners by providing a significant reservoir of **intellectual resources** focused on **advancing knowledge** and contributing to our customers' missions.

HIGHLIGHTS INCLUDE:

- Teaming with prime contractor Universities Space Research Association to win the new NASA Advanced Research and Technology Support (ARTS) contract, which has an estimated total value for OAI of \$20M over the life of the contract
- Being recognized by GrafTech International for research under Ohio's Third Frontier Program that contributed to GrafTech's development of novel graphite films for thermal management in advanced electronic devices. This led to the expansion of GrafTech's Engineered Solutions Division, with a new manufacturing facility, in Sharon Center, Ohio, that added 45 skilled manufacturing jobs (Dr. Euy-Sik Shin)
- Supporting the world's very first successful ice-crystal engine icing test in the NASA GRC Propulsion System Laboratory. This achievement was recognized with a NASA Group Achievement Award to the test team. This major breakthrough provides the U.S. and the world with the ability to conduct full engine icing tests that were not previously possible, contributing to improved flight safety worldwide (Dr. Jen-Ching Tsao)
- Hosting a NASA, National Research Council and Federal Aviation Administration research collaboration meeting at OAI and presenting NASA's ice-crystal scaling approach and plan (Dr. Jen-Ching Tsao)
- Developing a new solver for use in noise prediction for non-axisymmetric jets. The noise prediction code will be used to assess nozzle geometry effects on jet noise in support of the NASA Fundamental Aeronautics Program High Speed Project goals (Dr. Stewart Leib)
- Demonstrating a non-intrusive diagnostic that correlates Hall thruster service life with operating conditions, and reconstituting laser diagnostic capability in NASA GRC's Rocket Combustion Lab, which will enable assessment of plume properties of more environmentally friendly propellants – a necessity for their integration into future commercial spacecraft (Dr. George Williams)
- Achieving a significant milestone in shape memory alloy research by completing full-field strain measurement and analysis of shape memory alloy tubes that were thermally cycled for 100 cycles under multi-axial stress states (Mr. Darrell Gaydosh)
- Completing fatigue crack growth and stress intensity threshold tests on alloy samples; results were used to develop a life prediction model for heater heads on Stirling radioisotope generators (Mr. Andrew Ring)
- Developing a new finite element tool and preliminary modeling guidelines to predict lightning-induced damage in composite materials and developing a cyclic debonding model for analysis of composites within NASA's MAC/GMC framework (Dr. Paria Naghipour Ghezjeljeh)
- Making significant modifications to the Air Force Research Laboratory's AVUS computational fluid dynamics code to allow simulations of reacting internal flow (Dr. Casimir Suchyta)
- OAI's researchers continued to receive many awards and honors. Among the researchers honored during FY13 were:
 - Dr. Haiqon Guo, who, with NASA colleague Dr. Mary Ann Meador, received the 2013 NorTech Innovation Award for their development of polyimide aerogels, a revolutionary class of materials with significant commercial applications. Dr. Meador and Dr. Guo also received a NASA 2013 NASA Exceptional Space Act Award for this invention at NASA's Agency Honor Awards Ceremony
 - Dr. Sreeramesh Kalluri, who was honored with a NASA Group Achievement Award as a member of the Advanced Stirling Converter Early Development Team
 - Dr. Mrityunjay Singh, who received an Honorary Fellowship from the Indian Institute of Ceramics; the Einstein Professorship Award (the highest award of the Chinese Academy of Sciences); an Honorary Doctorate from Nagaoka University, Japan; the Distinguished Alumnus Award, Indian Institute of Technology; and the High Temperature Ceramic Matrix Composite Award International Contribution Award
 - Mr. Thomas Tanger, who received a NASA (Group) Significant Achievement Award for development and delivery of the Compatibility Test Sets S-Band and Ka-Band Relay Systems to NASA's Goddard Space Flight Center Network Integration Management Office
 - Dr. Michael White, who continued to serve on the graduate faculty at the University of Dayton, serving on two thesis committees
 - Dr. Philip Morgan and Dr. Daniel Garmann, each members of an Air Force Office of Scientific Research "Star Team" – a designation only 10 percent of AFOSR-sponsored research efforts achieve
- OAI also received awards, honors and recognitions, including:
 - 92 NASA, conference and journal publications and presentations (author/co-author), including two recognized with "best paper/presentation/poster" awards
 - 7 book chapters, editorships of proceedings, or guest editorships/journal editorships/roles as referee or reviewer
 - 6 technical society special awards or international honors
 - 18 international committees and technical society leadership roles or occasions serving as a conference/symposium/session chair or organizer
 - 5 Air Force "Star Team" designations, NASA Exceptional Space Act Awards or Group Achievement
 - 6 invited lectures
 - 1 new patent awarded

EDUCATION + TRAINING

OAI continued to vigorously pursue its mission of achieving **workforce preparedness** for the aerospace sector in Ohio and across the nation.



HIGHLIGHTS INCLUDE:

- Successfully teaming with Cleveland State University and Lorain County Community College to place interns in aerospace industry positions and provide a “Return on Internship” workshop for employers at OAI in support of the Ohio Means Internships Program. In the first year of the program, seven interns were placed at area companies. OAI’s partnerships will expand in the coming year to include the University of Cincinnati and the University of Toledo
- Supporting students pursuing aerospace-related degrees. The Ohio Space Grant Consortium (OSGC) awarded 92 undergraduate scholarships and graduate fellowships – bringing the total number of higher education students impacted to more than 1,100 to date. OSGC also supported teacher pre-service training and K-12 experiential learning activities designed to draw students into science, technology, engineering and mathematics (STEM)
- Hosting 103 college interns (51 from Ohio institutions of higher education) and one teacher at NASA GRC for a 10-week research experience, through its Lewis Education and Research Collaborative Internship Program (LERCIP). Through the Glenn High School Internship Program (GHIP), 24 high school students were hosted for eight-week research experiences
- Chairing the Workforce and Education Committee of the Ohio Aerospace and Aviation Council, developing state and national legislative recommendations and organizing a panel of education and industry representatives who testified on workforce issues and innovative approaches at Ohio Aerospace Day
- Updating and improving safety and mission assurance curriculum content and assessing the progress of system learners in NASA’s Agency-wide SATERN Learning Management System
- Hosting 16 summer faculty fellows with NASA GRC (six from Ohio colleges and universities), 10 Aeronautics Academy students and nine Space Academy students through the Glenn Academy
- Hosting six OAI Distinguished Lectures, including presentations by Jeffrey Thornburg (SpaceX), Dr. Mark Lewis (Institute for Defense Analysis), Dr. Alexander Michealis (the Fraunhofer Institute, Germany), Dr. Thomas Markusic (Virgin Galactic), Dr. Ramesh Agarwal (Washington University) and Dr. Paul McManamon (University of Dayton)



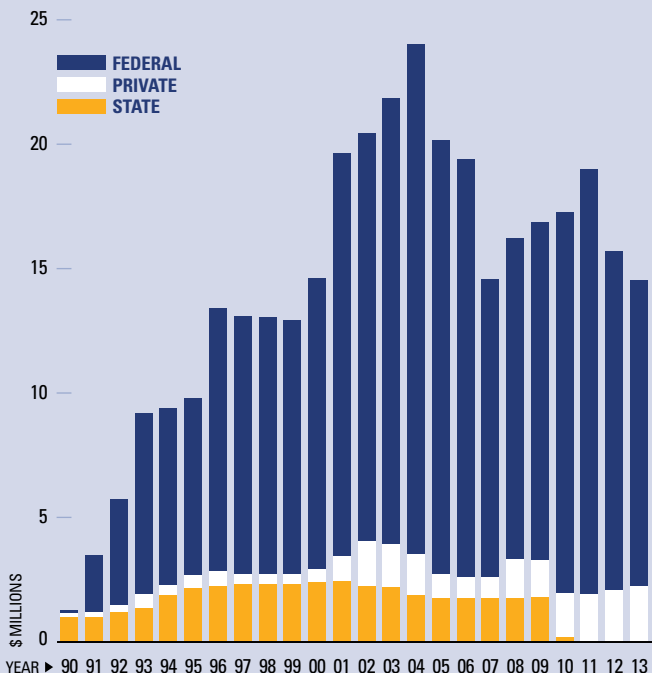
- Continuing to support the AFRL’s “Senior Capstone” project by assisting college engineering students in working on projects with AFRL. Six new student projects were added this year. The program was renewed for next year in a very challenging budget environment due to its effectiveness in producing problem solutions at a low cost and bringing students and Air Force mentors together
- Teaming with Practical Aeronautics and the American Institute of Aeronautics and Astronautics to deliver professional development courses to industry and government participants in jet engines and aircraft and rotorcrafts system identification
- Continuing OAI’s business management role in NASA’s One Stop Shopping Initiative (OSSSI). Through OSSSI, OAI has a leading role in OSSSI-outcome documentation and NASA Education’s program evaluation efforts in the Office of Education Infrastructure Division. This is helping to create groundbreaking approaches to longitudinal study evaluation that may ultimately be applied across federal government agencies
- Leading community support for the 12th Annual Buckeye Regional FIRST Robotics Competition, involving 52 high school teams and an estimated 1,300 students from Ohio and other states

“As CSU prepares the proposal for the second round of funding for the Ohio Means Internships and Co-ops initiative, I wanted to thank you for helping to make our initial grant possible. OAI’s member services and innovations in workforce development were critical to our receiving funding.”

Yolanda Burt | Director, Career Services Center |
Cleveland State University

- Collaborating with NASA Glenn Research Center, the Cleveland Foundation and the AIAA Northern Ohio Section to bring nearly 150 area high school students from Garrett Morgan High School, Polaris Career Center, Design Lab Early College, and home schools for special STEM education-oriented programming at NASA Glenn Technology Days in Cleveland, and to host a higher education student poster session at the event
- Providing editorial support for the Institute of Electrical and Electronic Engineers (IEEE)’s Transactions on Microwave Theory and Techniques. OAI received and processed more than 1,100 submissions from 20 different countries, assisting in publication of multiple transactions issues

REVENUE



As illustrated above, total OAI revenue declined for a second straight year due to further federal revenue reductions. Still, OAI has sustained an annual total revenue growth rate of more than 10 percent since its inception in 1990. OAI's cumulative surplus operations during that period and ongoing expense austerity programs allowed us to maintain our liquidity while achieving our mission.

STATEMENT OF FINANCIAL POSITION (AUDITED)

ASSETS

CURRENT ASSETS

Cash and investments	\$ 1,396,567
Funds held for others	296
Net receivables and deposits	<u>1,633,809</u>
Total current assets	<u>3,030,672</u>

NET PROPERTY AND EQUIPMENT - AT COST

6,353,142

\$ 9,383,814

LIABILITIES AND NET ASSETS

CURRENT LIABILITIES

Accounts payable and accrued expenses	\$ 938,728
Funds held for others	296
Deferred revenue	<u>1,320,684</u>
Total current liabilities	<u>2,259,708</u>

NET ASSETS

Unrestricted:	
Operating	770,964
Net investment in equipment/improvements	<u>930,807</u>
	<u>1,701,771</u>

Temporarily restricted - net building investment

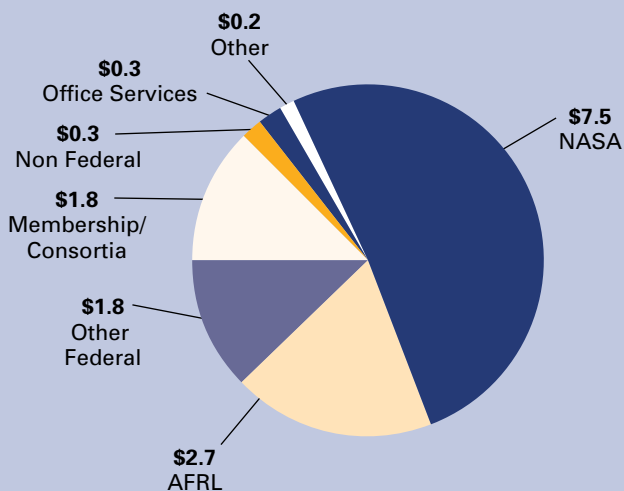
5,422,335

Total Net Assets

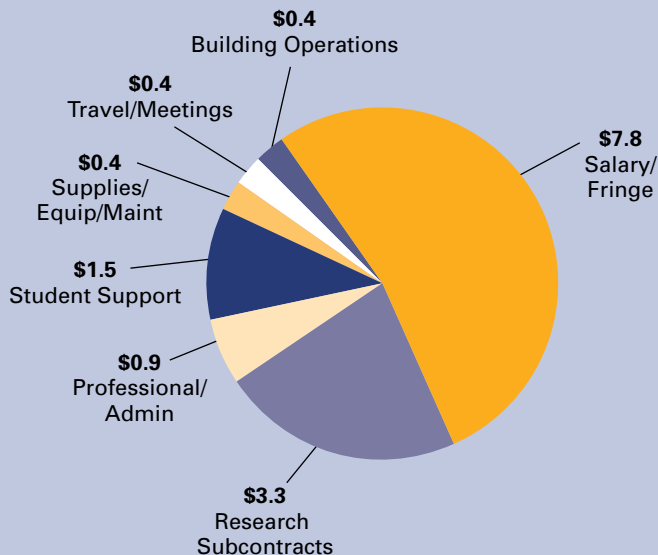
7,124,106

\$ 9,383,814

OPERATING REVENUES \$14.544M (AUDITED)



OPERATING EXPENSES \$14.765M (AUDITED)



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