Acuity Technologies

Air Systems

Design
Analysis
Prototypes
Testing
Production
Support

Capabilities Brochure
Our Mission: End-to-End Mission Specific Air Vehicle Supplier

Acuity Technologies develops, manufactures, and supports specialized unmanned aerial systems for defense and commercial applications. Experts in aerodynamics, propulsion systems and in-house design and fabrication, Acuity offers flight test capabilities to provide complete UAS life-cycle services.

With capabilities for customized vehicles from single prototypes to production quantities, Acuity provides operational support and navigation capabilities, including GPS-denied operation, low-level terrain and structure avoidance, and video-based waypoint and target matching software and remote 3D visualization.

Integrated Facilities, Integrated Capabilities

Since 1992, Acuity has been practicing in-house design, development and manufacturing. Acuity controls all aspects of its air vehicle prototyping and testing. Acuity specializes in developing aerial systems from the ground up, rather than attempting to fit existing vehicles into new requirements.

Customers who require certainty that all needed expertise is of the highest quality and available in all disciplines pertinent to integrated air systems will find that Acuity possesses in-depth understanding of the technologies and issues. We are a full-service shop with expertise in all areas as opposed to others who to outsource some work or are responsible for only a portion of the effort...a big advantage for our customers.

When considering a contractor for a new air system, ask which of our competitors has demonstrated air vehicles with capabilities similar to ours.....within the same time frame and cost.
**Aerodynamics**

NASA Overflow CFD software installed on Acuity servers for steady state and unsteady flow analysis.

Classical and vortex lattice aerodynamic analysis tools.

Flying wing, hovering, and rocket platform design and flight testing.

**Propulsion**

Acuity has designed and built experimental propulsion systems including

- Ducted fans with high disk loading.
- Hydrogen peroxide / methanol bipropellant rocket engines to 800 lbf.
- Cycloidal propulsion drive for VTOL flight.

**Payload Support**

Acuity’s 16 years of experience developing, manufacturing, and using complex sensors gives us the expertise needed to select, install, and support today’s sophisticated payloads.

**Control Systems**

Scientists and engineers with doctorates in Aerodynamics, Control Theory, and Image Processing, specializing in

- Extended Kalman Filters for vehicle navigation with tightly coupled inertial, magnetic, GPS, and video processing.

- Embedded control systems with navigation and flight control functions that conventional autopilots cannot provide, such as variable geometry wings, launch from a host aircraft, and GPS-denied navigation and control.

**Tools and Equipment**

- Machine Shop
- Electronics Development and Test – DSP and FPGA electronic design and programming tools, logic analyzers, oscilloscopes
- CAD and FEA tools for structural design and analysis
- Environmental chambers
- Composite layup and construction shop
- Software development
- Vehicle transport and mobile command trailer
Software and Sensor Products

Acuity has nearly 2 decades of experience developing, manufacturing, marketing, and supporting high technology equipment. Introduced in 1995, its AR-4000 laser sensor line is used in industrial automation and robotic vehicles for precision range sensing. The SRI-500 is used for navigation and path planning in autonomous navigation and obstacle avoidance, industrial as-built plant modeling, building and civil engineering structural recording for upgrades and remodeling, and for virtual reality environment and object capture. By combining inertial, video, and laser technologies, Acuity offers solutions for static and moving platform 3D capture requirements.

Scanning Imaging Rangefinders

The SRI-500 Laser Rangefinder is an omnidirectional scanning range image acquisition system for obtaining range images from stationary or mobile platforms at distances up to 500 feet and 800,000 points per second. Scanning is a combination of fast vertical scans at 500 lines/s combined with an azimuth sweep rate of up to 1000 deg/s.

In mobile applications, the optional internal inertial measurement unit captures platform vibration and rotation at 200 Hz and is used to correct the 3D coordinates of each sample point to create a stabilized world referenced dataset.

Laser Pattern Projection Photogrammetry

Acuity is developing a system for high-resolution, real-time, non-invasive wind tunnel model attitude and deformation measurement which combines projection of structured laser light with photography of the illuminated surface. Photogrammetric techniques are used to obtain the three dimensional shape of the surface.

Shapes of rapidly moving or deforming objects are captured in a single laser flash, allowing direct measurement of transient structure strain, vibration, or motion. 3D snapshots of wind tunnel models can be acquired in either single-camera or multi-camera mode with short exposure times, 40 Hz frame rates, and high accuracy.
Acuity’s Structure from Motion development program employs projective geometry to map 3 dimensional space from multiple 2 dimensional spaces, matching locations in images from a moving platform. With video rate execution this can be used for autonomous terrain matching, navigation, and remote visualization.
Key Personnel

Robert Clark
President
Mr. Clark received his BS Summa cum Laude from Princeton University in Aerospace Engineering in 1982 and MS in Digital Control Systems from Stanford University's Aeronautics and Astronautics department in 1983. He then spent several years as a software and electronics engineering consultant specializing in control systems. He has been Principal Investigator on development contracts in sensor systems and aeronautical design and UAV construction and flight test. He is the holder of several patents in a range of disciplines.

Chinmay Patel
Aerospace Research Engineer
Dr. Patel performs aircraft and flight control system design and development at Acuity. He received his Doctorate and Master's from Stanford University's Dept. of Aeronautics and Astronautics with research in energy extraction from atmospheric turbulence to reduce/eliminate propulsion requirements for small UAVs. His work included flight tests conducted on a his UAV and autopilot designs. He is the recipient of the Stanford Graduate Fellowship (SGF), Stanford University’s highest financial award to graduate students, and is the author of AIAA papers and a book on neutral energy cycles for a vehicle in sinusoidal and turbulent vertical gusts.

Kevin Ciocia
Lead Mechanical Engineer
Mr. Ciocia is the lead mechanical engineer on air vehicle and sensor systems at Acuity. His work here has included developing advanced propulsion concepts and designing and testing engine and rotor prototypes. He also led a team that placed in the top four nationally in the SAE Supermileage Vehicle Competition four years running, and developed the digitally controlled fuel injected engine for the car. Mr. Ciocia holds Bachelor's degrees in Mechanical Engineering and Applied Mathematics from the University of California at Berkeley.

Charles Guo
Staff Scientist
Dr. Guo works in Acuity's video processing group on reconstruction of 3D environment models from video streams. He received his Ph.D. from UCLA in Statistical Image Modeling, Machine Learning, Pattern Recognition and Computer Vision. He has performed research in, and developed software using, Generative/Descriptive/Discriminative image modeling, Bayesian Modeling and Inference, Markov chain Monte Carlo (MCMC) computing, ML/MAP estimation, HMM, EM, wavelets, and other methods. He is the author of several papers and book chapters in the field of computer vision.

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Customers in the last 5 years include
Arnold AFB
Hill AFB
DARPA IXO
NASA Dryden
Eglin AFB
NAVAIR Pax River
Edwards AFB
Northrop Grumman