



Athena Controls

Technical Update

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Aerospace Control and Guidance

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- We commercialize advanced control technologies for the manned and UV markets. Athena provides:
 - State-of-the-art flight-control and navigation system design, algorithms and software implementation for an array of platforms.
 - Guidestar™ Integrated Sensor Suit and Flight Control System
 - Avionics integration and flight test operations

Feedback LTI'zation enables rapid FCS prototyping



- Feedback LTI'zation is one of Athena's patented IP cornerstones.
- It is a mathematical technique that synthesizes control system solutions for nonlinear systems, such as airplanes, to automatically cover the full operating envelope. It provides a number of key benefits.
 - **Fast Control Design:** Full envelope solutions with one or a very small number of design points
 - **Robustness:** The math inherently ensures stability and robustness throughout, regardless of the complexity and non-linearity of the system.
 - **Time to Market:** Robust, multivariable, full flight envelope flight control solutions at a fraction of the cost and time it takes to design such control systems using traditional gain scheduling techniques.
 - **Track Record:** In production and flight proven over the past 15 years on many types of vehicles; fixed wing, helicopter, ducted fan, UCAV, high altitude, morphing, etc.



*AAI Shadow TUAV
GS-211e FCS
US Army MIL qualified; FRP*



*Raytheon UCAV
Demonstrator FCS*



*Alenia Sky-X UCAV
GS-311 FCS
Qualified for European
test airspace*



*NASA HADD-I
GS-111 FCS
101,000 ft. to Sea level*



*Raytheon LAM
GS-111 FCS*



*USAF BQM-167A
GS-111 APS
USAF MIL qualified; FRP*



*CopterVision
GS-111m FCS*

GuideStar Product, Production and Manufacturing



- GuideStar products are an all-in-one compact Integrated Sensor Suit and Flight Control System tailored to meet the needs of variety of applications:
 - Sensors include IMU, GPS, magnetometer and full air data system
 - Embedded INS/GPS Kalman filter and flight control law algorithms
 - Qualified to US Army and US Air Force MIL-Spec
- GuideStar products enable our customers to mitigate schedule and budget risk for either rapid prototyping or transition to production by providing qualified drop-in, turn-key navigation and flight control solutions that eliminate many design and integration issues that the primes would have to contend with.
- Products are scalable through commonality of HW and SW architecture, RTOS and embedded software
- Athena assembles, calibrates and tests all GuideStar products to ISO certified procedures in a state-of-the-art production and manufacturing facility.



- US Army RQ-7B Shadow TUAV with GS211e logged more than 8,000 hours in Iraq
- BQM-167 USAF target with GS111 in full rate production
- Aurora Flight Sciences GoldenEye free wing ducted fan demos:
 - high-speed bank-to-turn flight
 - recovery after actuator failure
- First flight of a European UCAV: Alenia Aeronautica Sky-X with GS311
- Active research into INS augmentation with Lidar and machine vision

GE-50 Avionics with Vision Engine

