

## IEEE Technical Committee on Aerospace Control

The control of aerospace vehicles such as aircraft, spacecraft, missiles, guided munitions, launch vehicles, unmanned aircraft systems, and formations or swarms of these vehicles has provided the control community with a fertile field for research and prototyping. Owing to their unique control challenges and the need to attain higher performance, several tools of modern multivariable control theory have been implemented and are operational on flight vehicles today, putting them among the relatively few real-world dynamical systems that are early adopters of advanced techniques for control synthesis. One example is the use of tools from nonlinear geometric control theory, specifically dynamic inversion, for the F-35 Lightning, a family of advanced fifth-generation fighter aircraft that also includes variants with the extremely difficult short takeoff and vertical landing capability. Aerospace control plays a key role in the burgeoning area of autonomy and coordinated control of unmanned aircraft systems.

The researchers associated with the Technical Committee on Aerospace Control (TCAC) are focused on fostering advancements in the technology and knowledge of control of flight vehicles and aerospace systems. This is accomplished in many ways, including organizing invited sessions and workshops at IEEE Control Systems Society (CSS) conferences; organizing special issues; authoring informational columns in CSS journals and magazines; serving on conference program committees; and providing a forum for engagement with other technical committees, societies, and professional organizations, such as the American Institute for Aeronautics and Astro-



Members of the IEEE Technical Committee (TC) on Aerospace Control after the in-person meeting at the American Control Conference in Chicago on July 3, 2015. Seated (from left): Kingsley Fregene (TC chair, Lockheed Martin), Rich Hull (United Technologies Aerospace Systems), Amit Sanyal (Syracuse University), Randy Beard (Bingham Young University), and Ilya Kolmanovsky (University of Michigan). Standing (from left): Scott Erwin (AFRL), Andrea L'Affilitto (University of Oklahoma), Naira Hovakimyan (University of Illinois), and Brett Ridgely (Raytheon). As can be seen from the affiliations, our members come from industry, government, and academia.



An F-35B Lightning II operates in short takeoff and vertical landing (STOVL) flight mode as it performs a vertical landing at sea on the flight deck of an amphibious assault vessel. (Photo from the U.S. Marine Corp.)

navics. We also identify and nominate individuals for awards and recognition, including our recently approved TC award for Technical Excellence in Aerospace Control.

Our committee members include IEEE Fellows (eight), Senior Members (16), and other professionals and researchers with backgrounds and

experience in a variety of specializations related to aerospace applications of modern control systems. There are currently 47 members of the TCAC (11 from industry, ten from government, and 26 from academia), of which 20% are located outside the United States. In addition to a monthly teleconference, the TCAC holds in-person meetings



Students and professors from the U.S. Air Force Test Pilot School and the University of Illinois Urbana-Champaign demonstrated an L1 adaptive controller on Calspan's variable stability Learjet. Technical Committee on Aerospace Control member Naira Hovakimyan (second from left) led the University of Illinois team. (U.S. Air Force photo by Rebecca Amber.)

at the American Control Conference (ACC) and/or Conference on Decision and Control each year. Please see the website (<http://aerospace-controls.ieeeccs.org/>) for more information. Any IEEE CSS member interested in joining the TCAC should e-mail the current chair ([kingsley.fregene@lmco.com](mailto:kingsley.fregene@lmco.com)).

### RECENT INVITED SESSIONS AND WORKSHOPS

Our members have organized invited sessions and workshops on hot topics at recent conferences. Sessions at the 2014 ACC included: 1) Navigation and Control in GPS Denied/Degraded Environments (organized by Kingsley

Fregene of Lockheed Martin Advanced Technology Labs and Sebastian Scherer of Carnegie Mellon University), 2) Sense and Avoid for Unmanned Aircraft Systems (organized by Alec Bateman of Barron Associates and Randy Beard of Brigham Young University), and 3) Rendezvous, Proximity Operations, and Capture of Space Objects (organized by Amit Sanyal of Syracuse University and Suresh Joshi of NASA). At the 2015 ACC, sessions included 1) Model Predictive Control for Aerospace Applications (organized by Morgan Baldwin of AFRL and Ilya Kolmanovskiy of University of Michigan); 2) Robust and Adaptive Control with Aerospace Examples (Kevin Wise and Eugene Lavretskiy of Boeing); and 3) the tutorial Robust, Adaptive, and Output Feedback-Based Aircraft Control Systems, to which our TC members made significant contributions.

**Kingsley Fregene**

## IEEE CSS Award for Technical Excellence in Aerospace Control

The following announces a new IEEE Control Systems Society (CSS) award called the *IEEE CSS Award for Technical Excellence in Aerospace Control* and solicits nominations.

*Description:* The award will be given annually to a person or team that performed an aerospace control engineering activity during the 36 months previous to the nomination deadline that demonstrates excellence and significant results with demonstrated impact. Examples of evidence of such contribution include: a paper appearing in an IEEE publication that specifically addresses aerospace control issues, a patent application that significantly advances the state of the art in aerospace control, innovative products that have appeared on the marketplace, and prototypes that have been demonstrated in a relevant operating environment. The award recognizes a specific contribution as opposed to cumulative contributions over a career. Eligibility and selection process shall comply with procedures and regulation established in IEEE and Society governing documents, particularly with IEEE Policy 4.4 on awards limitations.

*Prize:* Award winners will be given a certificate laminated on a plaque plus a stipend toward expenses for travel to accept the award. If the prize is awarded to a group, each group member will receive a certificate and one individual will receive partial travel reimbursement.

*Eligibility:* IEEE CSS membership is required. Any aerospace control engineering activity and results that occurred in the 36 months previous to the award nomination submittal deadline is eligible.

*Basis for judging:* Contributions (for instance, papers, products, prototypes, and/or patents) will be judged on the following criteria:

- the originality of technical innovation
- the significance/relevance to aerospace control
- a clear description of the aerospace application
- the potential impact on the practice of aerospace engineering.

*Presentation:* The award will be presented at the Society Awards Ceremony held during the annual IEEE Conference on Decision and Control. The award will be given only if a suitable awardee is identified.

*Nomination:* Nominations for the IEEE CSS Award for Technical Excellence in Aerospace Control must be submitted electronically as a package by May 15, using the CSS online awards nomination system:

- a letter from the nominator describing the outstanding features of the nominee(s).
- up to four additional supporting letters from individuals who are familiar with the nominee(s).