VFS STEM PROGRAM
2020 PROGRESS REPORT
THE VFS STEM Program aims to educate, motivate, and engage educators and students (both K-12 and in higher education) to learn and apply their knowledge of vertical flight technology and develop an interest in VTOL-related careers. We leverage local chapter representatives, industry and academic organizations, and other partners to host STEM demos and outreach events, as well as assist educators with curriculum content.
METHODOLOGY

**Educate**
- **Classroom learning guides**
- STEM outreach events at universities, corporate facilities, museums, etc. with hands-on demos, lab tours, and talks
- Local VFS chapters assist with classroom learning
- **Vertipedia** database

**Motivate**
- Forum STEM Day: presentation by an engineering professional and Q&A with company representatives on the exhibit hall
- VFF scholarships
- Career fair talks, company tours, classroom discussions and STEM outreach presentations by VFS corporate, educational, and individual members

**Engage**
- Student Competitions (MAV Challenge)
- Chapters working with local strategic partners (STEM RoundTable)
- Collaboration between VFS corporate member/local chapters and VFS university chapters or local universities (MIT Drone Race)
- Partnered Community outreach (Whirly Girls’ “Give It a Whirl” Youth Aviation Event, Smithsonian STEM events)
VFS STEM EDUCATION

- **VFS STEM Website**, Vertipedia as a learning aid resource
- Local chapters providing classroom assistance
- Local chapters demoing concepts and activities at outreach events
- Supports initiatives by strategic partners such as MIT Beaver Works’ Summer Institute
VFS STEM WEBSITE

- Lesson plans and classroom-suitable activity guides: (gyroscopic precession, rubber band helicopter)
- VFS and external VTOL/aviation related learning resources
- Opportunities and info on VFS competitions and scholarship opportunities
- VFS STEM Events and local chapter STEM initiatives
HAMPTON ROADS CHAPTER
CLASSROOM SUPPORT

• HRC’s Education Director, Dr. James Stephenson met with 140 first grade students to teach a hands-on lesson about sound and vibration, part of the Virginia Standards of Learning.

• Through the use of tuning forks, springs, a Chladni plate, and other hands-on tools he was able to show how vibrations propagate through different media, as well as how sound is produced through vibrations and movement.

• This is part of an active engagement in the local school districts by VFS-HRC, which includes outreach, scholarships, and science fair awards.
Volunteered at 2 KIPP Academies in Lynn, MA to support their sixth grade Space & Flight science unit

Assisted teachers in a discussion on wing design and how airfoils work, airfoil designs for lift using kits supplied by VFS STEM funding, and helping students design, build, and test balsa wood gliders

Discussed with students about various engineering careers

Technical assistance with high school design class and judging a science fair in spring 2019
VERTIPEDIA

- Relational database on VTOL aircraft, performance, powerplants, historical milestones, and biographies of notable figures
- Confederated search function on both VFS and government/scientific databases
- VFS Photo Gallery with 4,000+ images
FORUM STEM DAY

In 2017, VFS Southwest Chapter (Fort Worth area) restored the STEM Day at VFS Forum to inspire local high school students to pursue advanced studies and careers related to VTOL technology. VFS Arizona Chapter hosted it in Phoenix in 2018.

The program includes a presentation by a seasoned industry professional (Forum 73: Dr. Al Brand, Bell; Forum 74: Dr. Kendra Befort, Boeing), followed by an exhibit hall tour with around 10 organizations offering pre-planned talks.
MOTIVATE: MAV COMPETITION

- **MAV Student Competition**: electric-powered vertical take-off and landing (VTOL) micro air vehicle challenge; encourage interest in autonomous/unmanned aircraft technology as well as small air vehicle design and fabrication. Participating teams are usually university students but can include high school students; live competition takes place at Annual Forums.
FORUM 75 MAV COMPETITION

• 2019 MAV Competition held at University of Pennsylvania’s Mechanical Engineering Department

• Fully-autonomous or remotely-piloted option

• Timed mission: take-off from helipad and hover for 10 seconds; pick up a bag and hover for another 10 s; fly over 6-ft barrier; drop off package as closed to target as possible; repeat similar mission, and return to base helipad

• Competition is judged by professional engineers from Boeing, Lockheed Martin, Bell, NASA, etc.
MOTIVATE: VFF SCHOLARSHIPS

- **Vertical Flight Foundation** (VFF) disburses merit-based scholarships for university students in a STEM major related to VTOL technology and have intentions to pursue VTOL careers.
- Over 500+ scholarships since 1977; over $500K endowed in just the last decade.
- VFF Winner Alumni have gone on to become subject-matter experts and leaders in industry, government and academia.
ENGAGE: VFS UNIVERSITY CHAPTERS

• Georgia Tech Chapter members volunteer at Family Science Nights at local Atlanta elementary schools

• UT Arlington Chapter, Bell, and Airbus support 2017 “Give It a Whirl” Aviation Event by the Whirly Girls

• UMD Chapter supports Air & Scare, Smithsonian Museum’s Annual Halloween STEM Outreach Event and the Discover Engineering Family Day at the National Building Museum
ENGAGE: VFS LOCAL CHAPTERS

- Montreal/Ottawa Chapter organized STEM day for junior high students at Bell Mirabel facilities; arranged a CAE company tour and career talks to Concordia University students
- Arizona Chapter hosted the ongoing STEM RoundTable to support STEM education in the Phoenix area
- Hampton Roads Chapter annually endows two merit-based scholarships to local college-bound high school seniors who has conducted VTOL engineering research and pursuing a STEM major in college
PSU ROTOR DAY

• Penn State University hosts an annual “Rotor Day”, a free STEM outreach event for local families with K-12 students. Demonstrations and hands-on activities include a small scale wind tunnel, K-Max gearbox, RC quadcopter lessons, the X-Plane simulator software, a XV-15 flight simulator, high-speed cameras, gyroscopic precession, a QH-50 UAV, and a tour of the Penn State’s aerospace labs.

• About 200 students and chaperones attend this popular event in 2018, the fourth held since 2014.
ABERDEEN CHAPTER

• The Aberdeen Chapter has been supporting STEM Programs sponsored by the US Army.

• In the summer of 2019, the Aberdeen Chapter had introduced 150+ middle and high school students to vertical flight science using interactive and hands-on exercises. Held multiple 2-hr sessions with groups of 12-16 students over the summer of 2019 under the Gains in the Education of Mathematics and Science (GEMS) STEM Enrichment activity of the Army Educational Outreach Program (AEOP).

• The photo to the right shows one of the 10 batches of students participating in Army’s GEMS STEM program at APG.
ARIZONA CHAPTER

- Foster interest in VTOL and related careers among K-12 and university students
- Incorporate aviation, aerospace engineering, and VTOL-related topics and scientific principles into traditional K-12 STEM curriculums for teachers at local Arizona schools
- Provide academic and professional development opportunities for Arizona university students, especially those in the Mesa/Phoenix area
- Develop a talent pipeline for companies and organizations at the high school and university level (undergraduate and graduate)
- Engage local stakeholders (industry, universities, school administrators, Chief Science Officers, teachers, parents) to increase awareness and acceptance of VTOL technology
ARIZONA CHAPTER

- Supported 2018 Arizona SciTech STEM Festival
- Hosted STEM Day at Forum 74
- Supported ASU PolyTech’s Career Exploration Night
- Developed VTOL lesson/drone kit demo at local Arizona school
- Hosting the 2019 Autonomous Meeting/eVTOL Symposium’s STEM Night
ARIZONA CHAPTER DRONE INSTRUCTION PROGRAM

- Chapter members served as mentors and instructors for Title I school students in Phoenix, AZ for a two-semester long drone learning program
- Students learned about UAVs, basic flight principles and safety procedures, and how to design, build, test, program and flying drones
- Students acquired skills such as soldering electrics, drone programming, GPS usage, and registering with FAA to fly drones
- Students also learned soft skills such as leadership, communication, working as a team, and professionalism
SAN FRANCISCO BAY AREA CHAPTER (SFBAC)

- SFBAC partnered up with the Aeromechanics Branch at NASA Ames Research Center to host a senior from local high school to tour the facilities.
- The student spoke to several engineers in various stages of their careers and learn about on-going projects in the branch focusing on Urban Air Mobility (UAM) and Mars Rotorcraft research, as well as Ames’ interns who supported these projects.
- The student learned about controls requirements, passenger acceptability, and testing performed in the support of the UAM community at Ames and visited the RAPTOR wind tunnel and Vertical Motion Simulator.
PROFESSIONAL DEVELOPMENT
SHORT COURSES

- Electric VTOL Fundamentals
- Electric VTOL Designs
- Electric VTOL Aeromechanics & Acoustic Prediction Software
- Introduction to Helicopter/Tiltrotor Simulation
The VFS STEM Program is seeking financial and logistical support to continue supporting its initiatives and activities, both at the national and local chapter levels.

Thank you to our STEM Program corporate sponsor:
THANK YOU

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https://stem.vtol.org