NASAO Workshop Workforce

Moderator: Jim Brough
Mike McHugh; Grayson Ardies; Jared Esselman
Mike Ginter; Joey Colleran; Kim Kenville; Dr. Ralph Coppola
Mike McHugh
North Dakota Aeronautics Commission
Aviation Education Coordinator
Aviation Education Programs

- Aviation Art Contest
- Flight Training Assistance Program (FTAP)
- Airport Internship Program
- High School Programs
- Passport Program
FTAP – Flight Training Assistance Program

- Rural Airport Assistance
- 75% of transportation cost for flight instructor
- Increase of based aircraft and fuel sales

- Challenges
- Success
Airport Internship

- Administration
- Airside and landside
- Part 139 Operations
- Security

- 80% up to $10,000
Aviation Education Grants

- Career Fairs
- Aviation events with educational programming
- Transportation to Aviation Museums
- Start-up funding for high school programs
- Flight simulators
Educational & Promotional Handouts

- Educational Brochure
- Balsa Wood Gliders
- Whirly Gigs
High School Programs

- 5 High School programs, 2 Distance Ed programs
- Approximately 200 students
  - 39 continue to UND in 2019
- 1-3 years of instruction
- Pilot Ground School to Aircraft Maintenance
- Community Partnerships
Passport Program

- Fun and Education
- Tourism
- Feedback
Contact Info

NORTH DAKOTA AERONAUTICS COMMISSION

Mike McHugh
AVIATION EDUCATION COORDINATOR

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Cell: 701 426-4865
E-mail: mmchugh@nd.gov
Web: www.nd.gov/ndaero

“A Statewide Voice for Aviation”

M.Ed – Instructional Design and Technology
2015 Scott Crossfield Aerospace Teacher of the Year
Google Certified Innovator

www.aero.nd.gov
QUESTIONS?
Utah Aeronautics Pathways Program
Partnership
Aviation Universities
Established “Pathway”

- High School Aviation Classes + College Credit
- Pilot or Mechanic Courses + Company Line Number
- Guaranteed Career Placement
Possible Pathways for Students

- Fixed Wing Pilot
- Fixed Wing Mechanic
- Rotor Pilot
- Rotor Mechanic
- Aviation Management
  - Airport
  - Fleet
Rotor Pathway is Leading the Way

- UT Rotor Pathway Program
  - 22 groups now participating
  - Partnering with high schools
    - College credit
    - Mentoring, job shadowing, internships
    - Aviator High School building rotor education program
  - Outreach to CTE directors for additional connections
  - UT Talent Ready Grant
    - SUU and high schools
  - SWI Grant next goal - up to $300k ongoing allocation
- Why is UT Rotor Pathway Program so important
  • Developing legitimate workforce development channel
    • With state sponsored funding
  • First in the nation - national exposure – all eyes on UT
  • Template to be used in other states
  • Uniting industry, education partners and elected officials at local level
Cedar Valley Aviation High School
AOPA
High School Initiative Update
NASAO Workforce Workshop
September 7, 2019
Mike Ginter
V.P., Airports and State Advocacy
HIGH SCHOOL AVIATION STEM CURRICULUM

- 2 career pathways – Pilot, UAS
- Offering four years of curriculum – schools can decide how many courses to implement
- To be used as a credit-bearing course during the school day
- Prepare students for FAA written tests
  - Private pilot
  - Part 107 remote pilot
- Thanks to donations to the AOPA Foundation, this curriculum is offered at no charge to high schools.
# AOPA Curriculum Pathways

<table>
<thead>
<tr>
<th>Grade 9</th>
<th>Grade 10</th>
<th>Grade 11</th>
<th>Grade 12</th>
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<tbody>
<tr>
<td><strong>Semester 1</strong></td>
<td><strong>Semester 1</strong></td>
<td><strong>Semester 1</strong></td>
<td><strong>Semester 1</strong></td>
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<tr>
<td>Launching into Aviation</td>
<td>Introduction to Flight</td>
<td>Aircraft Systems</td>
<td>The Flying Environment - Manned and Unmanned</td>
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<tr>
<td>Exploring Aviation &amp; Aerospace</td>
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<td>Navigation and Human Factors</td>
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<td><strong>Semester 2</strong></td>
<td><strong>Semester 2</strong></td>
<td><strong>Semester 2</strong></td>
<td><strong>Semester 2</strong></td>
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<td>Unmanned Aircraft Systems</td>
<td>Exploring Aviation &amp; Aerospace</td>
<td>Aircraft Systems</td>
<td>Uas Theory and Operations</td>
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<td></td>
<td>Uas Design &amp; Applications</td>
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<td>Uas Capstone Project</td>
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# AOPA Curriculum Development Timeline

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<td>Grade 9</td>
<td>DEVELOP COURSES</td>
<td>FIELD TEST</td>
<td>IMPLEMENT</td>
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</table>
LESSON RESOURCES

- Lesson Plans
- Presentations
- Student Activities
- Student Projects
- Student Assessments
- Teacher Notes
- Teaching Aids
GRADE 9 CURRICULUM

• Foundation for exploration of flying and unmanned aircraft systems
• Incorporate engineering practices throughout ninth grade
• Engages students with hands-on activities and projects
• Career planning embedded throughout four years
GRADE 10 CURRICULUM

• Similar to the first half of ground school
• Teaches how an airplane is designed and constructed, how an airplane flies (four forces), aircraft systems
• Simulation activities embedded
• Schools can use 10th grade courses without using 9th grade courses
GRADE 10 “FOUR FORCES” LESSON

INTRODUCTION TO FLIGHT - 10

UNIT 4 | SECTION A | LESSON 2 | PRESENTATION

FOUR

FORCES

DRAW THE FORCES

NAME

CLASS

DRAW THE FORCES

Each question below describes an action which will affect one of the four forces of flight. Assume that you are the pilot and you wish to change that action. Draw the change in each of the four forces of flight that will result in the aircraft's new flight path.

1. You increase the throttle.
   - Throttles should be turned on to increase thrust.

2. You push forward on the joystick and the elevator goes down.
   - Throttles should be turned on to increase thrust.

3. You increase the flaps.
   - Flaps should be deployed to increase lift.

4. You pull back on the yoke and the elevator goes up.
   - Throttles should be turned on to decrease thrust.

MATERIALS (PER TEAM)

- 1 sheet of paper
- Microdot
- 1/4 inch x 1/4 inch x 1/4 inch

PROCEDURE

1. Each student will draw a sketch of an airplane using the materials provided.
2. Each student will place the airplane on a sheet of paper and then add a 1/4 inch x 1/4 inch x 1/4 inch block to represent each force of flight.
3. Each student will apply a constant force of lift to the airplane, moving it in the direction of the block.
2018-19 CURRICULUM PARTICIPATION DATA BY GENDER

Pilot population*

<table>
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<tr>
<th>Grade</th>
<th>Females</th>
<th>Males</th>
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<tr>
<td>9th grade</td>
<td>6.2%</td>
<td>93.8%</td>
</tr>
<tr>
<td>10th grade</td>
<td>18%</td>
<td>82%</td>
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</tbody>
</table>

*Pilot population data from Bureau of Labor Statistics

N = 2,282 students
N = 461 students
2018-19 CURRICULUM PARTICIPATION DATA BY ETHNICITY

9th grade
- African American: 484
- Hispanic: 577
- White: 1100
- Other:
- 6th grade: 61
- 63

10th grade
- African American: 77
- Hispanic: 52
- White: 258
- Other:
- Asian: 6
- Other: 9
GRADES 9 AND 10 PARTICIPATION

2018-19 school year

- Orange dots represent GRADE 9 PARTICIPATION
- Black dots represent GRADE 10 FIELD TEST PARTICIPATION
GRADES 9, 10, and 11 PARTICIPATION

2019-20 school year

- Orange circles represent GRADE 9 PARTICIPATION.
- Black circles represent GRADE 10 PARTICIPATION.
- Gray circles represent GRADE 9 and 10 PARTICIPATION.
- Blue circles represent FIELD TEST PARTICIPATION.
2019-20 HIGH SCHOOLS USING AOPA CURRICULUM

• 160 schools total from 34 states
• 142 will use ninth grade, 113 will use tenth grade
• Leading states by the numbers – Kentucky (25), Texas (18), Oklahoma (14), Florida (14), California (9)
• 85 new schools implementing AOPA curriculum
• 53 schools are starting brand new aviation programs
SCHOOLS AGREE TO:

• Provide a paid or contracted employee to teach the AOPA courses
• Support their teacher’s participation in a teacher workshop
• Provide high school credits for AOPA courses
• Enroll at least five students
• Provide non-identifying data to AOPA
• Use the AOPA courses, in their entirety, for the 2019-20 year
HOW TO RECRUIT SCHOOLS

• Find someone at the school who might be interested
  • Principal, instructional or curriculum administrator, board member, teacher

• Use simple talking points
  • Great need for future aviation workforce, 4 years worth of curriculum, can choose how many courses to implement, 2 career pathways (pilot or UAS), provides all teaching materials, teacher professional development provided, curriculum is FREE

• Share AOPA high school curriculum website for more information: https://youcanfly.aopa.org/high-school/high-school-curriculum

• Contact hs@aopa.org for more information.
2019 HIGH SCHOOL AVIATION STEM

WHEN & WHERE?
NOV. 10-12, 2019
United Airlines Flight Training Center
7500 E. 35th Ave. | Denver, CO 80238
AND
Doubletree by Hilton Denver
3203 Quebec St. | Denver, CO 80207
2019 HIGH SCHOOL AVIATION STEM SYMPOSIUM

Keynote Speakers

• Bryan Quigley, SVP, Flight Operations, United Airline

• Ricky Arnold, Astronaut, NASA

• Eric Allison, Head, Uber Elevate

Registration will open in late spring, 2019.
QUESTIONS OR COMMENTS?
Redbird Flight Workforce Development

We make pilots…as many as we can in several different ways!
Who do you know? Who *should* you know?
Joey Colleran
Director of Business Development – Government and Education
jcolleran@redbirdflight.com
512-301-0718
Welcome to the University of North Dakota!

Workforce Development
National Association of State Aviation Officials
September 7, 2019

Kim Kenville, Ph.D., C.M., professor
Chair, North Dakota Aeronautics Commission
University of North Dakota

• Established in 1883
• Nearly 15,000 students
  – 225+ fields of study
• Eight colleges
  – Medical School
  – Law School
  – College of Aerospace Sciences
John D. Odegard School of Aerospace Sciences

- Providing aviation education since 1968
- Departments
  - Atmospheric Sciences
  - Earth System Science and Policy
  - Space Studies
  - Aviation
  - Flight Operations
Aviation Degree Programs

Undergraduate Degrees (all AABI accredited)

– B.S.A. - Bachelor of Science in Aeronautics
  • Commercial Aviation
  • Air Traffic Management
  • Unmanned Aircraft Systems Operation
  • Flight Education
  • Aviation Technology Management

– B.B.A. – Bachelor in Business Administration (granted by Business College – AACSB accredited)
  • Aviation Management
  • Airport Management

Graduate Degrees

– Master’s of Science in Aviation
– Ph.D. Aerospace Sciences
Aviation Curriculum

• UND’s Focus
  – Traditional liberal arts education
  – Comprehensive professional education

• Breakdown in Coursework
  – 39 Credits of Essential Studies
    • Communication, Social Science, Arts and Humanities and Math, Science and Technology
  – Aviation Core Classes
  – Aviation Major Specific Classes
  – Electives
UND Flight Training
UND Flight Operations @ GFK Airport

• 400+ Employees
  – 199 Flight Instructors
  – 35 Mechanics
  – 40 Line Support
  – 40 Dispatch/Records
  – 35 Mgmt/Admin
The UND Fleet – Grand Forks

- 92 airplanes (transition from Cessna to Piper)
  - 76 Single-Engine
  - 14 Seminoles
  - 2 King Air C90

- 7 helicopters
  - Robinson & Schweitzer

- UAS
  - 23 platforms
    - Boeing Scan Eagles
    - DJI M600
    - Various Parrott products
  - 30 small “mambos”

- 22 FTD/AATD/PTT
  - 16 Aircraft
  - 6 UAS
Flight Instructor Shortage

• All schools are reporting CFI staffing issues
  – Main concerns:
    • High Turnover
    • Lack of Multi-Engine Instructors and Initial CFI instructors

• UND CFI Numbers (as of September, 2018)
  – Hourly CFIs = 171 (2018)
  – Hourly CFIs = 199 (2019)
    • Would like to have 220 - 230
    • 29 (17%) have an MEI
      – UND pays for MEI training with a 150 dual multi commitment ($6,300)
      – Without this program we would have NO MEIs
Real World Design Challenge
The Innovation Engine
A Workforce Solution

Dr. Ralph K. Coppola, Founder & Executive Director
The Real World Design Challenge
An annual competition that provides students with the opportunity to apply the lessons of the classroom to the technical problems currently faced in the engineering field.

- Real Problems
- Real Tools
- Real Roles
- Real Contributions

INDUSTRY, GOVERNMENT & EDUCATION
The Students Solve Real Aerospace Problems

Teams of 3-7 high school students design a plane looking at the forces of flight, lift, weight, thrust, and drag with the goal of enhancing performance.

**Total Lift** = Actual Lift – Reported Drag($\sin \alpha$)

**Total Drag** = Actual Drag + Induced Drag

**Free Body Diagram**

**Airfoil Selection Method**

Minimum Lift Coefficient = 0.3-0.5

**Lift for NASA SC(2)-0710**

**Drag Polar for NASA SC(2)-0710**
The Real World Design Challenge is the largest aviation education program in the world.

State Champion Teams

We have had 26,000 students participate over 12 years.
UAS Design Approach

1. ID Sensors (Payload)
   - CCD/CMOS
   - Multispectra
   - Thermal
   - LiDAR
   - Multi Sensors (Gimbal)

2. ID Platform
   - Fixed-wing Pusher
   - Fixed-wing Tractor
   - Rotary-wing
   - Multirotor
   - Hybrid

3. ID C3
   - RC Radio (TX/RX)
   - Portable GCS
   - Fixed GCS
   - Autonomous/semi
   - Directional Ant

4. ID Support Equip
   - Launcher
   - IC Eng Starter
   - IC Eng Fuel
   - Battery Charger
   - Tools

5. ID Operators
   - Pilot in Command (PIC)
   - Secondary Operator (Spotter)
   - Sensor Operator
   - Support
“Our future depends on reaffirming America’s role as the world’s engine of scientific discovery and technological innovation, and that leadership will come from young Americans Like you. The experience gained at competitions like the RWDC will help you drive our economy as tomorrow’s entrepreneurs, innovators; and guide our Nation as our future educators, policy makers, and parents.” President Barack Obama

“The Real World Design Challenge helps recruit manufacturers to Alabama.” Alabama Governor Kay Ivy

“RWDC is a jewel in the U.S. STEM Crown. Keep it up!” Dr. Jeffrey Weld, Senior Policy Advisor & Assistant Director STEM Education, Office of Science & Technology Policy, Executive Office of President Trump

“The Real World Design Challenge is the best engineering education program in the world!” Dr. Keith Hanna, Marketing Director, Mentor Graphics Mechanical Analysis Division, United Kingdom

“...both parents and students describe the experience as ‘life changing’. In the past three years, a total of six team members have graduated from [our] high school, all have selected engineering related fields of study at their respective universities. RWDC has extended their education outside of the classroom and given them the confidence to tackle challenging engineering fields of study and helped them develop a passion for learning.” Sandy Barnes, parent of an RWDC student on the Baldwin High School Kansas Team
RWDC Objectives:

• Prepare students for university study in STEM fields.
• Prepare students for the STEM workforce.
• Assist students in gaining employment in the STEM workforce by linking them with employers.

Plan to meet the objectives:

• Require a high level of academic rigor in solving Challenge problems.
• Employ a rigorous judging process to help identify the best and brightest students.
• Link RWDC alumni with STEM job opportunities.
Measuring Outcomes:

There were two methods used to measure outcomes:

• Student surveys were implemented annually to gain an understanding of interest in STEM and careers plans.

• A longitudinal study was conducted to determine where students ended up after they graduated from the RWDC.
Results

It was found that there are two key intervention points in the STEM pipeline:

- Having an in depth, academically rigorous STEM experience in high school provides students with a focus directed toward STEM and in this case engineering.

- The initial job students obtained after completing university study set the trajectory for their careers.
RWDC Student Geographic Locations

- Suburbs: 43%
- Urban: 31%
- Rural: 26%
RWDC Underrepresented Students in Science & Engineering
Compared with U.S. Underrepresented Groups in Science & Engineering Employed with Bachelor's Degrees

U.S. Underrepresented Groups Employed with S&E Bachelor's Degrees

RWDC Underrepresented Students in S&E
Comparison of RWDC Students and All United States Students Studying STEM Fields and Studying Engineering at the Undergraduate Level

- Students Studying Engineering
  - All U.S. Students: 5%
  - RWDC Students: 62%

- Students Studying STEM Fields
  - All U.S. Students: 34%
  - RWDC Students: 89%
Comparison of RWDC Students and All United States Students Pursuing Undergraduate and Graduate Degrees

- Students Pursuing a Graduate Degree:
  - All U.S. Students: 4%
  - RWDC Students: 18%

- Students Pursuing a Bachelor's Degree:
  - All U.S. Students: 70%
  - RWDC Students: 99%
## Intuitions of Higher Education that RWDC Alumni attended for undergraduate study

<table>
<thead>
<tr>
<th>Arizona State University</th>
<th>Georgia Institute of Technology</th>
<th>North Dakota State University</th>
<th>University of Alaska</th>
<th>University of Massachusetts</th>
<th>University of South Carolina</th>
<th>Virginia Polytechnic Institute &amp; State University</th>
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<tbody>
<tr>
<td>Boston University</td>
<td>Harvard University</td>
<td>Northwestern University</td>
<td>University of California</td>
<td>University of Michigan</td>
<td>University of Southern California</td>
<td>West Virginia University</td>
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<td>Brown University</td>
<td>Imperial College of London</td>
<td>Pennsylvania State University</td>
<td>University of Colorado</td>
<td>University of Minnesota</td>
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<td>Carnegie Mellon University</td>
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<td>Purdue University</td>
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<td>Duke University</td>
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<td>Stanford University</td>
<td>University of Kansas</td>
<td>University of Pennsylvania</td>
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<td>Georgetown University</td>
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<td>University of Alabama</td>
<td>University of Maryland</td>
<td>University of Pittsburgh</td>
<td>Notre Dame University</td>
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<td>University of Cambridge</td>
<td>Yale University</td>
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<td>Stanford University</td>
<td>University of Minnesota</td>
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<td>Organizations where RWDC Alumni are working. Note the Aerospace and Defense Organizations are bolded.</td>
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<tr>
<td>Accenture</td>
<td>DJI</td>
<td>Nei (analytical software)</td>
<td>Tesla</td>
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<td>Amazon</td>
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<td>Textron Aviation</td>
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<td>Box</td>
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