

Aviation is Everywhere

Integrating Aviation Content in Core Curriculum

Second Annual AOPA High School Aviation STEM Symposium
Museum of Flight - Raisbeck Aviation High School

Scott McComb and Marcie Wombold

Aviation is Everywhere

Introduction

1. About RAHS
2. About us
3. Why we do it



Bring real-world challenges into everyday classrooms

Project-based learning

- 1: introduction
- 2: planning, developing, and scheduling
- 3: managing the project
- 4: communication and presentation
- 5: assessment

Two contexts:

Science: Virtual Flight Test

Humanities: How To Make The Public Love Drones

Virtual Flight Test



Opportunities from aviation:

- Economic development
- Humanitarian response
- Military intervention

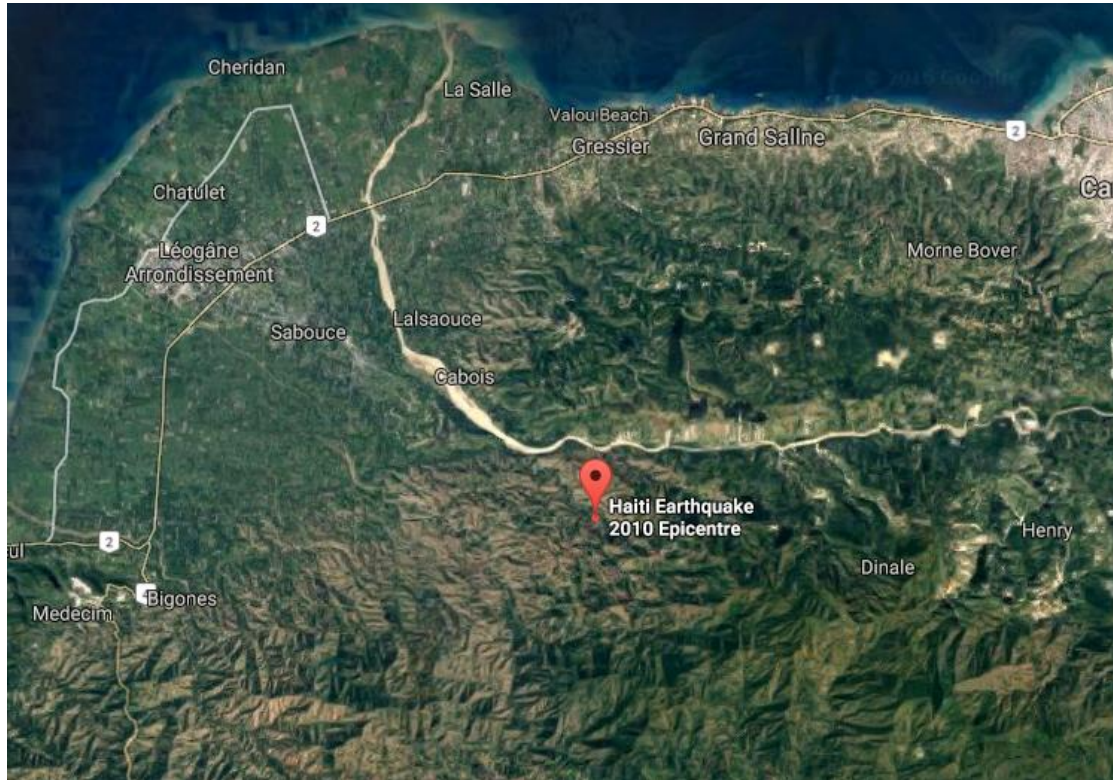
Each is critically limited by the length of the runway.

Virtual Flight Test



Hook

Virtual Flight Test



Hook

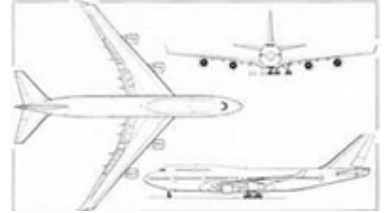
Virtual Flight Test



Hook



Virtual Flight Test



To answer these questions,
students will need to:

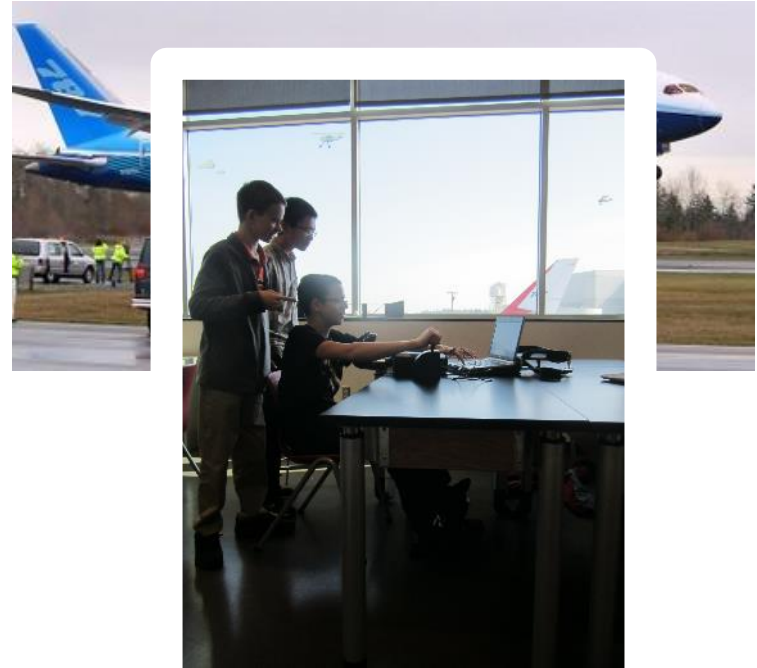
- Create and fly flight test plans
- Modify planes
- Make recommendations to pilots,
flight test engineers, and planners.

Virtual Flight Test



1. Brainstorming project ideas
2. Select most promising possibility
3. Envision goal
4. Establish process
5. Build a scaffold

Planning



Virtual Flight Test



My Drive > school > 2015-16 > 01-04 Physical Science > 04 flight te

Name ↑ Owl

100 progress

flight parameters										flight results									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Altitude	Speed	Altitude	Speed	Altitude	Speed	Altitude	Speed	Altitude	Speed	Altitude	Speed	Altitude	Speed	Altitude	Speed	Altitude	Speed	Altitude	Speed
Mannard	1	1	Boeing 747	034516	Full	1185 ft	130	0	Full	Satterlee	63.3	69.1	67	Alborton					
Mannard	1	2	Boeing 747	034516	Full	1185 ft	130	0	Full	Satterlee	177.6	183.2	201.0	Alborton					
Mannard	1	3	Boeing 747	034516	Full	1185 ft	130	0	Full	Satterlee	242.0	247.7	284.0	Alborton					
Alborton	2	1	Boeing 747	034516	Full	1185 ft	130	0	Full	Satterlee	1026.1	1031.6	1049.9	Satterlee					
Alborton	2	2	Boeing 747	034516	Full	1185 ft	130	0	Full	Satterlee	1111.7	1117.4	1135.8	Satterlee					
Alborton	2	3	Boeing 747	034516	Full	1185 ft	130	0	Full	Satterlee	1199.2	1203.9	1222.7	Satterlee					
Alborton	2	4	Boeing 747	034516	Full	1185 ft	130	0	Full	Satterlee	79.9502	83.70139	109.7	Satterlee					
Alborton	2	5	Boeing 747	034516	Full	1185 ft	130	0	Full	Satterlee	171.16622	136.62490	212.5569	Satterlee					
Alborton	2	6	Boeing 747	034516	Full	1185 ft	130	0	Full	Satterlee	292.63339	300.31146	325.19198	Satterlee					
Alborton	3	1	Boeing 747	400000	Full	1185 ft	130	0	Full	Satterlee	123.9	128.4	140.0	Satterlee					
Alborton	3	2	Boeing 747	400000	Full	1185 ft	130	0	Full	Satterlee	195.3	199.5	211.4	Satterlee					
Alborton	3	3	Boeing 747	400000	Full	1185 ft	130	0	Full	Satterlee	268.9	273.3	289.0	Satterlee					
Mannard	4	1	Boeing 747	034516	Full	1185 ft	130	0	Full	Satterlee	55.7	61.5	77.4						
Mannard	4	2	Boeing 747	034516	Full	1185 ft	130	0	Full	Satterlee	137.7	143.4	161.9						
Mannard	4	3	Boeing 747	034516	Full	1185 ft	130	0	Full	Satterlee	220.6	226.3	245.3						
Mannard	5	1	Boeing 747	034516	Full	1185 ft	130	0	Full	Satterlee	430.2	436.1	451.9						
Mannard	5	2	Boeing 747	034516	Full	1185 ft	130	0	Full	Satterlee	536.4	542.2	556.7						
Mannard	5	3	Boeing 747	034516	Full	1185 ft	130	0	Full	Satterlee	74.4	80.3	84.0						

Naming conventions for student data logs
Student data logs, color-coded by pilot

Ensure satisfactory progress towards goals

- “Typical” teacher tools for helping students acquire new skills and knowledge
- Project manager tools

17	1.7	Tigada, Yagen, Lotzfeld	that Heidi and Olivia know what they are doing (6) condition numbers are mislabeled... MoComb talked with them re: next steps see group 1.2	they are doing (6) condition numbers are mislabeled... MoComb talked with them re: next steps	per conversation on VEd; missing graphs will be missing No Data did not submit
18	1.8	Hei			
19	2.1	Lemieux, Bowen, Latry	see 4/22	Some data questionable condition 1.1-1.3, 6-10, Two decimal points condition 6-10	pretty good with a couple significant gaps revise
20	2.2	Glascock, Bourget, Pabla, Leighton	They need to transfer data for conditions 12 and 13. 8mmsec needs to enter correct time to start of takeoff	They re: data. Some questionable data condition 1.2 & 6	Good atm to detail; now fix physics and grammar; revise
21	2.3	Cox, Turner, Kennedy, Fishholz	looking good! flight to retest	Revised missing data for conditions 1.1-1.3, 6-10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100	pretty good with a couple of significant gaps revise
22	2.4	Boques, Mungia, Anderson, Dougry	Rosevelt appears to have misfiled his data; changes from 4/22; missing 1.10-12 (Michael)	Rosevelt missing data for conditions 1.1-1.3, 6-10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100	pretty bad; inconsistent with details re: experiment; missing handful of conditions with odd data improve
23	2.5	Ho, Lougran, Feenan, Rhotaris	HELP! Cooper does not appear to understand what he is doing; MoComb talked with him re: next steps. flight to retest and verified by VEd, 10/20; he'll work solo	Cooper no data. All other data is good	weak atm to detail; add lines, equation, and P; revise
24	2.6	McIntire, Halley, Huo, Hanson			
25	2.7	Pratt, White, Rosborough	Juarez needs to transfer data for conditions 1, 10 and 11	comment sent to Juarez re: data entry	Juarez missing data. One data questionable condition 6. did not submit file
26	2.8	Bowlin	Tucker asked to work by himself; refile three conditions		7
27	3.1	Adams, Duski, Nguyen, Wilson	David missing conditions 11-13. All verify data on target	Data is completed; missing review from team members	not ready for presentation missing
28	3.2	Herr, Farris, Horne, Blankenship		Some data looks incorrect.	excellent; talk about wind direction elaborate

Tracking team progress

Managing the project

Virtual Flight Test



Wednesday, 1 Jun									
Session 1: 0900 - 1040									
				interview 1	interview 2	interview 3			Flight Test Group
judge	judge	instructor	room	0905-0930	0935-1000	1005-1030			01.1 Harhi, Nurzhanov, Taylor, Krzyman

Presented by _____ Period _____ Date _____

Presented to _____ Occupation _____
 Organization _____

PHYSICAL SCIENCE & PHYSICS OF FLIGHT
FLIGHT TEST PROJECT RUBRIC

Category	Exemplary	Thorough & Complete	Developing	Novice	Missing	Comments
Test planning: identifies variables, outlines testing procedure, etc.	4	3	2	1	0	
Test Results: reflects the data; identifies anomalous data	4	3	2	1	0	
Analysis: provides physics-based explanation for results	4	3	2	1	0	
Distance calculations: explains how distance calculations were computed	4	3	2	1	0	
Overall presentation quality	4	3	2	1	0	
Overall test report quality	4	3	2	1	0	

Other comments _____

Preparing students

Preparing outside experts

Presentation

Virtual Flight Test



Knowledge

- Laws of motion
- Kinematics
- Vectors

Skills

- Data management
- Consistency
- Modeling

Foundations for success

- Teamwork
- Time management
- Communication

Virtual Flight Test



Extensions

Revision to challenge

Connection to flight
training, internships

Next steps

How To Make The Public Love Drones

FAA UAS Operational Test Sites (August 2014)



Pitch



How To Make The Public Love Drones



How to Make the Public Love Drones

And Teach Students
Authentic Research Strategies

M. Wombold
Raisbeck Aviation High School

Hook

A real problem

For a real audience

How To Make The Public Love Drones

Planning

1) Research Methods

2) Economic Sectors

3) Marketing Basics

4) Industry Terminology

Project Description

Working in small teams of 3-4, students will research, create and present to the Federal Aviation Administration a plan to promote Unmanned Aerial Systems integration to the public at large.

Step One: *Research and identify/select the economic sector you believe will see the largest positive impact from the UAS integration. i.e. Agriculture, Conservation, Disaster Response, etc.*

A. Explain and Defend your decision

Why do you believe this sector will impress the public at large?
- How are you defining "public at large"?

B. Explain and Defend your decision making model

Did you use a matrix to compare the different sectors? or expert opinions? Or your gut?
Why was that the best decision making model?

C. Explain and defend the change you believe the sector will see.

Showing your research will be important here!
Was it data or anecdotal evidence that you found most impressive?

Step Two: *Research and identify/select the social, political and/or economic factor you believe is limiting your big-in for UAS integration.
i.e. Privacy concerns, Military Applications, Fear of collision, Job loss, etc.*

A. Explain and Defend your decision

Why do you believe this issue is of greatest concern to the public at large?

B. Explain and Defend your decision making model

Did you use a matrix to compare the different sectors? or expert opinions? Or your gut?
A survey?
Why was that the best decision making model?

Step Three: *Create a plan - and product - for the FAA to promote the positive impact of UAS Integration to the public at large.*

A. Determine which media will have the largest impact on the public at large.

i.e. Print ads, Television ads, Social networking, YouTube, etc.
Why is this media the best method for the FAA to use?
- How do you measure impact?

B. Create promotional message/language/slogan/catch phrase for the FAA to use to promote the UAS integration to the public at large.

How does this message address the concerns of the public at large?
How does this message inspire the public to consider UAS in a new, positive way?

C. Design and construct a professional mock-up/sample of your message as it would appear in the medium you are promoting.

How To Make The Public Love Drones

Managing the project

1) Research Methods

How do we get good data?

How do we understand the data?

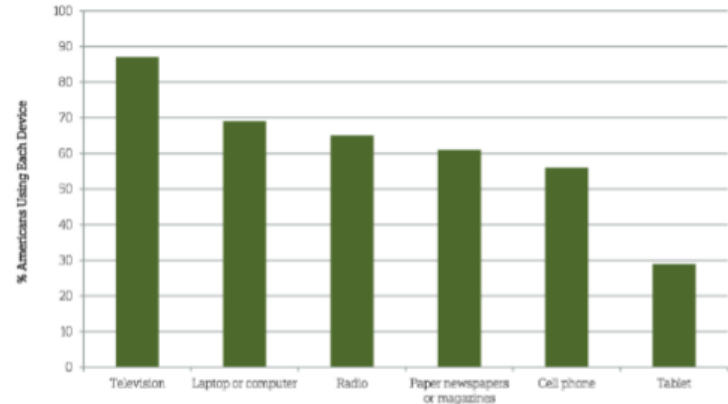
How do we share that information?

The Percent Source of News Split by Topic

Americans' Go-To Reporting Sources Depend on the News Topic

Topic	% 24 Hour TV News	% Local TV News Stations	% Unspecified TV Stations	% Newspapers	% Specialty
Foreign or international issues	35	3	14	13	0
National government and politics	28	7	18	14	0
Social issues	24	10	11	10	0
Business and the economy	21	10	10	15	9
Crime and public safety	12	40	13	17	0
Traffic and weather	1	32	9	3	27
Health and medicine	9	12	12	9	2
Environment and natural disasters	18	12	23	10	3
Your local town or city	1	30	9	17	0
Art and culture	2	6	6	28	7
Schools and education	7	20	11	21	0
Sports	3	18	13	10	36
Entertainment and celebrities	2	8	10	4	22
Science and technology	9	5	6	9	10
Lifestyle topics	3	2	7	13	14

Percent of Americans Who Used a Source for Their News



How To Make The Public Love Drones

Managing the project

1) Research Methods

2) Economy Sectors

What are economic sectors?

How do we identify economic indicators and trends?

How do we measure impact?



How To Make The Public Love Drones

Managing the project

1) Research Methods

2) Economic Sectors

3) Marketing Basics

How does “marketing” work?

How are marketing decisions made?

How do we influence behavior?



How To Make The Public Love Drones

Managing the project

- 1) Research Methods
- 2) Economy Sectors
- 3) Marketing Basics
- 4) Industry Terminology



QUADCOPTER

V/S



DRONE

How To Make The Public Love Drones

Managing the project

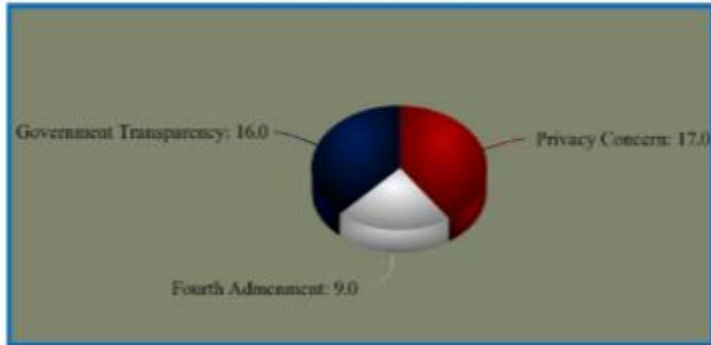
- Teams were tasked with recommendation a course of action to the FAA
 - 6 small teams
- Take what they had learned and apply it to the problem
 - Develop a possible solution

How To Make The Public Love Drones

Sample Student Work

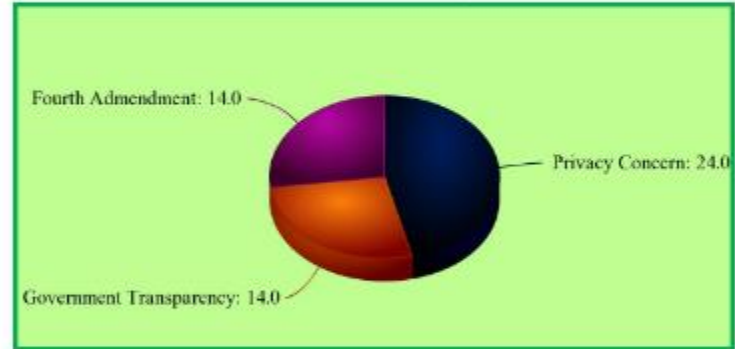
Why We Chose Privacy

What is Your Primary Concern for Drone Use In Today's World?
Source: Student Survey



■ Privacy Concern ■ Fourth Admendment ■ Government Transparency
meta-chart.com

What is Your Primary Concern for Drone Use In Today's World?
Source: Public Survey



■ Privacy Concern ■ Government Transparency ■ Fourth Admendment
meta-chart.com

How To Make The Public Love Drones

Sample Student Work

Reasons Why the Public Resists Unmanned Aerial Systems

Fears	Mostly Uninformed
<ul style="list-style-type: none">• Preconceived Ideas• Privacy• Safety	<ul style="list-style-type: none">• Not their biggest concern• Not aware of UAS potential• Opportunity to educate

How To Make The Public Love Drones

Impact of Drones on the Film Industry

- **Film industry is worth \$31 billion**
- **Cost of UAS: \$6,000 to \$28,000 flat rate**
 - **Plane/helicopter: \$5,000 to \$10,000 hourly**
- **6 film companies have permission for UAS use**
 - **(Aerial Mob, Astraeus Aerial, HeliVideo Productions, Pictorvision, Snaproll Media and Vortex Aerial)**
- **More money going into our economy instead of other countries**

How To Make The Public Love Drones

Sample Student Work



How To Make The Public Love Drones

Sample Student Work



TRAIS WORKING IN PART WITH THE FAA TO PROMOTE SAFE AND RESPONSIBLE DRONE USE.

How To Make The Public Love Drones

Feedback from the people who had presented information to them!

SLIDE 6 IS A PROBLEM

Tuesday Presentation

- Make the data slides clearer
 - Where did that data come from
 - If survey: how many people
 - What exactly are they showing/ what is the point of showing them
- Change main title to objective of presentation
- Talk about the survey earlier
- Consider addressing
 - The pro of environmental improvement
 - Safety concerns
 - Political issues
- Everyone looks at it from the own point of view
 - The POV of the FAA is that they want to know the advertising they're paying for is going to be palatable for the public and make audience think they are doing their job to ensure their safety



How To Make The Public Love Drones

Teams gave formal presentations to the FAA at their office

6 Teams. 1 Winning Proposal.



Assessment

Take-away

Project-based learning transforms teachers into project managers, and invigorates students learning.

Aviation is a rich field for finding authentic problems in every discipline.

If you're a teacher, reach out; if you're not, get involved.



Consider....

Who are some logical
partners in your community?

What might be an
interesting problem
relevant to your students
and your community?