

KC ISD AVIATION SCIENCE



HOW TO MAKE AVIATION PHYSICS WORK IN YOUR SCHOOL

DAVID PURSER, PHYSICS INSTRUCTOR, KARNES CITY HIGH SCHOOL

ERIC OPIELA, FOUNDING PRESIDENT, DIRECTOR, KARNES CITY ISD
EDUCATION FOUNDATION



KC  SD AVIATION SCIENCE

KCISD

Karnes City High School Aviation Science/Physics

AVIATION

If you desire to have a career in aviation and flying, join the

CLUB

KCISD AVIATION CLUB. You will learn flying through ground school education, simulator flight training, and have the opportunity to learn about enrollment in Liberty University's only completely on-line B.S. Science in Aviation Management. The culmination of which you can begin flight lessons at Texas Aviation Academy with locations at the Kenedy Airport. **RECEIVE A B.S. DEGREE WITHOUT HAVING TO LEAVE OUR COMMUNITY AND START WORK ON IT TODAY!**

Eric Opiela
using his
aircraft for
Harvey relief
missions.

Aviators are
Helpful people







TEKS

Texas Essential Knowledge and Skills

The standards of every curriculum



Flight And Aviation

SECONDARY SCHOOL

AN AVIATION CURRICULUM GUIDE

A rather outdated document by the FAA but was clear on objectives to be taught in High School Aviation

Edited by:

Margaret R. Lindman, Ed.D.

Professor

**Northeastern Illinois University
Chicago, Illinois**

Department of Transportation
**Federal Aviation Administration
Office of Human Resources and Management
Washington, D.C. 20591**

https://www.faa.gov/education/educators/curriculum/highschool/media/High_School_Aviation_Curriculum_Guide.pdf

ACKNOWLEDGEMENTS

To the Reader,

The Federal Aviation Administration is pleased to present four educational documents designed for teachers on aerospace education. They are directed to elementary and secondary schools. The documents are:

Future Aspiring Aviators: Primary K-3

Flying Ace Activities: Middle Grades 4-6

Fostering Aviation Activities: Junior High 7-8

Flight and Aviation: Secondary 9-12

We extend accolades to Northeastern Illinois University, Chicago, Illinois for the assistance and support in this project. We wish to recognize and applaud NEIU President, Dr. Gordon H. Lamb for his vision, enthusiasm and encouragement regarding the appointment of professor Margaret R. Lindman, Ed.D. to spearhead this project, at our request.

I. OUTLINE OF UNIT CONTENT

This unit demonstrates TEKS 4, 5 and 8 in depth

A. Aircraft classification by flight principles

1. Lighter-than-air craft
2. Gliders
3. Rotocraft
4. Airplanes
 - a. Prop type
 - b. Jet
 - (1) Ramjet
 - (2) Turbojet
 - (3) Turboprop
 - c. Rocket
 - d. V/STOL

D. Function of the controls

1. Lift
 - a. Bernoulli's principle
 - b. Venturi tube
 2. Gravity (g forces)
 3. Thrust
 4. Drag
 5. Torque (Newton's Third Law of Motion)
1. Ailerons (roll)
 2. Elevator (pitch)
 3. Rudder (yaw)
 4. Trim tabs
 5. Flaps
 6. Propeller (thrust)

This is a section of the FAA document, I added Texas TEKS and what I was going to teach within that section with regard to the TEK principles of Physics

1. Reciprocating
 - a. Operation (four-stroke cycle engine)
 - b. Controls
 - (1) Mixture
 - (2) Throttle
 - (3) Prop
 - (4) Carburetor heat
 - (5) Magnetos
 - c. Instruments
 - (1) Tachometer
 - (2) Mainfold Pressure
 - (3) Oil pressure
 - (4) Cylinder head temperature
 - (5) Carburetor air temperature
2. Jet (Newton's Third Law of Motion)

2. Demonstrate a model plane: show thrust, pitch, yaw, and roll and the forces acting on an aircraft.
3. Construct a wind tunnel and wing sections of different shapes.
4. Demonstrate Archimedes' principle with helium-filled balloons and weights.
5. Demonstrate Bernoulli's principle by blowing through a funnel that has a ping pong ball in it.
6. Demonstrate and explain the principles involved in throwing a "curve" ball.
Rotational Motion
- 7.

Students study a variety of topics in the field of aviation that include: laws of motion; changes within physical systems and conservation of energy and momentum; forces; thermodynamics; ~~characteristics and behavior of waves~~; and atomic, nuclear, and quantum physics. Students who successfully complete Physics of Aviation will acquire factual knowledge within a conceptual framework, practice experimental design and interpretation, work collaboratively with colleagues, and develop critical thinking skills. Upon completion of the course, students will be prepared to take the Federal Aviation Administration Private Pilot Airman Knowledge Test requisite to obtain a Private Pilot's License. This course will provide one Science credit for this 2 semester course. This course is intended for junior or senior students.

You have to read, edit, re-read and edit to make sure curriculum is accurate.

FINALLY, YOU CAN SEEK APPROVAL OF A NEW INNOVATIVE COURSE OR RENEW PRIOR APPROVALS

2017–2018 Innovative Course Application

Application request

Title of innovative course(s):

Applicant Information

Name of applying school district, charter school, or organization: Karnes City ISD

Complete mailing address: 314 N. Hwy. 123

Contact person: Jo Ann Gutierrez

Contact person's title: Instructional Services Director

Contact person's email address: 314 N. Hwy. 123, Karnes City, Texas 78118

Contact person's phone number, area code first: 83.0-780-2321 x260

County District Number (if applicant is a Texas public school): 128901

Superintendent (if applicant is a Texas public school): Jeanette Winn

Date of local board of trustees' approval of this innovative course application (if applicant is a Texas public school):

to enter text.

Course Information

Subject area (choose only one): Science

Career cluster (CTE only): *Choose an item.*

Number of credits per course that may be earned: 1.0

Grade level(s) to be served (high school only): 11 or 12

Click!



ity ISD P.O. Box 178
on Karnes City, Texas 78118
Date: **June 10, 2016**

Karnes City High School \$ **10,376**

ousand, three hundred seventy-six & No/100 Dollar

FOR KIDS · FOR TOMORROW

Aviation Grant Karnes City ISD Education F



USE FLIGHT SIMULATORS IN THE CLASSROOM

Karnes City ISD Education Foundation provided to funds to purchase three Redbird Jay Simulators.

UTILIZE YOUR LOCAL AIRPORT

- 2R9 (Karnes County Airport), led by Ron Hyde, airport manager, has been host to Karnes County's Aviation STEM Camp, class visits, and flight training for students.

- While only having a 3218x60 runway, a major capital improvement project supported by TXDOT and the City of Kenedy have made flight training possible with the return of both 100LL and JetA+ Fuel.



WELCOME TO
KARNES COUNTY AIRPORT
ELEV. 291 2R9 UNICOM 123.0

MAKE A FLIGHT TRAINING PARTNERSHIP WITH A FLIGHT SCHOOL

- Texas Aviation Academy, based out of New Braunfels, Texas, provides flight training out of Karnes County Airport to support the KCISD aviation curriculum.
- While small towns are unlikely to support a full time flight school, a partnership with a larger operation that is willing to base one or more of their aircraft at your airport is key to providing opportunities for students after school to train.



PARTNER WITH A COLLEGE OR UNIVERSITY

- Many colleges and universities have aeronautics programs you can partner with to provide college credit for students.
- In a rural school, the ability to take online courses for credit is likely the only way some students will be able to continue higher education.
- Liberty University can work with High Schools to offer college credit for aviation coursework. Contact: Ex. Director of Business Dev. and Affiliated Operations, Brian Hough, brhough@liberty.edu



INVOLVE YOUR ELECTED OFFICIALS FROM DAY ONE

- Get buy in from your school board first. “I’m ready to go up right now,” said one KCISD Board member when Purser outlined his proposed course.



“Aviation Program Could Take Flight For Karnes City Soon”



- KCISD participated in “General Aviation Day at the Capitol” organized by Karnes County’s State Representative and Chair of the GA Caucus, pilot John Cyrier.

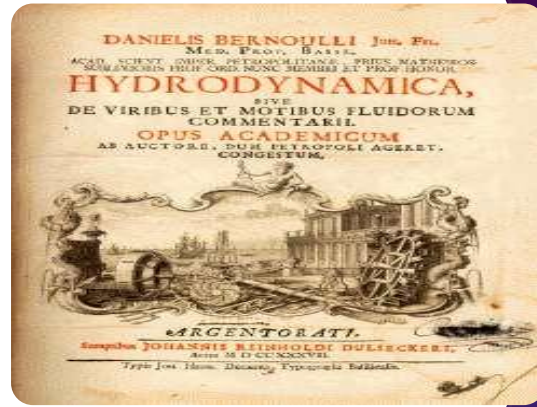
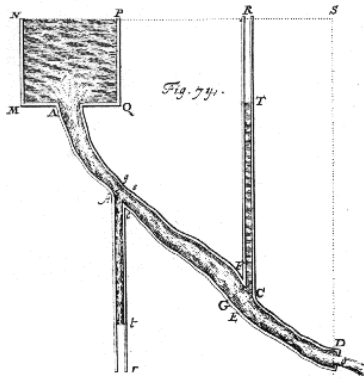
- Representative Cyrier has been an integral part of KCISD’s STEM Camp, even flying aerobatic demonstrations for students in his Stearman Biplane

STEM Science Day at the State Capitol

AVIATION PHYSICS DEMOS

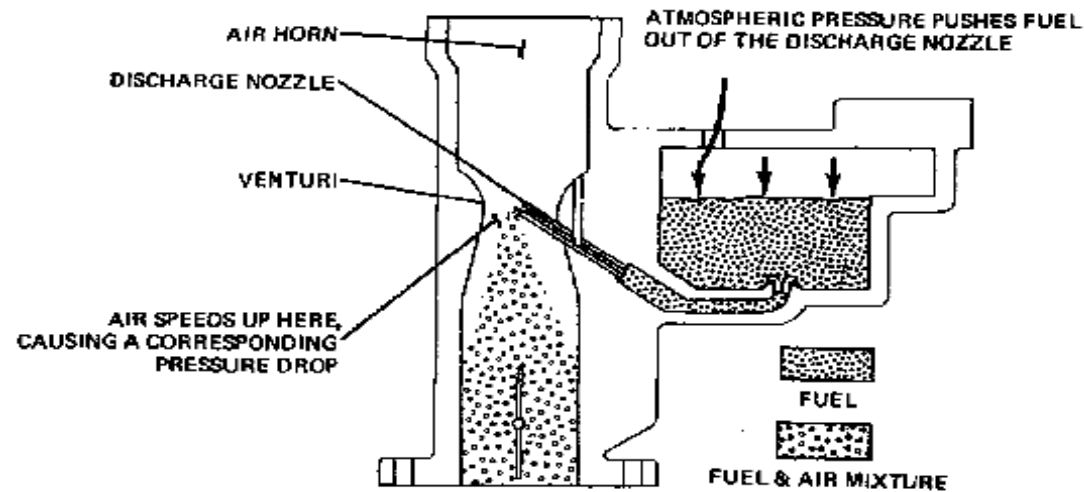
- “Einstein” of Engineering, Daniel Bernoulli
 - Mathematician, Doctor of Medicine, Fluid Engineer, Inventor
- Not the first to invent, but the first to understand the venture effect of sand through the neck and to realize that sand needed to be “triangular” shape to fall through consistently in rough seas.



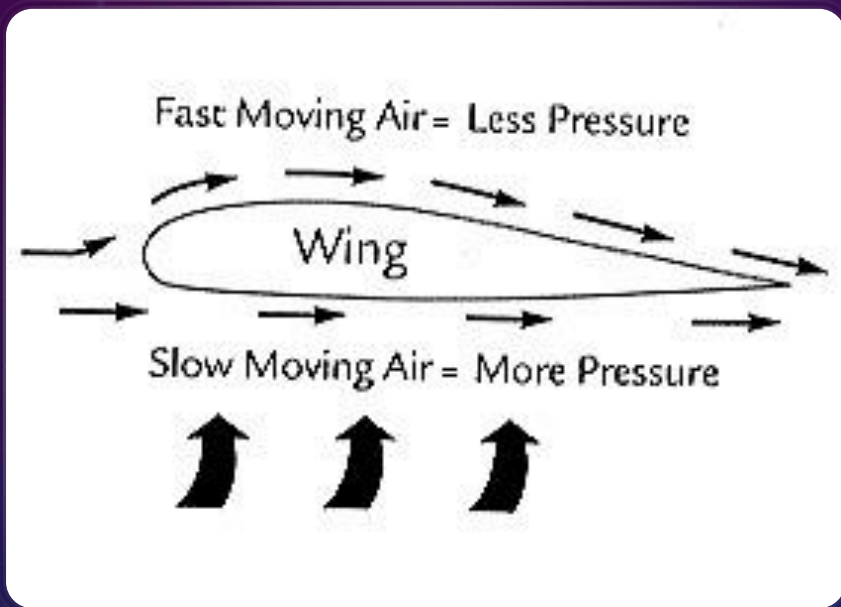


AVIATION PHYSICS DEMOS

- Early study of sand falling through neck of hourglass led to discovery of venturi effect and invention of present day carburetor.
- (top left) Daniel Bernoulli's own drawing of a capillary tube for measuring blood pressure.
- (top right) Bernoulli's published book on fluid flow and hydraulics.



AVIATION PHYSICS DEMOS



Simple Plastic Airplane, show the wing design

Funnel and small ball- faster-Low Pressure; slower- High Pressure or lift

Make a wing out of toilet paper- airflow and lift

Bernoulli Bag- fast moving air, low pressure into the bag draws more air with it

Balloon in Bottle- pressure of air is like a vacuum and keeps the wing up or the balloon inflated.

Slit in the cup vs no slit; balloon – if air escapes and cannot move faster around a curved surface no lift

Twin Balloons- air movement creates negative pressure and will pull the balloons in; same effect happens while passing trucks or boats. Can use soda cans on a string.

Save the Best for Last – the leaf blower and the balls. Students think the balls are held with a Push not a Pull..... Show them it is a pull.

LEGAL ASPECTS OF SCHOOL AVIATION PROGRAMS

- Very little potential liability with ground school programs, consider having instructors certified as FAA Ground Instructors so they can sign off students for private, remote, and sport pilot written examinations.
- Ways to minimize liability with flight operations:
 - Don't own aircraft. School doesn't need headache of being the legal operator of aircraft. Use a third party.
 - Partner with a Part 61 or Part 141 Flight School to operate, instruct, and conduct flight operations for students.
 - Students do not fly as part of the school day curriculum. Flight training is an after-school activity conducted by the flight school, not the public school district.
 - Use your school foundation to create a legal shell around any flight program. Have the foundation purchase flight training directly from the flight school to provide scholarships for students to either get introductory lessons or other flight training.
 - Make sure all involved know who is providing training and who is operating aircraft. Always clarify orally and in written materials that the school district is not operating a flight school, but has partnered with your foundation and an outside flight school to put aspiring aviators in touch with outside training opportunities.