



## NASA Aeronautics Resources for Educators



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### NASA Aeronautics– The first "A" in NASA

- NASA Aeronautics has made contributions to aviation for decades.
- Every US commercial aircraft and air traffic tower has NASA-developed technology
- NASA's aeronautics research is focused on the future of aviation
- This includes:
  - Quiet, supersonic flight over land
  - Future Airspace
  - Sustainable Aviation
  - Advanced Air Mobility



# NASA Centers and a focus on Aeronautics

### **NASA Aero Research Centers:**

- Ames Research Center CA
- Armstrong Flight Research Center–CA
- Glenn Research Center–OH
- Langley Research Center–VA





### **Sustainable Aviation**

- NASA's Aeronautics Research Mission Directorate focuses on technologies and systems that will shape aeronautics for decades to come
- Sustainability:
  - Quieter, more efficient engines
  - Quieting the "boom"

- Air traffic technologies and systems that allow more aircraft to safely and efficiently share airspace
- Reducing fuel consumption through
  - Electric propulsion
  - Better airspace systems





### **Return of the X-Planes**

- <u>https://www.nasa.gov/centers/armstrong/images/X-</u>
  <u>Planes/index.html</u>
- NASA has been working on X planes since the 1940s
  - Many were designed to develop high speed flight
- First X-plane series was the X-1 (when NASA was NACA—National Advisory Committee for Aeronautics with a goal to break the sound barrier)

- X-planes are designed to test technologies and designs
- Current X-planes include the X-57 Maxwell and X-59 QueSST
- Results of all X-plane programs will shape future aircraft, aircraft systems, or technologies





- First piloted X-plane in decades
- Will fly faster than the speed of sound over land
- Innovative technologies will reduce the "sonic boom" to a "sonic thump"
- X-59 will be flying over select cities to gather data
  - Data will be sent to officials with a goal of allowing supersonic transport over land



https://www.nasa.gov/specials/X59/why-build-a-quiet-supersonic.html#maxwell https://www.nasa.gov/specials/X59/



### **LBFD Community Overflights**

#### X-59 will be flying over select locations to gather data

Data will be sent to officials with an overall goal of allowing supersonic transport over land

#### **STEM and Community Engagement**

#### Goals:

- · Engage with communities around the country
- Build awareness and excitement of the benefits of NASA Aeronautics and aeronautics research
- · Be good stewards in the communities we are impacting with our testing
- · Connect NASA resources and career development opportunities to communities

#### **STEM Engagement opportunities**

- Connect with schools and classrooms
  - Provide STEM resources, interact with NASA education specialists and subject matter experts, increase awareness of continuous STEM engagement opportunities
  - School assemblies, classroom hands-on workshops, educator professional development workshops
- Work with informal education locations (museums, libraries, science centers)
  - Engage the community and build longer-term relationships after overflights have concluded
  - Hands-on workshops and activities, presentations, resources to build and support exhibits







# X-57 Maxwell



- <u>Physics, Engineering Design, and the X-57 Maxwell Electric</u> <u>Airplane</u>
- Small, experimental aircraft powered by electricity
- 460-Volt battery, 14 electric motors and a specially-designed wing that is 42% of the original size
- Modified Tecnam P2006T aircraft
- Two wing-tip propellers reduce wing-tip vortex at cruise altitude
- Goal: prove that energy efficiency at cruising altitudes may reduce overall operating costs for small aircraft by 40%

https://www.nasa.gov/specials/X57/index.html



### **"Drones" in Society** (Advanced Air Mobility)

- <u>https://www.nasa.gov/aam</u>
- Air taxis, drone cargo deliveries, revolutionary aircraft we don't even have yet
  - NASA is helping to develop new air transportation systems to move people and cargo

 NASA Aeronautics is not building the drones, or unmanned aircraft vehicles (UAVs), but we are helping create the systems to help them fly safely and efficiently

### **NASA Aeronautics Education Resources**

https://www.nasa.gov/aeroresearch/resources

Aeronautics@Home https://www.nasa.gov/aero-at-home

Next Gen STEM: Aeronaut-X https://www.nasa.gov/stem/nextgenstem/ aeronaut-x/index.html

#### **ARMD STEM Modules**

<u>AAM</u> <u>X-57</u> <u>X-59</u>

Leveled Readers and More

https://www.nasa.gov/aeroresearch/ resources/leveled-readers Aeronautics for Pre-K

https://www.nasa.gov/sites/default/files/ atoms/files/aero-prek.pdf

Museum in a Box https://www.nasa.gov/aeroresearch/resources/museum-in-a-box

#### eBooks

https://www.nasa.gov/connect/ebooks/ aeronautics ebooks archive 1.html

...and much more!



#### A E R O N A U T I C S

### **STEM Learning Modules**

NASA Aeronautics STEM Learning Modules are collections of activities, videos, assessments, and more.

Each STEM Learning Module is focused on a STEM topic(s) tied to a real-world NASA mission or project (K-12 focus)

X-59 Quiet Supersonic Flight Advance Air Mobility X-57 Electric Airplane



### NASA Aeronautics Education Resources cont...

University Leadership Initiative <a href="https://nari.arc.nasa.gov/uli">https://nari.arc.nasa.gov/uli</a>

NASA's Educator Professional Development Collaborative https://www.txstate-epdc.net/

Museum and Informal Education Alliance <a href="https://informal.jpl.nasa.gov/museum/">https://informal.jpl.nasa.gov/museum/</a>

eBooks

https://www.nasa.gov/connect/ebooks/aeronautics\_ebooks\_archive\_1.html





### Coming Soon and Newly Available!

X-59 Materials: •3D paper model •3D print files •now available! •Jr. Pilot Program (X-59) •STEM Resources Series





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