



# STEM FLIGHTS

## Learning Objectives

STEM Flights Learning Objectives (LOs) are a compilation of various STEM related tasks that Pilot Mentors can discuss/demonstrate with students as part of their ground and flight experience. Pilot Mentors can choose LOs related to the student's chosen Mission from the table below **or** other LOs that may be of interest to the student. **These are suggestions only.** Pilot Mentors should incorporate your own ideas about LOs for each mission. Each LO should only take about 5-7 minutes to complete.

Flight safety should never be compromised in order to complete any LOs. For questions, or more information on the LOs please contact [dave@stemflights.org](mailto:dave@stemflights.org)

Mission	LO Recommendations (or Pilot's own relevant areas of interest)
Commercial, General, and Military Aviation	<ol style="list-style-type: none"> <li>1. Science: Four forces of flight</li> <li>2. Technology: Instruments &amp; Function</li> <li>3. Engineering: Explain/demo Aircraft Control Surfaces</li> <li>4. Math: Calculate fuel and reserves</li> </ol>
Climate, Weather, & Environmental Sciences	<ol style="list-style-type: none"> <li>1. Science: Local weather patterns</li> <li>2. Technology: Foreflight and aviation weather.gov</li> <li>3. Engineering: Performance Charts (winds, altimeter)</li> <li>4. Math: Take off and Landing performance</li> </ol>
Drones, Physics & Advanced Air Mobility	<ol style="list-style-type: none"> <li>1. Science: GPS System</li> <li>2. Technology: Vertical Lift Concepts &amp; Systems</li> <li>3. Engineering: Weight and balance performance charts</li> <li>4. Math: Estimating distances; air to ground and deconfliction</li> </ol>
Aerospace Engineering: Coding & Design	<ol style="list-style-type: none"> <li>1. Science: Four forces of flight</li> <li>2. Technology: Avionics review</li> <li>3. Engineering: Aircraft &amp; wing design</li> <li>4. Math: Weight and balance, center of gravity,</li> </ol>

### LEARNINGS OBJECTIVES (LOs) EXPLANATIONS:

1. **SCIENCE:** Discuss the connection between science and aviation as it relates to their mission of choice.
  - a. **Four Forces of Flight**  
Draw the schematic & then demonstrate in flight with aircraft & engine controls.
  - b. **Geography, Mapping, GPS Operation, and Tracking**  
Have students plan a simple flight plan or profile, program data into aircraft systems, and then track the progress airborne.
  - c. **Environmental Sciences**  
Discuss weather patterns, conditions & safety of flight, environmental intelligence, climate, etc. Brief weather forecast & observations.
    - Have student tune AWOS/ATIS and transcribe select data.
    - Point out cloud types, visibility limitations, temps, winds, and other airborne environmental factors and their impact on flight.
2. **TECHNOLOGY:** Discuss the use of technology while operating an aircraft. What STEM skills

are needed to operate aviation technology and equipment?

- a. Operating System & Controls**  
Explain communication or navigation systems; have student program either, make a radio call or tune navigation aid & identify.
  - b. Analyzing technology data**  
Explain select instruments, their design/function, and importance to flight. Have student record specific flight parameters, change, then re-record.
  - c. Review air traffic control procedures & equipment**  
Discuss & demonstrate the local airport traffic pattern or ATC. Explain transponder, radar, flight following, & deconfliction.
  
- 3. ENGINEERING:** How is engineering used in relation to aviation? What types of engineering skills are necessary to operate an aircraft or to understand the mechanics of an aircraft?
  - a. Discuss aircraft design, engine, and performance.**  
Identify fuselage & wing type, chord, & impact on flight
  - b. Explain aircraft control surfaces**  
On preflight - have student move surfaces to their limits, identify, and what they do – then demonstrate in flight.
  - c. Performance Charts**  
Compute weight & balance and/or take-off/landing data before flight; compare with actual take-off & landing distance
  
- 4. MATHEMATICS:** What math concepts are used during a flight? What type of STEM skills are needed to best understand math concepts in the cockpit? Altitudes, headings, & airspeeds.
  - a. How pilots use graphs or charts to calculate data**  
Show aircraft performance chart in pre-flight brief, describe purpose & info presented; demonstrate in flight.
  - b. Interpolations:**  
Have students calculate fuel & reserves; interpolate during flight. Select divert options real-time (simulated)
  - c. Geometry: shapes, sizes, and spatial relationships between objects**  
Have students estimate distances (air-to-air & air-to-ground) – confirm. Flight path deconfliction with other aircraft or clouds (if sighted).
  
- 5. Real World Application:** Encourage students to continue their journey in aviation or STEM; share YOUR story!
  - a. Discuss how you became a pilot**  
What areas of school interested you? What courses did you take? What career(s) did you choose & why?
  - b. Suggest opportunities in the local community to further their STEM or Aviation journey.**  
Local cubs, Civil Air Patrol, Star Base, Science & STEM Fairs, Other
  - c. Encourage students to research STEM careers on their own or utilize the STEM Flight Flight Following™ resources on the stemflights.org website.**