

TOOLKIT 7 AIMING HIGH FOR CAREERS



OKLAHOMA
Aeronautics



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CareerTech

Overview: Students explore career opportunities in Aerospace & Aviation Pathways using career pathways videos.

Source: Oklahoma Department of Career and Technology Education

Grade Levels: 6-8, 9-12

Location: All resources are provided in this toolkit.

1 Student Activity	2 Lesson Plan or Procedure	3 Activity Evaluation or Rubric	4 Suggested Activities	5 Glossary	6 Teacher Background or Concepts	7 Student Background or Concepts	8 Standards Alignment
x	x	x					
Notes:							

KEY:

1. Student Activity: This is the focus of the toolkit. It is at least one complete activity or lab for students to complete that relates to a topic relevant to aviation/aerospace. It may include related worksheets.
2. Lesson Plan or Procedure: These are the steps or instructions for the teacher to use to deliver the activity.
3. Activity Evaluation or Rubric: These are the answers to the activity or a rubric or other tool for evaluating students' results.
4. Suggested Activities: These are additional or extension strategies for the teacher that relate to the topic/activity.
5. Glossary: This is a list of the vocabulary terms and their definitions that relate to the activity and/or associated concepts.
6. Teacher Background or Concepts: This is any background information for the teacher that explains key concepts relating to the topic/activity, provides the aerospace context for the activity or otherwise helps prepare the teacher for the topic/activity.
7. Student Background or Concepts: This is any background information for the student about theory and concepts related to the topic/activity. It may be separate handout files or a text section within the larger topic/activity.
8. Standards Alignment: These are education or industry standards that align with the topic/activity.

SUPPLEMENTAL RESOURCES

General Resources

- *Pilot's Handbook of Aeronautical Knowledge*, Federal Aviation Administration, 2016. Free to download at https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/.
- Airport Acronyms and Abbreviations, Federal Aviation Administration, <https://www.faa.gov/airports/resources/acronyms/>
- Find an Airport, Oklahoma Aeronautics Commission, <https://oac.ok.gov/airports>
- K-12 Student/Teacher Resources, NASA, <https://www.nasa.gov/aeroresearch/resources/k-12-resources>

Instructional Practice Resources

- *60 Formative Assessment Strategies*, Natalie Regier, 2012. Free to download at <https://www.okcareertech.org/educators/resource-center/teacher-trainer-tools>.
- *Student Learning That Works: How brain science informs a student learning model*, McREL International, 2018. Free to download at <https://www.mcrel.org/student-learning-that-works-wp/>.

Career Planning Resources

- OK Career Guide, Free to Oklahoma educators. For more information, see <https://www.okcareertech.org/educators/career-and-academic-connections/ok-career-guide>.
- Aviation Organizations, Oklahoma Aeronautics Commission, <https://oac.ok.gov/media-outreach/aviation-organizations>
- *Careers in Aerospace*, American Institute of Aeronautics and Astronautics. Free to download at <https://www.aiaa.org/get-involved/students-educators/Careers-in-Aerospace>.
- Flying for a Career, AOPA, <https://www.aopa.org/training-and-safety/learn-to-fly/flying-for-a-career>
- “Keeping Girls in STEM: 3 Barriers, 3 Solutions”, Edutopia, <https://www.edutopia.org/article/keeping-girls-stem-3-barriers-3-solutions>
- Oklahoma Aerospace: Building on a Rich Tradition, Oklahoma Department of Career and Technology Education, <https://www.okcareertech.org/business-and-industry/aerospace-and-aviation>
- *Direct Your Future* career exploration curriculum, Kuder, Inc., available to download at <https://www.okcareertech.org/educators/career-and-academic-connections/ok-career-guide/ok-career-guide-resources/direct-your-futurem-career-exploration-curriculum>

Activity-Specific Resources

- Aviation and Aerospace, Greater Oklahoma City Chamber, <https://www.greateroklahomacity.com/industries/aviation-and-aerospace/>
- Aviation Industry Career Options, Avjobs, <https://www.avjobs.com/careers/>
- *Careers in Aviation and Space*, FAA, https://www.faa.gov/education/students/resources/media/Careers_in_Aviation_and_Space.pdf
- “Women in Aviation: Past, Present and Future,” AeroGuard, <https://www.flyaeroguard.com/blog/women-in-aviation/>
- Learning on the fly with United, United Airlines, <https://hub.united.com/united-home-aviation-activities-kids-2645719248.html>

TEACHER INSTRUCTIONS

1. Assign the career profiles activity based on students' grade level:
Grades 6-8: Use the activity, "Aiming High for Careers!"
Grades 9-12: Use the activity, "The Sky's the Limit for Careers!"
2. Use career videos of your choice. The Oklahoma Department of Career and Technology Education is one source for career pathways videos.
3. Review background information about Aviation & Aerospace Pathways. One resource is <https://www.okcareertech.org/business-and-industry/aerospace-and-aviation/career-pathways>.
4. Use the rubric provided (or a similar one you prefer) to evaluate student presentations.
5. Use OK Career Guide (see "Supplemental Resources") to assist students with career planning.
6. Use the student handout, "GO4MRO!" with any students who may be completing their airframe and powerplant training. You can also use the handout to educate yourself about MRO work.

GO4MRO!

Many airframe and powerplant instructors think it is important to operate their classrooms and shops to simulate the work environment. They enforce strict rules about taking breaks and about tool security. Being successful as a learner in the classroom environment will give you an important heads up about what to expect while working in an MRO facility. You should note, however, that there's never anything quite like the real world. Violating the rules of cell phone usage in the classroom may cost you an extra work assignment. Violating the rules of cell phone usage in the MRO workplace might cost you your job. Here are some other things you might expect to find.



Gary Hall, 572nd Commodities Maintenance Squadron sheet metal mechanic, reinstalls an interior screen after removing foreign objects from inside an F-15 intake ramp (Air Force photo by Ed Aspera)

General work differences — You will use everything you've learned in your A&P training and will learn more as you go. Below are some critical ways in which MRO work is different:

- **Hand tools** — The MRO workplace is a series of gates that guide the flow of work. Time is money. You must know the right tools to use for the job, and how to use them correctly and safely. Using the wrong tool can result in more work or component damage, which also costs time and money.
- **Safety wire and ties** — Although you developed some basic skills in safety wiring, you may use those skills much more often in the MRO workplace.
- **Diversity of aircraft and systems** — Especially in the military MRO workplace, you may work with a variety of aircraft that range from recent designs to designs that are decades old. Some aircraft use hydraulics and cables, others rely upon wires and actuators. You may work with both old and new components at the same time. You may do some work with composites, but you're more likely to work with aluminum.
- **Fabrication often required** — The work in heavy MRO requires more metal-bending than working with fabric and dope.
- **Focus on precision** — MRO work involves working with close tolerances; deep and straight holes in thick metal; and the proper use of measuring tools such as micrometers, depth gauges and torque wrenches.
- **Less than ideal conditions** — Heavy MRO work may involve working with engines, filters and other components that are dirty or in less than ideal condition. This may be very different from your experience during your A&P training.

Gated workflow — The way that the work flows through an MRO facility follows a pathway that maximizes the use of available facilities and resources. Large-scale operations, such as aircraft overhaul, are divided into sections or gates. Each gate has a maximum number of operations it can perform on a given number of aircraft in a given number of days. It is a system designed to pinpoint areas of underperformance as well as areas in which multiple resources may be used within a single gate. In other words, sequential tasks may define the number of days within a gate, but other nonsequential tasks completed within a given gate can increase overall production. The five gates are pre-dock, inspection, structures, system checks and post-dock.



Brian McDaniel, a jet engine inspector, checks for leaks in an F118-100 engine for a B-2 Stealth Bomber in the Engine Test Cell with the 547th Propulsion Maintenance Squadron (Air Force photo by Kelly White)

Importance of a work ethic — From minimum-wage workers to highly skilled technicians, employers voice a common complaint about employees who can't show up for work on time. The MRO workplace is fast-paced and goal-oriented. Your supervisor expects you to be at your station ready to go when work begins. Highly skilled jobs pay well and are therefore very competitive.

The sum of the parts is greater than the whole — Your desire to become an airplane mechanic is probably based in part on your love of aircraft. When you are troubleshooting the engine of a single-engine aircraft, you still have the feel of working on an airplane. It is all right there in front of you: the wings, the fuselage and the parts that allow it to fly. In the MRO facility, an aircraft is the sum of its parts. Will you still get that feeling of satisfaction if your job is to use a borescope to look inside a jet engine sitting in a work stand? You might be working on the inside of an aluminum tube that doesn't really look like a fuselage after it's been disassembled for overhaul. The daily work in many MRO work groups involves working on accessories and other very small parts, not on the actual aircraft. Much of your job satisfaction may come from being part of a team that is contributing to the success of the larger mission.



Members of the Oklahoma City Air Logistics Complex work on the KC-135 line (Air Force photo by Edith Clemons)

Working in challenging situations — During your training, you probably encountered some situations where something was difficult to reach. In working on large aircraft, you will sometimes need to access areas that are enclosed so that you will need to fit your entire body inside. These confined spaces may be hot, cold or dark. You must be sure that you could work in these conditions. For example, to find or repair a leak in a fuel cell of a large aircraft means crawling inside the fuel cell. Individuals who have claustrophobia may find such work a challenge. Some individuals may even be physically too large to fit inside a small access point. Many schools offer confined-space training as part of an OSHA certification. This would be a good way to find out how you will react to this aspect of the MRO job. Confined-space certification would be a great addition to your resume as well.

The top of the vertical stabilizer of a KC-135 is 41 feet off the ground -- above the concrete. A good deal of heavy MRO work, including sheet metal work and painting, is performed on scaffolding or from lifting equipment. Working in, on and around very large aircraft can be intimidating. Being able to work comfortably at heights is a necessary part of the job. MRO employers are looking for versatile employees. If you know that you have a fear of heights, you may need to find a specialty where work is done primarily at ground level.

Safety focus — Manufacturers provide safety data sheets (formerly known as material safety data sheets) for chemicals and other materials you may encounter on the job. Each SDS includes information such as the properties of each chemical; the physical, health and environmental health hazards; protective measures; and safety precautions for handling, storing and transporting the chemical. Your job in the heavy MRO workplace will include locating and using safety data sheets.

In addition to safety data sheets, personal protective equipment plays a vital role in the MRO workplace. You've worked with personal protective equipment since your first day in the shop. In the MRO facility, you may encounter new types of equipment or new work practices. For example, working at heights means using lanyards and harnesses while you complete the work. You may have to use dual protection, such as both eye and ear protection, or redundant protection, such as safety glasses and a face shield. The safety of employees is a great concern for supervisors and employers. Be ready to respond to new policies and learn to use new equipment.

FOD control — Foreign object debris (FOD) is anything that is not a part of the aircraft. FOD generally refers to the object itself or the damage it causes. FOD can be tools, wire, parts or anything else that can be left inside of a work area on an aircraft. Common examples of FOD include the following:

- Metal or wire clippings, solder balls and debris.
- Fasteners and scrap materials.
- Tools, hardware or debris left in or around aircraft control systems or engine inlets.
- Any debris on runways, ramps and taxiways, including metal fragments, nails and small rocks.
- Construction debris.
- Rags and other cloths.
- Personal items.

FOD costs billions of dollars each year to the international aviation industry in both direct and indirect costs. Direct costs of FOD include damage to engines and aircraft parts. Indirect costs include delays, unscheduled maintenance and aircraft changes. Imagine the cost involved in terms of lost production if a single tool goes missing; your entire work group may have to stop work and help to search for the missing tool. The greatest potential cost due to FOD would be the loss of life and aircraft.

FOD control is a vital aspect of the MRO workplace every day. You will be expected to complete FOD prevention training. The procedures that guide your work will include specific tasks and task sequences designed to minimize the potential for FOD, including steps for handling, installing and operating components. You will also be expected to follow a clean-as-you-go approach to the work that includes tool and material controls. For example, you may be required to count the fasteners in a new package when you open it and account for all of the fasteners you used. (If any of the fasteners are not accounted for, did they end up as FOD?) You will need to follow specific rules for accounting for tools used. Your employer may require that your work group participate in regular FOD walks outside of hangars and around ramp areas.

Tools, hardware and materials accountability — Accountability ties in closely with FOD control. The MRO workplace will include procedures for managing tools. Such procedures will help ensure that tools do not become lost or end up as FOD. For example, you may have to check out and return tools to a tool crib, as well as use shadow boards and similar devices to store tools. Similar procedures may be in place for controlling hardware, such as nuts, bolts, pins, rivet heads and other items during each shift. When working, be aware of where your tools are. When you complete a job, perform a tools inventory. This includes rags. If you need to leave your work area temporarily, such as to take a break, perform a tool inventory as if you are leaving for the day. Follow the clean-as-you-go approach. Be aware of your employer's policy on missing items and when and how to report them.



Anthony Farrow, 561st Aircraft Maintenance Squadron Production Support, changes intake fasteners on an F-15. (Air Force photo by Ray Crayton)

Importance of people skills — In the MRO workplace, you will work with people from different backgrounds, of different ages, with different levels of education or experience, from different cultures and maybe with other languages. Of course, these different people will have different opinions as well. Being successful in the MRO workplace takes good people skills, especially when so much of the work requires effective teamwork. Here are some key people skills to build:

Communication — This is where good people skills begin. It refers to what we say and how we say it. Try to develop the skill of active listening. Active listening is focusing on what someone else is saying, rather than trying to form your response. Ask questions without interrupting. Learn to repeat what you hear to verify information.

Patience — This involves maintaining an even temper in difficult or stressful situations. Learn that you may sometimes need to repeat instructions to a co-worker that may seem very clear to you. Always control your anger and treat your co-workers with the respect they deserve.

Collaborative problem-solving — This is a skill you will use throughout your MRO career. It is the ability to work with others to identify and define problems and to arrive at solutions. Many MRO facilities use an eight-step process for solving problems. The members of a work group usually work through these steps together.

AIMING HIGH FOR CAREERS!

Name: _____ Date: _____

Instructions

- It is never too early to start thinking about careers. The sooner you start, the sooner you can make your flight plan to a career in aviation and aerospace.
- Choose one career in Aerospace & Aviation Pathways that interests you. Use the career pathways videos and other resources that your teacher gives you. Answer the questions below.
- Give a presentation about your career.

1. What career did you choose? Why did you choose it?

2. Does this career use any tools and technology? How would they make the job easier?

3. What knowledge is important to have for this career?

4. What skills and abilities are important to have for this career?

THE SKY'S THE LIMIT FOR CAREERS!

Name: _____ Date: _____

Instructions

- Many factors go into deciding what career might be a good fit for you. You can be proactive and start researching careers to help you decide on a career path.
- Choose three careers in Aerospace & Aviation Pathways that interest you. Use the career pathways videos and other resources that your instructor provides. Answer the questions below for each career.
- Choose one career and give a presentation about it. Choose a catchy title, such as “Plan-It Careers,” “Aerospace Careers Are Lunar Than You Think,” etc.

1. Why does this career interest you?

2. How do tools and technology make the job possible?

3. What knowledge is important to have for this career?

4. What skills and abilities are important to have for this career?

5. What work activities in this career might relate to things you already do at school, at home or at a job?

6. What about the work environment for this career would interest you?

7. Where can you develop the skills and abilities for this career?

STUDENT PRESENTATION RUBRIC

	9-10 pts.	7-8 pts.	1-6 pts.	Student Score	Teacher Comments
Preparedness	Student is completely prepared and has clearly rehearsed.	Student seems fairly prepared but could have used more rehearsal.	Student does not seem prepared to present.		
Stays on Topic	Stays on topic all of the time.	Stays on topic most of the time.	It was hard to tell what the topic was.		
Speaks Clearly	Speaks clearly and distinctly all the time and mispronounces no words.	Speaks clearly and distinctly most of the time. Mispronounces words occasionally.	Often mumbles or mispronounces words. Hard to understand.		
Posture and Eye Contact	Stands up straight, looks relaxed and confident. Establishes eye contact during the presentation.	Stands up straight and establishes eye contact some of the time during the presentation.	Slouches and/or does not look at people during the presentation.		
Content	Shows a full understanding of the topic.	Shows a good understanding of the topic.	Does not seem to understand the topic very well.		
Total Points					50 points possible

