

**2020 MICHIGAN STATE SKILLS USA CHAMPIONSHIPS
TASK & MATERIALS LIST**

SKILL OR LEADERSHIP AREA: AVIATION MAINTENANCE TECHNOLOGY

STATE CONTEST: March 14th, 2020

CONTEST LOCATION:

Western Michigan University
College of Aviation – Aircraft Maintenance Center
135 N. Helmer Rd
Battle Creek, MI 49037
www.wmich.edu/aviation

RESUME:

Each student must submit a one-page printed resume before the contest start at the contest site (present to contest coordinator, not judges). The resume is no longer submitted online. This is the only time that resumes can be turned in. Failure to do so will result in a 10 point penalty.

SECTION I

GENERAL INFORMATION

TASKS TO BE PERFORMED (Post-Secondary Contest):

1. Composites – Test a structure to determine delaminated areas and answer questions on composite repair procedures
2. Visible Dye Penetrant Inspection – Check a component for cracks using visible dye penetrant
3. Sheet Metal – Fabricate a sheet metal part given an engineering drawing
4. Aircraft Wheels and Tires – Remove, clean, and inspect an aircraft wheel and tire assembly
5. Aileron Rigging – Remove and replace a flight control cable and rig the flight control
6. Electrical Troubleshooting – Find the fault in an electrical circuit. Check continuity and measure electrical circuit values
7. Fluid Line Fabrication – Cut, flare and bend aluminum tubing to a specific dimension
8. Cable Fabrication and Tensioning – Fabricate a flight control cable with Nicopress thimble splices and tension the cable
9. Propeller – Measure blade angle and check propeller track
10. Magneto – Install points and internally time a magneto
11. Safety – Written test on aircraft safety and marshalling. Performed during written exam period
12. Turbine Parts Identification – Identify by part number and nomenclature several turbine engine parts
13. Airframe and Powerplant Knowledge Exam – Written exam taken from FAA airframe and powerplant test questions. Performed during written exam period

TASKS TO BE PERFORMED (High School Contest):

1. Precision Measuring – Measure the provided set of machined components including depth, inside and outside dimensions and tolerance
2. Hardware ID – Identify various pieces of aviation hardware using measuring tools and reference materials
3. Electrical – Troubleshoot electrical wiring board, make corrections as needed and calculate electrical values using Ohms Law
4. Tube Bending and Flare – Cut, flare and bend aluminum tubing to a specific dimension
5. TCDS/AD's – Answer questions pertaining to Type Certificate Data Sheets and Airworthiness Directives
6. Aircraft Parts Identification – Identify aircraft and instrument panel components using appropriate diagrams
7. Safety – Written exam on safety in the field of aviation maintenance. Performed during written exam period
8. FAR's – Answer questions based on the Federal Aviation Regulations that pertain to aircraft maintenance
9. Weight and Balance – Solve problems relating to weight and balance including moment, center of gravity (CG), and shifting CG
10. Safety Wire – Complete a combination of safety wire on turnbuckles and/or bolts as well as install cotter pins
11. Forms, Records, and Log Entries – Complete logbook entries and 337 Forms
12. Flexible Hose Fabrication – Fabricate flexible hose to a specific standard including fitting installation and made to proper length
13. General Knowledge Exam – Written exam using FAA General test questions. Performed during written exam period

Contest Schedule – High School and Post-Secondary:

Saturday March 14th – Check-in/Registration: 10:00AM – 10:30AM

Orientation: 10:30AM – 11:00AM

Written Exams: 11:00AM – 12:00PM

Lunch: 12:00PM – 12:45PM

(On-site. Provided by the WMU College of Aviation)

Skills Contest: 1:00PM – 4:30PM

Awards Ceremony: 4:45PM

Facility Tours: 9:00AM and after contest, if able

Note: Time is subject to change depending on number of contestants. Check schedule at time of registration. **Briefings and contests will begin promptly at the scheduled times.** Students arriving late will not be allowed to compete.

STUDENTS MUST SUPPLY: (This applies to all aviation maintenance contests.)

- * 1 page resume – submitted at check-in
- * Safety glasses with side shields or goggles
- * Hearing Protection
- * Appropriate dress as described in dress code below
- * 2 (two) #2 pencils

STUDENT DRESS CODE: Due to the professional nature of this contest, contestants are required to wear apparel appropriate to the trade. **Contestant apparel will be checked on Friday. Points will be deducted if inappropriate apparel is worn on Saturday.**

- Leather work shoes are required - no athletic shoes allowed. Steel-toe shoes are not required.
- Only shirts with a collar are acceptable, **NO TEE SHIRTS-no exception**. Shirts are to be tucked into trousers.
- Basic work-style jeans will be acceptable, however Dickies-style work pants are preferable.
- Any necklaces, bracelets and rings must be removed and long hair is to be tied back.
- No name and/or school identifying clothing

It is the responsibility of the instructors to ensure their students are properly prepared and supervised for these events. Students will not be allowed to compete if they do not have the proper shoes or if their attire presents a safety issue. All contestants called into briefing room will be inspected by the Resolution Team* prior to contest briefing. **ANY CONTESTANT NOT APPROPRIATELY DRESSED WILL RECEIVE A MAXIMUM OF 50 POINT DEMERIT FROM THEIR FINAL SCORE.**

All contestants and instructors are expected to act with courtesy and respect to all contest staff and fellow contestants. **ANYTHING LESS MAY RESULT IN REMOVAL/EXCLUSION FROM CONTEST.**

***The Resolution Team will consist of the contest coordinator and two judges from the post-secondary event.**

SPECIAL INSTRUCTIONS:

Contestants will be required to locate information and specifications in aircraft maintenance manuals, illustrated parts catalogs, and engineering drawings. They will be expected to know how to use them.

EQUIPMENT SUPPLIED BY TECHNICAL COMMITTEE:

Contestants will not have to bring hand tools and equipment to the contest. All tools necessary for accomplishing each task in the skills contest will be provided. Contestants will have the opportunity to orient themselves with the tools on Saturday, March 14th during the orientation period.

Cameras and / or video camera policy: **NO VIDEO TAPING BY TEACHERS, ADVISORS, OR PARENTS WILL BE ALLOWED DURING THE CONTEST.** Anyone wanting video of the contest should make arrangements ahead of time by contacting the Technical Committee. Photographs during the contest are allowed from outside the contest area. No photography allowed within the contest area.

SECTION II

Contest Overview for Post-Secondary Contest

(Note: All tools and equipment for each contest will be provided)

Composites

DESCRIPTION OF CONTEST:

This contest is designed to test the knowledge of composite repair procedures by:

- * Checking a composite panel for delamination
- * Answering questions about composite repair procedures

Tools and Equipment to be used:

- * Tap testing instrument

Visible Dye Penetrant

Description of Contest:

This contest is designed to test skill and knowledge of non-destructive methods by:

- * Applying a visible dye penetrant process to an aircraft part
- * Identifying the defect in the part

Tools and equipment to be used:

- * Spotcheck visible dye penetrant 3-part system
- * Timer

Sheet Metal

Description of Contest:

This contest is designed to test the contestants on sheet metal fabrication skills by:

- * Cutting, bending and drilling Aluminum alloy sheet metal
- * Installing solid rivets
- * Installing threaded fasteners and other blind/special fasteners

Tools and equipment to be used:

- * Air drills and drill bits
- * Rivet gun and sets
- * Rivets and other fasteners
- * Measuring equipment

Aircraft Wheels and Tires

Description of Contest:

This contest is designed to test skills and knowledge of aircraft wheels, tires and brakes by:

- * Disassembling and reassembling a Cleveland wheel and brake assembly
- * Inspecting brake discs and linings
- * Apply proper torque

- * Inflate tire to proper pressure

Tools and equipment to be used:

- * Tire bead breaker
- * Appropriate hand tools
- * Torque wrenches
- * Air hose and attachments
- * Measuring equipment
- * Aircraft maintenance manual

Aileron Rigging

Description of Contest:

This contest is designed to test skills and knowledge of flight control rigging by:

- * Checking and adjusting cable tension
- * Checking flight control deflection

Tools and equipment to be used:

- * Cable tensiometer
- * Inclinator (digital or manual)
- * Aircraft maintenance manual

Electrical Troubleshooting

Description of Contest:

This contest is designed to test skill and knowledge of aircraft electrical systems by:

- * Troubleshooting and finding the defect in a non-working electrical system
- * Repair a defect in an electrical systems
- * Calculate voltage, power and current using Ohm's Law

Tools and equipment to be used:

- * Digital multimeter
- * Wire crimper stripper, and cutter
- * Calculator

Fluid Line Fabrication

Description of Contest:

This contest is designed to test skill and knowledge of tubing fabrication by:

- * Cutting, bending, and flaring aluminum tubing
- * Fabricating aluminum to an exact dimension
- * Selecting proper hardware

Tools and equipment to be used:

- * Tubing cutter
- * Tube flaring tool
- * Tubing bender
- * Measuring instruments

Control Cable Fabrication

Description of Contest:

This contest is designed to test skill and knowledge of aircraft control cables by:

- * Installing nicopress sleeves
- * Splicing steel control cables
- * Applying tension to control cables

Tools and equipment to be used:

- * Cable cutters
- * Nicopress crimping tool
- * Cable tensiometer
- * Measuring equipment

Propellers

Description of Contest:

This contest is designed to test skill and knowledge of aircraft propellers by:

- * Measuring propeller blade angle
- * Removing and reinstalling a propeller
- * Applying proper torque
- * Installing safety wire

Tools and equipment to be used:

- * Basic hand tools
- * Torque wrench
- * Safety wire pliers
- * Propeller protractor

Magneto

Description of Contest:

This contest is designed to test skill and knowledge of aircraft reciprocating engine ignition systems by:

- * Replacing points in a Slick magneto
- * Setting internal timing
- * Applying proper torque to fasteners

Tools and equipment to be used:

- * Timing light
- * Torque wrench
- * Slick specific timing tools
- * Slick/Unison manuals

Safety

Description of Contest:

This contest is designed to test knowledge of aircraft safety by:

- * Written exam based on aircraft ramp safety

Tools and equipment to be used:

- * None

Turbine Parts Identification

Description of Contest:

This contest is designed to test knowledge of internal gas turbine engine parts by:

- * Identifying parts using nomenclature found in engine illustrated parts catalog
- * Identify basic turbine engine components on turbine engine cutaways

Tools and equipment to be used:

- * Illustrated parts catalog

Contest Overview for High School Contest

(Note: All tools and equipment for each contest will be provided)

Precision Measurement

Description of Contest:

This contest is designed to test knowledge and ability of precision measuring by:

- * Identify measurements from engineering drawings
- * Measure inside and outside dimensions and depth
- * Determine tolerance

Tools and equipment to be used:

- * Outside micrometer with vernier scale
- * Dial and Vernier calipers
- * Depth micrometer

Hardware Identification

Description of Contest:

This contest is designed to test knowledge and ability of aircraft hardware by:

- * Measuring common hardware dimensions
- * Measure thread pitch
- * Use reference material to identify aircraft hardware

Tools and equipment to be used:

- * Dial calipers
- * Thread pitch gauge

- * Advisory Circular (AC) 43.13

Electrical

Description of Contest:

This contest is designed to test knowledge and ability of aircraft electrical systems by:

- * Comparing circuit diagrams with actual circuit board
- * Correct circuit board to match diagram
- * Calculate voltage, current, resistance and power using Ohm's Law

Tools and equipment to be used:

- * Digital multimeter
- * Calculator

Tube Bending and Flare

Description of Contest:

This contest is designed to test knowledge and ability of aircraft fluid lines by:

- * Cut, bend, and flare aluminum tubing
- * Select proper hardware
- * Fabricate aluminum tubing to a specific dimension

Tools and equipment to be used:

- * Tubing cutter
- * Tube flaring tool
- * Tubing bender
- * Measuring instruments

Aircraft Parts Identification

Description of Contest:

This contest is designed to test knowledge and ability of aircraft parts by:

- * Identify aircraft instrument panel components
- * Identify aircraft parts using proper nomenclature
- * Look up parts in illustrated parts catalogs

Tools and equipment to be used:

- * Aircraft illustrated parts catalogs

Safety

Description of Contest:

This contest is designed to test knowledge and ability of aviation safety by:

- * Answering questions about safety in aircraft maintenance

Tools and equipment to be used:

- * FAA Aviation Maintenance Technician Handbook – General

Federal Aviation Regulations

Description of Contest:

This contest is designed to test knowledge of FAA rules governing aircraft mechanics:

- * Answer questions pertaining to Federal Aviation Regulations

Tools and equipment to be used:

- * FAR/AMT Textbook (ASA, Jeppesen)

Weight and Balance

Description of Contest:

This contest is designed to test knowledge of aircraft weight and balance by:

- * Calculating center of gravity
- * Computing weights and moments

Tools and equipment to be used:

- * Aircraft flight manual (AFM, POH)
- * Calculator

Safety Wire

Description of Contest:

This contest is designed to test knowledge and ability of aircraft hardware safety by:

- * Installing cotter pins
- * Install safety wire to turnbuckles and bolts

Tools and equipment to be used:

- * Stainless steel safety wire
- * Safety wire pliers
- * Diagonal cutters

Forms, Records, and Log Entries

Description of Contest:

This contest is designed to test knowledge of aircraft forms and records by:

- * Creating a logbook entry
- * Filling out an FAA 337 Form

Tools and equipment to be used:

- * FAR Part 43
- * AC43.9-1F – Instructions for Completion of FAA form 337
- * FAR/AMT textbook (ASA, Jeppesen)

Aircraft Flexible Hoses

Description of Contest:

This contest is designed to test knowledge and ability of aircraft hose by:

- * Installing proper hardware
- * Cutting aircraft hose
- * Fabricating hose assembly to a specific dimension

Tools and equipment to be used:

- * Hose mandrel
- * Appropriate hand tools
- * Lubricating oil

Revised 11/18/19

Aviation Maintenance Technology Scorecard (College/Postsecondary)

Items Evaluated	Possible Points	Contestant Number					
		1	2	3	4	5	6
Composite	75						
Dye Penetrant	75						
Sheet Metal	75						
Wheel and Brake	75						
Control Rigging	75						
Electrical	75						
Tube Bend and Flare	75						
Control Fabrication	75						
Propeller	75						
Magneto Timing	75						
Safety	75						
Turbine Parts Identification	75						
Written Exam	50						
Résumé Penalty	0 or -10 only						
Clothing Penalty	0 to -50						
Total Possible Points	950						

Aviation Maintenance Technology Scorecard (High School)

Items Evaluated	Possible Points	Contestant Number					
		1	2	3	4	5	6
Precision Measuring	75						
Hardware Identification	75						
Electrical	75						
Tube Bend and Flare	75						
T.C.D.S./AD's	75						
A/C Parts Identification	75						
Safety	75						
Federal Aviation Regulations	75						
Weights and Balance	75						
Safety Wire	75						
Logbook Entries, Forms and Records	75						
Hose Fabrication	75						
Written Exam	50						
Résumé Penalty	0 or -10 only						
Clothing Penalty	0 to -50						
Total Possible Points	950						

SkillsUSA-WMU
Aviation Maintenance Technology Contest
High School Resources

If your school does not have an aviation program, the following information will aid in your preparation for the contest.

Overall aircraft knowledge:

If you are looking for textbooks, there are several quality publishers available. Avotek has the most recent and updated textbooks in our opinion. Other publishers are ASA and Jeppesen. Here is the Avotek link: <https://www.avotek.com/shop/category/amt-series-2/>

The FAA also has textbooks that are FREE to download. Download the Aviation Maintenance Technician Handbook – General. All of the high school contest stations are based on this information. For additional information, download the Powerplant handbook and both Airframe handbooks. Here is the link:

https://www.faa.gov/regulations_policies/handbooks_manuals/aircraft/

Hardware Identification:

All aircraft hardware in the United States is in English units, not metric. They are all manufactured to AN, NAS, MS or other standards. One of the best resources for this is an FAA Advisory Circular, AC43.13-1B, specifically chapter 7. Here is the link:

https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_43.13-1B_w-chg1.pdf

Parts of an Airplane:

For this station, contestants are required to identify instruments on an aircraft instrument panel as well as identify the major parts of a small aircraft. Use the previously mentioned textbooks as a guide. The aircraft used in the contest is a Cessna 182P.

Federal Aviation Regulations (FARs):

FARs are the rules and regulations that govern all aircraft, pilots, mechanics, manufacturers, and everything/everyone that deals with aviation in the United States. For guidance, a good textbook is the FAR/AMT series published annually by ASA. Here is the link:

<https://www.asa2fly.com/2020-FAR-for-Aviation-Maintenance-Technicians-eBundle-P4122C553.aspx>

All of the FARs are available to view on the FAA website at https://www.ecfr.gov/cgi-bin/text-idx?&c=ecfr&tpl=/ecfrbrowse/Title14/14tab_02.tpl

Weight and Balance:

Weight and balance is critical to aircraft flight. Proper weight and balance will produce a center of gravity which allows the aircraft to fly “straight and level” without being tail or nose heavy. Aircraft maintenance technicians must calculate weight and balance when they remove and/or replace components on the aircraft. See the Aviation Maintenance Technician Handbook – General for details.

Tubing:

Aluminum tubing is standard for carrying fluids and air throughout the aircraft. They are typically used in systems that operate below 3,000psi. 3/8-inch aluminum tubing is used with specific tools for cutting, bending and flaring. The flare for aircraft is 37°, and the tubing uses AN hardware. A tube cutter can be sourced from a local hardware store. For more information reference FAA Advisory Circular, AC43.13-1B, specifically chapter 9. Here is some information on the specific tubing and the tools:

Tubing: https://www.aircraftspruce.com/catalog/mepages/alumtube_5052.php

Tube Bender: <https://aircraft-tool.com/shop/detail.aspx?id=368FH>

Tube Flaring: <https://www.aircraftspruce.com/catalog/topages/flaringtools2.php?clickkey=23245>

AN Hardware: <https://www.aircraftspruce.com/catalog/hapages/an818.php> and
<https://www.aircraftspruce.com/catalog/hapages/an819.php>

Safety Wire:

To ensure that hardware does not come loose and fall off in flight, aircraft maintenance technicians install safety wire as a preventative measure. Consult the FAA General Handbook as well as FAA Advisory Circular, AC43.13-1B, specifically chapter 7. See link above in the hardware section.

Safety Wire (.032 inch is a common size):

<https://www.aircraftspruce.com/catalog/appages/safetywire.php?clickkey=4386>

Forms and Records:

Documentation of work performed is critical for aircraft maintenance technicians. They must document all work performed on an aircraft to make sure the aircraft is safe to fly and to meet all the FAA requirements for the aircraft. A form that is used often, is the FAA 337 form to document major repairs and alterations. Here is some information:

https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_43.9-1F.pdf

Flexible Hose:

Much like aluminum tubing, flexible hoses are used throughout the aircraft to carry fluid and air. An aircraft maintenance technician may need to repair a hose by cutting and installing new

attachment hardware. The hardware is installed with a mandrel and typical hand tools. We use 3/8-inch hose from Stratoflex or Aeroquip. For more information reference FAA Advisory Circular, AC43.13-1B, specifically chapter 9. Here is information on the tooling, hose, and fittings:

Hose: <https://www.aircraftspruce.com/catalog/appages/strato111.php>

Fittings: <https://www.aircraftspruce.com/catalog/appages/strato300.php>

Mandrel: <https://www.aircraftspruce.com/catalog/appages/aqmandrel2.php?clickkey=876720>

Safety:

With safety, we focus on ramp safety. Ramp safety includes marshalling of aircraft and safely operating aircraft including engine run-ups and taxiing.

Type Certificate Data Sheets and Airworthiness Directives:

Type Certificate Data Sheets (TCDS) cover the certification of aircraft and their major components like engines and propellers. They will give specifications and approved components and accessories for the aircraft. Airworthiness Directives (ADs) are issued by the FAA and are the equivalent of a recall, except that an AD is mandatory, meaning the aircraft cannot be flown unless the AD has been complied with. Follow the links to search specific TCDS and ADs:

TCDS:

[http://rgl.faa.gov/Regulatory and Guidance Library/rgMakeModel.nsf/Frameset?OpenPage](http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgMakeModel.nsf/Frameset?OpenPage)

ADs: [http://rgl.faa.gov/Regulatory and Guidance Library/rgAD.nsf/MainFrame?OpenFrameSet](http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgAD.nsf/MainFrame?OpenFrameSet)

Conclusion:

Along with the textbooks mentioned above, the FAA website is a great resource for this contest and for aircraft maintenance technicians. I have the following page bookmarked on my computer because I've used it in the field working on aircraft and in the classroom:

<https://www.faa.gov/mechanics/>

If you have any questions about the contest or would like a tour of the WMU College of Aviation, please feel free to contact me at Jeremy.hierholzer@wmich.edu or (269)-964-4964.