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NEW CASTLE COUNTY VOCATIONAL TECHNICAL SCHOOL DISTRICT

Aviation Technology

LOCATION

Delcastle Technical High School

Instructor: Mr. John Serwinski



Career Program Review:
Spring 2007

Students in **Aviation Technology** learn to inspect, repair, service, and overhaul airplanes. Attention is given to scheduled maintenance following a timetable based upon the number of hours flown and to specialization in repair work. The program is based upon the Federal Aviation Administration (FAA) requirements for the aviation mechanic license and prepares students to obtain a power plant rating. To be federally licensed, a student must pass the FAA written and practical examination for the power plant technician. The field of aviation requires a person of high professional standards willing to accept responsibility for human lives that depend on his/her professional expertise. Essential skills include coordinating work with others; operating equipment; using tools; maintaining, inspecting, repairing, and installing parts; following written and oral instructions; keeping records; analyzing, interpreting, and evaluating data; exhibiting attention to detail; and working with computers.

NEW CASTLE COUNTY VOCATIONAL TECHNICAL
SCHOOL DISTRICT

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Employment opportunities available after high school graduation:

Aviation Parts Distribution/Procurement Technician, Aviation Field Technician, Ground Service Technician, Reclamation Worker, Helicopter Technician, Overhaul Technician, Flight Test Technician, Aircraft Rigging/Controls Technician, Aircraft Pressure Sealer and Tester, Aircraft Structure Technician, Aircraft Accessories/Component Repairer, Air Frame Technician, Power Plant Technician.

Preferred Personal Attributes and Skills

To do this kind of work, students should have these interests and aptitudes:

- Understand and use blueprints, sketches, drawings, and other kinds of specifications
- Detect differences in the shape, size, and texture of various items
- Pay strict attention to standards, guidelines, and ALL safety standards
- Make decisions based on personal judgments and facts
- Coordinate eyes, fingers, and hands to operate equipment, adjust instruments, make sketches, or use measuring tools
- Perform detail work with great accuracy
- Use clear language to write technical reports
- Visualize how a finished product will look or how a system operates
- Use arithmetic to measure, compute the amount of material to use, and inspect the product to be sure it conforms to requirements
- Read and follow instructions to set up and adjust machines and equipment

Average Earnings/Career Opportunities

Starting \$10/hr up to \$28/hr and beyond with experience

- | | |
|--|---|
| • Aviation Field Technician | • Aircraft Accessories & Component Repairer |
| • Flight Test Technician | • Aircraft Composites Repairer |
| • Aircraft Technician (Helicopter) | • Helicopter Technician |
| • Aircraft Rigging/Controls Technician | • Overhaul technician |
| • Aircraft Pressure Sealer and Tester | • Air Frame & Power Plant Technician |
| • Aircraft Structure Technician | • Reclamation Worker |
| • Aviation Parts Distribution/Procurement Technician | |

Aviation Technology Learning Targets

These are the major tasks students will be expected to demonstrate:

A. Career Area Orientation

- 1.0 Students will apply shop safety and Right to Know procedures and practices according to standards.
- 2.0 Students will know shop organization and operational procedures.
- 3.0 Students will operate various hand tools and shop equipment used in the shop according to standards.
- 4.0 Students will know past, present, and future essential facts about the Aviation Industry.
 - 4.1 Students will use reading strategies to identify issues, events, predictions, and/or other information related to the Aviation Industry from industry-related publications and will describe said information in writing.
 - 4.2 Students will utilize information obtained from Aviation-related publications to support or counter opinions during discussions of current events in Aviation.
- 5.0 Students will identify and describe the partnership between industry and professional organizations.
 - 5.1 Students will identify the purpose served by the Aviation Alphabet Groups towards the enhancement of A & P mechanics career.
 - 5.2 Students will list and describe the alphabet groups and the areas of the aviation industry they serve.
- 6.0 Students will identify and describe career opportunities in the Aviation Industry.
 - 6.1 Students will use reading strategies to identify career opportunities in Aviation presented in industry-related publications and will describe the opportunities in writing.
 - 6.2 Students will describe the importance of continuing education/training in Aviation by recognizing available opportunities and by explaining how the education/training will lead to advancement in the industry.
 - 6.3 (deleted—activity)
 - 6.4 (deleted—activity)

B. Aviation Materials, Production and Fabrication Processes

- 1.0 Students will know and apply criteria used to select aircraft materials.

- 1.1 Students will identify how the selection of aircraft materials is determined for use in aircraft manufacture or repair.
 - 1.2 Students will identify how the selection of aircraft materials is related to the cost of materials and the cost of labor involved with fabrication of parts using the materials.
 - 1.3 Students will identify how the selection of aircraft materials is related to the relative ease in maintaining materials and to the anticipated service life of materials.
 - 1.4 Students will determine the suitability of materials for aircraft repairs.
 - 1.41 Students will identify and access sources of information dealing with the structural strength of repair materials.
 - 1.42 Students will determine the stress requirements of parts to be repaired/replaced.
 - 1.43 Given information about the structural strength of repair materials, students will identify the appropriate materials to be used for specific repairs.
- 2.0 Students will identify and describe key characteristics and uses of materials used in the Aviation Industry.
- 2.1 Students will identify the mechanical properties and principle uses of iron and steel alloys, aluminum alloys and other metals and alloys, plastics, and rubber.
 - 2.2 Students will identify and describe mechanical tests used on common Aviation materials.
- 3.0 Students will identify aluminum alloys commonly used in the Aviation Industry.
- 3.1 Students will use the code numbering systems to identify aluminum alloys.
 - 3.2 Students will identify the hardness of specific alloys using standard industry practices.
 - 3.3 Students will differentiate between Alclad and Pureclad alloy materials.
- 4.0 Students will identify steel alloys commonly used in the Aviation Industry.
- 4.1 Students will identify uses of aircraft steel.
 - 4.2 Students will use the SAE code identification system to identify steel alloys.
 - 4.3 Students will correctly interpret code markings on steel alloys.
 - 4.4 Students will identify temper conditions for aircraft steel.
- 5.0 Students will identify and install fasteners commonly used in the Aviation Industry.
- 5.1 Students will use AN, MS and NAS numbering systems, head markings on bolts, color coding of bolts and machine screw threads to identify and install fasteners.

- 5.2 Students will select and use self-locking nuts for specific applications.
 - 5.3 Students will determine bolt length and diameter using standard measurement values.
 - 5.4 Students will identify torque requirements and tighten fasteners to these requirements within standard tolerances.
- 6.0 Students will identify and install conventional aircraft rivets following standard procedures.
- 6.1 Students will identify aircraft rivets using the:
 - 6.1.1 AN rivet code/numbering system
 - 6.1.2 MS rivet code/numbering system
 - 6.1.3 NAS rivet code/numbering system
 - 6.1.A Students will understand the fractional graduation of standard rivet diameter and lengths according to the code/numbering system of 6.1
 - 6.1.B Students will identify methods of measuring aircraft rivets.
 - 6.1.C Students will identify limitations for use of rivets.
 - 6.1.D Students will identify the correct rivet head type for any specific aircraft riveting application.
 - 6.2 Students will select the correct rivet installation tools to install conventional aircraft rivets.
 - 6.2A Students will select the correct rivets for the sheet metal layout and install same using the correct tools following standard procedures.
 - 6.3 Students will identify, remove, and replace improperly installed units following standard procedures.
 - 6.3.1 Students will understand the criteria for replacement of questionable rivets.
 - 6.3.2 Students will understand the precautions of removing faulty rivets.
 - 6.3.3 Students will remove faulty rivets using proper tools and following standard procedures.
- 7.0 Students will identify the materials used in aircraft control cables, firewalls, and exhaust shrouds and manifolds.
- 7.1 Students will identify the type and thickness of materials used in aircraft firewalls and exhaust shrouds and manifolds
 - 7.2 Students will identify and describe the various types of cable design, and the materials involved in the construction of aircraft control cables.
- 8.0 Students will know how metals are shaped and joined.
- 81 Students will identify and briefly describe key characteristics of the processes used to shape metal (e.g., casting, forging, extrusion, powder metallurgy, rolling, spinning, stretch-forming, and high energy forming processes).

- 8.2 Students will identify and briefly describe key characteristics of the processes used to join metal.
- 9.0 Students will inspect aircraft components for wear by following standard procedures and by using precision measurements.
 - 9.1 Students will describe standard inspection techniques used in a production environment (e.g., production tolerances, normal rejection factor, statistical inspection).
 - 9.2 Students will describe standard inspection techniques used in a line maintenance environment (e.g., dimensional checks, fits, and cleaners).
 - 9.3 Students will perform dimensional checks accurately using measuring instruments common to aviation (e.g., micrometers, calipers, hole gauges, swap gauges, dial indicators “v” locks, surface plates) according to standards.
 - 9.4 Students will verify fits and clearances within documented tolerances using measuring instruments common to Aviation (e.g., micrometers, calipers, hole gauges, swap gauges, dial indicators, “v” licks, surface plates) according to standards.
 - 9.5 Students will complete standard status report forms and/or tags according to standard.
- 10.0 Students will recommend and use nondestructive testing methods for aircraft according to standards.
 - 10.1 Students will identify the aircraft parts/materials that require nondestructive inspection (e.g. detecting defects in aluminum castings and forgings).
 - 10.2 Students will know when and how to use various nondestructive testing methods (e.g., magnetic particle inspection, Magnaflux and Magnaglo, X-ray or radiography, ultrasonic) according to standards.
 - 10.3 Students will use fluorescent dye penetrant (Zyglo) to perform dye penetrant inspections according to standards.
 - 10.4 Students will perform magnetic particle inspections according to standards.
 - 10.5 Students will perform chemical etching inspections according to standards.
 - 10.6 Students will identify when and describe how to perform X-ray inspection of welds.
 - 10.7 Students will identify optical aids used in the inspection of welds.
 - 10.8 Students will explain why it is important to be able to locate flaws in welds.
 - 10.9 Students will identify aircraft structure where welds need to be regularly inspected.

C. Fluid Lines and Fittings

- 1.0 Students will bend aluminum and stainless steel tubing according to standard.
 - 1.1 Students will use hand tube-bending tools according to standard.
 - 1.2 Students will know the procedures needed to perform power tube-bending.
 - 1.3 Students will bend soft aluminum by hand according to standard.
 - 1.4 Students will identify minimum bend radii for various types of tubing.

- 2.0 Students will perform beading on tubing effectively according to standard.
 - 2.1 Students will identify and describe the tools used to perform beading.
 - 2.2 Students will perform beading on various types of tubing according to standard.

- 3.0 Students will fabricate flares on tubing effectively according to standard.
 - 3.1 Students will identify and describe the tools and tubing materials required for the fabrication of flares on tubing.
 - 3.2 Students will fabricate flares on various types of appropriate tubing according to standard.

- 4.0 Students will install sections of rigid tubing effectively according to standard and will recognize and repair defects in same.
 - 5.1 Students will recognize defects in metal tubing.
 - 5.2 Students will differentiate between defects that can be repaired and defects that require that the tubing be replaced.
 - 5.3 Students will repair defects in metal tubing according to standard.
 - 5.4 Students will identify and describe various types of tubing connections.
 - 5.5 Students will install various fluid lines according to standard.

- 5.0 Students will fabricate and install flexible hoses according to standards.
 - 4.1 Students will select tools used to fabricate and install flexible hoses.
 - 4.2 Students will select appropriate materials for specific applications.
 - 4.3 Students will install fittings on flexible hoses according to standard.
 - 4.4 Students will install flexible hoses in fluid systems according to standard.

D. Cleaning and Corrosion Control

- 1.0 Students will explain the importance of aircraft cleaning and corrosion control.
 - 1.1 Student will describe how “dirty” exterior surfaces affect high-speed performance of aircraft.
 - 1.2 Students will identify and describe the causes of different types of corrosion (e.g., intergranular, intercrystalline, dissimilar metal, fretting and rust).

- 1.3 Students will identify potential problems associated with the degradation of rubber products.
- 2.0 Students will perform cleaning and corrosion control of aircraft exteriors and other aircraft components according to standards.
 - 2.1 Students will identify and describe procedures that control various types of corrosion (e.g., intergranular, intercrystalline, dissimilar metal, fretting and rust).
 - 2.2 Students will remove flakes, powder and salt deposits, scale, and rust according to standard.
 - 2.3 Students will apply protective coatings (e.g., paints and organic coatings) according to standard.
 - 2.4 Students will treat the interior surfaces of metal tubing according to standard.
 - 2.5 Students will clean and protect battery compartments and adjacent areas according to standard.
 - 2.6 Students will clean and protect rubber products according to standard.

E. Ground Operation and Servicing

- 1.0 Students will perform aircraft fueling procedures according to standards.
 - 1.1 Students will know the significant of octane performance number in identification of fuel.
 - 1.2 Students will identify color octane rating or performance number.
 - 1.3 Students will identify vapor lock on a reciprocating (piston) engine.
 - 1.4 Students will identify the cause of detonation and effective elimination.
 - 1.5 Students will identify kerosene versus gasoline as fuels for turbine engines.
 - 1.6. Students will determine quantities of fuel using standard measurements and convert between different measurement systems (e.g., gallons to pounds and vice versa).
 - 1.7 Students will describe the proper methods for refueling various types of aircraft.
 - 1.8 Students will take all necessary precautions before operating fueling equipment.
 - 1.9 Students will operate fueling equipment safely to fuel various types of aircraft.
- 2.0 Students will start and operate aircraft engines according to standards.
 - 2.1 Students will identify and describe the safety precautions and procedures required when starting and operating aircraft engines.
 - 2.2 Students will identify and describe external auxiliary electrical power sources (e.g., battery cart, motor generator or rectifier power unit, and gasoline-driven auxiliary power unit.

- 2.3 Students will connect external power sources to various types of aircraft and operate same according to standards.
 - 2.4 Students will list and describe the prerequisites for starting piston engines.
 - 2.5 Students will perform pre-starting procedures for starting piston engines according to standards.
 - 2.6 Students will perform starting procedures for piston engines according to standards.
 - 2.7 Students will follow operating and shutdown procedures for piston engines.
- 3.0 Students will know and perform procedures needed to combat fire in induction systems according to standards.
- 3.1 Students will identify the types of fire extinguishers that can be used to combat fire in induction systems.
 - 3.2 Students will perform appropriate extinguishing procedures to be used against fire in induction systems according to standards.
- 4.0 Students will connect and operate external hydraulic power sources according to standards.
- 4.1 Students will identify and describe various types of hydraulic power sources.
 - 4.2 Students will recognize the compatibility of different hydraulic power sources with different types of aircraft.
 - 4.3 Students will connect external hydraulic power sources to aircraft hydraulic systems according to standards.
 - 4.4 Students will conduct standard operational checks according to standards.
 - 4.5 Students will replenish hydraulic systems according to standards.
- 5.0 Students will direct the movement of aircraft on the ground according to standards.
- 5.1 Students will use hand signals to communicate instructions to pilots.
 - 5.2 Students will tow aircraft according to standard.
 - 5.3 Students will describe standard taxiing and parking procedures.
- 6.0 Students will prepare aircraft for outside storage according to standards.
- 6.1 Students will use proper equipment to secure aircraft outside according to standards.
 - 6.2 Students will follow standard procedures for securing aircraft outside.
 - 6.3 Students will follow standard procedures to protect aircraft from heavy weather.

- 7.0 Students will inspect, service, repair, remove or install aircraft wheels and tires according to standards.
 - 7.1 Students will clean an aircraft tire removing oils, deteriorating materials and inspect for wear limits and possible delamination according to standards.
 - 7.2 Students will remove and install a tube and tubeless type tire on a wheel following standard procedures.
 - 7.2.1 Students will know the precautions to be followed when deflating and disassembling an aircraft wheel and when reassembling and mounting the wheel following correct mounting procedure.
 - 7.2.2 Students will know to follow the prescribed inflation pressures on the tire.
 - 7.2.3 Students will service tires according to standard.
 - 7.2.4 Students will know the importance of proper bolt torque when installing through bolts in a split wheel assembly.
 - 7.3 Students will remove, install, and inspect a complete wheel assembly on an aircraft according to standard procedures.
 - 7.4 Students will remove, clean, inspect and pack aircraft wheel bearings according to standard.
 - 7.4.1. Students will clean old grease from bearing using appropriate cleaning solvents and will know to never rotate the bearing with compressed air.
 - 7.4.2 Students will inspect the clean bearing for wear.
 - 7.4.3 Students will determine the recommended lubricant and pack the bearing following standard procedures.

F. Maintenance Publications, Forms and Records

- 1.0 Students will select and use FAA and manufacturer's aircraft maintenance specifications, data sheets, manuals, publications and related Federal aviation regulations appropriately.
 - 1.1 Students will locate reference data using FAA specifications and type certificate data sheets.
 - 1.2 Students will use information from the aircraft specifications to identify aircraft specifications.
 - 1.3 Students will use information from the manufacturer's manuals to verify control surface travel using control travel reference information and methods of expressing limits of travel.
 - 1.4 Presented with an aircraft or a description thereof, students will identify regulations governing airworthiness certificates that relate to the aircraft.
 - 1.5 Students will select and use technical standard (T50) orders.
 - 1.6 Students will select and use manufacturer's publications.
 - 1.7 Students will select and use supplementary-type certificates.
 - 1.8 Students will select and use airworthiness directives.

- 1.9 Students will correctly interpret written technical information.
- 2.0 Students will use service overhaul manual and parts catalogs to locate procedures for repair or replacement of airframe and power plant components and to obtain part numbers for replacement parts
- 3.0 Students will write descriptions of an aircraft's condition and of work performed upon the aircraft according to standard.
 - 3.1 Students will inspect an aircraft and prepare a condition report containing a manufacturer's service information and aircraft condition reports according to standard.
 - 3.2 Students will write a description of major/minor repairs and routine maintenance containing classification of repairs and entry requirements according to standard.

G. Mechanic's Privileges and Limitations

- 1.0 Students will complete required maintenance forms, records and inspection reports according to standards.
 - 1.1 Students will make maintenance record entries containing time in service according to part FAR 91 and 43.
 - 1.2 Students will use inspection guides for various types of inspections to verify compliance with airworthiness directives.
 - 1.3 Students will evaluate required aircraft records for compliance with Federal Air Regulations.
- 2.0 Students will know the legal responsibilities, ethics, privileges and limitations inherent to the position of aircraft mechanic.
 - 2.1 Students will exercise mechanic privileges within the limitations prescribed by Federal Aviation Regulation 65.
 - 2.2 Students will apply Federal Aviation Regulation 43 correctly.
 - 2.3 Students will classify aircraft repairs according to Federal Aviation Regulation 43.
 - 2.4 Students will apply Federal aviation regulations governing propeller repairs and alterations and the modification of structures.
 - 2.5 Students will apply FAA regulations regarding repair station operation. (Federal Aviation Regulation 145)
 - 2.6 Students will identify the legal and ethical ramifications of the following: bailment, mechanics liens, customer relationships, pride and craftsmanship, integrity, employer relationships

H. Weight and Balance

- 1.0 Students will locate, interpret and apply weight and balance information according to standard industry practice.
 - 1.1 Given aircraft specifications, students will identify weight and balance information.
 - 1.2 Students will correctly interpret and complete aircraft weight and balance records according to standards.
 - 1.3 Given hypothetical scenarios, students will apply weight and balance information to jacking and leveling aircraft.
 - 1.4 Given hypothetical scenarios for various aircraft categories, students will apply weight and balance information to determine moment arms and calculate the center of gravity range.
 - 1.5 Students will read scales and record weights accurately.
 - 1.6 Students will correctly apply and interpret nomenclature and algebraic signs.

- 2.0 Students will perform complete weight and balance checks on aircraft and record related data according to standard industry practice.
 - 2.1 Presented with aircraft of varying categories, students will identify the weights required for balance computations.
 - 2.2 Given an aircraft and appropriate weight values, students will determine moment arms and the center of gravity range for the aircraft
 - 2.3 Students will compute forward and aft loaded center of gravity given the following parameters:
 - 2.3a. Minimum fuel for weight and balance computations.
 - 2.3b. Passenger and crew weights
 - 2.3c. Baggage placards and ballast
 - 2.3d. Weight and balance envelopes
 - 2.4 Students will compute the effect of equipment changes and loading schedules for major alterations.
 - 2.5 Presented with a helicopter, students will identify data references and weighing points and accurately perform weight and balance computations.

I. Power Plant Theory and Design

- 1.0 Students will know the parts and operating principles of reciprocating engines.
 - 1.1 Students will identify and describe engine cycles and the events in engine cycles.
 - 1.2 Students will recognize and classify types of reciprocating engines.
 - 1.3 Students will use correct cylinder nomenclature.
 - 1.4 Students will identify crankshaft and rod assemblies.

- 1.5 Students will match cooling methods and cylinder arrangements with the various types of reciprocating engines.
 - 1.6 Students will identify and describe functions of components of a reciprocating engine.
 - 1.7 Students will identify the purpose of compression checks and engine operational indications of poor compression perform.
 - 1.8 Students will describe valve overlap, valve timing, and valve gear train function using correct nomenclature and timing diagrams.
 - 1.9 Students will describe the firing order of reciprocating engines (e.g., radial engines, single and twin row (14 cycle or larger) engines, opposed engines, and in-line engines).
 - 1.10 Students will identify and describe problems associated with high power operating limits.
- 2.0 Students will know the parts and operating principles of turbine engines.
- 2.1 Students will identify and describe the major components of a turbine engine.
 - 2.2 Students will describe the basic functions of a turbine engine.
 - 2.3 Students will describe modular overhaul, time repairs, malfunction removals, inspection removals, and repair techniques.
 - 2.4 Students will identify factors that influence the amount of heat to which engine components are subjected.
 - 2.5 Students will identify the major components of and describe airflow in fan (by-pass) turbine engines.
 - 2.6 Students will identify where pressure changes occur in a turbine engine.
 - 2.7 Students will identify and describe the airflow and flame propagation characteristics and nozzle arrangements of combustion chambers (e.g., can, annular, and can-annular).
- 3.0 Students will contrast the basic structure and operation of turboprop engines with reciprocating engines.

J. Power Plant Inspection and Maintenance

- 1.0 Students will perform power plant conformity and airworthiness inspections according to standard industry procedures.
 - 1.1 Students will determine which directives apply to the power plant being inspected.
 - 1.2 Using the appropriate directives and maintenance record, students will inspect an engine for compliance with airworthiness according to standards.
 - 1.3 Using the appropriate manuals, students will inspect an engine for conformity with design specifications.

- 2.0 Students will prepare a work site for the overhaul of an engine according to standards.
 - 2.1 Students will locate and place engine overhaul equipment, including overhaul and inspection tools according to standards.
 - 2.2 Students will identify by label or tags and store parts during an engine overhaul according to standards.
 - 2.3 Students will use overhaul inspection sheets and a table of limits according to standard.

- 3.0 Students will inspect, service and repair opposed reciprocating engines following standard procedures.
 - 3.1 Students will inspect a reciprocating engine to determine repair or overhaul and complete as recommended by the manufacturer's recommendations.
 - 3.2 Students will inspect valve mechanisms, adjust valve clearances and make valve timing checks on cam speeds according to standards.

- 4.0 Students will install and remove reciprocating engines, propellers and manual engine controls following standard procedures.
 - 4.1 Students will lift or hoist an engine into an engine mount.
 - 4.2 Students will install and remove propellers from different types of propeller shafts according to standards.
 - 4.3 Students will check and rig cable operated and push-pull operated engine controls according to standards.

- 5.0 Students will overhaul a turbine engine by following standard disassembly, cleaning, inspection, repair, sub assembly, final assembly, and storage procedures.
 - 5.1 Students will remove and install a combustion case and liner following standard procedure.
 - 5.2 Students will safely disassemble and reassemble the compressor section of turbine engines following standard procedures for positioning the engine for disassembly and reassembly and for the sequence of work to be performed.
 - 5.3 Students will remove and reinstall a fuel nozzle in a turbine engine according to standards.
 - 5.4 Students will identify damaged turbine blades for heat damage according to standard.
 - 5.5 Students will recognize combustion chamber hot spots and identify possible causes.
 - 5.6 Students will make field adjustments to the fuel control of a turbine engine following standard operating principles.
 - 5.61 Students will recognize the effects of wear or damage on exhaust nozzles and tail pipes of various types.

- 5.62 Students will identify compressor surge.
- 5.63 Presented with the problem of performance loss, students will identify possible causes (e.g., compressor deterioration, turbine deterioration, instrument problems, lubrication problems).

K. Power Plant Lubrication Systems

- 1.0 Students will identify and select lubricants for various purposes.
 - 1.1 Students will identify and describe the types and properties of lubricants and their secondary functions (cooling, sealing, cleaning).
 - 1.2 Students will identify and verify acceptable lubricants using acceptable sources of information recommending correct lubricant use.

- 2.0 Students will inspect, check, service, troubleshoot and repair engine lubrication systems following standard procedures.
 - 2.1 Students will identify the components of a reciprocating engine lubricating system.
 - 2.2 Students will follow standard procedures to change oil according to recommended oil change intervals.
 - 2.3 Students will assure that all drains, screens and oil filling procedures adhere to standard safety parameters.
 - 2.4 Students will interpret FAA regulations pertaining to minimum expansion space requirements, filler opening markings, and design features of oil supply tanks.
 - 2.5 Students will describe the procedure for cleaning and testing oil tanks.
 - 2.6 Students will inspect, remove, clean and reinstall oil lines following Federal Aviation Regulations.
 - 2.7 Students will identify oil temperature regulations and describe oil cooler operation.
 - 2.8 Students will disassemble and reassemble an engine oil pump according to standard.
 - 2.9 Students will complete pre-oiling operations of an overhauled engine using appropriate equipment and standard procedures.
 - 2.10 Students will identify the probable source of metal particles found in oil screens by considering the various types of metals found in engine components and by the quantity of metal particles found.

- 3.0 Students will identify and describe the factors affecting oil consumption in a piston engine (e.g., condition of piston rings and valve guides and the general condition of the engine).

L. Engine Fuel Systems

- 1.0 Students will inspect, service, troubleshoot, and repair fuel systems and system components following standard procedures.

- 1.1 When servicing or repairing fuel lines, students will follow Federal Aviation Regulations governing finger strainers, vents, expansion space and sumps, and the routing and size of fuel lines.
- 1.2 Students will describe the operation and identify the features of fuel pumps, remove and install various types of fuel pumps, vane type, diaphragm type according to standard procedure.
- 1.3 Students will identify the various types of auxiliary and boost pumps, describe their operation, remove and install according to standard procedure.
- 1.4 Students will adjust idle speed and mixture on a carbureted engine using safety precautions and standard operating practices.

M. Fuel Metering Systems

- 1.0 Students will know parts and operating principles of fuel metering systems.
 - 1.1 Students will explain the operation of carburetors on internal combustion engines.
 - 1.4 Students will describe the pressure type carburetor and its operation.
 - 1.5 Students will describe direct fuel injection system and its operation.
 - 1.7 Students will describe the design and operation of direct fuel and pressure injection nozzles.
- 2.0 Students will inspect, service, troubleshoot, and repair fuel metering systems following standard procedures.
 - 2.1 Students will inspect, remove and install float type carburetors according to standard.
 - 2.2 Students will inspect, remove and install a pressure carburetor, or fuel injection system according to standard.
 - 2.3 Students will rig the fuel control unit on a static turbo-jet engine and trim the engine according to fuel flow schedules and operational limitations.
 - 2.4 Students will locate, remove, clean and reinstall screens in fuel metering system components according to standard.
- 3.0 Students will locate information about and inspect, check and service water injection systems following standard procedures.

N. Induction Systems

- 1.0 Students will inspect, troubleshoot, service and repair engine ice and rain control systems following standard procedures.
 - 1.1 Students will describe induction icing; identify its probable locations, its effect on engine performance and instrument indications.
 - 1.2 Students will describe the operation of thermal anti-icing systems for turbine engine air intakes, including heated air inlet ducts.

- 2.0 Students will inspect, service and repair heat exchangers and superchargers following standard procedures.
 - 2.1 Students will identify and describe the principle types of superchargers (e.g., mechanically driven, exhaust supercharger).
 - 2.2 Students will identify, inspect, service, and repair a supercharger system, including controls, following standard procedures.
 - 2.2 Students will explain heat exchanger operation, inspect, service and repair following standard procedures.

- 3.0 Students will inspect, check, service and repair carburetor air intake and induction manifolds following standard procedures.
 - 3.1 Students will inspect, service and repair an air intake duct, including ram air ducts, for a carbureted engine following standard procedure.
 - 3.3 Students will inspect, service and repair a carburetor heater system following standard procedures.
 - 3.3 Students will inspect and service air screens or air filters in the engine air intake according to standard.
 - 3.42 Students will inspect, service and repair an engine primer system following standard procedures.

O. Engine Cooling Systems

- 1.0 Students will inspect, troubleshoot, repair and service engine cooling systems following standard procedures.
 - 1.1 Students will trace the airflow directed and controlled so that heat transfer and dissipation takes place in all parts of the cylinder.
 - 1.2 Students will interpret information from the manufacturer's manual and describe the effects of excessive heat, excessive wear, baffles, augmentation tubes and fuel air ratios.
 - 1.3 Students will repair baffles and reprofile cylinder fins according to standards.
 - 1.4 Students will identify the materials used in baffles.

P. Exhaust Systems

- 1.0 Students will inspect, check, troubleshoot, service, and repair engine exhaust systems following standard procedures.
 - 1.1 Students will inspect an exhaust system and make a written report of condition.
 - 1.2 Students will describe, inspect, remove, replace, adjust, and repair joints in the exhaust system, including exhaust manifold joints, according to standards.

- 1.3 Students will remove, repair, and re-install exhaust manifolds according to standards.
- 1.4 Students will inspect and test, remove and re-install, exhaust heaters according to standards.
- 1.5 Students will identify the purpose of exhaust heaters.
- 1.6 Students will repair heater muffers according to standard.
- 1.7 Students will identify, inspect and describe the operation and purpose of turbo-superchargers.
- 1.8 Students will inspect power recovery turbines.
- 1.9 Students will identify the types and describe the operation of jet engine thrust reversers and noise suppressors.

Q Magneto Systems

- 1.0 Students will identify and overhaul magneto following standard procedures.
 - 1.1 Students will explain the electrical theory behind magneto operation.
 - 1.2 Students will disassemble, identify components, and reassemble a magneto according to standard.
 - 1.3 Students will prepare an engine for magneto installation and position the magneto following standard procedures.
 - 1.4 Students will inspect breaker cams according to standard.
 - 1.5 Students will identify the materials used in points.
 - 1.6 Students will install high-tension leads according to standard.
 - 1a. Students will know and describe what methods can be used to secure the ignition cable in the distributor block.
 - 1b. Students will explain why ignition harnesses are shielded.
 - 1.7 Students will use an ignition harness tester to inspect, according to standard, an ignition harness to identify shorter ignition leads and ignition lead faults.
 - 1.8 Students will describe the effect of faults in an ignition lead.
 - 1.9 Students will replace and correct faults in ignition leads according to standard.

R. Ignition and Harness System

- 1.0 Students will inspect, service, troubleshoot, and repair reciprocating and turbine engine ignition systems following standard procedures.
 - 1.1 Students will describe a typical ignition switch circuit.
 - 1.2 Students will inspect, troubleshoot, remove and re-install wiring to an ignition switch according to standard.
 - 1.3 Students will identify various types of ignition switches (e.g., single position, dual position, multi-position, start position, off-right-left and both positions).

- 1.4 Students will install, inspect, operate, troubleshoot and repair an ignition booster system according to standard.
- 1.5 Students will remove, inspect, recondition, test and re-install spark plugs according to standard.
- 1.6 Students will identify various types of spark plugs (e.g., shielded spark plugs, unshielded spark plugs, long reach spark plugs, short reach spark plugs, hot spark plugs, cold spark plugs).
- 1.7 Students will identify and describe the differences between piston engine and turbine engine ignition systems.

S. Electrical Systems

- 1.0 Students will know and describe types, purposes, applicability and operation of electrical fuses, circuit breakers, switches and wiring to electrical components.
 - 1.1 Students will identify the characteristics and uses of circuit breakers and fuses.
 - 1.2 Students will identify types of switches (e.g., normally open switches, normally closed switches, momentary switch, SPST, DPST, DPDT, 3PST) and their designations, and explain the nominal rating of switches.
 - 1.3 Students will determine current requirements for electrical components.
 - 1.4 Students will determine wire requirements for a specific installation.
 - 1.5 Students will determine the gauge of insulated electrical wire.
 - 1.6 Students will identify the procedures for wiring, wiring bundles, clamping, and why routing of wire is very important.
 - 1.7 Students will correctly interpret and apply the information contained in the electrical cable chart in AC43.13.2A, Acceptable Methods and Techniques.
 - 1.8 Given a specific installation requirement, students will select the appropriate aircraft switch and protective device.
 - 1.9 Students will identify the advantages and disadvantages of aluminum and copper wire.
- 2.0 Students will mount switches and connect wires to switches following standard procedures.
- 3.0 Students will install electrical terminals, junction boxes, splices, and bonding jumpers following standard procedures.
 - 3.1 Students will identify the different designs of junction boxes (e.g., aluminum alloy, stainless steel) and the mounting parameters for each.
 - 3.2 Students will correctly interpret AWG wire size designations and the information on electrical wire tables.
 - 3.3 Students will identify junction box wiring requirements.

- 3.3 Students will describe the internal arrangement of junction boxes and identify the purpose of drain holes.
 - 3.4 Students will identify the installation requirements and characteristics of terminal strips and barriers, terminal studs and other terminal hardware.
 - 3.5 Students will identify the purpose of shielding wiring and equipment and describe the methods for doing so.
 - 3.6 Students will prepare wire or cable for application of terminals following standard procedures and cable terminal strength requirements.
 - 3.7 Given specific applications, students will select the appropriate terminals for the applications by matching cable size with the type of terminal metal, the type of lug and the size of the lug.
 - 3.8 Students will identify special precautions related to insulating sleeves of terminals and the use of aluminum terminals.
 - 3.9 Students will perform various wire and cable splices according to standard.
 - 3.10 Students will identify the installation requirements, including allowable resistance, and characteristics of bonding jumpers and bonding connections.
- 4.0 Students will install and remove wiring in conduit following standard procedure.
- 4.1 Students will identify various types of aircraft electrical cables (e.g., aluminum wire, copper wire, shielded wire, unshielded wire).
 - 4.2 Students will remove damaged wiring from conduit according to standard.
 - 4.3 Students will clean conduit, prepare wires for pulling through conduit, and install wires according to standard.
 - 4.4 Students will check for correct circuit continuity.
- 5.0 Students will know and describe the use of quick-connect electrical connectors and the characteristics of high-and-low-tension electrical wiring.
- 5.1 Students will use quick-disconnect connector terminology (e.g., plugs, receptacles, male and female, pins and sockets) correctly.
 - 5.2 Students will identify the classes of connectors found in AC 43, 13-1
 - 5.3 Students will compare the applications of soldered wire connections with crimped wire connections.
 - 5.4 Students will identify causes of malfunctions with quick-connect electrical connectors (e.g., wires frayed or broken, pins bent, broken off, worn, corroded or loose, sockets enlarged or corroded).
 - 5.5 Students will identify and describe method of securing and insuring the safety of quick-connect connectors.
 - 5.6 Students will identify the installation requirements and characteristics of ignition high-tension wiring.
 - 5.7 Students will identify the installation requirements and characteristics of engine instrumentation wiring

- 5.8 Students will identify the installation, insulation, and shielding requirements and characteristics of low-tension wiring in engine areas (e.g., low-tension ignition primary wiring, thermocouple wiring).
- 6.0 Students will check, install and wire solenoid operated switches following standard procedures.
 - 6.1 Students will identify the installation requirements and characteristics of solenoid operated switches.
 - 6.2 Students will check the operation of a solenoid-operated switch, identify the symptoms of solenoid switch chatter, and determine the causes and effects of the chatter.
 - 6.3 Students will identify preventative and correction actions for solenoid switch chatter.
 - 6.4 Students will inspect, check, and repair solenoid operated valves for engine pneumatic functions following standard procedures.
 - 6.4a Purposes of solenoids as used in pneumatic valves
 - 6.4b Effects of power failure on a solenoid valve or switch
 - 6.4c Checking operation of solenoid valves
 - 6.4d Turbine engine starter switcher valves
 - 6.4e Solenoid hold-in switches
- 7.0 Students will check, troubleshoot, and repair an aircraft DC generator electrical system following standard procedures.
 - 7.1 Students will identify, describe the purpose of and the operation of DC electrical system components:
 - 7.1a Generator
 - 7.1b Voltage regulator
 - 7.1c Current and voltage indicators
 - 7.1d Reverse current relay
 - 7.2 Students will explain the purpose of making adjustments to equalize a circuit.
 - 7.3 Students will describe the effect of residual or stray magnetism in a generator field.
 - 7.4 Students will identify the effects of open and short circuits.

T. Engine Instrument Systems

- 1.0 Students will know and explain or describe the operation principles and installation, troubleshooting, and repair practices of thermocouples, ratiometer and resistance-temperatures-indicating systems (e.g. engine oil inlet and outlet, carburetor air temperature, turbine temperature sensing) for aircraft engines.
 - 1.1 Students will identify, inspect, correct/repair causes of incorrect indications in temperature indicating systems according to standard.

- 1.2 Students will apply accurate markings to glass faces of temperature-indicating instruments according to standard.
- 2.0 Students will know and explain or describe the operation principles, the installation, troubleshooting, and repair practices of pressure indicating and warning systems (e.g. manifold pressure, oil pressure, fuel pressure, turbine engine pressure ration (EPR)).
 - 2.1 Students will identify, inspect, correct/repair causes of incorrect indications in pressure-indicating and warning indicators according to standard.
 - 2.2 Students will apply accurate markings to the glass faces of pressure-indicating instruments according to standard.
- 3.0 Students will identify, inspect, troubleshoot and repair an engine tachometer system following standard procedures.
 - 3.1 Students will explain the difference between a flexible shaft tachometer and an electrical tachometer system.
 - 3.2 Students will identify causes of tachometer failure, electrical or cable systems.
- 4.0 Students will identify, inspect, troubleshoot and repair an aircraft fuel flow indicating system.
 - 4.1 Students will explain the difference between electrical and mechanical fuel flow systems.
 - 4.2 Students will describe the relationships between fuel flow and power output of engines.

U Engine Fire Protection Systems

- 1.0 Students will inspect, service, troubleshoot and repair fire detection and extinguishing systems following standard procedures.
 - 1.1 Students will inspect, troubleshoot and repair individual fire detectors and entire fire detection systems according to standard.
 - 1.2 Students will inspect, service, troubleshoot and repair engine fire extinguishing systems according to standard.
 - 1.3 Students will describe the operation of engine fire extinguisher discharge units including normal and thermal discharge indicator discs.
 - 1.4 Students will identify causes of fire extinguisher system failure.

V. Propellers

- 1.0 Students will know and describe or explain the design, operating principles, and differences among aircraft propellers (e.g. metal or wood fixed pitch,

- hydromatic, counter-weight, ground adjustable, variable pitch, feathering, and reversible).
- 1.1 Students will identify and describes the forces acting on a propeller.
 - 1.2 Students will measure propeller blade pitch angles and adjust or change blade pitch following standard procedures.
 - 1.3 Students will locate and interpret propeller “critical range” information for violations and identify the importance of balance to proper propeller operation.
 - 1.4 Students will describe the procedures for balancing fixed pitch and variable pitch propellers.
 - 1.5 Students will identify the information that must appear on a “critical page” vibration placard.
 - 1.6 Students will attach a placard to the instrument panel according to standard.
 - 1.7 Students will locate and interpret “static limit” information for fixed pitch propeller RPM limits.
- 2.0 Students will remove, install, inspect, services, and repair propellers according to standard.
- 2.1 Students will use proper propellers nomenclature correctly.
 - 2.2 Students will remove and install propellers on flanged or splined shafts according to standard.
 - 2.3 Students will inspect and measure the track according to standard and will identify the factors that affect the track of a propeller.
 - 2.4 According to standard, students will inspect and identify probable location of defects in the metal tipping of propellers.
 - 2.5 Students will smooth nicks, cuts, and scratches in the leading and trailing edges of metal propellers following standard procedures.
 - 2.6 Students will identify probably locations of oil leaks in propellers and service them following standard procedures.
 - 2.7 Students will identify and select propeller lubrications according to manufactures specifications.
- 3.0 Students will identify components, inspect, service, and repair propeller control systems according to standard.
- 3.1 Students will remove, install, externally adjust and maintain a propeller governor on an engine according to standard.
 - 3.2 Students will inspect the governor or engine drive pads according to standard for possible damage to present the current seal of the engine.
 - 3.3 Students will determine the direction of the governor rotation to that of the engine drive.
 - 3.4 Students will identify the mechanical adjustments that are possible on a governor.

- 3.5 Students will locate reference information for propeller synchronization system.
- 3.6 Students will describe the operation of propeller synchronizing systems.
- 4.0 Students will identify, inspect, service and repair propeller anti-icing systems according to standard.
 - 4.1 Students will identify components and describe the operation of alcohol or thermal propeller anti-icing systems.
 - 4.2 Student will service the anti-ice system of a propeller using standard procedures.

Technical Related Courses

In addition to the required academic and vocational courses, students in this career area will take the following technical related courses:

- Related Math

APPENDIX

Career Advisory Board Members & Business Partners

Career Program Data Review

Career Program of Study

AVIATION TECHNOLOGY

Delcastle Technical High School

Grade 9

MATH (M)		ENGLISH (ELA)	
3140 Math Concepts	1	2210 English	1
3150 Math Applications	1	2110 English	1
3170 Algebra	1	_____	_____
3710 Algebra	1	_____	_____
3300 Integrated Math 1	1	_____	_____
3400 Integrated Math 2	1	_____	_____
3500 Integrated Math 3	1	_____	_____

SCIENCE (S)		SOCIAL STUDIES (SS)	
4200 Physical Science	1	5200 Global Studies	1
4110 Physical Science	1	5110 Global Studies	1
_____	_____	_____	_____
_____	_____	_____	_____

VOCATIONAL and OTHER COURSES

1910 T. C. Exploration	2	_____	_____
3200 PASS Math	0.5	2200 PASS Literacy	0.5
3100 PASS Math	0.5	2100 PASS Literacy	0.5

Note: The grade in which Health and Physical Education are offered varies from school to school.

Grade 10

MATH (M)		ENGLISH (ELA)	
3150 Math Applications	1	2220 English	1
3170 Algebra	1	2120 English	1
3300 Integrated Math 1	1	_____	_____
3400 Integrated Math 2	1	_____	_____
3500 Integrated Math 3	1	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

SCIENCE (S)		SOCIAL STUDIES (SS)	
4300 Biology	1	5300 Civics/Economics	1
4120 Biology	1	5120 Civics/Economics	1
_____	_____	_____	_____
_____	_____	_____	_____

VOCATIONAL and OTHER COURSES

(3 VOCATIONAL CREDITS ARE REQUIRED.)

1432 Aviation 1	_____	Driver Education	_____
_____ P.E. / Health	_____	_____ Spanish I or II	1

Grade 11

MATH (M)		ENGLISH (ELA)	
3170 Algebra	1	2230 English	1
3400 Integrated Math 2	1	2130 English	1
3500 Integrated Math 3	1	2235 Honors English	1
3750 Intermediate Algebra	1	_____	_____
3820 Stat/Algebra	1	_____	_____

SCIENCE (S)		SOCIAL STUDIES (SS)	
4400 Integrated Science	1	5400 U.S. History	1
4170 Integrated Science	1	5130 U.S. History	1
4500 Chemistry*	1	_____	_____
4600 Physics*	1	_____	_____

VOCATIONAL and OTHER COURSES

(3 VOCATIONAL CREDITS ARE REQUIRED.)

1433 Aviation 2	_____	_____	_____
_____ P.E. / Health	_____	_____ Spanish I or II	1

(PR) Denotes a program requirement

* Denotes prerequisites must be met in order to enroll.

Grade 12

MATH (M)		ENGLISH (ELA)	
3310 Integrated Math I CT	1	2240 English	1
3500 Integrated Math 3	1	2140 English	1
3750 Intermediate Algebra	1	2245 Honors English	1
3820 Stat/Algebra	1	2245 Co-op English	1
3950 Pre Calculus A	1	_____	_____
3960 Pre Calculus B	1	_____	_____
_____ 9 Co-op	_____	_____	_____

SCIENCE (S)		SOCIAL STUDIES (SS)	
4500 Chemistry*	1	5500 World History*	1
4600 Physics*	1	5600 Cont. Citizenship	1
4700 Environmental Sci.*	1	5910 Law & Order	0.5
4130 Environmental Sci.*	1	5810 Intro. to Sociology	0.5
_____ 9 Co-op	_____	5920 Intro. to Psychology	0.5
_____	_____	_____ 9 Co-op	_____

VOCATIONAL and OTHER COURSES

(3 VOCATIONAL CREDITS ARE REQUIRED.)

1434 Aviation 3	_____	_____	_____
_____ P.E. / Health	_____	_____ Spanish I or II	1

Graduation Requirements:

Total = 24.5/26.5

Vocational = 9/10 credits

ELA = 4 credits

M = 3/4 credits

SS = 3/4 credits, to include U.S. History

S = 3/4 credits, to include Biology & a physical science

Health = 0.5 credits

Phys. Ed. = 1.0 credits

NCCVT School District

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District MISSION STATEMENT

The New Castle County Vocational-Technical School District is dedicated to the development of competent, caring and productive students for a diverse and changing society through high standards, quality teaching, instructional technology, and community partnerships.

9/4/09



