

**Driftless Region YouthFlight** is a 501c3 organization that will provide classroom curriculum and hands-on training to students to encourage them to enter a career in aircraft maintenance.

High school age students will join us in a completely remodeled aircraft hangar at the La Crosse municipal Airport where they will learn how to safely use tools, practice shop safety, learn manufacturing and maintenance vernacular, parts inventory systems, manufacturing traceability and work in progress systems all while building an ELSA aircraft, a Van's RV-12iS.

These first year students will be encouraged to become second year students where they will learn leadership and management skills by becoming mentors to the following first year students who are building their own aircraft. Second year students will also learn how to work with aerospace composite materials, 21st century manufacturing such as Fusion 360 CAD/CAM design software, CNC routers, lasers and water jets, as well as 3-D printers.

Also, utilizing our collaboration with the School District of La Crosse, and a technical college offering aviation courses, second year students will also earn transcripted college credits by taking FAA aviation maintenance technician classes at our facility. We believe this measurable approach to provide relevant, real world skills and up to date aerospace education will more effectively encourage the participants to enter a career as an aviation maintenance technician.

Beyond the two year cycle provided to high school age participants, we will offer age appropriate activities to younger potential students to garner interest in becoming a future participant in our program.

The program is free of charge to all participants made possible through grants, donations, corporate partnerships and fundraising.

# Why it's needed

The lack of interest in aviation maintenance is a growing concern throughout the aerospace industry. The Aviation Technician Education Council has found that new entrants make up just 2% of the AMT population annually, while 30% of the workforce is at or near retirement.

To put these figures into context, the FAA airman database includes 285,000 certified mechanics with the average age of 51, and 27% of the mechanic population at least 64 years old or higher. This is concerning because although 6,200 new mechanics join the industry each year, new A&Ps will not keep pace with retirements.

Enrolment in the 171 certified active aviation A&P programs in the U.S. is about 17,800, while the FAA-approved capacity in those programs is around 34,000. This shows that there is plenty of room for new students. Youth in our area need to be made aware that aviation maintenance is a strong, viable career for them to consider. *Driftless Region YouthFlight* will do exactly that.

# **Student Application Process**

The School District of La Crosse's STEM programs and engineering programs in the coulee region will be the source of students for *Driftless Region YouthFlight*. Those who wish to participate in our program will first attend a social gathering at the facility with their parents or guardians where all will be given a tour of the facility, be shown demonstrations of procedures of aircraft construction, and have the opportunity to meet the mentors and ask about the program and how it works. The purpose of this gathering is to get to know the students and their parents.

Potential students who showed promise during the first meeting will be invited back again for an afternoon at the facility with their parents or guardians. Students will have the opportunity to learn how to use hand tools and make a simple assembly. The quality of this assembly has little bearing on their placement in the program, this is only an exercise to see how the students interact with each other and see how they operate as part of a team. This day will end with a cookout at the facility to engage with each other in a relaxed, informal manner. Mentors will confer once again to make their final choices as to who will be allowed in the program. Applications will then be handed out to the parents of the accepted students..

This approach to program acceptance is the one that is used by other youth aviation programs that enjoy the most success. Allowing anyone into the program has proven difficult to some

organizations. After meeting with and talking to many of these organizers over the past several years, we are convinced that this is a process that makes the program run much smoother for both students and mentors.

# **Program Description**

On Tuesday and Wednesday nights from 6:00 to 8:30 up to 20 students will work under the guidance of experienced adult mentors to build a two seat Van's RV 12is ELSA Aircraft. If at least 20 students are enrolled, the project can be completed during the term of a standard school year, from August to May.

The first several nights of the program will take place in a classroom where the students will be shown the scope of the project, what tools and equipment they will be using, how to inventory the thousands of parts included in the six kits that comprise the aircraft, how to read and understand instructions and plans, and how to inspect and prepare the parts for construction.

They will be shown how to mark up their individual set of plans as they progress through each task to document their actions and progress. They will be shown how to read, understand and fill out *acceptable criteria sheets*. ACS's document that each step in the construction of every sub assembly and assembly, consistently meets a standard of quality control that is required to build an aircraft that is of the highest quality and is safe to fly.

In the following weeks students will be shown how to safely operate all of the tools that they will use to build the aircraft. They will participate in an exercise where they will build a simple assembly using the various techniques used in aircraft construction where they will learn:

-Understanding mechanical drawings -Preparing metal parts

-Edge finishing -Drilling

-Deburring -Dimpling

-Countersinking -Hand Squeezing Rivets
-Back Riveting -Pneumatic Riveting

Once all students have been taught and practiced all of these basic skills they will build a "Van's Toolbox" as a last step before aircraft construction begins. Each student can keep this toolbox for their own use as they see fit.

On subsequent nights they will work together as teams to open the crates that contain the aircraft kits and inspect the contents. They will document and inventory the parts and pieces. They will open bags of hardware to identify and separate them into storage systems that will be used during the construction of the aircraft. They will prepare their respective workspaces in preparation of the first sub assemblies to be constructed. When all of the pre-build tasks have been completed during those first several weeks, under supervision, students will begin the construction of a Van's RV12is aircraft.

The purpose of this program is to teach and reinforce life skills, they just happen to be building an airplane. They will be learning to work as a team and develop leadership skills. They will be learning college level information about manufacturing practices and systems. Most importantly, they will experience and practice these things, not merely be taught these things.

The supervision will be one mentor per five-student team. Twenty students will be accepted the first year and increased each year as long as qualified mentors can be added. We imagine forty students to be the maximum in any given year, with twenty on the assembly floor and twenty in classrooms or working with CNC equipment, 3-D printers and other related projects.

**Driftless Region YouthFlight** will not be all work and no play. Guest speakers from various industries will give presentations on non-build nights to round out the students' experience and education, and some nights will end early to offer parents a chance to be shown in detail, the progress made by the students. There will also, on occasion, be weekend events held at our facility that will include the friends and families of the students.

# **Building the RV 12**

Van's Aircraft, Inc. is an American kit aircraft manufacturer, founded by Richard "Van" VanGrunsven in 1973. Van's RV series of aircraft, from the single-seat RV-3 to the latest RV-14, are all-aluminum, low-wing monoplanes of monocoque construction. The RV series of airplanes has been extremely successful, and as of November 2019 about 10,600 RV kits had been completed and flown, and thousands more are under construction. Completion rates currently average about 1.5 per day, making the series the most numerous of all homebuilt aircraft.

### Typical "build night" explained:

- -Mentor explains the operation to the team
- -Mentor briefs the operation to the team leader
- -Team leader reads back the task to the mentor and their team

- -Team begins task under supervision of mentor
- -Plans are followed exactly as printed
- -Students will use "Acceptable criteria sheet" during each step
  - -Deburring completed correctly?
  - -Edge margin correct?
  - -Torque verified?
  - -This is manufacturing quality control
- -Each step is broken down into tasks
- -Each student or team completes one task at a time
- -These tasks create sub-assemblies
- -Sub assemblies are documented in Project management software then

inventoried

- -Sub-assemblies are brought together to make assemblies
- -Assemblies are brought together to make components
- -Components are brought together to make units
- -There are six basic units:
- -Empennage, center section, wings, powerplant, avionics package & finishing kit

Because the scope of the project is so big, it will be possible to keep all students busy learning and working by using production management software. Whenever a *sub assembly* is completed, it will be tagged with a sequential tracking number and entered into inventory. Utilizing the production software, the sub assembly will be located and retrieved at a later time with other *sub assemblies* to fabricate an *assembly*. This *assembly* will be tagged with its own tracking number and returned to inventory so that it can be located and retrieved when the construction plans call for its introduction into the project. This method of construction is not only an efficient way of keeping the students busy in between the layered segments of construction, it demonstrates to them on a smaller scale, how larger production and fabrication facilities operate in the real world.

Small mistakes are inevitable during the thousands of operations in the building of an aircraft, and students will use these opportunities to learn how to recognize and report these mistakes. They will learn that admitting a mistake is a big part of working on a winning team. They will learn how to use teamwork to solve a problem. They will learn what is the best practice to repair or correct the mistake. And also during this process, they will discover how to mitigate mistakes in the future through communication and documentation of their work.

# **Benefit to the Community**

The board of directors of **Driftless Region YouthFlight** will determine which other aviation themed organizations may use the meeting room in the building for their activities. Access to the hangar and ramp will be strictly regulated.

Because the hangar is on the flightline, its interior design, location of doors and design of the security system will prevent access to the hangar and ramp by unauthorized persons. This will be achieved by needing to badge through several doors using issued magnetic badges with unique I.D.s. The door lockout design on man doors and the hangar door will prevent unauthorized persons from accessing the ramp while maintaining fire code exit standards.

The front meeting space that can be accessed from the street will be <u>two</u> locked doors away from ramp access at all times, per design.

Board authorized EAA Chapters will be allowed to use the building for Young Eagles flights. Young Eagles is an EAA program that offers free airplane rides to youth ages 8-17 every second Saturday April through October.

**Driftless Region YouthFlight** is also the ideal facility for regional Boy Scout troops to study for and earn their aviation merit badge.

Part of the remodel of the building is to replace the current hangar door with dose to the original sized 60' door. As part of being a good neighbor, *Driftless Region YouthFlight* would offer available hangar space to Colgan Air Services as overflow cover in case of emergencies, violent weather, airshow parking or VIP aircraft storage. We understand that large, ramp-front hangar space is a premium at KLSE and we would want to be the best tenants of that space for the benefit of the entire airport.

**Driftless Region YouthFlight** will be creating a program that instills positive messages, educates and inspires youth to enter a career in aviation, and demonstrates to participants how to grow from learners to team leaders in an adult-level manufacturing environment. The effect on their self esteem and connection to community can only be a positive one. Many area youth organizations can benefit from **Driftless Region YouthFlight** by working with our organization as a recruiting partner or to visit on field trips to inspire growth in their own organizations.

**Driftless Region YouthFlight** will work in partnership with the School District of La Crossel, higher education and manufacturing professionals to ensure that what we teach will have a measurable, practical application in real world work environments.

# **Philosophy of Program**

This is not an after school program. During their time at *Driftless Region YouthFlight*, students will learn two very important things; The responsibilities of making a commitment, and time management. School comes first, but is not an excuse for missing a work night. Students must learn to schedule their days so they have all of their responsibilities taken care of before a work night begins. Only real emergencies are acceptable excuses for missing a work night. Students should treat this program just like a job; show up on time and with the right attitude. Parents will need to commit as well, assuring that the students worknight schedule is open and that they have safe transportation to and from the airport. Teamwork and leadership will be taught and demonstrated by students and staff. Group leaders will be created from top performing kids.

Maximum advantage of *Driftless Region Youthflight* can be achieved if each student attends for two years. First year students will focus on building a Vans RV12iS, and second year students will engage in composite construction technology, hydraulics, electronics and FAA Aviation Maintenance Technician classes that will earn them transcribed college credits.

By taking advantage of the ability to remove the stowable wings on the RV12 and load it in an enclosed trailer, students will have the opportunity to travel with their completed plane to trade shows and events. Local Home Shows, Community events, Deke Slayton Airfest in La Crosse and regional STEM shows. Also, all students will be invited to attend EAA Airventure with parents and chaperones to display their aircraft at the largest airshow in the world.

\*\*Driftless Region YouthFlight\*\* will have our own exhibit display space at EAA Airventure where students can meet and interact with people from around the world, while exhibiting the aircraft that they built. This week-long event will be a tremendous opportunity for the students.

As the program progresses and becomes more popular with students, teachers and parents, **Driftless Region YouthFlight** will broaden its scope to incorporate training and experience in Solid Works and Fusion 360 CAD/CAM software as well as 3-D printers and CNC routers. Students will also learn how to weld on both steel and aluminum using TIG and MIG methods.

One of the keystone goals is to develop a relationship with Delta airlines so that it will be possible to acquire timed-out components of actual commercial aircraft and this is where simulating an actual repair facility can really come to life.

Students could use a real jet engine that is no longer airworthy to disassemble, inspect, document and re-assemble. Used landing gear assemblies that would otherwise be turned into scrap would be the perfect platforms to use to learn and study how aircraft hydraulic systems work.

# Capitalization

**Driftless Region YouthFlight** will initially be capitalized by seeking \$2M in donations from local benefactors. \$1M is earmarked for the hangar remodel, and \$1M is for initial tool purchasing, the first two Vans kits and student Airventure attendance.

The first aircraft built by the students in year one, will be used as a display at varying trade shows that the students will participate in. All subsequent aircraft built by students will be auctioned off (sweepstakes) each year to provide additional working capital for the program, generally \$300K per aircraft.

The possibility of monetizing the space to offset expenses should be explored. Advances in experimental category aircraft are happening at an accelerated rate and the board should be open to the possibility that a business that deals with experimental category aircraft would want to lease space from *Driftless Region YouthFlight*. An operating experimental category aviation business in the hangar would provide great optics for the youth who attend the program.

However, at no time will any activity or business that competes with Colgan Air Services be allowed to happen in the facility, and this includes maintenance and flight training.

## **Organization & Management**

All Adults who are in any way involved with *Driftless Region YouthFlight* will need to complete a background check to insure the safety of the students. This background check will need to be completed annually in order to maintain any relationship with the program.

**Driftless Region YouthFlight** will be governed by a board of directors, and led by an executive director, Wolfgang Rittgers. Separate from the board, advisors and adult mentors will assist the executive director during build nights as well as organizing events and activities that are not build nights.

The executive director will be responsible for all building and grounds maintenance and upkeep such as snow removal, grass mowing, and regular cleaning and maintenance of the facility.

The board of directors meets every second Tuesday of the month.

# **Aviation Course Curriculum**

# Safety/Fasteners/Engines/Principles of Operations

#### 1. General Safety

- a. Hazardous Materials
- b. PPE and proper clothing
- c. Ergonomics / lift safely
- d. Clean work area
- e. Tool safety
- f. General shop safety
- g. OSHA 10 hour osha certification General Industry
  - i. Intro to OSHA
  - ii. PPE
  - iii. Industrial hygiene
  - iv. Preventing workplace violence
  - v. Walking working surfaces
  - vi. Hazard communication
  - vii. Bloodborne pathogens,
  - viii. Safety and health programs
  - ix. Emergency action plans
  - x. Materials handling and storge
  - xi. Ergonomics
  - xii. Avoiding Electrocution hazards
  - xiii. Machine Guarding
  - xiv. Safe driving practices
  - xv. Safety and health programs
  - xvi. Hand and power tools
  - xvii. Welding and cutting

### 2. Tools and Measuring Instruments

- a. Basic hand tools
- b. Power tools
- c. Specialty tools
- d. Measuring Instruments
  - i. Standard ruler reading
  - ii. Vernier/standard/digital micrometers
  - iii. Dial/Vernier/digital calipers
  - iv. Telescoping gauges

- v. Inside micrometers
- vi. .....

#### 3. Fasteners

- a. Threaded fasteners
- b. Set screws
- c. Self-tapping screws
- d. Bolts
- e. Nuts
- f. Lock nuts
- g. Thread nomenclature/fit
- h. Torque settings and wrench
  - i. How to tighten and loosen threaded fasteners (patterns)
- i. Tapping
- j. Washers
- k. Pins
- I. Thread adhesives
- m. Rivets
- n. Safety wire

#### 4. Principles of Operation.

- a. Basic four stroke engine operation
  - i. Intake, compression, power(combustion), exhaust
  - ii. Parts
  - iii. Valve train assembly
    - 1. Valve in block
    - 2. OHC
    - 3. OHV
    - 4. DOV
  - iv. Fuel
    - 1. Carburetors
      - a. Air fuel mixture
      - b. Atmospheric pressure/vacuum
      - c. Venturi principle
      - d. Types of carburetors
        - i. Diaphragm
        - ii. Float type
        - iii. Natural draft
        - iv. Up draft
        - v. Down draft
      - e. Acceleration system/well

- f. Idle circuit
- g. Economizer circuit
- h. Part throttle circuit
- f. Full throttle circuit
- j. Choke Circuit
- k. Governors
- I. Air cleaners

#### 2. Fuel injection

- a. Oxygen sensor
- b. Ignition module
- c. Manifold pressure sensor
- d. Throttle position Sensor
- e. Fuel pressure regulator
- f. Fuel injector
- g. Fuel pump
- h. Crankshaft/camshaft position sensor
- i. Intake air temp sensor
- i. Engine control unit
- 3. Ignition Systems
- 4. Lubrication Systems
- 5. Cooling Systems
- b. Basic two stroke operation

### 5. Reciprocating engine

- a. Radial
  - i. Parts
  - ii. Principles of operation
  - iii. Firing order
  - iv. Valve mechanism
- b. Opposed
- c. V-type
- d. Inline
- e. Wankel

### 6. Gas Turbine engines

- a. Turbo prop
  - i. Engine Parts
    - 1. Prop
    - 2. Gearbox
    - 3. Shaft

- 4. Compressor
- 5. Combustion chamber
- 6. Turbine
- 7. Exhaust
- ii. Fuel systems
- iii. Vacuum and electrical systems
- b. Turbofan
  - i. Fan
  - ii. Compressor/Centrifugal
  - iii. Combustion Chamber
  - iv. Hp turbine
  - v. Lp turbine
- c. Turbojet
  - i. Air intake
  - ii. Compression
  - iii. Combustion chambers
  - iv. Turbine
  - v. Exhaust/nozzle
- d. Turboshaft

e.

# High School Science Credit Through Central High School (.5 credits)

# 7. Aviation Training requirements

- a. Pilot certificates/requirements
- b. Training Programs
- c. Medical
- d. A&P school/Programs

#### 8. Aircraft basics

- a. Parts of an Airplane
- b. Controls
- c. Flight instruments
- d. Fundamental maneuvers
- e. Take offs/landings
- f. Flight simulation

## 9. Principles of Flight

- a. Forces of flight
  - i. Lift
    - 1. Air density

- 2. Wing area
- 3. Velocity/airspeed
- 4. Angle of attack
- 5. Airfoil Design
- 6. High/low pressure
- ii. Weight
- iii. Trust
  - 1. Deceleration
  - 2. Acceleration
  - 3. Straight and level flight
  - 4. Low speed
  - 5. Cruising
  - 6. High speed
- iv. Drag
  - 1. Induced drag
  - 2. Wingtip vortices
  - 3. Parasite drag
    - a. Profile
    - b. Interference
    - c. Skin friction
- b. Bernoulli's Principle
- c. Newton's laws
- d. Weight and Balance
- e. Center of gravity
- f. Stalls

#### 10.Weather

- a. Aircraft performance
- b. Aviation meteorology
- c. Weather forecast

## 11.Navigation

- a. Cross country planning
- b. E6B
- c. Sky vector

## 12. Federal aviation regulations

- a. Purpose
- b. Title 14
- c. Special federal aviation regulations

### Tech school Dual Credit

#### 13. Human factors

- a. How they affect
  - i. Mental state
  - ii. Human capabilities
  - iii. Human limitations
  - iv. Human-machine interface
  - v. Emotional state
  - vi. Physical state
  - vii. Environmental conditions
- b. Human factor disciplines
  - i. Clinical psychology
  - ii. Experimental psychology
  - iii. Anthropometrics
  - iv. Computer science
  - v. Cognitive science
  - vi. Safety engineering
  - vii. Medical science
  - viii. Organizational psychology
  - ix. Educational Psychology
  - x. Industrial engineering
- c. Factors affecting AMT's
  - i. Boring repetitive jobs personal life problems
  - ii. Poorly designed testing for skill or knowledge
  - iii. Poor instructions
  - iv. Fumes
  - v. Loud noises
  - vi. Incomplete or incorrect documentation
  - vii. Weather
  - viii. Substance abuse
  - ix. Fatigue
  - x. Poor tool control
  - xi. Lack of parts
  - xii. Slippery floors
  - xiii. Poor communication
  - xiv. Unrealistic deadlines
  - xv. Poor training
  - xvi. Lack of tools or equipment

#### d. P.E.A.R Model

- i. People who do the job
  - 1. Physical
  - 2. Physiological
  - 3. Psychological
  - 4. Psychosocial
- ii. Environment in which they work
  - 1. Physical
  - 2. Organizational
- iii. Actions they perform
  - 1. Job task analysis
    - a. Steps to perform a task
    - b. Sequence of activity
    - c. Number of people involved
    - d. Information control requirements
    - e. Knowledge of requirements
    - f. Skill requirements
    - g. Altitude requirements
    - h. Certification requirements
    - i. Inspection requirements
- iv. Resources necessary to complete the job.
  - 1. Paperwork/documentation
  - 2. Manuals
  - 3. Procedures
  - 4. Tools/test equipment
  - 5. Computers/software
  - 6. Fixtures/work stands/handling equipment
  - 7. Materials
  - 8. Training
- e. Types of Errors
  - i. Unintentional
  - ii. Intentional
  - iii. Active
  - iv. Latent
- f. The dirty dozen Mitigating the risk
  - i. Lack of communication
  - ii. Complacency
  - iii. Lack of Knowledge
  - iv. Distraction
  - v. Tack of teamwork
  - vi. Fatigue

- vii. Lack of Resources
- viii. Pressure
- ix. Lack of assertiveness
- x. Stress
- xi. Lack of awareness
- xii. Norms

#### 14. Maintenance Forms and Records

- a. Checklists
  - i. 100 hour inspection
  - ii. Annual inspection
  - iii. Progressive inspections
  - iv. Other required or approved
  - v. Total time in Service
    - 1. Airframe
    - 2. Engines
    - 3. Propellers
  - vi. Status of life/limited parts
    - 1. Airframe
    - 2. Engine
    - 3. Propeller
  - vii. Time since last overhaul
  - viii. Identification of current inspection
  - ix. Current status of applicable airworthiness directives
  - x. Copy of current t major alterations.
    - 1. Airframe
    - 2. Engine
    - 3. Propeller
- b. Log Books
- c. Airworthiness directives
- d. Safety directives
- e. Service bulletins
- f. Entries into aircraft maintenance records









# **BOARD OF DIRECTORS**

Wolfgang Rittgers - President

Mario Youakim - Vice President

**Cristina Kovacs - Secretary** 

Pat Stephens - Fundraising

Kelly Colgan Hammen - Colgan Air Services

Britta Rotering - Supervisor, School District of La Crosse -

Chuck Berendes - Legal Council

# Purpose of Driftless Region Youthflight

- 1. Be an asset to our community.
- 2. Bring awareness to the general aviation side of the airport.
- 3. Provide a safe, positive space for youth to build their self esteem in.
- 4. Provide education on cutting edge aerospace manufacturing technology.
- 5. Provide a one of a kind career development program in cooperation with the School district of La Crosse to city youth.
- 6. Bring national attention to La Crosse.



School District of La Crosse actions		Create Summer School enrichment opportunity for MS students	Draft/Estimate La Crosse SD Course Ilmeline	Negotiate "dual credit" opportunities with the WTCS System	Offer Summer School session #1	Offer possible Summer School session #2	Finalize course proposals to the SDL Teaching & Learning Committee	Sumit Courses for 23-24 approval		Create academy model/marketing/PR to students in the district and families		Student redistration process, let identification of course selection		Finalize Master Schedule for teaching staff, request bussing to location, create student schedules.	Hold family orientation for students involved			Driftless Flight Academy Kick Offl Open House/PK/Student Showcase																										
Cost	\$23K - Vans Aircraff							\$500K escro	\$70K - Vans Alrcraft								\$400-\$500K	\$25,000																										
Action	Order full kit #1				Major fundraising allowed														andp class (unit) begins										Shop class begins	Classroom courses begin										Shap class begins	Classroom courses begin			
Action	Obtain 25% downpayment for Aircraft #1	Begin negotlations to help open up hangar			Earliest approval of 501c3 status	Obtain 500K #1	Obtain 500K #2	Obtain lease on hangar / begin demo work	Construction of aircraft begins in separate shop	Hangar Remodel	t t	Hangar Kemodel Hangar Remodel	Hangar Remodel	Hangar Remodel	Hangar Remodel	Hangar Remodel / Demo aircraft complete	Move Into hangar - 9 Months of construction	Build workbenches / Outfit hangar with tools	First year of program begins							First year of program complete			Second year of program begins							Connect year of program complete	Second year or program compare			Third year of program begins				
	Dec 2022	Jan	March	April May	June	July	Aug	oct 6	Nov	Dec	2023	CBJ 497	Mar	April	May	June	ylub	Aug	Sept Sept	Nov	Dec	2024	Jan	Mar	April	May	enn¢ √n¢	Aug	Sept	Oct	No.	2025	Jan	Feb	Mar	i :	Way	July	Aug	Sept	5 0	DBC O	2026	