2017

Northwest UAV

A GLOBAL COMPANY

Where Precision and Reliability Soar!

REV C
AS9100
Quality Management Certified
ISO9001 CERTIFIED

PROPULSION & PAYLOAD INTEGRATION SPECIALISTS

Northwest UAV
A GLOBAL COMPANY

PROPULSION & PAYLOAD IN

INDEX

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NW-44 APPROVED FOR EXPORT

UAV ENGINES

Northwest UAV has delivered thousands of propulsion modules to defense contractors since 2005. We provide our clients cost effective solutions for their specific land, sea or air unmanned applications – COTS solutions, custom or build-to-print engine systems.

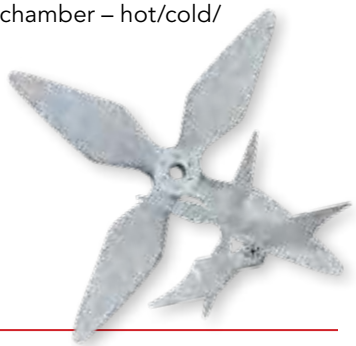
HIGH VOLUME PRODUCTION MANAGEMENT

NWUAV utilizes Intuitive ERP for high volume production management which provides the ability to implement LEAN manufacturing techniques and still retain the capacity to produce more than 500 engine modules and associated subsystems a month.

MORE THAN ENGINES

Electrical & Mechanical Engineering Teams

- Fuel injection/ignition systems
- Custom designed fuel tanks
- Low noise propeller blade designs design (patented)
- Cylinder head temperature mitigation solutions
- Propeller mold design and machining for carbon-fiber layup
- Muffler design (patented)
- Permanent magnet starter/generator systems
- Circuit card design
- Silicon mold design
- Castings
- Wire harness design
- Electrical assembly
- Environmental controlled engine endurance chamber – hot/cold/humidity



CUSTOM & MOBILE ENGINE TESTING

With our one-of-kind mobile test stands, you can operate, test, develop and record engine performance data locally and remotely. Customizable to meet your specific requirements.

Custom Engine Test Cell (CETC) is a self-contained 20 or 40 ft. unit, with a single test stand and optional hatches for larger aircraft.

Mobile Test Stand (MTS) is a smaller test unit and can be towed with a standard passenger truck.

Units are available for purchase or lease. We offer delivery and setup worldwide and will train your personnel.

The CETC and MTS are approved for export.

TEGRATION SPECIALISTS

CAPABILITIES

Facility Test Cells

- Remote monitoring and control
- Environmental temperature controlled altitude chamber
- Durability/Endurance evaluation (FAR 33)
- Accessories testing: Pumps/fuel tanks/ injectors/camera's
- Exhaust analyzers – 5 gas
- Fuel flow transmitters – minimum 1cc/min
- Engine tuning/fuel economy mapping
- In-Cylinder pressure mapping @ 100 KHz
- Engine/propeller power and torque mapping
- Propeller noise characterization per MIL-STD-1474D
- FAR 35 based propeller testing
- Mass airflow flow bench
- Engine break-in stations with DAQ's
- Propeller dyno
- Small engine dyno
- Large engine dyno (180 hp)

In-House Machine Shop for Prototyping & Production

- EOS 3D Printing equipment – EOSINT P 760, P 730 & P 390
- Zeiss Contrua® G2 RDS CMM
- Aluminum and Ti-Castings utilizing polystyrene lost patterns
- Carbon-Fiber layup
- Mori Seiki Machining Centers
- 5-Axis CNC
- Mori Seiki Lathes
- Vibratory finishers

PARTNERSHIPS & DISTRIBUTION

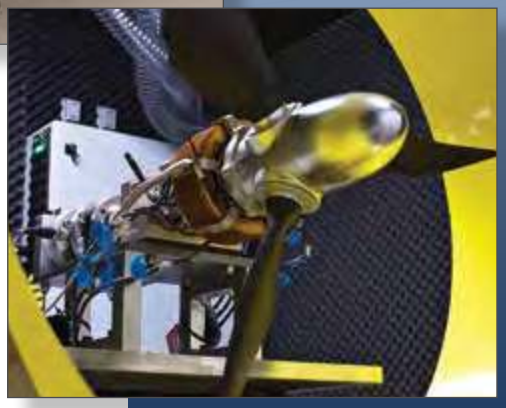
- Brican E100 UAV Aircraft
- Pegasus Servo Actuators
- uAvionix UAV Sense & Avoid
- RCV Engines
- Rotron Rotary Engines
- Distributor: NASAM, Japan

ENGINE DEVELOPMENT

Development & Manufacturing

- NW-44 EFI Multi-Fuel Engine
- NW-88 Multi-Fuel Engine
- NW-500 Gas Engine
- Electric Propulsion Units
- Rotron Rotary Engines
- RCV Engines
- Variable Pitch Propeller (VPP) systems design (patented)

AS9100 / DCAA COMPLIANT



Northwest UAV Research, Development & Manufacturing Advantages: NWUAV offers a wide variety of sophisticated on-site research, development, testing and manufacturing capabilities. These competencies are vertically integrated within our organization, producing quick turn results for our clients. We will provide services from the initial design concept all the way through to production within our AS9100/ISO9001 certified operation.

State-Of-The-Art Testing Facilities On-Site

NWUAV NW-44 Multi-Fuel Engine

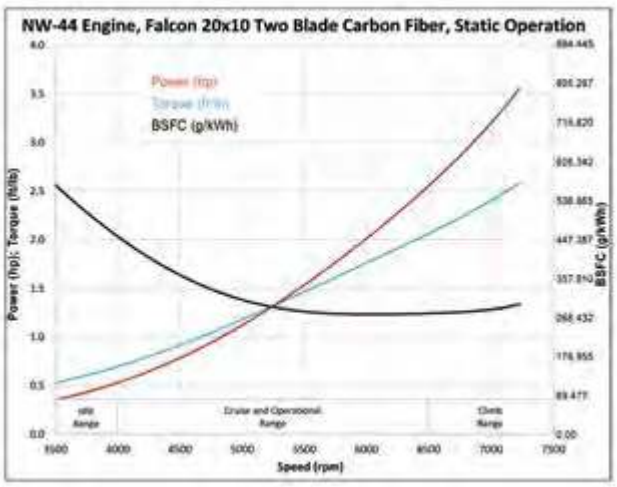
NWUAV purpose-built NW-44 multi-fuel (heavy-fuel/gas) engine is designed and built for unmanned aircraft systems, low altitude, long endurance aircraft and portable power generation.

Overview

The NW-44 engine is designed to gain STANAG 4671 and FAA Certification. Typical civilian uses include monitoring for climate change, forest fires, and mapping glaciers as well as supporting police, fire, and law enforcement bureaus.

The NW-44 engine is scalable for use in various classes of aircraft with multiple fuel types and incorporate design criteria and specifications not available with hobby based engine designs. The NW-44 can also be scaled with multiple cylinder configurations giving it flexibility beyond designs currently available.

Advanced materials incorporate characteristics needed for lighter weight and better performing engines when utilizing heavy-fuels (Jet-A1/JP-5/Jp-8, TS1, F35).



Incorporating NWUAV's Fuel Injection Sy: Pitch Propeller (VPP), with the NW-44 engine will dramatically enhance system performance.

The NW-44 has been tested to launch loads greater than 30G's and deceleration loads in excess of 15G's. In March 2016, FAR 33 Endurance Test of the NW-44 was sucessfully completed following stringent 14CFR part 33.49 guidelines.

Features

- Custom 250-watt direct drive generator with a 6/12/28-volt Generator Control Unit (GCU)
- Engines include: Barometric pressure, Active Cylinder Head Temperature (ACHT) control, intake air temperature sensors and heavy-fuel cold start provisions
- ECU Data Acquisition System (DAQ) contains 1 GB of storage for logging up to 31 standard engine parameters
- CAN or Serial Bus communication for external devices such as autopilots and avionics
- Lightweight muffler integrates proprietary designs, for very low acoustic detectability
- Conformal design mitigates unwanted parasitic drag, which increases fuel efficiency
- Interfaces with Piccolo and other popular autopilots
- Multiple generator output configurations available to fit customer Hp, electrical output and overall weight requirements
- The NW-44 engine is manufactured entirely in the USA to ensure future engine/system availability
- Includes: Fuel injection, cylinder head with twin spark plugs fired by dual 25kv ignition coils and features a secured cap provision with appropriate shielding and military-grade connectors

Call for specifications

With All The Extra Features Built Into The NW-44 Multi-Fuel Engine, You Will Be Flying Faster & Quieter At Any Altitude.

NWUAV NW-88 Twin-Cylinder Multi-Fuel Engine

29-68 kg (65-150 lbs.)
Weight Class*

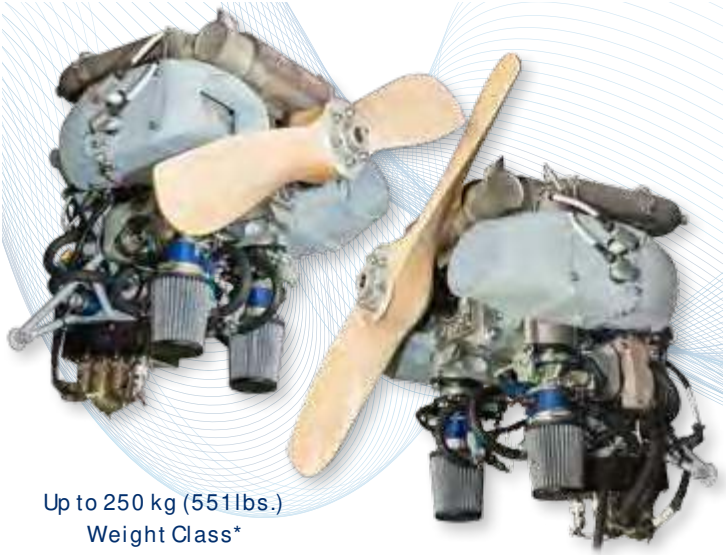
NW-88 Overview

The NW-88 is a purpose-built, twin-cylinder multi-fuel engine currently in development. The NW-88 closely resembles the NW-44 in all design criteria except bigger. Designed to gain STANAG 4671 and FAA Certification. This engine is for use with 29-68 kg weight class aircraft.

Features & Capabilities

- Heavy-Fuel – Boxer Configuration
- Fuel Injection
- Less drag means increased endurance
- Tractor & pusher
- Designed for High altitude long endurance aircraft
- Includes 250 Watts of usable power generation
- Commercial off-the-shelf
- Made in the USA
- No ITAR restrictions

NWUAV NW-500 Gas Engine



Up to 250 kg (551lbs.)
Weight Class*

NW-500 Overview

The NW-500 is a turn-key propulsion system that comes as a modular bolt on engine with a simple interface and fully self-contained. It has a vibration isolation system to minimize interference with sensitive autopilot and payload electronics. It is electronically fuel injected to maximize system flexibility, endurance, and reliability.

The NW-500 is currently deployed, and has been successfully integrated and flown on multiple missions.

Features & Capabilities

- 521CC (31.79 cu in), gas engine
- 2700-6350 RPM range (engine speed limited by ECU), 45-50 hp (32 kW) maximum power at 6150 rpm
- Maximum continuous speed 6350 rpm
- Two-cylinders with dual 25kv ignition coils and spark plugs
- Air cooled with Active Cylinder Head Temperature (ACHT) control
- 700-Watt, 28 VDC generator control unit, full output at 3000 rpm (generator is scalable up to 2000+ watts)

*Engine application is highly dependent on airframe factors including aerodynamics, propeller selection, and operational concept – please contact NWUAV for guidance.

Brican E100 UAV Partners with the NW-44 Gas Engine

Brican Flight Systems & Northwest UAV have teamed to produce one of the most technologically advanced long endurance UAVs available!

BRICAN FLIGHT SYSTEMS INC.

A POWERFUL PARTNERSHIP This system integrates our proven NW-44 gas engine with the superbly designed Brican Flight System E100 – creating a long-endurance UAV capable of safely and reliably carrying out your mission.

Brican E100 UAV Overview

One look is all it takes to realize the E100 Unmanned Aircraft System is different. Every aspect of this meticulous machine looks and feels like a real aircraft. And that's because it is one.

In an industry where off-the-shelf systems are being promoted as breakthroughs, where hobbyist parts from Hong Kong are being cobbled together and labelled "UAS" – the E100 comes with an unparalleled pedigree.

The Brican team has produced an aircraft whose avionics, build quality, reliability and payload capacity are second to none. It is the most sophisticated, made-in-Canada, fixed-wing UAS.

Features

- 20-lb payload with 10-hour fuel duration
- Portable all-terrain launcher/landing system
- Ultra-fast 20-minute deployment
- Standard with Transponder "C"
- Autopilot complete with DGPS precision GPS landing system
- Aircraft meets flight loads compliant to "Best Practice Criteria" (FAR Part 23)
- Multiple payload/sensor options

Rotron Rotary Engines

The Rotron RT600 LCR-EXE rotary engine is shaping a new generation of tier 2 class UAV engines.This compact, twin rotor engine delivers maximum mission-ready availability and bottom-line value, allowing operators to fly longer with superior performance.

Features

- 500 Hours TBO high endurance capability
- High power-to-weight ratio with increased efficiency
- Small engine size allows greater fuel and payload flexibility for multi-mission capability
- Low levels of torsional vibration and zero radial vibration at mid-to-high rpm range
- Fuel injection and ECU controlled altitude compensation fitted as standard
- Available in pusher or tractor (puller) configurations, with either direct or reduction drive

RT600LCR-EXE

SPECIFICATIONS

	RT600 LCR-EXE-53HP
Engine Type	Twin Rotor, Spark Ignition
Fuel Type	Gasoline/AVGAS
Max Power[3]	53HP @ 5,000 rpm
Max Continuous[3]	53HP @ 5,000 rpm
Max Torque[3]	76 lbs/ft @ 5,000 rpm
Power-To-Weight Ratio	2.50HP/kg
Displacement	600cc
Block Weight[1]	46.7 lbs/21.2 kg
Starting Device[2]	Onboard/External
Compression Ratio	9.6:1
Cooling	Air Ejection & Liquid Cooling
Fuel Consumption @ 3,700 rpm cruise	0.58 lbs/per HP/per HOUR
Min/Max Ambient	-20 TO 50°C / -4 TO 122°F
Generator	300W/Starter Generator from 1KW to 5KW
Additional Features	ECU Controlled Altitude Compensation

SUITABLE FOR UAVS REQUIRING 500 HRS TBO

[1]Core block weight only. [2]Onboard starter optional. [3]DIN70020

ROTRON

Rotron Rotary Engines

The Rotron Rotary UAV Engine Line features a revolutionary single-motor design. The Wankel cycle engine is a 4-stroke rotary engine, making it smaller, more fuel efficient, more powerful and more reliable than other equivalent piston engines.

ROTRON

RT300EFI

RT300HFE

RT600EFI

RT600HFE

Overview

The revolutionary Rotron Rotary UAV engine is considerably smaller, lighter, and contains fewer moving parts than piston engines of equivalent power output. Every engine is fine-tuned to its optimum operating efficiency and safety levels before shipment. If your application requires a different power configuration but needs to keep the same package size, custom options are available.

Features

- High power-to-weight ratio with increased efficiency
- Compact package size allows greater fuel and payload flexibility for multi-mission capability
- Fuel injection and ECU controlled altitude compensation fitted as standard
- Higher endurance lifecycle
- Available in pusher or tractor (puller) configurations, with either direct or reduction drive

SPECIFICATIONS

	RT300EFI-32HP	RT300HFE-31HP	RT600EFI-58HP	RT600HFE-56HP
Engine Type	Single Rotor, Spark Ignition	Single Rotor, Spark Ignition	Twin Rotor, Spark Ignition	Twin Rotor, Spark Ignition
Fuel Type	Gasoline/AVGAS	JP5/JP8/JET A1	Gasoline/AVGAS	JP5/JP8/JET A1
Max Power[3]	32HP @ 7,500 rpm	31HP @ 7,500 rpm	58HP @ 7,500 rpm	56HP @ 7,500 rpm
Max Continuous[3]	30HP @ 6,500 rpm	28HP @ 6,500 rpm	54HP @ 6,500 rpm	52HP @ 6,500 rpm
Max Torque[3]	24.32 lbs/ft @ 6,500 rpm	22.6 lbs/ft @ 6,500 rpm	43.55 lbs/ft @ 6500 rpm	42 lbs/ft @ 6,500 rpm
Power-To-Weight Ratio	2.68HP/kg	2.5HP/kg	2.73HP/kg	2.6HP/kg
Displacement	300cc	300cc	600cc	600cc
Block Weight[1]	26.2 lbs/11.9 kg	27.1 lbs/12.3 kg	46.7 lbs/21.2 kg	46.7 lbs/21.2 kg
Starting Device[2]	Onboard/External, All Models			
Compression Ratio	9.6:1	8.5:1	9.6:1	8.5:1
Cooling	Liquid Cooling, All Models			
Fuel Consumption @ 6000 rpm cruise	0.527 lbs/per HP/per HOUR	0.58 lbs/per HP/per HOUR	0.61 lbs/per HP/per hour	0.67 lbs/per HP/per hour
Min/Max Ambient	-20 TO 50°C / -4 TO 122°F, All Models			
Generator	300W/Starter Generator from 1KW to 5KW, All Models			
Additional Features	ECU Controlled Altitude Compensation, All Models			

[1]Core block weight only. [2]Onboard starter optional. [3]DIN70020

RCV Single & Twin cylinder Heavy-Fuel UAV Engines

NWUAV's line of RCV Engines can be configured for multiple applications. Utilizing a patented rotary valve 4-stroke technology these engines are available for unmanned aerial vehicles, micro power generation, and other defense and civilian uses.

RCV20

RCV35

RCV70

RCV Engine Overview

NWUAV can configure the RCV engine architecture to achieve 400 hours durability, 1 hp/lb power to weight and 0.5 lb/hp.hr fuel efficiency. The robust combustion system is tolerant of a wide range of fuels and octane ratings. The engine is easy to calibrate and will provide consistent performance over a wide range of ambient conditions. With controlled operating conditions there is minimal carbonization operating on heavy-fuels. The newest engine is the RCV20 Inline. A micro 4-stroke heavy-fuel engine, designed to replace battery powered UAV systems and signifi-cantly extend range beyond 8 hours.

Features

- Dual ignition
- Clockwise or anticlockwise rotation
- Cooling fan and shrouds for helicopter use
- Generator
- Multi-fuel operation
- Side starting
- Twins can run on one cylinder in limp home mode
- Muffler and Airbox designs available for low acoustic signature

SPECIFICATIONS

	RCV20/Single Cylinder	RCV35/Single Cylinder	RCV70/Twin Cylinder
Type	Rotary Valve, Spark Ignition, 4-Stroke		
Cooling	Air Cooling		
Lubrication	JASO-FD Type FD 2-Stroke Oil Ratio 20:1		
Fueling	Low Pressure Manifold Injection with Altitude Compensation		
Heavy-Fuel Starting	Cold Start Assisted with Installed Cartridge Heaters		
Capacity	20cc	35cc	70cc
Speed Range	2,000 to 10,000 RPM		
Power (JP8)	1.0kW (1.3 hp) at 9,000 RPM	2.0kW (2.7 hp) at 8,500 RPM	4.0kW (5.4 hp) at 8,500 RPM
Fuel (JP8)			
Consumption	350 g/kW.hr (0.58 lb/hp.hr)	350 g/kW.hr (0.58 lb/hp.hr)	330 g/kW.hr (0.54 lb/hp.hr)
Weight Control	0.90 Kg (2 lbs)*	1.9 Kg (4.2 lbs)**	2.7 Kg (5.9 lbs)**
TBO-VTOL	150 hours		
TBO-Fixed Wing	300 hours		
Capacity Range	10 to 20 cc	25 to 35 cc	50 to 70 cc

* Projected core engine weight. Weight does not include generator, propeller, ECU or fuel pump.

** Weight includes full engine assembly ready to run with fuel system, ignition, ECU and exhaust. Weight does not include propeller, generator or any cowling.

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PRODUCTS

BATTERY BACKUP MODULE (BBM)

The BBM is an all-in-one power management system. This combination of automatic bus transfer and battery charger selectively switches between ships power, shore power and battery power. It feeds back digital telemetry such as current, voltage, and charge state on the CAN bus. The module automatically manages balanced recharging for the LiPo battery pack.

Features

- Weight 1.7 kg for a 6-amp hour module
- Footprint 6 Ah module (L x W x H): 7.97 in x 5.16 in x 3.81 in (202.5mm x 131mm x 96.7mm)
- EMI shielded
- EMC compatible
- Designed for IP 64
- Shock and vibration resistant
- Scaleable for other battery sizes

Electrical Specifications

- Input Voltage Range
  - Ship/Shore Power 25 to 30-volts
  - Normal Output Voltage 25 to 30-volts
- Output Power
  - Ship/Shore 300-watts continuous
  - Battery Transition 200-watts up to 5 minutes
  - Battery Continuous 125-watts
- Switching
  - Continuous power provided with 21-volts minimum and 32-volts maximum
  - Normal output voltage resumed in no more than 100 µs

FUEL DELIVERY SYSTEM (FDS)

The NWUAV EFI Fuel Delivery System reliably delivers clean high pressure fuel for UAV electronic fuel injection solutions. The system provides a conformal header tank with acrobatic pickup, fuel filtration with serviceable filter, fuel pump, pressure regulation, Bingo level and pressure sensing functions all in a small footprint. Components are compatible with either gasoline or heavy-fuels.

When combined with the NWUAV SW1.0 ECU the pump can be dynamically driven to maintain fuel pressure or at a fixed rate with the relief valve managing rail pressure. When the proper injector and sensors are added along with the EFI Fuel System and SW1.0 ECU a full EFI solution is obtained.

Specifications

- Pressurized fuel up to 60 psi
- Rail pressure signal
- Bingo level status signal
- Custom fuel delivery systems available. The header (manifold) can be easily integrated into other tank designs.

Features

- Empty weight 410.5 g (dry/no tubing)
- Full weight with Fuel 726.5 g (total fuel weight 316 g)
- Footprint (L x W x H): 6.70 in x 4.04 in x 2.65 in (170.21mm x 102.64mm x 67.39mm)
- Self-priming with acrobatic fuel pickup
- The EFI Fuel Delivery System is easily customized for your application; flow rate, pressure, footprint/layout, and more.

ENGINE CONTROL UNIT (ECU)– SW1.0

The NWUAV SW1.0 Engine Control Unit is a purpose-built ECU for Unmanned Aircraft of all types. The SW1.0 is a ruggedized system intended to operate in extreme environments encountered during UAS operations. NWUAV has incorporated features missing in other ECUs.

Features

- ECU Data inputs include: IAT, BARO, MAP, O2 sensor, TPS, CHT, EGT, coolant temp, fuel temperature, fuel pressure
- Compatible with systems from 10 to 30-volts
- CAN bus protocol communication system
- EMI shielded and fully programmable ignition curve/Alpha-N
- Multiple configurable digital/analog outputs
- Multiple spare configurable analog/digital inputs
- Fuel pump output driver for active fuel pump control
- Throttle transition compensation
- Extensive self-diagnostic capabilities
- Capable of controlling single and multiple cylinder piston and rotary engines
- Adjustable rev limits including primary, secondary and boost limits
- Adaptable to most existing engine systems
- Configurable daughter board can be added for specific customer needs
- Up to 500 hours of data recording
- Sequential, batch or semi-sequential injector firing
- MIL-SPEC 51 Pin Micro-D connector
- Real time tuning available with configurable fuel map grid
- Primary/Secondary main fuel and ignition tables
- Closed loop control with adaptive learning
- Starting, air temp, coolant temp and barometric pressure compensations
- Adjustable dwell as a function of battery voltage
- Software compatible with common autopilots
- Dimensions (L x W x H): 4.6 in x 3.3 in x 0.975 in (117mm x 110mm x 248mm)
- Weight: 175 grams

GENERATOR CONTROL UNIT FOR PERMANENT MAGNET ALTERNATORS (GCU)

The Generator Control Unit allows you to mix and match the voltage and power requirements for your system. The design is modular and scalable to your needs.

The GCU Manages the variable voltage and frequency inputs from a permanent magnet alternator system and outputs stable DC power. The system is available for 28V or 21V, 12V, and 6V ± 10% trimmable outputs in any power and voltage combination.

Our Commercial Off The Shelf (COTS) SUAV module is designed to fit the needs for most Small Unmanned Air Vehicles (SUAV's). It supplies up to 280-watts of usable DC power at 28V, 12V, and 6V.

System Features

- Light weight 400 grams
- Small footprint (W x L x H) 2.64 in x 4.37 in x 1.73 in (67mm x 111mm x 44mm)
- EMI shielded
- EMC compatible
- Designed to meet IPC 67
- Shock and Vibration Resistant
- Requires minimal cooling air
- Operating temperatures -40C to 90C
- MIL grade connectors Electrical Specifications
- NO forced air cooling fans

Electrical Specifications

- Combined power 280-watts
- 28V at 10-amp max
- 12V at 10-amp max
- 6V at 3-amp max
- Voltage droop is 1V no load to full load
- CAN bus reporting of output voltages and currents, total power and board temp
- CAN bus compliance to ISO 11898-1
- Three-phase input voltage of 150 to 400-volts

GENERATOR – FRAMELESS/ BRUSHLESS

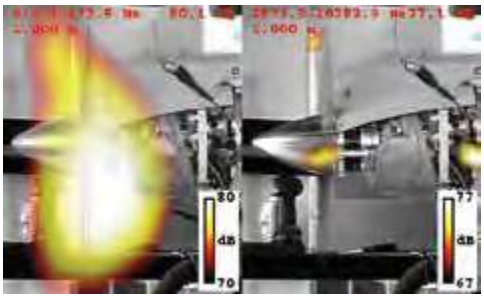
NWUAV's frameless brushless generator is designed to fit directly into your application using the systems mechanics to hold the generator. The generator is designed to be highly efficient, with high-grade magnets and materials in a compact design.

Features

- Stator dimensions: 1.4 in thick, 3.05 in OD, 2.46 in ID (35mm thick, 77mm OD, 62mm ID)
- Stator weight: 314 grams
- Rotor dimensions: 0.78 in thick, 2.44 in OD, 1.90 in ID (20mm thick, 62mm OD, 48mm ID)
- Rotor weight: 144 grams
- Max operational temperature: 250F
- 90% efficient
- High-grade permanent magnets:
  - 150-volts at 3000 RPM
  - 400-volts at 8000 RPM
- Power output 310-watts

NWUAV QUIET UAV MUFFLERS

The NWUAV muffler was designed to solve two technical problems inherent in current muffler designs: Excessive noise and air flow blockages within the structure of the muffler.



Example of muffler testing for demonstrative purposes only.

NWUAV technicians have developed a patented muffler that suppresses noise by using a novel design and innovative packing material. The muffler, due to its unique internal design can help to significantly reduce noise while maintaining or even increasing engine power compared to other designs.

NWUAV has beat out several competitors with an in-house muffler design that is currently being staged for deployment on UAV's. The unique design results in lower fuel consumption, higher power, and lower noise signature.

Sizes Available

Conformal designs are available for single and multiple cylinder engines. The design can be developed to fit inside client's air vehicle. NWUAV takes into account the aircraft envelope size, and airflow available for the optimal design. This produces a lower acoustic signature and optimal engine performance.

PEGASUS STANDARD & REDUNDANT SERVO ACTUATORS

Pegasus Actuators GmbH

PEGASUS Servo Actuators are electromechanical drive units of extraordinary power density, precision and reliability. Pegasus offers a wide range of affordable Servo Actuators for multiple rotary and fixed wing UAV applications from 30 lbs up to 1000 lbs maximum takeoff weight (MTOW).

PA-R-440-7

The PA-R-440-7 servo actuator with 35Nm maximum torque is the Powerhouse of our product range.

PA-R-340-9

By modifying our PA-R-340-9 servo's hardware and software, we significantly increased the power output of this well proven servo actuator.

PA-R-340-7

By modifying our PA-R-340-7 servo's hardware and software, we significantly increased the power output of this well proven servo actuator.

PA-R-250-9

We implemented the high-output brushless DC motor technology, refined the gear train and servo case design. Its power-to-weight relation speaks for itself.

PA-R-250-8

For applications with high demands on powerful torque and high speed positioning. It combines extraordinary reliability and precision.

PA-R-205-6

The PA-R-205-6, it's the power version of our PA-R-205-4 type with modified software and a much more powerful motor.

SERVO CHARACTERISTICS

Model Number	PA-R-440-7	PA-R-340-9	PA-R-340-7	PA-R-250-9	PA-R-250-8	PA-R-205-6
Continuous Torque	20Nm (14.8 Lb-ft)	1200Ncm (1700 oz-in)	850Ncm (1200 oz-in)	400Ncm (560 oz-in)	300Ncm (425 oz-in)	180Ncm (255 oz-in)
Maximum Torque	>35Nm (>26 LB-ft)	>2100Ncm (>2970 oz-in)	>1800Ncm (>2500 oz-in)	>700Ncm (>992 oz-in)	>500Ncm (>710 oz-in)	>350Ncm (>495 oz-in)
Operating Voltage	18-32 VDC	18-32 VDC	12 VDC & 18-32 VDC	24 VDC	12 or 24 VDC	6, 12 or 24 VDC
Travel Angle	±90° (Standard PA-ME/Contactless Angle Sensor), Alternative Angles On Request					
No Load Speed	100°/sec @ 24 VDC 120°/sec @ 28 VDC	200°/sec @ 24 VDC 230°/sec @ 28 VDC	200°/sec @ 24 VDC 240°/sec @ 28 VDC	180°/sec	205°/sec	210°/sec
PC-Board	Digital – Programmable – with Differential and Analog Sensor Feedback					
Signal	PWM Signal, TTL Level (Standard Configuration); PWM Signal, Differential (RS485 Transceiver) (optional) or RS485 Data Protocol (optional)					
Motor	BLDC Motor	BLDC Motor	BLDC Motor	Hi-Output BLDC Motor Neodym Magnet	BLDC Motor	DC Motor
Gear Train	10 Roller Bearings	8 Ball Races or Roller Bearings and PA-SC Overload Protection Output Shaft	Hardened Steel, Spur Gear Type with 8 Ball Races or Roller Bearings	6 Ball Races	6 Ball Races and Rigid Output Shaft (Optional with Slip Clutch Output Shaft PA-SC)	6 Ball Races
Case	Aluminum, Water & Dust Protected (IP67) with Solid Horizontal and Vertical Fixation	4-Point Fixation	4-Point Fixation	4-Point Fixation	4-Point Fixation	4-Point Fixation
Weight	1500 g (3.3 lb)	930 g (33 oz)	780 g (27.5 oz)	335 g (11.82 oz)	285 g (10.05 oz)	150 g (5.3 oz)

Northwest UAV is the proud distributor for the Pegasus UAV Servo Actuator product line.

- Gear-train service lifetime is improved by means of a dependable oil bath lubrication
- Actuators are shielded to minimize EMI/RFI susceptibility and magnetic interference
- Vibration tolerance is enhanced
- Aerospace specified connectors are incorporated
- Internal pc-board design and manufacturing complies with IPC-A-600 Class 3
- Redundant Servo's include PA-ME3 magnetic deflection angle sensor

PA-R-205-4

Despite its comparatively small size, it is suitable for all kinds of industrial motion/remote control applications demanding extraordinary reliability and lifetime service.

PA-R-135-4

This micro low-profile servo provides ultimate reliability, precision & power output in a tiny but rugged package. Currently the world's smallest professional servo in its class.

PA-RR-340-9

The PA-RR-340-9 is based on the well proven PA-R-340-9 and is a stand-alone solution. This means that all redundancy related process cycles are performed internally by the actuator.

PA-RR-340-7

The PA-RR-340-7 is based on the well proven PA-R-340-7 and is a stand-alone solution. This means that all redundancy related process cycles are performed internally by the actuator.

PA-RR-260-9

For applications where the PA-RR-260-8 type actuator seems to be just not powerful enough, the Pegasus PA-RR-260-9 type will generate the missing force to support your demand.

PA-RR-260-8

The world's first redundant UAV Servo Actuator for small and medium sized UAV systems, enhancing servo actuator reliability to an unparalleled level.

SERVO CHARACTERISTICS			REDUNDANT SERVO CHARACTERISTICS			
Continuous Torque	80Ncm (113 oz-in)	30Ncm (42 oz-in)	1200Ncm (1700 oz-in)	850Ncm (1200 oz-in)	400Ncm (560 oz-in)	300Ncm (425 oz-in)
Maximum Torque	>200Ncm (>283 oz-in)	>60Ncm (>84 oz-in)	>2100Ncm (>2970 oz-in)	>1800Ncm (>2500 oz-in)	>700Ncm (>992 oz-in)	>500Ncm (>710 oz-in)
Operating Voltage	6, 12 or 24 VDC	6, 12 or 24 VDC	18-32 VDC, Typical 24-28 VDC	18-32 VDC, Typical 24-28 VDC	18-32 VDC	18-32 VDC
Travel Angle	±90° (Standard PA-ME/Contactless Angle Sensor), Alternative Angles On Request		315° (PA-ME³/Redundant Contactless Angle Sensor)			
No Load Speed	335°/sec	425°/sec	200°/sec @ 24 VDC 230°/sec @ 28 VDC	200°/sec @ 24 VDC 240°/sec @ 28 VDC	170°/sec @ 24 VDC 210°/sec @ 28 VDC	195°/sec @ 24 VDC 230°/sec @ 28 VDC
PC-Board	Digital – Programmable – with Differential and Analog Sensor Feedback		Dual Servo Controller with Digital Position Feedback			
Signal	PWM Signal, TTL Level (Standard Configuration); PWM Signal, Differential (RS485 Transceiver) (optional) or RS485 Data Protocol (optional)		Redundant RS485 Data Protocol			
Motor	DC Motor	DC Motor	Duel BLDC Motor	Duel BLDC Motor	Duel Hi-Output BLDC Motor	Duel BLDC Motor
			Neodym Magnet			
Gear Train	6 Ball Races and Rigid Output Shaft (Optional with Slip Clutch Output Shaft PA-SC)	2 Ball Races with PA-SC Gear Train Protection Output Shaft	Hardened Steel, Spur Gear Type with 10 Ball Races and Roller Bearings	10 Ball Races and Roller Bearings and PA-SC Overload Protection Output Shaft	8 Ball Races	8 Ball Races
Case	Aluminum, Water & Dust Protected (IP67) with Solid Horizontal and Vertical					
	4-Point Fixation	3-Point Fixation	4-Point Fixation	4-Point Fixation	4-Point Fixation	4-Point Fixation
Weight	130 g (4.6 oz)	65 g (2.3 oz)	1450 g (51 oz)	1230 g (43 oz)	575 g (20.6 oz)	490 g (17.3 oz)

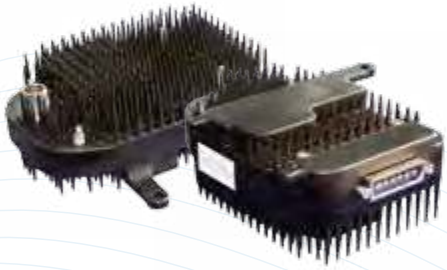
NW-44 MULTI-FUEL

NORTHWEST UAV: Turnkey Solutions for the UAS Industry

Northwest UAV is World industry leader in UAS Propulsion System Manufacturing, providing quality, made in the USA products to clients around the globe. At NWUAV we understand UAS requirements inside and out, incorporating a total lifecycle approach that provides top quality, high-performance solutions to enhance any system platform. Our onsite Engineering Group is dedicated to our company mission of delivering reliable, cost effective UAS systems, and their experience is proven. When you need to get in the air and stay there, you need Northwest UAV. NWUAV is a AS9100 | ISO 9001 certified supplier.

BATTERY BACKUP MODULE (BBM)

- Full power system management
- Switches between generator shorepower and battery
- Uninterrupted backup battery power



GENERATOR CONTROL UNIT (GCU)

- 280-Watts
- Outputs: 28V, 12V & 6V
- Trimmable to your application

FUEL DELIVERY SYSTEM (FDS)

- Pressurized fuel for EFI, filtered with acrobatic pickup
- Regulated fuel pressure
- Pressure and Bingo level sensors

ENGINE CONTROL UNIT (ECU)

- Purpose built for UAVs
- Highly versatile baseline, customizable

ECU WIRE HARNESS

- Mil SPEC connectors
- EMI/EMC protected

REV C AS9100 Quality Management Certified ISO9001 CERTIFIED

ITAR Compliant International Traffic in Arms Regulations

bsi. ANAB ACCREDITED MANAGEMENT SYSTEMS CERTIFICATION BODY

DEFENSE LOGISTICS AGENCY AVIATION QUALITY ASSURANCE COMPLIANT

AS9100

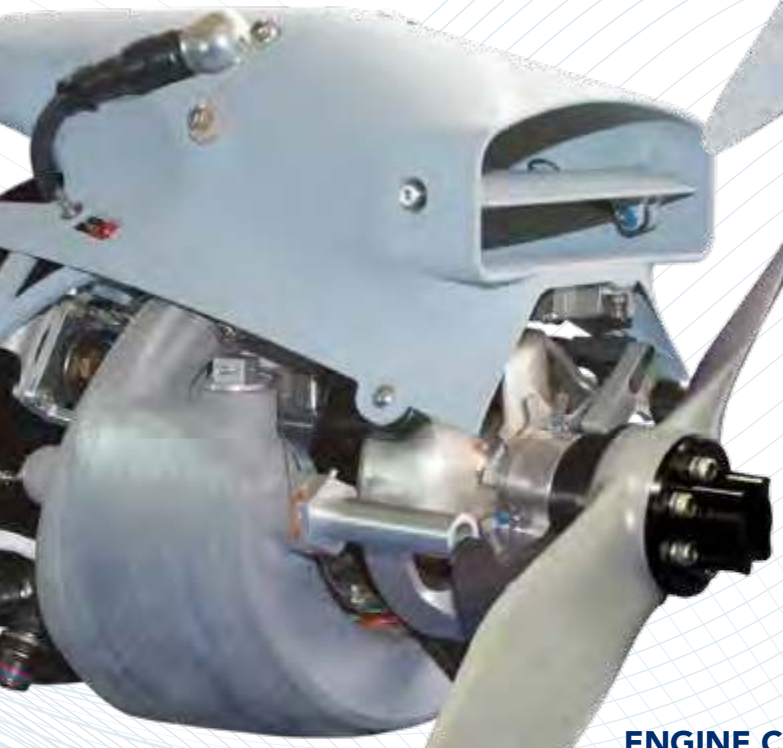
[HEAVY-FUEL/GAS] UAV ENGINE

ROTOR & STRATOR

- 310-Watts
- 90+% Efficient

PROPELLER

- Exclusive aerodynamic design
- Low noise



ENGINE CORE

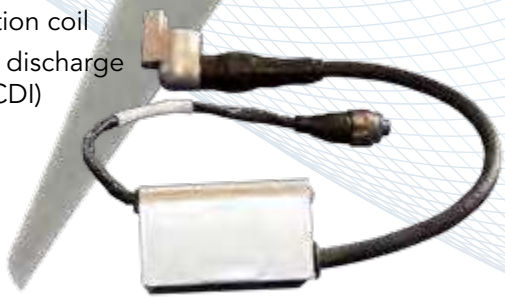
44cc

MUFFLER (PATENTED)

- Lightweight conformal design
- Extreme acoustic suppression

IGNITION

- 12-Volt power
- 25kV ignition coil
- Capacitor discharge ignition (CDI)



The NW-44 EFI is one of the most configurable small UAV engines on the market today. Purpose-built to handle aircraft from approximately 18 to 34 kg* (40-75 lbs.) depending on mission requirements. The NW-44 EFI core and sub-system components mitigate ITAR and end of life concerns and are primed to meet pending FAA Certification requirements.

APPROVED FOR EXPORT

uAVIONIX TRANSPONDERS | GPS RECEIVERS | ADS-B TRANSCREIVERS

SENSE & AVOID FOR DRONES
nd general aviation. The smallest, lightest and lowest power ADS-B and Air Traffic integration solutions for UAS available

- Mode S UAS Transponders
- Small and light FYXnav GPS Receivers
- Unmanned ADS-B UAS Transceivers & Receivers

For more information please contact
Northwest UAV at contact@nwuav.com

LOW NOISE PROPELLER DESIGN & CONSTRUCTION AND VARIABLE PITCH/CONSTANT SPEED PROPELLERS (VPP)

NWUAV utilizes propriety code developed for racing airplanes to improve maximum speed and efficiency. Performance efficiency and acoustical signature are the driving metrics for this low-noise propeller design.

The NWUAV low noise propeller design is a unique solution to an elliptical lift distribution along the blade span, making efficient use of the entire span. The thrust generated tapers off to virtually none at the tip, greatly decreasing energy losses and increasing the conversion of input energy to thrust overall.

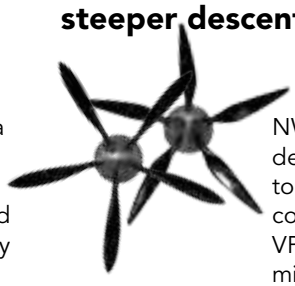
The unique shape that achieves this performance gain also serves to lower the acoustic signature. It is hypothesized that the swept segments of the trailing edge distribute the phases of the thickness and loading contributions of the spanwise elements, reducing the amplitudes of the tones.

With the specific design criteria and operating conditions defined, during the first design iteration the propeller geometry is tailored and optimized for the best aerodynamic and structural characteristics. The second design iteration considers the manufacturability of the aerodynamic design using the appropriate production techniques. The final propeller is the best solution for the combination of aerodynamic performance and efficient manufacturability.

The performance of a UAV Propeller is determined by its geometry, which consists primarily of the:

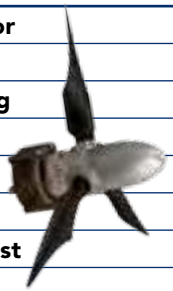
- Number of blades
- The diameter
- Hub diameter
- The airfoil shape/distribution
- Chord
- Pitch distribution
- Coning angle
- Aerodynamic design

The VPP has been designed for ease of use in field operations with universally interchangeable and easy to replace blades. The reverse thrust capabilities translates to steeper descent and shorter runway landings.



NWUAV's in-house CMM is used during the development and manufacturing process to ensure every VPP is delivered to exact configuration requirements. This ensures your VPP is delivered ready to fly; enabling longer missions and lower acoustic signature.

NWUAV utilizes in-house test cells for acoustic and performance testing, and computational fluid dynamics (CFD) for numerical performance validation over the entire operation range.



SPECIFICATIONS

Electric Motor	17.4hp @ 4800 rpm
Max RPM	5500
Weight lbs/kg	5.9 lbs/2.67619 kg
Blades	3 Blades
Blade Style	31.5" Elippse
Pitch Range	+ or -9° from Nominal
Reverse Thrust	down to -9° Pitch
Feather	Full Commanded Feather
Time to Feather from Nominal Communications	<15 s
Across Inductive Gap	Wireless
Max Power Transfer	6W
Testing	FAR 35 Based Propeller Testing
Rotational Inertia	~39 lb*in^2

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PORTABLE TEST CELLS

Custom Engine Test Cell (CETC)

The Custom Engine Test Cell (CETC) is completely self-contained and customizable to meet your specific requirements. The CETC is available in twenty or forty foot container lengths and includes everything needed to test a UAV engine.

Testing Capabilities

- Acceptance Testing
- Engine tuning/fuel economy mapping
- Engine/propeller power and torque mapping
- New/overhauled engine break-in
- Durability/endurance elvaluation (FAR 33)
- Over-speed testing
- Throttle response evaluation

Hardware

The CETC is completely contained and has wall sound dampening insulation. The CETC can be housed inside or outside of your facility with the appropriate duct work. For larger airframes optional hatches can be provided which allow engine testing with the entire airframe.

System Components

FUEL SYSTEM – The fuel system is low pressure gravity feed system compatible for use with gasoline and heavy-fuels.

COOLING SYSTEM – The engine cooling system consists of two heavy duty blowers.

EXHAUST – The purpose of the fan is to remove the exhaust from the CETC.

EXHAUST GAS ANALYZER SYSTEM (OPTIONAL) – The gas analyzer system is capable of measuring four gases; carbon monoxide (CO), carbon dioxide (CO_2), hydrocarbons (HC), and oxygen (O_2), and allows accurate tuning.

CAMERA SYSTEM – The camera system consists of four-pan tilt zoom (PTZ) cameras and a DVR.

SAFETY SYSTEM – The CETC is equipped with emergency stops that disable fuel and ignition to the engine.

REMOTE OPERATION – Allows control of the CETC from virtually any location.

DAQ

The CETC Data Acquisition (DAQ) system includes the NWUAV based operator control panel with selectable sample rates.

Custom Built for your Application

NWUAV's CETC can be custom built for your specific application and to your requirements. We offer delivery and setup worldwide and will train your personnel how to perform engine testing with the CETC. Purchase or Lease the CETC. On-site turn-key engine test solutions, **with NWUAV operators available**. The CETC is approved for export.

MEASUREMENT CAPABILITIES
Torque
Fuel Flow
Ambient Pressure
Ambient Temperature
Relative Humidity
Exhaust Gas Temperature
Cylinder Head Temperature
Engine Speed (RPM)
Brake Specific Fuel Consumption (BSFC)
Horsepower
Optional Measurement Capabilities
Thrust
In-Cylinder Pressure Mapping
Exhaust Gas Carbon Monoxide
OTHER CAPABILITIES
Generator Electronic Loading
Optional Build
Side Hatches*

* Hatches in the side of the CETC allow the customer to place their entire airframe into the CETC for testing.

Mobile Engine Test Stand (MTS)

The NWUAV Mobile Test Stand can be used to operate, test, develop and record engine performance data for various engine configurations. The MTS is Customizable to meet the application and testing required.

Mobile Test Stand Software

The LabVIEW NWUAV DAQ software included with the laptop is used to control and monitor the running engine, and can be configured for specific engine and/or targeted diagnostic tests.

Mobile Test Stand Hardware

Inside the Mobile Test Stand there is access to the battery, fuel system, data acquisition units, power supply blower system and laptop, with space for engine storage. A Power/Data Acquisition box contains all the power supply components and data acquisition units, which provide the interface between the engine sensors, stand sensors, starter and the laptop software. The main power panel provides power to the run stand using external 240-volt power, and includes a main on/off switch and two 110-volt outlets. The propeller guard is removable and installs on the back of the stand.

Mobile Test Stand Capabilities

The following is a list of some of the highlights of the analysis and testing that can be performed with the Mobile Test Stand:

- Engine durability testing
- Engine endurance testing
- Engine performance testing
- Exhaust analyzers – 5 gas
- Fuel flow transmitters – minimum 1cc/min
- Engine fuel mapping
- In-cylinder pressure mapping @ 100 KHz when properly equipped (custom option)
- FAR 33 endurance testing

Mobile Test Stand Custom Built for your Application

NWUAV's Mobile Test Station can be custom built for your special application and to your desired specifications. We will build, deliver and train your personnel worldwide (the MTS is approved for export).

Purchase or Lease the MTS

For more information on the purchase or lease call 503-434-6845.

SPECIFICATIONS & EQUIPMENT

Dimensions w/propeller guard vertical (WxLxH) 57.5x130.5x76 inch / 146.05x331.47x193.04 cm
Class III 2"/5.08 cm Hitch
1 Spare wheel and tire (P185/70R14)
4 Stabilizer Jacks
1 Stabilizing tongue jack
LED Caution Light
Forward access panel (57x34 in / 144.78x86.36 cm)
Aft access panel (57x19 in / 144.78x48.26 cm)
Propeller guard (37 in / 93.98 cm dia)
Power: (1) 4-Wire 240-volt (2) 110-volt outlets
12-Volt battery
Maximum tow speed 55 MPH
Panasonic Toughbook Laptop
NWUAV Data Acquisition
Data interface: Ethernet
On Board Engine Cooling
12-Gallon On Board Fuel System

ENGINE INDICATORS (running)

Torque
Thermocouples
Cylinder Head Temperature
Analog Input Channels
Fuel Flow
Fuel Pressure
Tachometer
Digital I/O Channels
Throttle Position

RUN ROOM ATMOSPHERE CONDITION INDICATORS

Ambient Pressure
Ambient Air Temperature
Humidity

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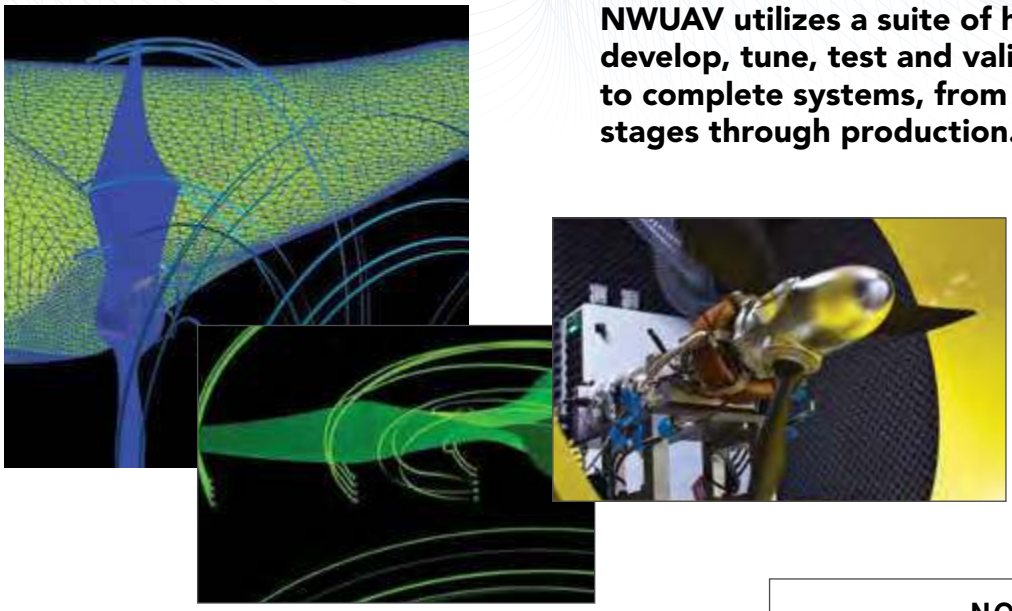
TESTING

Acoustical & Computational Fluid Dynamics Testing



NWUAV utilizes a suite of hardware and software tools to develop, tune, test and validate from the component level to complete systems, from research and development stages through production.

Effective uses of CFD:

- Propeller performance
- Cooling system design; external air cooling or internal water cooling
- Test cell airflow analysis
- Engine intake design

NWUAV's CFD and Acoustical analysis tools coupled with an experienced team will work with you to hone the performance of your design and realize the efficiencies you need in your component or complete system.

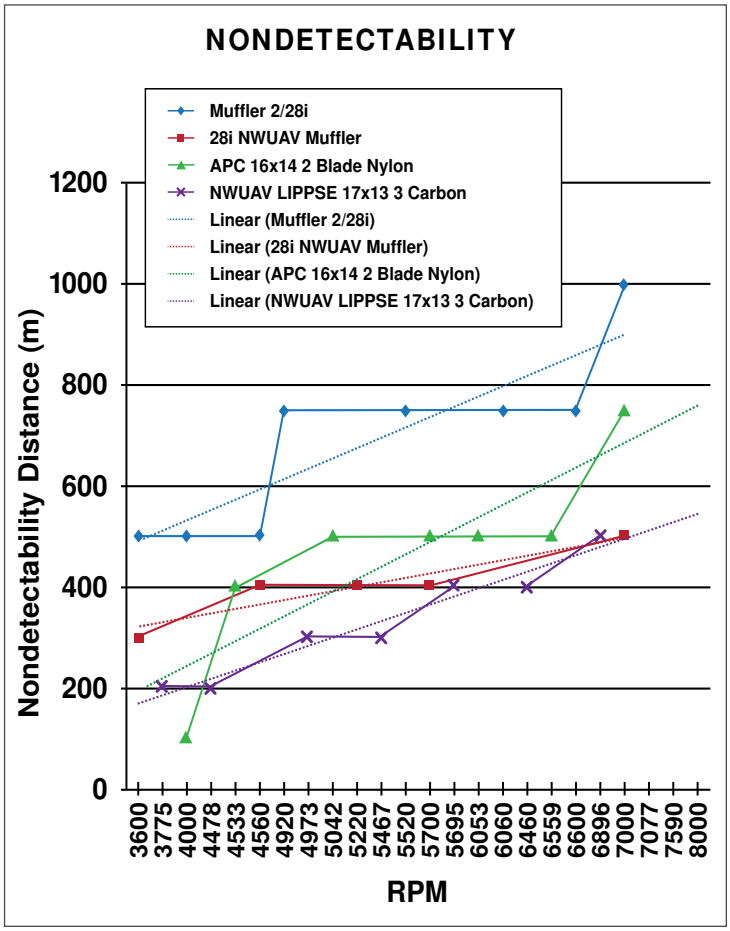
Computational Fluid Dynamics

NWUAV utilizes a suite of software to set up a flow problem, solve it, and extract the information needed to optimize your design. The software offers an extensive list of user defined flow parameters to more accurately model and simulate the flow field and can be utilized in:

- **INVESTIGATIVE ANALYSIS –** A valuable tool to answer questions early in the design process.
- **VALIDATING DESIGNS –** CFD data will help validate the design before cutting molds or making prototypes.
- **OPTIMIZATION –** Helps to fine-tune the design to increase efficiency.
- **DETAILED INFORMATION –** "Numerical sensors" provide flow properties anywhere in the flow stream.

Acoustical Testing

NWUAV utilizes a 1/24th octave Real Time Analyzer to visualize and record sound energy in a sound controlled room. Data provided by this system helps determine how "loud" a system is, and where in the frequency spectrum the highest levels of noise exist. The data can also be extrapolated to determine acoustical detectability per MIL-STD-1474D.



State Of The Art Testing Facility

NWUAV testing capabilities include engine performance and propeller testing. NWUAV has dedicated space for engine development, endurance testing, and production quantity engine break-in and tuning. National Instruments data acquisition modules and LabVIEW are the primary data systems supporting testing at NWUAV.

Real time acoustical analysis software and measurement quality condenser microphones are employed for acoustic testing and data collection down to 1/24 octave from 20Hz to 20kHz.

Test Cell Capabilities

NWUAV also offers its customers advanced testing and analysis for UAV propellers and engines.

The following is a list of some of the highlights of analysis and testing that are performed for our customers:

- Engine durability testing
- Environmental temperature controlled altitude chamber
- Engine endurance testing
- Accessories testing – pumps/fuel tanks/injectors/ camera's and more
- Exhaust analyzers – 5 gas
- Fuel flow transmitters – minimum 1cc/min
- Engine fuel mapping
- In-cylinder pressure mapping @ 100 KHz
- Propeller dyno
- Propeller noise characterization per mil standard 1474D
- FAR 33 endurance
- FAR 35 based propeller testing
- Mass airflow flow bench
- Engine break-in stations with digital acquisition systems
- Small engine dyno
- Large engine dyno (180 hp)

Test

NWUAV validates the finished product utilizing engine run-in stations and various dyno's to qualify the design elements to the clients specifications – *so you get the best propulsion system for your application*.

At NWUAV our software system allows you to access and test your running engine remotely, from anywhere that you have computer access.

Prop & Engine Dynos

NWUAV's capability to control the environment during the testing and design phases reduce test flight risk significantly, saving a substantial amount of time, money and resources.

NWUAV works with several electric motor manufacturers to produce propulsion systems for electric aircraft. NWUAV is currently working with the Army on an electric aircraft design.

Testing Facility

NWUAV is poised to grow alongside the UAV industry in its ten acre facility. The location houses a production facility, a diverse team of R&D engineers, a state of the art engine testing, and administrative offices.

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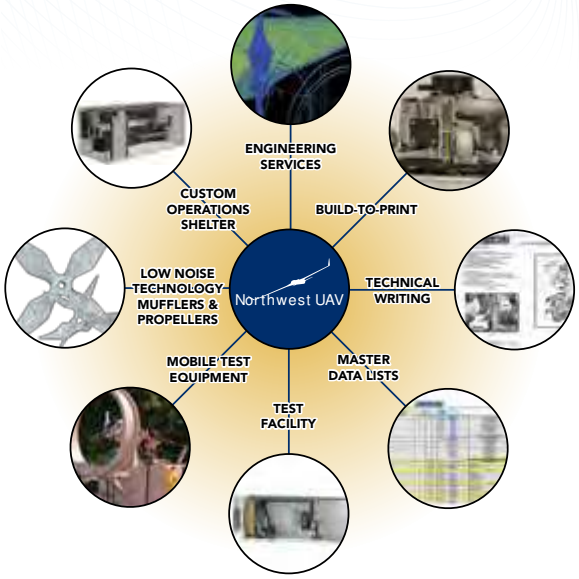
SERVICES

UAV Propulsion System Build-To-Print, Production & Manufacturing



With our technologically advanced facility, we build small engines for the UAV industry. These engines can be built to your specifications, or you can use a NWUAV purpose-built solution. Engine modules are delivered ready to fly.

We are more than aeronautics. We are a multidimensional engineering and manufacturing firm ready and able to react quickly to your prototyping and manufacturing needs.

NWUAV's AS9100 facility utilizes Intuitive ERP for high volume production management which provides the ability to implement LEAN manufacturing techniques and still retain the capacity to produce more than 500 engine modules and associated subsystems a month.

Build

NWUAV regularly produces 150-200 turn-key engine systems per week. A large investment in management software allows for high volume output with strict quality control oversight.

We work with our clients to provide cost effective solutions for their specific land, sea, and air unmanned applications – COTS or custom and build-to-print engine systems.

Production

Utilize NWUAV for full scale production (or refinement) of a proven design.

NWUAV's research and development capabilities make changes in designs an easy transition from the production floor, right into your unmanned system. NWUAV has delivered thousands of propulsion systems since 2005.

UAV Engines

NWUAV systems include solutions for unmanned vehicles of all types – in the air, on land, and in the sea. We excel in high volume production management and focus on several areas of expertise including:

- Engine design
- Engine vibration isolation and characterization
- Engine durability and endurance testing
- Environmental testing with altitude, temperature, and humidity control up to 40,000 feet
- Electrical assembly
- Carbon fiber propeller design and manufacturing
- Propeller thrust
- Noise and torque characterization utilizing our propeller dyno

Engine Accessories

We also build accessories for small engines, such as:

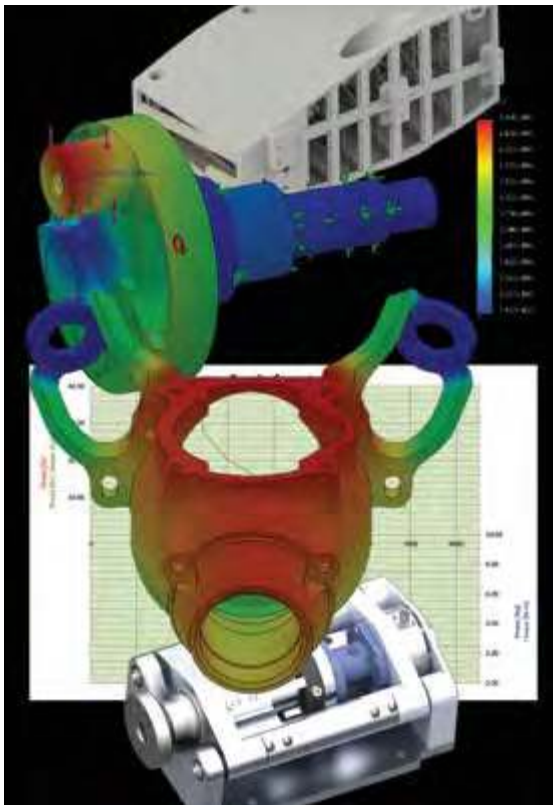
- Generators
- Electrical wiring bundles
- Inlet duct systems
- Shrouds
- Cowls
- Fuel tanks
- Variable Pitch Propeller systems

ITAR International Traffic in Arms Regulations Compliant

DEFENSE CONTRACT AUDIT AGENCY COMPLIANT

AS9100 / DCAA Compliant

Engineering Services



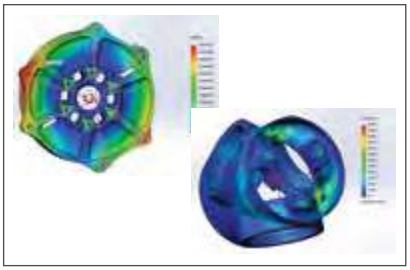
NWUAV's engineering capabilities eliminate weeks in the design and validation phases. Utilizing the latest in available software highly trained and skilled engineers will help to refine and shape any idea or design, making it production ready.

Beyond the SWAP (Size, Weight and Power)

Specializing in unmanned system propulsion design our engineers are familiar with the normal trade-offs required when designing for unmanned air vehicles. Many considerations need to be made specifically for the UAV industry including detectability, vibration transmission, lifecycle costs and deployed footprint minimization.

Our total lifecycle approach includes modular concept for design and development, with attention to manufacturability, and an emphasis on low impact maintainability.

With our state of the art testing facilities our world class test engineers and specialists design qualification and acceptance tests, and perform noise reduction and detectability analysis. This ensures that your flight program will be a profitable and predictable success.

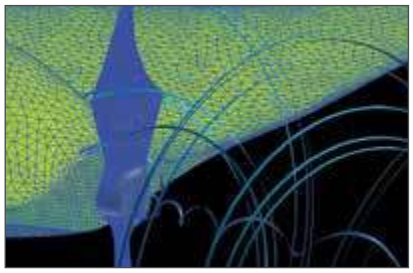


Mechanical Engineering

Specialists in each aspect of unmanned design Software developed by SolidWorks® allows NWUAV's engineers to take a concept and develop a prototype, evaluate and refine it as needed to produce final production ready designs.

Electrical Engineering

Precision Circuit and Electrical Systems Altium Designer® provides our engineers a single unified solution for the entire design process. NWUAV uses all the latest technologies to design and develop circuit and electrical systems with precision.

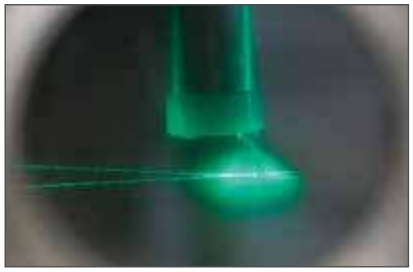


Aerospace Engineering

Experts in flight and propulsion dynamics

With the HyperWorks® suite of analysis tools we can understand the dynamics of your system to help ensure success with your total design.

Our engineers use the NWUAV proprietary method of propeller design to get the highest possible propeller efficiency at the lowest possible acoustic detectability for your specific application.



Physics

Experts in heavy fuel combustion dynamics

With access to the latest combustion dynamics software suites from Ricardo™, NWUAV understands how to optimize your system for operation on heavy-fuels.

Machining & Selective Laser Sintering Capabilities

NWUAV's vertically integrated machining and manufacturing capabilities, along with our experienced engineers and craftsman will take your idea through to the prototype and manufacturing stages.

From single components to entire propulsion systems and innovative engineering solutions. Our main focus is in engines, components and support solutions for any UAV or unmanned system.

Selective Laser Sintering (SLS)

NWUAV uses SLS systems for the rapid manufacturing of any design. With swift response to any change, our rapid prototyping and reverse engineering capabilities will build or re-build any existing part fast.

NWUAV can take conceptual ideas and with in-house rapid manufacturing and prototype technology, build it swiftly and deliver it to you, ready to test, form, fit and function – and not just propulsion, but any part – for any industry.

SLS Equipment

EOSINT P 390 – for printing high-quality nylon parts, patterns for plaster, and investment casting.

EOSINT P 730 – in addition to the uses above parts are suited for use with fuels and other aggressive substances.

EOSINT P 760 – with this machine's increased capacity it's exceptional for use in serial production, spare parts and functional prototypes.

SLS Materials

There are many materials available and most are specialized and/or derivations of nylon. We are constantly expanding our capabilities to better serve our customers. Custom blends are available by special order. Post-Processing techniques available include various finishing options, dyes, paints and inserts.

CNC Machining

NWUAV's CNC machine shop along with experienced craftsmanship equal precision and reliability. The computer design accuracy and control is what makes NWUAV a manufacturing partner you can count on. NWUAV's precision milling machine shop provides quality CNC machined parts fast.

The workhorse of NWUAV's machine shop is the Mori Seiki 5100. The 5100 is a machining center with high reliability and versatility that offers superior cutting ability, with a high torque spindle 2.3 times more powerful than conventional machines. The 5100 with a table size of 53.1" x 23.6," has the largest y-axis travel in its class <530 mm (20.9 in.)>. With the MasterCam® CNC software in use, NWUAV Propulsion Systems can turn precision milling from CAD data in less time and with greater precision.

Machine Shop Equipment

- Mori Seiki CNC Vertical Machining Centers
- 5-Axis CNC
- MasterCam® CNC Software
- NHX 4000 4-Axis Horizontal Milling Center
- Manual Mill
- Manual Lathe

Maintenance Repair Organization (NWUAV MRO)

NWUAV MRO provides UAV operators with a cost effective engine maintenance alternative. NWUAV MRO provides all levels of engine repairs, overhauls, or customized modifications; all with short turn times and exceptional value.

At NWUAV MRO, we have the experience of thousands of engine builds working for our customers. We have the engineering, prototyping and test/evaluation capabilities of NWUAV at our disposal, which enables us to perform custom modifications to meet our customer specifications.

Engine Repair & Overhaul

At NWUAV MRO we overhaul and repair engines to restore original levels of performance and efficiency at a fraction of the cost of new equipment.

We allow our customers to determine the level of service provided, giving you more control of your valuable resources.

In addition, NWUAV MRO can implement a Save All Serviceable Hardware (SASH) program for possible reuse as desired by our customers. Our SASH program will evaluate most lower level and/or accessory components for Serviceability, giving you the option to replace parts with new or serviceable, further enhancing your cost control.

Customized Modifications

NWUAV MRO will work closely with our customers to customize modifications including:

- Engine overhaul
- Engine repair
- Engine testing/monitoring
- Component overhaul
- Component repair
- Wiring repair
- Custom modification

Component Level Repairs

NWUAV MRO repairs custom engine assemblies, lower level and accessory components. We work with our customers to determine the most cost effective component service options, in order to better support your operational needs.

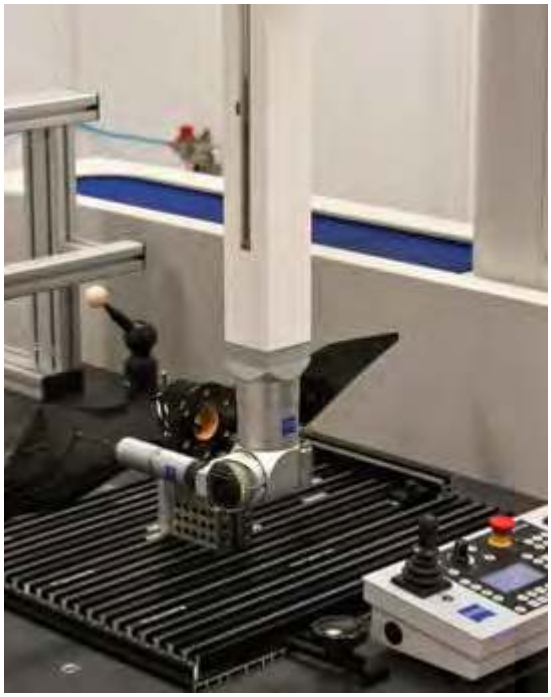
NWUAV MRO

NWUAV MRO understands that, second only to quality, engine repair turn-time is the most important factor in the overall cost of ownership of UAVs. We work with our customers to establish inventory of all major subassemblies in order to minimize lead time and reduce spare engine requirements for our customers.

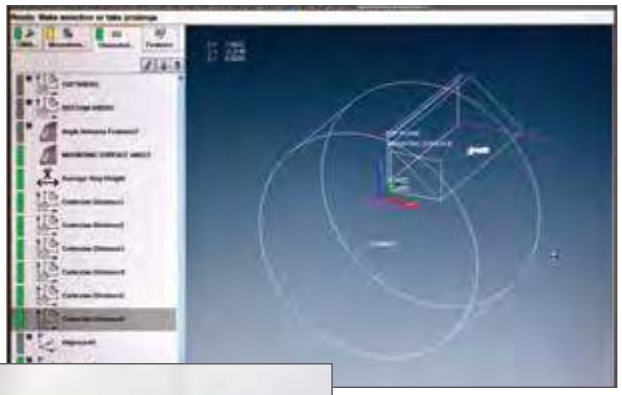
Benefits/Services

- Propeller
- Engine core
- Fuel delivery
- Ignition
- Muffler

Metrology Solution Services & CMM Capabilities



With our experienced operators and fast turnaround time, your CAD file or CMM report can be available on time, when you need it. Our precision and reliability is unsurpassed in our CMM inspection and measurement services.



We work with our clients to provide cost effective solutions for their specific applications. Contact us for more specific information, and quotes for your CMM project.

Our certified operators will ensure that your CMM (coordinate measuring machine) inspection and measurement is performed to your specifications. NWUAV's CMM is housed in an environment isolated, 68°F temperature controlled room for scanning precision.

CMM Equipment

Zeiss Contura® G2 RDS has high-speed scanning capability and with the articulating head, needs only a single stylus to measure a wide range of angles. The stylus holder can reach 20,376 positions in 2.5° increments. This leading-edge CMM performer can scan large quantities of data in a short time with reliability and precision, with accuracy down to 1.8 microns.

CMM Software

We use Zeiss' CALYPSO CAD based software for scanning and the CURVE module for the measurement of free form objects. With the RDS Articulating Probe and CALYPSO software, precision and accuracy is achieved for any CMM project. The advantages of scanning with CALYPSO include the ease with which the software can create measurement plans for CAD programming, and the flexibility of the software and sensor to switch between automatic and manual measuring modes. With CALYPSO, we are able to easily provide a customized measurement report to suit your project requirements. The software supports most file formats that are compatible with SolidWorks: ACIS, STEP, IGES, and Parasolid.

NWUAV CMM Capabilities

- First Article Inspection
- Reverse Engineering
- Laser Scanning
- AS9100/ISO9011 Standards
- Environment Isolated 68°F Temperature Controlled Lab
- Certified Operations
- Fast Turnaround Times

NOTES

Northwest UAV

A GLOBAL COMPANY

Where Precision and Reliability Soar!

CORPORATE OFFICE AND TESTING FACILITY:
11160 SW Durham Lane, Suite 1, McMinnville, OR 97128

Northwest UAV (NWUAV) was established in 2005 by President and Owner Chris Harris in an effort to meet the growing demand for the high volume production needs of companies that utilize propulsion systems and components required in Unmanned Aerial Vehicles (UAVs/ Drones). NWUAV is the largest UAV Propulsion System Manufacturer in the U.S. Our success is the result of our original mission to build and deliver the most reliable, dependable and cost effective UAV systems in the industry. To that end, we have assembled an on-site team of highly trained and skilled engineers that understand UAV requirements and work with a total life cycle approach for product optimization.

Northwest UAV expects to see rapid growth in the coming years due to the integration of UAVs into the national airspace. NWUAV is well positioned to take advantage of this growth, sustaining an AS9100/ ISO9001 (AS9104-1) certified, DCAA compliant plant. NWUAV is also in the process of establishing a Part 145 Repair Station to meet the future need for UAV MRO services.

Northwest UAV (NWUAV) is a privately owned corporation, managed by an executive team surpassing 80 years of combined manned aviation proficiency, giving us the background in safety and compliance that will be mandatory for unmanned flight in the public domain. We staff more than 60 employees which include a qualified team of engineers and highly skilled production technicians, with the ability to produce quality products in high volume.

We are situated outside of McMinnville, Oregon in a facility over 35,000 square feet in size. This location houses our engineering department, 23 state of the art UAV propulsion test cells, production, machine shop, wiring harness shop, electrical test lab, CMM, sales and marketing, and administration.

Customers

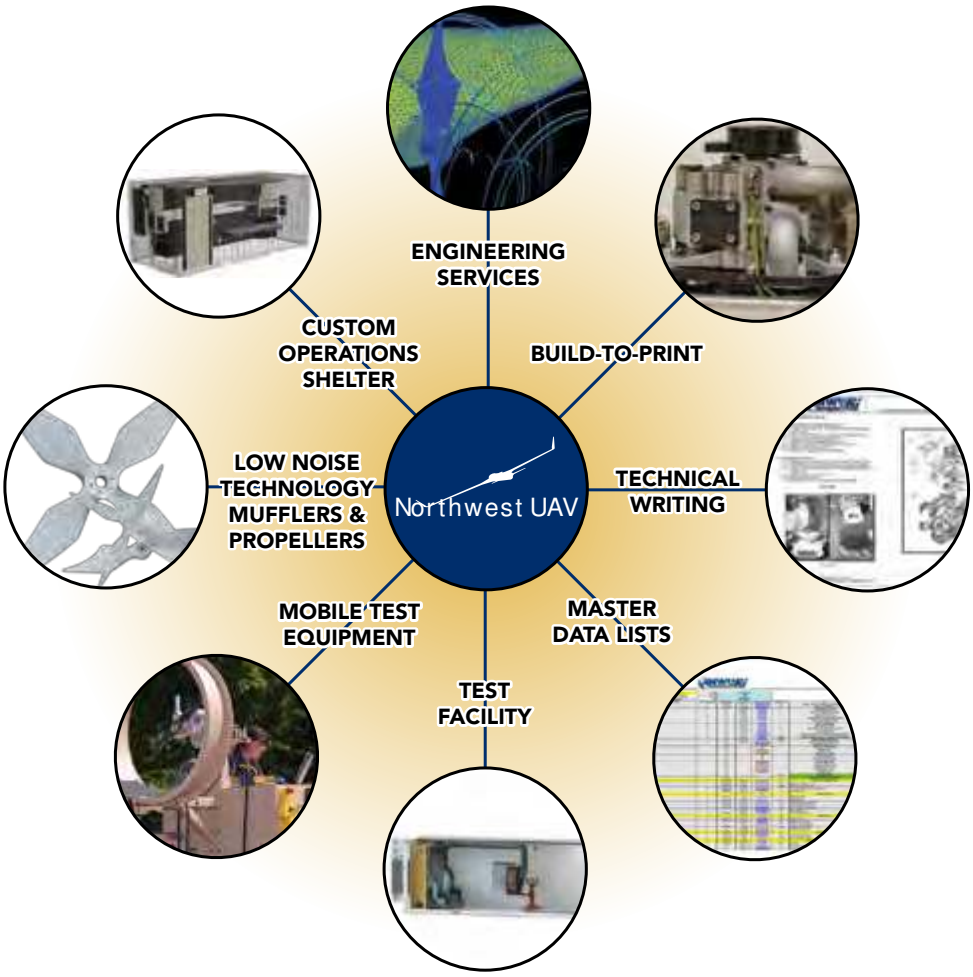
Northwest UAV currently holds key production contracts with Insitu/Boeing, who is the world's largest manufacturer of STUAS Class UAS. Clients purchasing NWUAV proprietary products and engineering services include associates in Latin America, Canada, Africa and Asia made up of Tier 1 OEM's and Direct Government contracts.

Products

NWUAV has created a purpose-built NW-44 EFI multi-fuel engine designed and built for unmanned aircraft systems, low altitude, long endurance aircraft and portable power generation. This engine is designed to gain STANAG 4671 and FAA Certifications, and is approved for export under EAR 99. The NW-44 growth potential is significant, as it fits into the 55 lb. class aircraft classification that the FAA plans to integrate into the commercial airspace in 2016. NWUAV is working with the FAA to develop certification criteria for small UAS propulsion systems.

NWUAV's alliance with Rotron Engines in the United Kingdom brings additional depth to our product line. This agreement includes sales, integration and manufacturing for US and international clients. NWUAV is also a distributor of Pegasus Servos Actuators. Additional new product introductions are expected throughout 2016.

Northwest UAV's formal business plan and other information will be made available by request.



NORTHWEST UAV PARTNERS

Platinum Member

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