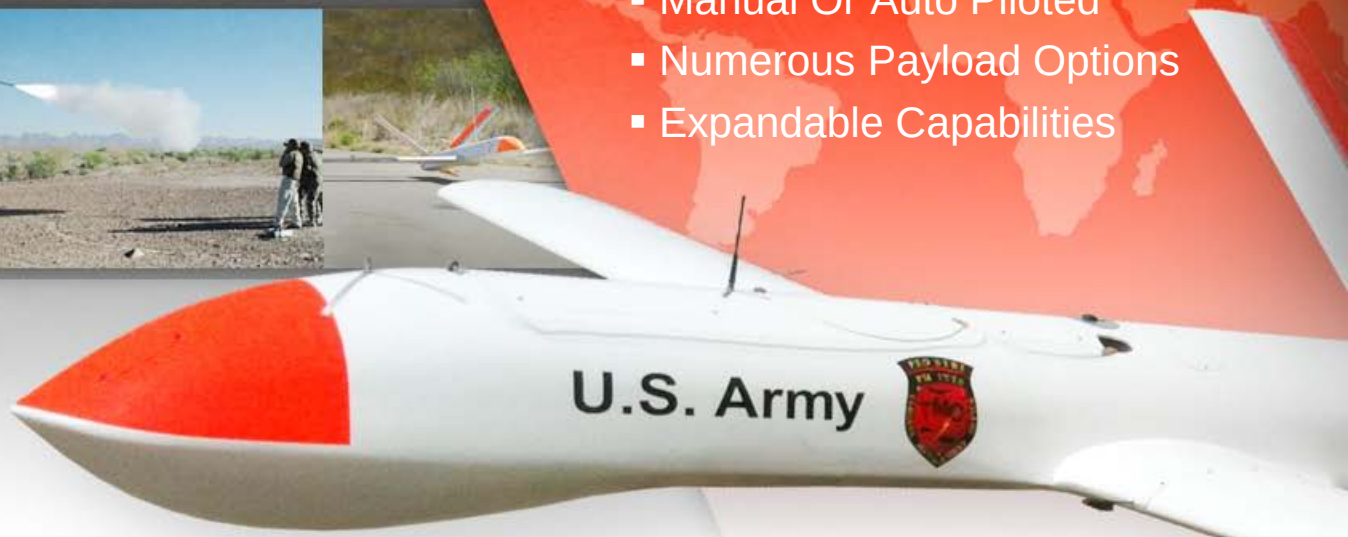
INTRODUCING OUTLAW ER

OUTLAW

- Affordable
- Easily Deployable
- Manual Or Auto Piloted
- Numerous Payload Options
- Expandable Capabilities



GRIFFON AEROSPACE

49th TARGETS, UAVS & RANGE OPS

Fort Walton Beach, FL, February 2011

Presented By: Greg Chando

Systems Engineer

Outlaw ER First Flight

OUTLAW

September 27, 2011

Why Outlaw ER?

OUTLAW

- ✓ Griffon's customers need:
  - Much longer endurance…..
    (Extended Range – "ER")
  - More payload weight/volume
  - Easier payload access/integration
  - Power generation
  - Expand the proven and qualified MQM-170A Outlaw systems and certifications
- ✓ Offer range and endurance to fully utilize the Outlaw's satellite Command and Control (C2) link
- ✓ Offer more capability without disrupting Environmental, Safety, Frequency, and Reliability documentation in place at test and training ranges.
- ✓ Continue to offer the industry's most cost effective unmanned aircraft systems and Flight Services.

Boomer…
Step to ER

OUTLAW

Outlaw Boomer

Outlaw ER

What is Outlaw ER?

OUTLAW

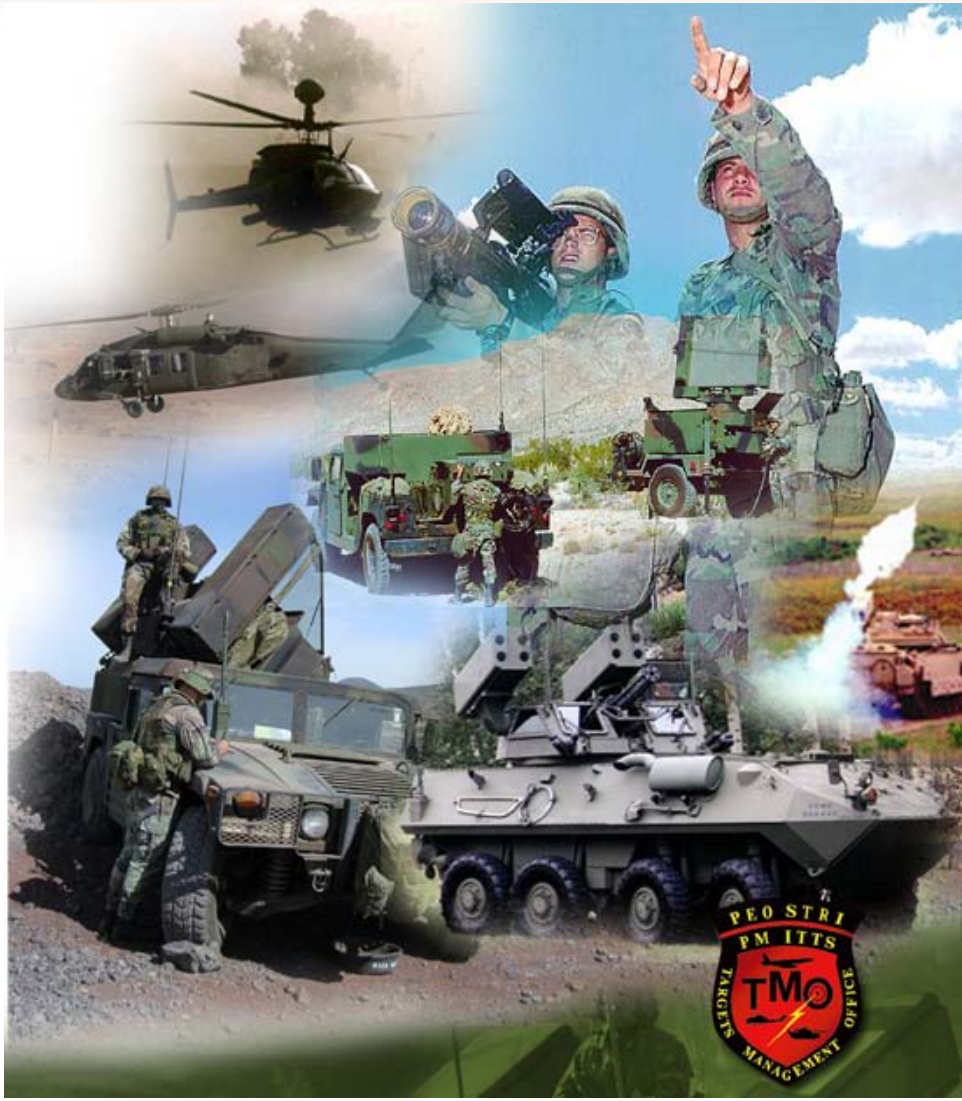
- A flight-proven unmanned aircraft / surrogate UAV target based on proven systems that have flown thousands of air defense training and payload test missions.
- Low-cost, tactical size, payload flexibility, 6-9 hour endurance, and multi-mission flexibility make it an extremely versatile tool for Test and Evaluation.
- Multi-mission solution for gun/missile tracking and live fire, payload test /development, ISR training, sensor and weapon development, and UAV system research and development.
- Griffon Aerospace is the U.S. Army's Target Management Office and the U.S. Navy's Prime Contractor for Outlaw design, production, and flight operations.

GRIFFON AEROSPACE

Missions Commonly Supported

OUTLAW

- ✓ Systems/Subsystem Research and Development
- ✓ Systems Test and Evaluation
- ✓ Surrogate UAS Training
- ✓ Tracking and Engagement
- ✓ Range Surveillance / Debris Observation
- ✓ UAV Payload Development Flight Ops
- ✓ Long Endurance Shipboard Defense Engagements



Design

OUTLAW

AIRCRAFT CONFIGURATION: High wing, boomed V-tail monoplane, pusher engine configuration

FUSELAGE LENGTH: 9.18 ft / 2.8 m

WING SPAN: 15.1 ft / 4.84 m

PAYLOAD BAY VOLUME: 1.9 ft^3 / .054 m^3

MAX HEIGHT IN PAYLOAD BAY: 1 ft / .3 m

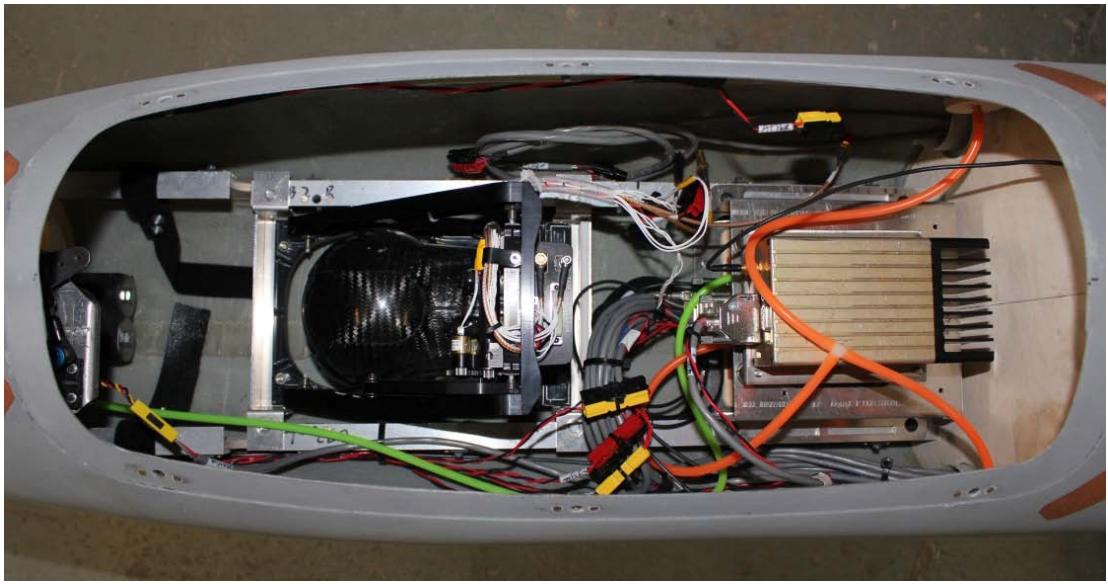
GROSS WEIGHT: 175 lbs / 79 kg

EMPTY WEIGHT: 98 lbs / 34.5 kg

STRUCTURAL LIMIT LOADS: +/- 8 g's

STRUCTURAL LIMIT VELOCITY: 150 mph

POWERPLANT: 16 HP, 2 cylinder 2-stroke, air-cooled engine



Performance

OUTLAW

Parameter	Standard Outlaw	ER
Gross T.O. Weight (lb/kg)……	120/54.4	175/79
Empty Weight (lb/kg)……	76/34.5	98/34.5
Max Fuel Weight (lb/kg)…….……	19/8.6 (3 gal)	56/25.4 (9 gal)
Payload at Max Fuel (lb/kg……...	25/11.3	21/9.5
Cruise Speed 75% power (knts)……....	80	75
Max Speed 100% power (knts)……....	108	98
Controllable Slow Flight (1.15 Stall) (knts)……	52	60
Stall Speed (knts)……..	45	48
Speed for Max Endurance (knts)……....	64	68
Maximum Endurance (hrs)……...	2.5	6-9
Maximum Range (nautical miles)……	160	594

Control System

OUTLAW

BEYOND VISUAL RANGE (BVR) AUTOPILOT SYSTEM

- Autonomous execution of pre-planned missions through waypoints and altitudes.
- State-of-the-art solid state acceleration and GPS position sensors and works with a laptop based ground station to provide mission execution and aircraft health and status data.
- Real-time waypoint and mission redirects are performed via the RF data link
- A 225 to 400 Mhz UHF transceiver C2 link with a transmit power adequate for 25-30 kilometer missions.
- Low cost satellite C2 link for very long range missions.

Mechanical Data

Dimensions: 4.8 inches (“) x 2.4” x 1.5”
Weight: 7.5 ounces
Power: 8 to 20 VDC; 3.6 watts at 12 VDC nominal

Capabilities

- Multiple Waypoints (100) Capable
- Integrated 6-axis IMU
- 6DOF Simulation Support
- Integrated GPS Receiver
- PWM-Based Servo Command Outputs
- Real-Time Waypoint Route Editing

BVR Ground Station

OUTLAW

BVR GCS

- BVR ground control station consists of a laptop, a communications control module, and a UHF transceiver.
- Provides pre-mission planning, mission monitoring, and real-time mission redirects.
- Mission waypoints are displayed and edited. The real-time mission data is stored and available for post-mission display and processing.
- BVR flights out to a range of 25 KM assuming minimal ground obstructions.
- Outlaw ground station is easy to use, compact, and extensively used by other UAVs.

Standard ISR Payloads

OUTLAW

EO/IR GIMBALED SENSORS

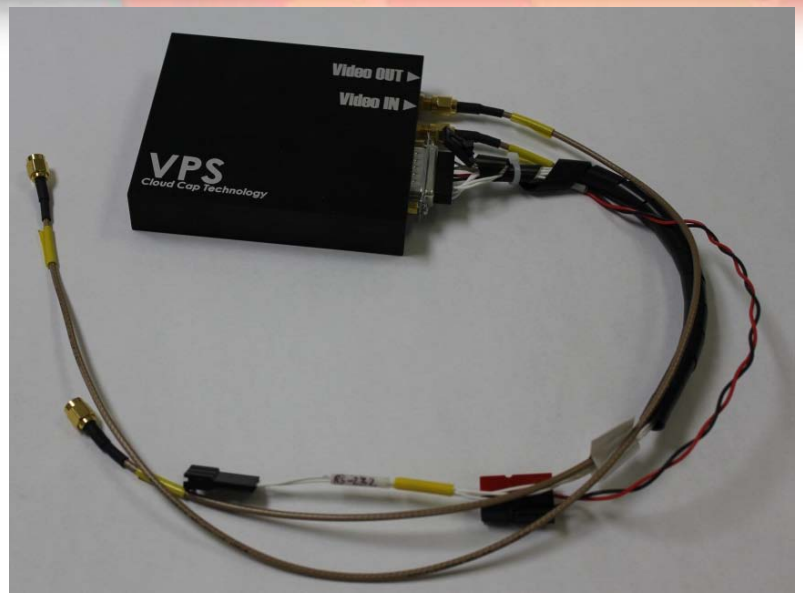
- Piccolo autopilots offer standard interfaces to a variety of gimbaled camera systems.
- Griffon owns and operates TASE retract gimbals.
- Outlaw supported Marine VideoScout training by serving as a surrogate Shadow UAV.
- Stabilized and target tracking.
- JF-12 video downlinks available.

Standard ISR Payloads

OUTLAW

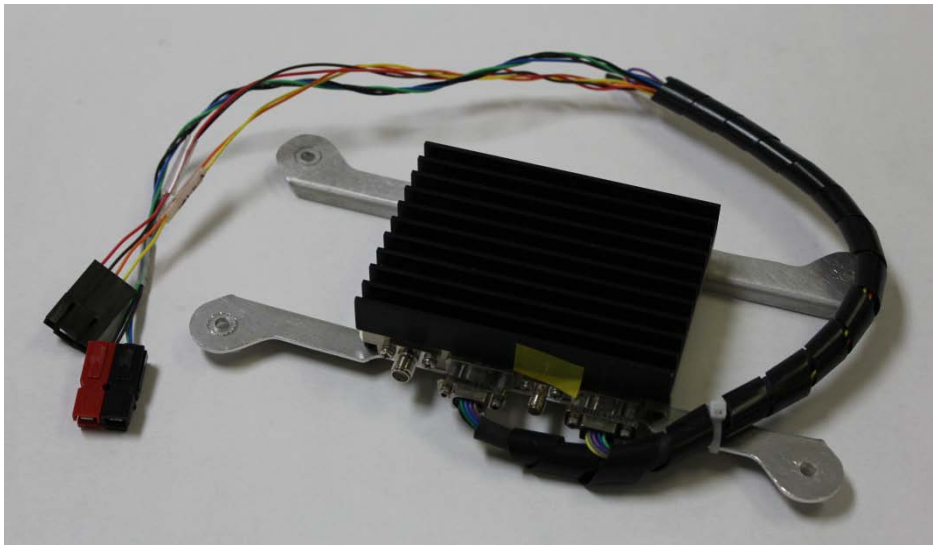
Onboard Video Processing

- Provides onboard gimbal processing and pointing.
- Superimposes metadata on video feed.
- Image stabilization.
- Provides feed to video downlink transmitter.



Video Downlink

- Analog video transmitters (L, S, and C).
- Different transmit power levels.
- Digital video downlinks available.

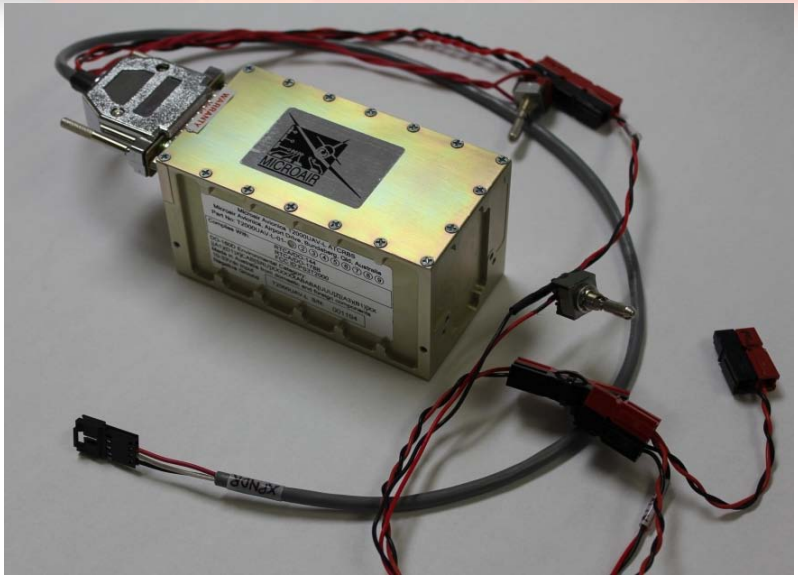


Standard Payloads

OUTLAW

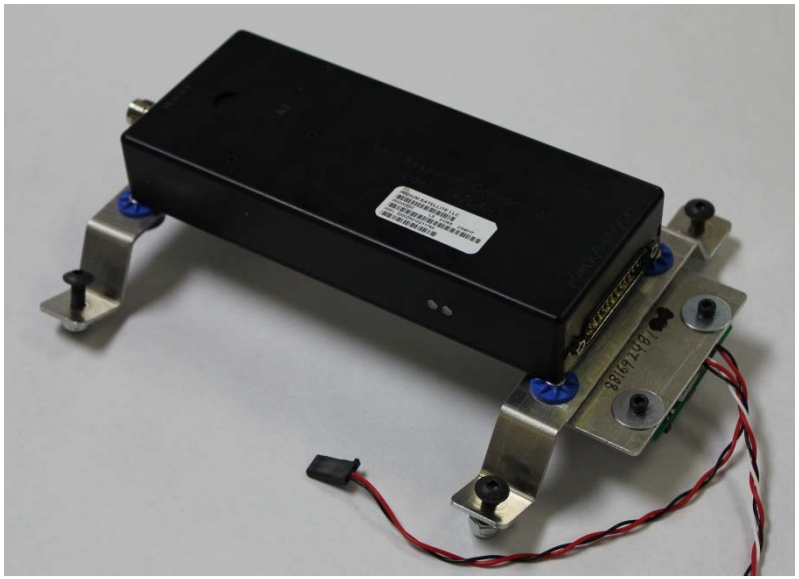
Transponders

- Standard Mode C IFF.
- 150 Watt pulse.
- Squawk code changeable in flight.



Satellite C2 Datalink Modem

- Offers unlimited range for control link.
- Low speed command link.



Standard RPVT Payloads

OUTLAW

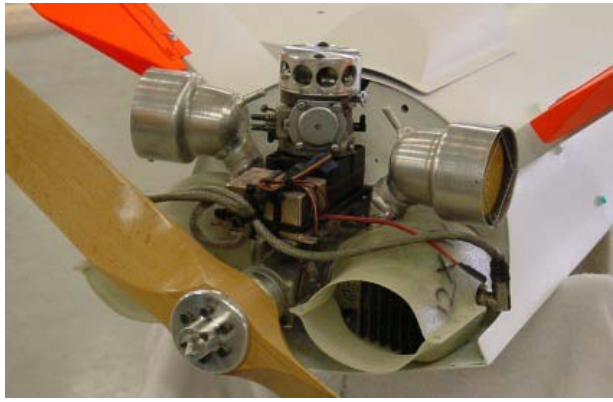
INFRARED (IR) ENHANCER
- Generates IR signature per STINGER/U.S. Army requirements.
- Engagements from directly aft to nearly nose on (~300 degree).

RADAR AND ACCOUSTIC SCORING
- Realtime round or missile scoring. Radar Scalar or Acoustic Vector

MULTIPLE INTEGRATED LASER ENGAGEMENT SYSTEM (MILES)
- Eight (8) state of the art laser sensors
- Optimally located for reliable detection from laser training weapons.
- Functions with on-board smoke system to provide visual hit or miss.

SMOKE GENERATOR
- Interfaces with the transmitter to provide smoke when commanded.
- Interfaces with the MILES laser training system.
- Provides a minimum of 10 minutes of smoke visible to 3000 meters.

RADAR REFLECTOR CORNER CUBES
- Metal corner cubes added to enhance RF signature.
- Cubes of different sizes to provide desired radar signature.



Ground Support Equipment

OUTLAW

PNEUMATIC LAUNCHER

- Zero Length Pneumatic Launcher
- High pressure air storage bottles provide launch energy
- Reliably supports high density altitude operations
- Can be towed behind commercial or military vehicles
- Designed to provide easy access to the engine and vital aircraft system
- Designed to accommodate optional landing gear equipped RPVTs

SHIPBOARD LAUNCH AND RECOVERY IN DEVELOPMENT

Flight Operations

OUTLAW

MISSION OPS TEAMS

- Mission Lead works directly with the field commander to achieve training objectives.
- Pilots present the aircraft to assure maximum probability of engagement success.
- 3 people – for 1 target in the air at a time.
- 4 people – for 2 targets flying simultaneously.
- 5-6 people – for 24 hour operations.
- All pilots experienced flying RPVTs, UAVs, and RC aircraft with a minimum of 2-5 years experience.

Ready to Serve

OUTLAW

Serving You… Anywhere, Anytime

- The equipment and pilots are prepared for the conditions.
- Outlaw pilots are certified in night flight and high altitude operations to offer realistic threat engagements - anywhere, anytime.

Surrogate UAV Services Now….

OUTLAW

- **UAV Threat Simulation**
- **Low Cost Sensor Development**
- **ISR Training Surrogate**
- **Range Debris Inspection**
- **UAV Fire Support Training**
- **What's your problem?**

Closing Video

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