BroadSword Flight Test Status 2006 NDIA



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- BroadSword will provide a UAV target to support developmental and operational testing for the Army's weapon system developers and the Army's Test and Evaluation Command.
- BroadSword (UAV-T) must work within the Army's existing TTCS-U test range control network to fulfill the Army's test objectives.
- UAV-T must satisfy the performance, form factor and TTCS-U control requirements to support upcoming Army weapon system testing.
- UAV-T is intended to serve as a generic Tactical Class UAV.





BroadSword Team



- Airframe/Systems Design
- Structural Design
- Tooling Design/Manufacture
- Prototype Development/Production
- Systems Integration
- Launcher Development
- Ground Systems Development
- Flight Test Operations
- O&M Manual
- Systems Training



- Systems Engineering
- ICD Development/Configuration Control
- O&M Manuals and Training Support



- TTCS Systems Integration
- CapLite Avionics Integration
- TTCS/Piccolo Software Integration
- Telemetry Stream Development

Cloud Cap Technology

- Piccolo Autopilot System
- TTCS/Piccolo Software Integration
- TTCS/Piccolo Telemetry Stream
- Prototype Development/Production
- Flight Test Support

UAV-T Physical Requirements

Propulsion – Pusher

Length – 4M +/-5% (13.8 Ft)

Wing Span – 5M +/-5% (17.2 Ft)

Fuselage Diameter - >.5M (1.6 Ft)

UAV-T Performance Requirements

Maximum Cruise – 115 KTAS (132 MPH); 200 mph Goal Minimum Cruise – 60 KTAS (69 Mph); 50 Goal Minimum Ceiling – 12,000 ft MSL; 23,000 MSL Goal Minimum Operating Altitude - <1000 ft AGL Minimum Control Slant Range – 25 Km; 50 Km Goal Loiter Endurance – 1 hr on station



BroadSword and Outlaw

BroadSword

Length..... 13.8 ft (4.2 m) Wingspan...17.2 ft (5.2 m) Speed.....125 mph Gross Weight... 300 lbs

Outlaw

Length..... 8.4 ft (2.56 m) Wingspan...13.6 ft (4.15 m) Speed.....125 mph Gross Weight... 120 lbs

Overall Aircraft Configuration

Pusher Configuration per requirement

V-Tail

Removable wings to ease logistics

Large wing supports low cost launcher and belly landing recovery

Fuselage shaped to provide reduced radar reflectivity

Materials optimally selected to minimize cost and support the mission requirements

Avionics selected to provide compatibility with TTCS-U and waypoint navigation







Flight Test Program

The Flight Test Program is using a Spiral Development approach to minimize risk to program assets and provide a parallel path to avionics development.

Phase	Flight Test Goals	Aircraft/Avionics
Manual Control	Evaluate handling, validate control surface size/travel, launcher structural/systems testing, launcher/launch dynamics evaluation, establish launch consistency	BroadSword/RCD
Manual/Autopilot - Autolaunch and Autoland	Evaluate Piccolo autolaunch software/ capabilities, train pilots in use of AL system	Outlaw/Piccolo
Manual/Autopilot – Autolaunch and Autoland	Tune gains, establish baseline control system parameters, test/establish autolaunch and autoland parameters	BroadSword/Piccolo
CAPLite	Test new avionics system, test autolaunch and autoland, test datalinks and GS commands, test ground station software, launch environment	Outlaw/CAPLite
Final/Qual Flights	Test airframe/avionics compatibility/interfaces, validate CAPLite flight, autolaunch, and autoland functionality, perform performance quals	BroadSword/CAPLite
Training	Train/handover system to operations team	BroadSword/CAPLite

Launcher

Outlaw derivative launcher modified to support BroadSword flight test ops



Launcher

Latest version modified to incorporate captured piston/hook

Launcher

Launcher consistently launching at 65 knots and retracting launch hook to clear prop.













CAPLite Status

MicroSystems and Cloud Cap Technology

teamed to produce a system that maintains the functionality of the Piccolo Autopilot yet is compatible with the TTCS-U command/control system.

CAPLite provides waypoint navigation and full TTCS-U command compatibility.

Comm and datalink checks performed. Command structure/format validated.

Final ATP and HIL simulations to begin in Nov-Dec timeframe.





Summary

- Aircraft/launcher operations has been a major challenge but the current design supports the flight test program.
- Flight data acquired to date confirms stability and control objectives.
- Top speed performance has yet to be explored.
- Aircraft exhibits good low speed handling and approach to stall characteristics necessary for recovery ops.
- Autopilot operations imminent pending more data on launch characteristics.
- CAPLite commands and datalink have been validated. HIL simulations will be initiated in the Nov-Dec timeframe.
- Baseline aerodynamic and structural design has been validated, but additional work is on-going regarding the recovery system and aircraft maintainability.



