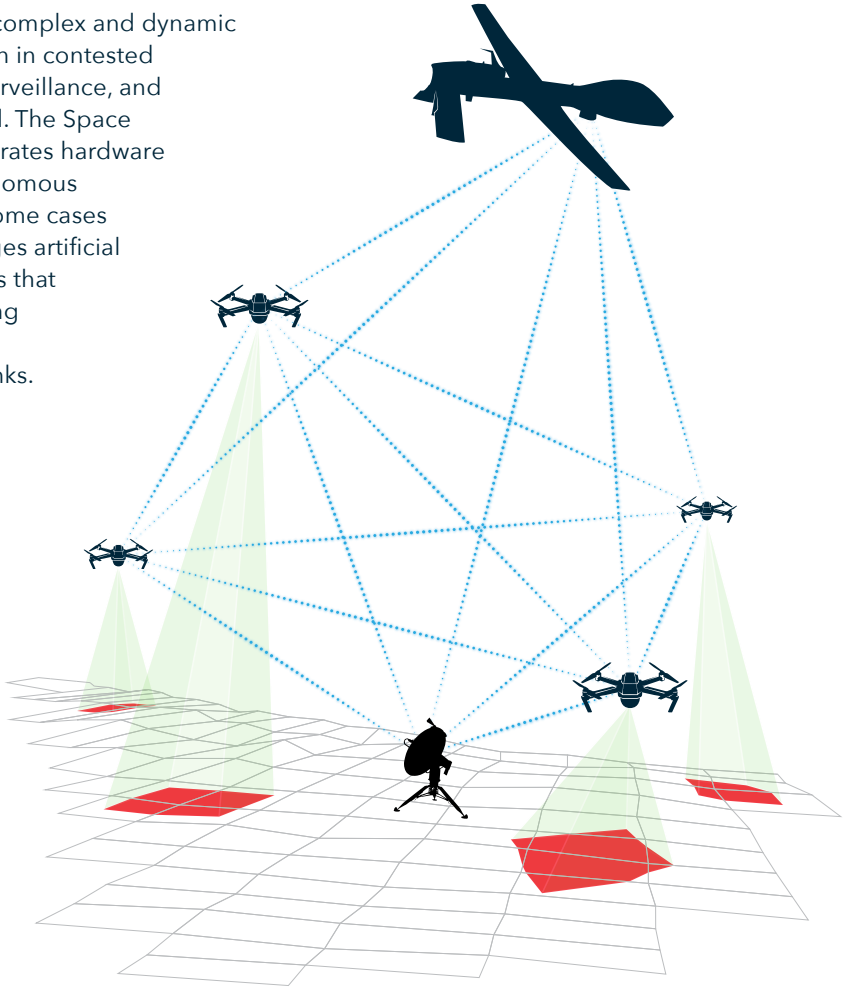
COLLABORATIVE AUTONOMY

ISR Platforms Operating Effectively Without Human Control

Today's warfighters must sense and make sense of a complex and dynamic battlespace for rapid, informed decision-making, even in contested environments where connectivity with intelligence, surveillance, and reconnaissance (ISR) platforms is degraded or denied. The Space Dynamics Laboratory (SDL) designs, builds, and integrates hardware and software solutions that enable coordinated autonomous operation of multiple ISR assets, minimizing, and in some cases eliminating, dependence on an operator. SDL leverages artificial intelligence and machine learning to develop systems that process data and make decisions at the edge, resulting in shortened timelines, reduced cognitive loads, and increased resilience to intermittent communication links. The technology is backed by SDL's rich heritage as a mission partner for the Department of Defense.



FEATURES

- Unmanned aerial systems (UAS) with onboard autonomy controlling pilotage, sensing & processing
- Tip & cue integration with unmanned ground vehicles & remote weapon systems
- Collaborative autonomy using heterogeneous teams & multi-intelligence sensing
- Rapid prototyping & access to various flight test ranges
- Solutions with full Government use rights

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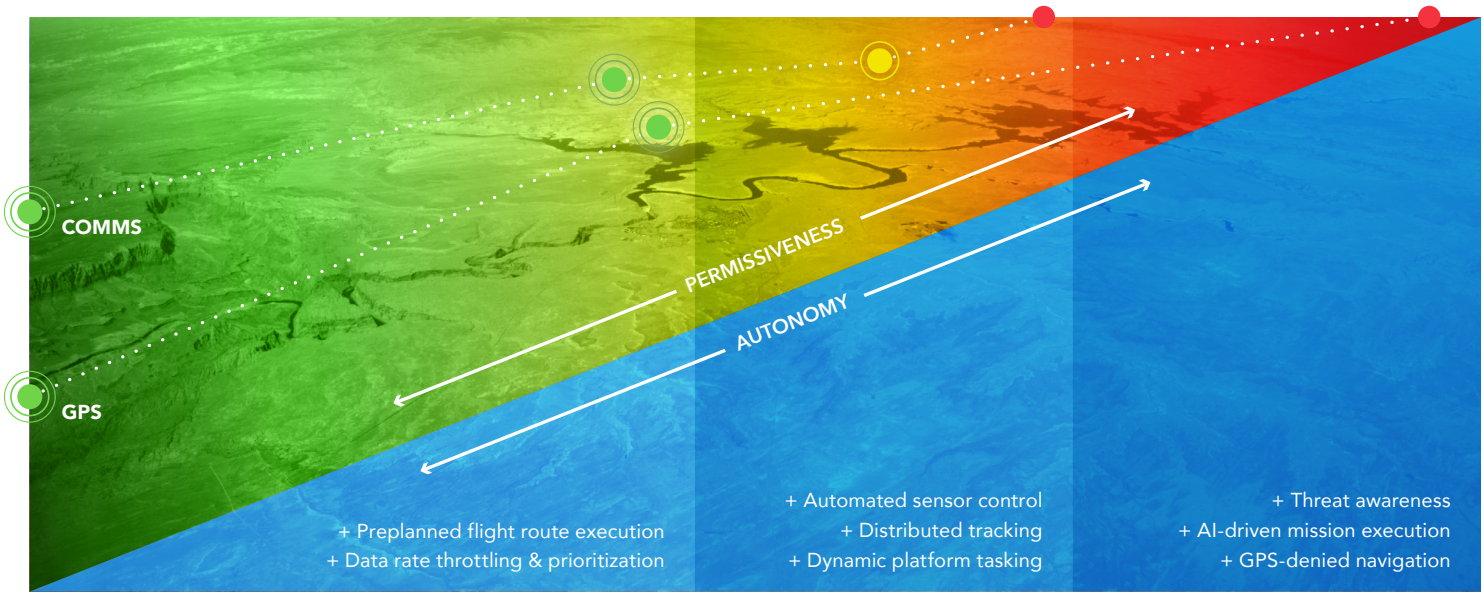
AUTONOMY IN CONTESTED ENVIRONMENTS

In permissive environments, unmanned platforms receive GPS signals and maintain reliable communications with other platforms and ground control stations, so operators have the information they need to adapt to changing conditions. However, as the operational environment becomes more contested, GPS signals and communications may become disconnected, intermittent, or limited in bandwidth. SDL's onboard systems compensate with progressively more advanced autonomous behaviors, enabling multiple platforms to execute missions collaboratively without human control.



FULL DEGRADED LOST/DENIED

As an environment's permissiveness decreases (green to red), SDL's systems compensate with increasingly advanced autonomous capabilities (blue).

SOFTWARE CAPABILITIES

- Modular open system architecture (MOSA) design
- Autonomous sensor cross-cueing from multiple platforms
- Configurable triggers & behaviors for adaptive mission execution
- Team member auto-discovery & pub-sub data sharing over any IP-based network
- Link-aware quality of service for robust & prioritized data transfer
- Support for standard messaging protocols (JSON, CoT, etc.) for third-party integration
- Onboard multi-agent route planning

HARDWARE CAPABILITIES

- Group 1 (fixed-wing & multi-copter), Group 2 (VTOL & multi-copter) & Group 3 (fixed-wing)
- Radio frequency (RF)-silent add-on module to make UAS resilient against electronic attack
- Experience with multiple embedded processing architectures
- Various sensor payloads to support autonomous ISR development & test (FMV, SAR, GMTI)
- Interfaces to many common autopilots
- Low-cost, packable, 3D-printed fixed-wing UAS

Two UAS collaborate on target detection during a field test.