IOS CTTL Platform

The IOS quantum dot taggants and laser interrogator platforms deliver unique advantages over current laser range finder/ designators. Using both technologies maximizes effective covert strategies through target analysis, acquisition and discrimination. See Chart 1. below.

Figure 4. Laser interrogator

	QD Taggant	Laser Interrogator
Target Analysis		
Criticality	YES – Time Sensitive	YES – Time Sensitive
Accessibility	YES - Enhances	YES - Enhances
Recuperability	N/A	N/A
Vulnerability	YES - Confirms	YES - Confirms
Effect	N/A	N/A
Recognizability	YES - Confirms	YES - Confirms
Target Acquisition		
Detection	YES - Enhances	YES - Enhances
Identification	YES - Discriminates	YES - Discriminates
Location	YES – Pin-Point Accuracy	YES – Pin-Point Accuracy
Target Type	YES - Discriminates	YES - Discriminates
Movement	YES – Real Time	YES – Real Time
Development	YES – Real Time	YES – Real Time
Strength	YES - Quantifies	YES - Quantifies

Chart 1. IOS CTTL platform to maximize covert strategies.

Summary

Current IOS taggant technology meets many requirements for TTL. With further development, QD taggants can be formulated into paints or polymers, developed to persist for variable lengths of time, be compatible with other designators, and satisfy additional TTL requirements that will minimize collateral damage while enhancing lethality to designated targets. With further funding, we anticipate that demonstration of these technologies at TRL 7 can be achieved within two years at a cost of $5M.

Intelligent Optical Systems, Inc. (IOS) is a technology engine for disruptive applications—a highly innovative supplier of optical sensor, test and measurement solutions to industry and research markets with a principal position in chemical, biological and physical detection. Our products enhance performance and reduce life cycle costs and have received international acclaim, including selection to Time Magazine's feature *Best Inventions of 2007*.

Our state-of-the-art research laboratories support projects including:

- Combat Optics Programs
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- Bio-Life / Medical Sciences
- Manufacturing / Platform Life Cycle Diagnostics
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  - Fiber Bragg Grating Based
  - Distributive Sensors
- Taggants
- Tera Hertz Detection Platforms

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INTELLIGENT OPTICAL SYSTEMS, INC.

Providing Solutions with Optical Science

Quantum Dot Tagging and Tracking in Support of Special Reconnaissance Missions

INTELLIGENT OPTICAL SYSTEMS, INC.

Clandestine Tagging, Tracking and Locating Platforms in support of Special Reconnaissance Missions

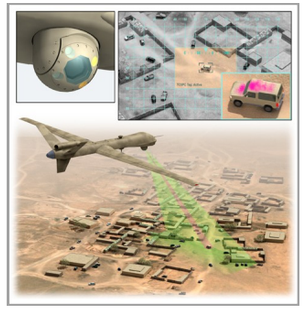
Challenge

The current conflict in Afghanistan poses several operational and strategic challenges to U.S. military forces. How does the combatant commander wield "shock and awe" while adhering to strict mandates to limit civilian casualties? How can our forces identify terrorist cells who intentionally blend in with the surrounding innocent civilian population?

And, how can our leaders decisively and surgically remove these terrorists who use these innocent civilians? The solutions to these challenges lie in the doctrinally-driven technologies that Intelligent Optical Systems is now developing for use by our nation's ground, air and sea forces.

Doctrinal Imperative: Effective Special Reconnaissance Activities

The challenges described above can be overcome effectively by precisely planned and executed special reconnaissance (SR) activities. SR activities are designed to answer specific, well defined and time-sensitive intelligence requirements and often impact upon strategic, operational and tactical decisions. Ground, air and sea forces conduct two critical SR tasks – Target Analysis and Target Acquisition – to provide the intelligence they need to conduct a lethal combat mission with no collateral damage.



Target Analysis Uses a Robust Matrix of Criteria

Criticality
Accessibility
Recuperability
Vulnerability
Effects
Recognizability

The acronym – CARVER – sets the stage for an effective SR plan so that technically complex targets can be engaged by direct combat activities or unconventional warfare methods. Figure 2 shows a ground-based operator conducting a typical SR mission in a desert environment.

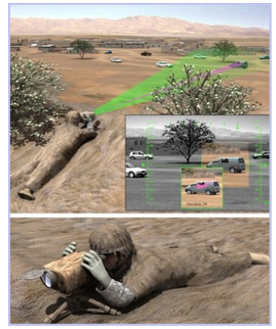


Figure 2. Ground force reconnaissance

Target Acquisition activities with Special Reconnaissance is more focused on the actual execution of obtaining priority intelligence. It includes the detection, identification and location of a target in sufficient detail to allow for effective engagements using lethal and – even non lethal means. Specific focus for Target Acquisition is given to target types – personnel (leadership versus cadre), equipment, vehicles, buildings; movement – toward or away from the conflict; development; strength, and; vulnerability.

Historically, Target Analysis and Acquisition activities were largely dependent upon the covert infiltration and exfiltration of specially trained individuals who would take extreme risks to enter into non permissive environments for extended periods of time. The introduction of laser range finders enabled SR teams to conduct Target Analysis and Acquisition activities at stand-off distances, but target discrimination still remained problematic. With the advent of disparate advanced technologies for tagging, tracking and locating; we can now minimize operator risks, improve intelligence gathering, enhance lethality, and minimize collateral damage.

Integrated Advanced Technologies The Intelligent Optical Systems (IOS) Solution

IOS has developed taggants using quantum dot technology (QD). With this technology, it is possible to target-discriminate by uniquely marking suspect individuals, groups, equipment, vehicles, and buildings allowing effective covert applications including, combat identification, material control, Tag, Track, and Locate (TTL), and other clandestine activities. Key advantages:

- Inconspicuous powder form (similar to dust or ash)
- Undetectable in the visible light spectrum
- Only observed via NIR detection equipment
- Various application methods such as aerosol sprays or precision strike devices
- Controlled decay (dissolves, minimizing signature noise)
- Multiple frequencies to discriminate multiple targets

IOS is also in development of a lightweight, laser interrogator that can simultaneously identify the QD tagged target and measure its range. Key advantages:

- Extended range for TTL
- Enhanced target discrimination
- Overcomes adverse weather effects
- Scalable (can be made smaller or larger)
- Battlespace flexibility (air, sea or land)
- Ease of use

Advantages of the IOS solution

The combination of the IOS QD taggant and laser interrogator technologies, allow ground, sea and air SR missions to be conducted with greater speed, accuracy and lethality while reducing risk to civilians near the targeting area.

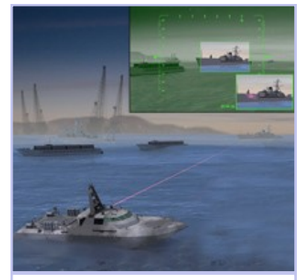


Figure 3. Sea reconnaissance