

## Concept: **CQAR (Closed-Quarters Aerial Robotics)**

### Scenario: **Closed Quarters**

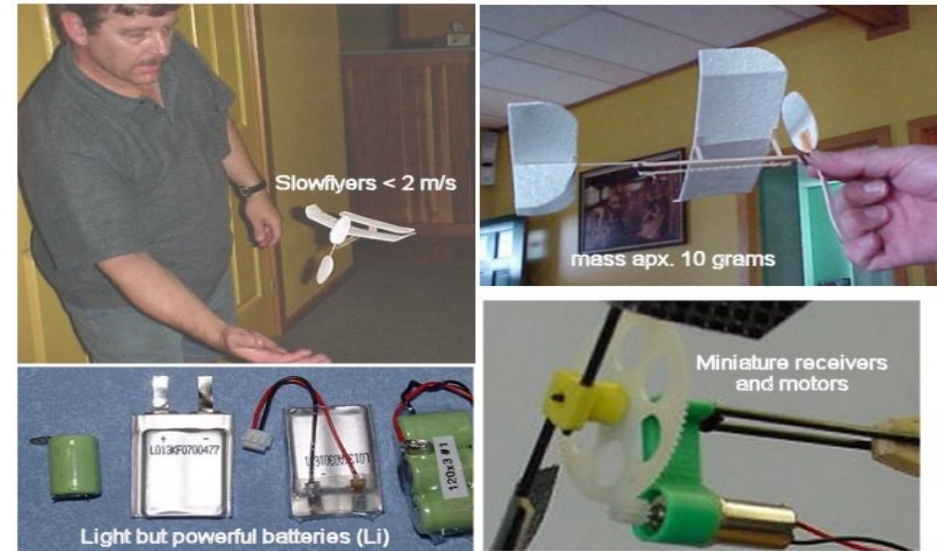
#### Examples

- Train Stations
- Stadiums
- Airports
- Warehouses
- Subway tunnels

#### Typically

- Enclosed
- Multiple floors
- Populated
- Congested

**Problem:** Easy to penetrate and hide with surveillance being time and labor intensive



**Operational Capability to be Provided:** aerial robots that fly slowly, autonomously avoiding obstacles to visually monitor closed quarters

### Technical Approach:

*Airfoil Data and Design:* Low Reynolds number for 50 gram aircraft flying slower than 1.5 m/s. Wind tunnel airfoil data does not exist and must be collected.

*Silicon Vision:* Conventional camera payload too heavy. Local processing: vision chips to detect, avoid and follow walls and ceilings.

*Sensor Fusion:* On-board ultrasonics and infrared. Global processing: Bluetooth for 2-way communication: transmitting robot position and receiving commands

### Research Space:

*Existing aerial robots:* mainly outdoor, leverages GPS, no or only partial autonomy, expensive, difficult to fly. Micro UAV program with flapping robots: limited to lab, battery technology currently poor.

*CQAR Markets:* DARPA (Organic Aerial Vehicle Program), ONR and ARL (Future Capabilities), SEPTA (maintenance in subway tunnels). Broadcasting: coverage in stadiums.