Proposal Title: Micro Air Vehicles (MAVs) for Surveillance and Remote Sensor Delivery

Operational Capability:
Unique operational capabilities
- Inexpensive, light-weight, compact, stealthy, highly maneuverable platforms for remote surveillance and/or sensor deployment.
- Sensor access to difficult-to-reach and/or hazardous locations.
- Multiple MAV deployment for redundancy/wide area of coverage.
- Improves situational awareness/reduces risks for field personnel.

System specifications
- Electric (silent) hand-launched MAV with on-board camera, GPS and optional chemical/biological agent sensors.
- Autonomy through vision-based stability and GPS navigation.
- Flight times between 30 min. and 1 hour; speeds of 20-50 mph.

Possible interested agencies:

Proposed Technical Approach:
Micro Air Vehicles (MAVs) will be developed for tracking individuals, locating terrorist threats, and delivering remote sensors, for surveillance and chemical/biological agent detection.

Tasks
- Develop robust MAV platform capable of carrying sensor payload.
- Develop fully autonomous capabilities for delivery of sensors to remote and distant locations.

Current capabilities and accomplishments
- Operational electric (inaudible) 6-inch MAVs with novel flexible wing, providing superior aerodynamic efficiency and control.
- Vision-based flight stability and control (from on-board cameras).
- Previous funding from USSOCOM, NSF and NASA.

Involved technology
Multidisciplinary approach incorporating novel control strategies, computational and experimental fluid dynamics, micro-electronics, vision-based control, and advanced construction technologies.

Rough Order of Magnitude Cost and Schedule:
Schedule (18 months period of performance):
- Phase I will focus on platform development and vision-based flight stability and control (9 months period of performance).
- Phase II will focus on GPS integration, and autonomous GPS-based navigation (9 months).

ROM Costs:
- Phase I: $150,000
- Phase II: $150,000

Deliverables:
Live, autonomous demonstration of MAV deployment; prototype MAV platform; autonomy software and documentation; final technical report.

Corporate Information:
Michael C. Nechyba, ECE Dept., University of Florida, 311 Benton Hall, PO Box 116200, Gainesville, FL 32611-6200
Phone: (352) 392-6503, Fax: (352) 392-4976
Email: nechyba@mil.ufl.edu
**BAA Number:** USD (ATL)/TSWG 02-Q-4655  
**Mission Area:** Video Human Tracking  
**Requirement Number:** 106/ATL-106-MNECHYBA-002  
**Proposal Title:** Micro Air Vehicle (MAV) Based Human Tracking  

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**Proposed Technical Approach:**

**Micro Air Vehicles (MAVs)** will be developed for multi-view airborne video human tracking.

**Tasks**

- Develop MAV platform with on-board cameras/GPS.
- Develop autonomous capabilities for tracking moving objects on ground.
- Develop collaborative control behaviors.

**Current capabilities and accomplishments**

- Operational electric (inaudible) 6-inch MAVs with novel flexible wing, providing superior aerodynamic efficiency and control.
- Vision-based flight stability and control (from on-board cameras).
- Previous funding from US SOCOM, NSF and NASA.

**Involved technology**

Multidisciplinary approach incorporating novel control strategies, computational and experimental fluid dynamics, micro-electronics, vision-based control, and advanced construction technologies.

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**Operational Capability:**

**Unique operational capabilities**

- Inexpensive, light-weight, compact, stealthy, highly maneuverable platforms for multi-view tracking of humans.
- Access to remote/difficult-to-reach locations.
- Multiple MAV deployment for redundant, uninterrupted tracking.

**System specifications**

- Electric (silent) hand-launched MAV with on-board video camera and GPS.
- Autonomy through vision-based stability and GPS navigation.
- Collaborative control of multiple MAVs.
- Flight times between 30 min. and 1 hour; speeds of 20-50 mph.

**Possible interested agencies:**


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**Rough Order of Magnitude Cost and Schedule:**

**Schedule (18 months period of performance):**

- **Phase I** will focus on platform development and vision-based flight stability and control (9 months period of performance).
- **Phase II** will focus on video-based target selection and tracking (9 months period of performance).

**ROM Costs:**

- Phase I: $250,000
- Phase II: $250,000

**Deliverables:**

Live demonstration of MAV deployment/target acquisition; prototype MAV platform; flight/targeting software and documentation; final technical report.

**Corporate Information:**

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Phone: (352) 392-6503, Fax: (352) 392-4976  
Email: nechyba@mil.ufl.edu
BAA Number: USD (ATL)/TSWG 02-Q-4655
Mission Area: Specialty Munitions
Requirement Number: 311/ATL-311-UFL-005
Proposal Title: Precise, Smart Micro Air Vehicle (MAV) Based Munitions

<table>
<thead>
<tr>
<th>Proposed Technical Approach:</th>
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<td>Micro Air Vehicles (MAVs) will be developed for precise targeting of small-scale objectives (e.g. small groups of enemy forces).</td>
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Tasks
- Develop MAV platform capable of carrying explosive payloads.
- Develop autonomous capabilities for delivery of munitions to identified targets.
- Supervised video-based target selection/tracking.

Current capabilities and accomplishments
- Operational electric (inaudible) 6-inch MAVs with novel flexible wing, providing superior aerodynamic efficiency and control.
- Vision-based flight stability and control (from on-board cameras).
- Previous funding from USSOCOM, NSF and NASA.

Involved technology
Multidisciplinary approach incorporating novel control strategies, computational and experimental fluid dynamics, micro-electronics, vision-based control, and advanced construction technologies.

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<th>Operational Capability:</th>
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<tr>
<td>Unique operational capabilities</td>
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- Inexpensive, light-weight, compact, stealthy, highly maneuverable platforms for precise, smart targeting of small-scale munitions.
- Targeting of remote/difficult-to-reach objectives.
- Multiple MAV deployment for redundancy/multiple strikes.
- "Friendly fire"/collateral damage mitigation/reductions.

System specifications
- Electric (silent) hand-launched MAV with on-board camera, GPS and small-scale explosives.
- Autonomy through vision-based stability and GPS navigation.
- Flight times between 30 min. and 1 hour; speeds of 20-50 mph.

Possible interested agencies:

<table>
<thead>
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<th>Rough Order of Magnitude Cost and Schedule:</th>
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<tr>
<td>Schedule (18 months period of performance):</td>
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</tbody>
</table>
- Phase I will focus on platform development and vision-based flight stability and control (9 months period of performance).
- Phase II will focus on supervised video-based target selection and tracking (9 months).

ROM Costs:
- Phase I: $150,000
- Phase II: $150,000

Deliverables:
Live demonstration of MAV deployment/target acquisition; prototype MAV platform; flight/targeting software and documentation; final technical report.

Corporate Information:
Peter Ifju, AeMES Dept., University of Florida, 231 Aero Bldg., PO Box 116250, Gainesville, FL 32611-6250
Phone: (352) 392-6744, Fax: (352) 392-7303
Email: ifju@ufl.edu
Proposed Technical Approach:

**Micro Air Vehicles (MAVs)** will be developed for multi-view search and localization of hidden ground targets.

**Tasks**
- Develop MAV platform with on-board video cameras/GPS.
- Develop frequency/color-based models of sought targets.
- Develop collaborative control behaviors.

**Current capabilities and accomplishments**
- Operational electric (inaudible) 6-inch MAVs with novel flexible wing, providing superior aerodynamic efficiency and control.
- Vision-based flight stability and control (from on-board cameras).
- Previous funding from USSOCOM, NSF and NASA.

**Involved technology**
Multidisciplinary approach incorporating novel control strategies, computational and experimental fluid dynamics, micro-electronics, vision-based control, and advanced construction technologies.

**Operational Capability:**
Unique operational capabilities
- Inexpensive, light-weight, compact, stealthy, highly maneuverable platforms for multi-view search and localization of hidden ground targets.
- Access to remote/difficult-to-reach locations.
- Multiple MAV deployment for redundant/wide-area coverage.

**System specifications**
- Electric (silent) hand-launched MAV with video camera and GPS.
- Autonomy through vision-based stability and GPS navigation.
- Collaborative control of multiple MAVs.
- Flight times between 30 min. and 1 hour; speeds of 20-50 mph.

**Possible interested agencies:**

**Rough Order of Magnitude Cost and Schedule:**

**Schedule (18 months period of performance):**
- **Phase I** will focus on platform development and vision-based flight stability and control (9 months period of performance).
- **Phase II** will focus on target modeling and localization (9 months period of performance).

**ROM Costs:**
- Phase I: $250,000
- Phase II: $250,000

**Deliverables:**
Live demonstration of MAV deployment/target acquisition; prototype MAV platform; flight/targeting software and documentation; final technical report.

**Corporate Information:**
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Phone: (352) 392-6503, Fax: (352) 392-4976
Email: nechyba@mil.ufl.edu
BAA Number: USD (ATL)/TSWG 02-Q-4655
Mission Area: Explosives Detection
Requirement Number: 420/ATL-420-UFL-004
Proposal Title: Micro Air Vehicle (MAV) Based Explosives Detection

Operational Capability:
Unique operational capabilities
• Inexpensive, light-weight, compact, stealthy, highly maneuverable MAV platforms for detection and localization of TNT explosives.
• Multiple MAV deployment for wide-area coverage.
• "Friendly fire'/collateral damage mitigation/reductions.

System specifications
• Electric (silent) hand-launched MAVs with on-board camera, GPS and TNT explosives sensors.
• Autonomy through vision-based stability and GPS navigation.
• Inter-MAV communication for MAV collaborative flight/control.
• Flight times between 30 min. and 1 hour; speeds of 20-50 mph.

Possible interested agencies:

Rough Order of Magnitude Cost and Schedule:
Schedule (18 months period of performance):
• Phase I will focus on sensor development and autonomous collaborative control behaviors (12 months performance period).
• Phase II will focus on integrated, multiple MAV deployment testing (6 months).

ROM Costs:
• Phase I: $250,000
• Phase II: $250,000

Deliverables:
Live demonstration of multiple MAV deployment; prototype MAV platform; flight/targeting software and documentation; final technical report.

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