



**RDECOM**



**TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.**

# RAMP

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# Report Documentation Page

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# Robotic Armed Maneuver Platform (RAMP) aka Wingman



## Interoperable Software Architectures



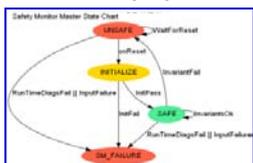
## Notional Armed Turret



## Integrated Platform And Turret Control



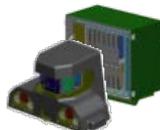
## UGV Safety Systems



## Notional UGV Platform



## Autonomous Navigation & Behaviors System



## Purpose:

*Develop, integrate, and demonstrate an armed robotic platform that is capable of performing tactically relevant maneuvers.*

## Products:

### Safe Armed Operations

- Aided target recognition & engagement
- Automated turret control
- Low latent remote fire

### Autonomous Tactical Behaviors

- Automated maneuvers in tactical formations
- Interaction of Manned and Unmanned Systems:
- Manned/unmanned intelligent teaming through advanced unmanned vehicle systems
- Common command and control of platform and turret

## Schedule & Cost

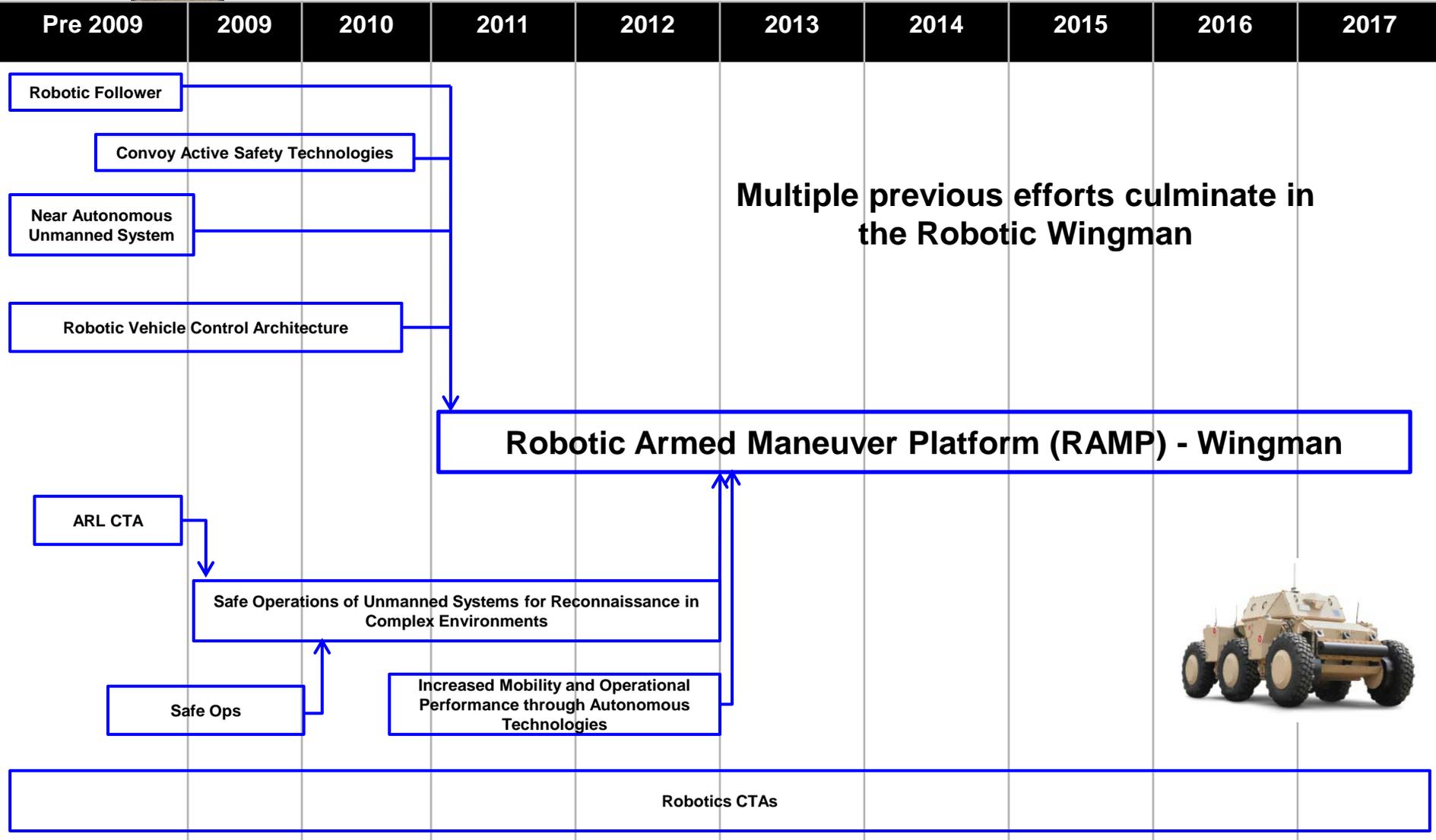
MILESTONE (FY)	11	12	13	14	15	16	17
Requirements Assessment	█						
Technology Assessment/Analysis		█ Enabling Techs					
Tactical/Mission Behavior Tech.	█						
Safe Armed Technologies		█					
Weapon System Dev & Integ. RSTA	█						
System Integration	█						
Op's M&S / Experimentation	█						
Engineering Evaluation			▲	▲			
Soldier Operated Demonstration		■		■			
Transition				◆			◆

## Payoff:

- Get Robotic Platforms in the Hands of the User
- Reduce Fleet Weight
- Increased Warfighter Survivability
- Increased Warfighter Lethality
- Reduced risk of future armed UGV integration



# RAMP Wingman Enabling Technologies





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# SOURCE

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# D.TAR.2009.03 Safe Operations of Unmanned systems for Reconnaissance in Complex Environments (SOURCE)



## Schedule & Cost

MILESTONE (FY)	09	10	11	12
Technology/Requirements Assessment	[Green bar]		[Green bar]	
Perception & Control Technologies - Safe Operations, Situational Awareness		[Green bar with diamond 5]		[Green bar with diamond 6]
Tactical/Mission Behavior Technologies - Cooperative & Dynamic Behaviors		[Green bar with diamond 5]		[Green bar with diamond 6]
Platform Integration		[Green bar]		[Green bar]
Engineering Evaluation		[Green bar with triangle]	[Green bar with triangle]	[Green bar with triangle]
M&S Experiments		[Green bar with triangle]	[Green bar with triangle]	[Green bar with triangle]
Field Experiments		[Green bar with diamond 5]		[Green bar with diamond 6]
<b>Total</b>	TARDEC ARL ERDC			

### Purpose:

Develop and demonstrate Perception, Intelligence, control and Tactical Behavior technologies that are required for autonomous collaborative unmanned systems (UMS) & Soldiers to conduct safe operations in a dynamic urban environment.

### Products:

- Perception sensors & planning algorithms for safe operations in dynamic/urban environments
- Tactical behaviors for mission execution (including MULE and SUGV class robots)
- Modeling & simulation software
- Integrated testbeds and data to develop UGV safety & testing procedures/methodologies in preparation for Interim Qualification Testing (IQT)
- Quantitative performance data to enable development of TTPs for UGVs

### Payoff:

- Remove warfighter from hostile situations
- Safer operations of UGVs in proximity to pedestrians and vehicles
- Increase in vehicle autonomy to enable less supervisory burden and reduced network loads
- Increased UGV situational awareness
- Robust soldier/robot and robot/robot teaming behaviors
- Robust UGV performance in all environments/conditions



# D.TAR.2009.03 SOURCE Joint Partnership Overview

## TARDEC

- Maturation, Integration & Demonstration



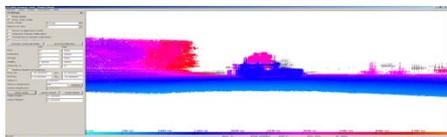
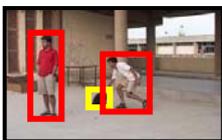
## ERDC

- Physics-based Simulation



## ARL/VTD

- Perception, Planning & Tactical Behavior Algorithms



## ARL/HRED

- Soldier-robot teaming and trust in automation



## ARL/CISD

- Indoor Navigation & Mapping

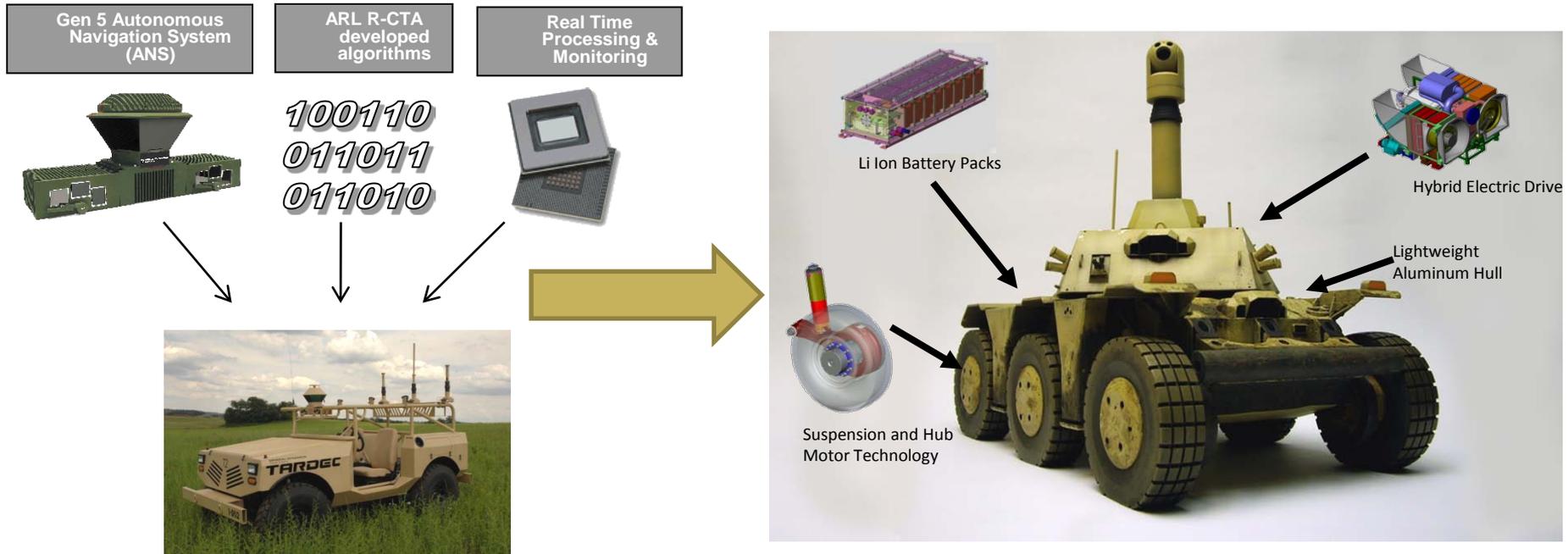






# SOURCE Large Platform

- Autonomously maneuver, operate and negotiate urban terrain
- Autonomously traverse paved roads at sustain speeds of 45KPH
- Autonomously traverse complex urban terrain at 8 KPH
- Detect oncoming vehicles at oncoming speeds of 80KPH and ranges of 50m
- Detect and Track humans up to 50m (standing and moving) and at speeds up to 10KPH
- Detect and avoid non-human entities moving at 10KPH





# SOURCE – Small Robots

## OBJECTIVE

- Enable dismounted operations of small scale robots in urban and complex environments using collaborative semi and fully autonomous behaviors, persistent surveillance, and mapping.

## CHALLENGES

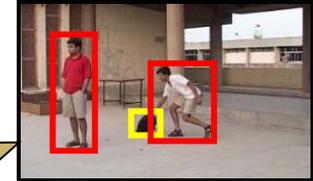
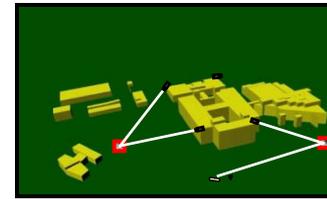
- Limited autonomous behaviors for SUGV
- Sensors don't yet exist to enable full autonomy on small robots
- Localization challenges in GPS-denied environments
- Persistent surveillance technology (including on moving robot)

## SOLDIER PAYOFF

- Reduced Soldier Workload
- Enhanced Situational Awareness

Technology Partners: ARL, SPAWAR, INL

## Persistent Surveillance



## Indoor Navigation And Mapping



## Indoor Navigation And Mapping

