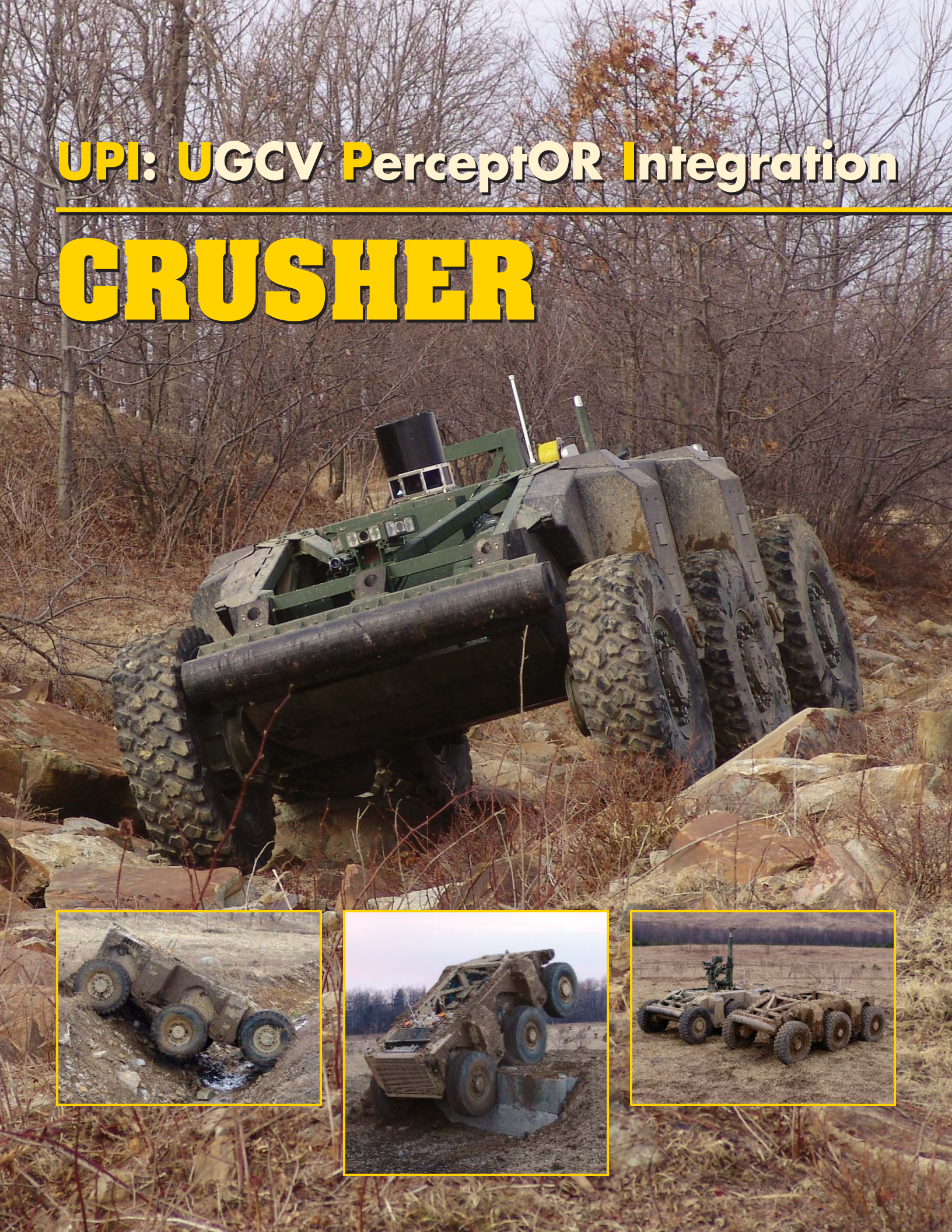
UPI: UGCV PerceptOR Integration

CRUSHER



CRUSHER

Unmanned Ground Combat Vehicle

Crusher's suspension system allows it to maintain high offroad speeds across extreme terrains.

THE VEHICLE

The Crusher vehicle was created as part of the UPI program at the National Robotics Engineering Center (NREC) of Carnegie Mellon University. The UPI program features quarterly field experiments that assess the capabilities of large scale, unmanned ground vehicles (UGV) operating autonomously in a wide range of complex, off-road terrains. UPI's aggressive mobility, autonomy and mission performance objectives required two additional test platforms that could accommodate a variety of mission payloads and state of the art autonomy technology. Crusher represents the next generation of the original Spinner platform, the world's first greater-than-6-ton, cross-country UGV designed from the ground up. Crusher offers more mobility, reliability, maintainability and flexibility than Spinner, at 29 percent less weight.

TOMORROW'S TECHNOLOGY AVAILABLE TODAY

Crusher has a new space frame hull designed by CTC Technologies and made from high-strength aluminum tubes and titanium nodes. A suspended and shock-mounted skid plate made from high-strength steel allows Crusher to shrug off massive, below-hull strikes from boulders and tree stumps. The nose was completely redesigned for Crusher to sustain normal impacts with trees and brush while also absorbing the impact of major collisions.

Suspensions designed by Timoney support 30 in. of travel with selectable stiffness and reconfigurable ride height. Crusher can comfortably carry over 8000 lbs. of payload and armor.

Crusher's hybrid electric system allows the vehicle to move silently on one battery charge over miles of extreme terrain. A 60kW turbo diesel engine maintains charge on the high-performance SAFT-built lithium ion battery module. Engine and batteries work intelligently to deliver power to Crusher's 6-wheel motor-in-hub drive system built around UQM traction motors.

By mid 2006, NREC will integrate its latest automation technology onto both Crusher vehicles. A combination of ladar and camera systems allow the vehicles to dynamically react to obstacles and travel through mission waypoints spaced over a kilometer apart. The use of overhead data via terrain data analysis will continue to be utilized for global planning. Over the next year these two vehicles will analyze, plan, and execute mobility missions over extreme terrains without any human interaction at all.

18-foot telescoping mast enables covert surveillance in dense environments.

A WINDOW TO THE FUTURE

As a core building block in the Army's future force, tactical UGVs enable new war-fighting capabilities while putting fewer soldiers in harm's way. The full benefit of this new capability can only be achieved with field-validated understanding of UGV technology limits and consideration of the impact to Army doctrine, personnel, platforms and infrastructure. UPI experiments encompass vehicle safety, the effects of limited communications bandwidth and GPS infrastructure on vehicle performance, and how vehicles and their payloads can be effectively operated and supervised. The UPI program invites military personnel, requirement developers, acquisition professionals, Future Combat Systems performers and researchers to observe and participate in UPI experiments.

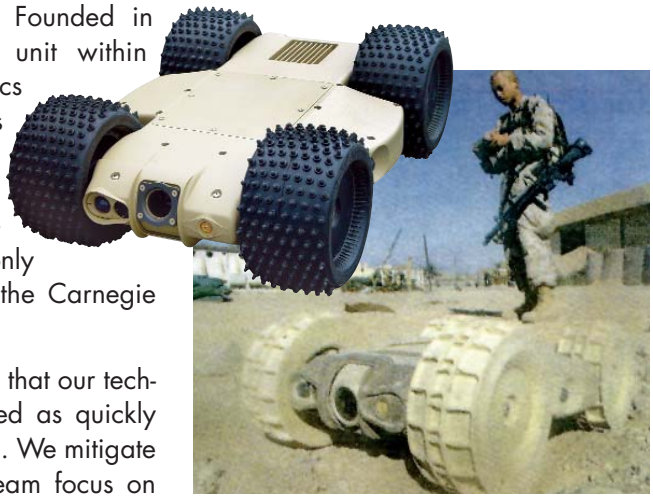
Unloaded vehicle weight	13,200 lbs
Maximum payload/armor	8,000 lbs (maintaining capability)
Length	201 in
Width	102 in
Height (w/16 in ground clearance)	60 in
Ground clearance	0-30 in (reconfigurable)
Tire diameter	49.5 in
Top speed	26 mph (<7secs)
Minimum turning radius	0 (skid steer)
Slope climbing	>40 deg (traction limited)
Side slope	>30 deg (traction limited)
Step climb	>4 ft
Gap/trench crossing	>80 in
Engine	Turbo diesel
Generator output	58 kW/78 hp
Onboard battery storage	18.7 kW-hr energy
Traction motors	210 kW/282HP continuous
Peak torque	40,000 ft-lb (6WD)
Payload volume (internal)	41.6 ft^3 main bay (inside hull)
	16.1 ft^3 front bay (inside hull)
Payload power	28V, 5kW
	300V, 10kW
Control modes	Wireless pendant control (RC)
	Teleoperation control
	Waypoint following
	Full autonomy

NREC

National Robotics Engineering Center

The National Robotics Engineering Center (NREC) develops and delivers leading edge automation technology to industry and government to enable new products and capability. Founded in 1995 as an operating unit within Carnegie Mellon's Robotics Institute, NREC employs over 125 scientists, technical staff, graduate students and support personnel. The 100,000 sq. ft. facility is only a ten minute drive from the Carnegie Mellon campus.

We partner with clients so that our technology can be transitioned as quickly and effectively as possible. We mitigate client risk by continual team focus on measurable project objectives, accelerated product development, reuse of core NREC technologies and extensive field testing under real-world conditions.



(Above) Gladiator, an unmanned robotic vehicle that exhibits high mobility and advanced robotic scouting capabilities required for the Ground Combat Element of the United States Marine Corps.

(Left) Dragon Runner™, developed for the US Marine Corps Warfighting Laboratory, is a small, man-portable robot, capable of inverted operation and designed to increase situational awareness.

Government Sponsors

DARPA

Office of the Assistant Secretary of the Army — Acquisition, Logistics & Technology

Program Manager FCS — Brigade Combat Team — One Team-The Army/Defense/Industry

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