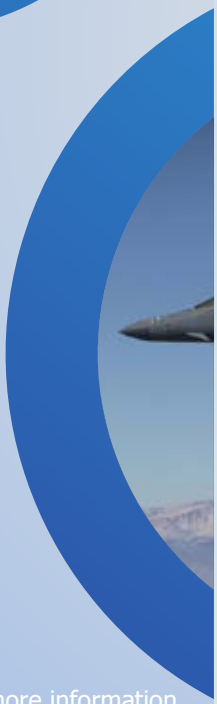
DARPA Transitions: Out of the Laboratory and Into the Field

DARPA understands that it is not enough to develop new and even extraordinary technical capabilities. The agency's work is not done until those technologies are making a difference. That's why, even before a program launches, DARPA starts developing strategies for transitioning anticipated results into applicable, real-world domains.

Transitions can follow different paths. In one approach, a DARPA program that demonstrates a military capability might become a program of record in one or more of the Services. In another instance, a new DARPA-enabled technology may transition first to the civilian sector, where commercial forces may drive further advances and cost efficiencies, facilitating subsequent incorporation into military systems. In still other cases, DARPA's role is simply to prove at a fundamental level that something is possible and practicable, after which the agency will transition the work to a military or civilian research organization for further research and development.

DARPA is committed to ensuring that its achievements are ultimately put to work in the furtherance of national security. Recent and ongoing transitions include:



Gauging Body Blasts

This low-cost, disposable, wearable blast exposure warning system quantifies and ranks explosive events from improvised explosive devices, rocket-propelled grenades, or other explosives including those deployed in training. Developed by DARPA and priced under $50 apiece, these gauges are now being adopted widely by Special Operations Forces and the U.S. Army.

Modernizing Maps

To overcome reliance on outdated paper maps, notes and voice radio transmissions, DARPA used an agile development process to turn Android smartphones into sophisticated tools for enhanced situational awareness—and quickly deployed 3,000 of the mobile devices to Army combat squads throughout Afghanistan.

Facilitating Close Air Support

DARPA-developed software on Android tablets was transitioned directly to units in Afghanistan, drastically improving ground forces' ability to coordinate air engagements, improve accuracy and reduce collateral damage and friendly-fire losses. In the United States, these wireless communication and coordination tools are also being tested and adopted by emergency responders, including firefighters in the West and Southwest.

For more information about the impact of DARPA's contributions, see **www.darpa.mil** or contact **Outreach@darpa.mil**.

DARPA's mission is to make the pivotal early technology investments that create or prevent strategic surprise for U.S. national security

November 2015

Enabling Long-Range Anti-Ship Abilities

DARPA jumpstarted the development of a precision-guided anti-ship standoff missile that is on track to reduce dependence on intelligence, surveillance and reconnaissance platforms. DARPA is working in close collaboration with the Navy to speed deployment of this capability, which promises to offer an unprecedented ability to penetrate sophisticated enemy air defense systems from long range.

Creating Submarine "Satellites"

DARPA's Distributed Agile Submarine Hunting program is creating fixed and mobile underwater observing systems that look up from the ocean floor in much the way satellites look down, to provide a wide-area view of submarine threats passing overhead. This deep-ocean system has as a goal the ability to track a sub until other platforms can arrive to track, trail or prosecute the threat. DARPA is working with the Fleet to conduct at-sea prototype testing that will integrate these new capabilities with existing undersea surveillance operations—testing that will underpin Navy consideration of a potential program of record for undersea surveillance.

Expanding Marine Platforms for UAVs

Many unmanned aerial vehicles (UAVs) used by the military require either an aircraft carrier or a land base with a long runway for take-off and landing—requirements that entail degrees of financial, diplomatic and security commitments incompatible with rapid response.

DARPA's Tactically Exploited Reconnaissance Node program envisions using smaller ships as mobile launch and recovery sites for medium-altitude, long-endurance fixed-wing UAVs. The Navy has teamed with DARPA to advance relevant technologies and enable a full-scale, at-sea demonstration of a prototype.

Gathering High-Altitude, High-Resolution Data

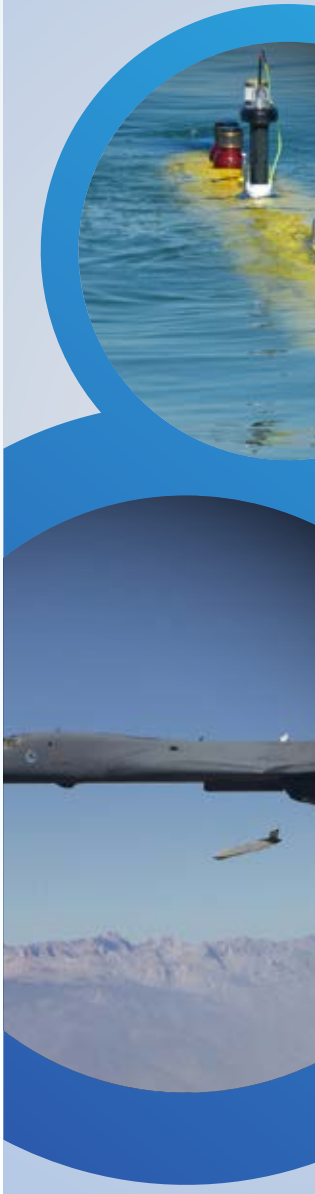
DARPA's High-altitude LIDAR Operations Experiment provided forces in Afghanistan with unprecedented access to high-resolution 3D data, collecting data orders of magnitude faster and from much longer ranges than conventional methods. It has been transitioned to other Defense Department entities.

Reconfiguring Flight Formations

Inspired by the energy efficiencies enjoyed by flocks of migratory birds that fly in a "V" formation, DARPA developed a creative way to reduce drag and fuel use for the C-17 fleet of the U.S. Air Force—the largest single DoD user of aviation fuel. New DARPA software enabled precise auto-pilot and auto-throttle operations with existing C-17 hardware. Flight test results showed that these aircrew- and aircraft-friendly software changes provided a 10 percent fuel flow reduction, leading the USAF to approve a plan for transitioning the technology to the C-17 fleet in 2014. The Air Force Research Laboratory is now investigating extending the technology to other aircraft.

Advancing Fuel Cells for Longer Flights

DARPA's early investments in materials for portable fuel cells challenged conventional wisdom but ultimately paved the way for a number of "firsts" in fuel cell technology development. Today this technology has evolved to the point where it is being commercialized and used to provide greater endurance for UAVs that help protect military personnel and serve other agencies. Users include the Marine Corps Warfighting Lab, the Army Research



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Lab, and the National Park Service, with additional transitions in the works.

Avoiding Collisions on Orbit

With the risk of space collisions growing apace with satellite traffic--and with satellites ever more important for communication, Earth observation and other critical military and civilian functions--DoD has made space domain awareness a top priority. DARPA's Space Surveillance Telescope, slated to be a dedicated sensor in the U.S. Space Surveillance Network, promises to enable much faster discovery and tracking of previously unseen, hard-to-find objects in geosynchronous orbits.

Breaking Through the Language Barrier

Multiple DARPA language translation devices and systems have been deployed in conflict zones over the past decade, and technology improvements continue to advance national security by supporting warfighter interactions with local populations and generating regional intelligence from broadcast media and other sources. DARPA-supported development in this domain is also helping to combat transnational crime and piracy while enabling international cooperation, including humanitarian assistance.

Exploiting Photo and Video Images

Burgeoning volumes of photographs and video collected in support of surveillance and reconnaissance efforts are challenging current abilities to gain timely intelligence. DARPA has developed and transitioned several technologies that enhance analysts' productivity, including technology that searches imagery and video archives for persons, objects, events and activities of interest; novel interfaces to support live video exploitation; and the capability to track all movers in a dynamic field of view.

Revolutionizing Prosthetics

Improvements in upper-limb prosthetic technology have trailed far behind lower-limb technology advances, reflecting the medical and engineering challenges posed by the complexities of the human arm and hand. DARPA has demonstrated that advanced prosthetics and direct neural interfaces can restore near-natural arm and hand control. In 2014, capping an intensive, multi-year DARPA-funded effort, the U.S. Food and Drug Administration gave marketing approval for a sophisticated, modular prosthetic arm and hand that provides unprecedented user dexterity. Related technology has transitioned to small robotic systems for manipulating unexploded ordnance and suspicious objects.