

Statement by Dr. William B. Roper, Jr.  
Director, Strategic Capabilities Office

Before the  
Subcommittee on Emerging Threats and Capabilities  
Armed Services Committee,  
U.S. Senate

Strategy and Implementation of the Department of Defense's Technology Offsets  
Initiative in Review of the Defense Authorization Request for Fiscal Year 2017

April 12, 2016

NOT FOR PUBLICATION UNTIL RELEASED BY THE SUBCOMMITTEE

Chairman Fischer, Ranking Member Nelson, and Members of the Subcommittee, thank you for the opportunity to testify before you today on this important topic. I am Will Roper, Director of the Strategic Capabilities Office, also known as SCO. It is an honor to be here with esteemed colleagues from the research and development arm of the Department who strive each day to maintain our technology edge against a world of threats. As these threats fill the vast space between non-state terrorism and great power competition, the Department's Third Offset Strategy is returning greater focus to highly-sophisticated adversaries. Recently created in 2012, SCO is the near-term component of this broader strategy, so I would like to share our framing of immediate challenges; process for prototyping solutions; partnerships with the Services, Agencies, and Intelligence Community; and examples of our ongoing work. This will be the focus of my remarks today.

## **UNDERSTANDING THE CHALLENGE: AN INSTRUCTIVE ANALOGY**

Our national security environment is one of complexity—the problems we face are intricate, interconnected, and difficult to simplify. In addition to the all-too-familiar threats of violent extremism, nuclear proliferation, and malign influences in the Middle East, the United States now faces a rising China and revanchist Russia, both challenging international laws and national sovereignty. These concerns span a world that is changing rapidly due to commercial technologies connecting us—and the things in our lives—more quickly and inextricably than ever before. Though challenges themselves are not new to the Defense Department, this rate of change is. It will affect all aspects of our national security, including our return to great power competition.

Though daunting in many respects, we interpret our immediate challenge via a simple, but instructive, analogy: that the U.S. military is akin to a football team running a successful playbook, but for too long. As in football where opponents watch film to find weaknesses, our decades of operations in the Middle East have provided valuable “game film” for rising powers to study and exploit in their weapons and strategy development. Though we still have the most dominant military of earth, we will not remain so if we continue running our 20th-century playbook indefinitely. We must change; the question is: “How?”

SCO's answer is to do what football teams do: great teams often find themselves over-analyzed and exploited, but they do not throw out their old playbooks. They

turn this vulnerability into opportunity by creating trick plays: running in pass formations, passing in run formations, reimagining their strengths rather than playing to opponents'. In like fashion, we can rejuvenate our military playbook by reimagining its strengths—ships, subs, aircraft, vehicles, etc.—using them in unforeseen, and hopefully uncontested, ways. The SCO was created over three years ago by Secretary Carter to do precisely this. Since then, we have developed capability partnerships with every Service, four Combatant Commands, and the Intelligence Community—opportunities for implementation are everywhere. Though this strategy often has advantages of lower cost and rapidity, its core tenet—our Department's need for change—is anchored in a greater advantage: our experienced operators, who can do the unparalleled with today's systems and rapidly master unconventional tactics. As in football, it is people—not plays—that ultimately win the game. This strategy also provides healthy connective tissue between our past and future efforts: the past, by keeping taxpayer investments viable for as long as possible; the future, by buying additional time for new technologies to field. Because of this, SCO is the near-term element of the broader Third Offset; our goal, to enhance deterrence backed by an arsenal of surprises and sleights of war using systems we have today.

Striking the balance between deterrence and warfighting is the one place our football analogy breaks down. There is no deterrence in football; teams show up to play regardless of skill differential. Because of this, surprises are never revealed prior to games, but the military must fulfill two competing roles: war reserves to win conflict and deterrence reserves to avoid it altogether. These latter “psychological salvos”—where capabilities are unveiled to change calculus and deter aggression—must be carefully and strategically analyzed to maintain a balanced stockpile for peace and war. Aiding this is SCO's second mission, and to that end, most of our capability details remain classified. However, I look forward to sharing some selected examples today, as well as our process for creating them.

## **SCO INNOVATION PROCESS**

Our innovation process is, itself, innovative because it flows in reverse: from existing systems to operational needs rather than operational needs to future systems. Living within the constraints of existing hardware and software focuses ideas, encourages joint cross-domain thinking, and necessitates partnerships between SCO and system owners—namely Services, Agencies, and the Intelligence Community—to prototype and prove out concepts before buying them

in bulk. In three and half years of practice, SCO has produced 15 projects containing 23 capabilities, with a total of six transitioning by the end of this year, and none failing transition thus far. Our FY 2017 Budget of \$902 million includes 36 percent for Navy projects, 24 percent for Air Force, 18 percent for Army, and 22 percent for other institutions. As I will discuss momentarily, we partner with these organizations to execute projects, but several other process attributes are worth highlighting:

- **Creative Imperative:** We strive for five to six strategic capability alternatives in each budget cycle. This maintains our healthy sense of near-term creative urgency as we tackle long-term problems.
- **Creativity Constraints:** Constraints imposed by existing government and commercial hardware and software (e.g. size, weight, power) structure our innovation and provide clear termination criteria. This prevents endless meandering of projects and maximizes the chance of successful transition to programs of record.
- **Cross-Cutting, Good-Enough Solutions:** Squeezing the full potential out of current systems forces us to look orthogonally across Service, Mission, Classification, and Title divides; many of our projects integrate disparate capabilities into hybridized joint solutions. Because speed of response is a key metric, we also explore partial solutions that provide earlier or cheaper alternatives to Department leadership.
- **Rapid Prototyping:** Because SCO repurposes systems for new missions, our concepts are high risk until demonstrated, even though the systems, themselves, may be mature. By funding two- to four-year prototyping efforts inside existing Service program offices, we prepare for future transition without prematurely creating programs before cost and performance are understood. Executing inside existing program offices is a significant force multiplier for our staff, allowing a small, agile team to kick-start many simultaneous projects.
- **Strategic Partnerships:** Our partnerships with Services and Defense Agencies, Combatant Commands, and the Intelligence Community are the true secret to our success; we are simply a hub that allows these important spokes to turn differently.

- *Services and Defense Agencies*: All of the systems we reinvent are owned by Services and Agencies; as such, we cannot explore new concepts without their unique engineering and programmatic expertise. SCO partnerships now span the Air Force, Army, Navy, Marine Corp, and the Missile Defense Agency.
- *Combatant Commands*: Because our solution process is rapid, U.S. Pacific Command and U.S. European Command created local SCO teams to be our theater umbilicals, ensuring our ideas target their most-difficult challenges. This partnership is essential to our success, and we are excited to initiate new efforts with U.S. Strategic Command and U.S. Special Operations Command this year.
- *Intelligence Community*: SCO is a voracious consumer of intelligence; it is vital to our understanding of adversaries and opportunities associated with them. Because the information we covet must be synthesized across multiple topics and disciplines, we have forged close bonds with the Intelligence Community, turning their insights into new concepts.

When applied to the broad U.S. catalog of systems, this process is evolving our immediate power projection playbook via three mechanisms: (i) repurposing systems for new missions, (ii) integrating systems into synergistic teams, and (iii) incorporating enabling commercial technology.

## **I. REPURPOSING SYSTEMS FOR NEW MISSIONS**

Modifying systems for new missions, a practice likely to become easier as designs become open and payloads, modular, has potential benefits of lower cost and faster development, but it also provides an additional bonus—rapid force structure—whenever modifications can be retrofit to current inventories en masse. Because inventory numbers are an important component of peacetime posture, achieving them rapidly makes this approach highly appealing whenever possible. Some examples of ongoing SCO projects include:

- **Anti-Ship Standard Missile-6 (SM-6)**: SM-6 was developed in the early 2000s for air and missile defense of ships. By modifying its software, SCO and the Navy successfully demonstrated its anti-ship ability, giving the Navy the option

of switch-hitting the 600+ missiles in its FY 2017 Budget between offense and defense.

- **Maritime Tomahawk:** Tomahawk has been a perennial ship and submarine weapon since the 1980s, but primarily for land targets. Partnering with the Navy on advanced maritime targeting as part of our Strike-Ex project, we transitioned another dual-threat weapon option into the Navy's FY 2017 Budget.
- **Army Tactical Missile Systems (ATACMS) Upgrades:** Options to upgrade the Army's ATACMS missile are also part of our Strike-Ex program. Because the modifications are higher risk than Maritime Tomahawk's, we will team with the Army to build and demonstrate an operational prototype, giving the Army multiple options for next-generation fires.
- **Hypervelocity Guns:** The Army's 155mm Paladin and Navy's Five-inch guns are relatively unchanged since their development in the 1990s. By leveraging projectiles from the electromagnetic railgun program and incorporating advanced composite materials, our joint team is prototyping a "supersonic shield" potentially capable of low-cost missile defense and long-range fires. In fact, a record-breaking, high-speed shot from a howitzer was conducted earlier this year.
- **Ground-Based Fighter Radars:** The Air Force's F-15 Eagle radar was designed in the 1970s and continually modernized into the 2000s. Partnering with the Missile Defense Agency, SCO is prototyping a ground-based variant to protect forward operating bases from dense missile raids, providing a mobile sensor counterpart to hypervelocity guns.
- **Advanced MK-48 Torpedo:** The MK-48 was designed in the 1960s as the Navy's heavyweight torpedo and has been successively upgraded ever since. As the torpedo reenters production, we are partnering with the Navy to build a higher-risk, higher-payoff variant with advanced propulsion, modular payloads, and classified capabilities, enabling this undersea workhorse to go further and do more.

## II. INTEGRATING SYSTEMS INTO SYNERGISTIC TEAMS

Teams of systems can survive—and even thrive—in contested environments where individuals, alone, would fail. This is simply due to separating, and then specializing, responsibilities amongst multiple team members as opposed to relying solely on super-star systems. Some of our most successful teams are architected across Service and Agency lines, as well as the Department’s classified programs. Some examples include:

- **Arsenal Plane:** Stealth fighters are designed for enemy penetration but at the expense of weapons capacity. By teaming them with standoff Arsenal Planes, these forward scouts can continue to put lethal eyes on target without landing to resupply their weapons. Partnering with the Air Force, SCO will build and test an operational prototype by FY 2020, giving the Air Force a completely new way to extend air power.
- **Third Eye:** Kill chains—the series of steps between finding and finishing targets—can be defeated by denying a single link. Our Third Eye program is working with multiple Services to create resilient “kill webs” where sensors and shooters are increasingly interconnected. Having already teamed disparate assets in live-fire demonstrations, this program should increase the difficulty of denying joint operations.
- **Sea Mob:** Navy ships are designed to carry high-value sensors and weapons—as well our sailors—making them critical to protect during combat. By also making them motherships for small swarming boats, the resulting team can surveil dangerous areas without putting sailors in harm’s way. Partnering with the Navy, SCO is building commercially-based kits to convert existing boats into autonomous “sea mobs.” In fact, we recently conducted a successful 800-km transit using an 11-m Rigid Hull Inflatable Boat.

## III. INCORPORATING ENABLING COMMERCIAL TECHNOLOGY

The commercial revolution in smart technologies is rapidly changing most facets of the world. This revolution is taking the ordinary things in our lives—refrigerators, thermostats, phones, to name a few; infusing them with compact sensors and processors; and wrapping them in high-speed networks and cloud-based services. The net result is new, transformational applications, even though

most of the underlying hardware—compressors, thermometers, and antennae—do not radically change. Its spillover into national security is accelerating. In a departure from the past decade, the Department must become a fast adopter of external technology to stay on the cutting edge. Though evolving commercial products may not meet all traditional DoD requirements, failure to move at their speed risks our entanglement in the global web of things, but not on our terms. We must envision and embrace smart military systems in order to thrive on this web, and using commercial technology and agile manufacturing to upgrade legacy assets is one way to begin. Some of our examples include:

- **Advanced Navigation:** Legacy air-to-ground weapons—like Small Diameter Bomb and the Joint Direct Attack Munition—use GPS to navigate, making them effective for strikes against terrorists but less so in regions where GPS is denied. Partnering with the Air Force, SCO is prototyping an upgrade kit leveraging commercial, smartphone-class sensors, giving the more than 37,000 weapons in the Air Force’s FY 2017 Budget the option for retrofitting smart navigation.
- **Information Common Operating Picture (iCOP):** Commanders use air, ground, and maritime common operating pictures, or COPs, to understand and respond to changing environments. In our ubiquitously-networked world, understanding the information environment—changing sentiment, perspectives, trends, legitimate news, and manufactured propaganda—is increasingly important. Thanks to commercial advances in big data, analytics, and deep learning, barrages of open-source data are now understandable in real time but relatively unexploited by operational commands. Partnering with U.S. Pacific Command and the Marine Corps, SCO has built and tested a prototype information COP—or iCOP—allowing operators to understand the effects of U.S. actions as well as foreign attempts to undermine them. In fact, just last week, we released the first beta test version to support the ongoing U.S.-Philippines Balikatan exercise.
- **Perdix:** Fighters are designed for speed and maneuverability, not loitering over hostile territory. By equipping them with 3D-printed swarming micro-drones, our fighters can now efficiently search hazardous areas without risk to pilots. Partnering with the Air Force, SCO has tested five generations of “swarmbots” out of F-16s and F-18s, including 150 at the Northern Edge exercise in Alaska last year.



The rest and best of our project details must remain classified, but I hope these examples illustrate how widespread applications can be—no facet of future conflict should be as it seems.

## **CONCLUSION**

In conclusion, both our great power challenges and opportunities are great: our challenges, because they require Department-wide change; our opportunities, because they involve some of our greatest strengths—ingenuity, technology, and operational prowess. If we leverage these strengths in concert, a new U.S. power projection playbook—one that undercuts attempts to exploit our predictability—can commence with systems we have today and continue as advanced systems field in future. Sustaining momentum on this playbook will require taking the long view while maintaining a sense of urgency today. As one of the bellwethers for the return to great power competition, I am pleased to say that SCO is making significant progress in making today count towards a future shaped by us, not for us. I hope you will support the President's 2017 Budget as we seek to sustain momentum inside the broader, Department-wide Third Offset.

Thank you, again, for the opportunity to testify today. I am happy to respond to any questions.