RISE OF THE DRONES: UNMANNED SYSTEMS AND THE FUTURE OF WAR

HEARING

BEFORE THE

SUBCOMMITTEE ON NATIONAL SECURITY
AND FOREIGN AFFAIRS

OF THE

COMMITTEE ON OVERSIGHT
AND GOVERNMENT REFORM

HOUSE OF REPRESENTATIVES

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RISE OF THE DRONES: UNMANNED SYSTEMS AND THE FUTURE OF WAR

TUESDAY, MARCH 23, 2010

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON NATIONAL SECURITY AND FOREIGN
AFFAIRS,
COMMITTEE ON OVERSIGHT AND GOVERNMENT REFORM,
Washington, DC.

The subcommittee met, pursuant to notice, at 2 p.m. in room 2154, Rayburn House Office Building, Hon. John F. Tierney (chairman of the subcommittee) presiding.

Present: Representatives Tierney, Flake, Foster, Luetkemeyer, and Quigley.

Staff present: Andy Wright, staff director; Bronwen De Sena, intern; Talia Dubovi, counsel; Elliot Gillerman, clerk; Linda Good, deputy clerk; Carla Hultberg, chief clerk; LaToya King, fellow; Adam Fromm, minority chief clerk and Member liaison; Tom Alexander, minority senior counsel; Christopher Bright, minority senior professional staff member; and Renee Hayes, minority Defense fellow.

Mr. TIERNEY. A quorum being present, the Subcommittee on National Security and Foreign Affairs' hearing entitled, "Rise of the Drones: Unmanned Systems and the Future of War," will come to order.

I ask unanimous consent that only the chairman and ranking member of the subcommittee be allowed to make opening statements.

Without objection, so ordered.

I ask unanimous consent that the hearing record be kept open for 5 business days so that all members of the subcommittee be allowed to submit a written statement for the record.

Without objection, so ordered.

Good afternoon. It is nice to see all of you here. I apologize that I was a bit late, and Mr. Flake and I didn't have much time to spend with you before you came, but we think we will get fully acquainted through your testimony and your comments on that in the question and answer period. We certainly hope that is the case.

Our hearing today introduces a new topic to the subcommittee, the rise of unmanned systems and their implications for U.S. national security. Over the last decade, the number of unmanned systems and their applications has grown rapidly. So, too, has the number of operational, political and legal questions associated with the technology.

(1)

To illustrate the wide variety of unmanned systems and some of their applications, we wanted to share some short video clips or unmanned systems ranging from the harmless to the lethal. The first system is clearly on the harmless side of the spectrum.

[Video shown.]

Mr. TIERNEY. I know from first-hand experience that was made in my district, the I-Robot, of course, not the cat, the robot is over there. [Laughter.]

Video two shows that other systems provide support to our warfighters. This particular slide is the Ripsaw MS–1, a remote gun tank that can travel at speeds of up to 60 miles per hour and can carry a payload of up to 2,000 pounds. As you will see, it can also be used to pull vehicles and other items that are potential security risks.

[Video shown.]

Mr. TIERNEY. Video three is known as the Big Dog, a four-legged robot that can walk through sand, snow and ice while carrying up to 340 pounds on its back and serving as a robotic pack mule. As you will see, it can retain its balance on uneven surfaces and can handle rough terrain.

[Video shown.]

Mr. TIERNEY. Looks like a dance class gone bad. [Laughter.]

And video four is the Raven UAV, used primarily for surveillance. And as you will see, it is hand-launched and remote-controlled from the field. The editor of a magazine recently built a homemade version of the Raven for around $1,000.

[Video shown.]

Mr. TIERNEY. That is, of course, what you are seeing from the Raven's equipment. That isn't the Raven making that buzzing noise, either. [Laughter.]

It basically means that we are going to have votes in a short while and what we will do is we will probably finish our opening remarks and break, hopefully briefly, for a couple of votes and come back. We apologize. We can probably expect that to happen a little bit throughout the afternoon.

The last and final clip shows the most lethal side of unmanned systems. Some of you may be familiar with footage similar to this. This is unclassified footage from an Army unmanned aerial vehicle engaging combatants in Iraq.

[Video shown.]

Mr. TIERNEY. Growing demand for and the reliance on unmanned systems has serious implications both on and off the battlefield. As the United States is engaged in two wars abroad, unmanned systems, particularly unmanned aerial vehicles, have become a centerpiece of that war effort.

In recent years, the Department of Defense's UAV inventory has rapidly grown in size, from 167 in 2002 to over 7,000 today. Last year for the first time, the U.S. Air Force trained more unmanned pilots than traditional fighter pilots.

Some express no doubt that unmanned systems have been a boost to U.S. war efforts in the Middle East and South Asia. CIA Director Leon Panetta said last May, "Drone strikes are the only game in town in terms of confronting or trying to disrupt the Al Qaeda leadership." Media reports over the last year indicating that

the top two leaders of the Pakistani Taliban were killed by drone strikes also are used to support that argument.

But some critics argue that drone strikes are unethical at best and counterproductive at worst. They point to the reportedly high rate of civilian casualties, which has been calculated by the New America Foundation to be around 32 percent, and argue that the strikes do more to stoke anti-Americanism than they do to weaken our enemies. A quick skim of any Pakistani newspaper provides some evidence to support this theory.

This is particularly relevant in the era of counterinsurgency doctrine, the central tenet of which is first do no harm. It also may be the case that we are fighting wars with modern technology under an antiquated set of laws. For example, if the United States uses unmanned weapons systems, does that require an official declaration of war or an authorization for the use of force? Do the Geneva Conventions, written in 1949, govern the prosecution of an unmanned war? Who is considered in lawful combat in unmanned war, the Air Force pilot flying a Predator from thousands of miles away in Nevada? Or the civilian contractor servicing it on the airstrip in Afghanistan?

If unmanned systems are changing the way that we train our military personnel, so too should they change the way that we respond to the stress of combat. We already know that unmanned pilots are showing signs of equal or greater stress from combat compared to traditional pilots. The stress of fighting a war thousands of miles away then minutes later joining your family at the dinner table presents mental health challenges that must be addressed.

On the domestic front, manufacturers have already developed a number of unmanned commercial products and are likely to find more applications for this technology in the future. From vacuum cleaners to crop dusters, traditional items that require manual operation are rapidly being rendered obsolete by unmanned technology. UAVs are now being used for environmental monitoring, particularly in hard to reach places like the North Pole. Last fall, the University of North Dakota chartered a 4-year degree program in UAV piloting.

These trends are already forcing us to ask new questions about domestic air and space regulation. Who is allowed to own unmanned systems? And where are they allowed to operate?

Additionally, as more law enforcement and border security services come to use unmanned systems, important questions continue to emerge about the protection of privacy. As this technology develops and becomes more commercially available, we must implement adequate measures to prevent it from falling into the wrong hands. At least 40 other countries are currently developing unmanned systems technology, including Iran, Russia and China.

We already know that during the Israeli-Lebanon war in 2006, Hezbollah deployed three surveillance UAVs that it acquired from Iran. A recent Air Force study concluded that a UAV is an ideal platform for a chemical or biological terrorist attack. As Peter Singer, one of our witnesses today, wrote recently in Newsweek, "For less than $50,000, a few amateurs could shut down Manhattan."

We have to ensure that the appropriate government agencies are coordinating their efforts to prevent this technology from proliferat-

ing and falling into the wrong hands, and also to ensure that we have adequate homeland security measures to respond to those threats.

And finally, as the new technology continues to develop, we must ensure that there are adequate measures to prevent waste, fraud and abuse in the acquisition process. A 2009 study by the U.S. Government Accountability Office, the author of which we will hear from today, reported significant cost growth, schedule delays and performance shortfalls in DOD's UAV acquisition process. This analysis raises serious concerns and I look forward to learning more on this from both the Government Accountability Office and the Department of Defense witnesses appearing before us.

These are some of the questions that we will begin to answer at this hearing. Surely, we are not going to have a conclusion to all of those questions during this afternoon's single day of conversation. But I hope that this hearing serves as a thorough introduction to the topic for the purpose of educating and informing our Members, as well as the American public.

With that, I would like to defer to Mr. Flake for his opening remarks.

Mr. FLAKE. I thank the chairman. I wish we had a couple of drones that could go and vote for us so we wouldn't have to go and then come back, but I am afraid we have to do it ourselves.

To many, the increased number of suspected terrorists killed between 2008 and 2009 indicates that the Obama administration has used UAV technology with great success. At the same time, while DOD is carrying out UAV missions, others in the administration are disputing the legality of their own tactics and avoiding taking personal responsibility for them.

Such discord within the administration could open the door to a number of legal questions and perhaps put an entire arm of our military strategy in Afghanistan and Pakistan at risk. I am hopeful that today's hearing will shed some light on this, and we can see a way forward.

And I thank the chairman for holding the hearing.

Mr. TIERNEY. Thank you.

With that, we will recess for probably about a half hour, if the witnesses want to get a cold drink or something while we are doing that, and we should be back about quarter to or maybe just a little bit after that.

Thank you.

[Recess.]

Mr. TIERNEY. Well, thank you for your patience and your forbearance. The subcommittee will now receive testimony from the first panel before us today. I would like to introduce them across the board before we get started, and then we will go to the 5-minutes for each.

Dr. Peter W. Singer is a senior fellow and director of the 21st Century Defense Initiative at the Brookings Institution. His work there focuses on the future of war, current U.S. defense needs, and the future of the U.S. defense system. Dr. Singer has published several books and articles, including most recently, Wired for War: The Robotics Revolution and Conflict in the 21st Century.

And I know it is not exactly getting a recommendation from Oprah, but I have read it, in the process of reading it, and it is a good read and well worth doing.

He was recently named by Foreign Policy Magazine as 1 of the top 100 global thinkers of 2009. Dr. Singer received a B.A. from the Woodrow Wilson School at Princeton University and a Ph.D. from Harvard University.

Dr. Edward Barrett is the director of research at the U.S. Naval Academy's Stockdale Center for Ethical Leadership, and a professor in the Department of Leadership, Ethics and Law. He joined the Naval Academy in 2006 after returning from active duty in Iraq and Afghanistan. He currently serves in the U.S. Air Force Reserve.

Dr. Barrett holds a B.S. from the University of Notre Dame and a Ph.D. from the University of Chicago.

Mr. Kenneth Anderson is a professor at the Washington College of Law at American University and a research fellow at Stanford University's Hoover Institution. He is an authority on international human rights, war, armed conflict and terrorism. Mr. Anderson has previously served on the board of directors of America's Watch, the precursor to Human Rights Watch, and is the Founder and former Director of the Human Rights Watch Arms Division.

He holds a B.A. from UCLA and a J.D. from Harvard University.

Mr. John Jackson is a professor of Unmanned Systems at the U.S. Naval War College where he is currently teaching a self-designed course entitled, "Case Studies in Technology and Warfare: Unmanned Systems." Mr. Jackson served for 27 years in the U.S. Navy as a supply and logistics specialists before retiring with the rank of Captain. An award-winning author, he has extensively studied history and operational uses of modern aircraft.

He holds degrees from Providence College and Salve Regina University, where he is currently a Ph.D. candidate.

And Mr. Michael Fagan is the chair of the Unmanned Systems Advocacy Committee for the Association for Unmanned Vehicle Systems International. He served for 26 years in the U.S. Marine Corps, including time as a Requirements Officer for Unmanned Aircraft, before retiring as a Colonel and Chief of Staff of the Defense Airborne Reconnaissance Office. He currently serves as the chief operating officer of Logos Technologies.

He holds a B.S. from Indiana University and an M.S. from the University of Southern California.

Again, I want to thank all of the witnesses for making themselves available today and sharing with us their expertise.

It is the policy of this subcommittee to swear in the witnesses before they testify. I ask all of you to please stand and raise your right hands.

Thank you.

[Witnesses sworn.]

Mr. TIERNEY. The record will please acknowledge that all of the witnesses answered in the affirmative.

As I think you already know, all of your written testimony will be entered in the record by unanimous consent. We like to allocate 5 minutes, if we can, for people to generalize their testimony so we can get to the question and answer period. The green light will be

on. When there is 1 minute remaining, the amber light will go on. And when the 5-minutes is up, the red light will go on, at which point we would like you to try to wind down if you are not already at that point so we can move to the other witnesses and then questions.

Dr. Singer, we will start with you, please.

STATEMENTS OF PETER W. SINGER, DIRECTOR, 21ST CENTURY DEFENSE INITIATIVE, THE BROOKINGS INSTITUTION; ED BARRETT, DIRECTOR OF RESEARCH, STOCKDALE CENTER FOR ETHICAL LEADERSHIP, U.S. NAVAL ACADEMY; KENNETH ANDERSON, PROFESSOR, WASHINGTON COLLEGE OF LAW, AMERICAN UNIVERSITY; JOHN JACKSON, PROFESSOR OF UNMANNED SYSTEMS, U.S. NAVAL WAR COLLEGE; AND MICHAEL FAGAN, CHAIR, UNMANNED AERIAL SYSTEMS ADVOCACY COMMITTEE, ASSOCIATION FOR UNMANNED VEHICLE SYSTEMS INTERNATIONAL

STATEMENT OF PETER W. SINGER

Dr. SINGER. Thank you very much, Mr. Chairman and members of the committee, for the opportunity to testify today. It is an honor to be part of this important discussion on an issue that is not only crucial to national security, but often crucially misunderstood.

As background, I work at the Brookings Institution where I lead our research and analysis on 21st century defense issues. Several years ago, I began to be quite interested in the issues of the greater use of robotics in our human wars. And so I set out on a journey to interview the variety of actors in this world, everything from the scientists who were building these machines to the science fiction authors who advised the military, to those in the military, everything from the 19 year old operators who were controlling machines 7,000 miles away, all the way up to the four star Generals that command them.

I was also interested in the politics of this, so interviews with, for example, White House advisers and civilian service secretaries.

Finally, the opposite side of the coin, what do insurgents think about this? What do news editors around the Middle East think about all of this? And then finally the right and wrong and the legal and ethical questions of this, so interviews with military lawyers, but also people at groups like Human Rights Watch.

And the book, Wired for War, gathers these stories together, but I think it also illustrates some of the dilemmas and questions that are emerging from this field.

And so what I would like to do today is briefly walk through what I see some of the key issues here.

The first is to pull back in this important domain. When U.S. forces invaded Iraq in 2003, we had a handful of unmanned systems in the air. We now have over 7,000. On the ground, the invasion force had zero. We now have over 12,000 in the U.S. military inventory.

But we need to remember that while these technologies often look like science fiction, they are only the first generation. They are the equivalent of the Model T Ford or the Wright Brothers Flyer. And the historic parallels that people make to where we are right

now I think are quite instructive. Some scientists parallel where we are with unmanned systems to where we were with horseless carriages back in 1909 or 1910. Many in the military, particularly the Air Force, make the comparison to the airplane back in 1918. Others in commerce, for example, Bill Gates of Microsoft, has said we are around where we were with computers back in 1980. Still others make the comparison to the atomic bomb in the late 1940's.

The point here is that these are issues. These are all technologies that had ripple effects on our world, in everything from our politics to our laws to our commerce to our ethics. And these were all technologies that created deep questions for us in the area of the creation of law and oversight. And that is why I think it is very important for this committee, that they are dealing with it.

So what do I see as some of the key questions moving forward? The first is the question of where the unmanned military is headed. We have gone from barely using robotics to using thousands of them in a bureaucratic blink of an eye. But as one U.S. Air Force Captain put it to me out in CENTCOM, the problem is, "It is not 'let's think this better.' It is 'only give me more'."

So the sort of issues that we are wrestling with within this bucket are questions like: What are the proper doctrines that we should choose? What are the structures and organizations that we should build around these systems? How do we maintain competition and experimentation in an emerging sector in the defense industrial base?

How do we ensure digital systems security so that insurgents in Iraq can't access our information using $30 software that they bought off the Internet? How do we better support the men and women who are operating them, who may not be in the physical war zone, but are experiencing an entirely new type of combat stress? And finally, what is the division of warrior and civilian in this space? That is, if this area is the future of the force, what does it mean that, for example, 75 percent of the maintenance of our Predator fleet has been outsourced to private companies, while Army systems operating in Iraq have been described as, government-owned, contractor-operated?

The second issue area that we have to wrestle with is, are we engaged in three wars? Our unmanned systems have carried out 119 known air strikes into Pakistan, which is about triple the number we did with manned bombers in the opening round of the Kosovo War. But Congress has not had a debate about whether to authorize or disapprove of it.

And so the question is, why do we not view it as a war? Is it because the strikes are being carried out by the CIA and not by the military, and thus not following the same lines of authority and authorization? Or is it because the impact on the public is viewed as costless?

And then related to this is the issue of what is the impact on the broader war of ideas, not just how it is being interpreted here in the United States, but how is it being interpreted abroad.

The next issue bucket is the question of law. Can our 20th century laws of war keep up with our 21st century technologies? Robotics don't remove the human from decisionmaking, but they do move that human role geographically and chronologically. That is,

decisions that determine a machine's action in the here and now may be made by an operator several thousand miles away or by a designer years ago, but the prevailing laws of war are from the 1940's.

This also extends to the domestic side. It is not just an issue of accountability, but the question of regulation. It is not just the military that is using these systems, but for example, the Department of Homeland Security. In turn, we have seen civilian border patrols or vigilante groups operating their own unmanned systems in the air. Criminals have started to use them to scout out targets.

So as the FAA debates the opening up of the air space, we also have broad issues of who can utilize these systems, which is a legal issue. But it also raises long-term questions that I remember discussing with a Federal District Court Judge. They believed it will reach the Supreme Court in terms of issues of probable cause and privacy.

And the final question area that I would raise is: How can we keep America from going the way of Commodore Computers? If this is a growing industry along the lines of computers or automobiles, why does the United States not have a national robotics strategy? What does it mean for us moving forward that 43 other nations are also building, buying and utilizing military robotics? How do we stay ahead in this game?

And then we may even need to think more broadly about this. And what direction does the state of the American manufacturing economy, as well as the state of science and mathematics education in our schools have us headed? Or another way of putting this is: What does it mean to deploy more and more soldiers, so to speak, whose hardware increasingly says "made in China" on the back of it, and whose software is increasingly written by someone sitting in a place like India.

And I would end on this. These questions move us into lots of different directions, but I think within them we find the policy answers. That is, we may debate the specifics of the answers, but almost all of them extend from a gap of some sort in our policy as the technology races ahead of our institutions.

And so, for that I thank you for the opportunity to be part of this discussion today.

[The prepared statement of Dr. Singer follows:]

STATEMENT

OF

PETER WARREN SINGER, PH.D.
SENIOR FELLOW AND DIRECTOR, 21st CENTURY DEFENSE INITITAIVE,
THE BROOKINGS INSTITUTION.

BEFORE

THE UNITED STATES HOUSE OF REPRESENTATIVES,
COMMITTEE ON OVERSIGHT AND GOVERNMENT REFORM,
SUBCOMMITTEE ON NATIONAL SECURITY AND FOREIGN AFFAIRS

Thank you very much Mr. Chairman and members of the committee for the opportunity to testify today. It is an honor to be a part of this important session on a topic that is crucial to our national security, but often crucially misunderstood.

As background, I work at the Brookings Institution, where I lead our research and analysis on 21st century defense issues, including on emerging actors and technologies in war. Several years back I became interested in just what was going on in this historic revolution, as robots begin to move into the fighting of our human wars. I interviewed everyone from robotic scientists and the science fiction writers who inspire them; 19 year old unmanned systems operators fighting wars 7,000 miles away, to those who command them, from Predator squadron commanders all the way up to the 4 star generals. I was interested in the politics of this and so met with White House advisors and military service secretaries. I was interested in the other side of perceptions and so pulsed the views of groups that ranged from Iraqi insurgents to Arab and Pakistani generals, and news editors across the Middle East and South Asia. Finally, I was interested in the questions of ethics, law, and right and wrong, and so interviewed military lawyers, as well as individuals with organizations like Human Rights Watch and the International Red Cross. Their stories, which I captured in my book *Wired for War*, were not just fascinating, but also shine a light on the political, legal, social, and ethical issues that ripple outwards.

What I would like to do today is briefly walk through where we stand now and then focus on what I see as some of the key policy questions that face us in this exciting, but sometimes scary new domain.

When the U.S. military went into Iraq in 2003, it only had a handful of unmanned systems in the air. The invasion force used zero unmanned ground vehicles. Today, we have over 7,000 of these unmanned systems in the air, ranging from 48-foot long Predators to micro-aerial vehicles that a single soldier can carry in their backpack. On the ground, we have over 12,000, such as the lawnmower-sized Packbot and Talon, which help find and defuse the deadly roadside bombs.

But we need to remember that while they often seem like they are straight out of science fiction, such PackBots and Predators are merely the first generation—the equivalent of the Model T Ford or the Wright Brothers' Flyer. Even more, they are being armed with everything from Hellfire missiles to 50 caliber machine guns. So, the term "killer app" (short for "killer applications," technologies that send massive bow waves onto industries, like what the I-Pod did to the music industry) is taking on an entirely new meaning.

The historic parallels that people make to where we stand now with robotics are instructive. Many scientists parallel unmanned systems today to where we were with "horseless carriages" back in 1909-1910, at the start of something so big we can only wrap our minds around what it is not. That is,

automobiles and the resulting mechanization didn't just become change industry and warfare, it also reshaped our cities through the creation of suburbia, gave power to Middle East potentates who lived above oil deposits, and led to the requirement of new laws, "traffic laws."

Others, such as Bill Gates, have described robotics as being where computers were around 1980; if this is the case, think how the computer reshaped everything from our economy to our social relationships to how we fight wars and now even where we fight them (cyberwar). Finally, others make the parallel of robotics being much like the atomic bomb in the 1940s, a cutting-edge technology, of immense power and potential, but also a genie that we will not be able to put back into the box.

The point here is that every so often in history, the emergence of a new technology changes our world. Like gunpowder, the printing press, or even the atomic bomb, such "revolutionary" technologies are game-changers not merely because of their capabilities, but rather because the ripple effects that they have outwards onto everything from our wars to our politics. That is, something is revolutionary not so much because of what it can do, but rather the tough social, military, business, political, ethical, and legal questions it forces us to ask.

So, what are some of the key questions emerging in the growing field of robots and our wars?

1)   Where is the (Unmanned) Military Headed?

The US military has gone from barely using robotics to using thousands of them in a bureaucratic blink of an eye. Its current plans, as one 3 star general described are that it will soon be using "tens of thousands." But as one USAF Captain put it to me out in CENTCOM, the problem is that "Its not "Let's think this better, it's only "Give me more.""

How do we ensure it buys the right ones and not over-priced, over-engineered, unwieldy systems that have gold-plated processors? How do we maintain competition and experimentation in an emerging sector in the defense industrial base? Knowing that having the right doctrine can be the difference between winning and losing wars, between committing America to the 21st century version of the Maginot Line vs. the Blitzkrieg, what are the proper organizational structures and doctrines for using these new systems? How do you ensure digital systems' security, so that foes can't tap into their communications, as insurgents in Iraq were able to do with a $30 software package they bought off the internet? How do we better support the men and women operating them, who may not be in the physical warzone, but are experiencing an entirely new type of combat stress? How do you ensure their future career prospects, so that organizational culture does not stymie change?

Another area is what is the proper division of warrior and civilian in this space? That is, if this area is the future of the force, is it proper that presently 75% of the maintenance and weapons loading of systems like the Predator have been outsourced to private contractors, including to controversial firms like Blackwater, while other Army systems operating in Iraq have been described as "government-owned-contractor operated?"

2) Are We Engaged in Three Wars?

As of March 12, 2010, American unmanned systems had carried out 118 known air strikes into Pakistan, well over double the amount we did with manned bombers in the opening round of the Kosovo War just a decade ago. By the old standards, this would be viewed as a war.

But why do we not view it as such? Is it because it is being run by the CIA, not by the military and thus not following the same lines of authority and authorization? Is it because Congress never debated it? Is it because we view the whole thing as costless (to us)? Or, are the definitions are changing, and what used to be war, isn't anymore?

3) What are the Perceptions of Robots in War?

How do robots change the public's and its representatives' relationship with war? Does the ability to YouTube video clips of combat turn war into a form of entertainment? Does it lead to Monday Morning Quarterbacking of our troops?

In turn, what about the perceptions of publics 7,000 miles away? Do they view our use of robots as "efficient" and "costless" as we report in our media, or as one newspaper editor described in Lebanon, "cruel and cowardly"? What does it mean when "drone" has become a colloquial word in Urdu and rock songs that Pakistani youth vibe to talk about America not fighting with honor? How does the reality of our painstaking efforts to act with precision emerge on the other side through a cloud of anger and misperceptions? Is America painting itself into the same corner that Israel did in Gaza, where it got very good at targeted strikes of Hamas leaders, but also good at unintentionally inducing 12 year old Palestinian boys to want to join Hamas?

4) Who Should be Allowed to Use This Technology?

It is not just the military that is using unmanned systems. DHS is flying them for border security. But so are some of the civilian vigilante "border militias," as well as criminals using them to scout targets. Local police departments like Miami Dade have gotten authorization to use them, and the FAA is exploring opening up the wider airspace, a crucial step to the continuation of the field. But, as one federal district court judge put it to me, the legal questions they raise in such areas as probable cause and privacy will likely reach to the Supreme Court. How about me, does the 2nd amendment cover my right to bear (robotic) arms? It sounds like a joke, but where does the line stop, and why?

5) Can the Laws Keep Up?

Robotics do not remove humans from the decision making, but they do move that human role geographically and chronologically. Decisions now made thousands of miles away, or even years ago, may have great relevance to a machine's actions (or inactions) in the here and now. But while technology moves at an exponential pace, our institutions are struggling to keep up. For example, the prevailing laws of war, the Geneva Conventions, were written in a year in which people listened to 45rpm records and the average home cost $7,400. Is it too much to ask them to regulate all the nuances of a 21st century technology like a Reaper system, that is being used to target an insurgent, who knows he is not supposed to hide out in a home surrounded by civilians, and that is exactly why he does? That is, with the 20th century laws under siege from both sides, do the laws need to be updated, how and in what ways?

6) Will America go the Way of Commodore Computers?

If this is a growing industry along the lines of computing or automobiles, why does the US not have a national robotics strategy, unlike many other states? If this field is also crucial to national security, how will America fare, especially given that 43 other countries are also building, buying, and using military robotics, including allies like the UK and Germany, but also states like Russia, China, and Iran? Can we stay ahead, or will we fall behind like so many other historic first-movers in technologic revolutions?

We may need to think even more broadly about this. In which direction does the state of the American manufacturing economy, as well as the state of science and mathematics education in our schools, have us headed? What does it mean for US security that the number of American students graduating each year with a degree in IT or engineering is slightly less than in 1986, but we have had a more than 500% rise in "parks, recreation, leisure and fitness studies"? What does it mean to have soldiers whose hardware increasingly says "Made in China" on the back and whose software increasingly is being written by someone in places like India?

7) What does the "Open Source" revolution hold for us?

Robotics are not like aircraft carriers or nuclear bombs; much of the technology is off-the shelf, and even do-it-yourself. Hitler's *Luftwaffe* may not have been able to fly across the Atlantic during World War II, but a 77 year old blind man has already done so with his own homemade drone. This technology will inevitably pass into the wrong hands, allowing small groups and even individuals to wield great power. Hezbollah flew four such weapons in its war with Israel.

As the 9-11 Commission warned, the tragedy that day was in part cause by a "failure of imagination." Can we apply the same lesson here? Can we develop a military and homeland-security strategy that considers not only how to use technology but how others will use it against us? That means widening the threat scenarios our agencies plan and train for, and the potential equipment they might need for a new range of defense. It also means new legal regimes to determine who should have access to such dangerous technologies—lest our best new weapon come back to bite us.

There are two summary points I would like to make about these questions.

The first is that within many of them we find the policy answers. That is, we may debate the specifics of the answer, but almost all extend from a gap of some sort in policy, as the technology races ahead of our institutions. The second is that these are all the sort of questions that used to be debated at science fiction conventions. But much like past technologies as the atomic bomb or the horseless carriage that were once just imaginary, they are now all too real. And thus they are crucial for serious people to engage upon.

Thank you very much for the opportunity to be part of this discussion today.

Mr. TIERNEY. Thank you. That gives us a lot to think about. Dr. Barrett.

STATEMENT OF ED BARRETT

Dr. BARRETT. Mr. Chairman and subcommittee members, thank you for inviting me to speak today.

Speaking as a civilian academic, I will first offer some reflections on these systems' ethical advantages and challenges, and then briefly discuss related educational initiatives at the Naval Academy.

The goals animating the development and use of unmanned platforms are ethically commendable. While sometimes excoriated as merely prudential, effectiveness and efficiency are fundamentally moral imperatives. Constituted and supported by its citizen taxpayers, the liberal democratic state is morally obligated to effectively defend their human rights with their limited resources.

Additionally, I would argue that unmanned systems are consistent with a society's duty to avoid unnecessary risks to its combatants, a duty that sparked a recent controversy over up-armored vehicles.

But these rights and corresponding duties must be weighed against other ethical considerations. The venerable just war criteria that now undergird international law specify both pre-war and in-war imperatives. To be permissible, war must be the last resort available to a state intending to pursue a just cause, and circumstances must indicate a reasonable chance of succeeding in a proportionate manner.

Once in war, harms must be necessary and proportionate vis-a-vis uninvolved civilians who maintain their right not to be harmed. Soldiers incur additional risks to avoid foreseeable harm to innocents and assign greater weight to this harm.

In this normative context, I will highlight four challenges generated by unmanned systems. First, they could encourage unjust wars. War cost reductions, of course, allow states to more readily pursue just causes. But favorable alterations to pre-war proportionality calculations could also reduce the rigor with which nonviolent alternatives are pursued and thus encourage unnecessary and therefore unjust-wars.

Additionally, an echoing concern about private security firms and cyber-attack capabilities, these less visible weapons could facilitate the circumvention of legitimate authority and pursuit of unjust causes.

While these moral hazards do not require us to maximize war costs and minimize unmanned systems, they do require efforts to better inform and monitor national security decisionmakers.

Second, once in war, remote controlled systems are said to induce unnecessary and disproportionate harm, especially to civilians. The argument assumes that soldiers engaged in such virtual warfare are less situationally aware and also less restrained because of emotional detachment. However, accumulating data points in the opposite direction, sensor improvements, lack of fear-induced haste, reduced anger levels and force protection anxieties, and crystal clarity about strike damage all combine to actually enhance awareness and restraint.

If true, this data suggests that it would be unethical not to use remote-controlled systems unless mitigating factors pertained.

This qualification brings us to a third ethical consideration. Reasonable chance of success in counterinsurgency and stability operations mentioned earlier, where indigenous perceptions are crucial, requires the judicious use of unmanned systems. Perceptions that these weapons are less discriminate or are indicative of flawed characters or tepid commitments can undermine our efforts unless accompanied by adjustments to footprints and perceptions themselves.

Also, ground robots are incapable of developing necessary personal relationships with local citizens. Again, these arguments suggest the need for prudent, not unreflective, limitations.

But the use of autonomous strike systems, my fourth and final ethical consideration, requires more caution. Again, effectiveness and efficiency would be important benefits. Truly robotic air, sea and ground capabilities would sense, decide and act more quickly than human beings. In an anti-access environment, a long range system capable of independently navigating to identifying and striking mobile targets would bolster conventional extended deterrence. And the need to merely monitor, not control, these systems would reduce personnel costs.

But exactly what would these autonomous systems sense, decide and do? Would they adequately distinguish combatants from illegitimate targets such as bystanding civilians and surrendering or injured soldiers, a task complicated by countermeasure requirements? Would they adequately, at least as well as humans, comply with necessity and proportionality imperatives?

Discouraging these possible in bello errors would require the elusive ability to credibly attribute bad results to a culprit, designers, producers, acquisition personnel, commanders, users, and perhaps even robots themselves. And if the notion of robots' responsibility ever becomes meaningful, would a self-conscious and wilful machine choose its own ends and even be considered a person with rights?

While robotic personhood is a titillating idea, near-term possibilities suggest a focus on the first few concerns. Computer scientist Ron Arkin is working assiduously to develop adequately discriminating and ethical robots with responsibility attribution capabilities, and I would not bet against him.

But even then, I would advise an incremental approach similar to that used with remote controlled systems: intelligence missions first, strike missions later. Given the complexity involved, I would also restrict initial strike missions to non-lethal weapons and combatant-only areas. Permission-seeking and override features should also be included.

One possible exception to this non-lethal recommendation would involve autonomous systems that target submarines, systems which only would have to identify friendly combatants, enemy combatants, and perhaps whales.

In closing, I want to assure the subcommittee that military educators are preparing military operators and staffers to think ethically about these and other emerging technologies. At the Naval Academy, the core ethics course taken by every second year mid-

shipman covers these issues and their theoretical foundations. Last year, Dr. Singer delivered an endowed lecture to the entire second year class.

The Department of Leadership, Ethics and Law offers an elective dedicated to emerging military technologies, including robotics. History and engineering courses that address these issues include history of technology, advanced topics in robotics, emerging technologies, and systems engineering.

In April, 300 students in this last class will witness a debate between Ron Arkin and his less sanguine critic, Peter Asaro. And also in April, the Stockdale Center, for whom I work, the Academy's ethics and military policy think tank, will host a 2-day conference on the ethical ramifications of emerging military technologies attended by instructors from all U.S. service academies, staff colleges and war colleges, and perhaps by a few congressional staffers who were invited.

Mr. Chairman and subcommittee members, thank you for the opportunity to address these issues and I look forward to your questions.

[The prepared statement of Mr. Barrett follows:]

Statement of
Dr. Edward Barrett
Director of Research, Stockdale Center
United States Naval Academy
"Rise of the Drones: Unmanned Systems and the Future of War"
House Committee on Oversight and Government Reform
Subcommittee on National Security and Foreign Affairs
March 23, 2010

Mr. Chairman and Subcommittee members, thank you for inviting me to speak about the ethical and educational ramifications of unmanned weapons systems. While ethical and educational inquiries often lag behind technological developments, the efforts of Mr. Singer and others have generated a timely and fruitful conversation among ethicists, educators, engineers, industry and military leaders, and civilian policymakers. Today's proceedings will surely contribute to that important conversation. Speaking as a civilian academic, then, I will first offer some reflections on these systems' ethical advantages and challenges, and then briefly discuss related educational initiatives at the Naval Academy.

The goals animating the development and use of unmanned platforms are ethically commendable. While sometimes excoriated as merely "prudential," effectiveness and efficiency are, fundamentally, moral imperatives. Constituted and supported by its citizen taxpayers, the liberal democratic state is morally obligated to effectively defend their human rights with their limited resources. Additionally, I would argue that unmanned systems are consistent with a society's duty to avoid unnecessary risks to its combatants—a duty that sparked the recent controversy over "Up-Armored" vehicles.

But these rights and corresponding duties must be weighed against other ethical considerations. The venerable just war criteria that now undergird international law specify both pre-war and in-war requirements. To be permissible, war must be the last resort available to a state intending to pursue a just cause, and circumstances must indicate a reasonable chance of succeeding in a proportionate manner. Once in war, harms must be necessary and proportionate. Vis-à-vis uninvolved civilians who maintain their rights *not* to be harmed, soldiers incur additional risk to avoid, and assign greater weight to, foreseeable harm to innocents.

In this ethical context, I want to highlight a few challenges generated by unmanned systems. First, they could encourage unjust wars. Cost reductions, of course, allow states to more readily pursue just causes. But favorable alterations to pre-war proportionality calculations could also reduce the rigor with which non-violent alternatives are pursued, and thus encourage

unnecessary—and therefore unjust—wars. Additionally, and echoing concerns about private security firms and cyberattack capabilities, these less visible weapons could facilitate the circumvention of legitimate authority and pursuit of unjust causes. While these moral hazards obviously do not require us to maximize war costs and minimize unmanned systems, they do require efforts to better inform and monitor national security decisionmakers.

Second, once in war, remote-controlled systems—compared to manned—are said to induce unnecessary and disproportionate harm, especially to civilians. The argument assumes that soldiers engaged in such "virtual warfare" are less situationally aware, and also less restrained because of emotional detachment. However, accumulating data points in the opposite direction. Sensor improvements, lack of fear-induced haste, reduced anger levels, and crystal clarity about strike damage all combine to actually enhance awareness and restraint. If true, this data suggests that it would be unethical *not* to use remote-controlled systems—unless mitigating factors pertained.

This qualification brings us to a third ethical consideration. Reasonable chance of success in counterinsurgency and stability operations—where indigenous perceptions are crucial—requires the judicious use of unmanned systems. Mistaken perceptions that these weapons are less discriminate, or are indicative of flawed characters and/or tepid commitments, can undermine efforts unless accompanied by adjustments to footprints and perceptions. Also, ground robots are incapable of developing necessary personal relationships with local citizens. Again, these arguments suggest the need for prudent, not unreflective, limitations.

But the use of *autonomous* strike systems, my fourth and final ethical consideration, requires more caution. Again, effectiveness and efficiency would be important benefits. Truly robotic air, sea, and ground capabilities would sense, decide, and act more quickly than human beings. In an anti-access environment, a long range system capable of independently navigating to, identifying, and striking mobile targets would bolster conventional extended deterrence. And the need to merely monitor, not control, these systems would reduce personnel costs.

But exactly what would these autonomous systems sense, decide, and do? Would they adequately distinguish combatants from non-legitimate targets such as bystanding civilians and surrendering soldiers—a task complicated by counter-countermeasure requirements? Would they adequately—i.e., at least as well as humans—comply with necessity and proportionality imperatives? Minimizing these possible *in bello* errors would require the elusive ability to credibly attribute bad results to a culprit—designers, producers, acquisition personnel, commanders, users, and perhaps even robots themselves. And if the notion of "robot responsibility" ever becomes meaningful, would a self-conscious and willful machine choose its own ends, and even be considered a person with rights?

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While robotic personhood is a titillating idea, nearer-term possibilities suggest a focus on the first few concerns. Computer scientist Ron Arkin is working assiduously to develop adequately discriminating and ethical robots with responsibility attribution capabilities, and I would not bet against him. But prior to that day, I would advise an incremental approach similar to that used with remote-controlled systems: intelligence missions first, strike missions later. Given the complexity involved, I would also restrict initial strike missions to non-lethal weapons and combatant-only areas. One possible exception to this non-lethal recommendation would involve autonomous systems targeting submarines, where one only would have to identify friendly combatants, enemy combatants, and perhaps whales.

In closing, I want to assure the Subcommittee that military educators are preparing military operators and staffers to think ethically about these and other emerging technologies. At the Naval Academy, the core ethics course taken by every second-year midshipman covers these issues and their theoretical foundations. Last year, Mr. Singer delivered an endowed lecture to the entire second year class. The Department of Leadership, Ethics, and Law offers an ethics elective dedicated to emerging military technologies, including robotics. History and engineering and courses that address these issues include History of Technology, Advanced Topics in Robotics, Advanced Technologies, Emerging Technologies, Principles of Systems Engineering, and Introduction to Systems Engineering. In April, 300 students in this last class will witness a debate between Ron Arkin and his less sanguine critic, Peter Asaro. And also in April, the Stockdale Center for Ethical Leadership, the Academy's ethics and military policy think tank, will host a two-day conference on the ethical ramifications of emerging military technologies attended by instructors from all U.S. service academies, staff colleges, and war colleges—and perhaps by a few congressional staffers.

Mr. Chairman and Subcommittee members, thank you for the opportunity to address these issues, and I look forward to your questions.

Mr. TIERNEY. Thank you. At first, I thought you were going to have a great debate between yourself on the one hand and on the other hand, but you rounded it out pretty well at the end, and I appreciate that.

Now, we have two professors that can audition for talking to the entire sophomore class at the Academy someday.

Professor Anderson.

STATEMENT OF KENNETH ANDERSON

Mr. ANDERSON. Thank you. Mr. Chairman and subcommittee members, thank you very much for having me here with these other very, very distinguished panelists.

I want to actually speak perhaps more politically and more practically than would be appropriate. And let me say that my background in this is legal and ethical. And here is my problem. We currently have a situation in which the President, the Vice President, the Director of the CIA, many, many senior officials from the President on down have stood up and said quite correctly, in my view, this is a really great thing we have with drones here. We are managing to take the fight to the enemy. This is how we attack Al Qaeda. This is how we actually engage in counter-terrorism directly against the leaders of Al Qaeda. And we think this is great.

I think that the Vice President is a little bit like a sort of father looking over his block of Predator chicks. I think that we are in a situation in which our political leaders and our policymakers have embraced a strategy, but if you were to line up their lawyers alongside them and ask their lawyers about this, I think the answer you would get is, "Well, we think it is legal, but we have actually not come to a clear conclusion, at least not one that we were able to share with the public."

Now, if I were the Vice President or the President under those circumstances, I do not think I would find myself to have been well served by my lawyers. Lawyers can't be yes men. Lawyers cannot be in the position of simply saying what their client wants to hear.

And these are incredibly difficult issues. We are over a year into the new administration, which has embraced this policy, and we have yet to find any clear statement by their lawyers that this program is legal or at least to tell us on what basis they think that it is legal.

Now, I believe that it is, but there is an increasing chorus of people in the international legal community and in other places that believe that it is not. And I think at some point there is going to be a collision that arises here, and that question has to be addressed.

So if there is one point on which I would join with the ACLU, which is now suing the U.S. Government for information on the legal basis for these programs, it is that I believe at this point the U.S. Government has to step up and say the basis on which it thinks it is lawful to do these things.

And that brings me into my second point, which is that most of the discussion here on this panel and on the subsequent panel is really directed to the military, and to a large extent the battlefield use of these weapons systems. That is not actually what the President and the Vice President are most thoroughly embracing. When

Director Panetta stands up and says, "This is how we take the fight to the enemy; this is terrific," they are actually not really most of the time talking about the tactical use of these things in an Afghanistan battlefield.

They are talking about the ability to target someone in Pakistan who is well away from any kind of hot battlefield at that moment. Or we are talking about the ability to take the fight to people in Yemen or Somalia or potentially other places.

At that point, 1 millimeter below the surface of this discussion about technology and drones is actually a discussion about the proper lawful and ethical role of the CIA and the covert, or at least clandestine, use of force. I believe that the Congress needs to be involved in that question. I believe the answer is that it is lawful under domestic law, certainly, and I believe it is lawful under international law. But I believe that question is certainly coming to the fore.

This leads me then to my third point, which is that I believe that Congress has a role here to play in getting the administration to do what is in the President's best interest and getting their lawyers to stand up and articulate the full extent of the legal defense and the legal rationale that accounts for the actual use that the President, the Vice President, the CIA Director and the senior members of government have embraced.

They have embraced a strategy of using drones that goes well beyond the battlefield in any sort of active hostile tactical sense. And if that is the case, then the legal rationales that the lawyers state had better be adequate to that task, or else they had better say that it can't be done and we had better rethink strategy.

I believe that we have not been willing to confront that. I think the administration, for very understandable political reasons of many kinds, would prefer not to have that discussion directly. I also believe that it is one which is going to happen, whether one likes it or not, and that it would be better if Congress helped to move that ball forward and move it in directions that I think would be favorable.

So let me sum up by saying that I think that at the end of the day, this is actually as much as anything in the area in which it is truly controversial, and not simply a question about do we have a better remote standoff platform that isn't that much different from the jet that has a pilot in it 25 miles away.

When we are talking about this as a genuinely innovative use at the strategic level, we are no longer so much at this moment talking about the U.S. military. We are, as much as anything or more, talking about the CIA and covert action, and I think that is where the discussion should be.

Thank you, Mr. Chairman and Members.

[The prepared statement of Mr. Anderson follows:]

U.S. House of Representatives

Subcommittee on National Security and Foreign Affairs

Subcommittee Hearing:
"Rise of the Drones: Unmanned Systems and the Future of War"

Tuesday, March 23, 2010, 2:00 pm
2154 Rayburn House Office Building

Written Testimony Submitted By
Kenneth Anderson
March 18, 2010

Honorable Chairman and Members:

<u>Introduction</u>

1. My thanks to the Subcommittee, the Chairman and Members for inviting me to offer this testimony. My name is Kenneth Anderson. I am a professor of law at Washington College of Law, American University, Washington DC, and a member of the Hoover Task Force on National Security and Law, The Hoover Institution, Stanford University, Stanford CA. My areas of specialty include the laws of war and armed conflict, international law, and national security law. I have attached a brief biography as an appendix to this statement.

2. I have been invited to testify regarding the use and future of unmanned battlefield systems, and particularly unmanned aerial vehicles (UAVs) commonly referred to as "drones," in current and future US armed conflicts and uses of force. I focus my remarks on the legal policy implications of these systems, set in the framework of technological and strategic evolution.

3. The basic conclusions of my testimony are six:

   - First, the United States government urgently needs publicly to declare the legal rationale behind its use of drones, and defend that legal rationale in the international community, which is increasingly convinced that parts, if not all, of its use is a violation of international law.
   - Second, the legal rationale offered by the United States government needs to take account, not only of the use of drones on traditional battlefields by the US military, but also of the Obama administration's signature use of drones by the CIA in operations outside of traditionally conceived zones of armed conflict, whether in Pakistan, or further afield, in Somalia or Yemen or beyond. This legal rationale must be certain to protect, in plain and unmistakable language, the lawfulness of the CIA's participation in drone-related uses of force as it takes

place today, and to protect officials and personnel from moves, in the United States or abroad, to treat them as engaged in unlawful activity. It must also be broad enough to encompass the use of drones (under the statutory arrangements long set forth in United States domestic law) by covert civilian agents of the CIA, in operations in the future, involving future presidents, future conflicts, and future reasons for using force that have no relationship to the current situation.

- Third, the proper legal rationale for the use of force in drone operations in special, sometimes covert, operations outside of traditional zones of armed conflict is the customary international law doctrine of self-defense, rather than the narrower law of armed conflict.

- Fourth, Congress has vital roles to play here, mostly in asserting the legality of the use of drones. These include: *(i)* Plain assertion of the legality of the programs as currently used by the Obama administration, as a signal to courts in the US as well as the international community and other interested actors, that the two political branches are united on an issue of vital national security and foreign policy. *(ii)* Congressional oversight mechanisms should also be strengthened in ensuring Congress's meaningful knowledge and ability to make its views known. *(iii)* Congress also should consider legislation to clarify once and for all that that covert use of force is lawful under US law and international law of self-defense, and undertake legislation to make clear the legal protection of individual officers. *(iv)* Congress should also strongly encourage the administration to put a public position on the record. In my view, that public justification ought to be something (self-defense, in my view) that will ensure the availability of targeted killing for future administrations outside the context of conflict with Al Qaeda – and protect against its legal erosion by acquiescing or agreeing to interpretations of international law that would accept, even by implication, that targeted killing by the civilian CIA using drones is per se an unlawful act of extrajudicial execution.

The Multiple Strategic Uses of Drones and Their Legal Rationales

4. Seen through the lens of legal policy, drones as a mechanism for using force are evolving in several different strategic and technological directions, with different legal implications for their regulation and lawful use. From my conversations and research with various actors involved in drone warfare, the situation is a little bit like the blind men and the elephant – each sees only the part, including the legal regulation, that pertains to a particular kind of use, and assumes that it covers the whole. The whole, however, is more complicated and heterogeneous. They range from traditional tactical battlefield uses in overt war to covert strikes against non-state terrorist actors hidden in failed states, ungoverned, or hostile states in the world providing safe haven to terrorist groups. They include use by uniformed military in ordinary battle but also use by the covert civilian service.

5. Although well-known, perhaps it bears re-stating the when this discussion refers to drones and unmanned vehicle systems, the system is not "unmanned" in the sense that human beings are not in the decision or control loop. Rather, "unmanned" here refers solely to "remote-piloted," in which the pilot and weapons controllers are not

physically on board the aircraft. ("Autonomous" firing systems, in which machines might make decisions about the firing of weapons, raise entirely separate issues not covered by this discussion because they are not at issue in current debates over UAVs.)

6. *Drones on traditional battlefields.* The least legally complicated or controversial use of drones is on traditional battlefields, by the uniformed military, in ordinary and traditional roles of air power and air support. From the standpoint of military officers involved in such traditional operations in Afghanistan, for example, the use of drones is functionally identical to the use of missile fired from a standoff fighter plane that is many miles from the target and frequently over-the-horizon. Controllers of UAVs often have a much better idea of targeting than a pilot with limited input in the cockpit. From a legal standpoint, the use of a missile fired from a drone aircraft versus one fired from some remote platform with a human pilot makes no difference in battle as ordinarily understood. The legal rules for assessing the lawfulness of the target and anticipated collateral damage are identical.

7. *Drones used in Pakistan's border region.* Drones used as part of the on-going armed conflict in Afghanistan, in which the fighting has spilled over – by Taliban and Al Qaeda flight to safe havens, particularly – into neighboring areas of Pakistan likewise raise relatively few questions about their use, on the assumption that the armed conflict has spilled, as is often the case of armed conflict, across an international boundary. There are no doubt important international and diplomatic questions raised about the use of force across the border – and that is presumably one of the major reasons why the US and Pakistan have both preferred the use of drones by the CIA with a rather shredded fig leaf, as it were, of deniability, rather than US military presence on the ground in Pakistan. The legal questions are important, but (unless one takes the view that the use of force by the CIA is always and per se illegal under international law, even when treated as part of the armed forces of a state in what is unquestionably an armed conflict) there is nothing legally special about UAVs that would distinguish them from other standoff weapons platforms.

8. *Drones used in Pakistan outside of the border region.* The use of drones to target Al Qaeda and Taliban leadership *outside* of places in which it is factually plain that hostilities are underway begins to invoke the current legal debates over drone warfare. From a strategic standpoint, of course, the essence of much fighting against a raiding enemy is to deny it safe haven; as safe havens in the border regions are denied, then the enemy moves to deeper cover. The strategic rationale for targeting these leaders (certainly in the view of the Obama administration) is overwhelming. Within the United States, and even more without, arguments are underway as to whether Pakistan beyond the border regions into which overt fighting has spilled can justify reach to the law of armed conflict as a basis and justification for drone strikes.

9. *Drones used against Al Qaeda affiliates outside of AfPak – Somalia, Yemen or beyond.* The President, in several major addresses, has stressed that the United States will take the fight to the enemy, and pointedly included places that are outside of any

traditionally conceived zone of hostilities in Iraq or AfPak – Somalia and Yemen have each been specifically mentioned. And indeed, the US has undertaken uses of force in those places, either by means of drones or else by human agents. The Obama administration has made clear – entirely correctly, in my view – that it will deny safe haven to terrorists. As the president said in an address at West Point in fall 2009, we "cannot tolerate a safe-haven for terrorists whose location is known, and whose intentions are clear."[1] In this, the President follows the long-standing, traditional view of the US government endorsing, as then-State Department Legal Advisor Abraham Sofaer put it in a speech in 1989, the "right of a State to strike terrorists within the territory of another State where terrorists are using that territory as a location from which to launch terrorist attacks and where the State involved has failed to respond effectively to a demand that the attacks be stopped."[2]

10. The United States might assert in these cases that the armed conflict goes where the combatants go, in the case particularly of an armed conflict (with non-state actors) that is already acknowledged to be underway. In that case, those that it targets are, in its view, combats that can lawfully be targeted, subject to the usual armed conflict rules of collateral damage. One says this without knowing for certain whether this is, in fact, the US view – although the Obama administration is under pressure for failing to articulate a public legal view, this was equally the case for the preceding two administrations. In any case, however, that view is sharply contested as a legal matter. The three main contending legal views at this point are as follows:

- One legal view (the traditional view and that presumably taken by the Obama administration, except that we do not know for certain, given its reticence) is that we are in an armed conflict. Wherever the enemy goes, we are entitled to follow and attack him as a combatant. Geography and location – important for diplomatic reasons and raising questions about the territorial integrity of states, true – are irrelevant to the question of whether it is lawful to target under the laws of war; the war goes where the combatant goes. We must do so consistent with the laws of war and attention to collateral damage, and other legal and diplomatic concerns would of course constrain us if, for example, the targets fled to London or Istanbul. But the fundamental right to attack a combatant, other things being equal, surely cannot be at issue.
- A second legal view directly contradicts the first, and says that the legal rights of armed conflict are limited to a particular theatre of hostilities, not to wherever combatants might flee throughout the world. This creates a peculiar question as to how, lawfully, hostilities against a non-state actor might ever get underway. But the general legal policy response is that if there is no geographic constraint consisting of a "theatre" of hostilities, then the very special legal regime of the laws of armed conflict might suddenly, and without any warning, apply – and overturn – ordinary laws of human rights that prohibit extrajudicial execution, and certainly do not allow attacks subject merely to collateral damage rules, with

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[1] Pres. Obama West Point speech.
[2] Abraham D. Sofaer, State Department Legal Adviser, [].

complete surprise and no order to it. Armed conflict is defined by its theatres of hostilities, on this view, as a mechanism for limiting the scope of war and, importantly, the reach of the laws of armed conflict insofar as the displace (with a lower standard of protection) ordinary human rights law. Again, this leaves a deep concern that this view, in effect, empowers the fleeing side, which can flee to some place where, to some extent, it is protected against attack.

- A third legal view (to which I subscribe) says that armed conflict under the laws of war, both treaty law of the Geneva Conventions and customary law, indeed accepts that non-international armed conflict is defined, and therefore limited by, the presence of persistent, sustained, intense hostilities. In that sense, then, an armed conflict to which the laws of war apply exists only in particular places where those conditions are met. That is not the end of the legal story, however. Armed conflict as defined under the Geneva Conventions (common articles 2 and 3) is not the only international law basis for governing the use of force. The international law of self-defense is a broader basis for the use of force in, paradoxically, more limited ways that do not rise to the sustained levels of fighting that legally define hostilities.

- Why is self-defense the appropriate legal doctrine for attacks taking place away from active hostilities? From a strategic perspective, a large reason for ordering a limited, pinprick, covert strike is in order to avoid, if possible, an escalation of the fighting to the level of overt intensity that would invoke the laws of war – the intent of the use of force is to *avoid* a wider war. Given that application of the laws of war, in other words, requires a certain level of sustained and intense hostilities, that is not always a good thing. It is often bad and precisely what covert action seeks to avoid. The legal basis for such an attack is not armed conflict as a formal legal matter – the fighting with a non-state actor does not rise to the sustained levels required under the law's threshold definition – but instead the law of self-defense.

- Is self-defense law simply a standardless license wantonly to kill? This invocation of self-defense law should not be construed as meaning that it is without limits or constraining standards. On the contrary, it is not standardless, even though it does not take on all the detailed provisions of the laws of war governing "overt" warfare, including the details of prison camp life and so on. It must conform to the customary law standards of necessity and proportionality – necessity in determining whom to target, and proportionality in considering collateral damage. The standards in those cases should essentially conform to military standards under the law of war, and in some cases the standards should be still higher.

11. The United States government seems, to judge by its lack of public statements, remarkably indifferent to the increasingly vehement and pronounced rejection of the first view, in particular, that the US can simply follow combatants anywhere and attack them. The issue is not simply collateral damage in places where no one had any reason to think there was a war underway; prominent voices in the international legal community question, at a minimum, the lawfulness of even attacking what they

regard as merely alleged terrorists. In the view of important voices in international law, the practice outside of a traditional battlefield is a violation of international · human rights law guarantees against extrajudicial execution and, at bottom, is just simple murder. On this view, the US has a human rights obligation to seek to arrest and then charge under some law; it cannot simply launch missiles at those it says are its terrorist enemies. It shows increasing impatience with US government silence on this issue, and with the apparent – but quite undeclared – presumption that the armed conflict goes wherever the combatants go.

12. Thus, for example, the UN special rapporteur on extrajudicial execution, NYU law professor Philip Alston, has asked in increasingly strong terms that, at a minimum, the US government explain its legal rationales for targeted killing using drones. The American Civil Liberties Union in February 2010 filed an extensive FOIA request (since re-filed as a lawsuit), seeking information on the legal rationales (but including requests for many operational facts) for all parts of the drones programs, carefully delineating military battlefield programs and CIA programs outside of the ordinary theatres of hostilities. Others have gone much further than simply requests that the US declare its legal views and have condemned them as extrajudicial execution – as Amnesty International did with respect to one of the earliest uses of force by drones, the 2002 Yemen attack on Al Qaeda members. The addition of US citizens to the kill-or-capture list, under the authorization of the President, has raised the stakes still further. The stakes, in this case, are highly unlikely to involve President Obama or Vice-President Biden or senior Obama officials. They are far more likely to involve lower level agency counsel, at the CIA or NSC, who create the target lists and make determinations of lawful engagement in any particular circumstance. It is they who would most likely be investigated, indicted, or prosecuted in a foreign court as, the US should take careful note, has already happened to Israeli officials in connection with operations against Hamas. The reticence of the US government on this matter is frankly hard to justify, at this point; this is not a criticism per se of the Obama administration, because the George W. Bush and Clinton administrations were equally unforthcoming. But this is the Obama administration, and public silence on the legal legitimacy of targeted killings especially in places and ways that are not obviously by the military in obvious battlespaces is increasingly problematic.

13. *Drones used in future circumstances by future presidents against new non-state terrorists.* A government official with whom I once spoke about drones as used by the CIA to launch pinpoint attacks on targets in far-away places described them, in strategic terms, as the "lightest of the light cavalry." He noted that if terrorism, understood strategically, is a "raiding strategy" launched largely against "logistical" rather than "combat" targets – treating civilian and political will as a "logistical target" in this strategic sense – then how should we see drone attacks conducted in places like Somalia or Yemen or beyond? We should understand them, he said, as a "counter-raiding" strategy, aimed not at logistical targets, but instead at combat targets, the terrorists themselves. Although I do not regard this use of "combat" as a legal term – because, as suggested above, the proper legal frame for these strikes is

self-defense rather than "armed conflict" full-on – as a strategic description, this is apt.

14. This blunt description suggests, however, that it is a profound mistake to think that the importance of drones lies principally on the traditional battlefield, as a tactical support weapon, or even in the "spillover" areas of hostilities. In those situations, it is perhaps cheaper than the alternatives of manned systems, but is mostly a substitute for accepted and existing military capabilities. Drone attacks become genuinely special as a form of strategic, yet paradoxically discrete, air power outside of overt, ordinary, traditional hostilities – the farthest project of discrete force by the lightest of the light cavalry. As these capabilities develop in several different technological direction – on the one hand, smaller vehicles, more contained and limited kinetic weaponry, and improved sensors and, on the other hand, large-scale drone aircraft capable of going after infrastructure targets as the Israelis have done with their Heron UAVs – it is highly likely that they will become a weapon of choice for future presidents, future administrations, in future conflicts and circumstances of self-defense and vital national security of the United States. Not all the enemies of the United States, including transnational terrorists and non-state actors, will be Al Qaeda or the authors of 9/11. Future presidents will need these technologies and strategies – and will need to know that they have sound, publicly and firmly asserted legal defenses of their use, including both their use and their limits in law.

The Role of the CIA

15. The foregoing is intended to make clear that, first, "drone warfare" is really a set of heterogeneous activities, technologies, strategies, and actors. What the military does with drones in Afghanistan is different on many metrics from what the CIA does. The legal rationales offered to sustain the policy therefore need to take account of these differences as well.

16. The reality, however, is that the controversy centers on the use of drones that goes further "outwards" on the axes of (i) geographical and tactical remoteness of their use from a "traditional" armed conflict, (ii) the actor – uniformed military or civilian agency, (iii) covert or overt, or, in today's increasingly peculiar circumstances, "clandestine" – not covert, but not publicly acknowledged, either, (iv) relation to an existing overt war, or response to a new threat, thus raising the many controversies of "preventive" uses of force.

17. As a practical matter today, this simply means that what we are here discussing, ostensibly about "drones" and UAVs, is really, a millimeter below the surface, as much or more a discussion of the appropriate and lawful role of the CIA. We should be completely plain about this. Yes, there are issues related to the military use of drones on the battlefield. But the fundamental argument is over the expansion of drones beyond being a substitute weapon on traditional battlefields by the uniformed military to be a strategic tool used far from AfPak, by civilian agents of the CIA, even

perhaps – as Graham Allison and John Deutch urged in an op-ed last year – once again genuinely *covert*.

18. If I might respectfully suggest to the Subcommittee, then, the most fundamental question at issue here is not drones per se, but the technological development of drones forcing a discussion on the proper role of the CIA.

19. The lawfulness under US domestic law of the CIA to use force, in accordance with US statutes dating back to the founding of the CIA is not at issue. Use of force is not mentioned as such, but there is no question as to its lawfulness under US domestic law, provided that the steps required by the statute are taken. Congress has never seen fit overtly to name the use of force as such in the statutory language, preferring to use softer euphemisms and generalities. My view is that the time has come for Congress explicitly to revise the CIA statute to declare the so-called "Fifth Function" explicitly. I believe it is time to make that shift. Why?

20. Although unquestionably lawful under US domestic law, and viewed by the United States as lawful under international law as a matter of international law of self-defense, the international law position is beginning to come under pressure as parts of the international law community come to see human rights law, the laws of armed conflict, and other international law, as outlawing these kind of drone uses of force, particularly done covertly by civilian agents of a government on the territory of another. I emphasize that state practice and the views of states have long accepted the legitimacy (even without pronouncing on the legality of such) of such interventions, or at a minimum acquiesced in them, at least if they remain exceptional.

21. But that acquiescence by states as a matter of international law has largely concerned the issue of the territorial integrity of states set against an intervention aimed, for example, at attacking a terrorist in a safe haven. The practice today is contested increasingly on grounds of human rights – it is a prohibited act of extrajudicial execution, it is claimed, for the United States, for example, to launch its 2002 Yemen missile strike; it should have attempted, at a minimum, to detain and capture, offer surrender, before striking. And once having detained, it should then charge and try suspects on criminal grounds. That goes to a claim of unlawful targeting; in addition, of course, the concerns about unlawful collateral damage. The United States government, its agencies, officials, and counsel, in my view, have very little idea of the groundswell of an international campaign developing to de-legitimate the practice of drone warfare, starting with its conduct by the CIA.

22. Beyond this, as the CIA's central role in the Pakistan missions is on the front pages many days, important voices in the international law community are going further to attack not just the legal bases of drone warfare as such, but the fundamental premise of "intelligence" uses of force by the CIA. The view of much of the international law community is that all uses of force must be either law enforcement seeking to arrest a person, or else uniformed military of a state, engaged in armed conflict under its legal definitions in the laws of war. On that view, there is simply no legal space for the

CIA to undertake uses of force as it is doing in Pakistan or anywhere else. Armed conflict can only lawfully be undertaken by lawful combatants, and, on this view, officials of the CIA are not lawful combatants. Consider the following statement of a leading international law scholar at Notre Dame, Mary Ellen O'Connell:

> "Members of the CIA are not lawful combatants and their participation in killing persons – even in an armed conflict – is a crime."

23. This view was reinforced by a recent op-ed in the Washington Post by the eminent Georgetown and former West Point scholar of the laws of war, Gary Solis. Consider that Professor Solis said flatly that the CIA agents engaged in drone warfare are America's very own "unlawful combatants" – no less so, he said, than those they target:

> "In our current armed conflicts, there are two U.S. drone offensives. One is conducted by our armed forces, the other by the CIA. Every day, CIA agents and CIA contractors arm and pilot armed unmanned drones over combat zones in Afghanistan and Pakistan, including Pakistani tribal areas, to search out and kill Taliban and al-Qaeda fighters. In terms of international armed conflict, those CIA agents are, unlike their military counterparts but like the fighters they target, unlawful combatants. No less than their insurgent targets, they are fighters without uniforms or insignia, directly participating in hostilities, employing armed force contrary to the laws and customs of war. Even if they are sitting in Langley, the CIA pilots are civilians violating the requirement of distinction, a core concept of armed conflict, as they directly participate in hostilities."

24. My view differs from that of either Professor O'Connell or Professor Solis. In my view, the use of force by civilian CIA agents makes them combatants in the armed conflict underway in AfPak, because they are taking direct part in hostilities under traditional standards. In uses of force outside of AfPak, insofar as they are engaged in lawful exercises of the customary sovereign right of self-defense against a non-state actor, they are not combatants, but they are not thereby unlawful, nor is their use of force unlawful under international law. I have stated the basis for that legal conclusion in other places, and want to make a somewhat different observation here.

25. Professor Solis concludes by stating that the "prosecution of CIA personnel is certainly not suggested." I have trouble understanding why not, if one accepts the legal view of unlawful combatancy by the CIA. He has stated a case of legal equivalance between terrorist unlawful combatants and CIA unlawful combatants; why prosecution does not follow is unclear. Indeed, Professor O'Connell – saying aloud what others in the world of international law outside the United States, in my experience, think about this matter but do not quite so bluntly say – CIA participation in killing persons "is a crime." Professor Solis concludes by wondering whether

26. Drone warfare, therefore, raises questions on its own – but an underappreciated question is one that drone warfare *forces onto* the table – whether the United States government agrees, or does not agree, with its critics that the use of force by the CIA is unlawful combatancy, and a crime under international law. And if it disagrees as it presumably must, on what basis does it justify its lawfulness? Professor Solis suggests that senior officials of the CIA have understood that question; the inexplicable silence by the legal officials of the Obama administration as to how they would defend the international lawfulness of these policies suggests, to the contrary, that they do not. I would respectfully urge that Congress ought to insist on the appearance by the relevant legal counsel to agencies in the administration to state for the record why and on what basis these practices are lawful. Even as solely a practical matter, the silence of the administration's lawyers threatens to undermine the legitimacy, as a practical, moral, legal, and political matter, of targeted killing by the CIA using drones, in the future.

The Lack of Public Legal Justification from the Administration

27. The United States government is in a peculiar mismatch with respected to drone targeted killing, particularly as done by the CIA outside of immediate hostilities. On the one hand, senior leaders from the President and Vice-President on down, positively gush over the program and its successes. In today's newspapers – Thursday, March 11, 2010 – CIA director Panetta was on the front pages in what was clearly a carefully conceived effort to bolster the perception of the program in the public mind, defending its many successes. He is right to do so. The program, in my view, has been a stunning success. However, the CIA director's touting of its success is somewhat beside the point in current circumstances. The public, so far as I can tell, does not doubt the success of the program – it does precisely what the President said he would do, take the fight to the terrorists. The question is not its success – it is its *lawfulness*. And its lawfulness not as a single thing focused around drones, but instead the lawfulness of particular parts, conducted by particular actors.

28. As much as CIA director Panetta needs to put those successes to the public, he needs another public discussion entirely – one in which he puts his general counsel on stage to articulate why this form of killing people is not just effective, but legal. The utter failure of the administration's lawyers, anywhere across the administration, to do that is breathtaking. This reticence extends beyond the general counsel of the agency directly involved, the CIA; the principal US government lawyer on international law, the State Department Legal Adviser, has likewise expressed no formal view as to the correct legal view of targeted killing using drones by the CIA in a variety of settings. The mismatch can perhaps be best imagined by thinking of President Obama and Vice-President Biden and CIA director Panetta, standing in a press conference saying the glowing things they have said about these programs and celebrating their success – taking the fight to the enemy, denying them safe haven, going even into places like

Yemen or Somalia if necessary. Imagine, however, that their senior lawyers are standing beside them as they celebrate the ramping up of drone strikes month after month, far in excess of the Bush years – turning to the lawyers, all they can say is, "We have not yet reached a legal conclusion on this matter." Would the President and Vice-President have reason to believe they had been well-served by their lawyers? Lawyers, we all know, cannot be mere yes-men, and these issues are complicated and difficult – but we are more than a year into the Obama presidency, and these programs have emerged as expanding centerpieces of its on-offense counterterrorism policy, as well they should – and yet the lawyers publicly say nothing.

29. It is no doubt unfair to say that the lawyers have not reached conclusions. In some cases, that might be true, but most likely conclusions have been reached – but not shared with the public. This seems to me a profound mistake, on legal grounds and political grounds. There are ways to articulate the legal basis of these policies without having to reveal operational matters, and the legitimacy of these programs over the long term is distinctly at issue.

30. Congress could serve a useful function in pressing the administration to articulate publicly its rationale. Moreover, if Congress believes – as certainly I believe it should – that it ought to move legislatively to provide greater personal legal protections, against legal action both domestic and abroad, for CIA and other national security officers, then a crucial component of that is the public articulation of the basis on which the United States government will tell the rest of the world that its actions are lawful. That is not possible to do if all the relevant legal analysis is hidden away in a confidential OLC opinion.

"Reducing US Disincentives to Use Violence"

31. Many other issues could be considered in this discussion. The levels of collateral damage, for example – and whether they are high or low, to the extent they are known, on the basis of the realistic alternatives to targeted killing. Critics of drone-incurred collateral damage, after all, sometimes seem to imply that the alternative is no use of force at all – whereas a more realistic comparison might be the effects of a Pakistani army artillery barrage.

32. We could consider the evolution of technology and its likely effects on targeting decisions, collateral damage, ability to identify a target and get close enough to kill him and only him. I would urge Congress, in particular, to press forward research and development of these technologies, in part with funding, but also with assurances that those who develop these advances in far more discrete uses of force will not find themselves also at legal risk, domestically or abroad, down the road. The best is very firmly the enemy of the good – particularly when technology in these areas develops incrementally, one small step at a time.

33. I propose to close this written submission on a much more general note, however. It has become something of a trope in these discussions that the very availability of drones somehow makes it too easy for the US to kill, resort to violence and force. For example, I spoke before a group of US law students at one of our finest law schools some months ago, and was told by a student – in a group of students highly unlikely, it seemed to me, to enlist in the armed forces or join the CIA – that the problem with drones was that they "reduced the disincentives for the US to use force below their efficient level." I inquired as to how one would know the efficient level of the United States use of force and what would serve to induce it, and was told that the problem was that US personnel were not at personal risk – not enough US servicemen and women were at personal risk – from getting killed on the battlefield to deter the United States from needless violence. I was grateful, as I hope those reading this testimony would be, that one young woman spoke up, visibly upset, and said that it was hardly for privileged law students to sit and play God about efficient incentives and disincentives to violence – and she hoped that the United States would legally kill its enemies at least risk to its personnel.

34. I share that young woman's sentiment, of course. Drones are a major step forward toward much more discriminating uses of violence in war and self-defense – a step forward in humanitarian weapons technology. That development needs strong encouragement. But more fundamentally, I would hope that Congress would send strong signals, not just that it regards this technology as a humanitarian step forward, and not even the obvious message that the US intends to protect its serving men and women while it undertakes lawful uses of force and sees no contradiction with its legal duties in so doing.

35. The additional message that Congress should send is that targeted killing using drones has evolved as fast and far as it has since 9/11 because the United States confronts an enemy that has chosen to hide itself among civilians. What we call drone warfare is, as much as anything else, an attempt to counter, through technology, tactics by our enemies that rely upon systematic violations of the laws of war. The next time that someone raises the proposition that American "disincentives to violence" are reduced by drones, let them be reminded that, far more, drones represent an attempt to address an unlawful equilibrium in which one side takes obligations under the laws of war seriously, while the other side does not. That is the fundamental disequilibrium at work here, and drones the most measured and discrete response available – consistent with the policy that, as President Obama and all his administration have correctly said, the United States must take the fight to its enemies.

36. I thank the Subcommittee for its kind invitation to appear and offer testimony, and will endeavor to answer any questions you might have to the best of my ability.

Kenneth Anderson
Professor of Law
Washington College of Law, American University
Member, Task Force on National Security and Law

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The Hoover Institution, Stanford University

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Mr. TIERNEY. Thank you.
Professor Jackson.

STATEMENT OF JOHN JACKSON

Mr. JACKSON. Thank you, Mr. Chairman, for this opportunity to speak on two subjects about which I am passionate: the education of our dedicated warriors; and the role that unmanned systems can and should play in future military operations.

I am privileged to currently serve as a professor at the U.S. Naval War College in Newport, RI. In the fall of 1884, just over 125 years ago, the College was formed as a place of original research on all questions relating to war or the prevention of war. At the time of the College's founding, the flagship of the U.S. Navy's North Atlantic squadron was USS Tennessee, a wooden-hulled steamship that also carried 22,000 square feet of sail as backup propulsion system.

The young military officers who comprised the College's first class spent many long hours considering the ways in which evolving technologies like wireless communications, electrical equipment and long range naval guns would change the nature of warfare at the close of the 19th century.

Now, a century and a quarter later, our students are still engaged in serious contemplation of the ways in which technology will alter the battlefield, this time in the form of a robotics revolution.

To be clear, the Naval War College is not a technical school and issues of systems design and software architecture are better suited to the more junior officers attending the Naval Postgraduate School in Monterey, CA, where innovative research is being conducted at their Center for Autonomous Vehicle Research. Rather, the mission of the Naval War College is to improve the ability of its students to make sound decisions in highly complex and stressful maritime and joint environments.

If trends in computer science and robotics engineering continue, it is conceivable that autonomous systems could soon be developed that are capable of making life and death decisions without direct human intervention.

The purpose of the new elective course, Unmanned Systems and Conflict in the 21st Century, is to provide a forum for the consideration of the scientific, ethical and operational issues inherent in the employment of these systems. The course provides the opportunity for students to study contemporary cases, trends and issues in the development and use of unmanned systems. The students study and evaluate these systems from the tactical, operational and strategic dimensions of war.

In order to provide a more detailed overview of the course, a copy of the current syllabus has been provided with my written statement. But in brief, the course looks at the hardware issues and the land, air and maritime environments, and provides hands on exposure to state-of-the-art systems. It then considers the issues of command and control, personnel management and the legal and ethical issues of employing these systems in national security situations. Students ultimately demonstrate their mastery of the subject through research requiring both written and verbal presentations.

I would like to note that significant support for the course has been provided by Dr. Peter Singer, the Association for Unmanned Vehicle Systems International, a number of manufacturers of unmanned systems, educational institutions including the Massachusetts Institute of Technology, U.S. Army War College, the Department of Defense, and Navy leaders and engineers from various program management offices, and the Navy Undersea Warfare Center.

I have made a number of observations based on my direct contact with the students who have taken this course and with other military officers and practitioners I have met at meetings, symposia and conferences.

These observations: I have found that military officers are generally well informed about the exponential growth in the use of unmanned systems throughout the Department of Defense. And they are highly motivated to probe beyond the headlines and promotional hype to ascertain the true capabilities and limitations of current technology.

They have a keen interest in understanding the full range of research and development activities now underway, particularly with regard to those systems that could be fielded in the near term that could impact on their critical warfighting abilities.

They have an intense desire for knowledge about unmanned systems, and this is evident across all branches of the Armed Service, with many government agencies, and it extends to our international partners and allies.

Students are acutely aware of the ethical and legal issues associated with the employment of robotic systems in combat. Of particular concern is the possibility that unmanned robotic systems could be programmed to make lethal decisions in combat situations without active human participation in the kill chain. And they are keenly aware that unmanned and robotic systems could represent a true revolution in military affairs that has the potential to alter career fields, training pipelines and combat tactics. They don't fear the future, but they are mindful of the need to skillfully manage the impact of this disruptive technology.

My final observations pertain to the professionalism and vision of the many people I have encountered while developing and teaching this course. At Navy headquarters, the Chief of Naval Operations, Admiral Gary Roughead, has been a strong and vocal advocate for unmanned systems, about which he has said, "This is the right way. This is the way we have to go, and it will make us much, much more effective."

I believe the message is getting through at all levels of the Navy, and whenever I have sought information or requested senior leaders to travel to the College to speak with students or when I have participated at conferences and symposia, I received immediate and unqualified support.

Additionally, I have been particularly impressed with the people I have met from academia, the scientific engineering communities, and industry, all of whom are working tirelessly to bring the potential of unmanned systems to fruition.

Finally, I salute our elected officials as represented by members of this subcommittee who seek to ensure that neither organizational inertia, nor the tendency to protect the status quo will keep

America from using the drive and genius of her people to devise and utilize technology as necessary to protect our citizens, our economy and our Nation.

I am prepared to entertain any questions, and since there are so many educators on the panel, I will pass out the quiz. [Laughter.]

[The prepared statement of Mr. Jackson follows:]

United States House of Representatives

Subcommittee on National Security

And Foreign Affairs

Statement prepared for the Hearing:

"Rise of the Drones:

Unmanned Systems and the Future of War"

Tuesday, 23 March 2010

Room 2154

Rayburn House Office Building

Statement of John Edward Jackson

Professor of Unmanned Systems

U.S. Naval War College

Newport, Rhode Island

This testimony reflects the personal views of the author and does not represent

the official views of the Naval War College or the Department of the Navy.

Thank-you Mr. Chairman, and thank-you to the rest of the Subcommittee members for this opportunity to speak on two subjects about which I am passionate: The education of our dedicated warriors, and the role that unmanned systems can and should play in future military operations.

I am privileged to currently serve as a professor at the U.S. Naval War College in Newport, Rhode Island. In the fall of 1884 (just over 125 years ago) the College was formed as a place *"...of original research on all questions relating to war... or the prevention of war"*. At the time of the College's founding the flagship of the U.S. Navy's North Atlantic Squadron was *USS Tennessee*, a wooden-hulled steam-ship that also carried 22,000 square feet of sail as a back-up propulsion system! The young military officers who comprised the College's first class spent many long hours considering the ways in which evolving technologies, like wireless communications, electrical equipment, and long-range naval guns, would change the nature of warfare at the close of the 19th century.

Now... a century-and-a-quarter later, our students are still engaged in serious contemplation of the ways in which technology will alter the battlefield, this time in the form of a robotics revolution.

To be clear, the Naval War College is not a technical school, and issues of systems design and software architecture are better suited to the more junior officers attending the Naval Postgraduate School in Monterey, California where innovative research is being conducted at their Center for Autonomous Vehicle Research (CAVR). Rather, the mission of the Naval War College is to improve the ability of its students

to make sound decisions in highly complex and stressful maritime and joint environments. If trends in computer science and robotics engineering continue, it is conceivable that autonomous systems could soon be developed that are capable of making life-and-death decisions without direct human intervention. The purpose of the new elective course entitled **"Unmanned Systems and Conflict in the 21st Century"** is to provide a forum for the consideration of the scientific, ethical and operational issues inherent in the employment of unmanned/robotic systems in the national security context.

The course provides the opportunity for students to study contemporary cases, trends, and issues in the development and use of unmanned systems in twenty-first century warfare. The students study and evaluate these systems from the tactical, operational, and strategic dimensions of war. In the course of their studies, they:

- Develop an appreciation for the current state of development in the field of unmanned/robotic systems in the air, ground and maritime domains.

- Understand the unique issues, opportunities, and challenges associated with the operational employment of unmanned/robotic systems.

- Appreciate the degree to which the use of unmanned/robotic systems could change the character of warfare in the 21st century.

- Assess the diverse ethical issues and attitudes relevant to the use of unmanned systems.

- Assess the unique leadership challenges that arise in the utilization of unmanned systems.

- Assess the diverse elements and key drivers affecting the decision-making process with regard to unmanned systems.

- Analyze the use of unmanned systems within the context of international law, the law of armed conflict, and the just war tradition.

In order to provide a more detailed overview of the course, a copy of the current syllabus is attached to this statement. In brief, the course looks at hardware issues in the air, land, and maritime environments and provides hands-on exposure to state-of-the-art systems. It then considers the issues of command and control, personnel manning, and the legal and ethical issues of employing these systems in national security situations. Students ultimately demonstrate their mastery of the subject through research requiring both written and verbal presentations (a sample of recent paper topics is attached). The course supports two specific Areas of Study (AOS): Leadership and Ethics and Strategy, Operations, and Military History.

It should be noted that significant support for the course has been provided by the Association for Unmanned Vehicle Systems International (AUVSI); a number of manufactures of unmanned systems; educational institutions including the Massachusetts Institute of Technology (MIT) and the U.S. Army War College; the Department of Defense; and Navy leaders and engineers from various program management offices and the Navy Undersea Warfare Center.

LESSONS LEARNED AND OBSERVATIONS

The following observations result from direct contact with the several dozen students who have taken the newly-established course during the current academic year, as well from discussions I have had with scores of military officers and other practitioners at meetings, symposia and conferences.

- I have found that military officers are generally well informed about the exponential growth in the use of unmanned systems throughout the Department of Defense; and they are highly motivated to probe beyond the headlines and promotional hype to ascertain the true capabilities and limitations of current technology.

- They have a keen interest in understanding the full range of research and development activities now underway, particularly with regard to those systems that could be fielded in the near-term that could impact on their critical war-fighting abilities.

- The intense desire for knowledge about unmanned systems is evident across all branches of the armed services, within many government agencies, and it extends to our international partners and allies.

- Students are acutely aware of the ethical and legal issues associated with the employment of robotic systems in combat. Of particular concern is the possibility that unmanned/robotic systems could be programmed to make lethal decisions in combat situations without active human participation in the "kill chain".

- They are keenly aware that unmanned/robotic systems could represent a true "revolution in military affairs" that has the potential to alter career fields, training pipelines, and combat tactics. They don't "fear" the future, but are mindful of the need to skillfully manage the impact of this disruptive technology.

My final observations pertain to the professionalism and vision of the many people I have encountered while developing and teaching this course. At Navy Headquarters the Chief of Naval Operations, Admiral Gary Roughead, has been a strong and vocal advocate for unmanned systems, about which he has said: *"This is the right way, this is where we have to go, and it will make us much, much more effective"*. (Remarks at Brookings Institution, 2 November 2009). I believe the message is getting through at all levels of the Navy, and whenever I have sought information, or requested senior leaders to travel to the College to speak with students, or when I have participated in conferences and symposia, I have received immediate and unqualified support. Additionally, I have been particularly impressed with the people I have met from academia, the scientific/engineering communities, and industry, all of whom are working tirelessly to bring the potential of unmanned systems to fruition. Finally, I salute our elected officials, as represented by the members of this subcommittee, who seek to ensure that neither organizational inertia nor the tendency to protect the status-quo will keep America from using the drive and genius of her people to devise and utilize technology and science as necessary to protect our citizens, our economy, and our nation.

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Newport, Rhode Island   ·   March 2010

UNMANNED SYSTEMS

AND CONFLICT IN THE 21ST CENTURY

Course Number SE-720

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Member: Association for
Unmanned Vehicle Systems
International (AUVSI)

Spring Trimester, 2009-2010

UNMANNED SYSTEMS AND CONFLICT IN THE 21ST CENTURY

1. Course Description:

The technological advances in the areas of computer science, artificial intelligence (AI) and robotics engineering achieved in the past decade have created the capacity for unmanned/robotic systems to move from the realm of science fiction onto the current battlefields of the 21st century. In 2009 there were over 5,300 unmanned aircraft systems in America's inventory, and the inventory of unmanned ground systems deployed to Iraq and Afghanistan exceeded 12,000. Sea-based unmanned/robotic systems are less fully developed, due in part to the demanding operating environment, but research and development is well underway on systems to be deployed in the air, on the surface, and under-seas. Critical design considerations for the Littoral Combat Ship, for example, have been made to accommodate the use of a variety of unmanned vehicles. One further indicator of Navy interest in this subject was the Chief of Naval Operations' October 2008 tasking to Strategic Studies Group XXVIII to study all aspects of the integration of unmanned systems into Navy force structure.

Many observers believe that the combination of super-computing technology and robotics engineering will drive changes within the military environment equal to the impact the wide-spread use of gunpowder had in the 16th/17th centuries and steam propulsion for ships had in the 19th and 20th centuries. These changes relate not only to the development and manufacture of highly-capable future systems, but also to issues regarding the ethics of their use, and the manner in which command and control will be exercised. The purpose of this course will be to acquaint students with the scientific, ethical and operational issues inherent in the employment of unmanned/robotic systems in the national security context.

2. Student Learning Outcomes:

This course provides the opportunity for students to study contemporary cases, trends, and issues in the use and development of unmanned systems in twenty-first century warfare. Students will study and evaluate these systems from the tactical, operational, and strategic dimensions of war looking at the multifaceted issues of their development and use. Graduates will be able to:

a. Develop an appreciation for the current state of development in the field of unmanned/robotic systems in the air, ground and sea domains.

b. Understand the unique issues, opportunities, and challenges associated with employment of unmanned/robotic systems.

c. Appreciate the degree to which the use of unmanned/robotic systems could change the nature of warfare in the 21st century.

d. Describe and assess the diverse ethical issues and attitudes in the use of unmanned systems.

e. Describe and assess the unique leadership challenges that arise in the utilization of unmanned systems.

f. Describe and assess the diverse elements and key drivers affecting the decision-making process with regard to unmanned systems.

g. Describe the use of unmanned systems within the context of international law, the law of armed conflict, and the just war tradition.

h. Describe the various legal issues and concerns with respect to the utilization of unmanned systems.

3. Methodology and Student Requirements:

Each student will complete a mini-research project requiring a written paper of 6-8 pages in length combined with a formal 10-15 minute presentation on a subject of their choice related to course themes. All work will be graded High Pass, Pass, or Fail. Successful completion of all course requirements will result in the award of two-hours of graduate credit.

4. Required Readings:

Wired for War: The Robotics Revolution and Conflict in the 21st Century by Dr. P.W. Singer, Penguin Press, New York, 2009.

Unmanned Systems Integrated Roadmap FY2009-2034, Department of Defense, Pentagon, Washington, D.C., 2009.

United States Air Force Unmanned Aircraft Systems Flight Plan 2009-2047, Headquarters, U.S. Air Force, Washington, D.C., 2009.

"Ethical and Legal Issues Associated with the Use of Unmanned/Robotic Systems" by Raul Pedroza, U.S. Naval War College, 2009.

5. Seminar and Reading Schedule:

Session 1:   Thursday, 11 March 2010

Title: Introduction to the Course

Session summary:

> This will be the kick-off session for the course. We will review the plan for the 10-weeks of
> instruction, and will make introductions.
>
> This session will also introduce the DOD Unmanned Systems Integrated Road Map, and the Air Force Unmanned Systems Flight Plan. A review of robotics in literature and cinema will also be conducted.

Readings:

- Wired, pp 19-93. Scan as much of entire book as possible prior to class.

- Roadmap, pp. xiii-15.

- Flight Plan, pp.14-19

Session 2:   Thursday, 18 March 2010

Title: Coming Soon to a Battlefield Near You: The Next Wave of WarBots

Session Summary:

> Part 1: Static display of Unmanned Undersea Systems from Bluefin Robotics.
>
> Part 2: VTC lecture by Brookings Senior Fellow Dr. P.W. Singer.
>
> We will spend the second half of the class in a VTC discussion with Dr. P.W. Singer, Senior Fellow at Brookings Institute, and author of the course's primary text Wired for War: The Robotics Revolution and Conflict in the 21st Century. Dr.

Singer will touch-upon many of the issues that will be addressed in subsequent sessions.

Readings:

- Wired, pp 109-123.

Session 3:   Thursday, 25 March 2010

Title: Review and demonstration of unmanned/robotic air systems.

Guest lecturer #1: RDML Terry Kraft, USN, Director of ISR Capabilities, OPNAV Staff N2/N6

Guest Lecturer #2: MAJ Joe Campo, USAF, Predator pilot

Session summary:

This session will focus primarily on unmanned airborne systems being used by DOD and other government agencies.

Part 1: Static Display of ScanEagle and Hummingbird unmanned air systems courtesy of Boeing/Insitu.

Part 2: Briefing by RDML Terry Kraft on status of Navy UAS development.

Part 3: Briefing by MAJ Joe Campo about his experiences as a Predator pilot.

Readings:

- Wired, pp. 116-120.

- Roadmap, pp. 51-103.

- Flight Plan, scan pp 25-51.

Session 4:   Thursday, 1 April 2010

Title: Review and demonstration of unmanned/robotic maritime systems.

Session summary:

This session will be conducted as a site-visit to the Navy Undersea Warfare Center (NUWC) Unmanned Systems Laboratory in Newport, Rhode Island.

Readings:

- Wired, pp. 114-116.

- Roadmap, 135-143.

- Other readings TBD

Session 5:   Thursday, 8 April 2010

Title: Ethical and legal issues with the use of unmanned/robotic systems

Session summary:

Professors from the NWC International Law Department and the College of Operational and Strategic Leadership (Stockdale Chair of Military Ethics) will lead discussions of the many legal and ethical issues related to the use of unmanned systems.

Readings:

- Wired, pp. 413-427; pp. 382-412.

- Selected Reading: "Ethical and Legal Issues Associated with the use of Unmanned/Robotic Systems" by Raul Pedroza.

- Selected Reading: "The Predator War: What are the Risks of the CIA's Covert Drone Program?" by Jane Meyer, The New Yorker, October 26, 2009.

Session 6:   Thursday, 15 April 2010

Title: Review and demonstration of unmanned/robotic ground systems.

Session Summary:

This session will focus on the various unmanned systems being used and/or developed to support ground operations. This will include a live demonstration of robotic systems provided by iRobot/Boeing and by Foster-Miller/QinetiQ Corporation.

Readings:

- Wired, pp. 110-114.

- Roadmap: pp 111-133.

- Other readings TBD

Session 7:   Thursday, 29 April 2010

Title: Artificial Intelligence, How Much is Too Much?

Session summary: This session will investigate the state of development of artificially intelligent systems and will consider the potential for such systems to become superior to the human mind. We will discuss the "Terminator-syndrome" and the threat (if any) a malevolent AI system might create for humanity.

Session 8:   Thursday, 6 May 2010

Title: Issues of Command and Control of unmanned/robotic systems

Session summary:

> This session will focus on issues of command and control, and will also review the CNO's Strategic Studies Group report on the integration of unmanned systems into naval operations in the 2025 and beyond timeframe.

Reading:

- Wired, pp. 123-134; pp. 205-236; pp. 344-359.

- Other readings TBD

Session 9:   Thursday, 13 May 2010

Student Presentations on research topics.

Session 10:   Thursday, 20 May 2010
Student Presentations and Course Wrap-up

Selected Bibliography

Arkin, Ronald C. *Governing Lethal Behavior in Autonomous Robots.* Boca Raton, FL: CRC
    Press, 2009

Axe, David. *Warbots.* Ann Arbor, MI: Nimble Books LLC. 2008.

Bar-Cohen, Yoseph and Hanson, David. *The Coming Robot Revolution.* New York:
    Springer Science and Business Media, Inc, 2009.

Bekey, George. *Robotics: State of the Art and Future Challenges.* London, England: Imperial
    College Press, 2008.

Krishnan, Armin. *Killer Robots: Legality and Ethicality of Autonomous Weapons.* Surrey,
    England: Ashgate Publishing, 2009.

Mets, David R. *Airpower and Technology: Smart and Unmanned Weapons.* Westport, CT:
    Praeger Security International, 2009.

Newcome, Laurence. *Unmanned Aviation: A Brief History of Unmanned Aerial Vehicles.*
    Reston, VA: American Institute of Aeronautics and Astronautics,   2004.

Wallach, Wendell and Allen, Colin. *Moral Machines: Teaching Robots Right from Wrong.*
    Oxford: Oxford University Press. 2009.

Yenne, Bill. *Attack of the Drones: A History on Unmanned Aerial Combat.* St. Paul, MN: Zenith
    Press. 2004.

Fiction

Asimov, Issac. *The Robot Series #1: The Caves of Steel.* New York: Bantam.1991.

_____. *The Robot Series #2: The Naked Sun.* New York: Bantam.1991.

_____. *The Robot Series #3: The Robots of Dawn.* New York: Bantam.1994.

_____, *The Robot Series #4: Robots and Empire.* London: Harper Collins.1996.

_____, *I, Robot.* New York: Bantam.1991.

Capek, Karel. *R.U.R: Rossum's Universal Robots.* New York: Penguin Books, 2004. (First
    published 1921).

Internet Resources

www.uvs-info.com   UVS International (Paris). A superb site with a tremendous amount
of data. No charge, but must register for use. Sign-up for monthly
"UVS News Flash".

www.auvsi.org   Site of the Association for Unmanned Vehicle Systems
International. Many links available without joining, full resources
available to registered members.

Sample Research Paper Topics: Winter Trimester 2009-2010

- "Bionics: Robotics in the Human Body"
- "Clausewitz vs. Unmanned Systems: When Theory and Technology Collide"
- "Defense Acquisition: Effects on the Future Unmanned Force Structure"
- "Do the Benefits of UCAS in a SEAD/DEAD Role Outweigh the Ethical Concerns?"
- "Gamers and Remotely Piloted Aircraft: Implications of the Video Game Generation in RPAs"
- "Is there a Requirement for Robotic Ethical and Moral Guidelines?"
- "Powering Unmanned Ground Vehicles"
- "Satellites and Remotely Piloted Vehicles: Two Remotely Operated Ships Passing In the Fight"
- "Swimming in Sensors, Drowning in Data"
- "Sensor Overload"
- "Tactical Application of Unmanned Systems"
- "The Singularity: The End of Humanity (NLT 2040)"
- "Unmanned Airships: Extreme Persistence"
- The Rise of the Machines: Ethics and Responsibility for Robots"
- "Unmanned Air Systems in Ballistic Missile Defense"
- "Unmanned Vehicles: A Viable Tool for the Marine Corps Logistician"

Mr. TIERNEY. Thank you very much.

Before we go to Mr. Fagan, just let me tell the folks that are in the audience here, they are here as the guests of Congress to participate and listen as citizens to this hearing. We don't really countenance any disruption, whether that is speaking out loud in the middle of the hearing or raising signs or any other kinds of disturbances. So we ask your cooperation in that regard. If we do that, we will be able to get through the hearing and hopefully we will all learn something and it will help us set policy.

Mr. Fagan, your 5 minutes, please.

STATEMENT OF MICHAEL FAGAN

Mr. FAGAN. Mr. Chairman and members of the subcommittee, thank you for this opportunity to address the subcommittee. My name is Michael Fagan. I chair the Unmanned Aircraft Systems Advocacy Committee for the Association for Unmanned Vehicle Systems International. It is an honor to represent the world's largest nonprofit organization devoted exclusively to advancing the unmanned systems community.

While national defense still is the primary use of unmanned aerial systems, there is much more that these systems can do and are doing to protect our Nation and its citizens. There are many technological reasons for the rise in applications of unmanned systems. I will briefly mention two.

One reason is that detection, surveillance, measurement, and targeting are more effective when done as close to the observable as possible. This axiom applies to military systems as much as it does to everyday life. Small and medium size UAS put military payloads close to hostile forces for very long periods of time, while significantly reducing risk to friendly forces.

Another reason is that size, weight and power [SWAP], requirements for equivalent data processing and storage capabilities are decreasing. Last month, for example, the Office of Naval Research completed the first test flights of key elements of a 50-pound persistent surveillance imagery payload for Shadow class UAS. The Shadow's model is the one closest to me on the table.

A similar operational payload is 1,000 pounds and needs a commuter size aircraft with a crew to put it in its necessarily predictable orbit overhead a hostile target. As reduced SWAP allows more data processing to move on board the UAS, available datalink bandwidth can transmit to the ground more products that are more relevant to more analysts over larger areas compared with the raw data that we send to the ground today.

Additionally, processing on board the unmanned aircraft automates intelligence analysis tasks and increasingly permits the same number of analysts to be effective over a greater area.

UAS technology will continue to increase in the current U.S. regulatory environment, but it will more efficiently and effectively provide benefits to warfighters if UAS manufacturers can more easily and frequently get access to the air space that permits the research, development, tests and evaluation flights. AUVSI is in favor of FAA rulemaking that will enable increased air space access for UAS manufacturers.

UAS manufacturers also depend significantly on engineers and scientists with relevant educations. It is therefore equally important to national security that science and engineering educational institutions have routine access to national air space. AUVSI is in favor of FAA rulemaking that permits educational institutions the air space access that they need to effectively educate the next generation in autonomous system technologies.

The wars in Iraq and Afghanistan have certainly driven demand for these systems, but many Americans are unaware that a ScanEagle UAS, which is represented by the second model in on the table, also aided in the successful recovery of Captain Phillips of the Maersk Alabama off the coast of Somalia last year. There are many other useful applications of UAS technology, some of which we saw on the screen earlier, air, ground and maritime systems that can protect our Nation. Border patrol, emergency response, wildfire monitoring, civil unrest, search and rescue, law enforcement, port security, submarine detection and underwater mine clearance, bulldozers for clearing land mines and IEDs, and ground robots used for explosive ordnance disposal are some examples of actual and potential robotic system missions for air, ground and maritime systems.

Unmanned systems have been and will continue to be proven in war, and it is time to prove their heretofore under-recognized capabilities for increasing the effectiveness of civil law enforcement and public safety.

Technologies originally developed for warfare also will be transitioned to commercial operations. There is a growing demand from the civil sector for use of UAS for precision farming, tracking shoals of fish, aerial photography and more. This demand has the potential to drive a rapid advance of the technology. The United States has an opportunity to be at the forefront of the research and development of these advanced systems if it can address regulatory obstacles.

Our industry growth is adversely affected by International Traffic in Arms regulations for export of certain UAS technologies, and by a lengthy license approval process by Political Military Defense Trade Controls. AUVSI is an advocate for simplified export control regulations and expedited license approvals for unmanned system technologies.

Our hope is that today's hearing illuminates some of the ways that unmanned system technologies are changing and could change modern warfare, increase the safety of our men and women in the military, law enforcement and public safety, and strengthen national security at all levels.

AUVSI's over 6,000 members from industry, government and academia are committed to fostering and promoting unmanned systems and related technologies.

Thank you for the opportunity to testify. I am happy to answer any question from you or other members of the subcommittee.

[The prepared statement of Mr. Fagan follows:]

AUVSI
ASSOCIATION FOR UNMANNED
VEHICLE SYSTEMS INTERNATIONAL

Statement of Michael S. Fagan
Chair, Unmanned Aircraft Systems (UAS)
Advocacy Committee
Association for Unmanned Vehicle Systems
International (AUVSI)

BEFORE THE HOUSE OVERSIGHT AND
GOVERNMENT REFORM SUBCOMMITTEE ON
NATIONAL SECURITY AND FOREIGN AFFAIRS

The Honorable John F. Tierney, Chairman
The Honorable Jeff Flake, Ranking Member

March 23, 2010

Mr. Chairman and members of the subcommittee, thank you for this opportunity to address the subcommittee. My name is Michael Fagan, and I Chair the Unmanned Aircraft Systems (UAS) Advocacy Committee for the Association for Unmanned Vehicle Systems International (AUVSI). It is an honor for me to be here representing the world's largest non-profit organization devoted exclusively to advancing the unmanned systems community.

While national defense still is the primary use of unmanned aircraft systems, there is much more that these systems can do (and are doing) to protect our nation and its citizens.

There are many technological reasons for the rise in the application of unmanned systems. I will briefly mention two. One reason is that detection, surveillance, measurement, and targeting are more effective when done as close to the observable as possible. This axiom applies to military systems as much as it does to everyday life. Small and medium-size UAS put military payloads close to hostile forces for very long periods of time while significantly reducing risk to friendly forces.

Another reason is that size, weight, and power (or SWAP) requirements for equivalent data processing and storage capabilities are decreasing. Last month, the Office of Naval Research completed the first test flights of key elements of a 50-pound persistent surveillance imagery payload for Shadow-class UAS. A similar operational payload is approximately 1,000 pounds and needs a commuter-size aircraft with crew to put it in its necessarily predictable orbit above the hostile target. As reduced SWAP allows more data processing to move onboard the UAS, available data link bandwidth can transmit to the ground more products that are more relevant to more analysts over larger areas – compared to raw data now sent to the ground. Additionally, processing onboard the unmanned aircraft automates intelligence-analysis tasks and increasingly permits the same number of analysts to be effective over a greater area.

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The wars in Iraq and Afghanistan have certainly driven demand for these systems, but many Americans are unaware that a ScanEagle UAS also aided in the successful recovery of Captain Phillips of the Maersk Alabama off the coast of Somalia last year. There are many other useful applications of unmanned technology -- air, ground and maritime systems -- that can protect our nation. Border patrol, emergency response, wildfire monitoring, civil unrest, search and rescue, law enforcement, port security, submarine detection and underwater mine-clearance, bulldozers for clearing land mines and IEDs, and ground robots used for explosive ordnance disposal are some examples of actual and potential robotic system missions for air, ground, and maritime systems.

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Technologies originally developed for warfare also must be transitioned to commercial operations. There is growing demand from the civil sector for UAS for uses such as precision farming, tracking shoals of fish, aerial photography, and more. This demand has the potential to drive a rapid advance of the technology. The United States has an opportunity to be at the forefront of the research and development of these advanced systems if it can address regulatory obstacles.

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Thank you for this opportunity to testify. I am happy to answer any questions you and Members of the Subcommittee may have.

UAS Facts, Figures and Quotes

UAS provide critical data for the Joint Warfighter - 24/7/365

- Predators and Reapers are providing more than 700 hours of full motion video every day (>22,000 hours per month) to the warfighter providing unmatched persistence and flexibility. Every second of every day, 40 Predator-series aircraft are airborne worldwide.

- Global Hawks are providing more than 550 hours of imagery each month.

- The U.S. Air Force's active and reserve components are fully engaged in UAS operations with 5 active MQ-1/9 squadrons; 1 active RQ-4 squadron; 2 Air Force Reserve MQ-1 squadrons; 4 ANG MQ-1 squadrons; 1 ANG MQ-9 squadron. The Air Force additionally is conducting UAS training operations at 5 Formal Training Units; 3 MQ-1 (1 ANG); 1 MQ-9; 1 RQ-4

The Air Force is currently flying 41 CAPS (28 Predator, 12 Reaper, 1 Global Hawk)

- The Air Force continues to grow its UAS combat capability and will add 6 MQ-1/9 CAPs over the next year. UAS growth will continue into FY11 with the culmination of 50 MQ-1/9 CAPs.

MQ-1 and RQ-4 aircraft are providing imagery in support of recovery operations in Haiti

- 1 RQ-4 CAP stood up 14 Jan 2010.
    -- CENTCOM asset redeployed enroute to the AOR to support SOUTHCOM.
    -- Over 50 hours of imagery provided to commanders and partner agencies.

USAF UAS Airframes

- Predators: 143 MQ-1 inventory, 78 in Combat
    o   690,000 hours flown; averaging 4,500 hrs/week

- Reapers: 40 MQ-9 in inventory, 19 in Combat
    o   95,000 hours flown; averaging 1,000 hrs/week

- Global Hawk: 18 RQ-4 in inventory (incl test), 7 combat coded, 4 deployed
    o   38,000 hours flown, averaging 120 hrs/week

Combat Flt Hours (FY08)
        Predator - 138,000
        Reaper - 12,770
        Global Hawk - 6,700

Combat Flt Hours (FY09)
        Predator – 179,000
        Reaper – 24,000
        Global Hawk – 6,500

Combat Flt Hours (FY10)
        Predator – 51,000
        Reaper – 12,000
        Global Hawk – 2,000

- Overall, use of Predator-series aircraft – In 2006 Predator-series aircraft flew 80,000 total flight hours. In 2009, this number more than tripled, growing to 295,000 flight hours for the year.

- Predator-series aircraft are expected to reach the one million flight hours milestone in late March or early April 2010. More than 85% of these hours have been accumulated in combat zones.

- In 2009, while performing border security missions, CBP flew more than 2000 hours and responded to more than 5,200 ground sensor activations; 2900 resulted in the identification of suspected illegal activity such as human or narcotics smuggling. These flight hours directly contributed to the seizure of more than 12,000 pounds of narcotics and the apprehension of more than 1500 suspects. (Source: DHS/CBP, March 2010)

Army UAS statistics as of 10 March 2010

- Approaching the 1 Million hours mark for all types of Army UAS
- 1,287 Fielded systems - in every Army Brigade Combat Team as organic equipment operated by line soldiers
- 291 Deployed systems in Iraq and Afghanistan, varies by density of units deployed - 15-17 per BCT, plus Military Police units
- Army Total Raven hours estimate: 275,269
- Army Raven Combat hours estimate: 241,775
- Over the last decade, the Army has experienced more than 4,200 percent growth in the operational tempo of unmanned aircraft systems.

Army Unmanned Aircraft Systems (UAS) are a rapidly growing capability that are quickly becoming indispensible to the Army. As an example of how quickly this capability has grown within the Army, when Operation Iraqi Freedom (OIF) began in March 2003, there were only 3 systems (13 aircraft) deployed in support of that operation. Today, we have 337 systems (1,013 aircraft) in OIF and Operation Enduring Freedom (OEF). This growth continues. For example, it took the Army 13 years to fly the first 100,000 hours of UAS. It took us less than a year to fly the next 100,000 hours, and now we fly more than 220,000 hours each year. By May 2010 Army UAS will have flown 1,000,000 flight hours, almost 90 percent of which were flown in support of combat operations.

Employment of UAS have become a critical part of how the Army conducts operations. The Army employs UAS across all echelons (to include Division/Corps level) providing dedicated/organic support for tactical maneuver and intelligence operations. Army UAS are predominately employed as tactical Reconnaissance, Surveillance, and Target Acquisition (RSTA) platforms supporting the Commander's scheme of maneuver. In this role, Army UAS have filled a critical need, providing "actionable" intelligence and decreasing the time between sensor and shooter (shortening the "kill chain").

Quotes from UAS Users

"The aircraft is an active contributor to the actual apprehension of these criminals. It's hard to imagine combat today without UAVs. The aircrafts' capabilities are continuously improving, and they are beginning to do a lot of the same missions as our manned aircraft."

> Maj. Jonathan Shaffner, brigade aviation officer and chief of operations, 2nd Stryker Brigade Combat Team, 25th Infantry Division

"The Shadow provides coverage for a lot of raids. We do road scans for roadside bombs and have actually caught terrorists in the act of implanting these bombs in the road. The UAV mission is imperative to today's combat operations. When the infantry troops are going into a certain area to clear buildings, we'll go in ahead of time and scan the area, and we'll be able to report to them exact grids of potential enemies in the area."

> Sgt. 1st Class David Norsworthy, a UAV platoon sergeant with 2nd BCT, 101st Abn. Div.

"In both Iraq and Afghanistan, my Marines prefer not to go outside the wire without first sending up a Raven or a Wasp to scan the area and see what's going on. We call the Raven and Wasp our Airborne Flying Binoculars and Guardian Angels."

> GySgt Butler, Infantry Patrol Sergeant, USMC, 2008

"The Shadow is the commander's eye on the battlefield. It's surveillance, target acquisition and route reconnaissance all in one "We saved countless lives, caught hundreds of bad guys and disabled tons of IEDs in our support of troops on the ground."

> Spc. Eric Myles, a UAV operator with Darkhorse Troop, 2nd Squadron, 1st Cavalry Regiment

"We've supported countless troops in contact. We've found IEDs and monitored vehicle-borne IEDs and supported a bunch of raids out there."

> Sgt. Reed Myers, a UAV operator with Darkhorse Troop, 2nd Squadron, 1st Cavalry Regiment

"We bring another level to the commanders overall situational awareness, allowing them a chance to check things that would take a lot longer for troops on the ground to find out: from seeing if a high-value insurgent is at his house to if smugglers are trying to cross a river or canal at night. If we see something suspicious, we report it. I personally found an improvised explosive device during Iron Pursuit, and I'm proud that I'm doing a job that can save lives of the troops on the ground."

> General comment by Spc. Sam Bishop, a UAV operator, 502nd Military Intelligence Company, 47th Forward Support Battalion, 2nd Brigade Combat Team, 1st Armored Division, Multi-National Division - Baghdad

"The simple fact is this technology saves lives."

> Sgt. 1st Class David Norsworthy, a UAV platoon sergeant with 2nd BCT, 101st Abn. Div.

Mr. TIERNEY. Thank you, Mr. Fagan.

I thank all of you. I am glad we decided this wasn't going to be our one and only hearing because there is certainly a lot of food for thought here. It runs the whole range on that.

And I want to thank Dr. Singer before we start. He spent some time with us actually a while back, helping us think through some of the questions that we wanted to present and have the witnesses discuss with us.

Let me start with Professor Anderson if I could. What is your legal rationale that you say leads you to the conclusion that the use of the UAVs is legal in context of sending them over a country like Sudan or Yemen or Pakistan, as opposed to a combat area like Afghanistan?

Mr. ANDERSON. Well, I think that the legal rationale for their use in regular combat where it is clear that it is part of traditional hostilities is exactly that as any other weapon. And so the question really becomes what happens when you move outside of that zone.

And I believe that the answer that has been given by the Obama administration, the Clinton administration, the Bush administration, going really back through the 1990's, has been that if you were in some kind of conflict with the terrorists that are transnational, you can chase them anywhere, and anywhere the combatant is located, you can attack them.

I am sympathetic to that, but don't think it is actually literally right under the laws of war. That is, there are treaty thresholds that are actually established for when you have an armed conflict. And my own view is that is not unlimited in geographic scope.

That said, the basis for the use of force is not limited strictly to armed conflicts in the narrow legal sense. We have always traditionally used force in ways that we describe as self defense on a broader basis. And self defense is, I believe, what we meant in the 1980's when Abe Sofer, the then-legal adviser to State, delivered an address stating that the policy of the United States was not to allow safe havens; that if a country was unwilling or unable to keep transnational terrorists out of its territories, we would feel free to attack them if we thought that was the prudent thing to do, attack the terrorists.

That is an exercise of self defense, rather than war in the full scale overt sense, and I think that it is an important capability that we have always had because I think that under many circumstances, it turns out that a smaller and sometimes covert action is a way of not escalating into a full overt war that could be very, very costly in every respect.

So I think the answer to that is that it is a broader doctrine of self defense.

Mr. TIERNEY. Thank you.

If we accept that, Dr. Singer, for argument's sake on that basis, then you get to the issue that you raise in your testimony: who is responsible for making decisions about whether or not we go there? And second, should we go there, who is responsible for making the decisions actually controlling the UAVs or other robotic instruments that are there? And if we are contracting them out, how appropriate or inappropriate is it? And at what stage is it a govern-

mental function that ought not to be contracted out? And how does all that play in? Could you talk to us a little bit about that?

Dr. SINGER. I think there are three important issues that are raised by that. The first is this technology is one that has certainly military applications, but it has also allowed a wider range of actors to utilize it. And there is a question of appropriateness there.

So for example, my concern with the CIA strikes may be a little bit shared with Professor Anderson, but a little bit different in that, first, you have, for example, CIA lawyers deciding issues of air strikes. The scale of this effort is an air war. It is on the scale of the Kosovo air war, the opening rounds of it, but it is not military lawyers who have spent their years training on those situations. It doesn't mean they are making bad decisions, but that it is not the background a JAG office would have, and that is on the authorization side.

Same in terms of the planning side. You have political appointees and people with an intelligence specialty deciding aspects of an air war campaign. So that is a question of appropriateness. And there is a quote in my book that connects to the seductive effect of it, and they describe how what we have playing out is like taking LBJ down to the foxhole. That is, civilians can make tactical level decisions now, utilizing this technology. It doesn't mean that they should.

The second aspect of this is that Congress has not weighed in whether to support it or to go against it. And I think that is a question of legislative-executive branch issues that we need to look at. And again, it is not a partisan issue. It is played out before this administration and now during it.

And the third is to the issue of effectiveness. There is a concern that while we may be taking out terrorist leaders, we may be sucking ourselves into a game of whack-a-mole, where we have been very successful at killing terrorist leaders, but are we also inadvertently aiding their recruiting? And I think the connection to the contractor issue here goes back to that question of appropriateness, the "should" of who should be involved.

And it is not just an issue of legality. I think it is a long-term question of the future of the force. I remember meeting with an Air Force officer who pointed out an NCO who worked on maintenance. And they said, they have served 12 years. How do we get to having a future NCO that has worked 12 years on these systems that brings that experience to bear? Or we have to turn that over to them right now and wait 12 years. And that is not going to happen if we continue to outsource it.

So if this is the future, we are setting ourselves up for a hollow capability.

Mr. TIERNEY. That would match some of our other capabilities that we have referenced that would outsource that work, and that would be problematical, I think.

Mr. Flake.

Mr. FLAKE. Thank you.

Dr. Barrett, you mentioned, I think, that the evidence shows enhanced awareness and restraint. Is that view shared among the community? I would like to see from others. Dr. Singer, do you

share that view that unmanned pilots have enhanced awareness and restraint?

Dr. BARRETT. Well, it is contested, I will just put it that way. But there is this debate going on, and there is empirical data coming in from various sources. I can get you those sources, that says exactly this, that especially because of these sensor improvements and all the other variables I mentioned, that there actually is more awareness and restraint.

So I think in Dr. Singer's book, you were a little bit more pessimistic about this issue. It is a debate. I will just leave it at that.

Mr. FLAKE. OK. I am glad to hear that. I was just wondering if that view was shared.

Dr. Singer.

Dr. SINGER. I think we need to divide it into two parts. We do know about the military use of these systems, and I think they have shown exceptional respect for the laws of war. When you discuss this with people who are engaged in these operations, there are a series of checks and balances and consultation with military lawyers that they have to go through for authorizing and conducting a strike.

The challenge is the use on the intelligence side. Again, we don't even acknowledge that we have carried out these strikes, so I can't answer about the mechanisms that they follow for that.

I will say one of the other issues is the wide array of perceptions about, for example, the civilian casualty concern. You have estimates that range from 2,000 civilian casualties on the high end, to I believe the smallest I have seen reported is 20. When you backtrack the sources, it is interesting the high end ones often track back to regional media. One, for example, was a Pakistani newspaper that was quoting someone from the ISI. The low end are quoting our own intelligence officials. My guess is the truth lies somewhere in between.

But there is a broader concern here in terms of a war of ideas. It is not just the reality that matters. These perceptions have a power unto themselves. And so a challenge for us is, how do we deal with that perception and show the painstaking way that we are going through, and deal with the fact that it is coming out being viewed on the other side through a lens of anger?

Mr. FLAKE. Thank you.

Professor Anderson, how is this being played out, this rise in these numbers are stark. We have 12,000 in inventory right now. I think Dr. Singer had mentioned that. How is this being viewed in terms of the drones, pilotless planes being flown between the agencies and the military? I would like the same question answered by Dr. Jackson.

Mr. ANDERSON. I think that the question at this point is partly the question of the perception in the region, as Dr. Singer has suggested. It is also a question of how it is seen in what we amorphously call the international community, international actors such as academics and U.N. officials and tribunals and all sorts of folks out there.

And I think that there is a sense sometimes within the U.S. Government across many administrations that none of this stuff really matters because it is just these soft law folks like me, who can't

really impact policy. But I think that if you look at the track of many different issues, starting with the land mines campaign, for which I was primarily responsible in the early 1990's, on through various parts of the War on Terror debates, perceptions in the international community powerfully shape U.S. Government responses in ways the U.S. Government finds very hard to get in front of.

And I think that here, the divide comes probably initially between the military use of these things on overt battlefields where they look pretty much like any other standoff weapon with particular technological characteristics attached, and then the questions that are raised by the CIA use, where it is not acknowledged. There is less data.

And those will actually be sort of the fault lines that we will initially see in terms of the perception.

Mr. FLAKE. Let me just followup on that. I am sorry, Dr. Jackson, I will get back to you later.

But in your Weekly Standard piece, you talk about unqualified success that we have had in terms of the President's and the Vice President's policy here. Is that view shared by each branch of government? Does the intel community see it differently than the military, for example?

Mr. ANDERSON. I am not an insider to government, but I guess I would say that my perception from the outside is that there is concern within the Department of State. There is concern within some of the departments of government among the lawyers that they have not settled on what their rationales are. And I believe that at some point, that ill serves an administration that is embracing this.

Now, maybe the answer is this is all really terrible and illegal, and anybody that does it should go off to The Hague. But if that is the case, then we should not be having the President say this is the greatest since whatever. That seems like a bad idea.

Mr. FLAKE. Thank you.

Mr. TIERNEY. Thank you.

Mr. Foster, you are recognized for 5 minutes.

Mr. FOSTER. Thank you, Mr. Chairman, for having this hearing on a very important subject.

First to whoever wants and feels competent to field it, what is the approximate ratio of how much we spend on manned versus unmanned aircraft across our country, roughly? Does anyone want to respond? All right.

Mr. TIERNEY. Our next panel will be able to do that, I am sure.

Mr. FOSTER. OK. And are there understood and generally agreed upon advantages of having a man aboard a combat aircraft at this point for either the ground support or air superiority purposes? I mean, is there any consensus on any list of advantages?

Dr. BARRETT. Well, a couple that come to mind. First, there are no bandwidth limitations or vulnerabilities. So with the unmanned remote controlled systems, you are working with a satellite and there is potential limitations on the amount of bandwidth available and then also the vulnerability issue.

So, a mix of, say, air systems that are manned and unmanned, for that reason would be called for.

Also, there is some data that says that doing combat aerial support CAS missions. If you are getting on station, the manned platform can get oriented more quickly. So for those types of missions, you might want a manned platform in the area if you need a very quick response and orientation.

Mr. FOSTER. And then for just general air superiority, is there any reason why drones won't essentially take over the business?

Dr. BARRETT. I would say that would just be a technical question. I don't think we are there yet, but it could happen at some point.

Mr. FOSTER. OK. We are about to spend apparently a lot of money on a tanker system. Is that relevant for a future where drones are really the dominant force in air superiority?

Mr. JACKSON. I think among the designs for the Navy UCAS, which is the delta wing airplane there, is a tanker version of it. If you are talking about carrier operations in particular, you have to provide for the refueling capability. There is no reason why that refueler could not also be an unmanned vehicle. So in the design work that is being done now, we are looking at that aircraft for combat and strike missions, but also as an air tanker version to refuel those unmanned systems.

Mr. FOSTER. OK. So the conclusion is, it is not clear that the tanker we are talking about building really will fit in very nicely into a predominantly drone system. Is that a reasonable conclusion or not?

Dr. SINGER. The designs of it, it is really not so much the tanker as opposed to the systems on the other side, the users of it. You want to make sure that they are interoperable with it. I think the overall strategic question that you are getting to is that we want to ensure that we are not making decisions right now that will paint us into a corner in the future.

So for example, the acquisitions part that you asked at the start, it is not so much the amount of money that we are spending on unmanned systems right now, but that we are purchasing more of them physically than we are manned platforms.

And so one of the mistakes that first movers have made in history, why they have fallen behind, is that they commit too early to one type, one model, and then 20 years out, when we learn what is the best one, we are in a bad way. The British with the aircraft carrier would be an example here.

So the issue I think for us is to ensure that we are continuing to experiment a great deal, and then also making sure that we are not locking ourselves into a one designer future, which to me means we need to focus on our acquisitions system and make sure that we don't have oligopolies emerge, or monopolies.

Mr. FOSTER. Is there just a working number for the cost ratio between a manned and an unmanned aircraft with comparable capabilities? Is it order of a factor of 10 or a factor of 100?

Dr. BARRETT. Close to 10, I think.

Mr. FOSTER. What I am worried about is we are going to at some point be asked to defend Taiwan with a set of aircraft carriers, and we are going to, and then all of a sudden Chinese-manufactured mass-produced drones will be coming at us and it will be game over.

Do those sort of things routinely get gamed out, sort of equal dollar value drone versus manned aircraft fleets? So that tradeoff is routinely looked at at this point?

Dr. SINGER. There are starting to be, at least within the media reports of war gaming to that effect. The real issue is one of quantity versus quality moving forward, and I think this is an issue for our overall acquisitions system. That is, do we want the capability for a large number? Or will the high cost of systems lock us into only being able to buy a very few gold-plated versions?

And a concern I have when I look at the models moving forward is that we are starting to make decisions right now that will lead to some of the similar things we have seen play out with the Joint Strike Fighter or DD(X) or FCS, where we don't exactly know the future, but we know that the system that is too big to fail and is so costly that we can only buy a couple of them, paints ourselves into a corner in a scenario with, for example, a China or the like, where the amount that we can buy should not decide the tactics and the strategy that we take in war. But that is the future that we are headed with, including in unmanned systems.

Mr. FOSTER. Thank you.

Dr. BARRETT. Could I add one comment? Another reason why you would want manned is because it keeps the homeland less involved. If you are fighting a war with only unmanned systems, there is no one for the enemy to shoot at. There is no option for even guerilla war. Therefore, you are inviting, I think, terrorism in the homeland.

So I think for that third reason, you would want a mix. You don't want to go to just unmanned. Otherwise, they are coming here.

Mr. JACKSON. And Mr. Foster, I might add that the Naval War College has done a lot of work in terms of the potential future for integrating unmanned systems into the maritime environment. The Chief Naval Operations task in 2008, its Strategic Studies Group, took a look at how you would use these systems. So there was a year spent in study of how you would integrate these systems, where you would used manned, where you would use unmanned systems, and some very fine work was done and brought out some notions that there has to be a balance between the two, but the unmanned provides you some unique capabilities in terms of endurance, in terms of ability to deploy from the continental United States, and use these systems and what not. So there has been a fair amount of work done in that. Not a lot of games per se, but a lot of discussion and thinking about how they would be employed.

Mr. TIERNEY. Mr. Fagan——

Ma'am, please, please be quiet and please sit down. I told you before at the beginning of this hearing, we are having——

[Interruption from audience.]

Mr. TIERNEY. You are going to have an opportunity to sit down now or be asked to leave. It is your choice, ma'am. Would you care to sit down and listen like the rest of us trying to learn something here? Or would you like to be asked to leave? Asked to leave. Thank you.

We are going give our guest—officer, we will give our guest one more chance, but if she speaks out again, we will have to ask for her to be removed.

Mr. Fagan, what I was going to ask you, obviously there are so many other uses that are non-military of this kind of technology. I can think of some in my own district, which is heavily reliant on the fishing industry, and some of the underwater technology that could really identify for purposes of determining catch shares or what fish are over-fished, which ones aren't, to other land uses, things of that nature.

And when you start talking about that, the real question becomes: How do we keep the innovation going, internationally, not just in our country? At the same time, obviously the ideal is to deprive other countries that might wish us harm from getting the technology that could do so. Can you possibly do that?

Mr. FAGAN. Mr. Chairman, I believe it is possible that the commercial market is going to drive requirements for technology. If there is a commercial demand for fishing and surveillance related to fishing, I think that sensor systems and technologies will be developed to support that.

Currently, there need to be some regulations that would support the operation of aircraft in support of that industry, and I am pretty confident that technology, I am not well versed in exactly how shoals of fish are spotted, but let's assume that it is done optically with optical sensors. There exist quite high quality optical sensors that I would imagine could be adopted for that, but we will need, as I said, two things, a requirement and permission to actually fly the systems in support of those.

So the technology is cross-cutting. As the market increases, the demand for these higher quality sensors will increase and costs will go down and the technology will improve. I hope that answered your question.

Mr. TIERNEY. Well, it does a little bit. I may not have asked it as clearly as I could have, but there comes a point in time when some people are going to say, look, we can't allow some of this technology to be exported. We can't allow even some of this equipment to be exported because we are afraid others will put it to a devious use.

Is it even possible to draw that kind of a line? Or it is going to happen anyway?

Mr. FAGAN. That is a difficult line, and I am not an expert on export control regulations. I know that our manufacturers have voiced their concern that sometimes they are too complicated and difficult to comply with. But yes, I think it is possible that if export controls aren't administered properly, it could end up providing bad people with highly technical systems that could be used against the United States.

So we are not, AUVSI and me personally, I am not opposed to export regulations. It is just that we would like to see them easy to use and administered in an expedited way.

Mr. TIERNEY. Let me just ask, to survey the rest of the panel, just quickly. Does anybody think that there is a possibility of controlling the export of this technology in such a way that it would not be something that we would have to be concerned about other countries using against our interest? Or is that just something that can't be done?

Dr. Singer.

Dr. SINGER. No, it would be like trying to control computers or trying to control automobiles. We already see 43 other countries building, buying and using these systems and a range of non-state actors for both positive and nefarious purposes.

I think the bigger question is: How do we maintain our competitiveness in this? How do we ensure that businesses can continue to thrive so that we can innovate? And I think a long-term issue here is ensuring that they have a pipeline of young scientists, young engineers who can succeed. And that speaks to the challenges of having a national robotics strategy that connects to broader science and technology, engineering and mathematics issues.

Mr. TIERNEY. Thank you.

Professor Jackson, do you agree?

Mr. JACKSON. Just as a point of interest, sir, the ScanEagle, which was used to support the rescue of Captain Phillips in the Maersk Alabama situation was originally developed for the tuna industry. And it was launched from tuna ships to go out to find where the fish were located and then they would recover it from the air. And so that was civilian technology that has been adapted. We now have over 200,000 hours of time used in military applications for surveillance purposes. So it is certainly a two way street.

Mr. TIERNEY. I see the others nodding, so I won't bother to question on that, in agreement. But so what the prospects does anybody want to offer here for an international treaty that addresses the use of these, to restrict the military or other uses of that in any particular circumstances? Is anybody aware of any negotiations or discussions that have been started anywhere about this topic?

Professor Anderson.

Mr. ANDERSON. Probably the closest to this would be the development by different bodies such as the International Committee of the Red Cross or several of the scholarly bodies that put up model codes for the laws of war. There has been recently released a model air war manual that would address part of these things, and it specifically has measures talking about unmanned vehicles, both in a surveillance capacity as well as a weapons-firing capacity.

The United States has participated through the Department of Defense in numbers of those discussions. And I would say that in the case of the air war manual, I would describe without attributing it, without speaking for the Department of Defense, I would describe it that the U.S. DOD has participated very actively in the formulation of the specific black letter rules that have been developed, but I think was actually quite stunned by the commentary manual that was developed by several of the experts that would go along with that and would attempt to provide sort of authoritative guidance. The United States, I do not think, will wind up regarding that as authoritative.

Second is also a technical issue in some sense. It is the International Committee of the Red Cross development of what it calls interpretive guidance on direct participation in hostilities, which goes to the question of civilians who may be taking part in ways that Dr. Singer referenced, or CIA personnel or terrorists themselves that may not be regarded, strictly speaking, as combatants, but nonetheless lawful targets.

Again, the United States had a number of experts who partici-
pated in that process and the ICRC has put that out as guidance.
However, that has been extremely controversial in parts of its for-
mulations, essentially in saying you can have part-time partici-
pants in hostilities who may not be targeted between activities that
they are carrying out. And the United States I do not think will
come close to signing onto those.

Mr. TIERNEY. Thank you.

Mr. Flake.

Mr. FLAKE. Dr. Singer, you mentioned that there are some crimi-
nal uses, and it has been mentioned for nefarious purposes, as you
put it. Can you give some examples of non-state actors or others
that are using it in this way?

Dr. SINGER. The examples range from one that was mentioned of
Hezbollah during its war with Israel operating these systems, to
some of the border militia groups utilizing them too. There were a
group of thieves in Taiwan a couple of weeks ago who used robotic
helicopters to scout out targets and ensure that they were ready to
steal from.

What we are seeing here, again, this technology is what you
could describe as the parallel to open source software. It is not like
an aircraft carrier. It is not like an atomic bomb where you need
a huge industrial structure not only to build it, but to utilize it.
And so that means that we have a flattening effect playing out in
terms of who can utilize this technology.

And the positive side is, again, the range of uses that can be
made, everything from fishery to environmental monitoring. We
used the Global Hawks for response to the humanitarian disaster
in Haiti.

But the opposite is that it lowers the bar for nefarious actors.
The best illustration I can give of that, of the potential, is during
World War II, Hitler's Luftwaffe, Hitler's air force could not strike
the United States. It didn't have that reach. A couple years ago,
a 77 year old blind man designed his own unmanned system that
flew across the Atlantic. And so what we have to in a sense do is,
in my mind, the 9/11 Commission described as part of the cause
of the tragedy on that day was a failure of our own imagination.
We need to apply this to this emerging technology here as well, use
imagination in how we can utilize it for positive ends, but also
being aware that the threat scenarios are widening as well.

Mr. FLAKE. Thank you.

Mr. Anderson, a U.N. official raised the prospect that drone at-
tacks are a form of extrajudicial execution, I think is the way it
was put. Have any organs of the United Nations, and you spoke
of it a little in your last colloquy, but are we likely to see these
challenges from international organizations or states themselves?
Where do you think the challenges are likely to come from, wheth-
er it is the Red Cross just looking for guidelines or is it likely the
U.N. through its agencies that are going to demand some kind of
guidelines here?

Mr. ANDERSON. Well, I think that this is gradually a developing
campaign in which there are various international actors who are
very unhappy with the development of this, both the technology
and, at this moment, by its use in particular by civilian agencies.

And I think that their difficulties with the technology range all the way back to military use on the active battlefield.

But the easy place to sort of move in a campaign to peel that off is with the CIA. And in that regard, then the charge has been leveled that this is a violation of international human rights standards. It constitutes extra-judicial execution without having any charges, without having attempted to arrest the person.

We respond by saying the person is a terrorist combatant and can be targeted at any point. We are not obligated to try and detain them or to capture them. But there are many, many authorities out there who disagree vehemently with that. And one of the questions that will arise is, the United States has never, across many, many decades, agreed to sign onto the extraterritorial application of the treaties that would make it possible to characterize these acts as being extra-judicial execution. It has never agreed to that.

And one of the questions will be whether the administration, without really sort of thinking about its impacts on these kinds of areas that are close to its heart, winds up weakening those restraints or winds up weakening the U.S. opposition to that, without really taking into account the effect that it would have on precisely these kinds of things.

The long-term effect of that, given that there are not necessarily statutes of limitations on these kinds of acts, could be the problem of CIA officers, or for that matter military officers or their lawyers being called up in front of international tribunals or courts of Spain or someplace and said, you've engaged in extrajudicial execution or simple murder and we are going to investigate and indict.

Mr. FLAKE. Thank you.

Mr. TIERNEY. Mr. Foster.

Mr. FOSTER. Yes. Dr. Singer, you have mentioned a couple times a national robotics strategy wherein education is crucial to keeping our lead in this area, if such a lead exists. And there are a number of things like the U.S.'s FIRST Robotics Competition. There is the Fab Lab where they have rapid prototype equipment that are distributed.

Do you have any favorites here or ideas of what the best strategy is going to be going forward, besides just dumping a bunch of money into it?

Dr. SINGER. I am not going to pick favorites in terms of competitions, but it is interesting that a number of the other states that are succeeding and thriving in this realm, like for example South Korea, do have these sorts of strategies and it would be interesting for us to learn from them.

I think you mentioned some of the aspects of what a strategy might look like. Some of the elements of it include, for example, not just the sort of isolated islands of excellence in terms of robotics labs or robotics competitions. How could we expand upon those so that you are engaging youth in a greater way, but also that you are allowing the best design to win?

Can we support greater graduate scholarships in this realm? Is there the possibility of creating public-private partnerships along the lines of special geographic zones the way that we have seen

with Research Triangle in North Carolina or Silicon Valley. Is there the potential for something like that in robotics?

But again, part of this should also be having it go hand in hand with discussions about the impact of what they are doing in the lab on the world beyond, the kind of ethics discussions that the professors here are leading. And I think that element has been missing, as well, to a prior question that was asked of debates about regulation.

We have to start within the robotics field of robotocists, what kind of research should they engage in and what should they not; should there be arms control, sort of the early nodes of the land mines treaty when it comes to the issue of autonomy moving forward. But for example, if you were a young robotocist, you don't have a code of ethics right now to turn to the way if you were a young medical scientist.

And I think that part of this strategy has to be not only what do we do to maintain national competitiveness, but also how do we wrestle with the issue beyond.

Mr. FOSTER. OK.

Professor Anderson, or anyone who wants to field it, is there a moral, legal or political distinction between a decapitation strike and just a strike against the normal military hierarchy that you see, and when you are deliberately going after the political leadership of an organization compared to just the chain of command?

Mr. ANDERSON. If one is talking about a non-state actor group which has been characterized with legal reasons as being a terrorist group, then there is not really going to be a distinction—I mean, they are targets in that sense. There are other kinds of legal issues that arise if one goes after a purely decapitation strategy with regards to a regime. Again, it is lawful, in my view, but the legal rationales are different because it is a state versus a non-state.

And so the legal questions that arise here about going after leadership targets in terrorist organizations, in part there the kinds of strategic and prudential arguments that Dr. Singer has raised about sort of whack-a-mole questions and those things. But I don't think that there is legal questions about the question of the lawfulness of targeting the people that are involved.

Mr. FOSTER. Another thing that I am sure occurs to everyone is whether we are in danger of gradually lowering the threshold for a declared war. During the cold war, there were all these games of chicken played over the Arctic continuously. And if we had drones, we just perhaps would have escalated that into actually destroying hardware. And when the hardware becomes nuclear-capable hardware, you are talking about a really scary line that is in danger of being crossed.

And I was just wondering what the thinking is in terms of, is it possible to implement a hard line that says, this is an act of war and this is not an act of war, when there are unmanned vehicles only in the battle.

Dr. SINGER. The way I visualize this is that the barriers to war are dropping both socially, and politically, but also now technologically. But at the same time, our definition of war is changing. And we can see this in terms set-aside from robotics. This body

hasn't declared war since 1941. We don't have a draft or conscription anymore. We don't pay war bonds or higher taxes for war.

And now we have a technology that allows us to carry out what we would have previously termed act of war, without having to have a political debate about it. I mean, literally it is not a theoretic issue. We have carried out at least 119 air strikes, and this body hasn't had a debate about it, either to support or to go against.

And so the way I see it, again, was that the barriers to war were already lowering. The technology perhaps allows these barriers to hit the ground. And what was interesting is that when I went around interviewing people, that was the concern that was shared. For example, I remember an interview with someone at Human Rights Watch who raised that, but also an interview with a special operations officer within the U.S. military as one of their big concerns here.

Mr. ANDERSON. If I could just add to that. If the administration's lawyers were here in front of you today, they would say that this is all covered by the AUMF in so far as we are targeting people who are in some way connected either with Al Qaeda or with the authors of 9/11 and that is true whether or not one is talking about the strikes in Pakistan or even the strikes in Yemen or any other place.

I believe that where this question that you raise becomes most important is that not all the enemies that the United States will face in the decades into the future are going to turn out to be Al Qaeda, nor will they be connected to 9/11. And the question that this body, the Congress, has to address is, as the thresholds that Dr. Singer described get lowered, then the question of the controls on the use of force will depend on, first of all, whether you assign those functions directly to the military and to no other force, or allow the CIA and covert operations to partake of that, which I believe is hugely important for avoiding overt wars.

There is a reason why the CIA has been tasked in Pakistan to do what it does, rather than having the undeniable presence of the U.S. military there. I think that is the right decision. But as this moves into the future, the lines drawn with respect to the CIA have to be drawn and I believe that, as the threshold for what constitutes the use of force is lowered, the responsibility of this body will not lie in issuing things like more AUMFs unless there is another 9/11 or something similar, but will lie in the way in which this body exercises its oversight functions and strengthens its oversight functions to require much greater reporting, much more detailed reporting.

But at the same time, the concomitant part of that is this body is going to have to learn to be a whole lot more effective at keeping the secrets that are involved.

Mr. TIERNEY. Thank you. I just want to let you know that you have our gratitude for that and we may at some time want to call you back either for a formal hearing or just for a discussion to educate us more on the issue. We are going to go for about a half hour and then we will come back, probably less than a half hour, for 20 minutes or so, and come back with our second panel.

I again thank all of you on this panel.

We will take a recess now.

[Recess.]

Mr. TIERNEY. We appreciate your staying with us and testifying. If we were more thoughtful on this, we probably would have scheduled this for another day instead of running you here this late. But I get the feeling that you may be back again at some point convenient to everybody. This looks like an area we will want to explore in some more depth at some point.

Let me just introduce the panel first for the record, if I could. Mr. Michael J. Sullivan serves as the Director of Acquisition and Sourcing Management at the U.S. Government Accountability Office. His team is responsible for examining the effectiveness of agency acquisition and procurement practices, and meeting the mission performance objectives and requirements. He also manages a body of work designed to help the Department of Defense apply best commercial practices to better develop advanced weapons systems. Mr. Sullivan holds both a B.A. and an MPA from Indiana University.

Mr. Dyke Weatherington is the Deputy Director for Unmanned Warfare and Portfolio Systems Acquisition in the Office of the Under Secretary of Defense for Acquisition, Technology, Logistics in the Office of the Assistant Secretary of Defense for Acquisitions. You must have quite the business card.

A retired Lieutenant Colonel in the U.S. Air Force, he is responsible for acquisition oversight for unmanned aircraft systems and associated subsystems. He is also the functional lead for the Deputy Secretary of Defense-directed UAS Task Force.

He holds a B.S. from the U.S. Air Force Academy and an M.A. from California State University.

And the Honorable Kevin Wolf serves as the Assistant Secretary for Export Administration at the U.S. Department of Commerce. Prior to his, he was a partner at Bryan Cave, LLP, where he worked on export administration regulations, international traffic in arms regulations and sanctions administered by the Office of Foreign Assets Control.

He holds a B.A. from the University of Missouri and an M.A. and J.D. from the University of Minnesota.

Thank you again, all of you, for being here and sharing your substantial expertise with us. It is our policy to swear in the witnesses, so if you would please rise and raise your hands.

[Witnesses sworn.]

Mr. TIERNEY. Thank you.

The record will please reflect that all of the witnesses have answered in the affirmative.

I remind you of what I think you already know, that all of your written testimony will be placed on the record in its entirety. We would just ask you if you could summarize that in about 5 minutes each, and we will do some question and answer after that. And thank you.

We will start with you, Mr. Sullivan.

**STATEMENTS OF MICHAEL J. SULLIVAN, DIRECTOR, ACQUISI-
TION AND SOURCING MANAGEMENT, U.S. GOVERNMENT AC-
COUNTABILITY OFFICE; DYKE WEATHERINGTON, DEPUTY,
UNMANNED AERIAL VEHICLE PLANNING TASKFORCE, OF-
FICE OF THE UNDER SECRETARY FOR ACQUISITION, TECH-
NOLOGY AND LOGISTICS, U.S. DEPARTMENT OF DEFENSE;
AND KEVIN WOLF, ASSISTANT SECRETARY FOR EXPORT AD-
MINISTRATION, BUREAU OF INDUSTRY AND SECURITY, U.S.
DEPARTMENT OF COMMERCE**

STATEMENT OF MICHAEL J. SULLIVAN

Mr. SULLIVAN. Thank you, Mr. Chairman and Congressman
Flake. Thanks for this opportunity to discuss GAO's report on the
Department's unmanned aircraft systems acquisition efforts from
July of last year.

My statement today focuses on acquisition outcomes, the extent
of collaboration among the services on those acquisitions, and re-
cent investment decisions related to unmanned aircraft acquisi-
tions.

As has been stated earlier in the hearing, from 2002 to 2008, the
number of unmanned aircraft in DOD's inventory has grown from
about 167 to more than 7,000 as a result of growing demand from
the field. Once fielded, these aircraft have proven to be quite valu-
able to our warfighters.

However, there have been growing pains along the way. We as-
sessed the 10 largest unmanned aircraft programs, eight air sys-
tems and two payload systems, for the report that we did last July,
and found that their development costs had grown by $3 billion or
37 percent on average. Procurement funding has increased for most
of those programs, but this was mostly due to increases in the
number of aircraft being procured, which is a good thing. Nonethe-
less, procurement unit costs have grown by 12 percent on average.

Our assessment found varying degrees of collaboration among
the services. For example, the Marine Corps was able to avoid the
cost of initial system development and a lot of duplication of capa-
bilities and was also able to deliver needed capability to its Ma-
rines very quickly by simply choosing to procure existing Shadow
aircraft from the existing Army program.

In another case, the Navy is expecting to save time and money
on its broad area maritime surveillance system by using the exist-
ing Air Force Global Hawk air frame. However, it is developing a
lot of its own unique subsystems, rather than joining the Air Force
in some of those procurements.

In contrast to those examples, the Army and the Air Force did
not effectively collaborate on their Predator and Sky Warrior Pro-
grams despite strong direction from the Department to do so. We
don't really have any estimates of the costs that might have oc-
curred because of the duplicative efforts there, but we do know that
the Army had to stand up a program office and had a development
effort of over a half billion dollars. So that probably is some costs
that they didn't need.

Much greater commonality could have been achieved as each of
those weapons systems are being developed by the same contractor.
One is a variant of the other.

Service-centric requirements and an unwillingness to collaborate were key factors in limiting commonality across these programs. Despite the Department's efforts to emphasize jointness and encourage commonality, the services continued to establish unique requirements, some of which have raised concerns about unnecessary duplication, such as the Sky Warrior and the Predator.

Since our report was issued, the Department has made an investment decision to increase development of unmanned aircraft and procure larger numbers, which we think is a good thing. It also recognizes that this important investment must be leveraged effectively.

One of the major goals of the UAS road map is to foster the development and practice of policies, standards and procedures for operating unmanned aircraft and to promote the enforcement of government, international and commercial standards for the design, manufacture, testing and operation of unmanned systems. The road map has recognized the potential for unprecedented levels of collaboration to gain capabilities at reduced acquisition costs. And we have reported in the past that one key to increased collaboration and commonality is the use of open systems across product lines, across air frames, subsystems and even down to the component level.

Unmanned systems are critical to the Department's mission and will continue to grow in numbers and in effectiveness. In order to acquire them most efficiently in today's environment of constrained resources, the Department should follow through on its stated goals and continue to force joint standardized weapons systems wherever it makes sense.

Mr. Chairman, that completes my statement.

[The prepared statement of Mr. Sullivan follows:]

United States Government Accountability Office

GAO

Testimony

Before the Subcommittee on National Security and Foreign Affairs, Committee on Oversight and Government Reform, House of Representatives

DEFENSE ACQUISITIONS

DOD Could Achieve Greater Commonality and Efficiencies among Its Unmanned Aircraft Systems

Statement of Michael J. Sullivan, Director
Acquisition and Sourcing Management

GAO

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GAO-10-508T

DEFENSE ACQUISITIONS

DOD Could Achieve Greater Commonality and Efficiencies among Its Unmanned Aircraft Systems

Why GAO Did This Study

For the last several years, the Department of Defense (DOD) has planned to invest billions of dollars in development and procurement of unmanned aircraft systems. In its fiscal year 2011 budget request the department indicated a significant increase in these investments, expecting to need more than $24 billion from 2010 through 2015. DOD recognizes that to leverage its resources more effectively, it must achieve greater commonality among the military services' unmanned aircraft system acquisition programs.

This testimony is based primarily on GAO's July 2009 report (GAO-09-520) which examined 10 unmanned aircraft acquisition programs: eight unmanned aircraft systems—Global Hawk, Reaper, Shadow, Predator, Sky Warrior, Fire Scout, Broad Area Maritime Surveillance, and Unmanned Combat Aircraft System-Demonstration; and two payload development programs—Multi-Platform Radar Technology Insertion Program, and Airborne Signals Intelligence Payload. The testimony focuses on: 1) the cost, schedule, and performance progress of the 10 programs as of July 2009; 2) the extent to which the military services collaborated and identified commonality among the programs; 3) factors influencing the effectiveness of the collaboration; and, 4) recent DOD investment decisions related to these acquisitions.

What GAO Found

Most of the 10 programs reviewed had experienced cost increases, schedule delays, performance shortfalls, or some combination of these problems. The programs' development cost estimates increased by more than $3 billion collectively, or 37 percent, from initial estimates. Procurement funding requirements for most programs also increased, primarily because of increases in numbers of aircraft being procured, changes in system requirements, and upgrades and retrofits to fielded systems. Procurement unit costs increased by an average of 12 percent, with three aircraft programs experiencing unit cost increases of 25 percent or more. Four programs reported delays of 1 year or more in delivering capability to the warfighter. Global Hawk, Predator, Reaper, and Shadow had been used in combat operations with success and lessons learned, but had been rushed into service in some cases, leading to performance issues and delays in development and operational testing and verification.

Programs collaborated and identified areas of commonality to varying degrees. The Marine Corps was able to avoid the cost of initial system development and quickly deliver useful capability to the warfighter by choosing to procure existing Army Shadow systems. The Navy expected to save time and money on Broad Area Maritime Surveillance (BAMS) by using Air Force's Global Hawk airframe, and payloads and subsystems from other programs. However, Army and Air Force had not collaborated on their Sky Warrior and Predator programs, and might have achieved greater savings if they had, given that Sky Warrior is a variant of Predator and being developed by the same contractor. DOD encouraged more commonality between these programs.

Although several programs achieved airframe commonality, service-driven acquisition processes and ineffective collaboration were key factors that inhibited commonality among subsystems, payloads, and ground control stations, raising concerns about potential inefficiencies and duplication. Despite DOD's efforts to emphasize a joint approach to identifying needs and commonality among systems, most of the programs assessed continued to pursue service-unique requirements. The services also made independent resource allocation decisions to support their unique requirements. DOD had not quantified the costs and benefits associated with pursuing commonality among these programs, and efforts to collaborate had produced mixed results. However, in order to maximize acquisition resources and meet increased demand, Congress and DOD have continued to push for more commonality.

Since July 2009, DOD has made several investment decisions regarding unmanned aircraft systems, which in general, reflect increased emphasis on developing advanced capabilities and acquiring larger numbers of specific systems. However, the decisions do not appear to focus on increasing collaboration or commonality among the programs.

Mr. Chairman and Members of the Subcommittee:

Thank you for this opportunity to discuss GAO's recently issued report on the Department of Defense's (DOD) unmanned aircraft systems (UAS) acquisition efforts.[1] From 2002 through 2008, the number of unmanned aircraft in the DOD's inventory increased from 167 to more than 6,000 as a result of the department's efforts to meet the growing demand from the warfighters for these capabilities. DOD has noted that meeting this demand has been difficult because of the dynamic nature of supporting ongoing combat operations in Iraq and Afghanistan, while at the same time developing new and emerging capabilities. At the time of our report in July 2009, the department was planning to invest more than $16 billion from 2008 through 2013 to develop and procure additional unmanned aircraft systems. More recently, the fiscal year 2011 defense budget request indicates a significant increase in DOD's unmanned aircraft investment plans. However, the growing number of national priorities competing for federal dollars will continue to challenge DOD's efforts to meet escalating demands for unmanned systems.

DOD recognizes that to more effectively leverage its acquisition resources, it must achieve greater commonality and efficiency among the military services' various unmanned system acquisition programs. In fact, DOD states in its Unmanned Systems Roadmap, that there is the potential for an unprecedented level of collaboration to meet capability needs and reduce acquisition costs by requiring greater commonality among the military services' unmanned systems. Although achieving commonality can be difficult, we have reported in the past that taking an open systems[2] approach and designing systems with common subsystems and components can reduce both production and life cycle costs as well as improve interoperability among systems. For maximum benefit, commonality should be incorporated into the design of a system when requirements are being established. Unmanned aircraft systems can potentially achieve commonality in design and development, ranging from a complete system, including the ground control segment, to a subsystem

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[1]GAO, *Defense Acquisitions: Opportunities Exist to Achieve Greater Commonality and Efficiencies among Unmanned Aircraft Systems*, GAO-09-520 (Washington, D.C.: July 30, 2009).

[2]Open systems allow the use of commercially available and widely accepted standard products from multiple vendors, rather than developing unique components.

or component, as well as commonality in production facilities, tooling, and personnel.

My statement today focuses on (1) the cost, schedule, and performance progress of selected unmanned aircraft acquisition programs as of July 2009; (2) the extent to which the military services had collaborated and identified commonality among those programs; (3) the key factors influencing the effectiveness of their collaboration; and (4) recent DOD investment decisions related to unmanned aircraft acquisitions. It is primarily drawn from our July 2009 report that examined 10 acquisition programs: eight unmanned aircraft programs and two payload programs. We conducted this performance audit from August 2008 to July 2009 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Summary

Once fielded, unmanned aircraft have proven quite valuable to the warfighter. On the other hand, most of the unmanned aircraft programs we reviewed had experienced cost increases, schedule delays, performance shortfalls, or some combination of these problems. Development cost estimates for the 10 programs we assessed had collectively increased more than $3 billion (37 percent in 2009 dollars) from initial estimates. Procurement funding requirements had also increased for most programs, primarily because of increases in the number of aircraft being procured, changes in system requirements, and upgrades and retrofits to equip fielded systems with capabilities that had been deferred. Overall, procurement unit costs increased by 12 percent, with three aircraft programs experiencing unit cost increases of 25 percent or more. Four programs had reported delays of 1 year or more in delivering capability to the warfighter. While the Global Hawk, Predator, Reaper, and Shadow systems had been used in combat operations with notable success and key lessons learned, they had been rushed into service in some cases, leading to performance issues and delays in development and operational testing and verification.

We found varying degrees of collaboration and commonality among DOD's unmanned aircraft acquisition programs. The Marine Corps was able to avoid the cost of initial system development and quickly deliver useful capability to the warfighter by choosing to procure existing Army Shadow

systems. The Army and Navy had settled on many common requirements between their Fire Scout systems, which had the potential to gain them efficiencies. However, in January 2010 the Army notified the Congress that it had terminated its Fire Scout program because the aircraft was no longer required. In another case, the Navy expected to save time and money on its Broad Area Maritime Surveillance (BAMS) system by using the existing Air Force Global Hawk airframe, with payloads and subsystems from various other programs. In contrast, the Army and Air Force had not effectively collaborated on their Sky Warrior and Predator programs, and greater commonality could have been achieved given that the Sky Warrior is a variant of the Predator and is being developed by the same contractor. At the time of our review, DOD officials continued to press for more commonality between these two programs.

Service-centric requirements and funding, and ineffective collaboration were key factors that resulted in the limited achievement of commonality. While several unmanned aircraft programs had achieved airframe commonality, most were pursuing service unique subsystems, payloads, and ground control stations. Despite DOD's efforts to emphasize a joint approach to identifying and prioritizing warfighting needs and to encourage commonality among programs, the services continued to establish service-unique requirements—some of which have raised concerns about possible inefficiencies caused by unnecessary duplication. Likewise, DOD's funding process gives the individual services the responsibility and authority to independently make resource allocation decisions to support their respective requirements. At the time of our review, DOD officials had not quantified the associated costs or benefits of pursuing increased commonality among unmanned aircraft programs, and service efforts to collaborate had produced mixed results. However, Congress and DOD continued to push for more commonality, which could maximize acquisition resources and help meet increased demand.

Since July 2009, when our report was issued, DOD has made several key investment decisions regarding unmanned aircraft systems that are contained in the 2010 Quadrennial Defense Review, DOD's fiscal year 2011 budget request, and DOD's Aircraft Investment Plan (2011-2040). In general, these decisions reflect increased emphasis on developing more advanced unmanned aircraft capabilities and acquiring larger numbers of specific systems. However, they do not appear to focus on increasing collaboration or commonality among unmanned aircraft programs.

Background

Unmanned aircraft systems generally consist of (1) multiple aircraft, which can be expendable or recoverable and can carry lethal or non-lethal payloads; (2) a flight control station; (3) information and retrieval or processing stations; and (4) in some cases, wheeled land vehicles that carry launch and recovery platforms. DOD categorizes these systems based on key characteristics including weight and operating altitude. While there were many small, less expensive unmanned aircraft in DOD's portfolio, our review focused on the larger, more costly programs. At that time, these programs accounted for more than 80 percent of DOD's total investment in unmanned aircraft from fiscal year 2008 through fiscal year 2013.[3] DOD's 2011 budget request indicates that the department plans to invest nearly $25 billion from 2010 through 2015 in development and procurement of the unmanned aircraft systems we reviewed. Table 1 details many of the key characteristics and funding requirements of those systems. See appendix I for additional program data.

Table 1: Characteristics and Funding Requirements of Selected Unmanned Aircraft Systems

(Then year dollars in millions)

Aircraft	Gross Weight (pounds)	Maximum Altitude (feet)	Imagery Intelligence	Signals Intelligence	Weapons	Total Investment Funding (FY10-FY15)
Reaper	10,500	50,000	X	X	X	$8,354.7
Global Hawk[a]	32,250	60,000	X	X		5,130.1
BAMS	32,250	60,000	X			3,783.9
Sky Warrior	3,200	25,000	X		X	3,306.1
Shadow	375	15,000	X			1,781.4
UCAS-D	46,000	40,000	n/a	n/a	n/a	1,056.4
Predator	2,250	25,000	X	X	X	829.5
Fire Scout[b]	3,150	20,000	X	X		472.4

Sources: DOD, *Unmanned Systems Roadmap 2007 – 2032* and BAMS Program Office

[a]Global Hawk characteristics presented in this table refer to the RQ-4B.

[b]Fire Scout data presented here are for the Navy program only.

Note: While we also assessed the Navy's Unmanned Combat Aircraft System Demonstration (UCAS-D) as part of our review, UCAS-D is a demonstration effort and will not be equipped with any mission payloads.

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[3]The programs we focused on are often referred to as tactical-level and theater-level systems.

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Unmanned Aircraft Acquisitions Have Experienced Cost Growth, Schedule Delays, and Performance Problems

Despite the proven success of unmanned aircraft on the battlefield and the growing demand for the aircraft, these acquisitions continued to incur cost and schedule growth. The cumulative development cost for the 10 programs we reviewed increased by over $3 billion, or 37 percent, from initial estimates. While 3 of the 10 programs had little or no development cost growth and one had a cost reduction, six experienced substantial growth ranging from 60 to 264 percent. This cost growth was in large part the result of changes in program requirements and system designs after initiating development. Many of the programs began system development with unclear or poorly defined requirements, immature technologies, and unstable designs—problems we have frequently found in other major acquisition programs.[4] For example, in 2001, the Air Force began the Global Hawk program based on knowledge gained from a demonstration program, and planned to incrementally integrate more advanced technologies over time. Within a year, however, the Air Force fundamentally restructured and accelerated the program to pursue a larger, unproven airframe with a multimission capability that relied on immature technologies. The final design of the new airframe required more substantial changes than expected. These changes ultimately drove development costs up nearly threefold.

Procurement costs also increased for 6 of the 7 systems that reported procurement cost data. Although in large part the cost increases were due to the planned procurement of additional aircraft, many programs had also experienced unit cost increases independent of quantity. As detailed in table 2, overall procurement unit costs increased by 12 percent on average, with three programs experiencing unit cost growth of 25 percent of more. The Reaper and Shadow had unit cost growth despite increased quantities. Reaper's unit costs increased in part because requirements for missiles and a digital electronic engine control were added—resulting in design changes and increased production costs. Unit cost increases in the Shadow program were largely the result of upgrades to the airframe that were needed to accommodate the size, weight, and power requirements for integrating a congressionally mandated data link onto the aircraft.[5] Furthermore, the Army is retrofitting fielded systems with capabilities that it had initially deferred, such as a heavy fuel engine.

[4]GAO, *Defense Acquisitions: Assessments of Selected Weapon Programs*, GAO-09-326SP (Washington, D.C.: Mar. 30, 2009).

[5]National Defense Authorization Act for Fiscal Year 2006, Pub. L. No. 109-163, § 141.

Table 2: Cost and Quantity for Selected Unmanned Aircraft Systems (as of July 2009)

2009 dollars in millions

Aircraft	Estimated development cost	Initial procurement cost estimate	Initial quantity	Current procurement cost estimate	Current quantity	Percent procurement unit cost change
Global Hawk	$3,657.5	$4,171.4	63	$5,929.7	54	66
Reaper[a]	385.5	508.7	33	2,405.7	118	32
Shadow	356.6	447.0	160	1,640.7	460	28
Fire Scout[b]	605.0	1,625.1	168	1,743.0	168	7
BAMS	3,049.1	9,048.6	65	9,048.6	65	0
Sky Warrior	568.5	647.5	48	1,614.2	132	-9
Predator	428.2	642.8	48	2,546.4	320	-41
UCAS-D[c]	1,474.9	n/a	n/a	n/a	n/a	n/a
Total	**$10,525.3**	**$17,091.1**	**585**	**$24,928.3**	**1,317**	**12 (average)**

Sources: DOD (data); GAO (analysis and presentation)

[a] Initial procurement cost estimate provided for Reaper was based on 33 aircraft. However, the Air Force initially planned for 63 aircraft.

[b] Fire Scout data presented here are for the Navy program only.

[c] UCAS-D is a demonstration effort only, so the Navy was not projecting procurement funding or quantities.

A number of programs had experienced problems in both testing and performance, requiring additional development that contributed to the cost growth noted above. Four programs had experienced delays of 1 to nearly 4 years in achieving initial operational capability. Some of these delays resulted from expediting limited capability to the warfighter, while others were the result of system development and testing problems. For example, early demonstration and production Global Hawks were rushed into operational service. Program officials noted that as a result, the availability of test resources and time for testing were limited, which delayed the operational assessment of the original aircraft model by 3 years. Similarly, in February 2009, the Air Force reported that initial operational testing for the larger, more capable Global Hawk aircraft and the program's production readiness review had schedule breaches. Air Force officials cite the high level of concurrency between development, production, and testing; poor contractor performance; developmental and technical problems; system failures; and bad weather as key reasons for the most recent schedule breach.

Efforts to Collaborate and Identify Commonality Were Successful in Some Cases, While Not in Others

Consistent with DOD's framework for acquiring unmanned systems, some of the tactical and theater-level unmanned aircraft acquisition programs we reviewed had identified areas of commonality to leverage resources and gain efficiencies. For example, the Army and Marine Corps achieved full commonality in the Shadow program. In assessing options for replacing an aging tactical unmanned aircraft system,[6] the Marine Corps determined that the Army's Shadow system could meet its requirements for reconnaissance, surveillance, and target acquisition capabilities without any service-unique modifications. An official from DOD's Office of Unmanned Warfare emphasized that the Marine Corps believed that Shadow represented a "100 percent" solution. The Marine Corps also found that it could use the Army's ground control station to pilot the Shadow aircraft as well as other Marine Corps unmanned aircraft. A memorandum of agreement was established in July 2007 to articulate how the Marine Corps and the Army would coordinate to acquire Shadow systems.

By forgoing any service-unique modifications in order to achieve a high level of commonality, the Marine Corps avoided the costs of developing the Shadow. Additionally, the Marine Corps and Army are likely to realize some benefits in supporting and maintaining the systems because the components are interchangeable. The Army's Shadow program office agreed that commonality has allowed the two services to realize economies of scale while meeting each service's needs. According to an official at the Navy, the Marine Corps has been able to realize savings or cost avoidance in other areas such as administration, contracting, and testing, although quantitative data on these savings were not available.

In some cases, the services had collaborated to identify common configuration, performance, and support requirements, but ultimately were not maximizing efficiencies. For example, the Army and Navy had different data link requirements for their respective variants of Fire Scout, primarily because of the Army's requirement for its variant to operate within the Future Combat Systems network. According to the Fire Scout contractor, the Army's system could have been equipped with the same data link as the Navy Fire Scout, as well as the Army's Shadow and Sky Warrior systems, and placed into service sooner. Though the services had

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[6]Shadow was identified as a replacement system for the Marine Corps Pioneer unmanned aircraft. Specifically, the cost for maintaining the Pioneer fleet was cited as a reason for selecting the Shadow system. The Marine Corps is considering a future replacement to the Shadow, which is not expected before 2015.

not agreed on a common data link, the Army and Navy had settled on common Fire Scout requirements for the air vehicle, engine, radar, navigation, and some core avionics subsystems requirements. The services had also agreed to use one contract to procure the airframe. However, in an information letter sent to members of Congress on January 11, 2010, the Army noted that it had terminated the Fire Scout portion of its FCS contract—following a decision by the Office of the Secretary of Defense (OSD) to cancel the FCS program—because analysis indicated that an improved Shadow system could meet future Army requirements, and the Fire Scout was no longer needed. Cancellation of the Army Fire Scout could lead to increased unit cost for the Navy variant.

Although the Navy BAMS and Air Force Global Hawk programs had identified commonalities between their airframes, the two programs had established different payload, subsystem, and ground station requirements. The Navy anticipated spending more than $3 billion to modify the Global Hawk airframe and ground stations, and to integrate Navy-specific payloads, including the radar. In addition, we found that the Navy had an opportunity to achieve greater efficiency in BAMS production. While production of the first two BAMS aircraft was planned to occur at the same California facility that produces Global Hawk, the remaining aircraft were expected to be produced at a facility in Florida. We pointed out that this approach might create duplication in production by staffing and equipping two facilities to conduct essentially the same work. At the time of our review the Navy had not assessed the costs or benefits of establishing a second production facility, and according to contractor officials, the official business case analysis would not be conducted for several years. Therefore, it was unclear whether any benefits of a second production facility would outweigh costs, such as additional tooling and personnel.

In contrast to the examples of the Shadow, Fire Scout, and BAMS / Global Hawk programs above, the Army and Air Force missed opportunities to achieve commonality and efficiencies between their Sky Warrior and Predator programs. In 2001, the Army began defining requirements for a replacement to the aging Hunter unmanned aircraft system, and decided to pursue the development of Sky Warrior. Both the Air Force and the Joint Staff responsible for reviewing Sky Warrior's requirements and acquisition documentation raised concerns about duplicating existing capability—specifically, capability provided by Predator. Nevertheless, the Army program received approval to forgo an analysis of alternatives that could have determined whether or not existing capabilities met its requirements. The Army noted that such an analysis was not needed and not worth the

cost and effort. Instead, it conducted a source selection competition and began the Sky Warrior development program in 2005, citing battlefield commanders' urgent need for the capability. The development contract was awarded to the same contractor working with the Air Force to develop and produce Predators and Reapers. Since the Sky Warrior is a variant of the Predator, the two aircraft are assembled in the same production facility. Despite the establishment of a memorandum of understanding in 2006, direction from the Deputy Secretary of Defense in 2007 to combine their programs, and a subsequent memorandum of agreement, the Army and Air Force maintained separate programs and at the time of our review, had achieved little commonality.

Service-Centric Acquisition Processes and Ineffective Collaboration Have Reduced Opportunities for Commonality

While several of the unmanned aircraft programs we examined had achieved commonality at the airframe level, service-centric acquisition processes and ineffective collaboration resulted in service-unique subsystems, payloads, and ground control stations. Despite DOD's efforts to encourage a joint approach to identifying and prioritizing warfighting needs and to emphasize the need for commonality among the programs, we noted that the individual services continued to drive requirements and make independent resource allocation decisions. In many cases, the services had established requirements so specific that they demanded service-unique solutions, thereby precluding opportunities for commonality. Within DOD's funding system, each service has the responsibility and authority to prioritize its own budget, allowing it to make independent funding decisions to support unique requirements. Therefore, once a service concludes that a unique solution is warranted, the service has the authority to budget for that unique solution, to the exclusion of other solutions that might achieve greater commonality and efficiencies. While we recognized that service-unique requirements appeared to be necessary in some cases, one OSD official we spoke with emphasized concerns that some of the services' distinctions in requirements could lead to duplication and inefficiencies. However, OSD had not quantified the potential costs or benefits of pursuing various alternatives, including commonality.

In 2007, OSD established the Unmanned Aircraft Systems Task Force and the Office of Unmanned Warfare primarily to facilitate collaboration and encourage greater commonality among unmanned aircraft programs. While the two groups act as advisors and have implemented OSD's

recommendations regarding areas where further commonality might be achieved key officials from these groups emphasized to us that they do not have direct decision-making or resource allocation authority.[7] OSD repeatedly directed the Army and Air Force to collaborate on their Sky Warrior and Predator programs, but the services continued to pursue unique systems. In response to OSD direction to merge their unique signals intelligence payload efforts into a single acquisition program, the Army and Air Force concluded that continuing their separate programs was warranted, and recommended that OSD direct an objective, independent organization—such as a federally funded research and development center—to conduct a business case analysis to assess the impact of merging the two programs.[8] Table 3 summarizes OSD's directions and the services' responses over the past few years.

[7]GAO recently reported (*GAO-09-175*) that the Under Secretary of Defense for Acquisition, Technology, and Logistics created the task force in 2007 to lead a DOD-wide effort to coordinate critical unmanned aircraft systems issues and develop a way ahead to enhance operations and streamline acquisitions.

[8]In a March 2010 meeting with the Air Force Predator and Reaper program office, program officials noted that the Air Force and Army are now pursuing a common sensor payload for their respective aircraft.

Table 3: OSD and Service Efforts to Achieve Predator and Sky Warrior Commonality

	OSD	Services
November 2006	Under Secretary of Defense for Acquisition, Technology and Logistics (AT&L) establishes goal for the programs to have a common aircraft, propulsion system, and avionics configuration	
September 2007	Deputy Secretary of Defense directs the services to combine the programs into a single acquisition program and to migrate to a single contract by October 2008	
February 2008		Army and Air Force program executive officers sign a memorandum of agreement
May 2008	Under Secretary of Defense for AT&L reiterates the Deputy Secretary of Defense's directive to combine the programs into a single acquisition program, states that fiscal year 2009 funds can only be used to purchase a common airframe, and expresses dissatisfaction with the progress made on achieving a common electro-optical and infrared sensor	
October 2008	Undersecretary of Defense for AT&L grants a waiver to the Air Force to buy 20 additional Predators, but also directs the Air Force to buy five common airframes and noted that no additional waivers would be granted	
January 2009	Deputy Under Secretary for Acquisition and Technology and the Deputy Under Secretary of Defense (Intelligence) for Portfolio, Programs, and Resources direct the services to conduct a comprehensive business case analysis to assess the impacts of migrating to a single signals intelligence payload acquisition program	
February 2009		Acting Assistant Secretary of the Army (Acquisition, Logistics, and Technology) and Assistant Secretary of the Air Force (Acquisition) issue a joint memorandum, noting that despite more than 15 months of work and a dozen meetings, neither service supports the assertion that a joint program makes sense, and recommend that an objective, independent agency or organization do the business case analysis

Source: GAO.

Congress and OSD took additional action in 2009 aimed at increasing collaboration and commonality among unmanned aircraft programs. In section 144 of the Duncan Hunter National Defense Authorization Act for Fiscal Year 2009, Congress directed "[t]he Secretary of Defense, in consultation with the Chairman of the Joint Chiefs of Staff, [to] establish a policy and an acquisition strategy for intelligence, surveillance, and reconnaissance payloads and ground stations for manned and unmanned aerial vehicle systems. The policy and acquisition strategy shall be

applicable throughout the Department of Defense and shall achieve integrated research, development, test, and evaluation, and procurement commonality." [9] In an acquisition decision memorandum issued on February 11, 2009, the Under Secretary of Defense for Acquisition, Technology and Logistics identified the opportunity to adopt a common unmanned aircraft ground control station architecture that supports future capability upgrades through an open system and modular design. Similar to OSD's approach to ground control stations, the Air Force Unmanned Aircraft Systems Task Force expected future unmanned aircraft to be developed as open, modular systems to which new capabilities could be added instead of developing entirely new systems each time a new capability is needed.

DOD Continues to Increase Its Emphasis on and Funding For Unmanned Aircraft Systems

Since July 2009 when our report was issued, DOD has made several key investment decisions regarding unmanned aircraft systems that will likely impact those estimates. In general, these decisions reflect increased emphasis on developing more advanced unmanned aircraft capabilities and acquiring larger numbers of specific systems, but they do not appear to focus on increasing collaboration or commonality among systems.

The 2010 Quadrennial Defense Review (QDR) reported that "U.S. forces would be able to perform their missions more effectively—both in the near-term and against future adversaries—if they had more and better key enabling capabilities at their disposal." The QDR report included unmanned aircraft systems among these key enablers, and emphasized the importance of rapidly increasing the number and quality of unmanned aircraft systems—among other enablers—to prevail in today's wars, and to deter and defeat aggression in anti-access environments. The report also noted that: the Air Force is going to increase the total number of Predator/Reaper aircraft it plans to buy; the Army will accelerate the production of its Predator-class Sky Warrior[10] system; and the Navy will conduct field experiments with prototype versions of its Unmanned Combat Aircraft System, which, the QDR points out, offers the potential to greatly increase the range of strike, and intelligence, surveillance, and reconnaissance (ISR) operations from the Navy's carrier fleet.

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[9]Pub. L. No. 110-417, § 144.

[10]The 2010 QDR specifically refers to the Extended Range Multi-Purpose system, which at the time of our 2009 report was being referred to as Sky Warrior.

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As part of DOD's fiscal year 2011 budget development process, OSD made several unmanned aircraft-related adjustments to the services' budget submissions. As part of those adjustments, OSD:

- Directed the Army to stop development and initial fielding of its Fire Scout unmanned aircraft;
- Provided the Air Force an additional $344 million from FY2011 to FY2015 to develop, procure, and integrate counter-communication and counter-improvised explosive device jamming pods onto 33 MQ-9 Reaper aircraft, and directed the Air Force to present its assessment of platforms for this capability by June 1, 2010;
- Provided an additional $1.8 billion from FY2011 through FY2015 to purchase an additional 74 MQ-9 Reaper aircraft;
- Added $2 billion to the Navy budget from FY2013 to FY2015 to define requirements and develop unmanned carrier based capability, and directed the Navy to develop an execution plan by March 30, 2010;
- Added $201.6 million to the Global Hawk procurement budget to procure 19 Block 40 aircraft by 2015, and 22 total;
- Added $270.5 million for development and procurement of Global Hawk satellite communication terminals;
- Added $2.4 billion over the Future Years Defense Program to the Army's Extended Range Multi-Purpose (Sky Warrior) Aircraft budget to procure an additional 12 aircraft and 5 ground stations (one company) per year from 2011 through 2015.

In concert with the QDR and the fiscal year 2011 budget, DOD also published its first submission of a long-range, fixed-wing aviation procurement plan. Among other things, the plan addresses DOD's strategy for meeting the demand for persistent, unmanned, multi-role ISR capabilities by:

- Emphasizing "long-endurance, unmanned ISR assets—many with strike capabilities—to meet warfighter demands;
- Projecting an increase in the number of platforms in this category from approximately 300 in 2011 to more than 800 in 2020, nearly 200 percent increase;
- Noting the "replacement of Air Force Predators with more capable Reapers";
- Establishing a specific category for Unmanned Multi-role Surveillance and Strike systems, that distinguishes those systems from other types of aircraft, such as fighters and bombers;
- Noting that the department will continue to adapt the mix of unmanned and manned systems as security needs evolve; and

- Noting that unmanned systems are being considered as future long-range strike platforms and future fighter / attack aircraft.

Concluding Observations

In closing, recent experience in Iraq and Afghanistan has proven that unmanned aircraft are extremely valuable to the warfighter, and it is clear that more are needed. However, DOD will continue to be challenged to meet this increasing demand within available resources. Many of DOD's larger unmanned aircraft acquisition programs have experienced cost growth, schedule delays, and performance shortfalls, while not enough have achieved the efficiencies one might expect from commonality. DOD recognizes that to more effectively leverage its acquisition resources, it must achieve greater commonality among the military services' various unmanned system programs. However, in many cases the services have preferred to pursue unique solutions. In general, the military services continue to establish unique requirements and prioritize resources while foregoing opportunities to achieve greater efficiencies. As a result, commonality has largely been limited to system airframes, and in most cases, has not been achieved among payloads, subsystems, or ground control stations.

Opportunities for identifying commonality are greatest when requirements are being established. Therefore, as the department continues to develop and procure unmanned aircraft systems, it must take more care in setting requirements for those systems. Rather than looking for unique solutions to common problems, DOD must increasingly find common solutions to those problems. However, we recognize that commonality is not a panacea, and in some cases, given legitimate differences in operating environments or mission needs, may not make sense. We also recognize that achieving commonality is not always easy, especially given the strong service-driven acquisition processes and culture within the department. Therefore, in our July 2009 report we recommended that DOD (1) direct an objective, independent examination of unmanned aircraft requirements and report a strategy to Congress for achieving greater commonality among systems and subsystems, and (2) require future unmanned aircraft programs to take an open systems approach to product development and to clearly demonstrate that potential areas of commonality have been analyzed and identified. We believe that these steps could help overcome these barriers and could go a long way to ensuring that DOD maximizes efficiency as it continues to greatly increase emphasis on developing and acquiring more capable and larger quantities of unmanned aircraft.

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Contacts and Staff Acknowledgments

For further questions about this statement please contact Michael J. Sullivan at (202) 512-4841. Individuals making key contributions to this statement include Bruce Fairbairn, Assistant Director; Travis Masters; Rae Ann Sapp; Leigh Ann Nally; Laura Jezewski; and Susan Neill.

Appendix I: Additional Unmanned Aircraft Program Data and Information

This appendix contains 3 tables that provide additional information about the 8 unmanned aircraft systems assessed in our July 2009 report. Table 4 contains the combined total development and procurement funding DOD has requested in its fiscal year 2011 budget submission for each of the programs. The budget data is presented in then year dollars and may not add precisely due to rounding. Tables 5 and 6 detail many of the key characteristics and compare the capabilities of the systems discussed in this statement.

Table 4: Fiscal Year 2011 Development and Procurement Funding Requested for Selected Unmanned Aircraft Programs

(Then year dollars in millions)

Aircraft	2010	2011	2012	2013	2014	2015	FY10-FY15
Reaper	$689.8	$1,474.3	$1,406.3	$1,600.2	$1,522.9	$1,661.1	$8,354.7
Global Hawk*	911.2	961.4	1,021.9	855.1	726.5	653.9	5,130.1
BAMS	439.0	529.3	541.0	744.5	807.2	723.2	3,783.9
Sky Warrior	568.2	644.2	544.2	519.9	532.2	497.4	3,306.1
Shadow	607.9	610.6	88.0	118.4	125.7	171.1	1,781.4
UCAS-D	304.9	266.4	216.0	165.2	51.3	52.7	1,056.4
Predator	188.9	208.2	123.0	99.7	75.1	44.8	829.5
Fire Scout	118.6	61.6	50.9	70.3	90.8	90.8	472.4
Total	**$3,921.1**	**$4,781.4**	**$4,003.2**	**$4,178.1**	**$3,935.6**	**$3,895.1**	**$24,714.5**

Source: DOD (data); GAO (analysis and presentation)

*Information on the RQ-4B Global Hawk is presented in this chart.

Table 5: Key Characteristics of Selected Unmanned Aircraft Systems

Aircraft	Length (feet)	Wing Span (feet)	Gross Weight (pounds)	Payload Capacity (pounds)	Endurance (hours)*	Maximum Altitude (feet)
Reaper	36	66	10,500	3,750	24	50,000
Global Hawk[b]	48	131	32,250	3,000	28	60,000
BAMS	48	131	32,250	3,200	34+	60,000
Sky Warrior	28	56	3,200	800	40	25,000
Shadow	11	14	375	60	6	15,000
UCAS-D	38	62	46,000	4,500	9	40,000
Predator	27	55	2,250	450	24+	25,000
Fire Scout	23	28	3,150	600	6+	20,000

Sources: DOD, *Unmanned Systems Roadmap 2007 – 2032* and BAMS Program Office

*Endurance capacity reported here is the maximum endurance possible, without external payloads. For some aircraft, the addition of external payloads can impact endurance capacity.

[b]Information on the RQ-4B Global Hawk is presented in this chart.

Table 6: Comparison of Key System Capabilities

Aircraft	Imagery Intelligence			Signals Intelligence		
	Electro-Optical / Infrared	Synthetic Aperture Radar	Full Motion Video	Communications Intelligence	Electronic Intelligence	Weapons
Global Hawk	X	X		X	X	
Predator	X	X	X	X		X
Reaper	X	X	X	X		X
Sky Warrior	X	X	X			X
Shadow	X		X			
Fire Scout - Navy	X		X			
Fire Scout - Army	X	X	X	X	X	
BAMS	X	X	X			

Source: DOD (data); GAO (analysis and presentation)

Note: While we also assessed the Navy's Unmanned Combat Aircraft System Demonstration (UCAS-D) as part of our review, UCAS-D is a demonstration effort and will not be equipped with any mission payloads.

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Mr. TIERNEY. Thank you very much. We appreciate your statement.

Mr. Weatherington.

STATEMENT OF DYKE WEATHERINGTON

Mr. WEATHERINGTON. Mr. Chairman, Congressman Flake, thank you for the opportunity to appear today before you to discuss the Department of Defense's unmanned aircraft systems acquisition programs, specifically Department initiatives to achieve greater commonality and efficiencies.

My testimony will address the full spectrum of DOD UAS systems. This distinction is important because we have pursued opportunities for commonality and efficiency successfully across the full range of DOD unmanned aircraft systems, including small unmanned aircraft systems.

Table one in the provided testimony is included to identify the broad diversity of unmanned aircraft systems supporting a broad range of warfighter needs, and you have examples of each of the groups of those systems on the table in front of you.

The GAO report, Defense Acquisitions: Opportunities Exist to Achieve Greater Commonality and Efficiency Among Aircraft Systems, was released last July and reviewed the DOD UAS program groups three through five. GAO had five recommendations. The Department partially concurred with the recommendation to conduct rigorous, comprehensive analysis of requirements for current UAS and to develop a strategy for making systems and subsystems among these programs more common.

At the time of the review, the UAS Task Force, with support from the Joint Requirements Oversight Council, had already completed a comprehensive analysis of the potential for commonality between the current Air Force Predator Program and the Army's Extended Range Multi-Purpose Program.

Since the report was released, the UAS Task Force, in coordination with Joint Staff, has conducted a rigorous review of the Navy's BAMS Program and the Air Force Global Hawk Program to evaluate opportunities for achieving greater commonality and joint efficiencies. We have completed that analysis, along with one addressing signals intelligence or SIGINT payload commonality.

The Department concurred with the remaining four GAO recommendations in that report. Since the GAO has released its report, the Department has completed its 2010 Quadrennial Defense Review and the President has submitted his fiscal year 2011 budget. The QDR highlights the continuing warfighter need for increased intelligence, surveillance and reconnaissance, and force protection capabilities provided by unmanned aircraft systems and the budget reflects the Department's increased investment needs in these areas.

This investment is consistent with the acquisition reform goal and DOD's high priority performance goals presented in the analytical perspective volumes of the President's fiscal year 2011 budget.

The Department's investment and operation in UAS continues to increase as demand for a wide range of UAS capabilities expands, as was discussed in the first panel. DOD's annual budget for development and procurement of UAS has increased from about $1.7 bil-

lion in fiscal year 2006 to over $4.2 billion in fiscal year 2010. During that same period, DOD UAS operations have grown from about 165,000 hours to over 550,000 hours annually, and there is a graphic in the testimony. Unmanned aircraft system inventory has increased from less than 3,000 to over 6,500 aircraft, as has been mentioned previously.

The Department is making significant investments in unmanned aircraft systems and that is projected to grow significantly over the next 5 years. Achieving commonality, interoperability and joint efficiencies in development, production, and operation and support is critical to controlling costs and delivering interoperable, reliable systems to the warfighter with capabilities they need to win.

We will continue to improve the defense acquisition system and have formed the UAS Task Force jointly to address critical UAS technology and acquisition issues to enhance operation, enable interdependencies, commonalities and other efficiencies.

Just a quick update on our current DOD UAS programs. This year, the Department made the commitment to grow Air Force Predator and Reaper combat air patrols [CAPs], to 50 by 2011, and the Air Force is on track to achieve this goal and will continue to expand the force structure to support up to 65 CAPs by fiscal year 2013.

The Army is also expanding many classes of UAS, including accelerated production of the Predator Class ER/MP and also upgrading Shadow. In addition to the quick reaction capability of eight ER/MP aircraft already fielded in Iraq, the Army will field a second quick reaction capability to Afghanistan this year.

The Army also plans to field 13 ER/MP systems of 12 aircraft each to each of the combat aviation brigades starting in fiscal year 2011. Navy is in engineering and manufacturing development phase for its BAMS UAS Program and is introducing sea-based unmanned aircraft systems with its vertical takeoff, unmanned aerial vehicle, and its small tactical unmanned aircraft system. Navy plans to award the STUAS contract later this year.

Finally, all the military departments and Special Operations Command are operating the hand-launched Raven with over 4,700 aircraft delivered to the warfighter.

In closing, Mr. Chairman, the Department's investment in UAS is projected to continue to grow. We recognize achieving commonality, interoperability and joint efficiencies in development, production, operations and support is critical to controlling costs and delivering interoperable, reliable systems to the warfighters.

Thank you for this opportunity to testify.

[The prepared statement of Mr. Weatherington follows:]

TESTIMONY OF

DYKE D. WEATHERINGTON

DEPUTY DIRECTOR, UNMANNED WARFARE

OFFICE OF THE UNDER SECRETARY OF DEFENSE

(ACQUISITION, TECHNOLOGY & LOGISTICS)

BEFORE THE UNITED STATES HOUSE

COMMITTEE ON

OVERSIGHT AND GOVERNMENT REFORM

SUBCOMMITTEE ON

NATIONAL SECURITY AND FOREIGN AFFAIRS

March 23, 2010

Acquisition of Department of Defense Unmanned Aircraft Systems

Mr. Dyke D. Weatherington
Deputy Director, Unmanned Warfare
Office of the Under Secretary of Defense
(Acquisition, Technology and Logistics)

Chairman Tierney, Congressman Flake and Members of the Committee:

Thank you for the opportunity to appear before you today to discuss Department

of Defense (DoD) unmanned aircraft system (UAS) acquisition programs, specifically,

Department initiatives to achieve greater commonality and efficiencies. My testimony

will address the full spectrum of DoD UAS, not just the larger (Groups 3-5) aircraft

addressed by the Government Accountability Office (GAO) in their July 2009 report.

The distinction is important because we have pursued opportunities for commonality and

efficiency successfully across the full range of DoD unmanned aircraft, including small

UAS. Table 1 is included to identify the broad diversity of DoD UAS supporting a wide

range of warfighter needs. Classifications are based on aircraft weight, operating

altitude, and speed. [1]

UAS Category	Max. Gross Takeoff Weight (lbs)	Normal Operating Altitude (ft)	Speed (KIAS[2])
Group 1	0-20	< 1200 AGL[3]	100
Group 2	21-55	< 3,500 AGL	<250
Group 3	<1320	< 18,000 MSL[4]	Any
Group 4	>1320		
Group 5		> 18,000 MSL	

Table 1: JUAS CONOPS UAS Categories[5]

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[1] Specifics on the methodology employed by the JUAS COE to determine groupings are found in the Joint UAS Concept of Operations, 2nd Edition, November 2008.
[2] Knots (Nautical Miles per Hour) Indicated Airspeed
[3] Above Ground Level
[4] Mean Sea Level
[5] Lighter than air vehicles are classified by the highest of their operating attributes.

The GAO Report, "Defense Acquisitions: Opportunities Exist to Achieve Greater Commonality and Efficiencies among Unmanned Aircraft Systems," released in July 2009, reviewed DoD UAS Groups 3-5. The GAO had five recommendations. The Department partially concurred with the recommendation to conduct a rigorous and comprehensive analysis of requirements for current UAS and to develop a strategy for making systems and subsystems among those programs more common. At the time of the review, the UAS Task Force with support from the Joint Requirements Oversight Council had already completed a comprehensive analysis of the potential for commonality between Air Force Predator and Army Extended Range Multi Purpose UAS. Since the report was released, the UAS Task Force in coordination with the Joint Staff conducted a rigorous review of the Navy Broad Area Maritime Surveillance (BAMS) and Air Force Global Hawk programs to evaluate opportunities for achieving greater commonality and joint effectiveness. We have completed that analysis along with one addressing Signals Intelligence (SIGINT) payload commonality. I will address the findings of both these analyses later in my testimony. The Department concurred with remaining four recommendations which included requiring the Military Departments to identify and document in their acquisition plans and strategies specific areas where commonality can be achieved, to take an open systems approach to product development, to conduct a quantitative analysis that examines the costs and benefits of various levels of commonality, and to establish a collaborative approach and management framework to periodically assess and effectively manage commonality.

Since the GAO released its report, the Department has completed its 2010

Quadrennial Defense Review (QDR), and the President has submitted his Fiscal Year

(FY) 2011 budget. The QDR highlights the warfighters' need for increased intelligence,

surveillance, and reconnaissance (ISR) and force protection capabilities, and the budget

reflects the Department's increased investment to meet that need. This investment is

consistent with the Acquisition Reform goal in DoD's High Priority Performance Goals

presented in the Analytic Perspectives volume of the President's FY 2011 Budget.

The Department's investment and operation in UAS continues to increase as the

demand for the wide range of UAS capabilities expands. The DoD annual budget for

development and procurement of UAS has increased from $1.7 billion in FY 2006 to

over $4.2 billion in FY 2010. During the same time period DoD UAS operations have

grown from 165,000 hours to over 550, 000 hours annually (as shown in Figure 1 on page

4), and the unmanned aircraft inventory has increased from less than 3,000 to over 6,500.

The Department is making significant investments in UAS, and that is projected to

grow significantly over the next five years. Achieving commonality, interoperability, and

joint efficiencies in development, production, and operations and support is critical to

controlling cost and delivering interoperable and reliable systems to the warfighters with

the capabilities they need to win. We continue to improve the Defense Acquisition

System, and have formed a UAS Task Force to jointly address critical UAS technical and

acquisition issues to enhance operations and enable interdependencies, commonality and
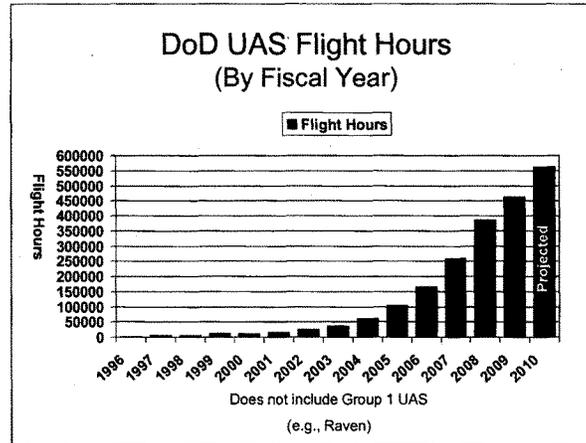
other efficiencies.

Figure 1 DoD UAS Flight Hours

I will now update you on the DoD UAS acquisition and summarize our efforts to increase commonality and achieve additional efficiencies.

Update on DoD UAS Programs

Overview of UAS Programs

In FY 2010, the Department made a commitment to grow Air Force Predator/Reaper combat air patrols (CAPs) to 50 by FY 2011. The Air Force is on track to achieve this goal and will continue to expand force structure to support up to 65 CAPs by FY 2013. The Army is expanding all classes of UASs, including the accelerated production of the Predator-class Extended Range Multi-Purpose (ER/MP) UAS and upgrading its Shadow UAS. The Army is embedding UAS in all its Brigade Combat Teams. In addition to the Quick Reaction Capability of four ER/MP aircraft already

fielded in Iraq, the Army will field a second Quick Reaction Capability to Afghanistan in

FY10. The Army also plans to field 13 ER/MP systems of 12 aircraft each to each

Combat Aviation Brigade, starting in FY 2011. The Navy is in the Engineering and

Manufacturing Development phase for its Broad Area Maritime Surveillance (BAMS)

UAS, and is introducing sea-based UASs with its Vertical Take Off Unmanned Aerial

Vehicle (VTUAV) and its Small Tactical Unmanned Aircraft System (STUAS)

programs. The Navy plans to award the STUAS contract during the next quarter. All

Military Departments and the U.S. Special Operations Command (SOCOM) are

operating the hand-launched Raven with over 4,700 aircraft delivered to the warfighter.

Overview of Department Initiatives to Increase Commonality and Efficiencies

The *Department of Defense Report to Congress on Common Control Stations and*

Payloads for Manned and Unmanned Aircraft Systems (UAS) was forwarded to the

congressional defense committees on June 25, 2009, in response to Section 144 of the

National Defense Authorization Act for FY 2009. It describes the Department's

initiatives to increase commonality and efficiencies for manned and unmanned aircraft

systems. The Department of Defense Instruction (DoDI) 5000.02, dated December 8,

2008, improves the Defense Acquisition System by providing increased management

focus early in program creation; this enables the Department to identify opportunities for

commonality and efficiencies across Military Departments and programs at the Material

Development Decision milestone in the acquisition life cycle. The UAS Task Force, led

by the Under Secretary of Defense for Acquisition, Technology and Logistics

(USD(AT&L)) with members from the Military Departments, the Office of the Secretary

of Defense (OSD), the Joint Staff, and Joint Forces Command, continues to coordinate critical UAS issues to enhance operations, enable interdependencies, and facilitate delivery of UAS capability to the warfighter. Key areas of UAS TF activity include civil airspace integration, frequency spectrum and bandwidth utilization, information assurance and encryption, and interoperability among ground stations and airframes across Military Departments with payload and sensor management transparencies.

In addition to working within the Department toward improving commonality and efficiencies among UAS, the DoD has joined with the Department of Transportation, the Department of Homeland Security, and the National Aeronautics and Space Administration to form a UAS Executive Committee (ExCom) to rapidly improve public UAS integration into the National Airspace System (NAS). DoD UAS require NAS access for training, development, and operations. Access is critical to supporting multiple warfighters with the ISR and force protection capabilities required to fight and win our current overseas contingency operations. We continue to engage directly with the Federal Aviation Administration (FAA) via the UAS ExCom to identify and resolve issues surrounding integration of UAS into the NAS. The FAA hosted the first UAS ExCom meeting in October 2009.

I will now summarize the Department's progress toward achieving greater commonality and efficiencies for the Group 3-5 UAS programs reviewed for the GAO Report, and also Group 1-2 UAS programs that were not part of the study.

<u>RQ-4 Global Hawk / Broad Area Maritime Surveillance (BAMS) Joint Efficiencies</u>

The Air Force Global Hawk and Navy BAMS UAS programs are just two of our unmanned systems that continue to pursue opportunities for greater commonality and efficiency. The Department understands that there exists a significant cost and operational benefit in leveraging system commonality where appropriate in the acquisition of our weapon systems. Specifically, within Global Hawk and BAMS UAS programs we are stressing several developmental areas to increase commonality both in weapon system design and during military operations. We are utilizing common production facilities at Palmdale, California, for both Global Hawk and BAMS EMD aircraft. Additionally, we are addressing critical flight safety issues of a new and technologically sound approach to operate UAS in the national airspace through the joint development and acquire a sense and avoid system. The Air Force and the Navy have agreed to jointly acquire a common radar as part of that system and the Military Departments are cooperating in expanding our aircraft certification process to include unique UAS elements. As the Global Hawk and BAMS systems share common elements and both operate beyond-line-of-sight long endurance missions, we are fully leveraging these similarities by re-architecturing the mission ground stations to streamline operations and mission effectiveness. The payoff for this production decision of ground station commonality is that we expect to enact total cost efficiencies for the equipment, sustainment, and training as well as reap operational efficiencies for the warfighter. OSD and the Joint Staff are actively coupling these acquisition efforts; together we monitor and encourage all efforts to increase joint efficiencies. Our efforts to increase commonality are documented in the Acquisition Decision Memorandums and Joint

Requirements Oversight Council Memorandums that direct these two Military

Departments to work together to gain even more elements of commonality, such as

incorporating a similar anti-ice technology for both Global Hawk and BAMS UAS

aircraft to expand operations in icing conditions. Other specific directed actions include

efforts to increase joint efficiencies in the areas of operations and support. Examples

include: common basing; consolidated maintenance; beyond-line-of-sight command and

control; processing, exploitation and dissemination functions; training; and supply chain

management. In summary, Global Hawk and BAMS UAS are two unmanned systems

that embrace the Department's efforts to use commonality and joint efficiency efforts to

lessen total program costs, leverage benefits derived from joint technology development,

and implement common systems when favorable.

Electro Optical Infrared (EO/IR) Sensor Payload for Predator and ER/MP

The Air Force and the Army have converged on a common electro optical infrared

(EO/IR) sensor payload for Predator and ER/MP. The sensor will provide high definition

(HD) full motion video and enhanced target location accuracy (TLA) supported by a fully

digital infrastructure. The Military Departments plan to procure from a common contract

with the initial orders for the HD EO upgrade placed the third quarter of this fiscal year,

and deliveries to the Army in FY 2011. HD IR and TLA will be added sequentially and

the fully upgraded sensor will be fielded in FY 2014 by both Military Departments.

Signals Intelligence (SIGINT) Payload

The Department, recognizing that requirements for the Air Force's Airborne

Signals Intelligence Payload (ASIP) and the Army's Tactical Signals Intelligence

Payload (TSP) sensors appear similar, determined a UAS SIGINT sensor business case

analysis was necessary to provide an independent assessment of the cost, schedule, and

performance implications of migrating to a highly common SIGINT system for the

Predator, ER/MP, and Reaper fleets. The UAS SIGINT business case analysis includes a

comparison of the cost versus capability for the ASIP and the TSP sensors to meet the

broad range of Military Departments', and Component and Combatant Commanders'

SIGINT capability requirements, and a technical assessment of each system providing

context for the requirements and desired performance parameters, industrial base issues

and program oversight. Special consideration was given towards technology maturity,

integration, and employment criteria to better understand the operational risks and future

challenges. The Department expects to finalize its assessment of the findings next

month, and will include its assessment in its *Report to Congress on Unmanned Aircraft*

Systems (UAS)-based Signals Intelligence (SIGINT) Payload.

Shadow UAS

     The Army and the United States Marine Corps (USMC) continue to procure and

operate the common Shadow UAS while incorporating program improvements. The

Army Procurement Objective has increased from the initial 41 in the original December

26, 2002 Acquisition Program Baseline to 102 in July 2008. All of the aircraft are

Shadow 7B variants with several different configurations. Program has been in full rate

production since 2002 with current Army production ending in FY 2011. The USMC

also operates the Shadow system and is procuring 13 systems utilizing the Army

production contract. The USMC utilizes the Army training base and sustainment capability to reduce cost and increase efficiency.

The Shadow program has undergone numerous upgrades since the full rate production decision in FY 2002. Major upgrades completing test include incorporation of a laser designator (LD) in the EO/IR sensor, engine electronic fuel injection (EFI), and aircraft re-wing. LD provides precision targeting capability for laser munitions including Hellfire equipped Apaches, and other aircraft capable of carrying laser seeking munitions. EFI improves engine performance, fuel consumption, and reliability, and eliminates carburetor icing. Re-wing improves endurance from five to eight hours and enables future incorporation of Tactical Common Data-Link. All these Army funded upgrades will migrate into both Army and USMC Shadow force structure.

Groups 1-2 UAS Programs

While not included in the GAO's recent review, I would like to take this opportunity to tell a success story with respect to small UAS (SUAS) commonality. Immediately following September 11, 2001, the Military Departments and SOCOM procured a number of different small hand-launched UAS. The SUAS proved to be a low cost, highly effective force protection system, and many different types were procured; Pointer, Dragon Eye, Swift, Raven A, and Desert Hawk were the primary systems fielded, but there were others as well. Today, all the Military Departments and SOCOM are procuring the Raven B system using the same contract and realizing cost savings while gaining improved performance. Today's Raven B has greater capability than the original system; improvements include greater aircraft endurance, and improved sensor,

communications and ground station capabilities. There are over 1,500 Raven B systems fielded; each system includes 3 aircraft.

Conclusion

In closing Mr. Chairman, the Department's investment in UAS is projected to continue to grow. We recognize that achieving commonality, interoperability, and joint efficiencies in development, production, and operations and support is critical to controlling cost and delivering interoperable and reliable systems to the warfighters with the capabilities they need to win. We continue to improve the Defense Acquisition System, and have formed a UAS Task Force to jointly address critical UAS issues to enhance operations and enable interdependencies, commonality and other efficiencies. These Task Force efforts are consistent with the Acquisition Reform goal in DoD's High Priority Performance Goals presented in the Analytic Perspectives volume of the President's FY 2011 Budget.

Thank you for the opportunity to testify before the Committee. I would be happy to answer any questions you and the Members of the Committee may have.

Mr. TIERNEY. Thank you for your testimony.

Mr. Wolf, you are recognized for 5 minutes.

STATEMENT OF KEVIN WOLF

Mr. WOLF. Thank you, Chairman Tierney, Congressman Flake, members of the committee, professional staff. Thank you for the opportunity to testify before your committee on the Department of Commerce's role in export controls of unmanned aerial vehicles, related components and technology.

The Bureau of Industry and Security [BIS], within the Department of Commerce administers the controls on the export, re-export, and in-country transit of a range of dual use items, commodities, software, technology, that have both civilian and military uses.

In doing so, BIS works closely with a number of departments and agencies, including the Departments of Defense, State, and Energy, the Central Intelligence Agency, Department of Homeland Security, and its Bureau of Immigration and Customs Enforcement, and the Department of Justice.

The dual use export control system is an important tool to protect the national security of the United States against diverse threats that our Nation faces. State and non-state actors seek to acquire weapons of mass destruction and the means to deliver them, as well as conventional arms and other items that could be used for terrorist purposes. BIS implements the dual use control system through the export administration regulations.

Under the EAR, BIS regulates the export of certain UAVs and related items based on multilateral control lists and other items that could be used in or for UAVs through unilateral controls on end uses and end users. What I mean by that is that the dual use regulations administered by the Bureau of Industry and Security are one part of a greater scheme.

You have multilateral controls, principally the missile technology control regime, sometimes called the MTCR, and the Wassenaar Arrangement, which are arrangements between, depending upon the regime, 34 to 40-plus member countries which have agreed to establish lists of items and technologies that should be controlled for export and re-export outside of the member countries. And these lists that are agreed to and worked on and revised regularly by various committees in which the Commerce Department and other U.S. departments participate, are updated to take into account current threats and current issues.

These lists that the MTCR creates and the other multilateral regimes' work are the basis for the list of items that the U.S. Government controls for export and re-export or in-country transit. The Commerce Department regulations, the dual use regulations, again even within the domestic regime, are only one part of that.

The other part is what are called the International Traffic in Arms regulations which are the regulations administered and implemented by the State Department's Directorate of Defense Trade Controls. And principally, what those regulations govern in terms of the export and re-export are defense articles such as UAVs that are specifically designed or modified for military application or parts or components for those UAVs that are specifically designed

or modified for military UAVs, rather, and all technical data and services that are directly related to the UAVs and to those parts and components. And for those items and for services related to those items, it is a worldwide licensing requirement except for Canada in some limited circumstances.

A subset of that are the dual use controls. So anything that is military is not controlled by us. It is those UAVs and related parts, components, accessories and technology or software for their production or development that are controlled for worldwide export. That is, if you were in the United States and you had one of these items or an accessory that was specially designed for a dual use UAV, a license would be required from the U.S. Government before it is exported.

Similarly, if it is an item that is of U.S. origin or otherwise subject to these regulations, a license would be required to re-export it from one destination to another destination.

And then behind these rules is a vigorous set of enforcement authorities, both civil and criminal penalties that are available to the U.S. Government for those individuals and companies that violate these regulations, export something from the United States or re-export it if it is otherwise controlled without a license.

There is a series, as our testimony, my written testimony has, of enforcement actions against companies, both civil and criminal, for people trying to export and re-export things directly or indirectly related to UAV manufacture, production or use outside the United States in violation of these rules.

So with that general summary of U.S. export control law and UAVs, I would be happy to answer any specific questions you might have.

[The prepared statement of Mr. Wolf follows:]

Testimony by Kevin J. Wolf
Assistant Secretary for Export Administration
Bureau of Industry and Security
U. S. Department of Commerce

Before the National Security and Foreign Affairs
Subcommittee of the Committee on Oversight and Reform

March 23, 2010

Chairman Tierney, Congressman Flake, Members of the Committee:

Thank you for the opportunity to testify before the National Security and Foreign Affairs Subcommittee of the Committee on Oversight and Reform, on the Department's role in export controls of unmanned aerial vehicles (UAV) and related technology.

The Bureau of Industry and Security (BIS) within the Department of Commerce, administers controls on the export of a range of dual-use items (commodities, software, and technology with civilian and military uses). In doing so, BIS works closely with a number of departments and agencies, including the Departments of Defense, State, and Energy, the Central Intelligence Agency, the Department of Homeland Security's Bureau of Immigration and Customs Enforcement, and the Department of Justice.

The dual-use export control system is an important tool to protect the national security of the United States against the diverse threats our nation faces. State and non-state actors seek to acquire weapons of mass destruction (WMD) and the means to deliver them, as well as conventional arms and other items that could be used for terrorist purposes. BIS implements the dual-use control system through the Export Administration Regulations (EAR). Under the EAR, BIS regulates the export of certain UAVs and related items based on multilateral control lists and other items that could be used in or for UAVs through unilateral controls on end-uses and end-users.

U.S. Dual-Use Export Controls Relating to UAVs

A. The Missile Technology Control Regime

The United States has a comprehensive export control program, consisting of multilateral commitments and unilateral controls, intended to prevent the proliferation of sensitive items to countries and programs of concern. The Missile Technology Control Regime (MTCR) has 34 member countries, including many of the key manufacturers and exporters of cruise missiles and UAVs. The MTCR has a control list, or "Annex," of items (goods and technologies) which all members control according to the MTCR guidelines – including certain UAVs. The MTCR Guidelines and Annex serves as the basis for the dual-use missile technology controls set forth in the EAR. The MTCR definition of UAVs includes cruise missiles, target drones, reconnaissance drones, and other forms of UAVs regardless of whether they are military or civilian or armed or

unarmed. UAVs can be as large as a commercial airplane or as small as a model airplane and jet or propeller driven; they can be airplanes, helicopters, or even blimps; they can be guided autonomously or by a remote operator or pilot. But only UAVs meeting certain range/payload criteria are MTCR-controlled.

The MTCR also addresses newly emerging technologies, the application of new uses for old items, and requests for the imposition of additional controls. The Department of Commerce, along with the Departments of State, Defense, and Energy, actively participates in the interagency Missile Annex Review Committee (MARC). The MARC is responsible for reviewing internal and foreign proposals for modifying existing MTCR control parameters or assessing proposals for new MTCR controls.

The MTCR, from its inception in 1987, subjected exports of UAVs capable of delivering a payload of at least 500 kg to a range of at least 300 km (so-called "Category I" or "MTCR-class" UAVs) and their directly associated technology to a "strong presumption of denial." Exports of complete warhead safing, arming, fuzing, firing subsystems useable in such UAVs, and their directly associated technology, also are subject to a "strong presumption of denial." In addition, under the MTCR Guidelines, the transfer of MTCR-defined "production facilities" for Category I items and the technology directly associated with these facilities will not be authorized.

Key components and materials useable in producing MTCR-class UAVs -- such as small, fuel-efficient jet engines; structural composites and their production equipment; various types of avionics, guidance, and flight control systems; telemetry and ground support equipment; various test equipment; and stealth technology -- are controlled as MTCR Category II items. MTCR countries review exports of such items on a case-by-case basis against specified nonproliferation criteria, and such exports also are subject to a "strong presumption of denial" if assessed to be intended for use in WMD delivery. In 1994, additional UAVs -- those not captured under Category I, but inherently capable of a 300 km range regardless of payload capability -- were added to Category II MTCR controls.

In addition to MTCR controls, UAVs and their components are controlled under the Wassenaar Arrangement, the multilateral export control regime for conventional arms and associated dual-use items. The Department of Commerce implements Wassenaar-related controls over non-military UAVs having either: a) an autonomous flight control and navigation capability (e.g., an autopilot with an inertial navigation system); or b) the capability of controlled-flight out of direct vision range involving a human operator (e.g., televisual remote control). Wassenaar also requires controls on the export of a wide range of materials and equipment that may be used in the production of UAVs, beyond those controlled by the MTCR.

Moreover, there are a large number of UAV-relevant items that are not controlled under the MTCR or Wassenaar, mostly because of their broad civil uses (e.g., in manned aircraft). On a national basis, the U.S. and most other members of the multilateral export control regimes have enacted "catch-all" controls to cover exports of such items when an exporter knows or is informed by his government that they are intended for use in WMD programs (including WMD delivery).

Thus, continuing to work within the multilateral MTCR framework is essential to the success of our missile and UAV nonproliferation goals.

B. U.S. Implementation of Missile Technology Export Controls

Consistent with its MTCR commitments, the United States implements a comprehensive export control program intended to prevent the proliferation of sensitive items to programs of concern. The Department of State has export licensing jurisdiction for defense articles and services covered by the U.S. Munitions List, including all military UAVs regardless of range or payload, commercial UAVs with a range of at least 300km and a payload capability of 500 kg as well as certain related components and technologies. The Department of Commerce has export licensing jurisdiction for dual-use items (items with civilian and military applications) enumerated on the Commerce Control List (CCL), as well as items not on the CCL but subject to the EAR. The Department of Commerce also has jurisdiction over certain WMD and missile-related activities of U.S. persons.

The Department of Commerce uses a number of tools to prevent the proliferation of items under its jurisdiction related to cruise missiles and UAVs. First, the CCL contains a list of items controlled for Missile Technology (MT) reasons. These MT-controlled items encompass the equipment and technologies that the MTCR has agreed are of proliferation concern and not already controlled as munitions items.

Under the EAR, an exporter must submit a license application to export any item controlled for MT reasons to any country in the world (except Canada). Since January 2003, BIS has issued 96 licenses for items covered by Export Control Classification Number (ECCN) 9A012 on the Commerce Control List which is a part of the EAR. ECCN 9A012 covers certain non-military UAVs, associated systems, equipment, and components. Twenty-five of these licenses have actually been used to export UAV and UAV components totaling just over $4 million dollars. Of the 25 exports the vast majority went to MTCR Partner Countries in Europe, Australia, South America, and South Korea with the remaining going to Mexico, Singapore, Indonesia and Iraq. The Departments of Defense, State, and Energy, as well as Commerce, review all license applications for MT-controlled items. The reviewing departments apply the MTCR Guidelines and additional criteria, consider available intelligence and law enforcement information, and determine if the transaction would pose an unacceptable risk of diversion or provide a material contribution to a missile program of concern.

In addition, the interagency Missile Technology Export Control (MTEC) group meets once a week to review all pending missile technology license applications. The process for interagency review of export license applications submitted to the Department of Commerce established by Executive Order 12981, as amended, ensures the positions of the reviewing departments are fully considered before an export license is approved.

The U.S. controls on exports that could support WMD and missile programs go well beyond the MTCR Annex items. Under our catch-all controls, exporters also are required to obtain a license for the export, reexport, or in-country transfer of any item, even a non-controlled item, if they know or are informed that the item will be used in or for prohibited nuclear activities, chemical or biological weapons programs, or the design, development, or production of missiles, or by facilities engaged in such activities. The definition of missile includes UAVs with a range equal to or greater than 300 kilometers.

These catch-all controls, set forth in Part 744 of the EAR, seek to prevent the export, reexport, or in-country transfer of any item that could be used in a missile program of concern, and thus specifically detail the inclusion of cruise missiles and UAVs capable of performing military

reconnaissance, surveillance, or combat support to ensure there is no "gap" in the application of export controls for proliferation reasons. In calendar year 2009, the department reviewed 77 applications for otherwise non controlled items for missile "catch-all" related concerns. These applications were valued at 23.5 million dollars.

In addition, the EAR contains an Entity List that identifies specific end-users in countries throughout the world that pose a proliferation concern. Many of these end-users have been listed because of missile proliferation concerns. For most listed end-users, a license is required for all exports and reexports of items subject to the EAR.

The catch-all controls also go beyond control of items and extend to the activities of U.S. persons. Under the EAR, U.S. persons may not perform any contract, service, or employment that they know will directly assist in chemical and biological weapons or missile activities in or by certain countries. Our regulations also include prohibitions against exports of dual-use items, software or technology to sanctioned countries as designated by Congress.

Finally, our controls also target non-state actors. The EAR prohibits exports and reexports of any items to persons designated by the Department of the Treasury as Specially Designated Global Terrorists, Specially Designated Terrorists, or Foreign Terrorist Organizations. The Department of Commerce also maintains an extensive system of unilateral anti-terrorism controls, in addition to the controls imposed on items that are controlled for MT and other reasons. These controls are intended to keep even low-level goods and technologies out of the hands of the most dangerous actors.

It is also important to note our outreach program to U.S. industry. The government alone cannot protect our security interests in this globalized world. It is essential that the public and private sector combine their strengths to confront the threats to our economic and national security. The Department of Commerce has an extensive outreach program to inform U.S. industry of their export obligations and explain the scope of export controls to all exporters. Most U.S. companies are strongly committed to protecting our national security and they therefore seek to achieve excellent compliance with our laws. It is therefore imperative that those who could supply sensitive items to end-users of concern understand their obligations and the importance of compliance.

Thus, in addition to implementing our international commitments under the MTCR, the United States has in place a comprehensive program of additional measures to prevent the proliferation of missile systems capable of delivering WMD to countries of concern or terrorists.

C. Export Control Enforcement

BIS's Export Enforcement team, along with the Department of Homeland Security's Bureau of Immigration and Customs Enforcement, and the Federal Bureau of Investigation, enforce controls on dual-use exports. These agencies, through investigations of suspected violations of law and regulations, and the interdiction of suspected illicit shipments, have provided the necessary evidence to successfully prosecute both criminal and civil cases on export violations. Our multilateral controls also provide a strong framework for cooperative enforcement efforts overseas when such efforts call for an international approach.

The following highlights recent cases involving UAV's from the Department of Commerce's Office of Export Enforcement and the Department of Justice.

Aviation Services International

On September 24, 2009, Aviation Services International BV (ASI), an aircraft supply company in the Netherlands, Robert Kraaipoel, Director of ASI, Neils Kraaipoel, sales manager of ASI, and Delta Logistics pled guilty in U.S. District Court in Washington, DC to charges related to a conspiracy to illegally export aircraft components and other U.S.-origin commodities to entities in Iran, via the Netherlands, the United Arab Emirates and Cyprus. Between October 2005 and October 2007, the defendants received orders from customers in Iran for U.S.-origin items, · including video recorder units for end use in Unmanned Aerial Vehicles, then contacted companies in the United States and negotiated purchases on behalf of the Iranian customers. The defendants provided false end-user certificates to U.S. companies to conceal the true end-users in Iran. The defendants caused U.S. companies to ship items to ASI in the Netherlands or other locations in the United Arab Emirates and Cyprus which were then repackaged and transshipped to Iran. In a related case, ASI, Robert Kraaipoel and Niels Kraaipoel settled administrative charges with BIS that included, in part, ASI and Robert Kraaipoel being placed on BIS's Denied Persons List for seven years. Niels Kraaipoel agreed to a three year denial of his export privileges that would be suspended pending no future export violations.

ARC International

On February 3, 2010, Harold Hanson (Hanson) and Nina Yaming Qi Hanson (Qi) were sentenced in U.S. District Court in the District of Columbia. Qi was sentenced to 105 days in jail with credit for time served, placed on one year of supervised release, ordered to pay a fine of $250 and a $100 special assessment fee and ordered to attend a U.S. Department of Commerce sponsored export education training program. Hanson was sentenced to 24 months probation, required to pay a fine of $250 and a $100 special assessment fee, ordered to perform 120 hours of community service, and also ordered to attend a U.S. Department of Commerce sponsored export training program. On November 13, 2009, Hanson and Qi pleaded guilty to making false statements. On March 12, 2009, a federal grand jury in the District of Columbia returned an indictment charging Qi, her husband Hanson (an employee at Walter Reed Army Medical Center), and a Maryland company, ARC International, LLC, with illegally exporting miniature Unmanned Aerial Vehicle (UAV) Autopilots controlled for national security reasons to a company in the People's Republic of China.

Mayrow General Trading

In September 2008, a federal grand jury in Miami, FL, returned a Superseding Indictment charging eight individuals and eight corporations in connection with their participation in conspiracies to export U.S.-manufactured commodities to prohibited entities and to Iran. They were charged with conspiracy, violations of the International Emergency Economic Powers Act and the United States Iran Embargo, and making false statements to federal agencies in connection with the export of thousands of U.S. goods to Iran. Charges against defendant Majid Seif, also known as Mark Ong, and Vast Solutions alleged that Seif and Vast exported radio control devices and accessories used in Unmanned Aerial Vehicles from a Singapore firm to Malaysia. The radio control devices were then shipped to Iran.

Landstar/Yi-Lan Chen

On February 3, 2010, Yi-Lan Chen, also known as Kevin Chen, was arrested on charges of illegally exporting commodities for Iran's missile program. According to the affidavit filed in support of the criminal complaint, Chen caused dual use goods to be exported from the U.S., including P200 Turbine Engines, which the investigation revealed were for end users in Iran. The P200 Turbine Engines are designed for use as model airplane engines but can also be used to operate Unmanned Aerial Vehicles and military target drones.

Conclusion

The Department of Commerce believes the issue of missile proliferation has never been as important to our national security interests as it is now. A comprehensive export control system is already in place to protect our national security. As noted above, the Department of Commerce is committed to enhancements to that system as needed to ensure it continues to protect our national security.

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[1] We note that the MTCR is not the only international regime that works to prevent the spread of missile-related technologies. The Wassenaar Arrangement, the multilateral export control regime responsible for controls on conventional weapons and related items with both civilian and military (dual-use) applications, has recently imposed complementary controls on the export of UAVs.

Mr. TIERNEY. So Mr. Wolf, not the first time you have given that rap, right?

Mr. WOLF. Excuse me?

Mr. TIERNEY. Not the first time you have given that rap.

Mr. WOLF. No, indeed. [Laughter.]

Mr. TIERNEY. We understand that.

But look, we just finished a panel. I think you were here for at least part of it, if not all of it, where the witnesses on that panel told us there is no way you can get this back in the box. We have Hezbollah out there with UAVs. We have Russia, China, other people on that.

So how successful is our export regime?

Mr. WOLF. Well, it is very successful. There is an active, robust enforcement action. And with respect to the comment that he was making, one thing that I failed to mention but should have, is even with respect to parts and components that aren't specifically listed in either set of regulations or that are not specially designed for use in a UAV, both the MTCR countries and certainly the United States have controls on exports of just about anything to certain end users.

So for example, if a coffee cup or something that is going to be used in developing a UAV were destined for, or from the United States, rather, or a U.S.-origin item re-exported from a third country, if it were destined to a prohibited end user, things that are called either denied entities, which are the list of companies that have participated, many of them, in UAV or other proliferation-related activities that we don't like, or what the Treasury Department's Office of Foreign Assets Control maintains are called specially designated nationals.

If somebody were exporting something to one of those entities or individuals, that would be prohibited without U.S. Government authorization, which of course would be denied.

Similarly, even if not to an entity or an end-user that has been listed by the U.S. Government, our regulations, the Commerce regulations have what are called general prohibitions on exporting just about anything that is subject to the EAR, to anyone and a certain group of countries if it is with respect to certain types of UAVs, or to just about anyone in most countries if there is knowledge or reason to believe, it is a fairly broad standard, that it is destined for a UAV production-related or for a weapons of mass destruction-related end use.

So what he was referring to is that there are some things that are so common that they just simply can't be controlled. I understand the point, but what it failed to take into account are the very broad controls, the catch-all controls over prohibited end uses and prohibited end users.

Mr. TIERNEY. So I guess that leaves us then with a question of who are the member participants in the missile technology control regime and other similar protocols and who is not?

Mr. WOLF. Well, it is funny you should ask, because I can leave this for you, if you like. It is, I think, about 34 members.

Mr. TIERNEY. I would like it, if you have it there. We would certainly like to put that on the record.

Mr. WOLF. I will enter it into the record, of who the members are.

Mr. TIERNEY. Now you can tell us, is Iran in the group?

Mr. WOLF. Well, no, no. With respect to Iran and four other countries——

Mr. TIERNEY. Russia, China.

Mr. WOLF. No, China is not a member of the MTCR.

Mr. TIERNEY. Pakistan?

Mr. WOLF. Pakistan is not a member of the MTCR. But a couple of things. With respect to Iran and Sudan and Syria and Cuba and North Korea, there is an absolute embargo on all items that are of U.S. origin or which would capture and control anything, whether it is for a UAV or not.

Mr. TIERNEY. But no cap on China selling them similar technology or Pakistan selling similar technology or whatever. So we have it coming out of this country back and forth, but no international agreement to which they are a member that might stop them from doing that.

Mr. WOLF. I don't know the scope of China's efforts or not in an open session to sell UAV-related technology to Iran, Pakistan or any of the other countries. But I can, with respect to China in particular, to the extent that U.S.-origin items would be used in an activity, there is something called the China rule, informally, or a China catch-all, depending on who you speak to, but really it is a requirement that for even items that aren't specific to UAVs, like general purpose avionics, if the exporter or re-exporter knows or has reason to believe, again, a very open standard, that the item is destined to China and destined for a military end use, again even if something that otherwise wouldn't require a license for export to China, a license is required from the U.S. Government before exporting it.

Mr. TIERNEY. Thank you.

And very quickly, Mr. Weatherington, you say the problems that Mr. Sullivan pointed out in terms of compatibility are solved. He got the message. It is already done.

Mr. WEATHERINGTON. Sir, we are working on those challenges. As Mr. Sullivan pointed out, there has been very rapid growth in this technology area. And to provide the warfighter the capabilities he needed in many cases, and some that were talked about in the first panel, DOD procured capabilities we currently had. Those, in some cases, did not achieve the full interoperability and commonality that the Department would like to have so we are working on those.

My written testimony has many examples of areas where OSD, working with Joint Staff and the services, are working hard to improve our interoperability and commonality. But today, we do have systems that aren't fully integrated into the manner that we would like them to be.

Mr. TIERNEY. OK. I will get back to Mr. Sullivan and ask him his opinion on that in a second.

Mr. Flake.

Mr. FLAKE. I just wanted to followup on that.

Mr. Weatherington, it is just a little baffling that, if we are talking about old systems that have been around a long time, and after

9/11 obviously the effort we spent a lot of money at Department of Homeland Security for interoperability, whether it is firemen being able to communicate with whomever or whatever.

But you would think with relatively new technology like this that ought to be the least of the problems; that if we are acquiring and procuring these, that ought to be assumed, I guess, that there would be interoperability. So it just surprises me that is still a problem. Do you want to elaborate on that?

Mr. WEATHERINGTON. Sure, sir. For example, the Air Force began procuring Predator manned aircraft systems in 1994. At the time we were procuring those systems, the Department did not have a fully interoperable data link for that class of system. So what was procured was a commercial C-band datalink that met the specific requirements of Predator but was not fully integrated into the DOD force structure.

Congress has weighed in on that and provided direction to the Department that all the services should migrate to a common standard, which we call a common datalink [CDL]. We are in the process of doing that. That datalink has many advantages. One of the advantages is it is a fully digitized link. It also provides full encryption for the data being pushed over that datalink.

The limitation was at the time we were buying Predator, a datalink with that capability did not exist in a form factor that we could get on Predator. And so the decision was made the Department would take some risk in some areas, datalinks being one of them, to provide the warfighter with the immediate requirement we had.

At the same time, the Department is working very hard to go back and upgrade those systems, define interoperability interfaces where they don't exist, require those interfaces where they do exist across the services.

Mr. FLAKE. Mr. Sullivan, do you have anything to add to that?

Mr. SULLIVAN. Yes. I would bring up between the Army's Sky Warrior and the Air Force's Predator Program is probably the most blatant experience that we had with the ability to look at requirements for the warfighter in two different services and come to some common agreement, and it just didn't happen.

And that was, if you refer to my written statement, we tracked the history of the ability of the Office of the Secretary of Defense and the Under Secretary for Acquisition, Technology and Logistics, to try to force that. As I stated in my oral statement, at least a half billion dollars were spent to start an Army program office and a separate development program when the Army was looking for basically the same characteristics and the same capabilities that the Air Force had with the Predator. So that is one example.

There is another example with the Fire Scout, where the Navy and the Army basically could have bought the same system, but the Army decided that they wanted a datalink that would be compatible with the future combat systems, which as we know now has been terminated. And in fact, the Army's version of Fire Scout has been terminated, too. That established two separate programs because they couldn't get together on the datalink.

It is things like that. There is a high-performance kind of a parochial culture across the services that I think a lot of people under-

stand, but in today's environment where every dollar counts, and in addition to that we have an opportunity with this new technology to be more standard and common, it is just our belief that the services should try harder to find these commonalities, especially when the Department itself is pointing it out to them and requesting that they work harder to do that.

Mr. FLAKE. Thank you. That is helpful.

Mr. Wolf, it would seem that in terms of export controls, as the chairman said, this is pretty much off the shelf stuff when it comes to the units themselves, whatever we are talking about. It is the communications side of it, the software, I guess it is. Is that where most of your focus really is? Or if not, why not? Because it would seem that the ability of others to get a hold of the software and I guess, some hardware to interfere with communications here would be the problem that we ought to worry about.

Mr. WOLF. Going to the question of what the focus is, it depends on what you are talking about with respect to particular export-related transaction. If it is an off the shelf item, for example, that wasn't specially designed or modified for a UAV and isn't otherwise captured or listed on what is called the Commerce Control List, and wasn't somehow specifically designed or modified for a military application, then you are right, it wouldn't be a listed item. It would be an otherwise commercial off the shelf item with multiple applications.

Mr. FLAKE. I guess, in some way, the datalink stuff, that is all proprietary within the military anyway. Is that correct?

Mr. WOLF. I don't know the technology well enough to be able to comment, but if for some reason it was directly related to a military application or otherwise specifically modified for a military end item, then it would be controlled under the other set of regulations.

Mr. FLAKE. Thank you.

Mr. TIERNEY. Thanks.

So Mr. Weatherington, let me get this right. I read your title as Deputy Director, Unmanned Warfare Portfolio Systems Acquisition in the Office of Under Secretary of Defense for Acquisition, Technology and Logistics in the Office of the Assistant Secretary of Defense for Acquisition.

You are responsible for the acquisition oversight for Department of Defense unmanned aerial systems and associated subsystems, including sensors and communication links within all of that alphabet soup I just read on that.

So you are the guy. So how is it, were you not there yet or was it under your watch that the Army and the Air Force ignored the directive to work cooperatively and have some commonality?

Mr. WEATHERINGTON. Sir, I was there. And we had oversight over that acquisition that grew out of the requirements process. The Army ER/MP Program came through the JCIDS process. And that process first——

Mr. TIERNEY. Could you spell that out for the record, JCIDS?

Mr. WEATHERINGTON. J-C-I-D-S.

Mr. TIERNEY. You are not going to get off that easy.

Mr. WEATHERINGTON. And it is Joint Service——

Mr. TIERNEY. The temptation is there, though, isn't it? [Laughter.]

Mr. WEATHERINGTON. It is joint capability requirements process.

Mr. TIERNEY. Thank you.

Mr. WEATHERINGTON. When the Army requirement for ER/MP came in, the Department's position is that we always look to current solutions to meet those warfighter requirements. So the Army's requirement was looked at against the Air Force Predator Program and the JCIDS process, including up to the vice chairman of the Joint Chiefs of Staff, determined that Air Force solution did not meet the Army requirements.

Now, the Army fully competed that program, which was core to the AT&L goals of maximum competition where we can get it. The competitor who won that program was the same competitor who built the Air Force Predator Program. And I would characterize that the Army took a good Air Force design and made it better.

Mr. Sullivan has identified that there were unique requirements between the two systems that did not afford identical subsystem capabilities and the datalink happens to be one of those. The Army has a relay requirement that the Air Force does not have, and OSD and Joint staff spent a lot of time at the subsystem level doing analysis to determine what subsystems could be common.

There is direction, both out of AT&L and out of Joint staff for the two services to buy a common video system, video ball, for those two programs, which is in my written testimony. We are undergoing a review to look at SIGINT capability on those two platforms that will come over in a congressional report very soon.

But as to the Army simply buying the Air Force Predator system to meet their requirement, the Department's process looked at that and determined that was not sufficient to meet the Army requirement.

Mr. TIERNEY. Was the Army requirement sufficient to meet the Air Force requirement?

Mr. WEATHERINGTON. Well, sir, that is somewhat overcome by events because the Air Force has decided to terminate procurement of Predator in lieu of the larger Reaper system that they are procuring today.

Mr. TIERNEY. So here is what I think, or what I see as a potential problem here or whatever, too many cooks in the kitchen. If we are talking about unmanned aerial vehicles and we have a number of different services, obviously, but we have one Department of Defense, and we continue to let each department, each service go off and do its own thing, as if they were all in the different military in their own right and working for some other government.

I don't know, but my understanding of having the Department of Defense and having a Joint Chiefs of Staff's operation here was to get some uniformity across the way and have somebody make some decisions with some discipline at the top that would say, "all right, you tell me what you want; you tell me what you want, but we are going to get one for the two or three or four of you or whatever that works best for everybody, and then maybe we could do little subsets off of it. We are not going to do eight or nine because yours isn't exactly like yours is."

That gets tremendously expensive. We don't have unlimited amounts of money. We just don't have it. You know that from your own work. So why don't we see a better structure with more discipline and somebody stand up to the different services and say, this can't go on?

That is what I think your role at DOD is. I am not putting this on you. I understand you are the Deputy Director and deputies only get to do so much, whatever, but isn't somebody there thinking along those lines and saying, "look, this just doesn't make sense. We haven't got an unlimited pocketbook here?"

Mr. WEATHERINGTON. Mr. Chairman, that is a very fair question and I would articulate that the Department is doing a very good job of that. Again, in my written testimony, there are several examples of where, through OSD and Joint Staff encouragement, we have gotten all the services to procure identical or virtually identical systems.

Mr. Sullivan commented on the Marine Corps decision to buy the Army Shadow system. They are buying that.

Mr. TIERNEY. Well, it sounds like it sometimes works and sometimes doesn't.

Mr. Sullivan, what do you say to my question?

Mr. SULLIVAN. Well, I would agree with that. As we understand the position of the Under Secretary of Defense for Acquisitions, Technology and Logistics, that is the position that should be making these decisions, and we don't see that.

Mr. TIERNEY. Instead, each of the services is making the decision.

Mr. SULLIVAN. We don't see that happening. The services, and there is enough that you are getting into here that could be a whole different hearing on acquisitions.

Mr. TIERNEY. Well, I suspect we might. I mean, somebody is going to set priorities here, and sometimes you have to say no. And so maybe this service's request isn't as important as somebody else's and one has to be delayed a little and the other has to be expedited.

Mr. SULLIVAN. Yes.

Mr. TIERNEY. That is, I would think, the referee's job here at the Department of Defense and that acquisition group on that.

Mr. SULLIVAN. And certainly——

Mr. TIERNEY. Maybe that is important, I think, for another hearing some day.

Mr. SULLIVAN. Certainly, Mr. Weatherington, like you stated, I mean, this isn't the only place that this happens. This is all over.

Mr. TIERNEY. Yes, this is not a blame game thing. You guys are all working as hard as you can and we appreciate that, but I guess it is our job, sitting where we are sitting, to start helping people focus a little bit here and thinking of different ways to do it. Prioritization would be one thing on that. Putting some central management and discipline into it would be another way to go about it.

And the other part that we haven't got into today but will probably be part of any future hearing that we do on this, we continue right across all acquisitions to see too few really qualified managers, too few qualified schedulers. So that even when we try to

have oversight, we have just been hollowed out a little bit. We don't find that we have the resources.

We have talked about this with the people in various aspects of that agency on that. And we are going to have to find out what the Department of Defense's plan is to get people in. I know it is competitive financially. Some people get a better job going off to the private sector and it is hard to entice people. So what is our plan to turn that around? What is our plan so that when we go to production with something we have good schedulers who keep us on line, good product managers to keep us on line, and somebody to say, no, we are not going to change this 15 times along the path here, which helps escalate the costs all the way up. So we probably will get into that at a little bit more.

Mr. Flake, do you have any additional questions you want to ask on that?

I do think that this is going to probably require us to talk a little bit about the subsystems and the commonality between those uniqueness needs and things of that nature. We want to talk with the idea of how do we not stifle innovation while we are doing that and all of those things at another point.

Let me give each of you the opportunity to tell me what we should have asked you or should have explored here that we should bring up at the next meeting if we can.

Mr. Sullivan.

Mr. SULLIVAN. Well, I think I just would say that it is an exciting area to be in. And we were just kind of going through all the problems with the acquisition process, and certainly this isn't immune to it, but what I see with unmanned systems is an opportunity to really capitalize on standardization and plug and play kind of thing.

And I would also say that the road map that Mr. Weatherington's office has published has goals in it that I think are goals and priorities that are pretty sound, but somebody has to listen to them. And a lot of them drive toward commonality standardization as a way to reduce duplication and save money in the acquisition process.

Mr. TIERNEY. When would be an appropriate time, Mr. Sullivan, for us to ask GAO to take a look at the performance of the Department in meeting those goals, giving them time to get them up and running before we start trying to critique them?

Mr. SULLIVAN. That might be something that—well, the latest road map was, when was that issued?

Mr. WEATHERINGTON. Late last year.

Mr. TIERNEY. Mr. Weatherington, what do you think is a fair time for us to ask Mr. Sullivan's group to take a look and see how close you are adhering to that?

Mr. WEATHERINGTON. Sir, that is really on your timeline.

Mr. TIERNEY. Well, it is, but I am asking for a recommendation from you. I could ask for it tomorrow and it would seem unfair to you because you just passed the darn things.

Mr. WEATHERINGTON. Yes, sir.

Mr. SULLIVAN. We can probably discuss that with your staff and figure out a way where——

Mr. TIERNEY. Well, let's keep Mr. Weatherington in the loop here so that he doesn't feel like he has an unfair assessment on that. I want it to be constructive. This isn't about, as I said earlier, playing tag with people or anything like that. We want to be able to look at it a little bit out and say it is working or it is not working, how are we doing on these things.

Mr. Weatherington, anything else that we should add?

Mr. WEATHERINGTON. No, sir.

Mr. TIERNEY. OK.

Mr. Wolf.

Mr. WOLF. Just one followup on your China question about exports from China, for example. I forgot to mention that there are various statutes that give the U.S. Government the ability to impose sanctions against foreign companies that are engaged in proliferation-related activities, which would include the export of UAVs and other MTCR-controlled items to Iran and other sanctioned countries.

Those statutes are largely administered by the State Department, but that is another avenue that the U.S. Government has in terms of trying to effect and prevent the flow of non-U.S. origin exports from third countries.

Mr. TIERNEY. Thank you. Thank you.

Let me just leave you with this. Why don't combatant commands' sense of warfighting requirements drive the procurement requirements since we do fight jointly, rather than as individual services?

Mr. SULLIVAN. The combatant commands should have more say in what the requirements are for the weapons systems, I agree. Goldwater-Nichols was a major piece of legislation passed a long time ago that was trying to matrix all that. And if you look at it, I think we did it very well on the operations side, but on the acquisition side it didn't take too well.

Mr. TIERNEY. Do your goals, Mr. Weatherington, sort of get us back in that direction at all, do you feel?

Mr. WEATHERINGTON. Sir, actually one of the goals specifically talked to meeting specific urgent warfighter requirements. And I would articulate that it is difficult to find any other technology in the Department of Defense that in a single decade has made such a tremendous impact on the warfighting capability of the Department.

That is not to say that we have done everything perfectly, because in many cases we had to react very, very quickly. But I believe the process we have today, with the formal acquisition process and the opportunity for warfighters to send in urgent warfighter requirements get equal weight in our acquisition process.

Mr. TIERNEY. Yes, and as I say, these oversight hearings are about getting things perfect in the future more so than beating people up over the past. So the idea is how can we help you. How can our oversight process help you meet the goals, if they are reasonable goals, of getting there so that we do do it in that way. And what is what we will strive for.

We are all set. Thank you all very, very much. Sorry that it went so late because of the votes and things of that nature, but you have been extremely helpful, and I suspect we may be getting you back to take advantage of your expertise sometime in the future as well.

The meeting is adjourned.
[Whereupon, at 5:26 p.m., the subcommittee was adjourned.]
[Additional information submitted for the hearing record follows:]

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MTCR

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MTCR Partners

Argentina (1993)	Greece (1992)	Portugal (1992)
Australia (1990)	Hungary (1993)	Republic of Korea (2001)
Austria (1991)	Iceland (1993)	Russian Federation (1995)
Belgium (1990)	Ireland (1992)	South Africa (1995)
Bulgaria (2004)	Italy (1987)	Spain (1990)
Brazil (1995)	Japan (1987)	Sweden (1991)
Canada (1987)	Luxembourg (1990)	Switzerland (1992)
Czech Republic (1998)	Netherlands(1990)	Turkey (1997)
Denmark (1990)	New Zealand (1991)	Ukraine (1998)
Finland (1991)	Norway (1990)	United Kingdom (1987)
France (1987)	Poland (1998)	United States of America
Germany (1987)		(1987)

Membership

As with all MTCR decisions, the decision to admit a new partner is taken by consensus. In making membership decisions, partners tend to consider whether a prospective new member would strengthen international non proliferation efforts, demonstrates a sustained and sustainable commitment to non proliferation, has a legally based effective export control system that puts into effect the MTCR Guidelines and procedures, and administers and enforces such controls effectively. The Regime's dialogue with prospective partners is conducted through the MTCR Chair, visits to capitals by teams comprised of representatives of four MTCR partners and bilateral exchanges. The group does not have an observer category.

MTCR Plenary Meetings

MTCR partners hold an annual Plenary Meeting chaired on a rotational basis (see below for a list of MTCR Plenaries). The Plenary host becomes the Chair of the MTCR for the period extending to the next Plenary. Technical Experts Meetings, Information Exchanges and Enforcement Expert Meetings are held on an ad hoc basis. The MTCR has no secretariat. Distribution of the Regime's working papers is carried out through a Point of Contact (POC), the functions of which are performed by the Ministry of Foreign Affairs of France. Intersessional consultations also take place monthly through POC meetings in Paris, occasionally reinforced with capitals-based officials.

September 1988	Italy
December 1989	United Kingdom
July 1990	Canada
March 1991	Japan
November 1991	USA
June 1992	Norway
March 1993	Australia
November 1993	Switzerland
October 1994	Sweden
October 1995	Germany
October 1996	UK
November 1997	Japan