NONPROLIFERATION: ASSESSING MISSILE TECHNOLOGY EXPORT CONTROLS

HEARING

BEFORE THE

SUBCOMMITTEE ON NATIONAL SECURITY, EMERGING THREATS AND INTERNATIONAL RELATIONS

OF THE

COMMITTEE ON GOVERNMENT REFORM

HOUSE OF REPRESENTATIVES

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NONPROLIFERATION: ASSESSING MISSILE TECHNOLOGY EXPORT CONTROLS

TUESDAY, MARCH 9, 2004

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON NATIONAL SECURITY, EMERGING
THREATS AND INTERNATIONAL RELATIONS,
COMMITTEE ON GOVERNMENT REFORM,
Washington, DC.

The subcommittee met, pursuant to notice, at 2:05 p.m., in room 2154, Rayburn House Office Building, Hon. Michael Turner (vice chairman of the subcommittee) presiding.

Present: Representatives Shays, Turner, Burton, Duncan, Ruppersberger, and Tierney.

Staff present: Lawrence Halloran, staff director and counsel; J. Vincent Chase, chief investigator; Robert A. Briggs, clerk; Anna Laitin, minority communications and policy assistant; Earley Green, minority chief clerk; Jean Gosa, minority assistant clerk; and Andrew Su, minority professional staff member.

Mr. TURNER. A quorum being present, the Subcommittee on National Security, Emerging Threats and International Relations, entitled, "Nonproliferation: Assessing Missile Technology Export Controls," is hereby called to order.

Cruise missiles and unmanned aerial vehicles [UAVs], pose a growing threat to U.S. interests at home and abroad. Available, affordable and versatile, these technologies offer rogue nations and sub-state actors access to strategic capabilities previously beyond their reach. The burgeoning global marketplace of military and commercial systems means our battlefield and homeland defenses will face profound challenges from the thick catalog of pilotless machines some call the poor man's air force.

According to the Congressional Research Service, as of last year, 161 UAV production programs operated in 50 nations. The arsenals of 75 nations currently contain 131 different types of cruise missiles. By one estimate, an enemy with $50 million to spend could buy just one or two advanced tactical fighters, 15 ballistic missiles or 100 off-the-shelf, ready-to-fire cruise missiles, each carrying a substantial conventional payload. Slower and small UAV systems from model airplanes to GPS-enabled rotary wing craft can be effective purveyors of chemical or biological weapons. A standard sized cargo container on the deck of a freighter approaching our coast could conceal a cruise missile and launcher.

Numerous commercial UAV applications and the ready availability of dual-use components like guidance systems make controlling the spread of sensitive technologies extremely difficult. Many of the

systems sought by proliferators literally and figuratively fly under the defensive radars arrayed against them. To prove the point, a New Zealander with only limited aerospace expertise was able to obtain all of the components needed to build a homemade cruise missile last year. He apparently broke no laws while procuring an airframe, propulsion plant and guidance and control systems for less than $5,000.

The dimensions of this rapidly emerging threat compel us to ask, what is being done to keep these lethal technologies from falling into the wrong hands? Are cold war era counterproliferation strategies focused on system range and payload limits relevant against a post-September 11 threat characterized by rapid technology innovation, miniaturization and a highly adaptable enemy? Do national and international export control regimes effectively limit the flow of the most advanced components that define our current technological advantage in the cruise missile and UAV fields?

To help us address these issues, we asked the General Accounting Office to assess international counterproliferation efforts and evaluate U.S. programs to verify that UAV and cruise missile technology exports are used as intended. The GAO findings released last week point to gaps in export license reviews and post-shipment monitoring. GAO recommends far more aggressive use of end-use verification and inspections by the Department of Commerce, Defense and State.

We will hear testimony this afternoon from two panels of experts. The first will describe the scope of the problem. The second panel will discuss the complex international and interagency export control process used to limit the diversion of critical UAV and cruise missile technologies.

We appreciate the experience and insight of all of our witnesses and what they bring to our oversight of these issues, and we look forward to their testimony.

Now I would like to recognize my colleague, Mr. Ruppersberger.

[The prepared statement of Hon. Christopher Shays follows:]

Statement of Rep. Christopher Shays
March 9, 2004

Cruise missiles and unmanned aerial vehicles (UAVs) pose a growing threat to U.S. interests at home and abroad. Available, affordable and versatile, these technologies offer rogue nations and sub-state actors access to strategic capabilities previously beyond their reach. The burgeoning global marketplace of military and commercial systems means our battlefield and homeland defenses will face profound challenges from the thick catalogue of pilotless machines some call "the poor man's air force."

According to the Congressional Research Service, as of last year 161 UAV production programs operated in 50 nations. The arsenals of 75 nations currently contain 131 different types of cruise missiles. By one estimate, an enemy with $50 million to spend could buy just one or two advanced tactical fighters, fifteen ballistic missiles, or 100 off the shelf, ready to fire cruise missiles each carrying a substantial conventional explosive payload. Slower and smaller UAV systems, from model airplanes to GPS-enabled rotary wing craft, can be effective purveyors of chemical or biological weapons. A standard-sized cargo container on the deck of a freighter approaching our coast could conceal a cruise missile and launcher.

Numerous commercial UAV applications, and the ready availability of dual-use components like guidance systems, make controlling the spread of sensitive technologies extremely difficult. Many of the systems sought by proliferators literally and figuratively fly under the defensive radars arrayed against them. To prove the point, a New Zealander, with only limited aerospace expertise, was able to obtain all the components needed to build a homemade cruise missile last year. He apparently broke no laws while procuring an airframe, propulsion plant, and guidance and control systems for less that $5000.

The dimensions of this rapidly emerging threat compel us to ask: What is being done to keep these lethal technologies from falling into the wrong hands? Are Cold War-era counter proliferation strategies focused on system range and payload limits relevant against a post-9/11 threat characterized by rapid technological innovation, miniaturization, and a highly adaptable enemy? Do national and international export control regimes effectively limit the flow of the most advanced components that define our current technological advantage in the cruise missile and UAV fields?

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Mr. RUPPERSBERGER. Thank you, Mr. Chairman. At the center of today's discussion is the inherent tension between national security and commercial concerns. This conflict has always existed, but a world more complicated by global trade and terrorism only makes the divide more complicated. Export controls and the laws created to deal with them, both domestic and international laws, are based on states dealing with states. Much of this is based on knowing who our friends are and who our enemies are. This is the way the world once was, but it is not that way anymore.

I understand the business concerns. They need to keep manufacturing lines running and retain highly skilled employees. International trade has allowed many in this industry, including the AAI Corp., the developer and manufacturer of the Shadow UAV located in my district, Maryland's Second Congressional District, to keep production going when U.S. purchases have been sporadic. When export controls are cumbersome or ineffective, U.S. businesses struggle to remain competitive. At a time when we need to grow the American economy and create more jobs, I understand the business perspective well.

But I also understand the national security concerns. Technology improves every day, and the success found in recent conflicts make American products attractive to our enemies as well as our allies. With so many questions about who we are selling to, how what we sell will be used, and potential dual uses of this technology, we cannot ignore threats to our servicemen and women serving abroad or our homeland defense.

My experience on the House Intelligence Committee gives me another perspective on the national security aspect. It leads me to question whether the Intelligence Community provides a satisfactory assessment of the cruise missile and UAV threat to support export control decisions. It makes me wonder if our current export control regimes are sufficiently adaptable to take into account any new threats from cruise missiles or UAVs.

I don't believe GAO included these questions in the scope of their investigation. However, I believe these questions are critical to this discussion and hope they will be a part of today's or future discussions on this topic.

I would like to thank all the witnesses today for their hard work in this area. I look forward to your testimony. Continuing these conversations is critical to strike the right balance between commerce and security. Thank you, Mr. Chairman.

[The prepared statement of Hon. C.A. Dutch Ruppersberger follows:]

Congressman C.A. Dutch Ruppersberger
Subcommittee on National Security, Emerging Threats, and International Relations Hearing
Nonproliferation: Assessing Cruise Missile / UAV Technology Export Controls
Opening Remarks
03.09.04

Thank you Mr. Chairman. I would like once again to thank the leadership of this committee for holding this hearing.

At the center of today's discussion is the inherent tension between national security and commercial concerns. This conflict has always existed, but a world more complicated by global trade and terrorism only makes the divide more complicated.

Export controls and the laws created to deal with them – both domestic and international laws – are based on states dealing with states. Much of this is based on knowing who our friends and enemies are. That is the way the world once was, but it is not that way anymore.

I understand businesses concerns. They need to keep manufacturing lines running and retain highly skilled employees. International trade has allowed many in this industry, including AAI Corporation – the developer and manufacturer of the Shadow UAV located in my district – to keep production going when US purchases have been sporadic.

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Mr. TURNER. Thank you, Mr. Ruppersberger.

I ask unanimous consent that all members of the subcommittee be permitted to place any opening statement in the record and that the record remain open for 3 days for that purpose. Without objection, so ordered.

And I ask further unanimous consent that all witnesses be permitted to include their written statements in the record. Without objection, so ordered.

I'd like to recognize our first panel, which includes Mr. Andrew Feickert, Specialist in National Defense, Congressional Research Service; Mr. Joseph A. Christoff, Director of the International Affairs and Trade Team, U.S. General Accounting Office; and Mr. Dennis M. Gormley, senior fellow, Monterey Institute, Center for Nonproliferation Studies.

Gentlemen, we do swear in our witnesses in this committee. If you wouldn't mind standing, please. Please raise your right hands.

[Witnesses sworn.]

Mr. TURNER. Note for the record that the witnesses responded in the affirmative.

We're going to begin our testimony with Mr. Feickert. We're going to ask that your comments be somewhere in the range of 5 to 10 minutes. We do have the light, so we'll show you when the 5-minute period is concluded, and then you'll have additional time after that to wrap up your comments.

STATEMENTS OF ANDREW FEICKERT, SPECIALIST IN NATIONAL DEFENSE, CONGRESSIONAL RESEARCH SERVICE; JOSEPH A. CHRISTOFF, DIRECTOR, INTERNATIONAL AFFAIRS AND TRADE TEAM, U.S. GENERAL ACCOUNTING OFFICE; AND DENNIS M. GORMLEY, SENIOR FELLOW, MONTEREY INSTITUTE, CENTER FOR NONPROLIFERATION STUDIES

Mr. FEICKERT. Mr. Chairman, thank you for the opportunity to appear before you today to discuss the growing cruise missile threat as delivery systems for both conventional weapons and weapons of mass destruction. Cruise missiles and UAVs are no longer the exclusive domain of a few select countries. They are widely available throughout the world. At present there are reportedly about 130 cruise missile types——

Mr. TURNER. Mr. Feickert, I appreciate that you've turned on the microphone. Could you also move it just a little bit closer, please?

Mr. FEICKERT. Yes, sir—in the hands of about 75 different countries. According to experts, there are 161 operational UAV programs in 50 different countries.

Because pilots and aircraft are not put at risk, cruise missiles and UAVs are very attractive systems——

Mr. SHAYS. I'm sorry, Mr. Chairman. Could you just please move the mic a little closer?

Mr. FEICKERT. Is that better, sir?

Mr. SHAYS. Yes.

Mr. TURNER. I think it's a little bit directional. Perhaps if you'd put it in front of you and point it directly out, it might allow us to all hear better. Thank you.

Mr. FEICKERT. Because the pilots in aircraft are not put at risk, cruise missiles and UAVs are very attractive systems, particularly

in countries with small or less than capable air forces. Some analysts believe that countries with cruise missiles and UAVs might be more inclined to conduct high-risk operations against better equipped countries such as the United States. These systems are easy to build or acquire. One report predicts that 6,000 to 7,000 land attack cruise missiles could be sold by the year 2015, excluding United States, Russian and Chinese sales.

Despite MTCR restrictions, many countries produce cruise missiles which fall just under the regime's parameters or modify missiles proscribed by the MTCR to produce a less capable variant. If acquiring a land attack cruise missile proves to be too difficult or too expensive, it is possible to convert an antiship cruise missile such as the SS-N–2, Styx, which is found in the inventories of more than 20 different countries.

UAVs, which are also covered under the MTCR, can be acquired on the international market as complete, ready-to-fly systems or can be built from scratch or by converting an existing manned aircraft.

Most experts agree that any country or group with even a modest aerospace program can readily build UAVs with common dual-use aviation technologies.

These systems are very affordable. As previously noted, a country with $50 million to spend by can buy 1 or 2 advanced tactical fighters, 15 ballistic missiles or 100 cruise missiles.

The chart before you helps to further illustrate this point. In addition to being affordable, these systems are accurate. Cruise missiles with global positioning system or GPS guidance can strike their targets within a few meters of their intended aim point. Both cruise missiles and UAVs are versatile. Cruise missiles can be launched from an aircraft which can significantly extend the range or they can be launched from surface ships, submarines or also from ground positions.

The UAV's versatility as a dual-use system is why many experts believe that it could be very difficult to regulate them under nonproliferation or export control regimes. But unlike the cruise missile, which has little utility outside the military arena, there are a host of nonmilitary uses for UAVs.

Cruise missiles are very difficult to defend against because of their small size and their ability to fly unpredictable routes at low altitudes. Defending against cruise missiles is further complicated if the cruise missile employs stealth technologies which are available worldwide and are being incorporated into a number of new designs.

Cruise missiles also challenge missile defense systems. According to defense officials, the Patriot system when currently employed in its ballistic missile defense mode, has limited ability to detect and engage incoming targets at 100 meters or less.

UAVs offer their own defensive challenges. Smaller propeller-driven UAVs flying slower and closer to the ground may escape detection by ground and air based radars. Higher flying larger UAVs can employ stealth technologies which can improve their chances of penetrating hostile airspace.

Even though cruise missiles and UAVs offer a variety of challenges, it is important to note that the majority of these systems

pose only a local or regional threat. Currently only a few cruise missiles and UAVs have a range of 1,000 kilometers or more.

A wide variety of conventional munitions have been developed for cruise missiles. A less extensive array of warheads is currently available for UAVs. This is due to the payload capacity of most of today's UAVs, which were originally intended to serve as information gathering platforms.

United States and foreign efforts to develop unmanned combat aerial vehicles [UCAVs], will likely expand the conventional weapons utility of UAVs.

The United States has developed the majority of special payloads that are currently available for cruise missiles. In 1991, the United States reportedly used Tomahawk cruise missiles filled with chemically treated carbon graphite filaments to short out Iraqi electrical transformers and switching stations. Special payloads under consideration for UAVs include microwave weapons as well as ballistic missile defense interceptors. Other nations could also develop special warheads for their own systems.

Cruise missiles can deliver nuclear weapons. Currently only the United States and Russia have nuclear cruise missiles, although China is reportedly developing a new cruise missile with nuclear potential. Many analysts agree that nuclear cruise missiles are currently outside the technical range of most countries, as most Third World nuclear warhead designs are too large and too heavy for cruise missile use.

UAVs could also be used to deliver a nuclear weapon, but in addition to size and weight constraints, the UAV's ability to penetrate air defenses might be somewhat limiting.

Both cruise missiles and UAVs could be effective for delivering biological agents because of their ability to dispense payloads at subsonic speeds, thereby ensuring survivability of the biological agent.

Cruise missiles that use advanced guidance systems and onboard sensors could alter their flight profiles to respond to local terrain and weather conditions to provide optimum target coverage. While this advanced capability may at present be within the grasp of only a few countries, less sophisticated attacks with biological agents using cruise missiles and UAVs are certainly within the capabilities of most countries or nonstate actors that could produce or gain access to such weapons.

Cruise missiles and UAVs can also dispense chemical agents. Chemical agents are generally more survivable than biological agents, but larger chemical payloads may be required to achieve the same level of lethality or area of coverage. Most analysts believe that developing a simple chemical warhead for a cruise missile or UAV is well within the technical capabilities of most countries that have these programs and quite possibly within the capabilities of technically adept nonstate groups.

Mr. Chairman, this concludes my remarks. Thank you for the opportunity to appear before you today, and I welcome any questions that you might have.

[The prepared statement of Mr. Feickert follows:]

STATEMENT OF

ANDREW FEICKERT

SPECIALIST IN NATIONAL DEFENSE

CONGRESSIONAL RESEARCH SERVICE

BEFORE THE

HOUSE OF REPRESENTATIVES COMMITTEE ON GOVERNMENT REFORM

SUBCOMMITTEE ON NATIONAL SECURITY, EMERGING THREATS, AND

INTERNATIONAL RELATIONS

HEARING ON NONPROLIFERATION: ASSESSING MISSILE TECHNOLOGY

EXPORT CONTROLS

MARCH 9, 2004

NOT FOR PUBLICATION
UNTIL RELEASED BY
HOUSE OF REPRESENTATIVES COMMITTEE
ON GOVERNMENT REFORM

Mr. Chairman, distinguished members of the subcommittee, thank you for the opportunity to appear before you today to discuss the growing cruise missile and unmanned aerial vehicle (UAV) threat to national security as delivery systems for both conventional weapons and weapons of mass destruction. As you have requested, I will address the following questions:

- What makes cruise missiles and UAVs a threat to U.S. national security ?

- How effective are these systems for delivering conventional as well as nuclear, biological, or chemical weapons ?

Overarching Observations

Before I directly address your questions, I would like to offer you some observations that might be useful when considering today's discussions.

- Cruise missiles and UAVs offer a number of attractive alternatives to countries who are forced to live in a world where even regional military parity no longer exists and resources available for military purposes are becoming increasingly constrained.

- The potential commercial applications for UAVs may make it difficult to regulate their trade as well prevent them from being diverted from commercial to military or terrorist use.

What Makes Cruise Missiles and UAVs a Threat to U.S. National Security ?

U.S. national security is a function of both the security of the United States homeland and the security of its overseas interests, often represented by U.S. military presence at foreign bases on land and U.S. naval presence at sea and in the littoral regions of the world. No one particular aspect of cruise missiles or UAVs makes them any more threatening than other delivery platforms, instead it is the combination of a number of features that make them a potential threat to U.S. national security. I would like to discuss what many experts believe are the eight most important features of these systems.

Proven and Effective

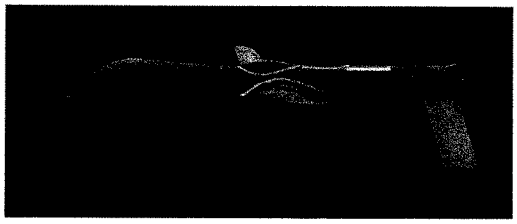
Thanks in large part to the United States, the combat effectiveness of cruise missiles and UAVs has been amply demonstrated to the world on numerous occasions. Their use has ranged from punitive strikes involving a few cruise missiles and attacks against individual terrorists by armed UAVs, to large numbers of systems employed in combined arms combat operations.

Land attack cruise missiles (LACMs) have featured prominently in a variety of U.S. contingency operations in the past decade. In the recent war in Iraq, cruise missiles once again played a crucial role. During three weeks of war, the U.S. used almost 800 cruise missiles, with 40 of them opening the war in an attack on Saddam Hussein's

regime in Baghdad.[1] Of these 800 or so missiles, 7 of them reportedly failed to reach their targets.[2] The Iraqis, who probably gained a keen appreciation of cruise missiles in the 1991 Gulf War, achieved their own cruise missile notoriety by being the first country to attack U.S. ground forces with a cruise missile when the Iraqis fired a CSSC-3 Seersucker Anti Ship Cruise Missile (ASCM) at Camp Commando, the U.S. Marine headquarters in northern Kuwait, on March 20, 2003.[3]

Until recently, military UAVs were used primarily for intelligence, surveillance, and reconnaissance (ISR) purposes. UAVs have shown great value in collecting targeting data, providing near real-time intelligence data, and on surveillance operations, particularly in high threat areas. The arming of U.S. Predator UAVs and their successful use against terrorist targets in Afghanistan and Yemen have only served to further demonstrate their utility and effectiveness. Citing U.S. defense officials, the media reported a single U.S. Global Hawk UAV was credited with providing intelligence that led to the destruction of 13 Iraqi air defense missile batteries and 300 armored vehicles.[4] Recently, Australia's Defense Minister Robert Hill, when announcing a $760 million U.S. dollar plan to buy a squadron's worth of U.S. Global Hawk UAVs stated that: "The success of the Global Hawk in operations in both Iraq and Afghanistan have demonstrated the huge capacity boost these assets can bring." The Defense Minister also noted that these UAVs would be able to assist with civil tasks such as brush fire detection and response.[5]

Figure1: U.S. Predator UAV[6]



Politically Attractive

UAVs and cruise missiles are politically attractive weapons for a number of reasons but one of the more significant ones is that they do not put pilots and aircrews at risk of

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[1] Tony Capaccio, "Raytheon Tomahawks Miss Few Iraqi Targets, Navy Says," *Bloomberg.com*, April 12, 2003.

[2] Ibid.

[3] Michael R. Gordon, "A Poor Man's Air Force," *New York Times on the Web*, June 19, 2003.

[4] Steven J. Zaloga, "UAVs Increase in Importance," *Aviation Week & Space Technology*, January 19, 2004, p. 105.

[5] "Australia to Buy Drone Squadron," *BBC News*, February 4, 2004.

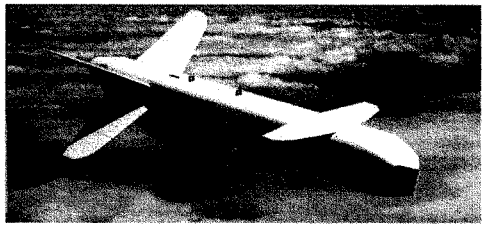
[6] Photo from Department of Defense photo archives.

being killed or captured. For nations such as the United States, where captured pilots in the first Gulf War and Somalia were used as political bargaining tools and for propaganda purposes, the benefits are obvious. For other countries who may not have a large air force and where qualified pilots may be scarce, cruise missiles and UAVs mean not having to risk a pilot and an aircraft. Another feature is cost efficiency. It is far more attractive to risk a cruise missile or UAV which, in some cases, could cost less than a million dollars per system than a multi-million dollar aircraft. Many experts believe that the combination of these two features, no risk to pilots and cost efficiency, lowers the threshold of use for these weapons. The U.S. government's preference for cruise missiles demonstrated in Iraq in 1993, in Afghanistan and Sudan in 1998, and the Balkans in 1999 significantly lowered the threshold and added the term "cruise missile diplomacy" to our modern lexicon. Recent cruise missile and UAV employment in Afghanistan and Iraq has continued to keep the threshold for their use low.

Widely-Proliferated

At present, there are reportedly about 130 cruise missile types in the world, in the hands of about 75 different countries.[7] **(See Appendix 1)** Of the 75 nations thought to have cruise missiles, 19 of them were considered "producers" and of them only six (India, Japan, Taiwan, South Africa, Iran, and Syria) were considered non-exporters[8], although India and South Africa's status may be in doubt. The joint Russian-Indian Brahmos, the recently developed state-of-the art supersonic anti-ship cruise missile, has completed its trials and is being fielded to the Russian and Indian armed forces, and reportedly will be offered for sale to Third World countries.[9] South Africa's TORGOS land attack cruise missile, which is expected to be fielded sometime this year, is reportedly considered a prime export candidate by U.S. intelligence officials.[10]

Figure 2: South African TORGOS Cruise Missile[11]



[7] Michael E. Dickey, "Chapter 6, The Worldwide Biocruise Threat, The War Next Time - Countering Rogue States and Terrorists Armed with Chemical and Biological Weapons," United States Air Force Counterproliferation Center, Maxwell Air Force Base, Alabama, November 2003, p. 156.

[8] Ibid.

[9] Anupama Katakam, "India's Supersonic Cruise Missile," *Frontline - India's National Magazine*, Volume 18, Issue 13, June 23 - July 6, 2001, p. 1.

[10] Robert Wall, "Growing Threat - Countries Increase Focus on Land-Attack Cruise Missiles," *Aviation Week & Space Technology*, August 25, 2003, p. 38.

[11] Photo from "Ballistic and Cruise Missile Threat," National Air & Space Intelligence Center, Wright-Patterson Air Force Base, Ohio, February 2003, p. 24.

One report indicates that U.S. intelligence officials believe that state-sponsored developmental efforts are shifting from the production of shorter-range, less sophisticated, anti ship cruise missiles to longer-range land attack cruise missiles.[12] Some experts estimate that China may have hundreds of land attack cruise missiles by 2030 and Iran may have many tens of cruise missiles and Syria and Libya could have in the low tens of these missiles by 2030.[13]

While there are apparently no public domain reports on proliferation of land attack cruise missiles to non-state actors, it is possible that terrorists could acquire them by a variety of means. Terrorist organizations could conceivably purchase complete cruise missiles or the components necessary to build one through a surrogate nation or through a dummy or front corporation. Another way of acquiring a cruise missile would be through converting an anti ship cruise missile into a land attack cruise missile.

As of October 2003, there were a reported 161 operational UAV programs in 50 different countries[14] with the majority of the programs residing in the United States, Israel, Russia, and in Europe (primarily the United Kingdom, France, and Germany).[15] **(See Appendix 2)** According to one study, Europe is expected to double its share of the world UAV market by 2010 and Israel, an early proponent and significant exporter of UAVs, will continue to be a major innovator in the UAV field.[16] Because UAVs have numerous non-military applications and a demonstrated civilian market, it will likely be difficult to predict the scope of their proliferation.

Easy to Build or Acquire

According to one senior DOD official, "if you want to see how easy it is to acquire a cruise missile or UAV, just visit any international air show and see how aggressively they are marketed."[17] One market analysis predicted that 6,000 to 7,000 LACMs could be sold by 2015 - - excluding U.S., Russian, and Chinese sales.[18] Despite Missile Technology Control Regime (MTCR) restrictions, many countries either produce cruise missiles which just fall under the regime's parameters or modify missiles proscribed by the MTCR to produce a "less capable" variant [19] such as the SCALP/Storm Shadow version of the French APACHE stealthy cruise missile. If acquiring a cruise missile proves to be too difficult or expensive, it is possible to convert shorter range, anti ship cruise missiles, which are found in upwards of 75 different countries.

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[12] Wall, p. 38.

[13] Ibid., p. 32.

[14] Geoff S. Fein, "Ballistic, Cruise Missile Proliferation Worries U.S.," *National Defense*, October 2003, p. 3.

[15] J.R. Wilson, "UAVs: A Worldwide Roundup," *Aerospace America Online,* [http://www.aiaa.org/aerospace/Article.cfm?issuetocid=365&ArchiveIssueID=39], June 2003.

[16] Zaloga, p. 108.

[17] Dickey, 156.

[18] Robert Wall, "Cruise Missile Threat Grows," *Aviation Week & Space Technology*, July 27, 1998, p. 24.

[19] Ibid., p. 57.

Figure 3: Black Shaheen Export Verison of the French SCALP-EG Cruise Missile[20]

One such anti-ship cruise missile, the Styx-class (SS-N-2/SSC-3), is considered by some experts one of the most easily converted missiles, largely due to its available on-board space, its conventional aircraft-like construction, and its large warhead.[21] The Styx liquid rocket engine can be replaced with a turbojet to extend range and its guidance system can be replaced with a modern/compact inertial navigation system (INS)/global positioning system (GPS) system to provide sufficient accuracy for land attack operations.[22] At least 20 countries including Angola, Cuba, Ethiopia, India, Libya, North Korea, Somalia, Syria, and Yemen are believed to have the Styx and India, North Korea, and possibly Egypt produce the missile.[23]

UAVs, also covered by the MTCR, can also be acquired on the international market as complete, ready-to-fly systems, including ground control stations (**See Appendix 3**), or can be built from scratch or from a kit or by converting an existing manned aircraft. Most experts agree that any country or group that has even a modest aerospace industry can readily build UAVs with common, dual-use, aviation technologies.

Affordable

Relative to combat aircraft and ballistic missiles, cruise missiles and UAVs are affordable to most nations and possibly to some financially well-off, non-state actors. As one senior U.S. official asserted, " an enemy with $50 million dollars to spend could buy one or two advanced tactical fighters or 15 ballistic missiles with three launchers, or 100, off-the-shelf, ready to fire cruise missiles, each potentially carrying a weapons of mass destruction (WMD) warhead."[24] The table below, which provides some general cost data, helps to further illustrate the relative affordability of these systems:

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[20] Photo from "Ballistic and Cruise Missile Threat," National Air & Space Intelligence Center, Wright-Patterson Air Force Base, Ohio, February 2003, p. 24.

[21] "Cruise Missiles: Potential Delivery Systems for Weapons of Mass Destruction," *U.S. Government Publication*, April 2000, p. 47.

[22] Ibid.

[23] Ibid.

[24] Adam J. Herbert, "Cruise Control," *Air Force Magazine*, December 2002, p. 43.

Table 1: Comparative Costs
(costs in 2004 U.S. dollars)

Aircraft	**Fly Away Cost**
F-15E (U.S.)	$78 million
F-16 (U.S.)	$28 million
Eurofighter	$60 million
MiG-29 (Russia)	$26-31 million (new); $3-12 million (slightly used)
Pilot Training (U.K. military)	$11.3 million per pilot
Cruise Missiles	**Fly Away Cost**
Tomahawk (U.S.)	$608,000
Apache (France)	$1.5 million
SS-N-22 Sunburn (Russia)	$481,000
UAVs	**Fly Away Cost** (less ground control equipment)
RQ1A Predator (U.S.)	$3 million
Seeker (South Africa)	$772,000
Searcher (Israel)	$515,000

Notes: All costs cited are approximate costs for generic versions of the systems. Department of Defense (DOD) deflators from the FY 2004 National Defense Budget Estimate, Office of the Under Secretary of Defense (Comptroller), March 2003, Table 5-6 were used to adjust all costs to 2004 dollars. Unless otherwise cited, all systems costs are from the Teal Group Corporation's *World Military & Civil Aircraft Briefing* and *World Missile Briefing* Briefing Book Series, 2003. Cost data for U.K. military jet pilot training is from U.K. National Audit Office, Ministry of Defense Report on Training New Pilots, HC 880 1999/2000, September 14, 2000. Tomahawk cruise missile cost data is from a U.S. Navy Fact Sheet on the Tomahawk Cruise Missile, updated August 11, 2003.

Accurate

Many analysts believe that the cruise missile's most significant attribute is its accuracy. During the 1980s, LACMs required sophisticated guidance and navigation technologies -- including complex inertial navigation systems (INS), Terrain Contour Matching (TERCOM) guidance for the missile's midcourse phase of flight, and Digital Scene Matching Area Correlation (DSMAC) systems for terminal guidance -- technologies that were available to only a few nations, such as the U.S., U.K., the Soviet Union, and France.[25] This situation changed in the 1990s with the advent of precision navigation and guidance technologies such as GPS, commercially-available high resolution satellite imagery for terrain mapping, and sophisticated geographic information systems (GIS).[26] Unclassified estimates of cruise

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[25] Rex R. Kiziah " The Emerging Biocruise Threat," *Air & Space Power Journal*, March 5, 2003, p. 3.

[26] Ibid.

missile accuracy are between 10 and 100 meters[27] (33 feet and 328 feet, respectively) but some experts suggest that accuracies of almost 1 meter or less are possible. This accuracy permits precise targeting which, in turn, means that less explosives are required to achieve a desired effect. This accuracy can also help to lessen collateral damage which, for some countries, is a significant political consideration.

UAVs employ many of the same guidance and navigation systems that common aircraft or cruise missiles use. UAVs are most commonly controlled and flown to their destinations from ground stations using either line of sight or satellite communications links. More advanced UAVs can be controlled from the air and from ships. Another way of "controlling" a UAV is by pre-programing a flight route into the UAV but this limits the flexibility of the UAV. Accuracy, in UAV terms, is a function of the UAV pilot/flight control interactions or how accurate the pre-programmed flight route is.

Versatile

Cruise missiles are versatile in terms of their mode of delivery, payload configuration, and adaptability. Many cruise missiles can be delivered from a variety of aircraft which can help extend their range. Cruise missiles can be fired from a wide variety of surface naval vessels as well as by submarines. Cruise missiles can also be ground launched from static or mobile sites or from vehicles. Some experts believe that cruise missiles can also be launched by state or non-state actors from modified commercial vessels operating in litoral regions. While this is possible, the missile's targeting, navigation, and power connections would need to be made compatible with the ship's systems -- it is not simply a matter of firing a pre-programed missile from a ship, as some have suggested.[28]

Cruise missiles can be readily fitted with a wide range of payloads including conventional, nuclear, biological, chemical, or "special" payloads. Specifics on payloads and how effective cruise missiles might be in delivering these payloads will be addressed later in this testimony.

Cruise missiles are also adaptable weapons. The cruise missiles from the 1991 Gulf War were highly effective against static targets but were of little use against mobile targets, as the missiles had to be pre-programed for a specific target prior to launch. The U.S. Navy's Tactical Tomahawk (Block IV), scheduled to become operational in mid 2004, addresses this deficiency. The Tactical Tomahawk can be reprogrammed in flight to strike any one of 15 pre-programmed alternate targets or can be redirected to any GPS target coordinates. The Tactical Tomahawk will also be able to loiter over a target area and be directed to a developing target and also use its on-board camera to conduct real-time battle damage assessment.[29] Other countries are believed to be working on similar capabilities, including stealth technology, decoys and countermeasures, and turbofan propulsion to increase range, but the U.S. intelligence community reportedly believes that these sort of technologies currently remain outside the capabilities of most countries.[30]

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[27] "Key Cruise Missile Technologies in Detail," *Center for Defense and International Security Studies (CDISS),* [http://www.cdiss.org/cmtech2.html], Lancaster University, U.K., 1996, p. 1.

[28] "Cruise Missiles: Potential Delivery Systems for Weapons of Mass Destruction," p. 40.

[29] "Tomahawk Cruise Missile", *U.S. Navy Fact Sheet,* August 11, 2003.

[30] Bradley Graham, "Cruise Missile Threat Grows," *Washington Post,* August 18, 2002, p. A01.

The UAV's versatility is considered by many experts as its primary strength as well as the reason why it could be extremely difficult to regulate under nonproliferation or export control arrangements. Unlike the cruise missile, which has little utility or commercial demand outside of the military arena, there are a host of civilian as well as government applications for these systems. It is possible that the demand for UAVs for non-military purposes may make efforts to regulate them ineffective, thereby opening the door for their diversion for military or terrorist use. While UAVs were only about a $1.5 billion dollar segment of the global aerospace market in 2003, their estimated potential for major market growth is significant.[31]

Military UAVs have proven versatile in a number of venues. In terms of scope, UAVs perform missions from the strategic level down to the tactical level, with some smaller UAVs being found at even the platoon level. In terms of mission capabilities, UAVs have been used for some of the following purposes:

- Intelligence, Surveillance, and Reconnaissance,
- Target Acquisition,
- Attack (Air to Ground, Air to Air),
- Suppression of Air Defenses,
- Unexploded Ordnance Detection, and;
- Battle Damage Assessment.

It has also been suggested that UAVs could be used to detect nuclear, radiological, biological, or chemical contamination, to resupply conventional or special operations forces in hostile or denied areas, and, possibly, for medical evacuation of casualties in extreme circumstances. Some UAVs, such as the Global Hawk, with the ability to fly for 13,000 nautical miles and remain aloft for up to 36 hours at a time[32], could provide militaries the ability to keep armed or reconnaissance UAVs "continuously on station" during limited - duration combat operations, affording commanders either near-real time information or the ability to strike targets of opportunity.

According to some experts, the versatility of UAVs in non-military roles is just starting to be appreciated. Some possible UAV applications include, but are not limited to:

- Crop Monitoring and Spraying,
- Pipeline/Powerline/Railline Inspections,
- Facility Security,
- Geological and Petroleum Survey,
- Commercial Fishing,
- Communications Relays, and;
- Freight Delivery.

There are also significant scientific and research applications such as:

- Environmental Monitoring,
- Meteorological and Atmospheric Survey,
- Oceanographic Data Collection,
- Pollution Data Collection, and;

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[31] Zaloga, p. 105.

[32] "Controversial UAV Could Get Leapfrogged by Bush Administration," *Inside the Air Force,* February 16, 2001.

- Terrain Mapping.

There are also a number of possible law enforcement and government-related applications, particularly in the area of homeland security including:

- Highway Control/Traffic Surveillance,
- Firefighting,
- Border/Coastal Security,
- Drug Interdiction,
- Port Security,
- Contaminated Area Monitoring, and;
- Disaster/Emergency Monitoring.

Two current examples of non-military UAV usage include the South African police use of the Seeker II UAV for crowd monitoring and urban surveillance and the use of the Australian Aerosonde UAV for meteorological surveillance in the Asia Pacific region by Australia, Japan, and Taiwan.[33]

A 2002 study by the University of Sydney in Australia not only attests to the versatility and utility of UAVs in non-military roles, but also suggests potential market growth areas for these systems. According to the study, UAVs could qualify for:

- 60% of the Worldwide Environmental Control/Weather Research Market,
- 30% of the Mineral Exploration Market,
- 50% of the Unexploded Ordnance Location Market,
- 80% of the Crop Monitoring Market,
- 5% of the Coastal Surveillance Market,
- 10% of the Marine Resources Remote Sensing Market, and;
- 5% of the News Broadcasting Market.[34]

Difficult to Defend Against

Cruise missiles, in particular, are extremely difficult to defend against because of their physical characteristics and their ability to fly at high speeds at low altitudes. The cruise missile's relatively small size results in low visual, infra red (IR) and radar signatures which enhance the missile's survivability. The reduced radar signature – referred to as radar cross section (RCS) – makes the missile difficult for air defense radars to detect, identify, track, and engage.[35] This problem is further complicated if the cruise missile employs low observable technologies that reduce or minimize signatures. These technologies include infrared suppression of the engine and exhaust and radar-absorbing paints and coatings that reduce the radar reflectivity of leading edges and body surfaces.[36] By means of comparison, the radar cross sections (RCSs) of a number of systems illustrate the potential difficulty in detecting cruise missiles:

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[33] Sara Waddington, "Commercial and Civil Missions for Public Service Agencies: Are UAVs a Viable Option ?," *Unmanned Vehicles,* December 2002, p. 4.

[34] Waddington, p. 5.

[35] Kiizah, p. 4.

[36] "Cruise Missiles: Potential Delivery Systems for Weapons of Mass Destruction", p. 11.

Table 2: Radar Cross Sections of Various Systems

System	Radar Cross Section (in square meters)
Typical Fighter Aircraft	6.0
B-2 "Stealth" Bomber	.75
Tomahawk Cruise Missile	.05
Bird in Flight	.01

Information for this table is taken from Rex R. Kizah " The Emerging Biocruise Threat," *Air & Space Power Journal*, March 5, 2003, p. 5.

This relatively small radar cross section, which could conceivably shrink even more as new stealth technologies are developed, presents challenges for air defense systems which must detect, lock on, and engage cruise missiles. Some analysts suggest that most military air defense fire control radars have a great deal of difficulty in tracking targets with a RCS of .1 square meter or less and even if the missile can be tracked, the radar may not be able to lock onto the target in order to complete the intercept.[37] These challenges could be further exacerbated if the cruise missile employs relatively simple countermeasures such as chaff or decoys.[38]

Cruise missiles also offer challenges to missile defense systems. According to defense officials, the Patriot system, when currently employed in its ballistic missile defense role has "limited ability to see and engage a target approaching at an elevation of 100 meters (330 feet)."[39] The Army's Joint Land Attack Cruise Missile Defense Elevated Netted Sensor or (JLENS) currently under development, consisting of an aerostat with radars, is intended to provide over-the-horizon surveillance for cruise missiles and, if successful, will extend and improve the Patriot's cruise missile detection and engagement range.

Cruise missiles can also avoid detection by following a flight path that avoids known air defense radars and sites and by approaching the target at extremely low altitudes which permits them to blend into ground clutter and to be masked by terrain.[40] Terrain hugging technologies such as satellite navigation, radar altimetry, computerized flight controls, and high resolution satellite imagery, and digital terrain mapping which are both dual use and readily available on the commercial market, are becoming more affordable, putting them within the reach of most nations and some non-state actors.[41]

UAVs also present defensive challenges. Smaller, propeller-driven UAVs flying slower and closer to the ground may escape detection by ground or air based radars. Higher flying and

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[37] Kiziah, p. 5.

[38] Ibid.

[39] Herbert, p. 5.

[40] Kiziah, p. 5.

[41] Ibid.

larger UAVs can also employ low observable or stealth technologies to improve their chances of penetrating hostile air space.

How effective are these systems for delivering conventional as well as nuclear, biological, or chemical weapons ?

The cruise missile's accuracy and ability to accommodate a wide range of payloads makes it a highly effective delivery system for both conventional and non-conventional payloads. UAVs can be employed as a weapons platform from which missiles can be fired or bombs can be dropped in a similar fashion to manned military aircraft but the UAV's effectiveness is dependent on its size and related ability to accommodate weapons and penetrate enemy airspace. UAVs that have warheads that detonate on contact with a target have more in common with cruise missiles than UAVs which, generally, are expected to be re-used after a mission. In order to look at the overall effectiveness of cruise missiles and UAVs, I will discuss a variety of payloads both conventional, special, and non-conventional.

Conventional

There are a wide variety of conventional munitions that have been developed for cruise missiles throughout the world. Most cruise missile payloads are modular in design meaning that the missiles can easily accommodate a wide variety of warheads and any excess space not used by the warhead can be filled with countermeasures or extra fuel to extend the missile's range. The most common conventional warheads are the unitary or semi-armor piercing or (SAP) type. The SAP warhead employs kinetic energy to penetrate soft to medium targets like buildings or ships, and then detonates inside the target to maximize the transfer of blast and fragmentary energy.[42] Cruise missile warheads may also employ shaped charges to penetrate deeply into hardened targets such as underground bunkers or facilities.

Submunitions are also employed very effectively by cruise missiles. Submunitions are smaller, individually fuzed warheads that are ejected aerodynamically or by pressure and are primarily intended to be used against area targets such as airfields or troop concentrations. While highly effective, submunitions must be ejected at a sufficient altitude to achieve the desired coverage. Examples of cruise missile submunitions found worldwide include:

- Combined blast/fragmentation,
- Shaped charges (penetrators),
- Rocket-assisted runway penetrators,
- Incendiary, and;
- Anti-armor.

Current UAVs do not have the extensive conventional weapons delivery capability that cruise missiles have. This is due, in large part, to the size and payload capacity of the majority of the world's UAV fleet which were originally intended to serve as information gathering platforms. The arming of UAVs, most notably the use of AGM-114 Hellfire missiles from U.S. RQ-1 Predator UAVs in Afghanistan and Yemen, has opened the floor to extensive international debate on armed UAVs. Proposals have ranged from putting small explosive charges on small, model aircraft-sized UAVs to placing conventional aircraft ordnance on large UAVs such as the U.S. Global Hawk UAV, with a wingspan greater than a Boeing 737 airliner. U.S. and foreign initiatives to develop unmanned

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[42] "Cruise Missiles: Potential Delivery Systems for Weapons of Mass Destruction," p. 31.

combat aerial vehicle (UCAV) systems will likely expand the conventional weapons utility of UAVs. According to one report, UCAV initiatives are underway in Great Britain, France, Sweden, and Italy.[43] Until actual test results are made publicly available or additional documentation of their use in combat is provided, it is still probably too early to speculate how effective UAVs would be in the delivery of conventional munitions.

Special: The definition of special payloads is subject to interpretation, but for our purposes today, a special payload will be any payload not employing high explosives or WMDs as their primary means of target defeat. While the U.S. has developed the majority of special payloads for cruise missiles, it is reasonable to suggest that other nations could develop similar payloads for their missiles.

The U.S. has reportedly used a Magnetocumulative Generator Warhead (MGW) on cruise missiles during contingency operations prior to April 2000.[44] These non-lethal warheads produce a magnetic field roughly equivalent to a small nuclear bomb and were designed to disable or destroy computers, radio transmissions and electronics, and air defense radars.[45]

During the 1991 Gulf War, U.S. Navy Tomahawk cruise missiles reportedly used BLU-114/B submunitions to attack the Iraqi power grid. The Tomahawks were packed with bomblets that dispensed large numbers of chemically-treated carbon graphite filaments which short-circuited electrical transformers and switching stations.[46] Some reports credit these special cruise missiles with depriving Iraq with up to 85% of electrical generating capacity during the war.[47] One feature of this payload/missile combination is that it can be used to great effect in populated areas where minimal collateral casualties or damage may be desired.

There are reportedly special mission payloads being considered for UAVs. Both the U.S. and Great Britain are reportedly experimenting with mounting microwave weapons on UAVs.[48] Theoretically, microwave pulses from these weapons could follow almost any conduit - electrical lines, waterlines, or antennas - into a deeply buried underground structure and disrupt any electronics inside with large bursts of energy. [49] The United States and Israel are also said to be considering the utility of UAVs for Boost Phase Intercept (BPI) for ballistic missile defense where UAVs, armed with interceptors, would launch them at missiles and their launch systems during the boost phase of flight.[50]

Nuclear: Cruise missiles are potentially effective delivery systems for small nuclear weapons, primarily due to their accuracy and ability to penetrate air defenses. Currently,

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[43] Zaloga, p. 110.

[44] "Cruise Missiles: Potential Delivery Systems for Weapons of Mass Destruction," p. 31.

[45] Ibid, p. 32.

[46] "CBU-94 "Black Out Bomb: BLU-114/B "Soft Bomb," *Globalsecurity.org,* [http://www.globalsecurity.org/military/systems/munitions/blu-114.htm], August 16, 2003.

[47] Ibid.

[48] Robert A. Fulghum and Robert Wall, "UAV Weapons Focus of Debate," *Aviation Week's Aviation Week & Space Technology,* September 25, 2000, p. 1.

[49] Amrith Mago, "Unmanned Aerial Vehicles Go Through Major Expansion," *JINSA Online,* [http://www.jinsa.org/articales/print.html/documentid/1462], April 10, 2002, p. 2.

[50] Ibid., p. 1.

only the U.S. and Russia have air and submarine launched nuclear cruise missiles with yields between 200 and 250 kilotons (KTs)[51] and China is reportedly developing a new cruise missile with nuclear potential.[52] Many analysts agree that longer-range cruise missiles are best suited for nuclear delivery purposes in order to achieve a sufficient stand-off range so that friendly forces avoid the effects of the nuclear detonation. Nuclear cruise missiles are probably outside the technical range of most countries and non-state groups, as most Third World nuclear designs would probably be too large and too heavy for cruise missile use.[53] In a similar sense, UAVs could also theoretically be used to deliver a nuclear weapon, but in addition to size and weight constraints, the UAV's ability to penetrate air defenses might be a limiting factor.

Biological: Cruise missiles and UAVs also have the potential to be effective delivery systems for selected biological agents because of their ability to accurately deliver these payloads at sub-sonic speeds. According to one report, less than 5% of biological agent payload is viable after flight and dissemination from a ballistic missile due to the high thermal and mechanical stresses associated with launch, reentry, and agent release.[54] Cruise missiles and UAVs could use a bulk-filled biological payload or could employ biological submunitions or an aerosol sprayer to conduct a line source attack which would maximize the lethal coverage of the biological agent. Cruise missiles using onboard meteorological sensors, used in combination with an advanced guidance system using GPS and terrain mapping technologies, could enable these systems to alter their flight profile to respond to local topography and micro-meteorological conditions to provide optimum target coverage.[55] While this advanced capability may presently be within the grasp of only a few countries, less sophisticated attacks with biological agents using cruise missiles and UAVs are certainly within the capabilities of most countries or non-state actors who have a biological warfare capability.

Chemical: In a similar fashion, chemical agents can also be successfully dispensed from cruise missiles or UAVs. Chemical agents are generally more survivable than biological agents but larger chemical payloads may be required to achieve the same level of lethality or area of coverage that biological agents can achieve. These larger required chemical payloads could prove to be difficult on some cruise missiles and smaller UAVs. In general terms, most analysts believe that developing a simple bulk-filled chemical warhead for a cruise missile or UAV is well within the technical capabilities of most countries with cruise missiles or UAVs and chemical weapons programs and, quite possibly, for well-financed and technically adept non-state groups.

Thank you, Mr. Chairman and members of the subcommittee. I am pleased to answer any questions that you might have.

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[51] The 1987 Intermediate-range Nuclear Forces Treaty (INF) between the United States and the former Soviet Union banned, among other things, ground-launched nuclear cruise missiles capable of ranges between 500 and 5,000 kilometers.

[52] "Ballistic and Cruise Missile Threat," National Air & Space Intelligence Center, Wright-Patterson Air Force Base, Ohio, February 2003, p. 22.

[53] "Cruise Missiles: Potential Delivery Systems for Weapons of Mass Destruction," p. 32.

[54] Kiziah, p. 224.

[55] Ibid.

Appendix 1: Selected Land Attack Cruise Missiles

System	Country	Launch Mode	Warhead Type	Maximum Range (miles)	Initial Operational Capability
New Cruise Missile	China	Undetermined	Conventional or Nuclear	Undetermined	Undetermined
APACHE-AP	France	Air	Conventional/ Submunitions	100 +	2002
SCALP-EG	France	Air and Ship	Conventional/ Penetrator	300 +	2003
Black Shaheen *	UAE	Air	Conventional/ Penetrator	250 +	2003 +
KEPD-350	Germany/ Sweden/ Italy	Air and Ground	Conventional/ Penetrator/ Submunitions	220 +	2004
Popeye Turbo	Israel	Air	Conventional/ Unitary	200 +	2002
AS-4	Russia	Air	Conventional or Nuclear	185 +	Operational
AS-15	Russia	Air	Nuclear	1,500 +	Operational
SS-N-21	Russia	Submarine	Nuclear	1,500 +	Operational
New Conventional Cruise Missile	Russia	Undetermined	Conventional/ Unitary or Submunitions	Undetermined	Undetermined
MUPSOW	South Africa	Air and Ground	Conventional/ Unitary or Submunitions	125 +	2002
TORGOS	South Africa	Air and Ground	Conventional/ Unitary or Submunitions	185 +	2004 +
Storm Shadow	United Kingdom	Air	Conventional/ Penetrator	300 +	2003

This table is from pages 22 and 23 of "Ballistic and Cruise Missile Threat," National Air & Space Intelligence Center, Wright-Patterson Air Force Base, Ohio, February 2003.

Note: All ranges are approximate and represent the range of the missile only. The effective system range may be greatly increased by the range of the launch platform.

* The Black Shaheen is an export version of the SCALP-EG.

Appendix 2:

The World Wide UAV Roundup Chart found on the next page is taken from J.R Wilson's "UAVS: A Worldwide Roundup", Aerospace America Online, June 2003, [http://www.aiaa.org/aerospace/Article.cfm?issuetocid=365&ArchiveIssueID=39]

Worldwide UAV Roundup

Country	Prime	Designation	Development	Production	Operation	Propulsion	Gross weight, lb	Payload weight, lb	Weapons, lb	Endurance, hours	Range, n.mi.	Ceiling, ft	Mission
AUSTRALIA	Tempest	Vindicator	Complete			Piston	1,050	200		20	110	25,000	
	Aerosonde	Mark V	Complete	Under way									
AUSTRIA	C Craft	Eyrie Mk 7	Complete			Piston	486	165	16.5	15	32	15,000	Multirole
	Schiebel	Camcopter 5.1	Complete	Limited	Limited	Piston	145	20	10 (R)	5	10	2,000	RSTA
BELGIUM	Thales	Epervier	Complete	Complete	Deployed	Turbojet	324	44	5.7	0.5	60	10,000	R
BULGARIA	Aviotechna	Yastreb-2S	Complete	Complete	Deployed	Piston	138	10	11.5	4	27	3,000	Jammer
CANADA	Bombardier	CL-89	Complete	Complete	Deployed	Turbojet	238	40	3.1	0.2	32	10,000	S
		CL-227 Sentinel	Complete	Complete	Deployed	VTOL							Multirole
		CL-327	Complete	Limited		Turboshaft	518	110	13 (R)	6.2	54	18,000	
		CL-427	Complete			Turboshaft	750	150	13 (R)	7	120	18,000	
	Bombardier/Dornier	CL-289	Complete	Complete	Deployed	Turbojet	650	75	4.3	0.5	108	3,900	S/Target Attack
CHINA	BSST	Observer 1	Complete			Piston	22	5	8.8	1.2	3	5,000	Intelligence
	BUAA	Chang Hong 1	Complete		Deployed	Turbojet	3,150	140	32	3	200	57,400	High Altitude Multirole
	NUAA	Solar Bird	Complete			Piston	620	40	19 (R)	4	81	9,800	
	Xian	ASN-206	Complete	Under way	Limited	Piston	488	110	19.7	8	81	19,500	RS
		DP-4 RD	Complete	Under way	Limited	Piston	309	66	14.1	2	54	9,800	RS
CROATIA	RH-ALAN	BL-50	Complete	Complete	Deployed	Piston	117	46	13.1	5	45	5,000	RS
		BLS-B	Complete	Complete	Deployed	Piston	84	32	13.1	3	27	5,000	
CZECH REPUBLIC	VTUL STV	Sojka III	Complete	Under way	Limited	Piston	320	66	13.4	2	54	6,600	RS
FINLAND	IAI (Israel)	Ranger	Complete	Under way	Deployed	Piston	595	86	18.8	5	54	14,700	RSTA
FRANCE	EADS	Hussard 2	Complete			Piston	66	18	11.5	1	4	6,600	
	Aerospatiale	Sarothalb	Under way			Turbofan	11,700	1,100	180	24	OTH	60,000	
	Alcore	Ahmut	Complete			Battery	14	1	11.3	2.5	6	1,000	S
		Chacal 2	Complete	Under way		Piston	170	40	8.7	4	27	10,000	Multirole
		Biodrone	Under way										S
	Altec	MART Mk II	Complete	Under way	Deployed	Piston	242	55	11.2	4	54	9,800	RS
		S-Mart	Complete			Piston	318	66	11.2	7	81	9,800	RSTA
	CAC Systemes	Fox AT2	Complete	Under way	Deployed	Piston	265	55	11.8	5	81	11,500	RS
		Fox TX	Complete			Piston	265	66	11.8	5	81	11,500	EW
		K-100	Under way			Piston	62	11	8.5	0.5	8	9,600	R/Attack
		Helios	Complete	Limited	Limited	Piston	992	265	22 (R)	2.5	54	6,700	RS/EW
	Dassault	AVE	Under way	2007—2010									Stealth Demonstrator
	ECT/ISNAV	Hetel	Under way			VTOL							
	Eurodrone	Brevel	Complete	Under way		Piston	330	66	11.2	6	108	9,800	R/BDA
	Matra	Dragon	Complete	Ready	2010	Rotary	331	66	9.8	2	27	9,600	EW
	Matra/EADS	Eagle 2	Complete	Under way									MALE
		Fregate	Under way										
		TM33	Complete	Under way	Available								S
	Onera	Mirador	Under way										MAV Demonstrator
	SAGEM	Crecerelle	Complete	Complete	Deployed	Piston	298	77	10.8	6	49	13,100	RSTA
		Marula	Complete			Rotary	298	77	7.2	5	54	13,100	Follow-on to Crecerelle
		Mopyen Duc											Slow-Fast Tactical Stealth
		Sperwer/Ugglan	Complete	Under way	Deployed	Piston	573	99	13.8	8	81	16,400	S/Target Attack
	Survey-Copter	Copter 1/2	Complete	Under way	Deployed	Piston	40	10	6.0 (R)	2	3	1,600	Observation
	Techno Sud	Vigilant F2000	Complete			Piston	93	18	6.2 (R)	1	16	9,800	
		Vigilant F 5000	Under way			Piston	130	220	15.7 (R)	3.5	15	6,600	
	IAT	MK-106C Hit	Complete			Piston	220	50	10.5	3	27	12,000	
	STN Atlas	Tailan	Under way			Piston	330	50	11.8	4	54	12,000	Attack/EW
GERMANY	Dornier	Seamos	Complete			Turboshaft	2,337	308	20 (R)	4	65	2,000	
	Cassisa/INTA EADS	SIVA	Complete	Under way									S
	EADS	Seamos	Complete		2005—2008	VTOL							Maritime RTA
	Eurodrone/MBB	Brevel/Tucan	Complete	Under way	Deployed								R/Target Designation/BDA
	TESTEM	Deltron III	Under way			Rotary	150	24	8.8 (S)	3	27	13,000	
INDIA	ADE	Kapothaks	Complete	Complete	Deployed								Concept Validation
		Lakshya	Complete	Under way	Deployed								
		Nishant	Complete	Under way	Limited	Rotary	771	132	21.3	4	54	13,100	RSTA
	IAI (Israel)	Searcher	Complete		Deployed	Piston	820	139	23.7	14	65	15,000	Long Endurance Multirole
		Harpy	Complete	Under way	Deployed								Antiradar Attack
		Heron	Complete			Piston	2,400	550	54.5	50	125	30,000	MALE/LR RSTA
IRAN	HESA	Ababil-B/S/T	Complete	Under way	Deployed	Piston							RS/Attack
		Mohadjer 2/3/4	Complete	Under way	Deployed								Multirole
		Talush 1/2	Complete	Under way	Deployed								Operator Training
IRAQ	FSPF	L-29	Complete			Piston	7,200	1,200	33.8	1	344	25,000	Attack
ISRAEL	AD&D	Hornet	Complete	Under way		VTOL							
	Aeronautics	Aerolight	Complete	Under way	Deployed								RSTA
		Aerosky	Complete	Under way	Deployed								RSTA
		Aerostar	Complete	Under way	Deployed								RSTA
		Tail Sitter	Under way			VTOL							
	BTA	Canard	Under way			Piston	77	12	7.9	6	54	3,000	S/Target Attack
		Mini Sheddon	Complete			Piston	55	10	9.8	3	5	12,000	Multirole
		Sheddon MK3	Complete			Piston	90	18	13.5	8	24	15,000	RSTA
	EAS	Crow	Complete	Limited	Limited	Piston	287	55	16.8	9	108	15,000	
		Vanguard	Complete	Under way	Limited	Piston	386	88	19.7	16	108	15,000	
	EMIT	Blue Horizon	Complete	Under way	Deployed	Piston	288	77	16.4	16	50	20,000	RS
	IAI	E-Hunter	Complete	Under way	Deployed	Piston	2,100	150	50	25	80	20,000	MALE RSTA
		Eagle	Under way	Under way									
		Eye View/Firebird	Complete			Piston	340	33	15.4	6	27	15,000	
		Harpy/Cuttass	Complete	Under way	Deployed								Antiradar Attack
		Heron	Complete			Piston	2,400	550	54.5	50	125	30,000	MALE/LR RSTA
		Pioneer (RQ-2A)	Complete	Complete	Deployed								S
		Scout	Complete		Deployed	Piston	350	84	16.3	7	54	15,000	Multirole
		Searcher	Complete		Deployed	Piston	820	139	23.7	14	65	15,000	Long Endurance Multirole
		Searcher Mk II	Complete	Under way	Deployed	Rotary	940	150	28.1	16	80	18,500	RSTA
	IAI/TRW	Hunter (RQ-5)	Complete	Under way	Deployed	Piston	1,600	150	29.2	11	144	15,000	RSTA
	Silver Arrow	Caliber	Under way			Piston	79	22	13.2	1	27	5,600	
		Dartec	Under way			Rotary	220	22	14	4	50	20,000	
		Hermes 450S	Complete	Under way	Limited	Rotary	992	220	34.4	20	108	29,000	ISTAR/SIGINT
		Hermes 1500	Under way			Piston	3,300	500	32.8	36	108	30,000	ISTAR/SIGINT
		Micro-V	Complete			Piston	100	18	11.8	5	27	15,000	
		Sniper	Complete			Rotary	375	55	13.8	6	27	15,000	
ITALY	Meteor	Mirach 26	Complete	Complete	Deployed	Piston	463	77	15.5	6	27	11,500	
		Mirach 100	Complete	Complete	Deployed	Turbojet	617	88	5.9	1	135	29,500	Variant of Aerial Target
		Mirach 150	Complete	Under way	Limited	Turbojet	750	110	8.5	1	135	29,500	Follow-on to the Mirach 100
JAPAN	Fuji	RPH-2	Complete	Limited	Limited	Piston	673	175	16 (R)	1	5	2,000	E/O, IR
	Kawada/Schweizer	RoboCoptor 300	Complete			Piston	1,750	650		1	1	2,000	Multirole
	Yamaha	R-50	Complete	Complete	Deployed	Piston	148	44	10 (R)	0.5	0.1	300	
		R-Max	Complete	Under way	Limited	Piston	194	66	10 (R)	1	0.1	300	
PHILIPPINES	EMIT (Israel)	Blue Horizon	Complete	Under way	Deployed	Piston	286	77	16.4	16	50	20,000	RS
POLAND	OBRUM	Bee	Under way										Micro UAV (MAV)
		CamBat	Under way	Under way									Close-range Mini UAV
PORTUGAL	OGMA/ST	ARMOR X7	Under way			Piston	440	110	19.7	12	216	6,600	Civil Research
RUSSIA	ENICS	R90	Complete										RS
	Kamov	Ka-37	Complete			Piston	550	110	16 (R)	1	3	9,800	
		Ka-115	Complete	Under way									
		Ka-137	Under way			Piston	617	110	17 (R)	4	27	16,400	Multirole
		PS-01 Komat	Complete										
		GRANT											S
	Novic-XXI centure	Elf-D	Complete										
	Tupolev	Tu-143	Complete	Under way	Deployed	Turbojet	3,060	400	7.3	0.2	51	9,800	Tactical R
		Tu-243	Under way			Turbojet	3,100	500	7.3	0.4	97	16,400	
		Tu-300 Black Kite	Under way										
	Yakolev	Albatross	Under way			VISTOL							S
		Ind. 60C	Complete	Complete	Deployed								S
		MARKS-95	Under way										
		Strokoza/Expert	Under way										S
		Yak-061 Shmel	Complete	Complete	Deployed	Piston	285	60	10.7	2	27	9,800	
		Pchela/Stroy-P	Complete	Under way	Limited	Piston	286	50	10.7	2	54	8,600	

Country	Prime	Designation	Development	Production	Operation	Propulsion	Gross weight, lb	Payload weight, lb	Wingspan, ft	Endurance, hours	Range, n.mi.	Ceiling, ft	Mission
SERBIA/ MONTENEGRO	SOKO	VBL-2000	Under way										Multirole
SINGAPORE	IAI (Israel)	Searcher	Complete		Deployed	Piston	820	139	23.7	14	65	15,000	Long Endurance Multirole
SOUTH AFRICA	ATE	Vulture	Complete	Under way	Deployed	Piston	220	55	16.1	3	32	16,400	RS/EW
		Super Vulture	Under way										EW/R
	Kentron	RPV-2E Seeker	Complete	Under way	Deployed	Piston	529	88	23	8	108	18,000	R/Tactical Attack
		Seeker 3A	Intro. in 1999										
		Lark	Complete			Rotary	265	55	6.9	4	54	15,000	Antirader/S
SOUTH KOREA	KAI	TRPV-1 Doyosae	Complete	Under way	Limited	Rotary	286	50	15.8	3	27	6,000	RS
		Night intruder 300	Complete	Under way	Deployed								RS
		ARCH-50	Complete			Piston	661	110	16 (R)	0.5	0.1	330	Agriculture
	TechMent	RPG Midget Mk III	Complete			Piston	132	44	7.8 (R)	3	54	2,000	Autogyro
	INTA/Dornier	SIVA	Under way			Piston	507	66	15.8	8	81	9,800	S
SRI LANKA	IAI (Israel)	Scout	Complete		Deployed	Piston	350	84	16.3	7	54	15,000	Multirole
SWEDEN	Scandicraft	APID-1/2/3	Complete	Under way		Piston	121	20	9.8 (R)	1	14	1,000	
	TechMent	Midget RPG Mk III/IV	Complete	Under way	Deployed								
SWITZERLAND	Oerlikon-Contraves/IAI	ADS-95 Ranger	Complete	Under way	Deployed	Piston	595	86	18.8	5	54	14,700	RSTA
TAIWAN	Chung-Shan Inst.	Kestrel II	Complete		Limited	Piston	250	50	16.5	5	27	8,000	RS
THAILAND	IAI (Israel)	Searcher	Complete		Deployed	Piston	820	139	23.7	14	65	15,000	Long Endurance Multirole
TUNISIA	TAT	Annasnas	Under way			Piston	275	55	12.5	14	54	16,000	R/Multirole
		Super Nasnas	Under way										HALE Version
TURKEY	EES	Kanarya	Complete	Under way									
		Kirlangic	Complete	Under way	Deployed	Piston	298	30	16.8	8	81	20,000	
		Dogan	Complete	Under way	Deployed	Piston	364	40	19.7	12	81	20,000	
		Firefly	Complete			Piston	110	10	13.8	5	27	12,000	
		Serce	Complete	Under way									
		Suhan	Complete	Under way									
	TAI	UAV-X1	Complete	Under way	Deployed	Rotary	540	66	19.7	7	18	15,000	S
UAE	AES	Nibbio 1/2	Complete	Under way	Deployed								Multirole
UKRAINE	NPS	Remez-3	Complete	Under way	Deployed								Multirole
UK	Aerobotics	Sprite	Under way			Piston	80	13	5.3 (R)	2	15	10,000	
	Channon	Nitro Hawk	Under way			Piston	22	5	5 (R)	0.5	6	1,200	RS
	Cranfield	Observer 1	Under way			Piston	65	12	7.9	5	27	8,000	RSTA
	CyberFlight	CyberOne	Under way										S
		Swift-Eye	Under way										S
		Supwr Swift-Eye	Under way										
	Flight Refueling	Raven	Complete			Piston	185	45	13	3	54	14,100	S
	Intara-Firebird	Firebird	Under way			Tjet	770	50	10 (R)	0.5	15	18,000	
	Marconi	Phoenix	Complete	Under way	Limited	Piston	386	110	18.1	5	32	8,000	S/Target Attack
	Meggitt	Spectre/	Complete	Under way	Deployed								Multirole
		Spectre II											
		Phantom	Complete	Under way	Available								RS
		CSV-20	Complete			Piston	44	8	9.3	2	6	5,000	S
	Tasuma	MSV-20	Complete			Piston	9	1	9.1	0.5	3	2,000	S
	Thales/Northrop Grumman	Watchkeeper	Under way										ISTAR
	TTL	ASR-4 Spectre	Complete	Under way	Deployed	Rotary	242	81	10.8	3	27	17,000	Multirole
	TTL/Northrop Grumman	Spectre II	Complete	Under way	Deployed	Piston	320	50	10.5	5	27	13,000	Multirole
	TTL	Phantom	Complete			Piston	77	18	8.2	3	16	9,800	RS
	UTS	Mercury	Under way										
USA	AAI	Shadow 200	Complete			Rotary	275	50	12.8	6	108	15,000	RSTA
		Shadow 200T	Complete			Piston	280	40	12.8	4	27	15,000	
		Shadow 600	Complete	Limited	Limited	Rotary	600	100	22.4	12	108	17,000	RSTA
	AeroVironment	Pointer	Complete	Complete	Limited	Battery	8	2	9	0.3	4	1,000	S/Chemical Sensor
		(FCM-151A)											
		Pathfinder	Complete	Complete	Complete	Solar	480	25	100	14	108	70,000	
		Centurion	Under way			Solar	1,300	100	206	14	200	100,000	
		Helios	Under way			Solar	1,800	220	256	240	OTH	60,000	
	Alliant Tech/Mi-Tex	Outrider	Complete	Complete	Limited	Piston	500	80	13	6	108	15,000	
	Aurora	Perseus B	Under way			Piston	2,500	110	65	6	250	65,000	Research
		SkyWatch	Under way			Turboprop	7,900	900	114	32	250	62,000	
	BAI	Dragon Drone	Complete	Under way	Limited	Piston	91	15	8.2	2	48	10,000	Exdrone Variant/R/EW
		Javelin	Complete	Limited	Limited	Piston	20	3	8	2	1	1,000	RS
		Porter	Complete	Complete	Limited	Piston	200	50	12	4	27	5,000	
		Tern	Complete	Limited	Limited	Piston	75	30	10.2	3	9	2,000	Chemical Sensor
	CLIV	SLURS	Under way			Battery	10	2	5	1	5	500	
	Daedalus	Dakota / Truck	Complete	Complete	Limited	Piston	133	50	12.7	3	120	15,000	
	Frontier Systems	Arrow	Under way			Turbofan	14,000	500	115.3	36	120	70,000	
		Shadow	Complete			Turbofan	3,500	200	65	12	OTH	50,000	
	GA-ASI	Altus DT	Under way			Piston	1,600	220	56.3	6	300	65,000	One UAV for NASA ERAST
		Altus ST	Complete	Complete	Limited	Piston	1,600	220	55.3	30	250	45,000	One UAV for DoE/CIRPAS
		Gnat	Complete	Complete	Deployed	Piston	1,125	140	35.3	40	250	20,000	
		I-Gnat	Complete	Under way	Limited	Piston	1,350	200	42	40	350	23,000	RSTA
		Predator (RQ-1A)	Complete	Under way	Deployed	Piston	2,250	450	48.8	40	OTH	26,000	RSTA/EW
		Predator B	Under way			Turboprop	2,500	850	48.8	20	OTH	40,000	RSTA/EW
		Prowler I	Complete			Rotary	200	30	18	6	140	21,000	
		Prowler II	Complete	Under way	Deployed	Piston	650	50	24	20	135	20,000	RSTA/EW
	AeRA	Aerozonde	Complete	Under way	Limited	Piston	26	5	8.5	36	OTH	13,000	Coastal S
	BAE Systems	R4E SkyEye	Complete	Complete	Limited	Rotary	1,250	275	24	12	100	16,000	RSTA
	Lockheed Martin/Boeing	DarkStar (RQ-3A)	Cancelled										
	Mi-Tex	Backpack	Under way			Piston	25	4	3	1	5	5,000	RS
		Hellfox	Complete			Rotary	350	50	11	8	54	15,000	RSTA
		Mini Vanguard	Under way			Piston	100	12	7	3	31	16,300	RSTA
		Vixen	Complete			Rotary	200	50	9.2	4	50	15,000	
	Northrop Grumman	BQM-74C	Complete	Complete	Deployed	Turbojet	514	173	5.8	1	200	30,000	
		Global Hawk (RQ-4A)	Under way			Turbofan	25,600	1,900	116.2	36	OTH	65,000	RS
		Sea Ferret	Complete			Turbojet	150	30	6	3	160	20,000	
		Starbird	Complete			Rotary	380	60	17.3	4	108	17,000	
		Scarab	Complete	Complete	Limited	Turbojet	2,370	290	11	2	500	43,000	
	PUI	Pioneer (RQ-2A)	Complete	Complete	Deployed	Rotary	417	75	16.8	5	100	12,000	RSTA/BDA/Attack
	Scaled Composites	Raptor											
		Demonstrator	Complete			Piston	1,764	75	65.8	24	150	65,000	
	DRS Unmanned Tech.	STM-5B Sentry	Complete	Under way	Deployed	Piston	220	45	11	8	200	16,000	E/O S
	Thorpe SeeOp	P-7180	Complete			Piston	40	8	8.5	2	5	5,000	Half-Scale Pioneer Trainer
		TS-2000	Complete			Piston	1,000	150	27	4	27	5,000	
	Aerocam	22F	Complete	Complete	Limited	Piston	20	6	5.1 (R)	0.5	1	7,500	
		60F	Complete	Under way	Limited	Piston	40	20	7.7 (R)	0.3	2	7,500	
	Bell	Eagle Eye	Complete			Turboshaft	2,250	100	15.2 (S)	9	200	20,000	
	Boeing	Canard Rotor/Wing	Under way			Turbofan	1,800	200	12 (R)	3	500	10,000	
	Bostan	ACRW	Under way			Turbojet	300	15	5 (D)	3	30	1,000	
	Daedalus	STF-9A	Complete			Rotary	220	50	12.7 (S)	5	250	20,000	
	Dragonfly	DF4	Complete	Under way	Limited	Piston	140	30	8.5 (R)	1	1	7,000	
	D-Star	D'HumBug	Under way			Piston	150	25	6.5 (S)	4	27	18,000	
	Frewing/Scaled Composites	60-25	Complete			Piston	75	20	9.8 (S)	2	108	5,000	
		100-50 (Scorpion)	Complete			Piston	383	57	16.1 (S)	4	108	15,000	
	Northrop Grumman/ Schweitzer	Model 330	Under way			Piston	1,100	200	27 (R)	5	110	20,000	
	Orion	Seabat	Under way			Rotary	200	50	10 (S)	4	108	10,000	
	SAIC/American Sportcopter	Vigilante	Complete			Piston	1,100	160	32 (R)	8	120	12,000	RTA
	Sikorsky	Cypher	Complete			Rotary	298	41	6.2 (D)	2	27	8,200	
	NRL	Flyrt	Complete	Complete	Limited	Battery	72	25	8	0.5	4	2,000	
		Sender	Complete	Complete	Limited	Battery	10	3	4	2	50	5,000	
		Swallow	Under way			Battery	62	10	15	2	60	30,000	

Based on information available April 2003

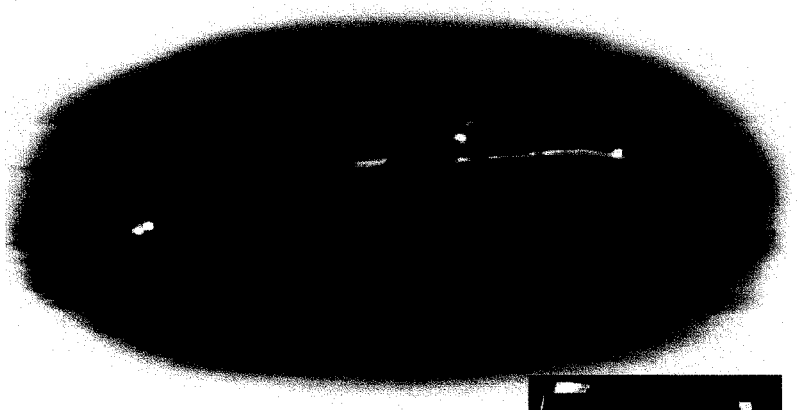
KEY

RSTA = Reconnaissance/Surveillance/ Target Acquisition
RS = Reconnaissance and Surveillance
(S) = Span
(D) = Diameter
(R) = Radius
EW = Electronic Warfare
BDA = Bomb Damage Assessment

Appendix 3:

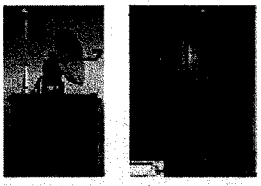
Seeker II UAV Sales Brochure

For use of Members of Congress in their Legislative Duties



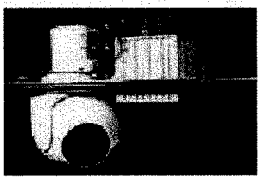
Seeker is an Unmanned Air Vehicle (UAV) Surveillance System, with the following features:

- **250 km radius surveillance range**
- **10 hours endurance**
- **18 000 ft service ceiling**
- **50 kg multi-mission payload**



The system consists of the following:

- **4 to 6 air vehicles**
- **Mission control unit**
- **Tracking and communication unit**
- **Payloads**
- **Field support equipment**



KENTRON UAVs

For use of Members of Congress in their Legislative Duties

The System

The Seeker II system operates at ranges of up to 250 kilometres from base and provides:

- **Real-time day and night reconnaissance**
- **Target location**
- **Artillery fire support**
- **Electronic intelligence**

Its reliable communication link, modular design, high mobility and self-contained support provide an advanced system that has passed the real test of operational use.

Unmanned Air Vehicle (UAV)

The UAV has an all-composite, low-drag airframe that ensures optimum performance. Its highly efficient engine and large fuel capacity allow endurance of more than 10 hours. This, combined with a service ceiling of 18 000 feet and a payload capacity of more than 50 kilogram, puts it in a class of its own.

An on-board directional antenna gives high resistance to jamming and enables real-time communication up to 250 kilometres from base.

Take-off is from either a paved, gravel or grass runway. An arrester cable is used to stop the aircraft within 70 metres on landing.

Tracking and Communication Unit (TCU)

The TCU contains the tracking and communication equipment that maintains contact with the UAV. It is an unmanned, separate unit that can be located up to 100 metres from the MCU, enabling it to be positioned for optimum line-of-sight communication.

Mission Control Unit (MCU)

The MCU provides the main interface between the mission control crew and the UAV. Its features include:

- **Mission planning**
- **UAV monitoring and control**
- **Communication control**
- **Payload control: optical and ESM**
- **Mission simulation**
- **System simulation**

Workstations have identical hardware, with dedicated software enabling specific functions.

Payloads

The fully steerable, precision-stabilized, high-quality colour video camera and second-generation Thermal Imaging System (TIS) camera form the prime mission payloads. The video camera has a zoom capability that allows recognition of a 2,3 metre target at a slant range of 5,4 kilometres. The TIS camera has a variable field of view, with a recognition range of 2,7 kilometres for a 2,3 metre target.

An Electronic Support Measures (ESM) payload is available for emitter location, with a high probability of interception of search radars. The man/machine interface for the ESM is integrated into the GCS. This provides the system with an Enemy Electronic Order of Battle through emitter identification and location.

KENTRON

KENTRON UAVs

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Broc0145

Mr. TURNER. Thank you.

Mr. Christoff.

Mr. CHRISTOFF. Mr. Chairman, members of the committee, I am pleased to be here today to discuss GAO's recent report on U.S. efforts to limit the proliferation of cruise missiles and UAVs. Last year this committee asked us to assess United States and international efforts to limit the proliferation of cruise missiles and UAVs. In a report we released 2 weeks ago, we addressed three key areas: First, the nature and extent of the proliferation; second, the tools used to address proliferation risks; and third, U.S. efforts to verify the end use of these sensitive technologies.

In summary, we found that nonproliferation tools and end-use monitoring efforts are not keeping pace with the growing threat from cruise missiles and UAVs, and let me now summarize our findings and our recommendations.

First, we found that cruise missiles and UAVs pose a growing threat to U.S. national security interests. They are accurate, inexpensive delivery systems for conventional, chemical and biological weapons. They are difficult to detect, difficult to defeat and are available worldwide.

For example, at least 70 nations possess about 75,000 cruise missiles, mostly antiship cruise missiles armed with high explosive warheads. China and Russia have sold cruise missiles to Iran, Iraq, Libya, North Korea and Syria. In addition, commercial items such as global positioning systems and lightweight engines are increasingly available worldwide. These items have allowed countries to expand the range and accuracy of their cruise missile systems.

The Chinese Silkworm missile you see on your left was found in Iraq after the first Gulf war. In October 2003 the United States found 10 additional Silkworm missiles that the Iraqis had modified to become land attack cruise missiles. As a result, the range of the missiles increased from 100 to 180 kilometers.

The second picture you see on your left is the U.S.-built Predator UAV. UAVs are pilotless vehicles that operate like airplanes. They have primarily been used for reconnaissance. Countries worldwide are increasingly interested in acquiring and developing UAV technology; 32 nations are developing or manufacturing more than 250 models of UAVs.

We also assessed tools the United States uses to reduce the proliferation of cruise missiles and UAVs. First, multilateral export control regimes are voluntary arrangements among supplier countries to restrict exports of sensitive technologies.

Between 1997 and 2002, the Missile Technology Control Regime accepted six U.S. proposals to expand the list of cruise missile and UAV technologies subject to international controls. Regime members are expected to scrutinize the listed items before approving an export license.

However, these lists do not preclude countries from exporting sensitive items. In addition, regime members have disagreed over the sales of cruise missiles to countries of concern. For example, the U.S. disagreed with France's 1997 decision to sell its Black Shaheen cruise missile to the United Arab Emirates.

In addition, nonmembers such as China and Israel continue to export cruise missiles and UAV technology to countries of concern.

The United States also uses its national export control laws to address missile proliferation but finds it difficult to identify and track commercially available items not covered by control lists.

In addition, a gap in U.S. regulations has allowed nonstate actors to acquire cruise missile or UAV technology without violating U.S. laws. This gap is illustrated by the 2003 case of a New Zealand citizen who illegally obtained U.S. dual-use items to develop a cruise missile.

Current regulations prohibit the sale of unlisted dual-use items to 12 missile proliferation projects and 20 countries of concern. This regulation does not apply to individuals or nonstate actors.

We recommended that the Secretary of Commerce determine whether the regulations should be modified to close this gap.

Finally, we review the results of end-use monitoring checks completed between 1998 and 2002 by the Departments of State, Defense and Commerce. We found that the departments conducted few checks to confirm the recipient's cruise missiles and UAVs complied with U.S. license conditions.

The State Department conducted checks on only 4 of the 786 licenses it issued for cruise missile and UAV-related technology. The Department of Defense conducted no checks on the more than 500 cruise missiles and related items transferred to other countries. And the Department of Commerce conducted checks on only 29 of nearly 2,500 cruise missile or UAV-related licenses it approved.

We recommended that the departments conduct a comprehensive assessment of the nature and extent of compliance with license conditions on these technologies. This assessment should include additional end-use checks.

Mr. Chairman, members of the committee, that concludes my statement, and I will be happy to answer your questions.

[The prepared statement of Mr. Christoff follows:]

United States General Accounting Office

GAO

Testimony Before the Subcommittee on National Security, Emerging Threats, and International Relations, Committee on Government Reform, House of Representatives

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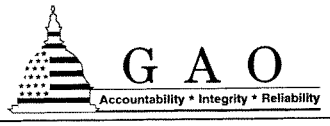
NONPROLIFERATION

Improvements Needed for Controls on Exports of Cruise Missile and Unmanned Aerial Vehicle Technology

Statement of Joseph A. Christoff, Director
International Affairs and Trade



GAO-04-493T

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Highlights

Highlights of GAO-04-493T, testimony before the Subcommittee on National Security, Emerging Threats, and International Relations, Committee on Government Reform, House of Representatives

Why GAO Did This Study

Cruise missiles and unmanned aerial vehicles (UAV) pose a growing threat to U.S. national security interests as accurate, inexpensive delivery systems for conventional, chemical, and biological weapons. GAO assessed (1) the tools the U.S. and foreign governments use to address proliferation risks posed by the sale of these items and (2) efforts to verify the end use of exported cruise missiles, UAVs, and related technology.

What GAO Recommends

The Secretary of Commerce should assess and report to Congress on the adequacy of an export regulation provision to address missile proliferation by nonstate actors and on ways the provision might be modified to address a gap in U.S. export control authority.

The Secretaries of State, Commerce, and Defense each should complete a comprehensive assessment of cruise missile, UAV, and related dual-use transfers to determine if U.S. exporters and foreign end users comply with conditions related to the transfers.

Commerce and Defense partially agreed with the recommendations. State disagreed to complete an assessment, but said it would pay special attention to the need for more checks on cruise missile and UAV transfers.

www.gao.gov/cgi-bin/getrpt?GAO-04-493T.

To view the full product, including the scope and methodology, click on the link above. For more information, contact Joseph A. Christoff at (202) 512-8979 or christoffj@gao.gov.

Tuesday, March 9, 2004

NONPROLIFERATION

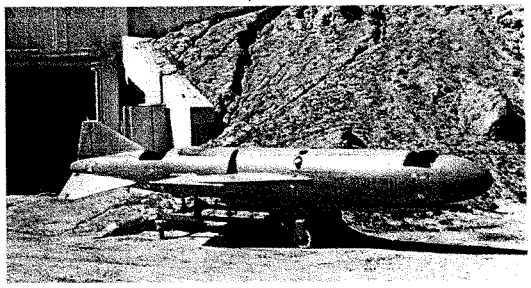
Improvements Needed for Controls on Exports of Cruise Missile and Unmanned Aerial Vehicle Technology

What GAO Found

The growing threat to U.S. national security of cruise missile and UAV proliferation is challenging the tools the United States has traditionally used. Multilateral export control regimes have expanded their lists of controlled technologies that include cruise missile and UAV items, but key countries of concern are not members. U.S. export control authorities find it increasingly difficult to limit or track unlisted dual-use items that can be acquired without an export license. Moreover, a gap in U.S. export control authority enables American companies to export certain dual-use items to recipients that are not associated with missile projects or countries listed in the regulations, even if the exporter knows the items might be used to develop cruise missiles or UAVs. American companies have in fact legally exported dual-use items with no U.S. government review to a New Zealand resident who bought the items to build a cruise missile.

The U.S. government seldom uses its end-use monitoring programs to verify compliance with conditions placed on the use of cruise missile, UAV, or related technology exports. For example, State officials do not monitor exports to verify compliance with license conditions on missiles or other items, despite legal and regulatory requirements to do so. Defense has not used its end-use monitoring program initiated in 2002 to check the compliance of users of more than 500 cruise missiles exported between fiscal years 1998 and 2002. Commerce conducted visits to assess the end use of items for about 1 percent of the 2,490 missile-related licenses we reviewed. Thus, the U.S. government cannot be confident that recipients are effectively safeguarding equipment in ways that protect U.S. national security and nonproliferation interests.

A Chinese SILKWORM Cruise Missile in Iraq



Source: Department of Defense.

Mr. Chairman and Members of the Committee,

I am pleased to be here today to discuss GAO's report[1] on U.S. efforts to limit the proliferation of cruise missiles and unmanned aerial vehicles (UAV). These efforts are complicated by the widespread availability of these items among countries of concern.[2] The U.S. government faces trade-offs when making decisions about transfers of cruise missiles, UAVs, or related technology. The United States wants to prevent the proliferation of these weapons systems to countries of concern and terrorists. At the same time, the U.S. government has an interest in encouraging transfers of cruise missiles and UAVs to U.S. allies to support regional security and bilateral relations. The U.S. government also wants to use these sales to help maintain the health of the U.S. defense industrial base.

You asked us to assess U.S. and international efforts to limit the proliferation of cruise missiles, unmanned aerial vehicles, and related technology. Specifically, we assessed (1) the nature and extent of cruise missile and UAV proliferation; (2) the nonproliferation tools that the United States uses to address the proliferation risks posed by the sale of these items; and (3) U.S. and other governments' efforts to verify the end use of exported cruise missiles, UAVs, and related technology.

To address these issues, we reviewed analyses prepared by the Departments of State, Commerce, Defense, and Homeland Security, and the U.S. intelligence community, as well as studies prepared by nonproliferation experts. We also reviewed multilateral export control regime[3] documentation; met with representatives of the Missile Technology Control Regime (MTCR) in Paris, France; and interviewed government officials in France, Italy, and the United Kingdom. Furthermore, we analyzed export licensing information from the

[1]U.S. General Accounting Office, *Nonproliferation: Improvements Needed to Better Control Technology Exports for Cruise Missiles and Unmanned Aerial Vehicles*, GAO-04-175 (Washington, D.C.: Jan. 23, 2004).

[2]Countries of missile proliferation concern listed in the Export Administration Regulations are Bahrain, China, Egypt, India, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Libya, Macau, North Korea, Oman, Pakistan, Qatar, Saudi Arabia, Syria, United Arab Emirates, and Yemen.

[3]Multilateral export control regimes are voluntary, nonbinding arrangements among likeminded supplier countries that aim to restrict trade in sensitive technologies to peaceful purposes. Regime members agree to restrict such trade through their national laws and regulations, which set up systems to license the exports of sensitive items.

Departments of State, Commerce, and Defense on exports of cruise missiles, UAVs, and related dual-use technology that have both military and civilian applications.

Summary

In summary, we found that

- Cruise missiles and UAVs pose a growing threat to U.S. national security interests as accurate and inexpensive delivery systems for conventional, chemical, and biological weapons. Conventional anti-ship cruise missiles pose an immediate threat to U.S. naval vessels because of the widespread availability of these weapons worldwide. At least 70 nations currently possess some type of anti-ship missiles armed with conventional, high explosive warheads, and at least 32 nations are developing or manufacturing more than 250 models of UAVs. Land-attack cruise missiles pose a future threat to the U.S. homeland because of the anticipated growth in the availability of these more accurate, longer-range systems. The widespread availability of commercial items, such as global positioning systems and lightweight engines, has made it easier for countries and terrorists to acquire or build at least rudimentary cruise missile or UAV systems.

- The United States primarily uses multilateral export control regimes and national export controls among other tools to address the threat associated with cruise missile and UAV proliferation. Between 1997 and 2002, multilateral export control regimes have added cruise missile and UAV-related items to their control lists, thereby committing regime members to provide greater scrutiny to these items before licensing them for export. However, nonmembers such as China and Israel continue to acquire, develop, and export cruise missile or UAV technology. This growing capability of nonmember supplier countries to develop technologies used for weapons of mass destruction and trade them with other countries of proliferation concern undermines the regimes' ability to impede proliferation. In addition, the United States faces limitations in applying national export controls. First, the U.S. government finds it difficult to identify and track widely available dual-use items that are not on control lists but that can be used for cruise missile and UAV proliferation purposes. Second, a gap in U.S. catch-all control regulations[4] enabled American companies to legally

[4]Catch-all controls are controls that authorize a government to require an export license for items that are not on control lists but that are known or suspected of being intended for use in a missile or weapons of mass destruction (WMD) program.

export dual-use items to a New Zealand resident who bought the items to show how a terrorist could legally build a cruise missile.

- The U.S. government uses post-shipment verification (PSV) visits as a key tool available to confirm that the recipients of sensitive U.S. technologies are using them in accordance with license conditions. However, of 786 licenses for cruise missile and UAV technology that the Department of State issued between fiscal years 1998 and 2002, it conducted verification visits on only 4 licenses. The Department of Defense conducted no monitoring over more than 500 cruise missiles and related items that it transferred to other countries between fiscal years 1998 and 2002. The Department of Commerce conducted verification visits on 1 percent of nearly 2,500 missile-related licenses issued between fiscal years 1998 to 2002.

We are recommending that the Secretary of Commerce assess and report to Congress on the adequacy of the export control regulations' catch-all provision to address missile proliferation by nonstate actors and on ways the provision might be modified. We are also recommending that the Secretaries of State, Commerce, and Defense each complete a comprehensive assessment of the nature and extent of compliance with license conditions on cruise missiles, UAVs, and related dual-use technology. Commerce and Defense partially agreed with the recommendations. State disagreed to complete an assessment, but said it would pay special attention to the need for more checks on cruise missile and UAV transfers.

Background

Distinctions between cruise missiles and UAVs are becoming blurred as the militaries of many nations, in particular the United States, attach missiles to traditional reconnaissance UAVs and develop UAVs dedicated to combat missions. A UAV, a pilotless vehicle that operates like an airplane, can be used for a variety of military and commercial purposes. UAVs are available in a variety of sizes and shapes, propeller-driven or jet propelled, and can be straight-wing aircraft or have tilt-rotors like helicopters. They can be as small as a model aircraft or as large as a U-2 manned reconnaissance aircraft. A cruise missile is an unmanned aerial vehicle designed for one-time use, which travels through the air like an airplane before delivering its payload. A cruise missile consists of four major components: a propulsion system, a guidance and control system, an airframe, and a payload. The technology for the engine, the autopilot, and the airframe could be similar for both cruise missiles and UAVs, according to a 2000 U.S. government study of cruise missiles.

Cruise missiles provide a number of military capabilities. For example, they present significant challenges for air and missile defenses. Cruise missiles can fly at low altitudes to stay below radar and, in some cases, hide behind terrain features. Newer missiles are incorporating stealth features to make them less visible to radars and infrared detectors. Furthermore, land-attack cruise missiles may fly circuitous routes to get to their targets, thereby avoiding radar and air defense installations.

U.S. policy on the proliferation of cruise missiles and UAVs is expressed in U.S. commitments to the MTCR and Wassenaar Arrangement. These multilateral export control regimes are voluntary, nonbinding arrangements among like-minded supplier countries that aim to restrict trade in sensitive technologies. Regime members agree to restrict such trade through their national laws and regulations, which set up systems to license the exports of sensitive items. The four principal regimes are the MTCR; the Wassenaar Arrangement, which focuses on trade in conventional weapons and related items with both civilian and military (dual-use) applications; the Australia Group, which focuses on chemical and biological technologies; and the Nuclear Suppliers Group, which focuses on nuclear technologies. The United States is a member of all four regimes. Regime members conduct a number of activities in support of the regimes, including (1) sharing information about each others' export licensing decisions, including certain export denials and, in some cases, approvals and (2) adopting common export control practices and control lists of sensitive equipment and technology into national laws or regulations.

Exports of commercially supplied American-made cruise missiles, military UAVs, and related technology are transferred pursuant to the Arms Export Control Act, as amended, and the International Trafficking in Arms Regulations, implemented by State. Government-to-government transfers are made pursuant to the Foreign Assistance Act of 1961, as amended, and are subject to DOD guidance. Exports of dual-use technologies related to cruise missiles and UAVs[5] are transferred pursuant to the Export

[5]Related items include technical data, subcomponents, and spare parts.

Administration Act of 1979, as amended,[6] and the Export Administration Regulations,[7] implemented by Commerce.

The Arms Export Control Act, as amended in 1996, requires the President to establish a program for end-use monitoring of defense articles and services sold or exported under the provisions of the act and the Foreign Assistance Act.[8] This requirement states that, to the extent practicable, end-use monitoring programs should provide reasonable assurance that recipients comply with the requirements imposed by the U.S. government on the use, transfer, and security of defense articles and services. In addition, monitoring programs, to the extent practicable, are to provide assurances that defense articles and services are used for the purposes for which they are provided. The Export Administration Act, as amended, provides the Department of Commerce with the authority to enforce dual-use controls. Under the act, Commerce is authorized to conduct PSV visits outside the United States of dual-use exports.[9]

Proliferation of Cruise Missiles and UAVs Poses a Growing Threat to U.S. National Security Interests

Although cruise missiles and UAVs provide important capabilities for the United States and its friends and allies, in the hands of U.S. adversaries they pose substantial threats to U.S. interests. First, anti-ship cruise missiles threaten U.S. naval forces deployed globally. We reported in 2000 that the next generation of anti-ship cruise missiles—most of which are now expected to be fielded by 2007—will be equipped with advanced target seekers and stealthy design.[10] These features will make them more difficult to detect and defeat. At least 70 nations possess some type of cruise missile, mostly short-range, anti-ship missiles armed with conventional, high-explosive warheads, according to a U.S. government study. Countries that export cruise missiles currently include China, France, Germany, Israel, Italy, Norway, Russia, Sweden, United Kingdom, and the United States. China and Russia have sold cruise missiles to Iran,

[6]50 U.S.C. app. §§ 2401 and following. Executive Order 13222, 66 Fed. Reg. 44025 and subsequent presidential notices continue the export control regime established under the act and the Export Administration Regulations.

[7]15 C.F.R. §§ 730-774.

[8]22 U.S.C. § 2785.

[9]50 U.S.C. app § 2411(a)(1).

[10]U.S. General Accounting Office, *Defense Acquisitions: Comprehensive Strategy Needed to Improve Ship Cruise Missile Defense*, GAO-NSIAD-00-149 (Washington, D.C.: July 2000).

Iraq, Libya, North Korea, and Syria. Nations that manufacture but do not yet export cruise missiles currently include Brazil, India, Iran, Iraq, North Korea, South Africa, and Taiwan. None of these nonexporting manufacturing countries is a member of the Wassenaar Arrangement, and only Brazil and South Africa are in the MTCR.

Second, land-attack cruise missiles have a potential in the long-term to threaten the continental United States and U.S. forces deployed overseas. Various government and academic studies have raised concerns that the wide availability of commercial items, such as global positioning system receivers and lightweight engines, allows both countries and nonstate actors to enhance the accuracy of their systems, upgrade to greater range or payload capabilities, and convert certain anti-ship cruise missiles into land-attack cruise missiles. Although not all cruise missiles can be modified into land-attack cruise missiles because of technical barriers, specific cruise missiles can and have been. For example, a 1999 study outlined how the Chinese Silkworm anti-ship cruise missile had been converted into a land-attack cruise missile.[11] Furthermore, the Iraq Survey Group reported in October 2003 that it had discovered 10 Silkworm anti-ship cruise missiles modified to become land-attack cruise missiles and ... that Iraq had fired 2 of these missiles at Kuwait. According to an unclassified national intelligence estimate,[12] several countries are technically capable of developing a missile launch mechanism to station on forward-based ships or other platforms to launch land-attack cruise missiles against the United States.

Finally, UAVs represent an inexpensive means of launching chemical and biological attacks against the United States and allied forces and territory. For example, the U.S. government reported its concern over this threat in various meetings and studies. The Acting Deputy Assistant Secretary of State for Nonproliferation testified in June 2002 that UAVs are potential delivery systems for WMD, and are ideally suited for the delivery of chemical and biological weapons given their ability to disseminate aerosols in appropriate locations at appropriate altitudes. He added that,

[11] *Feasibility of Third World Advanced Ballistic and Cruise Missile Threat, Volume 2: Emerging Cruise Missile Threat*, Systems Assessment Group; National Defense Industrial Association Strike, Land-Attack and Air Defense Committee (Washington, D.C.: August 1999).

[12] *Foreign Missile Developments and the Ballistic Missile Threat Through 2015, Unclassified Summary of a National Intelligence Estimate*, National Intelligence Council (Washington, D.C.: December 2001).

although the primary concern has been that nation-states would use UAVs to launch WMD attacks, there is potential for terrorist groups to produce or acquire small UAVs and use them for chemical or biological weapons delivery.

Key Nonproliferation Tools Have Limitations Addressing Cruise Missile and UAV Proliferation

The U.S. government generally uses two key nonproliferation tools—multilateral export control regimes and national export controls—to address cruise missile and UAV proliferation, but both tools have limitations. The United States and other governments have traditionally used multilateral export control regimes, principally the MTCR, to address missile proliferation. However, despite successes in strengthening controls, the growing capability of countries of concern to develop and trade technologies used for WMD limits the regime's ability to impede proliferation. For example, between 1997 and 2002, the United States and other governments successfully revised the MTCR's control lists of sensitive missile-related equipment and technology to include six of eight U.S.-proposed items related to cruise missile and UAV technology. Adding items to the control lists commits regime members to provide greater scrutiny when deciding whether to license the items for export. Despite the efforts of these regimes, nonmembers such as China and Israel continue to acquire, develop, and export cruise missile or UAV technology. The growing capability of nonmember supplier countries to develop technologies that could be used for WMD and trade them with other countries of proliferation concern undermines the regimes' ability to prevent proliferation.

In October 2002, we reported on other limitations that impede the ability of the multilateral export control regimes, including the MTCR and Wassenaar Arrangement, to achieve their nonproliferation goals. We found that MTCR members may not share complete and timely information, such as members' denied export licenses, in part because the regime lacks an electronic data system to send and retrieve such information. The Wassenaar Arrangement members share export license approval information but collect and aggregate it to a degree that it cannot be used constructively. Both MTCR and the Wassenaar Arrangement use a consensus-based process that makes decision-making difficult. The regimes also lack a means to enforce compliance with members' political commitments to regime principles. We recommended that the Secretary of State establish a strategy to work with other regime members to enhance the effectiveness of the regimes by implementing a number of steps, including (1) adopting an automated information-sharing system in MTCR to facilitate more timely information exchanges, (2) sharing greater and

more detailed information on approved exports of sensitive transfers to nonmember countries, (3) assessing alternative processes for reaching decisions, and (4) evaluating means for encouraging greater adherence to regime commitments.[13] However, State has not been responsive in implementing the recommendation to establish a strategy to enhance the effectiveness of the regimes. State officials said that the recommendation is under consideration in a review by the National Security Council that has been ongoing for over a year.

The U.S. government uses its national export control authorities to address missile proliferation but finds it difficult to identify and track commercially available items not covered by control lists. For example, Bureau of Immigration and Customs Enforcement agents upon inspecting an item to be exported might identify that the item is a circuit board, but not that it is part of a guidance system and that the guidance system is intended for a cruise missile. Moreover, a gap in the catch-all provision of U.S. export control regulations could allow subnational actors to acquire American cruise missile or UAV technology for missile proliferation or terrorist purposes without violating U.S. export control laws or regulations. This gap in U.S. export control authority enabled American companies to legally export dual-use items to a New Zealand resident who bought the items to show how a terrorist could legally build a cruise missile. The gap results from current regulations that restrict the sale of certain dual-use items to national missile proliferation projects and countries of concern, but not to nonstate actors such as certain terrorist organizations or individuals.[14] The United States has other nonproliferation tools to address cruise missile and UAV proliferation—diplomacy, sanctions, and interdiction of illicit shipments of items—but these tools have had unclear results or have been little used.

[13]U.S. General Accounting Office, *Nonproliferation: Strategy Needed to Strengthen Multilateral Export Control Regimes*, GAO-03-43 (Washington, D.C.: Oct. 25, 2002).

[14]See 15 C.F.R. § 744.3(a). Although the Export Administration Regulations restrict exports to terrorist organizations and individuals that are listed in the regulations, the regulations do not apply to those that are not listed.

Compliance with Conditions on Exports of Cruise Missiles, UAVs, and Dual-use Items Seldom Verified through End-use Monitoring

End-use monitoring refers to the procedures used to verify that foreign recipients of controlled U.S. exports use such items according to U.S. terms and conditions of transfer. A post-shipment verification visit is a key end-use monitoring tool for U.S. agencies to confirm that authorized recipients of U.S. technology both received transferred items and used them in accordance with conditions of the transfer.

State is responsible for conducting PSVs on direct commercial sales of cruise missiles, UAVs, and related technology. We found that State did not use PSVs to assess compliance with cruise missile or UAV licenses having conditions limiting how the item may be used. These licenses included items deemed significant by State regulations.[15] Based on State licensing data, we identified 786 licenses for cruise missiles, UAVs, or related items[16] from fiscal years 1998 through 2002. Of these, 480 (61 percent) were licenses with conditions, while 306 (39 percent) were licenses without conditions. We found that State did not conduct PSVs for any of the 480 licenses with conditions and conducted PSVs on 4 of 306 licenses approved without conditions. A State licensing official stated that few post-shipment checks have been conducted for cruise missiles, UAVs, and related items because many are destined for well-known end users in friendly countries. However, over fiscal years 1998 through 2002, 129 of the 786 licenses authorized the transfer of cruise missile and UAV-related items to countries such as Egypt, Israel, and India. These countries are not MTCR members, which indicates that they might pose a higher risk of diversion.

In commenting on a draft of our report, State emphasized the importance of pre-license checks in verifying controls over the end user and end use of exported items and said that we did not include such checks in our analysis. We therefore reviewed the original 786 cruise missile and UAV licenses to determine how many had received pre-license checks, a possible mitigating factor reducing the need to conduct a PSV. We found that only 6 of the 786 licenses from fiscal years 1998 through 2002 that State provided us had been selected for pre-license checks.

[15]The International Trafficking in Arms Regulations define significant military equipment as articles for which special export controls are warranted because of their capacity for substantial military utility or capability. 22 C.F.R. § 120.7.

[16]Related items may include spare parts, software, or technical data.

Defense is responsible for monitoring transfers of cruise missiles, UAVs, and related technology provided under government-to-government agreements through the Foreign Military Sales program. Defense's end-use monitoring program has conducted no end-use checks related to cruise missile or UAV transfers, according to the program director. From fiscal years 1998 through 2002, DOD approved 37 agreements for the transfer of more than 500 cruise missiles and related items, as well as one transfer of UAV training software. The agreements authorized the transfer of Tomahawk land-attack cruise missiles, Standoff land-attack missiles, and Harpoon anti-ship cruise missiles, as well as supporting equipment such as launch tubes, training missiles, and spare parts. Approximately 30 percent of cruise missile transfers were destined for non-MTCR countries. Despite the 1996 legal requirement to create an end-use monitoring program, Defense's Golden Sentry monitoring program is not yet fully implemented. DOD issued program guidance in December 2002 that identified the specific responsibilities for new end-use monitoring activities. In addition, as of February 2004, DOD was conducting visits to Foreign Military Sales recipient countries to determine the level of monitoring needed and was identifying weapons and technologies that may require more stringent end-use monitoring. The program director stated that he is considering adding cruise missiles and UAVs to a list of weapon systems that receive more comprehensive monitoring.

The Commerce Department is responsible for conducting PSVs on exports of dual-use technology that might have military applications for cruise missiles and UAVs. Based on Commerce licensing data, we found that Commerce issued 2,490 dual-use licenses between fiscal years 1998 and 2002 for items that could be useful in developing cruise missiles or UAVs.[17] These licenses were for items to countries including India, Israel, Poland, Switzerland, Turkey, and the United Arab Emirates. Of these, Commerce selected 2 percent of the licenses, or 52 cases, for a PSV visit and completed visits for about 1 percent of the licenses, or 29 cases.

Other supplier countries place conditions on cruise missile and UAV-related transfers, but few reported conducting end-use monitoring once

[17]The Commerce Control List does not designate whether an item is useful for ballistic missiles or cruise missiles, according to Commerce officials, but identifies only that an item is useful for missile technology. The 2,490 cruise missile or UAV-related licenses that we reviewed were in dual-use missile-related categories of items in the Export Administration Regulations that the Commerce Department determined contain items that could be used for cruise missile purposes or for UAVs or their components.

they exported the items. While national export laws authorize end-use monitoring, none of the foreign government officials reported to us any PSV visits for cruise missile or UAV-related items. Government officials in France, Italy, and the United Kingdom stated that their respective governments generally do not verify conditions on cruise missile and UAV transfers and conduct few PSV visits of such exports. The South African government was the only additional supplier country responding to a written request for information[18] that reported it regularly requires and conducts PSVs on cruise missile and UAV transfers.

Conclusion

The continued proliferation of cruise missiles and UAVs poses a growing threat to the United States, its forces overseas, and its allies. Most countries already possess cruise missiles, UAVs, or related technology, and many are expected to develop or obtain more sophisticated systems in the future. The dual-use nature of many of the components of cruise missiles and UAVs also raises the prospect that terrorists could develop rudimentary systems that could pose additional security threats to the United States. Because this technology is widely available throughout the world, the United States works in concert with other countries through multilateral export control regimes whose limited effectiveness could be enhanced by adopting recommendations we have made in previous reports. U.S. export controls may not be sufficient to prevent cruise missile and UAV proliferation and to ensure compliance with license conditions. Because some key dual-use components can be acquired without an export license, it is difficult for the export control system to limit or track their use. Moreover, current U.S. export controls may not prevent proliferation by nonstate actors, such as certain terrorists, who operate in countries that are not currently restricted under missile proliferation regulations. Furthermore, the U.S. government seldom uses its end-use monitoring programs to verify compliance with the conditions placed on items that could be used to develop cruise missiles or UAVs. As a result, the U.S. government does not have sufficient information to know whether recipients of these exports are effectively safeguarding equipment and technology and, thus, protecting U.S. national security and nonproliferation interests. The challenges to U.S. nonproliferation efforts in this area, coupled with the absence of end-use monitoring programs by

[18]Governments responding to our request were Israel, Japan, South Africa, and Switzerland. Russia's and Canada's responses were provided too late to be included in our January 2004 report. Other countries that we queried provided no information on end-use monitoring.

several foreign governments for their exports of cruise missiles or UAVs, raise questions about how nonproliferation tools are keeping pace with the changing threat.

Recommendations for Executive Action

We recommended that the Secretary of Commerce assess and report to Congress on the adequacy of the export control regulations' catch-all provision to address missile proliferation by nonstate actors and on ways the provision might be modified. We also recommended that the Secretaries of State, Commerce, and Defense each complete a comprehensive assessment of the nature and extent of compliance with license conditions on cruise missiles, UAVs, and related dual-use technology. As part of the assessment, the departments should also conduct additional PSV visits on a sample of cruise missile and UAV licenses. This assessment would allow the departments to gain critical information that would allow them to better balance potential proliferation risks of various technologies with available resources for conducting future PSV visits.

Commerce and Defense partially concurred with our recommendations, which we modified to address their comments. State disagreed with the need to conduct a comprehensive assessment of the nature and extent of compliance with license conditions for cruise missile and UAV technology transfers. However, State said that it would consider conducting more PSVs on such technology transfers as it improves its monitoring program.

Mr. Chairman and Members of the Subcommittee, this concludes my prepared statement. I will be happy to answer any questions you may have.

Contact and Acknowledgments

For future contacts regarding this testimony, please contact Joseph Christoff at (202) 512-8979. David C. Maurer, Jeffrey D. Phillips, Claude Adrien, W. William Russell IV, Lynn Cothern, Stephen M. Lord, and Richard Seldin made key contributions to this statement.

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Mr. TURNER. Thank you, Mr. Christoff.

Mr. Gormley.

Mr. GORMLEY. Mr. Chairman, members of the committee, I'm honored to appear before you today to illuminate how cruise missiles and unmanned aerial vehicles pose a threat that could affect both U.S. interests and the American homeland. The timing of this hearing and the release of the GAO report on improvements needed to better control technology exports could not come at a more propitious time. We are at a crucial turning point, in my view, in the proliferation of cruise missiles and UAVs, one precipitated via events during Operation Iraqi Freedom as well as by growing evidence of terrorist plans for using UAVs.

The GAO report interestingly mentioned at least five times that cruise missiles and UAVs pose an emerging threat to U.S. interests abroad as well as at home. Permit me in these brief remarks to illustrate how, and I would ask that my longer statement and accompanying journal article be placed in the record.

First, in regard to threats to the U.S. homeland, cruise missiles or UAVs might be launched from concealed locations at modest distances from their targets or brought within range and launched from freighters or commercial container ships; in effect, two-stage forms of delivery. Al Qaeda is believed to possess at least 15 freighters. In the aftermath of the September 11, 2001 terrorist attacks on the U.S. homeland, key U.S. decisionmakers began to take such two-stage threats more seriously.

The 2002 National Intelligence Estimate on the ballistic missile threat to the United States drew attention to the covert conversion of a commercial container ship as a launching pad for a cruise missile. Even a large bulky cruise missile like the ones Iraq used to fire at coalition forces last year could be equipped with a small internal erector for launching and still comfortably be fit within a standard 12-meter shipping container.

Indeed, the 2002 National Intelligence Estimate argues that because such a delivery system, among several others, is less costly, easier to acquire and more reliable than an intercontinental ballistic missile, a cruise missile attack against the American homeland is more likely to occur than a ballistic missile attack.

The notion that a terrorist group might entertain using UAVs is by no means far-fetched. One recent accounting of terrorist activity notes 43 recorded cases involving 14 terrorist groups in which remote control delivery systems were either threatened, developed or actually utilized.

Model airplanes were used or planned for use by al Qaeda to kill leaders at the 2002 G–8 summit in Genoa, Italy. Moreover, according to the London Independent newspaper, a British national held at Camp Delta, Guantanamo Bay, Cuba has confessed to being part of an al Qaeda plot to acquire a drone to attack the House of Commons with anthrax.

Let me now turn to threats—conceivable threats that might affect our regional interests. Operation Iraqi Freedom demonstrates powerfully how cruise missiles and UAVs might threaten our overseas interests. Patriot missile batteries performed immensely better than they did during the first Gulf war. All nine of Iraq's most threatening ballistic missile launchers were successfully inter-

cepted and destroyed, but the second Gulf war saw the first use of enemy land attack cruise missiles against Patriot in combat.

American and Kuwaiti Patriot batteries failed to detect any of Iraq's low-flying cruise missiles, one of which came perilously close to striking a U.S. Marine encampment on the war's opening day. What's more, at least two Iraqi ultra light aircraft, which were feared capable of carrying chemical or biological agents, were detected only after flying over thousands of U.S. troops, equipment and command facilities prior to a U.S. Army's divisional advance on Baghdad.

Iraq's use of cruise missiles and slowflying air vehicles, which were manned but needn't have been, also contributed to the Patriot's unfortunate series of friendly fire incidents, two of which led to the loss of two coalition aircraft and the deaths of three crew members.

America's adversaries are bound to draw important lessons from the performance of U.S. missile defenses against Iraq. Referring to Iraq's use of cruise missiles, the Chief of Staff of the 32nd Army Air and Missile Defense Command told the New York Times, "this was a glimpse of future threats. It is a poor man's air force; a thinking enemy will use uncommon means such as cruise missiles and UAVs on multiple fronts."

At least two reasons account for why we should anticipate an acceleration of interest in acquiring cruise missiles and UAVs. First, countries wishing to deter U.S. military interventions were unlikely to invest heavily in cruise missiles until American missile defenses performed decisively better against ballistic missiles than they did during the 1991 Gulf war. Patriot's success against Iraqi ballistic missiles in 2003 coupled with problems coping with cruise missile attacks increases the incentive to acquire difficult to defend against cruise missiles and UAVs.

Second, American's adversaries are likely to appreciate the operational advantages of combining ballistic and cruise missile launches to maximize the probability of penetrating even the best American missile defenses. Converting small airplanes or UAVs into weapons-carrying missiles offers a particularly attractive poor man's option.

When these in large numbers are combined with more expensive and sophisticated ballistic and cruise missiles, they raise the stakes enormously for American missile defenses.

Consider, for example, the dire and unfavorable cost exchange arithmetic associated with current U.S. missile defenses and conceivable adversary missile threats. The guidance upgrade alone on the Patriot PAC–2 guidance enhanced missile costs $400,000 per missile, and each new PAC–3 interceptor roughly costs $3.5 million dollars per interceptor. A flock of cruise missiles or converted airplanes, several orders of magnitude cheaper, could readily saturate most economically feasible missile defense architectures. Thus, controlling the quantitative spread of cruise missiles and UAVs through improved nonproliferation policies is an absolute necessity

to guarantee confidence in our missile defense expenditures.

Beyond the excellent set of recommendations offered by the GAO in its report, I would be pleased to discuss additional proposals during our question and answer time. I thank you, Mr. Chairman.

[The prepared statement of Mr. Gormley follows:]

Testimony of
DENNIS M. GORMLEY
Senior Fellow
Monterey Institute's Center for Nonproliferation Studies
Before the
Subcommittee on National Security, Emerging Threats, and International Affairs
Of the
U.S. House of Representatives Committee on Government Reform
March 9, 2004

Mr. Chairman, members of the committee, I am honored to appear before you today to help illuminate how cruise missiles and unmanned air vehicles (UAVs) pose a threat that could affect both U.S. interests abroad and the American homeland. The timing of this hearing and the release of the GAO report on improvements needed to better control technology exports for cruise missiles and UAVs could not come at a more propitious moment. We are at a crucial turning point in the proliferation of cruise missiles and UAVs—one precipitated by events during Operation Iraqi Freedom as well as by growing evidence of terrorist plans for using UAVs.*

Military events during Operation Iraqi Freedom demonstrated America's extraordinary capacity to deliver *offensive* firepower with unprecedented effectiveness. Yet, the performance of missile defenses was not nearly as impressive. To be sure, Patriot missile batteries performed immensely better than they did during the first Gulf war: all nine of Iraq's most threatening ballistic missile launches were successfully intercepted and destroyed. But the second Gulf war saw the first use of enemy land-attack cruise missiles against Patriot in combat. American and Kuwaiti Patriot batteries failed to detect any of Iraq's low-flying cruise missiles, one of which came perilously close to striking a U.S. Marine encampment on the war's opening day. What's more, at least two Iraqi ultralight aircraft—which were feared capable of carrying chemical or biological agents—were detected only after flying over thousands of U.S. troops, equipment, and command facilities prior to a U.S. Army division's advance on Baghdad. Iraq's use of cruise missiles and slow-flying air vehicles, which were manned but needn't have been, also contributed to the Patriot's unfortunate series of friendly-fire incidents, two of which led to the loss of two coalition aircraft and the deaths of three crew members.

The poor performance of Patriot missile defenses against cruise missiles, including the related problem of friendly-fire casualties, should not have come as a big surprise. In a report issued just before the second Gulf war, the Senate Armed Services Committee stated that the Pentagon's "longstanding" combat identification and friendly-force tracking weaknesses were not being rectified "in the most expeditious manner." These longstanding weaknesses, however, have less to do with Patriot's combat identification flaws than with the absence of fully integrated service data links and target-tracking techniques, otherwise known as the Single Integrated Air Picture (SIAP). Thus, pinning blame on Patriot alone is unwarranted. In a February 22 broadcast, the CBS

* For a detailed elaboration of these issues, see Dennis M. Gormley, "Missile Defence Myopia: Lessons from the Iraq War," *Survival*, vol. 45, no. 4 (Winter, 2003-04), pp. 61-86, available at http://cns.miis.edu/research/missile.htm.

news magazine *60 Minutes* did precisely that by ignoring the impact that low-flying cruise missile threats had on Patriot's unfortunate friendly-fire incidents. The news magazine essentially branded Patriot as the exclusive culprit in causing the deaths of three aircrew members, the loss of two aircraft, and the destruction of a Patriot radar after it had mistakenly "painted" a U.S. Air Force F-16, which promptly destroyed the radar station to protect itself from a Patriot interceptor. Focusing myopically on Patriot alone, particularly the problematic performance of positive electronic means and procedural tactics, overlooks the fact that these combat identification techniques operate with low reliability when missile batteries are faced with the challenge of positively identifying low-flying cruise missiles, steep-trajectory ballistic missiles, and returning friendly aircraft. Simulated friendly-fire incidents have been disconcertingly high, often producing friendly attrition levels of 10-20% or more. Thus, fixing Patriot's combat identification flaws alone will produce inconsequential results without a broader attendance to the need for radically improved cruise missile defenses.

Although *60 Minutes* disparaged Patriot's poor performance against ballistic missiles during the first Gulf war, it never posed the question why, in spite of Patriot's poor performance in 1991, its radars never once confused a returning friendly aircraft for an enemy missile, as occurred during the second Gulf war. The reason why Patriot experienced no friendly-fire casualties in 1991 was because coalition air forces quickly eliminated Iraq's air force and Iraq possessed no cruise missiles, small airplanes, or UAVs to confuse Patriot's radars. Thus, missile defense batteries could afford to establish highly restrictive rules of engagement, which effectively shut down missile defense batteries against everything but the ballistic missile threat. Because a cruise missile and UAV threat had materialized during the second Gulf war, comparably narrow rules of engagement were apparently not implemented, producing the results pre-war simulations predicted would occur.

Of course, Patriot missile defense interceptors are theoretically capable of shooting down low-flying cruise missiles, but the horizon limits of their own ground-based radar mean that a Patriot unit would not see a low-flying cruise missile until it had closed to within 35 kilometers or less of the battery. This explains why after the war, Dr. William Schneider, Chairman of the Pentagon's Defense Science Board, called for integrating airborne sensors like AWACS with Patriot units to improve chances of detecting and intercepting such threats. Surely, establishing communications between AWACS and Patriot batteries is a step in the right direction, but much more needs to be done as cruise missiles and UAV spread. Implementing an effective SIAP depends importantly on better airborne sensors for detecting low- and slow-flying cruise missiles and UAVs. The kind of high-quality fire-control sensors slated for integration into the U.S. Air Force's Multi-Sensor Command and Control Aircraft (MC2A) would radically alter and dramatically improve the currently service-centric approach to controlling the fires of missile defense batteries, whereby each missile is guided to its target by its own ground-based, horizon-limited radar. Operating as a centralized command and control system, MC2A could conceivably extend the range capability of ground-based interceptors much beyond their current horizon-limited performance levels. High-quality airborne sensors would also greatly reduce friendly-fire casualties, as potential targets, friend and foe alike, would be identified and tracked over great distances afforded by a platform flying at 35,000 feet altitude. But such an airborne platform may not be fielded

for another decade, assuming it survives the inevitable battles associated with defense budget priorities.

In the meantime, America's adversaries are bound to draw important lessons from the performance of U.S. missile defenses against Iraq. Referring to Iraq's use of cruise missiles, the chief-of-staff of the 32nd Army Air and Missile Defense Command told the *New York Times* "this was a glimpse of future threats. It is a poor man's air force. A thinking enemy will use uncommon means such as cruise missiles and unmanned aerial vehicles on multiple fronts." At least two reasons account for why we should anticipate an acceleration of interest in acquiring cruise missiles and UAVs. First, countries wishing to deter U.S. military interventions were unlikely to invest heavily in cruise missiles until American missile defenses performed decisively better against ballistic missiles than they did during the 1991 Gulf war. Patriot's success against Iraq ballistic missiles in 2003 coupled with problems coping with cruise missile attacks increases the incentive to acquire difficult-to-defend against cruise missiles and UAVs. Second, America's adversaries are likely to appreciate the operational advantages of combining ballistic and cruise missiles launches to maximize the probability of penetrating even the best American missile defenses. Converting small airplanes or UAVs into weapons carrying "missiles" offers a particularly attractive poor man's option. When these, in large numbers, are combined with more expensive and sophisticated ballistic and cruise missiles, they raise the stakes enormously for American missile defenses. Consider, for example, the dire and unfavorable cost-exchange arithmetic associated with current U.S. missile defenses and conceivable adversary missile threats. The guidance upgrade alone on the PAC-2 Guidance Enhanced Missile costs $400,000 per missile, and each new PAC-3 interceptor costs $3.5M. A flock of cruise missiles or converted airplanes several orders of magnitude cheaper could readily saturate most economically feasible missile defense architectures. Thus, controlling the quantitative spread of cruise missiles and UAVs through improved nonproliferation policies is an absolute necessity to guarantee confidence in our missile defense expenditures.

Saturation with cheap cruise missiles or UAVs is of less concern when we consider terrorist use of such systems against the U.S. homeland. Were an attack to involve delivery of a weapon of mass destruction, one successful strike against the American homeland—particularly a major urban target—could have devastating consequences. Due to its aerodynamic stability and capacity to release agent along a line of contamination, a cruise missile or UAV is much effective than a ballistic missile in delivering chemical or biological payloads (conservatively enlarging the lethal area for biological attacks by at least ten times).

Analysts of the missile threat to the United States focus on "range rings" to show the distance beyond a nation's borders that its missiles can reach. But UAVs essentially destroy the relevance of range rings. Cruise missiles or UAVs might be launched from concealed locations at modest distances from their targets, or brought within range and launched from freighters or commercial container ships—in effect, a "two stage" form of delivery. Al Qaeda is believed to possess at least 15 freighters. In the aftermath of the September 11, 2001 terrorist attacks, key U.S. decisionmakers began to take such two-stage threats more seriously. The 2002 National Intelligence Estimate (NIE) on the ballistic missile threat to the United States drew attention to the covert conversion of a commercial container ship as a launching pad for a cruise missile. Even a large, bulky

cruise missile like the ones Iraq used to fire at coalition forces last year could be equipped with a small internal erector for launching and still fit comfortably in a standard 12-meter shipping container. Indeed, the 2002 NIE argues that because such a delivery system, among several others, is less costly, easier to acquire, and more reliable than an intercontinental ballistic missile, a cruise missile attack against the American homeland is more likely to occur than a ballistic missile attack.

Making matters worse from a missile defense standpoint, a terrorist group might wish to convert a small kit airplane into an autonomous delivery system, which could be launched from locations near their intended target. The development approach would be similar to a state wishing to create a poor man's air force of cruise missiles. Larger than the ultralights used by Iraq last year, kit airplanes could be converted at substantially less cost, with less significant engineering prowess, and fewer steps—and thus less chance of failure—than either converting anti-ship cruise missiles, as Iraq did, or small reconnaissance or target drones, into land-attack systems. From a worldwide list of manufacturers, a terrorist group could choose from among nearly 500 well-tested designs, many with ranges exceeding 600 miles, payloads of 400 pounds, football-field takeoff distances from soft, grassy areas, and stall speeds of under 80 knots. Such slow speeds actually furnish an advantage as many of our sophisticated lookdown airborne and ground-based air defense radars eliminate slow-moving target on or near the ground to prevent their data processing and display systems from becoming overtaxed. This means that propeller-driven kit airplanes flying under knots per hour would be ignored as potential targets.

The notion that a terrorist group might entertain using a UAV is by no means far-fetched. One recent accounting of terrorist activity notes 43 recorded cases involving 14 terrorist groups in which remote-controlled delivery systems were "either threatened, developed or actually utilized," including al Qaeda plans to use unmanned airplanes to kill leaders at the 2002 G-8 summit in Genoa, Italy. Moreover, according to the London *Independent* newspaper, a British national held at Camp Delta, Guantanamo Bay, Cuba, has confessed to being part of an al Qaeda plot to acquire a drone to attack the House of Commons with anthrax. Such threats may explain why member states of the Missile Technology Control Regime (MTCR) and Wassenaar Arrangement have pledged to strengthen efforts to limit the risk of controlled items and their technologies from falling into the hands of terrorist groups and individual.

The challenges and potential costs of defending the homeland against both offshore and domestic cruise missile threats are considerable. The North American Aerospace Defense Command (NORAD) is currently studying the idea of an unmanned airship operating at an altitude of 65,000 feet and carrying sensors to monitor and detect offshore low-flying cruise missiles. Several such airships would be needed together with fast-moving interceptors to cope with perceived threats. Perhaps 100 aerostats at an altitude of 15,000 feet could act as a complementary or alternative system of surveillance and fire control for an interceptor fleet. Still, other problems remain. Someway is needed of providing warning information to the Coast Guard on potentially hostile ships embarking from ports of concern. Missile threat sensor data must be capable of distinguishing between friendly traffic and enemy threats, prior to threat engagement. Progress in national cruise missile defense will not be made without corresponding improvements to respective service programs, foremost in implementing the SIAP

program. The question of affordability looms large. Even a limited defense against offshore cruise missiles would cost $30–40 billion. Finally, none of these costs or technical challenges pertains to improved defenses against domestic threats. In the aftermath of the September 11, 2001 terrorist attacks, NORAD had no internal air picture—nor were its radar assets linked with those of the Federal Aviation Administration (FAA), which controls internal US-air traffic. Progress towards making such linkages has occurred but major gaps remain, especially when dealing with the detection of low- and slow-flying air targets. One area showing particular promise, not least because of its potential affordability, is the exploitation of the nation's existing High Definition Television infrastructure to detect, track, and classify such low-flying threats. Still, the nation will remain ill prepared to cope with such threats for the foreseeable future. As a NORAD test director commented after a 2001 counter-terrorism exercise in which a simulated cruise missile is launched from a merchant ship in the Gulf of Mexico, "we are naked . . . [and] have no capacity to deal with that kind of problem."

How can more effective nonproliferation policies help constrain the kinds of threats discussed above? First, to the extent that the administration takes seriously the GAO's excellent set of recommendations, stronger compliance with existing export control provisions governing transfers of cruise missiles, UAVs, and related technologies should result. Moreover, it is imperative that the current catch-all provision be broadened to capture potential transfers of items of greatest significance for cruise missiles and UAVs that are not currently on the Commerce Control List. While the executive branch should be congratulated for taking the initiative to revise the MTCR's control lists of sensitive missile-related equipment and technology related to cruise missile and UAV technology, there is another initiative that should be taken to address the threats I have outlined in my testimony.

This initiative bears on the control of flight control systems specially designed to transform manned aircraft or radio-controlled UAVs into completely autonomous systems. In its letter to the GAO commenting on its report, the Department of Commerce tries to make an important distinction "between threats posed by a rudimentary UAV that is radio-controlled and operates only in line of sight, versus a cruise missile with a range of 1000 km and payload of 1000 kg." Of course, a cruise missile or UAV needn't possess a payload capacity of 1000 kg to achieve catastrophic damage; if a biological agent were involved, a fraction of that capacity could produce devastating effects. But such a UAV needn't be constrained by line-of-sight control, either. A small number of new aerospace firms have emerged in the last five years to sell fully integrated flight control systems that permit an air vehicle to be flown either by remote control or fully autonomously over great distances. At present, no export controls govern the sale of these flight control systems either to states or individuals. These firms not only sell a complete flight control solution, but also furnish services to help in the integration effort. The most significant technical challenge facing any terrorist group wishing to convert a small kit airplane into a terrorist UAV is building and integrating a flight control system, along with servo-controls and actuators, into the air vehicle to fly it autonomously over the desired range. If that can be achieved readily, a seemingly rudimentary radio-controlled UAV or a kit airplane could be transformed into a system capable of achieving strategic impact.

The U.S. unsuccessfully attempted to introduce a measure of control over such technology when it introduced an "anti-terrorism" proposal to the Wassenaar Arrangement in early 2003. Expressing concern about the possible terrorist use of kit airplanes or other manned civil aircraft as "poor man's" UAVs, the U.S. proposal sought export control reviews and international notifications for all equipment, systems, and specially designed components that would enable these airplanes to be converted into UAVs. It is my understanding that the proposal failed to produce a consensus for implementation because it was viewed as insufficiently specific with respect to precisely what technology was to be controlled. Executive branch authorities should redirect their efforts toward redrafting this proposal with the intention of controlling variable autonomy flight control systems that enable unmanned and manned aircraft to fly autonomously over long distances. Moreover, the proposal should be introduced not only within the Wassenaar Arrangement, but also within the MTCR. In contrast to the Wassenaar Arrangement, the MTCR possesses strong denial rules and no-undercut provisions, which provide for a greater degree of effectiveness in controlling unwanted transfers. Implementation of such a proposed measure would serve to make the terrorist's job of transforming a kit airplane or small radio-controlled UAV into fully autonomous delivery far more problematic than it is today.

Missile Defence Myopia: Lessons from the Iraq War

Dennis M. Gormley

Strategists have already seized upon the US military's 21-day march to Baghdad as a vindication of US Secretary of Defense Donald Rumsfeld's determination to transform the US military into a tightly integrated force capable of quickly and decisively defeating any conceivable adversary.[1] American air, sea and land forces demonstrated an extraordinary capacity to deliver offensive military power in a highly orchestrated way. The promise of Network Centric Warfare – the Pentagon's appellation for a robustly networked joint force capable of sharing and acting upon a common picture of both friendly and enemy activities – became evident when offensive firepower was brought to bear simultaneously throughout the theatre of operations.

Yet the Rumsfeld-led transformation was not nearly as impressive on the defensive side of American military performance. Admittedly, the war's greatly anticipated engagement between Iraqi ballistic missiles and America's improved *Patriot* missile defences went decidedly in America's favour: all nine of Iraq's most threatening missile launches were successfully intercepted and destroyed. But American and Kuwaiti missile defences and warning systems apparently failed to detect or intercept four of five Iraqi low-flying cruise missiles and there is no public evidence that *Patriot* was involved in one way or the other.[2] One of the cruise missiles came perilously close to a US Marine encampment on the war's first day. Furthermore, at least two Iraqi ultralight aircraft – which were feared capable of carrying chemical or biological agents – were detected only after flying over thousands of US troops, equipment and command facilities prior to the unit's advance on Baghdad.[3] Iraq's use of low-flying cruise missiles and slow-flying air vehicles also contributed to the *Patriot*'s unfortunate series of friendly fire incidents, two of which led to the loss of two aircraft and the deaths of three crew members.

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In a practical sense, the United States fielded only half a missile defence system, capable of handling but one dimension of the missile threat.

To many observers, asking missile defences to defend against low-flying cruise missiles and small manned or unmanned air vehicles must seem like moving the goalposts: with every new war, missile defences are called on to perform missions that appear to be ahead of what the technology can provide.[4] But the truth is that awareness of the shortcomings of cruise missile defence and steps needed to rectify them date back nearly a decade. The Pentagon's own Defense Science Board conducted at least two detailed reviews and offered recommendations for improvements during the 1990s, while the Congress fashioned the 'Cruise Missile Defense Initiative' in its National Defense Authorization Act of Fiscal Year 1996. A call for greatly improved cruise missile defences to respond to an earlier-than-expected emergence of the cruise missile threat also made it into the Pentagon's *Defense Planning Guidance* in 1998.[5] And in a report issued prior to *Operation Iraqi Freedom*, the Senate Armed Services Committee stated that the Pentagon's 'longstanding' combat identification and friendly-force tracking weaknesses, which surely contributed to the *Patriot's* friendly fire incidents, were not being rectified 'in the most expeditious manner'.[6]

Sadly, then, the poor performance of missile defences against cruise missiles, including the related problem of friendly-fire casualties, should have come as no big surprise. America's adversaries could draw important lessons from the performance of US missile defences against Iraq. The chief-of-staff of the 32nd Army Air and Missile Defense Command told the *New York Times* that 'this was a glimpse of future threats. It is a poor man's air force. A thinking enemy will use uncommon means such as cruise missiles and unmanned aerial vehicles on multiple fronts'.[7] Although such worries were already in evidence prior to the war with Iraq, missile defence planners should anticipate an acceleration of interest in acquiring cruise missiles for at least two reasons.[8] First, countries wishing to deter US military interventions were unlikely to invest heavily in cruise missiles for land attack until American missile defences performed decisively better against ballistic missiles than they did during the 1991 Gulf War. *Patriot's* success against Iraq's ballistic missiles in 2003 coupled with problems coping with cruise missile attacks increases the incentive for the United States' potential adversaries to acquire cruise missiles. Second, they are likely to see the operational advantages of combining ballistic and cruise missile launches to maximise the probability of penetrating even the best American missile defences. Converting small airplanes or UAVs into weapons-carrying 'missiles' offers a particularly attractive 'poor man's' option. When these, in large

numbers, are combined with more expensive and sophisticated ballistic and cruise missiles, they could have a distinct advantage over even layered defences.

Given the high stakes involved in facing an adversary with such offensive missiles armed with weapons of mass destruction (WMD) – most notably nuclear or biological weapons – America has no choice but to rectify the disparity in investments and bureaucratic attention between its ballistic and cruise missile defence programmes. Critical challenges face both missile defence planners and officials charged with missile non-proliferation policy.

Scoring ballistic missile defence

The Iraq War demonstrated positive returns on a $3 billion programme to upgrade *Patriot* since its abysmal performance during the 1991 Gulf War, when the US Army rushed a modified version into combat. Its major limitation came from a proximity fuse that failed to detonate the fragmentation warhead close enough to destroy the missile warhead. Even when it did hit the intended target, it merely knocked the missile off course – and potentially towards urban centres or troop concentrations. A US Government Accounting Office report estimated that only 9% of the *Patriot* Advanced Capability-2 (PAC-2) interceptors actually hit their targets during the 1991 Gulf War, while Israeli authorities reported that *Patriot* succeeded in intercepting no more than one of the 39 Iraqi *Scuds* launched at Israel.[9] This time around, upgraded PAC-2 missiles, together with roughly 50 of the latest *Patriot* interceptors, the PAC-3, were deployed. Army officials report that Iraq launched 19 ballistic missiles at coalition targets in Kuwait and Iraq, only nine of which proved to threaten potential targets. *Patriot* batteries successfully intercepted all nine of the most threatening missiles. Ten other non-threatening missiles, most of which may have been hastily aimed because the Iraqis feared coalition counter-fire, were allowed to land harmlessly in the desert or in Gulf waters.[10]

Patriot batteries were deployed in Kuwait, Qatar, Bahrain, Saudi Arabia, Israel and Turkey, the last under NATO control. Instead of remaining in fixed positions throughout the war, some Kuwaiti-based batteries moved with coalition ground forces towards Baghdad to furnish local-area protection. And rather than depending on just the space-based Defense Support Programme for warning information on launch detection, *Patriot* units were furnished with early warning information from two dedicated sources: an *Aegis* cruiser equipped with a *SPY* phased array radar deployed in the Persian Gulf, and a regionally deployed *Cobra Judy* ship-based radar system normally used to monitor missile tests.[11]

America's decade-long investment in upgrading *Patriot's* performance has led to overall communications and command-and-control improvements that yield a seven-fold increase in the area each *Patriot* battery can protect. Of course, theoretical area protection is only useful to the extent *Patriot's* missile interceptors actually perform as expected. In *Operation Iraqi Freedom*, some missile defence batteries carried as many as three different interceptors – all developed since the 1991 Gulf War. According to an Army official, the *Patriot's* radar evaluates the incoming target's characteristics and automatically selects the best interceptor to engage it.[12] The first and most prominently used interceptor was the PAC-2 Guidance Enhanced Missile (GEM). Designed to rectify the intercept limitations of the PAC-2, the PAC-2 GEM features an altered fragmentation pattern in its high-explosive warhead together with modified electronics that enhance the probability of an explosive impact near the target missile's nose cone. A second set of improvements came with the introduction of the PAC-2 GEM-Plus, which includes an improved fuse and a missile sensor that enables the detection and engagement of smaller targets, presumably including cruise missiles. The third and most operationally tenuous of *Patriot's* upgrades is the entirely new PAC-3. Still in operational testing in early 2003, it appears that the entire US inventory of 50 PAC-3 interceptors was rushed into the region. The PAC-3 features controversial hit-to-kill technology, whereby the interceptor destroys the target, including any chemical and biological agents, by kinetic impact without a high-explosive warhead. Because the PAC-3 is considerably smaller than the PAC-2 (roughly a quarter to a third of PAC-2's weight), each *Patriot* launch canister can carry four PAC-3s compared with one PAC-2 GEM or GEM-Plus. Yet PAC-3's improved capabilities carry a hefty price tag: each four-missile canister costs $12–15 million, or close to $3.4m per missile compared with the original PAC-2's unit cost of $700,000.[13]

Beyond cost is the question of whether the PAC-3 has been tested with enough operational realism to warrant confidence about its prospective performance in battle. The PAC-3 performed well (in fact, missing only one target) during a developmental sequence of 11 tests, but this was only against ballistic missiles or target drones flying predictable trajectories. In more recent operational testing, when a higher degree of battlefield realism was introduced, only three of seven targets were destroyed. Most importantly, to date, none of the PAC-3's tests has featured a ballistic missile target similar to the ones that proved so difficult to intercept in 1991 Gulf War. In order to extend their range, the Iraqis clumsily modified Soviet-furnished *Scud* missiles in the late 1980s. When they were launched in 1991, these longer-range *Scuds* encountered

severe aerodynamic stresses, which caused many of them to break up or flutter wildly, making them difficult to engage.[14]

During the war with Iraq, *Patriot* units were not tested against faster and more challenging *Scud* variants. American and British intelligence presumed that about 25 existed in Iraq's arsenal. Instead, Iraq used *al-Samoud*-2 and *Ababil*-100 ballistic missiles, which, given their range of, at most, 150km, are slower and easier to intercept. That said, a senior US army official noted that shorter-range missiles leave less time for defenders to respond to launches.[15] Moreover, *al-Samoud* and *Ababil* missiles are much more accurate than *Scuds*. Even armed with only high-explosive warheads, rather than chemical or biological payloads, they represented a much greater threat to coalition forces. For example, according to the Army's post-event analysis, a *Patriot* missile intercepted an *Ababil*-100 only three kilometres before it would have struck the coalition's main command centre at Camp Doha in Kuwait.[16]

More often than not, *Patriot* batteries employed the PAC-2 GEM interceptor to engage Iraqi ballistic missiles. Using PAC-2 GEMs, Kuwaiti-manned batteries were credited with shooting down two of the nine intercepted missiles. American-manned batteries successfully engaged the other seven Iraqi missiles, five with PAC-2 GEM interceptors and two with the new PAC-3 hit-to-kill interceptor.[17] All missile batteries practiced the standard targeting doctrine of sequentially expending two missiles per target – and occasionally more, when it was determined necessary – in order to increase the probability of intercept. According to Army analysis, however, most intercepts came from the first missile fired.[18] To avoid inflated claims of success such as those that followed the 1991 Gulf War, Army officials this time based their reports on electronic tapes of missile engagements and examinations of the remains of intercepted missiles found in the desert.[19]

Repeated false alarms had a debilitating effect on military performance

While *Patriot* batteries performed well in their principal task, there were an extraordinarily high number of false alarms, despite the availability of both space-based and off-shore ballistic missile warning radars. Because military officials had to assume that Iraqi missiles might be carrying chemical or biological payloads, they erred on the side of caution, which caused alerted ground units to don chemical suits and gas masks in 37°C-plus heat. The repeated false alarms had such a debilitating effect on military performance that it led US and British on-the-ground commanders, worried about the pace of the ground advance towards Baghdad, to request that such alerts occur only when positive

evidence of a missile launch was obtained. But in light of the risks of just one chemically armed missile getting through, senior military officials continued to practice a risk-averse warning policy.[20] Without greatly improved broad-area detection and tracking of cruise missiles and UAVs, the false-alarm rate will have even more deleterious effects in the future. Cruise missile launch signatures, unlike those for ballistic missiles, are too faint for confident launch detection by space-based and even most airborne sensors. Given that cruise missiles are substantially more effective than ballistic missiles in delivering chemical or biological weapons (conservatively, enlarging the lethal area for biological attack by at least ten times), military decision-makers are likely to be even more risk-averse for fear of the consequences.[21]

Success is relative

If *Patriot* missile batteries and other warning systems shone against ballistic missiles, they performed dimly against Iraq's improvised use of anti-ship cruise missiles and low-flying aircraft. In all, the Iraqis fired five Chinese-made HY-2 *Seersucker* (a NATO appellation) missiles, each of which can carry a payload of 500kg to a range of around 100km, flying a terrain-hugging profile to avoid radar detection. *Seersuckers* are designed for use against ships at sea, but can be employed – if far less effectively – over land, and especially flat desert terrain, to attack large targets that afford enough contrast for their primitive radar guidance systems to detect. The Interim Report of Dr David Kay, however, indicates that before the war the Iraqis had modified ten *Seersuckers* to permit them to be employed over land and to fly to a range of 150–180km.[22] No matter which model was used, the Iraqis nearly achieved tactical success when, on the first day of the war, a *Seersucker* came undetected within one kilometre of striking Camp Commando, the US Marine Corps headquarters in Kuwait. Another hit just outside a large Kuwaiti shopping mall later in the war.

Although Army officials were quick to point out that each and every Iraqi ballistic missile that threatened coalition objectives was successfully engaged, they didn't explain how Iraqi cruise missiles managed to come so close to both a military and civilian target undetected. An industry official claimed that no *Patriot* assets were assigned in the area in which the mall was located, and that if there had been radars and interceptors in the area they could have engaged such low-flying threats.[23] While the *Patriot* system in theory is capable of engaging low-flying cruise missiles, in practice the *Patriot's* ground-based radar probably would not detect such low-flying missiles unless furnished with advanced warning information provided by an airborne radar. Many ground-based radars supporting today's air-defence missiles reduce the amount of ground

clutter by tilting the search beam back about three degrees, effectively lifting it above the ground. This increases the chances that a low-flying cruise missile will go undetected. Moreover, whereas airborne radar systems (like the US Air Force's Airborne Warning and Control System, or AWACS) can see several hundreds of kilometres, the earth's curvature means that the *Patriot's* ground-based radar, in trying to detect a cruise missile flying at a 50-metre altitude, might first see it only when it has closed to some 35km or less. This would leave roughly two-and-a-half minutes to react to an incoming *Seersucker*. Curiously, the Kay Report's claim that one *Seersucker* was shot down does not explain by what means. In any event, *Patriot's* inherent limitations against such threats were recognised after the war when William Schneider, chairman of the Pentagon's advisory Defense Science Board, called for integrating airborne sensors like AWACS with *Patriot* to improve chances of intercepting low-flying cruise missiles.[24]

Equally telling were the two Iraqi ultralight aircraft that went undetected until they were directly over a large US Army forward encampment south of Baghdad on 28 March. A day after the incident, Central Command officials were still telling reporters that the Iraqis were incapable of flying aircraft because their airfields were being kept closed and carefully monitored.[25] However, ultralights and other kit-built aircraft do not require airfields to take off and land. Moreover, sophisticated airborne surveillance aircraft like AWACS and the US Air Force Joint Surveillance Target Attack Radar System (JSTARS) are unable to detect them because their radars screen out slow-flying targets on or near the ground to ensure that their data processing and display systems are not overburdened.[26]

Two Iraqi ultralight aircraft went undetected

It remains unclear whether a *Patriot* battery was covering the forward US Army encampment, though it seems likely since missile defence units were deployed in Iraq in part to furnish protection for such units. Onsite reporting indicates that anti-aircraft units, consisting of *Linebacker* (*Bradley* fighting vehicles armed with *Stinger* anti-aircraft missiles) and *Avenger* systems (Humvees mounted with *Stingers*), received a mid-afternoon report on the ultralights and oriented their fire units to prepare to engage the small aircraft. Unit members visually spotted the ultralights flying at about 270 metres above the ground roughly at the speed of a helicopter. But the Iraqi aircraft had departed the area by the time higher command had approved their firing on such targets, as required by local rules of engagement. The enormously cluttered friendly air environment probably accounts for the lengthy decision process. Local air defence

officers admitted that it was difficult to distinguish the ultralights from the huge number of returning US helicopters and fixed-wing aircraft on their radar screens.[27]

Unintended consequences

During the 1991 Gulf War, *Patriot* batteries had a relatively easy task when they were confined to detecting the comparatively steep trajectories of ballistic missiles. Coalition air forces had rapidly eliminated the Iraqi air force and no cruise missile, small airplane, or UAV threats existed. Thus, coalition defenders could afford to establish highly restrictive rules of engagement, which effectively shut down *Patriot* batteries against everything but the ballistic missile threat. This, in turn, prevented friendly fire accidents from occurring. But because a cruise missile and UAV threat had materialised by the time of the second Gulf War, comparably narrow rules of engagement were apparently not implemented.[28] As a consequence, an American *Patriot* unit inadvertently shot down a British *Tornado* fighter three days into the war, killing two crew members. The next day, to avoid the same fate, a US Air Force F-16 destroyed a *Patriot* ground-based radar after it mistakenly 'painted' the friendly aircraft. In spite of efforts to tailor *Patriot* rules of engagement after these incidents, yet another friendly aircraft, a US Navy F/A-18, was shot down and its pilot killed on 2 April.[29]

Subsequent press interviews with industry and military officials, and reporting on the formal post-war investigations, focused specifically on the responsible *Patriot* batteries and friendly aircraft and on possible flaws in positive electronic means and procedural tactics (such as using protected engagement zones for returning friendly aircraft) associated with combat identification. Indeed, a malfunctioning identification electronic warning beacon on the British *Tornado*, the *Patriot* crew's decision to place its radar on automatic owing to heavy local fire, and heavy electronic interference due to the positioning of two *Patriot* radars too close to each other, have been cited as possible explanations for the respective friendly fire incidents.[30] Yet while the formal investigation was still underway, the US Army's Center for Lessons Learned noted in its own evaluation that positive electronic means of identifying airborne objects have 'low reliability'. In fact, based on military exercises conducted in 1993, a 1996 National Research Council study reported that 'attempts to coordinate air and [surface-to-air missile] intercepts in the same airspace led to unacceptably high levels of [simulated] fratricide'.[31]

Regardless of whether combat identification measures (such as acoustic signatures of friendly aircraft or IFF transponders) or protected engagement zones are used, the levels of simulated friendly fire incidents

Threat and response timeline

Date	Threat(s) – Real or Mistaken	Apparent Target(s)	Response
20 March	1 cruise missile	Marine Camp Commando	No detection indicated, nor missile interception attempted.
20 March	3 ballistic missiles	101st Airborne Division; Camp Doha; and Camp Udari	US *Patriot* batteries intercepted all 3 threatening missiles.
21 March	1 ballistic missile	Ali Al Salem air base	Kuwaiti *Patriot* battery intercepted 1 threatening missile, while 2 others were allowed to land in the desert or Gulf.
23 March	British Tornado GR-4	Somewhere in northern Kuwait	US *Patriot* PAC-2 battery misidentified friendly aircraft as a missile threat and destroyed the aircraft, killing two pilots.
24 March	1 ballistic missile	US troops in Kuwait	A US *Patriot* battery apparently intercepted 1 threatening missile, while another non-threatening missile landed in the desert.
24 March	US F-16 CJ	*Patriot* battery forward-deployed to protect 3rd Infantry Division	Mistaking the F-16 for a missile threat, the *Patriot's* radar 'painted' the F-16, which in turn fired on the radar, damaging it. The *Patriot* battery, reportedly, was operating on automatic.
25 March	1 ballistic missile	Somewhere in Kuwait	A Kuwaiti *Patriot* battery intercepted the threatening missile.
26 March	1 ballistic missile	Somewhere in Kuwait	A Kuwaiti *Patriot* battery intercepted the threatening missile.

Date	Threat(s) – Real or Mistaken	Apparent Target(s)	Response
27 March	1 ballistic missile	Camp Doha	A US *Patriot* battery intercepted an *Ababil* 100 missile on course for the allied command center.
28 March	2 cruise missiles	First aimed apparently at Kuwait's naval port; second hit close to nearby shopping mall	Press reports indicate no detection and no interception. Kay Report claims one missile shot down but no date given. Shoot down could have occurred on 31 March.*
28 March	2 manned ultralight reconnaissance aircraft	US Army forward encampment south of Baghdad	No detection until 2 penetrating aircraft were directly over encampment. No interception attempted due to delay in execution authority.
29 March	1 ballistic missile	Somewhere in Kuwait	This reported intercept by a Kuwaiti *Patriot* battery may be apocryphal. US Army officials reported that Kuwaiti *Patriot* batteries successfully engaged only 3 missiles.
31 March	2 cruise missiles	Allied forces at Umm Qasr; another at forces at Safwan	No evidence of detection, or attempt at interception, but neither missile threatened targets.
1 April	1 ballistic missile	Apparently allied forces near Najaf	A US *Patriot* battery intercepted the threatening missile with a PAC-3 interceptor.
2 April	US F/A-18C	Near Karbala	A US *Patriot* battery misidentified the F/A-18 as a threatening missile and destroyed the aircraft, killing its one pilot.

Sources: Author's compilation based on Center for Defense Information, at http://www.cdi.org/document/search/displaydoc.cfm?DocumentID=1001&StartRow=1&ListRows=10; Michael R. Gordon, 'A Poor Man's Air Force', *New York Times*, 19 June 2003, p.1; Sean D. Naylor, 'Iraqi ultralights spotted over U.S. Troops', *Army Times*, 29 March 2003, at http://209.157.64.200/focus/f-news/879398/posts and Interim Report of the Iraqi Survey Group (Kay Report), at http://www.cia.gov/cia/public affairs/speeches/2003/david_kay_10022003.html.

*The Kay Report indicates that 10 modified (from anti-ship to land attack) HY-2 *Seersucker* missiles were delivered to the Iraqi military before the war, and of the two used during the war, one was shot down though by what means is not stated. After the war, 33 *Seersucker* missiles were found intact on the al-Faw peninsula, suggesting that perhaps both anti-ship and land-attack versions were used to account for the total of five reported used during the war.

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have been disconcertingly high, often producing friendly-aircraft attrition levels of 10–20% or more.[32] Technical or procedural flaws do not completely explain the longstanding systemic weaknesses of American air combat identification. While establishing communications between AWACS and *Patriot* batteries would be a step in the right direction, for instance, problems would remain severe in the early stages of any conflict when only minimal surveillance and battle management and control systems would likely be in place and coordination among service air fleets and coalition partners probably would not have gelled. As the cruise missile and UAV threat grows, today's fratricide and missile defence challenges could become tomorrow's nightmare.

A glimpse of future threats

The nature of future air campaigns is far less likely to involve air-to-air combat than the enemy's use of both ballistic and cruise missiles against air defences. While the enemy's aircraft must operate from highly vulnerable airfields, which are high-priority targets in the early hours of any initial air campaign, ballistic and cruise missiles can be launched from mobile launchers. These have proven devilishly difficult to find and successfully destroy in past military campaigns. During the 1991 Gulf War, the coalition was unable to destroy even one Iraqi *Scud* launcher, and while counterforce-targeting capabilities have improved somewhat since 1991, the advent of ground-launched cruise missiles will tax them further. Pre-launch attack is obviously preferable against WMD-armed missiles, but pre-launch detection of cruise missiles is especially problematic because cruise missile launchers are smaller than ballistic missile launchers and more closely resemble other civilian and military vehicles. This could mean a doubling of the 'look-alike' or 'confuser' population, which places the burden of distinguishing real from false

targets on airborne sensors.[33] And, as noted before, post-launch detection of cruise missiles will be highly doubtful due to their faint launch signatures. Although it is premature to draw any conclusions about the record of counterforce attacks on Iraqi missile launchers during the second Gulf War, the Iraqis did manage to continue firing both ballistic and cruise missiles throughout the brief campaign, and 33 *Seersucker* missiles, along with two launchers, were found intact on the al-Faw peninsula after the war ended.[34]

In light of Iraq's use of surplus *Seersuckers* during the war, any projection of the future cruise missile threat necessarily ought to begin with a closer look at anti-ship cruise missiles. Whether or not to allay the fear of Kuwaiti citizens, who experienced several unnerving if ultimately harmless *Seersucker* attacks during the recent war, coalition military officials severely misrepresented the potential capability of these missiles. 'The *Seersucker* is much, much smaller than a *Scud* and we don't think it can be converted to carry any significant NBC [nuclear, biological or chemical] payload', said one coalition office after *Seersuckers* were launched against targets in Kuwait.[35] In fact, the *Seersucker*'s smaller size is arguably an operational advantage, and certainly not a disadvantage. The *Seersucker* can be transformed into a comparably long-range missile without becoming nearly as heavy and difficult to support as the *al-Hussein*. Furthermore, each missile delivers a payload of 500kg. The *Seersucker* is a decidedly more suitable platform for delivering biological and chemical payloads than a *Scud* or *al-Hussein* in that the cruise missile's steady horizontal flight pattern permits the release and spraying of agent at right angles to the wind direction and upwind of the target area, greatly increasing dissemination efficiency compared with a ballistic missile.[36]

States may wish to achieve significantly greater lethal effects from their surplus inventories of *Seersuckers* by converting them into genuine land-attack cruise missiles. According to the Kay Report, this seems to be precisely what Iraq did to at least ten of its surplus *Seersuckers*. Launched over water and flying low, anti-ship cruise missiles like the *Seersucker* have a relatively easy task: using a simple autopilot for navigation, they employ a terminal radar guidance system to seek out a large metal object (ship). Used over the desert, however, such missiles have more difficulty in hitting their intended targets because such targets furnish less contrast than a ship at sea.[37] Land-attack cruise missiles generally must navigate more variegated terrain than anti-ship cruise missiles (or such missiles launched over desert terrain) before they reach their intended targets, while flying low to avoid detection.

Conversion is nothing new. The US Navy has transformed the ubiquitous *Harpoon* anti-ship cruise missile (exported to 24 nations) into

the Stand-off Land-Attack Missile (SLAM/AGM-84E). Russia's export family of anti-ship cruise missiles, called *Klub*, has a dual-mode feature on at least one version – the jointly produced Russian-Indian *Brahmos* cruise missile – that permits attacks against ships at sea and targets over land.[38] Yet North Korea and Iran could convert their existing inventories of *Seersucker* missiles to much more dangerous effect. Modern anti-ship cruise missiles like *Harpoon* and the French *Exocet* are considerably smaller in overall size and space than the older *Seersucker*. They are densely packed with electronics, leaving little room for the kinds of changes required to both convert an anti-ship missile into a land-attack one and increase the missile's range.[39] The HY-2 *Seersucker*'s roominess and simplicity of design make it easier to convert to land-attack roles than any of the more modern anti-ship designs.

Conversion is technologically much easier to accomplish than it was a decade ago. Then, countries like the United States and Russia depended on tightly controlled guidance systems such as Terrain Contour Matching (TERCOM), which match highly classified imagery from satellites with radar returns from a miniature radar in the missile's nose to guide the system to within tens of metres of the target. Now, navigation for land-attack cruise missiles requires only relatively cheap and widely available inertial navigation systems integrated with Global Positioning System (GPS) receivers.[40]

Two main barriers still stand in the way of converting surplus *Seersuckers* or other members of the HY anti-ship missile family. The first and most formidable is obtaining a modern land-attack navigation system. Although the already noted component technologies are readily available 'off the shelf', it is not easy to integrate individually complex electronic subsystems into a working whole that achieves repeatable results demanded of a precision delivery system. Yet there are shortcuts that make the job simpler. The most attractive is to acquire a commercially available UAV flight management system designed to convert a manned aircraft into a fully autonomous UAV. Several small aerospace companies have emerged since the advent of GPS to sell fully integrated flight management systems along with an array of system integration services that greatly ease the conversion task. The second and less challenging barrier is that of incorporating a suitable jet engine to replace the *Seersucker's* liquid-fuelled rocket engine. There is a large pool of export-unrestricted turbojet engines in the civilian and military marketplace from Canadian, European, Japanese, American and other international manufacturers from which to draw. With space liberated from replacing the *Seersucker*'s autopilot and radar guidance with a modern (and thus much smaller) navigation system, a converted missile

could achieve a range of at least 500km for a payload of 500kg. That range could be extended if the payload was reduced in exchange for added fuel, or if the airframe was extended to allow for more fuel.[41] The Kay Report indicates that the Iraqis were working on a more ambitious conversion of the *Seersucker* than the model used in the war, involving the incorporation of a Russian turbine engine designed to fly the missile to a range of 1,000km. If Iraq had managed to perfect their converted *Seersuckers*' land-navigation system, their attacks against Kuwait could have achieved militarily and politically significant damage.

A truly 'poor man's air force' of cruise missiles would best be achieved by converting simple, cheap kit airplanes into weapons-carrying vehicles. Larger than the ultralights used by Iraq, kit airplane conversion would involve substantially less cost, less significant engineering prowess, and fewer steps – and thus less chance of failure – than either converting anti-ship cruise missiles or small reconnaissance or target drones into land-attack systems. From a worldwide list of manufacturers, an adversary could choose from among nearly 500 well-tested designs, many with ranges to 1,000km, payloads of 200kg, 100-metre take-off distances from unhardened fields and cruise speeds of 120 knots. The average cost for the kit and engine combined is around $25,000. As with converting an anti-ship cruise missile, the major technical hurdle lies in building and integrating a flight management system, along with servo controls and actuators, in order to fly the system autonomously over the desired range.[42] But instead of wrestling with this difficult challenge alone, a rogue state or terrorist group could turn to the new manufacturers of flight management systems and related support services to produce an autonomous UAV. At present, no export controls govern foreign sales, nor, or course, domestic US transactions for these services. Outside flight management assistance would add around $35,000 to the cost of producing each vehicle – meaning a per-unit cost of roughly $60,000 – but would greatly save on the overall time to produce a militarily useful number of converted airplanes.[43] Such a delivery system would have sufficient payload weight and space to carry a sprayer system that could deliver a biological or chemical agent. A payload of gasoline could produce significant damage to many soft civilian and military targets, as this common fuel, when mixed with air, releases 15 times the energy as an equal weight of TNT.[44]

The most worrisome scenario is one in which large numbers of cheap cruise missiles, combined with smaller numbers of much more sophisticated and stealthy cruise missiles, confront missile defence systems expected to take on both low-flying cruise and high-angle ballistic missile threats. It still remains to be seen how effective the

principal missile non-proliferation mechanism – the Missile Technology Control Regime (MTCR) – will prove to be in staunching the spread of highly advanced cruise missiles. Britain and France's decision in the late 1990s to sell the United Arab Emirates their jointly produced, stealthy cruise missile, called the *Black Shaheen*, in spite of Washington's protestations that the missile was subject to the MTCR's highest degree of controls, set an unwelcome precedent. More problematic states like Russia and China may wish to follow suit by selling their own advanced cruise missiles to states outside the MTCR's membership.[45] At the very least, a toxic mix of low- and high-end cruise missiles together with ballistic missiles could produce unacceptable levels of friendly fire casualties to combat aircraft. More dire is the prospect that high-cost missile defence inventories will be roundly insufficient to cope with low-cost offensive missile attacks. Given that the guidance upgrade alone on the PAC-2 GEM-Plus costs $400,000 per missile, and that each new PAC-3 interceptor costs $3.5m, it becomes clear that a flock of cruise missiles several orders of magnitude cheaper could saturate most economically feasible missile defence architectures.[46]

American missile-defence planners cannot focus solely on regional contingencies against state actors and military force-projection requirements. Terrorist use of UAVs and cruise missiles against overseas military assets should receive serious attention.[47] To take just one example, the US Navy must begin to examine force-protection measures that deal with slow-flying UAV threats to ships in port. Defending against cruise missiles is also a global counter-terrorism matter. Using converted *Seersuckers* to attack homeland targets is also a conceivable future scenario. In the aftermath of the 11 September 2001 terrorist attacks, US decision-makers began to take the offshore cruise missile threat more seriously than ever before.[48] Even cruise missiles as large as the *Seersucker* can be hidden and launched from standard 12-metre shipping containers. Launched from just outside territorial waters, these missiles could strike many of the world's large population and industrial centres. The latest US National Intelligence Estimate draws attention to this scenario, including its possible association with non-state actors.[49] Two former US National Security Council staff members recently highlighted such a scenario, noting that al-Qaeda is believed to possess 15 freighters.[50] Finally, airborne threats can emanate from inside as well as outside US territory. Small slow-flying airplanes can be launched from concealed land locations close to their intended targets just as Iraqi ultralights did.

Al-Qaeda is believed to possess 15 freighters

Making missile defence work

The increased saliency of the cruise missile and UAV threat means that highly restrictive rules of engagement that focus only on high-angle ballistic missiles to prevent friendly fire incidents can no longer compensate for the inadequate ability of American air defences to distinguish friendly aircraft from enemy cruise missiles. The inadequacy is attributable to the disparate data links and target-tracking techniques used by the military services. Substantial enhancements will require the merging of various service and Missile Defense Agency (MDA) battle management command, control and communications programmes to achieve connectivity across the services. The quest for such a joint approach, now known as the Single Integrated Air Picture (SIAP), was initiated as far back as 1969 to improve tactical air control. If SIAP were fully realised, it would afford users, including allies, the wherewithal to share multiple-aspect viewing of threats over a broad geographic region, greatly reducing gaps in coverage and widening the window within which to provide timely cues to air and missile defence weapons. Having one fully interoperable view of the air picture would also accelerate decision-making on identifying friend from foe, limiting the incidence of air fratricide.

One interoperable view of the air picture would limit air fratricide

While improved tracking through SIAP interoperability makes sense, its effectiveness depends ultimately on better airborne sensors for detecting low- and slow-flying cruise missiles and UAVs. *Patriot* missile defence interceptors are theoretically capable of shooting down low-flying cruise missiles, but the horizon limits of their own ground-based radar means they must depend on a sensor deployed on an airplane or balloon to alert the fire battery in sufficient time to engage the incoming missile. The US Army is developing a surveillance and fire-control sensor carried by an aerostat (a blimp-like balloon flying at 4,570 metres). Called the Joint Land-Attack Cruise Missile Defense Elevated Netted Sensor System (JLENS), the system has several shortcomings. While the US Navy has expressed some interest, JLENS remains essentially an Army programme. The time it would take to deploy such a system is prohibitively long; also, JLENS is sensitive to weather and cannot cope with terrain-masking challenges in areas with high terrain such as northeast Asia. Nevertheless, JLENS could complement higher-flying, faster-reacting, weather-insensitive aircraft like the US Air Force's next-generation wide-area surveillance and battle management platform – the Multi-Sensor Command and Control Aircraft (MC2A).

Intended to incorporate the functions of both the airborne and ground-based surveillance missions of today's AWACS and JSTARS, MC2A would include improved sensors to detect low-flying cruise missiles and furnish fire-control information to both airborne and ground-based interceptors. The challenge here is to take full advantage of such a capability by linking various Army and Navy missile defence systems into a new concept of operation known as air-directed surface-to-air missile (ADSAM). This concept would radically alter and dramatically improve the currently service-centric approach to controlling the fires of missile defence batteries, whereby each missile is guided to its target by its own horizon-limited radar. ADSAM would hand over fire-control responsibility to a centralised, elevated platform – namely, MC2A – so that the Army and Navy would depend on an Air Force system to execute their missile defence responsibilities.[51] No longer limited by their ground-based radars, each Army and Navy missile defence interceptor would be capable of intercepting low-flying cruise missiles to their full range potential of 100–150km. Air-to-air missiles fired by Air Force fighters would also see their range extended to perhaps 60km. Unfortunately, MC2A will not be available until 2011 at the earliest, even if funding remains steady and technical challenges are suitably met. Should the cruise missile and UAV threat intensify more rapidly, it may become necessary to accelerate MC2A's development or incorporate ADSAM capabilities into existing service airborne platforms.

If the new threats posed by cruise missiles and other slow-moving aircraft are profound, the defensive benefits derived from ADSAM's revolutionary concept of operations are equally far-reaching. With increased interceptor range come multiple shot opportunities and greatly reduced leakage against large onslaughts of cruise missiles. High-quality fire-control sensors on a high-flying airborne platform mean that air fratricide could be significantly reduced, as potential targets, friend and foe alike, would be identified and tracked over great distances. Although ADSAM would not lessen the need to develop cheaper missile defence interceptors, the concept would make more efficient use of finite interceptor inventories since each battery would provide much greater coverage. Nevertheless, the prospect of large raids from a 'poor man's air force' underscores two additional priorities: driving down the cost of today's high-priced interceptors and modifying current and future airborne radars to permit them to track slow-flying targets in the 60–90 knot range.[52]

The challenges and potential costs of defending the homeland against both offshore and domestic cruise missile threats are considerable.

The North American Aerospace Defense Command (NORAD) is currently studying the idea of an unmanned airship operating at an altitude of 21,000 metres and carrying sensors to monitor and detect offshore low-flying cruise missiles. Several such airships would be needed, along with fast-moving interceptors to cope with perceived threats. Perhaps 100 aerostats at an altitude of 5,000 metres could act as a complementary or alternative system of surveillance and fire control for an interceptor fleet. Other problems would still remain. Better methods are needed of providing warning information to the Coast Guard on potentially hostile ships embarking from ports of concern. Missile threat sensor data must be capable of distinguishing between friendly traffic and enemy threats prior to threat engagement. A sufficient national cruise missile defence requires improvements to respective service programmes, and ideally would involve implementing the SIAP programme. The question of affordability looms large. Even a limited defence against offshore cruise missiles would cost $30–40bn. Finally, improvements are needed in defences against domestic-based threats. In the aftermath of 11 September NORAD had no internal air picture, nor were its radar assets linked with those of the Federal Aviation Administration (FAA), which controls internal US-air traffic. Progress towards making such linkages has occurred but major gaps remain, especially when dealing with the detection of low- and slow-flying air targets.[53] In sum, comprehensive defences against offshore cruise missiles and domestic terrorist attacks employing light aircraft will remain operationally, technically and financially problematic for at least the next decade.

Pressing missile defence challenges are the stuff of true military transformation. They require unprecedented service cooperation, disciplined civilian and military leadership, steady budgetary support from the Congress and perhaps even organisational changes in the way the Pentagon manages missile defence. The situation may be desperate, but it is not hopeless. Commenting on a 2001 counter-terrorism exercise in which a simulated cruse missile was launched from a merchant ship in the Gulf of Mexico, the NORAD test director said, 'we are naked ... [and] have no capacity to deal with that kind of problem'. As for implementing SIAP, however, he also observed that 'interoperability is achievable, if the leadership wants it to be achievable'.[54] Making combat identification a comprehensively joint endeavour has been stymied largely because the Pentagon's mechanisms for implementation do not have inter-service sweep. Annual action plans can only implore the services to action, not authorise funding and execution, which is the exclusive domain of each service.[55] Thus, SIAP implementation is far less a

matter of technology than bureaucratic politics. While stressing its concern about the growing cruise missile threat, the Bush administration has avoided any radical departure from business as usual in regard to the service-centric approach to cruise missile defence. True transformation may simply demand a single Pentagon agency to lead development of cruise missile defences, similar to the MDA, which manages all aspects of ballistic missile defence.

Non-proliferation policy helps, too

The MTCR – the only extant multilateral arrangement covering the transfer of missiles (ballistic and UAVs), related equipment, material and technology relevant to delivery of weapons of mass destruction (WMD) – is flawed but has frequently been effective. On one hand, it has achieved remarkable – and largely unsung – success in controlling the qualitative spread of ballistic missiles by curtailing the export of dual-use components, technologies and production capabilities relevant to making ballistic missiles. As a consequence of the MTCR, the spread of ballistic missiles to date has been limited largely to 50-year-old *Scud* technology. This achievement makes missile defences more practical, as they can exploit many of the weaknesses of this level of rudimentary missile technology. On the other hand, the MTCR has been too easy on cruise missile proliferation. For example, current MTCR coverage of flight management systems and technology (under Item 10, Category II) is too narrowly crafted to have any inhibiting effect on access to the technology required to convert anti-ship cruise missiles into more lethal land-attack drones.[56]

The MTCR has been too easy on cruise missile proliferation

Policy affecting the pace and scope of cruise missile and UAV proliferation, however, received a palpable boost in potential effectiveness in late 2002. Diplomats from the 33 states party to the MTCR, while gathered in Warsaw, Poland in September for their annual plenary meeting, agreed on new language to tighten ground rules for defining the true range of cruise missiles and UAVs. This makes it more difficult for states to exploit the inherent range variability of these non-ballistic systems to justify the transfer of highly advanced cruise missiles and UAVs to potentially worrisome states. MTCR member states also took the first step toward addressing possible terrorist use of UAVs and cruise missiles by concluding the Warsaw meeting with a commitment to examine ways of limiting the risk that controlled items and their technologies could fall into the hands of terrorist groups and

individuals.[57] No more effective way of fulfilling this commitment exists than to close existing MTCR loopholes affecting the spread of new flight management technology. A sense of urgency in placing more effective controls on this technology appears to lie behind a January 2003 US 'antiterrorism' proposal to the Wassenaar Arrangement, a group of 33 co-founding nations that strives to achieve transparency and greater responsibility in transfers of conventional arms and dual-use goods and technologies (including UAVs). Expressing concern about the possible terrorist use of kit airplanes and other manned civil aircraft as makeshift UAVs, the US proposal seeks export control reviews and international notifications for all equipment, systems and specially designed components that would enable these airplanes to be converted into UAVs. However, because the Wassenaar Arrangement does not incorporate the MTCR's strong denial rules and no-undercut provisions, the MTCR membership should act quickly to improve its own controls on UAV flight management systems.[58]

There are additional ways to make the MTCR a more effective instrument in controlling the pace and scope of cruise missile and UAV proliferation. These include more stringent restrictions on missiles with a given stealth capability; on certain countermeasure systems (such as towed decoys and terrain-bounce jammers specifically designed to match the delivery system they are aiding); and on jet engines, which are now exempted as being for manned aircraft but are nonetheless suitable for UAV/cruise missile use. It is equally important to preclude the erosion of existing MTCR controls. The Bush administration seems intent on liberalising standards covering both large UAVs (e.g., *Predator* and *Global Hawk*, for example) and missile defence interceptors (e.g., the *Arrow* system, which Israel wants to sell to India), arguing that the regime's provisions regarding export of these systems are inconsistent with the MTCR's original goal of arresting the spread of WMD delivery systems. Large reconnaissance UAVs are seen as capable of achieving great target discrimination, as opposed to mass destruction, while the spread of missile defences, particularly in the aftermath of withdrawal from the Anti-Ballistic Missile (ABM) Treaty, is something to be supported rather than constrained. But in the wrong hands, seemingly benign UAVs and missile defence interceptors are capable of delivering significant WMD payloads to great distances. A lack of care in dealing with non-proliferation mechanisms could also produce unwanted precedents for other states to act cavalierly. The administration should not undertake any radical departures from longstanding missile non-proliferation norms.[59]

Heeding a serendipitous warning

Turning American missile defences into a tightly integrated and carefully orchestrated joint operation, capable of dealing with both ballistic and cruise missiles while avoiding air fratricide to the extent possible, remains a major challenge for the Rumsfeld-led military transformation drive. Too often, government decision-makers are beset by an overwhelming array of immediate tasks, causing them to fixate myopically on a few problems that do not always include those most deserving of their attention. It is vital that the problem of defending against non-ballistic missiles is no longer neglected in this way. States and terrorist groups wishing to acquire a 'poor man's air force' or even more advanced cruise missiles will not leave many fingerprints. Such development programmes, unlike ballistic missile ones, are far less susceptible to intelligence monitoring. But the second Gulf War has given top officials a rare glimpse of future threats. The lessons from Iraq should therefore be taken as a fortuitous wake-up call to embrace substantial military and diplomatic measures to cope with threat uncertainty. They should trigger a more aggressive approach to making missile defences work against a more plausible range of missile threats. Anything less would be irresponsible.

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Notes

1 See, for example, Max Boot, 'The American Way of War', *Foreign Affairs*, vol. 82, no. 4, July/August 2003, pp. 41–58.

2 The Interim progress report of the Iraqi Survey Group, delivered on 1 October 2003 by its head, Dr David Kay, is the only source suggesting that one Iraqi cruise missile was intercepted. All press and military commentary during the war indicated that not one Iraqi cruise missile was either detected or intercepted. For the Kay Report, see http://www.cia.gov/cia/public_affairs/speeches/2003/david_kay_10022003.html.

3 According to the US Federal Aviation Administration, an ultralight aircraft is defined as a single occupancy-only aircraft, used for sport or recreational purposes only. No airworthiness certificate is required. Moreover, a powered vehicle cannot be operated when it has an empty weight of 254 pounds (115kg) or more, a fuel capacity exceeding 5 US gallons (19 litres), or an air speed of more than 55 knots at full power in level flight. Whereas sport paragliders possess a steerable parachute canopy, ultralights have a fixed, stable wing frame. The two Iraqi ultralights spotted over US troops on 28 March possessed wings roughly 4.5–6m (15–20 feet) in length. See Sean D. Naylor, 'Iraqi ultralights spotted over U.S. troops', *Army Times*, 29 March 2003, at http://209.157.64.200/focus/f-news/879398/posts.

4 The author is grateful to Michael Krepon for this point.

5 These executive- and legislative-branch initiatives are documented in Dennis M. Gormley, *Dealing with the Threat of Cruise Missiles*, Adelphi Paper 339 (Oxford: Oxford University Press for the IISS, 2001), chapter 4. See also Dennis Gormley, 'Cruise Missile Threat Quietly Rises', *Defense News*, 27 March 1995, p. 27. See also *Cruise Missile Defense: Progress Made But Significant Challenges Remain*, GAO/NSIAD-99-68 (Washington, DC: USGAO, March 1999); and Dennis Gormley, 'Cruise Missile Threat Rises: US Navy, Army Lag in Defense Preparations', *Defense News*, 31 May 1999, p. 15.

6 David Ruppe, 'United States: Army Describes Patriot Friendly Fire Difficulties', *Global Security Newswire*, 29 July 2003, at http://www.nti.org/d_newswire/issues/2003/7/29/12s.html.

7 Michael R. Gordon, 'A Poor Man's Air Force', *New York Times*, 19 June 2003, p. 1.

8 For two recent appraisals of cruise missile proliferation, see Dennis M. Gormley, 'New Developments in Unmanned Air Vehicles and Land-attack Cruise Missiles', in *SIPRI Yearbook 2003* (Oxford: Oxford University Press for SIPRI, 2003), pp. 409-432 and Robert Wall, 'Land-Attack Cruise Missiles Seen as Growing Threat', *Aviation Week & Space Technology*, 25 August 2003, p. 38.

9 Andrea Stone, 'Friend or Foe to Allied Troops', *USA Today*, 14 April 2003, at http://www.usatoday.com/news/world/iraq/2003-04-14-patriot-missile_x.htm. US Army officials contend that *Patriot* units achieved a

70% rate of effectiveness in Saudi Arabia and 40% in Israel.

[10] Various accounts exist of just how many Iraqi ballistic missiles were launched during the war. Pending the release of an official US Army report, the most authoritative account appears to be Kent Faulk, 'Patriots Intercepted 9 Iraqi Missiles, Says Project Head', *Birmingham News*, 22 August 2003, accessed via http://www.lexus-nexus.com.

[11] Gordon, 'A Poor Man's Air Force'.

[12] Elaine M. Grossman, 'Most Intercepts of Iraqi Rockets Were by Older Patriot Missiles', *Inside the Pentagon*, 24 April 2003, p. 1.

[13] Andy Murray, 'Missile test', *Eagle-Tribune Publishing*, 23 March 2003, at http://www.eagletribune.com/news/stories/20030323/BU_001.htm. For further details on each *Patriot* interceptor, see the Federation of American Scientists' web site at http://www.fas.org/spp/starwars/program/patriot.htm.

[14] Murray, 'Missile Test'.

[15] The official was Lt. Gen. Joseph Cosumano, commander of the Army's Space and Missile Defense Command, as cited in Robert Wall, 'Dangerous Missile Mix Sparks Scrutiny', *Aviation Week & Space Technology*', 7 July 2003, pp. 47–48.

[16] Gordon, 'A Poor Man's Air Force'.

[17] Grossman, 'Most Intercepts of Iraqi Rockets'.

[18] Wall, 'Dangerous Missile Mix Sparks Scrutiny'.

[19] Bradley Graham, 'Radar Probed in Patriot Incidents', *Washington Post*, 8 May 2003, p. 21.

[20] 'U.S. Ground Forces in Iraq Wearied of Repeated False Missile Alarms', *Inside the Pentagon*, 26 June 2003, p. 1.

[21] Gormley, *Dealing with the Threat of Cruise Missiles*, p. 9.

[22] Kay Report.

[23] Wall, 'Dangerous Missile Mix Sparks Scrutiny'.

[24] *Ibid.* See also Marc Selliger, 'Patriot May Need Integration with AWACS, DOD Adviser Says', *Aerospace Daily*, 26 June 2003, on http://www.lexus-nexus.com.

[25] Details relating to the ultralight overflights are exclusively derived from Naylor, 'Iraqi ultralights spotted over U.S. troops', apparently the only onsite reporting that took place on this incident.

[26] Gormley, *Dealing with the Threat of Cruise Missiles*, p. 11.

[27] Army air defence and intelligence personnel were not completely surprised by the appearance of the Iraqi aircraft. In December 2002, months before the invasion, about six Iraqi ultralights were detected flying over US military camps in Kuwait. For reasons unspecified, US air defences failed to engage the aircraft. Air defence officers were told that the Iraqis attempted to procure at least 100 ultralights from an overseas company, but only around 50 were delivered by the war's outbreak. One Army intelligence officer believed the Iraqis might use ultralights for either strategic reconnaissance, spreading chemical or biological agents, or suicide attacks with high explosives. Despite this intelligence, pre-war threat briefings advised air defence units to expect the Iraqis to use paragliders (which use a parachute canopy) rather than fixed-wing ultralights. See Naylor, 'Iraqi ultralights spotted over U.S. troops'.

[28] Before the second Gulf War, senior Bush administration officials fostered the expectation that allied forces would face a threat from armed Iraqi UAVs, possibly carrying chemical or biological payloads. Anonymous officials leaked information suggesting that President Bush was concerned about the Iraqis sneaking a

small UAV into the United States for use against homeland targets. In the post-war search for Iraqi weapons of mass destruction, however, US forces recovered abandoned Iraqi UAVs that appear capable of performing only surveillance, not weapons-delivery, roles. The important point, however, is that prudent defence planning had to be predicated on the expectation that *Patriot* missile batteries might have to intercept both ballistic and UAV threats. For details, see David Rogers, 'Air Force Doubts Drone Threat: Report Says Bush Exaggerated Perils of Unmanned Iraqi Aircraft', *Wall Street Journal*, 10 September 2003.

[29] The senior air component representative to the ground headquarters in Iraq, Air Force Maj. Gen. Dan Leaf, noted that after the British *Tornado* was inadvertently shot down, a decision was taken to alter *Patriot's* rules of engagement to make them 'more restrictive in certain modes'. Still, Leaf stated that they had to remain sufficiently permissive to permit *Patriot* to deal with the Iraqi missile threat. In the aftermath of the *Seersucker* cruise missile strike on the US Marines' Camp Commando on the war's first day, one might assume that the coalition could not afford to restrict *Patriot* only to fire against the steep trajectories of Iraqi ballistic missiles. See Elaine M. Grossman, 'Patriot May Mistake Aircraft for Missile in Combat's Electronic Glut', *Inside the Pentagon*, 24 April 2003, p. 1.

[30] For various explanations regarding the *Patriot* friendly-fire incidents, see Pamela Hess, 'The Pentagon's Fratricide Record', *United Press International*, 24 April 2003, at http://www.lexus-nexus.com; Grossman, *Ibid.*; Ruppe, 'United States: Army Describes Patriot Friendly Fire Difficulties'; Stone, 'Friend or foe to allied troops'; Graham, 'Radar Probed in Patriot Incidents'; Wall, 'Dangerous Mix Sparks Scrutiny'; and Michael Smith, 'US 'Clears' Crew Who Shot Down Tornado', the *Daily Telegraph*, 16 July 2003, at http://www.telegraph.co.uk.

[31] Hess, *Ibid.*

[32] Author interviews with former government officials in Washington DC in December 2000 and January 2001.

[33] Dennis M. Gormley, 'Counterforce Operations', presentation at Royal United Services Institute for Defence Studies conference on 'Extended Air Defence and the Long-range Missile Threat', London, 17-18 September 1997. For a detailed assessment of the implications of detecting smaller UAV launchers, see Gregory DeSantis and Steven J. McKay, *Unmanned Aerial Vehicles: Technical and Operational Aspects of an Emerging Threat*, PSR Report 2839 (Arlington, VA: Veridian-Pacific-Sierra Research, 2000).

[34] As reported by MSNBC, at http://www.msnbc.com/news/916313.asp?0sl=-21 (accessed 28 May 2003, link now expired). The Kay Report's assessment that only ten HY-2 *Seersuckers* were converted into longer-range land-attack systems suggests that some of the five reported *Seersuckers* fired during the war may have been unmodified anti-ship systems.

[35] Tim Butcher, 'Iraq's Missile is a Damp Squib', *Daily Telegraph*, 2 April 2003.

[36] For technical details, see Edward Eitzen, 'Chapter 20 — Use of Bio Weapons', in *Medical Aspects of Chemical and Biological Warfare* (Washington, DC: Walter Reed Army Medical Center, 1997), pp. 440–442.

[37] The *Seersucker* used to attack the Kuwaiti mall complex appears to have used floating barges nearby the mall to act as contrast targets for its radar guidance system. This appraisal is

based on press reports and the analysis of Dr Gregory DeSantis (telephone interview, 24 September 2003). If they are true, it would appear that this missile was not one of the ten converted land-attack *Seersuckers*, or it may suggest that the Iraqis had failed to master highly accurate navigation over land.

[38] For technical details see http://www.brahmos.com/missile_tech.html.

[39] For example, although the *Harpoon's* conversion to SLAM permitted the SLAM to be used very accurately over land, the missile has essentially the same 100km-range as the *Harpoon*.

[40] For more on the use of commercially available navigation, see Gormley, *Dealing with the Threat of Cruise Missiles*, pp. 29–33.

[41] For more on this conversion option, see *ibid.* Converted land-attack *Seersuckers* would be even more difficult to intercept because they would not depend on their active radar, which is susceptible to detection, for terminal guidance.

[42] The controversy over whether or not the White House exaggerated the threat of Iraqi unmanned drones hinged in part on US Air Intelligence's belief that Iraqi drones had flight management weaknesses, among several others. See David Rogers, 'Air Force Doubts Drone Threat', *Wall Street Journal*, 10 September 2003, at http://www.lexus-nexus.com.

[43] The author is grateful to Dr Gregory DeSantis for providing survey details on the kit airplane marketplace.

[44] Richard A. Muller, 'The Cropdusting Terrorist', *Technology Review*, 11 March 2002, at http://www.technologyreview.com/articles/print_version/muller031102.asp.

[45] Besides the Russian–Indian *Brahmos* cruise missile, Russia has been quietly marketing shorter-range derivatives of their air-launched AS-15 (Kh-55) and sea-launched 3M-55 cruise missiles. Transfers of critical technologies, such as advanced engines, low-observable, and countermeasure components, could also profoundly affect horizontal proliferation patterns. See Gormley, *Dealing with the Threat of Cruise Missiles*, pp. 81-86 and Douglas Barrie, 'Russian Low-Observable Technology Research Detailed', *Aviation Week & Space Technology*, 11 August 2003, pp. 50–53.

[46] Cost data on *Patriot* interceptors come from Murray, 'Missile Test'. Of course, the advent of slow-flying UAVs will force American missile defence planners to consider an array of much cheaper ways to defend against such threats. See Gormley, *Dealing with the Threat of Cruise Missiles*, pp. 72–73.

[47] For the author's own recent treatment, see Dennis M. Gormley, 'UAVs and Cruise Missiles as Possible Terrorist Weapons', in James Clay Moltz, ed., *New Challenges in Missile Proliferation, Missile Defense, and Space Security*, Occasional Paper No. 12 (Monterey, CA: Monterey Institute's Center for Nonproliferation Studies, 2003), pp. 3–9.

[48] Bradley Graham, 'Cruise Missile Threat Grows, Rumsfeld Says', *Washington Post*, 18 August 2002, p. A1.

[49] For a discussion of this NIE assessment, see Dennis M. Gormley, 'Enriching Expectations: 11 September's Lessons for Missile Defence', *Survival*, vol. 44, no. 2, Summer 2002, pp. 19–35.

[50] Daniel Benjamin and Steven Simon, 'The Worse Defense', *New York Times*, 20 February 2003, p. 31.

[51] In theory, the airborne sensor would guide the interceptor during both its

mid-course and terminal phases, or the surface-to-air interceptor could guide itself using its own on-board seeker.

[52] The Defense Advanced Research Projects Agency of the US Department of Defense is pursuing such a cost-reduction effort, primarily focused on cheap missile seekers. See http://www.darpa.mil/spo/programs/lowcostcruisemissiledefense.htm.

[53] For a discussion of some of the challenges of homeland defence against cruise missiles, see Michael Sirak, 'US DOD seeks to bolster cruise missile defences', *Jane's Defence Weekly*, 4 September 2002, p. 3. NORAD has also recently deployed a portable radar enhancement system for spotting low-flying threats, which could prove valuable in protecting a select few high-priority targets. See 'New Air Defense Platform Debuts', *Associated Press*, 21 July 2003.

[54] Sandra I. Erwin, 'Lack of 'Single Integrated Air Picture' Hinders Commanders, Study Says', *National Defense Magazine*, November 2001, at http://www.nationaldefensemagazine.org/article.cfm?Id=624.

[55] See, for example, US General Accounting Office, *Combat Identification Systems: Strengthened Management Efforts Needed to Ensure Required Capabilities* (Washington, DC: GAO-01-632, June 2001), at http://www.defensedaily.com/reports/combatidsystems.pdf.

[56] In fact, current language is less effective than the original wording of Item 10, which was changed sometime subsequent to 1987 – the regime's inaugural year – in order to remover most case-by-case controls on these technologies. Reverting back to the original 1987 language would actually be better than the current language, but even a more systematic treatment of controls on the means of turning airplanes into UAVs appears worthy of urgent MTCR action. For example, case-by-case controls should apply not only to UAV flight management systems usable in Item 1 systems (missiles capable of delivering 500kg to a range of at least 300km), but Item 19 systems (300km-range missiles independent of payload weight), too. Given that Item 19 systems are ideal means of delivery for biological payloads, UAVs with substantially less than 500kg of payload can produce mass-casualty effects.

[57] Press Release, 'Plenary Meeting of the Missile Technology Control Regime, Warsaw, Poland, 24–27 September 2002', at http://www.mtcr.info/english/press/warsaw.html.

[58] 'No-undercut provisions' mean that if one member denies a sale, all must follow. For background details, see Dennis M. Gormley and Richard Speier, 'Controlling Unmanned Air Vehicles: New Challenges', a paper commissioned by the Non-Proliferation Education Center, pp. 13-15, at http://www.npec-web.org/ and forthcoming in *The Nonproliferation Review*, vol. 10, no. 2, Summer 2003.

[59] For more on missile interceptor transfers, see Amy Svitak and Gopal Ratnam, 'Missile Defense Vs. Non-Proliferation: While House Policy Tests International Limits', *Defense News*, 14 July 2003, p. 1. On the matter or large UAVs, see Gormley and Speier, 'Controlling Unmanned Air Vehicles: New Challenges'.

Mr. TURNER. Thank you, Mr. Gormley. We'll move to a series of question periods of—we'll do 5 minutes and then a rollover of additional 5 minutes for additional questions, recognizing Mr. Ruppersberger.

Mr. RUPPERSBERGER. Sure. OK. Can you tell me how from your perspective, all three, whoever wants to answer, the authority agencies involved interact with the intelligence community to determine who and what the current threats are and how often are lists of who we sell to and who we will not sell to updated on this intel data?

Mr. CHRISTOFF. The intelligence community and the data is used in the licensing process. In addition to doing what the departments refer to as prelicense checks, they look at the bona fides of the companies or the countries that are—we're selling our cruise missiles and UAVs to and they also incorporate intelligence information into the interagency process.

Mr. RUPPERSBERGER. Do you think it's effective and it's working, the relationship with getting the data?

Mr. CHRISTOFF. We haven't looked in detail about that part of the licensing process. I don't think I'd want to comment on that.

Mr. RUPPERSBERGER. OK. The way I see that you've looked at your report, there are three stages. That's before we sell. That's the actual transfer. And I think the focus of your report was more of the end-use compliance. Is that correct?

Mr. CHRISTOFF. Correct.

Mr. RUPPERSBERGER. Now, do any of you believe that the current authority provided to State and subsequently to Commerce and DOD is adequate and do you think the GAO findings are the result of—the GAO findings the result of inadequate authority or failure to exercise authority they already have?

Mr. CHRISTOFF. I think it's a failure to exercise existing authority, because the one main point that we want to make in our recommendation to do this comprehensive assessment is that you need better information. If you only have conducted 33 post-shipment verifications out of 4,000 licenses, it's difficult to really thoroughly assess the risks associated with not doing more, and therefore by doing more PSVs, you will be able to determine what the potential risk is and be able to determine what your priorities are, where you should be placing your resources and how best to use that information in prelicensing decisions as well.

Mr. RUPPERSBERGER. Well, then what would you recommend?

Mr. CHRISTOFF. Well, the recommendations that we made are the ones that we made in the report. First is that the paucity of the number of post-shipment verifications that the three agencies have done is insufficient. It doesn't give them a basis for believing, as State does, that there is no problems that have occurred in the post-shipment verification process. So doing more, going back to the 4,000 and doing as DOD suggested to us, a statistically valid random sample, will give you good information about the problems in the past and then conducting more PSVs in the future as well and to commit to that.

Mr. RUPPERSBERGER. Do you think it needs more resources or money?

Mr. CHRISTOFF. It needs more information, No. 1, to then make decisions about where the priorities and resources should be targeted.

Mr. RUPPERSBERGER. Where are you going to get the information?

Mr. CHRISTOFF. Going to look at the prior PSVs that have not been——

Mr. RUPPERSBERGER. And that's the only area you recommend, looking at the prior from a random point of view?

Mr. CHRISTOFF. Looking at that, and also we recommended for the Commerce Department to look into the existing catchall regulations to determine whether or not the scope of those regulations should be broadened.

Mr. RUPPERSBERGER. Sometimes you need one boss, one person in authority. Do you see any problems between DOD and Commerce working that through?

Mr. CHRISTOFF. We've issued prior reports that have talked about the interagency process and the need for three departments to work more closely together to use the intelligence information that they have available, to make sure that they are transferring information from one department to the other. So, yes, the interagency process can always be improved considerably.

Mr. RUPPERSBERGER. Well, then, the purpose of this hearing is to find out how and why. How would you improve it? And I'd like to hear from the other two also on these questions that I'm asking.

Mr. GORMLEY. Well, let me make one comment in regard to how one might improve it. It strikes me that all of the recommendations are necessary but not sufficient, particularly with respect to this growing concern about a poor man's air force. When you look at the necessary elements to put together a poor man's air force—there is the concern about effects on commercial enterprise—one can certainly not conceive of regulations that make it more difficult for people interested in, for example, recreational aircraft to require a case-by-case review for that. That's inconceivable, and I couldn't imagine that occurring.

But when one thinks about the challenges associated with turning that recreational aircraft requiring a man to fly it into a fully autonomous cruise missile, there are serious transformation requirements associated with it, the most notable being the creation of a fully autonomous flight control system to guide that system to the intended target without a man piloting it.

And there are on the marketplace today—and it's a recent phenomenon over the past 5 years—I would imagine less than 10 companies which are largely spin-offs of the large aerospace firms that are now producing what are called variable autonomy flight control systems. They provide the complete flight management solution for turning a manned aircraft into an unmanned air vehicle, and it seems to me that the impact on placing some case-by-case reviews on these UAV flight management systems would make immense sense in terms of making that transformation hurdle more difficult for an individual or a terrorist group who might be interested in turning that recreational aircraft into a weapon of terror.

There was an attempt in 2003 by the U.S. Government to introduce an antiterrorism proposal that focused on this particular poor

man's issue of turning airplanes into terror weapons, and because it was not sufficiently detailed with respect to precisely what kind of technology should be controlled, I understand that it was rejected within the Wassenaar Arrangement where it was introduced.

Now, my recommendation would be to clean up that proposal, focus specifically on the technologies that ought to receive case-by-case review and consider it not only within the Wassenaar Arrangement but within the Missile Technology Control Regime as well, because they have better, you know, no denial, no undercut rules that I think would provide for a more effective basis for monitoring these transfers.

Mr. RUPPERSBERGER. OK. And what I'm trying to get to, and I think you're answering some of it, and what I'd like to hear from all three, though, why do you think that there are problems now? Lack of resources, direct funding or manpower, time, all of that, or do you believe it's a lack of just prioritizing? I mean, whenever we have funding issues and what's going on now, sometimes it's a matter of prioritizing. Would you expand on that, Mr. Feickert?

Mr. FEICKERT. I'm really not privy to the interagency process or what goes on in terms of regulating exports, but one solution might be examining some of the more critical enabling technologies that——

Mr. RUPPERSBERGER. Like you referred to, Mr. Gormley? There's eight groups?

Mr. FEICKERT. Well, there's present technologies. For example, your small fuel-efficient gas turbine engines that have commercial applicability for business jets, guidance systems, perhaps the seekers, which are the actual guidance system used in the terminal phases of cruise missile flight. Some analysts have suggested that looking out into the future, things like fuel cell technology which could be incorporated into cruise missiles and UAVs to increase their range might be something worth considering.

Mr. RUPPERSBERGER. Any other comments on that?

Mr. GORMLEY. Let me add one additional comment. I haven't been in government service for over 20 years, so I don't have direct experience, but I have talked to many people involved——

Mr. RUPPERSBERGER. That might make you an expert.

Mr. GORMLEY [continuing]. In this process.

Mr. RUPPERSBERGER. No offense.

Mr. GORMLEY [continuing]. And I would say that what I hear consistently from people who have—or are charged with responsibility for dealing with this area in the interagency process is being overwhelmed by largely the issue of maintaining an awareness of rapid technological change and how that technological change affects current regimes, and they're simply understaffed in my view. So it is a matter of staffing priority from——

Mr. RUPPERSBERGER. That's the point I was trying to get out of you, that——

Mr. GORMLEY. And I would also say a matter of priority as well.

Mr. RUPPERSBERGER. Mr. Christoff, anything further from your perspective?

Mr. CHRISTOFF. I think also focusing on the multilateral export control regimes. Two years ago when we looked at these different regimes, specifically the Missile Technology Control Regime, the

Wassenaar Arrangement, we had several recommendations about how to improve those regimes themselves. Keep in mind these are voluntary, nonbinding, consensus-based regimes, and so it's important to try to have some type of accountability mechanisms put into these different regimes. Just getting them to share information among countries using an automated information system so that you have timely reporting of denials is something that's lacking, for example, on the MTCR. So the regimes can be—an important focus on the regimes is trying to strengthen them as well. I think it's important.

Mr. RUPPERSBERGER. I'm sure the State Department—you don't have to answer the question, but do you see any possibility of strengthening the regime cooperation? I mean, that seems to be a huge letdown, and it's just voluntary. And I understand if one—there's one violation, then everyone should abide and not deal with that group, and that's not the case and that happens I'm sure on a regular basis. Do you see that? Do you see any way we could strengthen the regime issue?

Mr. CHRISTOFF. Well, I think in some of the recommendations we made, just in terms of getting the regimes to be a little more efficient and effective in sharing information from one country to another. When it takes anywhere from 3 and 6 months for one country to send a denial notice to another country in the MTCR, that's not quick enough. That's important information that should be transmitted immediately, such as what the nuclear suppliers group does.

Mr. RUPPERSBERGER. What leverage do we as the United States have to effectuate that, or would working with other countries to effectuate that type of situation——

Mr. CHRISTOFF. Well, I think the example of the six out of the eight proposals that the United States pushed through on the MTCR is an excellent example of how we got more items on the control list that just occurred in the past few months.

Mr. RUPPERSBERGER. But you don't have China a part of the group. Right?

Mr. CHRISTOFF. No.

Mr. RUPPERSBERGER. Who else? What other major countries are not part of that, that we need to worry?

Mr. CHRISTOFF. Well, China is obviously the most important nonmember of the MTCR. I mean, they've sold cruise missiles to Iran, Iraq, North Korea, Pakistan. That's a critical secondary proliferator. That's important. You have other—those countries, those secondary proliferators are also not members of the MTCR. So they're important countries that have the capability and currently manufacture cruise missiles. They're on the cusp of exporting cruise missiles, and they're not member of the MTCR.

Mr. RUPPERSBERGER. OK. Thank you.

Mr. TURNER. Thank you. Now to our chairman, Mr. Shays.

Mr. SHAYS. Thank you, gentlemen. Thank you, Mr. Feickert and Mr. Christoff and Mr. Gormley, for being here.

First, which is the greater threat to national security, the UAV or the cruise missiles?

Mr. GORMLEY. Today I would say that just looking at Operation Iraqi Freedom, as I mentioned, where a crude first-generation anti-

ship cruise missile called a Seersucker from the Silkworm family of antiship cruise missiles was used quite effectively and undetected by our Patriot batteries and also created complications by virtue of changing the rules of engagement so that Patriot radars had to look both for high-angle ballistic missile—incoming ballistic missiles and low-flying cruise missiles, which complicates the whole issue of separating friendly returning aircraft from low-flying cruise missiles.

So I think that event suggests to me that existing inventories of cruise missiles, however crude, represent a serious threat, particularly when they're combined with the use of ballistic missiles.

Now, UAVs is an interesting and more recent phenomenon, I think, accelerated by virtue of the very effective use and prominent use and prominent public display of the effectiveness of the Predator in Afghanistan, initially after September 11th, and then its increasing use in other conflicts and the arming of Predator to demonstrate that what had heretofore been a seemingly innocent reconnaissance system now had the capacity to deliver a payload to a rather significant range.

So I think I would argue that existing inventories of cruise missiles represent the near-term threat and the longer term threat comes from the UAV and particularly the opportunity that adversaries have to turn very small manned aircraft into so-called cruise missiles or UAVs armed with weapons of mass destruction.

Mr. SHAYS. Would either of you gentlemen care to add something?

Mr. FEICKERT. Yes, sir, I do. I'm going to look at it from two perspectives, a security threat posed by foreign militaries and a security threat posed by nonstate actors. I think if you look at it from the foreign military perspective, I believe that probably cruise missiles would pose a more immediate threat. Although they're available and they're relatively unsophisticated, it still requires an infrastructure, mission planning and your various mapping technologies. The fact that they can also penetrate most known air defenses also lends itself to military use.

In terms of nonstate use, if you look at some of the cruise missiles—excuse me, UAVs that are available out there, nonstate groups tend to be a little more unsophisticated. Perhaps it might be a little easier for them to acquire the UAV which in some cases can be nothing more than an upscale model aircraft, radio-controlled aircraft, and perhaps employ either conventional or weapons of mass destruction with that particular vehicle.

Mr. SHAYS. Mr. Christoff.

Mr. CHRISTOFF. Just to cap what Dennis and Andy said was the order of priority would obviously be anticruise ship missiles. The predominant of the 75,000 cruise missiles out there, most of them are antiship cruise missiles. The emerging concern are land attack cruise missiles because of the capabilities of converting—as Iraq proved, taking an antiship cruise missile and turning it into a land attack capability.

And then the emerging threat that I would agree is UAVs. You couple that with nonstate actors, chem/bio concerns, and you definitely have an emerging threat.

Mr. SHAYS. You all pretty much agree, it seems to me. I've been kind of wondering how we respond—tell me the justification—I mean, I know why we want to do it, but tell me the justification of a country that has cruise missiles deciding that no one else can have them. How do we sort out the logic of that, and how are we able to convince others that makes sense?

Let me back up and say are we basically saying to those who have them, you have them, so let's make sure more don't have them? Is that our logic so we're just arguing to those who have? Or are we trying to make an argument to the world as well that it won't be in your best interest to have them because your neighbor will have it too? Walk me through that kind of philosophical question.

Mr. CHRISTOFF. Well, it's the philosophy of all other regimes, for example. You know, these regimes that I've been referring to, the missile technology control regime, Wassenaar, etc., these are regimes that are supplier based regimes. The belief that the existing possessors of these missiles, these dual-use items, these nuclear materials, etc., have an obligation and a commitment to try to reduce the supply and to educate those nonmembers about the reasons why it's not in their best breast to obtain these sensitive technologies.

So it's a two-prong approach of reducing the supply, and that's the philosophy within all the regimes, and trying to educate other regime members about the bad effects of having those types of sensitive technologies.

Mr. SHAYS. Do either of you care to add anything?

Mr. FEICKERT. Yes, sir. In this particular case we may be a victim of our own success. Our research has indicated that a lot of countries now consider these an integral part of their national security framework, just as in past generations new systems like tanks and aircraft carriers developed along those lines.

There's been some criticism by some countries of the MTCR, that it is sort of a have and have not situation, where certain countries are allowed to have missiles and UAVs and other countries are not.

There's no really easy answer to that. I mean, we certainly have a vested interest in keeping these systems out of the hands of people that intend to do us harm, but at the same time it's very difficult to try to convince these countries, for example, like India and Pakistan, to become members of the MTCR. That's been one of the central arguments of those two countries for a long time as to why they don't want to join that particular agreement.

Mr. SHAYS. Because I look at the UAVs and I wonder at the challenge that's going on in our own air force—and this is somewhat of an aside, but I'm thinking of Mitchell trying to convince our military that we should be able to use airplanes to bomb ships, and what he did was—at least I think I recall he basically brought his planes in lower and knocked them all out and was ultimately court-martialed, but there was this tremendous resistance on the part of the military to use airplanes in this way.

Do you sense from any of your work that there's a reluctance on the part of the Air Force to acknowledge that this type of weapon may in fact make manned flight somewhat obsolete?

Mr. GORMLEY. I think that is dissipating very rapidly as a by-product of the lessons learned that come from both Afghanistan and Operation Iraqi Freedom, but your point is well taken. If one simply looks at the development of the Tomahawk cruise missile, I can recall as a—while I was in government service in the late 1970's, there was enormous resistance at first both within the U.S. Air Force and the U.S. Navy to promoting the Tomahawk for various missions, not least because the alternative was to deliver munitions by manned aircraft. The whole development program for the Tomahawk took an enormous amount of time before it was well accepted that the Tomahawk could play a dominant role, and indeed not until the 1991 Persian Gulf war where the Tomahawk in the initial attack demonstrated that it could open up corridors and increase dramatically the effectiveness of follow-on manned aircraft attacks, where it truly demonstrated that unmanned cruise missiles had an enormously important role to play.

Mr. SHAYS. Let me ask you, from all three of your testimonies, I am struck by the fact that you are saying to us that cruise missile and UAV technology is not all that cutting edge anymore. Is that correct for the most part? So the answer basically by nodding heads was yes.

And therefore I begin to wonder what about the sharing of the technology, because basically they're going to be able to bypass this anyway. In other words, do you get the gist? So tell me how—so we do a great job. We don't share what we know, but so what? Respond to that.

Mr. FEICKERT. In terms of our technology sharing from just——

Mr. SHAYS. I'm going to ask you to speak a little louder.

Mr. FEICKERT. Yes, sir. In terms of technology sharing, to use cruise missiles for example, there are a number of cruise missile systems out there that have been developed by more than one country. Certain countries bring certain expertise. For example, the Indian-Russian Brahmos, an antiship cruise missile, a supersonic cruise missile which is going to be entering service in the near future, capitalized on the strengths of the Russian propulsion system and India's guidance system. The French Apache has had various foreign involvement.

Mr. SHAYS. So what you would be arguing to me would be that they can have much more sophisticated weapons if they are able to get the technology of others, but the bottom line is that they can get the basic concept. So are you saying, in essence, it would be kind of like a 1934 Ford as opposed to a 2004 Ford? It would just be that kind of difference? It would still be a car, but it wouldn't be as good, still be a cruise but not as good? Is that your point?

Mr. FEICKERT. Sir, there are varying levels of technology in cruise missiles. For example, you've got your Silkworm or your STICs missiles, which are roughly equivalent to a Scud ballistic missile. I mean, they've been around for a long time. They were developed in the late 1950's, and they're very adaptable. They're found in the inventories of many, many Third World countries.

And then you have some leading-edge cruise missiles like the French Apache, the South African Torgos cruise missile, which was supposed to make a debut either in 2004 or 2005, is very state-of-

the-art. Some of these foreign cruise missiles are in a sense almost as capable as our current Tomahawk cruise missile.

Mr. SHAYS. Mr. Chairman, I know I have a red light. Just let me ask this question if I could. Thank you.

So what am I to infer? Let me ask you this to close. You're basically saying there are some very sophisticated technologies in cruise and Predator systems, but can I—and therefore the sharing of technology there would enable people to advance more quickly, but can I infer that a fairly simplistic cruise missile or Predator could still do a hell of a lot of damage?

Mr. CHRISTOFF. Yes.

Mr. FEICKERT. Yes, sir. Absolutely.

Mr. SHAYS. OK. Thank you, Mr. Chairman. Did you want to say anything, Mr. Gormley?

Mr. GORMLEY. I would simply add that the qualitative—what you're referring to is the qualitative spread of cruise missile and UAV technology, and the interesting way to look at it from my view is to suggest that the MTCR has been enormously effective in terms of qualitatively controlling the spread of ballistic missiles. If it could become as effective in terms of controlling the qualitative spread of cruise missiles and UAV technology, it will have done an immense job at achieving a slow, steady, more controllable environment within which we can improve our missile defenses to become more effective against emerging threats.

Mr. SHAYS. But ultimately these folks are going to get these weapons?

Mr. GORMLEY. Well, I would hope, for example, that the case of the French transfer of the Storm Shadow version of—called the Black Shaheen—to the United Arab Emirates was an isolated incident, and that a missile with a radar cross-section like that missile had would not occur again. Now, that happened within the existing regime, where France and the UK permitted that transfer to occur, notwithstanding objections from various members. If we can prohibit or control those kinds of high quality transfers, then we'll be doing an important job.

Mr. SHAYS. Thank you, Mr. Chairman.

Mr. TURNER. Thank you, Mr. Chairman. I want to recognize Representative Burton from Indiana, Representative Duncan from Tennessee and Mr. Tierney from Massachusetts, who have joined us.

Mr. BURTON. Do you want to go with Mr. Tierney first, or do you want me to go ahead?

OK. I just have a couple of questions. You know, nuclear proliferation that has been taking place over the past couple of decades scares the pants off everybody. We're worrying about North Korea right now and others, and after I saw the Hellfire first missile that was fired from that Predator that took out some of Osama bin Laden's top people, I think I came to the realization like a lot of people that this is something—it's a weapon of the future that could be used for a whole host of things, and it was something that ought to be looked at with a jaundiced eye.

And one of the things that concerns me, and you touched on it a minute ago, was the Chinese and others selling advanced missile technology, and I don't know about the kind of technology we have

in the UAV, but to a lot of countries that we might be very concerned about like Iran and others in the somewhat hostile world.

I don't know if there's anybody in the administration that's here or not that can give us an idea on what kind of pressures we could use to bring about some changes in the policies of these other countries and in particular countries like China that are selling this technology to our potential adversaries. What can be done or what is being done to stem the tide of this technology getting out of hand? I don't think we're going to see the end of wars in our lifetime, and I'd like for the United States to be a few jumps ahead of the potential enemies. And I'd like to know if anybody can answer what we're doing to try to make sure that the kind of proliferation we're talking about doesn't continue and what kind of pressure we can be bringing to bear on our friends like the Chinese, "who are selling this technology." Any of you want to take a shot at that? Is there anybody in the State Department or the administration that might want to take a shot at that?

Mr. TURNER. Mr. Burton, we do have the second panel which perhaps they should——

Mr. BURTON. Should I reserve that question for them?

Mr. TURNER. They certainly could respond on behalf of the——

Mr. BURTON. Well, if you're out there and I have to leave, I hope you do answer that question. I'll try to stick around.

Mr. SHAYS. I'll ask it.

Mr. BURTON. OK. Thank you. I think that was the only question I have. I was just listening and I said my gosh, how do we get a handle on this thing.

Thank you, Mr. Chairman.

Mr. TURNER. Thank you.

Mr. Tierney. No questions.

Gentlemen, when we're talking about end-use verification and post-shipment verification, one of the things that strikes me obviously from your testimony is that we're not doing a good enough job in those areas and that we can improve it.

Mr. Christoff, you talked about the recommendations that were made in your report, which included using the existing authority we have and expanding it on a very limited basis that we're conducting, what would be prudent or would be necessary. But in listening to the discussion about that, it strikes me as it almost seems as if the end use verification process would be a cradle to grave process, that even if we just look at the initial transaction that occurs, any verification that occurs there would not really give us assurances that in the future that technology is not going to be further transferred.

I'd like each of you to talk about just the process of end user verification, the post-shipment verification process, how you can see it can be enhanced and really the issues and difficulties that we have of being able to have an effective process.

Mr. Feickert.

Mr. FEICKERT. Yes, sir. In terms of enhancements, because there's such a vulnerability in terms of diversion, it would be very easy the day after a team comes and inspects. Let's say, for example, gas turbine engines that were destined for commercial aircraft, it wouldn't be that hard the day after that team leaves to perhaps

divert those or even copy those for use in cruise missiles, or even UAVs.

Perhaps one approach might be on the intelligence side of the house is actual—the intent of the customer or the country or the group, what is the intent? I would imagine they would sort of have a feel as to whether or not these countries are even interested at all in cruise missiles or UAVs, or possibly they want these things for legitimate aerospace use.

So I would suggest the possibility of going a step further and looking at intent. Is there a possibility that they're being diverted to a military program or are they going to be used for peaceful purposes?

Mr. CHRISTOFF. I would just reiterate what we found in our report. We can talk about additional things to do in end-use monitoring, but I think the first thing is to do it. When you have done only 4 out of 786 by the State Department, 29 out of 2,490, zero out of 500 for DOD, that suggests that there isn't much information to even base decisions on about, is this a problem? Is it a risk?

PSVs are important. They are important because they're the primary vehicle that you have to check on whether or not an item is being used as intended after it leaves our shore. It's important because it's good feedback into the prelicensing decision. If you know that a country or you know that a company is not adhering to the license conditions, then that should feed back into any future decisions about that license or future exports that you would permit.

Mr. GORMLEY. I would really defer to Mr. Christoff's reaction, but it seems to me—in reading the GAO report, I can't help but think that the issue of staffing and sufficient moneys to be consistent in end-use assurances is an important issue; and it seems to me, providing those resources to get involved in more than the number that have historically been the case would be a sensible approach. So the resource issue is something that ought to be looked at closely.

Mr. TURNER. Mr. Gormley, when you were talking about the petition and its limitations and the threat of the cruise missiles and UAV, I was struck by the fact that we've undertaken a huge investment in air defenses, antimissile technology. Can you give us additional thoughts as to what our current strategies are as we approach these issues and our design of our current defenses?

Mr. GORMLEY. Yes, Mr. Chairman. We have a huge investment that the Department of Defense has made in U.S. air defenses since the early 1950's. But the advent of the cruise missile threat largely makes those investments, while necessary, not nearly sufficient to deal with the emerging cruise missile and UAV threat, and that is largely because these threats fly low under the radarscope, so to speak. And not only do they fly low, but once they reduce their radar cross-section or add countermeasures, they impose severe difficulties on existing U.S. missile defenses, as they did in Operation Iraqi Freedom.

And then there's another perverse issue and that is, when systems fly slow, our modern legacy, airborne and some ground-based radars actually eliminate slow-flying objects that are close to the ground in order to permit their signal processing and display systems to operate more effectively. So there are—critically, it seems

to me—some defense priorities that we need to turn to, and one is creating a single, integrated air picture to use and link together in a connected system all of the radars that are looking at these threats, including returning friendly aircraft, so that we have coverage, a common, single view of multiple aspect angles out to a large geographic region, so that we can be in a better position to discern friend from foe.

The second area is simply to increase our battle space by producing better sensors on our airborne platforms and better missile seekers for our ground-based surface-to-air missile systems and air-to-air missile systems.

And finally, we need to make cruise missile defenses cheaper. I referred to the unfortunate arithmetic associated with the cost of Patriot missiles and even the guidance upgrade for the PAC 2 system in comparison to the cost of an investment in a large number of cheap cruise missiles or UAVs; and until we get the costs of our seekers down, then we are going to have a difficult time as time passes, as the quantitative threat emerges, unless we can get the cost of our missile defenses down. And there are existing programs that are looking at trying to radically reduce the cost of seekers, which represent about 65 percent of the cost of an intercepter.

Mr. TURNER. Mr. Christoff, you've mentioned the number of end-use verification inspections that had been conducted, which, of course, is a quantification. Did you notice anything about the end-use verification process when an inspection had been undertaken that related to the quality of the threat? Did you notice any anticipation of an end user that might represent a greater threat for proliferation versus nonproliferation?

Mr. CHRISTOFF. You mean in terms of whether or not they set priorities on the few that were done?

Mr. TURNER. Yes.

Mr. CHRISTOFF. The Commerce Department, for example, does focus on certain choke-point technologies when it goes out and tries to determine where it's going to be doing its end use monitoring, and I think that's good process, good criteria that they're applying. So I think that's one good example of the 29 that they did do, that does undergo the process of looking at what are the most important aspects of the technologies or the technologies that they want to focus on.

Mr. TURNER. Very good. Mr. Ruppersberger.

Mr. RUPPERSBERGER. One question. Regarding the end-use monitoring for compliance, I think, Mr. Christoff, you said that there were only 33 licenses out of 4,000 that were checked for compliance. Out of those 33, what did you find?

Mr. CHRISTOFF. You mean, what did the departments find?

Mr. RUPPERSBERGER. What did the departments find? What did you find when you investigated the departments——

Mr. CHRISTOFF. I'd like to submit for the record all the details. I can't recall all the details of the 33 licenses, but in some of them they did find that they were, "unfavorable checks" in a few of the cases. Some of them did result—I think in two instances it resulted in some criminal penalties being applied to individuals that had not dealt with the technology appropriately. There were also ones

in which they had favorable checks in which there were no problems.

Mr. RUPPERSBERGER. What did you find? You're telling me what was bad or not. What did you actually find from a factual point of view——

Mr. CHRISTOFF. We found that the process—when the process for end-use monitoring is conducted, the departments do go out and look thoroughly at the extent to which the end-use efforts that the departments are doing are accurate. They are looking at whether or not the item is where it's supposed to be, there is adequate security, and whether or not the item's being used as intended. So when the results are applied, they're important results and they do provide good information back to the licensing process.

Mr. RUPPERSBERGER. What happens when you find that there are bad results? What action is taken——

Mr. CHRISTOFF. It depends on the actions. Congress can—for example, can undertake civil penalties against the company that may be violating some of the terms and conditions of the license. Others, such as the Customs Department, can engage in criminal penalties as well.

Mr. RUPPERSBERGER. Do you know if that was done?

Mr. CHRISTOFF. Yes.

Mr. RUPPERSBERGER. It was done?

Mr. CHRISTOFF. Uh-huh.

Mr. RUPPERSBERGER. Let me ask you this, too. It seems to me that 33 out of 4,000 is not much, and that is not really a good sampling of the entire program. Do you think there needs to be a change in the 33 out of 4,000 as far as the random checking that is done?

Mr. CHRISTOFF. Absolutely. And when we broached our concerns with the departments, our original recommendation was go back and do a comprehensive assessment.

Well, we realized that would be difficult to do, going back to all 4,000, so go back and do a sample, take a statistically valid sample of those 4,000 and conduct PSVs——

Mr. RUPPERSBERGER. What would that be? What number do you think that would be?

Mr. CHRISTOFF. I don't know.

Mr. RUPPERSBERGER. I'm asking your opinion.

Mr. CHRISTOFF. I don't know.

Mr. RUPPERSBERGER. You're not going to talk for Mr. Gormley. He's telling me he's nongovernment. What do you think?

Mr. CHRISTOFF. I know. And here I'm from the accounting office.

Mr. RUPPERSBERGER. That even makes it worse. Give it a shot then. We won't hold it against you.

Mr. CHRISTOFF. Right. Actually, statisticians will tell you precisely what is a statistically valid sample based on a sample size of 4,000, and I don't really know what it is, but certainly it has to be more than 29 from one department and four from another department.

Mr. RUPPERSBERGER. What do you feel the reason is that we're not doing more?

Mr. CHRISTOFF. We're not doing more? What the department stated to us was that, No. 1, the resource constraints in terms of

being able to go out there and do additional ones, and the priority, it's not as high a priority as let's say Stinger missiles and AMRAAMs, those kinds of checks as well.

Mr. RUPPERSBERGER. OK. So then it gets down to resources and priority?

Mr. CHRISTOFF. Yes.

Mr. RUPPERSBERGER. Fine. Thank you.

Mr. TURNER. Mr. Chairman, additional questions?

Mr. SHAYS. I don't have a lot of questions, but I'd like to know, why were licenses for cruise missiles and UAV-related technology issued to non-MTCR members?

Mr. CHRISTOFF. That's a good question, I think, to direct to the next panel; but 15 to 30 percent of those licenses that we looked at out of 4,000 went to non-MTCR countries.

Mr. SHAYS. But you don't know why?

Mr. CHRISTOFF. No.

Mr. SHAYS. And there were no arguments presented.

What countries should the United States be most concerned about regarding cruise missile-UAV proliferation?

Mr. CHRISTOFF. China is No. 1. Clearly, China, having sold cruise missiles to particular countries of concern: Pakistan, Iran, Iraq, North Korea. And also I think I referred to these emerging markets where you have certain countries that currently manufacture cruise missiles, but they're not exporters and they are also not members of the MTCR such as Egypt, Israel, Oman, Iran as well, Pakistan.

Mr. SHAYS. So they're making their own——

Mr. CHRISTOFF. Yes.

Mr. SHAYS. But they're not exporting.

Mr. CHRISTOFF. Not yet.

Mr. SHAYS. But they've probably got technology to enable them to create their weapons?

Mr. CHRISTOFF. Yes.

Mr. SHAYS. Thank you, Mr. Chairman.

Mr. TURNER. Thank you.

Do any members of the panel have anything else they wish to add before we move on to the next panel?

We thank each of you for participating.

Moving on to our second panel, which will include Mr. Matthew Borman, Deputy Assistant Secretary for Export Administration, the Department of Commerce; Mr. Robert Maggi, Managing Director of Defense Trade Controls, Department of State, who is accompanied by Mr. Van Diepen, Director, Office of Chemical, Biological and Missile Nonproliferation, Department of State; Lieutenant General Walters, U.S. Air Force, Defense Security Cooperation Agency, Department of Defense, and Ms. Lisa Bronson, Deputy Under Secretary of Defense for Technology Security Policy and Counterproliferation, Department of Defense.

We appreciate your attendance today, and participation. Before you all get comfortable, perhaps you would all stand, please, so we can administer the oath.

[Witnesses sworn.]

Mr. TURNER. Please note for the record that the witnesses have responded in the affirmative.

We will begin this panel with the testimony of Mr. Borman.

STATEMENTS OF MATTHEW S. BORMAN, DEPUTY ASSISTANT SECRETARY OF COMMERCE FOR EXPORT ADMINISTRATION, DEPARTMENT OF COMMERCE; ROBERT W. MAGGI, MANAGING DIRECTOR OF DEFENSE TRADE CONTROLS, DEPARTMENT OF STATE; LIEUTENANT GENERAL TOME H. WALTERS, JR., USAF, DEFENSE SECURITY COOPERATION AGENCY, DEPARTMENT OF DEFENSE, ACCOMPANIED BY VANN H. VAN DIEPEN, DIRECTOR, OFFICE OF CHEMICAL, BIOLOGICAL AND MISSILE NONPROLIFERATION, DEPARTMENT OF STATE; AND LISA BRONSON, DEPUTY UNDER SECRETARY OF DEFENSE FOR TECHNOLOGY SECURITY POLICY AND COUNTER-PROLIFERATION, DEPARTMENT OF DEFENSE

Mr. BORMAN. Thank you, Mr. Chairman and members of the committee.

Mr. TURNER. Mr. Borman, would please move your microphone in front of you. As we said in the last panel, these do appear to be directional. So if you have it in front of you, it would be helpful.

Mr. BORMAN. How does that sound? Thank you.

Mr. Chairman, Mr. Vice Chairman, and members of the committee. It's a pleasure to be here to testify before you on this important topic. I have a short oral statement and ask that my full written testimony be entered into the record.

The Department of Commerce's Bureau of Industry and Security is responsible for administering controls on U.S. Dual-use exports for reasons of national security, foreign policy, nonproliferation, and short supply. In this regard, the Bureau vigorously administers and enforces missile technology and anti-terrorist controls to stem the proliferation of systems that can be used to deliver weapons of mass destruction. We carry out our mission working closely with the Departments of Defense, State, Energy, Homeland Security, and Justice, as well as the Intelligence Community.

National security is the primary focus of Commerce's Bureau of Industry and Security. We are keenly aware that our Nation faces significant threats both from terrorist groups and from countries seeking to acquire weapons of mass destruction and the means to deliver them. Although the export controls we administer cannot solve all of these problems, they do have a crucial role in denying terrorists and proliferators some of the tools they need for their hostile operations. As requested, I will address how the Department of Commerce mitigates the proliferation risks posed by cruise missile and UAV technology, paying particular note to the General Accounting Office's recent report.

We appreciate GAO's work on this issue and note that the GAO did not conclude that U.S.-origin items are contributing to the proliferation of cruise missile and UAV technology. Although we do not believe GAO fully analyzed all of these issues, we are nonetheless in the process of addressing the two recommendations in the GAO report.

Export controls are most effective when implemented on a multilateral basis. The Missile Technology Control Regime [MTCR], is the primary multilateral organization that addresses exports of items which can be used in cruise missiles and UAVs. The MTCR

currently has 33 member countries, including many of the key manufacturers and exporters of cruise missiles and UAVs.

The MTCR is highly focused on stemming the spread of missile systems capable of delivering weapons of mass destruction. Important steps the MTCR has recently taken include amending its guidelines to address concerns regarding terrorism, adopting new definitions for missile range and payload to sharpen the regime's focus on missile systems with WMD delivery capability, expanding controls to include short-range unmanned aerial vehicles which could have applicability in spreading chemical and biological agents, and also adopting catch-all controls.

I also note that two of the other multilateral export control regimes, the Wassenaar Arrangement, which deals with conventional arms and dual-use items related to conventional arms, and the Australia Group, which deals with chemical and biological weapons, agents and precursors, are undertaking efforts within their jurisdictions to enhance controls related to cruise missiles and UAVs.

Continuing to work within the multilateral framework is essential to the success of our nonproliferation goals, including stemming the proliferation of cruise missiles and UAVs that could deliver weapons of mass destruction.

Consistent with our MTCR commitments and nonproliferation objectives, the United States implements an extensive export control system intended to stem the proliferation of weapons of mass destruction and their delivery systems. The Department of Commerce has jurisdiction for the export of dual-use items, items that have civilian and military applications, including items both enumerated on the Commerce list, as well as uncontrolled items. Commerce's controls directed to preventing the proliferation of cruise missile and UAV technology include inclusion on the Commerce control list of all items on the MTCR annex that are not covered by the Department of State's munitions list, additional unilateral antiterrorism controls on lower-level items that have missile or other weapons applications, catch-all controls that require exporters to obtain a license for the export of any item, even an uncontrolled item, if they know or are informed that the item will be used in or by certain countries for prohibited weapons of mass destruction or missile delivery activities.

I would note that these catch-all controls also extend to nonexport activities, such as contracting, servicing or financing of U.S. persons anywhere in the world, regardless of whether any U.S. origin items are involved. And under this provision, a U.S. person was criminally convicted of violating the Export Administration regulations by failing to apply for a Commerce license to broker the transmission of material to be used as a missile propellant in Iraq; and it is important to note that in that case the material was of foreign origin and did not even enter U.S. territory. So the catch-all controls really have quite an extensive territorial reach.

We also publish the entity list, which is a list that identifies specific end users in countries throughout the world that pose a proliferation concern. A license is required for all exports for most entities on the entity list.

We also prohibit exports and reexports of any U.S.-origin items to persons designated by the Department of the Treasury as spe-

cially designated global terrorists, specially designated terrorists or foreign terrorist organizations.

In addition, a critical component of our export control success is our outreach program to U.S. industry. We have an extensive outreach program to inform U.S. industry of their export obligations.

Thus, we have an extensive set of controls to prevent the proliferation of missile technology, including cruise missiles and UAVs; and this set of controls covers sensitive items, sensitive uses of uncontrolled items, weapons of mass destruction-related activities and terrorists.

Let me now turn to what we are doing to enhance these already robust controls. We are in the process of reviewing our existing missile catch-all controls and have identified options for further enhancement of these controls. The options we have identified will be submitted for interagency review shortly by the Department of Commerce.

I would also note in this regard that our engineers, who have extensive experience and expertise in both commercial and military aerospace applications, are skeptical that a functioning cruise missile could be constructed out of uncontrolled parts and components.

We also will undertake an assessment of dual-use exports related to cruise missiles and UAVs to determine if U.S. exporters and foreign end users are complying with license conditions.

In conclusion, while we have an extensive system of controls that I think minimizes the likelihood of proliferation of cruise missiles and UAVs based on U.S.-origin technology, dual-use technology, we are taking steps to reduce that likelihood even further.

Thank you for your attention to this important issue, and I will be pleased to answer any questions you have after the other witnesses have testified. Thank you.

Mr. TURNER. Thank you.

[The prepared statement of Mr. Borman follows:]

Testimony of

Matthew S. Borman

Deputy Assistant Secretary of Commerce for Export Administration

Before the

Subcommittee on National Security, Emerging Threats, and International Relations

Committee on Government Reform

U.S. House of Representatives

March 9, 2004

Chairman Shays, Congressman Kucinich, Members of the Committee:

Thank you for the opportunity to testify on the role of export controls in preventing the spread of missile technology, particularly critical cruise missile and unmanned aerial vehicle (UAV) technology.

Summary

The Bureau of Industry and Security (BIS) within the Department of Commerce is responsible for administering controls on U.S. dual-use exports for reasons of national security, foreign policy, nonproliferation, and short supply. BIS vigorously administers and enforces these controls to stem the proliferation of weapons of mass destruction and the means of delivering them, to halt the spread of weapons to terrorists or countries of concern, and to further important U.S. foreign policy objectives. BIS works closely with 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 in implementing the dual-use export control system. The U.S. export control program is quite successful in stemming the proliferation of and access to missile technology by those countries and individuals that would use it against us.

As you requested, this testimony will address how the Department of Commerce mitigates the proliferation risks posed by cruise missile and unmanned aerial vehicle (UAV) technology with a focus on how these issues relate to the recently released General Accounting Office Report (GAO) entitled, "Nonproliferation: Improvements Needed to Better Control Technology Exports for Cruise Missiles and Unmanned Aerial Vehicles" (GAO-04-179). We appreciate the work the GAO put into this report and are taking steps to address the specific issues raised in the report. As I explain below, however, we do not believe that the report fully analyzed the significance of the threat posed by attempts to construct cruise missiles and UAVs from uncontrolled parts or the compliance issue. More importantly, GAO does not contend that the growing worldwide capacity to produce cruise missiles and UAVs stems from improper exports of U.S. goods and technology.

Nonetheless, Commerce is taking action on GAO's recommendations. We had already begun a review of the missile catch-all controls in the Export Administration Regulations (EAR). Based on that review, Commerce is in the process of considering possible options for revising these controls. In addition, the Department will undertake an assessment of compliance with conditions on licenses to export dual-use technology related to cruise missiles and UAVs.

The Threat of Cruise Missiles and UAVs

The paramount concern of BIS is the national security of the United States. Our nation faces significant threats, both from terrorist groups and from countries seeking to acquire weapons of mass destruction (WMD) and the means to deliver them. Export controls cannot solve these problems alone, but they do have a crucial role in denying terrorists and proliferators some of the tools they need for their hostile operations. As we have seen in recent weeks with the revelations regarding transfer of controlled technology by certain parties in Pakistan, and the past efforts to develop weapons programs in Libya, the threat is real.

However, our national security is not best served by denying every export license application. Although U.S. national security requires us to restrict the export of sensitive commodities, it also requires a strong U.S. industrial base. The United States has a critical national security interest in the economic strength of its suppliers of key technologies, such as in the aerospace industry. If U.S. companies are unable to compete in important export markets due to excessive controls, and as a result are forced to exit those product lines, the United States would not only lose that production capability and be forced to rely on foreign suppliers, we would also lose much of our ability to control exports of those items. Moreover, the U.S. military depends on U.S. industry in order to maintain and extend our technological advantage. So we must not lose sight of the impact of overly broad or restrictive export controls on the industrial base, which increasingly supplies our military, in this country. It is critical that export controls enhance both our national security and economic interests.

I. U.S. Dual-Use Export Controls Relating to Cruise Missiles and UAVs

A. The Missile Technology Control Regime

Export controls are most effective when they are implemented on a multilateral basis. The Missile Technology Control Regime (MTCR) is the primary multilateral control regime that addresses exports of items which can be used in cruise missiles and UAVs.[1] The MTCR has 33 member countries, including many of the key manufacturers and exporters of cruise missiles and

[1] We note that the MTCR is not the only international regime that works to prevent missile proliferation. 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. The Department of Commerce implements these controls over many 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).

In addition, the Australia Group is considering controlling the export of certain aerosol sprayers, including those capable of being used on UAVs, to deliver a significant downwind respirable hazard of pathogenic micro-organisms or toxins.

UAVs. The MTCR has a control list, or "Annex," of items (goods and technologies) which all members control according to the MTCR guidelines. The MTCR Guidelines and Annex serves as the basis for the dual-use missile technology controls administered by the Department of Commerce.

The MTCR has been responsive in addressing 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 and Defense, 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. For the most part, MTCR members are receptive to U.S. proposals to control new items or modify existing entries on the MTCR's control list.

The MTCR is now even more focused on stemming the spread of missile systems capable of delivering weapons of mass destruction. For example, the MTCR recently:

* amended its Guidelines to address concerns regarding terrorism. The new Guidelines make clear that the MTCR is intended to limit the risk of controlled items and their technology falling into the hands of terrorist groups and individuals.

* adopted new definitions for missile "range" and "payload" to sharpen the regime's focus on missile systems with WMD delivery capability. The definitions require members to use consistent criteria in interpreting the range and payload of a particular system, thereby ensuring proper control over systems which may be modified to meet "Category I" parameters (systems capable of carrying a 500 kilogram payload at least 300 kilometers).

* expanded controls to include short-range UAVs, which could have applicability in spreading chemical and biological agents. Recognizing the potential threat posed by systems designed or modified to dispense aerosols, capable of carrying a particulate or liquid greater than

20 liters, and having certain flight control and navigation capabilities, the MTCR placed controls over these UAVs.

* broadened its approach to export controls by recently adopting "catch-all" controls to ensure that individual exports of items not currently controlled that are intended for WMD delivery systems are prohibited, regardless of the commodity's control status. This measure, adopted at the September 2003 MTCR Plenary in response to a U.S. proposal, significantly strengthens the regime by broadening its scope beyond listed items to end-uses. While most MTCR members, including the United States, already have domestic catch-all controls, having MTCR catch-all controls provides enhances the stature of catch-all controls as part of the international standard for all countries' export control system. It also adds impetus to members' implementation of their own catch-all controls.

Thus, continuing to work within the MTCR framework is essential to the success of our missile 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 countries and programs of concern. The Department of State has export licensing jurisdiction for defense articles and services covered by the U.S. Munitions List. 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 all items controlled for Missile Technology (MT) reasons. These MT items represent the equipment and technology 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). In 2003, Commerce reviewed 565 license applications for items controlled for MT reasons. The Department of Defense, State, and Energy, as well as Commerce, review all approved license applications for MT 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 Committee (MTEC) meets once a week to review all pending missile technology license applications. In this process, all end-users identified on an export license application for MT items are vetted for proliferation concerns by the intelligence community. 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 of <u>any</u> item, even a non-controlled item, if they know or are informed that the item will be used in or by certain countries for prohibited nuclear activities, chemical or biological weapons programs, or the design, development, or production of missiles, or facilities engaged in such activities. These catch-all controls, set forth in Part 744 of the EAR, seek to prevent the export of any item that could be used in an MTCR-class missile program of concern, including cruise missiles and UAVs, and ensure there is no "gap" in the application of

export controls for proliferation reasons. Last year, the relevant departments reviewed 479 license applications submitted under the missile catch-all controls.

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 end-users identified on the Entity List, a license is required for all exports 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 knowing it will directly assist in chemical and biological weapons or missile activities in or by certain countries. For instance, a U.S. person was criminally convicted of violating this requirement by failing to apply for a license to broker the transmission of material to be used as missile propellant in Iraq.

Finally, our controls also target terrorists. 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 exports of MT items. These controls are intended to keep even low-level technologies out of the hands of the most dangerous actors in the proliferation marketplace.

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.

B. Strengthening Commerce Department Export Controls

The GAO recommended that the Department of Commerce review the sufficiency of the EAR's catch-all controls to address missile proliferation by nonstate actors. The GAO based this recommendation on the claim of an individual in New Zealand who asserted he could construct a cruise missile using uncontrolled U.S. parts and components. As exports of uncontrolled items to this individual would not generally require a license from the United States unless the U.S. exporters knew or were informed that the item was destined for WMD or missile programs in countries of concern, or otherwise informed by the government that a license was required, the GAO deemed this to be a "gap" in our controls.

This circumstance is much more theoretical than real. Based on a review of this individual's website (GAO's source), this individual has not flown a complete working cruise missile and appears to be using an experimental pulse jet engines that does not appear to be suitable for powering a cruise missile. None of the lower level technology items identified on his website are appropriate for the development and guidance of a cruise missile capable of meeting MTCR performance levels of a 300 km range and a 500 kg payload capability, let alone a working missile of lower capability. In addition, New Zealand is an MTCR partner country and is firmly committed to the regime's guidelines. It appears, from this individual's website, that the government of New Zealand has taken action concerning this effort. Thus, while this example may raise domestic law enforcement issues for New Zealand, it appears to be much more of a theoretical proliferation concern than an example of a practical "gap" in export controls.

Nonetheless, Commerce is acting on GAO's recommendation regarding our catch-all controls. Even prior to GAO's recommendation, we had begun a review of the missile catch-all controls in the Export Administration Regulations (EAR). Based on that review, Commerce is in the process of considering possible options for revising these controls.

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.

One issue raised by the GAO was that the U.S. government has difficulty enforcing the missile technology "catch-all" control because it must prove the exporter's knowledge of the law in order to impose civil penalties on an unauthorized export. For these knowledge-based licensing requirements, in civil enforcement cases, it is only necessary to show that an exporter knew or was "aware of a high probability" that an item was destined for a missile proliferation activity. It is not necessary to show, in such cases, "knowledge of the law" or "the intent to violate it."

The GAO also raised the issue of the number of Department of Commerce visits to assess the end-use of licensed missile-related items. In particular, the GAO identified 20 cruise missile or UAV related licenses the GAO believed met Department of Commerce criteria for end-use visits and noted visits had been carried out on only 2 of those 20 transactions. There are two principal points to consider in assessing this concern. First, the licensing process serves to establish that an item is being exported to an appropriate end-use and end-user. In approving a license, the U.S. government will consider a wide range of information about the end-user, including the end-user's past licensing history, input from the intelligence community, and pre-license checks. In brief, by the time an export is approved, the U.S. government has a substantial degree of confidence that the item will not be diverted to an inappropriate end-use. For this reason, it is not necessary, and would be an inefficient use of limited resources, to conduct on-site end-use visits for a high percentage of export licenses.

Second, the Department of Commerce, like any enforcement agency, has a limited amount of resources that it must target on the highest priorities. The GAO report correctly notes that criteria established by Commerce with regard to technologies and countries enable the most effective use of post-shipment verifications and pre-license checks. There is an established protocol that includes a number of variables that help determine whether such an action should be initiated: information about the parties to the transaction, the proposed end-use, the ultimate destination, previous licensing history, and known end-user concerns. This protocol contributes to our ability to effectively enforce end-use and end-user controls on missile technology within limited available resources.

As GAO notes in their report, the same guidance on targeting end-use checks for selection also includes factors that mitigate the need for selection for an end-use check. In the 18 cases where a post-shipment verification (PSV) was not selected as necessary, 7 of these 18 had favorable end-use checks previously completed on the consignees involved (in some cases Commerce had multiple favorable end-use checks on the consignees) and another 3 involved

large well known U.S. subsidiaries as the overseas consignee where the U.S. exporter was the parent company. In yet another case, the MTEC (an interagency committee that reviews all sensitive MT export transactions) agreed to approve the case with a condition that any follow-on licenses would receive both a pre-license check and government to government assurances. In another case, the MTEC approved the case with a condition of government to government assurances prior to export. Finally, 5 cases involved an export of technology - not commodities. Technology transfers are typically not selected for PSVs because PSVs have limited utility in detecting the diversion of technology as opposed to physical items. In the evaluation of a technology transfer license, numerous factors are considered during the interagency review process in determining whether the export should be approved or denied, such as the security control program, workforce analysis, business ownership and partnerships, and indigenous capabilities. The remaining check was not completed for other reasons.

Although the Department believes its current program for conducting end-use checks is appropriate, it will undertake an assessment of compliance with conditions on licenses to export dual-use technology related to cruise missiles and UAVs as recommended by GAO

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.

Mr. TURNER. Mr. Maggi.

Mr. MAGGI. Mr. Chairman, Mr. Tierney, Mr. Shays, thank you very much for having us here today. It's a real pleasure to be here to talk about this very important issue and discuss the views from our colleagues at the General Accounting Office.

As stewards of this Nation's defense trade controls and exports, we have no higher priority than ensuring that the recipients of defense articles and services comply with U.S. export control laws and regulations. As such, and there's so much at stake, I actually welcome views and practical suggestions on how we can be doing a better job. This is real important to us. I have a prepared statement, and with your permission, I'd like to have that submitted for the record, please, sir.

To begin with, there's an awful lot we agree about with the GAO. They did a lot of hard work and we appreciate their views.

First of all, we're welcoming the attention that they've put on the issue of post-shipment verifications. That's really important.

We also share the concern of the report having to do with proliferation of cruise missiles as well as UAV technologies.

We also agree that the capabilities and the use of cruise missiles and UAVs have expanded around the world and we need to be paying attention to it.

Finally, we do agree that we need to be conducting more end-use checks, and we're on our way to doing that.

But there are other areas where we're not in complete agreement. I'm not sure that we actually agree with the threat as presented in the report. I think that was quite a picture that we just heard from our colleagues on the prior panel, and that's a very worrisome issue, but I'm not sure that those are things that have occurred as a result of our system or our parts or our equipment. The picture was an accurate one, but I'm not sure it was driven be diversion of U.S. equipment.

Additionally, I think that with regard to concern of the homeland danger, we'll have to be looking at that as well.

Finally, we certainly don't agree with the views in the report having to do with the effectiveness of export controls. I believe that end-use verification is very important, but of singular impatience is the full range of activities that we take to make sure that defense goods and services are properly managed when they leave the United States; and I think it gives a misimpression of the full degree and the range and depth of the activities we take to make sure that the right stuff ends up in the right place.

Mr. Ruppersberger started on a very good point about balance and tension between two priorities. For us, it's the tension between making sure that important weapons and technology stay out of the hands of people we don't want them to be in, while, at the same time, we help our friends and allies have in their possession the equipment and the technology available for them to help share the burden of world peace. That's real important for us.

Strategic balance and regional stability are our major concerns. Last year, we adjudicated 55,000 cases worth over $90 billion. We are headed for zero defect. We need to get every single one of those right the first time, and to do that, we rely on a full spectrum of tools that go beyond just post-shipment verification. They include

the actual licensing process, preshipment checks, compliance and enforcement activities, and very close work with other groups of folks and other agencies.

The report, I think, could have given a little more credit to the full range of activities that we take, including how our registration process works, how our watch list works; how our flag system draws attention to suspicious activities; the vetting that we do within the Department of State and with the Department of Defense and the Department of Commerce; the work that's done by the Missile Tech Export Committee checking on whether or not these technologies should be going places. The idea of establishing and validating the bona fides of the end user and the confidence that we have in them is important for us to know to shape our views of who should be getting what sorts of things.

I would make note that with the exception of six Predator UAVs for Italy, no complete systems were licensed by the Department of State, the vast majority of the cases that were reviewed of that 786 were spare parts for UAVs that were in the possession of known allies, and that the vast majority of the cases ended up in well-known programs that had very high levels of transparency.

I would also make note that one of the things that allows us to track what the cases look like is a piece of our automated process called "commodity codes," which we are updating. So sometimes what looks like the export of an actual piece of hardware turns out to be a license was for marketing or a spare part.

To be clear, compliance and enforcement are critical. We've restructured. We took an organization and made a separate office just to focus on compliance. We've given them a lot of resources. We've upped our compliance staff from 3 to 30 people in the last 15 years. We added 5 in the past year; there will be 10 more this year. The growth of the people and keeping them on board will help us with the excellence of the quality of the cases that we're working on.

We've now got a new automated system, so by doing this, augmented by computers and, particularly, attaching our computer work with that of the Customs folks now known as ICE, we will be able to see what actually leaves each day in a contemporaneous way and be able to see how we track that against the use of the end users.

And our work with the other agencies continues to be important. Our end-use checks benefit from what goes on with, for example, Customs and Justice. Last year, we had 665 cases that we cooperated with the Justice Department and Customs on, for a total of over $100 million in seizures. We assessed over $63 million in fines to folks that violated the Arms Export Control Act and the international traffic in arms regulations.

The report, in conclusion, addresses a very valid concern and we're concerned as well, but I don't think it gave a complete picture of how we do our business. Almost a third of my team is either active duty military or veterans. We're serious about weapons and we're serious about the technologies surrounding them. Every day we are mindful of our responsibility not only to the American taxpayer, but to the world community. We're not complacent.

We also recognize the need to stay ahead of the emerging threat. While past performance is no guarantee of future success, it's worth noting that neither we nor the report are aware of any areas in which our technologies have left and have presented a threat back to us.

Finally, three points: We pay special attention to cruise missile and UAV technology transactions. We are increasing the number and effectiveness of our end-use monitoring checks, and we are increasing the quality in the way we do our targeting on UAV and MTCR-related actions.

Thank you for your attention.

Mr. TURNER. Thank you.

[The prepared statement of Mr. Maggi follows:]

STATEMENT BY ROBERT W. MAGGI, MANAGING DIRECTOR, DIRECTORATE OF DEFENSE TRADE CONTROLS, U.S. DEPARTMENT OF STATE

Before the Subcommittee on National Security, Emerging Threats, and International Relations of the House of Representatives Committee on Government Reform, March 9, 2004

Mr. Chairman, members of the committee, thank you for the opportunity to appear before you today to discuss the General Accounting Office's assessment of the Department of State's controls on the export of cruise missles, unmanned aerial vehicles (UAV) and related technologies. As stewards of the nation's defense exports, we have no higher priority than ensuring that the recipients of U.S. defense articles and services comply with U.S. export control laws and regulations. We are also very mindful in the post 9/11 environment of our responsibility for preventing the proliferation of weapons of mass destruction (WMD) and the systems for their delivery as well as the ease with which rogue states and non-state actors can acquire these systems and technologies. With so much at stake, therefore, we welcome the scrutiny of our performance and practical suggestions on how to improve our system of export controls over such defense articles.

We are grateful to the GAO for focusing attention on some of the means we use to verify the end-use of cruise missiles and UAVs, in particular the role of the Blue Lantern program as a post-shipment check, and we accept many of the report's conclusions and observations. We wholeheartedly agree, for example, that cruise

missiles and UAVs in the hands of our adversaries pose a threat to U.S. national security. We also agree that effective export controls are an important tool in combating the proliferation of these capabilities.

At the same time, however, I would like to draw attention to several critical aspects of the Department's approach to controlling these weapons and technologies that the report overlooks – in particular the rigorous review and screening process that each export receives as part of the licensing system and the essential role this process plays in our end-use check program. By looking at the Blue Lantern program in isolation from these other tools -- and our broader response to the threat of cruise missiles and UAVs falling into the hands of rogue states or non-state actors -- the GAO paints an incomplete and fuzzy picture of our end-use check program and the level of controls over these exports. Today, I'd like to fill in some of the details missing from the GAO study to put our end-use check program into the proper context.

The Cruise Missile/UAV Threat and the U.S. Response

Although ballistic missile proliferation continues to grab most of the headlines, we remain vigilant about the growing threat of cruise missile and UAV proliferation. Today, as you will hear in subsequent presentations, there is increasing interest by both state and non-state actors in acquiring cruise missiles and UAVs for the delivery of both non-conventional and conventional payloads.

The UAV proliferation threat: The same attributes of UAVs that are so useful for the U.S. military – for example, the ability to strike targets with

precision, substantial protection from interception, and capabilities for real-time intelligence collection – make UAVs in the hands of our adversaries a threat to the United States and to our friends and allies. Moreover, UAVs are potential delivery systems for Chemical and Biological Weapons (CBW). In the past, most of our concern about the use by adversaries of WMD-armed UAVs focused on nation-states. Since 9/11 however, we have been much more conscious of the potential for terrorist groups to produce or acquire small UAVs and use them for CBW delivery. It is important to note, however, that because of MTCR controls the biggest threat of proliferation does not come from the United States and its allies, but rather from other countries that produce UAVs indigenously.

The Cruise Missile Proliferation Threat: As noted in previous National Intelligence Estimates, in some scenarios cruise missiles can provide a better alternative than ballistic missiles when launched from forward areas. Adversaries could therefore see these missiles as advantageous in attacking the United States, our forward-deployed forces, or our friends and allies. Indeed, the U.S. Intelligence Community estimates that one to two dozen countries probably will possess a land-attack cruise missile (LACM) capability by 2015 through indigenous development, acquisition, or modification of such other systems as anti-ship cruise missiles or UAVs. The most plausible means for a forward-based launch against the U.S. homeland would be a covertly equipped commercial vessel.

While acknowledging the threat posed by proliferation of these weapons to rogue states or non-state actors, it is equally important that we have the ability to provide appropriate systems to allies and friends, while

maintaining adequate protections to prevent further proliferation. In this regard, it is important to note several salient characteristics of the emerging cruise missile/UAV proliferation threat.

- First, while cruise missiles and UAV capabilities have multiplied around the world, the United States and our allies in Europe and the Pacific are not significant contributors to this problem. U.S-origin systems have not been exported to the threat countries about which we worry. Nor do we see indications that our friends and allies are engaged in the unauthorized re-export of U.S.-origin cruise missiles and UAVs. We expect these trends to continue because of, among other things, the strength of the U.S. export control system and improved multilateral export controls, both of which make foreign suppliers more attractive to proliferant countries as sources of cruise missiles, UAVs and associated technologies.

- Second, much of the cruise missile/UAV proliferation that has occurred to date has posed a limited threat to the U.S. homeland. The vast majority of cruise missiles and UAVs in the inventory of problem countries are battlefield models with short range and limited payload capacity – not longer-range land attack variants. We are concerned about the growing threat to U.S. forces deployed overseas from non-U.S. origin weapons, particularly long-range anti-ship cruise missiles. Overall, however, the United States' overwhelming conventional military superiority will limit the military utility of these weapons to our opponents for some time to come.

- Third, cruise missiles and UAVs vary widely in their capabilities and operational requirements and thus lumping these systems together under one label creates a distorted picture of the threat. As discussed in more detail below, making distinctions among these systems is important in assessing U.S. export controls because most of the cases the GAO highlighted involved the sale of the U.S. Navy's Harpoon anti-ship missile and related supplies, a short-range system (60-150 miles) with a limited conventional payload and land attack capability.

None of this should be seen as complacency in the face of a growing threat. To the contrary, this administration, as the GAO acknowledges, has taken several steps in response to the worldwide proliferation of cruise missiles and UAVs.

- **U.S. Defense Trade Controls:** We need to assure that our controls are clear and well-defined. To this end, we currently are engaged in a review of the United States Munitions List (USML), which lists the goods and services subject to State Department licensing authority. We are seeking to clarify the controls on UAVs by incorporating into the USML the range/payload parameters for UAVs outlined in the Missile Technology Control Regime (MTCR). This change, which we intend to publish shortly, reflects our own increased attention to this potential threat.

- **Other Tools:** Our own export controls are only one of many tools the United States employs to impede cruise missile and UAV proliferation and mitigate its impact. For example, through the

MTCR, the Wassenaar Arrangement (WA), and our export control assistance programs, we work cooperatively with friends and allies to ensure that sensitive technologies are not transferred to missile programs of concern. Indeed, during the past two years the Wassenaar Arrangement has formulated and implemented new controls on its dual-use list for UAVs and associated technologies, and the MTCR has added controls to UAVs capable of dispensing aerosols (such as chemical and biological weapons). In addition, we have a longstanding effort to identify and interdict individual shipments of equipment and technology to such programs, particularly foreign shipments, which has now been bolstered by President Bush's Proliferation Security Initiative. Finally, U.S. law mandates sanctions against foreign entities involved in variousacts of missile proliferation, which act as a deterrent. Put simply, the GAO's focus on the use of export controls to curb proliferation, and U.S. exports controls in particular, represents only one aspect of our efforts to ensure that these systems and technologies do not fall into the wrong hands.

Defense Export Controls and Risk Management

The effectiveness of export controls in advancing U.S. national security and foreign policy goals can best be understood within our broader regulatory philosophy. The concept of risk management is central to the U.S. system of regulating defense trade. We want to get selected weapons and technologies into the hands of allies and friends, and we want to enhance our defense industry's ability to provide the U.S. armed forces the tools they need and

deserve. Arms and defense technology transfers, when regulated judiciously, are an integral part of the United States' ability to help meet legitimate security needs of friends and allies, deter aggression, and foster regional stability. Friends and allies with modern capabilities are better coalition partners for the United States in both winning wars and securing the peace, and their participation in these situations reduces the cost in American lives and dollars and confers international legitimacy on the use of force. They are also better able to preserve stability and security in vital regions, easing the burden on our overstretched military forces. In short, we achieve much more security when we work with our friends than if we act alone.

Equally important, however, we want to keep U.S. weapons and technology out of the hands of our enemies – and preventing proliferation is more important than ever when the intersection of military technologies and WMD terrorism poses such a major threat to our security. In addition, we also worry about the proliferation of less glamorous low-tech weapons, such as small arms and light weapons, including man-portable air defense systems (MANPADS), to unstable regions, to failed or failing states wracked by violence and disorder, and to countries on our list of prohibited destinations.

The only sure way to eliminate the proliferation risk of U.S. defense exports is to never allow U.S. defense articles and services to leave our shores. This is an untenable policy and it would not make us more safe and secure. What we try to do, therefore, is to manage these risks in a responsible and prudent manner. Balancing these competing considerations has become increasingly complex and challenging in today's environment: the boundary between

technologies that have military applications and those that don't is harder to fix precisely. It's harder to know which subcomponents within complicated machines can be reverse-engineered for military purposes. And it's growing increasingly difficult to counter the shadowy network of front companies, middleman, and organized crime networks that engage in illegal arms trade with the benefit of modern information technology, porous borders, and corrupt foreign customs officials.

In reviewing the controls over cruise missile and UAV exports, the GAO report focuses on only one of the tools we use to mitigate the risks that defense exports will be diverted -- post-shipment checks. In view of the serious consequences of the proliferation of dangerous weapons and technologies, however, we employ an array of tools to mitigate these risks, most notably a comprehensive and rigorous licensing process of "front-loaded" end-use checks and extensive compliance and enforcement activities. Our coordination with other agencies that share responsibility for controlling trade in defense and dual-use commodities is also a key to the success of our end-use check program.

Review and Screening of Export Licenses

I wish to emphasize here the importance of the procedures and screens embedded in the licensing process. The licensing process incorporates a number of controls to enforce end-use restrictions -- only one of which is the Blue Lantern program of pre- and post-license checks – and therefore plays a critical role in ensuring the appropriate end-use of U.S. defense exports. A singular focus on the post-license end-use checks in the Blue Lantern

program may easily give the mistaken impression that an export not subject to a specific post-shipment Blue Lantern check would not have been scrutinized by the Department and was therefore a high risk export. As a result of this narrow focus, the GAO significantly understates the overall effectiveness of our end-use check program.

Under the Arms Export Control Act (AECA) the Department strictly controls the export of all defense articles and services. The International Traffic in Arms Regulations (ITAR) are the key implementing regulations. This legal and regulatory framework provides strict standards for the licensing of defense exports (including defense technology), requiring, for example, that all persons engaged in the business of manufacturing, brokering or exporting defense articles to first register with the Department of State. The regulations have stringent rules on who is eligible to participate in defense trade, include significant criminal and administrative penalties for non-compliance, and recognize the critical role that other Departments such as Defense, Homeland Security, Commerce, and Justice play in this effort.

These legal and regulatory safeguards, which the GAO report did not address, come into play in the licensing process and are critical to our efforts to ensure licenses are issued to legitimate, reliable entities and for specified programs or end-uses that support U.S. national security and foreign policy goals. We also require end-use and retransfer assurances from the companies receiving these defense articles or technology as well as, in most cases, the country where the companies are located. Additionally, pre-license checks are a crucial element in building the history of the reliability

(or unreliability) of foreign parties, particularly those that repeatedly appear in a variety of license transactions, and thus in establishing the legitimacy of the parties involved and the end-use of the export. Let me highlight briefly the key elements of this screening process.

- Every exporter must be registered with the Department and each company and its principal officers are vetted with law enforcement officials.

- Every end user and every applicant -- indeed every party to every export -- is run against a comprehensive watchlist maintained by the Department that includes over 50,000 names from law enforcement, intelligence, the Department of Homeland Security, and other sources. The U.S. Intelligence Community also plays an important role in identifying potential or actual unauthorized use or diversion of U.S. origin defense articles.

- Licensing officers are trained to look for suspicious transactions– unusual quantities, new or suspicious end-users, unusual shipping or payment arrangements, and discrepancies between the export and the inventories of the end-user country.

- Sensitive cases are staffed to the Department of Defense for their input on both the technical releasability of the articles and its impact on their war fighting interests and capabilities.

- Missile related cases are vetted through an interagency working group called the Missile Technology Export Control group that specifically assesses and makes recommendations on certain missile related exports and helps ensure these exports are in compliance with our international commitments as well as our nonproliferation policies.

- Many of the significant UAV and cruise missile related exports are also subject to international safeguards commitments obtained through government-to-government agreements negotiated to obtain additional assurances on the end-use and controls over these items and technology.

- Industry also plays an important role in this effort. The Department works extensively with industry on self-compliance and the need to watch for suspicious transactions. The significant criminal and administrative penalties provide a powerful incentive to full cooperation in this area and I am happy to report that U.S. industry is a critical ally in preventing, detecting, and reporting the diversion of U.S. defense articles.

Controls on UAV and Cruise Missile Exports

Against this backdrop, I would like to specifically address the cases highlighted in the GAO report of UAV and cruise missile exports to foreign weapons programs that did not receive a Blue Lantern post-shipment check. First and foremost, let me underscore that U.S. armaments cooperation with friends and allies is important to our national security and foreign policy

interests and our level of involvement provides us with confidence that the export supports U.S. interests. The one export of a whole UAV system mentioned in the report was for a key NATO ally and longtime friend of the United States, and was part of a larger cooperative program important to improving coalition warfare capabilities. Moreover, the risk of diversion was small. In addition, I would stress that the majorityof exports discussed in the report were:

(1) made to government end-users who provided government-to-government assurances, including no retransfers or changed end-use without USG approval;

(2) destined to well-known programs with a significant amount of U.S. industry and defense cooperation that helps to ensure control and accountability of U.S.-origin defense articles; and

(3) in support of FMS cases and involved licenses for marketing, spare parts, and supplies rather than the end-items themselves.

The GAO report suggests that pre- and post-shipment checks do not verify the conditions placed on exports of defense articles although it neglects to specify what types of conditions it believed required special monitoring. This concern needs to be put in perspective. The most important and fundamental condition on any authorized export is that it is delivered to the identified end-user for the end-use that has been approved. Post-shipment checks do verify this by establishing delivery and end-use on specified programs and pre-checks help establish a high confidence of compliance.

Many export licenses or other export approvals will include technical provisos limiting the capability or type of article that may be exported. Many of these conditions are not susceptible to overseas postshipment verification because they are typically applicable to the U.S. exporter, not the foreign recipient, or by their nature are not susceptible to physical inspection or verification. For example, a frequent proviso will prohibit the exporter from offering any comparison of the exported system to similar items in the U.S. inventory. A violation of such conditions is a criminal violation of the AECA and would fall under the investigative jurisdiction of Immigration and Customs Enforcement (ICE) at the Department of Homeland Security and possible prosecution by the Department of Justice. In short, while post-shipment checks may not be sufficient to monitor highly technical provisos applied to certain transactions, the problems and risks identified in the GAO report, such as diversion to unauthorized entities or illegal retransfers of U.S. technologies, are detectable and more importantly can be deterred by both pre- and post-license checks.

Compliance and Enforcement

Before turning to a discussion of the Blue Lantern program, I would like to underline the importance that the Directorate of Defense Trade Controls (DDTC) places on our overall compliance and enforcement activities. Like the licensing process, these efforts play a critical role in the success of our end-use check program. Accordingly, compliance and enforcement is one of our highest priorities, and the administration's commitment in this area is

reflected in the many actions taken to improve the defense trade controls we administer. Let me highlight some of our accomplishments to date:

- In January 2003, to enhance the capabilities of what was then the Office of Defense Trade Controls, we created separate offices for the licensing and compliance functions to focus attention and resources on these critical missions.

- The Department has increased the resources devoted to compliance and enforcement. For example, personnel over the past few years for this mission has increased roughly 20 percent.

- The Department has launched a new automated export licensing system called "D-Trade" that will strengthen our compliance regime in three ways. First, it will improve our ability to track, monitor, and audit defense trade. Second, by making the processing of routine cases more efficient, those responsible for scrutinizing licensing applications will have more time to focus on the tough cases. Third, D-Trade will make DDTC's cooperation with colleagues in the Defense and Commerce Departments more efficient and effective.

- In 2003, the Department joined with the Department of Homeland Security in rolling out the Automated Export System (AES). This system provides greater automation and visibility to defense exports by requiring exporters to file electronically information on all their defense exports. As we gain experience with assimilating this data, we expect AES to provide information never before available to our

licensing staff, our compliance staff, and to law enforcement officials enforcing our export laws. This system will not only allow tracking and analysis within DDTC of what defense goods are actually being exported, but will also give our licensing officers direct access to information that will enhance our targeting and screening of suspect exports. In particular, it will provide for the first time better information on actual shipments that can be used to more quickly trigger and target post-shipment checks.

- Later this year, we will be standing up compliance inspection teams to visit certain companies for inspection on compliance related issues such as record-keeping, evidence of recurring violations, and other issues. These inspection visits will not only improve our understanding of industry practices of concern but will also send a strong message that the Department is stepping up our commitment to company compliance.

The Blue Lantern Program

The Blue Lantern program is a long established system of pre-license and post-shipment checks conducted by staff from our embassies. The program is used to help licensing officers by providing them additional information to verify the specific end-use and end-user of commercial defense exports and transfers. The goal is to prevent U.S. defense exports from falling prey to diversion, including from the gray arms network, which uses fraudulent export documentation to acquire defense articles through legitimate channels for end-users inimical to U.S. interests.

The Blue Lantern program of pre- and post license checks is an integral part of the licensing process. While the Blue Lantern program clearly provides a specific check on the bona fides of a particular export transaction, equally important is that these checks over time help provide a record on the reliability of the parties to an export. For example, licensing officers often request a pre-license check on unfamiliar end users. The response from our embassy overseas is often positive with a full explanation of the history of the company and its role in a particular project or the relationship of the company to the Ministry of Defense. Given this information, the licensing officer usually does not need to seek another pre-license check on this party in the next application. In short, the previous check, coupled with the other information available with the new application and all the other checks that are run, is usually sufficient for the licensing officer to make a determination on whether to approve that license.

Blue Lantern checks are targeted based on a well-developed selection process designed to identify for our licensing and compliance officials transactions that are most vulnerable to diversion or misuse so that the most efficient use is made of the finite resources available for pre and post-shipment verification. Over the past three years, the Department has improved and refined this targeting system and the program results demonstrate this. We have conducted over 1200 checks over the past three years and developed derogatory information in almost 200 cases. In FY2003 alone, DDTC initiated 413 checks that resulted in 76 unfavorable cases.

The most prevalent commodities involved in unfavorable determinations are firearms and ammunition, which accounted for almost half of unfavorable cases in FY2003. (Just last month a pre-license check blocked hundreds of 9mm pistols from going to Colombian rebels). The percentage of unfavorable checks involving aircraft spare parts at risk of diversion to prohibited countries such as China and Iran jumped from 18 percent in 2002 to 24 percent in 2003. Electronics and communications equipment represented 17 percent of the unfavorable cases last year, while the remaining unfavorable checks involved commodities such as tactical missile spare parts, military training equipment, and night vision equipment.

The Blue Lantern program has strengthened export controls and has proven to be a useful instrument in: 1) deterring diversions; 2) aiding the disruption of illicit supply networks used by rogue governments and international criminal organizations, and 3) helping the Department make informed licensing decisions and ensuring compliance with the AECA and the ITAR. End-use checks performed under the Blue Lantern program have significantly encouraged compliance with legal and regulatory requirements and have proven particularly effective in addressing the growing problem of gray arms trade. These checks also support broader U.S. policy goals related to legitimate defense trade. These goals include:

- Impeding access to military items and technologies by persons and organizations that do not have the best national security interests of the United States or our friends and allies in mind, including those which contribute to the proliferation of weapons of mass destruction;

- Preserving continued technological advantages enjoyed by U.S. military forces and our friends and allies over potential adversaries; and

- Encouraging foreign government support for U.S. principles, laws, regulations, and practices concerning the responsible sale, retransfer, and end use of defense equipment and services.

The profile of the Blue Lantern Program has been raised over the past few years by DDTC's outreach efforts to U.S. embassies, U.S. exporters, and foreign governments. In FY 2003, DDTC officers presented Blue Lantern briefings at various U.S. embassies through Asia and Central America to provide additional guidance to posts on the implementation of end-use checks. Briefings were also given to relevant host government officials to make them aware of the goals and purposes of the program as well as to facilitate its implementation abroad. In addition, DDTC officers also attended conferences in the United States and abroad in order to increase understanding of the program by foreign governments and U.S. exporters and to emphasize the utility of end-use monitoring in fighting the gray arms trade. And we continue to encourage NATO and EU governments to adopt Blue Lantern-type programs to ensure that their exports are not inadvertently entering the gray arms market. DDTC plans to continue outreach efforts in the future.

Conclusion

In closing, I'd like to underscore the importance of viewing our end-use check program within the broader framework of our multifaceted approach to regulating defense trade and the numerous end-use controls that are embedded within the licensing process and many of our other compliance and enforcement activities. Seen within this context, it is not surprising that GAO found no evidence of misuse or diversion of UAV or missile-related technologies authorized for export by the Department of State– a conclusion that speaks volumes about the effectiveness of our export licensing system and end-use check program.

Nevertheless, we are not standing still in the face of the growing threat posed by the increasing efforts of unfriendly nations to acquire cruise missiles, UAVs, and related technology. We are committed to improving all aspects of the licensing process including the Blue Lantern program and our overall compliance effort. The weaknesses of the GAO report notwithstanding, we agree with its basic findings and accept many of its recommendations. In particular, we agree on the need for more Blue Lantern checks and indeed our program plan for this year includes a 25% increase in the number of checks to be conducted. This increase will be done concurrent with our ongoing effort to continually improve the targeting and effectiveness of the end-use checks we conduct. Part of our work plan for increasing the number of checks is to target select industries, technologies or countries for intensive review. As I have said, because the Department shares GAO's observation of the importance of controlling cruise missiles, UAVs, and related technologies, we will include these items as part of this year's effort. In sum, on this issue GAO and the Department of State are both singing from the same sheet of music.

Mr. TURNER. General.

Lieutenant General WALTERS. Mr. Chairman, distinguished members of the committee, thank you for the opportunity to appear before you today to discuss the Department of Defense's controls on items that we sell to our friends and allies.

Mr. Chairman, I have a longer written statement that I have submitted for the record.

The Defense Security Cooperation Agency manages U.S. foreign military sales. Those are government-to-government sales, typically, $12 to $13 billion annual. We do that to achieve very specific goals: to strengthen America's alliances and partnerships, to help our friends and allies defend themselves, to build trust and influence with those friends and allies in peacetime so that we can gain access in times of crisis and then be interoperable when we fight together.

In all of this, there's a dynamic tension, on the one hand providing highly capable U.S. equipment to friends and allies, but at the same time making sure we protect ourselves, our forces around the world, and America. We fully recognize our responsibility to make sure the equipment we transfer only goes to the right hands and is only used for its intended purpose.

We agree with the thrust of the GAO report to make sure foreign end users are complying with the conditions of the transfer. We've got an extensive process in the Pentagon to establish a trustworthiness of the end user before the transfer decision is made. It's focused on two key questions: Does the prospective user have the capability to protect our equipment as we would; and second, does he have the will to do that? There is no more vigorous debate over arms transfers than the one that goes on inside the Department of Defense before the transfer, for one simple reason: If we get it wrong, we're first in line to deal with the consequences.

The GAO has recommended that we beef up postshipment verification after transfer, and we will do that.

Now, the drafters of the 1996 amendment to the Arms Export Control Act chose their words with care when they told us to establish end-use monitoring programs to the extent practicable and to provide reasonable assurance that end users are complying with our requirements to protect the equipment we transfer. Since the GAO investigator spoke with us a year ago, we have published specific guidance designating manned portable air defense system, MANPADS; Javelin attack missiles; advanced medium-range air-to-air missiles, AMRAAM; night vision devices; TOW-B antitank and antibunker land attack missiles; and now cruise missiles and UAVs for increased postshipment verification. We've gotten Secretary of Defense approval for four additional manpower billets for this purpose, and we're in the process of hiring those people now.

We have begun work to create an end-use monitoring data base application on a Web-based system; and we have reached agreement with the Defense Threat Reduction Agency to support our efforts in inspection visits with their manpower.

I'll close by noting that the GAO report did not find any evidence of misuse or diversions of military equipment transferred through the foreign military sales system. That's a good sign that our processes are working now. But I do agree that we can and should do

more to raise the end-use monitoring bar higher to be clear in our own minds that we have that reasonable assurance that those who receive our equipment are protecting and using it properly.

Thank you, Mr. Chairman, and I look forward to the questions.

Mr. TURNER. Thank you, General.

[The prepared statement of Lietenant General Walters follows:]

Written Statement of
Lieutenant General Tome H. Walters, Jr., USAF
Director, Defense Security Cooperation Agency
Before the
COMMITTEE ON GOVERNMENT REFORM
SUBCOMMITTEE ON NATIONAL SECURITY, EMERGING THREATS
AND INTERNATIONAL RELATIONS
9 March 2004

Introduction

Mr. Chairman, ranking member, and members of the committee, thank you for the opportunity to appear before you today to discuss the Department of Defense's controls on items that we export to international friends and allies of the United States. Specifically, the subcommittee has indicated it would like to learn what the Department of Defense is doing to ensure compliance with the conditions on cruise missiles, unmanned aerial vehicles, and related technologies it exports to other countries. As requested, I will relate my remarks to the findings discussed in the recent GAO report, "Nonproliferation: Improvements Needed to Better Control Technology Exports for Cruise Missiles and Unmanned Aerial Vehicles." To adequately address this important issue, I will cover the following points:

- First I need to let you know who the Defense Security Cooperation Agency (DSCA) is. This is the Agency that I lead and understanding

our mission and focus will help make it clear how we fit into the export process for these types of technologies.

- Second, I will describe the processes that we use to mitigate risks in providing materiel and training to our foreign partners and allies. These processes are fairly robust and involve intensive scrutiny before a transfer is made; during the actual transfer process; and after the equipment has been provided to the foreign customer.

- Finally, I will discuss our response to some of the findings in the GAO report and identify some areas where we are trying to improve our monitoring and compliance processes to give even greater confidence that we maintain control over critical technologies.

Defense Security Cooperation Agency (DSCA)

As Director of the Defense Security Cooperation Agency, I have the privilege of overseeing a community of professional military, civil servants, Foreign Service nationals and contractors that efficiently execute our nation's Security Assistance programs worldwide. Our vision is to foster Security Assistance programs that create trust and influence, while promoting access and interoperability vital to United States' national security. These programs strengthen America's alliances and partnerships through: (1) Transfer of defense capabilities; (2) International military education; and (3) Humanitarian Assistance and Mine Action. Security Assistance programs, as authorized in the Foreign Assistance and the Arms

Export Control Acts, allow the Department of Defense to sell or grant (under specific authorities) articles, services and training to foreign friends and allies around the world in furtherance of this mission. While these laws give the Department of State the approval authority over Security Assistance programs, these programs are executed by the Department of Defense---and DSCA is the focal point within DoD.

By far our largest Security Assistance program is the Foreign Military Sales (FMS) program. In the last 5 years, we have sold approximately $13 billion of equipment and services annually using FMS procedures. Equipment provided to our international partners under this program range from basic, simple items such as boots and uniforms, to high-technology, high-capability equipment such as high performance aircraft, missiles, etc.

We fully recognize that our responsibility in implementing and executing these programs is not limited to the provision of materiel and training to our international partners and allies. Our responsibility also includes monitoring these transfers to ensure articles and services we provide are being used (1) by the right customer and (2) in the right way. I have no higher priority than to ensure we protect the U.S. war fighter---in DoD, we are very aware that if our foreign partners decide to use equipment we provide them in an unacceptable manner, particularly to transfer them to others without approval, it is our soldiers, sailors, airmen, and Marines that could suffer.

With that goal in mind, I would like to now describe some of the processes that we have in place to ensure that critical technologies – such as unmanned

aerial vehicles and cruise missiles – are protected and proliferation risks are mitigated. While the GAO report highlighted some issues, its limited focus did not recognize or credit the overall effectiveness of the vetting and monitoring processes in-place within the Department of Defense. There are several pieces to our overall export control program that must all be considered in any evaluation of its effectiveness.

DoD Processes Prior to Any Transfer– Pre-checks and Vetting

First: DoD plays a critical role in shaping arms transfer policies and processes and in assuring the appropriate end-use of U.S.-origin defense article transfers. The most important restrictions placed on these exports, indeed the fundamental elements of the U.S. export control regime, involve establishing the trustworthiness of the end-user and the actual "end-use" ***before*** approval of the defense article's transfer. I would like to highlight that under Security Assistance procedures, the Department of Defense only provides defense articles, services and training to foreign governments and international organizations that have been approved by the Department of State and determined by the President as supporting our national security and foreign policy objectives. This is done via a "Presidential Determination" that certifies that any proposed provision of defense articles, services and training to these partners must be in the U.S. national interest. So my first point is that the foreign customers we provide goods and services to must in fact be "eligible" – as determined by the Department of State and the President.

Second: Each proposed transfer is thoroughly vetted by many different organizations and offices to ensure releasability, disclosure, and other concerns are addressed. The FMS process is officially activated when a written Letter of Request is received from the foreign government. These requests are evaluated to ensure the customer is eligible and then must go through a more detailed analysis regarding the specific equipment being requested. Foreign customers' requests for significant military equipment are coordinated closely with the Combatant Commands and the U.S. country team. The U.S. country team must assess several aspects of the transfer to include political impacts in the region as well as the ability of the host nation and the security assistance organization in-country to properly perform end-use monitoring. If the proposed transfer is for a first introduction of a weapon system or capability into the country or region, a pre-notification is sent to the Department of State, the Joint Staff, and the OSD staff---giving them extra time to review the request and potentially reject it early in the vetting process. The endorsement of the Combatant Commander and consistency with Theater Security Cooperation strategy and implementation plans are critical. During this "pre-sale" process, determinations are made as to whether a country has the will and the capability to secure, account for, and operate these systems within the requirements established by the United States.

Third: For some systems, approval must be obtained from the National Disclosure Policy Committee for release to each specific country. The Committee evaluates release requests which must satisfy set criteria based on political and military objectives, security and technology transfer

requirements. Committee membership includes the Military Departments, the Joint Staff, the Department of State, and various OSD and intelligence Agencies. Disclosure evaluations adhere to strict practices in accordance with DoD Directive 5230.11, "Disclosure of Classified Military Information to Foreign Governments and International Organizations." If the capability requested is not within the release authority of the National Disclosure Policy for that country, the Implementing Agency determines whether or not to sponsor a request for an exception to National Disclosure Policy. If any one Agency votes against the disclosure, there is an appeal process that brings the issue to the Secretary or Deputy Secretary of Defense for a decision.

Fourth: An initiative my Agency has worked to enhance our monitoring program is an intensified review of Missile Technology Control Regime (MTCR)-related items prior to a transfer decision. This has been done in close coordination with the Department of State and was in response to a previous GAO audit which recommended additional reviews for these items. The Department of Defense identifies MTCR-controlled items that purchasers have requested via FMS and reviews them for recommended transfer denial or approval. To help ensure our personnel reviewing these items fully understand their role, my Agency has developed a Missile Technology Control Regime course given at our Defense Institute of Security Assistance Management. The purpose of the course is to familiarize personnel within the security assistance community with the requirements of the MTCR guidelines, including the annex of controlled items, and the role of the MTCR in the management of security assistance

programs. These persons then become reviewers within the Military Departments and OSD---they review all proposed FMS transfers looking for MTCR-controlled items that might need greater control and recommend further OSD and State Department review as required.

Fifth: Formal Congressional Notification is required prior to any offer being made to transfer certain levels of military equipment and technology. These notifications, as you are likely aware, are made regularly by our office and mandate specified periods for Congressional review that must elapse before the offer can be extended to the foreign customer. These notifications clearly identify the customer and the capability being proposed for transfer and provide an opportunity for further discussion or rejection of a proposed transfer.

Sixth: When materiel, services, or training are provided under Foreign Military Sales, there is a government-to-government agreement (known in our terminology as a Letter of Offer and Acceptance or "LOA") between the United States and the foreign government or international organization. Once the decision has been made to allow the offer and any required Congressional Notification period has passed, the LOA may then be finalized and officially offered to the customer. This agreement spells out the type and quantities of items to be sold as well as any unique end-use monitoring requirements that might be necessary based on the complexity or sensitivity of the actual equipment or technologies being provided. These notes or LOA conditions may require the country to secure, account for, and operate the systems in accordance with provisos that normally equal the

requirements of the U.S. Military Departments. The conditions of the LOA may also inform the country that the USG may travel in-country to physically inventory or otherwise monitor the use of specific types of equipment---either as part of routine visits or to verify reports of unauthorized use. The LOA standard terms and conditions, a part of each and every LOA we write and offer, also restrict retransfers of equipment, services or training provided without the prior consent of the U.S. Government. So our foreign customers are well informed on the LOA about what their responsibilities are for using and monitoring the equipment we provide---and by signing the document they agree to these conditions. While we must be sensitive to issues of sovereignty with our foreign friends and allies, they must understand that we always reserve the right to monitor and ensure compliance with the articles and services we provide.

There is no more thorough debate during a sensitive arms transfer than that which takes place within the Pentagon and at State before we come to consensus in support of a transfer. This redundancy in reviews and staffing, combined with the sensitivity to Homeland Security leaves little room for an uninformed transfer approval decision. In view of the serious consequences of the proliferation of dangerous weapons and technologies, we believe by 'front-loading' this array of processes and procedures, we mitigate these risks.

DoD Processes <u>During</u> Transfer– Government-to-Government Agreements

In addition to the up-front requirements just discussed, the Department of Defense also has processes in-place to safeguard equipment during the actual physical transfer. Certain levels of security and handling are required when specific types of items are being transported. When we have a signed agreement with an FMS customer, the LOA document, the mode of shipment for items being sold must be clearly identified within that agreement. For many items, the customer may chose to use a Freight Forwarder---a commercial entity that they hire to help move their materiel from the United States into their country. These Freight Forwarders must be registered and licensed with the Department of State and must meet additional standards if they propose to carry or transport classified materiel.

For classified, sensitive, and arms, ammunition, and explosive items, there are additional requirements. We may, for example, require that specific items be transported using the U.S. Defense Transportation System (DTS). Under this system, the U.S. Government either provides or arranges for transportation of the materiel. This materiel is then transported using the same transportation infrastructure (both organic and commercial) that supports our DoD domestic requirements. Certain defense articles may also require that a U.S. quality assurance team escort the item into the country to conduct a serial number inventory at the time of the physical transfer of the item.

DoD Processes <u>After</u> Transfer – End-Use Monitoring and Compliance

Once an offer has been made to a customer and has been accepted and implemented, we will begin procurement and delivery actions to implement the program. It is at this time that we begin the enforcement portion of the most visible tenant of our export compliance program - the "Golden Sentry" program.

The purpose of the "Golden Sentry" program is to scrutinize the foreign purchaser's use of defense articles and services (to include training) to ensure their use is in compliance with the agreements under which they were provided. As pointed out in the GAO report, the "Golden Sentry" program is relatively new --- we formally implemented the program in 2001 --- and we are still in the process of fully putting procedures in place throughout the Security Assistance community. The program levies monitoring and compliance requirements not only on the host nation, but also on our Security Assistance Organizations in-country as well as our Military Departments. It also provides for compliance visits where "Tiger Teams" will travel to countries to ensure proper end-use and accountability procedures are being used by our foreign partners and Security Assistance personnel.

Although "Golden Sentry" was implemented in 2001, I don't want to create the impression that we did not do end-use monitoring prior to that time. Prior to "Golden Sentry" we did include statements in government-to-government agreements regarding specific monitoring and accountability requirements. We also required annual inventories on certain types of

equipment. But in 2001 we recognized the need to give end-use monitoring greater emphasis and implemented "Golden Sentry" to address that need.

Based on reviews of the threat and capabilities of various weapons systems that we have transferred under the FMS process, my Agency, in coordination with the military Services, has prioritized our "Golden Sentry" efforts. The program consists of "Routine" checks (which I will discuss in a moment) as well as "Enhanced" checks on those systems and technologies which have some of the greatest potential for use by terrorists. Our program relies heavily on the Military Departments to determine which technologies should have the most stringent accountability and monitoring requirements. The Military Departments determine what their "crown jewels" are and we include these systems on our Enhanced EUM list.

Thus far, our priority in the Enhanced EUM program has been to monitor man portable air defense systems (MANPADS such as Stinger Missiles); long range, highly capable man portable land attack missiles (such as JAVELIN); and beyond visual range air-to-air missiles (such as AMRAAM). Some of the other items on our Enhanced EUM list include Night Vision Devices, Communications Security Equipment (COMSEC), and Tube-Launched, Optically-Tracked, Wire-Guided (TOW-2B) missiles. During some of our recent "Tiger Team" visits, we have also reviewed inventories of Harpoon AGM-84 and Hellfire Missiles.

I want to emphasize that missiles provided under Security Assistance programs are vetted before the sale, and monitored after the transfer.

Exports of missiles are scrutinized very closely by DoD. This includes special transportation and handling requirements. The Missile Technology Control Regime (MTCR) controls transfers of missiles that meet certain range and payload thresholds. The Harpoon is well under the range requirements of an MTCR-controlled missile. However, as an additional safeguard, for a Harpoon to have land attack capability it must have cryptographic codes that are further controlled by a special Communication Security (COMSEC) regime.

In addition to our "Enhanced" program, I also want to highlight the more "Routine" aspects of our total monitoring program. Many items we transfer do not have any unique notes and/or conditions associated with the specific transfer. The point I want to make is that, while we are focusing our resources and attention on the "Enhanced" items (those that are advanced and sensitive), we do not ignore the rest of the materiel that we provide to these customers. We encourage our personnel to take every opportunity—during routine trips in-country, during meetings and visits for any purpose, etc.---to observe and report on the use of U.S. Government-provided equipment. Many of the items being transferred to our friends and allies already have periodic maintenance checks and service requirements mandated by the U.S. Military Departments and industry. Throughout the life cycle of these items, U.S. Government employees are afforded access for maintenance, training, etc. This access may take place in the host nations, or, in many cases, the item must be returned to the United States for repair. These checks provide many opportunities for monitoring use (or potential mis-use) of U.S.-provided items.

With the implementation of the "Golden Sentry" program, we are confident that end-use monitoring will be emphasized and accomplished as it needs to be throughout our Security Assistance community. As the GAO report pointed out, we have ". . . an interest in encouraging transfers. . . to U.S. allies to support regional security and bilateral relations" in furtherance of our overall mission. We must balance this need with the equally important requirement to ensure compliance with proper end-use and accountability procedures.

THE WAY AHEAD

I want to discuss where we are heading with our Department of Defense compliance procedures. We agree with the GAO that there is room for improvement and are planning a greater number of End-Use Monitoring verification visits in the future. This process has already begun and in October 2003 we did assess one country's Harpoon missile compliance program. Here are some of the things we are doing in terms of resources, guidance to the community, automation support, internal reviews, and outreach.

Resources: We recognize the importance of end-use monitoring programs and are taking additional steps to ensure we can fulfill this important part of our mission. In 2001 I hired a full time civilian employee to manage the "Golden Sentry" program; and, in 2003 I added a full time contractor to assist him with the program. Additionally, in 2003, I designated EUM as a

major business activity for budget submissions in FY05 and beyond. This will assist in identifying the monetary and personnel resources needed to implement the "Golden Sentry" program throughout the security cooperation community – including the Combatant Commands and the Military Departments. Additionally, the Secretary of Defense approved an FY04 Budget Program Decision for four additional civilian EUM employees at DSCA. We believe these additional resources will allow us to maintain our Golden Sentry program momentum.

EUM Guidance: To strengthen this program and ensure compliance throughout the community, DSCA has published policy memoranda in regards to Golden Sentry. The first memorandum delineated the responsibilities of the security cooperation community in support of the Golden Sentry EUM program. The second policy memorandum strengthened the inventory guidelines for foreign STINGER missile stocks. As a result of world events since September 11, 2001, we initiated reviews with the Military Departments, to ensure the adequacy of the physical security and accountability notes included with our Foreign Military Sales cases for such enhanced equipment as STINGER and JAVELIN missiles, and Night Vision Devices. We are currently coordinating guidance for compliance visits to include weapon system checklists and inventory requirements. We are also amplifying an FMS-Only policy which is intended to shape decisions as to whether we sell defense items via a Direct Commercial Contract or under FMS. The intent is in-part to determine the need for the government-to-government control, accountability, and responsibility gained via the FMS process.

Automation Support for EUM: I have directed that an EUM database application be developed to allow the implementing agencies, Security Assistance Organizations and host nations to input deliveries, receipt, inventories and final disposition of Enhanced EUM items via a web-based automation tool. This application, part of our larger "Security Cooperation Information Portal," will benefit the entire security assistance community and allow "tracking" of all Enhanced EUM items from shipment from the implementing agencies to the customers, receipt, mandatory inventories and final disposal of the Enhanced EUM items. All authorized EUM stakeholders will be able to "read" the Enhanced EUM inputs in a real-time, secure and "compartmentized" environment via the web.

Internal Review: Critical to the future incorporation of EUM into the security assistance organizations' operations, and formalizing EUM performance requirements, are the mandatory Security Assistance Organization internal review programs by the Combatant Commands. A key objective in 2004 will be the inclusion of EUM into the Combatant Commands' formal internal review programs, (e.g., Performance Evaluation Group and/or Inspector General visits).

Outreach: "Golden Sentry" continues its outreach program via attendance at conferences hosted by the Combatant Commands; hosting EUM "worldwide" meetings; partaking in bi-lateral and other stakeholders' meetings in various venues worldwide. This outreach has contributed to a greater understanding of the "Golden Sentry" program, thereby

strengthening awareness of U.S. export controls. Additionally, outreach has proven to be a useful instrument in support of broader U.S. policy goals related to legitimate arms transfer.

Conclusion

The "Golden Sentry" End-Use Program has accomplished a great deal since its inception, but I recognize that there is more left to do. We are confident that the momentum is positive and the end use monitoring direction is clear: to protect key technologies and maintain our qualitative edge over those entities with interests unfriendly to those of our country and allies. Equally important, we want to keep U.S. weapons and technology out of the hands of our enemies – and preventing proliferation is more important than ever when military technologies in the hands of terrorists pose such a major threat to our security.

We agree with GAO on the importance of controlling cruise missiles, UAVs, and related technologies, I am directing that these systems be included on the "Golden Sentry" Enhanced EUM listing of defense articles. We need to assure that our controls are clear and well-defined. To this end, I have directed my staff to join with the Department of State (the executive agency for arms transfers), DoD security experts, Defense Technology Security Administration (DTSA), the Defense Threat Reduction Agency (DTRA), and the Military Departments to review the current physical security and accountability requirements and language for inclusion in future Letters of Offer and Acceptance for the transfer of these systems.

The GAO report did not find any evidence of misuse or diversion of technologies that have been transferred by the Department of Defense. This is a good sign and confirmation that our processes are working. But we agree that we can and should continue to do more in this area to raise the non-proliferation bar even higher.

Mr. TURNER. Mr. Van Diepen.

Mr. VAN DIEPEN. Thank you, Mr. Chairman. I've got no statement, but I will be prepared to answer questions.

Mr. TURNER. Thank you.

Ms. Bronson.

Ms. BRONSON. Good afternoon, Mr. Chairman. Thank you for the opportunity to appear before you today to discuss how the Defense Technology Security Administration [DTSA], formulates its recommendations to the Departments of State and Commerce in the development of export control lists to help prevent the spread of missile technology. I have submitted written testimony, which I ask be included in the record.

The Defense Technology Security Administration is a defense field activity of the Office of the Under Secretary of Defense for Policy. In addition to my position as the Deputy Under Secretary of Defense for Technology, Security Policy and Counterproliferation, I serve as the Director of DTSA. DTSA provides technical assessments of license applications referred from the Department of State and the Department of Commerce. DTSA also works closely with these two organizations in the development of export control regulations and procedures.

During the past 4 years, DOD has undertaken a comprehensive review of the U.S. munitions list. Two of the categories of the USML review are relevant to today's discussion. USML Category IV controls our missiles including cruise missiles. Category VIII, which controls military aircraft, also controls unmanned aerial vehicles or UAVs.

The Category IV review began in June 2002, when the DOD working group for that category first met. Over the next 6 months, a total of seven meetings were held and included technical experts from DTSA, OSD Acquisition, Army, Navy, Air Force, the Missile Defense Agency, and the Institute for Defense Analyses.

This working group closely examined the Category IV controls for cruise missile systems, components, materials, test facilities, manufacturing equipment and tooling, and associated technologies. The working group ultimately determined that the existing Category IV control is appropriate and no new control or definition was proposed for cruise missile systems. However, new control language was proposed for test equipment and facilities for manufacturing equipment and tooling specific to cruise missile development and production. Existing control language on [inaudible] and composite materials for heat shields or nozzles was also revised to better describe the items meriting export control.

DTSA submitted the working group draft language for interagency review in October 2003, and the interagency agreement was obtained in December 2003.

The Category VIII review was conducted in a similar fashion beginning in 2000. My written testimony describes the Category VIII review in detail.

The Defense Technology Security Administration has provided technical advice in support of the development and modification of the Missile Technology Control Regime Technical Annex since 1991. As new threats evolve and technologies mature, our technical exports develop proposals to modify the Technical Annex and

evaluate proposals submitted by other U.S. Government agencies, as well as by our MTCR partners.

After the September 11 terrorist attacks, the threat from the use of crop-dusting aircraft or UAVs for spread of chemical and biological agents was highlighted. In response, DTSA recommended adding a new control in March 2002 at the U.S. Interagency Missile Annex Review Committee. A U.S. white paper, drafted by DTSA, was presented and discussed with our MTCR partners during the biannual MTCR Technical Experts Meeting in April 2002.

Following the April Technical Experts Meeting, DTSA developed a formal USG proposal to control aerosol-dispensing UAVs and presented this proposal at the September 2002, multinational Technical Experts Meeting. New controls on UAVs equipped for aerosol spraying were ultimately adopted into the multinational Technical Annex in April 2003.

Chairman Turner, in your opening statement, you asked whether in today's security environment, payload and range limits continue to make sense. The U.S. proposal to control aerosol-dispensing UAVs adopted by the multilateral MTCR does not have a range limitation. This was a significant shift in thinking for the Missile Technology Control Regime.

The new controls on UAVs equipped for aerosol spraying is just one example of the improvements made to the Missile Technology Control Regime Technical Annex over the past 3 years. Other examples are included in my written testimony.

Besides controlling specific hardware, it is important to control the underlying technology and the know-how that enables production of UAVs and cruise missiles. To identify future technologies that may yield military capabilities beyond that envisioned during the review of the current export controls, DTSA created an interdisciplinary team to identify emerging technologies that are likely to result in fundamental warfighting paradigm shifts. They began their work 6 months ago.

While I must stress that our review is at the most preliminary stages, our initial internal review identified certain enabling technologies related to UAVs for further examination. Specifically, technologies related to miniature sensors, advanced data links, and micro-miniature guidance and navigation components have been identified as key enabling technologies for UAVs. Although these are only initial results, I believe that our ongoing review will underscore the importance of controlling these emerging systems and capabilities.

Mr. Chairman, I trust my comments have addressed the specific question raised by your staff, how does DTSA formulate its recommendations to the Departments of State and Commerce concerning export control lists? I would be happy to answer any questions you may have regarding this subject.

Thank you.

[The prepared statement of Ms. Bronson follows:]

Testimony of
Lisa Bronson
Deputy Under Secretary of Defense for Technology Security Policy and Counterproliferation
and
Director, Defense Technology Security Administration
Before the
House Committee on Government Reform
Subcommittee on National Security, Emerging Threats, and International Relations
on Nonproliferation: Assessing Missile Technology Export Controls

March 9, 2004

Chairman Shays, Congressman Kucinich, Members of the Committee:

Thank you for the opportunity to appear before you today to discuss how the Defense Technology Security Administration (DTSA) formulates recommendations to the Departments of State and Commerce in the development of export control lists to help prevent the spread of missile technology, particularly critical cruise missile and unmanned aerial vehicle (UAV) technology.

The Defense Technology Security Administration is a Defense Field Activity of the Office of the Under Secretary of Defense for Policy. In addition to my position as Deputy Under Secretary of Defense for Technology Security Policy and Counterproliferation, I serve as the Director of DTSA. DTSA acts as the single point of contact for the coordination of Department of Defense support to the Departments of State and Commerce in their export control missions. DTSA provides technical assessments of license applications referred from the Department of State's Directorate of Defense Trade Controls (DDTC) and the Department of Commerce's Bureau of Industry and Security (BIS). Additionally, DTSA works closely with DDTC and BIS to support development of export control regulations and procedures.

The Defense Technology Security Administration also supports the development of DoD policy with respect to missile proliferation. We provide technical advice to our sister organization in the Pentagon, the Office of Negotiations Policy, which has responsibility for the formulation of DoD non-proliferation policy.

DTSA's nearly 200 military and career civilian personnel are actively engaged in the fashioning of the conditions and provisos that address national security concerns posed by export license applications. Last year, DTSA reviewed over 27,000 licenses. In support of DTSA's mission, I have outlined the following objectives for my staff:

- Retain U.S. technological edge while narrowing the gap with our Allies (if possible).
- Increase interoperability with Allies so as to:
    a. Improve military effectiveness, and
    b. Increase the pool of countries that can fight with us.
- Increase the scrutiny of exports that contribute to terrorism and weapons of mass destruction.
- Facilitate defense exploitation of commercial technology.
- Maintain a healthy defense industrial base.

To support this mission, DTSA has a technical directorate comprised of 40 engineers and scientists dedicated to our technology security mission. Nine of these engineers and technical experts have PhD's, 29 others have Master's Degrees, many of whom have multiple Master's Degrees. These individuals represent many decades of technical experience in laboratories, industry, academia, and government. Our experts have numerous publications, patents, certifications and awards to their credit. The Directorate is organized into six technical teams, each specializing in a different family of technologies. The Directorate includes three rocket scientists and five others with direct cruise missile and UAV experience.

United States Munitions List Review

During the past four years, DoD has undertaken a comprehensive review of the United States Munitions List (USML). Each category of the USML has been reviewed by a separate technical working group having specific expertise regarding the items described in that category. Two of these categories are particularly relevant to today's discussion. USML Category IV controls all missiles, including cruise missiles. Category VIII, which controls military aircraft, also controls unmanned air vehicles or UAVs.

Category IV review began in June 2002 when the DoD working group for that category first met. Over the next six months, a total of seven meetings were held. An average of 14 DoD representatives participated in each meeting and included technical experts from DTSA; OSD Acquisition, Technology and Logistics; Army, Navy, and Air Force; the Missile Defense Agency; and the Institute for Defense Analyses. This working group closely examined the Category IV controls for cruise missile systems, components, materials, test facilities, manufacturing equipment and tooling, and associated technologies. Comparison was made with other USML categories and with the CCL to ensure that all items were controlled appropriately while avoiding gaps or overlapping coverage. Controls used in multinational regimes such as the MTCR and the Wassenaar Lists were also examined to ensure USML congruence with international commitments while simultaneously identifying any gaps in the international lists. Current acquisition programs and laboratory efforts were examined to identify any emerging items that would

merit additional control language. Licensing history, particularly commodity jurisdiction determinations, was also studied to determine any precedents that might apply.

The working group ultimately determined that the existing Category IV control is appropriate and no new control or definition was proposed for cruise missile systems. However, new control language was proposed for test equipment and facilities and for manufacturing equipment and tooling specific to cruise missile development and production. Existing control language on ablative and composite materials for heat shields or nozzles was also revised to better describe the items meriting export control. Except for these changes, it was found that MTCR items were already effectively described. Once DTSA concluded its technical review, further study was conducted in 2003 to determine whether more detailed breakdown description of the controlled items was needed. DTSA concluded that no further breakdown was required and submitted the working group draft language for interagency review with the Departments of State and Commerce in October 2003. Interagency agreement for the controls was obtained in December 2003.

The Category VIII review was conducted in similar fashion, beginning in 2000. UAVs are currently controlled under Category VIII, but are simply called "drones." To clarify export control of UAVs, the DOD working group developed language that controls "unmanned aerial vehicles including remotely piloted vehicles, drones, and optionally piloted vehicles specifically designed, developed, configured, adapted, or modified for military purposes." The DOD working group also recommended control of "all other unmanned aerial vehicle systems capable of delivering at least a 500 kg payload to a range of at least 300 km." This latter item would control any UAV defined to be an MTCR Category I system as a munitions item. In addition, the Category VIII working group clarified that launchers, ground support equipment, command and control equipment, test equipment and facilities, and manufacturing equipment and tooling for the UAVs are also subject to munitions controls. The Defense Technology Security Administration provided these DOD recommendations to the Departments of State and Commerce in May 2001. Category VIII language continues to be discussed within the interagency process.

Missile Technology Control Regime

The Defense Technology Security Administration has provided technical advice in support of the development and modification of the MTCR Technical Annex since 1991. As new threats evolve and technologies mature, our technical experts develop proposals to modify the Technical Annex and evaluate proposals submitted by other United States government agencies, such as the Departments of State and Commerce, as well as by our MTCR partners.

After the September 11, 2001 terrorist attacks, the threat from the use of crop dusting aircraft for the spread of chemical and biological agents was highlighted. As a result of this heightened awareness, DTSA reviewed the use of unmanned crop dusters available in the international marketplace and realized this was an emerging market. Given the threat from using these UAVs for the delivery of WMD, we recommended adding this new control in March 2002 at the US interagency Missile Annex Review Committee. A U.S. white paper, drafted by DTSA, was presented and discussed with our MTCR partners during the bi-annual MTCR Technical Experts Meeting (TEM) in April 2002.

Following the April Technical Experts Meeting, DTSA developed a formal USG proposal to control aerosol dispensing UAVs, including crop dusting UAVs, and presented this proposal at the next multi-national Technical Experts Meeting in September 2002. Concurrent with the September Technical Experts Meeting, we held bi-lateral meetings with several of our MTCR partner countries to address MTCR policy issues and to pave the way for acceptance of this new control. In September 2002, the multinational TEM reached consensus on controlling UAVs equipped for aerosol spraying conditional upon MTCR Plenary acceptance of this new control. The MTCR Plenary agreed to a six month silence procedure for approval. Subsequently, in March 2003, one of the partners broke silence and requested modifications to the control language. The United States submitted new control language addressing the partner's concerns during the March 2003 MTCR Point of Contact (POC) meeting and initiated a new 15 day silence procedure for adoption. Silence was not broken and new controls on UAVs equipped for aerosol spraying were adopted into the multinational Technical Annex in April 2003.

There are two aspects of this effort that are of particularly noteworthy. First, the USG proposal to control UAVs equipped for aerosol spraying *without regard to range* was a significant shift in thinking for the MTCR regime. Previously, the MTCR Technical Annex did not control UAVs or cruise missiles with a range less than 300 km. Second, with strong interagency cooperation and support, we were able to gain international acceptance of this proposal *in just slightly over a year* from the time the idea was first discussed in the U.S. interagency to adoption into the MTCR Technical Annex. Both the Departments of State and Commerce cleared short suspense papers and proposals making major modifications to the types of systems controlled by the MTCR. Likewise, State and Commerce leadership during the Plenary and Technical Experts Meetings proved critical in quickly gaining MTCR partner concurrence. This is an example of how the interagency process should work. The unprecedented speed with which this new MTCR control gained USG and international acceptance is a model for future modifications to the MTCR Technical Annex.

The new controls on UAVs equipped for aerosol spraying is just one example of improvements made to the MTCR technical annex over the past three years. Three others warrant brief mention:

- In 2001, we enhanced our controls on small, fuel efficient turbojet and turbofan engines. Previously, the MTCR only controlled engines with a large thrust, allowing the smaller turbojet and turbofan engines to be exported without any missile technology controls. We recognized the limited number of countries in the world capable of producing highly efficient turbojet and turbofan engines and that this was a key chokepoint where enhanced protection and export controls could yield significant payoff. The approved revision resulted in control of lower thrust engines that are of proliferation concern for use in smaller cruise missiles and UAVs.

- We have recognized the growing utility of integrating GPS systems into lower fidelity navigation systems to achieve very precise navigation solutions. As a result, in 2002 we revised the previous GPS controls that were focused on ballistic missiles to ensure capture of GPS systems particularly well suited for supersonic cruise missiles. We also agreed on new controls on integrated navigation systems that incorporate a GPS receiver to update other, less precise navigational instrumentation.

- We have closely monitored the development of new technologies that are usable in missiles. In 2003, when new continuous propellant mixers were developed and became available on the international marketplace, we modified existing MTCR controls to ensure we captured these new designs.

We have also made progress on strengthening the MTCR language to ensure adequate protection of key technologies while ensuring a level playing field between US and foreign industries. For example, previous language controlling telemetry equipment was vague and imprecise. As a result, the US was one of the few partners controlling telemetry ground equipment. In 2003, we worked with our MTCR partners to clarify this language and ensure that all partners are controlling ground based telemetry receivers designed for the development, testing and upgrading of missile systems.

We have also been sensitive to the unique needs of US industry. New technologies and processes have been developed in the commercial world that are not applicable to missiles and UAVs but were inadvertently captured by existing MTCR controls. We have removed controls on nitrogen trifluoride, used in the semi-conductor industry, when it was captured by a generic control of liquid oxidizers for missiles. This reduced a significant licensing burden on US industry and helped ensure we remain competitive in the global market.

Commerce Control List

Revisions of the Commerce Control List typically follow multilateral acceptance of changes to the MTCR Technical Annex. The Department of Commerce prepares proposed modifications to the CCL to incorporate MTCR Technical Annex changes into the Export Administration Regulations (EAR). Prior to publishing these CCL changes in the Federal Register, DTSA engineers review each proposed modification to ensure it captures the agreed MTCR Technical Annex changes. After our technical review, we recommend any necessary changes and must concur with the final text prior to its incorporation into the EAR.

Future Technologies Evaluation

Besides controlling specific hardware, it is important to control the underlying technology and know-how that enables production of UAVs and cruise missiles. To identify future technologies that may yield military capabilities beyond that envisioned during review of the current export controls, DTSA created an interdisciplinary team to identify emerging technologies that are likely to result in fundamental warfighting paradigm shifts. They began their work six months ago. The members of this team represent many decades of personal involvement in technology development and technology export control. The team also conducts literature searches; visits government and industry laboratories and other organizations with technology development expertise or responsibilities; and participates in technical reviews and conferences to identify technologies for further review.

While I must stress that our review is at the most preliminary stages, our initial internal review identified certain enabling technologies related to UAVs for further examination. Specifically, technologies related to miniature sensors, advanced data links, and micro-miniature guidance and navigation components have been identified as key enabling technologies for UAVs. Besides unmanned air vehicles, the team believes these same technologies will also enhance other unmanned vehicles such as ground and underwater systems. The team is currently examining hypersonic propulsion technology and carbon laminate phase change materials as potentially enabling technologies that could result in hypersonic cruise missile development. Although these are only initial results, I believe that our ongoing review will underscore the importance of controlling these emerging systems and capabilities.

As we refine this examination of emerging technologies, as we widen the scope of our review, and as we discuss further with our DoD colleagues, we will make additional recommendations in the coming years regarding appropriate changes to our technology export control lists, international agreements, and processes.

Conclusion

Mr. Chairman, I trust that my comments have addressed the specific question raised by your staff: how does DTSA formulate its recommendations to the Departments of State and Commerce concerning export control lists.

I would be happy to answer any questions you may have regarding this subject.

Mr. TURNER. Thank you.

We will begin our questions with Mr. Tierney.

Mr. TIERNEY. Thank you, Mr. Chairman. I thank the witnesses for their testimony today.

Let me just start with a rather general question. The recommendations in the GAO report indicate that a gap in dual-use export control regulations could enable individuals in most countries in the world to legally obtain, without any U.S. Government review, U.S. dual-use items not on the Commerce control list to help make a cruise missile or UAV.

Mr. Borman, do you accept that statement as accurate or do you have some issue with that?

Mr. BORMAN. No. We are working, actually, to draft the regulatory change to address that, but I would note that the example that I think gave rise to that recommendation, this individual in New Zealand who had a Web site who claimed that he could make a cruise missile based entirely on uncontrolled parts and components. As I said, our engineers, who have a lot of experience in both commercial and military applications, are very skeptical that someone could truly build, in effect, a cruise missile solely through that method. But, nonetheless, we are looking to revise our regulations to close out that potential loophole.

Mr. TIERNEY. When do you think that revision will be done?

Mr. BORMAN. I would say within the next 6 weeks.

Mr. TIERNEY. Mr. Maggi.

Mr. MAGGI. Yes, sir.

Mr. TIERNEY. Do you accept that statement as accurate or do you have contrary feelings and opinions about that?

Mr. MAGGI. I'm fine with Mr. Borman's position.

Mr. TIERNEY. Now, the other statement here that concerns me is that because the departments have conducted so few PSV visits to monitor compliance with the U.S. Government export conditions on transfers of cruise missiles, UAVs and related dual-use technology, the extent of the compliance problem is unknown.

If I could just ask each of you, do you think that we have our hands around what the extent of the problem is, or do you think that there are large potentials out there for types of violations that we may not be aware of because there have been so few PSVs?

Mr. BORMAN. I guess I can start from the Commerce perspective; and the first point I'd make is that certainly I've seen no information that leads me to believe that U.S.-origin items, at least dual-use items, are being diverted for cruise missile or UAV proliferation. So that's a starting point.

Having said that, we are certainly again willing to go back——

Mr. TIERNEY. Can I interrupt? I hope you don't mind. Just that, is it that you have seen no information because we just haven't done the inquiry or we haven't made the visits or——

Mr. BORMAN. No. Well, there is information that is made available to us on a regular basis from the Intelligence Community that relates to these issues. So the actual checks are one part of the way we view compliance, but obviously there is other information that comes in to us that also helps us evaluate that. I can't say too much more in open session, but we don't rely solely on the end-use

checks to determine whether particular licenses are being complied with.

Mr. TIERNEY. With respect to the other means that you use to monitor the situations, how much after the delivery is made do they continue? Do they continue ad infinitum or do they stop for a period of time, so after that we would have a concern?

Mr. BORMAN. Well, let me put it another way.

Information comes to us on a regular basis not necessarily on specific transactions, but on actions of foreign parties that come to the attention of others in the U.S. Government.

Mr. TIERNEY. So——

Mr. BORMAN. But let me then come back to also the GAO point.

I think one of the things that GAO could have explored further in their report is that, as Mr. Maggi mentioned, in reviewing a license application, there's a whole range of things we look at. And so, for example, if the transaction is going to a foreign party that we have previously done an end-use check on, even though it otherwise meets the criteria for a check, we usually don't go ahead and do that again because we have a high degree of confidence that end user, particularly if it's a U.S. subsidiary, for example, will comply with the license conditions.

In some cases, we get government-to-government assurances. And in some cases, there is technology transferred, and the technology transfer is obviously much more difficult to do an end-use check on. It's much easier to check on a thing than it is on technology.

And so up front in the licensing process is where we really put a lot of emphasis in determining, is the foreign party reliable and likely to comply with the license conditions? So while we take GAO's point that we certainly should look at doing more of these, we take some issue with their view that so few of them are done we have no idea whether compliance is there or not.

Mr. TIERNEY. Thank you.

Mr. TURNER. Thank you.

One of the issues that was discussed was concerned the Missile Technology Control Regime and its restrictions. It seems as if a lot of the testimony we received indicated that there needed to be an effort to strengthen or curb proliferation through increasing the restrictions or at least the cooperation among the regime.

Could each of you talk a little bit more about that issue, giving us some information from your perspective on the operation—the agreement among the regime and also ways in which you can see that it could be strengthened.

Mr. VAN DIEPEN. If I might start, Mr. Chairman, first of all, the critical function of the MTCR is to try and put in place coordinated export controls over the most threatening pieces of equipment and technology from a missile proliferation standpoint, and the regime members have put together the so-called "annex," which is the list of specific equipment and technologies that all of them have agreed to control according to the regime's guidelines. The fundamental purpose is to make sure that these transfers get adequate scrutiny and that they are looked at to make sure that they don't inadvertently contribute to proliferation.

So most items are subject simply to a case-by-case check against agreed nonproliferation factors, the end result being to try and make sure that they don't contribute to the delivery of weapons of mass destruction or to the activities of international terrorists, a new aspect of MTCR controls that's been added within the past 2 years.

Certain systems and certain technologies are subject to what's called a "strong presumption of denial," meaning that they are so sensitive that normally they will not be exported except on so-called rare occasions that are especially well justified in terms of the guidelines. And certain cruise missiles have been controlled by the MTCR from its advent in 1987.

Additional cruise missiles and UAVs were added to control in 1993; and as Ms. Bronson noted in her testimony, still further UAVs were added to control within the last 2 years. In addition, this past year we got agreement that so-called "catch-all controls" that control items, including missiles not on the MTCR Annex when they are destined for WMD delivery, have now been made an MTCR-wide requirement. So what started as a U.S. unilateral control is now a multilateralized MTCR control.

In addition, the MTCR technical experts continue to look for areas, including in the UAV area and the CBW delivery area which is related, where we continue to improve the controls. We're looking at things like, are there additional propulsion systems, additional guidance systems that should be added to MTCR control?

And then, finally, there's a great deal of intelligence and information exchange including on cutting-edge threats such as cruise missiles and UAVs, including on the progress of missile programs of proliferation concern, including in the UAV area to help sensitize all the members to the threat to the methods that proliferators use to try and get equipment and technology. Thank you.

Mr. TURNER. Ms. Bronson, Mr. Gormley testified that the United States had unsuccessfully attempted to introduce a measure of control over additional technology when it introduced an antiterrorism proposal to the Wassenaar Agreement in early 2003. He stated, "expressing concern about the possible terrorist use of kit airplanes or other manned civil aircraft" as a poor man's UAV, the U.S. proposal sought export control reviews and international notifications for all equipment systems and specifically designed components that would enable these planes to be converted into UAVs." he goes on to recommend that the executive branch authority should redirect their efforts toward accomplishing this and redefining their proposal. Do you have any comments on his testimony?

Ms. BRONSON. He raises an area where we don't have controls, and the way in which we go ahead and work our process in the U.S. Government is to attend to get multilateral before we go ahead and add something to the CCL.

From our perspective, adding the conversion kits for civil aircraft to the CCL is a desirable thing to do. The specifics on how we would go about modifying our proposal in the Wassenaar Arrangement are still under study, but it continues to be an area of concern, and we will take into account what we have heard today as we refine that process.

Mr. TURNER. Do you think it might be accomplished soon or are we pretty far away from a resolution of that?

Ms. BRONSON. It is very difficult to predict how soon one can get multinational agreement on a proposal in the Wassenaar Arrangement, so I wouldn't even attempt to predict whether or not that agreement could be achieved in a short period of time.

Lieutenant General WALTERS. Mr. Chairman, if I could add one more point to that question and answer, it's my understanding that the components for these so-called "conversion systems" are already under control, principally MTCR-controlled items, and I think the issue we're talking about here is sort of an additional explicit control that controls them as conversion kits themselves in addition to the individual components that go into a conversion kit.

Mr. TURNER. Thank you.

Mr. Maggi, you testified that end-user control and end-user verification, postshipment verification, is a process that you did agree with in the testimony that you had heard. It was something that needed to be enhanced, increased, and was desirable. Would each of you comment about your various agencies and what you're doing to increase what we might expect after this hearing in accomplishing both increased end-use verification and postshipment verification.

Mr. MAGGI. Yes, sir. Whether there had been a hearing or not, we had already been headed for about a 20 to 25 percent increase in the postshipment verification checks. We've already discussed that it is just one part of the full range of all of the activities we do to make sure that we understand how items are being used after they are transferred.

Earlier, I believe it was mentioned that there was a thought about a cradle-to-grave requirement to be watching what was going on. That's a very good point; and part of how that happens in many areas is because our active duty folks from the Department of Defense are actually out there engaged with the folks that are using some of this equipment. So our goal from the direct licensing perspective is, in fact, looking to go from about 400 to about 500 postverification checks this year with actually a desire to go higher than that in the not too distant future.

You had asked earlier, sir, about the requirement for more resources. From our perspective, I think we're in pretty good shape for what we have, but the folks that are actually doing our end-use postmonitoring checks or postshipment verifications are the country team people out at the embassies. So this will make them work a little harder.

Mr. TURNER. Mr. Borman.

Mr. BORMAN. Again, we are in the process of reviewing both our protocol and—for doing end-use checks particularly on these types of items; and our records so far—and as I mentioned, it is important to take into account the other factors that come into play in doing the postshipment verifications, the up-front work—who the parties are, what the transactions that have been previously checked are to the same end users.

Mr. TURNER. Does anyone else want to comment on that?

General, one of the points that our chairman had made is, regardless of what efforts the United States may undertake in con-

trols or efforts to limit proliferation, this technology is technology that is going to at some point become dated and of age where it would be widely available and less subject to just our control or the control of those countries who are party with us currently to agreements.

We heard in testimony from the previous panel about our efforts for our air defenses, the limitations of the Patriot missile, and anticipation that our efforts alone might not be successful in stopping the proliferation of these types of missiles or UAVs.

What are some of the things that you would recommend that we look at in increasing—or anticipating a need to increase our air defenses in this area.

Lieutenant General WALTERS. That's a very large question and I don't presume to be the expert in that area. I was at Asian Aerospace 2 weeks ago, at the Singapore air show. The first day, they had a UAV conference that was attended by many countries and hundreds of people. The numbers that we walked away with, GAO said, 32 countries, 250 UAVs. By our quick math, I think at that conference we calculated it to be 39 countries and 425 UAV systems. So UAVs right now are at about the Orville and Wilbur stage. Every mom-and-pop bicycle shop operated out there is basically trying to figure out how to put together a small engine and a set of wings and go fly those things. So horses are out of the corral when it comes to UAVs.

Now, building one and operationalizing it is an entirely different matter and something meaningful, particularly something that's a threat to the U.S. homeland.

The air defenses, to get back to your question specifically about the air defenses, trying to build—a previous witness testified to a single integrated air picture. We have spent a lot of long time doing that in this country, focused originally at a Soviet threat. I'm not sure that some of that system hasn't degraded since the fall of the Berlin Wall.

The importance of having an integrated air picture that's capable of seeing very small cross-section vehicles is important to the United States. It's important for the homeland. It's equally or more important for forward deployed forces in theaters. So that's a body of work that the Pentagon is very hard at work on. The combined air component commander has that as a very high, high priority to do that. To give you a more expert opinion on the whole thrust of air defenses, I would have to turn to other experts in the Pentagon and ask them to give you more specific details.

Mr. TURNER [presiding]. Thank you, General.

Mr. Ruppersberger.

Mr. RUPPERSBERGER. Yes. Mr. Maggi, I interpreted from your testimony that you felt that the GAO focused too heavily on the compliance process. Could you walk through the compliance process and tell how it works and also what you would do to change it?

Mr. MAGGI. I certainly am of the opinion that the report focused on the postshipment verification part of the compliance process too much. The entire activity that we do with regard to licensing from my perspective is in fact compliance. Making sure that in the first step the individual, the entity trying to export is registered with

the Department of State, that's the first step toward compliance. Do we know who they are, do we know where they are, do we know the people that run the company, do we know their background?

The second thing is, have they provided us—with regard to compliance, have they given us all the data that we need to know: What is it, where it's going to go, and why is it going there?

The third part of this is as we're checking into the actual application, we have a watch list that we run names against. There's about 50,000 entities in that watch list, and that's the very first thing that happens before we go any further into the application process.

Once we get through those parts of making sure that the application is compliant with law and regulation, we then look into the actual substance of what is it that they're trying to transfer, and through about a third of our cases we send them out to our colleagues in the Department of Defense and other places inside the State Department to get their views and recommendations on how that works.

Let me back up. You were asking me about the blue lantern process and the postshipment verification. Well, as we go through the beginning and the front end of the checks on this and we look to see are there any extraordinary things that are going on, our teams are put together with regard to the commodities that they manage, so they're generally pretty familiar with who the people are that are in the industry. They also try to be pretty familiar with who are the shippers, because those are people that we're very concerned about: Who are the people that are actually moving these defense goods or services? So if a flag comes up or if this is an unknown entity, then we're very mindful of who those people are.

The GAO folks did a great job in looking at the 786 cases, and made a good point about they're a very small number at the State Department that were actually looked at, but in conjunction to those, there had been in that same timeframe almost 100 checks that had been done against the same parties that were in those cases that came under scrutiny.

Mr. RUPPERSBERGER. Well, why wasn't that stated? So you're saying it's not 33 but it's 100 now?

Mr. MAGGI. No. What I'm saying is the words in the GAO report were absolutely correct. Of the 786 cases that they looked at, we did 3 special blue lantern, end-use monitoring, post-verification checks. But in conjunction with those, of the entities that were associated with those cases, there had already been another actually 97 checks done on the same parties in those cases in a timeframe—in that same timeframe. So we had—Mr. Borman was saying, we had already looked at some number of those folks in those cases having to do with another license for another commodity or another product going to the same end user.

Mr. RUPPERSBERGER. OK.

Mr. MAGGI. So you asked me what would I be doing. No. 1, compliance is life. Trust, yet verify. So we really believe in this stuff. We're automating. We're coming up with a new system called T-REX in which we'll be able to keep track of all of the compliance activities that are going on. It's going to be connected with our

main licensing system called D-Trade which came online this year in full operation, and we're also interoperable with the AES, the Automated Export System that you can get from the Customs folks at Homeland Security. By seeing what goes out every day through this automated process, we think we will greatly improve our efficiencies and our knowledge of what we're doing.

The next thing we'd do is continue to add more folks.

Mr. RUPPERSBERGER. OK. Thank you.

General Walters, in your testimony page 11, you state that you rely on military departments to determine your priorities. How does that work with the State Department and the Intelligence Community?

Lieutenant General WALTERS. We rely on the military departments to determine what's really—what are their crown jewels, what's important to them; what, if it was coming back in the other direction, would really bother them. We go through a very complex release process. First, we only sell to our friends. Kind of an important point to make to begin with. We look very hard at their capability and their track record and their will. And it's important to note that the service that's making the determination to sell something to a country is—let's take antiship cruise missiles and let's take harpoon missiles that the United States makes and sells. U.S. Navy are the people that are deciding whether or not to sell the harpoon to another country, and they've got a track record with the countries. They're talking to the intelligence services. The intelligence agencies get a vote.

If it's a higher-end process system and we go through an exceptions to national disclosure policy review, joint staff gets a vote. The U.S. Navy gets a vote. The intelligence agencies get a vote. State Department gets a vote. So all the players get a vote, and the most important player is, in the case of the harpoon missile, the U.S. Navy, which is the organization that's most concerned with what's going to happen if it comes back at me. And I can look you in the eye and tell you with absolute certainty that the U.S. Navy, in dealing with the cruise missiles, that it has worked with—and those are the majority of the ones that we're talking about here—is absolutely certain that it's maintained an edge and is not threatened by what it sold.

Mr. RUPPERSBERGER. OK. Now, bearing in mind this is an unclassified session, does the Intelligence Community provide a satisfactory assessment of the cruise missile and UAV threat to support export control decisions?

Lieutenant General WALTERS. To my mind they do. For our purposes and to my mind, particularly when we're talking about a military threat back to us, I believe that they do. In terms of pieces and parts and technology transfer, I'll defer to the other witnesses.

Mr. RUPPERSBERGER. Well, Mr. Maggi, could you respond to that? Does the Intelligence Community provide a satisfactory assessment of the cruise missile and UAV threat to support export control decisions?

Mr. MAGGI. Yes, sir.

Mr. RUPPERSBERGER. Could you elaborate?

Mr. MAGGI. Well, you may have noticed I was smiling, because you can never have too much intelligence, and understanding what all the——

Mr. RUPPERSBERGER. Are you talking about personal intelligence or—no, I'm kidding.

Mr. MAGGI. Well, that was my staff. Having that intelligence and understanding what it means is often very difficult, and knowing how to use it, particularly in the compliance area, is very complicated for us, because it then gets complicated with regard do what we know, what we can share with others, how we can go to other governments. We spoke earlier about how we induce others to do the right thing, and frequently we aren't able to share that data.

Yes, we get the data we need.

Mr. RUPPERSBERGER. One of the reasons I ask the question, because there's an ongoing debate within the Intelligence Community of the volume that we're getting in intelligence that because of security clearances and issues like that, there's a lot of information that probably should be maybe unclassified, it needs to go to different agencies that is not in order for you to do your job.

Mr. MAGGI. Well, I think we get plenty of support at the classified level. Of course, I don't know what I don't know, but I think we get a pretty steady stream of data. My larger concern is not being able to share it with other governments, to be able to point out to them the shortcomings of people in their countries.

Mr. RUPPERSBERGER. OK. Thank you.

Mr. TURNER. Mr. Chairman.

Mr. SHAYS. Thank you. I thank the gentlemen and the lady for being with us.

I would like to first know from each of you the point you agreed with the most in the first panel and the point you disagreed the most. And by the way, I appreciate you all being here for the first panel. That's helpful to us.

Mr. MAGGI. May I start, sir?

Mr. SHAYS. Yes.

Mr. MAGGI. The thing I agree with the most is that there's a threat out there, and we really need to pay attention to it. The thing I disagree with the most is that we're contributing to it.

Mr. SHAYS. "We" being?

Mr. MAGGI. We, my organization, is contributing to that threat, the licensing process.

Mr. SHAYS. Well, weren't they basically saying you're contributing, but you can take steps to do a better job? You don't disagree you can do a better job?

Mr. MAGGI. Sir, we can definitely do a better job, but I don't think we're contributing to the threat that we heard presented by the first panel.

Mr. SHAYS. Mr. Borman.

Mr. BORMAN. I have a similar reaction, and that is I think——

Mr. SHAYS. Is your mic on?

Mr. BORMAN. The GAO report perhaps gives the impression that there are U.S. origin items, either dual use or munitions, going into this proliferation threat, and I just don't think there's any evidence for that. But certainly we agree that there are steps that we can

take, both on the regulatory side and on the compliance side, to look to improve both our performance in both of those areas.

Mr. SHAYS. General.

Lieutenant General WALTERS. GAO does us a great service when they say they're—when they highlight the threat for both UAVs and cruise missiles. That's unarguable. And to the extent that they say you can do better—a better job in postshipment verification, yeah, we can. And so we'll work on that. But let me put that in context——

Mr. SHAYS. That's really not in dispute, is it?

Lieutenant General WALTERS. No. Let me put it in context. I'm only focused on government-to-government foreign military sales. Well, we haven't sold any UAVs through the foreign military sale system, No. 1, for us, so I don't have anything to go count in the UAVs that we participated with.

In the cruise missiles, GAO says 500 cruise missiles. Our best records show between 1998 and 2002, 317, of which 207 have been delivered. The countries that they've been delivered to are the United Kingdom, Canada, Denmark and Taiwan. I've got high trust and confidence in those countries and in our allies.

The countries that we've sold but not delivered to include Imam and South Korea and the United Arab Emirates. So there's nothing for me to go count at this point.

What the report doesn't say is that we sold over 3,000 earlier-model cruise missiles, primarily harpoon—simple model—simpler-model harpoons from many years ago. We did our first tiger team—we've done three tiger teams. We've done one to Egypt, and I was quite pleased with what happened. Mr. Leon Yates here, who was our end-use monitor when he went there, asked to go take a look at their harpoon missiles that we had sold. They're not part of this—the GAO's report. And the Egyptians were quite forthcoming, and they were quite happy that we were there to visit. They took him to their central storage facility. He went through all of their records. They willingly, happily, led him into the facility, and he was so impressed at the point, that he didn't feel the need to count serial number by serial number every single weapon that was in there, you know.

So on the basis of a sample of one, with one country having gone out there, I've got pretty reasonable assurance that at least for that customer, that things are not seriously off track.

We'll do more counting. There's a problem with accounting, and that is national sovereignty. Some of the—we have a right, and we make it very clear that we have a right to go in and count. We ask them to verify to us, and so they do when we sell some of these cruise missiles, for example, and other systems. But we tell them very clearly that we reserve the right to come in. But even so, if I go down to Australia or the U.K. or some of our friends, they say, come on guys; you know we're fighting side by side with you, is this really necessary?

So there are some sensitivities out there, and we're going to have to bruise a few sensitivities and step on a few toes as we increase our sample size.

UAVs and cruise missiles aren't the biggest problem that I have, and I don't think that what we, the United States, are selling in the UAV and cruise missiles are the problem. It's all those others.

Mr. SHAYS. The others?

Lieutenant General WALTERS. It's all the others. It's China and North Korea, and everybody else who is building other—both missiles and UAVs. So, yes, we can focus on ours, but it's kind of like we're looking through a soda straw at a small piece of the problem, and there's this carrier looming over my shoulder. And that's everybody else that's selling things out there, in my view.

The biggest challenge I have in postshipment verification isn't the UAV and the cruise missile. It's actually my colleague, Ms. Bronson, who from the Defense Technology Security Agency, has asked me to go count all night vision devices. Now, that is a much bigger problem.

Mr. SHAYS. I was a little confused when you said your biggest challenge was Ms. Bronson. Maybe we're onto something here.

Lieutenant General WALTERS. She's asking me to go count night vision devices. Now, that's a problem on an order of magnitude harder.

Mr. SHAYS. Mr. Van Diepen, do you have any point that you would strongly disagree or agree with that you wanted to highlight from the previous panel?

Mr. VAN DIEPEN. I would strongly agree with the first panel's emphasis on the novel and future aspects of the UAV and cruise missile threat, the possibility of combined ballistic missile and cruise missile attacks, the risk of nonstate actors acquiring.

In terms of disagreement, I think there may be an overemphasis on export control as a way of dealing with this problem, particularly the nonstate actor problem, where, frankly, someone within the United States without exporting anything or importing anything could acquire the wherewithal to put together the kinds of rudimentary UAVs the panel was talking about here and use them to attack us here at home. And so export controls is only one of a whole series of tools that one has to use to try to impede the proliferation threat.

Mr. SHAYS. Thank you. Makes you wonder, though, if we need to be keeping a better track on what's happening here, I mean, from the point you make.

Ms. Bronson.

Ms. BRONSON. I would agree with two things in particular that I heard. First, I wholeheartedly agree we need to look to the enabling technologies as we think about what are the newer controls of the future.

Second, I agree we need to do more postshipment verifications and end-user checks. I think that there's a bit of an overstatement of the effectiveness of the Iraqi cruise missile, and I want to look a little more closely at the data that informed that judgment.

I'd also point out that the cruise missiles that are most capable are very, very difficult to build, and we have to be careful not to lump the ability to build the UAVs and the ability to lump effective cruise missiles together in the same category.

Mr. SHAYS. Thank you.

The first panel, as I heard them, said on the short-run cruise missile, their biggest concern. In the long run it's UAVs. And I think they said in the long run it's the UAVs for nongovernment organizations, terrorist organizations. Would you disagree with that basic position?

How do we measure the success if people are able to get this stuff outside even the agreements we have?

Mr. MAGGI. I think, sir, the people that you're looking at in front of you, at least myself, we're fighting a holding action. Over time, technology is going to change. Over time, technologies will proceed in a way, and our goal is to maximize it being in the hands of our friends and allies and minimize it being in the hands of the enemies. And it's a job we work on every day, and over time it's just going to all change.

Mr. SHAYS. You have this kind of—giving me this impression it's kind of like the finger in the dike. Is it that bad?

Mr. MAGGI. Well, it's not a finger in the dike. There's a whole load of people working on this; but over time, technology—earlier today you mentioned is this a 1938 Ford or a 2004 Ford. Well, colloquially, if I get hit by either one of them and get run over, I'm in trouble. So——

Mr. SHAYS. I hear you. I said I would ask a question—Mr. Burton's question, but it was really—I just want the record to note he asked what is being done to limit the proliferation of cruise. And you were asked, given that we have the multilateral agreements and we have the export controls and what else, and I think that question was pretty much answered. So I just want the record to show that it was answered.

Is there anything that any of you would like to put on the record before we adjourn this hearing?

Mr. TURNER. If not, thank you, Mr. Chairman. We'll be adjourned.

[Whereupon, at 4:19 p.m., the subcommittee was adjourned.]

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