Order Code RS21252

Cruise Missile Proliferation

Updated July 28, 2005

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Summary

About 75 countries currently possess cruise missiles.[1] Many experts predict that anti — ship and land attack cruise missile proliferation will increase in terms of both scope and technological sophistication. This report will be updated as events warrant.

Introduction

There are reportedly about 130 different types of cruise missiles in the world today and approximately 75 different countries are believed to have cruise missiles — with the majority of these countries having only short range anti-ship cruise missiles (ASCM).[2] In testimony to to the Senate Armed Services Committee on March 17, 2005, the Director of the Defense Intelligence Agency (DIA), Vice Admiral Lowell E. Jacoby stated:

> The numbers and capabilities of cruise missiles will increase, fueled by maturation of land-attack and Ant-Ship Cruise Missile (ASCM) programs in Europe, Russia, and China, sales of competing systems, and the spread of advanced-dual use technologies and materials. Countering today's ASCMs is a challenging problem and the difficulty in countering these systems will increase with the introduction of more advanced guidance and propulsion technologies. Several ASCMs will have a secondary land-attack role.[3]

Land attack cruise missiles (LACMs), which can be launched against ground targets from the air, surface naval vessels, submarines, and from the ground, are of particular concern. According to the U.S. National Air and Space Intelligence Center:

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[1] Cruise missiles differ from ballistic missiles in that they are powered throughout their entire flight and fly a relatively flat, as opposed to ballistic, course to the target.

[2] 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, Nov. 2003, p. 156.

[3] Testimony of Vice Admiral Lowell E. Jacoby, Director of U.S. Navy Defense Intelligence Agency, in U.S. Congress, Senate Armed Services Committee, *Current and Projected National Security Threats to the United States*, Mar. 17, 2005.

> Proliferation of land attack cruise missiles will expand in the next decade. At least nine countries will be involved in producing these weapons. The majority of new LACMs will be very accurate, conventionally armed, and available for export. The high accuracy of many LACMs will allow them to inflict serious damage on important targets, even when the missiles are armed only with conventional warheads. U.S. defense systems could be severely stressed by low-flying stealthy cruise missiles that can simultaneously attack a target from several directions.[4]

There are believed to be about 70,000 ASCMs in the inventories of about 70 countries.[5] The largest class of these exported ASCMs are the U.S. Harpoon (entered service in 1981), the French Exocet (1977), the Russian SS-N-2 Styx (1959) and the Chinese HY-1 Silkworm (1959). About 12 industrialized countries currently produce LACMs, and this number is expected to increase by the end of the decade.

Currently, only the United States and Russia have air and submarine launched nuclear cruise missiles, although China is reportedly developing a new cruise missile with nuclear potential.[6] Some believe that nuclear cruise missiles are probably outside the technical range of most countries as most Third World nuclear designs would probably be too large and too heavy for cruise missile use.[7] Cruise missiles have the potential to be effective delivery systems for selected chemical and biological agents because they could accurately deliver these payloads at sub-sonic speeds, insuring greater survivability of the agent. Some have expressed concern that non-state or terrorist groups could obtain cruise missiles and use them to conduct WMD attacks against either the United States or its interests abroad. While terrorist use of a cruise missile may eventually become a plausible scenario, successfully employing cruise missiles requires an in-depth technical knowledge of the missile itself and mission planning,[8] which many experts consider a fairly difficult task for non-state groups.

Cruise Missile Attributes

Cruise missiles have a number of attributes that make them attractive to militaries around the world — some of which include:

Proven and Effective. Air and sea-launched ASCMs are credited with the destruction of the Israeli destroyer *Eilat* by Egypt in 1967, the *HMS Sheffield* and the

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[4] *Ballistic and Cruise Missile Threat (Unclassified)*, National Air and Space Intelligence Center (NASIC), Aug. 2003, p. 25.

[5] Information in this paragraph is from Thomas G. Mahnken, *The Cruise Missile Challenge Overview*, Center For Strategic and Budgetary Assessments, Nov. 9, 2004.

[6] *Ballistic and Cruise Missile Threat*, National Air & Space Intelligence Center, Feb. 2003, p. 22.

[7] *Cruise Missiles: Potential Delivery Systems for Weapons of Mass Destruction*, U.S. Government Publication, Apr. 2000, p. 32.

[8] Mission planning for cruise missiles involves planning a route using detailed terrain information typically gained from high-resolution satellite imagery. In addition, specific target data is needed for the terminal phase of the missile's flight and route and target data must then be uploaded to the missile's flight computer.

transport ship *Atlantic Conveyor* by Argentina in 1982, and the damaging of the *USS Stark* by Iraq in 1987.[9] Land attack cruise missiles (LACMs) have featured prominently in a variety of U.S. contingency operations in the past decade. During the 2003 Iraq War, the United States used almost 800 cruise missiles.[10] Of these 800 or so missiles, only 7 of them reportedly failed to reach their targets.[11] U.S. vulnerability to cruise missile attack was highlighted during the 2003 Iraq War. During the conflict, U.S. and Kuwaiti Patriot theater missile defense batteries intercepted and destroyed all nine Iraqi ballistic missiles launched against the Coalition but failed to detect or intercept the five HY-2/CSSC-3 Seersucker cruise missiles launched against Kuwait.[12] All the more troubling was the fact that HY-2/CSSC-3 missiles — developed in the 1970s — are considered large and slow compared to modern cruise missiles. This demonstrated vulnerability could further the attractiveness of cruise missiles to countries looking for a means to strike U.S. targets.

Affordable and Easily Acquired or Built. Relative to combat aircraft and ballistic missiles, cruise missiles are affordable to most nations. As one senior U.S. official suggested, " 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."[13] In addition to the cost of acquisition, cruise missiles require less maintenance, training, and logistical support than either manned combat aircraft or ballistic missiles, which translates into lower operating costs.[14] Given these attributes, cruise missiles are often referred to as "The Poor Man's Air Force."

According to one senior DOD official, "if you want to see how easy it is to acquire a cruise missile, just visit any international air show and see how aggressively they are marketed."[15] One market analysis predicted that 6,000 to 7,000 LACMs could be sold by 2015 — excluding U.S., Russian, and Chinese sales.[16] To avoid Missile Technology Control Regime (MTCR)[17] restrictions, many countries either produce cruise missiles which just fall under the regime's parameters or modify missiles proscribed by the MTCR

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[9] Thomas G. Mahnken, *The Cruise Missile Challenge*, Center For Strategic and Budgetary Assessments, Mar. 2005, p. 13.

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

[11] Ibid.

[12] Thomas G. Mahnken, p. 1.

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

[14] Jeffrey A. Larsen and Kerry M. Kartchner, *Emerging Missile Challenges and Improving Active Defenses*, United States Air Force Counterproliferation Center, Aug. 2004, pp. 9-10.

[15] Dickey, p. 156.

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

[17] The MTCR, begun in 1987, created a common set of export control guidelines that each member country administers independently. See CRS Report RL31848, *Missile Technology Control regime (MTCR) and International Code of Conduct Against Ballistic Missile Proliferation (ICOC): Background and Issues for Congress.*

to produce a "less capable" variant [18] 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 ASCMs into longer- ranged LACMs.

One such ASCM, 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.[19] 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) to provide sufficient accuracy for land attack operations. At least 20 countries including Angola, Cuba, Ethiopia, India, Libya, North Korea, Somalia, Syria, and Yemen are believed to have the Styx. India, North Korea, and possibly Egypt produce the missile.

Accurate and Ability to Penetrate Defenses. Many analysts believe that the cruise missile's most significant attribute is its accuracy. Unclassified estimates of cruise missile accuracy are between 10 and 100 meters[20] (33 feet and 328 feet, respectively) but some experts suggest that accuracies of almost 1 meter or less are possible. Cruise missiles are difficult to defend against because of their physical characteristics and their ability to fly unpredictable courses at low altitudes. The cruise missile's relatively small size results in low visual, infrared (IR) and radar signatures which makes the missile difficult for air defense radars to detect, identify, track, and engage.[21] This situation is further complicated if the cruise missile employs low observable (stealth) technologies that reduce or minimize signatures.

Proliferation

The proliferation of both ASCMs and LACMs continues to be a significant U.S. and international security concern. According to one report, naval surface combatant programs in several countries (i.e. Denmark, Finland, France, Germany, Italy, the Netherlands, Norway, Singapore, South Korea, Spain, Sweden, and the United Kingdom) have provisions for a new generation of ASCMs, including some with the dual capability of striking land targets.[22] Most of these newer missiles (e.g. many upgraded versions of older missiles such as the Exocet and the Harpoon) incorporate new navigation and target acquisition technologies, enabling the missiles to fly complex trajectories in littoral, confined waters and still detect and track their intended targets.

India has conducted at least nine test firings of its PJ-10 supersonic "Brahmos" ASCM (which it co-developed with Russia) since 2001 and has recently started serial

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[18] Robert Wall, p. 57.

[19] Information in this section is taken from "Cruise Missiles: Potential Delivery Systems for Weapons of Mass Destruction," p. 47.

[20] *Key Cruise Missile Technologies in Detail,* Center for Defense and International Security Studies (CDISS), 1996, p. 1.

[21] Rex R. Kiziah, p. 3.

[22] Information in this section is taken from Joris Janssen Lok, "Modern Navy Missiles March On," *Jane's International Defense Review,* Apr. 2005, pp. 47-48.

production.[23] Because of its supersonic speed, some suggest that the Brahmos will be almost impossible to defend against. It can also be easily modified for land-attack use. It is reported that Russia and India plan to market the Brahmos to supposedly "friendly" countries in order to cover developmental and production costs. Russia (an MTCR member) pledges to keep the missile's range below the MTCR's 300 km range threshold. China and Iran are also co-developing new short and long-range ASCMs.[24]

Developments in LACMs also continue to be a source of concern. In April 2005, a Taiwanese intelligence source reported that China would soon begin to deploy a new, subsonic LACM.[25] This missile is "expected to approximate the performance and tactical flexibility of the U.S. RGM/UGM-109 Tomahawk and will eventually be fielded in ground, submarine, ship and air-launched versions."[26] This missile, known as the "Hong Niao" or HN-class LACM, comes in three versions with the HN-2 version having a 1,800 km range from ground or ships and a 1,400 km range when fired from a submarine.[27] It is believed that this LACM can carry both nuclear and conventional payloads.[28] According to Taiwanese press reports, China is expected to deploy some 200 additional LACMs (including the new HN series) within striking distance of Taiwan by the end of 2006.[29] Taiwan is also said to be developing a LACM with a 900 km range — capable of striking targets in China.[30]

Russia has reportedly deployed its first conventional air launched cruise missile.[31] The Kh-555 is a derivative of its Kh -55SM nuclear cruise missile and reportedly has a range of between 3,000 and 3,500 km, an accuracy of between 5 to 10 meters, and a 400 kg conventional warhead capacity. These missiles, designed to be carried on Russian long-range strategic bomber aircraft, are described by the Russian press as a weapon for use in "local conflicts and counter-terrorist operations." A number of unarmed Kh-55SM cruise missiles — left in the Ukraine after the withdrawal of Russian forces — were reportedly illicitly transferred to Iran and China.[32] According to Ukranian government officials, 12 missiles were supplied to Iran and six missiles to China in 2001. Some Western analysts believe that more missiles could have been supplied than the 18

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[23] Information on the Brahmos is taken from Scott Jones, "Focus on Cruise Threat: Proliferation Grows, Defense Unavailable," *DefenseNews.com,* April 11, 2005.

[24] "Chinese Missile Technology Transfers to Iran," Jane's Intelligence Review, May 2005.

[25] Richard Fisher Jr., *China's New Strategic Cruise Missiles: From the Land, Sea, and Air*, International Strategy and Assessment Center, June 3, 2005.

[26] Ibid.

[27] Jane's Strategic Weapons Systems, Issue 42, Jan. 2005, p. 69.

[28] Ibid., p. 70.

[29] "1,000 Chinese Missiles Near Taiwan by 2006," *Taepi Times,* Apr. 24, 2005.

[30] Fisher.

[31] Information on the Kh-555 is from Robert Hewson, "Russian Conventional Cruise Missile Enters Service," *Jane's Defense Weekly,* Dec. 15, 2004.

[32] Information in this paragraph is taken from Robert Hewson, "Ukranian Cruise Missile Transfer Under Scrutiny," *Jane's Defense Weekly,* Mar. 30, 2005 and Bill Gertz, "Missiles Sold to China and Iran," *Washington Times,* Apr. 6, 2005.

acknowledged by the Ukranian government and that North Korea might have also received missiles. Some are concerned that these Kh-55SMs could be modified into precision guided Kh-555s and could ultimately be fired from smaller aircraft (i.e. SU-24s), thereby increasing its utility to nations that do not have large, long- range bomber aircraft.

Reports indicate that other nations continue to advance their LACM programs. France has recently announced that it is considering developing a new cruise missile based on the Scalp-EG design and Sweden plans to test a new land attack version of its RBS-15 in 2007.[33] Italy also plans to test its MBDA Storm Shadow in South Africa sometime in 2005 to fully demonstrate the missile's capabilities.[34]

Cruise Missile Defense[35]

DOD's cruise missile defense programs to protect deployed forces are under a number of offices and organizations, which some analysts feel makes it difficult to develop an effective strategy as well as associated technologies and weapons. Perhaps in response to repeated calls by Congress for DOD to develop affordable and operationally efficient cruise missile defense programs, DOD's June 2005 Strategy for Homeland Defense and Civil Support commits DOD to "devote significant attention to defending U.S. territory against cruise missile attacks."[36] The Senate version of the National Defense Authorization Act for Fiscal Year 2006 (S.Rept. 109-69 to S. 1042), calls for the Secretary of Defense to establish an executive agent within DOD to "manage the acquisition of capabilities necessary to defend the homeland against cruise missiles, unmanned aerial vehicles, and other low altitude threats."[37] The House version (H.Rept. 109-89 to H.R. 1815), does not contain similar provisions.

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[33] Scott Jones, "Focus on Cruise Threat," *DefenseNews.com*, Apr. 11, 2005.

[34] Tim Ripley, "Italy to Test Storm Shadow in South Africa," Jane's Defence Weekly, Jan. 26, 2005, p. 15.

[35] For additional information see CRS Report RS21921, *Cruise Missile Defense.*

[36] *Strategy for Homeland Defense and Civil Support*, Department of Defense, June 2005, p. 25.

[37] See Sec. 902 of S.Rept. 109-69 to S. 1042, National Defense Authorization Act for Fiscal Year 2006, May 17, 2005.