

## Navy Programs

In FY2003, the Navy requested funding for research on a new type of reentry vehicle that could significantly improve the accuracy of the Trident II (D-5) missiles. This program, known as the Enhanced Effectiveness (E2) Initiative, included an initial funding request of \$30 million, a three-year study, and a full-scale flight test in early 2007.<sup>21</sup> Congress rejected the initial funding request in FY2003 and FY2004, but Lockheed Martin Corporation, the contractor pursuing the study, has continued with a low level of research into this system.

The E2 reentry vehicle would integrate the existing inertial measurement unit (IMU) guidance system (the system currently used to guide long-range ballistic missiles) with global positioning system (GPS) technologies so that the reentry vehicle could receive guidance updates during its flight.<sup>22</sup> A standard MK4 reentry vehicle, which is the reentry vehicle deployed on many Trident SLBMs, would be modified with steering system, allowing it to maneuver when approaching its target to improve its accuracy and increase its angle of penetration. This steering system, which the Navy has referred to as a "backpack extension," would increase the size of the reentry vehicle, making it comparable in size to the MK5 reentry vehicle that is also deployed on Trident missiles. The E2 warhead could possibly provide Trident missiles with the accuracy to strike within 10 meters of their intended, stationary, targets. This accuracy would not only improve the lethality of the nuclear warheads but it would also permit the missiles to destroy some types of targets with conventional warheads.<sup>23</sup>

Lockheed Martin, has flown two reentry vehicles in test flights of Trident missiles.<sup>24</sup> In a test conducted in 2002, it demonstrated that the new reentry vehicle could steer towards a target and strike with improved accuracy. In a test conducted in early 2005, a modified version of its reentry vehicle demonstrated that it could not only steer towards a target with improved accuracy, but also slow down and "control the impact conditions," capabilities that would be needed for the delivery of some types of conventional warheads to their targets. Lockheed estimates that, if the

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<sup>21</sup> Norris, Robert S. and Hans M. Kristensen. "U.S. Nuclear Forces 2005," *Bulletin of the Atomic Scientists*. January/February 2005. pp. 73-75.

<sup>22</sup> According to the Defense Science Board Task Force on Future Strategic Strike Forces, the IMU would guide the missile in its early phases, but the reentry body would receive a GPS update during its exoatmospheric flight; it would then use the IMU and control flaps to steer the warhead with GPS-like accuracy during atmospheric reentry. See U.S. Department of Defense. *Report of the Defense Science Board Task Force on Future Strategic Strike Forces*. February 2004. pp. 5-7.

<sup>23</sup> Grossman, Elaine M. "Pentagon Eyes Bunker-Busting Conventional Ballistic Missile for Subs," *Inside the Pentagon*, June 27, 2002. p. 1. See also, Robert S. Norris and Hans M. Kristensen. "U.S. Nuclear Forces 2005," *Bulletin of the Atomic Scientists*, January/February 2005, pp. 73-75.

<sup>24</sup> Krivich, David. Director, SMP Advanced Programs and Business Development. Lockheed Martin Space Systems Company. *Update on Precision Conventional Ballistic Missile Global Strike Capabilities*. Briefing to the Defense Science Board Task Force on Nuclear Capabilities. July 22, 2005.

program received funding from Congress beginning in FY2006, its reentry vehicle could enter production in FY2010 and achieve an initial operational capability in 2011. The Navy, however, did not seek funding for this program in FY2004, 2005, or 2006.

The Navy has included funding for a conventional warhead for Trident in its budget request for FY2007. Press reports indicate that the request includes a total of \$500 million over 5 years, with \$125 million for FY2007, \$225 million for FY2008, \$120 million for FY2009 and \$30 million for FY2010.<sup>25</sup> The same report indicates that the Navy may seek to reprogram \$100 million in the FY2006 budget to get and “early start” on the effort to equip Trident missiles with conventional warheads. Although the Navy has not spoken publicly about its plans for these warheads, the press reports indicate that the Navy could deploy each of its 12 Trident submarines on patrol (2 would be in overhaul at any given time) with 2 missiles equipped to carry 4 conventional warheads each. The remaining 22 missiles on each submarine would continue to carry nuclear warheads, and the submarines would continue to patrol in areas that would allow them to reach targets specified in the nuclear war plan. In addition, only four submarines would be within range of their targets, with two in the Pacific Ocean and two in the Atlantic ocean. Consequently, only eight conventional missiles would be available for use at any time, and only one or two of the submarines are likely to be within range of the targets specified for attack with conventional ballistic missiles.<sup>26</sup>

These warheads would provide the Navy with the ability to contribute to the prompt global strike mission in the near term, a goal that was identified in the 2006 QDR. The report indicated that the Navy would seek to deploy an “initial capability to deliver precision-guided conventional warheads using long-range Trident” missiles within two years,<sup>27</sup> although many expect it to take four years to field the full complement of 96 warheads.

## Air Force Programs

The Air Force is pursuing two initiatives related to the deployment of conventional warheads on long-range ballistic missiles. The first of these is known as FALCON (Force Application and Launch From Conus [Continental United States]), a joint Air Force/DARPA demonstration that is developing, among other things, both near-term and far-term capabilities for the prompt global strike missions.<sup>28</sup> The second is an Air Force Analysis of Alternatives (AOA) study that is to review technologies and programs that could meet the requirements of the prompt global strike mission.

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<sup>25</sup> Grossman, Elaine. Pentagon Wants Early Start on Conventional Missiles for Subs. InsideDefense.Com, January 20, 2006.

<sup>26</sup> Ibid.

<sup>27</sup> U.S. Department of Defense. Quadrennial Defense Review Report. February 6, 2006 p. 50.

<sup>28</sup> DARPA, “FALCON (Force Application and Launch from CONUS) Technology Demonstration Program,” Fact Sheet. November 2003.