Shielded from Oversight

The Disastrous US Approach to Strategic Missile Defense

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Appendix 3: The Long Range Discrimination Radar

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Introduction

In March 2014, at its FY 2015 budget release press conference, the Missile Defense Agency (MDA) announced that it was starting a program to design and deploy a new Long Range Discrimination Radar (LRDR) for the Ground-based Midcourse (GMD) missile defense system.[1] The deployment of the LRDR was required by the FY 2014 Defense Authorization Bill of December 2013, which stated that: "The Director of the Missile Defense Agency shall deploy a long-range discriminating radar against long-range ballistic missile threats from the Democratic People's Republic of Korea. Such radar shall be located at a location optimized to support the defense of the homeland of the United States."[2]

The announcement was also consistent with repeated MDA statements that improving the capability of the GMD system to discriminate warheads from decoys was one of its top priorities. For example, in July 2013 when MDA Director Vice Admiral Syring was asked in a congressional hearing where he would spend his "next dollars" to best improve the GMD system, he stated that "I would spend our next dollar on discriminating sensors, meaning radars, big radars west and east, to give us the capability of where I see the threat going in the next five to ten years."[3]

The MDA's FY 2015 budget request included $79.5 million in FY 2015 for a new Long Range Discrimination Radar to be deployed by 2020.[4] Press reports at the time put the total cost of the new radar at about $1 billion.[5] As of 2015, the MDA planned to spend a total of $935 million on the LRDR through 2020, including $285 million for its construction.[6] In May 2015, the MDA announced the radar will be built at Clear Air Force Station in central Alaska.[7] Clear Air Force Station also hosts a PAVE PAWS early warning radar that is to be upgraded and integrated into the GMD system by 2017. In October 2015, the Lockheed Martin Company was awarded a nine-year, $784 million contract to develop, build and test the LRDR, with operational testing to begin in 2020.[8]

According to the MDA Director Vice Admiral James Syring at a Senate Appropriations Committee hearing, "The new long-range midcourse-tracking radar will

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[1] Syring, J. 2014a. Briefing on the Missile Defense Agency's FY 2015 budget in the Pentagon briefing room. News Transcript. Washington, DC: Department of Defense. March 4. Online at: ***http://archive.defense.gov/Transcripts/Transcript.aspx?TranscriptID=5388***. Note: All URLs in footnotes to this appendix were accessed May 16, 2016.

[2] U.S. Congress. 2013. National Defense Authorization Act for fiscal year 2014. Legislative text and joint explanatory statement to accompany H.R. 3304. Public Law 113-66, Section 235. December, 45. Online at ***www.gpo.gov/fdsys/pkg/CPRT-113HPRT86280/pdf/CPRT-113HPRT86280.pdf***.

[3] Syring, J. 2013. Testimony before the Defense Subcommittee of the Senate Appropriations Committee. July 17. Online at: ***https://www.gpo.gov/fdsys/pkg/CHRG-113shrg39104550/pdf/CHRG-113shrg39104550.pdf***

[4] Syring 2014a.

[5] Shalal-Esa, A. 2014. Pentagon to boost missile defense spending by over $4 billion: Sources. ***Reuters***, February 7. Online at ***www.reuters.com/article/2014/02/07/us-usa-military-missile-idUSBREA1605T20140207***.

[6] Missile Defense Agency (MDA). 2015. ***Research, development, test & evaluation, defense wide***. Defense wide justification book volume 2a of 2 of ***Fiscal Year (FY) 2016 president's budget submission***. Washington, DC: Department of Defense. February. Online at ***http://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2016/budget_justification/pdfs/03_RDT_and_E/MDA_RDTE_MasterJustificationBook_Missile_Defense_Agency_PB_2016_1.pdf*** , 2a-xxiii to 2a-xxiv.

[7] Department of Defense. 2015. Department of Defense identifies planned site of future Long Range Discrimination Radar (LRDR). Press release NR-193-15. May 22. Online at ***www.defense.gov/News/News-Releases/Article/605521***.

[8] Lockheed Martin Company. 2015. Lockheed Martin awarded $784 million contract to build ballistic defense radar. Press release. October 26. Online at ***www.lockheedmartin.com/us/news/press-releases/2015/october/151023-mst-lockheed-martin-awarded-784-million-contract-to-build-ballistic-missile-defense-radar.html***.

provide persistent coverage and improve discrimination capabilities against threats to the homeland from the Pacific theater." [9] In response to a question at the hearing, he added: "The importance of the radar is that it provides us that needed discrimination capability against the threat from North Korea. As they continue to progress and add decoys and countermeasures, and I'll stop there in terms of classification—we must have a discrimination capability of a radar to counter that to keep our shot doctrine manageable and to defeat raid sizes of more than one."[10]

The deployment of the LRDR in Alaska could also allow the MDA to change the status of the Sea-Based X-band (SBX) radar (see Appendix 2: The Sea Based X-band Radar (SBX)). In 2012, the SBX, the only discrimination radar in the current GMD system, was placed in a limited test and operations status, from which it could be recalled to active duty as needed. According to Vice Admiral Syring: "This new radar will also give more geographic flexibility to deploy the Sea-Based X-band (SBX) radar for contingency and test use."[11] In particular, after deployment of the LRDR, the SBX radar could be given a permanent operational status either on the East Coast or possibly in Hawaii. According to Vice Admiral Syring at a March 2015 Congressional hearing: "That is the importance, ma'am, of what we are doing with the continued request of the long-range radar in Alaska, some thinking about additional sensor capability in Hawaii. And I think, in that priority order, when those are complete, you will see us offer the option to the Northern Command commander to move SBX to the East Coast."[12]

Long Range Discrimination Radar Characteristics

Other than its probable location, cost, and operating band, relatively little information about the LRDR is publicly available.

The MDA's initial March 2014 LRDR Request for Information to industry stated that it was not specifying the operating frequency band for the radar but rather was "looking for recommendations with rationale" based on tradeoffs necessary for the radar to perform its "precision tracking, discrimination and hit assessment" missions.[13] It also raised the possibility that the radar could have a limited field-of-view phased-array antenna instead of a full field-of-view antenna, and that in addition to its electronic-scanning capability, its antenna could be mechanically steered in azimuth or elevation or both. This would be necessary if a limited field-of-view design was chosen (see Appendix 2: The Sea-Based X-band Radar (SBX)). It also stated that the MDA was interested in "software/hardware reuse and economy-of-scale benefits from existing programs leveraging the current and near-term production base."[14]

An August 2014 update to the LRDR Request for Information provided additional insight into the MDA's plans for the radar.[15] It asked bidders for the LRDR to provide price estimates for three different LRDR configurations. Significantly, all three of these configurations would have the radar operating in the S-band of radar frequencies (2–4 GHz). One radar configuration would have a single antenna face. Another configuration would have two antenna faces. A third configuration would also have two antenna faces, but only one face would be populated with the modules that transmit and receive the radar energy. The second, inactive face could subsequently be populated with modules if such an upgrade was later determined to be needed. A subsequent Request for Information update

[9] Syring, J. 2014b. Testimony before the Defense Subcommittee of the Senate Appropriations Committee. June 11. Online at ***https://www.gpo.gov/fdsys/pkg/CHRG-113shrg59104623/pdf/CHRG-113shrg59104623.pdf***

[10] Syring 2014b.

[11] Syring 2014b.

[12] Syring, J. 2015. Testimony before the Strategic Forces Subcommittee of the Senate Armed Services Committee. U.S. Senate. March 25. Online at ***www.armed-services.senate.gov/imo/media/doc/15-35%20-%203-25-15.pdf***.

[13] Missile Defense Agency (MDA). 2014. Missile Defense Agency Long Range Discrimination Radar request for information. SN HQ0147-14-R-0002. Redstone Arsenal, AL. March 14. Online at ***www.fbo.gov/?s=opportunity&mode=form&id=42f1a95465dac067ca3ee0a665adf7f7&tab=core&_cview=1.***

[14] Ibid.

[15] Missile Defense Agency (MDA). 2014. Long Range Discrimination Radar (LRDR) Draft Request for Proposal (DRFP). Fort Belvoir, Va: Department of Defense. August 8. Online at ***www.fbo.gov/utils/view?id=e99a8df060014911595a2960425c84d8***

stated that "Both radar faces will be designed to accommodate the same antenna hardware necessary to achieve the same future growth sensitivity."[16] A conceptual drawing released by Lockheed Martin when it announced it had won the LRDR contract shows a radar with two fixed-orientation faces.[17]

At a 2015 press conference, Vice Admiral Syring confirmed that the LRDR would operate in S-band.[18] Lockheed Martin subsequently stated that the LRDR will be an S-band radar using solid state gallium nitride (GaN) technology.[19] There has been no official public discussion as to why S-band (2–4 GHz) was chosen over the higher frequency X-band (8–12 GHz), which is used by the TPY-2 radar and the GMD's current discrimination radar, the SBX. However, in 2016 congressional testimony, Admiral Syring stated that the LRDR will use the same technology as the Navy's Air and Missile Defense Radar (AMDR).[20] The S-band active antenna used in the AMDR is designed to be readily scaled to larger or smaller sizes.

Since a radar's range resolution — the length scale on which it can attempt to resolve separate features on a target— is roughly inversely proportional to bandwidth and bandwidth is roughly proportional to frequency, it would be expected that an X-band radar (about 9–10 GHz) would have a range resolution roughly three times better than an S-band radar (2–4 GHz). (Frequencies much higher than X-band are precluded by atmospheric effects). Thus while an X-band radar might achieve a range resolution of 15–25 cm, an S-band radar might achieve only 50–100 cm, depending on the precise frequency within the S-band.

[16] Missile Defense Agency (MDA). 2015. LRDR DRFP: HQ0147-14-R-0002. Industry questions and answers Round 10. January 7. Online at ***www.fbo.gov/utils/view?id=ef14a4007c2cd1dbb611df166f32b226***.

[17] Gruss, M. 2015. Lockheed Martin lands missile defense radar contract. ***Space News***, October 22. Online at ***http://spacenews.com/lockheed-martin-lands-missile-defense-radar-contract/***.

[18] Syring, J. 2015. Briefing on the fiscal year 2016 Missile Defense Agency budget in the Pentagon briefing room. News Transcript. Washington, DC: Department of Defense. February 2. Online at ***http://archive.defense.gov/Transcripts/Transcript.aspx?TranscriptID=5584***.

[19] Lockheed Martin Company 2015.

[20] Syring, J. 2016. Testimony before the Strategic Forces Subcommittee of the House Armed Services Committee. April 14. Online at ***http://docs.house.gov/meetings/AS/AS29/20160414/104621/HHRG-114-AS29-Wstate-SyringJ-20160414.pdf***