



RADAR TECHNOLOGY ASSESSMENT  
BASED ON  
FY96 POM RDT&E DESCRIPTIVE SUMMARY



The following BMDO radar development activities are described in the PMA 1102 CDS and are organized by contract for discussion purposes. Additionally, the attached chart provides a graphical depiction of where technology developments applicable to NMD, (1) through (4) and (7), would be functionally inserted into the GBR.

1. Radar Component Technology (RCT).

The contractor, Phase IV, delivered and demonstrated **high density power converters** in FY93 to provide power conditioning for solid state arrays.

Additionally, Phase IV is scheduled to deliver a brassboard model of the **Advanced Waveform Generator (AWG)** in 3Q/FY94. The AWG will be capable of generating extremely complex, large time-bandwidth product waveforms to permit continued radar operation in severe ECM/clutter environments. Miniaturization and more extensive testing will follow by mid-FY95, predicated upon adequate FY95 funding.

Due to funding restrictions, other developments planned for FY94 have been deferred to FY95 or later. These include additional **power supply** development for T/R modules, and continuation of the **Radar Computer-Aided Design (RADCAD)** activity, both to be performed by Phase IV's subcontractor, Westinghouse (WEC).

<u>FY95</u>	<u>FY96</u>	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>	<u>FY00</u>	<u>FY01</u>
2.0	1.5	0.0	0.0	0.0	0.0	0.0

Assessment: 1. The wideband waveform generation capability will be needed by TMD to address electronic counter-measures and OPINE considerations. NMD needs are similar, but could be deferred until NMD-GBR becomes an acquisition program, maximizing the potential for leveraging from TMD efforts.

2. The power supply and RADCAD efforts are not essential to NMD.

2. Acousto-Optic (A-O) Correlators.

The two signal processing activities described below are intended to provide some of the enhanced processing capability needed to support the use of advanced wideband waveform modulation provided by the Advanced Waveform Generator (AWG) to achieve increased electronic counter-measures immunity and reduced OPINE susceptibility.

The **Extended A-(O) Engineering Development Model Signal Processor (EAOEDMSP)** is being developed by Dynetics as an upgrade to the SDC-developed A-O EDM Correlator. This effort will provide a breadboard demonstration by the 4Q/FY94 of this improved high speed optical correlator. Development goal is to achieve improved stability and output repeatability while doubling the bandwidth capability.

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The **Range-Doppler A-O Signal Processor (RDA(OSP))** contractor, Essex Corp, will develop very high speed post-processing techniques for range-doppler images of targets to enhance target ID and classification with wideband arbitrary waveforms.

	<u>FY95</u>	<u>FY96</u>	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>	<u>FY00</u>	<u>FY01</u>
A-O Signal Processing	0.75	0.95	0.0	0.0	0.0	0.0	0.0

Assessment: This wideband waveform processing capability will be needed by TMD to use the capabilities of the Advanced Waveform Generator to address electronic counter-measures and OPINE considerations. NMD needs are similar, but could be deferred until NMD-GBR becomes an acquisition program, maximizing the potential for leveraging from TMD efforts.

### 3. Radar Waveform Processing Demo / Data Acquisition System (DAS)

The **Radar Waveform Processing Demo** contract to Dynetics, with TRW as their subcontractor, will provide a wideband waveform processing testbed to demonstrate digital and analog (acousto-optic) processing of wideband waveforms generated by the advanced waveform generator. Hardware components to support this testbed, other than the A/D converters described below, are being developed in the developments described above. The full-up demonstration is scheduled for 2Q/FY97.

The DAS portion of this effort will provide **high speed analog-to-digital converters** (a few billion samples/second) to permit real time A/D conversion of arbitrary wideband waveform returns for digital signal processing for improved electronic counter-measures immunity, track handling capability, and discrimination capability.

	<u>FY95</u>	<u>FY96</u>	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>	<u>FY00</u>	<u>FY01</u>
	2.0	1.5	0.6	0.0	0.0	0.0	0.0

Assessment: The wideband waveform processing capability to be demonstrated under this contract will be needed by TMD to use the capabilities of the Advanced Waveform Generator to address electronic counter-measures and OPINE considerations. (The demo date may need harmonization with the TMD-GBR development schedule.) NMD needs are similar, but could be deferred until NMD-GBR becomes an acquisition program, maximizing the potential for leveraging from TMD efforts.

### 4. Fiber-Optic Controlled Phased Array Technology (FOCPAT)

The contractor, Martin Marietta, will develop and test a high-speed, low loss fiber-optic link (to replace the current coaxial cable link) from the beam steering control/data processor to the antenna elements. This development provides improved EMP/ RFI/ EMI immunity while significantly reducing system weight and volume. Delivery/demo is scheduled for late FY95.

	<u>FY95</u>	<u>FY96</u>	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>	<u>FY00</u>	<u>FY01</u>
	2.0	1.0	0.0	0.0	0.0	0.0	0.0

Assessment: This activity primarily supports TMD to meet the C-130 transportability requirement, and is not essential to NMD.

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## 5. Advanced Radar Component Technology (ARCT).

ARCT is an FY94 new start, which is an outgrowth of the RCT program, intended to continue investigations into radar component technologies specifically for CORPS SAM, ERINT/PATRIOT, and Boost Phase Intercept (BPI). RFP release is imminent with award projected for 4Q/FY94 (originally projected for 2Q/FY94). Other than indicating that the unfinished activities in the RCT program (power supply development and RADCAD) would take priority, a more definitive description of ARCT development activities was not provided but should be available to government personnel in the form of the preliminary RFP S.O.W.

<u>FY95</u>	<u>FY96</u>	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>	<u>FY00</u>	<u>FY01</u>
1.5	2.0	3.5	3.0	3.0	3.0	3.0

ARCT Assessment: Activities directly support TMD and BPI needs: no identified application to NMD.

## 6. Advanced Active Apertures.

This FY94 new start is a continuation of solid state transmit/receive module development activities focusing on developing **accelerometer-equipped T/R modules** and **advanced beam-forming algorithms** as the basis for providing a **conformal array** for airborne testbed evaluation in the FY97-99 time frame. This airborne capability could be applied to TMD counter-fire / Boost Phase Intercept missions. Award was projected for 3Q/FY94, but may be slipping based on delays experienced with the ARCT award.

<u>FY95</u>	<u>FY96</u>	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>	<u>FY00</u>	<u>FY01</u>
1.7	2.0	3.5	3.0	2.8	2.8	2.8

Assessment: This activity supports TMD/BPI needs and has no known NMD application.

## 7. Real Time Waveform Processor (RTWP).

This contract with Ratheon was terminated in FY93, apparently for unsatisfactory technical progress. Development goal was to fabricate a very high speed radar receiver pulse compressor based on Residual Number System (RNS) signal processing architecture which would provide the high speed processing capability to support use of arbitrary wideband waveform modulation for jammer mitigation.

<u>FY95</u>	<u>FY96</u>	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>	<u>FY00</u>	<u>FY01</u>
0.0	0.0	0.0	0.0	0.0	0.0	0.0

Assessment: Contract terminated. Digital processing needs for TMD wideband waveform processing will need to be met by alternative means. NMD needs are similar, but could be deferred, maximizing the potential for leveraging from TMD efforts.

**RADAR TECHNOLOGY (1102) SUMMARY**  
**FY96 POM RDT&E DESCRIPTIVE SUMMARY**  
(\$ Millions)

	<b>FY95</b>	<b>FY96</b>	<b>FY97</b>	<b>FY98</b>	<b>FY99</b>	<b>FY00</b>	<b>FY01</b>	<b>Remarks</b>
1. Radar Component Technology - Adv Waveform Generator - Power supplies - RADCAD	2.0	1.5	0.0	0.0	0.0	0.0	0.0	NMD can defer and leverage TMD (AWG) efforts. (Power supply and RADCAD not essential to NMD)
2. Acousto-Optic Correlators	0.75	0.95	0.0	0.0	0.0	0.0	0.0	NMD can defer and leverage TMD efforts.
3. Radar Waveform Processing Demo - Data Acquisition System	2.0	1.5	0.6	0.0	0.0	0.0	0.0	NMD can defer and leverage TMD efforts.
4. Fiber Optic Controlled Phased Array Technology	2.0	1.0	0.0	0.0	0.0	0.0	0.0	TMD requirement. Not essential to NMD.
5. Adv Radar Component Tech (FY94 New Start)	1.5	2.0	3.5	3.0	3.0	3.0	3.0	Supports CORPS SAM, PATRIOT / ERINT & Boost Phase Intercept
6. Advanced Active Apertures (FY94 New Start)	1.7	2.0	3.5	3.0	2.8	2.8	2.8	TMD/BPI application.
7. Real Time Waveform Processor (RTWP)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Program terminated FY93.



# TECHNOLOGY PROGRAMS FOR TMD/NMD (GBR) INSERTIONS (PMA A1102) (U)

