

# Flexible Manufacturing Environment for Millimeter Wave Transceivers

## PROBLEM / OBJECTIVE

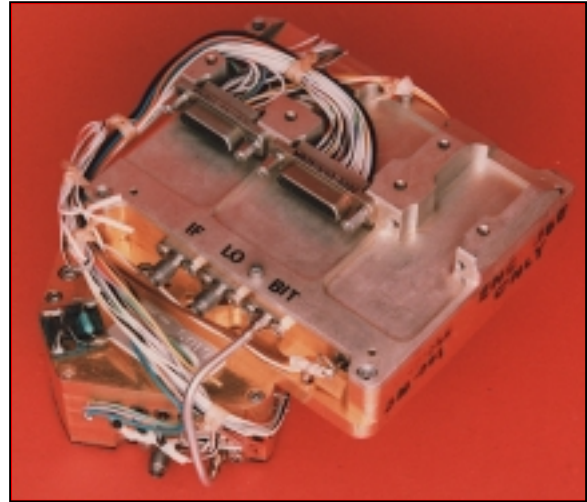
The purpose of this project was to develop and demonstrate an Integrated Product / Process Development (IPPD) flexible manufacturing methodology to reduce the cost of the Millimeter Wave (MMW) transceivers to support production of multiple band/types of transceivers in the 35 to 95 GHz frequency range for use in missiles such as the Longbow Hellfire.

## ACCOMPLISHMENTS / PAYOFF

**Process Improvement:** The MANTECH process improvement and automation developments to date have demonstrated an 80% reduction in touch labor and 50% reduction in manual tune and test times for Longbow Hellfire missile transceivers. Additional benefits include the improvement of the electrical, mechanical and thermal modeling during the design process.

**Industry Acceptance:** This IPPD methodology is established as an on the shop floor strategy for Longbow Hellfire missile production by Lockheed Sanders and Stellex Microwave.

**Implementation/Technology Transfer:** All of the improved manufacturing processes are completed and in place, and are currently being used during the LRIP-2 build of the Longbow Transmitter. The IPPD tool is adaptable to any product domain. Currently Longbow Hellfire and BAT P3I are targeted systems for this technology. Selected process improvements are being used in the fabrication of Lockheed Sanders MMW hardware used on the Patriot PAC-3 and THAAD missiles, the F-22 Raptor next generation air superiority fighter, and space applications including the X-33 VentureStar reusable launch vehicle (RLV) and Defense Meteorological Satellite Program (DMSP). The ongoing Design Environment Improvement effort has resulted in two patent applications.



*Longbow Missile Transceiver*

**Expected Benefits:** The benefits include a projected \$40M cost avoidance to the Army for the Longbow Hellfire missile production program.

## TIMELINE / MILESTONES

Start Date: May, 1995  
End Date: September, 2001

## FUNDING

### **MANTECH Funding:**

Army MANTECH investment: \$9.05M

### **Cost Sharing:**

Air-to Ground Missile System Project Office (Longbow): \$12.4M

Army TACMS-BAT Project Office (BAT P3I): \$3.05M

DARPA MAFET\* - W-band chips and CAD/CAE: \$500K

\* DARPA's Microwave Analog Front End Technology Program

## PARTICIPANTS

Lockheed Martin  
Lockheed Sanders  
TRW Incorporated  
Stellex Microwave