

G. TITLE III OF THE DEFENSE PRODUCTION ACT



The Defense Production Act (DPA) (50 U.S.C. App. 2061 et seq.) is the primary legislation to ensure the timely availability of industrial resources and critical technology items that are essential for national defense. The mission of Title III of the DPA is to establish, modernize, or expand domestic production capability and capacity for technology items, components, and industrial resources that are essential for national defense and for which either no domestic capacity exists or it is insufficient to meet defense needs. Title III accomplishes this by providing domestic industry with a variety of financial incentives, which reduce the risk of establishing the needed capacity. These incentives include the use of purchases or purchase commitments, loans and loan guarantees, and the purchase or lease of advanced manufacturing equipment which can be installed in government or privately owned facilities. Purchases and purchase commitments are the incentives used most frequently.

The Title III Program is unique among DoD programs since it is the only program specifically aimed at establishing or expanding domestic production capacity. Furthermore, Title III has proven to be an exceptionally effective tool for transitioning new technologies from the laboratory to the factory floor.

Title III is organized and executed as a DoD-wide program. Title III efforts generally focus on materials and components that can be used in a broad spectrum of defense systems. The Title III Program undertakes projects that have multi-system application and enables these programs to acquire materials that would otherwise be unavailable or too expensive. The Office of the Secretary of Defense provides top-level management, direction, and oversight. The Air Force is the Executive Agent for the program and is responsible for the execution of approved and funded projects.

During 1998 the Title III program began development of three new projects in addition to continuing to execute six existing projects. The cumulative value of all active Title III projects exceeds \$90 million.

Project Activities Initiated in CY 1998:

Power Semiconductor Switching Devices

The objective of this effort is to expand production capabilities for Power Semiconductor Switching Devices (PSSDs). PSSDs are solid-state devices that can be used to replace conventional electro-mechanical switches in medium and high-power electrical applications. They provide increased switching efficiency, reliability, and power handling capability with the additional benefit of reducing acquisition and life-cycle costs for both military and commercial applications. This project will focus on optimizing quality, performance, reliability, and availability with improvements in PSSD affordability. Avionics, missiles, and C3I applications will dominate the initial military demand for PSSDs. These devices will remove a major barrier to the replacement of hydraulic systems in aircraft, ships, and ground combat vehicles with more efficient, reliable electrical controls. PSSDs will also facilitate the development of compact, lightweight power supplies for directed energy weapons and electro-magnetic launchers.

This project is valued at \$12.0 million, of which, the contractor is cost sharing \$2.3 million. The project will promote an increase in domestic production capacity in MOSFET turn-off™ Thyristor PSSDs from 5,000 devices/year to over 15,000/year and an increase of the Full Light Silicon Sandwich PSSD production rate from 300 devices/year to over 1,200/year. A contract was initiated in August 1998 with Silicon Power Corporation of Malvern, PA. The project is scheduled to be completed in December 2003.

Silicon-on-Insulator Wafers

The intent of this project is to establish a domestic source of Silicon-on-Insulator (SOI) wafers to satisfy current and future defense requirements. New SOI materials significantly improve the performance of electronic devices used in defense systems and are used to fabricate low power and/or radiation tolerant devices. The inability of industry to scale up to production-level processes has created a situation where advanced SOI materials are either unaffordable or unavailable. This project will establish domestic sources for SOI substrates that have emerged from R&D, but which require lower-cost, higher-volume production capabilities before they can be affordably inserted into DoD systems. The project will concentrate on the development of wafers up to eight inches in diameter.

The SOI project is expected to be initiated in March 1999 and will cost approximately \$7 million over a three-year period. It will promote the creation of a production capacity for SOI wafer material of 1.4 million square inches per year.

Silicon Carbide Substrates

This project will establish a viable, world-class domestic manufacturing capability for Silicon Carbide (SiC) semiconductor substrates. It will enable the transition to full scale manufacturing by establishing the capability to produce 75mm diameter SiC substrate wafers for semiconductor device fabrication. The Title III SiC project will improve affordability and quality through improvements in boule and wafer manufacturing processes. Military systems will be targeted for SiC technology insertions and DoD investments will be leveraged by requiring the Title III contractor(s) to enter into relationships with potential SiC device fabricators.

The Title III SiC project will cost approximately \$7 million and includes a contractor cost sharing requirement. A contract award is anticipated in May 1999.

On-going Projects:

High Purity Float Zone Silicon

High Purity Float Zone (HPFZ) silicon is vital to the manufacture of infrared laser seeker detectors, vidicons, and high-power switching devices. It has purity and quality requirements 1,000 times greater than those required for the most advanced electronic silicon semiconductor applications. While this is a pervasive technology in U.S. defense systems, at the time of this project's initiation, in 1993, there was no domestic producer of HPFZ silicon.

The Title III HPFZ contractor, Unisil Corp., has demonstrated a capability to produce float-zone silicon at production rates. Its production process has achieved ISO 9002 registration. Using the Title III incentives, the contractor implemented technical improvements, cost reduction, and marketing efforts to achieve the project's production capacity goal of a minimum of 6,000 kgs of HPFZ silicon per year.

The government's investment of \$10.9 million was matched by an \$8 million capital investment by the contractor. This project will be completed in April 1999.

Flat Panel Cockpit Displays

This Title III project constitutes a portion of the National Flat Panel Display (FPD) Initiative, a program designed to develop competitive domestic suppliers and provide early, assured, and affordable access to FPD technology for the DoD. Title III provided various defense programs with a total of \$25.8 million in financial incentives to facilitate and/or accelerate the insertion of FPDs into military cockpit avionics and other defense applications.

Title III successfully assisted the Apache Longbow helicopter program, one of the seven defense systems receiving Title III incentives, to qualify FPDs to replace Cathode Ray Tubes (CRTs). Apache Longbow constitutes a demand of more than 4,000 FPDs, plus a potential for up to 1,000 units in foreign military sales. The initial Title III investment was leveraged into a \$300 million demand for domestic FPD producers. Nearly 1,100 FPD panels will be ordered as much as two to three years earlier than anticipated.

Small Flat Panel Displays

This project also constitutes a portion of the National Flat Panel Display Initiative. It is an effort to qualify a small format active matrix electroluminescent flat panel-based night vision heads up display (HUD) system for Special Operations Forces (SOF) applications. The HUD system was flight qualified on the MH-60Q and additional qualifications will be performed on the C-141B, MC-130P/N, MC-130E, and other Navy and Army platforms through February 1999.

The test results, under this \$875 thousand dollar contract with Marconi/Tracor, have been extremely positive. Air Force SOF qualification results led to the identification of a requirement to purchase 100 displays.

Titanium Metal Matrix Composites

This Title III project will establish a production capability for continuously reinforced, silicon carbide fiber/titanium metal matrix composite (Ti MMC) material, targeted to the insertion of Ti MMCs in aircraft jet engines. The project will focus on demonstrating the production capability for cost-effective Ti MMC material fabrication processes, component manufacturing, and the necessary component fabrication testing and data generation sufficient for insertion of production ready components into the jet engine structure. Production insertion of Ti MMC components is the primary goal of this activity.

The key objectives of this project are to establish a viable domestic production base for Ti MMCs, demonstrate a cost of \$1,600 per pound at a capacity of 2,500 lbs/year, and provide incentives for insertion opportunities to stimulate demand for Ti MMCs. A cooperative agreement was signed in August 1996 with the Titanium Matrix Composites Turbine Engine Components Consortium (TMCTECC) for \$25 million, with a matching TMCTECC cost-share of \$25 million. The project is scheduled to be completed in September 2000.

Aluminum Metal Matrix Composites (Al MMCs)

The objective of this Title III project is to design and test prototype Al MMC track shoes for the Bradley Fighting Vehicle. The project will demonstrate that Al MMCs provide an optimal cost/performance alternative approach to fabricating military components by combining a low cost, high performance silicon carbide whisker reinforcement with the high volume, near net shape processing capability of squeeze casting. The Army Tank-Automotive and Armaments Command is executing the project via a contract with Advanced Refractory Technologies, Inc. This project was initiated in January 1998 and will be completed in December 2001. General Motors is providing key subcontractor support for this effort. The value of this project is \$3 million.

Semi-Insulating Indium Phosphide Wafers

This Title III project will establish an economically viable, domestic, world-class production capability for Semi-Insulating Indium Phosphide (SI InP) wafers. SI InP is a compound semiconductor material critical to a variety of optoelectronic and very high frequency, millimeter wave, and high power microwave electronics. The existing manufacturing infrastructure for InP wafer production is incapable of meeting defense requirements for quality, price, size, and availability. Increased domestic production capacity for InP is required to support current and future needs for both military systems (such as BAT, BCIS, MILSTAR, GPS, MILSATCOM, GBR, and F-22) and commercial applications. Title III incentives will be used to enable the transition to full scale manufacturing, improve quality and affordability, target military systems insertions, and leverage government investments.

In May 1997 contracts were signed with American Xtal Technologies, Inc. and M/A-COM, Inc. for the InP project. This effort will be completed in October 1999. The Title III investment is \$5.5 million, with a contractor cost sharing contribution of \$3.6 million. The project objective is for each contractor to achieve an InP production capacity of 50 thousand square inches of 75mm diameter SI InP wafers per year.