



# WHARTON AEROSPACE & DEFENSE REPORT

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## **Outsourcing in Defense and Aerospace: Demand Is Up but the Standards Are High**

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## **Demand Is Up but the Standards Are High**

As more and more chips and electronic circuits are crammed into weapons, aircraft and navigation systems, the defense and aerospace industry is increasingly turning to outsourcing to meet its manufacturing demands. But building these products requires rigorous specialization to meet standards unheard of in the commercial outsourcing sphere.

Many of the same companies that produce the chips and electronics for mobile phones, computers, televisions and other consumer electronics also build components for military contractors. But in military applications, the products must withstand intense physical conditions on the battlefield. Defense contracts also call for low-volume production, adding another challenge, because low volume typically means a lower return than high-volume production in the consumer sector.

The tougher standards have not stopped electronics manufacturing services providers (EMS) like Toronto, Canada-based Celistica and Singapore-based Flextronics from jumping into a growing market. The overall defense, aerospace and homeland security share of the EMS market was about \$2.8 billion in 2006, but is expected to grow to \$4.4 billion by 2011, according to Technology Forecasters, a research firm in Alameda, Calif. This is only a sliver of the overall EMS market, however, which globally hit \$268 billion in revenues in 2007, according to International Data Corporation, a research firm based in Framingham, MA.

EMS providers have room for growth in the defense and aerospace segments, which have long worked with contractors. In fact, while commercial outsourcing has been a key business strategy for just the past decade, the U.S. Department of Defense (DOD) has a long history of outsourcing. The DOD would never consider setting up its own plants to manufacture its weapons, jets and ships because the inefficiencies of running a factory and the political battles to locate the plants within a lawmaker's congressional district would rise to damaging levels.

Instead, the DOD contracts to a host of original equipment manufacturers (OEM) like Boeing, Northrop Grumman and Lockheed Martin. These prime contractors are increasingly turning to EMS providers for the required electronic components and chips, which in turn are increasingly subcontracting to electronics distributors that specialize in militarizing common electronic products.

The OEMs have an entrenched history of tapping a range of specialized subcontractors for major components like jet engines, fuselages and navigation systems. "Boeing is a good example because its aircraft are very sophisticated and there are many companies involved in the entire manufacturing process," said Serguei Netessine

**[<http://www.wharton.upenn.edu/faculty/netessine.html>]**, professor of operations and information management at Wharton. "About seven or eight parts are delivered to a Boeing plant for final assembly."

Some of the features of that jet, however, are closely held company secrets. "There are certain parts of a plane, for example, that they never outsourced because that is where the intellectual property resides," said Morris Cohen

**[<http://www.wharton.upenn.edu/faculty/cohen.html>]**, a professor of manufacturing and logistics at the Wharton School. "So the wing design is something that Boeing never outsources because they don't want to give up those designs —whereas the tires, they don't care."

## **Sand, Water, Fire and Heat**

Chips and electronics fall into the non-essential category, along with tires. The chips are identical to those used for consumer products, but are wrapped in a protective layer that allows them to survive and function accurately in an otherwise destructive environment such as sand, water, fire or extreme temperatures.

"For consumer products like a cell phone, your pocket is a pretty benign place —maybe there's some lint or hair there. Or maybe you toss your cars keys in there too," said Charlie Barnhart, a founder and principal at Charlie Barnhart and Associates, a consulting firm that closely follows the global electronics manufacturing industry. "But if you take a piece of military hardware, it may end up in a desert where it needs to be much more rugged and may be subjected to who knows what."

In this case, the EMS providers turn to electronic distributors for parts and services to meet military grade requirements. Companies like Plainview, New York-based Astrex, Dallas, Tex.-based Knight Electronics and Boca Raton, Fla.-based Summit Electronics, have the complex task of hardening these products for the battlefield.

At the same time, the production volume for these battle-ready boxes is relatively low compared to that of other consumer electronics. And unlike commercial orders, which usually vary only when demand dips or increases, orders from military contractors can be one-off deals or inconsistent at best.

## **Local Partners**

While the manufacture of most commercial products gets outsourced overseas, Barnhart noted that, for some military and aerospace companies, electronics outsourcing usually remains within the U.S. The reason for that has nothing to do with national security or safeguarding intellectual property from foreign countries, he said. Rather, it arises from the need to maintain engineering resources close to the prime contractor.

"Many of these projects and products that involve electronics tend to be very complicated and leading edge, and require a lot of design and engineering support," said Barnhart.

In those situations, it is almost always the case that the prime contractor sees an advantage to manufacturing on-shore. The cost savings that outsourcing might provide often do not justify the potential disruption of finding an offshore supplier when the manufacturer already has an existing local relationship.

"Prime contractors sometimes decide they either don't have or don't want to expend their bandwidth or schedule flexibility to go out and find and validate these requirements anew," said Barnhart. "In the military-aerospace world—unlike the commercial world—it is not all about costs. The consideration of risk to schedule, to quality, to customer support, etc., carries much more weight in the decision making process."

The EMS providers will gladly take a military/aerospace contract because the overall margin remains very attractive. The gross margin varies according to size of the deal—the bigger the deal, the lower the gross margin, said Barnhart. He estimates that a \$1 million deal will yield margins around 30% to 35% while a \$1 billion deal will yield margins around 10% to 12%.

These companies also hope that the initial contract will lead to bigger contracts in the future. And indeed it may. Sometimes the prime contractor has no other choice in suppliers when it needs spare parts for equipment that has been in service a long time. While consumers upgrade their cell phones, cars and computers every few years, military and aerospace equipment can remain in service for decades. In other cases, the subcontractor who first manufactured a particular part may no longer exist and a new player must be tapped to recreate a part from scratch. And sometimes the work is outsourced to overseas contractors and suppliers because they are the only immediately available resource with a specific skill or capability.

There also are times the Defense Department has no choice but to look overseas, said Netessine, such as when a project carries technical parameters that only a foreign aerospace or military contractor could fulfill. The European Aeronautic Defense and Space Company (EADS), an alliance of European companies, for example, sometimes builds aircraft for the U.S. defense industry or the aerospace sector in its European-based factories.

"You might have to accept that because if you insist that the assembly occurs in United States, it might take another 10 years just to have the factory in place," said Netessine. "For certain equipment, it's just too impractical to manufacture in more than one place."

But whether the plants are in Europe or in the United States, smaller components might come from yet other places in the world. And of course, hiccups in any part of the supply chain can spell trouble.

"It's interesting how coordination problems with worldwide supply chain networks can derail an entire manufacturing process," said Netessine. "So you have to keep a close eye on your suppliers—and the more you have and the farther away they are, the more reason you have to worry about it."