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On wings of carbon

Israel Aerospace Industries is engaged in high-tech manufacturing for the F-35 fighter jet project

THE DEFENSE Ministry announced on February 22 that it had signed a contract to buy 14 F-35 next-generation fighter jets from the giant US defense contractor Lockheed Martin. The plane is officially known as the F-35 Lightning II. The total cost of the deal is $3 billion.

Earlier, in 2010, Israel bought 19 F-35s; the plan is to buy 17 more in the future to create two Israel Air Force F-35 squadrons with 25 aircraft each. The first two F-35s will be delivered late next year. IAF pilots will begin training on the planes at Eglin Air Force base, in the Florida Panhandle, early in 2016 and will fly two planes home to Israel later in the year. The jets will be known as the F-35I (I for Israel), and will have the Hebrew name Adir, meaning mighty.

Israel will become the first international buyer of F-35s to take delivery, even though eight other countries paid upfront to join in the development process. All the planes will be paid for by American military aid to Israel, about $3 billion annually.

The announcement barely caused a ripple in Israel where the furor over Prime Minister Benjamin Netanyahu's March 3 address to Congress drew massive press coverage. Yet, I remember a time when Israel had to sweat blood just to get any country to sell it advanced jet aircraft, let alone pay for them as well.

The Israel Navy had to "steal" five missile boats from the harbor in Cherbourg, in late 1969, because of a French embargo, even though the vessels had been paid for in full. In 1956, Israel joined Britain and France in attacking Egypt partly because it was the only way France would agree to sell Israel Mystere fighter jets and French tanks.

So, while political leaders squabble, high-level cooperation between Israeli and American defense officials continues. I find this deeply reassuring. When Susan Rice, President Barack Obama's national security advisor, called Netanyahu's speech to Congress "destructive" to US-Israel relations, she is telling the truth.

Fortunately, the US and Israel have a common interest in seeing ad-

The Hebrew name for the Israel Air Force's Lockheed Martin F-35 Lightning, due to begin arriving in Israel in 2016, is Adir, meaning mighty

REUTERS

vanced American defense technology deployed in Israel. Israel needs the long-range, stealthy F-35 to counter Iran's nuclear threat and possibly S-300 anti-aircraft systems Russia may offer Iran and Syria. Lockheed Martin and the Pentagon want to sell the F-35 to other countries to lower the cost per plane through economies of scale, and having it deployed by the IAF is a valuable endorsement – the equivalent of Tiger Woods using a Lockheed Martin golf club (if there were such a thing).

The process that will bring the first F-35s to Israel next year, after a long flight from the US, is particularly fascinating and illuminating. Here are a few of the key things we can learn from it.

Israel gets not only next-generation jets, but also next-generation technology from the deal.

THE FACT THAT ISRAEL WILL HAVE CARBON-COMPOSITE CAPABILITY, A MATERIAL OF THE FUTURE MANY TIMES HARDER THAN STEEL AND ONE-SIXTH THE WEIGHT, IS AN IMPORTANT BYPRODUCT OF THE F35- DEAL

Part of the massive contract to buy F-35 jets involves some $688 million in so-called offset agreements, in which Israel makes some of the F-35 components. Elbit won a contract to make helmet-mounted displays for F-35 pilots and, most importantly, Israel Aerospace Industries (IAI) will make 811 sets of F-35 wings.

On November 4, IAI inaugurated its assembly line for F-35 wings at its Lahav plant, announcing that "IAI is scheduled to produce more than 800 pairs of F-35 wings over the next decade." The first set of wings will be delivered to Lockheed Martin by midyear. The potential sales are estimated at $2.5 billion.

The wings are made of high-tech carbon composite "skin," developed especially for the F-35 and very tricky to make. In this process, layers of carbon fiber are overlapped with resin and then baked in a high-temperature oven. The process is technologically challenging.

IAI made conventional F-16 wings in the past – thus winning Lockheed's respect – but making carbon composite wings is a big step up. IAI is setting up a business accelerator, a kind of incubator that improves start-up companies' chances of survival. Perhaps IAI's carbon composite expertise will find use among the start-ups that shelter under IAI's wing.

In producing its X-32 plane, an early competitor for the F-35, Boeing had real difficulty in making the carbon-composite wings – they had big wrinkles and air pockets and had to be redone, causing troublesome delays. The fact that Israel will have carbon-composite capability, a material of the future many times harder than steel and one-sixth the weight, is an important by-product of the F-35 deal.

The price of an F-35? If you have to ask…

Modern defense technology is staggeringly expensive, to the point of being unaffordable – even for the US.

Let's do the math. Divide the $3 billion cost by 14 (planes), and you get $214 million per plane. This includes maintenance, spare parts, pilot training, and so on. An F-35 weighs about 35,000 pounds. If you add the cost of development to production costs, you get a plane worth almost its weight in gold. The F-35 can be deployed a hundred kilometers or more from the target, using "standoff" weapons that keep the aircraft out of range of enemy anti-aircraft weapons – at that price, you cannot risk losing even one aircraft (and, of course, its pilot).

But isn't the US paying for Israel's purchase? Isn't the F-35 a free lunch?

Far from it. Some IDF strategists feel that the billions in US military aid could be better used elsewhere, such as in equipping flexible ground forces rather than buying gold-plated aircraft. For instance, producing large numbers of the Namer armored-personnel carrier, based on the Merkava tank chassis, which is far more useful in Gaza than the F-35.

David Francis, a defense analyst quoted by CNBC, claims the F-35 program could cost the Pentagon $1.5 trillion over its planned 55-year lifetime. In 2010, the Pentagon called the F-35 project "too big to fail," a phrase used earlier to describe troubled US banks. In the future, Francis says the US Air Force "plans to invest in "agile" weapons that can be adapted for multiple uses. Because of its cost, the F-35 will likely be the last manned aircraft. The age of sophisticated drones is about to begin.

Meanwhile, to paraphrase a credit-card commercial: Price of air superiority – many billions of dollars. Its value for survival? Priceless. There are some things only money can buy – if they're willing to sell them to you.

Israel's defense relationship with the US is strictly monogamous.

Israel gets F-35s as part of its privileged relationship with the Pentagon. Eight nations joined the so-called Joint Strike Fighter program at its inception and helped finance its development. They included the UK and even Turkey.

Israel joined the System Development effort, as a "security cooperation participant" – but was booted out of the project after signing a defense deal with China. That arms deal was put on hold (i.e., canceled), and on July 31, 2006, Israel was reinstated to the F-35 program. Clearly, to get high-tech American defense technology, Israel will

AMIR COHEN / REUTERS

A new production line for F-35 wings is seen at the Israel Aerospace Industries campus, near Tel Aviv, November 4

never be able to supply its own technology to America's potential foe, China.

Prime Minister Benjamin Netanyahu alienated the Obama administration in his effort to keep Iran from becoming nuclear. This is not a strategy I would have recommended. Israel's defense experts, aware of their dependence on American technology, dumped China to retain America's goodwill. Otherwise, those F-35s would never have arrived. The contrast between the two strategies is stark, and so are the results.

Competition is not a panacea.

Moshe Kahlon, as minister of communications, brought sharply lower cell-phone prices by opening the industry to competition. The US Defense Department tried this approach and ran a high-stakes competition. In free-market capitalism, competition is a core value.

To save money, it was decided to build a single "joint strike fighter" for the Air Force, Navy and Marines – service branches that normally demanded their own unique weapons. For the Air Force, it would have to be invisible to radar. For Marines, it would have to have short take-off and vertical landing capability. For the Navy, it would have to be suitable for aircraft-carrier landings. One plane, three versions. On paper, a good idea – in practice, fiercely difficult to implement. Building a supersonic aircraft that can hover and land vertically? It had never been done.

Three major aircraft manufacturers – Lockheed Martin, Boeing and McDonnell Douglas – joined the competition at the design stage. Two were selected – Boeing and Lockheed. McDonnell Douglas, maker of the F-15, lost and was soon acquired by Boeing.

Boeing and Lockheed then ran competing efforts to develop and produce two JSF prototypes each, at a cost of more than $1 billion for each program. No other country in the world could even dream of investing such sums in a two-company competition when only one program would win and the other would be scrapped. In the end, the Pentagon chose Lockheed's design, the X-35, over Boeing's X-32. The stakes were enormous – possible contracts worth some $200 billion.

Was the capitalist model successful? Competition spurs motivation and innovation. But in defense technology, it also duplicates efforts and wastes money. Could a better plane have been built had Boeing and Lockheed engineers collaborated rather than battle in a winner-take-all fight? Why could Boeing and Lockheed not work together even after the Lockheed design was chosen as the winner? Could some of the enormous cost overruns, which almost bankrupted the F-35 program, have been prevented in a collaborative effort? We'll never know for sure.

The fierce competition that characterizes free-market capitalism sometimes needs a bit of adjustment.

Boeing, one of the two major civilian aircraft producers in the world together with Airbus, has core competence in manufacturing. Lockheed, which made America's first military jet fighter in 1943, has long experience in designing military aircraft, including Israel's F-16s. In the end, that capability won.

I spoke with a senior Israel Air Force pilot about the F-35. "The F-35 will be Israel's first fifth-generation fighter jet," he said. "It is far superior to fourth or 4.5 generation aircraft, which cannot match it. It is not invisible to radar like the US F-22 Raptor. But its main advantage lies in its advanced systems, in its ability to process data, mine data and share data; much of this is done automatically by the F-35's systems for the pilot. It is effective against anti-aircraft missile systems.

"This is, technologically, a plane with a brand new concept, not more of the same. It is extremely important for the IAF, which focuses not on the quantity of aircraft but on their quality and the quality of their pilots."

The F-35I Adir is a highly complex jet. It is, among other things, a flying computer with eight million lines of software code, four times that of its fifth generation predecessor, the F-22 Raptor. But its importance for Israel is simple, the senior IAF pilot told me. It is far superior to anything else in the air. With it, Israel will continue to own the skies, for crucial years to come.

The prophet Isaiah said, "They that wait upon the Lord shall renew [their] strength; they shall mount up with wings of eagles." The IAF will soon protect our skies on wings of carbon. Happily, they will be homemade. ■

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