

Aiming high: Turkey's aerospace ambitions make progress

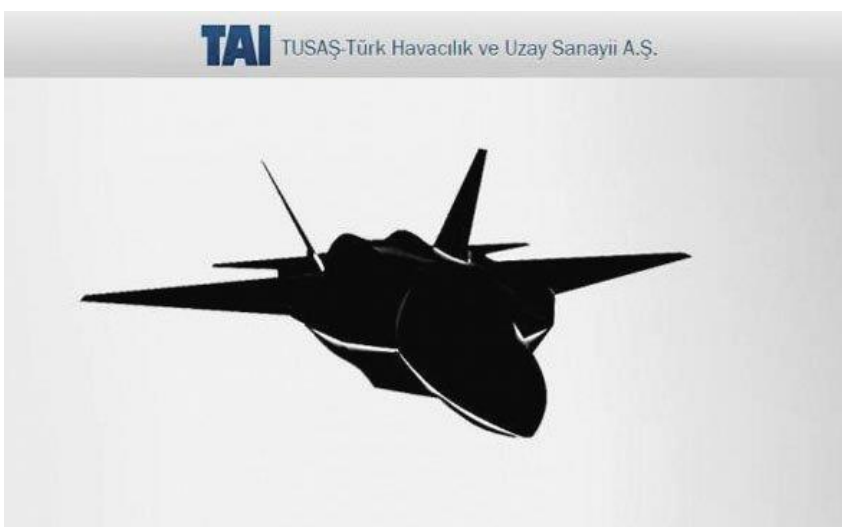
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Turkey is accelerating efforts to build up its aerospace industry as it strives to become a global player with 'technological superiority'. Although a latecomer to the space challenge, Turkey is also taking rapid steps to close the gaps in this field. *Kerry Herschelman and Lale Sariibrahimoglu report*

Turkey, in line with its strategy to grow its aerospace industry, has been pursuing more aggressive policies to develop advanced indigenous technological capabilities to reduce its dependency on exports while forging more partnerships with foreign companies. In the words of a senior Turkish defence industry official, Turkey has up until now lacked a true aerospace infrastructure, even though in the land and - to a certain extent - naval sectors the country remains relatively strong. A latecomer to the space challenge, Turkey has also been taking rapid steps to catch up through the acquisition of ambitious and expensive space technology.

Speaking to *Jane's*, one Western defence industry spokesperson said it did not appear that Western companies were affected by the coup attempt of July 2016 and the ongoing purges within the Turkish Armed Forces (TSK) with regard to business activities with their Turkish interlocutors. Around 8,000 military personnel, including top commanders, were either dismissed or imprisoned for their alleged links to the aborted coup.

According to the spokesperson, TUSAS Aerospace Industries (TAI), a state-owned company valued at USD1 billion, has continued supporting projects such as the Lockheed Martin F-35 Lightning II Joint Strike Fighter (JSF) programme; building utility helicopters with US manufacturer Sikorsky; as well as continuing with the Turkish jet fighter (TF-X) programme in conjunction with UK's BAE Systems.



An image tweeted by Isik on 28 January of Turkey's MMU project, also known as the TF-X programme. (TAI via Fikri Isik)

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Moving into space

In an attempt to realise its ambitions to own the capacity to launch satellites as well as acquire satellite capabilities, Turkey has finally taken steps to create a long-delayed space agency, with a draft bill submitted to the Turkish parliament early in March. The agency, which will be under full civilian control, will concentrate on reducing dependence on foreign technology and defining basic policies and strategies regarding space and aviation technologies. It will also co-ordinate work for space platforms, launch facilities and systems, as well as help develop, integrate, launch, monitor, and operate aerospace systems. It will also assist Turkish companies to develop a competitive local space industry not dependent on foreign technology.

In a separate move, a draft bill was also submitted to parliament in early March for the creation of a High Technologies Research Center and Science, Technology, and Industry Executive Board (YUTAM). Institutes and research centres involved in satellite projects and affiliated to the Turkish Scientific and Research Board (Tubitak) will all come under the YUTAM umbrella in order to avoid any duplication of effort. Under the draft bill Tubitak will be tasked to commission projects, while YUTAM will be responsible for planning and executing space and other high-technology projects.

Turkey is seeking to transit to a new level of technological advancement that will pave the way for the country to enter the space race, while further boosting its aerospace power.

During a debate on the space agency draft bill at a parliamentary commission on 2 March, Turkish minister for transportation, maritime, and communications Ahmet Arslan said that Turkey will not only become a country that produces and launches satellites, but will also export satellite technology.

"There are 12 countries with the capability to launch satellites and the goal is to bring Turkey into that category of nations," the spokesperson noted. "We will be able to increase local technological input through the Turksat 5A and 5B satellites, and hence will be able to manufacture satellite parts domestically. It will come to a point where Turkey produces the Turksat 6A communication satellite fully through local means. It is not enough to build satellites. Owning a capacity to launch satellites as well as acquiring their capabilities is also very important for self-sufficiency."

Led by Tubitak Space, Turksat 6A is being developed jointly by TAI, Aselsan, and CTech and is scheduled to be launched into space in 2020.

It is estimated that Turkey currently has 25% of the requirements needed to develop and produce an indigenous satellite system, but it plans to increase this ratio to 65% in the coming years.

The delay in institutionalising Turkish space programmes stems largely from a longstanding rift between the military and successive Turkish governments over who assumes control of the planning of space programmes and the procurement of related technology. Now, the Turkish Chief of the General Staff (TGS) is to be part of the space agency, mostly at the technical level.

Turkey is also looking to carry its assault, defence, reconnaissance/surveillance, and early warning capabilities into space.

The Turkish space agency will have the authorisation to form companies at home or abroad, buy shares in existing companies, or acquire them.

However, Turkish opposition parties have several criticisms over what they say are shortcomings in the space agency and the YUTAM bill.

Turkey's main opposition Republican People's Party (CHP) released a statement on 7 March stating that, while the creation of a space agency has come quite late, the party supports the main goals of the draft that aims to enable Turkey to enter into the space economy. However, it said the success of the agency will rely, among other things, on making it an autonomous entity instead of affiliating it to the prime minister's office, strengthening the education system to create awareness of space technologies, and not allowing the agency to fall victim to the government's policy of neglecting the merit system and qualified human capacity.

Turkey has set a target of having around a USD5 billion share of the global space economy by 2023. The opposition, however, has said this represents only a 1% share of an expected USD530 billion global space sector economy that will unavoidably make Turkey reliant on foreign technologies.

Turkey will have to find qualified people to do the job; today, only about 600 people work in the space field.

"Turkey will have to come up with a long-term personnel recruitment and training plan for space activities - especially since the Turkish Air Force, which is the driving engine of space activities, has suffered since the 15 July coup attempt and subsequent purge. Some of the qualified space project personnel were dismissed, the Air Force Academy was closed, and the Aeronautics and Space Technologies Institute, which was the sole institution offering graduate studies in space sciences, was shut down," Metin Gurcan, a former Turkish officer, wrote in an AI Monitor website article on 12 December 2016.

Through projects such as the Göktürk-3 satellite Turkey has gained a position as a country that develops satellites and satellite subsystems among the fraternity of countries with active space projects, said Koksal Liman, deputy undersecretary of the Turkish Defence Industries Undersecretariat (SSM), during a parliamentary commission briefing early last year.

Turkey's next target is to obtain "an absolute localisation" in producing space technology on its own, Liman added.

The SSM released a request for information (RFI) in 2016 for the acquisition of a synthetic aperture radar (SAR) satellite system payload to be integrated on the indigenous Göktürk-III reconnaissance and surveillance satellite system being jointly developed by TAI, Aselsan, and Tubitak.

However, it remains to be seen whether Turkish defence projects in general and space projects in particular will be affected as a result of the recent high number of detentions being made in the wake of the failed coup. Personnel at Tubitak and Aselsan have been charged with membership of the Fethullahist Terrorist Organization (FETO) that the Turkish government blames for masterminding the coup.

Thus far, Turkey has focused on developing ground observation and communication satellites. In addition to TAI and Tubitak Space, Aselsan has also emerged as one of the main actors developing space technologies in Turkey, while Turksat holds expertise mainly in communication satellites.

In recent space activity, meanwhile, Turkey's long-delayed Göktürk-1 military reconnaissance and observation satellite was finally launched on 5 December 2016 from the European spaceport in Kourou, French Guiana.

Göktürk-1 was built for Turkey by prime contractor Telespazio and partner Thales Alenia Space: a joint venture between Thales (67%) and Leonardo-Finmeccanica (33%). Local industrial partners included TAI, Aselsan, Tubitak Bilgem, Roketsan, and TR Technology.

The system has a resolution of close to 0.5 m and will be operated by the Reconnaissance Satellite Battalion Command of the Turkish Air Force Command (TAFC).

In a statement released after the launch the office of the TGS said the satellite will fulfil the Turkish Army's intelligence requirement without being "restricted by geographical boundaries". The satellite is expected to capture more than 60,000 images per year and will cost Turkey EUR261.5 million (USD278.9 million). With its download speed, manoeuvring abilities, and advanced ground system characteristics the new satellite will, along with Göktürk-2, increase Turkey's power in space, the TGS added. The medium-resolution (2.5 m), 400 kg Göktürk-2 satellite was launched in China in December 2012. The level of national contribution to the production of the Göktürk-1 satellite was 20%.

Environmental testing of Göktürk-1 was carried out at TAI's USD10 billion facilities for assembly, integration, and testing of space systems (Uzay Sistemleri Entegrasyonve Test Merkezi: USET), set up in 2015. Regarded as a critical centre in the creation of a national space industry, USET serves national and international space programmes for spacecraft assembly, integration, and test activities.

Meanwhile, Turkey has set a target of building a satellite domestically of at least 0.5 m resolution.

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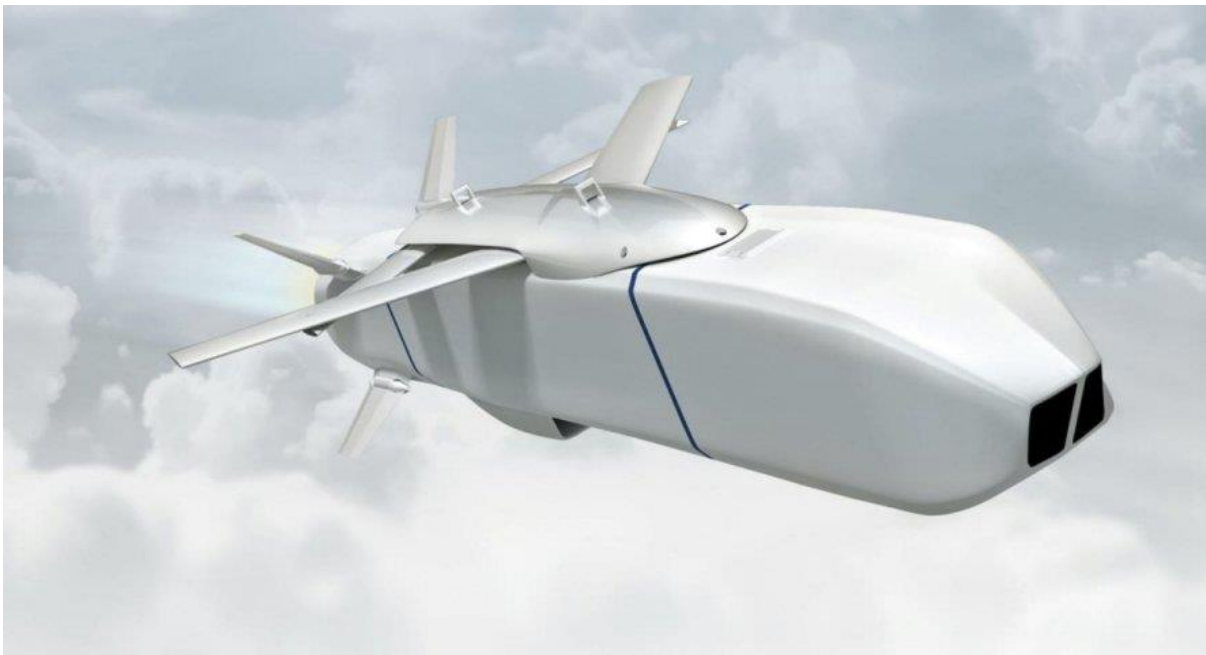
F-35 work

According to one Western military official who spoke to *Jane's*, Turkey has done "superb engineering work" on developing a 1,000 lb (454 kg)-class air-to-surface stand-off cruise missile (SOM-J) for internal carriage on the F-35 Lightning II Joint Strike Fighter (JSF) in co-operation with F-35 prime contractor Lockheed Martin.

"Lockheed Martin is an advisor to the project and does not claim any design expertise. Turkey has come a long way in a short period of time and made advances in design and development," noted the official, adding that "Turkey is no longer a parts maker. It is doing design development itself. Turkey is now a competitor and is offering to the world market the SOM-J missile. This demonstrates Turkish capabilities."

Under an agreement signed in 2014 between Lockheed Martin and Roketsan, the SOM-J is being co-developed and co-produced for integration onto Turkish Air Force F-35As. The SOM-J is an autonomous, long-range, low-observable, all-weather, precision air-to-surface cruise missile.

Turkey is now looking to sell SOM-Js to Australia to arm its F-35As, Cenk Onen, director of Roketsan's Engineering unit, said on 1 March.



The SOM-J cruise missile is specifically being designed for internal carriage by the F-35. (Roketsan)

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Volatile relations

Meanwhile, however, Turkey's sometimes strained relations with its NATO allies on various issues - including differing strategies in relation to the civil war in Syria, Turkey's southern neighbour - have raised question marks over future arms co-operation between Ankara and the nations of the alliance.

Concerns about the political direction of Turkey were exacerbated after the administration of Turkish president Recep Tayyip Erdogan decided to continue the state of emergency in the country that was initially declared on 20 July last year after the attempted coup. This was a move many feared would only serve to deepen Turkey's existing political instability.

One Western military source told *Jane's* that the country's Justice and Development Party (AKP) government had shown signs of moving away from the West even before the coup attempt and subsequent crackdown. The source cited Turkey's initial selection in 2013 of the China Precision Machinery Import and Export Corp (CPMIEC) HQ-9 air defence system to fulfil its USD4 billion T-Loramids long-range surface-to-air missile (SAM) requirement as an example of this: a selection that was subsequently cancelled in November 2015 following considerable criticism from the United States and Turkey's other NATO allies over the interoperability and security issues of the TSK operating a Chinese system.

It also remains to be seen whether the current deepening political crisis between Turkey and some EU member countries will result in further arms embargoes being imposed on Turkey. The Austrian parliament has already decided to impose a non-binding arms embargo against Turkey in response to increased human right violations in the country in the wake of the coup attempt.

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Russian relations

Yet while Western sources have observed that Turkey has been keener than before for defence co-operation with its European partners, Turkey has once again turned to Russia for the purchase of long-range missile systems. Turkish defence minister Fikri Isik told local TV channel TGRT on 9 March that the acquisition of these missiles is Turkey's top priority.



Turkey is in talks with Russia to buy the S-400 and believes this is the most plausible option to fulfil the country's air defence needs, according to Isik. (PA Photos)

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TF-X plans

In the post-coup period Turkey has also accelerated some of its most challenging projects with Western partners, such as the programme to indigenously produce a Turkish fighter jet by 2023 (the year that Turkey marks 100 years of the Republic). In January TAI and the UK's BAE Systems signed a heads of agreement document in relation to collaboration on the development of an indigenous Turkish fifth-generation fighter. The non-binding agreement paves the way for the signature of a contract between the two companies for the conceptual design (Period 1) phase of the project - which could be worth GBP130 million (USD163 million) - and for even deeper co-operation over the lifetime of the project.

Known as the Milli Muharebe Uçagi (MMU) project locally and the Turkish Fighter Experimental (TF-X) project overseas, the programme aims to build a modern air superiority fighter to replace Turkey's F-16s. Turkey selected BAE Systems as its first choice international partner for the project in late 2015.

The engine for the TF-X has yet to be selected, with Rolls-Royce (offering the Eurojet EJ200 engine from the Eurofighter Typhoon) one of several interested bidders.

Due to enter service in the 2030s, the TF-X will be a twin-engine aircraft. According to SSM sources, the project involves three phases: design and prototype qualification (Phase 1); gaining initial and then full operational capabilities (Phase 2); and serial production (Phase 3). The preliminary design work (Phase 1) is expected to last four years, with a first prototype ambitiously planned for 2023.

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Peace Onyx

In 2015 TAI handed over the final upgraded Lockheed Martin F-16 Fighting Falcon to the TAF. In total 163 Turkish F-16 fighters were upgraded under the Peace Onyx III (PO-III) programme at a cost of about USD1.1 billion.



The final aircraft delivered under the Peace Onyx III programme, an F-16D, was one of 163 F-16C/Ds that were upgraded. (TAI)

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The PO-III included the upgrading of all of Turkey's Block 40 and Block 50 F-16s to a standard similar to the US Air Force's Common Configuration Implementation Program (CCIP) standard.

Although PO-III included the upgrade of the remaining Block 40/50 aircraft bought under the PO-I and PO-II programmes, it did not include the country's Block 30 F-16s purchased under PO-I.

A project for the modernisation of the Block 30 aircraft (of which around 30 remain in service) was approved by former Turkish prime minister Ahmet Davutoglu on 9 April 2015.

The Peace Onyx programmes, which include high levels of local workshare and production under offset arrangements, have regularly been cited as being key to the building up of Turkey's aerospace industry.

With 239 F-16C/Ds in service the Fighting Falcon currently forms the mainstay of Turkey's combat aircraft inventory, with Turkey one of the largest operators of the aircraft in the world. With the completion of the upgrade programmes, Turkey's F-16s will continue flying into the 2030s at least. Turkey's planned fleet of 100 F-35As, due to enter service from around 2020, will take on the air-to-ground role of the F-16s as well as that of the TAF's F-4E 2020 fighters. The bulk of the F-16 fleet is then intended to be replaced around 2030 by the TF-X.

A Western defence analyst talking to *Jane's* said that the TF-X, as well as the current Anka unmanned aerial vehicle (UAV) and Hurkus trainer aircraft programmes, would likely not be possible without the expertise gained from the Peace Onyx projects.

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UAV developments

Turkey has accelerated its development and production of UAVs in the face of its continuing fight against the country's outlawed Kurdistan Workers Party (PKK) as well as its now-concluded 'Euphrates Shield' operation in northern Syria.

Turkey is known to highly value the capabilities of UAVs for monitoring and targeting PKK fighters in the protracted insurgency in the country's southeast, with an armed Anka likely being developed for this role. The Anka decision may also be due to the failure of the US Congress to authorise a longstanding Turkish request for the purchase of four MQ-1 Predator and two MQ-9 Reaper UAVs.

An armed Anka-S UAV completed a successful test on 8 March, Isik told local TV channel TGRT in an interview on 9 March, adding that testing of an armed Hurkus basic trainer aircraft will be completed this month.



A screenshot taken from a Baykar video of the release of a Roketsan SMM from a Bayraktar TB2 UAV on 17 December 2015. (Baykar Makina)

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"Turkey has made a great success in the fight against terror with armed UAVs," he added, apparently in reference to the extensive use of local manufacturer Baykar Makina's tactical UAVs in the southeast.

In 2015 Baykar Makina dropped ordnance from a UAV for the first time, making Turkey one of only a handful of countries to have indigenously designed an armed UAV. The Bayraktar TB2 UAV

(also known as the Bayraktar Block 2) dropped a Roketsan Smart Micro Munition (SMM/Mini Akilli Mühimmat: MAM) on 17 December that year. The Bayraktar TB2, a tactical medium-altitude, long-endurance (MALE) UAV, is in service with the Turkish Army.



A modified version of the Anka-A UAV made its operational debut on 5 February 2016, flying a four-hour sortie over the eastern Anatolian town of Elazig: an area that is close to the Kurdish-dominated southeastern region of the country and the Syrian border. (TAI)

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Turkey's military is on track to receive its first series-produced Anka-S UAV sometime this year. The Anka-S is fitted with additional capabilities above and beyond those of the two Anka-A and single Anka-B prototypes already built by TAI. All 10 Anka-S aircraft ordered in October 2013 are due for delivery by 2018.

Unlike the earlier prototypes, the Anka-S will be fitted with a satcom system to extend its control beyond line of sight.

In a joint release at the end of December 2016 TAI and SSM stated: "The Anka-S will be controlled via satellite [satcom Turksat 4B]. Plus more than one Anka-S [can] simultaneously be controlled beyond eyesight via satellite through an Operation, Simulator, and Training Center [OSEM]."

The Anka-S is billed as having an 18-hour endurance and a service ceiling of 23,000 ft. The Anka-B, meanwhile, is cited as having a 24-hour endurance and 30,000 ft service ceiling.

"Basically, the Anka-S has been developed to have the capability of being controlled via satellite and via the Turkish Armed Forces Communications Systems, but independent of distance. In particular, with its mission range reaching to thousands of kilometres due to its control via satellite, the Anka-S will enhance the TSK with strategic capabilities as well as add value," TAI stated.

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