Typhoon Profile: ECRS Radars Introduce Electronic Attack Functionality

Editor's note: The May issue of JED features an EW profile of the Typhoon multirole fighter. The article below covers a specific aspect of the Typhoon's radar upgrade program.

The Euroradar consortium—comprising the UK and Italian businesses of Leonardo, Hensoldt in Germany and Spain's Indra—has been working with Eurofighter for over two decades to define a new generation AESA multi-mode radar to replace Typhoon's current Captor mechanically scanned radar. Following a series of technology maturation and demonstration activities, and development of the export baseline Captor-E AESA system, the overarching European Common Radar System program in 2020 crystalized a roadmap that has set out to satisfy the respective operational requirements of the Eurofighter partner nations along twin tracks.

Under this plan, Captor-E has become ECRS Mk 0; Germany and Spain are pursuing an upgraded ECRS Mk 1 evolved from the Mk 0; while the UK is funding a substantially different multifunctional ECRS Mk 2 to meet the specific needs of the RAF. What is noteworthy to *JED*'s readers is that both ECRS Mk 1 and Mk 2 will embody EA functionality alongside traditional air-to-air and air-to-surface radar modes.

Hensoldt (as design authority) and Indra are developing ECRS Mk 1 under contract to Airbus Defence and Space. ECRS Mk 1 radar builds on the Mk 0 standard, but introduces a new multi-channel digital receiver and new wideband transmit/receive modules (TRMs) in the array.

According to Hensoldt, the initial ECRS Mk 1 Step 0 is basically the ECRS Mk 0 radar prepared for future upgrade

(including the wideband antenna). This will be followed by the ECRS Mk 1 Step 1 configuration which includes the new multi-channel receiver. EA functionality will be embodied via a software upgrade (the multi-channel receiver hosts all EW specific hardware).

ECRS Mk 1 is currently planned for retrofit to 110 Luftwaffe Tranche 2 and Tranche 3 Typhoons. The company is also supplying ECRS Mk 1 to equip 38 Tranche 4 aircraft being procured for the Luftwaffe under Project Quadriga. Spain is buying ECRS Mk 1 radars for the 20 new-build Tranche 4 Typhoons to be delivered from 2026 under the Halcón program, and a further 25 aircraft to follow between 2030 and 2035 under Halcón II.

Hensoldt received a € 350 million contract extension from Airbus in February 2025. This covers delivery of test systems for an Airbus A320 flying testbed D-ATRA, as well as revisions to the Mk 1 Step 1 radar system. The goal is to commence flight testing of the revised radar at the end of 2025, paving the way for installation of ECRS Mk 1 Step 1 on German Quadriga aircraft during 2027.

ECRS Mk 2, which is under development by Leonardo UK, embodies an altogether different multifunctional RF architecture that exploits research and development previously pursued under the UK's earlier Advanced Radar Targeting System (ARTS) and Bright Adder radar testbeds. ARTS began flight trials in 2007, with sorties performed in both the UK and the US; the follow-on "Bright Adder" technology demonstrator program, beginning in 2010, sought to demonstrate the integration of high-power EA techniques into the radar system.

The RAF's requirements have shaped an ECRS Mk 2 solution capable of generating high-power wideband EA effects interleaved with traditional radar functionality. To achieve these goals, ECRS Mk 2 features a new high-power multifunction array which, according to Leonardo, hosts a significantly

greater number of TRMs in the array face than comparable AESA radars. The combination of the large array and wider bandwidth will afford the pilot the ability to simultaneously task the radar to perform air-to-air, air-to-surface, EW, and EA functions.

Following a period of land-based test and evaluation, flight trials of Typhoon test and evaluation aircraft ZK355 with the prototype ECRS Mk 2 was completed from BAE Systems' Warton aerodrome in late September 2024. The prototype set combines the existing Bright Adder array with the back end from the Captor-E/ECRS Mk 0 radar. Initial flight trials were expected to complete by the end of March 2025.

Production-standard radars will introduce a new multichannel receiver, high-capacity multichannel processor, and antenna power supply and control unit to fully realize the performance of the new multifunction array and EA capability. Alongside the multichannel receiver, ECRS Mk 2 also integrates a dedicated EW receiver and an EA techniques generator developed by Leonardo's EW business in Luton.

ECRS Mk 2 is currently planned for retrofit to 40 Tranche 3 Typhoon aircraft in RAF service. Initial operating capability is scheduled for 2030. — *R. Scott*