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# GREECE'S DELTA



*'One way to respect the Mirage 2000-5 is to fly it; the other way is to fly against it...'*

*So goes the mantra of 331 Mira. Combat Aircraft flew with the squadron, taking a seat on board the most advanced air superiority fighter in the Greek inventory to fully understand the capabilities of the 'Dash Five.'*

report and photos:  
**Ioannis Lekkas**

**T**he history of the Hellenic AF Mirage 2000 dates back to 1988, when the first examples of the French-built fighter touched down at Tanagra in central Greece. The Mirage 2000 force, divided into two squadrons, 331 and 332 Mira, signaled a resurgence in Greek interception capabilities, and the fighters would provide the tip of the spear for Hellenic air defense for years to come.

Mirage 2000 pilots soon enjoyed total air supremacy over the Aegean waters, taking advantage of the Mirage's outstanding dogfighting performance, advanced weapons and self-protection equipment. Until the introduction of the AMRAAM missile on F-16 Fighting Falcon fleets on both sides of the Aegean from the late 1990s, the Mirage ruled the roost. As the French-made fighter began to lag behind its American rival in beyond visual range (BVR) engagements, the Greek government signed a contract with Dassault, Thomson-CSF, SNECMA and Matra BAe Dynamics in August 2000, covering 15 new Mirage 2000-5 Mk2 fighters and the modernization of 10 aircraft from the existing fleet. The first airframe upgraded by Hellenic Aerospace Industry made its maiden flight at Tanagra in January 2005 and the new-built fighters from Dassault began to arrive in Greece from July 2007.

When Dassault launched the Mirage 2000 in 1982, its designers introduced a robust airframe with excellent maneuvering capabilities, a fly-by-wire system (the very first to enter operational service in a military jet), a very reliable avionics suite with a groundbreaking autopilot system, and the Magic 2 dogfight missile. The French manufacturer then redesigned the avionics to bestow multi-role capabilities on the fighter. The Mirage 2000-5 Mk2 employs the RDY2 radar, ICMS-2000 Mk3 electronic warfare suite, the MICA air-to-air missile in both EM and IR versions, and a totally redesigned, fully 'glass' cockpit. The tactical advantage enjoyed by Greek Mirage pilots in earlier years has now been reinstated. As 331 Mira executive officer, Maj Stefanos Abouleris says of the Mirage 2000-5: 'The key element that gives us enhanced capabilities in the air superiority role is the integration of the weapon system: radar, self-protection suite, MMI (man-machine interface), MICA missiles and airframe performance are integrated together, generating an invincible shield.'

The reward for the hard work by 331 Mira personnel in bringing the squadron to operational status came in December 2009 when NATO evaluators granted the unit 'mission capable' status within NATO's Deployable Forces (DF). Assessed in the air



# DEFENDERS



superiority role, the squadron achieved an 'excellent' grade during 10 days of tactical evaluation at Tanagra.

## Air superiority and QRA

Assigned air superiority as its primary role, 331 Mira commences its aircrew training with defensive counter air (DCA) and offensive counter air (OCA) scenarios. Sorties include air combat maneuvering (ACM) and air combat tactics (ACT) exercises, which together constitute the majority of the squadron's flying program. Visiting the courses offered by the Hellenic AF Fighter Weapons School at Andravida, 331 Mira aircrew build confidence in air-to-air engagements as they participate in composite air operations (COMAO) with other Greek squadrons, practicing dissimilar air combat training. Pilots of 331 Mira are

quick to point out the advantages that the Mirage 2000-5 Mk2 offers. In particular, the enthusiasm of the younger pilots is evident. 'The performance of the RDY2 radar supplemented by the early warning capability of the ICMS in the air-to-air arena is surely superior to any system flying in this part of the world', says Lt Nikolaos Georgiou.

The 'Dash Five' owes its air defense prowess mainly to remarkable radar performance in conjunction with its MICA missiles. Capable of detecting 24 aerial targets, the RDY2 can lock on to the eight that represent the greatest threat, and determines launch parameters for four radar-homing MICA EM missiles simultaneously. Target prioritization is carried out automatically, although the pilot is able to intervene in the target evaluation. Raid assessment is another important feature

that becomes critical in DCA missions when the combat air patrol assets operate within a COMAO package. Although Hellenic AF Mirage 2000 doctrine does not anticipate air-to-ground operations — with the notable exception of SCALP and Exocet missile release — the RDY2 retains the ability to track aerial targets while in an air-to-ground mode, minimizing exposure to aerial threats.

In the BVR arena, pilots benefit from the two different versions of the MICA missile: the active radar-guided ER, and the heat-seeking IR version. Using an infra-red seeker, one might expect the MICA IR to be of limited utility in longer-range engagements. Although designed as a high off-boresight

*'Our radar/self-protection suite along with the MICA missile gives us the potential to engage several targets before they enter close in. The MICA either in the EM or in the IR version is always a fearsome BVR weapon with a high probability of kill'*

**Lt Col Ilias Panagopoulos**

Above left: Flying low over wild Aegean coastal scenery, the Mirage excels in aerial combat at low altitudes and low speeds.

This photograph: 331 Mira is unique within the Hellenic AF as the only squadron equipped with 25 fighters, ensuring a high number of sorties generated every day.



dogfight missile, the MICA IR's seeker and motor offer very useful BVR capabilities.

'The IIR (imaging infra-red) MICA version is capable of engaging BVR targets with the benefit of approaching undetected, unlike all other radar-guided missiles that give significant warning of their lock on', explains Maj Achilleas Arseniou. 'The missile's lethality is ensured by excellent maneuvering performance due to the thrust-vectoring engine along with the imaging sensor that is impossible to deceive with known countermeasures'. Loaded with four MICA EM and two MICA IR missiles, the Mirage 2000-5 Mk2 is thus considered to be armed with six genuine BVR rounds. There is no restriction on the combination of MICA versions carried, providing the tactical commander with the flexibility to conduct different air operations.



*'From the very first moments we realized that the 'Dash Five' features a unique man-machine interface suite... The situational awareness that the 'Dash Five' provides the pilot is just out of this world!'*

#### **Maj Ioannis Vasilakis**

The 'Dash Five' incorporates a pilot-friendly MMI suite that allows the crew to monitor only the desired parameters in terms of flight or combat conditions. In the modern air-to-air arena, data fusion is one of the most difficult problems for the crew to resolve. With the considerable radar detection ranges, the flow of information from the electronic warfare and datalink systems can saturate the pilot's workload. The Mirage 2000-5 Mk2 takes on this load and filters the information to the flight crew through the Modular Data Processing Unit. Using technology lifted directly from the Rafale, Dassault introduced a Head-Level Display (HLD) along with the three multi-function displays (MFDs). The HLD provides the pilot with immediate information from the various sensors, radar or targeting pods. Another significant element is the autopilot system taken from the Airbus A330 series, which takes control of the flight profile when pilot workload becomes an issue. The level of sophistication in the autopilot system can make the difference in air combat, and Dassault has a long history in the adoption of crew-friendly autopilots.

Maj Ioannis Vasilakis flew the 'Dash Five' during the acceptance program: 'From the very first moments we realized that the 'Dash Five' features a unique man-machine interface suite. The cockpit is designed to take up the workload from the pilot in task-saturated situations. Dassault consulted front-line pilots of the Armée de l'Air and used their experience in the design of the cockpit features, ending up with three MFDs, the head-up display and the radar/sensor display.



The situational awareness that the 'Dash Five' provides the pilot is just out of this world!

Lt Col Ilias Panagopoulos, 331 Mira commanding officer from May 2009 until April 2010, highlights another feature of the new fighter that is of vital importance in modern warfare: 'No matter what kind of sensors or weapons a fighter employs in combat, no matter how powerful the engines or how much fuel it is capable of carrying, there is a parameter that few fighters fulfill with satisfaction. Aircraft combat survivability is a measure of the survival possibility of the airframe during its combat cycle. It concerns the turnaround times, the ability to operate from unprepared runways, the ability to absorb punishment, and the value of the fighter's tactical weapons system. In the Mirage 2000-5 Mk2, the small radar and optical signature, the excellent RDY2 and the ICMS-2000 Mk3 performance build



Top: One of the key strengths of the 'Dash Five' is its ability to carry six BVR missiles in both electro-magnetic and IR versions.

Above left: A 331 Mira pilot walks around his jet after a sortie from Tanagra. Traditionally the center of Greek interception duties, Tanagra gives Mirage 2000 pilots the chance to experience real-life scrambles from the beginning of their operational careers.

This photograph: Mirage 2000 pilots spend most of their flight time over water, around the hundreds of small islands of the Greek coastal region.



a strong situational awareness potential resulting in a high prospect of survival. The rigid airframe has proven quite capable of taking punishment, ensuring the survival of the crew'. Another feature that contributes to enhanced survivability is the datalink system. With datalink, each pilot in the formation has an uninterrupted flow of information along with a clear picture of targets locked on by the rest of the formation. Furthermore, with the SEG-53 standard the Mirage 2000-5 would be able to launch missiles with its RDY2 switched off, thus approaching by stealth, and gathering lock-on information from a higher-flying friendly 'Dash Five'.

From the very first operational deployment in the late 1980s up to the introduction of the 'Dash Five', QRA duties have always been the main concern of Greek Mirage 2000 crews. Pilots and groundcrew are required to maintain a QRA status on a daily basis, from both Tanagra and the remote islands defending Greece's eastern borders. As in the 'legacy' airframe, the time from shelter to taxi is low — typically half that of comparable US-built fighters. Usually flight crews are on five-minute alert, staying close to their aircraft, and frequently dropping to a two-minute alert that forces pilots to strap into their jets ready to start the engines. This procedure can be very exhausting for the crews, especially during the summer period when temperatures on the airfield rise above 35°C. The Mirage 2000-5 Mk2 marked its operational debut over the Aegean in June 2008, when two jets departed Tanagra to assume readiness duties from a remote island base.

### Long-range attack

With the introduction of the SEG-52 software state, the 'Dash Five' is now capable of performing as a swing-role fighter. The Hellenic AF decided to add the stand-off

SCALP-EG missile to its inventory, although it excluded from the contract any targeting or reconnaissance pods. The squadron's long-range attack mission relies on the fighter's ability to operate as a swing-role platform, without any compromise in its primary air superiority role. 331 Mira is therefore the sole Hellenic AF squadron capable of attacking strategic-value ground targets with the SCALP-EG.

The SCALP-EG is a 1,300kg weapon armed with a 450kg BROACH (Bomb Royal Ordnance Augmented Charge) warhead capable of penetrating more than 5m of reinforced concrete. Prior to the mission, location data is loaded onto the weapon for both primary and secondary targets. The missile takes advantage of its Microturbo TRI turbofan engine to reach a cruising speed of Mach 0.8, while navigating terrain at low level for more than 200 miles to the pre-selected target via GPS, INS and TERPROM. TERPROM (Terrain Profile Matching) consists of a ground-proximity warning system that incorporates stored digital elevation data combined with navigation system and radar altimeter inputs to determine the precise location of the missile. Final target acquisition is accomplished by the IIR sensor, capable of autonomous target recognition. As a stand-off weapon, the SCALP-EG enables Mirage pilots to fly in safe zones outside the enemy's anti-aircraft systems, leaving combat air patrols as the only threat. Aerial threats can be confronted without any form of escort during a SCALP mission, as the 'Dash Five' retains its full air-to-air potential with a load of six MICA missiles. The destructive power of the SCALP means it is capable of neutralizing the enemy's strategic assets, such as powerplants, factory complexes, bridges and command centers.

Another key issue is the ability of the airframe to land with the SCALP and a full MICA load. This provides the tactical

commander with significant flexibility in terms of mission planning. A SCALP mission can be launched from anywhere on Greek territory, from established mainland bases to the remote airfields of the eastern islands, and even in Cyprus, further extending the weapon's operational range. The 'Dash Five' and SCALP-EG combination is regarded as a true force multiplier, as squadron commander Lt Col Georgios Kiriakou highlights: 'SCALP-EG is the definitive weapon to enforce air power. The potential deterrent of the missile will discourage any foe.'

### Prospects

The Hellenic AF is now considering expanding Mirage avionics capabilities to SEG-53 level. Among others, this will enable the full employment of the datalink system, allowing communication with the Hellenic AF's airborne early warning platforms, and integration of the Exocet anti-ship missile that is already in use with the 'legacy' Mirage 2000 squadron, 332 Mira. In a four-ship formation, weapons release would be possible from any fighter that received target information from a higher-flying fighter. 'Dash Five' flight crews would also certainly appreciate the advantages offered by the introduction of night vision goggles, and the cockpit is already fully compatible with these systems. Night vision aid systems are of vital importance in modern warfare and any future Greek procurement program is likely to take this into serious consideration. An even more ambitious proposal would involve an upgrade program to bring all the remaining Mirage 2000EGM/BGM aircraft up to 'Dash Five' standard, allowing the deployment of two such squadrons.

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