

# FLY MAG

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## PROTECTING THE BALTIC STATES

What happens in the event of loss of communication once in the air? Or what are the actions after violating restricted airspace or flight without proper transponder?

### JULGRANSFLYGNING

In a way to celebrate that Christmas is coming the Swedish Air Force has a tradition of flying around the country.

### ALWAYS THE FIRST

Dirk Jan de Ridder visits the fire-fighting specialists of 359 MAEDY of the Hellenic Air Force.

### HAWGSMOKE 2018

Between October 17-20 the 2018 edition of Hawgsmoke took place at Whiteman AFB. Ivan Voukadinov reports from Missouri.

The first edition of 2019 looks back at Christmas last year, with the Julgransflygning of the Swedish Air Force, as well as looking into the legendary Hawgsmoke exercise, Baltic Air Policing and much more.

We hope you like the magazine - enjoy!

## THE MAGAZINE

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In the year that it celebrates 50 years of existence and 35 years of operating the M-18 Dromader, Dirk Jan de Ridder visits the firefighting specialists of 359 MAEDY of the Hellenic Air Force.

04

### HAWGSMOKE 2018

Between October 17-20 the 2018 edition of Hawgsmoke took place at Whiteman AFB in Missouri, hosted by the resident 442nd Fighter Wing. Ivan Voukadinov reports from Whiteman AFB.

14

### JULGRANSFLYGNING - THE CHRISTMAS TREE

The month of December is a synonym for Christmas and the holidays. In a way to celebrate that Christmas is coming the Swedish Air Force has a tradition of flying around the country.

26

### PROTECTING THE BALTIC STATES

What happens in the event of loss of communication once in the air? Or what are the actions after violating restricted airspace or flight without proper transponder?

34

### CLOSING GAPS

In November 2017, Vice Admiral Mike Shoemaker stated that nearly one in three Hornets was non-operational awaiting serious overdue maintenance. How do you close this kind of gap?

46

### IRAN AIRSHOW 2018, KISH ISLAND

Iran Airshow is an aeronautical exhibition and air show that takes place every two years on the island of Kish, in Iran and it is the most important event in the field of civil aviation in the country.

60

### HELLENIC BUCKEYE PILOT TRAINING

Almost 60 years after the introduction of the T-2 Buckeye into military service, the days are sadly numbered for this jet engined training aircraft. Peter ten Berg looks into their final operations.

74

### POLISH MIG-29 FULCRUM SURVEY

The Polish Mikoyan Gurevich MiG-29 fleet is a diverse one. This feature will give you a look into the origin and the state of the Polish Fulcrums.

84



# ALWAYS THE FIRST

TEXT & PHOTOS - DIRK JAN DE RIDDER

In the year that it celebrates 50 years of existence and 35 years of operating the M-18 Dromader, Dirk Jan de Ridder visits the firefighting specialists of 359 MAEDY of the Hellenic Air Force.



*Up to 2,500 liters of water leave the aircraft in a matter of seconds.*

*Photo by Dirk Jan de Ridder*

## Always the first - 359 MAEDY

The 359 MAEDY (359 Moira Exipiretisis Dimosion Ypiresion, Public Services Air Support Unit) was established in 1968 and initially operated ten Bell 47 crop dusting helicopters from Elefsis air base, located to the west of Athens. The unit moved to Tatoi air base, on the northern outskirts of Athens, in 1970. Exactly fifty years on after its establishment, and after operating C-47 Dakotas and Grumman G.164 Ag-Cats in the same role, the unit currently operates 22 PZL M-18 Dromader aircraft, three of which are M-18BS twin-seater training aircraft.

During the Cold War, they were the only aircraft manufactured in a Soviet country and operated by a NATO air arm. Thirty single seaters were delivered in 1983, but the aircraft's attrition rate clearly shows the dangers of aerial firefighting. Five aircraft were lost in the first three years, plus four more by the turn of the century, so they were supplemented by the three twin-seaters to improve training, in 2002.

The 359 MAEDY is not the only firefighting squadron of the Hellenic Air Force. For a very short period, it also operated CL-215 Scoopers, but they were transferred to 355 MTM to form their own squadron in 1975. Some eleven CL-215s are still flown by 355 MTM and the firefighting fleet was reinforced with the purchase of ten CL-415 Super Scoopers in 1999, seven of which are still operational with 383 MEEA based at Thessaloniki airport. People commonly think that the CL-215 and CL-415 are more capable than, say, a smaller aircraft like the M-18.

Colonel Ioannis Kaloudis, one of the unit's most experienced pilots, explains: *"The PZL [M-18] is a very misunderstood aircraft. The majority of people believe that CL-415s or helicopters are better to attack fires. Imagine we have a fire on the mainland, relatively close to the airfield and pairs of CL-415s, helicopters and PZLs take off and go to the fire at the same time.*

*What happens? The CL-415s and the helicopters have no water. The PZL can drop it immediately. The time factor is essential and the first attack is our advantage. If there is a fire in your house, do you prefer having a fire extinguisher or having to call the fire department?*

## Extensive modifications

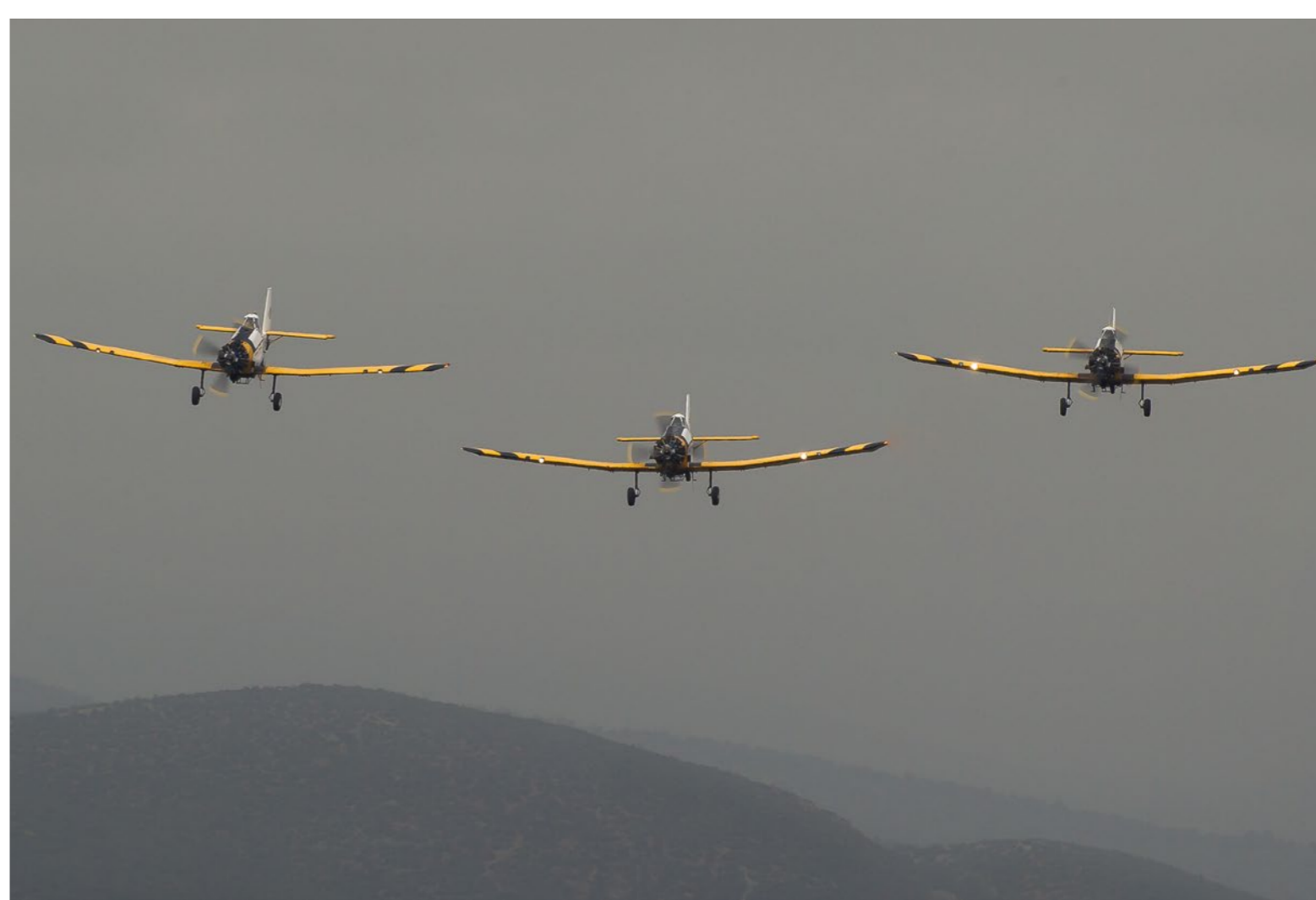
Colonel Ioannis Kaloudis, continues: *"The PZL is the fire extinguisher. The longer you wait, the more water you need to extinguish the fire. The CL-415 first has to find a calm surface of water to land on and come back. It takes 30 minutes, sometimes up to one hour. In the same time space, the PZLs will make three or four attacks.*

*Also, CL-415s and helicopters drop the water in pattern lengths. Our aircraft is really targeting the fire. We use 5 to 10 degree angles of attack with surgical accuracy at a release altitude of just ten meters. I can drop the water in a garden without destroying the buildings around it. It is a bomb of 1.5 tons [approaching the fire] with the velocity of the aircraft. The effect is the same as doing three or four water drops from 40 meters. From that release altitude, the water will be sprayed."*

During their service life, the M-18s were extensively modified. Larger wing fuel tanks were installed to double the aircraft's autonomy from about two to four hours. They also received new flaps in order to increase the aircraft's agility. Finally, a 60 liter tank was installed to add a retarding foam to the water. Pilots use a portable GPS for navigating around the country and a pair of radios to communicate with air traffic control and firefighters on the ground.

A year is roughly divided into a six-month training and recovery period from November to May and a firefighting period in the remaining months. Maintenance and other inspections are normally planned off-season, so that each and every aircraft is available during the firefighting season. The unit then abandons its homebase, by sending its aircraft in pairs to about eight airfields around the country. The exact locations vary every year, but in recent years they have included Amygdaleonas, Corfu, Epitalio, Kalamata, Kefalonia, Lamia, Lesbos, Sparta and Tripoli.

From there, they operate from sunrise to sunset. Each detachment has a large watertank, so that personnel can refill the aircraft without having to depend on support from the local airfield's firefighting department. In case it's needed, the aircraft can also be refilled directly by fire trucks. With all pre-flight checks carried out early in the morning and with water and fuel tanks filled, pilots can be airborne in about ten minutes.





*Although the M-18 is considered a dangerous aircraft to fly without the right amount of experience, the aircraft is cheap and easy to maintain, so the Hellenic Air Force sees no need to replace it. Even after 35 years of service, all 18 single seaters are typically available for firefighting missions throughout the summer season.  
Photo by Dirk Jan de Ridder*



## Prevent and extinguish fires

The unit's main goal is to prevent fires and extinguish them early on, rather than fighting against big fires. For this reason, the aircraft also carry out preventive surveillance flights with a water load when requested by the fire department. A secondary role of the unit is aerial spraying against mosquitos, but this role has diminished in importance since the amount of fires has increased in recent years and after the Grumman G-164 Ag-Cat was retired.

Fires mainly happen in the central and southern part of the country, the majority of them in August and September. Personnel are on duty at the airbase from sunrise to sunset with good conditions for them to rest and stay fit. In case of a big fire, additional personnel can be called to reinforce them. Colonel Kaloudis explains how this is centrally coordinated: *"We have a department in Athens coordinating how we combat the fires. We go first to hit the fire as soon as possible and to see if more aircraft are needed. If the fire is big or dangerous, for example because of the wind, they decide to hit the fire with CL-415s or other aircraft. They have an overview of all the aircraft available and the fires around the country."*

Last year was the worst year in a decade with the Dromaders logging well over 2,000 flying hours working on fires. He continues: *"There was a spotfire on the island of Corfu in August, some ten miles north of the airport. We took off to locate the fire area and we dropped the water. Firefighting personnel on the ground asked us to refill and make another drop. On the approach to the airport, we overflew Dafnila [a tourist area with several hotels] and everything was fine there. When we took off again, there suddenly was a big fire. The tourists at the hotels were panicking as there was no way out because of the smoke."*

## Experience is the key

Colonel Kaloudis continues: *"I told the fire department we were going to this new fire. We made twelve water drops with two aircraft. The chief of the fire department in Kerkyra [the island's capital] had already requested reinforcement because it was a big fire. A CL-415 soon took off from Andravida and landed three hours later, but the fire was already extinguished and the people at the hotels were unharmed. The PZLs did the job without any help, because we are all over the country in order to make the first attack. Eighty to ninety percent of wildfires are extinguished by PZLs or ground personnel. In the media, you only hear about the ten percent."*

You will hardly find any pilot under the age of 40 in the unit. Flying the M-18 in the firefighting role requires a lot of experience. Most pilots coming to the unit have a long career behind them flying fighter jets. Some of the senior staff have flown a variety of aircraft such as the CL-215, F-4, F-5, P-3, T-33 and even the C-47 Dakota (that remained in active service until some ten years ago).

Newcomers start their flying training on the M-18BS twin-seater with an instructor sitting in the front, because the rear seat better resembles the pilot's position in the single-seater. In perfect weather conditions the conversion training can be completed in about a month. One of the most difficult things to learn is to land the aircraft. Most aircraft require the pilot to pull the stick back during landing, but an M-18 pilot needs to push the stick forward in order to land using the front wheels. Push it too far forward though and the propeller will hit the ground causing the aircraft to crash. It is very difficult to make a perfect landing, especially because the wind has a huge effect on the aircraft.

After mastering the takeoff and landing, they will learn to handle the limits of the aircraft and they complete the course with operational training. The latter comprises carrying out water drops, all of which are solo flights. The M-18BS has a small water tank, but in practice the aircraft is so close to its maximum takeoff weight with two pilots on board that it makes no sense to use it for water drops. Various ground targets are in use and new pilots gradually build up their confidence hitting the targets with increasing amounts of water, while working their way down to an altitude of 10 meters.



## A quick drop

The M-18B has a water capacity of 2,500 liters, but the aircraft usually takes off with 1,500 liters because of takeoff weight limitations. As the plane consumes fuel and its weight reduces, the amount of water carried is gradually increased. The water tank is installed in the nose and the pilot can actually see the water level through a little window.

A full water drop takes around one to two seconds to empty from the aircraft, but the pilot also has a possibility to make a fireline which takes around 7 to 10 seconds. This is mainly used in case of smoke without flames.

Right next to the water tank is the tank with flame retardant foams. Depending on the fire, before each water drop the pilot can select to add 3, 9 or 17 liters of foam to the water. The foam is always used, except when there is only some smoke or if the fire is under unburnt trees. In the latter case with foam the water would simply not reach the surface.

## Still going strong

The unit's aircraft are getting older, but according to colonel Kaloudis this is not an issue: *"Our aircraft still have many years left. If you follow the maintenance program, the aircraft don't get old. In my personal opinion, I would like to have the Air Tractor [AT-802]. I prefer small aircraft for firefighting and it has a very good engine and better payload."*

*Air Tractors are more effective against the fire due to their load and velocity, but you have to consider the price. It is expensive. It also has another disadvantage, which is that its turboprop engine, like the CL-415, cannot fly through smoke. Our aircraft can fly through light smoke, if the pilot can see the terrain."*



# HAWGSMOKE 2018

TEXT - IVAN VOUKADINOV  
PHOTOS - IVAN VOUKADINOV, & 4AVIATION - STEFAN GOOSSENS & MICHEL VAN DE MHEEN

Between October 17-20 the 2018 edition of Hawgsmoke took place at Whiteman AFB in Missouri, hosted by the resident 442nd Fighter Wing. Ivan Voukadinov reports from Whiteman AFB.



*A pair of "Tank killers" on their way to their mark.  
Photo by Ivan Voukadinov*



## Hawgsmoke 2018

Between October 17-20 the 2018 edition of Hawgsmoke took place at Whiteman AFB in Missouri, hosted by the resident 442nd Fighter Wing. Since the first Hawgsmoke competition was held in 2000, this is now the 9th time that A-10 squadrons have gone head to head to find out who is the best at mastering the Warthog.

The roots of Hawgsmoke go back to the "Gunsmoke" competition which was held by the USAF at Nellis AFB between 1949 and 1995. Gunsmoke was an air-to-ground gunnery and bombing competition which involved many different types of aircraft. In 2000, it was reincarnated by Col. Cliff Latta as Hawgsmoke, except now it was specific only to the A-10.

The first edition was held at the Alpena Combat Readiness Training Center (CRTC) in Michigan and hosted by the 172nd Fighter Squadron. Since then it is held every two years. The various critical skills that all Hawg drivers train for and use in combat are put to the test, which includes mission planning, bombing, strafing, and use of guided missiles. It is also a very good opportunity, if not the only one, for pilots and maintainers from all A-10 squadrons to come together as a community and exchange experience while enhancing camaraderie.

The event began on October 17 with the arrival of all the participants. Each squadron sent 4-5 jets and its best pilots to Whiteman AFB, arriving in formation and landing at a specified time which they had previously committed to. The squadrons were actually scored even upon arrival, based on how close to their specified arrival time they landed.







## Twelve squadrons

The rules of Hawgsmoke state that the winner of the previous event must host the next event. In 2016, it was the 47th Fighter Squadron from Davis-Monthan AFB which won. However, the rules also state that a squadron cannot host more than twice in a row. Since the 47th FS had hosted in 2016 and 2014, the responsibility was passed on to the runner-up, which was the 303rd Fighter Squadron of the 442nd Fighter Wing.

A total of 12 squadrons made the trip to Whiteman AFB for the event. This included:

- **47th Fighter Squadron "Termites"**  
Davis-Monthan AFB, Arizona
- **74th Fighter Squadron "Flying Tigers"**  
Moody AFB, Georgia
- **75th Fighter Squadron "Tiger Sharks"**  
Moody AFB, Georgia
- **76th Fighter Squadron "Vanguard"**  
Moody AFB, Georgia
- **104th Fighter Squadron "Ravens"**  
Warfield ANGB, Maryland
- **107th Fighter Squadron "Red Devils"**  
Selfridge ANGB, Michigan
- **163rd Fighter Squadron "Blacksnakes"**  
Ft. Wayne ANGB, Indiana
- **190th Fighter Squadron "Skullbangers"**  
Gowen Field ANGB, Idaho
- **303rd Fighter Squadron "KC Hawgs"**  
Whiteman AFB, Missouri
- **354th Fighter Squadron "Bulldogs"**  
Davis-Monthan AFB, Arizona
- **357th Fighter Squadron "Dragons"**  
Davis-Monthan AFB, Arizona
- **358th Fighter Squadron "Lobos"**  
Davis-Monthan AFB, Arizona

Notably missing was the 25th Fighter Squadron from Osan, in South Korea which couldn't make the trip. Also missing were the A-10s of the 66th Weapons Squadron from Nellis AFB. Although most of the squadrons flew in with their own aircraft, the 74th used the aircraft brought by the 75th FS, the 76th FS used the 303rd FS jets, while the 357th FS flew on the 354th FS aircraft. A total of over 40 A-10s arrived in Whiteman from all around the USA.



## The opening ceremony

Traditionally, every Hawgsmoke opens with the arrival of the squadrons followed by an opening ceremony. After the opening statements, the servicemen and pilots from all the squadrons gather together to pay respect and remember the A-10 pilots who have been lost during the years in a "Fallen Hawg" ceremony. This is initiated by a 4-ship of A-10s which performs a missing man formation.

The names of all the A-10 pilots who have been lost are then read aloud as the rest of the pilots take a shot of whiskey and shatter them into a fire pit. This year, an A-10 tactical demonstration was also flown above Whiteman AFB. As the pilots and maintenance personnel prepared for the next day's shooting, the 442nd Fighter Wing had also prepared the Cannon Range in Fort Leonard in anticipation. The three main "disciplines" were bombing, strafing and missile shooting.

The range day was split up into time blocks, with one for every team. Each squadron flew a formation of 4 A-10s to bomb and shoot. As they approached the range, the first task was to destroy a simulated truck convoy with AGM-65 "Maverick" missiles. In fact, real missiles were not used and instead the inert training version known as the CATM-65 was used in conjunction with the AN/AAQ-28 LITENING targeting pod.

Simulated launches were performed with both the infrared and electro-optical versions of the Maverick and scoring was based on imagery from the CATM-65 which shows the simulated "kill" and the time. The highest score was awarded to the team which managed to destroy all the simulated targets in the shortest amount of time.

Next up was the bombing which consisted of three main profiles, and two runs of each for a total of 6 bombing runs. The three profiles were the 30-degree angle dive bomb, the 20-degree low angle low drag bomb, and the 15-degree low angle high drag pop.

Each of these has their own unique restrictions on approach angles and minimum release altitude. For example, the 30-degree dive bomb requires the pilots to release no lower than 4,500 feet.

## The competition

The 15-degree "drag pop" requires the pilots to perform a "pop-up" maneuver as they approach the target and then initiate a bombing run at 15 degree dive with release no lower than 75 feet of altitude, although none of the pilots came even close to being that low. Hits were calculated using imagery from different cameras as well as range telemetry data.

The target being an old Army truck, was bombed with 25 lb. BDU-33 practice bombs filled with white phosphorus to mark their hits. Scoring was similar to a game of golf, with the lowest score being the winner. If a bomb made a direct hit, it was counted as zero points. The further away from the target it hit radially, the more points were awarded. The team with the lowest score won this part.

Last, was the most impressive part, which of course was the shooting competition with the GAU-8 Avenger Gatling cannon, unique only to the A-10. Each pilot had 100 practice rounds to work with during their strafing runs. The first half was the long range strafe, which required pilots to shoot from no closer than 2,000 feet.

Each pilot was required to hit the target with at least 10 rounds before being able to shoot from a closer short-range distance. The goal then was obviously to put as many rounds as possible into the target. Measuring the accuracy was done acoustically, using a system of microphones located at different points around the target. Each microphone measures the sound intensity, which corresponds to how far away from it the round landed. The microphone readings are then triangulated to calculate the exact location of the hit. These are then combined to get the score.





## The winners

The following day, all the scores were tallied up and calculated with the winners announced the day after on October 20th. The results were:

- 30 High Angle Dive Bomb - Maj Aaron "Boomhaur" Bohn 76th FS
- 20 Low Angle Low Drag - Maj Ryan "Slinga" Yuengling 104th FS
- 15 Low Angle High Drag Pop - LTC Bart "Shrek" Ward 107th FS
- Strafe - Sky "Comet" Lesh 354th FS (Demo Team)
- Overall Pilot - LTC Bart "Shrek" Ward
- Overall 3rd Place Team - 358th FS "Lobos"
- Overall 2nd Place Team - 354th FS "Bulldogs"
- Top Tactical Team - 74th FS "Flying Tigers"
- Top Bombing Team - 74th FS "Flying Tigers"
- **Overall 1st Place Team - 74th FS "Flying Tigers"**

What's even more impressive is that the winners, the 74th FS, had recently completed a deployment just before Hawgsmoke, with little time to prepare for the competition. This was the first Hawgsmoke win for the 74th FS. Other units, such as the 107th FS had also recently come back from deployment.

Given these results, it is clear where to go see Hawgsmoke in 2020, as the hosts will now be the 74th FS at Moody AFB in Georgia. Capt. Randall Ott, a pilot with the 74th FS summed up what it means to the squadron:

*"We can always improve, we're always working hard to be the best pilots and close-air support team we can regardless of the event. Whether it is working with joint terminal attack controllers (JTACs) here at Moody, Red Flag integrating with a massive air picture, or Hawgsmoke, we are always learning and improving."*

*"Continuing to push ourselves home station and TDY will help us defend our title [at Moody] in 2020 and, more importantly, help protect our brothers and sisters on the ground in combat."*



# JULGRANSFLYGNING - THE CHRISTMAS TREE

TEXT & PHOTOS - SØREN NIELSEN

The month of December is a synonym for Christmas and the holidays. In a way to celebrate that Christmas is coming, as well as showcasing the air force to the societies in the areas around their bases, the Swedish Air Force has a tradition of flying around the country from four of their wings, Søren Nielsen reports from Sweden.



*The Christmas tree coming in.  
Photo by Søren Nielsen*

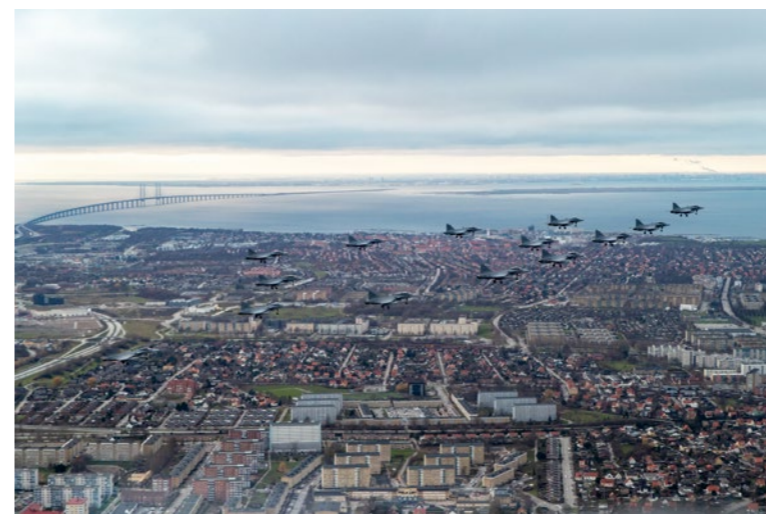
## Julgransflygning - The Christmas tree

The month of December is a synonym for Christmas and the holidays. In a way to celebrate that Christmas is coming, as well as showcasing the air force to the societies in the areas around their bases, the Swedish Air Force has a tradition of flying around the country from four of their wings, F 7 Såtenäs, F 17 Ronneby, F 21 Luleå and Luftstridsskolan at Malmen, in a Christmas tree formation. As formation lead of the 2018 Julgran (Christmas tree) formation at F 17, Squadron Commander of 172 squadron Lt Col Robert Krznic states: *"It's a nice greeting from the air force, to the civilian society. We're showing presence, and they can see what we're doing in the air - they can see the aircraft."*

The Julgran consists of multiple aircraft in a Christmas tree formation. The route from the different wings are calculated on how to reach as many people on the ground as possible, giving them the opportunity to enjoy this tradition in the sky. They make an effort of having the landing gear down during the formation, as much as possible, to represent the lights of a Christmas tree, although this limits the range of the route.

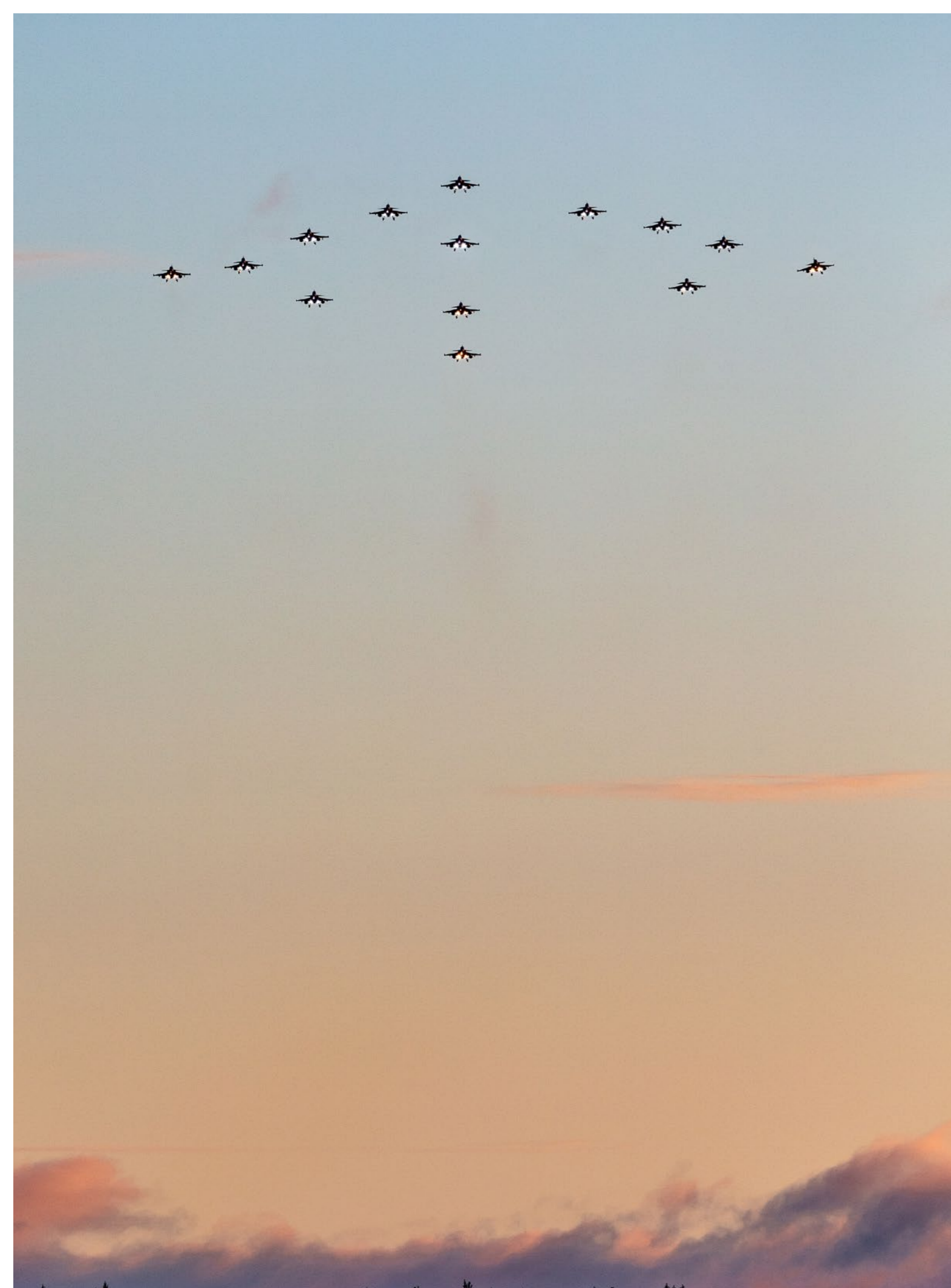
It's a common interest that continues this tradition, as the people are asking the air force for the Julgran formation, as it's a part of their Christmas experience, and the air force wants to send their Christmas greetings back to the country. As Lt Col Krznic explains: *"We have a lot of people asking us to do Julgran formation, and we think it's important to show a presence for the people, and show what we're doing, and this is also a good opportunity for us to motivate people to join the air force, or Swedish Armed Forces, and we'll have a benefit from that too."*

The 2018 Julgran formations saw three flights. One with four TP 84 Hercules from F 7, one consisting of sixteen JAS 39 Gripen from F 7, and one with fourteen JAS 39 Gripen from F 17. Keeping everyone safe is the number one priority, and the weather is always a factor when flying. Being in a formation consisting of so many aircraft is no different, which meant that the flights from Luftstridsskolan and Luleå, and a part of the F 17 route unfortunately had to be cancelled due to bad weather.









## A lot of benefits

The Julgran flight has a lot of benefits for the pilots and air force alike, as it's an unusual flying sortie that gives some opportunities that they usually don't have, making them able to train elements that are not common in their everyday flying. As Lt Col Krznic illustrates: *"We have a lot of benefits from it as well, so it's a good practice for me and the other participants in the formation. It's really good formation training for our younger pilots, as they're going to be in the formation for a long time, and it's a lot of aircraft - and that's really good."*

*It was the first time for a lot of the pilots in the formation, flying with that many aircraft - we had 14 aircraft, and we have a lot of pilots who haven't flown in such big formations before. There are usually no tactical reasons in doing it (formation with that many aircraft), but if you have the knowledge of flying in a big formation, then it'll be easier for you when you do the smaller tactical formations."*

The public just see the formation going by for a short moment, but what they don't see is all the planning and preparation for the event, something that's also a part of the mission, and a benefit for them.

Coordination with multiple airspaces, active shooting ranges, weather etc. is a big task leading up to the actual flight, as Lt Col Krznic explains: *"It seems really easy when you're on the ground, looking at the formation - the Christmas tree, thinking: 'Hey I think it looks really nice', but then you have to remember that it's a lot of planning, a lot of coordination with a lot of different people, who will talk to us in the air. We have for example some shooting areas in the route, and different airports with their own airspaces, so we had to plan a lot of things. We had to give people timings and we had weather issues because it's that time of year where the weather is not necessarily sunshine and clear blue skies."*

*So, actually, what you see in the air is one hour / one and half hours of flying, but it's a lot of planning, and that planning is really good for the squadron, especially for the younger pilots when they have to coordinate and plan a lot of things."*

## Not an every day mission

As with all missions, there are a lot of "what if"s. Having a plan for almost every outcome, such as having aircraft go tech before the flight, needing to rearrange the formation, as well as if they'll lose visual contact with each other, or bad weather that will force them to separate mid-air, is an important factor in the planning, and something the public doesn't see.

Leading up to the event required a lot of planning as Lt Col Krznic continues: *"They (the public) don't know that 4 hours prior to the flight we had a mission brief, we had a step brief, we have to coordinate with a lot of people, calling us to have us fly over them, we have to calculate with fuel, if we're going to have the gear down or up. If we were to have the gear down for the whole route, we wouldn't be able to make it all way through, as we wouldn't have enough fuel to do it. It's a lot of work, a lot of calculations just to produce this, but we're used to doing a lot of work, we're used to doing a lot of planning, but this is slightly different planning, so I think it's a really good experience for us, and especially the younger pilots."*

This year the Julgran was flown on the last day of squadron training in 2018, and marked the end of the year for the squadron, sending them on a well deserved holiday, as Lt Col Krznic concludes: *"The event - the Christmas tree, is good for us, to fly it, but also for planning and coordination. We have a lot of benefits in doing it, but I wouldn't do it everyday because we have a lot of other tactical operations / missions that we do, but it's good while we're doing it."*

*It's also very good for us to show what we're doing for younger people who think about their future - and we want a lot of people to join the air force and the armed forces. So we hope that we can attract a lot of people by doing this, by showing presence."*

The author would like to thank the entire F 17 Wing - Blekinge Flygflottilj, and especially Lt Col Krznic, Jerry Lindbergh and Capt Tommy Nilsson.

# PROTECTING THE BALTIC STATES

TEXT & PHOTOS - FILIP MODRZEJEWSKI

What happens in the event of loss of communication once in the air? Or what are the actions after violating restricted airspace or flight without proper transponder? Filip Modrzejewski answers these questions as he looks into the Baltic Air Policing.



An armed F-16 from the Polish Air Force conducting air policing over the Baltics.  
Photo by Filip Modrzejewski

## Baltic Air Policing block 49

What happens in the event of a loss of communication once in the air? Or what are the actions to be taken after violating restricted airspace or flying without the proper transponder? For sure many people already try to answer these questions... now let's add the factor that this is caused by military aircraft, so there is one correct answer – Alpha Scramble alert.

This is the time, where active duty jets are taking off in a very fast manner to intercept and identify mentioned plane as well as take the respective actions. It looks exactly the same in case of Baltic Air Policing mission, where fighters from different NATO countries are on duty 24h every day a week.

In the first quarter of this year, Baltic Air Policing mission was taken over by 4 F-16 fighters from the Polish Air Force as part of the PMC (Polish Military Contingent) Eagle 8. These jets are being stationed in Siauliai AFB in Lithuania as the “leading nation” supported by a contingent of 4 German Air Force Eurofighter Typhoons in Amari AFB (Estonia) and 4 Portuguese Air Force F-16 jets in Malbork (Poland) as the “augmenting nation”.

Polish Air Force pilots have replaced the previously stationed Belgian detachment, while from the 1st May 2019 they will be replaced by Hungary Air Force. It's worth mentioning that Poland is one of the most actively supporting countries for this NATO mission – from the beginning in 2004, they were there 8 times already with 4 months period rotations each.







## Baltic Air Policing – why and what for?

Baltic States – Lithuania, Latvia and Estonia – don't have their own fighters and are not able to maintain active duty and protect their airspace, in a so called QRA – Quick Reaction Alert. However, being part of the NATO pact they cooperate with different countries, which perform a 4 month rotation to protect the NATO Eastern Flank and Baltic Sea. The current rotation is special for all countries in terms of NATO participation – Lithuania is celebrating its 15th anniversary, while Poland is celebrating 20th anniversary in NATO.

Most of the fighters are based in Siauliai AFB which is located in the northern part of Lithuania, in the middle between Vilnius and Klaipeda. During rotations “host nation” Lithuania takes care of all the logistical aspects on the ground for all contingents. The Lithuanian Air Force has a modern airport with new buildings, hangars and ATC, as well as a modernized runway and taxiways built to the highest standards.

Whilst pilots feel at home here with the new, modern infrastructure, they also appreciate flying on detachment in Lithuania. Apart from typical flying part, both pilots and soldiers try to keep active within the local community – they organise air base visits for children and meetings with pilots/commanders in order to raise awareness for the people of Siauliai and basically maintain better public relations.

QRA flights are one of the hardest and most stressful for pilots. During such missions we should distinguish the two types – Alpha Scramble (real interception) and Tango Scramble (training flight).

Everyone who has witnessed an Alpha Scramble at least once, has the understanding of how quick actions are taken and how great everything is combined to provide the fastest response time. Usually pilots on duty are half way dressed in special sea flying suits, which are extremely helpful in case of a water landing or ejecting over the sea, as it does not allow the human body to be affected by the cold so quickly.

## Quick Reaction Alert

When a scramble alert is on, pilots will don anti-g suits extremely fast as well as collect their life vests and other necessary equipment. Then, a fast run to airplanes, which were properly checked and armed by technicians prior, quick checklist and immediate take off. Everyone knows their role, so the whole procedure does not take more than 10 minutes once the Scramble Alert has been launched.

As we've written, the most eastern of NATO's air bases are Siauliai (Lithuania) and Amari (Estonia) – both of which maintain a 24 hour watch with aircraft ready for immediate action. Coordination of flights as well as airspace monitoring are held by the Combined Air Operation Centre in Uedem (Germany) – this unit is responsible for launching Scramble jets as well as routing pilots to unidentified objects. This is the brain of whole operation, which also keeps pilots updated about every situation in the airspace around them or about changes in flightpath or flight level, etc.

Once in the air, pilots must locate the aircraft, intercept, visually identify and then escort it, while the air is in flight, in the controlled zone. QRA flights usually consist of interceptions of aircraft violating NATO's airspace or flying not according to ATC commands. In addition, flights without transponder or flight plan may also be intercepted by fighters. Most popular aircraft belong to the Russian Air Force during flights to/from Kaliningrad, however it's worth noting that these flights are usually not of the aggressive manner, more a show of force rather than a real threat. But NATO is always prepared for every scenario.

This is the reason why fighters fly with live ammunition and real rockets with characteristic yellow markings instead of blue/white ones (depending on the version). Naturally, military aviation is not the only area where BAP missions are being utilised – fighter pilots also aid civilian aircraft in case of a communication failure or even during a hijack – that's a standard procedure, where PMC Eagle 8 also fulfils its role perfectly.



*The sun is setting as these armed Vipers breaks away to patrol the sky above the Baltics.  
Photo by Filip Modrzejewski*

## PMC Eagle 8

Current the Baltic Air Policing rotation is fulfilled by pilots from the Polish Air Force as Polish Military Contingent "Eagle 8". This is already 8th time that the Poles has conducted Baltic Air Policing from Siauliai AFB, where they have gained an amazing reputation and review both among local communities as well as pilots of other detachments.

The main core of this contingent are 4 F-16C Block 52+ jets from 31st Tactical Air Base in Poznan (Poland) along with pilots and technicians as well as logistics support.

Pilots are taking rotational shifts to provide support 24/7, and as for the Poles, they are known to be very best at what they do – they are appreciated both by Lithuanian pilots as well as ones from other countries. Interceptions and scramble alerts are quite popular in this area, so they definitely have hands full. Polish F-16s intercept many types of aircraft – from transport planes like IL-76 to fighters like Su-27 or Su-30, where all the scrambles are always made by a pair of aircraft.

The Polish Air Force will end its rotation at the beginning of May, while their place will be taken over by pilots from the Hungarian Air Force with 4 JAS 39 Gripen aircraft.

## Lithuanian Air Force's L-39s

Taking a look at the pictures done during training flights over Lithuania one may also notice colourful Aero L-39 Albatros jets with military markings. These are light fighter aircraft leased in by the Lithuanian Air Force from the Baltic Bees Jet Team to train their pilots and keep their flying skills honed.

## Private contracts

Lithuania's budget is not enough to purchase new aircraft and maintain a bigger fleet active, hence this option is much more preferable by the LAF.

In the past the Lithuanian Air Force had 2 L-39s of their own, but due to the high cost of modernization and maintenance, their airworthiness wasn't extended. Besides this, Lithuanian pilots are really experienced and formation flying comes second nature to them – both during photo flights and as well as normal training flights.

Unfortunately, these pictures here are probably some of the last of the L-39s with Lithuanian Air Force markings. In April this year the contract signed with the Baltic Bees Jet Team was terminated, and it probably won't be extended. In this case, the pilots will be re-certified for helicopters or transport aircraft, so we could say that these images are history in the making.

There is no doubt that the Baltic Air Policing mission is required. NATO's Eastern Flank is an important aspect of the defense system as well as a flight route for many aircraft, so the presence of fighters in these countries is invaluable.

Currently, interceptions or QRA flights are performed a few times a week, so pilots can not complain about a lack of tasks. In the future, it will probably stay the same way, which proves that BAP missions should still carry on.



# CLOSING GAPS

TEXT - PATRICK ROEGIES, PAUL GROSS, JURGEN VAN TOOR  
PHOTOS - PATRICK ROEGIES, PAUL GROSS, JURGEN VAN TOOR & RICHARD RIGBY

In November 2017, Vice Admiral Mike Shoemaker stated that nearly one in three Hornets was non-operational awaiting serious overdue maintenance. How do you close this kind of gap?



*The ground crew and pilots are in working together to get the airplane started up for the next mission.  
Photo by Richard Rigby*



## Closing gaps

The war against terrorism has put an enormous strain on the United States Naval Aviation Super Hornet operational employability the last few years. This resulted in an actual aviation readiness crisis in the aftermath of the war on terror. A major maintenance backlog presented itself and the Navy has been working intensively to decrease the number of Super Hornets marked as “non-mission capable”.

In November 2017, Vice Admiral Mike Shoemaker stated that nearly one in three Hornets was non-operational awaiting serious overdue maintenance. Later that same year the U.S. Navy secretary stated that only one-third of the more than 546 Super Hornets within the operational inventory of the U.S. Naval fleet was mission capable and considered fit for deployment.

The non-fit for deployment Super Hornets were in the process of maintenance, awaiting maintenance or were assigned to the training squadrons since the condition of the aircraft allowed the aircraft only to be used for training purposes.

During the “low-point” of the crisis unusual measures were deemed necessary. To meet the requirements of the planned deployments for the 2018 carrier strike groups of the USS Carl Vinson, USS Nimitz and USS Theodore Roosevelt, a total of ninety-four Super Hornets had to be submitted to overdue maintenance at the Naval depots. The Navy is struggling to close the readiness requirements gap and is developing a project(s) to prevent similar situations in the future.

With the crisis in progress, the delivery of factory new Super Hornets is still in full swing, with the Hornet production line to remain open until at least 2025. In March 2018 Kuwait ordered twenty-two F/A-18E and six F/A-18F and the U.S. Navy ordered an additional ten Super Hornets, on top of the fourteen already purchased aircraft in fiscal year 2018. The 2019 defence budget will comprise the acquisition of 110 additional Super Hornets to be delivered between fiscal years 2019 and 2023.

## Super Hornet developments

Although all operational active Naval fighter squadrons have completed their conversion to the Super Hornet during 2018, and the decommissioning of Carrier Air Wing (CVW) 14 in March 2017, reducing the number of active Carrier Air Wings to nine, a requirement for the delivery of additional Super Hornets is deemed necessary.

With the decommissioning of one Carrier Air Wing, one squadron VFA-15 “Valions”, already operating the Super Hornet was decommissioned on 12 June 2017. The VFA-15 Hornets were reassigned to the remaining squadrons. The decommissioning of CVW-14 however only marginally decreased the strike fighter availability gap.

Another reason of the operational readiness gap is the result of the increase in the Carrier Air Wing (CVW) deployment durations, which have been increasing from 2011 onwards. From an average of 6.4 months between 2008 and 2011 increasing to 8.2 months between 2012–2014. The average duration of a deployment over the three carrier air wings in 2015 was approximately 9 months.

All these reasons combined with the continuing high operational strain have affected in an extended time required for maintenance to deal with the wear on the aircraft. Also the training program for pilots that have not experienced an actual deployment has been delayed as an effect of the increased operational tempo. Additional budget is requested and allocated in order to deal with those challenges.

The requirement received a higher priority due to the delayed Initial Operational Capability (IOC) of the F-35C Lightning II which confronted the United States Navy with an increased number of operational readiness gaps. As a result, several operational Legacy Hornets were submitted to a severe refurbishment program, to extend their operational lifetime. This was the main reason a budget request funding was requested from fiscal year 2017 onwards to bridge the gap between the older Legacy Hornets and the F-35C Lightning II.





## Situation appraisal

With the current knowledge that the war against terrorism resulted in a heavily “crippled” Super Hornet availability, the U.S. Navy completed a situation appraisal, to get an as accurate as possible actual root cause analysis for the situation that became apparent. Besides the high up-tempo and the strain on the aircraft and aircrews, economic restrictions, as an effect of budget cutbacks also played a vital role.

Early 2017, the Navy provided Boeing with two carefully selected Super Hornets, possessing the highest amount of flight hours, to facilitate the situation appraisal, and gain an understanding of the “to be expected” scope of works overhauling the Super Hornets. It also provided Boeing with an opportunity to determine if the condition of these aircraft were according to their expectations based upon and developed through modelling, simulation, and physical torture testing of various components.

One of the two Super Hornets the U.S. Navy provided to Boeing for the situation appraisal process was carefully analysed and the findings were better than expected. In October 2017 Boeing completed the situation appraisal and concluded that no severe deviations compared to their simulated expectations were detected and the airframes and components were in a far better state than expected.

## Getting on top SLAP and SLEP

The Super Hornet design specifications stated an operational lifetime of 6000 flight hours. Currently the earliest delivered Super Hornets have reached the 35 percent hours limit. If this amount of flight hours is extrapolated to the planned service life of the Hornet to 2035, this will not be sufficient to meet the operational commitment expectations.

Since this was partially anticipated the development of a Service Life Assessment Program (SLAP) commenced in 2008 and comprised a three-phased program. The development of this program was completed in early 2018.

## Depot Readiness Initiative

The main purposes of SLAP is to assess the feasibility of extending the current Super Hornet operational service life from 6000 flight hours to 9000 flight hours. It is based on actual data, used to analyse the effect of the current use and resulting state of the aircraft. The analysed data will be compared with structural test data. Subsequently a Service Life Extension Program (SLEP) should effectively result in the actual prolongation of operational service lifetime of the aircraft until 2035.

Three stages have been defined to assess each individual airframe. During the first stage the airframe is assessed, including the flight controls including and all integrated subsystems and is already completed. The second stage is analysing the data derived from the assessment. The results from this stage will be the basis for the SLEP specifying the modifications and necessary inspections to maintain and ensure airworthiness. The third stage is carrying out the defined work as assessed in the analysis.

The first Super Hornet that was SLEP overhauled to extend the aircrafts operational lifetime commenced in 2015. Work was carried out by Boeing. An increasing number of aircraft are currently in the process of entering stage 2 and stage 3. On an annual basis forty to fifty Super Hornets are submitted to their specific SLEP in the Boeing facilities at St. Louis and San Antonio. Hornets that have been earmarked as “worst condition aircraft” will be submitted to this program with priority.

In May 2018 the Defence Logistics Agency awarded a five-year contract to Boeing, budgeted at 427 Million USD annually and comprised the delivery of required spare parts. This meant the starting point to work through a reasonable backlog of Hornets due for maintenance. The program was referred to as the “Depot Readiness Initiative” and the main purpose of the program was to drastically decrease the number of non-mission capable Hornets. As a result of this program, during 2018 the operational employability situation slightly improved to 50 percent. By early August 2018 it was reported that 241 aircraft were fully mission capable and by the end of August the number of mission capable aircraft improved to 270 aircraft.



A line up of F/A-18F from VFA-122  
Photo by Richard Rigby

## The Blue Angels

In 2018 U.S. Naval Air Systems Command (NAVAIR) also awarded a 17 million USD contract to Boeing for the conversion of 11 existing Super Hornets for the Blue Angels. The contract comprised the retrofit documentation and kits for nine F/A-18E and two F/A-18F aircraft in accordance with engineering change proposal 6480.

The retrofit will be carried out in the St. Louis facility and is planned to be completed in 2021. The Blue Angels received their first Hornets in 1986 and operated all variants of the Legacy Hornet.

## Legacy Hornets last leap

The U.S. Navy retired most of the Legacy Hornets from operational deployment, as the F-35C nears operational status. The last Legacy Hornet cruise took place on the USS Carl Vinson and was completed on 12 March 2018. The last squadron operating the F/A-18C was VFA-34 "Blue Blasters" and started their conversion to the F/A-18E Hornet upon their return.

On 01 February 2018 the last Legacy Hornet operations took place at NAS Oceana where VFA-34 was the last squadron to exchange their Legacy Hornets for Super Hornets. The role of the Legacy Hornet within the U.S. Navy however is not yet completed as it will continue service with the Naval Aviation Warfighting Development Center (NWADC) at NAS Fallon and in reserve squadrons. The first F/A-18C models entered service in 1987 and cost 29 million USD each.

It was concluded that 136 mainly F/A-18D aircraft that reside within the U.S. Navy and U.S. Marine Corps could be authorized to be struck off charge. This decision has been taken because their effective technical lifetime has exceeded, and it would require significant funding to extend their service life as a result from refurbishment and refit programs.

The decision to withdraw these aircraft from use was mainly based upon the readiness risk, long term operational costs to keep the aircraft combat capable, versus the gain in capability compared to the Super Hornet.





### Withdrawal of the Delta

By withdrawing the F/A-18D from use and putting them in long term storage the aircraft can also be used to keep the Legacy Hornets in use within the U.S. Marine Corps. This by using parts and sending the best of breed aircraft to the U.S. Marine Corps operational squadrons. In March 2018 the U.S. Navy revealed that the 136 selected F/A-18D aircraft will be sent to the AMARG at Davis Monthan to serve as parts donors for the remaining Legacy Hornets within the U.S. Navy and U.S. Marine Corps.

On 17 January 2019 however Raytheon received a purchase order to supply a total of 84 U.S. Marine Corps Legacy Hornets with new APG-79 version 4 Active Electronically Scanned Array (AESA) radar. This radar system is similar to the application implemented in the Super Hornets and is according to the U.S. Marine Corps 2018 Aviation Plan. The delivery of the first modernized Legacy Hornets is planned for delivery in 2020 and will continue until 2022, as a temporary measure to keep the Legacy Hornets combat capable until they will be replaced by the F-35B aircraft.

The U.S. Navy also stated their plan to use the parts to keep the remaining Legacy Hornets within the inventory of the U.S. Navy operational until they are replaced with the Super Hornet. It is planned that four squadrons will make their conversion to the F/A-18 Super Hornet by the end of 2019.

On 6 March 2018 the plan to strike the F/A-18D from the operational inventory between fiscal years 2017 and 2020 was approved by the U.S. Navy.

### Transferring the Legacy Hornets

According to the U.S. Marine Corps 2018 Aviation Plan the service operates 180 Legacy Hornets divided over active, reserve and training squadrons. Additionally, there are another 100 Legacy Hornets besides the 2018 Aviation Plan that are all submitted to heavy maintenance.

From 2017 onward however more than 50% of all Legacy Hornets within the operational inventory of the U.S. Marine Corps were not in operational capable status and therefore not mission ready. Supplementing the shortage in available Hornet resources the U.S. Marine Corps received 30 legacy Hornets from the U.S. Navy that already had been stored in at AMARG in Davis Monthan. These were returned to active service within the operational squadrons. The struggle to keep an increasing number of aircraft in operational status however continues.

The F/A-18D aircraft will subsequently be replaced by the F-35B Lightning II. Since the U.S. Marine Corps did not select the Super Hornet as an interim solution to close the gap between the full swing delivery of the F-35 and keeping the Legacy Hornet fleet operational is creating severe problems. Unfortunately, the development challenges and delays in deliveries of the F-35C Lightning II have slowed the process of replacing the Legacy Hornets for the new fifth generation fighter into the operational squadrons. According to current expectations the U.S. Marine Corps plans to operate the Legacy Hornets until 2030 until the aircraft will be retired.

The hand me down aircraft could be a major boost to the U.S. Marine Corps. Depending on whether the U.S. Navy has completely stripped the retired aircraft of useful components, those donor airframes could continue the support Marine Corps Hornets as well. The deciding factor will be how fast the U.S. Navy can transition its own units and transfer the Legacy Hornets to the U.S. Marine Corps Squadrons.

On 1 March 2018, Boeing stated that the initial service life extension program contract (SLEP), worth up to \$73 million, to begin the overhaul of four Navy Super Hornets was received. The company says it will open a production line at its San Antonio, Texas plant specifically for this program in 2019.



## Remaining on top of things

Boeing will combine this traditional service life extension work with the Block III upgrades, as well, to try and streamline the integral process. The new separate configuration will include infrared search and track capability, conformal fuel tanks, updated electronic warfare systems, a larger widescreen cockpit display, an improved mission computer, and data links with greater capacity to send and receive information.

Starting up the program Boeing estimates the combined upgrade process will take approximately 18 months per aircraft. However, by gaining experience and efficiency Boeing expects to decrease the required modification time to 12 months as the facilities at San Antonio come on line and they work through any residual issues. The first four airframes will serve as an important trial run and both Boeing and the Navy have been working together since 2017 to get a better understanding of exactly what the process will entail.

The two parties are eager not to repeat the issues they experienced with an earlier service life extension effort for older F/A-18C/D Hornets that started in 2012. That project suffered extensive delays. This was caused by attempting to do the work as an extension of normal less intensive depot-level maintenance. The program hit a number of unexpected issues, including discovering more extensive structural wear and tear and corrosion than expected, as contractors actually began pulling the planes apart.

Besides the inventory of the crippled Super Hornet Fleet and the immediate demand for maintenance the U.S. Navy also purchased an additional 110 Super Hornets in fiscal year 2019 and has awarded Boeing with a contract to start with the overhaul and the service life extension program of the existing “early” Super Hornets to the latest Block III configuration.

The two-seat Block III Super Hornet, with integrated conformal fuel tanks, an enhanced electronic suite featuring improved electronic defences, data links and other mission systems will result in enhanced capabilities of the Super Hornet.

## Block III modifications

The infrared search and track system will further improve the Hornets already powerful AN/APG-79 active electronically scanned array radar. This will enable the crew to spot adversaries at extended ranges. The conformal fuel tanks will increase the overall range without the need for drop tanks, allowing the Hornet to carry additional weapons or other mission specific equipment.

Further improvements currently in development include some limited stealth features, such as a fully enclosed weapons pod, and a more powerful, fuel efficient engine. However, these updates are unlikely to be part of the final Block III configuration.

Integrally combining the refurbishment and modification program will most probably result in a multiple phase overhaul for a yet non-defined number of Super Hornets. This might result in an extended overall overhaul time to get fully modernized jets back in for deployment service. The full-service life extension program modification kits including software will not be ready until the earliest 2022 or 2023. This means that the selected jets in severe need of new parts and maintenance before that period will only get a partial update and will have to return to the factory for the additional modifications when available.

## The path to success

It remains unclear how many of the over 546 Super Hornets currently in the operational inventory of the U.S. Navy will ultimately be put through the upgrade program. With deliveries of the newly built Block III Super Hornets the U.S. Navy intends to reduce the most imminent demands and close the gap to the desired level of operational readiness capable Super Hornets.

Independent of the final result of the program within a reasonable time the U.S. Navy will be significantly reducing its Legacy Hornet inventory. This in favour of the advanced Super Hornet operating alongside the F-35C Lightning II now slowly being integrated into the operational Navy squadrons. As a secondary result the program will also boost the Marine Corps Hornet squadrons remain mission capable until it can acquire sufficient numbers of F-35B Lightning II aircraft.



# IRAN AIRSHOW 2018, KISH ISLAND

TEXT & PHOTOS - MIRCO BONATO & STEFANO POLATO

Also known as Persian Gulf Airshow, the Iran Airshow is an aeronautical exhibition and air show that takes place every two years on the island of Kish, in Iran and it is the most important event in the field of civil aviation in the country. Mirco Bonato and Stefano Polato reports from Iran.



*A pair of Su-22M-4 conducting a flypast during the 2018 edition of the Iran Airshow at Kish Island. Photo by Mirco Bonato*

## Iran Airshow 2018, Kish Island

Also known as Persian Gulf Airshow, the Iran Airshow is an aeronautical exhibition and air show that takes place every two years on the island of Kish, in Iran and it is the most important event in the field of aviation in the country. The airshow first dates back to 2002 when 11 foreign companies including France, Russia, the United Kingdom, Ukraine, Germany, Czech Republic, Switzerland, Slovakia, Holland, Italy and Pakistan, participated.

The second edition was held in 2005 when some hundred Iranian and foreign companies made the air show five times greater than in 2002. Thanks to this remarkable success and also thanks to the repeal of the American sanctions precisely during the exhibition of 2005, it was decided to arrange another one in the following year.

From 2006 and onwards, the exhibition has taken place every two years, but the subsequent developments in the international field and the new American sanctions have drastically reduced international participation.

Also this year, it takes place under international pressure and unilateral sanctions, but it aims to strengthen the interaction among the organizations involved in the field of Iranian aviation and showcase the capacity of the nation in this region. With these premises a large number of national companies (105), as well as some foreign companies (10), have taken part in the 9th Iran Kish Airshow.

They are active in the field of aeronautics, aerospace, air transportation and other related sectors, and together with academics show a wide range of products, systems and services for the civil and military sectors. Iran is actively concerned not only on the supply of airplanes and helicopters, but also on the import of technologies for the construction of aircraft.







## An international airshow

Practically all the companies from the aeronautics industry belong to the state and are connected to the Ministry of Defense. Held from 26 to 29 November 2018 at the Kish International Exhibition Centre, adjacent to the civil terminal of the airport, it was organized as usual by the Pars Kish Aero Exhibitions Co. and was supported by Kish Free Zone Organization.

At the official opening ceremony of the exhibition lots of authorities such as the Minister of Defense and Armed Forces, the commander of the Air Force, the head of the Civil Aviation Authority, various CEOs of airlines within Iran, the head of the Organization for Cultural Heritage and Activities, the secretary of the Supreme Council for the Free Territories and many other officials in the air transport sector, were present.

Subsequently an international conference on aviation, in collaboration with the Aerospace Research Institutes and various professors of the aeronautical industry, was held. The Exhibition Centre offered a covered exhibition area of 21,000 square metres and was accessible from 09:30 until 14:00, after which all participants and exhibitors transferred to the nearby exhibition area outside to participate and attend the aerial performances that were held from 14:30 to 16:30, organized by the Islamic Republic of Iran Air Force (IRIAF).

A static display of aircraft was organized over 100,000 square metres that hosted several aircraft and helicopters representing both the army and navy of the Islamic Republic of Iran. The Kish Airshow, despite being on an island of a little more than 90 sq km - which has an estimated population of 26,000 - still attracts a considerable amount of enthusiasts and general public that even just for curiosity want to attend this event.

Even foreign participation, of the latest shows, is increasing considerably because this seems to be the only opportunity to see, up close, the military aircraft of the Iranian air force that aren't to be seen anywhere around the globe.



## The exhibition and the static

The opening of the Exhibition Centre was timely, even though not all the exhibition stands were ready, as a strong and violent perturbation the previous day had certainly compromised preparations. However, after a few hours, everything was in order and the show ran for four days without issue.

Also, for the static show, there were some delays (due to the perturbation) and some airplanes and helicopters postponed their arrival until the end of the first day of the exhibition. Apart from this there were no other disturbances during what was an otherwise smooth and functioning air show.

On the static display the first morning there were only two Pilatus PC-7B Turbo Trainers, four Embraer EMB-312 Tucano turboprops, also basic trainers but often used for light attack, a Harbin Y-12-II twin turboprop from China, a Lockheed C-130 Hercules, three HESA Saeqeh (Lightning) single and twin-seater fighters derived from the American Northrop F-5 Tiger, and eagerly awaited by all that made the trip from afar the mighty Grumman F-14AM Tomcat - a US interceptor purchased in the 1970s before the Iranian revolution and still in service today with the IRIAF.

During the morning it was possible to witness the arrival of the Latvian Baltic Bees Jet Team, with their Aero L-39C Albatros, for their second consecutive Kish Airshow. In the late afternoon, almost at sunset, aircraft was arriving from the bases on the mainland.

First, the arrival of a Mil Mi-171, belonging to the Aerospace Force of the Army of the Guardians of the Islamic Revolution (AFAGIR) followed by an ASH-3D of the Islamic Republic of Iran Navy (IRINA). Last to arrive, and accompanied by an Ilyushin IL-76 of the Russian Strizhi (Swifts) Aerobatic team were Mikoyan-Gurevich MiG-29 and MiG-29UB Fulcrums.

Amongst the additional arrivals during Tuesday morning was another Harbin Y-12, which was placed straight into the static display and an Antonov An-74 - both of which brought in staff and representatives to the exhibition. By 14:00 the gates to the base were opened to the general public and people were admitted to the static display, and later could witness the flying display.







### The opening

The opening of the program included the launch of a dozen paratroopers from the Harbin Y-12-II and then, as soon as the last one had landed, two visiting Sukhoi Su-22M-4 in a very striking two tone green/brown camouflage performed several fly-bys.

These two aircraft are part of a larger number of aircraft that Iran received in 1991 after the outbreak of the Iraq war when Iraqi pilots had been given orders to desert and escape to neighboring countries in order to save the aircraft, but the aircraft have never been returned. Returning to the airshow, after the Sukhois, three Embraer EMB-312 Tucano took off to perform various close passes to each other and then it was the single display of the Pilatus PC-7B Turbo Trainer, showing off its aerobatic talents.

After the landing of the Pilatus, two HESA Saeqeh of the IRIAF took off and exhibited a very close pair formation in perfect "Couteau Delta" style.

### Irani uniqueness

One of the surprising characteristics of this plane, in addition to the power and manoeuvrability similar to the Northrop F-5, was a whistling which warns of its arrival, even before any real engine noise is heard, and quite comparable to the whistling of the Junkers Ju-87 Stuka during a bombing dive. Of relevance, Iran is the only nation to operate the Saeqeh and according to some sources have 30 aircraft on strength.

Subsequently there were displays from the other assets of the IRIAF, with some changes over the following days of the show.

On Monday the display consisted of three McDonnell Douglas F-4D/E Phantom IIs and two Grumman F-14AM Tomcats, which flew together for a while before splitting and performing separately.

Tuesday saw the tanker/transport Boeing 707 joining the show, while on Wednesday it was replaced by the heavier Boeing 747. Following these a Lockheed C-130 Hercules dropped three wooden parachute-pallets simulating the supply of ground forces without landing.

Finishing up, the public could enjoy the two aerobatic teams; first the Baltic Bees and then the Russians Swifts, in warm light as the sun descended on to the horizon. Apart from the perturbation on Sunday, the weather had contributed to the success of the exhibition and resulted in two beautiful, sunny days, slowly clouding over for the remainder of the show.

The 10th edition of the Kish Airshow, in 2020, will also take place on this beautiful and welcoming island, the pearl of the Persian Gulf.



# HELLENIC BUCKEYE PILOT TRAINING

TEXT & PHOTOS - PETER TEN BERG

Almost 60 years after the introduction of the T-2 Buckeye into military service, the days are sadly numbered for this jet engined training aircraft. Peter ten Berg looks into the final operator of the type.



A lineup of the last active T-2 Buckeyes of the Hellenic Air Force.  
Photo by Peter ten Berg

## Hellenic Buckeye pilot training

Almost 60 years after the introduction of the T-2 Buckeye into military service, the days are sadly numbered for this jet engined training aircraft. Main operator of the type, the US, retired the aircraft out of its naval pilot training in 2008. The US Navy then continued to use a few Buckeyes as chase aircraft for weapon training with VX-20 at Patuxent River Air Station, until the final flight of the type in 2015.

The Venezuelan Air Force, who had 12 T-2s operational for approximately 16 years, had already withdrawn the type earlier than the US navy, namely in 1999. The last world-wide operational T-2s can now be found in Europe with the 3rd and final user of the type: the Hellenic Air Force. As the Greeks are in the process of finding a replacement, the days of the last flying Buckeyes are numbered. The internal debate for its replacement is likely to reach a critical phase, after 2 Buckeye crashes last year (2018).

## Greek history

The career of the T-2 in the Hellenic Air Force started about 42 years ago. Greek military aviation was undergoing a metamorphose in the seventies, when a large modernization took place by buying A-7 Corsair II, F-4 Phantom II and Mirage F-1 aircraft. Consequently a new jet engined aircraft was needed for pilot training and in 1974 a contract was signed for delivery of 40 T-2E Buckeyes. The aircraft entered service in 1976 at Kalamata Air Base, at the south side of the Peloponnesus peninsula in Greece.

Now in 2018, the type is still based at Kalamata within the 120 Air Training Wing. Here we meet Hellenic Air Force (HAF) Colonel Christos Petalas, current base commander of the 120 Air Training Wing. Colonel Petalas still active on the T-2, evaluating instructor pilots and overall more than 4,500 flying hours including F-4E Phantom II, explains the concept of Greece military pilot training. The Greek pilot training format is built around the training syllabus with four separate phases.

## Pilot training phases

Phase I is about further screening of the student pilots and takes place at Deklia-Tatoi AB and for which the Cessna T-41D is used of 360 squadron. Currently the squadron is transiting over to the newly acquired Tecnam P2002JF. According to the agreement, the delivery of the 12 new trainer aircraft should have been finalized by last December.

For Phase II the students move to the base of Colonel Petalas, Kalamata, where they receive initial and basic training on T-6A Texan II aircraft. Kalamata has 2 Air Training Squadrons (Mira Ekpedefsis Aeros – MEA) with Texans, namely MEA 361 “Mistras” and MEA 364 “Pelops” and here the aspiring pilots will fly a total of 110 flying hours plus 40 simulator sorties.

Jet engine flight training on the T-2E Buckeye is included in the “Advanced” Phase III. The T-2’s are part of the other 2 squadrons of the 120 ATW, namely MEA 362 “Nestor” and MEA 363 “Danaos”. This part of the course counts 60 flying hours on the Buckeye added with another 25 simulator sorties. The following and final “Operational” Phase IV is also taking place at Kalamata AB. Again on the T-2 Buckeye, the trainees will make 60 flying hours on mission types covering air-to-air and air-to-ground. For simulator sorties, 15 missions are added in this phase.

Students will run through the 4 phase academic and flying training course of the Hellenic Air Force Academy in 4 years and then continue with an assignment in a fighter squadron. There is also a possibility that they get an assignment in the Hellenic Transport Command for heavy transport aircraft. In this case an extra course is applicable after the completion of the basic training course and includes another 30 sorties on the T-6 Texan II.

The 120 ATW has approximately 60 instructor pilots of which 1 is female flying on T-6. Most of the instructors usually have a three years tour moving from fighters. The Hellenic Air Force Academy has approximately 50 cadets annually who attend the academic and flight training course.









### The Buckeye in Greek service

From 1976 40 Buckeye “E” models entered the Hellenic military service. The T-2E model was an export variant of the US Navy operated T-2C, especially for the Hellenic Air Force. Ever since the T-2 has been the backbone for Greek pilot training. During its career in the HAF, 7 T-2s were written off due to accidents.

Last year 2 crashes took place; the first occurred on January 3rd when a T-2 crashed only 2 miles south of Kalamata after a reported mechanic/engine failure. The 2 man crew was able to eject safely from the aircraft. The latest crash, which occurred on August 28th had more impact, as it involved the loss of life of one of the 2 crew members.

The T-2 was on a training mission and performing a spin exercise. Both crew members ejected, resulting in the death of squadron leader Major Nikolaos Vasileiou. The cause of the crash is still under investigation. Although there were only a few crashes during the operational life of already 42 years in the Hellenic Air Force, it is assumed that currently only around 5 T-2 aircraft are operational. The majority of Greek Buckeyes are stored because the air frame ran technically out of flight hours or has become a source for spare parts.

Although in non airworthy condition, you can still find them parked along the flight lines of the air base, which gives an impressive sight of this beautiful aircraft of the previous century. Through the years Kalamata also received more than 10 former US Navy T-2C aircraft, which are mainly used for their spare parts.

### The Buckeye in Greek service

Talking with Captain Divaris, Chief of T-2 maintenance, he makes it clear that the former US Navy aircraft are very important for the remaining operational HAF Buckeyes. This is the only source of spare parts as no more new parts have been produced since the US Navy ceased T-2 activities. Captain Divaris says that it is an advantage that the T-2 has such a strong airframe and the two J85-GE-4 engines are rather small and easy to control.

Nevertheless the maintenance crew has to adapt a creative and flexible attitude to maintain the ever decreasing T-2 force. Under the given circumstances they do a great job and succeed to have enough aircraft available to fulfill flying training requirements. Maintenance on the T-2 has several repetitive phases like a weekly and a monthly phase for general aircraft condition.

More thorough is the 250 flight hours or 224 days phase (first of the 2 indicates the start of maintenance) and in-depth maintenance (depot level) is indicated at 1,800 flying hours - or 5 years.

Several years ago the Hellenic Air Force started the process of replacing their ageing T-2s which are close to the end of their serviceable lives. Furthermore, a new modern trainer would better connect to HAF front line fighter aircraft like the block 30/50/52 F-16s and their announced future upgrade to F-16V “Viper”, as well as the upgraded Mirage 2000s.

Another future advantage would probably be less consuming hours of maintenance on a new airframe versus the amount currently on the T-2. As no budget could be released for the funding of new trainer aircraft, a decision for a new trainer remains still on hold. Nevertheless, the replacement of the aged T-41, also on hold for years due to budget constraints, was released as of 5 July 2018.

A contract was signed to replace this aircraft by Tecnam P2002JF aircraft. This could indicate that there’s a new situation within the Hellenic Air Force which could also have a decision on the T-2 Buckeye trainer replacement. Time will tell.



## AMI cooperation

The Hellenic Air Force and the Italian Air Force (Aeronautica Militare Italia – AMI) have maintained a close partnership for the past ten years, cooperating in pilot training. The implemented cooperation makes it possible for Italian students to follow the training course at Kalamata and fly on Greek T-6 Texan II aircraft and for Greek cadets to fly their training phases on AMI MB-339 aircraft of the 61 Stormo based at Lecce AB, Italy. The agreement makes a smooth continuation of HAF pilot training somehow more flexible in relation to the pending decision of replacing the declining fleet of the iconic T-2 Buckeye.

## Next step for graduates

Once graduated at the Hellenic Air Force Academy, the new pilots find their way towards the several fighter units flying the F-4, F-16 and Mirage 2000. We talk further at Tanagra Air Base with 331 squadron (Mira) deputy commanding officer and Mirage 2000-5 pilot, Lieutenant Colonel Vasileios Tsantilas. New pilots arriving at the 114th Combat Wing can be assigned to one of the two Tanagra based squadrons, namely 331 Mira (Mirage 2000-5) or 332 Mira (Mirage 2000B/E).

Lt.Col. Tsantilas explains that a new pilot has to pass an additional program of approximately 60 sorties to successfully join the squadron. 1st phase includes about 8 sorties which are basically focused on learning the aircraft. Although appearing simple, experiencing taking off in a Mirage 2000 compared to a T-2 is completely different and must be trained and all skills have to be acquired before going to the 2nd phase. This phase teaches the pilots how to fight and use their aircraft as a combat tool. Lt.Col. Tsantilas describes this as a kind of “Initial Operational Capable-IOC” pilot stage, which is followed in the same schedule with additional training to come onto the final stage, where the pilot becomes “Combat Ready”.

331 Mira, popularly called the “Aegean Deltas”, flies the modern Mirage, namely the fully digital glass cockpit 2000-5 version. This type differs from the B/E version in 332 Mira on radar, armament/missiles and a weapon system which is linked to a network. According to Lt.Col. Tsantilas, who flew the B/E version before, the newer technology in the Mirage 2000-5 requires a different mindset of the pilot.

## Only national training

There are a lot of sensors in this aircraft and it is essential to learn to find and manage them in the system. The main mission of the squadron is Air Defense, for which the unit rotates in a Quick Reaction Alert-QRA schedule according the Greek National Defense Plan. An additional role of the squadron is Strategic Attack for which 331 Mira is equipped with SCALP missiles (the French variant of the Storm Shadow missile). Sister squadron 332 Mira has besides the QRA task, an additional role in Anti Ship Warfare for which they can be armed with AM-39 Exocet missiles.

331 Mira has about 20 pilots including 3 young pilots currently engaged in the squadron course. The squadron has also some HQ based senior officers, who fly occasionally in the squadron. Although there are female pilots in the HAF, at this moment 331 Mira has only male pilots. Despite the training wing at Kalamata having foreign pilots temporary assigned, the fighter squadrons of the HAF do not participate in any foreign exchange pilot programs.



# POLISH MIG-29 FULCRUM SURVEY

TEXT & PHOTOS - PATRICK ROEGIES, PAUL GROSS, THEO VAN VLIET & HANS ANTONISSEN

The Polish Mikoyan Gurevich MiG-29 fleet is a diverse one. This feature will give you a look into the origin and the state of the Polish Fulcrums.



*A Polish MiG-29UB.  
Photo by Hans Antonissen*

## Introduction

The Polish Mikoyan Gurevich MiG-29 fleet is a diverse one. A number of the Fulcrums in operational use were originally acquired as new aircraft directly from the MiG-MAPO factory.

The larger part however got acquired from other air forces which considered the MiG-29 as surplus aircraft. The Polish air force received a number of MiG-29s from the Czech Republic which had been operated in the Czechoslovakian Air forces prior to separation to the Czech Republic and Slovakia.

The MiG-29s received from Germany were initially delivered to the German Democratic Republic (Lufstreitkräfte/Nationale Volks Armee)LSK/NVA) and after the reunion of both Germanies they were integrated in the operational structure of the German Air Force (Luftwaffe). This article describes the history of the Polish Air Force MiG-29s and their previous owners.

## Czechoslovakian Fulcrums

The Czechoslovakian Air Force received its first Fulcrums in 1989. A total of 18 single seats and 2 dual seat Fulcrums were delivered. The MiG-29s were assigned to the 11 SLP based at Zatec airbase. Only shortly after their arrival Czechoslovakia was peacefully divided in two independent states being the Czech Republic and Slovakia. The MiG-29s were equally divided over the two newly born states

The Czech Republic formed 2 new squadrons in a newly formed wing 1 SLP based at Ceske Budejovice. The Czech Republic only operated the MiG-29s for a short period before they were stored at Ceske Budejovice and subsequently offered for sale. The government of the Czech Republic choose to upgrade a total of 30 MiG-21s.

Israeli Aircraft Industries (IAI) received the order to carry out this upgrade program. Amongst others a new radar had to be integrated, the navigation system would be improved and the possibility to carry modern western weapon systems had to be integrated. A total of 24 MiG-21MFs and 6 MiG-21UMs were updated and would be assigned to LOK at Kbely.





## German Fulcrums

The premiere of the MiG-29 in East Germany took place in 1986 when the first Fulcrums were delivered to the Soviet squadrons permanently deployed in East Germany as support on behalf of the Warsaw Pact treaty. The first regiment to receive the MiG-29 was the 33 IAP based at Wittstock airbase.

The German MiG-29s were delivered when the two Germanies were still divided - East and West. It was only two years later on March 12, 1988 that the first four MiG-29As of the LSK/NVA bound for East Germany and flew in to Preschen airbase near Cottbus, signifying the start of a new era for the East German air force. These next aircraft followed in quick succession by means of another eight single-seaters and three MiG-29UB two-seaters. In May 1988, 3rd Fighter Wing (or JG-3 = Jagd Geschwader 3) "Vladimir Komarov" commenced flying operational missions as the first foreign air force within the Warsaw Pact. A total of 20 MiG-29A (production type 9.12) and 4 MiG-29UB (Production type 9-51) were assigned to JG-3.

It was planned to equip all three squadrons of JG-3 with the MiG-29. The newly built MiG-29 replaced the MiG-21 which served within JG-3 until then. It was also planned to equip JG-2 at Neubrandenburg Air Base with the MiG-29. The reunion of the both Germanies in the early nineties made this expansion of the MiG-29 fleet unnecessary.

The NVA MiG-29 Fulcrum A were able to carry 2 nuclear weapons. This task was never practiced in exercises however, because the MiG-29 was assigned to the air defence roll. Between then and German reunification, 1 and 2 Squadrons were deployed on "constant readiness for action" the Warsaw Pact equivalent of NATO's Quick Reaction Alert, QRA. All necessary electronics and avionics built in for the nuclear task were removed after delivery.

The identification system PAROL was removed shortly before the reunion of both Germanies for secrecy reasons. The MiG-29A (izdelye or production number 9.12) of the NVA were equal to the Russian MiG-29s when they were delivered. The Russian MiG-29s however were upgraded to the standards of izdelye 9.13 where the NVA MiG-29s remained as izdelye 9.12 standard.



## The former East German Air Force

On 03 October 1990, the future was somehow unclear. Because of the reunification all aircraft of the NVA/LSK were added to the inventory of the Luftwaffe. The Luftwaffe put a large number of aircraft types of the aircraft inherited from the NVA inventory in storage awaiting their fate. The Luftwaffe Command however choose to continue operational flights with the MiG-29s, as one of the latest fighter aircraft from the Soviet MiG factory.

It had a key role to play in the functional requirements for the Eurofighter development program, which was being specified at that time. It therefore seemed appropriate to carry out a thorough investigation of the capabilities of the MiG-29.

In the former East German Air Force the “Fulcrums” were assigned to JG-3, and were reassigned to “Test and Evaluation Wing MiG-29” within the Luftwaffe. Two single-seaters and two two-seaters were transferred to Manching for a test programme at the hands of the German Armed Forces Test and Evaluation Centre (WTD 61), and another four single-seaters took part in a series of training flights and Air Combat Training (DACT) in Wittmund in March 1991, home of the F-4F ICE (Improved Combat Efficiency) Phantoms of JG 71 “Richthofen”.

A month later six German Fulcrums were deployed to Decimomannu, Sardinia for the first NATO exercise air combat training missions against a variety of jets from other NATO nations. The MiG pilots were aided by their helmet-mounted sight, which at that time was unique, to fire R-73 missiles at targets at angles of up to 75 degrees to the side and thus to take many opponents by surprise. This resulted in a loan to the USAF for eighteen months of testing.

A completion report was drafted after the test and evaluation period and was submitted to the German Defence Minister, Gerhard Stoltenberg. Finally he came to a decision on 25 July 1991: the MiG-29s were to remain in service with the Luftwaffe for another twelve years.

## The NATO upgrades

To adapt the Fulcrums to the standards prescribed by NATO for use in NATO air space, all 24 aircraft were upgraded by DASA to MiG-29G standards between 1991 and 1995. The “ICAO I” package as the modification was referred to included the following items:

- TACAN navigation system
- IFF (identification friend or foe) system
- SIF (Selective identification facility)
- Modernization of avionics up to NATO standards
- New VHF/UHF radio equipment to replace the old UHF equipment
- Emergency radio equipment
- Anti collision lights
- Cockpit labelling and displays changed from Russian to English
- Paint was changed from a green – green – brown to a grey – grey scheme.

The aircraft were also to be registered within the Luftwaffe. The former NVA serial would disappear on the intake of the aircraft and initially got a place in the fin tip of the aircraft. During this time the aircraft still flew in their original camouflage schedule. After the new grey camouflage schedule was introduced the former 3 digit serial within the NVA had disappeared.

After this modification programme the single-seater “Fulcrum” was referred to as the MiG-29G (for “Germany”), and the trainer Fulcrum as MiG-29GT (for “German Trainer”). On 1 June 1993, the unit lost its “test and evaluation” status and was renamed JG 73.

In this newly formed Wing (or JagdGeschwader in German) former East German Pilots and JG 71 Phantom pilots that had completed their conversion training operated the Fulcrums. From that moment the MiG-29 was always standby on QRA (quick reaction alert) in Preschen.







## Phantoms of the Luftwaffe

In the opinion of Luftwaffe Command in the long term plan Preschen, close to the border with Poland, was not a suitable home for the newly formed unit. An alternative location was searched and found in the north-east of Germany. The airbase Laage near Rostock was to become the new home of JG 73. Laage had been used by the NVA to operate the Su-22 fighter bombers and the airbase was suitable for the MiG-29. From 1997 this squadron also operated a number of F-4 Phantoms in order to fly air combat training missions with and against the MiGs.

These F-4Fs were mainly provided by the JBG 35 squadron that was based at Pferdsfeld and was recently disbanded. In October 1994, the relocation operation began, and on 15 December the last aircraft left Preschen. In February 1995, the fighter wing was assigned to NATO, and "National Quick Reaction Alert" became "Quick Reaction Alert". The German MiG-29s were the first Fulcrums to join the NATO forces.

Training missions were flown in exercises with most of the NATO partners but the most frequent sparring partners were the F-4F's from their sister squadron, which, formed out of the two flying squadrons of ex-Fighter Bomber Wing 35 in Pferdsfeld, moved to Laage in June 1997. JG 73, the new merged unit, was given the tradition-steeped name "Steinhoff" on 18 September 1997.

Up to the "Phantom Phly-out" in March 2002, JG 73 was the only unit of jets in the Luftwaffe to have two different operational types. On exercises, the two types would frequently fly as a "tactical pair" so as to combine their advantages – the F-4F in air combat at long distances and the agile Fulcrum in dogfights.

## No air-to-air refuelling

There was also an interest by the USAF to test and evaluate the capabilities of the MiG-29. The MiG-29 however was not equipped to be able to perform air to air refuelling. To overcome the lack of an air-to-air refuelling capability and enable the jets to cross the ocean, the ICAO II programme was designed to improve its long-range navigation and extend its range.

Between 1996 and 2000, seven single-seaters were upgraded. Two underwing tanks, each holding 1,150 litres of fuel, combined with the auxiliary fuselage tank increased its action radius to over 1,850km which was a 100% increase of the action radius the MiG-29 had with internal fuel tanks. By adding a centreline tank this action radius could be increased by another extra 550 km. In addition, a GPS satellite navigation system was integrated into the avionics suite.

Finally, in the autumn of 1999, six MiGs were deployed via Scotland and Greenland to North America, where they took part first in ultra low-level flying training of Luftwaffe pilots in Goose Bay, Canada and then in the US Air Force's Red Flag 2000 edition 1 exercise at Nellis Air Force Base, Nevada. Here the Luftwaffe's Fulcrums adapted the aggressor simulating the part of enemy forces.

For cost reasons, many of the MiGs did not get the promised 1300-hour workshop overhaul. Following the decision to hand the jets over to the new NATO partner, Poland, to help it build up its strength. The Polish Air Force was already equipped with the MiG-29 and showed interest in the German MiG-29s. The Polish Air Force already received a number of the surplus Fulcrums of the Czech Republic.





## More modernizations

The Polish Air Force received its first MiG-29s in 1989. The initial delivery received from the MiG-MAPO factories included 9 MiG-29A and 3 MiG-29UB. The MiG-29 was assigned to the 1.plm wing at Mińsk Mazowiecki northeast of Warsaw. The MiG-29s were to replace the MiG-21 which was the backbone of the Polish air defense at that time.

In early 1992 the conversion was completed and the MiG-21 remained operational until the arrival of the MiG-29s of the Czech Republic. During the years the Polish air Force MiG-29 fleet expanded due to acquiring additional aircraft.

Only 2 years later after the initial delivery and conversion were completed in 1993 the Polish Air Force received a total of 10 MiG-29s from the Czech Air force originally delivered to the Czechoslovakian Air Force. With the delivery of the extra 10 MiG-29s the total of the Polish Air Force got up to 22 of which 4 were trainers. The second delivery took place in January 1996 and contained the following aircraft.

After the arrival of the Fulcrums received from the Czech Republic the entire Fulcrum fleet was upgraded by WZL-2 at Bydgoszcz in order to make them compatible with NATO operations. During this program the aircraft were repainted in an attractive new grey colour scheme.

The Fulcrums were modified by WZL-2 in Bydgoszcz receiving the following systems:

- Rockwell Collins ANV-241MMR VOR/ILS
- AN/ARN-153 (TCN 500) TACAN
- Trimble 2101AP GPS receiver
- Thompson-CSF SB-14 radar warning receiver
- Polish made Radwar SC-10 Suprasl IFF
- Unimor-Radiocom RS 6113-2 VHF/UHF radio with new R-862 control panel
- New anti-collision lights
- New "NATO" two-tone gray camouflage
- GPS, TACAN and VOR/ILS systems were integrated with the aircraft navigation system via TGR-29A interface)

## German Fulcrums turn Polish

16 fighters of 1. ELT squadron (former 1. PLM squadron) were operational in this standard while the rest of the aircraft were put in storage.

After the arrival of the Czech MiG-29s in 1996 the MiG-21s were reassigned to other squadrons and the older MiG-21 types were flown to the Polish Air Force storage facility at Mierzecieze. From this point forward 1. elt based at Mińsk Mazowiecki northeast of Warsaw was only operating the MiG-29.

The next delivery of Fulcrums to the Polish air Force followed in 2003 when the German Luftwaffe sold its MiG-29s to Poland. These were originally MiG-29s delivered to the German Democratic Republic (GDR) and after the reunion of both Germanies taken into the active inventory of the German Luftwaffe. These Fulcrums have been upgraded by DASA when they were in operational use by the German air Force.

Upon delivery the aircraft flew to WZL-2 for an overhaul at Bydgoszcz, however four were already delivered to 41. ELT at Malbork following a limited overhaul. These aircraft entered service in 2007 and were assigned to the 41. Eskadra Lotnictwa Taktycznego (41. ELT) based at Malbork . The Fulcrums replaced the older MiG-21 aircraft.

The former German MiG-29s delivered to the Polish Air Force were in very bad shape. The Polish Air Force maintenance facility WZL-2 based at Bydgoszcz decided that only 14 aircraft of the 22 Fulcrums received were to be assigned to the active squadron 41 ELT at Malbork (15 TCAO I conversion and 7 TCAO II conversion). In 2006 about 10 Fulcrums had passed the "Kurpie" upgrade program which was a joint venture between MiG-MAPO and WZL-2.

With this update the airframe lifetime was extended until 2015. The avionics were upgraded into a standard comparable with the MiG-29s from 1 ELT. The only remaining exception was the navigation systems already installed on the ex-German Fulcrums. All the Fulcrums that have been received by 41. elt have all been submitted to the "Kurpie" upgrade program.





### Extended lifetime upgrade program

The 1. ELT MiG-29s have also been submitted to the airframe lifetime extension program, equal to the Fulcrums that preceded them from 41. elt aircraft with the purpose to realize one standard of the MiG-29 within the Polish Air Force. The Polish Air Force is planning to use the MiG-29 until 2025.

By the time the “Kurpie” upgrade program was completed both active squadrons 1. ELT and 41. ELT were expected to operate 18 aircraft each of which 14 single and 4 dual aircraft.

The extended lifetime upgrade program extended the upgrade of the following avionics:

- Rockwell Collins ANV-241MMR VOR/ILS
- AN/ARN-153 (TCN 500) TACAN
- Trimble 2101AP
- GPS receiver
- Thompson-CSF SB-14 radar warning receiver
- Polish made Radwar SC-10 Suprasl
- IFF and Unimor-Radiocom RS 6113-2 VHF/UHF radio with new R-862 control panel, -new anti-collision lights
- New “NATO” two-tone gray camouflage

(GPS, TACAN and VOR/ILS systems were integrated with the aircraft navigation system via TGR-29A interface). Aircraft of 1 ELT already have received the avionics upgrades (the airframe overhaul is planned later), 41 ELT aircraft receive both the avionics and the airframe upgrades simultaneously.

In 2011 another modernization program was submitted to further upgrade the MiG-29 aircraft. This order however comprised the modernization of only 16 MiG-29 aircraft instead of the entire fleet. The purpose of this modernization program was the digitalization of the aircraft management system, achieving the standards as set by NATO and improving the data management system available to the pilot. This would extend the technical and operational lifetime of the Fulcrums for another 10 -15 years, mainly since the Polish Air Force did not have a designated successor for the MiG-29.

By 2014 the upgrade of the MiG-29 fleet was completed by WZL.2 (Military Aviation works number 2) completed the modernization of 16 MiG-29 Fulcrum aircraft.

### A joint venture

The modernization program was a joint venture between WZL.2 and the company Israeli Aerospace Industries (IAI). The modernization included the implementation of modern avionics, advanced mission computers and a NATO compatible communication suite. On 4 November 2014 the final MiG-29 was delivered to 23 Air Base Minsk Mazowiecki where all the modernized Fulcrums were assigned to 1. elt.

The actual changes included a inter alia, installation of a two-band radio, better positioning system and modernized aerodynamic computer. The new avionics suite is equipped with a MIL-Std-1533B data bus, mission computer which facilitates mission planning and post-flight analysis. However, the change which was the most visible is the new data visualization system, consisting of a 5”x4” MFD and modern HUD display in the cockpit.

The Polish Armament Inspectorate has also started a market analysis within the scope of equipping the aircraft with IFF Mark XIIA systems, which would be compliant with the latest NATO standard - “mode 5”. This would be a follow up upgrade for the aircraft already upgraded.

### Legendary 303 Squadron

A number of Fulcrums bear on top of the fuselage the emblem of the 303 squadron, a legendary unit of the first hour, consisting of Polish pilots who fought at the British Royal Air Force during the Second World War. In addition, many jets are provided with the portraits of these pilots.

### The future

Although it has been rumoured that the MiG-29s were to be replaced there are currently no concrete plans for this. A study was to be started in 2017 but no concrete conclusions have been presented until recent. There are currently no active plans to acquire fifth-generation aircraft that would eventually replace the MiG-29 Fulcrum aircraft, currently operated by the Polish Air Force alongside the F-16s.

The decision has recently been postponed by the leadership of the Polish Ministry of Defense and it is currently planned to have the MiG-29 in operational service until 2022-2025. This means that for the foreseeable future the MiG-29 will remain the backbone of Poland’s air defence.

## THE NEXT ISSUE OF FLYMAG MAGAZINE

The next issue of FLYMAG will be published in June of 2019. FLYMAG reports from the one of the Swedish Air Force Fighter Wing, F 17 Blekinge Flygflottilj, and shines lights on the life of the Swedish Fighter Pilot, as well as the legendary EA-6B Prowler has had its sunset flight, Ivan Voukadinov looks into the last operations of the USMC, and more.



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