



EXERCISE NORTHERN EDGE 2017

NE17 saw 6,000 personnel, and approximately 200 aircraft participating, from U.S. military units from both the continental U.S., the Pacific.

RF-4 PHANTOM SPECIAL

HAF retired its RF-4E Phantom. We look closer to both the HAF retirement as well as the RF-4 in general.

EXERCISE COPE TIGER '17

The largest multilateral aerial exercise in the Southeast Asia region was conducted in the form of Cope Tiger 2017.

CROATIAN FIREBOMBERS

Dirk Jan de Ridder and Menso van Westrhenen spent a week with the pilots of the Croatian Air Force Fire Fighting Squadron.

We're looking into the reconnaissance of the mighty Phantom, with the retirement of the Hellenic Air Force RF-4, as well as reports from different exercises around the globe amongst other.

We hope you enjoy the magazine - Happy reading.

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EXERCISE INIOHOS 2017

TEXT & PHOTOS - PAUL VAN DEN HURK

The largest joint medium scale air exercise in Greece, named INIOHOS 2017, took place from March 27th until April 6th 2017. Paul Van Den Hurk report from Greece.



A mix of nationalities, an UAE Air Force F-16 taxiing, and another F-16, this time from HAF, taxiing behind it, and an Israeli IAI/G550 AEW&C in the back. Photo by Paul Van Den Hurk



INIOHOS 2017

The largest joint medium scale air exercise in Greece, named INIOHOS 2017, took place from March 27th until April 6th 2017. Since 2015 both NATO allies and partner nations are invited by the Hellenic Air Force (HAF) to train on different realistic air warfare scenarios in challenging environments.

The event is hosted and led by the Air Tactics Center (ATC) based at Andravida airbase, under the supervision of the General Staff of the HAF in Athens. The main goal is not only to establish and maintain joint readiness and good interoperability on air warfare, but also to build a learning curve for all the military involved to improve the effectiveness of international air operations and electronic warfare.

Greece is the perfect place for hosting these kind of exercises: Its rough terrain, its mountains, the Aegean Sea and the islands offers a great diversity of landscapes with no densely populated areas. Ideal to simulate all kinds of air warfare scenarios.

For the INIOHOS 2017 edition forces from Italy, United States of America, United Arab Emirates and Israel joined forces, alongside the Hellenic Forces. Israel and the United Arab Emirates have no formal diplomatic ties.

During the media day took place on March 29th the Greek minister of Defense, Mr. Panos Kammenos, emphasized the importance of the exercise also to build better and stronger relationships between the participating nations. Especially the geo political theatre and the threat of terrorism can undermine peace and stability in the region.

“Act with awareness”

Besides the Hellenic General Staff, ambassadors from UAE and from the USA were attending the INIOHOS 2017 presentation, as were military attaches from Italy and Israel. Also Cyprus and Egypt are seen as allies in order to create an ‘Arc of stability’. Therefore this international exercise will send a common message to the world, Mister Kammenos stated.

This article will focus on the INIOHOS combined air operations that were flown out of Andravida airbase, although the scale of exercise was much bigger in a vast area. E.g. deploying paratroopers into simulated enemy territory, surface to air missile (SAM) training, aerial refueling, etcetera

The HAF detached 4 jets per fighter squadrons to Andravida for the exercise, except the 110th Combat Wing at Larisa airbase as they apparently didn’t participate. The 114th Combat Wing at Tanagra airbase sent only two Mirage 2000-5 BG aircraft to INIOHOS 2017.

A summary of the international INIOHOS 2017 participants operating out of Andravida air base:

- **United States Air Force**
93FW: F-16C
- **Isreal Air Force**
101Sqn: F-16C
105Sqn: F-16D
122Sqn: IAI/G550 AEW&C
- **United Arab Emirates Air Force**
2Sqn: F-16E
- **Italian Air Force**
132 gruppo: AMX





INIOHOS - A big exercise

Conducting an international exercise like INIOHOS 2017 is not easy. Good preparation is essential for all involved. It is not only about planning air tactics to encounter the latest threats. As not only NATO allies are involved, it is -for instance- essential to establish common ground for communication (use of English language; use of radio communication, etcetera). To adapt and integrate all the participating personnel and hardware into the NATO combat doctrine is key. Besides this, the safety of all participants has to be secured both on and off base.

After the preparation the assets and personnel were deployed to Andravida airbase. Then the combined air operations out of Andravida airbase were flown. The exercise ends with the redeployment of the units to their home bases

During INIOHOS 2017 approx 100 missions utilizing 50 aircraft were flown daily in different waves. Key asset to lead these air operations was the Airborne Early Warning and Control aircraft, in this case a deployed Israeli IAI/G550 Nachshon Aitam. It can track up to 100 targets and control a dozen attacks simultaneously.

Each day another kind of mission was flown in which the participants were divided into "Blue Force" (attackers) and "Red Force" (defending against the attackers). The missions included: interdiction of air defenses; counter air operations, air strikes against high value enemy targets (power plants, bridges, industrial compounds, etcetera) and maritime attack.

The Israeli's have experienced the importance of dealing with SAM threat during air operations over Syria. They were attacked by advanced Russian made S-300 (range 100 miles) and S-400 (range 200 miles) anti aircraft missiles.

As Greece was able to purchase a S-300 system from Cyprus in 1999, this system provides high value training for all participating forces. Also western anti aircraft systems were put to good training use as they defended airbases that were attacked by the Blue Forces.

A promising future

On April 5th the Chief of the HAF General Staff, Lieutenant General C. Christodoulou, welcomed U.S. Air Force General T.D. Wolters, Commander of NATO's Allied Air Command to Andravida airbase to exchange views concerning the INIOHOS exercise. This is seen as another example of the support for the ATC. The HAF wants to gradually expand the ATC at Andravida airbase during the next five years.

The aim is eventually to increase the number of annual Fighter Weapon graduation courses on one hand and also to provide the best large scale multinational combined air operations exercise in Europe! Currently, Andravida airbase is also home to the 117th Combat Wing, equipped with two squadrons of F-4E AUP Phantom as well. If these aircraft would be relocated to another airbase, for instance Larissa (losing the RF-4E aircraft), that would create the necessary space to house more fighters that are likely to be based here in order to conduct such large scale exercises. Time will tell. However, the future of the ATC and the INIOHOS exercises look very promising as it is supported both nationally and internationally!



THE 'FIGHTING SAINTS' - VFC-13

TEXT & PHOTOS - SØREN NIELSEN

Located in northern part of Nevada, is NAS Fallon, which is the homestead of the 'Fighting Saints' of VFC-13. Søren Nielsen reports about the Saints adversary role in the Navy.



A couple of 'Saints' in their F-5 on the way back from a mission in the desert.

Photo by Søren Nielsen

The 'Fighting Saints' - VFC-13

Normally, you're in a terrible situation if you have a 'bogey' on your tail. But having the 'bogey' from the 'Fighting Saints' of VFC-13 on your tail means that - even though you might get 'shot down' during the dogfight - you'll live to fight another day, as everything is simulated giving you the experience to help prevent a similar situation with a 'bogey' on your tail in the future.

With 'Bogey' as their main radio callsign, the Saints mean business! Doing what they do best, their task is to provide the U.S. Navy with adversary training. The Saints - out of NAS Fallon, Nevada - mainly provide adversary support for the Strike Fighter Air Readiness Program (SFARP), air wing training deployments and the Topgun course, through the Naval Strike and Air Warfare Center.

LT Justin 'Corky' Pace, a F/A-18 Fleet aviator, and currently an adversary pilot flying the F-5N Tiger II in VFC-13, explains what the Saints are doing: *"We are the adversary, or red air. We try to provide a high quality product to our customer - that being the fleet aviator. Trying to give him a good presentation, based on what is asked from us."*

The Saints aren't the only part of the red air presentation at NAS Fallon, as the VFC-13 also work together with the NSAWC with both their F-16s and F/A-18s to be the red air presentation. But it's not all about being the red guy, as LT 'Corky' continues: *"90% of what we do is being the adversary. The red air presentation, the red air game plan - the red lead."*

We occasionally do close air support, for the SEALs doing work up here, and that's mostly helping them building their radio skills.

We are the low cost, easy man to do that. We don't burn a lot of gas, we are stationed here - plus its lower risk due to it all being simulated ordnance."





A F-5N Tiger with tiger stripes.
Photos by Søren Nielsen

Should the good guy always win?

LT 'Corky' explains the mixed feelings, when being asked how it feels, when he eventually 'shoots down' a fellow aviator:

"It's definitely a kind of a catch 22 there, while it's fun to be the guy that shoots down a F/A-18, while at the same time you kind of hope that they shoot you down before I get the chance to shoot them down."

"It's a unique aspect of it. I want the other guys to succeed, I want them to shoot me down. We are a training aid, and if for some reason they make a mistake, they don't see us, they don't use their radar correctly, and we get to a position where we can shoot them, then we kind of have to punish that, because that's a pretty bad mistake. I mean I fly a lot older aircraft and they should have no problem shooting me down."

Although it happens, it's not often, that the Saints get to 'shoot down' their fellow aviators, as 'Corky' continues: *"If I'm lucky, I'll get a shot every once in awhile. It all depends on what kind of event we're on - how sneaky we're being."*

"If they shoot me, I think 'Yeah I'm dead - sweet, I'm ready to go home'. However, if I'm trying to be more sneaky,, then I'll definitely have a higher opportunity, and go to a merge and shoot one of the guys."

Homefield advantage

Flying out of the same location, for most of their sorties, helps the Saints to get a sort of home field advantage, as LT 'Corky' explains:

"We are very familiar with this area (The ranges around NAS Fallon red.). I can just look outside and I know where I am."

"It'll be like 'There is a mountain here, and it will be hard to visually acquire me. So I'm going to hide right here, because it worked in the past', and usually that works out - it is a little bit of an unfair advantage."

The advantage might seem unfair, but the terms of fighting are almost never equal, as LT 'Corky' continues: *"More often than not it's what the Navy F/A-18 aircrew are going to face. They are going to be over enemy territory where the enemy will know their own terrain very well, and whilst our own aircrew will have an idea of what's there, they won't know it as well as the enemy."*

This gives the aviators the feeling of being in a real enemy territory, and it's one of the finest goals of the Saints, with LT 'Corky' concluding: *"That's our goal - we want to be as real world as possible."*



The F-5 adversary community

The Saints are not alone flying the F-5 in the adversary role in the US. With two sibling squadrons, the VFC-111 'Sundowners' at NAS Key West, Florida, and Marines VMFT-401 'Snipers' at MCAS Yuma, Arizona, flying the plane, in the same role as the Saints.

The Sundowners originated from Saints, as LT 'Corky' explains: *"VFC-111 was born out of VFC-13. Originally there was only VFC-13 at Fallon. Then, VFC-13 started doing deployments to Key West. When many of the bases, airspaces and ranges closed on the east coast, it made more sense for the east coast squadrons to deploy down to Key West. There is a lot of good rage space."*

Key West started to be utilized a lot more, so we had to put more F-5s down there. Then the deployment became permanent, with VFC-13 Fallon, and VFC-13 Key West. Eventually, that got a little bit painful and they decided to designate that squadron VFC-111 'Sundowners', with a new CO, XO and complete new command down there."

The Snipers, out of MCAS Yuma, are the last of the three siblings, flying the F-5. All of the three units have the same task, to provide adversary training for naval aviators in the US. As all three units fly the same airplane, in the same configuration, they end up exchanging airframes from time to time, as LT 'Corky' elaborates: *"We are kind of overall the same unit, but they (VMFT-401 red.) are a little bit different. They are the marines while we are the navy, so there is a little bit of difference there."*

They still fly the same airplane."

F-5N Tiger II

The F-5N that the Saints fly, is not a regular F-5. With modifications to simulate different threats, an internal jamming pod and the ability to carry weapons being removed, it is now designed to fulfill the role as the virtual bogey.

Even though it's a plane from the seventies, with no radar, less thrust and turning capabilities than the Hornet, it still fulfills its task, as LT 'Corky' explains: *"It's a small aircraft, so it doesn't have a lot of gas, so it can't burn a lot of gas. It's relatively easy to maintain, as there's not a lot of systems on it. A lot of it is analog, there's not a whole lot of digital anything in it."*

Compared to the F/A-18 it's an ancient beast. I guess you can call it the pilots' airplane. In the F/A-18 you tell the airplane that you want to go right and you just move the stick to the right. The flight control computers move the ailerons and rudder, etc. and the airplane will go to the right."

In this thing, you move the stick to the right, the ailerons move, the rudder and anything else don't do anything. You are like 'I hope I go the right way now'. It's a little more difficult to fly, being that there are more control inputs you need to put in. You kind of think ahead of the airplane itself as well. It's not as forgiving."

With less thrust and turning capabilities than the Hornet, it gives the pilots some challenges which in the end makes them better pilots, as LT 'Corky' continues: *"½For the F/A-18 you have the ability to maneuver easier. In this airplane, not so much. You have to think about it a couple of more steps ahead of the airplane, continue to fly it, and fly it well - especially against an F/A-18 that is more capable."*

Keep in mind that it's also a bit of an experience level too. I flew the F/A-18, flew it for three years, then I came here, and I'm just continually expanding my pilot knowledge and experience."







How to become a pilot in VFC-13

Pilots in the Saints are a mix of active duty pilots that are in the squadron for three to four years, and reservists, that continue flying in the squadron, some for more than a decade. LT 'Corky' is here on active duty orders, as he explains: *"I was given active duty orders to come here. Other guys have done selective reservist, so they have essentially got out of the Navy and come back here part time, and fly the F-5, still instructors. Then we have other guys who are full time support - essentially active duty guys, that can not deploy. They are here every day."*

The mix of young active duty pilots and experienced reservists gives the Saints an advantage when educating new adversary pilots and instructors, as LT 'Corky' continues: *"It's an extremely good thing to have these experienced pilots that can take some of their past experiences, could be situations they got themselves into, that they don't want others to be in. And sharing that knowledge, passing it down to the newer pilots, is key. Keep in mind, there aren't many pilots in the Navy that fly the F-5, especially compared to the number on the F/A-18."*

Having senior pilots that have a lot of knowledge on the aircraft does help us become more proficient, also just being safer in the aircraft as well."

The older guys are an asset to the younger F/A-18 aviators aspiring to become adversary pilots, by passing down their experiences and knowledge, as LT 'Corky' continues: *"All the younger guys have flown the F/A-18, and the older guys have flown the F-14, back when that beast was still flying around."*

Obviously the capabilities are much reduced, but we have a good internal syllabus of how to fly the airplane. Then there's a lot of hands on, how to build a game plan, to test the fighter objectives in this way, or punish the fighters if they mess it up in this way."

It's definitely an experience to be gained, and a lot of it comes from this way of receiving passed down experiences from the older guys, to these newer pilots"

Back to basics

When you arrive in the Saints it's back to basics. Even if you have been flying for a number of years you'll start out with basic maneuvers, as LT 'Corky' illustrates how the training of a new pilot works out: *"When you start as a pilot in the squadron, you learn how to fly the F-5, learn how to take off and land. I have already done that in a different airplane, now I'm going to learn how to do it in this airplane. We have a two seater for that, with an instructor pilot to guide you."*

After that then you're in the single seater every time. Then you start off with some offensive and defensive BFM (Basic fighter maneuvers - dogfighting red). Then you'll get a little red air course, kind of learn how to build the presentation. Then we do it again, but instead of being the student, you're the instructor, and you're in the instructor role, so you're teaching people how to do everything, while you are still being evaluated."

The final portion is then being the overall red lead, for a large element, such as SFARP, air wing, or something like that. We might have twelve airplanes on the red side, and it's your goal to kind of create the game plan, and make sure everyone is deconflicted, and run it overall."

You might have an opportunity to go through the TOPGUN adversary course here at VFC-13. Do the adversary course at TOPGUN, you are an F-5 student over there and you learn how to become a red air player; to become an overall better presenter for the red side"

Even though that the Saints are the only true adversary unit at NAS Fallon, they are not the only adversaries at their home base, as they work close together with the NSAWC and their F-16s and F/A-18s adversaries, to be the red air presentation. LT 'Corky' illustrates how this joint venture of adversaries works: *"When you have the red lead, you've got all the adversaries, and it's your goal to figure out how you want to use them. 'You want the F-5s here, the F-16s here and the F/A-18s here, and this is what they are going to do'. You have the ability to use them however you see fit, and how it works best."*

The old and the new

To become an instructor pilot you usually have to have had at least one deployment. This gives the instructor real world experience before providing as close to real world scenarios as possible, to their fellow naval aviators, in the form of adversary training, as LT 'Corky' explains: "By having us having at least one deployment under our belt, we now have all that basic experience as an instructor, and we are just becoming more experienced instructors and pilots. Keep in mind, this is the viewpoint of a guy that just come out of the fleet."

If we talk with one of the older guys, who have probably flown the F-5 for 10 years now, their experience level is off the chart, compared to myself. They know the F-5 so well, that they can take the aircraft to an extreme level of what it's capable of and really show the F/A-18 guys what someone who's really experienced can do - in an aircraft that's underpowered - in comparison to the F/A-18, doesn't turn as well and is slower and smaller, less capable, and doesn't have the radar, the engines or the thrust!

However, if it's flown superiorly, then it can really demonstrate the experience that some of the guys here have."

LT 'Corky' concludes the interview on how it is to be a pilot in the Saints: "It's fun - it's a unique experience, just being able to go out there, fly the F-5. You can fly to your max every day if you want. We have the opportunities to either go fast and turn the EA on and jam the guys, or BFM with the F/A-18, or another F-5, and that's really a fun experience."

The author would like to extend a big thank you to the hospitality of the Saints, in particular LT Justin 'Corky' Pace and NAS Fallon PAO, Mr. Zip Upham, for making this article possible.



EXERCISE COPE TIGER 2017

TEXT & PHOTOS - VINCENT MARTENS

March 20th until March 31st, another episode of the largest multilateral aerial exercise in the Southeast Asia region was conducted in the form of Cope Tiger. Vincent Martens reports from Khorat Air Force Base, of the Royal Thai Air Force.



A C-130 from the Royal Thai Air Force on its way to another mission.
Photo by Vincent Martens

Cope Tiger 2017

March 20th until March 31st, another episode of the largest multilateral aerial exercise in the Southeast Asia region. Again forces of Thailand, Singapore and the United States of America tested their skills during combined operations. The place to be Khorat Royal Thai Air Force Base which is located close to the city of Nakhon Ratchasima.

This large exercise goes back all the way to 1995, when it was held for the first time under the code name Cope Tiger. The exercise was approved by an Thai cabinet resolution dated June 29th 1993, and has been conducted every year from 1995 up until present time. Khorat Royal Thai Air Force Base is also an historic place as it is a familiar name to thousands of US Air Force airmen and civilians who served at this base during the Vietnam War.

Some 160 miles northeast of Bangkok, Khorat was home for the 388th Tactical Fighter Wing during 1966-1975. Thousands of missions were flown by F-105 Thunderchiefs and F-4 Phantoms from this air base against North Vietnam. One of the memories of that time and still present is the old control tower that's situated close to the C-ramp. Nowadays its a place to rest and get coffee and where you can find some historic attributes.

Through the years the airbase and the exercise did not change much besides several OPS buildings. What did change are the participating aircraft that fly from Khorat. The Singaporean brought the Block 52 F-16C/D with conformal tanks, the F-15SG and the new G-550. The Thai Air Force still uses older airframes like the L-39ZA, Alpha-Jet, F-5, but also provide training with the relatively new Saab-340 AEW and the JAS 39 Gripen.

The latter is the most modern fighter in its inventory but due to circumstances it did not participate in Cope Tiger 2017. The US send air force, air national guard, navy and marines units to Khorat through the years. This year eight F-15's were send to Thailand, and rumours are that they will not be there next year.

The two parts of the exercise

During the 23rd Cope Tiger air and ground units were participating. The purpose exercise is to improve readiness and interoperability, and security relations between the countries. This years Cope Tiger consisted of two primary events. Staff exercise that was conducted at the Multinational Operations and Exercise Center (MOEC) at Changi Naval Base in Singapore.

This event took place during 6-9 December 2016. Second primary event was the (FTX) Field Training Exercise at Wing 1 at Khorat, Wing 2 at Lopburi, the Chandy Range in Lopburi, and the Army Tactical Training Center (ATTC) in Lopburi. The Chandy Range is used by the RTAF as one of the primary ranges for air to ground training. The northern part of the range is the conventional range used for practice ordnance, and the southern section is the tactical range used for dropping live ordnance.

The ATTC is an area with mountains and flat area's used for instance during practice shooting with army tanks or dropping paratroopers and special operations training. The Command Post was set up at Wing 1 Khorat and was used to supervise, providing tactical and intelligence support, and exercise evaluation. Officers of the Air Defense Command, Air and Coastal Defense Command, Aeronautical Radio of Thailand, and Civil Aviation Authority of Thailand also joined the planning and training.

Exercise Cope Tiger 2017 included work up trainings (WUT) and large force employment (LFE). The field exercise involved aircraft and armaments and more than 2,000 service members. The exercise was divided into two parts:

- Aerial exercise, which included basic fighter manoeuvres, dissimilar air combat training, active and defensive air defense, air interdiction, radar and radio jamming, unmanned aerial vehicles in target search.
- Ground exercise including command and control, deployment, aerial engagement.





A Republic of Singapore Air Force KC-135 aerial refueling tanker takes off for another mission at Cope Tiger 2017

Photo by Vicent Martens



New features and equipment

Perfecting the wartime tactics was not the only activity during the exercise. Cope Tiger also conducted two civic assistance and cultural exchange programs in Khorat and Lopburi. These programs included medical care and dental care units, donations of sports equipment, and giving lunch to school children.

During Cope Tiger 2016 the communication data link 16 was implemented for the first time into the exercise. New challenges this year were the unmanned aerial vehicles (UAV) that were deployed into the exercise. Three RSAF's Heron-1 saw action in a combined UAV training exercise with RTAF's Aerostar UAV's.

Also new into the exercise was the possibility for three members of the RTAF, who normally operated from their command and control center on the ground, to fly with the E-3C crew during an large exercise mission with at least 50 aircraft working together.

One other succes for this years Cope Tiger was the integration of a Command and Control Intelligence Surveillance and Reconnaissance cell. Which means that an intelligence officer was designated to an mission commander for mission planning and providing critical information for support.

This year the exercise involved 70 aircraft and 43 ground based air defence systems. Eight GBAD systems were provided by the Singaporean and other systems that were used were for instance the Giraffe 180 Radar, Royal Thai Army's Starstreak, Royal Thai Navy's QW-18, and Flycatcher. The Giraffe 180 radar is developed by the Swedish Saab industry and is based on 3D and real time.

The RTA Starstreak is and lightweight air defense missile system designed for close air defense against, for instance fighters or helicopters. The RTN QW-18 is a Chinese developed Man Portable Air Defense System (MANPAD) for shoulder launching surface to air missiles. The Flycatcher is a track-while-scan radarsystem and can operate anti aircraft guns and surface to air missiles simultaneously.

The missions

Cope Tiger missions were flown twice a day. The morning wave started around 08.00 with the take off of first the USAF E-3C, Singapore KC-135R and Thai Saab-340 AEW. Followed by taxiing L-39, F-16A/B, F-15C, F-15SG, F-16C/D, Alpha-Jet. The participating F-5's that flew were sheltered at the far end west of the air base.

Duration of the mission was around 1.5 hours and the whole package landed before 11.00 hours, last to arrive was the American E-3. The afternoon mission started around 13.00 hours. Airspace used during Cope Tiger is roughly situated between Khorat and Bangkok. During the second week the Thursday was to be the last day of flying.

The Friday was the wash up day and the official closing ceremony of the exercise which included some high ranking officials from all three nations. During this Cope Tiger over 730 flight hours were logged and 812 sorties flown.

The following units participated in Cope Tiger '17:

- **Singapore Air Force**
 - 111Sqn: G550
 - 112Sqn: KC-135R
 - 143Sqn: F-16C/D
 - 145Sqn: F-16D
 - 149Sqn: F-15SG
 - 128Sqn: UAV
- **Royal Thai Air Force**
 - 102FIS: F-16A/B
 - 103TFS: F-16A/B
 - 201Sqn: Bell-412
 - 211TFS: F-5E/F
 - 203Sqn: UH-1H
 - 231Sqn: Alpha-Jet
 - 401TFS: L-39ZA
 - 403TFS: F-16A/B
 - 404Sqn: Aerostar UAV
 - 411TFS: L-39ZA
 - 702Sqn: Saab 340AEW
 - 601Sqn: C-130H (-30)
- **US PacaF**
 - 44FS: F-15C/D
 - 961AACs: E-3C

The author would like to thank the Royal Thai Air Force. In particular Cope Tiger PAO Sqn Ldr Yanumast.



FIRE BOSSES AND SUPERSCOOPERS

TEXT - DIRK JAN DE RIDDER & MENS0 VAN WESTRHENEN
PHOTOS - DIRK JAN DE RIDDER



*A Canadair CL-415 'Superscooper' simulates a drop of its water payload in the lake.
Photo by Jan Dirk de Ridder*

Fire Bosses and Superscoopers

Some boys dream of becoming a firefighter, others want to become a pilot. Combining both may seem like a dream job, but firefighting pilots themselves describe their job more like a combination of being a surgeon and a miner. Working days are long and they have to be very precise, yet after a long day they return home dirty, smelly and sweaty. They all have a bag packed with toothbrush, underwear and clothes, because at any time they may be called upon without returning home for a few days or even weeks.

Zemunik airbase has been home to firefighting aircraft from the days when Croatia still formed part of Yugoslavia. After the breakup in 1991, its CL-215s were withdrawn from the country and sold to Greece. The Croatian Air Force initially hired CL-215s directly from Bombardier Aerospace and then bought the first of three CL-215s in 1995.

They were retired in 2004, by which time they had been replaced with turboprop CL-415s. Over the decade that followed, the fleet grew to its current size of six Bombardier CL-415 Superscoopers and six Air Tractor AT-802s, four of which are equipped with floats and called Fire Bosses.

The aircraft are operated by the protupožarna eskadrila (firefighting squadron, PPE). PPE Squadron Commander Lieutenant Colonel Davor Turković is one of the world's greatest authorities on the subject of aerial firefighting. After being an instructor pilot on the PC-9 for a few years, he joined the firefighting community. He became the youngest ever CL-415 captain in the world at the age of 33 and has logged over 20.000 water drops in Croatia, Bosnia and Herzegovina, Greece, Israel, Macedonia and Portugal.

Standardized course

One of his biggest jobs right now is to standardise the way his pilots build up experience in the firefighting role: *"In previous years, we had pilots with all sorts of different backgrounds, from helicopter pilots and civilian pilots to fighter pilots.*

Now we are on a standardisation course, so we make all pilots go through the same framework during their career. The final training product of this squadron is a CL-415 captain and in the past, we sometimes had difficulties to make a very experienced fighter pilot into a multi-crew member, because they are used to do everything by themselves. There are now basically two routes [towards becoming a CL-415 captain].

One type of training process is for less experienced pilots to get the notion of what this job is all about on the Air Tractors, to get some experience and reach some maturity as a pilot. After a while he gets transferred to the CL-415 and he undertakes the CL-415 training. The other path is for more experienced pilots. They go directly to the CL-415.

The more experienced pilots are usually of higher age, so if you were to drag them through the original process, they would reach the full scope of potential the day they retire. In addition to that, we tend to train all pilots to fly all types.

Whenever we have a chance to train a CL-415 pilot who didn't undertake Air Tractor training, we try to perform the training. Somewhere in the future I hope that all pilots in the squadron will be able to fly all aircraft types."





Strategical and tactical

PPE operates an interesting mix of six CL-415s, two single seat amphibious AT-802A Fire Bosses, one double seat amphibious AT-802A Fire Boss, one land-based AT-802F single seater, one land-based AT-802F double seater, and one locally designated as AT-802A/F that was converted from a land-based AT-802F into a Fire Boss in 2010.

It would be easy to say that the CL-415s are more capable in almost every way, but Turković doesn't agree with that: *"One mustn't look at the aircraft from one perspective. If you compare performance, the CL-415 will always win. If you compare price, the Air Tractor will always win. You have to compare it not on a tactical level, but on a strategical level. What can be done with the CL-415 in some conditions can certainly not be done with an Air Tractor, but why should it?"*

Sometimes you have a small fire and no wind. You can send two Air Tractors, they will put it out and the total cost of this mission is going to be ten times less than if you deployed a CL-415. On the other hand, there are some meteorological conditions or sea states during which only a CL-415 can be used. The real value of the aircraft is not within the aircraft itself. It is within the capability of the people who are dictating the strategy of how to use an asset in the best possible way.

It is the art of balancing how to use it and in order to balance it, you really have to know the aircraft and the pilot. Sometimes the combination of the pilot, the environment and the aircraft can do miracles and sometimes you can have an underachievement. Aerial firefighting is a very special business. If you compare it with a bombing run, you can send bombers and if they miss, the target will still be there.

Maybe tomorrow it will be heavily guarded, but it will not move. The fire always moves. Your responses have to be dynamic. On the other hand, fire is very stupid. It's an enemy that doesn't have a general staff or plans. It has certain behaviour patterns. The more experienced the system is to recognise the behaviour, connecting the meteorological situation, terrain, vegetation, you can put this on one side of the equation and on the other side you will get how many aircraft and what type of aircraft you need to deploy."

Do things no one else does

Although the two land-based Air Tractors obviously need to land at an airstrip after every water drop, they do have a value in their own right: *"Sometimes they are the best choice. If you have a starting fire near an airstrip, if you dispatch them early enough and if the turnaround time from this airstrip is fast enough, you can extinguish the fire at a very low cost.*

We also use the fixed gear version for patrols, because they have greater endurance than the Fire Boss and they are operationally the cheapest asset in the fleet. We use the wheeled version where there are not many problems. When we have a fire on the other side of the mountains [where there are few water sources], we send them because it is better for them to work from an airstrip over there than scoopers going up and down the mountain.

We try to keep the strong assets committed to the big problems. All Croatian islands are very scarcely inhabited, domestic population is very rare and they are of a higher age. Even if they try, they cannot generate respectable ground forces for firefighting. Many tourists go to the islands and if there is a fire there we have to dispatch Canadairs very quickly. If the Canadairs are committed elsewhere, we have a problem."

Several factors make fighting wildfires in Croatia unique. *"If you look at the real area that we are protecting, we have the biggest number of aircraft per square kilometre in the world. The rest of our firefighting elements are underdeveloped. If you compare our ground troops with, for example, Italian ground troops just across the Adriatic Sea, it is a whole different story.*

The islands they have are not scarcely inhabited. Sicily is like a country on its own, it is nothing like a Croatian island. These environmental conditions, geographical features, and demographical features have forced us to do things in a way that no one else does in the world. The further you go comparing [us to] bigger or wealthier countries, the differences become greater. "

No retardants, only water

“Compared to Spain, we have very little in common in terms of CL-415 [operations]. With the United States, we have nothing in common. They use a lot of helicopters, they don’t use scoopers, they use a lot of chemicals, foam retardants and gels. We do use foam, but not as much as some other countries.

From a tactical side, we don’t need it and from an environmental side it is better not to use chemicals unless absolutely essential. When you drop foam, the aircraft gets polluted with it and when you scoop, you wash it.

If you scoop with three or four aircraft at a small lake, at the end of the day the entire lake looks like somebody was washing their laundry. We try to avoid that, especially because we don’t want to destroy a lake in a national park that is visited by many tourists in order to save bushes.”

The type of vegetation and the layout of the area that we are defending requires that we have very specific tactics compared to some other countries. What we try to do is catch the head of the fire. In some other countries, they try to reach the fire from behind or they try to flank it and then keep narrowing the flanks.

We don’t have the space for that. It’s like in a war, the big countries can trade space for time and then exhaust the enemy, so in some countries they are just protecting houses and infrastructure as they wait for the rain. The narrowness of the Croatian coastline is not wide enough for us to wait.

So, we try to stop the progress of the fire, because once you stop the progress what’s left is that you only need to do cleaning. On some fires, we use all aircraft types in an effort to stop the head. Sometimes the situation on the head is too dangerous or the terrain is such that the smaller [AT-802] aircraft cannot withstand flying in those conditions. We then assign tasks for them on a different part of a fire.”

The training process

“For example, if there is a big fire progressing fast and leaving behind just small flanks, then the Air Tractors are going to attack the flanks in order to prevent that the flank becomes a new head if the wind shifts. Sometimes they chase the small spot fires. It would be stupid to waste 6,000 litres of water on something that can be put out with 3,000.”

CL-415 captains take a leading role when both aircraft types fight the same wildfire, as lieutenant colonel Turković explains: “When we go to a fire we coordinate with ground troops in terms of safety and to determine the tactics. Once this coordination is done, the pilot decides what is going to happen in terms of tactical use of the aircraft.

Since the majority of the CL-415 pilots have flown the Air Tractors, or have at least spent a lot of time flying with them in terrain, they decide what is going to be done with both types of aircraft. During the training process, we try to do all different scenarios with a single aircraft, with a group of aircraft, and so on, so that when the real situation comes we just combine these elements and put them in a real-life situation.

This is why we do a big part of our training on real fires. Whoever becomes a firefighting pilot, regardless of the type of aircraft, in order to get his certification, he has to fly a certain amount of hours on a real fire. That is why we have [AT-802] twin-seaters in both configurations [with and without floats].

When the pilot is released for solo flights, he has already been in real situations with other aircraft inside a confined area with smoke obstacles and so on. Then at least we know he will be performing safely. Maybe in the beginning he will not be very efficient, but he will not crash into another aircraft or into a hill behind the smoke.”





Fires don't recognise phases

To the question whether something like a 'firefighting season' exists, another profound answer follows: "We have two different universes. First there is the administration universe. Guys who are high above say that the calendar year is divided in three phases: preparation, the firefighting season and recuperation. This is done for planning of resources etcetera.

In the real world, fires don't recognise these phases. They only recognise the meteorological situation and the number of fools that are very incautious during the drought. We are only changing the number of aircraft on alert and the number of fires in every particular month. Sometimes we have more fires during February and March than during July.

After the winter drought, there is dry grass and people go into their vineyards and then they clean and burn it. Sometimes it goes away downwind and then we have business. In April the rain falls, maybe the wind drops, the green grass grows and there is no potential for fire.

As the summer approaches, the [high] grass is getting dry and then the real peak of the year is from July 15 to the first of September, but in the past ten years it has shifted more towards autumn."

Drought and wind

"This year [2017] shows us that there is a drought, so precipitation is below average and wind is above average. What we can expect is that in the beginning of the summer season, nature is very well adaptive to fires. In these conditions, what we are going to do is 'tactical package A'. That means we are going to deploy Air Tractors filled with water on recon flights and if they see any spot fires [new fires that start outside the area of the main fire], they will attack it.

Inside our regulations, the pilots are allowed to attack the fire, regardless of whether there is a request filed by anyone in the system. In this tactical package A we are aware that whenever there is a fire, we will have to be very swift in scrambling and that we will have to scramble a lot of aircraft. That is how we set up the system. In 2014, in the middle of June and July there was green grass two feet tall.

Then we know if there is a fire, and it is very unlikely that there will be one, that this is going to be a slowly moving fire with no potential energy and no present danger. Then we move to tactical package B. There is no need for patrols. Somebody is going to see the fire, we have plenty of time and we don't have to scramble very fast, nor with a lot of aircraft.

When there is a drought and there is wind, we dispatch aircraft without calculating whether we need two, three or four aircraft. It is a little bit more expensive, but we have to do it. We just send as many aircraft as we can. It is better to have the aircraft in the air, because the pilots are allowed to assess the fires and fight the fires. I think that our record is that we caught 17 uprising fires on one day and each of these fires could have presented a potential disaster."





An AT-802A Fire Boss making a low sweep across the lake.

Photos by Dirk Jan de Ridder

Coordination

In favourable conditions, it takes a CL-415 traveling at 70 knots twelve seconds, the equivalent of 410 meters (1,350 feet), to scoop up 6,000 litres of water. Pilots describe it as the simplest manoeuvre during firefighting.

In case of waves at sea it may take longer than a minute as water can only be scooped up from the top of each wave. The 3,000 litre water tank of the AT-802A Fire Boss is filled in around 15 seconds.

Lieutenant colonel Turković: *“When we scoop water, the first thing that we assess is the dimensions of the body of water. The second thing is the prevailing conditions and the third thing is obstacles. Basically 95% of waters in Croatia are not restricted for water scooping. It is a pilot’s decision where and how he is going to perform that. In our documentation we don’t forbid places, except rivers and harbours.”*

We tell pilots to choose not the closest area, not the one with the best conditions, because it may be 200 miles away, but the most optimal one. Find an area that is near enough, where the conditions are bearable for repeatable operations, where there are no obstacles, no birds, that you can safely climb out of and so on. During the training and during the experience gathering process, they get a mental picture of what is a good or bad body of water.

This allows them to go to another country and, based on the same elements, pick a body of water there. If you prescribe something inside your country, and if the pilots don’t know the background of why those locations are good, how are they going to choose a suitable location? We make ourselves thinkers and not paper users, because if you are a paper user and you lose a paper, you are worth nothing.”

Crews on alert are divided into a blue and a yellow group. Lieutenant colonel Turković explains: *“The yellow group is staying at the airport and they have to release brakes within 30 minutes of signal. In real life, it will happen between 17 and 22 minutes. The 30 minutes is because we don’t want to put pressure on them and we don’t want them to stress. If they forget something here at the apron, it can cost them their lives two hours later.”*

Hundred drops a day

“Blue crews are situated wherever they choose, but they are obligated to release brakes two hours after the signal. The purpose of the blue crews is, if the yellow crew reaches the daily limit, we switch the crews. If the situation is such that we made a mistake in how many aircraft we put on alert, we fetch blue crews.”

The third reason for having them is that somebody in the yellow group is not feeling well, so that we have a reserve. Usually, they inform themselves in the morning of the situation and if there are no takeoffs until noon [they know] this is not the day that they are going to be scrambled.”

“Our daily limit is seven hours or 100 drops [60 for the Fire Boss], whichever is achieved first. During the years, we have tried to find where to put the limit. Based on mistakes in flight and some things that happened to pilots, we decided that after more than seven hours you get a little undercapacitated.”

You are working in heat and whatever you are doing, you are repeating the same cycles. Seven hours is two tanks of fuel and you’re off. For the drops, first we had [a limit of] eighty and then we saw that sometimes when there is a fire on an island and they reach the drop limit way before they spend the flight hours. We needed to change the crew very early during the day and this opened up the need for the third crew per aircraft per day.

We said maybe we should raise the limit, but where should we put a stop? Then for two years we had no [drop] limit at all, let’s see what’s happening. We saw that it can go to madness, it went to 160 drops. That is 160 opportunities to lose your head.”

The 160 drops on a single day was actually a world record set by major Ivica Markač and his crew in September 2013, an average of one every three minutes for the duration of eight hours! Lieutenant colonel Turković about that: *“No country can reach that number [with their current limitations]. It was a fire on an island on the verge of the sea. The biggest problem for the captain was to wait for the aircraft to be prepared to scoop, because it has a timed cycle.”*





A lot of maintenance and hard work

While working days can be long for aircrew, they are even longer for maintenance crews. On a full day of firefighting operations, maintenance crews may work as long as 16 hours per day, although they have breaks in between. They release the aircraft early in the morning, then the aircraft goes somewhere to fight a fire, sometimes returning every 3,5 hours for fuel and/or a crew change, and finally returns ten or twelve hours after the first takeoff.

At the end of 2016, two CL-415s with 14 crew members and technical staff deployed to Israel, while forest fires of biblical proportions blazed through the country, threatening the city of Haifa.

The Croatians were among the first to arrive, according to lieutenant colonel Turković: *“We were scrambled on the 23rd of November at 1500 hours in the afternoon. We took off at 0700, 24th of November. We reached Israel at 1700 in the afternoon, so we lost one hour for refuelling and one hour because of the time difference.*

Our first mission was the next day. We fought some fires that were a residue of the big Haifa fire and some new fires in the north and central part of Israel. After the intensity of fires came down, we stayed there for a couple more days as a watch guard and due to the bad weather in the Mediterranean Basin the entire mission lasted for 13 days.”

Fires in Isreal

“I think it was the biggest international gathering [of firefighting aircraft] in history, because there were like 23 foreign aircraft plus fourteen of their aircraft. Thirteen countries came to help, [including] the American 747, Antonovs from Ukraine, Berievs from Russia and Azerbaijan, Canadairs from Croatia, France, Italy, Spain, Turkey, an Air Tractor from Cyprus.

It was very interesting. Never has there been so many [firefighting] aircraft in such congested airspace. It was very challenging to do the air traffic deconfliction, because you don't know how these people are trained at home, what they are doing, what their safety margins are, but they did a perfect job.”

Images of Israeli prime minister Benjamin Netanyahu thanking lieutenant colonel Turković went worldwide and Croatia and Israel deepened their ties in the months that followed.

The squadron even planned to return to Israel with two aircraft a month after the author's visit in April, but they couldn't specify the purpose of that visit because 'the details of the cooperation hadn't been finalized yet'.



EXERCISE NORTHERN EDGE '17

TEXT & PHOTOS - SØREN NIELSEN

NE17 saw 6,000 personnel participating from U.S. military units stationed in the continental United States, and from U.S. installations in the Pacific, as well as approximately 200 aircraft from all the services. Søren Nielsen reports from Alaska.



A KC-135 Stratotanker is powering up its engines, with the Alaskan Range mountains in the back.

Photo by Søren Nielsen

Northern Edge 2017

The majority of the lakes were still frozen and the mountains were still covered in snow, when dozens of 4th and 5th generation fighter jets, together with surveillance, electronic warfare, tankers and transport planes, from across the U.S. military took to the skies over Alaska on 1st of May 2017, as Northern Edge 2017 (NE17) kicked off.

With Spring appearing early May in Alaska it would mean the lakes wouldn't remain frozen for too long. And with the long hours of light and great weather, NE17 now had the right training conditions.

NE17 was one in a series of U.S. Pacific Command exercises in 2017 - which all have the same goal; to prepare the joint forces to respond to crises in the Indo-Asia-Pacific region. The exercises are designed to sharpen participants' tactical combat skills, to improve command, control and communication relationships, and also to develop interoperable plans and programs across the joint force.

NE17 saw 6,000 personnel participating from U.S. military units stationed in the continental United States, and from U.S. installations in the Pacific, as well as approximately 200 aircraft from all the services. The participants served as part of a joint task force, practicing tasks associated with joint operations.

Major participating units included U.S. Pacific Command, Alaskan Command, U.S. Pacific Fleet, Pacific Air Forces, Marine Corps Forces Pacific, U.S. Army Pacific, Air Combat Command, Air Mobility Command, Air Force Material Command, Air National Guard, Air Force Reserve and U.S. Naval Reserve.

As Col. David Mineau, Commander of the 354th Fighter Wing, explained:

"The different U.S. forces are gathered to sharpen the tactics, techniques, procedures, command and control, and the interoperability with each other, against the most advanced, and the most complicated scenario that they can go face."

Still maintaining real world capacity

The majority of the planes were split between the two air force bases, Joint Base Elmendorf-Richardson (JBER) to the south, and Eielson AFB to the north. Besides the local aggressors and tankers, Eielson saw additional tanker support, as well as two air force units on base. The majority of the planes were placed at JBER. Fast jets, surveillance, and electronic warfare, tankers and transport units from the marines, air force and navy had JBER as their temporary home during the exercise.

"Right now we have one runway on each base, so there's a limit on the number of aircrafts we can actually launch and recover at anyone time. But the other thing, and that's a very positive aspect of the training; we would expect if we would operate in a large-scale conflict, that we would have to operate from a number of different air bases, and you could imagine, how they would sit there and depart, and we would have to synchronize in terms of times, so they would arrive at the same place at the same time, and orchestrate the exercise." said Col. Christopher Niemi, Commander of the 3rd Wing, to illustrate the challenges the planners faced during the exercise, as they would in a real world conflict.

Even though most of the local Alaskan units participated in the exercise, the units were still ready to handle any real world event that would come up, as Col. George Dietrich, Commander of JBER and the 673d Air Base Wing illustrated: *"So, the exercise aside, here at JBER we're always going to be ready to respond to any real world event. If we had a call today, we would still be able to do that, despite the exercise going on. The exercise gives us the opportunity to hone those skills even a little bit better."*





*The final checks are being done on this 18th Aggressor F-16, while other F-16s from Misawa AFB are also getting ready for take off.
Photos by Søren Nielsen*



The massive training ground

Large scale radar/anti-radar and electronic countermeasures training can be conducted at the vast Joint Pacific Alaska Range Complex (JPARC) where NE17 took place. To cover all scenarios, and give the participants the opportunity to achieve their goals, a couple of large training areas in Alaska were used.

“It’s a great venue for training, we have the largest range space available to almost anybody in the world, certainly in the United States, to practice techniques, tactics and procedures, not only for our airmen, but also for our soldiers, marines and sailors as well.” said Lt. Gen. Ken Wilsbach, Alaskan Command and 11th Air Force Commander.

The entire JPARC airspace covers around 157.000 square kilometers over land in the southern and central part of Alaska, as well as a separate area of about 130.000 square kilometers over the Gulf of Alaska were used during NE17. Adding to this, a special corridor between the two airspaces was set up by the FAA, that allowed the participating aircraft to travel from one airspace to the other, without getting into conflict with civilian traffic.

Col. Niemi illustrated; *“We don’t have the opportunity to operate in airspaces that we potentially would be in, in a conflict. In the course of a conflict, we would expect that there probably wouldn’t be a lot of airline traffic. Work could be in an area that’s very wide open, that’s not heavily populated, like the lower 48 States are, and so Northern Edge with it’s expansive airspace here in Alaska gives us kind of a peek into the opportunity, and allows us to bring all these assets in, both other air force units, navy units, marine units, and integrate them all together in one place and time in the exercise.”*

The size matters, and with the size comes opportunities, that is not achievable in other places: *“We have a great opportunity because of the size of range - to train and maximize our assets, because of the space, and the freedom of maneuver that the large space allows.”* explained Lt. Gen. Wilsbach, and added; *“It’s the size of Florida!”*



Training the crews

About 50% of the crews were inexperienced and used this exercise to gain experience, and learning these lessons for the first time. The experienced crews were mostly in a leading role, giving the inexperienced crews the lessons, and also improving their own leading capabilities.

“We have specific mission objectives on every sortie.” said Lt. Gen. Wilsbach, *“We are doing some experiments during this Northern Edge where we have additional new hardware and new software brand new to the forces, that we’re trialling during the scenario, so we can learn those tactics, techniques and procedures. Much of that is classified, so we won’t publish what we’re learning, other than to say that we’re improving capabilities overall.”*

The battlefield is the classic good guy against bad, seeing the good guys on different missions, trying to defeat or hold back the bad guys.

“It’s red vs. blue. The red forces’ side is primary made up by aggressors - predominantly airmen that have the expertise to simulate threat tactics, techniques and procedures. We have aircraft, we have surface to air missiles, cyber, and many other things they simulate.” said Lt. Gen. Wilsbach.

It’s not only the F-16s of the 18th Aggressor Squadron at Eielson AFB, which made up the red force. The other participants of the exercise would also act as aggressors, where a typical mission could be ten aggressor F-16s from the 18th Aggressors Squadron, supplemented by another six F-15Es from Seymour Johnson AFB, and six F-16CGs from Misawa AFB. It didn’t have to be all dedicated air superiority units taking the role as the red force.

Almost all of the participating air units would split their time between doing red air and blue air. Besides the military assets, a number of civilian airplanes were taking part in the exercise. These civilian airplanes were equipped with sensors and jammers, etc. to add complexity to the training. To simulate different threats and scenarios, making the blue air training even more difficult.



Continued development of 5th gen.

NE17 saw 5th generation fighters, with the air forces F-22s side-by-side with the marines F-35s, integrating with 4th generation fighters, such as variants of the F-15, F-16, and F/A-18.

It was not all training, but also a continued development of the integration of the 5th gen. aircraft, such as the F-35, as Lt. Gen. Wilsbach explained:

"We are all learning what the F-35 can do, including the marines. So it's of great benefit to see how all of it comes together - army, navy, air force and the marines - over both land and water, all of what is being practiced. So it'll be a tremendous benefit at the end of this exercise."

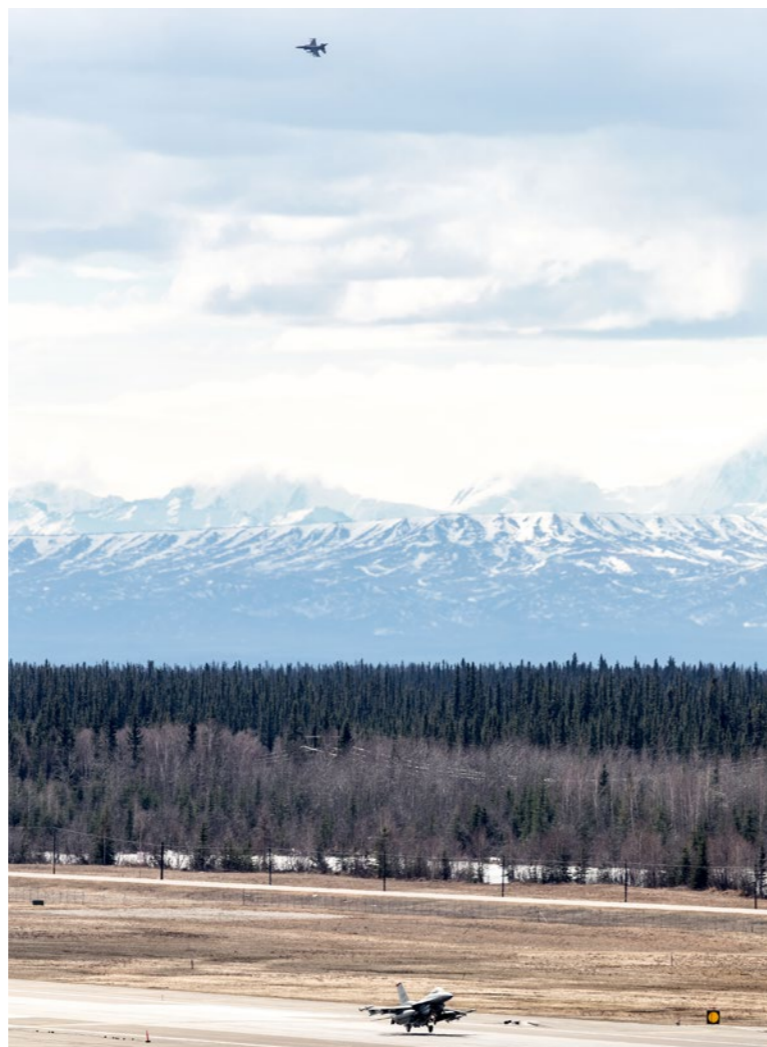
It was not all integrations and crew training of the 5th generation aircraft, but also further testing of the aircraft itself, both 4th and 5th generation. Having the aircraft loaded with new hardware and software saw them testing all new usages of the planes, as well as operating the newest weapon system in a large-scale operation, which brings great possibilities, to find the surprises, limitations and opportunities of the planes.

Col. Niemi, illustrated: *"When you acquire a new weapon system, like the F-35, then it's not like going in and buying a car, where there's not really a lot of surprises. We have a very rigorous test and development program, but the reality is that when you are dealing with something completely new and complex as the F-35, despite our best efforts, there's going to be some surprises and we're going to learn some things."*

Test programs

Col. Niemi got an extensive experience from the F-22 test program, which was used during NE17 with the F-35s; *"I was fortunate enough to be involved in the early F-22 test program, and some of the ideas of how we were going to employ the aircraft turned out to be exactly spot on, but to be absolutely frank with you, some of the ideas were way off the mark and we didn't know that until we had the opportunity to integrate, and there were some strings that we discovered, that we didn't anticipate. There were also some limitations that we became aware of, that we had to mitigate. By working with the F-35 we are able to sit there and realise those, so that we can be better operating in an operational environment in the future."*

The continuation of the training with the F-35 and F-22 carried on after the exercise, where the marines of the VMFA-121 would stay for an additional few weeks, before returning to Japan. This was to do dedicated tests side-by-side with the F-22s of the 3rd wing at JBER, and the 18th Aggressors at Eielson, building on top of the experience gain during the two week exercise.





Better than Red Flag

The Northern Edge exercises are massive in scale, both with the physical training areas used, and the number of players involved. To get all the involved players aligned and up and running for the short time, of the two weeks the exercise was running - this being; the ground crews, pilots, sailors on their ships, army foot soldiers on the ground, to the mission planners etc., wasn't an easy task, but it's something that reflects how real combat operations works, and making this exercise as close to real combat operations, as possible.

With the exercise coming to and end, Col. Niemi concluded that Northern Edge was a success, and was as close to a real combat operation as possible:

"I was fortunate enough to be here (Alaska red.) from 2007 to 2011, and during that time frame, we had three Northern Edge exercises and I flew in two of those. Each year we continued to build on that, make it better and generally bigger.

When that younger pilot, or that younger operator, gets into a combat environment for the first time, they have that same feeling like I did in 1999, where it's comfortable to them because they've seen it before and they know what to expect, and they know how to deal with it.

My comment, the first time I flew in Northern Edge, was: This is the closest exercise that we have, to combat operations, even surpassing Red Flag, for numerous reasons.

Red Flag is a very good exercise, but Northern Edge builds on that, and takes it to the next level. We have had Northern Edges over the years, and we have been able to continue to build on that, and improve it each year, and that's what we are doing again this year."

This edition of Northern Edge saw the last time that Alaskan Command was in charge of it, and the future Northern Edge exercises were handed over to the U.S. Pacific Command, which will lead the 2019 edition of the exercise.

A bit thank you to Alaskan Command, and especially USAF Capt. Anastasia Schmidt, USNR Lt. Mikel Weigel and USAF Lt. Kellie Rizer for making this article possible.



THE MIGHTY RF-4 PHANTOM II

TEXT & PHOTOS - ANDREW TIMMERMAN AND SCOTT WAYNE

The reconnaissance version of the mighty McDonnell Douglas Phantom, the RF-4 is not flying for much longer, and is being taken out of service by most countries. Andrew Timmerman and Scott Wayne takes a look at this mighty plane.



*A reconnaissance version of the Phantom, the RF-4E, taxis back after the end of a sortie.
Photo by the authors*

McDonnell Douglas RF-4

Appearing low on the horizon, two circular plumes of brown exhaust smoke signal the imminent arrival of a McDonnell Douglas F-4 Phantom II. Whilst most people associate the Phantom with dogfights over the Vietnam jungle, or the classic bombing “Snake and Nape” missions flying in support of ground troops, there is a lesser known version of this amazing aeroplane. Flying completely unarmed over the battlefield, the RF-4 Phantom has one mission, reconnaissance.

Using aircraft as a photographic platform dates back to the First World War, when German and British forces used cameras mounted on aircraft to photograph the battlefield and record troop movements. Nearly 100 years later, the technology has changed but the role of these aircraft remain the same.

The origins of the reconnaissance variant of the F-4 can be traced back to the initial specifications submitted to the US Navy in 1955. Although McDonnell included a recon version in the proposal, this was met with a luke-warm reception from the Navy, instead preferring to utilize the F8 Crusader instead. However, the US Marine Corps did warm to the RF-4, and an initial order of 9 aircraft was placed.

This version, designated RF-4B, first flew on 12th March 1965. The first of these new aircraft were delivered to US Marine Corps squadron VMCJ-3, based at MCAS El Toro, in May 1965. This was shortly followed by deliveries to VMCJ-1 and VMCJ-2. The aircraft first saw combat in October 1966, when they operated from Da Nang airbase during the Vietnam conflict. In total 46 RF-4Bs were produced, with the last of these being delivered to the USMC in December 1970.

To house the 3 camera stations, the RF-4B had to be fitted with a longer nose than a standard F-4B. With the increased bulk of the cameras, the existing AN/APQ-72 radar was swapped for the AN/APQ-99 forward-looking J-band monopulse radar which was optimized for terrain avoidance and terrain-following, and could be used for ground mapping.

The equipment

Camera station 1 typically carried the forward oblique or vertical KS-87 camera. Station 2 housed a single KA-87 low-altitude camera. Station 3 normally carried either a KA-55A or KS-91A high-altitude panoramic camera. It could also house a KS-127A camera if required. The cameras in the RF-4B were fitted on rotating mounts which could be aimed by the pilots at targets in flight.

The aircraft was fitted with an AN/APQ-102 SLAR (Side-Looking Mapping Radar), which was installed into the lower fuselage. The AN/AAD-4 infrared reconnaissance system was also fitted in the fuselage just behind the SLAR. An APR-25/27 warning system, an ASW-25B datalink and an ALQ-126 ECM package were also installed.

One unique ability of the aircraft was the ability to develop the film in-flight, then eject the film cassettes at low level over the battlefield. This would then allow commanders on the ground to utilise the intelligence gathered as quickly as possible.

In 1975 the USMC RF-4B's were upgraded with an improved data link facility, a new AN/APD-10B SLAR and infrared reconnaissance systems. These, coupled with new more powerful and efficient engines made the RF-4B a very capable platform. The RF-4B remained in service with the USMC for over 2 decades, with the last aircraft being retired in 1990.

Looking for a supplement, and eventual replacement, for the RF-101 Voodoo, the US Air Force also looked at a possible reconnaissance variant of the F-4 Phantom. From this, the RF-4C development programme began in 1962 with the first aircraft flying 2 years later. The first production RF-4Cs entered service in September 1964, with the last aircraft of the 503 built rolling off the production line in December 1973.





A special painted HAF RF-4E is done flying, with marks on its tail telling the story of its service career from 1953 to 2017. Photo by the authors



The models

Like the RF-4B, the C model consisted of 3 camera stations in the nose of the aircraft. The forward station carried a forward oblique or vertical KS-87 camera. The Low Altitude station could carry either; a left or right oblique KS-87 camera, a trio of oblique KS-87 camera's (vertical, left and right facing) [note: a KS-72 could replace a KS-87 in the 30-degree oblique position if required], a KA-56 low-altitude camera or a vertical KA-1 camera. The high altitude station normally carried a single KA-55A or KA-91 high-altitude panoramic camera in a stabilized mount. The high altitude station could also carry either two split vertical KS-87 cameras, a KC-1 mapping camera or a T-11 mapping camera if required.

The RF-4C could also carry a HIAC-1 LOROP (LONg-Range Oblique Photography) camera in a large G-139 centreline-mounted pod under the fuselage when the mission dictated. Like the RF-4B, the C model was also capable of ejecting the processed images over the battlefield, directly to commanders on the ground. However, in reality this proved impractical and was rarely used.

Upgrades

Also, like the B model, the RF-4C used the AN/APQ-99 radar, although this was later replaced with the AN/APQ-172 radar. Located just behind the nose wheel bay was either an AN/AAD-5 or AN/AAS-18 infrared detection system. In some aircraft the AN/APQ-102 SLAR was replaced with an AN/APD-10.

This upgrade made it possible to send radar images to ground stations in real time, via a datalink function. A variety of ECM systems were also installed including the ALR-17, 31, 46, 50 or 126 and AN/ALR-46A Radar Warning Receiver (RWR). The Westinghouse AN/AQL-115(V)-15 or Raytheon AN/AQL-184(V)1 ECM pod was often carried on the inboard wing pylon.

Both the RF-4B and RF-4C were designed to operate with no offensive armament, relying instead upon the speed of the aircraft, the element of surprise and the skill of its crews to complete the missions successfully. However, the RF-4C was later upgraded to carry and fire the AIM-9 Sidewinder missile for self-defence. The RF-4C remained in USAF service at the time of the Gulf War with the Alabama Air National Guard, with the type finally leaving active service in 1994.



In 1989, 12 RF-4Cs were transferred to South Korea to operate with the Republic of Korea Air Force (ROKAF). These aircraft went on to serve with the 131st TRS (Tactical Reconnaissance Squadron) at Suwon Air Base. A further 11 RF-4Cs were also transferred to the ROKAF. The RF-4C served with the ROKAF for a further 25 years, with last of them finally being retired in 2014, becoming the last operators of the C model.

International interest

In October 1978, the Spanish Air Force acquired 4 ex-USAF RF-4Cs under the Mutual Defence Aid Program (MDAP). The RF-4Cs were given the Spanish designation CR.12. In 1989, another 8 ex-USAF RF-4Cs arrived, serving with 123 Squadron, based at Torrejón airbase. This second batch of RF-4Cs was updated to the highest USAF standard prior to delivery and had a completely revised avionics suite, including new radios, RWR, VOR and ILS navigation equipment and KS-86 cameras.

These aircraft also had J79-GE-15E “smokeless” engines. In 1995, six more RF-4Cs were obtained. These new arrivals had improved avionics, including Have Quick digital UHF/VHF radios, Itek AN/ARL-46 RWR, and Tracor AN/ALE-40 chaff and flare dispensers.

The existing Spanish fleet also underwent a standardisation program, which among other changes included replacing the existing radar with a new AN/APQ-172 radar, a new laser-ring gyro inertial navigation system and the installation of an Israeli Aircraft Industries in-flight refuelling probe. These improvements allowed the Spanish RF-4C fleet to serve into the 21st century, finally being retired in 2002.

Following intense international interest in the RF-4, an export version was developed, the RF-4E. The E model combined much of the systems of the RF-4C, with the latest J79-GE-17 engines and much of the airframe of a standard F-4E. The internal cannon normally found on the F-4E was removed however for the RF-4E.

The RF-4E was designed as a day/night reconnaissance aircraft, with the majority of its missions being conducted at low level and high speed. Like the B and C model, the RF-4E had 3 stations in which a variety of cameras could be installed. A Fairchild KS-87B or KS-72 camera was normally installed in station 1. Station 2 could carry either three KS-87s or, alternatively, pairs of KS-72 or KS-87 cameras. Station 3 normally held a KA-91 or KS-55A camera, or two KS-87 cameras. The user could also install KC-1 or T-11 mapping cameras when the mission dictated.

Luftwaffe

For night missions, the RF-4E carried photoflash cartridges which were ejected upwards from locations in the rear fuselage. There were also two night/all-weather reconnaissance systems fitted to the E model.

One was the AAS-18A Infrared Recognition System (IRRS) and the other was the UPD-4 Side-Looking Airborne Radar (SLAR), which was mounted in the side of the fuselage. Like the B and C models, the E model could also develop film in flight, and eject the cassettes over the battlefield for analysis by commanders on the ground.

The Luftwaffe (then West German Luftwaffe) was the biggest customer, ordering a total of 88 RF-4Es. The first of these entered service on 20th January 1971. The Luftwaffe aircraft were fitted with an advanced version of the Goodyear UPD-4 side-looking radar system, mounted in a centreline pod underneath the aircraft.

Under the “Peace Trout” program, a single Luftwaffe RF-4E was fitted with an EElectronic INTelligence (ELINT) system, which was based on the APR-39 used in the F-4G. This was installed in place of the nose-mounted cameras. It could easily be recognized by the presence of a distinctive bulge underneath the forward camera access door.

In 1978, the Luftwaffe decided to give the RF-4Es a ground attack capability. By 1982, all serving Luftwaffe RF-4Es were fitted by Messerschmitt-Bolkow-Blohm (MBB) with a weapons delivery system. The RF-4E was fitted with hardpoints and wiring for underwing weapons pylons.

A weapons aiming sight was also installed in the front cockpit, with weapons selection switches being provided in both the front and rear cockpits. Up to six BL-755 cluster bomb units could be carried, or up to 5000lbs of other ordnance. At the same time, the RF-4Es were upgraded with newer cameras and fitted with Tracor AN/ALE-40 chaff and flare dispensers.





The users, the countries

The RF-4E served with Aufklärungsgeschwader 51 "Immelmann" (AKG 51) based at Bremgarten airbase and AKG 52 at Leck airbase. With the introduction of the Panavia Tornado, the Luftwaffe began phasing out the RF-4Es in 1993-1994. Some of these surplus aircraft were supplied to other Allied NATO nations, with 32 aircraft being sold to Turkey and 29 to Greece.

After Germany, Iran was the next largest customer for the RF-4E with a total of 27 examples being ordered. The first RF-4E arrived in Iran in 1970 and 15 more aircraft were delivered in succeeding years. The only squadron believed to operate the RF-4E in the IRIAF was the 31st Tactical Reconnaissance Squadron, based at 3rd Tactical Air Base, Hamadan.

The final batch of 11 RF-4Es destined for Iran were cancelled in February 1979 for political reasons (after the fall of the Shah, all arms deliveries to Iran were embargoed). It was last reported that the Iranian RF-4Es had reportedly been cannibalized to keep the few remaining serviceable F-4Es flying.

Fourteen unarmed reconnaissance versions of the F-4EJ were built by McDonnell and delivered to the Japan Air Self-Defence Force (JASDF) between November 1974 and June 1975, being designated as RF-4EJ. They were virtually identical to the USAF RF-4Cs, with the only major difference being the removal of the radar homing and warning suite.

Seventeen F-4EJs were also converted to reconnaissance Phantoms, being designated as RF-4EJ-Kai. The JASDF also upgraded 11 of its current RF-4Es to RF-4E-Kai models. The Kai modifications included the replacement of the AN/APQ-99 radar with a new AN/APQ-172 unit, allowing for digital radar image processing. The J/APR-2 RWR was also replaced with a J/APR-5 RWR.

Another eight F-4EJs were converted to the reconnaissance role (becoming RF-4EJs). These aircraft differ from the RF-4E/RF-4E-Kai in not having any internal reconnaissance equipment. However they can carry three types of sensor pods.

The retirement

These are the TACER (an electronic reconnaissance pod with datalink), the TAC (carrying KS-135A and KS-95B cameras, plus a D-500UR IR system) and the LOROP (with KS-146B camera). The RF-4s currently serve with the 501st Hikōtai (501st Tactical Reconnaissance Squadron), based at Hyakuri Air Base.

Under the multitude of "Peace Echo" programs, 12 RF-4Es were delivered to the Israeli Air Force (IAF) between 1971 and 1976. In Israeli service the Phantom was given the designation RF-4E Orev (Raven). As with most aircraft serving in the IAF, these aircraft have been repeatedly upgraded with structural improvements and newer avionics. The Raven can carry the Sidewinder, Python and Shafrir air-to-air missiles. They have also been provided with indigenous reconnaissance and avionics equipment.

Greece was another customer for the RF-4E and bought 8 new examples of the type. The first of these arrived with the 348th "Eyes" Tactical Reconnaissance Squadron (Mira 348) in 1979. The Greek RF-4Es have radar warning receivers mounted on the air intakes and on the rear of the vertical fin. In 1993, the strength of Mira 348 was increased when 29 ex-Luftwaffe RF-4Es that were sold to the Hellenic Air Force (HAF) in 1993. The RF-4E continued to serve with the HAF until their retirement on 5th May 2017.

Eight RF-4Es were delivered to Turkey, with the first aircraft arriving in 1978. The RF-4E went on to serve with 113 Filo (squadron) at Eskisehir. Thirty two ex-Luftwaffe RF-4Es were also delivered to the Turkish Air Force between 1992 and 1994. With this arrival of these additional Phantoms, 173 Filo became the second RF-4E squadron, being based at Erhac-Malataya.

Between 2009 and 2011, 16 of the aircraft were modernised by the 1st Supply & Maintenance Centre, bringing them up to the RF-4E/TM standard. After a crash between two RF-4Es on 24th February 2015, it was decided that the remaining 8 operational RF-4Es would be retired. This retirement took place on 12th March 2015 ended a 35-year service life of the type with the Turkish Air Force.

HELLENIC AIR FORCE RF-4E PHANTOM II

TEXT - JEROEN VAN VEENENDAAL
PHOTOS - ROELOF-JAN GORT & JEROEN VAN VEENENDAAL

Jeroen van Veenendaal reports from Larissa, Greece,
where the Hellenic Air Force has retired it's RF-4E Phantom II



A Hellenic Air Force RF-4E Phantom II sits in it's HAS.

Photo by Jeroen van Veenendaal;

History of HAF RF-4E

Jeroen van Veenendaal spoke to Lt. Col. Dimitris Papadimitriou, the commander of the squadron. He has over 2,000 flight hours on the Phantom, is evidently proud of the squadron, and is keen to explain its history: *"348 Tactical Reconnaissance Squadron is one of the older and most historical squadrons in the Hellenic Air Force. It was set up initially as 348 Tactical Reconnaissance Flight under the 112 Combat Wing in 1953."*

Back then, it was operating with F-84G aircraft which had been altered to perform tactical reconnaissance missions. Two years later the 348 flight became a squadron, named the 348 Mira Taktikis Anagnoriseos (MTA; Tactical Reconnaissance Squadron) 'Mátia' ('Eyes'), and was provided with RT-33 and later with RF-84F aircraft

The Colonel explains why there are two types of RF-4 Phantom operating in the squadron. *"In 1979 The RF-4E aircraft entered the inventory of the 348 Tactical Reconnaissance Squadron. They were new aircraft supplied by the USAF, and were delivered in the same camouflage pattern they flew the whole era."*

In the summer of 1993, the Hellenic Air Force received 27 more RF-4E aircraft from the German Air Force, which were added to the squadron's fleet. They had a much more dark green camouflage pattern, and were not repainted as either."

Analog cameras

The RF-4E Phantom II is designed from birth to be used for tactical reconnaissance. One of the squadrons instructor pilots, Captain Nik Sofologis, "So'ph'os" (meaning "wise man", and with the 'ph' for Phantom) informs us of the parts where it all revolves around, the cameras. He starts: *"The RF-4 is an old aircraft which uses cameras which are analog cameras that record frames on black and white film. When you see the aircraft, you'll notice three glasses, two are on the sides and one is on the bottom. Those are the three camera stations."*

Combinations of photographic equipment can be equipped, depending on the mission. Two of the camera types are built by CAI, the KS-87B classic camera, and the KS-127A Long Range Oblique Photography (LOROP) cameras. For panoramic view, KA-56E cameras are used for low altitude, and KA-91B for high altitude. For specific day or night missions the near-infrared AAD-5 cameras can be used.

Especially the 66-inch (1676mm) long range LOROP cameras impresses Captain Sofologis. *"It's a big camera, it takes all the stations. It was used to take strategic pictures from a great altitude, I can remember 35,000ft (10,668m). We can get great pictures with a great ground resolution. We are able to zoom in very far, and find in the frame what we need."*





The digital successor

After retirement of the RF-4, the reconnaissance tasks will be performed by F-16's, equipped with recce pods. Captain Sofologis tries to make a comparison between the RF-4, and the DB-110 reconnaissance pod under the F-16. The pod takes digital images: *"It is fully autonomous and has the ability to take long range photos. Images are recorded on a solid state hard drive. It is great because it can take pictures in the infrared spectrum using electro-optical sensor technology during night or day operations to see extra details on targets that we need."*

But still, there's an advantage that the RF-4 has, that the F-16 doesn't have. 'Sophos' explains: *"In the F-16 you must plan the exact route on the ground and you have to follow that specific route. When I get to a specific waypoint on my route, the camera opens automatically and shoots photos from these areas, like a box with overlaps."* This means there is a small target of opportunity on the F-16, but it doesn't have the flexibility with the cameras that are on board the RF-4.

In the RF-4, the co-pilot is the primary user of the camera, and he can operate the camera to take the pictures at the point he wants. *"The backseater is the main operator of the cameras. The pilot in front has two means of detecting where he's taking pictures. In front there is a viewfinder, and on the sides you had circles. If the target you wanted was inside the circle, that is the frame. In the Phantom, we can take a photo of anything we want."* With the F-16 with the DB-110 recce pod there is a possibility to send small pictures via a form of data link to a ground station. For the full download the aircraft must land, as these images are too large to transfer via wireless communication.





*A Hellenic Air Force RF-4E Phantom II sits in it's HAS.
The end of this recce version of the mighty Phantom has come.*

Photo by Jeroen van Veenendaal;

2nd vs 4th generation aircraft

The RF-4 is an aircraft that has been in service for a very long time, but it's getting harder to operate in a modern environment. The captain states: Generally speaking, it's a great aircraft, but the big disadvantage is that it lacks electronics.

Nowadays, we are trying very hard to follow new tactics with the 2nd generation Phantom, while a big part of the air force uses 4th generation aircraft. If you want to use the RF-4 to the limits, you must try very hard.

The missions

The primary role of the 348 T.R.S squadron is to perform tactical reconnaissance according to the needs of all three branches of the Hellenic military. *"The experience from recent combat situations has shown that the success of modern operations does not depend on the amount of armed forces, but on the effective combination of methodical and efficient reconnaissance"* says squadron commander Papadimitriou.

"The ability to perform reconnaissance missions gives substantial strategic advantage to a country by providing invaluable information for mission planning and target recognition. The planning of combat attack missions largely depends on the amount of information collected by aircraft during recce missions."

Recce missions can also be flown to provide battle damage assessment after strike aircraft have released their weapons to a target.

Captain Sofologis: *"After a specific time we take photos for further analysis about the functionality of the attack and destruction of the target."*

The purpose of the photos is for our staff to see if an extra group of forces has to re-attack this specific target or if we achieved the desired effect on the target."

The commander adds: *"During critical periods the 348 T.R.S is the first Squadron to depart and the last to land."*

Electronic warfare

The squadron also carries out missions to the benefit of social services such as photographing fires. Captain Sofologis recalls one of those missions: *"There was a wide spread fire the civil officers wanted to see where the border line of the fire was, so with our cameras we were taking pictures, making a mosaic of the area. In two hours after the landing they had a clear image of the interest area."*

Another use for the RF-4 was finding water: *"The IR camera had the opportunity to help in finding water in some areas that didn't have enough water. In one city, it was very helpful."*

But the RF-4 had an electronic warfare task too. Making use of the ASTAC pod, an airborne electronic reconnaissance system, emissions from land-based radars and weapon systems could be intercepted and analyzed. With the ASTAC pod targeted radar emitters could be located and identified precisely and quickly in order to prepare future strikes. Captain Sofologis clarifies: *"We were using trigonometry to find the geographic position of the emitters. It was a useful tool to extract the electronic order of battle of the enemy."*

Another assignment of the RF-4 Phantom, that wasn't related to gaining information was the dispensing of aluminum strips, or chaff via the ALE-40 chaff dispensers. *"We would make corridors to jam enemy radars to produce false targets, or to damage or make blind spots to the enemies radar picture in order to blind or distract the enemy."*





The training

Before flying an RF-4, students have to follow a certain path. All of them go through the Hellenic Air Force Academy, The HAFA has the same standards for all the pilots. Sofologis explains: *"In the first year we fly the Cessna T-41 and after that the T-6 Texan. In the third year or after you graduate from the HAFA we fly the T-2 Buckeye."*

"Then you must decide if you want to go to an air to air squadron, or go to an air to ground squadron, and if you like the air to ground squadron you must go to the specific squadrons we have in Greece."

The F-16 squadrons are multi-role but some of them have air defence as a primary role, and others have the air to ground missions. The mindset is that all the squadrons are multi-role. The 348 squadron is an exception, it has a unique role as reconnaissance unit. *"So after the three training aircraft we will come here with the RF-4, we start flying at the back seat for about three to five years and after in the back seat we finally go in front, to fly the aircraft."*

"You must have at least 300 hours in the back seat to become an RF-4 pilot." Commander Papadimitriou adds: *"After the crews have been certified as combat ready, they go through subsequent programs to maintain their skills."*

The conclusion

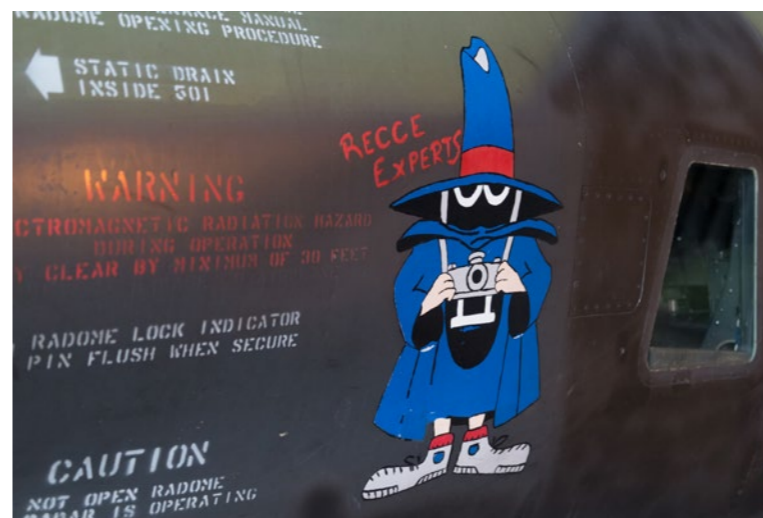
When asking the pilots about the experiences they've had in the recce Phantoms, they smile. *"We are famous for low level flying. Low level navigation is the only way for the RF-4 to avoid detection from the enemies' radar, so the ground is our friend. Personally speaking, we have a lot of beautiful experiences from low level navigation."*

They all love the Phantom very much, and are sad to see them go. 'Sophos' remembers: *"When I was younger I was very impressed about what our cameras could do, and how much the air force was based on this aircraft. So much intel about enemy forces could be gathered."*

"I was also impressed, because it's very great to think that an aircraft that was designed in the 1950s has all these opportunities. It can take pictures traveling up to 600 miles an hour from altitudes up to 30,000 feet."

"For its time it had systems that you could not imagine. My previous car did not have ABS, but the Phantom has."

The official date for the RF-4E's withdrawal is past, and the last flight has landed. The RF-4s will be missed by pilots and enthusiasts alike.



THE NEXT ISSUE OF FLYMAG MAGAZINE

The next issue of FLYMAG will be published in September of 2017.

We'll continue with the the adversary theme, with a look into the United States Air Force 18th Aggressor Squadron, based at Eielson AFB, Alaska. The issue will also feature an article about the Austrian Eurofighters visit to Wittmund to conduct live shooting.



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