

Dirk Jan de Ridder and Menso van Westrhenen spent a week with the pilots of the Croatian Air Force's Firefighting Squadron, who are among the most respected in their field.

# FIRE BOSSES

## AND SUPER SCOOPERS

Main photo: CL-415 888 drops a 6,000-litre water 'bomb' over the Adriatic Sea during a training flight from its Zadar base. All photos: Dirk Jan de Ridder and Menso van Westrhenen



SOME CHILDREN dream of becoming firefighters, others want to become pilots. Combining both may seem like a dream job, but firefighting pilots themselves liken

their profession to a combination of being a surgeon and a miner.

The pilots' working days are long and they have to be very precise, while after a long day they often return home dirty, smelly and sweaty. Each has a bag packed with toothbrush, underwear and clothes to hand because they may be summoned at any time, sometimes not returning home for days or even weeks.

Zemunik air base in Zadar has been home to aerial firefighters since Croatia was still part of Yugoslavia. After the country's break-up in 1991, Yugoslavian CL-215s were withdrawn and sold to Greece (see *Greek multi-mission legends*, April 2017, p76-82).

The new Hrvatsko ratno zrakoplovstvo i protuzračna obrana (HRZ i PZO, Croatian Air Force) initially hired CL-215 firefighting amphibians directly from Bombardier Aerospace, and then bought the first of three of the type in 1995.

They retired in 2004, replaced by turboprop CL-415s, and over the next ten years the fleet grew to its current six Bombardier CL-415 Super Scoopers and six Air Tractor AT-802s – four of which are equipped with floats and called Fire Bosses.

### Firefighting Squadron

The firefighting aircraft are operated by the protupožarna eskadrila (PPE, Firefighting Squadron). Its commander, Lt Col Davor Turković, one of the world's leading authorities on aerial firefighting, joined the team after serving as an instructor pilot on the PC-9.

He became the youngest ever CL-415 captain in the world at 33 and has logged 20,000-plus water drops in Croatia, Bosnia and Herzegovina, Greece, Israel, Macedonia and Portugal.

He says one of his most important roles is to standardise the way his pilots accumulate 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're 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. In the past we sometimes had difficulty turning an experienced fighter pilot into a multi-crew member because they were used to doing everything themselves."

"There are now basically two routes [towards becoming a CL-415 captain]. One type of training is for less experienced pilots to get the idea 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 they transfer to the CL-415 and undertake CL-415 training."

"The other path is for more experienced pilots. They go directly to the CL-415 and are usually older, so were you to drag them through the original process they would reach the full scope of their potential the day they retire!"

"We also train all pilots to fly all types. Whenever we have a chance to train a CL-415 pilot who hasn't undertaken Air Tractor training, we try to [fulfil it]. Sometime in the future I hope all pilots in the squadron will be able to fly all aircraft types."

### Diverse fleet

The PPE operates a mix of six CL-415s, two single-seat amphibious AT-802A Fire Bosses, a twin-seat amphibious AT-802A Fire Boss, a land-based AT-802F single-seater, a land-based AT-802F twin-seater and one aircraft – locally designated

as AT-802A/F – converted from a land-based AT-802F into a Fire Boss in 2010.

Outsiders might imagine the CL-415s are more capable in almost every way, but Turković doesn't agree: "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 on a strategic, not a tactical, level. Certain things that can be done with the CL-415 in some conditions certainly can't be done with an Air Tractor, but why should they?

"Sometimes you have a small fire and no wind. You can send two Air Tractors – they'll put it out, and the total cost of the 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 is not within the aircraft itself: it's the capability of the people who dictate the strategy of how to use an asset in the best possible way. It's the art of balancing how to use it – and 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 work miracles and sometimes you'll underachieve.

"Aerial firefighting is a very special business. Compare it to a bombing run: if the bombers miss, the target will still be there. Maybe tomorrow it will be heavily guarded, but it won't 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.

"On one side of the equation you have to recognise the behaviour, connecting the meteorological situation, terrain and vegetation; and on the other side you work out how many aircraft, and what type, you need to deploy."

### Local conditions, local tactics

Turković says the type of vegetation and the layout of the area the squadron covers requires very specific tactics compared to procedures in other nations.

"We try to 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 being in a war, when big countries can trade space for time and then exhaust the enemy – [with firefighting] in some other countries, they just protect houses and infrastructure as they wait for the rain.

"The narrowness of the Croatian coastline means we can't wait. So we try and stop the progress of the fire. Once that's done, what's left is just the cleaning up.

"On some fires we use all aircraft types in an effort to stop the head. Sometimes the situation at the head is too dangerous or the terrain is such that the smaller [AT-802] aircraft can't withstand those conditions and we assign tasks for them on a different part of the fire.

"For example, if there's a big fire progressing

## Land-based assets

Although the PPE's two land-based Air Tractors need to land after every water drop, they do have a value in their own right, says Turković.

"Sometimes they're the best choice. If you have a fire starting near an airstrip, if you dispatch them early enough and if the turnaround time from the airstrip is fast enough, you can put out the fire at very low cost.

"We also use the wheeled version for patrols, because they have greater endurance than the Fire Boss and are operationally the cheapest assets in the fleet.

"When we have a fire on the other side of the mountains [where there are few water sources], we send them because it's better for them to work from an airstrip over there than having scoopers going up and down the mountain.

"All Croatian islands are sparsely inhabited. Their domestic populations are small and tend to be older. Even if they try they can't generate sufficient ground forces for firefighting. Many tourists visit the islands where, if there's a fire, we have to dispatch Canadairs very quickly. If the Canadairs are committed elsewhere, we have a problem."

Several factors make fighting wildfires in Croatia a unique task. "If you look at the area that we're protecting, we have the largest number of [firefighting] aircraft per square kilometre in the world," explains Turković.

"The rest of our firefighting elements are underdeveloped by comparison. Our environmental conditions, geographical features and demographic features have forced us to do things in a way nobody else in the world does.

"Take Spain: we have very little in common in terms of CL-415 [operations]. We have nothing in common with the United States, where they use a lot of helicopters, don't use scoopers but do use a lot of chemicals, foam retardants and gels.

"We 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's better not to use chemicals unless really unavoidable.

"When you drop foam the aircraft becomes polluted with it, and when you scoop you wash it out. If you scoop with three or four aircraft at a small lake, at the end of the day the entire lake looks like somebody's been washing the laundry."



fast and leaving behind just small flanks, the Air Tractors will attack those flanks to prevent them becoming a new head if the wind shifts.

"Sometimes they chase the small 'spot' fires [new ones starting outside the area of the main flare-up]. It would be stupid to waste 6,000 litres of water on something that can be put out with 3,000."

The CL-415 captains take a leading role when both aircraft types fight the same wildfire, as Turković explains: "When we go to a fire we co-ordinate with ground troops regarding safety and to determine the tactics.

"The pilot then decides on the tactical

use of the aircraft. Since most 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's going to be done with both types.

"During training we try to do all different scenarios with a single aircraft, a group of aircraft and so on – so when the real situation comes we just combine these elements. This is why we do a big part of our training on real fires.

"Whoever becomes a firefighting pilot, regardless of aircraft type, has to fly a certain amount of hours on a real fire to get their certification. That's why we have [AT-802] twin-seaters in both configurations [with and without floats].

"When a pilot is released for solo flights, they've already been in real situations with other aircraft inside a confined area, with smoke obstacles and so on. Then at least we know they'll be performing safely. They may not be very efficient to start with, but they won't crash into another aircraft or a hill behind the smoke."

While most countries prone to wildfires experience a discrete 'firefighting season', Croatia is more complex with what Turković calls "two different 'universes'".

"First there's the administration universe. The high-up guys say the calendar year is divided into three phases for the planning of resources – preparation, the firefighting

season and recuperation. In the real world, fires don't recognise these phases. They only recognise the meteorological situation and the number of people being incautious during the drought.

"Sometimes we have more fires during February and March than in July. After the winter drought there's dry grass, and people go into their vineyards and clean and burn it. Sometimes it goes away downwind, and then we have work to do.

"In April the rain falls, maybe the wind drops, the grass grows and there's no potential for fire. As the summer

approaches, the [high] grass gets dry, and then the real peak of the year is from July 15 to September 1. But in the past ten years it's shifted more towards autumn.

"This year [2017] there's a drought, so precipitation is below average and wind is above average. At the beginning of the summer season, nature is very well adapted to fires. In these conditions, we use 'tactical package A', which means we deploy Air Tractors filled with water on recce flights – if they see any spot fires, they attack them.

"Under our regulations, the pilots are allowed to attack the fire regardless of



Above: AT-802F 890 is the Firefighting Squadron's only dual-seat land-based Air Tractor. Top: For its size, the CL-415 is extremely manoeuvrable and therefore ideally suited to the firefighting role. Left: Single-seat AT-802A Fire Boss 895 represents the most numerous Air Tractor variant operated by the PPE.



whether there's a request filed by anyone in the system. In 'tactical package A' we're aware that whenever there's a fire we'll have to be very swift in scrambling – and that we'll have to scramble a lot of aircraft. That's how we set up the system.

"In June and July 2014, there was 2ft-tall green grass – [which tells us that] if there's a fire, which is unlikely, it's going to be slow-moving with no present danger. That's when we move to 'tactical package B' – there's no need for patrols. Someone's 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.

"But when there's a drought and there's wind, we dispatch aircraft without calculating whether we need two, three or four.

"It's a little bit more expensive but we have to do it. We send as many aircraft as we can. It's better to have them in the air because the pilots are allowed to assess the fires and fight them.

"I think our record is catching 17 outbreaks on one day, and each of those fires could have presented a potential disaster."

### Water scooping

In favourable conditions it takes 12 seconds, the equivalent of 1,350ft (410m), for a CL-415 travelling at 70kts to scoop up 6,000 litres of water. Pilots describe it as the simplest manoeuvre during firefighting.

In choppy seas, 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. "When we scoop, the first thing we assess is the dimensions of the body of water," says Turković. "The second is the prevailing conditions and the third, obstacles.

"Around 95% of Croatian waters are unrestricted for water scooping. It's a pilot's decision where and how they do it. We don't forbid any locations, except rivers and harbours.

"We tell pilots not to choose the closest area nor the one with the best conditions. Find an area that's near enough, where the conditions are suitable for repeated operations, where there are no obstacles or birds and where you can safely climb out of and so on.

"During training and the experience gathering process, pilots get a mental picture of what's a good or bad body of water. This enables them to go to another country and pick a body of water based on the same criteria."

Crews on alert are divided into blue and yellow groups. Turković explains: "The yellow group stays at the airport and they have to release brakes within 30 minutes of the signal. In real life, it will occur between 17 and 22 minutes.

"The 30-minute guideline is because

we don't want to put pressure on them and we don't want them to hurry. If they forget something here at the apron it can cost them their lives two hours later.

"Blue crews are located wherever they choose, but are obligated to release brakes two hours after the signal. We need them because if the yellow crew reaches the daily limit, they have to be switched.

"If we make a mistake over how many aircraft we put on alert, we fetch blue crews. The third reason for having them is that if somebody in the yellow

### Israel deployment

At the end of last year, two CL-415s with 14 crewmembers and technical staff deployed to Israel when enormous forest fires blazed through the country, threatening the city of Haifa (see *Fire-Fighting Aircraft Converge on Israel*, January 2017, p27).

The Croatians were among the first to arrive, according to Lt Col Turković: "We were scrambled on November 23 at 15.00hrs in the afternoon. We took off at 07.00hrs on November 24 and reached Israel at 17.00hrs 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 ones in the north and central part of Israel.

"After their intensity reduced we stayed there for a couple more days as a watch guard. Due to bad weather in the Mediterranean basin the entire mission lasted for 13 days.

"I think it was the biggest international [firefighting aircraft] gathering in history: there were 23 foreign aircraft plus 14 of theirs. Thirteen countries came to help, [including] the American 747, Antonovs from Ukraine, Berievs from Russia and Azerbaijan, Canadairs from Croatia, France, Italy, Spain and Turkey and an Air Tractor from Cyprus. It was very interesting.

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

Images of Israeli Prime Minister Benjamin Netanyahu thanking Lt Col 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 AFM's visit to Croatia in April, but details of the co-operation were still to be finalised.

group is unwell, we have a reserve.

"Usually, they inform themselves of the situation in the morning, and if there are no take-offs until noon [they know that] this is not the day they're going to be scrambled.

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

"You're working in heat and, whatever you're doing, repeating the same cycles. For the drops, we first had [a limit of] 80 – and then we saw that sometimes when there's a fire on an island the pilots reach the drop limit way before they exhaust 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 considered raising the limit, but where should we put a stop? Then for two years we had no [drop] limit at all, to see what happened.

"We saw that it can lead to madness: it went to 160 drops. That's 160 opportunities to lose your head. That number on a single day was actually a world record, set by Maj Ivica Markač and his crew in September 2013 – an average of one every three minutes over eight hours!

"No country can reach that number [with their current limitations]. It was a fire on an island, at the edge of the sea. The biggest problem for the captain was waiting for the aircraft to be prepared to scoop, because it had a timed cycle."

While working days can be long for aircrew, they are even longer for maintenance crews which, on a full day of firefighting operations, may work as long as 16 hours, although they have breaks.

They release the aircraft early in the morning, which then goes to fight a fire, sometimes returning every 3.5 hours for fuel and possibly a crew change before finally coming back ten or 12 hours after the first take-off."



**Above:** The AT-802 is capable of dropping 3,000 litres of water, half the amount of the CL-415.  
**Top:** CL-415 888 and AT-802A 897 demonstrate the Croatian Air Force's amphibious capabilities. Pilots don't usually fly mixed formations, but it's a skill they learn on the PC-9 trainer that doesn't degrade easily.  
**Right:** Maj Markač – world record holder with 180 water drops on a single day – his co-pilot and a flight engineer walk away from their CL-415 after a successful training flight.

