UNMANNED AERIAL VEHICLES (UAVs)

Captain Per Gram, Helicopter Pilot, Norwegian Air Line Pilots Association (Norsk Flygerforbund/ Norway ALPA)

Some time ago I discussed the development and use of UAVs, via e-mail, with the Norwegian Airline Pilots' Association IFALPA Director. This followed the first trials at Lista Airport in Southern Norway. At that time we could not see them as a threat to civil aviation. Today, celebrating the Wright Brothers' 100 years of their famous 40 yard flight, I may have to reconsider.

In the 2-8 September 1998 edition of Flight International, one could read that an *"Uninhabited Aerial Vehicle"* had completed a 2000nm transatlantic flight in 26 hours. Prior to the flight of this small 13kg vehicle, trials had taken place in Western Australia, Vancouver Island and the South China Sea. On 21 August 1998, this vehicle flew from Bell Island on Newfoundland via a pre-programmed flight path to the Benbecula military range in Scotland where controllers took over manual control and landed it on South Uist Island in the Outer Hebrides. It should be added that altogether three vehicles were launched; one crashed just after take-off and one disappeared en-route. This was an American/ Australian civilian venture. Unmanned 'spy planes', missiles and drones had flown well before this in many countries, but this was really a first as far as operation outside line-of-sight and range goes and using GPS for navigation.

In National Geographic of December 2003, the magazine carry a story on another transatlantic crossing by a small model aeroplane which took place in August 2002. They write as if this were the first crossing of the Atlantic, which of course is not quite correct. However, military testing, spurred by a couple of wars and numerous conflicts around the globe, development accelerated tremendously from after the Gulf War and onwards and it became apparent that UAVs would constitute a new observation, communication and jamming platform with weapons carrying capability. And, will they replace piloted aircraft? Darryl Davies of Boeing and Manager of the UAV X-45 project says to National Geographic: *'No, not yet. That might be for the third century of flight'*. Rumour has it though, that a US company is working on a conversion of cargo DC-10s into an UAV. However, I wondered what this accelerating trend means for civilian, low flying operations like offshore oil and gas exploitation and support. Will UAVs be a threat to us operating in uncontrolled airspace?

The story really begins during the Second World War (WWII). Radio controlled gliding bombs, actually fairly large ones like the Henschel Hs 293 "Schmetterling" (above) and the Fritz X (right), were launched by Ju-88s and other German mother aircraft:

The Soviets, probably by use of German technology, developed flying bombs, airborne and guided motorised long range missiles soon after WWII.

Names like Global Hawk, Dark Star and Predator has become common in the aviation press. An Israeli Hellfire-armed UAV, believed to be a Hunter, scored a direct hit on a moving car with a Hamas leader in Palestine, but most of these vehicles are high altitude fliers using optical sensors and payloads up to 3000lbs. In October 2003, a Global Hawk flew from Edwards Air Force Base in California to Northolz, a Deutche Kriegsmarine (Navy) Air Base in Northern Germany. This is a large UAV with a wingspan of 44ft and an amazing range of 13,500nm. Germany intends to buy 5 of the European version called Euro Hawk. They are meant as a supplement to the German Navy's Atlantique Maritime Patrol Aircraft, and in some cases may substitute the Signal Intelligence (SIGINT) gathering Atlantiques. The information available now indicates that these 5 UAVs will operate at high altitude. But nevertheless, there must be developed rules and regulation for operations of UAVs in airspace where the presence of civilian aircraft may be expected. The same goes for Australia which is planning to buy Global Hawks for intelligence gathering, drug interdiction and immigration control.

(Pictured above) Global Hawk taxies onto main runway at Edwards Air Force Base in preparation for flight. Photo: US Air Force

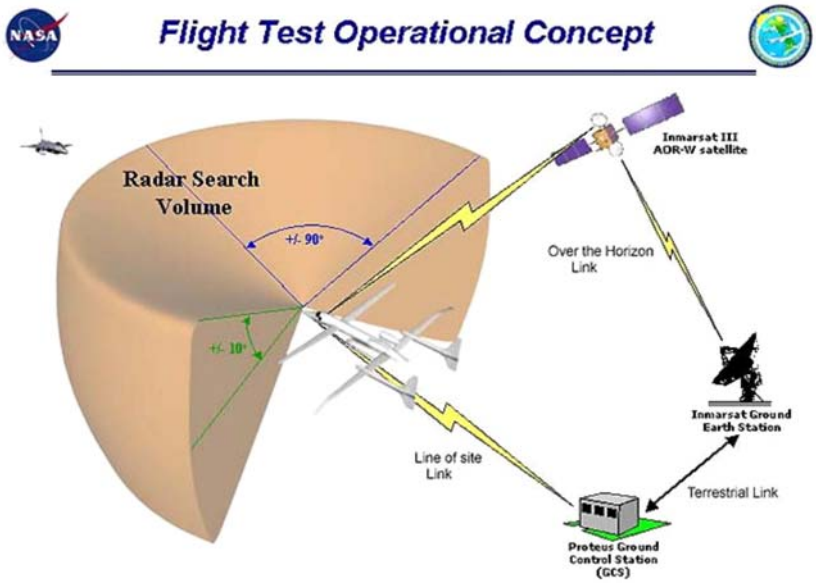
Other UAVs are extremely small and may actually be used inside houses. A Defence Advanced Research Projects Agency (DARPA) micro air vehicle derives its power from a chemical reaction between dry hydrogen pellets and the relative wind flowing over is 15" wingspan. Hardly a threat to civil aviation, but an indication of one of many uses of emerging fuel cell technology. US Army's Dragon Eye is a back packing UAV, so is the EADS Tracker. Some of these are helicopters or Unmanned Combat Armed Rotorcraft, UCARs.

Segregation or integration?

If UAVs are to operate in civilian airspace, both controlled and uncontrolled, measures must be taken which does not increase risks to civilian aeroplanes and helicopters. In the 18–24 July 2000 issue of Flight International, I read about a helicopter obstacle radar made by the Canadian company Amphitech International. It was called 'Oasys' and is a millimetre wave radar for obstacle detection. The same radar is now being tested onboard the remarkable Burt Rutan's Scaled Composites' Proteus aircraft.

Burt Rutan's Scaled Composites' Proteus aircraft
Photo: NASA

The program is run by NASA and is called Environmental Research Aircraft and Sensor Technology. (ERAST). The whole idea is to use sensors to avoid collision between UAV's and other aircraft.



Today U.S. UAV operators will have to file for a waiver from the Federal Aviation Administration (FAA) 60 days in advance if operating in airspace where other aircraft also fly. Several tests have been carried out over the continental USA with the Goodrich Skywatch HP, a transponder based Airborne Collision Avoidance System (ACAS) available for General Aviation and helicopters. The other sensor used during tests was the Oasys radar. Fighter aircraft and slower moving aircraft, including a hot air balloon, also participated.

Although there were some problems during tests, it seems clear that UAVs can safely operate in civilian controlled airspace.

I must add though, that in airspace where one may encounter UAVs, all other aircraft should also be required to carry at least an ACAS similar to the Skywatch HP (an ACAS Type I) which does not give the controller/pilot a Resolution Advisory, only Traffic Alert. Also note the requirement for line-of-sight during tests between the controller and the UAV. The distance between the Oasys and the threat is maximum 4nm in the original version and 6nm in the test version.

The ACAS detects aircraft with transponders switched on and the oasys detects those which are not squawking. The link via Inmarsat, is used for registering the time lag between the object's detection and ground pilot reaction time.

'We and other aerospace researchers are hoping to develop unmanned aircraft safe enough to fly in controlled airspace by 2008' NASA says to SPACE.com. I'm not so sure if all parties involved are that optimistic.

The International Federation of Air Line Pilots' Associations (IFALPA) says that '*Unmanned Aerial Vehicles shall be treated as manned aerial vehicles'* and *'there needs to be a Pilot-in-Command responsible for the vehicle/ mission'*. Their policy also quotes a so-called Target Level of Safety (TLS), which for all phases of an airline operation is a total risk which should not exceed 6.5 fatal accidents per 10 million flight hours. In other words, the introduction of UAVs should not exceed this risk value to civil operations. TLS is higher for each phases of flight, i.e. 2.5 for the enroute portion of flight, 0.2 for the lateral separation portion and so forth. Prior to the emergence of UAVs in public airspace, simulations must therefore be made to ensure that this TLS will be met as a minimum. This is what Burt Rutan's aircraft is about to do.

UAVs in Iraq

The following is an account of how US military ATC personnel view the combination of manned and unmanned military aircraft operations in and out of Balad and Tallil Air Bases (clipped from AW&ST Feb. 16, 2004): Interestingly enough, UAVs are popular with the air controllers. Because of their slow speed and remote control, '*they are easy to work with and take off and land on schedule'* unlike manned aircraft. However, according to Senior Master Sgt. Michael Ferman at Tallil, they aren't that popular with pilots. *'They are slow'* which means manned aircraft, that can't orbit for safety reasons, have to leave the area of the airfield and return later. Since controllers can't issue traffic locations, the manned aircraft have to keep away. *'UAVs also spend a long time on the runway'* doing checks in preparation for flight which ties up the runway. And, as planned, *'they're also hard to see'* he said.

At home

In the areas offshore Norway where helicopters operate, the pilots work intensely to increase the size of the Class E airspace here. We have one MSSR placed on a huge offshore installation called Gullfaks C.

We have E Class airspace surrounding this installation and extending all the way to shore.

Modified ADS (ADS C or 'Contract') is also used in the enroute phase. However so called State Aircraft, this may mean UAVs and other military aircraft are free to transit below and above the controlled layer, below 2000` and above FL080 where you find G airspace.

More large lumps of airspace offshore will be Class E by 2007, perhaps sooner. The Norwegian pilots will have to keep an eye on the situation and safeguard themselves against 'trespassers' unless the JAA and ICAO comes up with measures which will either integrate UAVs in a safe manner, or segregate them from civilian activity.

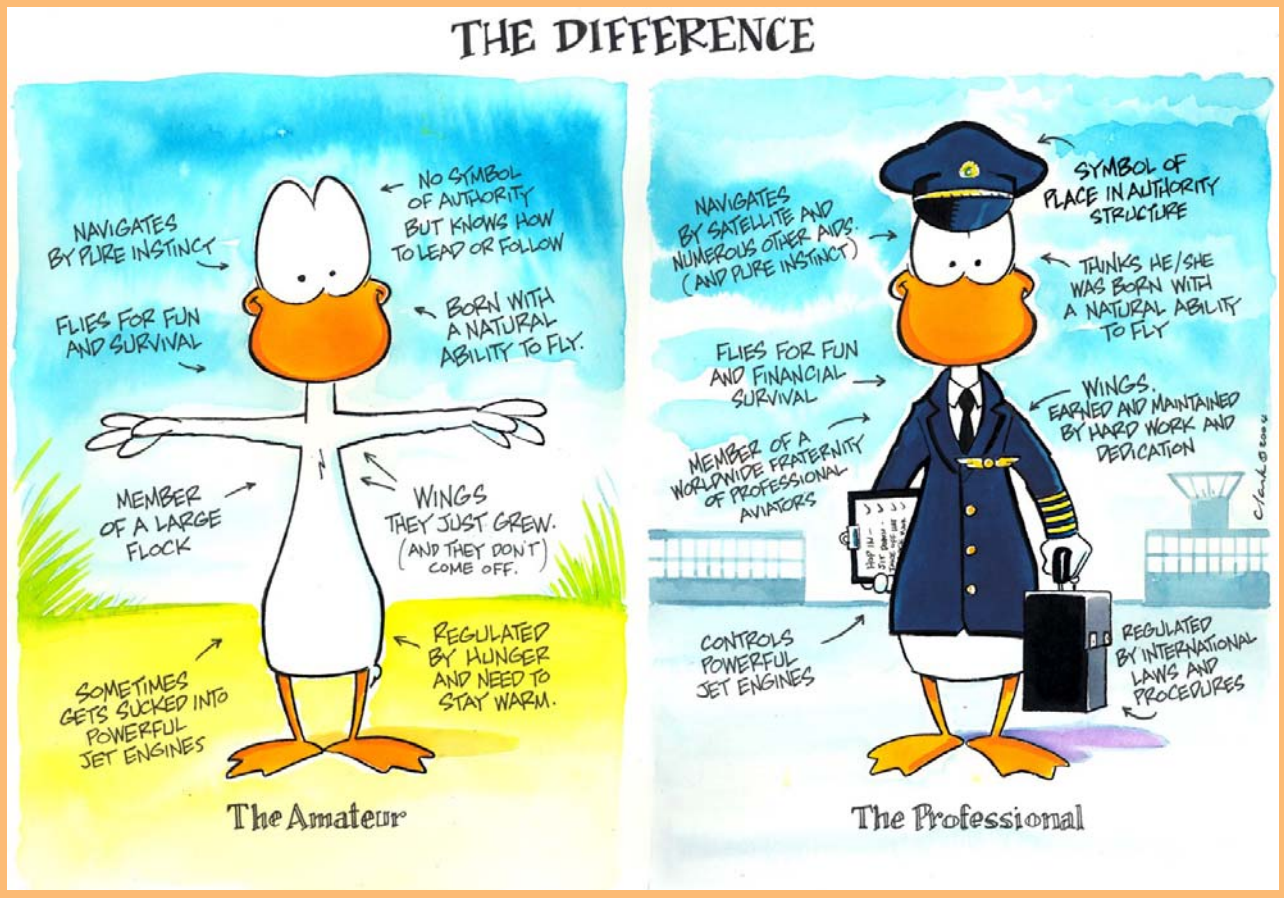
At the present time, IFALPA is discussing whether they need to develop specific policies in this field or not. I do have a feeling though, that the pilots may lag behind the development if they don't engage themselves actively, together with the ATC Association, the International Federation of Air Traffic Controller's Associations (IFATCA).

Some useful links:

www.space.com/businesstechnology/technology/uav_proteus_030326a.html

www.goodrichavionics.com/docs/Collision_Avoidance.pdf

www.dfrc.nasa.gov/Gallery/Photo/Proteus/HTML/EC03-0086-1.html



IFALPA's very special thanks goes to Gary Clark of Swamp Productions, Brisbane, Australia who created (and donated) this original painting specifically for the IFALPA 59th Annual Conference in Sydney. The painting was used as one of the major prizes at the Gala Dinner Prize Draw helping to raise $AUD 4,105.00 for the ALPA-Japan Scholarship Fund. This Scholarship Fund was initiated by the Air Line Pilots' Association of Japan (ALPA-Japan) with the aim of assisting all pilots, regardless of geography, to have the same opportunities of participating in such additional training and education to further promote IFALPA's mission of the highest level of safety worldwide.

A coloured poster (matt framed) of the original painting can be purchased for only $AUD 85.00 plus postage ($12.00 overseas, Australia $6.00)

For details on how to order this print, as well as other black and white and colour aviation cartoon prints and originals, go directly to the following website:

www.swamp.com.au/assets/swamp_strips.htm