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Sailors have always dreamt of seeing as far as they could beyond the horizon afforded by their deck-height position. Crow's nests at the top of tall masts were of course used by look-outs to spot enemy ships before they saw you, but the stretch thus gained was minimal. The first "mechanical" solution came with the inception of the rotordyne, which was in this case tethered to the stern of one's ship

Wet feet* drones

By Eric H. Biass • ESDPA Switzerland

While these could be sent relatively high up, their use was limited by the fact that the ship had to sail against the wind and/or fast enough since they were unpowered. So adequate wind speed was a *sine qua non*, and the trailing ship was condemned to follow a steady course until the rotordyne was winched back to its home deck. As one could presuppose, many a pilot of these helicopter precursors ended up in the drink rather than on the deck, either due to a sudden drop of the wind, or because the superstructures of the ship could induce troublesome turbulences in their wake in the take-off or landing phase. Although history books and period footage show that they had been used during World War II, the rotordynes in this application were quickly abandoned. Beyond-the-horizon observation was thus the privilege of aircraft carriers, if one excepts the short-lived USS Macon airship (1933-1935) which was given the extraordinary ability to launch Sparrowhawk biplanes and recover them in flight with an astute swinging hook design.

It is only decades later, with the advent of electronic systems that had become small and reliable enough to

*About the title: **"Wet Feet" was an expression used by U.S. Navy pilots in Vietnam operations to indicate to their mother ship that they were back over water on their return flight from an over land mission.**

←The Austrian Schiebel Camcopter S-100 has carried out naval trials in rough sea conditions with the German Navy in 2008. ↓ The Northrop Grumman RQ-8 Fire Scout has a 8.4 metre diameter rotor to lift the machine's 1,429-kilogrammes maximum take-off weight. With a payload of about 250 kilogrammes, it has an endurance of over five hours. © Schiebel & Northrop Grumman

fit in relatively small remotely controlled aircraft that ships other than aircraft carriers were given a chance to posses a means of stretching their gaze beyond the horizon – and yet, only for technologically advanced and navies with large ships and infrastructures. Indeed such drones were still relatively large and needed to be rail-launched with the assistance of jettison rockets, and then had to be recovered one way or another. Generally this was done by equipping the drone with inflatable floats and let them land on the water. This in turn presupposed ships equipped with suitable cranes to fish them out. But it must be remembered too that while electronics had finally made their way into remote control systems they had not yet – and for still quite a while - reached the photosensitive part of cameras, whether of movie or stills nature. Films thus had to be safely retrieved and processed onboard. So shipborne drones definitely were a large navy's chasse gardée.

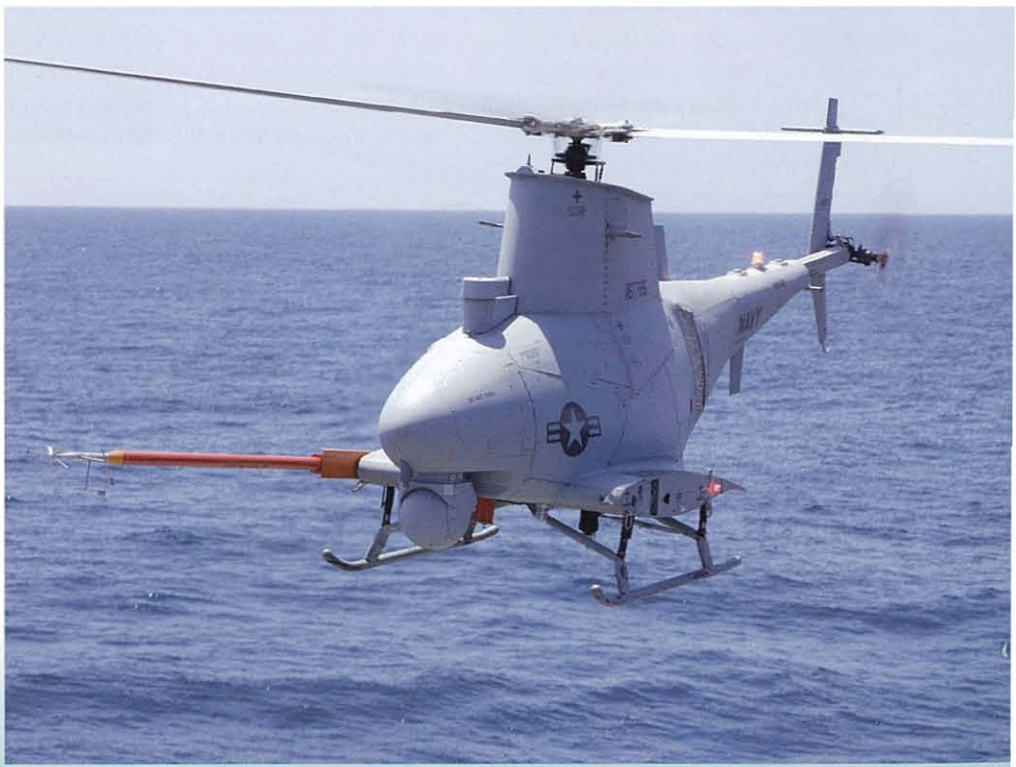
Modern era

Arguably, the first really practical ship-based drone came in the form to the Insitu Scaneagle, now part of a Boeing-Insitu U.S. Navy programme. The bird, which only weighs 18 kg has an endurance of between 15 and 20 hours. It can thus be launched from a relatively small catapult, but is retrieved in a rather unusual manner. Since it is equipped with a differential satellite navigations system it can return home with metric precision. This is necessary because the aim is for one of its wings to intercept a cable hanging vertically from a 15-metre tall pole (a gallows, really) on the side of the home ship. The cable thus slips outward along the leading edge of the wing where it eventually gets caught by a hook in which it snags. The aircraft thus spins around the cable and gets securely entangled. This retrieval method is now known as the Sky Hook. With a wingspan of 3.05 metres for a fuselage length of only 1.20, the Scaneagle is pretty much a scaled-down motorglider. This explains why it can sustain such long endurances with only a 1.5 horsepower, two-stroke engine. Its typical payload is a nose-mounted stabilised day or infrared camera, but perhaps more interestingly, also has a datalink with a range of 100 kilometres, which enables it to carry out deep reconnaissance missions inland. Latest developments includes its ability to be controlled by a Boeing E-3 AWACS and by a Bell-Boeing MV-22 Osprey aircraft.

Chatter jobs

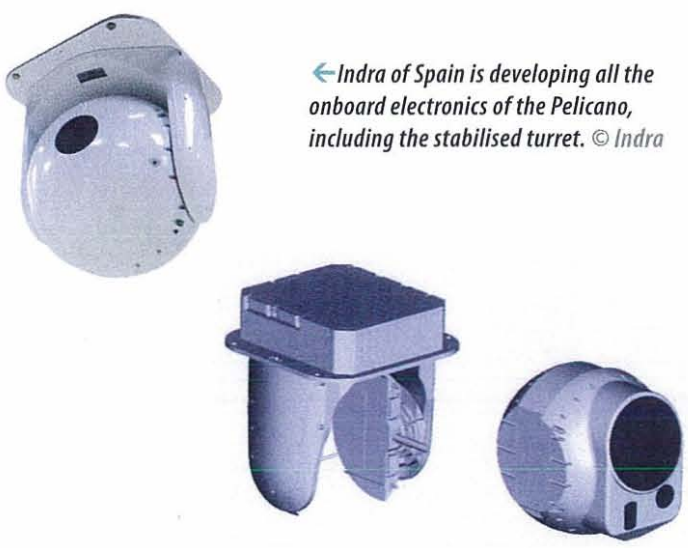
Of course, the helicopter drone would have sounded like an obvious candidate for ship-based operations. Yes but. Even a small vertilift drone has a fairly large diameter rotor, which furthermore remains at a uncomfortably low height (read body height), which is something that sailors do not like to see going out of hand on cramped deck, particularly if the latter is being listed and rolled by a disturbed sea surface. In fact this is one of the main reasons why no vertilift drone are fully operational on naval ships – but we're soon there. What gradually made navies change their minds is that technological developments now enable helicopter drones to take-off and land automatically. This endows them with a phenomenal stability in the most critical phase of their flight, in gusty winds and on unstable decks.

The pioneer here is Northrop Grumman with its RQ-8 Fire Scout. The least one can say is that this machine has had a rather convoluted history. It was first intended for the U.S. Navy, but was still looked upon with great suspicion for the reasons explained above. Come the U.S. Army's Future Combat System programme, however, and a love affair with the Army which planned orders for hundreds of units. Alas, after billions of investment in research and development the Future Combat System got slashed, and the acquisition of Fire Scouts with it. But amazingly, while it was being developed for the Army and because of that, it again attracted keener interest from the Navy, with which it now appears to be



running on solid rails. It has completed its assessment trials, flying routinely, at all attitudes, with automatic take-off and landing, day and night from the USS McInnerney – an Oliver Hazard Perry-class frigate. During those recent trials in the Gulf of Mexico, incidentally, it caught sight of a fast moving speedboat and followed it from a range of about ten kilometres until this suspect craft met with a larger one to transfer "goods". An amazing film shows the smugglers doing their dirty trade totally unaware that they were being observed by the Fire Scout. The Coast Guards called to the rescue finished ruining their week-end. The Fire Scout is now scheduled to enter initial operational capability in 2011, with the Navy planning to acquire some 168 units over the next two decades.

The FFG Haliburton is now being outfitted to this end. Digressing slightly now, guess whom the Fire Scout is seducing again with such feathers in its cap? The U.S. Army, of course, which as drawn a new "UAV roadmap" which includes a Fire Scout X for resupply and logistic missions since the demise of the Future Combat System programme. Don't look for a Fire Scout as we are accustomed to see it, however. The idea behind what currently is a project is to use a comparatively larger helicopter to obtain a substantially increased payload capacity. So what is currently being done with the Fire Scout X demonstrator is to transfer all the Fire Scout systems into a Bell 407, which could well have taken to the air by the time these lines are read. The use of the '407 purely results from an immediate availability of a unit, nothing sealed, Northrop Grumman told the author in a private conversation.

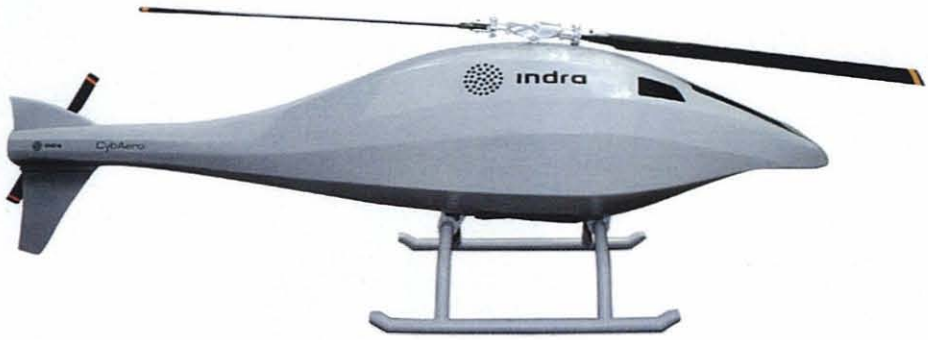


←Indra of Spain is developing all the onboard electronics of the Pelicano, including the stabilised turret. © *Indra*

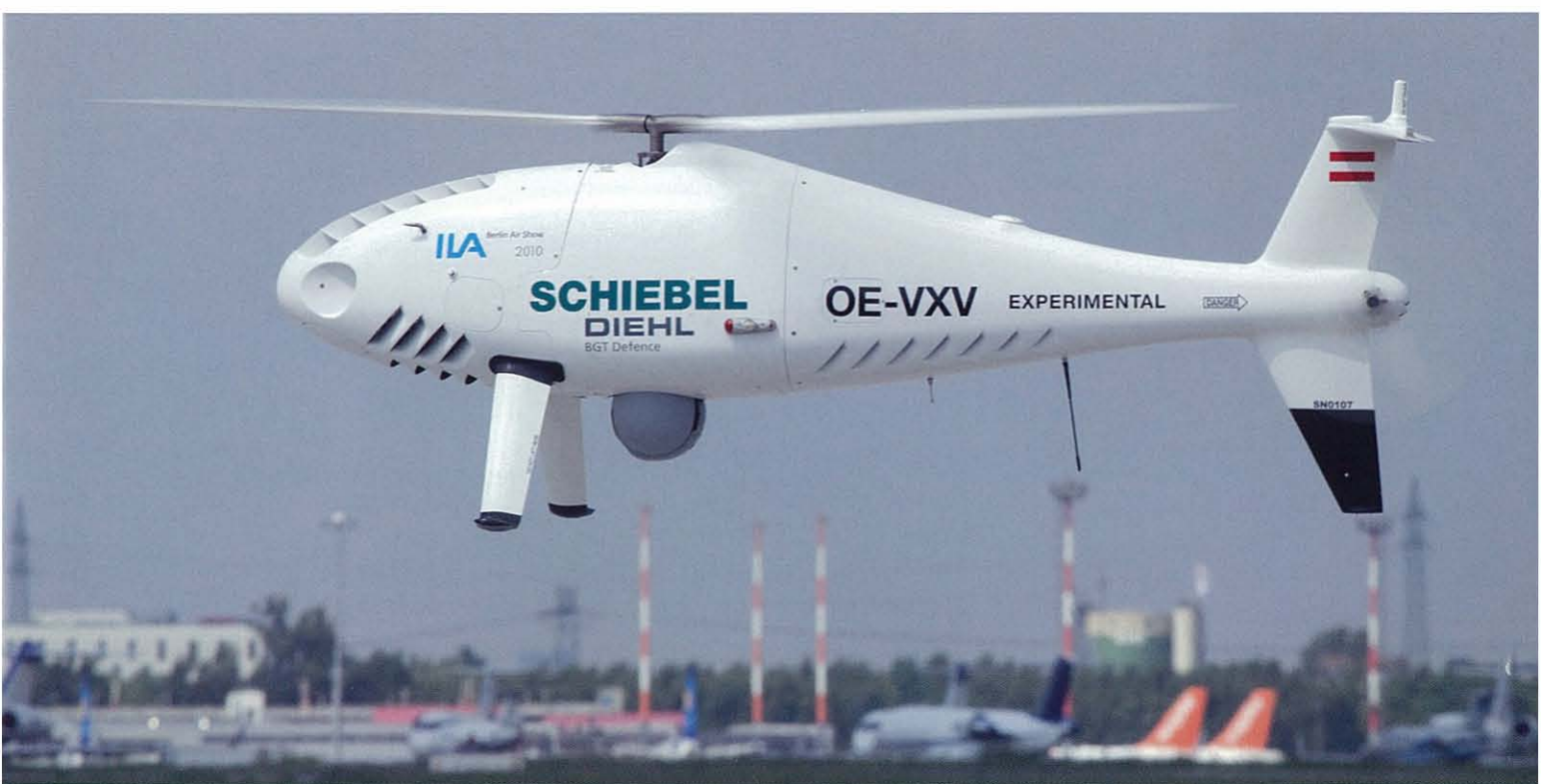
Europe finally awakes

The other world's highly successful company in the field of rotordrones is European – and Austrian to be precise. Originally known for its portable mine detectors, Schiebel

←The RQ-8 Fire Scout during its recent trial on board the USS McInnerney. ↘ The Indra Pelicano drone tips the scales at 200 kg, has a 3.30-m diameter rotor, a payload capacity of 30 kg, can take-off and land in winds of 10 metres per second and is equipped with a deck-locking system. ↓Seen here performing a demonstration at the recent ILA air show in Berlin, the Schiebel Camcopter S-100 lifts off at a MTOW of 200 kg, including a payload of 50 kg. It has demonstrated its ability to operate from a deck in wind speeds of over 15 knots. © Northrop Grumman, Indra & Schiebel



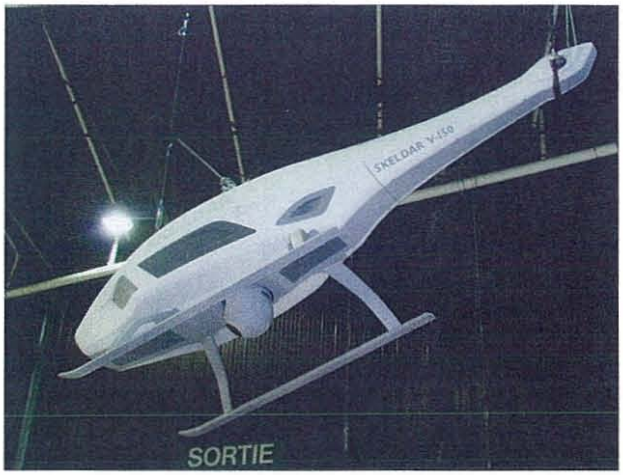
has hammered itself a solid niche on the drone market with the Camcopter S-100. This machine was initially based on the Cyber-Aero rotor system, but has evolved in such a dramatic manner that it really is a company-developed drone in its own right. The Camcopter S-100 scored in a very strong way, chalking up a firm order for an initial batch of some 80 units from the United Arab Emirates a few years ago, and many smaller orders from the four corners of world soon followed. With several non-American navies now taking a fresher approach to naval 'copter drones, and with the phenomenal experience garnered by Schiebel over the years thanks to its longsighted boss Hans Schiebel, the Camcopter S-100 became a candidate of choice for naval "feasibility trials", notably in France and Germany with their respective navies. Of course, the S-100 is a much smaller system than the Fire Scout, but running costs are also a fraction of its American big brother's – and above all, it is of a size that ideally suits the smaller ships it would be required to operate from – typically frigates and corvettes. Unsurprisingly thus, it is from German and French frigates that it performed its automatic and landing trials, sometimes in pretty adverse sea states. Not only did the S-100 become the world's first drone to be allowed to operate at a public air show – this was in Paris last year – it also demonstrated its versatility to take on state-of-the-art technologies such as using synthetic aperture radars, as exemplified by recent tests carried out with a Selex Galileo Picosar affixed to its starboard hardpoint. Little seems to be an insurmountable challenge to Schiebel,



Under development by Saab, the Cybaero-based Skeldar V-150 is also aiming at a potential Swedish requirement for a naval rotordrone.

A promissing proposed helicopter UAV development based on the French Helicopters Guimbal-produced Cabri two seater light helicopter was to take shape in the form of the EADS Defence & Security (now Cassidian) Orka 1200. Development initially flagged in 2002 with initial alternative mock-ups unveiled in June 2003. A formal industrial agreement to advance the design was signed in June 2005 between EADS sister company Eurocopter and Helicopters Guimbal, but it obviously never went beyond the initial stage concept on account of escalating costs. © E. H. Biass & J.-M. Guhl

the Camcopter also having been displayed in model form with a pair of side-mounted rockets. Another Camcopter forte is its relatively simple, but efficient and small, control station.



But back to France for a while. The French Marine Nationale, through the DGA procurement agency, has launched a request for information (RfI) with a formal request for proposals in its cross-hairs for 2011 as part of its SDAM (Système de drone aérien de la Marine) initiative, a project aimed at equipping its La Fayette-class frigates with beyond-the-horizon intelligence-gathering drones as France's Navy on-board manned helicopter assets are now at a low ebb. The second series of the above-mentioned tests involving the S-100 entailed some 20 hours of flights over a period of four days, was aimed at evaluating the suitability of vertilift drones in operations such as counter-piracy (the attack of ships by smaller boats, as off the coasts of Somalia) and anti-drug smuggling. According to Schiebel, the mission, which this time involved a Thales Agile 2 stabilised electro-optical turret, was a complete success. This small-size turret from Thales is incidentally meeting with widespread sellout on the market.

Meanwhile, the Camcopter might soon be having good company in the form of the Pelicano. In this programme and because in came in later on a beaten path, Indra wisely decided not to re-invent the wheel – well, at least as far as the hardware is concerned. The Spanish company too opted for a Swedish Cybaero backbone design, but engine apart modified to run on JP-5, concentrated its efforts on control and peripheral systems. Indra is an electronics systems company to be reckoned with in Europe if one may judge from the fact that some of its electronics are actually used by Israel. As the company explained personally to the author during the recent Eurosatory exhibition where the Pelicano was unveiled, Indra aim is to use all its know-how in electronics and fit the Pelicano with its own suites, including IFF, 100-kliometre capable datalink, redundant autopilot system, stabilised turret and automatic take-off and landing system. The development of a Ka-band synthetic aperture radar is also envisaged for this drone which is aimed at meeting a Spanish Navy requirement for a 100 km range and four-hour endurance rotordrone to equip its future Buque de Accion Maritima.

A fully representative model of the production Pelicano is due to have its maiden flight in early 2012.