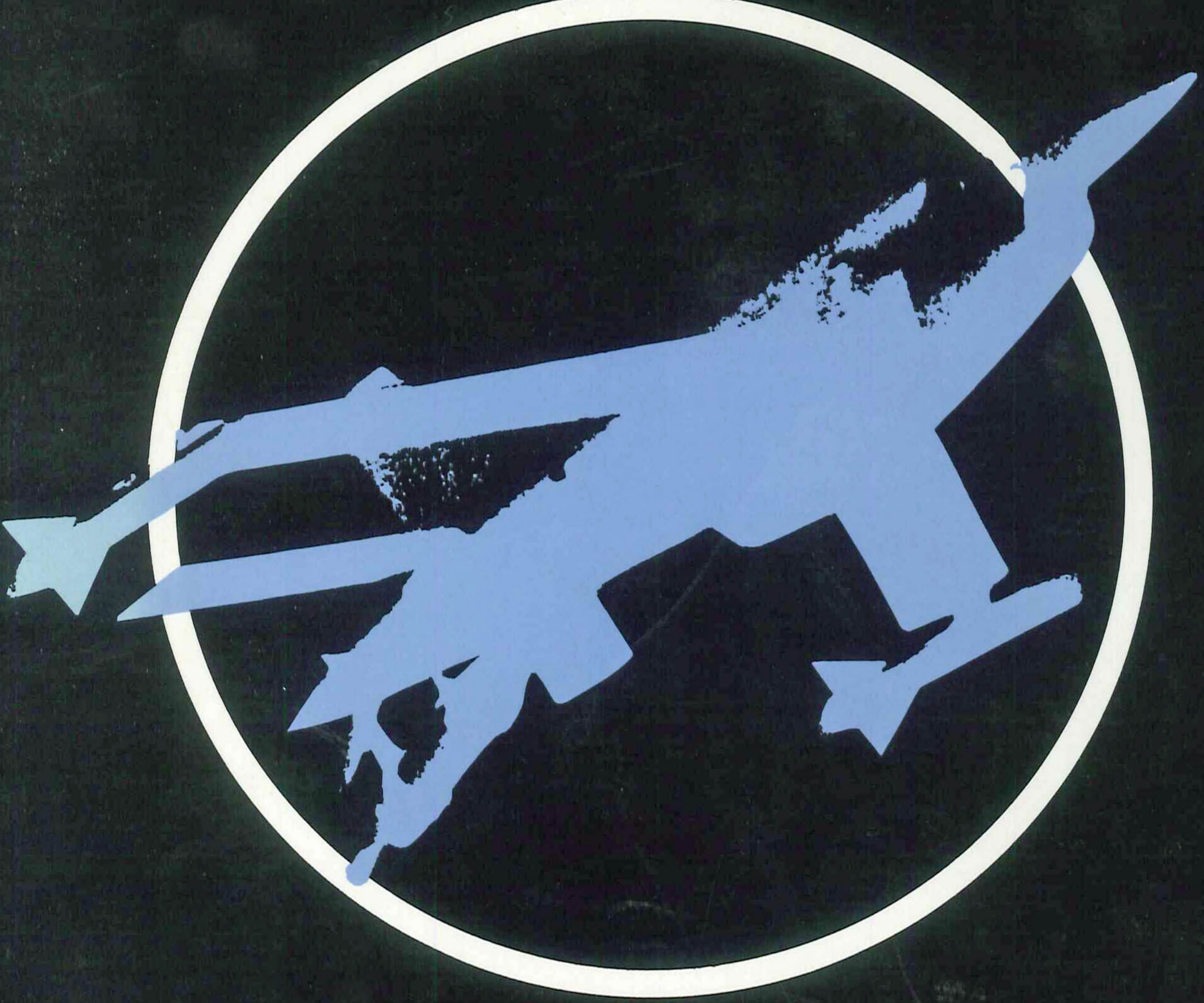
WORLD UNMANNED AIRCRAFT



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Preface

The Jane's Pocket Book *Robot Aircraft Today*, published a decade ago, was able to cover all such aircraft then in service or under development with a list of about 120 basic types. To them have been added, in the ensuing ten years, approximately double that number, most of them new designs and many of considerably more advanced concept and capability. They represent a convincing expression of the aerospace industry's continuing faith in the present and future value of this class of aircraft, ranging from the simplest hand-launched 'model aircraft' targets to sophisticated vehicles for real-time surveillance, target acquisition and detection, airborne early warning, electronic warfare and other vital military or naval missions.

Selection of a title for this new volume presented an early problem. 'Pilotless Aircraft' was clearly inappropriate for vehicles controlled by a remote 'pilot' on the ground. The term 'RPV', although the one most widely used, was not ideal, since (a) it can imply equally a ground or underwater vehicle and (b) would be just as inaccurate when applied to UMAs with missions that are entirely pre-programmed. No one much liked the nowadays less descriptive 'drone'; and so, at risk of offending the occasional diehard feminist, 'Unmanned Aircraft' won the day. Adoption of a larger format has allowed each UMA to be presented in a style and depth virtually identical to those in each annual edition of *Jane's All the World's Aircraft*, following the same policy of omitting towed targets, ballistic targets, and such other borderline UMAs as cruise missiles.

It was, however, hard to avoid the thought that the letters 'E & OE' should also have been a part of the title. Unmanned aircraft still receive far less media coverage than their manned brethren, and are in a market area where potential supply far exceeds possible present-day demand. That being so, one hoped for a better response from the manufacturers invited to provide details of their products; but the sad truth is that, of more than 100 companies whose input was requested, approximately half failed even to reply. I can only claim, therefore, to have done the best I could with the material available; if any company or its products are inadequately or inaccurately portrayed, it will not be for want of trying to obtain something better.

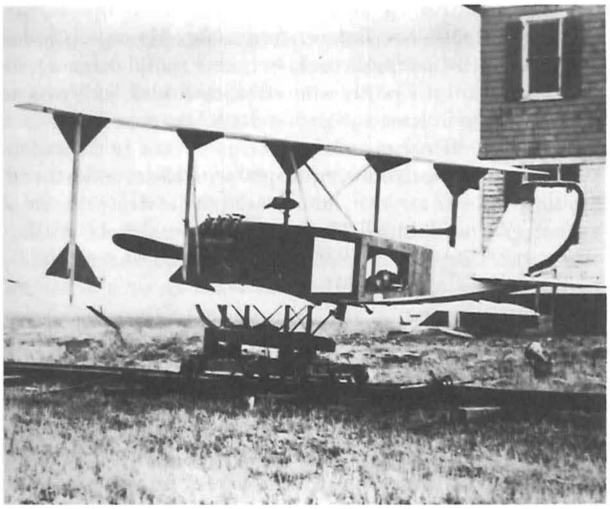
That said, my thanks clearly *are* due to those companies that did respond, some of them well beyond the highest expectations, to requests for information and illustrations. To them is due in no small measure any merit that this volume may have. For much other advice, encouragement and assistance I am indebted to (among many others) Reg Austin and Roger Moses, respectively the Chairman and Organising Secretary of the Bristol International RPV Conference; Ron Pretty and Bernard Blake of *Jane's Weapon Systems*; the publisher, for his uncomplaining patience in awaiting completion of the manuscript; and, certainly not least, John W. R. Taylor, with whom I was happily associated in the original *Robot Aircraft Today*, who fully supported this replacement, and who unearthed many elusive last-minute photographs.

Finally, a word of explanation and apology for what may otherwise appear to be my substandard mathematics. Where original dimensions are metric, they were converted to the nearest quarter of an inch and expressed as such in the original manuscript; but midway through production the publisher decided, for typographical reasons, that these vulgar fractions should be 'decimalised'. Thus, while a fully accurate conversion of 3.75 m (for example) would be 12 ft 3.64 in, it will appear as 12 ft 3.75 in. However, the reader should have no problem provided that the *standard* of conversion adopted is borne in mind.

K. M.

Seaford, East Sussex
July 1987

Introduction



The Sperry-Curtiss 'aerial torpedo', built for the US Navy in 1917 *(US National Archives)*

The ability to steer a flying machine automatically, without the hands-on attention of an onboard human pilot, has been with us ever since Lawrence Sperry first flight tested his gyro stabiliser – the world's first automatic pilot – in a Curtiss biplane in 1913. A mere four years later an improved version became the heart of Sperry's 'aerial torpedo', which made several successful flights for the US Navy from Sperry's Long Island airfield. It would seem incredible to him that, 70 years after those tests, arguments should still be raging over whether or not unmanned aircraft have a serious future.

On the face of it, UMAs have many sound arguments in their favour. They can be developed, produced and operated at a fraction of the cost of manned aircraft in airframes, engines, fuel consumption, pilot training, logistics and maintenance. They can be made smaller, more manoeuvrable, more numerous, more available, and above all more survivable, all without putting a single human operator at risk.

Consider these two quotations:

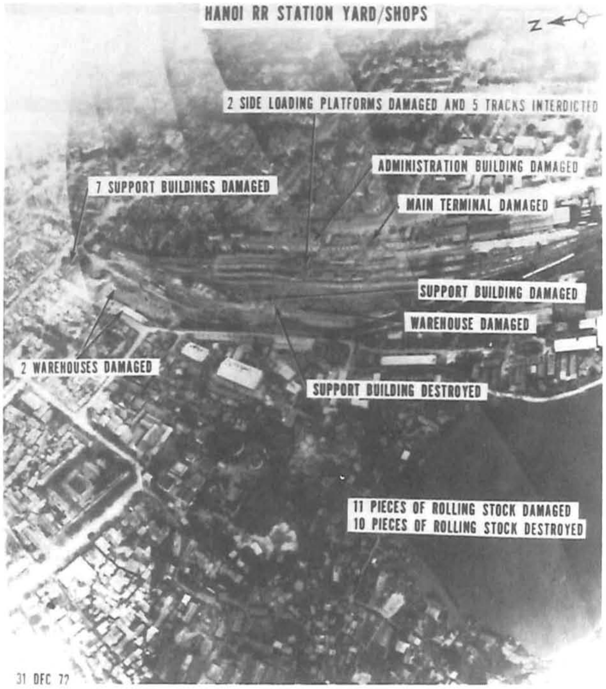
'This . . . target was . . . flown against the concentrated gunfire of the (British) Home Fleet during an exercise in the Mediterranean. For two hours, every gun in the fleet tried in vain to destroy the lone, slow and fragile target, but it was recovered safely.'

'Thousands of rounds of radar-directed fire from a sophisticated air defense gun, as well as hundreds of rounds of fifty caliber, were expended on an unmanned vehicle flying well within range. The unmanned vehicle flew on without a scratch.'

They are noteworthy not merely as evidence of survivability, but because between the two incidents there is an interval of 47 years. The former achievement, recorded by Richard A. Botzum in his excellent Northrop UMA history *50 Years of Target Drone Aircraft*, was logged in January 1933 by an ancient Fairey Queen biplane; the second was quoted during a US government hearing in 1980. Further irrefutable proof of drone survivability is given in *Lightning Bugs and other Reconnaissance Drones*, William Wagner's superb saga of the Ryan 147 RPVs in Viet-Nam, in which he records that, between 1964 and 1975, a total of 3,435 operational drone sorties was flown by USAF's 100th Strategic Reconnaissance Wing, and from 2,873 of those sorties – nearly 84 per cent – the drone came back. From 1972, as more sophisticated models were introduced, survival rates were well in excess of 90 per cent.

In that same war America lost more than 2,500 manned aircraft, about 5,000 of her airmen were killed, and nearly 90 per cent of *all* US servicemen taken prisoner were pilots and crewmen. Proponents of UMAs were confident that RPVs had proved their case, and were set to become a major new 'force multiplier' in military thinking. Instead, the expected upturn in their fortunes failed to materialise, and five years after Viet-Nam the USA had not one single operational RPV in its inventory. Four years later still, we find the US Navy risking two crewmen, in a 40-million-dollar carrier-based F-14, to obtain non-real-time photographic intelligence of targets in Lebanon – followed by an air strike in which the USN lost two aircraft out of 28, a third damaged, one pilot killed and another taken prisoner. Both missions could have been carried out by suitable UMAs, more cheaply, probably with real-time

Top-scoring Ryan drone was 'Top Cat', a Model 147SC which survived 68 sorties over Viet-Nam, with an average 12 targets per mission, before being lost in 1974



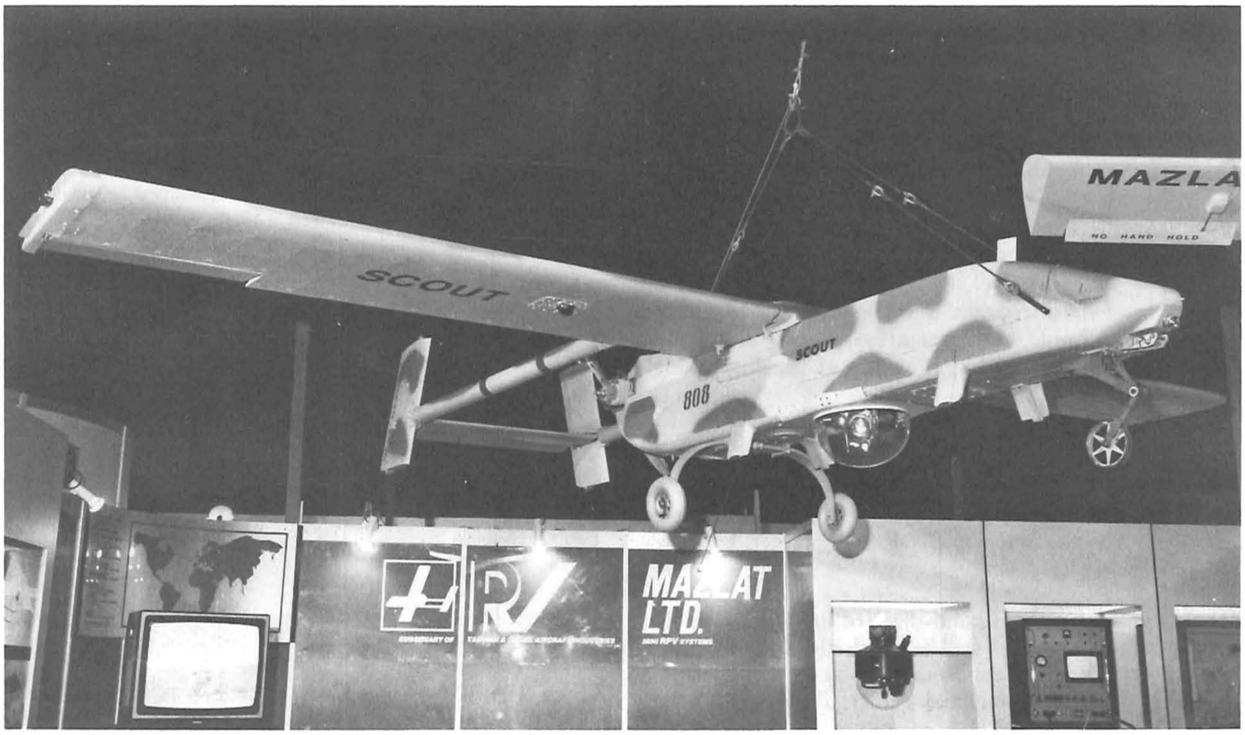
Typical damage assessment photograph obtained by Ryan 147 reconnaissance drone after the 1972 'Linebacker 2' bombing raids on North Viet-Nam

data, and certainly without human casualties. Small wonder that a few months earlier the Editor of *Armed Forces Journal International*, in his Foreword to *Lightning Bugs*, had written: 'RPVs may have met their enemy. Could it be us?'

Contrast this with Israeli action in Lebanon the same year. Israel first recognised the value of RPVs during the Yom Kippur war of 1973, when it was able to reduce its manned aircraft losses by using inexpensive Chukar decoys to deceive and saturate Egyptian SAM batteries along the Suez Canal. Shortly after that war it charged the IAI and Tadiran companies with developing small, versatile, low-signature RPVs, able to send back real-time intelligence by direct video link, and capable of being operated in the field by ordinary soldiers after only three to six months training. The Scout and Mastiff mini-RPVs came into their own in June 1982 when Israel launched its 'Peace for Galilee' offensive against Syrian forces in Lebanon. While some of the drones, equipped with radar reflectors to simulate full size aircraft, acted as decoys to draw the fire of Syrian gun and missile batteries in the Beka'a Valley, others carrying explosive charges remained undetected by Syrian radars, enabling them to home in on the radars' emissions and destroy them on impact. The air defence batteries, thus 'blinded', were totally vulnerable to attack by manned strike aircraft, which wiped them out completely. In this object lesson in the *combined* use of manned and unmanned aircraft, not one single Israeli pilot was lost, and Syria quickly paid Israel the compliment of acquiring drone systems for its own forces from the USSR.

The conclusion to be drawn from these two scenarios seems obvious enough: that when the need is perceived, and the motivation is strong enough, UMAs will be acquired, will be used, and will be successful at many missions (though not yet all) hitherto performed by manned aircraft. Unfortunately, that perception has all

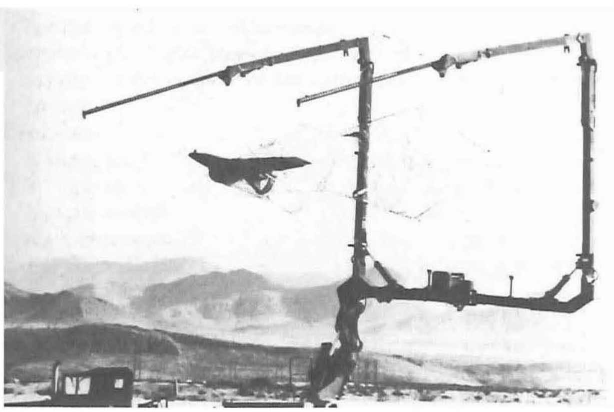
Most successful operational mini-RPV to date, the Scout formed the basis for Israel's new Pioneer system, now being deployed by the US Navy *(Brian M. Service)*



too often been blunted, both by industry (in overstating its case) and by potential customers (by failing to recognise that UMAs can actually help them to make *better* use of their manned equipment and resources). The day of the RPV as a natural ingredient of military thinking is much nearer than it was a decade ago, but there is still an urgent need for clearer and more widespread understanding, not only of what they can do but also of what they can *not* do better than manned systems – or at least not yet. In short, they need a better image. Given that, and the right user motivation, they also need one other vital ingredient: a fair, and consistent, share of defence spending. Sadly, two of these three ingredients have not always been present in the one major RPV programme that has received more public attention than any other.

Even its staunchest advocates would not deny that Lockheed's Aquila battlefield RPV for the US Army has been an unconscionably long time a-coming. If it does indeed become operational in 1988 as currently predicted (and it was on the Congress 'hit list' again in the autumn of 1987), it will be 14 years, or one year longer than it took four British and French manufacturers to design, develop and put into service the world's first supersonic airliner. Launched in 1974, the initial XMQM-105 demonstration phase was completed successfully in about three years, and the proposed IOC of summer 1984 seemed well within reach when the YMQM-105 FSED phase began on 31 August 1979. But subsequent troubles with the data link and TV payload, and the stop-go failure of several budgets to fund the programme fully, were not helped in mid-1983 when, in a major shifting of the goalposts, the US Army cut its planned purchase from 995 Aquilas to 548, simultaneously expanding the range of required missions to include communications relay, weather reconnaissance and electronic warfare. The effect of this on the timetable was admitted at the end of the following year when, to minimise further delays, the Army terminated development of all but the basic air vehicle, its TV/FLIR/laser designator payloads, the launch/recovery vehicles and the GCS. Even so, by 1985 the FSED period had been stretched from 43 months to 79, overall programme cost was nearing $2,000 million, and procurement plans had been further cut to 376 air vehicles at a unit cost fast rising towards the $1 million mark. When Aquila does enter service, the US Army will be getting fewer than 40 per cent of the air vehicles originally planned, at a cost virtually four times the original estimate. That still compares well with the cost of developing a manned aircraft for the same job, but is not exactly calculated to work wonders for the oft-preached 'quick, cheap and simple' image of mini-RPVs, and must surely have had an adverse knock-on effect upon other UMA programmes already competing for support with more complex and expensive manned systems.

After launch and recovery, Aquila can be made ready to fly another three-hour mission after only half an hour's refuelling and refurbishing

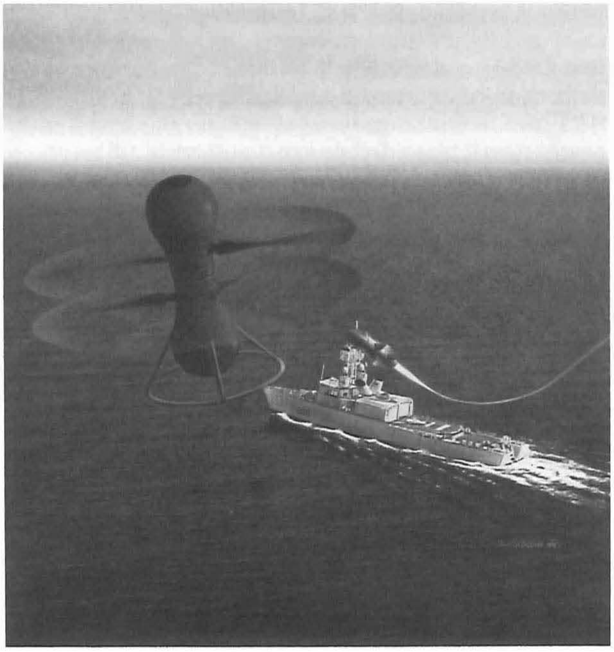


The other side of the coin is that the operational Aquila should be a far more capable and survivable RPV than the little 13·6 kg (30 lb) payload, 54·4 kg (120 lb) gross weight vehicle originally planned back in 1974. Endurance has been doubled to three hours (and could exceed this handsomely if required), payload is almost doubled, and the shape of the 120 kg (265 lb) production Aquila has a much 'stealthier' outline. Moreover, it will be operable worldwide in virtually any climate, unlike some other simpler, fair-weather minis with which it is sometimes unjustly compared.

To its credit, the US Army has sustained its belief in Aquila throughout its protracted development, and it has to be remarked that, around the world, it is armies that have taken the lead in adopting UMA systems. Belgium has its Épervier, four European armies operate the CL-89 surveillance drone, and the British Army is awaiting GEC Avionics' Phoenix battlefield system as eagerly as the US Army looks forward to fielding Aquila. A few navies are at last beginning to look more favourably at UMAs, but navies have their own special operating problems. For example, as the US Navy has discovered during early trials with the Israeli Pioneer, it is one thing to land a UMA on a flat strip of sunlit desert, but quite another to try catching it in a net mounted on the heaving deck of a ship at sea. Moreover, most ships have enough 'top hamper' on deck already, without adding to it such extra clutter as a launching ramp and retrieval system. Some form of rotorcraft or other VTOL air vehicle would seem to offer a better solution to most naval requirements. Air forces, with very few exceptions, apparently still need educating out of the fear that UMAs are going to make all their human pilots redundant overnight.

On the industry/technological side, the most profitable military missions to pursue in the immediate future seem to be those of reconnaissance and data gathering, electronic intelligence, and detecting and attacking hostile radars.

More research and development effort is still needed to improve the effectiveness and reliability of data links, especially over more than local ranges, and to facilitate payload integration. There must also be honesty in the marketplace, to present UMAs as a means of augmenting rather than supplanting existing ways of conducting a mission; and, as in any marketplace, it is necessary to separate the sheep from the goats. As the contents of this book show very clearly, the range of UMAs developed over the past two decades offers vehicles with payloads ranging from 2·5 kg to over 500 kg (5·5 to 1,102 lb), endurances from 15 minutes to 24 hours or more, and virtually every conceivable kind of land, air or shipboard launch and recovery. As a catalogue of industry capability, it may be impressive, but as an example of over-capacity in a market where potential demand is still limited, it is far less reassuring, and only those designs that can prove themselves the most reliable and cost-effective are likely to survive.



From frigates and smaller ships a small RPH like Canadair's Sentinel, with 3-4 hours' endurance, could perform a variety of useful roles (decoy is illustrated here) without the deck clutter of separate launch and recovery systems