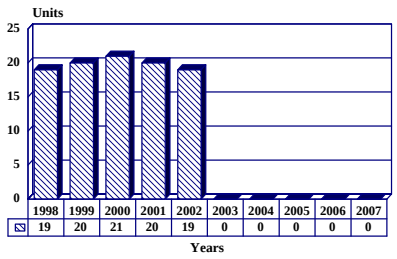
Phoenix RPV - Archived 5/99

Outlook

- Full-scale development completed; initial production starting
- Performance problems and cost increases supposedly resolved
- May now finally enter UK military service during 1998
- No forecast for the Frigate Bird, since no customers identified
- UK studying various future applications for UAVs, including a complement to Phoenix and an unmanned strike aircraft

10 Year Unit Production Forecast
1998 - 2007



Orientation

Description. Tactical reconnaissance remotely piloted vehicle system

Sponsor. The United Kingdom Ministry of Defence.

Contractors. Phoenix will be produced by GEC-Marconi Avionics Ltd, Combat Aircraft Controls Division, Rochester, Kent, England; and Flight Refuelling Ltd, Wimbourne, Dorset, England, United Kingdom. Marconi Command and Control Systems is also involved in this development program.

Major Subcontractors. Normalair-Garrett provides the power plant; Hitco Limited is responsible for the air vehicle; Ferranti and Pilkington PE supply part of the electronic control and mission equipment.

Status. Phoenix full-scale development has been completed; initial operating capability has been delayed. Air vehicle development is essentially complete, with testing focusing on the integration of the ground control station. However, performance problems have persisted, especially with the datalink and the amount of damage the air vehicle sustains upon recovery. Cancellation was being considered, but the UK government decided to give Phoenix one last chance. The Phoenix could enter service with the UK military in 1998, some nine years behind original estimates. The Phoenix was accepted in 1994, but was not placed in operational service. GEC Avionics has completed development of a new UAV design concept called Frigate Bird.

Total Produced. A total of 23 Phoenix air vehicles had been produced as of the end of 1997.

Mission. Remotely piloted vehicle for target acquisition and designation in any weather out to 50 km (26.99 nm) range. Phoenix will replace the Canadair CL-89 reconnaissance drone.

Price Range. The basic Phoenix air vehicle is estimated to cost $560,500 in Fiscal 1994 dollars. This price may have increased to over $700,000 in FY97 dollars.

Technical Data

Specifications. The following information is for the Phoenix and Frigate Bird unmanned air vehicles. Some of the information on the Frigate Bird UAV remains provisional and could change if the system enters production.

	Metric	Metric	US	US
Dimensions				
	Phoenix	Frigate Bird	Phoenix	Frigate Bird
Wing Span	4.27 m	3.7 m	14 ft	12 ft
Launch Weight (Max)	160 kg	255 kg	353 lb	562 lb
Propeller Diameter (Frigate Bird)	Not Available	2 m	Not Available	6.7 ft
Max Payload	40 kg	46 kg	88 lb	100 lb
Length	3.8 m	3.4 m	12.5 ft	11 ft
Performance				
Max Speed	157 km/hr	296 km/hr	85 knots	160 knots
Cruise Speed	100 km/hr	152 km/hr	53.99 knots	82 knots
Launching Speed (Phoenix)	130 km/hr	Not Available	70.15 knots	Not Available
Combat Radius	50-60 km	50-60 km	26.99-32.39 nm	26.99-32.39 nm
Altitude	2,744 m	2,744 m	9,000 ft	9,000 ft
Endurance	6 hours	4.5 hours	6 hours	4.5 hours

Design Features. A single 18.6 kW (25 hp) Target Technology Ltd WAEL 342 two-stroke air-cooled piston engine. However, GEC is considering re-engining the Phoenix with a more powerful Wankel rotary propulsion system.

The Phoenix air vehicle can be remotely controlled or possibly preprogrammed. The overall control system is called Machan. This system includes a Ferranti FS60 and FDG60 vertical and directional gyroscopes. Thorn EMI supplies an HR3 magnetic sensor for heading reference.

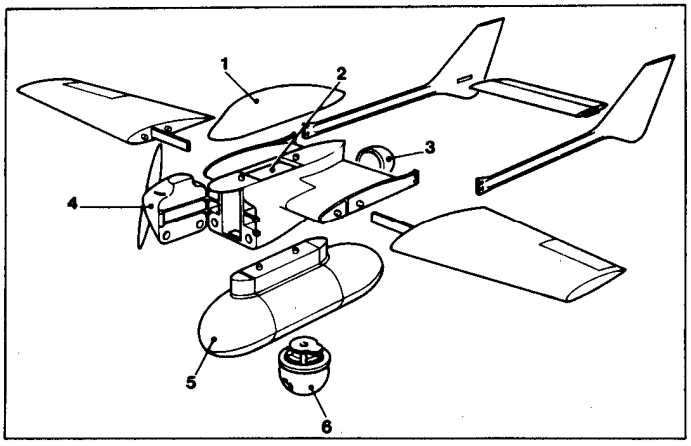
Phoenix is to be launched from a truck- or trailer-mounted catapult.

No warhead or munitions deployment capability is planned for Phoenix.

Operating Characteristics. Phoenix is to be recovered via a parachute deployed either by command or automatically. The recovery system is provided by Flight Refueling.

Command is via radio datalink. The ground control facility will interface with Marconi Command and Control Systems' BATES command and control system.

The air vehicle will use a stabilized thermal imaging system with a zoom lens and a secure real-time datalink supplied by Marconi Electronic Devices Ltd. Some type of laser designation system is also in the offing.



GEC Avionics/Flight Refuelling concept for the Phoenix program includes: 1) a crushable recovery module, 2) fuel module, 3) parachute bay, 4) hinged engine module, 5) a roll stabilized mission systems pod housing a directional antenna at each end, and 6) the TICM II imaging sensor.

PHOENIX

Source: FR Aviation

Variants/Upgrades

Model A/Model B. Basically there are two models of the Phoenix: Model A and Model B. For additional information on these systems and a package provided by Marconi for electronic surveillance and countermeasures, please see the pertinent entries under the Program Review section below.

Program Review

Background. In late 1981, it was learned that the British Ministry of Defence was again studying a remotely piloted vehicle system for the designation of targets for artillery systems, especially MLRS. The program, called Phoenix, was to replace the old Supervisor program of Westland, which had been canceled. The 1982 Falklands War added urgency to the program. In June 1983, competitive development contracts were awarded to Marconi Avionics (now GEC Avionics) and Ferranti. Each main contractor teamed up with an airframe contractor to develop the air vehicle, GEC with Flight Refuelling and Ferranti with Slingsby Aviation. Each engineering study contract was worth £1 million.

In late February 1985, GEC/Flight Refuelling was awarded an £80 million contract for full-scale development and production of Phoenix. However, in 1990 a decision to delay the introduction into British service was made and the new schedule was established, which then called for an initial operating capability (IOC) of Phoenix to be achieved by 1995-96. However, difficulties persisted and the program found itself facing a ministry-level review and possible cancellation. Now given a final chance to overcome previous problems, the Phoenix may enter service still in 1998.

Payload Options. Marconi Defense Systems has unveiled an electronic surveillance and countermeasures equipment designed to fit into the Phoenix payload pod. Known as the Monarch electronic warfare system, it is being developed as a private venture, and could be configured to fit other RPVs. Also, the UK Ministry of Defence operational requirements staff is examining the possibility of using the Phoenix system to designate high value targets by equipping the air vehicle with a laser designator.

New Requirement: BGUMA. The United Kingdom is considering the development of another unmanned air vehicle that would complement the Phoenix. Known as Battlegroup Unmanned Aircraft (BGUMA). A study is under way at the UK Defence Research Agency to assist the Ministry of Defence in drawing up its BGUMA requirement.

Future UK UAVs. The United Kingdom is examining potential future uses of unmanned air vehicles. Under a US$59 million contract, the UK Ministry of Defence has launched a study into a Future Offensive Air System (FOAS), formerly known as Future Offensive Aircraft (FOA). The system would replace the RAF Tornado GR.4 around 2015. The program's name was changed after the UK decided to add an unmanned option for meeting this requirement.

Options being studied include the following:

- a Eurofighter variant
- a new design or an off-the-shelf aircraft
- an unmanned aircraft
- a stand-off missile system launched from a transport aircraft

The purpose of the study is to examine the feasibility, cost and operational effectiveness of the various solutions being proposed. Selection of a particular option, if any are pursued, would be made once this process is completed (around the end of 1999). The United Kingdom could cooperation with various allies in meeting this need and is already sharing information with France.

Meanwhile, British Aerospace is proposing the development of a new system, which includes an unmanned air vehicle, for air defense suppression. The conceptual system, using various types of unmanned air vehicles, would replace current anti-radiation missiles beyond 2015. To defeat mobile SAMs, British Aerospace is offering the Modular Interdiction Stand-Off Weapon (MISOW). The MISOW would combine a long-endurance UAV carried surveillance system, a low-observable probe (drone type system) for designation and target work in high threat areas, a ground-based mission support station (MSS) for real-time analysis and, to attack the target, an air-launched stand-off missile system. The UAV would carry a sophisticated surveillance payload and an eight-hour endurance.

Air Vehicle Models. The following provides a brief description of Phoenix air vehicle models, as well as a

look at the new Frigate Bird vertical-takeoff-and-landing UAV system.

Phoenix Model A. The GEC/Flight Refuelling air vehicle is of twin-boom configuration, with the thermal imager housed in an under-fuselage pod. The air vehicle is of modern composite construction, with components supplied by Herman Smith Hitco Ltd.

Phoenix Model B. The Phoenix has undergone substantial changes from the A model, three of which have been flying since the middle of 1986. The preproduction system features rounded fins and wing-tips, probably in a bid to give the RPV a limited Stealth capability against radar detection. The full-production version of the Phoenix is expected to be virtually identical to the preproduction model.

The redesigned air vehicle will be recovered by parachute, floating to the ground inverted in order to protect the mission sensors attached to the system's belly. The A model uses a crushable blister to limit damage to the thermal imager (the Phoenix's prime surveillance sensor), since it was recovered right way up.

Frigate Bird. This new vertical takeoff-and-landing (VTOL) unmanned air vehicle system is designed for use aboard surface warships. The Frigate Bird is a result of a series of in-house studies at GEC Avionics Combat Aircraft Controls Division, and represents the first in a family of air vehicles (weighing from 114 kg to 450 kg). Frigate Bird is a tail sitter vehicle of canard configuration which offers advantage over previous VTOL designs, such as its compactness. The Frigate Bird must turn 90 degrees to shift from vertical to horizontal flight. The air vehicle is typically equipped with a 112 bhp Williams WTS 117 turboshaft engine (providing a range capability of 815 km and an endurance of 4.5 hours), although an optional 100 bhp Norton (now UEL) NR642 rotary engine can provide substantially enhanced performance. Endurance and payload can be increased via a catapult or rocket-assisted conventional takeoff.

Following launch, the vehicle transitions to conventional flight, with the lift forces being provided by the canard and wing surfaces. During hover and slow forward flight, the lift is provided by the counterrotating propellers, and directional control is achieved by using the conventional control techniques. On recovery, Frigate Bird latches onto the deck using a harpoon mechanism and then utilizes the top-heavy characteristic of a tail sitter to topple into a stable attitude on a normal undercarriage.

The Frigate Bird was evaluated by the British Royal Navy in 1990, although there is no formal requirement. The Royal Navy is continuing to follow this program's development studies. The air vehicle is compatible with a range of existing payload packages, including thermal imagers, radar systems and electronic warfare equipment.

Funding

No information is currently available.

Recent Contracts

A fixed-price contract, worth £80 million, for the development of the Phoenix was originally awarded in 1985. Total program cost increased to £100.4 million by November 1990 after inflation and design changes demanded by the UK Ministry of Defence. The last cost estimate has placed Phoenix at £111.8 million.

Timetable

Month	Year	Major Development
Oct	1981	Phoenix program revealed
Jun	1983	Competitive contracts awarded
Late Feb	1985	Contract awarded
Early	1986	First flight of Phoenix air vehicle
	1990	Announcement that Phoenix IOC would be delayed
	1992	Frigate Bird announced
	1994-95	UK MoD review; cancellation under consideration
	1996	Flight Refuelling offers UAV for US Tactical UAV competition

Month	Year	Major Development
	1996-1997	GEC given one last chance to fix Phoenix problems or face cancellation
	1998[a]	Initial operating capability

[a]estimate

Worldwide Distribution

Although the Phoenix program is nearing an initial operational capability (IOC), the potential of this system on the export market has yet to be assessed. Phoenix could find export interest among a number of countries, including those within the NATO alliance and operators of the Lockheed Martin Corporation M270 227 mm Multiple Launch Rocket System (MLRS). The United States has had a requirement for a Phoenix-type RPV, since the MQM-105 Aquila program apparently has been canceled. However, the US could use a version of the Outrider close-range UAV or another in-service air vehicle to fill this need. Sweden is also a potential customer for the Phoenix (see separate Ariel/Midget report).

UK. (The only expected near-term operator of the Phoenix unmanned air vehicle is the United Kingdom.)

Forecast Rationale

The United Kingdom has given GEC-Marconi one last chance to get it right or the Phoenix program will be terminated. GEC-Marconi is confident that it has corrected existing problems and that the Phoenix will enter service with the UK military during 1998. However, Phoenix's triumphant entry into the active inventory comes some nine years behind its original schedule.

The United Kingdom is not in an enviable position considering the time and money already invested in Phoenix. Its cancellation would save no money despite plans to recoup some of Phoenix's development expense from GEC-Marconi. Furthermore, since the military's UAV requirement still exists, an alternative procurement program would have to be launched. The UK Ministry of Defence has been considering alternatives to Phoenix. Among the systems examined were the French Crecerelle and Israel's Hunter. The UK was also evaluating its original requirement to determine if an unmanned air vehicle is actually needed. One non-UAV-based option is to use the AH-64 Apache helicopter, recently ordered by the UK and equipped with the Longbow radar, to provide the necessary target data to its artillery support units.

Presently, the UK Ministry of Defence is expected to move ahead with Phoenix procurement, at least on a limited basis. A limited procurement program would allow the UK to refine its UAV requirement and better understand the capabilities of these systems. The United Kingdom's Phoenix procurement objective remains unclear, despite an apparent move toward its procurement. An original figure of 200 air vehicles, with about 40 for reserves and training, no longer seems plausible under current circumstances. Procurement cuts due to a changing international threat environment and falling domestic defense spending could push the final Phoenix production total down to as low as 50 air vehicles. Recovering even part of these procurement losses through international sales will be difficult for Phoenix due to the highly competitive nature of this market. Therefore, the following Phoenix forecast is a reflection of the exclusive indigenous demand generated by the UK Royal Armed Forces.

The United Kingdom is also examining potential future UAV concepts, including one that could replace the Royal Air Force's Tornadoes with an unmanned strike vehicle after 2015. More near-term applications could be the possible fielding of a complement to the Phoenix under the Battlegroup Unmanned Aircraft (BGUMA) requirement, while the Royal Navy could deploy an unmanned air vehicle system of its own for surveillance and reconnaissance missions. However, no firm schedules have been established for the introduction of these systems.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR PRODUCTION

			High Confidence Level			Good Confidence Level				Speculative		
Designation	System	thru 97	98	99	00	01	02	03	04	05	06	07	Total 98-07
PHOENIX RPV	REMOTELY PILOTED VEHICLE (UK)	23	19	20	21	20	19	0	0	0	0	0	99