A New Chapter in the History of Aviation

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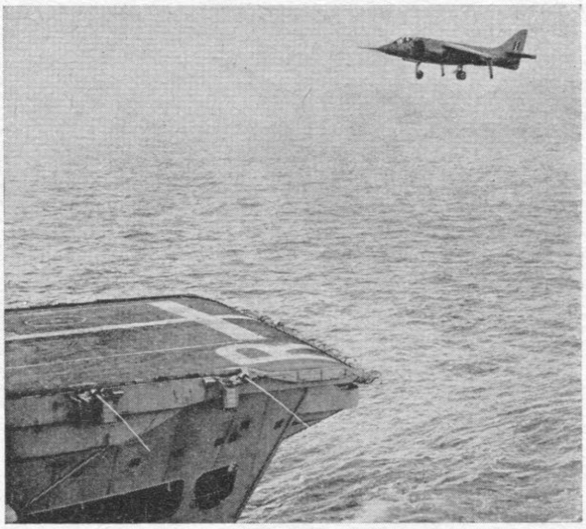

AVIATION DEVELOPS AT an astonishing pace—from bamboo structures braced with piano-wire to space capsules in sixty years. From 40 m.p.h. to 15,000 m.p.h. in less than a lifetime, and the development curve shows no sign of levelling out.

Aviation development rides rough-shod over the discouraging "experts"—the men who say it can't be done or if it can it won't be any use anyway. This development upsets many established ways and habits and nothing can stop its advance. Nothing.

The latest chapter is V/STOL. And what a fuss this is causing! It had a difficult birth with many upsets and tumbles but it is being nourished and grows stronger and it is going to be examined by the United States Army, Air Force and Navy, the West German Air Force and the Royal Air Force next year when the P.1127 Tripartite Evaluation Squadron forms at R.A.F. West Raynham. The Hawker Siddeley P.1127 and especially the Pegasus engine will not be fully developed by then* but nevertheless it will allow these Services to sharpen their teeth on operational V/STOL procedures.

And the Royal Air Force will have the high-performance V/STOL Hawker Siddeley P.1154 by 1970.

Perhaps the primary reason for this new state in our aeronautical affairs is due to the astonishing increase in jet engine power-to-weight ratios. Clearly by directing part, or preferably all, the thrust installed in the aircraft vertically (or near vertically) downwards during take-off or landing, we have a fine high-lift device. And if flight can be sustained at zero forward speed on jet-lift alone, we have the ultimate in high-lift devices. This of course is the technique used in the P.1127 and the P.1154.

It is appreciated that to fly at very high speeds enormous power is required to overcome the transonic drag rise. If a simple means can be employed to direct that power or thrust downwards, during take-off and landing, one has an automatic V/STOL capability. A fine example of this potential is the McDonnell Phantom II. The total installed thrust of its engines is 36,000 lb. Its empty weight is about 26,000 lb. Thus if it could vector its thrust it would theoretically be able to perform a short take-off and a *vertical* landing, provided of course that its vertical thrust line was adjacent to the aircraft's centre of gravity. Ducting for jet reaction controls would take the place of the existing ducting associated with high-lift blowing over the wing and flaps.

One must not over-simplify this proposition but, in the final analysis, it all boils down to applied engineering while keeping a beady eye on basic principles.

"The Future of the Fleet Air Arm" in the February issue of *Air Pictorial* was a most refreshing article. Here was some constructive thought, well directed at possible future V/STOL applications at sea. The total length of the flight deck of current aircraft carriers is mainly determined by: (*a*) the required catapult run; and (*b*) by the series of arrester wires and the pull-out distance of the last wire. A vectored-thrust V/STOL aircraft can dispense with both these facilities and thus a smaller ship will suffice—provided that its complement is made up entirely of V/STOL aircraft (or helicopters).

The first flight-deck trials of the P.1127, with a development engine of very limited thrust, on H.M.S. *Ark Royal* early in 1963, illustrated this fact admirably. With no catapult-tow or arrester-hook requirements, great economy in airframe and undercarriage structure weight is achieved. Clearing the flight-deck area of catapults, arrester wires and associated heavy machinery results in a saving of weight in the ship—where weight, for sea-going reasons, can best be saved—up top. A further weight-saving feature in the V/STOL fighter lies in its small wing free of any folding mechanisms (the P.1127's span is almost exactly equal to the width of a folded Sea Vixen).

There are obvious advantages in the V/STOL fighter landing with zero kinetic energy on the flight deck after a vertical approach. This method is far less wearing on both men and machines when compared to present-day carrier landings—described rudely by some as "Controlled Crashes". The weight penalty in beefing up the whole aircraft's structure to tolerate this treatment must not be overlooked.

An interesting comment from both Bill Bedford and Hugh Merewether of Hawker Siddeley Aviation after the *Ark Royal* trials was that the ship's island, seen with peripheral vision, proved to be a most useful height and rate of change of height indicator while letting down in the P.1127 on to the carrier's flight deck.

The tactical advantage of not always having to turn the ship into wind during V/STOL take-offs or landings is significant. The ship can still be operational even, for instance, when refuelling at sea. Indeed these aircraft can take off or land when the ship is at anchor or in harbour.

With V/STOL aircraft Naval Aviation will increase its effectiveness while exercising considerable economies: lighter ships manned by fewer men with less equipment.

British aircraft engineers have forged ahead of the world in vectored-thrust techniques designed to meet current V/STOL fighter requirements. These far-sighted men refuse to be dismayed by those who offer discouraging comment.

* Originally delivering 11,500 lb. of thrust the Bristol Siddeley BS.53 Pegasus is now rated at 15,000 lb. and is capable of being developed to give over 18,000 lb.—ED.

Unlike the U.S. Navy, the Royal Navy will not be represented in the Tripartite Evaluation Squadron. What the R.N. really needs, however, is its own P.1127 Flight to prove the V/STOL concept at sea