

NAVAL AIRCRAFT SERVICING POLICY

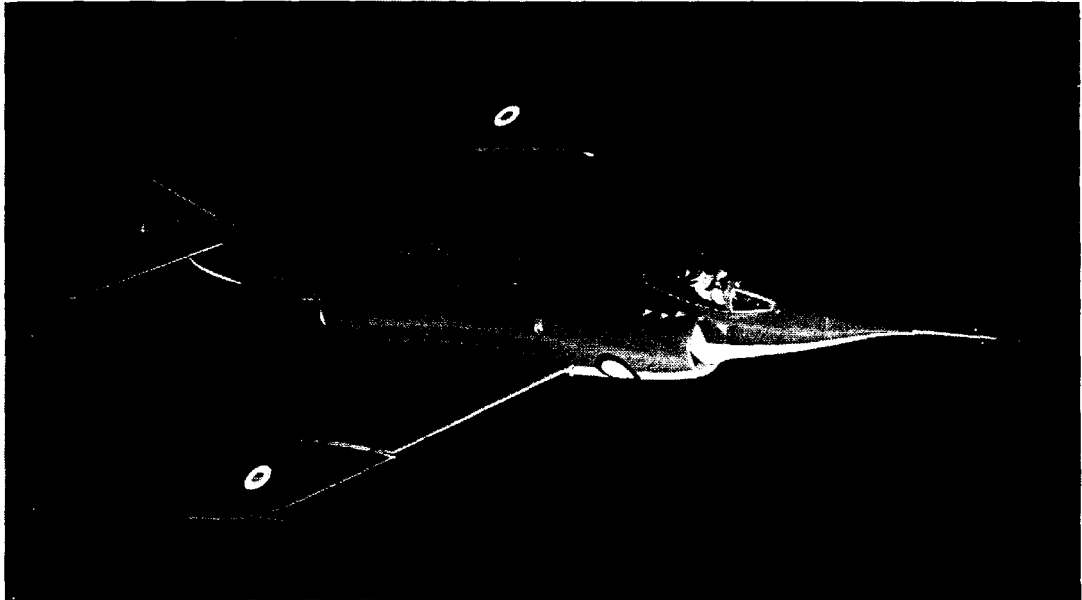
BY

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A recent article in the *Journal* (Servicing Modern Aircraft : Vol. 10 ; No. 1) and an earlier one in the Fleet Air Arm magazine *Flight Deck* have put the calendar servicing of naval aircraft under fire. As the subject of calendar versus flying-hour servicing often crops up, not only in the Navy but also in the Royal Air Force—there being always quite sound arguments why one or the other system should be adopted—readers of the *Journal* might like to know how the calendar system came to be adopted in the Royal Navy and why it is retained.

Previous History

Naval aircraft were originally maintained on Daily, Minor and Major inspection cycles. The Daily inspection was carried out every 24 *calendar* hours except in the case of certain types employed on flying training on which the inspection was every 36 hours. The normal Minor inspection period was 30 *flying-hours*. This continued throughout most of World War II during which it was judged inexpedient to make a change ; but in 1944 the Minor inspection period was increased to 40 flying-hours. At the same time a 10 flying-hour inspection for initial periods of use of new aircraft types was introduced. Later in 1944, a calendar factor was superimposed, aircraft being given a Minor inspection at least once every 4 months irrespective of whether the flying-hours were achieved. Major inspections varied from 180 to 320 flying-hours depending upon the aircraft type.



THE SCIMITAR

After the war the whole subject was reviewed with the object of reducing maintenance effort and effecting other economies. In 1946, the Oliver Committee advanced the opinion that the deterioration of a naval aircraft was caused more by weather at, or near, the sea or by ground conditions than by actual flying, although the flying-hour aspect remained important. There was also a need to simplify the administration of maintenance at both unit and staff level, particularly when movements, ship to shore and vice versa, were involved. This was vital to facilitate carrier-borne operations. It was decided that a calendar system of routine servicing was required and that this would effect both the greater efficiency and the economies looked for. In 1947 trials were conducted and the results supported the theory. The calendar-time based inspection cycle was therefore introduced in 1948, with the Minor inspection cycle set at 3 months.

Concurrently, a costly 'laundry' programme had to be initiated to make good the deterioration of numbers of aircraft which had not reached the Major inspection point on a flying-hour basis but which were, nevertheless, in poor condition. The Major inspection was then abolished and 'Reconditioning' on calendar time substituted. Aircraft which, after a period of time had reached a 'utilization' limit, were reconditioned at 30 to 40 'utilization' months depending upon the type.

In 1949, inspection schedules were rationalized again and in 1950, following trials, the Minor cycle periodicity on all aircraft was increased to 4 months and the Daily inspection period to 48 hours.

By this time the trials and the experience gained had demonstrated the following advantages of servicing on a calendar basis :—

- (a) A reduced number of aircraft was required to carry out any particular flying task
- (b) Increased aircraft availability was achieved
- (c) Planning was simplified
- (d) Frequency of stripping aircraft and components for inspection was reduced.

By 1952, further experience with the calendar cycle, substantiated by trials, allowed the Minor cycle periodicity to be increased to 6 months for all aircraft except helicopters.

Reports proved that the aircraft utilization expectations were exceeded ; indeed, misgivings were expressed from the Mediterranean, at one time, at the excessive amount of flying completed between Minor inspections. As a precautionary measure certain items in Inspection Schedules were marked to indicate that a flying-hour limitation was set. However, these were few and, at the present time, have almost disappeared.

Application of Calendar Servicing to Modern Aircraft

The introduction of new aircraft has permitted or required further developments in inspection procedure. Thus, the Daily cycle has recently been increased to 60 hours and has been renamed Primary and the remaining inspections re-categorized as Maintenance Checks 1, 2, 3, etc. It now seems that inspection periodicities can be extended still further and trials are under way to this end. The calendar system of maintenance is, however, still paying dividends and comparison with similar R.A.F. aircraft types shows that a high naval utilization is being maintained. In some naval squadrons it is low (from which may spring the desire to go on to a flying-hour cycle) but the average overall (F.A.E. and T.A.E.) is satisfactory.

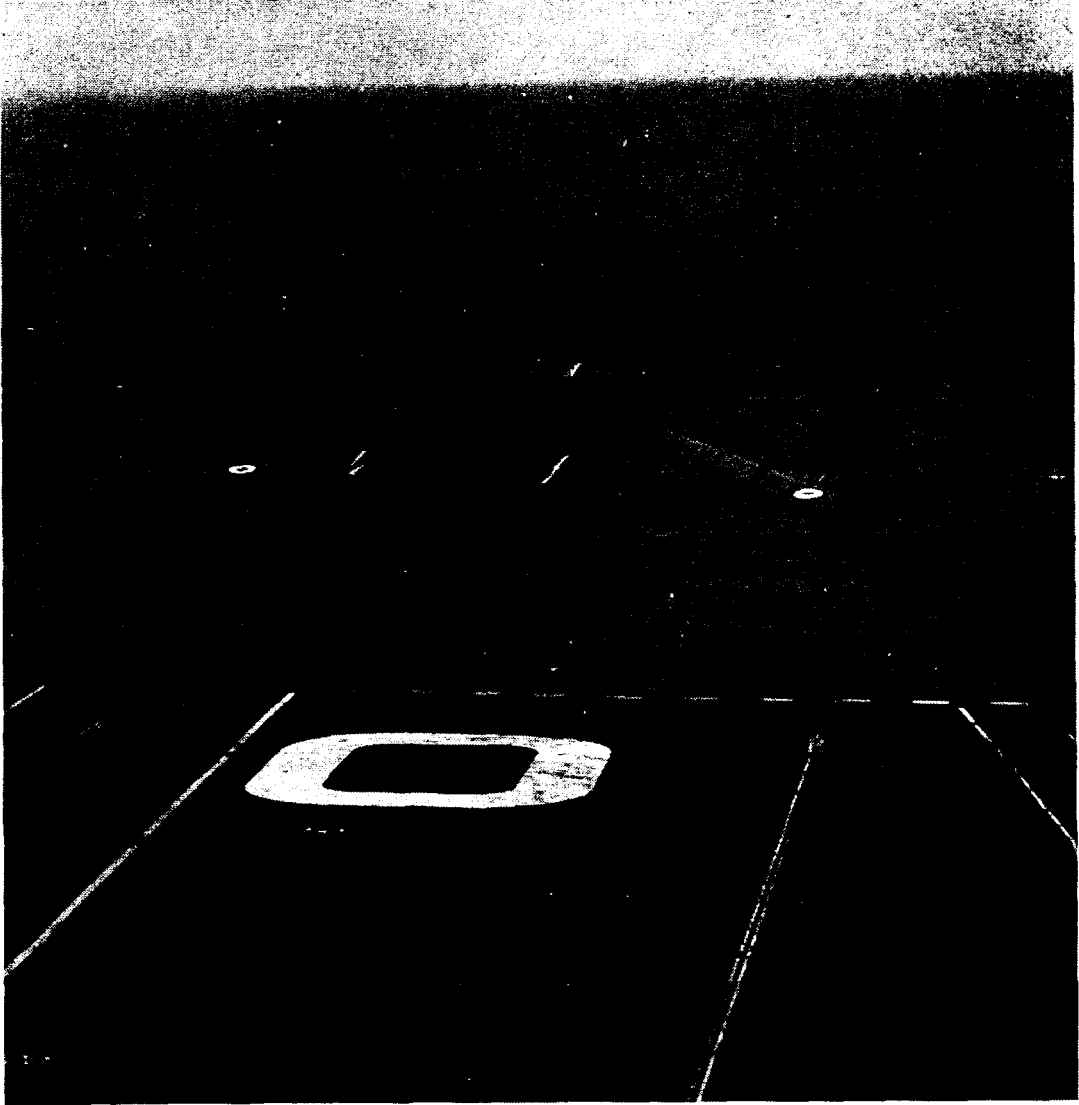
The table shows the figures for 1955 and 1956 of the two main naval aircraft types.

<i>Utilization between Second Line Inspections (Flying-Hours)</i>		
<i>Aircraft Type</i>	1955	1956
Sea Hawk	118	122
Gannet	111	114

The average Sea Hawk flying hours for 1956 have been obtained from 136 second-line inspections of which 70 per cent occurred at intervals of more than 100 flying-hours. Of the remainder a few managed less than 50 hours. Among these were certainly some 'Christmas trees' which, tucked away in a corner of a hangar, grounded perhaps through lack of spares in short supply, were forgotten except as a source of spares for other aircraft. These aircraft are not only prone to robbing (unfortunately unauthorized in some instances) but are subject to deterioration because of lack of use and corrosion. Hence, although some aircraft do not attain a high average utilization, the number is comparatively small and it is undoubtedly safer for them to be inspected on a calendar basis irrespective of the hours they fly. There are other experiences to remind us that corrosion is still a factor to be seriously considered in the Fleet Air Arm. Recent examples are a batch of Gannet aircraft severely corroded as a result of carrier operations and requiring reconditioning ahead of their time.

Lifed Components

It is sometimes argued that certain components which are necessarily lifed in flying-hours and classed as supplementary inspections could, if the aircraft were on a flying-hour maintenance cycle, be fitted into routine inspections and



A SEA VIXEN BEING CATAPULTED FROM H.M.S. 'ARK ROYAL'

so reduce the time aircraft are out of action for servicing. This would be true if component lives could always be fixed to phase in with routine inspections and if the components 'played the game' and remained serviceable until their time for overhaul or replacement came up. In practice this does not happen. Component lives vary considerably, they still have a maddening habit of becoming defective at odd times and hence require replacement between normal servicing. Component lives are also constantly being increased or decreased for economy or safety as a result of experience, making it difficult if not impossible to fit into a routine flying-hour cycle. This problem is also with the R.A.F., although a large proportion of their aircraft are still maintained on a flying-hour basis.

On fixed wing aircraft, the Navy is not at present seriously troubled in this respect, as many as possible of the component changes being phased in with the calendar inspections. A review is at present in hand to reduce them still more and in some instances to include them only in Modernization.

Modernization

One calendar inspection introduced before 1949, the 'Recondition', has now become uneconomical. Applying reconditioning rules to the more robust

modern aircraft has led to unnecessary stripping and has taken the process far beyond the original conception of a Major inspection on a calendar rather than flying-hour basis. Modern types, particularly in the front line, have seldom completed a full reconditioning life before return to Air Equipment Authorities. Either the squadrons were disbanded or were rearmed with more up-to-date aircraft, or defects had arisen on these complex aircraft beyond user unit resources. The work done in such circumstances before re-issue has amounted to some 2,000 man-hours; it was natural to take the opportunity 'in hand' to bring the aircraft up-to-date and go over it thoroughly. Clearly it was uneconomical to recondition these aircraft when next due (often it was no more than a year or 18 months later), hence the decision in April of this year to recondition aircraft only when their general condition so dictated. The requirement to examine periodically, rectify and modify aircraft is now being met by 'Modernization', an apt title since opportunity will be taken to bring aircraft up to a high modification standard and nearer to the state of their contemporaries off production. Routine modernization, to be done at 2 to 2½-yearly intervals, is a development of the old Major inspection: Recondition will be undertaken of aircraft found to need it on the second, third or later Modernizations, and, exceptionally, when found in service to need it.

Helicopters

The supporters of servicing on a flying-hour basis may derive comfort from the news that there is a likelihood of helicopter aircraft reverting to that form of servicing. These aircraft consist mainly of rotating components which have overhaul and fatigue lives in flying-hours and comparatively little fuselage and structure requiring calendar inspection. 'Supplementary' inspections on flying-hours for these aircraft are formidable and it may be more economical for them to be serviced completely on flying-hours. A trial is in progress, using a special schedule in which the calendar based items have been phased to fit the appropriate flying-hour period. Deterioration due to time, and other problems, will still have to be considered but, if the trials prove that a good saving in labour is effected and availability maintained or increased, the change will be made. Paradoxically, at the time these trials were being considered, the Air Ministry were considering a proposal from a Royal Air Force helicopter unit for the R.A.F. to go over to calendar based inspections. The unit had naval aircraft on loan and were required to use the naval maintenance schedules. Having worked this system for some months they were most impressed and reported in glowing terms on its efficiency!

Present Policy

Trials are continually being conducted to test suggestions and ideas for further improvement. Rationalizing schedules is also a continuous process but here sadly little help is forthcoming from user units. Items which appear to be over-inspected are seldom reported as suitable for down-grading or removal from the schedule altogether. Usually, it is only when trouble has occurred that a suggestion is received and then it is one to add to the schedule. If every such suggestion was adopted naval aircraft would seldom leave the deck (or ground). Fortunately, the N.A.M.D.U. and its Defect Analysis Section are of great help in determining the right course of action. Present trials suggest that an extension of periodicities and/or a deletion of many items in first and second line servicing schedules may be possible. It is worth mentioning that use is also made of the experiences of other users of aircraft, whether Service or civilian. Quite a lot can be learnt from the civil air lines.

One recent criticism—the inflexibility of the present planned inspection—has proved valuable and revised planned schedules which have been prepared,

tried, and proved are now being issued. They should permit much greater flexibility in their use, and use smaller parties of men. In these schedules better provision is also made for 'stage' servicing; this will replace the old 'group' servicing which is allowed in embarked squadrons. Trials are also proceeding with the object of increasing availability by breaking down second-line inspections for all aircraft into four or five 6-hourly stages, each stage to be done as opportunity affords, e.g. bad weather or even at night, if convenient or in operational necessity. Schedules for all the main aircraft types will soon be of a standard type, so arranged that they may be used either for planned unplanned or stage inspections, whichever is most efficient for the particular unit, at that particular time.

The policy, therefore, is to continue to explore all means of reducing the maintenance effort and increasing aircraft availability while retaining the calendar system (except possibly for helicopters) because it has achieved a minimum of safe inspection coupled with a high average availability. Present experiments and research aim at 9 months between second-line inspections and further reductions in inspection items by, *inter alia*, X-ray inspection, though this latter only perhaps at Modernization. This policy is particularly important for the costly types such as the Scimitar and Sea Vixen, which are now coming into service. A great effort will be needed if these aircraft are to give the same availability and serviceability which their predecessors have achieved. The factors which influenced the adoption of calendar servicing in 1948 still hold good today. A reversion to flying-hour servicing will not be made unless, and until, the evidence is so strong that it justifies the extra work and upheaval which would result.

Nevertheless, the Fleet Air Arm has always been noted in the Royal Navy for its readiness to accept an upheaval if the situation demands it, and for its ability to move with the times. So far as aircraft upkeep is concerned, this tradition will be firmly maintained.