Helicopters in Malaya*

By

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Casualty Evacuation Flight was formed in May, 1950, at Royal Air Force Station, Changi, and was disbanded on the 31st January, 1953, and its aircraft and personnel were absorbed into No 194 Squadron, on formation, at R N A S , Sembawary

The helicopters, Westland Dragonfly II (S 51 with fabric blades) were assembled and test-flown at Seletar in April, 1950 When the unit based at Changi trials were carried out to deduce the aircrafts performance using as many combinations of individual pilot and aircraft as possible at various times throughout the day to obtain varying humidity and temperature variations and their effects on performance

It was soon apparent that the Dragonfly II would only climb vertically to a height dictated by its all-up weight At the top of this climb it would slow up, stop and perhaps even sink a little , but if, as its vertical climb slowed, it was moved smoothly into translational speed flight it was possible to climb away with little, if any, loss of height in doing so The performance was therefore measured as true vertical climb, minimum height in gaining climbing speed, height at 50 yards and height at 100 yards It was found, as well, that there was an optimum weight for jungle operation (5,300 lb) and that any increase in all-up weight beyond this resulted in a disproportional loss in performance

It was deduced from this that every effort must be made to obtain maximum ground cushion effect at take-off The following method of take-off was therefore used Power was increased at take-off until the oleos were extended and the helicopter was about to leave the ground This power setting was held for some 10/15 seconds and then full throttle and pitch were smoothly applied

Some trials were also carried out in an overload condition (*i e* , two panniers, three passengers, lead ballast, etc) to give an all-up weight of 6,100 lb These trials showed that the Dragonfly was able to clear 100 feet in 125 yards of ground distance consistently In this case every effort was made to simulate a running take-off Power was applied in a similar manner to the previous case but this time the helicopter was lifted just clear of the ground and allowed to move forward, with gradual power feed in to prevent settling, until 40 k was achieved and the helicopter was climbed away An additional advantage of this type of take-off was the fact that the wheels would be prevented from sinking into boggy ground surfaces prior to take-off causing a loss of available power during the initial life

The take-off trials showed that the worst performance was experienced at dawn when humidity was high (95%) accompanied by a fairly high temperature and still air condition

The Far East Land Forces Jungle School now (June, 1950) produced a clearing for trials It had been blown with explosives in primary jungle with a tree height of 130/150 height and was 21 yards wide at the landing point and 100 yards long Although the clearing was very narrow it had been carefully checked by pilots prior to its use since information was required on various airflow effects No difficulties were experienced in using the clearing but, on few occasions, branches were whipped into the main rotor disc by the airflow and slightly dented the tips of the blades

CASUALTY STOWAGE

The unit was equipped with the external panniers as used in Korea Two of these panniers, when installed, added over 200 lb to the aircraft's weight and the take-off trials already carried out indicated that only one pannier could be carried

* This paper has been submitted by Flight Lieut K Fry in a private capacity for the interest of our Readers

The pannier was fitted to the starboard side of the fuselage and its installation weighed about 110 lb Trials showed that in slow speed descents the fitting of one pannier caused a lack of lateral control with very slow control response and it was obvious that apart from its weight the pannier caused an increase in vertical drag during take-off Passengers carried in the pannier varied in their comments but most of them accurately forecast the effects on a casualty who " came to " locked (externally) into something shaped like a coffin and suspended outside of a helicopter

The pannier was therefore discarded and an internal stowage was designed The seat and passenger door were removed and a metal carrier was fitted to the starboard seat supports, overlapping the door sill and strutted to the step Onto the carrier slid a wicker basket stretcher The basket was lined with canvas (to act as a windbreaker and for hygienic purposes), it had a sorbo bottom and a metal hinged lid at the end (acting as a windbreaker to prevent slipping of the canvas against the patient's body) This stowage (with blankets) added 25 lb to the aircraft's weight and the installation cost about £5 The idea was that the basket would be unloaded in the clearing and the casualty lifted into it where he would remain until lifted onyo a hospital bed During the flight the patient would be warm without excess weight of blankets and could see the pilot—in most cases preferable to the view from the pannier's ventilation lid of the whirling rotor head

Against the use of the basket was a very real disadvantage in that it tended to condemn the aircraft to one role—that of casualty evacuation

Winching

Winching was by no means the easy solution that it would at first appear To avoid inducing a " vortex ring " state due to proximity of vegetation it was necessary to winch from above 10/15 feet and at this height the reduction in ground cushion effect reduced the power available to climb and hence the extent of the vertical climb Apart from the vegetation below and around the helicopter tending to induce a vortex ring state due to " shaped " airflow it was considered that there was less ground cushion over vegetation due to cellular absorption, as in sound proofing The winch itself was heavy (111 lb) and the performance of the aircraft precluded the carriage of a winch operator due to weight considerations It is not feasible to lift a man by winch with bad wounds in every case and the static weight of the winch itself was affecting the payload and performance in other duties Throughout the tour of the unit there was never any requirement for winching and where it was possible to winch it was found that a safer alternative could be arranged, *e g* , a simple platform, where a landing could not be made

General Flying Conditions

Broadly speaking, there were only two types of jungle experienced, *i e* , primary and secondary jungle

Secondary jungle is found alongside rivers, etc , and in old clearings The trees are small in height but the vegetation is very dense , later in the struggle for air and light certain trees out-distance the others and primary jungle is formed Primary jungle trees average 150 feet in most parts although in the deeper jungle the average is 200 ft and 250 ft trees are by no means uncommon Primary jungle trees are characterised by heavy " cauliflower " tops and often the canopy of branches will start 150 feet up the tree trunk Visibility is poor but progress through is not too difficult due to the absence of growth at ground level , on the other hand patrols have to cut their way through secondary jungle and marching time is slow

The country is relatively flat apart from the high ground running down the left centre of the country for 2/3 the length from the north and on either side ov the high ground are strings of isolated limestone outcrops Starting from Johore Bahru communications fan out over the country upwards although there are few communications from East to West

In the centre of the country it is common to experience morning mists which do not lift enough to fly under until perhaps eight o'clock in the morning although the hills clear earlier Storms are often experienced in the late afternoon and the heavy rain and associated low cloud sometimes are not possible to fly through in the helicopter If heavy rain was met the aircraft's height was reduced gradually and then the airspeed dropped off and the helicopter flown along the right hand side of a line of communication at about 100 feet and 30 knots On one occasion a pilot flew behind an Auster in heavy rain using the Auster's wings as an horizon

Turbulence is often severe especially in the bowls at the ends of the passes through the high ground and the usual procedure was to drop the speed to about 45 knots or adopt altitude flying until clear of the area

It was often necessary to fly above broken cloud but this was not done if the cumulus cloud tops exceeded 6,000 feet to prevent being caught out by build-ups

General cross country navigation was by following lines of communication using a 1 500,000 map and then using a 1 250,000 map for the final trip to the landing zone

Casualty Procedure

In Malaya there are many small air strips and at several of these there are fuel dumps

There is a most efficient Air O P Squadron (No 656) equipped with Auster VI aircraft The Auster aircraft are fitted with the same radio as ground forces and are equipped with a trailing aerial It is not possible to fit this set conveniently into a helicopter for pilot operation because of size, weight and centre of gravity problems and the set itself is not a simple one to operate whilst flying a helicopter

Method of evacuating a casualty has now become an almost standardised procedure As soon as Headquarters, Malaya District, learns of a casualty an Auster and helicopter are alerted The Auster contacts the ground forces who send up smoke to indicate their position and the Auster pilot passes them their present map reference position After a general exchange of information the pilot flies round the area looking for a clearing or ground which could be made into a helicopter landing patch He would then advise the patrol commander of the distance, bearing and estimated marching time to those places It is then for the patrol commander to decide whether to use a helicopter or whether it would be quicker to march out of the jungle carrying the casualty The preparation of the clearing is not an easy matter and the decision to use a helicopter means the loss of valuable marching time if it later transpires that the helicopter could not, for some reason, be used This procedure is vital as it must be remembered that visibility in primary jungle may be as low as 25 yards and it is possible for a patrol to be 100 yards from a clearing and not know of its existence

The Auster pilot would keep a watching brief on the patrol if the decision is made to use a helicopter and advises them of the measures necessary for the perparation of the helicopter landing patch Whilst this is going on the helicopter would have flown to the nearest airstrip to the clearing and, if possible, the helicopter pilot would fly as passenger in the Auster acting as advisor to the troops When the clearing is considered satisfactory, the Auster escorts the helicopter to and from the clearing The Auster thus saves valuable flying time to the helicopter and can be used to lift sitting cases to hospital that the helicopter has ecavuated to the airstrip If the helicopter were to come down in the jungle whilst carrying a casualty the pilot would be morally bound to stay with his casualty and thus the excorting Auster could initiate immediate rescue activities were this to happen The pilot of the Auster controls the evacuation from the air as regards putting up smoke, etc , and by means of Verey lights, can indicate to the helicopter pilot that it is safe to land although some Austers are also fitted with V H F radio and can intercommunicate with the helicopter this way

Patrols prepare the clearing by use of knives, axes, portable saws or explosives and experience indicates the necessity in future in such terrain for a specialist parachutists medical team equipped with portable saws and explosives to prepare the way for the subsequent evacuation of themselves, their equipment and the casualty by helicopter Frequently patrols burn off the surface of the clearing but this is dangerous as the rising ashes blot out all visual references during the last ten feet of the landing and in one case the airflow even fanned the clearing alight again

The only additional local modifications incorporated as a result of early clearing landings was the addition of two rear vision mirrors fitted either side of the pilot's cockpit These were adjusted so that the pilot could see the main wheels and if the aircraft was bogging , if this occurred the power was increased to prevent the tendency The port mirror was most useful for engine starting as the pilot could see at a glance the state of the engine exhaust

Servicing, Etc

No second-line servicing facilities exist in the Federation and in consequence the aircraft were forced to return for each 100 hour inspection In practice the aircraft were returned to base, wherever possible, monthly or at every 50 hours as the helicopters, when up-country, would frequently be parked in the open without cover and perhaps 100 miles from any R A F unit

Initially, the servicing up-country was carried out by the flights' two Sergeants (Aircraft fitters), who took it in turn to fly as crewman These men would carry out alone all the servicing and refuelling necessary in the field and the latter successes of the unit reflected the great debt owed to them for their sterling work

The principle of carrying a crewman for servicing had been proved most successful and was continued The crewmen for the last nine months were selected corporals of the airframe or engine trades who were certificated for the remaining Daily Inspections

Detachment Procedures

The helicopters were based at R A F Station Changi and as soon as the unit increased in size an aircraft was based at Kuala Lumpur , in addition, helicopters would be based occasionally for periods of a month or more where special operations were in progress Each helicopter, as far as was possible, carried a crewman and sufficient servicing gear to be an independent detachment when in the Federation Daily Inspections were carried out in the evenings and took about two hours The helicopter was then covered with two G S tarpaulins and a tail rotor blade was tied to the tail cone to prevent the rotors turning Tail rotor coning was checked frequently, especially if turbulent flying conditions had been met, and the fuselage plates were oiled twice a week The resulting immaculate appearance of the helicopters did much to give confidence to passengers and patients many of whom had never seen a machine in their lives before (In one case aboriginals were lifted out by helicopter but refused to get into a truck at the airstrip)

The numerous starts on the aircraft battery and the small amount of charging (flying) time between starts was largely overcome by carrying a spare battery and also a wiring system enabling M T Vehicles 6 volt batteries to be wired in series to become an effective external starting battery

The Clearing and Evacuation

The considerations affecting the performance of the helicopter can be taken as being at their worst in a clearing This is because of the very high humidity (95%), the high temperature (say 70°), the still air conditions in the clearing and virtually unknown wind above the tree tops, the adverse effects on the airflow caused by the proximity of vegetation and bad ground (*i e* , muddy or uneven) affecting the unstick during take-off

The clearing dimensions asked for were as follows

(1) 50 yard diameter landing zone, *i e* , from overlap to overlap, cut down to 2 feet in height
(2) In the centre of the above landing zone a 30 yard circle cut out and cleared to ground level
(3) An approach angle of below 45° and preferably of 30° of a width of 30 yards
(4) The centre of the landing ground to be on firm level ground
(5) Markers to be pegged down or removed immediately prior to landing

It was quickly seen that with native troops there was a tendency to march 50 paces in assessing the 50 yard circle and which would in fact produce a clearing of 35 yards across The more that the troops used the helicopter the easier became the task for the pilot The Special Air Service Regiment, for example, ran a clearing like a flight deck with a battery officer and men each side of the clearing carrying logs to use as chocks , on one occasion they even went so far as to produce a windsock in the jungle Troops of this calibre allowed the helicopter pilot to land safely at the most alarming angles due to the assistance of the log chocks

The clearing landing was treated in a similar manner to a precautionary landing An initial slow speed circuit would be made to choose turning points and sometimes this would indicate wind velocity as a ground speed variation The first approach would be made at a slight forward speed with a very gentle rate of descent Take-off r p m would be used and the pilot would watch for the vibration warnings of induced vortex ring state, especially as the helicopter sank below the tree tops into the 'vegetation effect' and still air The helicopter would be slowly brought to a hover and lowered gently with brakes off onto the ground The pilot would feel whether there was any tendency to roll, etc , before being chocked and applying brakes Power would still be kept on sufficiently to extend the oleos however One case was experienced after landing on a bare-surfaced clearing which had been exposed to heavy rain when, presumably due to erosion and lack of roots to bind the soil together, some two minutes after the helicopter had landed the earth fell away from under one wheel leaving a large hole Fortunately, the pilot only had to snatch the pitch stick through a few degrees to lift the helicopter clear of the ground without danger

It was considered that any wind would dip over the top of the clearing causing the helicopter to experience the effect just prior to clearing the tree tops and on take-off it might happen that the helicopter could be pointed downwind and this would show initially as a stick-aft condition followed by a little vibration , in which case the helicopter would cease to climb just below the tree tops If the helicopter was now turned slowly to the right the Air Speed Indicator and Rate of Climb Indicator would flick as the helicopter turned into wind and if this direction was held it would climb out satisfactorily

Often the helicopter would pause during its vertical climb shake a little and then continue to climb If, however, the unstick was bad it was usually better to land again and carry out a fresh take-off procedure The vertical climb was held until some fifty feet above the tree tops and the helicopter was then moved steadily into forward flight gaining 45 knots climbing speed as quickly as possible

Since the all-up weight had the biggest effect on performance it was kept to a minimum The fuel load was calculated for the flight and not less than 15 gallons of fuel added as fuel margin

The big problem was lack of wind indication above the trees around a clearing Smoke puffs were too small and smoke sent up from the ground dispersed and was too thin for use as an indication by the time it reached the tree tops and in any case, due to calm conditions in the clearing, the smoke tended to hang and obscure vision in the clearing

In early 1952 permission was granted to increase the boost of the engine and in the autumn the flight received the first of its Mark IV aircraft with metal blades and servo controls These improvements eliminated the performance hazards and the piloting problem became one of handling

Use of the Dragonfly in Malaya

Malaya, due to its poor communications, is a country producing an infinite number of useful roles for helicopter employment , although in fairness it must be admitted that this is often due to the lack of suitable light aircraft

Apart from the assigned role of casualty evacuation, the helicopters were frequently used for V I P transport and visits by operational commanders to units for briefing in the field and morale boosting Their value in this role was also used with great success by District Officers, etc , who were thus able to visit outlying kampongs and settlements in a matter of hours which would otherwise have taken many days , for example, the flight between a post at Gua Chah and another at Kg K Betis in Kelantan took less than ten minutes by helicopter but was in fact one day's march

In another case a survey party had lost their altimeter whilst on a march and a helicopter was used to complete the survey by hovering at or near ground level and taking readings

Flight by helicopter was tremendously popular and aboriginals have been known to offer money for a flight in one In one case some very old and sick aboriginals had to be flown out and to do the carrier and basket were removed from the helicopter and the passengers sat on the floor (unescorted) with no passenger door fitted Their only comment was that they would have liked to have had a door on the helicopter as they found it very draughty , but, that otherwise they enjoyed it very much The helicopter was a source of uncontrolled mirth with the Gurkhas especially those who could drive There was something seriously wrong to them that a helicopter should go when the driver put the hand brake (*i e* , pitch lever) on and should stop when the driver put the hand brake off

Helicopter Design Requirements

(A personal opinion based on Malayan requirements and experience)

Considerations

(*a*) The Dragonfly Mark IV was immensely popular with the pilots but it could not be utilised as fully as would be desirable because of its small payload and payload space

(*b*) The ideal helicopter for service use, especially in Malaya, should be large enough to carry a section of men or 4—6 stretcher cases and an attendant without modification It should, moreover, be limited in size for two reasons

(*c*) Firstly, to reduce pilot errors of judgment due to the distance from the tail rotor or the need for excessively big landing areas and, secondly, so that it can be hidden when not in use

Specification

(*a*) Helicopter of basic configuration

(*b*) Good rotor clearance so that ground forces, by day and night, can walk in the rotor disc area safely

(*c*) Fuselage clearance of ground—2 feet

(*d*) Tri-cycle undercarriage

(*e*) Steerable wheelbrakes and locking and steerable nose wheel

(*f*) Fuselage dimensions to be adequate for a defined payload and payload measurements

(*g*) Good Power/Weight Ratio

(*h*) Control loading to be by design and not by servo controls which prevent feed-back of vibration

(*i*) Fields of view should be by design and defined

e g, 45° forward and down — 110° back

60° side and down — 110° upwards

(*j*) Fuel to be in self-sealing bags and the feed controlled by fuel pump selection —it should not be necessary to change tanks in the air

(*k*) Pitch stick small with small angle of cockpit movement—full pitch movement should be possible by the pilot without body movement so that he can be correctly strapped in

(*l*) Control column should have either spade grip top or be of the shaped type fitted to the F 86 Sabre

(*m*) Throttle large and fitted with rubber grip

(*n*) Full instrumentation

(*o*) Ease of switching engine off in difficult autorotation conditions

(*p*) If dual controls are fitted it is undesirable that two pitch sticks be fitted due to the risk of the second stick being foiled by seat straps, etc

(*q*) Take-off should be possible in any climate within five minutes and the pilot should control sufficient shutters and immersion heaters from the cockpit to effect this

(*r*) Some modification should be produced for emergency loss of height as an evasive action without the present handling problems involved

(*s*) Cartridge starting

(*t*) Clear vision panels and windscreen wipers should be fitted

(*u*) Ease of maintenance by part replacement and the fitting of simple cowlings

Note —(*d*) Tri-cycle undercarriage

Although the writer's experience is largely confined to helicopter equipped with tri-cycle undercarriages and is limited to a small amount of flying on the Bell and Hiller helicopters it is felt that a tri-cycle undercarriage would tend to be more stable on rough ground For example, a table with four legs is unstable on an uneven surface whereas a three-legged table will assume a stable tilt It is considered that the S 55 type undercarriage tends to be, in effect, a simulated tri-cycle design and further the Bell and Hiller are not prone to ground resonance which might be encouraged were the undercarriage not firmly balanced