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CAA APPROVAL
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ENGLISH-BUILT DHC-1 CHIPMUNK TECHNICAL NEWS SHEET

TECHNICAL NEWS SHEET SERIES CT(C1) No 138 ISSUE 6

FATIGUE LIVES AND MANDATORY REQUIREMENTS FOR MANAGEMENT AND RECORDING OF FATIGUE CONSUMPTION

- COMPLETELY REVISED AND RETITLED -

1. PLANNING INFORMATION

1.1 **Aircraft Affected.**

English and Portuguese-built DHC-1 Chipmunk (all marks).

1.2 **Reason for Issue.**

a. **Background.** Technical News Sheet (TNS) CT(C1) No 138 was first published in 1960 to notify the safe lives applicable to certain critical components of Chipmunk aircraft structure. Monitored flying in various roles later revealed that airframes were experiencing higher loadings than those on which the original fatigue estimates had been based. The effect of this finding was to alter the safe lives of some critical items, and to introduce fatigue life limitations on additional parts of the structure. Details of these changes to lifing were promulgated in Issue 4 of this TNS. It was later discovered that some steel fuselage centre section lower tie bars had been manufactured with bushed lug holes as a production salvage scheme. Issue 5 of this TNS was therefore published in 1985 to promulgate a reduced safe life for these components.

b. **Application of Mandatory Fatigue Lives.** There is a growing body of evidence to show that mandatory fatigue life limitations are being inadequately enforced on many UK civil Chipmunk aircraft. Widespread disregard for the requirements of this TNS appears to have been encouraged by inexpert perceptions of surplus airframe strength, reinforced by the exemplary record of Service aircraft which did adhere in full to all life limitations. Honest and accurate declaration of Role Factor and the use of Fatigue Hours (rather than flying hours) are imperative to track the status of life-limited components. It is further evident that the previous lack of a clear and standardised means of presenting fatigue data, common to every UK-built Chipmunk, has resulted in avoidable confusion when these aircraft move between successive owners and maintenance organisations.

c. **Correction of Previous Errors and Omissions.** At the request of owners or would-be purchasers, de Havilland Support Ltd has carried out independent reviews of the fatigue data for a number of civil Chipmunk aircraft. This activity revealed operator uncertainty over the correct terminology for spar root components, and misconceptions as to the benefits of Modification No H.290. Numerous recording errors came to light and occasionally life-expired components were found to still remain in service. Most significantly, arising from a review of Chipmunk fatigue clearances undertaken for the UK Ministry of Defence, it has been discovered that publication of a civil replacement life for the wing attachment bolts was overlooked at the time when a similar life was notified for the wing link plates.

d. **Phased Implementation of New Requirements.** The above factors together raise significant concern for the continued structural integrity of some Chipmunk airframes. In addition to providing improved explanatory information, this Issue 6 of TNS (CT) C1 No 138 now addresses the specific safety issues as follows:

- A standardised method of recording Chipmunk operation, usage and fatigue consumption is introduced. A risk-based approach has been taken to prioritise identification of recording errors on aircraft which still contain critical components to the earliest design standard, and hence have the lowest available fatigue life. Similarly, early review is appropriate for those aircraft having all the relevant fatigue modifications in place but which are known to be close to life expiry on any one item. Specific dates have been set for completion of the required documentation changes.

- A replacement life limitation is introduced for the main wing attachment bolts. A schedule for a phased programme of replacement for life expired bolts is promulgated to avoid non-essential grounding of aircraft. [Bolts for which the life consumed cannot be determined accurately from the aircraft documentation must be replaced at an early opportunity]

- Arrangements are introduced for an independent annual assessment of Role Factor, and formal calculation of the Fatigue Hours consumed.

1.3 **Reference.**

A. de Havilland Chipmunk Maintenance and Repair Manual, reference CMR.1.

1.4 **Approval.**

The technical content of this Technical News Sheet is approved under the authority of CAA Approval Reference AD/1819/00.

2. DESCRIPTIVE AND BACKGROUND INFORMATION

2.1 **Configuration of Wing-to-Fuselage Attachments.** Experience has shown that considerable confusion exists over the terminology relating to various elements of the wing-to-fuselage attachment joints. Detailed information on assembly of the wing-to-fuselage attachments is provided in Chapter 5 of the Maintenance and Repair Manual (Reference A). However, to aid interpretation of the requirements of this TNS, details of the joint configuration are illustrated in Figure 1 below:

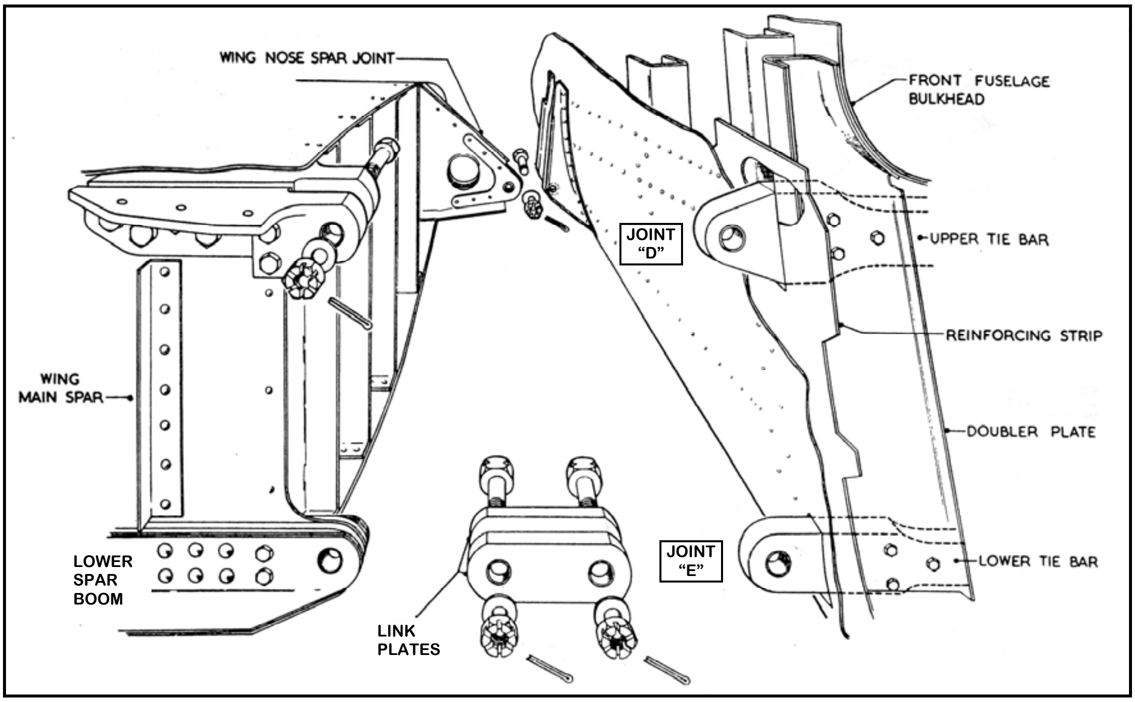


FIG. 1. CONFIGURATION OF WING-TO-FUSELAGE SPAR ATTACHMENTS
(Port side illustrated, looking forward)

2.2 **Fatigue in Metal Aircraft Structures.**

a. Metal fatigue is characterised by the formation and growth of cracks under the repeated application of alternating loads. The stress levels which induce cumulative fatigue damage and crack growth, leading eventually to catastrophic failure, can be significantly lower than would cause static failure of the same structure.

b. A basic cycle of alternating stress is imposed on any aircraft by the ground-air-ground cycle of each flight. Additionally, gust loadings are reacted by the wings during penetration of turbulent air, and positive and negative loads may be induced by the pilot. Loads from one source will frequently add to loads from another. The aerobatic qualities of the Chipmunk permit the legitimate application of elevated manoeuvring loads to the airframe, but at the expense of accelerating the rate at which fatigue damage is accrued.

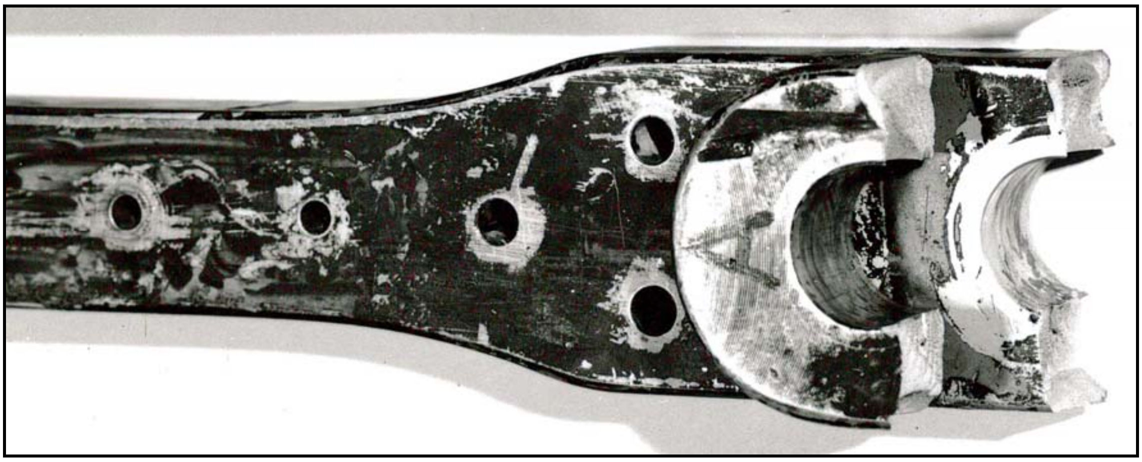
c. A 'Safe Life' established by 'Fatigue Test' refers to the time period for which an airframe or component has been shown to withstand loads simulating those experienced in service. The result of the fatigue test is factored to obtain a suitable confidence in the cleared safe life, recognising the many potential sources of uncertainty. Amongst these are possibly unrepresentative loading of the test specimen, material variability, and the degradation of an in-service airframe. [Severe stress-raisers such as scratches, corrosion pits or fretting at main structural joints can invalidate a fatigue clearance]

d. Associated with the Chipmunk safe life clearance are various ‘Role Factors’. The Role Factor is simply a multiplier which enables the consumption of Safe Life to be related to the current form of usage.

2.3 **<u>Chipmunk Aircraft Structural Design and Testing</u>.**

a. In the late 1940s, when the Canadian Chipmunk design was being adapted for use by the Royal Air Force, the applicable design requirement was Air Publication 970 (AP 970), entitled ‘Design Requirements for Aircraft of the Royal Air Force’. There were minimal requirements for fatigue testing and it was not until 1958 that the Royal Aircraft Establishment put forward proposals for generic fatigue requirements to be included in AP 970. In June 1959, Hawker Siddeley Aviation first issued a report to impose a ‘Safe Life’ on the then aluminium alloy fuselage centre section lower tie bar. This followed instrumentation of a Royal Air Force aircraft operating in the pilot training role and led to the initial issue of TNS CT(C1) No 138 for civil-registered aircraft.

b. The fatigue lives first imposed on the fuselage centre section lower tie bar in 1959 were reappraised in 1968, with further reference to the sortie profiles flown by the Royal Air Force. This study also examined the need to apply a fatigue life to additional components and led to publication of Issue 4 of TNS CT(C1) No 138. Subsequent tests of two life-expired aluminium alloy tie-bars removed from Royal Air Force aircraft showed that they indeed failed in fatigue (one at a lug and the other at a bolt hole); Figure 2 illustrates the lug failure. Further refinement of Role Factor and lifing data occurred in 1970 following detailed analysis of data from fatigue meters fitted to additional aircraft of the Royal Air Force.



<u>FIG. 2</u>. FAILED LIGHT ALLOY FUSELAGE CENTRE SECTION TIE BAR

2.4 **<u>Chipmunk Full-Scale Fatigue Test</u>.**

a. Up to 1970 the basis of all Chipmunk fatigue lifing was theoretical and it was decided to carry out a full-scale test of the mainplanes and centre fuselage with the aim of demonstrating a safe life of 30,000 Fatigue Hours. A Chipmunk T Mk 10 from the

Royal Air Force fleet was selected as the test specimen because no new airframe was by then available. In Figure 3 the aircraft is shown rigged for the test.

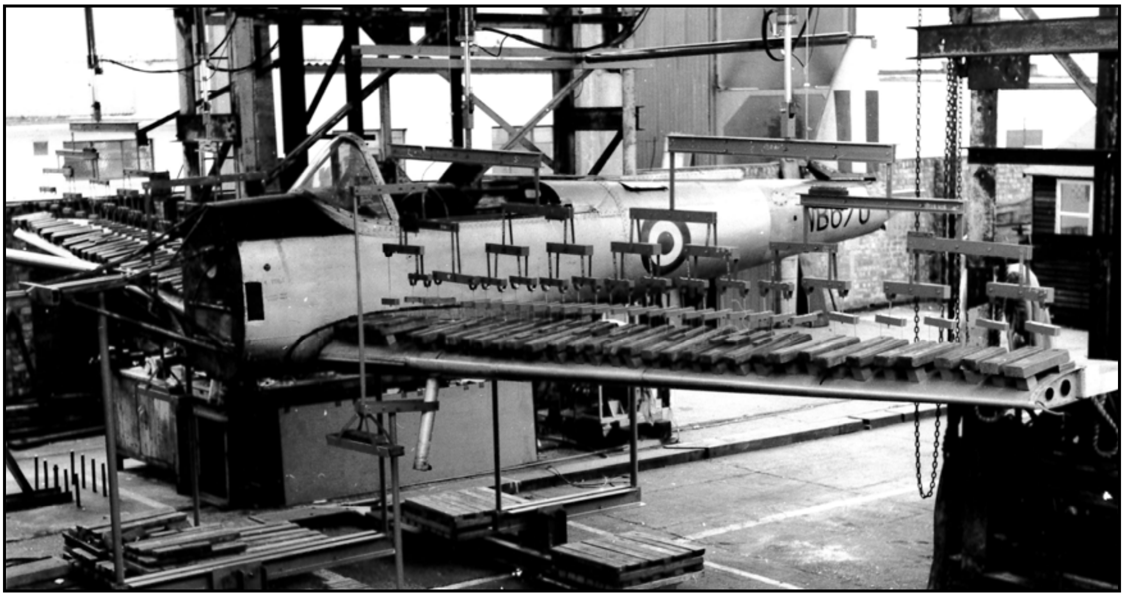


FIG. 3. DHC-1 CHIPMUNK T MK 10 - FULL-SCALE FATIGUE TEST

b. On completion of the fatigue testing, a residual static strength test was carried out on the test rig. Following analysis of the data from the full-scale fatigue test, the component safe lives now promulgated in this TNS CT(C1) No 138 were confirmed.

3. FATIGUE LIVES APPLICABLE TO CRITICAL COMPONENTS

It is essential to understand that the safe lives of components are NOT expressed in aircraft flying hours but in "Fatigue Hours", which are determined by multiplying the aircraft flying hours by the applicable Role Factor (see Part 5 of this TNS).

3.1 Fuselage Centre Section Lower Tie Bar.

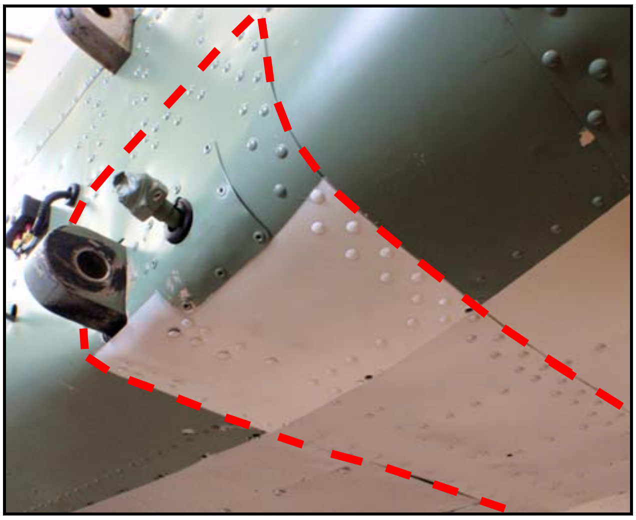
a. **General.** Three different design standards of fuselage centre section lower tie bar may be encountered, and these are listed in Table 1:

Part Number	Description	Qty per Aircraft	Approved Safe Life (Fatigue Hours)
C1-FS-167A	Fuselage centre section lower tie bar - aluminium alloy type [pre-modification H.288]	1	**10,000**
RD-C1-FS-107	Fuselage centre section lower tie bar – steel type [post-modification H.288]	1	**30,000**
RD-C1-FS-107	Fuselage centre section lower tie bar – steel type with one or both lug holes bushed [post-modification H.288] **[See also TNS CT(C1) No 175]**	1	**16,000**

Table 1. Fatigue Lives for Alternative Standards of Fuselage Centre Section Lower Tie Bar

b. **<u>Identification of Design Standard</u>.** It is often difficult to determine the design standard of an installed tie bar purely by reference to retained military records and civil logbooks. Physical examination of the aircraft may therefore become necessary:

(1) A steel tie bar can readily be identified with a magnet after removing the lower wing root fairings. Additionally, if the tie bar has been changed subsequently to initial build, the fuselage belly skin is likely to show panel lines as at Figure 4.

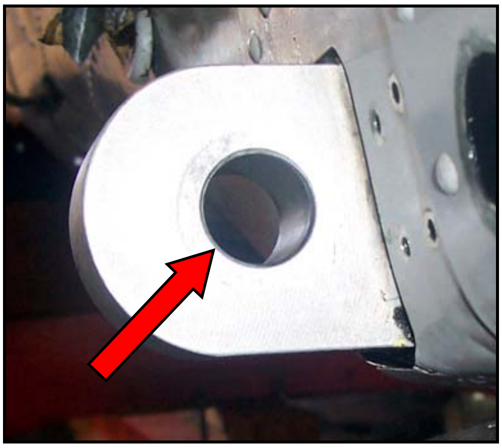


<u>FIG. 4</u>. TYPICAL OUTLINE OF CHIPMUNK FUSELAGE BELLY SKIN PATCH FOLLOWING TIE BAR REPLACEMENT.

(2) Previous satisfaction of **TNS CT(C1) No 175** should have determined whether the end holes of a steel fuselage tie bar have been bushed for salvage purposes. If the aircraft records do not record the status of the tie bar it may be necessary to carry out a visual examination to establish the situation.

(3) To undertake a visual examination (if required), a link plate from either end of the tie bar must be removed or moved aside to allow access; sensibly this will be the aft plate, immediately beneath the nuts. As the anticipated bush wall thickness is only 1/16" (1.59 mm) it may be that a dye penetrant method of examination will improve clarity for viewing. Also, unblemished tie bars have a 0.040" (1.0 mm) radius at entry to the wing attachment bolt hole, whereas a bush is likely to be chamfered at 45°, as at Figure 5.

<u>FIG. 5</u>. CHIPMUNK FUSELAGE TIE BAR WITH BUSHED WING ATTACHMENT HOLE



c. **<u>Recording of Embodiment</u>.** From June 1969 Chipmunk Modification No H.288 was approved for replacement of the original aluminium alloy lower tie bar with a new item made from steel. However, before the modification was allocated, steel tie bars were being installed in accordance with repair scheme drawings R-C1-FS-106 and R-C1-FS-191. When scrutinising aircraft documentation for evidence of steel tie bar fitment (especially on an ex-UK Armed Forces aircraft), it should therefore be noted that embodiment may be recorded under the repair scheme number rather than the modification number.

3.2 **Wing Attachment Link Plates and Bolts.**

a. **General.** In a report into the full-scale fatigue test carried out for the Ministry of Defence, Hawker Siddeley Aviation identified fretting and wear on the wing attachment bolts and recommended that the wing attachment link plates and bolts should be replaced at 15,000 Fatigue Hours. The life limitation for the link plates was promulgated in earlier issues of this TNS CT(C1) No 138, but for reasons unknown the recommended replacement life of the bolts was not published. Accordingly, it is now necessary to promulgate a replacement life for the wing attachment bolts.

b. **Life Limitations.** With effect from the date of issue of this Issue 6 of TNS CT(C1) No 138, the following replacement lives are applicable to the wing attachment link plates and associated bolts:

Part Number	Description	Qty per Aircraft	Replacement Life (Fatigue Hours)
C1-W-491	Bolt – Joint "D"	2	**15,000**
C1-W-493	Link Plate – Joint "E"	4	**15,000**
C1-W-495	Bolt – Joint "E"	4	**15,000**

Table 2. Replacement Lives: Wing Attachment Link Plates and Wing Attachment Bolts

3.3 **Wing Lower Spar Boom Root Inserts.**

a. **General.** The wing lower spar boom root "Inserts" comprise two tapering plates either side of the spar web. Nesting flange angles complete the laminated root end to the main spar on each wing (see illustration at Figure 6 below). All UK and Portuguese-built wings were manufactured with their inserts fabricated from aluminium alloy. Similar inserts but made from steel were later introduced to obtain an extension of fatigue life.

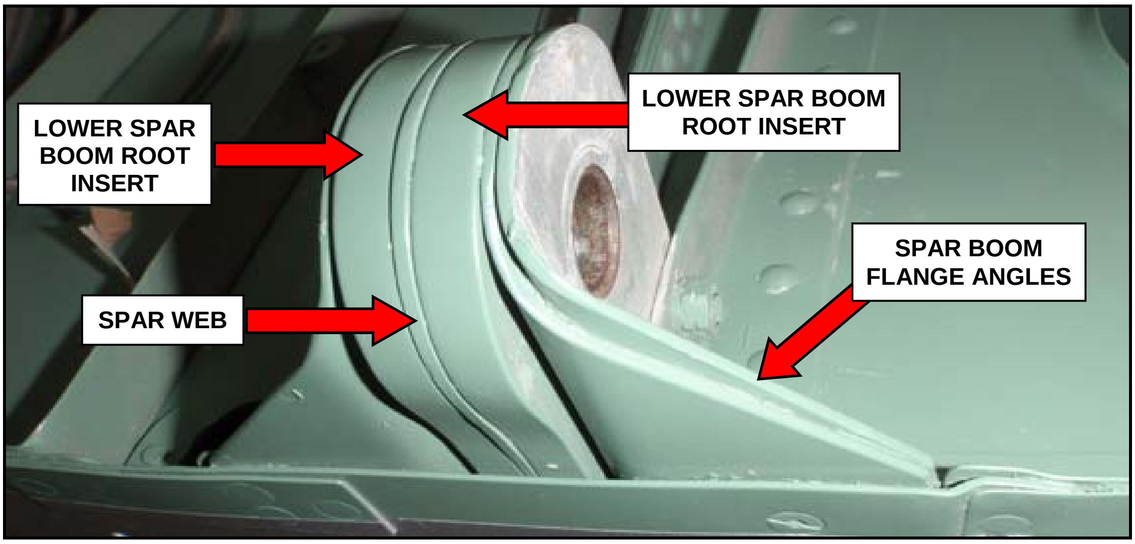


FIG. 6. CHIPMUNK WING LOWER SPAR BOOM SHOWING ROOT INSERTS

To provide an interim life extension for the early design of aluminium alloy wing root insert, TNS CT(C1) No 160 introduced a scheme of crack detection in conjunction with reaming and bushing of the wing lower spar attachment bolt hole. [Note that prior application of this scheme has implications if steel inserts are later to be fitted, and that direct embodiment of steel inserts is preferable]. Two different design configurations of spar boom root insert might be encountered, but with three different permutations of cleared safe fatigue life, as shown in Table 3:

Modification Status	Description	Qty per Wing	Approved Safe Life (Fatigue Hours)
Original Design [pre-modification H.289]	Aluminium alloy lower spar boom root inserts *where TNS CT(C1) No 160 was not carried out or was accomplished before 5,000 Fatigue Hours*	2	**8,000**
Original Design [pre-modification H.289]	Aluminium alloy lower spar boom root inserts *where TNS CT(C1) No 160 was accomplished after 5,000 Fatigue Hours*	2	**+ 3,000 from the time at which TNS CT(C1) No 160 carried out (but not exceeding 17,500)**
[Post-modification H.289]	Steel lower spar boom inserts	2	**22,000**

Table 3. Fatigue Lives for Alternative Standards of Spar Boom Root Insert

b. **Identification of Build Standard.** Where access is readily available - as on a removed wing - a magnet may be used to determine if the spar boom root inserts are made of steel. Alternatively, viewing the internal rear face of the main spar through the square quick-release panels beneath the wing walkway, it can easily be seen if the wing has been repaired or modified to the post-modification number H.289 standard:

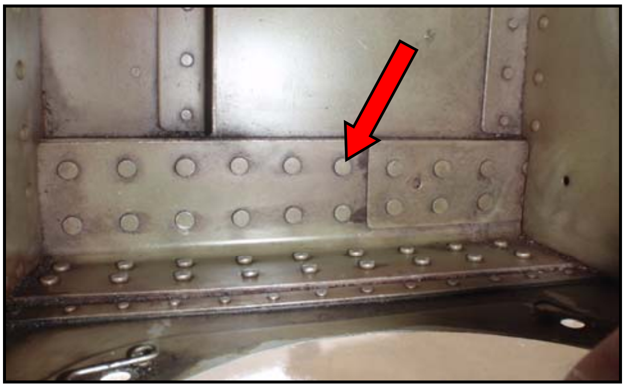


FIG. 7. PRE-MODIFICATION H.289

RIVETED ATTACHMENT OF ALUMINIUM ALLOY INSERTS

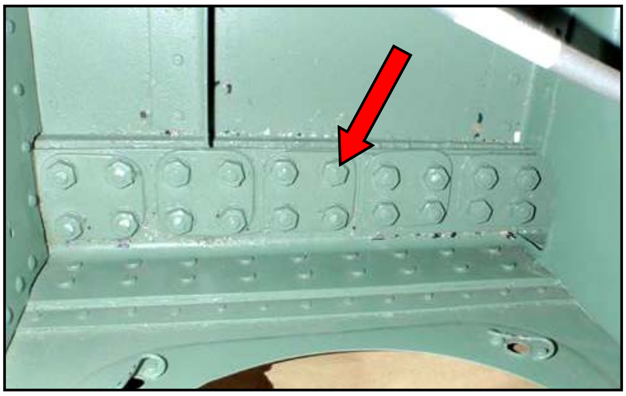


FIG. 8. POST-MODIFICATION H.289

BOLTED ATTACHMENT OF STEEL INSERTS

[Nuts clustered in groups of four over washer plates with rounded corners]

c. **Recording of Embodiment.** From June 1969 the modification number H.289 was approved for replacement of the original aluminium alloy root inserts with new items made from steel. However, even before the modification number was allocated, steel root inserts had been installed in accordance with repair scheme RD-C1-W-102. When scrutinising aircraft documentation to ascertain the embodiment of steel wing root inserts (especially on ex-UK Armed Forces aircraft), the embodiment point may be recorded under the repair scheme number rather than the modification number. Note that it was the practice of UK military organisations to exchange wings when due for recovering or when repairs beyond user-unit capability were required. **It is therefore highly likely that the two wings on a particular aircraft will have consumed very different fatigue hours.**

3.4 **Wing Lower Spar Boom and Remainder of Wing Structure.**

a. **General.** Full-scale fatigue testing of the Chipmunk airframe, funded by the UK Ministry of Defence, ceased when sufficient evidence was accrued to justify a fatigue life on the wing lower spar boom of 30,000 Fatigue Hours, subject to the embodiment of modification H.289 at the appropriate time. By that stage, however, modification H.290 had been developed to replace substantial inboard parts of the lower spar boom flange while also incorporating modification H.289 inserts. Unfortunately, fatigue testing had ceased before any beneficial life increment beyond 30,000 Fatigue Hours, attributable to modification H.290, was proven. Many wings undergoing overhaul by Hawker Siddeley Aviation at Chester nonetheless had modification H.290 embodied.

b. **Applicability of Modification H.290.** There is a popular belief that embodiment of modification H.290 (to the inboard section of the lower spar boom) restores an entire Chipmunk wing to 'zero time'. This is not the case and regrettably there is no test evidence to underwrite such a claim. Wing record cards and other documentation for wings incorporating modification H.290 may wrongly show an available fatigue life greater than 30,000 Fatigue Hours.

For the avoidance of doubt, the approved safe life of post-modification H.290 lower spar booms, and of all remaining elements of wing structure without individually specified lives, is limited to 30,000 Fatigue Hours since manufacture.

c. **Life Expired Wings.** It is recommended that the owners of all life expired wings ensure that they remain safely stored and that their lifing data is correctly recorded and retained with the wing. It is possible that at some time in the future a repair or inspection regime may be developed which will allow an extension of the life of the wing structure and lower spar boom beyond the current 30,000 fatigue hours.

3.5 **Tailplane Front Spar Attachment Brackets.**

a. **General.** For completeness, the fatigue life and inspection requirements for the tailplane front spar attachment brackets are now included in this TNS CT(C1) No 138 and in the Aircraft Fatigue Statement (Chipmunk Form A) shown at Appendix A. The configuration of the tailplane attachment brackets is shown overleaf at Figure 9.

[Detailed rationale for the application of a safe life and the specific inspection requirements for these brackets is contained in TNS CT(C1) No 176, to which cross-reference should be made]

NOTE: PRE AND POST MOD H.357 TAILPLANE BRACKETS CANNOT BE DIFFERENTIATED BY APPEARANCE.

REFER TO MARKED PART NUMBERS OR AIRCRAFT RECORDS.

[Part marking may be on the bracket face adjoining spar]

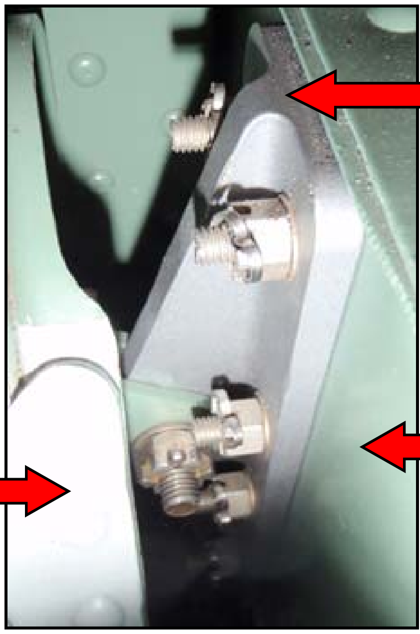


FIG. 9. TAILPLANE ATTACHMENT BRACKET (Port bracket illustrated)

b. **Lifing and Inspection Requirements.** The following lifing and inspection requirements apply to the tailplane attachment brackets:

Part Number	Description	Qty per Aircraft	Approved Safe Life (Fatigue Hours)
C1-TP-167	Bracket [pre-modification H.357]	2	**9,984** **Plus 6-monthly dye penetrant inspection [See TNS CT(C1) 176]**
C1-TP-313	Bracket [post-modification H.357]	2	**9,984**

Table 4. Fatigue Lives and Inspection Requirements for Tailplane Front Attachment Brackets

4. APPLICABILITY OF FATIGUE LIVES TO MODIFIED CHIPMUNK AIRCRAFT

4.1 **General.** The fatigue lives promulgated in TNS CT(C1) No 138 apply only to the basic English-production Chipmunk, as fitted with a Gipsy Major engine and the range of propellers approved by the UK Civil Aviation Authority. The stated fatigue lives will not be applicable to aircraft which have been altered from the basic design standard, especially those which have been fitted with alternative engines and propellers (but see para 4.2 below). The fatigue lives applicable to critical components fitted to modified aircraft must be determined by the Design Organisation responsible for undertaking the modification, and these must be agreed with the appropriate National Aviation Authority.

4.2 **UK-Registered Aircraft with Lycoming O-360 Engines.** A number of Chipmunk aircraft on the UK Register are fitted with Lycoming O-360 engines in accordance with Airworthiness Approval Notes (AAN) approved by the UK Civil Aviation Authority. These aircraft are, in general, used for glider towing and the terms of the AANs restrict their use to non-aerobatic flying. Provided that such aircraft are operated within the constraints of the applicable Approved Flight Manual, the fatigue lives in Part 3 of this TNS are to be applied to these aircraft. **However, see Part 5, para 5.4 for specific instructions on the allocation of Role Factors for aircraft engaged in glider towing.**

5. ROLE FACTOR AND DETERMINATION OF FATIGUE HOURS CONSUMED

5.1 Background.

a. The rate of fatigue damage to an aircraft can be related to its operational role and the severity of the resulting damage may be indicated by a multiplier allocated to that role. For the Chipmunk this multiplier is known as the "Role Factor". When the number of flying hours achieved in a given period is multiplied by the applicable Role Factor, the result is the number of Fatigue Hours accumulated in that particular period of flying.

b. For example:

Hours flown in period x Role Factor = Fatigue Hours consumed

127 flying hours x 2.5 Role Factor = 317.5 Fatigue Hours consumed

5.2 Determination of Role Factor and Fatigue Hours Consumed by Military or Other Flying Prior to Initial Civil Certification.

a. **General.** Chipmunk aircraft are being restored to flying condition having served in a variety of countries and with widely variable standards of military and other documentation. In some cases these aircraft have usage information based solely on flying hours, not Fatigue Hours. On rare occasions there is no available usage information of any kind. Provision must therefore be made for the control and management of the critical fatigue-lifed components in all such aircraft to be properly brought under the requirements of this TNS CT(C1) No 138.

b. **Aircraft and Components with Usage Data Expressed in Flying Hours.** In the case of aircraft where the usage of the critical component is known only in flying hours, the Fatigue Hours of the component are to be determined using a Role Factor of 2.5. For example, a component having flown 2,300 flying hours would have consumed (2,300 x 2.5) = 5,750 Fatigue Hours. To be acceptable for carry-forward into civilian operation, the flying hour data must be presented on some form of official document, such as an aircraft Log Book or a major assembly Log Card.

c. **Aircraft and Components with Usage Data Expressed in Fatigue Hours.** In some cases the usage of critical components will be documented in Fatigue Hours. This is likely to be so in the case of aircraft which have originated from the UK Armed Forces, where specific Role Factors were applied according to the role of the unit to which the aircraft was allocated. To be acceptable for carry-forward into civilian operation, such data must be presented on some form of official document, such as an aircraft Log Book or major assembly Log Card. In particular, where an aircraft may have been operated on tasks with different Role Factors, typically with the UK Armed Forces, documents within the UK Ministry of Defence Form 700 series will be essential to provide the level of assurance required. Where any doubt exists over the veracity of documentation from former users, de Havilland Support Ltd should be consulted.

d. **Aircraft and Components with No Documented Usage Data.** It is possible that some aircraft or critical components will be offered for certification where there is no documented usage data. Previous iterations of this TNS CT(C1) No 138 have allowed a calculation based upon a usage of 750 Fatigue Hours per year for each year since the date of manufacture. However, as so many years have now passed since the UK-built Chipmunks and their critical components were manufactured, this method of usage assessment is no longer tenable and has been withdrawn. Aircraft owners and maintenance organisations confronted with a lack of formally documented usage data for critical components, or wings which lack Serial plates, should contact de Havilland Support Ltd for advice.

e. **Aircraft and Components Manufactured in Portugal.** For the purposes of UK civil certification, a Chipmunk aircraft manufactured in Portugal by OGMA (for use by the Portuguese Air Force) may be treated on the same basis as one manufactured in the UK.

Experience has shown that the usage data provided with these ex-Portuguese aircraft is provided in a flying hour format, not in Fatigue Hours. It has become apparent that in calculating the Fatigue Hours amassed by these aircraft in their previous Portuguese military service, a Role Factor of 1.0 has in some cases been used.

However, the Portuguese Air Force has confirmed to de Havilland Support Ltd that its prior military usage of all Chipmunk aircraft involved flight profiles which require the application of Role Factor 2.5.

In cases where this misallocation of Role Factor has occurred, the fatigue hours of the affected aircraft are to be re-assessed in accordance with the terms of this revised TNS CT(C1) No 138, paragraph 5.2 b.

This action is to be carried out not later than 31 March 2012

[see also paragraphs 7.3 a.(1) and 7.3 a.(2)]

5.3 **Role Factor Classification.**

a. **Group A. Role Factor = 1.0**

Aircraft usage falling into Group A may include air experience flights, formation, navigation and cross-country exercises, glider towing within the design assumptions, communications flying and "occasional" aerobatics:

Notes:

1. Role Factor 1.0 will not necessarily apply for glider towing if any manoeuvring during descent and recovery falls within the definition of an aerobatic manoeuvre (eg tight turns, inside loops, slow rolls, stall turns, etc). See paragraph 5.4.

2. To qualify for the allocation of Role Factor 1.0, "occasional" aerobatics is defined as aerobatics carried out on not more than an average of one in ten flights.

b. **Group B. Role Factor = 2.5**

Aircraft usage falling into Group B will include all general flying not specifically covered in Groups A or C.

c. **<u>Group C</u>. Role Factor = 4.0**

Aircraft usage which is to be allocated to Group C includes persistent and/or competitive aerobatics, air racing and agricultural applications:

<u>Notes</u>:

1. Any aircraft on which aerobatics are carried out on an average of more than one in four flights must be placed in this category.

2. It is possible that glider towing may attract Role Factor 4.0 if manoeuvres routinely flown during the descent are classified as aerobatic (see paragraphs 5.3 a., Notes 1 and 2, and 5.4 c).

5.4 **<u>The Allocation of Role Factor to Glider Towing Aircraft</u>.**

a. **<u>Original Design Approval for Glider Towing</u>.** UK military approval of the Chipmunk glider towing installation was granted under modification H.197, the design of which was read across for civil use in 1969. Glider towing operations by all Chipmunks have to date been authorised using a standard Role Factor of 1.0.

b. **<u>Basis of Original Role Factor 1.0</u>.** A design assumption of modification H.197, enabling Role Factor 1.0 to be adopted, was that the application of manoeuvring loads during a towing flight would be as benign after glider release as during the climb phase. Unfortunately, this proviso was never effectively communicated to operators.

c. **<u>Revised Allocation of Role Factors for Glider Towing</u>.** During the descent and recovery from a glider towing flight, manoeuvres of an aerobatic character may well be flown. It should be noted that 'tight turns' fall within the design definition of 'aerobatics'. Any flights with an aerobatic content have implications for the allocation of Role Factor, and this possibility does not exclude the glider towing role.

<u>Notes</u>:

1. Section III, Limitations, of the Approved Flight Manual for standard Chipmunk aircraft defines the aerobatic manoeuvres which may be carried out, including tight turns, inside loops, slow rolls, and stall turns.

2. 'Tight turns' means bank angles in excess of 60°.

3. Lycoming-powered Chipmunk Mk 22/22A and 23 variants are certificated as non-aerobatic.

d. **<u>Re-assessment of Fatigue Hours for Glider Towing Aircraft</u>.** Where it is known that descent manoeuvring has exceeded the definitions of Role Factor 1.0, the Fatigue Hours of any affected aircraft are to be retrospectively reassessed. If detailed flight-by-flight records are not available, the number of flying hours flown at Role Factors in excess of 1.0 is to be assessed. This flying hour total is to be multiplied by Role Factor 2.5 and the aircraft and component Fatigue Hour records adjusted accordingly.

Any reassessment of Fatigue Hours imposed by this requirement is to be completed not later than 31 March 2012.

e. **<u>Future Recording of Glider Towing Flights</u>. All glider towing flights after 31 March 2012 are to be detailed on Chipmunk Form B, the Individual Flight and Usage Record proforma (see paragraph 6.3).**

6. FATIGUE MANAGEMENT AND RECORDING

6.1 **Background.**

a. Prior to publication of this TNS CT(C1) No 138 at Issue 6, no standardised recording method was provided to assist aircraft owners and their maintenance organisations in making an accurate determination of the life consumed on fatigue-critical components. As a result, many recording systems evolved, devised by individual engineers or organisations, such that on transfer to another organisation it was often difficult if not impossible to comprehend the data presented. Moreover, some aircraft operators have evidently failed to monitor the consumption of Fatigue Hours with sufficient frequency, allowing some aircraft to over-fly the stated life limitations of components. If this situation were to be allowed to continue, the outcome would be an unacceptable threat to structural integrity of the Chipmunk fleet.

b. A range of standard documents is therefore introduced to record data for all fatigue-critical components. Additionally, for annual confirmation of the applicable Role Factor and calculation of the Fatigue Hours consumed, it is now necessary to make a submission of flight-by-flight records to the Type Certificate/Type Responsibility Holder. This process will increase in importance as more of the fleet reaches the fatigue life limitations, especially of the mainplane lower spar booms, when increasingly regular analysis of Role Factor and remaining Fatigue Hours may be necessary.

6.2 **Aircraft Fatigue Statement. [Chipmunk Form A]**

a. **General.** It is essential that an aircraft owner or maintenance organisation has ready visibility of the modification status of all critical fatigue lifed items on the aircraft. Whilst in general this information can be found within an aircraft Log Book, it often takes considerable time and effort to ascertain the required detail. By the introduction and retention of a standard proforma to record appropriate data on all critical lifed items, these problems should be overcome.

b. **Aircraft Fatigue Statement Proforma.** The Aircraft Fatigue Statement is to be made on **'CHIPMUNK FORM A'** which lists all fatigue-critical components on the Chipmunk aircraft, together with the specific modification, installation and lifing data applicable to each. Chipmunk Form A is shown at Appendix A; an example of a completed Chipmunk Form A is shown at Appendix B. The data recorded on the Chipmunk Form A is not expected to change frequently, except when there is a change of major assembly, when a lifed component is changed or when a fatigue-related modification is embodied on the aircraft.

Chipmunk Form A is available for download in A5 format from the de Havilland Support Ltd website, enabling it to be easily inserted in the UK Civil Aviation Authority CAP 398 Aircraft Log Book.

6.3 **Recording of Flights and Usage. [Chipmunk Form B]**

a. **General.** To ensure that the correct Role Factor can be allocated, taking into account the actual usage of the aircraft, it is necessary to record aircraft flying time and usage on a flight-by-flight basis. This data is the information from which Role Factor is determined and it forms part of the continuing airworthiness record for the aircraft.

b. **Recording Proforma.** Chipmunk flying and usage is to be recorded on the proforma identified as **'CHIPMUNK FORM B'.** Chipmunk Form B is shown at Appendix C; an example of a completed Chipmunk Form B is shown at Appendix D. It is essential that a record is kept of each individual flight, noting whether aerobatics or other special activities were involved. The actual flight time spent conducting each activity on each individual flight need not be recorded. Data entered must be authenticated by a signature and the form must also be signed when data is carried forward to a new form. A new form should be opened immediately on submission of the data for the annual calculation of Fatigue Hours consumed.

Chipmunk Form B is available for download from the de Havilland Support Ltd website.

6.4 **Recording Critical Component Fatigue Life Remaining. [Chipmunk Form C]**

a. **General.** To assist aircraft owners and maintenance organisations with tracking the fatigue life remaining on critical components, **Chipmunk Form C** is provided.

b. **Recording of Fatigue Life Remaining.** The fatigue life remaining on critical Chipmunk components is to be recorded on the proforma identified as **'CHIPMUNK FORM C'.** Chipmunk Form C is shown at Appendix E; an example of a completed Chipmunk Form C is shown at Appendix F.

Chipmunk Form C is available for download in A5 format from the de Havilland Support Ltd website, enabling it to be easily inserted in the UK Civil Aviation Authority CAP 398 Aircraft Log Book.

6.5 **Availability of Forms.** In addition to free of charge downloads from the de Havilland Support Ltd website at www.dhsupport.com copies of Chipmunk Forms A, B and C may be obtained in electronic or hard-copy format from de Havilland Support Ltd.

6.6 **Annual Assessment of Role Factor and Fatigue Hours Consumed.**

a. **General.** From the annual return of flying hours and usage, it is necessary to determine the appropriate Role Factor with which to compute the Fatigue Hours that have been consumed over the period. The assessment of Role Factor and Fatigue Hours consumed is to be undertaken annually, at the time of an aircraft's Annual Check or Airworthiness Review. This will allow any peaks of atypical usage to be averaged over a reasonable period of time.

b. **Undertaking the Assessment.** At the time of the aircraft's Annual Check or Airworthiness Review, the aircraft owner or the Continued Airworthiness Management Organisation (on behalf of the owner) is responsible for ensuring that all Chipmunk Forms B completed since the last assessment, together with photocopies of the pages of the aircraft Log Book covering the same period, are submitted to de Havilland Support Ltd. From this supplied data de Havilland Support Ltd will determine the applicable Role Factor and will provide a Certificate showing the Fatigue Hours consumed during the period. The Certificate should be added to the aircraft Log Book and the data on Chipmunk Form C updated accordingly. The fatigue life remaining on each critical component must then be computed to determine if any component is near to life expiry. To avoid interruption to the use of the aircraft, the applicable data should be submitted to de Havilland Support Ltd at least four weeks before expiry of the current certification.

c. **Increased Frequency of Fatigue Hour Assessment.** In general the Role Factor and the consumption of Fatigue Hours need only be determined on an annual basis. However, as an individual aircraft approaches one or more of the critical component fatigue lives, the Type Certificate/Type Responsibility Holder may specify that the Fatigue Hour assessment is to be undertaken more frequently than annually.

6.7 **Retention of Records.**

Forms A, B and C required by this Part 6 of TNS CT(C1) No 138 contain data which is fundamental to sustaining the structural integrity and continued airworthiness of a given aircraft. All completed copies of these forms are to be retained in perpetuity, to ensure that if the need arises in future to reassess component fatigue lives, there is full visibility of the aircraft's previous flying and usage.

7. IMPLEMENTATION OF NEW RECORDING REQUIREMENTS

7.1 **General.** This Issue 6 of TNS CT(C1) No 138 introduces more rigorous documentation and recording to improve oversight of the consumption of Chipmunk aircraft fatigue life. Transitional arrangements are described which provide for the phased introduction of documentation meeting the new requirements.

7.2 **Implementation of the New Documentation.**

a. **Aircraft Fatigue Statement (Chipmunk Form A).** The status of the critical lifed components fitted to an individual aircraft is to be documented on the Aircraft Fatigue Statement proforma, which is identified as **CHIPMUNK FORM A** (see Appendix A). Initial compilation of this proforma is to be carried out as follows:

(1) Using data contained in the aircraft log books and other documentation (especially ex-military documents and record cards), the aircraft owner is to arrange for the aircraft's maintenance organisation or Continued Airworthiness Management Organisation to compile and certify the initial Aircraft Fatigue Statement (Chipmunk Form A).

(2) If difficulty is experienced in compiling Chipmunk Form A, de Havilland Support Ltd should be consulted.

b. **Flying and Usage Proforma (Chipmunk Form B).** The Individual Flight and Usage Record is to be completed and signed by the pilot on completion of every flight.

c. **Critical Component Life Remaining Proforma (Chipmunk Form C).** The Critical Component Life Remaining Proforma should be compiled at the time of initial compilation of the Aircraft Fatigue Statement (Chipmunk Form A). Thereafter, the Chipmunk Form C should be updated annually, on completion of the annual assessment of Fatigue Hours consumed. In this way, aircraft owners and their maintenance organisations will have a readily accessible record of the life remaining on all critical components.

7.3 **Timescales for Transition to the New Documentation.**

a. **Transition Timescale.** The new suite of fatigue and usage documentation (Chipmunk Forms A, B and C) is to be compiled and implemented for all aircraft at the next Annual Check, or for:

(1) Aircraft with pre-modification H.288 fuselage centre section lower tie bars (i.e. aluminium alloy and not steel):

Not later than 31 March 2012

(2) Aircraft with one or both wings having pre-modification H.289 lower spar boom inserts (i.e. aluminium alloy and not steel):

Not later than 31 March 2012

(3) Aircraft where existing records show that there are less than 500 Fatigue Hours remaining before life expiry on any lifed component:

Not later than 30 June 2012

(4) All remaining aircraft not covered by the requirements of paragraphs 7.3 a.(1) to (3) inclusive:

Not later than 30 September 2012

b. **Aircraft with Incomplete Documentation.** It is possible that some aircraft will have inadequate historical records which will prevent full completion of the new suite of documentation. These cases are to be notified to the Type Certificate/Type Responsibility Holder and an action plan agreed.

8. INTRODUCTION OF REPLACEMENT LIFE FOR WING ATTACHMENT BOLTS

8.1 **General.** As stated in paragraph 3.2b, with effect from the date of publication of this Issue 6 of TNS CT(C1) No 138, a replacement life of 15,000 Fatigue Hours is introduced for the wing attachment bolts, part numbers C1-W-491 (qty 2 per aircraft) and C1-W-495 (qty 4 per aircraft). It is therefore essential that the lifing of the wing attachment bolts is reviewed in a short timescale. Once the situation on each aircraft is known, a risk-based programme of phased transition can be implemented.

8.2 **Immediate Action.** The following immediate action is to be taken:

For every aircraft, the life consumed by the wing attachment bolts, part numbers C1-W-491 (qty 2) and C1-W-495 (qty 4) is to be determined (from scrutiny of the aircraft documentation) within the following timescale:

Not later than 31 March 2012

8.3 **Timescale for Replacement of Life-Expired Bolts.**

a. Where documentary evidence shows that the subject bolts are within the newly introduced replacement life of 15,000 Fatigue Hours, the bolts may remain in service until they reach their life limitation.

b. Where there is no documentary evidence to substantiate the lifing of the installed bolts, or where it is found that the life of the bolts has already expired, the bolts are to be replaced within the following timescale:

Not later than 30 June 2012

<u>Note</u>: UK CAA released wing attachment bolts of new manufacture should be available from de Havilland Support Ltd before this date.

8.4 **<u>Bolt Replacement Procedure</u>.** The procedure for replacement of the wing attachment bolts is stated in the Chipmunk Maintenance and Repair Manual (see Reference A), Chapter 5. Specific instructions on the procedure for shimming the wing to fuselage attachment joint are contained in Technical News Sheet (TNS) CT(C1) No 161 Issue 3.

9. <u>RECORDING AND REPORTING ACTION</u>

a. **<u>Recording</u>.** This TNS CT(C1) No 138, Issue 6, dated 1 December 2011 supersedes TNS CT(C1) No 138, Issue 5, dated 1 August 1985, which should be removed from the folder and destroyed.

b. **<u>Reporting</u>.** All replacements of wing attachment bolts or discoveries of life-expired components are to be reported to the Type Certificate/Type Responsibility Holder using the proforma at Appendix G. It is emphasised that this reporting action is not requested for regulatory purposes but to ascertain the extent of bolt and component changes being undertaken, and also to gather data which might help to justify some alleviation of the timescales for undertaking remedial action.

<u>List of Appendices</u>:

A. Chipmunk Form A – Aircraft Fatigue Statement.

B. Example of Completed Chipmunk Form A.

C. Chipmunk Form B – Individual Flight and Usage Record.

D. Example of Completed Chipmunk Form B.

E. Chipmunk Form C – Critical Component Life Remaining.

F. Example of Completed Chipmunk Form C.

G. Critical Component Reporting Proforma.

CHIPMUNK FORM A – AIRCRAFT FATIGUE STATEMENT

DHC-1 CHIPMUNK FORM A – AIRCRAFT FATIGUE STATEMENT

Aircraft Registration		Constructor's Number	C1-	Aircraft Mk.		Airframe Hours When Compiled		Date When Compiled	

LIFED COMPONENT DESCRIPTION	LIFED COMPONENT PART NUMBER OR VERSION	MODIFICATION STATE OF LIFED COMPONENT & AUTHORISED LIFE IN FATIGUE HOURS [SEE TNS CT(C1) No 138]		COMPONENT LIFE CONSUMED WHEN FITTED TO AIRCRAFT [FATIGUE HOURS]	FATIGUE HOURS OF HIGHER ASSEMBLY WHEN THE LIFED COMPONENT WAS FITTED [SEE TNS CT(C1) No 138 PARA 5]	LIFED COMPONENT THEREFORE EXPIRES AT…
FUSELAGE				**SERIAL NUMBER ⟶**	(from plate on rear cockpit rear bulkhead)	
Fuselage Centre-Section Lower Tie Bar	C1-FS-167A	Alloy Pre H.288	10,000		(Fuselage Fatigue Hours)	(Fuselage Fatigue Hours)
	RD-C1-FS-107	Steel unbushed. Post H.288	30,000			
		Steel bushed. Post H.288 [see also TNS CT(C1) No.175]	16,000			
PORT WING				**SERIAL NUMBER ⟶**	(from plate on external lower skin at wing root)	
Lower Spar Boom	Original design	Alloy OR steel inserts, pre OR post H.289/290	30,000	**0** (at build)	**0** (at build)	**30,000** (Wing Fatigue Hours)
ALUMINIUM ALLOY Insert Fittings at Wing Root	Original design (pre H.289/290)	No TNS CT(C1) No.160 or TNS before 5,000 Wing Fatigue Hours	8,000	**0** (at build)	**0** (at build)	(Wing Fatigue Hours)
	Original design (Pre H.289/290)	Reamed and bushed iaw TNS CT(C1) No.160 after 5,000 Wing Fatigue Hours	+ 3,000 from point of TNS No.160 [Max 17,500]	**0** (at build)	(Wing Fatigue Hours at TNS No.160)	(Wing Fatigue Hours)

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LIFED COMPONENT DESCRIPTION	LIFED COMPONENT PART NUMBER OR VERSION	MODIFICATION STATE OF LIFED COMPONENT & AUTHORISED LIFE IN FATIGUE HOURS [SEE TNS CT(C1) No 138]		COMPONENT LIFE CONSUMED WHEN FITTED TO AIRCRAFT (FATIGUE HOURS)	FATIGUE HOURS OF HIGHER ASSEMBLY WHEN THE LIFED COMPONENT WAS FITTED [SEE TNS CT(C1) No 138 PARA 5]	LIFED COMPONENT THEREFORE EXPIRES AT…
STEEL Insert Fittings at Wing Root	RD-C1-W102	Mod H.289 [H.290 implies H.289 embodied]	22,000		(Wing Fatigue Hours)	(Wing Fatigue Hours)
Wing attachment links at wing-to-fuselage lower joint (port)	C1-W-493 Qty 2	Pre- OR Post-H.385	15,000		(Fuselage Fatigue Hours)	(Fuselage Fatigue Hrs)
Wing attachment bolts (port)	C1-W-491 Qty 1 C1-W-495 Qty 2	Pre- OR Post-H.383	15,000		(Fuselage Fatigue Hours)	(Fuselage Fatigue Hrs)
STARBOARD WING				**SERIAL NUMBER ⟶**	(from plate on external lower skin at wing root)	
Lower Spar Boom	Original design	Alloy OR steel inserts, pre OR post H.289/290	30,000	**0** (at build)	**0** (at build)	**30,000** (Wing Fatigue Hours)
ALUMINIUM ALLOY Insert Fittings at Wing Root	Original design (pre H.289/290)	No TNS CT(C1) No.160 or TNS before 5,000 Wing Fatigue Hours	8,000	**0** (at build)	**0** (at build)	(Wing Fatigue Hours)
	Original design (Pre H.289/290)	Reamed and bushed iaw TNS CT(C1) No.160 after 5,000 Wing Fatigue Hours	+ 3,000 from point of TNS No.160 [Max 17,500]	**0** (at build)	(Wing Fatigue Hours at TNS No.160)	(Wing Fatigue Hours)
STEEL Insert Fittings at Wing Root	RD-C1-W102	Mod H.289 [H.290 implies H.289 embodied]	22,000		(Wing Fatigue Hours)	(Wing Fatigue Hours)
Wing attachment links at wing-to-fuselage lower joint (stbd)	C1-W-493 Qty 2	Pre- OR Post-H.385	15,000		(Fuselage Fatigue Hours)	(Fuselage Fatigue Hrs)
Wing attachment bolts (stbd)	C1-W-491 Qty 1 C1-W-495 Qty 2	Pre- OR Post-H.383	15,000		(Fuselage Fatigue Hours)	(Fuselage Fatigue Hrs)

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TAILPLANE ATTACHMENT BRACKETS

(bolted to tailplane front spar)

LIFED COMPONENT DESCRIPTION	LIFED COMPONENT PART NUMBER OR VERSION	MODIFICATION STATE OF LIFED COMPONENT & AUTHORISED LIFE IN FATIGUE HOURS [SEE TNS CT(C1) No 138]		COMPONENT LIFE CONSUMED WHEN FITTED TO AIRCRAFT [FATIGUE HOURS]	FATIGUE HOURS OF HIGHER ASSEMBLY WHEN THE LIFED COMPONENT WAS FITTED [SEE TNS CT(C1) No 138 PARA 5]	LIFED COMPONENT THEREFORE EXPIRES AT…
Tailplane Attachment Brackets	C1-TP-167	Pre H.357	9,984 plus 6-month inspect		(Fuselage Fatigue Hours)	(Fuselage Fatigue Hours)
	C1-TP-313	Post H.357	9,984			

- CERTIFICATE -

I certify that the above data is correct to the best of my knowledge and belief and that it is a true reflection of the fatigue life of the designated components.

NAME		SIGNATURE	
LICENCE /APPROVAL Ref		DATE	
NAME OF APPROVED ORGANISATION		ORGANISATION APPROVAL No.	

DHC-1 CHIPMUNK FORM A - AFFIX TO AIRFRAME LOGBOOK

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EXAMPLE OF COMPLETED CHIPMUNK FORM A

DHC-1 CHIPMUNK FORM A – AIRCRAFT FATIGUE STATEMENT

Aircraft Registration	G-ABCD	Constructor's Number	C1- 1015	Aircraft Mk.	22A	Airframe Hours When Compiled	12370·00	Date When Compiled	30 MAR 2012

LIFED COMPONENT DESCRIPTION	LIFED COMPONENT PART NUMBER OR VERSION	MODIFICATION STATE OF LIFED COMPONENT & AUTHORISED LIFE IN FATIGUE HOURS [SEE TNS CT(C1) No 138]		COMPONENT LIFE CONSUMED WHEN FITTED TO AIRCRAFT [FATIGUE HOURS]	FATIGUE HOURS OF HIGHER ASSEMBLY WHEN THE LIFED COMPONENT WAS FITTED [SEE TNS CT(C1) No 138 PARA 5]	LIFED COMPONENT THEREFORE EXPIRES AT…
FUSELAGE				SERIAL NUMBER ⟶	DHB.F.999 (from plate on rear cockpit rear bulkhead)	
Fuselage Centre-Section Lower Tie Bar	C1-FS-167A	Alloy Pre H.288	10,000	N/A POST H288	7421·00 (Fuselage Fatigue Hours)	37,421·00 (Fuselage Fatigue Hours)
	RD-C1-FS-107	Steel unbushed. Post H.288	30,000	NIL		
		Steel bushed. Post H.288 [see also TNS CT(C1) No.175]	16,000	N/A NOT BUSHED		
PORT WING				SERIAL NUMBER ⟶	DHB.W.123 (from plate on external lower skin at wing root)	
Lower Spar Boom	Original design	Alloy OR steel inserts, pre OR post H.289/290	30,000	0 (at build)	0 (at build)	30,000 (Wing Fatigue Hours)
ALUMINIUM ALLOY Insert Fittings at Wing Root	Original design (pre H.289/290)	No TNS CT(C1) No.160 or TNS before 5,000 Wing Fatigue Hours	8,000	0 (at build)	N/A 0 (at build)	N/A (Wing Fatigue Hours)
	Original design (Pre H.289/290)	Reamed and bushed iaw TNS CT(C1) No.160 after 5,000 Wing Fatigue Hours	+ 3,000 from point of TNS No.160 [Max 17,500]	0 (at build)	POST H289 (Wing Fatigue Hours at TNS No.160)	N/A (Wing Fatigue Hours)

Page 1 of 3

LIFED COMPONENT DESCRIPTION	LIFED COMPONENT PART NUMBER OR VERSION	MODIFICATION STATE OF LIFED COMPONENT & AUTHORISED LIFE IN FATIGUE HOURS [SEE TNS CT(C1) No 138]		COMPONENT LIFE CONSUMED WHEN FITTED TO AIRCRAFT (FATIGUE HOURS)	FATIGUE HOURS OF HIGHER ASSEMBLY WHEN THE LIFED COMPONENT WAS FITTED [SEE TNS CT(C1) No 138 PARA 5]	LIFED COMPONENT THEREFORE EXPIRES AT...
STEEL Insert Fittings at Wing Root	RD-C1-W102	Mod H.289 [H.290 implies H.289 embodied]	22,000	NIL	4,398·00 (Wing Fatigue Hours)	26,398·00 (Wing Fatigue Hours)
Wing attachment links at wing-to-fuselage lower joint (port)	C1-W-493 Qty 2	Pre- OR Post-H.385	15,000	NIL	4,398·00 (Fuselage Fatigue Hours)	19,398·00 (Fuselage Fatigue Hrs)
Wing attachment bolts (port)	C1-W-491 Qty 1 C1-W-495 Qty 2	Pre- OR Post-H.383	15,000	NIL	4,398·00 (Fuselage Fatigue Hours)	19,398·00 (Fuselage Fatigue Hrs)
STARBOARD WING				SERIAL NUMBER ⟶	DH. FAL. 321 (from plate on external lower skin at wing root)	
Lower Spar Boom	Original design	Alloy OR steel inserts, pre OR post H.289/290	30,000	0 (at build)	0 (at build)	30,000 (Wing Fatigue Hours)
ALUMINIUM ALLOY Insert Fittings at Wing Root	Original design (pre H.289/290)	No TNS CT(C1) No.160 or TNS before 5,000 Wing Fatigue Hours	8,000	0 (at build)	0 (at build)	N/A (POST TNS 160) (Wing Fatigue Hours)
	Original design (Pre H.289/290)	Reamed and bushed iaw TNS CT(C1) No.160 after 5,000 Wing Fatigue Hours	+ 3,000 from point of TNS No.160 [Max 17,500]	0 (at build)	7750.00 (Wing Fatigue Hours at TNS No.160)	10,750.00 (Wing Fatigue Hours)
STEEL Insert Fittings at Wing Root	RD-C1-W102	Mod H.289 [H.290 implies H.289 embodied]	22,000	N/A PRE H289	N/A (Wing Fatigue Hours)	N/A (Wing Fatigue Hours)
Wing attachment links at wing-to-fuselage lower joint (stbd)	C1-W-493 Qty 2	Pre- OR Post-H.385	15,000	5,150.00	7421.00 (Fuselage Fatigue Hours)	17,271.00 (Fuselage Fatigue Hrs)
Wing attachment bolts (stbd)	C1-W-491 Qty 1 C1-W-495 Qty 2	Pre- OR Post-H.383	15,000	5,150.00	7421.00 (Fuselage Fatigue Hours)	17,271.00 (Fuselage Fatigue Hrs)

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TAILPLANE ATTACHMENT BRACKETS

(bolted to tailplane front spar)

LIFED COMPONENT DESCRIPTION	LIFED COMPONENT PART NUMBER OR VERSION	MODIFICATION STATE OF LIFED COMPONENT & AUTHORISED LIFE IN FATIGUE HOURS [SEE TNS CT(C1) No 138]		COMPONENT LIFE CONSUMED WHEN FITTED TO AIRCRAFT [FATIGUE HOURS]	FATIGUE HOURS OF HIGHER ASSEMBLY WHEN THE LIFED COMPONENT WAS FITTED [SEE TNS CT(C1) No 138 PARA 5]	LIFED COMPONENT THEREFORE EXPIRES AT…
Tailplane Attachment Brackets	C1-TP-167	Pre H.357	9,984 plus 6-month inspect	N/A POST H357	7421.00 (Fuselage Fatigue Hours)	17,405.00 (Fuselage Fatigue Hours)
	C1-TP-313	Post H.357	9,984	NIL		

- CERTIFICATE -

I certify that the above data is correct to the best of my knowledge and belief and that it is a true reflection of the fatigue life of the designated components.

NAME	I.M. CROSS	SIGNATURE	I.M. Cross
LICENCE /APPROVAL Ref	UK 001	DATE	30 MAR 2012
NAME OF APPROVED ORGANISATION	ESSEX AERO LTD.	ORGANISATION APPROVAL No.	UK.145.001

DHC-1 CHIPMUNK FORM A - AFFIX TO AIRFRAME LOGBOOK

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CHIPMUNK FORM B – RECORD OF FLIGHTS AND USAGE

DHC-1 CHIPMUNK FORM B
INDIVIDUAL FLIGHT AND USAGE RECORD

Constructor's No.	C1-	Registration	
Date Sheet Opened		Date of Last Annual Fatigue Hour Assessment	

Date of Flight	Hours Flown	Total Airframe Hours	Were Any Aerobatics* Flown?	Was Glider Towing Carried Out?		Air Racing?	Signature
Brought Forward			Yes/No	Yes/No	Descent * Profile (✓)	Yes/No	
Carried Forward							

* <u>NOTES</u>:
1. 'Aerobatics' are defined in Flight Manual Section III.
2. 'Descent Profile' – tick if aerobatics were flown.
   } *Tight turns exceeding 60° bank <u>are</u> aerobatics.*
3. Return Forms B to DHSL for annual assessment. See TNS CT(C1) No 138 for detailed information.

DHC-1 CHIPMUNK FORM B

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EXAMPLE OF COMPLETED CHIPMUNK FORM B

DHC-1 CHIPMUNK FORM B
INDIVIDUAL FLIGHT AND USAGE RECORD

Constructor's No.	C1-1015	Registration	G-ABCD
Date Sheet Opened	30 MAR 2012	Date of Last Annual Fatigue Hour Assessment	30 MAR 2012

Date of Flight	Hours Flown	Total Airframe Hours	Were Any Aerobatics* Flown?	Was Glider Towing Carried Out?		Air Racing?	Signature
Brought Forward		12370.00	Yes/No	Yes/No	Descent * Profile (✓)	Yes/No	RMCross
5/4/12	1.00	12371.00	N	N		N	ABrown
5/4/12	·55	12371.55	Y	N		N	BSmith
29/4/12	·15	12372·10	N	Y	✓	N	TWilson
"	·10	" ·20	N	Y		N	
"	·10	" ·30	N	Y	✓	N	
"	·20	" ·50	Y	Y		N	
"	·10	12373·00	N	Y	✓	N	
"	·15	" ·15	N	Y		N	
"	·05	12373·20	N	Y		N	
10/5/12	1·30	12374·50	N	N		N	[signature]
"	1·20	12376·10	N	N		N	(MJ Muller)
20/6/12	·45	12376·55	N	N		N	[signature]
"	·25	12377·20	N	N		Y	[signature]
	A/c out of service for engine overhaul						
25/3/13	1·05	12378.25	N	N		N	RMCross
Carried Forward		12378·25					RMCross

* NOTES:
1. 'Aerobatics' are defined in Flight Manual Section III.
2. 'Descent Profile' – tick if aerobatics were flown.

} *Tight turns exceeding 60° bank are aerobatics.*

3. Return Forms B to DHSL for annual assessment. See TNS CT(C1) No 138 for detailed information.

DHC-1 CHIPMUNK FORM B

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APPENDIX E TO
TNS CT(C1) No 138 ISSUE 6
DATED 1 DECEMBER 2011

CHIPMUNK FORM C – CRITICAL COMPONENT LIFE REMAINING

DHC-1 CHIPMUNK FORM C
CRITICAL COMPONENT LIFE REMAINING

Aircraft Registration		Constructor's Number	C1-	Aircraft Mk.		Airframe Hours at First Compilation		Date of First Compilation	

Lifed Component Description	Annual Recording Period [Dates From/To] → Lifed Component Expires at..		Higher Assembly Fatigue Hours at First Compilation		Life Remaining (Fatigue Hours)	/ Fatigue Hours Flown	/ Fatigue Hours Flown	/ Fatigue Hours Flown	/ Fatigue Hours Flown
(Extract Data from Chipmunk Form A and from Airframe Records)						Life Remaining	Life Remaining	Life Remaining	Life Remaining
Fuselage Centre Section Lower Tie Bar		Fuselage Fatigue Hours		Fuselage Fatigue Hours					
PORT Wing Lower Spar Boom	30,000	Wing Fatigue Hours		Wing Fatigue Hours					
PORT Wing Root Inserts									
PORT Wing Attachment Links		Fuselage Fatigue Hours		Fuselage Fatigue Hours					
PORT Wing Attachment Bolts									
STARBOARD Wing Lower Spar Boom	30,000	Wing Fatigue Hours		Wing Fatigue Hours					
STARBOARD Wing Root Inserts									
STARBOARD Wing Attachment Links		Fuselage Fatigue Hours		Fuselage Fatigue Hours					
STARBOARD Wing Attachment Bolts									
Tailplane Attachment Brackets		Fuselage Fatigue Hours		Fuselage Fatigue Hours					
Date of Entry									
Signature/Authority									

DHC-1 CHIPMUNK FORM C - AFFIX TO AIRFRAME LOGBOOK

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EXAMPLE OF COMPLETED CHIPMUNK FORM C

DHC-1 CHIPMUNK FORM C
CRITICAL COMPONENT LIFE REMAINING

Aircraft Registration	G-ABCD	Constructor's Number	C1-1015	Aircraft Mk.	22A	Airframe Hours at First Compilation	12,370·00	Date of First Compilation	30 MAR 2012

Lifed Component Description		Lifed Component Expires at..		Higher Assembly Fatigue Hours at First Compilation		Life Remaining (Fatigue Hours)	MAR 2012 / APR 2013	APR 2013 / APR 2014	/	/
						Annual Recording Period [Dates From/To] →	Fatigue Hours Flown 33·40	Fatigue Hours Flown 287	Fatigue Hours Flown	Fatigue Hours Flown
(Extract Data from Chipmunk Form A and from Airframe Records)							Life Remaining	Life Remaining	Life Remaining	Life Remaining
Fuselage Centre Section Lower Tie Bar		37,421	Fuselage Fatigue Hours	16,100	Fuselage Fatigue Hours	21,321	21,287·20	21,000·20		
PORT	Wing Lower Spar Boom	30,000	Wing Fatigue Hours	19,236	Wing Fatigue Hours	10,764	10,730·20	10,443·20		
PORT	Wing Root Inserts	26,398				7,162	7,128·20	6,841·20		
PORT	Wing Attachment Links	19,398	Fuselage Fatigue Hours	16,100	Fuselage Fatigue Hours	3,298	3264·20	2,977·20		
PORT	Wing Attachment Bolts	19,398				3,298	3,264·20	2977·20		
STARBOARD	Wing Lower Spar Boom	30,000	Wing Fatigue Hours	10,055	Wing Fatigue Hours	19,945	19,911·20	19,624·20		
STARBOARD	Wing Root Inserts	10,750				695	661·20	374·20		
STARBOARD	Wing Attachment Links	17,271	Fuselage Fatigue Hours	16,100	Fuselage Fatigue Hours	1,171	1,137·20	850·20		
STARBOARD	Wing Attachment Bolts	17,271				1,171	1,137·20	850·20		
Tailplane Attachment Brackets		17,405	Fuselage Fatigue Hours	16,100	Fuselage Fatigue Hours	1,305	1,271·20	984·20		
Date of Entry		30 MAR 2012					1 APR 2013	1 APR 2014		
Signature/Authority		I M CROSS (I.M. CROSS) UK 001					I M Cross UK 001	B Mendham 2764705 ABCX		

DHC-1 CHIPMUNK FORM C - AFFIX TO AIRFRAME LOGBOOK

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CRITICAL COMPONENT REPORTING PROFORMA

From: …………………………………….. **Date:** …………………………..…

Address: ……………………………………..

…………………………………….. **Phone:** …………………………

…………………………………….. **FAX:** …………………………..

…………………………………….. **e-mail:** ………………………….

……………………………………..

Post/Zip Code: ………………………………

Aircraft C/No: …………………………… **Aircraft Home Base:** ….……………

Aircraft Registration: …………………. **Maintenance Org:** ……..………….

Please advise details of critical components changed (Note: The purpose of this proforma is to gather data on which to plan reprovisioning; it will not be used for regulatory or enforcement purposes):

Part Number	**Qty Changed**	**Reason for Change**

Please Return to:

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