THE DE HAVILLAND AIRCRAFT OF CANADA, LIMITED

ENGINEERING STANDARD PRACTICE

TITLE

NON-DESTRUCTIVE TESTING (NDT) WHEN TO SPECIFY ON DRAWINGS

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Please file under Section EM 1-10 of the Engineering Manual

ISSUED BY

STANDARDS, MATERIALS AND PROCESS ENGINEERING

1.0 INTRODUCTION

This Engineering Standard Practice (ESP) states the guide lines under which the following non-distructive inspection methods shall be specified.

Ultrasonic Inspection
Magnetic Particles Inspection
Fluoresent Penetrant Inspection
Electrical Conductivity Inspection

2.0 SCOPE

This ESP shall apply to all drawings for the DHC-8 and subsequent aircraft and all new drawings for DHC-7 and previous aircraft

3.0 APPLICABILITY

The non-destructive inspection methods stated in the ESP shall apply to parts made from wrought raw material such as sheet, plate, bar, rod, extrusions, tubing and forgings (hand and closed die).

Non-destructive inspection for welded assemblies, and castings is covered by the class of weld or class of casting that is specified.

3.1 Ultrasonic Inspection is used to detect discontinuities in ferrous and non-ferrous metal forms, having flat or curved surfaces such as plate, bar, rod, extrusions, hand forgings and curtain areas of die forgings.

3.2 Magnetic Particle Inspection is suitable for parts made from magnetic ferrous alloys such as 4130 and 4340 low alloy steels and heat treatable stainless steels such as 431, 17-4PH, 17-7PH and Custom 455.

3.3 Fluorescent Penetrant Inspection is suitable for use on parts made from high strength aluminum alloys, copper alloys and non-magnetic stainless steels such as 301, 303Se, 304, 321 and 347.

3.4 Electrical Conductivity Inspection is suitable for use as an indicator of heat treat condition or temper for aluminum alloy raw material, forgings or machined parts.

4.0 DRAWWING CALL-OUT NOTES

4.1 Ultrasonic Inspection

4.1.1 Die Forgings

VENDOR ULTRASONIC INSPECT TO MIL-I-8950 CLASS _____.

4.1.2 Other Forms

a) When the discontinuity class for a certain thickness of material to be inspected is the same class as stated in Table I*, then the drawing note is

4.1.2 Continued

a) ULTRASONIC INSPECT TO QCD/G/C8

b) When the discontinuity class for a certain thickness of material to be inspected is NOT the same class as stated in Table I*, then the drawing note is

ULTRASONIC INSPECT TO QCD/G/C8, CLASS _____

*Note: Table I of this document contains the same information as Table II of QCD/G/C8.

4.2 Magnetic Particle Inspection - all forms

MAGNETIC PARTICLE INSPECT TO PPS 20.01

4.3 Fluorescent Penetrant Inspection

4.3.1 Die Forgings

VENDOR FLUORESCENT PENETRANT INSPECT TO MIL-I-6866

4.3.2 Other Forms

FLUORESCENT PENETRANT INSPECT TO PPS 20.03

4.4 Electrical Conductivity Inspection

4.4.1 Die Forgings

VENDOR ELECTRICAL CONDUCTIVITY TEST TO MIL-STD-1537

5.0 WHEN TO SPECIFY NON-DESTRUCTIVE INSPECTION

5.1 Ultrasonic Inspection shall be specified when all of the following 3 conditions apply.

a) raw material (plate, bar, hand forgings die forgings and "Blob" ends of stepped extrusions) having section thicknesses of 1.0 inch and greater.

b) raw material is aluminum alloy 7050, 7075 or 7175.

c) when raw material is used to machine major aircraft structural components such as:

-wing and stabilizer spars and spar caps.
-all forgings used for primary structure parts.
-wing pick-up fuselage frames.
-flight compartment windshield frames.
-engine mount attachment fittings.
-nacelle attachment fittings.
-flight control surface actuator and hinge fittings.
-wing box bulkheads.

5.2 Magnetic Particle Inspection shall be specified for:

-All low alloy and stainless steels parts when final heat treat condition is 150-170 KSI, and higher.
-Non-standard bolts, nuts, screws and pins heat treated to a

5.2 Continued

range of 125-145 KSI and higher.
-Engine mounts and attachments fittings.
-Cargo tie down and safety belt attachment fittings.
-Wing, fin, stabilizer and nacelle attachment fittings.
-Landing gear attachment fittings.
-Flight control actuator attachment fittings.
-Steel forgings
-Other prime structural attachment points and parts.

5.3 Fluorescent Penetrant Inspection shall be specified for:

-Magneformed tube assemblies
-All aluminum alloy parts made from ultrasonic inspected material.
-Engine mounts and attachment fittings.
-Wing, fin, stabilizer and nacelle attachment fittings.
-Flight control actuator attachment fittings.
-Landing gear attachment fittings.
-Machined, window and windshield frames.
-Aluminum alloy forgings before and after machining.
-All hinge fittings
-Other prime structual attachment points and parts.

5.4 Electrical Conductivity Inspection shall be specified for:

-Hand and die forgings which are to be received from the vendor in the final heat treat temper and which have a section thickness of 2.0 inches and greater.

TABLE I ULTRASONIC DISCONTINUITY LIMITS					
PRODUCT	ALLOY	SIZE			DISCONTINUITY CLASS
		THICKNESS IN.	MAX. WEIGHT PER PIECE LB.	MAX. WIDTH TO THICKNESS RATIO	
Plate	2024 2124 2219 7075 7050	0.500-1.499	2,000	-------	B
		1.500-3.000	2,000	-------	A
		3.001-4.500	2,000	-------	B
Extruded Bar and Shapes	2014 2024 2219	0.500 and over	600	10 to 1	B
	7075 7050	0.500-1.499	600	10 to 1	B
		1.500 and over	600	10 to 1	A
Rolled or Cold Finished Bar and Shapes	2219 2024 7075	0.500-1.499	600	-------	B
		1.500-3.000	600	-------	A
		3.001-6.000	1,000	-------	B
Die Forgings and Rolled Rings	7175 2219 7075 7079	0.500-4.000	300	-------	B
Hand Forgings	2219 7075 7175	1.000-8.000	600	-------	A