BOMBARDIER

de Havilland
Material Specification

TITLE:	**HONEYCOMB CORE, ARAMID BASE PHENOLIC COATED**
SPECIFICATION NUMBER:	**DHMS P 1.26**
ISSUE:	**K**
AMENDMENT:	**--**
DATE:	**August 31, 2012**
PAGE:	**1 of 15**

Prepared by: Approved by:

SIGNED ORIGINAL ON FILE

Hai Yen Tran
Materials Technology

Leonard K. John
Materials Technology

HONEYCOMB CORE, ARAMID BASE PHENOLIC COATED

REVISION RECORD

Issue	Page	Description and Reason for Change
E		This is a new specification.
E	3	Para 2.1.1 revised to include Advisory Circular No. 21-26
Amd. 1	4	Para. 3.1 & 3.1.1- Table 2A changed to Table 3.
	5	Para 3.6.1 was revised.
	8	Para 4.3.3 changed to 4.3.4
		New Para. 4.3.3 was added.
E	6	Table 2 - 1/8, 4.0(2), specified paper thickness is a minimum value.
Amd. 2	11	Hexcel- HRH10-1/8-4.0 added to QPL
E	11	Qualified Products List
Amd. 3		Ciba Geigy Hong Kong added.
		Ciba Geigy Canada deleted.
		Hexcel's address changed.
F		This is a complete revised issue. Detail changes have not been noted.
	11	Hexcel's address changed.
	11	Hexcel-HRH10-OX-3/16-3.0 deleted from QPL.
Amd. 1	13	QPL: M.C. Gill - Gillcore HD added.
Amd. 2	11	Hexel-HRH10-OX-3/16-3.0 has been reinstated.
Amd.3	7	Added requirement for PCD from manufacturer.
G		This is a complete revised issue, Detail changes have not been noted.
		Hexcel Duxford is qualified to manufacture HRH10 core.
		Ciba-Geigy ,Duxford name changed to Hexcel Duxford.

REVISION RECORD

Issue	Page	Description and Reason for Change
H		Updated format.
	13	Added Gillcore HD163, HD312O, HD332O to M.C.Gill Qualified Products List.
	11	Removed Ciba Geigy Miami, FL and Hong Kong as products no longer exist.
Amd. 1	8	Updated Table 4.
I		Not used.
J		Added Euro-Composites VA,US as qualified supplier.
K		This is a complete revised issue, Changes have been noted with change bars
	3	2.1, removed MIL STD-401B as the spec has been cancelled.
	3	2.2, added ASTM F1645 to replace MIL-STD-401B.
	4	3.2 , replaced MIL-STD-401B with ASTM F1645.
	4	3.3, clarified dimension for Flam test specimen.
	5	3.7, added Formability requirement .
	5,6	3.8.1, 3.8.2 , Added to clarify test specimen sizes.
	7	Table 3: paper thickness was 5 mil, now mininum 4 mil.
	8,9	Updated section 4.0 and 5.0 standardized with BA specifications.
		Clarified acceptance testing is required for both supplier and purchaser.
	10	Table 4, replaced MIL-STD-401B with ASTM F1645

HONEYCOMB CORE, ARAMID BASE PHENOLIC COATED

1 SCOPE

This specification establishes the requirements for a regular, overexpanded and Flex-core honeycomb core made from aramid fibre sheets and coated with phenolic resin, suitable for bonded sandwich structures requiring high strength in the temperature range of -67°F to + 180°F.

1.1 Classification

Regular - For flat sandwich panel construction; can also be heat formed for slight double curvatures (**Figure 1**).

Overexpanded - For single curvature panels (**Figure 2**).

Flex-core - For exceptional formability into compound curvature with controlled buckling of cell walls (**Figure 3**).

FIGURE 1

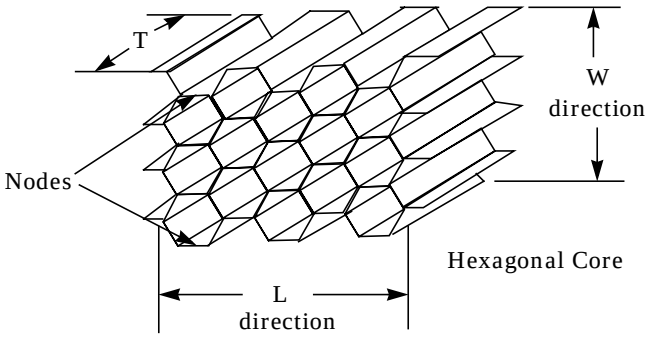


FIGURE 2

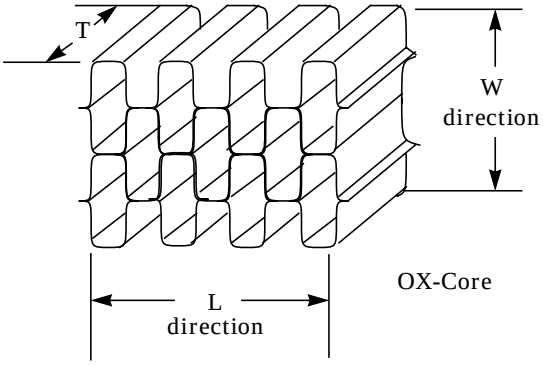
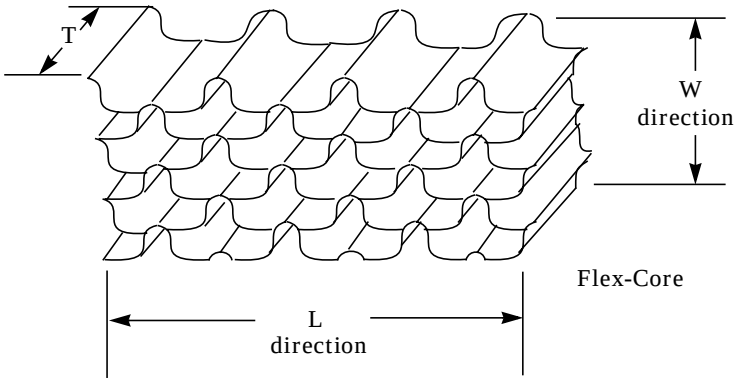


FIGURE 3



Dimension Nomenclature

T = Thickness, a cell depth

L = Ribbon direction or longitudinal direction

W = Transverse direction or direction perpendicular to the ribbon

2 APPLICABLE DOCUMENTS

The following documents form a part of this specification to the extent defined herein. In the event of conflicting requirements between this and the specifications listed below, the requirements of this specification shall govern. Where a specific issue of a document is not specified, the current issue shall be used.

2.1 U.S. Government Specifications

2.1.1 Federal Aviation Administration

FAR 25.853 APP. F, Part I (a) (1) (i) - Flammability Requirements

Amd. 25-86

Advisory Circular No: 21-26 - Quality Control for the manufacture of Composite Structures.

2.2 American Society for Testing and Materials

ASTM C273 - Shear Test in Flatwise Plane of Flat Sandwich Constructions or Sandwich Cores

ASTM C365 - Flatwise Compressive Strength of Sandwich Cores

ASTM C271 - Test Method for Density of Core Materials for Structural Sandwich Constructions

ASTM F1645 - Water Migration in Honeycomb Core Materials, Standard Test Method

2.3 Aerospace Material Specifications

AMS 3711 - Core, Honeycomb, Fibrous Aramid Base, Phenolic Coated

AMS 3713 - Core, Flexible Honeycomb, Polyamide Paper Base, Phenolic Coated

AMS 3714 - Core, Overexpanded Honeycomb, Polyamide Paper Base, Phenolic Coated

3 REQUIREMENTS

3.1 General

The regular and overexpanded honeycomb core product shall meet all the requirements of AMS 3711 and AMS 3714, the flexible honeycomb core product shall meet all the requirements of AMS 3713 and criteria specifies herein.

3.2 Core Water Migration

When tested in accordance with ASTM F1645, the water migration shall not exceed six contiguous cells in 24 hours.

3.3 Flammability

The honeycomb core product shall meet the requirements of FAR 25.853 APP. F, Part I (a) (1) (i), Amd. 25-86. Specimen size shall be 3 inch (W) by 12 inch (L, ribbon), 0.500± 0.006 inch thick.

3.4 Dimensions

Unless otherwise specified on the purchase order, the honeycomb core shall be supplied in length, width and thickness dimensions as noted in **Table 1**.

Table 1:

	L	W	T max	T min
Product	**Ribbon Direction or Width**	**Long Direction**	**Thickness***	**Thickness***
Regular (Hexagonal Cell)	50" + 2" - 0	100" ± 6"	20"	0.060"
OX-Core (Overexpanded)	Refer to QPL and specific supplier	100" ± 6"	20"	0.060"
Flexcore	42" ± 2" 42" ± 2"	48" ± 2" 72" ± 2"	3" 3"	0.125" 0.125"

* 0.060" to 2.000" Tolerance ± 0.006"
2.001" to 4.000" Tolerance ± 0.010"
4.001" and over Tolerance ± 0.125"

3.5 Core Quality

3.5.1 The quality of the honeycomb core product shall be as specified in AMS 3711, 3713 and 3714 with the following additional criteria.

3.5.1.1 Sheets of core with any cells plugged with resin are unacceptable.

3.5.1.2 Sheets containing any continuous regions of excess resin which are greater than one inch in diameter are unacceptable.

3.5.1.3 Sheets in which more than one region of excess resin exists in any randomly selected 2 ft. diameter circle are unacceptable.

3.5.1.4 Measurements of cell count and cell size shall be read at six locations on full sheet, approximately 6" away from any edge. Refer to **Figure 4** for measurement locations.

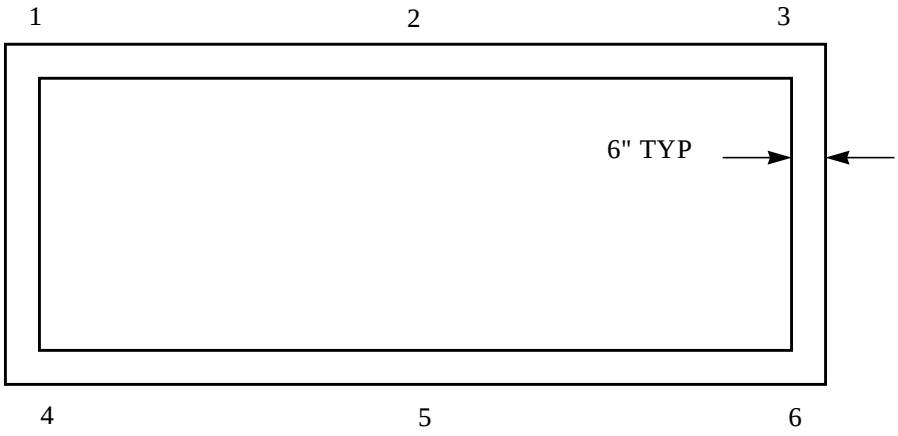


FIGURE 4

3.6 Density

3.6.1 The density of the honeycomb core product shall be within ± 10% of the nominal density quoted on the Qualified Products List. The density shall be determined in accordance with ASTM C271 using at least three samples with a minimum sample size of 6" x 6". Dry specimens in an oven at a temperature of 221° ± 4° F (105 ± 2° C) for a minimum of 2 hours. Store and test samples in the following environment: 70 ± 5° F (21 ± 3° C) and 50 ± 5 % relative humidity. Alternatively, the density of the honeycomb core can be determined using the whole sheet.

3.7 Formability

The core material shall be capable of being formed by conventional heat forming techniques without excessive node bond or cell wall failures.

3.8 Mechanical Properties

Unless otherwise specified, tests shall be conducted at 70˚F ± 5˚F and a relative humidity of 50% ± 5%. Specimens tested at room temperature shall be conditioned for a minimum of 24 hours at 70 ± 5˚F and 50 ± 5% relative humidity immediately prior to the test. At least five specimens shall be used per test except for flammability test which requires a minimum of three specimens, and the results averaged. No individual value shall be less than 90% of the value specified; this shall not apply to flammability tests.

3.8.1 Compressive Tests

Test sheets, blocks shall be tested in accordance with ASTM C365.The specimen size shall be 3.00 X 3.00 ± 0.05 inches. The specimen thickness shall be 0.500± 0.006 inch .

Calculate and report the individual and average values in psi.

3.8.2 Plate Shear Tests

Test sheets, blocks shall be tested in accordance with ASTM C273. The specimen width shall be 2.00± 0.05 inches and length of 6.00± 0.05 inches. The specimen thickness shall be 0.500 ± 0.006 inch.

Calculate and report the individual and average values in psi, mode of failure.

A failure mode of cohesive or adhesive of the core/plate bondline is unacceptable and a new set of test coupons shall be retested.

Table 2: Properties of Regular and Overexpanded Nomex Honeycomb at 77° F

			Compressive			Plate Shear			
Cell	Density	Paper thickness	Bare	Stabilized		"L" Direction		"W" Direction	
Size inches (mm)	lbs/ ft^3. (kg/m^3)	mil(μm)	psi Strength Min Av.	psi Strength Min.Av.	ksi Modulus Typical	psi Strength Min. Av.	ksi Modulus Min Av.	psi Strength Min	ksi Modulus Min Av.
1/8(3.2)	1.8(29)	1.5(38)	70	80		65	2.0	36	1.3
1/8(3.2)	3.0 (48)	2(51)	180	270	20	162	5.2	85	2.5
1/8(3.2)	3.5 (56)	2 (51)	324			171	5.8	90	3.2
1/8(3.2)	4.0(64)	2(51)#	330	470	28	225	7.0	112	3.6
1/8(3.2)	5.0(80)	3(76)	600	660		235	8.5	120	4.5
1/8(3.2)	6.0(96)	3(76)	800	825	60	260	10.0	135	4.7
1/8(3.2)	8.0(128)	3(76)	1100	1250	78	355	13.0	190	6.5
3/16(4.8)	2.0(32)	2(51)	90	105	11	72	2.5	40	1.4
3/16(4.8)	3.0(48)	2(51)	180	270	20	135	4.5	67	2.4
3/16(4.8)	3.5(56)	2(51)	250	350	25	165	5.8	80	3.1
3/16(4.8)	4.0(64)	3(76)	320	470	28	215	7.0	112	3.8
3/16(4.8)	4.5(72)	5(130)	320	400		225	7.5	110	3.0
3/16(4.8)	6.0(96)	5(130)	580	650		330	11.6	150	4.5
3/16(4.8)*	1.8(29)	2(51)	70	110		45	1.0	35	1.0
3/16(4.8)*	3.0(48)	2(51)	250	270	17	95	2.4	95	3.6
**3/16(4.8)*	4.0(64)	2(51)	-	450		105	3.3	124	6.9

\# Indicated paper thickness is a minimum value.

* Overexpanded Core to AMS 3714

** Hexel is the only qualified source of this type of material

Table 3: Properties of Flex-Core Nomex Honeycomb (77°F)

			Compressive			Plate Shear			
Cell	Density	Paper thickness	Bare	Stabilized		"L" Direction		"W" Direction	
Count (per linear foot)	lbs/ ft^3. (kg/m^3).	mil(μm) Min.	psi Strength Min Av.	psi Strength Min Av	ksi Modulus Typical	psi Strength Min Av.	ksi Modulus Min Av.	psi Strength Min Av	ksi Modulus Min Av
F50	4.5(72)	4(102)	316	387	33	227	5.1	119	2.6

4 MATERIAL QUALIFICATION REQUIREMENTS

4.1 Request For Qualification

All requests for qualification to this specification shall be addressed to Bombardier Aerospace Materials Technology Engineering department for approval.

All material qualification shall be site specific.

An audit of the manufacturers and/or test facilities by Materials Technology Engineering may be necessary prior to approval.

4.2 Qualification testing

Potential suppliers shall submit a written qualification test report based on 3 batches/lots of materials showing compliance with the requirements contained in section 3. The test report shall contain actual numerical test values, average test results as well as failure modes where applicable.

4.2.1 A sample shall be submitted for testing at the discretion of Bombardier Aerospace Materials Technology for evaluation.

4.3 Qualification by Similarity

Where a product has been qualified to another similar specification, the supplier may submit the qualification data applicable to this specification for consideration. The similar specification may be a government, company, or other specification where the requirements are similar to this specification.

4.4 Process Control Document

4.4.1 The manufacturer shall develop and maintain a Process Control Document (PCD). The PCD shall define the manufacturing and quality control requirements and procedures for assuring consistent, uniform and compliant products. The PCD shall identify baseline chemical constituents, in-process test procedures and requirements, and manufacturing procedures. All specifications and test prccedures employed during the process shall also be listed and issue/date controlled.

4.4.2 When qualification has been granted, the PCD shall be signed by the supplier and Bombardier Aerospace Materials Technology Engineering and shall not be changed without prior written approval.

4.4.3 The PCD and all production data shall be available to any Bombardier Aerospace auditors when requested.

4.5 Qualification Approval

4.5.1 Upon review of supplier's data, PCD and de Havilland tests, the supplier will be advised either of product qualification or reasons for not qualifying the product.

4.5.2 Products that are qualified will be listed in the Qualified Products List of this specification.

4.5.3 No changes in the method of manufacture and/or formulation shall be made without notification and

prior written approval of Materials Technology Department.

4.5.4 Re-qualification of the product may be requested by the Bombardier Materials Technology if there are any changes in the method of manufacture and/or formulation.

5 QUALITY ASSURANCE REQUIREMENTS

5.1 Supplier Batch/Lot Acceptance Tests

5.1.1 The manufacturer/supplier is responsible for the performance of all sampling, inspection and testing of each batch/lot as specified in **Table 4.**

5.1.2 The manufacturer/supplier shall issue with each batch of product one copy of an Acceptance Test Report showing actual test data conformance to the acceptance tests specified in **Table 4**. The report shall include the supplier's batch identification, materials specification and date of testing.

5.1.3 Bombardier Aerospace Materials Technology Engineering reserves the right to perform any or all of the tests set forth in this specification to ensure that the product continues to meet specification requirements. Any product not meeting the requirements of this specification will be returned to the supplier at the supplier's expense.

5.1.4 The manufacturer/supplier shall certify with a Certificate Conformance that each batch of each shipment meets the requirements of this specification.

5.2 Purchaser Batch/Lot acceptance tests

5.2.1 The purchaser/user is required to perform of all sampling, inspection and testing of each batch/lot as specified in **Table 4.**

Table 4: Qualification and Batch Acceptance Tests

Test	Reference	Qualification (Supplier)	Acceptance (supplier and purchaser/ user)
Cell Walls	AMS 3711, 3713, 3714	x	
Double Layer	AMS 3711, 3713, 3714	x	
Shear Strength	ASTM C273	x	
Shear Modulus	ASTM C273	x	
Compressive Strength	ASTM C365	x	x [1]
Compressive Modulus	ASTM C365	x	
Quality of Core	AMS 3711, 3713, 3714	x	
Density	ASTM C271	x	x
Flatness	AMS 3711, 3713, 3714	x	
Node Bond Breaks	AMS 3711, 3713, 3714	x	
Node Bond Strength	AMS 3711, 3713, 3714 & MIL-STD-401B	x	
Ribbon Direction	AMS 3711, 3713, 3714	x	
Core Thickness	Per QPL	x	x
Length and Width	AMS 3711, 3713, 3714	x	
Cell Pitch	AMS 3711	x	
Cell Size	AMS 3711	x	x
Cell Count (for Flex & OX)	AMS 3713,3714	x	x
Flammability	FAR 25.853 APP. F, Part I (a) (1) (i), Amd. 25-86	x	
Core Water Migration	ASTM F1645	x	

1. Bare compressive strength , 5 specimens are required.

5.3 Definitions

5.3.1 Batch is defined as the end product of all the raw materials mixed and/or manufactured at the same time and place. The weight or volume may vary, depending upon the capacity of the manufacturer's facilities.

5.3.2 Lot is defined as the total quantity of product in a shipment taken from the same batch.

6 ORDERING DATA

6.1 Prerequisite

Material furnished under this specification for production use shall be qualified and listed on the Qualified Products List prior to issuing of a purchase order.

6.2 Procurement Documents

Procurement documents shall specify the following:

- Title, Number, Issue and Amendment Number of this Specification
- Classification (Regular, Overexpanded or Flex-core)*
- Core Cell Size (inches) or cell count, Density (lb/cu.ft.) and Thickness (inches)
- Manufacturer's Material Designation
- Total Quantity (No. of sq. ft.)
- Acceptance Test Report

* If material is not classified, regular is assumed.

7 PREPARATION FOR DELIVERY

7.1 Identification

Each piece of core and each interior and exterior package shall be identified with the following information applied to a durable tag, using characters of such size as to be clearly legible and which will not be obliterated by normal handling:

- Core, Honeycomb, Aramid Fibre Base, Phenolic Coated
- DHMS P1.26 (Issue and Amendment Number)
- Core Classification (Regular or Overexpanded or Flex-core)
- Core Cell Size (inches) or Cell Count, Thickness (inches), Density (lb/cu.ft.)
- Length and Width
- Manufacturer's Material Designation
- Stock or Lot Number
- Purchase Order Number
- Date of Manufacture

7.2 Packaging and Packing

The honeycomb core product shall be packed and packaged for shipping in accordance with AMS 3711, AMS 3713 or AMS 3714.

7.3 Shipping Documentation

Each shipping container shall have the exterior legibly marked with the following information in such a manner that the markings shall not smear or to be obliterated during normal handling or use:

- Core, Honeycomb, Aramid Fibre Base, Phenolic Coated
- DHMS P1.26 (Issue and Amendment Number)
- Core Classification (Regular, Overexpanded or Flex-core)
- Cell Size or Cell Count, Density, Thickness
- Manufacturer's Material Designation
- Purchase Order Number
- Number of Packages
- Total Quantity (No. of sq. ft.)
- Batch or Lot Number

Containers shall be prepared for shipment in accordance with commercial practice to assure carrier acceptance and safe transportation to the Point of delivery.

Each shipment shall contain a copy of Material Safety Data Sheet.

8 HEALTH AND SAFETY DATA

When supplying samples for qualification per **Para.4**, the supplier shall submit a Material Safety Data Sheet (MSDS) complying with the "Controlled Products Regulations" of the hazardous Products Act (also known as W.H.M.I.S. Regulations). The document must state all hazardous ingredients, safe-handling procedures, first-aid measures, fire and explosion data, re-activity data, physical properties, preparation information and procedures for storage and disposal.

This (MSDS) must then be supplied with a completed DH 4339 "Application To Introduce A New Material" form to the Material Safety Committee.

Upon receipt of DH 4340 "Recommendation" form that approves the use of the material, it can then be included on the Qualified Products List.

NOTE: Any changes in the formulation of the material require a re-submission of the Material Safety Data Sheet.

QUALIFIED PRODUCTS LIST

MANUFACTURER'S NAME AND ADDRESS	MANUFACTURER'S PRODUCT IDENTIFICATION NO.			MATERIAL SAFETY DATA SHEET NO.	DE HAVILLAND QUALIFICATION SHEET NO.	DATE OF PRODUCT APPROVAL
	Cell Size	Density (pcf)	Product Designation			
Hexcel Corp.,	1/8	1.8	HRH10-1/8-1.8	0298	PQS 2	Oct.26,1984
1214 West High Way 84	1/8	3.0	HRH10-1/8-3.0			
85230	1/8	3.5	HRH10-1/8-3.5			
Casa Grande, Arizona	1/8	4.0	HRH10-1/8-4.0			
(520) 836-8761	1/8	5.0	HRH10-1/8-5.0			
	1/8	6.0	HRH10-1/8-6.0			
Distribution:	1/8	8.0	HRH10-1/8-8.0			
Hexcel Corp.,	3/16	2.0	HRH10-3/16-2.0			
101 East Ridge Dr.	3/16	3.5	HRH10-3/16-3.5			
Suite 102,	3/16	4.0	HRH10-3/16-4.0			
Danbury,	3/16	4.5	HRH10-3/16-4.5			
CT 06810	3/16	6.0	HRH10-3/16-6.0			
(203) 798-8311	3/16	1.8	HRH10-3/16-OX-1.8			
	3/16	3.0	HRH10-3/16-OX-3.0			
	3/16	4.0	HRH10-3/16-OX-4.0			
	F50	45	HRH10/F50-4.5			
	N.B. L-Dimension of Ox-core (Table 1) is 50" ± 2".					

MANUFACTURER'S NAME AND ADDRESS	MANUFACTURER'S PRODUCT IDENTIFICATION NO.			MATERIAL SAFETY DATA SHEET NO.	DE HAVILLAND QUALIFICATION SHEET NO.	DATE OF PRODUCT APPROVAL
	Cell Size	Density (pcf)	Product Designation			
Hexcel S.A., Parc Industriel, B-4840 Welkenraedt, Belgium.	1/8	3.0	HRH10-1/8-3.0	0298	PQS #3	Nov. 2, 1987
	1/8	4.0	HRH10-1/8-4.0		PQS #6	July 7, l988
	3/16	3.0	HRH10-3/16-3.0		PQS #3	Nov. 2, l987
	1/8	6.0	HRH10-1/8-6.0		PQS #6	July 7, 1988
	1/8	8.0	HRH10-1/8-8.0		PQS #3	Nov.14, 1988
	3/16(0X)	3.0	HRH10-3/16-OX-3.0		PQS #3	Nov. 2, 1987
	1/8	1.8	HRH10-1/8-1.8		PQS #7	
	3/16	1.8	HRH10-3/16-OX-1.8		PQS #7	
	N.B. L-Dimension of Ox-core (Table 1) is 50" ± 2"					
Showa Aircraft, Industry Co. Ltd., No. 600 Tanaka-Machi, Alishima, Tokyo Japan. Distributor: C. Itoh and Co. (Canada) Ltd., 3688 Nashua Dr., Mississauga, Ont.	1/8	1.8	SAH-l/8-1.8		PQS #4	Nov.2, 1987
	1/8	3.0	SAH-1/8-3.0			
	1/8	5.0	SAH-1/8-5.0			
	1/8	6.0	SAH-1/8-6.0			
	1/8	8.0	SAH-1/8-8.0			
	3/16	2.0	SAH-3/16-2.0			
	3/16	3.0	SAH-3/16-3.0			
	3/16(0X)	1.8	SAH-3/16-OX-1.8			
	3/16(0X)	3.0	SAH-3/16-OX-3.0			
	N.B. L-Dimension of Ox-core (Table 1) is 50" ± 2"					
Eurocomposites S.A., B.P.95, Zone Industrielle, L-6401 Echternach, Luxemburg.	1/8	3.0	ECA 3.2-48		PQS #5	July 7, 1988
	1/8	4.0	ECA 3.2-64			
	1/8	5.0	ECA 3.2-80			
	3/16	3.0	ECA 4.8-48			
	3/16(0X)	3.0	ECA 4.8-48(R)			
	1/8	1.8	ECA 3.2-29			
	1/8	6.0	ECA 3.2-96			
	1/8	8.0	ECA 3.2-128			
	3/16	4.0	ECA 4.8-64		PQS #6	Feb. 9, 1989
	3/16"(0X)	1.8	ECA 4.8-29(R)			
	N.B. L-Dimension of Ox-core (Table 1) is 50" ± 2"					

MANUFACTURER'S NAME AND ADDRESS	MANUFACTURER'S PRODUCT IDENTIFICATION NO.			MATERIAL SAFETY DATA SHEET NO.	DE HAVILLAND QUALIFICATION SHEET NO.	DATE OF PRODUCT APPROVAL
	Cell Size	Density (pcf)	Product Designation			
Hexcel Corp., Duxford, Cambridge, CB2 4QD	1/8	3.0	A1-48-3		PQS #7	Feb. 9,1989
	1/8	4.0	A1-64-3			
	3/16	3.0	A1-48-5			
					PQS #9	July 18, 2005
	1/8	1.8	HRH10-3.2-29			
	1/8	3.0	HRH10-3.2-48			
	1/8	4.0	HRH10-3.2-64			
	3/16	3.0	HRH10-4.8-48			
	3/16 OX	1.8	HRH10/OX-4.8-29			
	3/16 OX	3.0	HRH10/OX-4.8-48			
	N.B. L-Dimension of Ox-core (Table 1) is 50" ± 2"					
M.C.Gill Corporation, 4056 Easy Street, El Monte, CA 91731 Ph.: (818) 443-6094 Fax:(818) 350-5880	GILLCORE HD				PQS #8	Nov. 19, 1997
	1/8	1.8	HD111			
	1/8	3.0	HD132			
	1/8	4.0	HD142			
	1/8	5.0	HD153			
	1/8	6.0	HD163			Nov. 1, 2005
	1/8	8.0	HD183			
	3/16	2.0	HD322			
	3/16	3.0	HD332			
	3/16 OX	1.8	HD312O		PQS #10	Nov. 1, 2005
	3/16 OX	3.0	HD332O			
Euro-Composites Corp. 13213 Airpark Drive Elkwood, Virginia 22718-1703	1/8	1.8	ECA 3.2-29		PQS #11	Dec. 8, 2009
	1/8	3.0	ECA 3.2-48			
	1/8	4.0	ECA 3.2-64			
	1/8	6.0	ECA 3.2-96			
	3/16	3.0	ECA 4.8-48			
	3/16"(0X)	1.8	ECA 4.8-29(R)			
	3/16(0X)	3.0	ECA 4.8-48(R)			
	N.B. L-Dimension of Ox-core (Table 1) is 50" ± 2"					