



Heli-Cushion Products
Specifications & Regulatory Data

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Heli-Cushions products are manufactured by **Helitowcart enterprises**,
a company also registered under the name **Vanair inc.** in Canada.



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1) Conformity to Regulatory Requirements

1.1) Heli-Cushion approval

Helitowcart developed its **Heli-Cushions** product line with the intent to offer replicas of the original cushions with upgraded components that allow products to last longer, be more comfortable and be easier to maintain.

This product line did not require an STC as it meets both essential requirements:

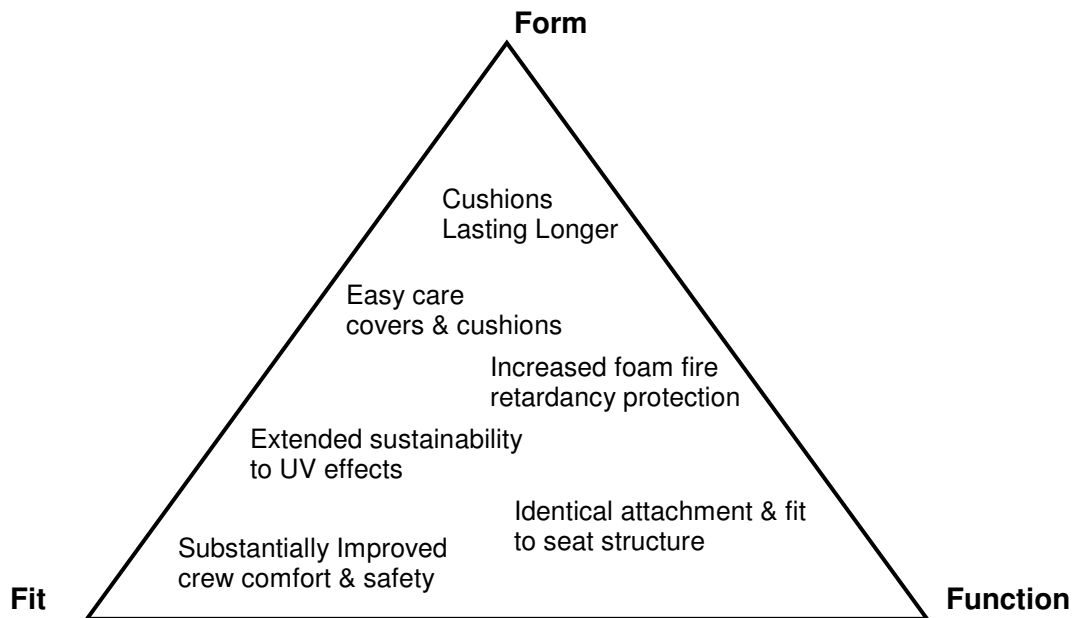
- 1) It maintains the Form-Fit-Function of the original seat cushions, and
- 2) It meets CFR 27.853 Normal Category Rotorcraft* Airworthiness requirements regarding fire retardancy.
*Normal category rotorcraft: Rotorcraft with maximum mass (weights) of 3,175 kg (7,000 lbs.) or less and nine or less passenger seats.

The following sections are dedicated to helicopter mechanics in order to allow a detailed review of Heli-Cushion product construction and a review of conformity to applicable standards in view of above statement.

1.2) Respecting Form-Fit-Function

Meeting Form, Fit and Function of the original OEM components is essential to regulatory conformity. Helitowcart has taken great care in designing the Heli-Cushion product line with the intention of respecting OEM original part characteristics. This has allowed our products to stay within this Form-Fit-Function triangle zone. All improvements introduced to the original parts have stayed within this defined zone. See figure 1.2.1.

Figure 1.2.1
Respecting Form-Fit-Function Zone





1.3) Applying FAR 27.853 (CFR 27.853)

We must remember that there are multiple airworthiness standards depending on aircraft category:

- FAR 23.853 defines Airworthiness Standards for Normal, Utility, Acrobatic and Commuter Category Airplanes.
- FAR 25.853 defines Airworthiness Standards for Transport Category Airplanes.
- FAR 27.853 defines Airworthiness Standards for Normal Category Rotorcrafts.
- FAR 29.853 defines Airworthiness Standards for Transport Category Rotorcrafts.

In regards to fire protection in compartment interiors the most well known standard is FAR 25.853 as this is the most stringent due to corresponding flights at high altitudes and large passenger numbers involved. Included in this standard are very specific parameters specifying both how should burn tests be performed and how should materials successfully meet these tests. Supplied burn test certificates are typical records issued from such process.

For Normal Category Rotorcrafts, the applicable fire protection standard is much less stringent. FAR 27.853 simply requires that materials used in helicopter interiors be flame-resistant. Unlike the requirements stated for Transport Category Airplanes in 25.853, this standard does not specify how and to which specific level fire retardancy should be demonstrated and recorded.

Helitowcart has developed replacement cushions, headliners and carpets for the Normal Category Rotorcrafts market only. The applicable standard is thus FAR 27.853.

When creating Heli-Cushion products, Helitowcart ensures that each product meets FAR 27.853 by being a sum of components classified as fire retardant according to trusted and recognized industrial standards. This involves searching for appropriate materials and corresponding data sheets that confirm conformity to fire resistance standards. The following sections, figures and annexes of this document provide you with the data confirming this process has been successfully achieved. It also provides you with a synthesis allowing you to instantly obtain the demonstration that the Heli-Cushion products you have in hand fully conform to FAR 27.853.

1.4) Regulatory Summaries

As mentioned in the previous section, the following figure 1.4.1 and 1.4.2 have been created to allow you to have an instant portrait of components used to create the Heli-Cushion product you have in hand. It lists all applicable recognized fire retardancy standards met by each component.

We also added figure 1.4.3 in order to provide you with visual reference to the product's main components in a fire retardancy perspective as well as the steps to manufacturing these products.

For your convenience we invite you to refer to section 2 of this document to consult definitions allowing you to fully interpret listed standards and specifications.

Should you require further details, we also invite you to review the Annex section as it includes FAR and CFR excerpts as well as all data sheets provided by suppliers to support their fire retardancy statements.

This information package thus provides you with substantial information to allow approval of Heli-Cushion products as they fully meet FAR 27.853 for installation into Normal Category Rotorcrafts.



**Figure 1.4.1
Regulatory Summary - Eurocopter Applications**

Element	Type	Standard	Products:		
			<u>Cushions</u> HC350 HC120 HC120R3	<u>Flat Cushions</u> HC350RBF HC350RHR	Column left blank intentionally
ASSEMBLY	Flame Resistant	CFR14/ FAR 27.853	✓	✓	
	Flame Resistant	CAR Part V, 527.853	✓	✓	


COMPONENTS					
<u>Cushions</u>					
Main support foam	Fire Retardant	CA TB 117	✓	✓	
Energy absorbent foam	Fire Retardant	CA TB 133	✓	na	
Foam Protective Coating	Fire Resistant	CA TB 133	✓	✓	
<u>Covers</u>					
Tricot Cover Material	Flame Retardant	CA TB 117	✓	✓	
Ultra-Leather Cover Material	Flame Retardant	CA TB 117	✓	✓	
Cover foam backing	Flame Retardant	FMVSS 302	✓	✓	
Velcro	Flame Retardant	FMVSS 302	✓	✓	
	Flame Resistant	CFR14/ FAR 25.853 (Apx F,12s. Ignit.)	✓	✓	



**Figure 1.4.2
Regulatory Summary - Robinson Applications**

			Products:		
Element	Type	Standard	Cushions HC44CU HC44CUCF	Headliners HC44HL	Carpets HC44CA
ASSEMBLY	Flame Resistant	CFR14/ FAR 27.853	✓		
	Flame Resistant	CAR Part V, 527.853	✓		
COMPONENTS					
<u>Cushions</u>					
Main support foam	Fire Retardant	CA TB 117	✓		
Energy absorbent foam	Fire Retardant	CA TB 133	✓		
Foam Protective Coating	Fire Resistant	CA TB 133	✓		
<u>Covers</u>					
Ultra-Leather Cover Material	Flame Retardant	CA TB 117, and FMVSS 302	✓		
Cover foam backing	Flame Retardant	FMVSS 302	✓		
Velcro	Flame Retardant	FMVSS 302	✓		
	Flame Resistant	CFR14/ FAR 25.853 (Apx F, 12s. Ignit.)	✓		
<u>Headliners</u>					
Headliner Cover Material	Flame Retardant	FMVSS 302	✓		
Headliner Foam backing	Flame Retardant	CA TBG 117, and FMVSS 302	✓		
<u>Carpets</u>					
Carpet	Flame Retardant	FMVSS 302	✓		

**Figure 1.4.3
Heli-Cushions Typical Construction**

Construction parameters	Image	Manufacturing Steps
<p>High quality foam base High resilience urethane foam is used to minimize bottoming out effect and to ensure long lasting cushions.</p> <p>This characteristic also ensures a stable support base for improved body positioning and comfort especially essential for crews subject to high frequency flying or long haul daily routines.</p>		<p>Step 1: Mold Injection (molds designed to match manufacturer's original cushions to make sure they fit seat structure perfectly. Top surface with mild contouring for increased sitting tolerance and postural stability.</p> <p>Step 2: Memory foam and lumbar support foam cut to size.</p>
<p>Fire Retardant Coating All cushion assemblies are coated with a dense layer of fire retardant paint.</p> <p>This durable water base fire retardant coating also seals and protects foam assemblies.</p> <p>This coating contributes to keeping cushions moisture free and easy to clean should passenger spillage occur.</p>		<p>Step 3: Fire retardant coating of individual foam components.</p> <p>Step 4: Foam Assembly (lumbar and leg support are added as applicable. Then Memory foam is added to bony zones).</p>
<p>Fire Retardant Covers Cushion cover kits are made of fire retardant materials. An intermediate foam layer is sewn to cover fabric for additional smoothness on top surfaces. This foam layer also meets fire retardant characteristics.</p> <p>For Eurocopter applications the covers are removable for easy care. Once added to the cushion kit, the covers allow for easy installation to helicopter seat structure with snaps and Velcro matching original model. Velcro used is also meeting fire retardant requirements. Safety loops are in place for additional attachment as required by Eurocopter Service Bulletin 25.00.70. (see "Warnings" section)</p> <p>For Robinson applications the covers are installed to the foam base and its own frame according to the same design as the original seat cushions. Covers are studded to cushion kit meeting the original design.</p>		<p>Step 5: Cover manufacturing</p> <p>Step 6: Cover Installation</p> <p>Step 7: Embroidery (on request only)</p> <p>Units are shipped fully assembled, ready for installation.</p>



2) Definitions

ASTM D-3574: Dynamic Fatigue Test By Constant Force Pounding

CA TB: California Technical Bulletin: Information about this standard: It requires manufacturers to make upholstered furniture and bedding products sold in California flame-retardant. In the event of a residential fire, these products act as a significant fuel source and are difficult to extinguish once ignited. The Bureau measures flame retardance in accordance with flammability standards developed by the Bureau or the United States, Consumer Products Safety Commission (CPSC). Since 1975, the Bureau has developed several flammability standards, called technical bulletins. These performance-based standards do not prescribe the use of flame-retardant chemicals, manufacturing methods, or specific materials to meet the standards. The Bureau encourages the industry to use innovative solutions and products to achieve flame resistance without compromising the environment. Manufacturers must strictly adhere to state and federal laws governing the manufacture and sale of upholstered furniture and bedding products.

CA TB 117: (Flame retardance of resilient filling materials used in upholstered furniture). Requirements, Test Procedures and Apparatus for Testing the Flame Retardance of Resilient Filling Materials Used in Upholstered Furniture. California Technical Bulletin 117, a mandatory standard, is both an open flame test and a smoldering cigarette test for the component materials used to make residential upholstered furniture which is to be sold in the state of California. In this test, each upholstery component except the covering fabric is time exposed to either an open flame or a smoldering cigarette in a defined test chamber, and the propagation of the open flame or the cigarette char length is measured to a specific specification criteria contained in Technical Bulletin 117. All upholstered furniture components except frames must comply with this test procedure and criteria.

CA TB 133: (Flame retardance of full scale furniture). Flammability Test Procedure for Seating Furniture for Use in Public Occupancies. California Technical Bulletin 133 is a very severe open flame test, mandatory for furniture sold in what is called "public occupancies" in the state of California. It should be noted that several other states have adopted California Technical Bulletin 133 for the same occupancies in their states. In the California Technical Bulletin 133 (TB-133) test protocol, a full scale piece of furniture or a mock up is placed in a specially designed room where the furniture or mock up is exposed to an approximate 16 kw open flame for eighty seconds. The temperature at the 4 foot level and at the ceiling are monitored constantly. The mass loss of the test furniture is monitored continuously, and the carbon monoxide concentration in the test room is monitored continuously. Smoke opacity in the room is also monitored continuously. TB-133 lists criteria for each function measured. Another way to test for passing TB- 133 is the use of oxygen consumption (depletion) calorimetry. In oxygen consumption calorimetry, the oxygen consumed by the burning furniture is monitored continuously, and the peak heat release and total heat release are calculated from the amount of oxygen consumed by the burning furniture. There are specific criteria for peak heat release and total heat release. It should be said here that the TB-133 test for upholstered furniture was designed specifically for upholstered furniture used in public occupancies, and this test is definitely not applicable to upholstered furniture used in residential occupancies. It should also be noted that TB-133 is the most severe fire test in the world for upholstered furniture.

FAR Part 23: Federal Aviation Regulations Part 23. Part 23 contains airworthiness standards for airplanes in the normal, utility, aerobatic, and commuter categories. It dictates the standards required for issuance and change of type certificates for airplanes in these categories. The Maximum Takeoff Weight of an airplane in the normal, utility or acrobatic category cannot exceed 12,500 lb. The Maximum Takeoff Weight of an airplane in the commuter category cannot exceed 19,000 lb.

This Part has a large number of regulations to ensure airworthiness in areas such as structural loads, airframe, performance, stability, controllability, and safety mechanisms, how the seats must be constructed, oxygen and air pressurization systems, fire prevention, escape hatches, flight management procedures, flight control communications, emergency landing procedures, and other limitations, as well as testing of all the systems of the aircraft. It also determines special aspects of aircraft performance such as stall speed (for single engine airplanes - not more than 61 knots), rate of climb (not less than 300 ft/min), take off speed (not less than 1.2 x Vs1), weight of each pilot and passenger (170 lb for airplanes in the normal and commuter categories, and 190 lb for airplanes in the acrobatic and utility categories).



FAR Part 25: Federal Aviation Regulations Part 25: This Part contains airworthiness standards for airplanes in the transport category. The majority of airplanes up to 12,500 lb Maximum Takeoff Weight are type certificated in the normal, utility or acrobatic categories so most airplanes certificated to Part 25 have Maximum Takeoff Weights greater than 12,500 lb, although there is no lower weight limit.

FAR Part 27: Federal Aviation Regulations Part 27: This Part contains airworthiness standards for rotorcraft in the normal category. Rotorcraft up to 7,000 lb Maximum Takeoff Weight and 9 or fewer passengers are type certified in this Part. Examples of rotorcraft certified in this Part are the Schweizer 300 and the Bell 429.

FAR Part 29: Federal Aviation Regulations Part 29. This Part contains airworthiness standards for rotorcraft in the transport category. Rotorcraft with more than 20,000 lb Maximum Takeoff Weight and 10 or more passengers must be certified to Category A standards. An example of rotorcraft certified in this Part is the Sikorsky S-92.

Fire Resistant: Material so impervious to fire that, for a specified temperature and time, there will be no structural failure and the side away from fire will not be hotter than a certain temperature. Also called Flame resistant.

Fire Retardant : Substance added to a material or applied to a surface to suppress, reduce, or delay the combustion of the material to a significant degree. Material not susceptible to combustion to the point of propagating a flame, beyond safe limits, after the ignition source is removed. Also called flame retardant.

Flame Resistant: See Fire Resistant.

Flame Retardant: See Fire Retardant.

FMVSS 302 - Federal Motor Vehicle Safety Standards & Regulations, Part 571, Standard 302

Flammability of interior materials. Specifies burn resistance requirements for materials used in the occupant compartment of motor vehicles. FMVSS 302 is a general safety measure which seeks to reduce the likelihood of injury or death that may result from a vehicle fire. Officially known as 49 CFR 571.302, The Federal Motor Vehicle Safety Standard (FMVSS) 302 for Flammability of Interior Materials - Passenger Cars, Multipurpose Passenger Vehicles, Trucks, and Buses is one of the most common automotive materials tests. Founded as a Federal Standard in 1972, it is identical to the Canadian Motor Vehicle Safety Standard (CMVSS) 302 and will occasionally be called out on a specification or part print simply as MVSS 302.

FMVSS 302 is an abbreviation for "flammability of interior materials," and is a frequently referenced U.S. government specification for flammability, despite the fact that its intended use is for fabrics in the interior of motor vehicles. Items covered under FMVSS 302 include things like seat covers, headliners and instrument panel padding. In the general requirements section of the specification, it states "material shall not burn, nor transmit a flame front across its surface at a rate of more than four inches per minute." This statement describes the burning behavior of the product tested according to the FMVSS302 standard. This standard specifies burn resistance requirements for materials used in the occupant compartments of motor vehicles. Its purpose is to reduce deaths and injuries to motor vehicle occupants caused by vehicle fires, especially those originating in the interior of the vehicle from sources such as matches or cigarettes.

This test, as written, involves burning two or more samples of a 356mm x 102mm x thickness (13mm maximum) plaque or section of material and measuring the burn rate in millimeters per minute (mm/min). Ignition is at one end of the sample by exposing it to a Bunsen burner flame for 15 seconds. The burn rate dictates conforming or non-conforming material and a maximum burn rate of 102mm/min is allowed by FMVSS 302, although this criteria may be overridden by an OEM specification or part print detail. The Society of Automotive Engineers (SAE) J369 and the International Standards Organization (ISO) 3795 are technically equivalent methods of test to FMVSS 302, however they both require burning five specimens per material



3) Warnings

Cushions:

- Do not use these cushions if you feel that they hinder your natural movements
- Ensure lumbar back adjustment has been put to your personal comfort setting prior to acting as crew on board helicopter
- When applicable, ensure rear seat safety straps are passed through designated loops located behind backs in order to prevent them from flying off the helicopter when operating without doors.
- For covers machine wash: Ensure zippers are well closed and that no hook (male) part velcro is left on the covers. Machine wash at gentle cycle only.
- Do not soak cushions. All cleaning must be surface only with damp mild cloth.

Headliners:

- Ensure headliner sections are appropriately positioned and glued to position to prevent their movement and any possible hindering of crew & passenger activity and view.
- Clean Headliners only with damp mild cloth

Carpets:

- Ensure carpet sections are appropriately positioned and glued to position to prevent their movement and any possible hindering of crew & passenger activity.



3.1.1) Instruction for application of Eurocopter Service Bulletin 25.00.70

HeliCushion Safety Loops & Velcro Installation

Ref : Eurocopter Service Bulletin 25.00.70

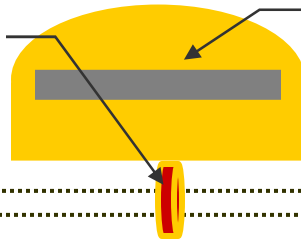
Object: Installing HeliCushions in conformity with Eurocopter Service Bulletin 25.00.70.

Issue: For additional safety when flying without rear doors, strapping and using self gripping fasteners (Velcro) to secure rear seat cushions.

Application: This instruction applies to all Helitowcart HeliCushion models.

Head Rests

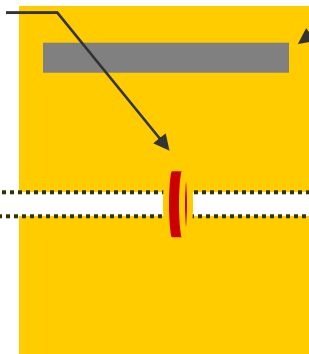
1- Insert strap through loop



2- Apply Hook (male) Self-Adhesive Velcro to wall. Ensure position matches sewn-on Loop (female) Velcro on cushion.

Back Rest Cushions

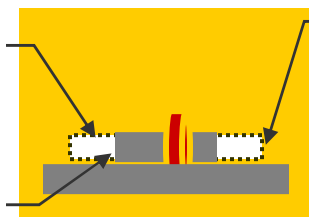
1- Insert strap through loop



2- Apply Hook (male) Self-Adhesive Velcro to wall. Ensure position matches sewn-on Loop (female) Velcro on cushion.

Seat Cushions

1- FOR REAR SEAT ONLY: Insert Loop (female) Velcro through loop. Attach to Hook Self-Adhesive Velcro



3- Apply Hook (male) Self-Adhesive Velcro to seat structure. Ensure position matches sewn-on Loop (female) Velcro on cushion.

2- FOR REAR SEAT ONLY: Apply Hook Self-Adhesive Velcro to seat support bar frame (under tubing)

(note: Above sketches show cushion backs. These sketches are not to scale. They are for reference purposes only.)



3) Annexes

See Following document package titled:

**Heli-Cushion Products
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Annexes