CONSTRUCTOR TESTS FILE HELICOPTER HELMET LH TYPE

TEST RESULTS

NOTICE :

All tests have been carried out on LH 250 type helmet : those results are valid also for LH 050 and LH 150 type, as the shell of these type are the same of LH 250 type.

SHOCK ABSORPTION TESTS

These tests were carried out following the protocol proposed by MIL-DTL-87174/A (USAF) which requires a blow of 47,5 J without redoubling. The maximum acceptable acceleration is 400G with acceleration greater than 200G not exceeding 3 ms and acceleration greater than 150G not exceeding 6 ms.

The helmet meet or exceed all above requirements.
Test report n°3010643 (16th of November 2001), from American laboratory ITS, can be shown on request.

PERFORATION RESISTANCE TESTS

These tests were carried out in accordance with the MIL-DTL-87174/A (USAF) standard with a requirement of 13,5 J and a validation condition which does not permit the point to come into contact with the dummy head.

The helmet meets above requirements.
Test report n°3010643 (16th of November 2001), from American laboratory ITS, can be shown on request.

VALIDATION OF THE SCREENS QUALITIES

The injected screen - validated with small outer clear and yellow screens and big inner green screen - meet or exceed the EN 1836 : 1997 standard for :

- Optical powers: spherical power (optical class 1), astigmatic power (optical class 1), and prismatic power difference (optical class 1),

- Transmittance: filter category 0 for the clear and yellow, filter category 3 for the green,

- UV 400 protection: Transmittance (100 - 400nm) < 1 % for all the colours, and IR protection: T_{SIR} < 45 % for the green and grey,

- Requirements for road use and driving,

- Scattered light,

- Enhanced robustness,

- Resistance to radiation,

- Ignition,

The injected screen – validated with worst configuration – meet or exceed the MIL-V-43511C standard for optical qualities:

- Vertical and horizontal prismatic deviation,

- Refractive power,

- Luminous transmittance,

- Optical distortion of critical areas,

- Hase,

- Ultraviolet transmittance,

- Neutrality of the green and grey,

- Chromaticity of the grey.

The laboratory's reports could be shown on request.

ACOUSTIC INSULATION MEASUREMENT

The measurements were carried out by the Ergonomics and Cognitive Sciences Department of the IMASSA (*Institut de Médecine Aérospatiale du Service de Santé des Armées*: Institute of Aerospatial Medicine of the Forces' Health Service) in Brétigny sur Orge.

The attenuation levels obtained with pink noise at 107 dBA are as follows:

Frequency	50	63	80	100	125	160	200	250	315	400	500	630	800
Attenuation	5,1	6,5	5,1	4	3,7	4,5	7	8,5	8,8	7,8	10,5	15	22,2

Frequency	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000	12500
Attenuation	25	29,9	34,1	41,9	46	49,1	50,9	53,9	57,3	61,1	57,5	55,6

The test report from IMASSA dated 1st April 1997 can be shown on request.

VALIDATION OF THE INTELLIGIBILITY OF THE ELECTRO-ACOUSTIC EQUIPMENT

The measurements were carried out by the Ergonomics and Cognitive Sciences Department of the IMASSA (*Institut de Médecine Aérospatiale du Service de Santé des Armées*: Institute of Aerospatial Medicine of the Forces' Health Service) in Brétigny sur Orge.

This test uses the Steeneken method of measuring intelligibility. It gives the STI index which defines the level of intelligibility of the equipment. It is considered that the minimum level of intelligibility corresponds to an STI index of 0.35: beyond this theoretical threshold intelligibility is deteriorated to the extent that the user would have to ask confirmation from the person in contact.

The test was carried out on 3 subjects subjected successively to silence and pink noise of 107 dBA intensity in a diffuse field. The helmet is fitted with a SILEC M-2000 equipment electro-acoustic unit.

The helmet is validated: it gives a sufficient level of intelligibility.

The test report from IMASSA dated 1st April 1997 can be shown on request.

WEARING GLASSES

In accordance with the EN-966 standard a check was made that wearing glasses was compatible with the operation of the helmet. The test was carried out with a large size helmet and a pair of average enveloping glasses: it was observed that the screens retain their original kinematics.

The helmet is thus validated for wearing glasses, subject to glasses of reasonable dimensions being worn.

RESISTANCE TO PULLING OFF

Insofar as the helmet has no post-cranial strap, it is appropriate to carry out a test of resistance to coming off so as to guarantee this option.

The tests were carried out in accordance with the EN-966 standard. The helmet is subject to a traction force applied to the back of the dome in the helmet's vertical median plane and directed at an inclination of 45° to the top and to the front. The conditions for validation are that the helmet should not separate from the dummy head and that after the test the angle formed by the reference line at the top of the helmet and by the reference plane of the dummy head should not exceed 30°.

The helmet meets above requirements

RETENTION SYSTEM RESISTANCE

The tests were carried out in accordance with the EN-966 standard.

The conditions for validation are as follows. The dynamic stretching should not exceed 35 mm and the residual stretching should not be greater than 25 mm. After the test, the retention system should still enable the helmet to be removed from the dummy head by using opening device in the normal way.

The retention system is validated in accordance with the EN-966 standard.

BREAKAGE OF THE LADDER-LOCKS

It is considered that breakage of the ladder-locks occurs at the point where the section encountered is weakest.

Static traction tests were carried out on the retention system, where a check was made that the ladder-locks broke first at the two defined sections under a load of 170 kg ($\approx 1670N$).

The breakage of the ladder-locks on the retention system is validated at 167 daN per ladder-lock.

CLIMATIC TESTS

These tests were carried out by the CEV (*Centre d'Essais en Vol:* Test Flight Centre in Brétigny).

The cold tests (-20°C) and the hot tests (+70°C) validated the proper operation of the helmet. This test also provided assurance that the subjective impressions of comfort, in extreme use, are satisfactory.

The DGA's test report no. 19/CEV/SE/EQS/OV/1997 can be shown on request.

FIRE RESISTANCE

This test was carried out by the CEAT (*Centre d'Essais Aéronautique de Toulouse* : Aeronautics Test Center of Toulouse)

The results show that the protection against fire and self-extinguishing properties afforded by the helmet is satisfactory.

The CEAT's test report E 00/5825 Partiel 2 can be shown on request.

TEST PROTOCOLS

PERFORATION RESISTANCE

Following protocol of MIL-DTL-87174/A (USAF) standard.

SHOCK ABSORPTION

Following protocol of MIL-DTL-87174/A (USAF) standard.

ACOUSTIC INSULATION

The method which was used is only valid for studying the attenuation of a finished product, in this case the helmet, on a human subject.

The measurement is made by difference of recording between an uncovered dummy head and a dummy head wearing the helmet. The dummy head is fitted with integrated microphones placed by the ears; these microphones measure the acoustic level. The dummy head is placed horizontally in a diffuse field subjected to pink noise of an amplitude of 107 dBA.

The measurement covers a frequency band ranging from 50 Hz to 12500 Hz.

RESISTANCE TO PULLING OFF

Following protocol of EN-966 standard.

RETENTION SYSTEM RESISTANCE

Following protocol of EN-966 standard.

ALTITUDE DECOMPRESSION TEST

This test consists of a rapid climb to 40000 ft followed by levelling off at this altitude and descending at $20\,m/s$. For this test the subject is equipped with an Ulmer 82 GK breathing mask. The helmet is fitted with a radio telephone providing monitoring of the subject. The regulator is of the IN 437 type.

A check is made that no anomaly appears. A check is also made on the level of protection against hypoxia on descending and lastly if the Valsalva manoeuvre can be carried out.

CENTRIFUGE TEST

Three subjects take part in this assessment. They are equipped with ARZ 830 anti-g trousers, a GP 2000 pressure suit and a Ulmer 82-type mask. Each subject carries out two runs: the first on a GOR profile (Gradual Onset Rate) with an acceleration increase rate of $0.1\,G/s$ and a $9G_z$ stop and the second on a ROR profile (Rapid Onset Rate) with an acceleration increase rate of $0.6\,G/s$ and levelling off of 15 to 20 seconds at 5.7 and $9G_z$. On the second run ventilatory superpressure is given from 4 G with a maximum value of 90 hPa at $90G_z$.

After the test each subject's impressions are obtained.

FIRE RESISTANCE

The helmet is fitted to a dummy's head fitted with thermocouples. This head is fixed on a horizontal support firmly attached to a gantry allowing the assembly to pass over a kerosene fire. The period spent in the fire lasts for 8 seconds during which the temperatures on the surface of the dummy are continuously recorded. At the end of exposure, observing the equipment and the state of the dummy provide an assessment of the protection given by the equipment.

EJECTION RAMP TEST

A dummy with an articulated neck is fitted with the helmet, transparent visor lowered and locked like a pilot in flight, and tied onto an MK 10 ejector seat. The seat is fitted onto a ramp inclined at 30°. The ejection order is then given in the same conditions as in flight ($16G_z$), then quickly braked. The sequence is filmed using a TV camera and a rapid-shot camera

CLIMATIC TESTS

A cold test is carried out at a temperature of -20°C for 15 minutes. Another is carried out under heat at a temperature of +35°C and 25 % relative humidity. Temperature measurements are made only on the hot test. The subject is equipped with a flying suit, polar equipment during the cold trial, and a helmet fitted with an Ulmer 82-type mask.