

CHAPTER 1

A1.0- ADMINISTRATION, GENERAL COMMENTS AND SUMMARY OF TESTS
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1.1 GENERAL COMMENTS

This document reports the procedures and results of certification tests on 406-MHz SARSAT beacons. The tests were conducted for the United States Coast Guard (USCG) by INTESPACE (ITS) under a Center National d'Etudes Spatiales (C.N.E.S., the French Space Agency) contract.

1.2 ADMINISTRATION

1.2.1 WORK ORDER

Manufacturer : JOTRON
 Address : P.O. Box 85 – TJODALYNG, NORWAY
 Represented by : Mr Fred Ivar TALLAKSEN

1.2.2 INTESPACE TEST CENTER

The test operations have been conducted by : Mr Gérard PEYROU

1.2.3 SCHEDULE

Start of test : 09 may 2000
 End of test : 13 october 2000

1.2.4 WORK REFERENCE : M2393-RTCM

1.2.5 EQUIPEMENT UNDER TEST

The results from this test report concern only the equipment here after referenced :

Equipement Under Test (EUT)	Model	Beacon serial number	Flot free system auto-release mechanism	Comments
1	TRON 40GPS	7000	JOTRON Model : FB4 AA S/N : 2811	
2	TRON 40GPS	7001		- Antenna disconnected - 50 Ω RF Output Connector

1.3 TEST FACILITIES

- ARGOS – COSPAS/SARSAT Certification Test Bench
- INTESPACE Enviromental Test Equipements
- Toulouse CNES MCC

1.4 STANDARDS AND TEST PROCEDURES APPLICABLES

- COSPAS-SARSAT standards :
 - "C/S T. 001- Issue 3 - Revision 3 - October 1999 "
 - "C/S T. 007- Issue 3 - Revision 6 - October 1999"
- RTCM Recommended Standards for 406 MHz Satellite Emergency Position-Indicating Radiobeacons (EPIRBs) - Version 2.0 - February 5, 1997
- INTESPACE Radiobeacon Test Procedures

1.5 TEST SEQUENCE

1.5.1 SERIES OF TESTS TO BE RUN IN ORDER : (RTCM item)

- | | |
|--|----------|
| 1 - Initial Alivness Test | (A 1.0) |
| 2 - Dry Heat Test | (A 3.0) |
| 3 - Damp Heat Test | (A 4.0) |
| 4 - Vibration Test | (A 5.0) |
| 5 - Bump Test | (A 6.0) |
| 6 - Salt Fog Test | (A 7.0) |
| 7 - Drop Tests | (A 8.0) |
| 8 - Leakage and Immersion Tests | (A 9.0) |
| 9 - Spurious Emission Test | (A 10.0) |
| 10 - Thermal Shock Tests | (A 11.0) |
| 11 - Cospas-Sarsat C/S T.007 Tests | (A 12.0) |
| 12 - Operational Life, Strobe Light and Self Tests | (A 13.0) |

1.5.2 SERIES OF TESTS TO BE RUN ANY TIME DURING THE SEQUENCE :

- Automatic Release Mechanism & Automatic Activation Tests (A 14.0)
- Stability & Buoyancy Test (A 15.0)
- Inadvertent Activation Test (A 16.0)
- Auxillary Radio-Locating Device Transmitter Test (A 17.0)
- Humidity Test (A 18.0)
- Orientation Test (A 19.0)

The two electronic beacon are identical :

- EUT 1 : TRON 40GPS n° 7001 was used for environmental and electrical tests RTCM items A 2.0 to A 13.0, A 17 (partial) and A 18
- EUT 2 : TRON 40GPS n° 7000 was used for tests RTCM items A 12.0 (partial), A14.0 to A 17 (partial), and A19.0 .

1.6 RESULTS

See following pages Summary of Test results and following chapters Test Result Reports (data and graphs)

General remark :

Regarding the issue of the measurement results performed on the certification test bench, due to the numbering of the computer data sheets, the beacon serial number alters from one curve to the other although the same beacon is concerned.

SUMMARY OF TESTS

PARAMÈTRES TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T min. (± 3 °C) (__ °C)	T amb. (± 3 °C) (22 °C)	T max. (± 3 °C) (+ 70 to + 55 °C)	
1. INITIAL ALIVENESS TEST (A1.0) * Carrier Frequency * Power Output * Data Message	406.025 ± 0.002 35 - 39 must be correct	MHz dBm √		406.025101 37.6 √		Chapter 2 11may, 2000 (C/S Elec. & Funct. Test at amb Temp. Chapter 12)
2. DRY HEAT CYCLE (A3.0) • Aliveness Test (during 2 hour period) * Carrier Frequency * Power Output * Data Message • Aliveness Test (at end of 2 hour period) * Carrier Frequency * Power Output * Data Message	406.025 ± 0.002 35 - 39 must be correct 406.025 ± 0.002 35 - 39 must be correct	MHz dBm √ MHz dBm √			406.025072 37.4 √ 406.025061 37.4 √	Chapter 3 11-12 may, 2000 (C/S Elec. & Funct. Test at + 55°C Chapter 12)

PARAMÈTRES TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T min. (± 3 °C) (__ °C)	T amb. (± 3 °C) (22°C)	T max. (± 3 °C) (+40 °C)	
3. DAMP HEAT CYCLE (A4.0) • Aliveness Test (during 2 hour period) * Carrier Frequency * Power Output * Data Message • Aliveness Test (end of 2 hour period) * Carrier Frequency * Power Output * Data Message	406.025 ± 0.002 35 - 39 must be correct 406.025 ± 0.002 35 - 39 must be correct	MHz dBm √ MHz dBm √			406.025080 37.6 √ 406.025081 37.6 √	Chapter 4 17-18 may, 2000
4. VIBRATION TEST (A5.0) • Exterior Mechanical Inspection • Aliveness Test * Carrier Frequency * Power Output * Data Message	No damage 406.025 ± 0.002 35 - 39 must be correct	√ MHz dBm √		√ 406.025090 37.1 √		Chapter 5 6-7 june, 2000

PARAMÈTRES TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T min. (± 3 °C) (_____ °C)	T amb. (± 3 °C) (22°)	T max. (± 3 °C) (_____ °C)	
5. BUMP TEST (A6.0) • Exterior Mechanical Inspection • Aliveness Test * Carrier Frequency * Power Output * Data Message	No damage 406.025 ± 0.002 35 - 39 must be correct	√ MHz dBm √		√ 406.025096 37.2 √		Chapter 6 8 june, 2000
6. SALT FOG TEST (A7.0) • Exterior Mechanical Inspection • Aliveness Test * Carrier Frequency * Power Output * Data Message	No damage 406.025 ± 0.002 35 - 39 must be correct	√ MHz dBm √		√ 406.025094 37.1 √		Chapter 7 8-12 june, 2000

PARAMÈTRES TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T min. (± 3 °C) (- 30 °C)	T amb. (± 3 °C) (22 °C)	T max. (± 3 °C) (_____ °C)	
7-A. DROP TEST (A8.1) On Hard Surface • Exterior Mechanical Inspection • Aliveness Test * Carrier Frequency * Power Output * Data Message	No damage 406.025 ± 0.002 35 - 39 must be correct	√ MHz dBm √	√ 406.025094 37.4 √			Chapter 8 20 june 2000
7-B. DROP TEST (A8.2) Into Water • Exterior Mechanical Inspection • Aliveness Test * Carrier Frequency * Power Output * Data Message	No damage 406.025 ± 0.002 35 - 39 must be correct	√ MHz dBm √		√ 406.025086 37.6 √		20 june 2000

PARAMÈTRES TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T min. (± 3 °C) (_____ °C)	T amb. (± 3 °C) (22 °C)	T max. (± 3 °C) (_____ °C)	
8. LEAKAGE AND IMMERSION TEST (A9.0) • Aliveness Test * Carrier Frequency * Power Output * Data Message • Interior Inspection	406.025 ± 0.002 35 - 39 must be correct No water	MHz dBm √ √		406.025067 37.4 √ √		Chapter 9 20-22 june 2000
9. SPURIOUS EMISSIONS TEST (A10.0) • 406 MHz • 121.5 MHz	Figure 2-1 Figure 2-6	√ (attach graphs) √ (attach graphs)		√ √		Chapter 10 20-22 june 2000 OK after manufacturer Adjustment (See Annex of C/S Results Chapter 12)

PARAMÈTRES TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T min. (± 3 °C) (_____ °C)	T amb. (± 3 °C) (_____ °C)	T max. (± 3 °C) (_____ °C)	
10. THERMAL SHOCK TEST (A11.0) • Self-activation in water • Aliveness Test : * Carrier Frequency * Power Output * Data Message • Frequency Stability * Short term stability * Medium term stability : • mean slope • residual frequency variation	≤ 5 406.025 ± 0.002 35 - 39 must be correct ≤ 0.002 ≤ 0.001 ≤ 0.003	minutes MHz dBm √ parts/ million in 100 ms parts/ million /minute parts/ million	LOW TEMPERATURE - 31° → 0.1°C < 0.2 406.025011 37.4 √ ≤ 0.0002 < 0.001 < 0.002		HIGH TEMPERATURE +70° → +31°C < 0.2 406.025062 37.4 √ ≤ 0.0008 < 0.001 < 0.001	Chapter 11 22-24 june 2000
11. COSPAR-SARSAT TYPE (A12.0) APPROVAL TESTS	C-S Certificate (attach test report)	√	-20 °C ± 3 °C √	22 °C ± 3 °C √	55 °C ± 3 °C √	Chapter 12

PARAMÈTRES TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T min. (± 3 °C) (- 20 °C)	T amb. (± 3 °C) (_____ °C)	T max. (± 3 °C) (_____ °C)	
12. OPERATIONAL LIFE, STROBE LIGHT AND SELF TESTS (A13.0) Operational Life • Frequency * Nominal Carrier * Short-term stability • Medium term stability : * Mean slope * Residual variation • RF output power • Strobe flash rate • Auxiliary radio-locating Peak Envelope output Power	 406.025 ± 0.002 ≤ 0.002 ≤ 0.001 ≤ 0.003 35-39 20-30 14-20	 MHz parts/ million in 100 ms parts/ million /min parts/ million dBm /min dBm	 406.025129 < 0.0003 < 0.00002 < 0.0003 36.9 21 24.8			Chapter 13 30 june to 4 july 2000 Résultats after 50 hours (C/S Oper. Life Test at min Temp. Chapter 12) Acceptable taking account of the PERP result See Chapter 17

PARAMÈTRES TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T min. (± 3 °C) (- 20 °C)	T amb. (± 3 °C) (22 °C)	T max. (± 3 °C) (55 °C)	
13. STROBE LIGHT TEST (A13.2) • Flash rate • Effective intensity • Pulse duration	20-30 0.75 10 ⁻⁶ to 10 ⁻²	/min Cd S	21 0.85	20 0.85	20 0.80	Chapter 13 and Chapter 12 (C/S Elec. & Funct. Test at min, amb, and max Temp.)
14. SELF TEST (A13.3) • RF pulse duration • Frame synchronization pattern • Number of RF bursts	≤ 0.444 sec 0 1101 0000 1-burst	√ √ √	√ √ √	√ √ √	√ √ √	Chapter 13 and Chapter 12 (C/S Elec. & Funct. Test at min, amb, and max Temp. P 43)

PARAMÈTRES TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T min. (± 3 °C) (- 30 °C)	T amb. (± 3 °C) (22 °C)	T max. (± 3 °C) (70 °C)	
15. AUTOMATIC RELEASE MECHANISM TEST (A14.0) • Normal mounted orientation • Rolling 90° starboard • Rolling 90° port • Rolling 90° bow down • Rolling 90° stern down • Upside down	Release and float free before 4 meters ; automatic activation	√ √ √ √ √ √	√	√ √ √ √ √ √	√	Chapter 14 29 june 2000
16. STABILITY AND BUOYANCY TEST (A15.0) • Time to upright • Reserve buoyancy • Float upright ; Antenna base	≤ 2 ≥ 5 > 4	s % cm		1 0.4 > 4		Chapter 15 24 july 2000 OK with old method of specification measurement
17. INADVERTENT ACTIVATION TEST (A16.0) • EUT not release from bracket • EUT not automatically activate		√ √		√ √		Chapter 16 27 july 2000

PARAMÈTRES TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T min. (± 3 °C) (-20 °C)	T amb. (± 3 °C) (22 °C)	T max. (± 3 °C) (55 °C)	
18. AUXILIARY RADIO-LOCATING DEVICE TRANSMITTER TEST (A17.0)						Chapter 17 and Chapter 12 (C/S T.A. Tests Results) 9 march to 26 july 2000
• Carrier frequency	121.5 ± 0.006	MHz	121.501	121.5007	121.501	
• PERP	14-20	dBm		16.6		
• Duty Cycle	100	%	100	100	100	
• Modulation						
* Frequency	≤ 700 Hz within range of 300-1600 Hz	Hz	380 → 1560	380 → 1560	380 → 1560	
* Direction	Upward	√	√	√	√	
* Duty cycle	33-55	%	48	47	48	
* Factor	0.85-1.0	#	0.90	0.92	0.93	
* Sweep repetition rate	2 - 4	Hz	2.6	2.6	2.6	
• Antenna						
* Pattern	Omnidirectional	√		√		9 march 2000
* Polarization	Vertical	√		√		
* VSWR	≤ 1.5:1	√				Not checked (Antenna integrated)

PARAMÈTRES TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T min. (± 3 °C) (_____ °C)	T amb. (± 3 °C) (_____ °C)	T max. (± 3 °C) (40 °C)	
19. HUMIDITY TEST (A18.0) • Aliveness Test : * Carrier frequency * Power Output * Data Message	406.025 ± 0.002 35-39 must be correct	MHz dBm √			406.025080 37.9 √	Chapter 18 19 july 2000
20. ORIENTATION TEST (A19.0) VERTICAL • Aliveness Test : * Carrier frequency * Power Output * Data Message UPSIDE DOWN • Aliveness Test : * Carrier frequency * Power Output * Data Message HORIZONTAL • Aliveness Test : * Carrier frequency * Power Output * Data Message	406.025 ± 0.002 35-39 must be correct 406.025 ± 0.002 35-39 must be correct 406.025 ± 0.002 35-39 must be correct	MHz dBm √ MHz dBm √ MHz dBm √		406.025105 37.7 √ 406.025061 37.4 √ 406025134 36.6 √		Chapter 19 and Chapter 12 (C/S T.A. Tests Results) 9 march to 26 july 2000