COSPAS-SARSAT SYSTEM MONITORING AND REPORTING

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COSPAS SARSAT

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1 - INTRODUCTION

1.1 Overview and Background

The Cospas-Sarsat System forms an integral part of the search and rescue capabilities throughout the world. It consists of many elements provided by a number of countries which all contribute to the final System output. These elements consist of Cospas and Sarsat satellites with Search and Rescue Repeaters (SARR) and Search and Rescue Processors (SARP) payloads; Local User Terminals (LUTs) and Mission Control Centres (MCCs); 406 MHz and/or 121.5 MHz[1] beacons.

To ensure coherent and reliable System operation, performance standards and monitoring procedures are required to determine if all System elements are operating in the desired manner. If anomalies are detected in the System operation, procedures for the notification of anomalies and for reporting on System performance should provide all those involved in Cospas-Sarsat related activities, including the Space Segment Providers, LUT/MCC Operators, SAR services, national authorities and, when appropriate, manufacturers of Cospas-Sarsat equipment and the users of Cospas-Sarsat emergency beacons, with the necessary information so that corrective action can be taken.

1.2 Objectives

The purpose of System monitoring is:

a) to detect anomalies in the performance of System elements; and

b) to ensure the integrity and the validity of data provided to SAR services.

To achieve the general objective of System monitoring as described above, abnormal conditions must be identified by the Space Segment Providers and by each operator of Ground Segment equipment commissioned in the Cospas-Sarsat System. This also requires that, whenever possible, the detection of anomalies be performed automatically by the LUT or the MCC, for each satellite pass, and detected anomalies notified as appropriate to operators of Space Segment and Ground Segment elements. In addition, the evolution of System performance must be assessed to avoid unacceptable degradations and be reported as required.

[1] Certain beacons also transmit on 243 MHz. The 243 MHz signals are relayed by the Sarsat satellites only and not all LUTs are equipped to receive them. Since the 243 MHz system operates in the same manner as the 121.5 MHz system, monitoring and reporting of the 243 MHz system is the same as presented for the 121.5 MHz unless otherwise stated.

1.3 Scope of Document

This document details the elements of the System which should be monitored, how such monitoring should be performed, the applicable standards, and describes the procedures to be followed when anomalies are detected in the operation of the System's elements. This document also addresses the reporting requirements on System status and operations, and the implementation status of monitoring procedures.

1.4 General Description

1.4.1 Monitoring Cospas-Sarsat Space and Ground Segments

The System monitoring procedures described in this document are designed to provide each Space Segment and Ground Segment operator with efficient tools for the quality control of System operation. For each System element, the baseline performance is established during the commissioning of Ground Segment elements, and during the post-launch testing of satellite payloads. They are re-established periodically to serve as references for the detection of anomalies.

The monitoring of individual elements of the Cospas-Sarsat System (Space Segment units, Ground Segment equipment or distress beacons) is the responsibility of the provider of that element or the Administration authorising the use of the beacon. However, as indicated in section 1.2, all operators of Cospas-Sarsat equipment must ensure that the data provided to SAR services is reliable and that the System is operating at its optimum performance level.

Therefore, in the course of conducting normal Cospas-Sarsat operations, LUT/MCC operators should endeavour to verify that the System is operating normally and be alerted about degraded System performance or abnormal conditions. This function described in section 3 is referred to as "System" monitoring. It should be performed routinely, as part of the monitoring activities of individual Ground Segment elements. When anomalies are detected by a Space Segment or a Ground Segment operator, a notification message is sent to all interested Cospas-Sarsat operators.

The implementation of the monitoring procedures described in sections 3 to 7 of this document is shown at Annex E which provides a status of monitoring activities performed by Cospas-Sarsat Space Segment and Ground Segment operators.

1.4.2 Monitoring the Cospas-Sarsat Distress Beacon

The monitoring of distress beacon performance is an important part of the overall Cospas-Sarsat System monitoring since the beacon initiates the distress alert and its good performance is essential for the success of the SAR operation. This monitoring should be performed by all Administrations world-wide.

Beacons operating at 121.5 MHz, however, have not been specifically designed for operation with the Cospas-Sarsat satellite system. Therefore, specific technical characteristics cannot be monitored by Cospas-Sarsat. Nevertheless, monitoring of non-distress activations of 121.5 MHz beacons is encouraged.

The 406 MHz beacons have been designed to operate with the Cospas-Sarsat satellite system and Cospas-Sarsat has defined a specific type approval procedure for these beacons. This is complemented by the definition of a comprehensive monitoring programme developed to assist Administrations in ensuring their reliable performance.

1.4.3 Reporting on System Status and Operations

The integrity of the Cospas-Sarsat System is the result of routine monitoring activities performed individually by each Space Segment and Ground Segment Provider. However, to ensure this System integrity, the long term evolution of System performance should be assessed by gathering statistical information on the status and operation of the System elements and reporting this data, together with the detected anomalies, for every twelve-month period.

1.5 Reference Documents

a. C/S A.001 "Cospas-Sarsat Data Distribution Plan".

b. C/S A.002 "Cospas-Sarsat Mission Control Centres Standard Interface Description".

c. C/S A.005 "Cospas-Sarsat Mission Control Centre (MCC) Performance Specification and Design Guidelines".

d. C/S A.006 "Cospas-Sarsat Mission Control Centre Commissioning Standard".

e. C/S T.001 "Specification for Cospas-Sarsat 406 MHz Distress Beacons".

f. C/S T.002 "Cospas-Sarsat LEOLUT Performance Specification and Design Guidelines".

g. C/S T.003 "Description of the Cospas-Sarsat Space Segment".

h. C/S T.005 "Cospas-Sarsat LEOLUT Commissioning Standard".

i. C/S T.006 "Cospas-Sarsat Orbitography Network Specification".

j. C/S T.007 "Cospas-Sarsat 406 MHz Distress Beacon Type Approval Standard".

k. C/S R.001 "Cospas-Sarsat Project Report".

l. C/S R.002 "Cospas-Sarsat Exercise of 1986".

m. C/S R.004 "Cospas-Sarsat Exercise of 1990".

n. C/S R.005 "1990 Exercise of the Cospas-Sarsat System" (Summary Report).

- END OF SECTION 1 -

2 - PERFORMANCE PARAMETERS, QUALITY INDICATORS AND CALIBRATION FACTORS

This section describes the various performance parameters, the quality indicators and the calibration factors which can be used to monitor the integrity of the Cospas-Sarsat System. They are generally estimated with reference to a standard pass of a satellite over a beacon (i.e. a pass with a maximum beacon to satellite elevation angle of at least 8°) or for satellite passes over LUTs at elevation angles over 5°.

2.1 Performance Parameters

Performance parameters characterise the System data output (i.e. the Cospas-Sarsat alert data provided to SAR services). The typical values of these parameters are established by analyzing the results of world-wide exercises or specially defined trials and used for monitoring purposes by comparison with estimates obtained for each satellite pass.

2.1.1 406 MHz System

The performance parameters of the 406 MHz system which can be monitored routinely as part of the Cospas-Sarsat monitoring procedures include:

a) Single pass location acquisition probability

Estimated by the ratio of the actual number of orbitography beacon locations obtained from the 406 MHz PDS data, versus the expected number of locations corresponding to Standard Passes over these beacons;

b) 406 MHz location accuracy

Estimated by computing the location of those 406 MHz orbitography or reference beacons available in the 406 MHz PDS data which have not been used by the LUT for orbit updating, and comparing with the actual position of these beacons;

c) System timing

The Cospas-Sarsat alert notification time is the time elapsed from beacon activation until the first alert message is delivered to the appropriate RCC. However, this alert notification time includes MCC to RCC communication times which are not specific to the Cospas-Sarsat System and cannot be easily measured. Therefore, to assess the Cospas-Sarsat System performance, an alert handling time is defined as the time elapsed from beacon activation until the alert data is ready for transmission from a Cospas-Sarsat MCC to the appropriate RCCs.

In the 121.5 MHz system, the alert handling time includes the waiting time for the first satellite which simultaneously passes in visibility of both the 121.5 MHz beacon and an LUT, the LUT processing time and the LUT/MCC data transfer time.

In the 406 MHz system, the alert handling time includes the waiting time, the satellite storage time, the LUT processing time and the LUT/MCC data transfer time.

These times can be:

- estimated by MCCs on the basis of statistics of real transmissions;
- measured by analyzing the results of a System exercise; or
- estimated by computer simulations using an analytical model describing the satellite constellation, the Cospas-Sarsat LUT/MCC network, and a specific geographical distribution of beacons.

2.1.2 121.5 MHz System

In the 121.5 MHz system, there are no reference signals available on a permanent basis and monitoring activity of performance parameters can only be performed occasionally. The following 121.5 MHz system performance parameter can be used for monitoring purpose:

<u>121.5 MHz location accuracy</u>

Estimated with reference to actual positions when available (e. g. the 406 MHz location of same beacon, or actual position reported by SAR services).

2.2 Quality Indicators

Quality indicators are available to the LUT/MCC operator as a by-product of the processing of satellite data. They do not directly characterise the quality of alert data provided to SAR services but would be affected by System element malfunctions. Consequently, these quality indicators can be used to perform, at the LUT or MCC, a quick assessment of the System performance after the processing of each satellite pass. They can also be used for statistical analysis to assess the evolution of System element performance.

The baseline values of quality indicators will vary for each Space Segment and/or Ground Segment equipment. Baseline values should be established during the commissioning of the LUT or the MCC, and re-established afterwards as appropriate, in particular when software or hardware enhancements are made to a Ground Segment equipment and when new satellites are declared operational.

The following quality indicators can be used to perform Cospas-Sarsat monitoring functions:

a) Received down-link power level

Estimated using the AGC value of the LUT receiver to detect severe degradations of the maximum received power during satellite passes for elevation angles over 5°;

b) Number of times the LUT receiver loses down-link "carrier lock" during a pass

Computed during each pass for satellite elevation angles over 5°;

c) Percentage of time the LUT does not maintain "carrier lock"

Estimated during each pass over 5° elevation as a percentage of the pass duration;

d) 406 MHz SARP throughput

Estimated as the ratio of the received number of 406 MHz data points versus the expected number of data points for the corresponding standard pass, for orbitography/reference beacon data available in the 406 MHz Processed Data Stream (PDS);

e) 406 MHz PDS data recovery

Estimated as the ratio of PDS frames received by the LUT versus the number of expected PDS frames (PDS frame counter) while the satellite is above 5° elevation angle;

f) Number of 406 MHz single point alerts

Computed for each pass for 406 MHz PDS data acquired by the LUT;

g) 406 MHz bit error rate

Estimated by the average number of bit errors in the protected data field of 406 MHz beacon messages processed during a pass;

h) Number of 121.5 MHz locations generated per pass

Computed for each pass as a result of the 121.5 MHz channel processing;

i) Absence of location by LUT of 121.5 MHz beacon signals reported by other sources

Checks performed after completion of pass processing by the LUT, using information from other sources concerning existing 121.5 MHz distress transmissions in the LUT coverage area;

j) Average LUT processing time per location

Estimated, for each frequency band processed by the LUT, as the time elapsed from satellite LOS until completion of data processing, divided by the corresponding number of locations generated for that satellite pass;

k) LUT/MCC data transfer time

The time elapsed from completion of processing at the LUT, until the alert data is received at the MCC;

l) Pre-pass check

Test performed by a LUT, at least once a day, prior to a satellite pass, to verify its antenna and RF sub-system performance;

m) Pass scheduling accuracy

Comparison of the actual and predicted AOS and LOS times for all satellite passes to detect anomalies;

n) Orbit accuracy

Monitoring of "orbit update" and "SARP Calibration" flags to detect series of failures over several passes of the satellite. A series of failures would indicate that the satellite orbit parameters may be corrupted and new orbit vectors should be requested from the MCC for further investigation.

2.3 Calibration Factors

To perform their functions, LUTs must receive calibration data from time to time, through the MCC network. The following calibration factors are necessary to correctly update the satellite orbits and have a direct impact on the System output data. They should be checked prior to using them in the LUT software, as follows:

a) Sarsat time calibration (TCal)

Compare the new TCal value with the projected date (epoch) of reset to zero of the Sarsat-SARP time counter (DA0) as defined in document C/S T.003;

b) Sarsat Ultra Stable Oscillator (USO) frequency (FCal)

Compare the value of the SARP Ultra Stable Oscillator (USO) frequency, which is computed and distributed by the FMCC, with the previous value in the LUT software;

c) Sarsat and Cospas satellite ephemeris (Orbit Vectors)

Compare the updated satellite ephemeris with satellite ephemeris on file in the MCC before distributing to the LUT. In the event of a satellite manoeuvre, validate satellite ephemeris based on the expected change in satellite position, as specified in section 3.7.5.a of C/S A.001.

- END OF SECTION 2 -

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3 - SYSTEM MONITORING

3.1 Description of System Monitoring

Section 3 describes the monitoring procedures which should be implemented by all LUT/MCC operators for each processed satellite pass in order to detect anomalies in the performance of the System and ensure the integrity of alert data.

By monitoring routinely certain parameters listed in the following sections, the LUT/MCC operators can, in addition to monitoring their own equipment performance, detect malfunctions of various System elements which may affect the quality and integrity of alert data provided by the Cospas-Sarsat System.

Sections 3.2 to 3.5 describe how each System function should be monitored and, when an anomaly is detected, the steps to be followed to identify the possible origin of the anomaly. In addition, section 3.3 addresses the specific requirement of Sarsat satellite monitoring which concerns the use of time and frequency calibration factors and the use of Cospas and Sarsat satellite orbit vectors. Finally section 3.6 defines the procedure to be followed to notify the appropriate operators of a detected anomaly, in accordance with the requirements of C/S A.001 (DDP).

Additional parameters which should be monitored to assess thoroughly the performance of Ground Segment and/or Space Segment elements, are described further in sections 4 to 6 of this document.

3.2 Satellite Down-link

3.2.1 The following quality indicators should be monitored on each satellite pass to detect anomalies:

a) Received down-link power level;

b) Number of times the LUT receiver loses down-link "carrier lock";

c) Percentage of time the LUT receiver does not maintain down-link "carrier lock".

Anomalies on these quality indicators could be the result of faults either in the satellite down-link transmitter / antenna or in the LUT antenna / receiver sub-systems which may affect any of the System performance parameters.

3.2.2 In case of abnormal conditions detected in accordance with the criteria of Annex D, on either of these indicators, the LUT operator should:

1st Step: - Verify whether the same anomaly is observed with other satellites and/or with the same satellite at other LUTs in the vicinity.

2nd Step: - If no other LUT experiences the same anomaly, investigate further at LUT level.

- If another LUT experiences the same defect, notify possible satellite down-link degradation according to applicable procedure described in section 3.6.

3.3 LUT Calibration

3.3.1 The following calibration factors which are periodically distributed via the MCC network, should be checked prior to using them in the LUT software:

a) Sarsat FCal;

b) Sarsat TCal; and

c) Cospas-Sarsat satellite ephemeris.

3.3.2 In case of abnormal conditions on either of these calibration factors (see Annex D), the Ground Segment operator should:

1st Step: - Inhibit the updating of FCal, TCal or Orbit Vectors in the LUT.

2nd Step: - Verify with the FMCC the validity of calibration data received and request retransmission as appropriate.

3.3.3 In addition, the following performance parameters and quality indicators should be monitored to detect a degraded LUT calibration:

a) Pass scheduling accuracy;

b) Orbit accuracy; and

c) 406 MHz location accuracy.

3.3.4 In case of abnormal conditions on any of these parameters or indicators (see Annex D), the Ground Segment operator should:

1st Step: - Verify the validity of the calibration data in the LUT

2nd Step: - Request retransmission of the abnormal calibration factors and/or investigate further other subsystems, as appropriate.

3.4 406 MHz System

3.4.1 The following performance parameters and quality indicators should be monitored to detect abnormal conditions:

a) Single pass location acquisition probability;

b) 406 MHz SARP throughput;

c) 406 MHz location accuracy;

d) 406 MHz PDS data recovery;

e) Number of 406 MHz single point alerts;

f) 406 MHz bit error rate;

g) Date (epoch) of reset to zero of the Sarsat-SARP time counter (DA0);

h) Average LUT processing time per 406 MHz location.

Anomalies on these performance parameters and quality indicators can be detected by comparison with the criteria given at Annex D.

3.4.2 In case of abnormal conditions on any of these parameters, the Ground Segment operator should:

1st Step: - For 3.4.1 a), b) and c) anomalies - investigate if all orbitography beacons are similarly affected.

- For 3.4.1 d), e) and f) - investigate if same anomaly exists for other satellites.

- For 3.4.1 g) and h) - investigate further the LUT software configuration according to local maintenance procedure.

2nd Step: - If problem is unresolved at 1st Step, verify with other LUTs whether the same anomaly was observed.

3rd Step: - If no other LUT experienced the same or similar anomalies, investigate further at LUT level.

- If another LUT experienced the same anomaly, notify possible satellite problem as described in section 3.6.

3.5 121.5 MHz System

3.5.1 The following performance parameters and quality indicators should be monitored when feasible and as often as possible:

a) Number of 121.5 MHz locations generated per pass;

b) Absence of location by LUT of 121.5 MHz beacon signals reported by other sources;

c) Accuracy of 121.5 MHz locations with reference to actual positions.

3.5.2 In case of abnormal conditions on any of these parameters, the LUT operator should:

1st Step: - Collect data on several passes.

2nd Step: - If anomaly is confirmed on several passes for different satellites, investigate further at LUT level.

- If not, verify with other LUTs if the same anomaly is observed.

3rd Step: - If anomaly is not observed by other LUTs, investigate further at LUT level.

- If anomaly is observed by other LUTs, notify possible satellite problem as described in section 3.6.

3.6 Notification of System Anomalies

Anomalies on performance parameters and quality indicators, detected in accordance with the above procedure and the criteria set forth in Annex D of this document, shall be notified to the appropriate Space Segment Provider and/or Ground Segment operator, as required in the document C/S A.001 (DDP), after the origin of the anomaly has been identified.

Anomalies detected on the calibration factors listed in section 3.3 should be notified to the transmitting MCC and the originator of the calibration factor together with a request for retransmission.

The anomaly notification should be made using the format given in Annex F. A copy of the anomaly notification message may also be sent to the Cospas-Sarsat Secretariat for information.

3.7 Notification of 406 MHz Large Location Errors (Doppler Processing Anomalies)

When a 406 MHz large location error (over 120km) is detected, the party detecting the error should complete the Report on Cospas-Sarsat Large Location Error (Doppler Processing Anomalies), per Annex G and forward this report to the Cospas-Sarsat Secretariat. The party detecting the error should make an attempt to determine the cause of the error using the information described in Annex G. If the cause is determined to be a known systematic error (e.g., 24 hour problem), the party detecting the error will also inform the MCC associated with the source LUT. This latter information will be transmitted using the message formats described in Annex F.

The Cospas-Sarsat Secretariat will collect all reports on large location errors and group the reports into at least three categories:

- errors caused by less than optimal observation parameters (i.e., less than 4 points and/or TCA not in window and/or CTA not between 1 and 29 degrees).

- systematic errors caused by either faulty equipment or incorrect processing of data (e.g., 24 hour problem).

- errors caused by beacons activated during a satellite pass.

The Secretariat will provide an analysis of reported 406 MHz large location errors to the Joint Committee for review and action.

- END OF SECTION 3 -

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4 - GROUND SEGMENT MONITORING

4.1 Scope and Objectives of Ground Segment Monitoring

The objectives of Ground Segment monitoring are to:

- detect anomalies in the local ground segment and verify that performance requirements are met; and

- investigate anomalies observed locally or reported by other ground segment operators, to assist in their resolution or implement back-up procedures, as appropriate.

In order to perform the monitoring function, the baseline performance of individual ground segment elements should be established during commissioning tests of the installation and/or by collecting statistical data and evaluating appropriate quality indicators from time to time, as described in the following sections. Baseline values should be re-evaluated after major modifications or repairs.

The monitoring function should be automated whenever possible so that only the status of parameters is presented to the operator.

4.2 LUT Monitoring

In accordance with the requirements of the document "Cospas-Sarsat LUT Performance Specification and Design Guidelines" (C/S T.002), LUTs commissioned in the Cospas-Sarsat System shall provide the MCC with information to allow the MCC to determine any degradation of the LUT capabilities. The monitoring of performance parameters, quality indicators and calibration factors listed in the following sections, or in section 3 for System level monitoring, will provide the necessary information to satisfy the above requirements.

4.2.1 Baseline Requirements

4.2.1.1 Statistical data should be collected to establish the baseline for the following quality indicators which characterize the LUT operation:

a) Received down-link power level;

b) Number of times the LUT receiver loses down-link "carrier lock";

c) Percentage of time the LUT has not maintained "carrier lock";

d) 406 MHz PDS data recovery;

e) Number of 406 MHz single point alerts;

f) 406 MHz bit error rate;

g) Number of 121.5 MHz locations generated per pass;

h) LUT processing time.

4.2.1.2 In addition, the baseline for the following quality indicator should be established for new satellites:

406 MHz SARP throughput.

4.2.2 LUT Monitoring Requirements

4.2.2.1 The following performance parameters and quality indicators should be monitored routinely to detect anomalies:

a) Received down-link power level;

b) Number of times the LUT receiver loses down-link "carrier lock";

c) Percentage of time the LUT has not maintained "carrier lock";

d) 406 MHz SARP throughput;

e) 406 MHz PDS data recovery;

f) Number of 406 MHz single point alerts;

g) 406 MHz bit error rate;

h) Single pass 406 MHz location acquisition probability;

i) 406 MHz location accuracy;

j) Number of 121.5 MHz locations generated per pass;

k) LUT processing time.

4.2.2.2 In addition, the following verifications should be performed periodically to detect any significant degradation of the LUT performance:

a) Pre-pass check;

b) Pass scheduling accuracy;

c) Orbit accuracy.

4.3 MCC Monitoring

The document "Cospas-Sarsat MCC Performance Specification and Design Guidelines" (C/S A.005), requires an MCC to monitor the following System elements in its national ground segment: LUTs, LUT/MCC communication networks, the MCC itself and connections to external communication networks.

4.3.1 Baseline requirements

In order to achieve this objective, the MCC shall be provided with the necessary information, including that described in section 4.2 concerning the LUT monitoring, and in section 4.4 which concerns LUT/MCC and external communication networks.

Ground Segment Providers are encouraged to make arrangements with national RCCs and SPOCs in their service area to assess periodically the effectiveness of Cospas-Sarsat alert data distribution. This can be achieved by cooperation between MCCs and SPOCs or RCCs to ensure that sufficient feed-back information is provided by SAR services.

Anomalies in the MCC operations should be detected by the MCC itself whenever possible, in particular to avoid distributing unreliable or corrupted data. If such detection fails, the other MCCs with which it communicates in accordance with the "Cospas-Sarsat Data Distribution Plan" (C/S A.001), should endeavour to detect these anomalies and should notify the observed anomalies to the transmitting MCC.

4.3.2 Monitoring of MCC Operations

An MCC's compliance with the above requirements can be verified by:

- analyzing an associated LUT's performance parameters and quality indicators described in section 4.2, or receiving the appropriate status information and warnings generated at the LUT level; and

- monitoring of its communication links with its LUTs, its national RCCs and associated SPOCs, and with other MCCs as described in section 4.4.

4.4 MCC Communication Links Monitoring

4.4.1 LUT/MCC Communication Links

4.4.1.1 Link Failures

The MCC should monitor communication links between the MCC and its associated LUTs, which should achieve 100% availability. MCCs which do not have automatic detection of link failure should be kept aware of each satellite-pass processed by the LUT and monitor the time delay between the forecasted loss of signal at the LUT and the reception of alert data from that pass. If no data is received at LOS + 30 minutes, the MCC should verify the availability of the communication link.

In addition MCCs should monitor the following quality indicator to detect any anomalies in the LUT/MCC links:

LUT/MCC data transfer time.

4.4.1.2 Integrity of Data

The MCC shall verify the integrity of alert data it receives, which includes monitoring:

a) the number of received alerts with reference to the number of alerts sent by the LUT and/or the sequence of messages;

b) the percentage of messages received from the LUTs with format errors and/or out of range data.

Any significant discrepancy of these parameters should be detected and the anomaly corrected, or appropriate actions should be undertaken at MCC level to eliminate the corrupted data from the alert data distributed to SAR services.

4.4.2 MCC to MCC Communication Links

4.4.2.1 Link Failure

Communication link failures observed by an MCC shall be notified to the corresponding MCC with a view to:

a) correcting the anomaly; or

b) switching to available back-up links.

4.4.2.2 Integrity of Data

Any detected loss of messages exchanged between MCCs should be notified to the transmitting MCC and investigated. However, such loss may remain unnoticed, depending on the communication link protocol, and the assessment of communication link performance may require periodic testing.

All MCCs should monitor the percentage of messages received with format errors or out-of-range data for each communication link and report to the originating MCC, as appropriate.

4.4.3 MCC to RCC/SPOC Communication Links

4.4.3.1 Link Failures

Communication link failures observed by an MCC shall be notified to the corresponding RCC/SPOC and alternative alert data distribution procedures should be used, as appropriate.

4.4.3.2 MCC/SPOC Communication Test

Each MCC should perform a monthly communication test with each SPOC, using each declared communication link. The test should include a transmission of a test message from the MCC to each SPOC and an acknowledgement from each SPOC to the MCC. However, MCC-SPOC communication links that have been used at least once during the previous month may be considered as already tested.

4.4.3.3 Reporting of MCC/SPOC Communication Tests

Each MCC should report results of the MCC/SPOC communication test to the Cospas-Sarsat Secretariat, who will provide a summary report to IMO COMSAR as part of the annual Cospas-Sarsat status report.

MCCs should report on a monthly basis (after each communication test) using the format provided at Annex K to this document. All reports should be focused on non-functionality, but a report should be submitted even if all communication tests are successful.

4.5 Orbitography Beacons

4.5.1 The following parameters should be monitored as part of the 406 MHz system monitoring by all Ground Segment operators and can be used to detect anomalies in orbitography beacon performance:

a) Single pass 406 MHz location acquisition probability;

b) 406 MHz location accuracy; and

c) 406 MHz SARP throughput.

4.5.2 In the case of observed abnormal conditions on any of these parameters affecting one of the orbitography beacons, the Ground Segment operator should notify the orbitography beacon provider of possible problems on this equipment.

4.5.3 In addition, organizations in charge of orbitography beacon maintenance should monitor the following:

a) 406 MHz frequency stability of orbitography beacons; and

b) Power stability of 406 MHz orbitography beacons.

4.6 Notification of Ground Segment Anomalies

Anomalies on performance parameters and quality indicators, detected in accordance with the above procedures and the criteria set forth in Annex D of this document, shall be notified to the appropriate Ground Segment operators, as required in the document C/S A.001 (DDP), after the origin of the anomaly has been identified.

- END OF SECTION 4 -

5 - SPACE SEGMENT MONITORING

5.1 Monitoring of the Space Segment

The general health of the spacecraft is routinely monitored by the spacecraft provider, using telemetry data, to detect out-of-specification conditions.

Information on anomalies which could significantly degrade System performance or limit the operation of a SAR payload, will be provided to all Ground Segment operators via the MCC network and to the Cospas-Sarsat Secretariat, in accordance with the procedures defined in the "Cospas-Sarsat Data Distribution Plan" (C/S A.001). If the status of any of the payload changes the Secretariat will update the Space Segment Status in C/S A.001 and provide the updates to all Participants.

5.2 Notification of Space Segment Anomalies

Any Ground Segment operator who detects anomalies in the performance of the Space Segment during routine System monitoring activities, and has confirmed that such anomalies are not due to its Ground Segment equipment, shall inform the relevant Space Segment Provider. Analysis of Space Segment anomalies will be coordinated among the relevant Space Segment Providers and possible corrective action (e.g. switch to back-up payload) will be taken, as appropriate.

Information on anomalies which could significantly degrade System performance, that are detected during tests and confirmed by the relevant Space Segment Provider, will be provided to all Ground Segment operators via the MCC network, in accordance with the procedures defined in the "Cospas-Sarsat Data Distribution Plan" (C/S A.001).

- END OF SECTION 5 -

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6 - 406 MHz BEACON PERFORMANCE MONITORING

6.1 Description of 406 MHz Beacon Monitoring

The 406 MHz beacon monitoring and reporting consists of two parts:

- Monitoring of beacon performance and reporting anomalies to interested parties; and
- Monitoring of non-distress beacon activations, or operational false alerts, and determining the cause of activation.

Beacon anomalies include:

- Non-activation of beacons in distress situations, or in circumstances where a beacon should have been automatically activated;
- Anomalies related to actual beacon activation; and
- Anomalies detected during mandatory or routine inspections of installations by responsible authorities.

Administrations should monitor 406 MHz beacon anomalies and exchange information with other Administrations who have type-approved the same type of beacon. This exchange of information should be done as soon as practical and contain data that is useful in determining if the anomaly is a local problem or a global concern.

Operational false alerts may have a variety of origins and their elimination is of interest to all users. Distress alert statistics should identify the cause of operational false alerts. Each operational false alert should be categorised as being caused by either beacon mishandling, beacon malfunction, mounting failure, environmental conditions, or unknown circumstances.

6.2 Beacon Monitoring Requirements

All Cospas-Sarsat participants should monitor the operation of 406 MHz beacons to determine the number of 406 MHz beacon anomalies such as:

- Non-activation of beacon in distress situation; and

- Operational false alerts, in the following categories:

Beacon mishandling: activations which were caused by the mishandling of the beacon by its user/owner;

Beacon malfunctions: activations caused by beacon (electronics including battery) malfunctions;

Mounting failures: activations which were caused by mounting failures or release mechanism malfunctions;

Environmental conditions:	activations caused by extreme weather conditions; and
Unknown:	confirmed beacon activations where the cause could not be determined or no feedback information was received from the SAR authorities.

In addition, Administrations should record, and report as provided for in section 8, the following beacon anomalies:

- Non-detection or location of an active beacon;
- Beacons transmitting repeatedly in the self-test mode; and
- Anomalies detected during manufacturers' testing or inspection performed by Administrations on equipment installed on board ships or aircraft.

All Cospas-Sarsat Participants should work with appropriate national Authorities to reduce the number of beacon anomalies.

One or more of the following individuals and/or organizations should be notified when a beacon anomaly is detected:

Beacon Owner - The owner/user should be notified of the problem and the importance of having the beacon serviced, as well as the potential for the beacon not working correctly when required. The owner/user may be contacted using identification information embedded in the beacon (e.g., radio call sign, tail number, MMSI, etc.), the registration information if the beacon is registered, or using the manufacturer to trace the owner.

Beacon Manufacturer - The manufacturer of the beacon should be notified of the problem. The manufacturer can be traced through the information embedded in the beacon message (e.g., C/S Type Approval Number), or through the registration information. The manufacturer can then detect systemic problems and take preventive and/or corrective action as necessary.

National Type Approval Authority - The national type approval authority, or mandating authority, should be notified so that it may track beacon malfunctions and take appropriate action if required.

Cospas-Sarsat - Cospas-Sarsat Participants should be notified in accordance with the format in Annex B so that they may make appropriate recommendations concerning the type approval of the affected beacon model(s).

Since the determination of the cause of false alerts is totally dependent on the feed-back information received from national RCCs and SPOCs, national Administrations should encourage their RCCs and SPOCs to provide timely information which describes the cause and disposition of each beacon activation, when an alert is received from their associated MCC.

- END OF SECTION 6 -

7. INTERFERENCE MONITORING

7.1 406 MHz Interference Monitoring

7.1.1 Effects of Interference on the 406 MHz System

The 406 MHz band has been allocated by the International Telecommunication Union (ITU) for low-power EPIRBs: nevertheless there are unauthorised signal sources in various areas of the world radiating signals in the 406.0-406.1 MHz band which interfere with the Cospas-Sarsat System. These sources are not 406 MHz beacons, but operate either in the 406 MHz band or at some other frequency and produce spurious emissions in the 406 MHz band.

Interferers degrade the performance of the on-board SAR processor and reduce the probability of detecting real beacon messages. A few strong interferers (i.e. > 5 Watts) located in an area about the size of a continent can virtually jam the satellites and prevent distress beacons in that area from being located.

Unless immediate steps are taken to locate and remove these unauthorised interference transmissions, lives could be lost when strong interferers mask the 406 MHz distress signals.

Conventional land-based interference monitoring methods are not suitable for an international satellite system providing global coverage. Fortunately, the Cospas-Sarsat satellite system itself can be used to detect and locate many of the interference sources world-wide, if the interference signals are monitored at suitably equipped earth receiving stations (i.e. LUTs with this capability).

7.1.2 Means of Monitoring 406 MHz Interference

Sarsat satellites have 406 MHz repeaters for retransmitting emissions received from Earth in the band 406.0-406.1 MHz. As a result, the time/frequency pairs of interference emissions can be measured at LUTs, specially equipped to perform this processing, by applying principles similar to those employed for locating 121.5 MHz distress beacons. 406 MHz interferers generally transmit continuous signals for a long period of time as compared to the short, one-half second beacon bursts. These near continuous signals produce a Doppler curve which is used to compute the interferer location. Unlike the processing of distress beacon emissions, no identification code can be extracted from an interfering signal, since its modulation, if any, would not be in the correct format. Emissions from one and the same interference source must be identified by its location.

The coverage area for processing unauthorised emissions is limited to the reception area of the LUT. Therefore, a network of interference monitoring LUTs at selected locations is desirable in order to provide an interference monitoring capability over a larger area. Annex C shows the location and coverage area of LUTs currently monitoring 406 MHz interference.

7.1.3 Suppression of 406 MHz Interference

The following actions have been taken by the ITU or Cospas-Sarsat regarding 406 MHz interference:

a) the ITU has set up a framework for protecting the 406 MHz band as described in Recommendation ITU-R SM.1051-2 "Priority of Identifying and Eliminating Harmful Interference in the Band 406-406.1 MHz";

b) the ITU has requested countries participating in Cospas-Sarsat to monitor the 406 MHz band for interference;

c) the ITU has developed forms for the "Information report concerning interference" and the "Feedback report concerning the interference source". These report forms are shown in Annex C;

d) the Cospas-Sarsat Council encourages countries/territories installing new LUTs to incorporate an option in their LUTs for monitoring 406 MHz interference and to utilise this capability routinely;

e) the Cospas-Sarsat Council has approved LUT specifications which include optional 406 MHz repeater processing for interference monitoring;

f) the Cospas-Sarsat Council has requested the Secretariat to provide information on 406 MHz interference to user organizations, such as IMO and ICAO, including the list and locations of interference sources reported by Cospas-Sarsat Participants; and

g) the Cospas-Sarsat Council has agreed a form for reporting persistent 406 MHz interferers. This form is show in Annex C and includes the data required by c) above.

7.1.4 Notification of 406 MHz Interference

Ground Segment operators are encouraged to provide monthly interference reports on persistent interferers to the Cospas-Sarsat Secretariat using the reporting format as presented in Annex C at Table C.1 1, and to provide reports to the ITU in accordance with their national procedures and the ITU requirements. An interferer is persistent when it has been detected by 10% or more of the available Sarsat satellite passes at or above a 5° elevation angle (measured from the interference source) and when it has been observed no less than 10 times per month and per LUT over the reporting period. A persistent interferer case should remain open and should continue to be reported until there were no emissions for a period of 60 days. After that time the case should be considered closed.

When an interferer significantly degrades System performance, Ground Segment operators are also encouraged to inform the search and rescue authorities in the area where the interferer is located.

7.2 121.5 MHz Interference

7.2.1 Effects of Interference on the 121.5 MHz System

The 121.5 MHz band is an emergency channel which is dedicated to ELTs, EPIRBs and distress and safety voice transmissions. In addition, the characteristics of the Cospas-Sarsat 121.5 MHz system do not allow for an automatic elimination of signals from interferers, which therefore generate a significant number of false alerts at 121.5 MHz. Furthermore, strong interferers at 121.5 MHz may block the reception of real distress transmissions. For that reason, it is essential to eliminate, as far as possible, all sources of permanent interference at 121.5 MHz.

7.2.2 Identification of 121.5 MHz Interferences

Permanent 121.5 MHz interferers are located by the Cospas-Sarsat System in the same way as any other source of 121.5 MHz transmissions. However, it is not possible, usually, to discriminate between real beacon transmissions and interference at 121.5 MHz. Only the presence, over a long period of time (e.g. over 48 hours), of fixed 121.5 MHz Doppler locations is a clear indicator of a permanent 121.5 MHz interferer. Such interferers, which directly affect the performance of the Cospas-Sarsat 121.5 MHz system, should be eliminated.

7.2.3 Notification of 121.5 MHz Interference

When a permanent source of 121.5 MHz interference is detected and located, Ground Segment Operators are encouraged to inform the appropriate administration in the country where the interference source was located using national procedures.

- END OF SECTION 7 -

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8 - REPORTING ON SYSTEM STATUS AND PERFORMANCE

8.1 Scope and Objectives of Reporting

Cospas-Sarsat is an evolving system, partly through changes in technology, and also as more countries become associated with the Programme (as User States or Ground Segment Providers), or simply make use of the System. It is therefore essential to assemble basic information for keeping track of the evolution of the System and its world-wide performance and use, in order to form the necessary basis for future planning activities in Cospas-Sarsat.

The status of the System (including Space Segment, Ground Segment and beacons), and a summary of its performance and the history of detected anomalies, should be reported by all Participants, as appropriate, for every twelve-month period, in accordance with the format provided at Annex B-1. These reports, after being aggregated by the Secretariat into a single document, are reviewed by the Joint Committee and submitted to the Council. The annual reports therefore form the basis used for updating the operational System documents (e.g. C/S A.001) and also such widely distributed documents as the "Cospas-Sarsat System Data" and "Information Bulletin".

8.2 Space Segment

Information on the Space Segment status and its operation is to be provided by the Cospas-Sarsat Parties only (i.e. the Space Segment Providers).

Such information should cover:

- operational spacecraft;
- 406 MHz and 121.5 MHz payloads;
- other payloads when applicable (e.g. 406 MHz and/or 243 MHz repeaters);
- the readiness and launch schedule of new spacecraft and payloads; and
- significant events affecting the Space Segment (e.g. changes in payload configuration of operational satellites).

All participants should be kept informed of the current status of the Space Segment. In order to accomplish this, Space Segment Providers shall inform all Ground Segment Operators whenever there is a change to the status of any SAR payload. A change in status can be the commissioning (with or without limitations), de-commissioning, or change in configuration of a SAR payload. The Secretariat should also be notified of the change in status. The Secretariat will update C/S A.001 and distribute the update to all Participants.

8.3 Ground Segment

8.3.1 MCCs and LUTs

The annual reports should cover the operational status of LUTs for each processed frequency band, and of MCCs, including communication links. Information on the availability of Ground Segment equipment should also be reported as defined in section 8.3.3. It is important that information on the upgrading of existing MCCs and LUTs, and about the implementation of MCCs and LUTs by new participating countries is included.

Such developments may have an impact on other Ground Segment Providers, and the information is vital for planning an orderly evolution of the MCC communication network.

For the same reasons, reports from MCC operating countries should also include information on the number of 406 MHz and 121.5 MHz beacon signals reported to RCCs within the MCC service area.

8.3.2 Other Ground Segment Sub-Systems

The annual reports should include information on the status and performance of sub-systems such as orbitography and reference beacons and the Sarsat time reference beacon.

8.3.3 Calculation of LUT/MCC Availability

Availability (A) is expressed as a percentage and is calculated by dividing the amount of operational time (OT) by the time required to be in operation (OTR). The time required to be in operation (OTR), expressed in hours, is 24 times the number of days in the reporting period inclusive of all maintenance downtime. The operational time (OT) is OTR minus the system downtime (DT) reported in hours. Downtime is that period of time when a system fails to perform its basic functions as described below. Therefore, availability (A) is calculated as:

$$A = (OT/OTR) * 100 = (1 - (DT/OTR)) * 100$$

8.3.3.1 MCC System Availability

MCC system availability measures the probability of an MCC performing all its basic functions of receiving and processing LUT/MCC data and communicating with other MCCs as presented in Figure 8.1. An MCC's basic functions are described in Cospas-Sarsat Mission Control Centre (MCC) Performance Specification and Design Guidelines (C/S A.005). Specifically, a Cospas-Sarsat MCC must be able to:

a. receive and process (e.g., validate, geosort, filter) all alert and system data from national LUTs and foreign MCCs in accordance with Cospas-Sarsat Data Distribution Plan (C/S A.001) and Cospas-Sarsat Standard Mission Control Centre Interface Description (C/S A.002);

b. monitor the Cospas-Sarsat System in accordance with Cospas-Sarsat System Monitoring and Reporting (C/S A.003);

c. archive and retrieve alert data and information; and

d. maintain communications links.

8.3.3.2 LUT Data Availability

LUT data availability measures the probability of receiving complete and accurate LUT data at the MCC as shown in Figure 8.1. Whenever LUT data is not received at the MCC, downtime is measured from LOS of the last successful satellite pass to AOS of the next successful satellite pass. Part of LUT data availability is a LUT’s ability to perform basic functions. A LUT's basic functions are those specified in Cospas-Sarsat Local User Terminal Performance Specification and Design Guidelines (C/S T.002) and national requirements. If **any** basic function or requirement is not performed by the LUT and the function has an impact on the operational data to the SAR forces, the LUT data should be considered unavailable.

The LUT's basic functions are further described as the capability to:

a. maintain ephemeris, acquire, track and receive the downlink signal from Cospas-Sarsat satellites;

b. demodulate 121.5 MHz repeated, 243 MHz repeated (as required), 406 MHz repeated (as required) and 406 MHz processed data stream channel (PDS) signals;

c. maintain and update the required time and frequency references;

d. process 406 MHz PDS data in the format specified in Cospas-Sarsat Space Segment Description (C/S T.003);

e. decode and error correct 406 MHz PDS data;

f. process 121.5 MHz repeated, 243 MHz repeated (as required) and 406 MHz repeated (as required) signals;

g calculate Doppler positions for all signals; and

h. provide the data (required by C/S A.002) and an interface to national MCCs.

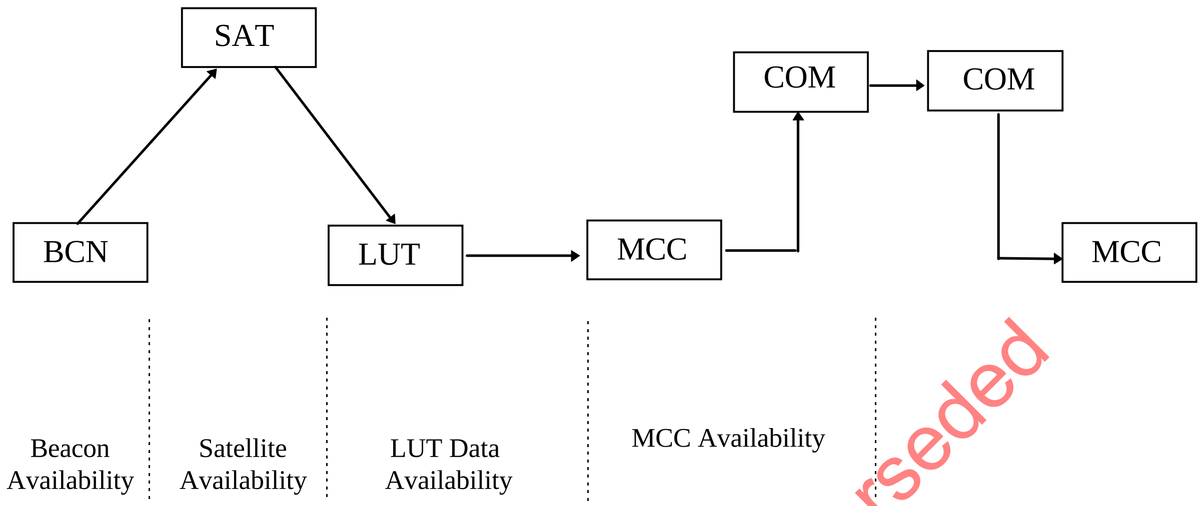

Figure 8.1: System Availability

8.3.4 Determining the Status of Operational Ground Segment Equipment

The status of Ground Segment equipment, as reported by the respective Ground Segment operators, is regularly compiled and presented by the Secretariat in widely distributed documents such as the "Cospas-Sarsat System Data" and "Information Bulletin". To ensure that these reports reflect the true status of the Cospas-Sarsat System, there is a requirement to identify those components of the System which have reached full operational capability (FOC) but no longer function, or could cause adverse effects on System operations. System components which are so identified are to be considered as commissioned, but not operational.

In addition, System components should not continue to be operated in an initial operation capability (IOC) status for a period greater than one year. If Ground Segment equipment does not attain FOC status within one year, then it is to be considered as under development. Additional information on extended operation of equipment in an IOC status is contained in the documents C/S T.005 (LEOLUT commissioning), C/S T.010 (GEOLUT commissioning) and C/S A.006 (MCC commissioning).

8.3.4.1 Procedure for Determining the Status of Operational Ground Segment Equipment

In addition to the annual reports submitted by Ground Segment operators, several other methods can be used for determining equipment status. These include:

- periodic monitoring by Ground Segment operators as described in section 4;
- periodic tests on a regional or global level; or
- reporting of anomalies by nodal MCCs (as part of their regular System monitoring).

An annual system test of alert processing will be conducted in January of each year, as described in Annex J. Each Ground Segment operator should report on their ground segment processing and, in addition, each nodal MCC should review the results of the performance of the ground segment processing in their DDR based on the traffic flow that was observed. Ground Segment operators and nodal MCC operators should report results of the test in Section 1.2.5 of the Report on System Status and Operations as per Annex B, indicating whether the expected processing described in Tables J.2 and J.3 successfully occurred and giving details on any failures.

The Joint Committee, using the information provided as noted above and the guidelines described below, will review the status of all commissioned Ground Segment equipment on an annual basis and present their recommendations to the Council.

Figure 8.2 presents an overview of the procedure to be used for determining and reporting the status of Cospas-Sarsat Ground Segment equipment. The figure depicts activities involved for equipment which is operational in either an IOC or FOC status. As shown in Figure 8.2, for example, equipment that has been downgraded to a "commissioned, not operational" status will have to undergo some limited retesting prior to reintegration into the System in an FOC status and reported in System documentation as fully operational.

8.3.4.2 Guidelines for Determining the Status of Operational Ground Segment Equipment

If there is a problem with a particular Ground Segment component that is noted from System monitoring, a Participant's annual report, or from periodic exercises, careful consideration should be used when making a determination of its status and each case should be reviewed considering the following general guidelines:

- the effect of the problem on SAR operations;
- the expected duration of the problem;
- the impact on the integrity of the Cospas-Sarsat System; and
- the impact on other Ground Segment equipment.

For example, if an MCC consistently provides an invalid value for a field in distress alert messages which is not required for message processing, there is probably a negligible impact on SAR forces. In cases such as this, no change in the equipment status would probably be necessary as the mission of the System is not affected.

The expected duration of the problem also has to be determined. A situation where equipment does not meet specifications for a short period may be acceptable. However, equipment failing to operate according to specifications for long durations should be declared as "commissioned, not operational." Similar to the impact on SAR operations, the impact on the integrity and credibility of the System should also be considered in the reporting of System status.

Lastly, the impact of a problem in the equipment of one Ground Segment operator on the equipment of other operators should be considered. The failure to follow prescribed specifications by one Ground Segment operator should not negatively impact on others.

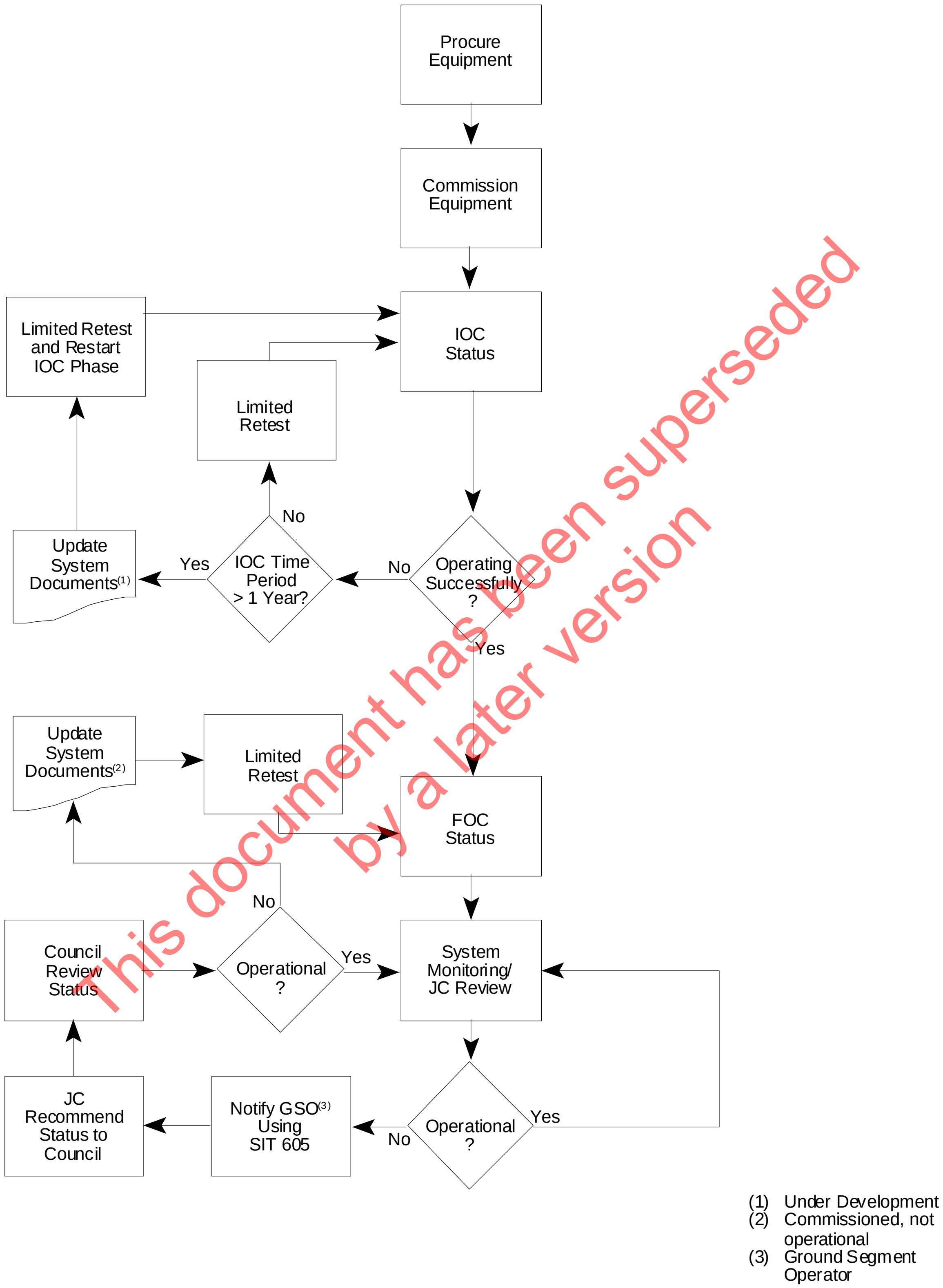

Figure 8.2: Operational Status of Ground Segment Equipment

8.4 Distress Beacons

It is essential to regularly update 406 MHz beacon population figures (maritime, aeronautical, land-mobile and test), as well as national forecasts of beacon populations over a 5 year period, in order to assess in due time any future adjustments which might be required in the ground segment capacity. The 406 MHz beacon population should be assessed in accordance with the Cospas-Sarsat definitions for EPIRBs, ELTs and PLBs.

For similar reasons, changes in the national regulatory situation should be reported, including the possible impact on beacon population forecasts.

Each Cospas-Sarsat Participant should also provide the list of nationally approved 406 MHz beacon models to the Secretariat. This list will be maintained by the Secretariat for distribution to Cospas-Sarsat Participants. Administrations participating in Cospas-Sarsat will thereby have access to additional information about the performance of 406 MHz beacons type approved in their country but used in other areas.

Each Cospas-Sarsat Participant should include a narrative summary of beacon anomalies in its annual report for inclusion in the Cospas-Sarsat Report on System Status and Operations.

Although the actual number of 121.5 MHz beacons cannot be provided, an estimation is useful for detecting any significant changes of this population.

8.5 False Alert Rate

The false alert rate should be calculated in three ways, i.e., one percentage to show the false alert rate as a function of the beacon population, a second percentage to show the false alert rate as a function of total alerts transmitted to SAR authorities, and a third series of percentages to show false alert rates as a function of specific beacon models. The procedures for calculating each of the three false alert rates are described below.

8.5.1 False Alert Rate as a Function of Beacon Population

The false alert rate as function of the total beacon population can be viewed as a method of tracking false alerts from a Cospas-Sarsat System perspective. The rate should be calculated by dividing the number of false alerts and undetermined alerts occurring world-wide with the reporting Participant's country code(s), by the estimated total of 406 MHz beacons with the Participant's country code(s), as reported at section 1.3.1 of the Report on System Status and Operations provided at Annex B. This calculation is recommended to be provided for each type of beacon (EPIRBs, ELTs and PLBs). Because of the measurement criteria it can only be applied to the 406 MHz system.

8.5.2 False Alert Rate as a Function of the Total Number of Alerts

The false alert rate calculated as a function of the total number of alerts can be viewed as representing the SAR response perspective, and should be calculated for 121.5 MHz and 406 MHz systems. This rate should be calculated by dividing the number of false alerts and undetermined alerts transmitted to SAR authorities in the reporting Participants service area, by the number of total alerts transmitted to the SAR authorities in the service area. The data for these calculations is provided in sections 2.1 and 2.2 of the Report at Annex B.

8.5.3 406 MHz False Alert Rates as a Function of Beacon Model

The 406 MHz false alert rate for each beacon model is used as a first step for identifying possible problems with specific variants of beacon models. This rate is calculated by dividing the number of false alerts attributed to a given beacon model variant (e.g. beacon model, type and activation method) transmitted to SAR authorities in the reporting Participant's service area, by the estimated total number of 406 MHz beacons of that model, type and activation method with the Participant's country code. Participants are encouraged to conduct further analysis on those models which exhibit high false alert rates with a view to identifying their causes. Caution is advised in drawing conclusions in respect of possible beacon problems from this data since experience has shown that false alerts can be caused by factors not related to beacon design.

A hypothetical example for reporting these statistics is provided below at Table 8.1.

Table 8.1: Example for Reporting False Alert Rate by Beacon Model

Model Name	TAC	Beacon Type / Activation Method	Estimated Number of Beacons	Number of False Alerts	False Alert Rate
ModelA	300	ELT / Manual	100	2	2.0%
ModelA	300	ELT / Auto	200	25	12.5%
ModelB	321	EPIRB / Manual	20	1	5.0%

8.6 Interference

Experience has shown that interference is a threat to System integrity and that eliminating it is a long term effort. In order that Cospas-Sarsat can ascertain the global status of interference at 406 MHz, it is necessary that LUT operators which perform routine monitoring of interference in the 406 MHz band report on a monthly basis to the Secretariat and to ITU as specified in section 7.1.4. The Secretariat should summarise data on persistent interference in its annual report on System status and operations and present this information to international organizations (IMO, ICAO and ITU) on an annual basis.

8.7 406 MHz Beacon Message Processing Anomalies

Processing anomalies which occur during 406 MHz beacon message processing may have a detrimental impact on System integrity. In an effort to minimise this negative impact, MCC operators should collect and analyse processing anomalies as a function of all MCC processed messages, with a view to determining which type of alerts are a source of the anomalies. The analysis of processing anomalies should be reported according to the guidelines provided at Annex H.

8.8 Distress Incident Report of SAR Events Assisted by Cospas-Sarsat Information

To assess the effectiveness of the contribution being made by the Cospas-Sarsat System to search and rescue world-wide, information on distress incidents should be provided by MCCs on a quarterly basis, in the format given at Annex B, section B-2.

8.9 Collecting and Reporting Data for SAR Event Analysis

On occasions, Cospas-Sarsat may be asked to provide information on the performance of the System in respect of specific search and rescue events. The Cospas-Sarsat Council has approved a procedure for interested parties to request this information from Cospas-Sarsat; this procedure is provided at Annex I.

Annex I also provides guidelines to Ground Segment operators for collecting and reporting the necessary data to the Cospas-Sarsat Secretariat for analysis. All data should be accompanied with a covering letter that summarises the information provided. The letter should also provide a narrative description of the status of the operator's Ground Segment equipment during the time period of the event analysis.

- END OF SECTION 8 -

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9. METHODOLOGY AND PROCEDURES FOR CONTINUOUS MONITORING AND OBJECTIVE ASSESSMENT OF COSPAS-SARSAT SYSTEM STATUS

9.1 Introduction

The Cospas-Sarsat Quality Management System (QMS) objectives stated at section 7 of the document C/S P.015 "Cospas-Sarsat Quality Manual" are to:

- ensure that Cospas-Sarsat consistently provides accurate, timely and reliable distress alert and location information to search and rescue authorities; and
- continually improve the overall Cospas-Sarsat System Performance.

In order to accomplish these objectives, Cospas-Sarsat has decided to develop and implement a procedure for continuous monitoring and objective assessment of the status of System components, to include:

- detailed monitoring procedures and data transmission requirements,
- tools based on a standard set of requirements for the analysis of data,
- standard evaluation criteria and assessment methodology, and
- standard reporting procedures and follow-up actions.

9.2 Methodology

The status of System components shall be monitored on a continuous basis using 406 MHz transmissions of known orbitography and reference beacons. The transmissions of selected orbitography beacons, received by LEOSAR satellites for each orbit, shall be processed and sent by each LEOLUT to its associated MCC, in accordance with document C/S T.002. The associated MCC shall send messages for the selected orbitography beacons to the appropriate nodal MCC in accordance with procedures defined in document C/S A.001 "Cospas-Sarsat Data Distribution Plan".

Each GEOLUT shall send alert messages to its associated MCC every 20 minutes for selected orbitography or reference beacon transmissions in the GEO satellite footprint, in accordance with document C/S T.009. The associated MCC shall send messages for the selected orbitography beacons to the appropriate nodal MCC, in accordance with procedures defined in document C/S A.001.

Nodal MCCs shall run an automated data analysis daily and an assessment procedure on the basis of Cospas-Sarsat standard evaluation criteria. This assessment may result in various follow-up actions, including:

- warnings addressed to the responsible provider or operator of a non-conforming System component;
- modifications to the status statements of System components posted on the Cospas-Sarsat website; and
- suppression of unreliable data from non-conforming System components.

The performance and status of orbitography and reference beacons used for the monitoring and assessment procedure shall be periodically re-evaluated and confirmed by the Cospas-Sarsat Participants responsible for their operation.

9.3 Monitoring Procedures and Data Transmission Requirements

The procedures and data transmission requirements described in this section concern the minimum System-wide monitoring and assessment process performed in accordance with Cospas-Sarsat Quality Management System (QMS) requirements. Space and Ground Segment Providers or Operators can perform any additional monitoring and assessment procedure that is deemed appropriate for their own QMS requirements.

9.3.1 LEOLUT Data Requirements

LEOLUTs commissioned in the Cospas-Sarsat System shall process the global and local mode data which result from the McMurdo (ID - ADC268F8E0D3780) and Longyearbyen (ID - A0234BF8A7335D0) orbitography beacon transmissions, as received during all passes of all operational LEOSAR satellites. The alert and location data obtained for the McMurdo and Longyearbyen orbitography beacons shall be forwarded via the associated MCC to the nodal MCC of the DDR.

If combined LEO/GEO processing has been implemented at a LEOLUT, the alert message provided for the McMurdo and Longyearbyen orbitography beacons shall not include combined LEO/GEO processing data.

MCCs shall not merge or suppress redundant alert data received from multiple LEOLUTs for the McMurdo and Longyearbyen orbitography beacons. All alert messages received from operational LEOLUTs for these beacons shall be forwarded to the appropriate nodal MCC.

9.3.2 GEOLUT Data Requirements

GEOLUTs commissioned in the Cospas-Sarsat System shall produce for every 20 minute time slot starting from the hour, one alert message for the transmissions of the designated orbitography and reference beacons in the GEOSAR satellite footprint.

MCCs shall not suppress redundant alert data received from multiple GEOLUTs for the designated beacons. All alert messages received from GEOLUTs for these beacons shall be forwarded to the appropriate nodal MCC.

The orbitography / reference beacons to be used in each GEOSAR satellite footprint for the data collection and assessment process are:

- Toulouse time reference beacon (ID - 9C600 00000 00001) for GEOLUTs in the MSG satellite footprint,
- Edmonton reference beacon (ID - A79EE E26E3 2E1D0) for GEOLUTs in the GOES East and GOES West satellite footprints, and
- Kerguelen reference beacon for GEOLUTs (ID - 9C7FEC2AACD3590) in the INSAT satellite footprint.

Note: A second orbitography or reference beacon may be designated in each GEOSAR satellite footprint for the purpose of this monitoring procedure. However, the selected reference beacons should meet specific performance requirements and be adequately monitored by the provider, in accordance with the relevant sections (to be developed) of the document C/S T.006 "Cospas-Sarsat Orbitography Network Specification".

9.4 Data Analysis

The data analysis requirements are described in section 6 of document C/S A.005 “Cospas-Sarsat Mission Control Centre (MCC) Performance Specification and Design Guidelines”. The requested data analysis results in the production on a daily basis of:

- availability ratios for each LEOLUT / LEOSAR satellite combination and each GEOLUT in a GEOSAR satellite footprint
- accuracy ratios for each LEOLUT / LEOSAR satellite combination.

The LEOLUT availability and accuracy ratios are calculated daily, using data collected over the three consecutive days that precede the computation (Day -3, 00:00 UTC to Day -1, 24:00 UTC). The GEOLUT availability ratio is computed daily using data collected during the day that precedes the computation (Day -1, 00:00 to 24:00 UTC). Details of the calculations are provided in document C/S A.005.

9.5 Evaluation Criteria, Assessment Procedure and Follow-up Actions

9.5.1 Assessment Methodology and Status Tables

A set of evaluation criteria is used to determine, on the basis of the availability and accuracy ratios described in section 9.4, the status of a LUT / satellite combination, i.e. the conformity of alert data from a given LUT when processing data from a given satellite.

If the appropriate evaluation criteria are met the status of the LUT is shown as "Green"(i.e., in conformity) in the appropriate status table posted on the Cospas-Sarsat website.

If the appropriate evaluation criteria are not met, notification is sent to the Ground Segment Provider responsible for the non-conforming LUT via a SIT 605 message and the status is shown as "Red" (i.e., non-conforming) in the appropriate status table on the Cospas-Sarsat website.

Templates of the status tables for LEOLUTs and GEOLUTs are provided below in Tables 9.1 and 9.2.

Table 9.1: Template for the LEOLUT and GEOLUT Availability Table

	SARSAT X	SARSAT Y	SARSAT N	COSPAS X	COSPAS Y	COSPAS N	GEOSAT X	GEOSAT Y	GEOSAT N
LEOLUT 1	R	R	R	R	R	R	n/a	n/a	n/a
LEOLUT 2	R	G	R	G	G	R	n/a	n/a	n/a
LEOLUT 3	R	G	G	G	G	G	n/a	n/a	n/a
LEOLUT N	R	G	G	G	G	G	n/a	n/a	n/a
GEOLUT 1	n/a	n/a	n/a	n/a	n/a	n/a	G	n/a	n/a
GEOLUT 2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	G	n/a
GEOLUT N	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	G

Table 9.2: Template for the LEOLUT Accuracy Table

	SARSAT X	SARSAT Y	SARSAT N	COSPAS X	COSPAS Y	COSPAS N
LEOLUT 1	R	R	R	R	R	R
LEOLUT 2	R	G	R	G	G	G
LEOLUT 3	R	G	G	G	G	G
LEOLUT N	R	G	G	G	G	G

Table 9.1 shows that LEOLUT 1 availability ratios are poor ("Red" status) for all LEOSAR satellites. LEOLUT 1 availability ratios are constantly below the Cospas-Sarsat availability requirement and the LEOLUT should be considered not operational.

All LEOLUTs on Table 9.1 show a non-conforming "Red" status for the Sarsat X satellite. This indicates that the SARSAT X satellite or payload does not satisfy the availability requirement of the Cospas-Sarsat System. However, it is important to note that no alert data is suppressed on the basis of a "Red" non-conforming availability status.

Table 9.2 shows that LEOLUT 1 provides no location data for all LEOSAR satellites, or unreliable location data that are suppressed by the nodal MCC in accordance with the procedures described in section 9.5.4.

In Table 9.2, Sarsat X shows a "Red" status for all LEOLUTs: no reliable location data can be derived from Sarsat X and this data is therefore suppressed, or the Sarsat X payload is not operational and provides no data to any LEOLUT in the System.

Table 9.2 also indicates that LEOLUT 2 does not provide reliable location data when tracking Sarsat N and the Doppler location in the alert messages is suppressed in accordance with the procedure described at section 9.5.4. The corresponding availability status for the LEOLUT 2 / Sarsat N combination in Table 9.1 is also shown as non-conforming (Red).

9.5.2 LEOLUT Availability Assessment, Status Reporting and Follow-Up Actions

The LEOLUT availability ratio shall be greater than or equal to 80 %.

If this availability criterion is met, the status of the LEOLUT(i) / LEOSAT(j) combination shown in the LUT availability table posted on the Cospas-Sarsat website is "Green" (see Table 9.1: Template for the LEOLUT and GEOLUT Availability Table).

If this availability criterion is not met, the nodal MCC shall notify the associated MCC, using the SIT 915 message template provided at Annex F.

If the availability ratio for LEOLUT(i) and LEOSAT(j), computed as described in section 9.4 over a 3 day period, remains constantly below the availability criterion for 4 successive days, LEOLUT(i) shall be declared non-conforming in respect of LEOSAT(j). The nodal MCC shall:

- inform all MCCs and the Cospas-Sarsat Secretariat using a SIT 605 message (see sample at Annex F), and
- update the LUT availability table posted on the Cospas-Sarsat website for the LEOLUT / LEOSAT combination to "Red".

If the LEOLUT non-conformity is corrected, the availability status for the LEOLUT / LEOSAT combination shall be returned to "Green" as soon as the availability criterion is met. The nodal MCC shall:

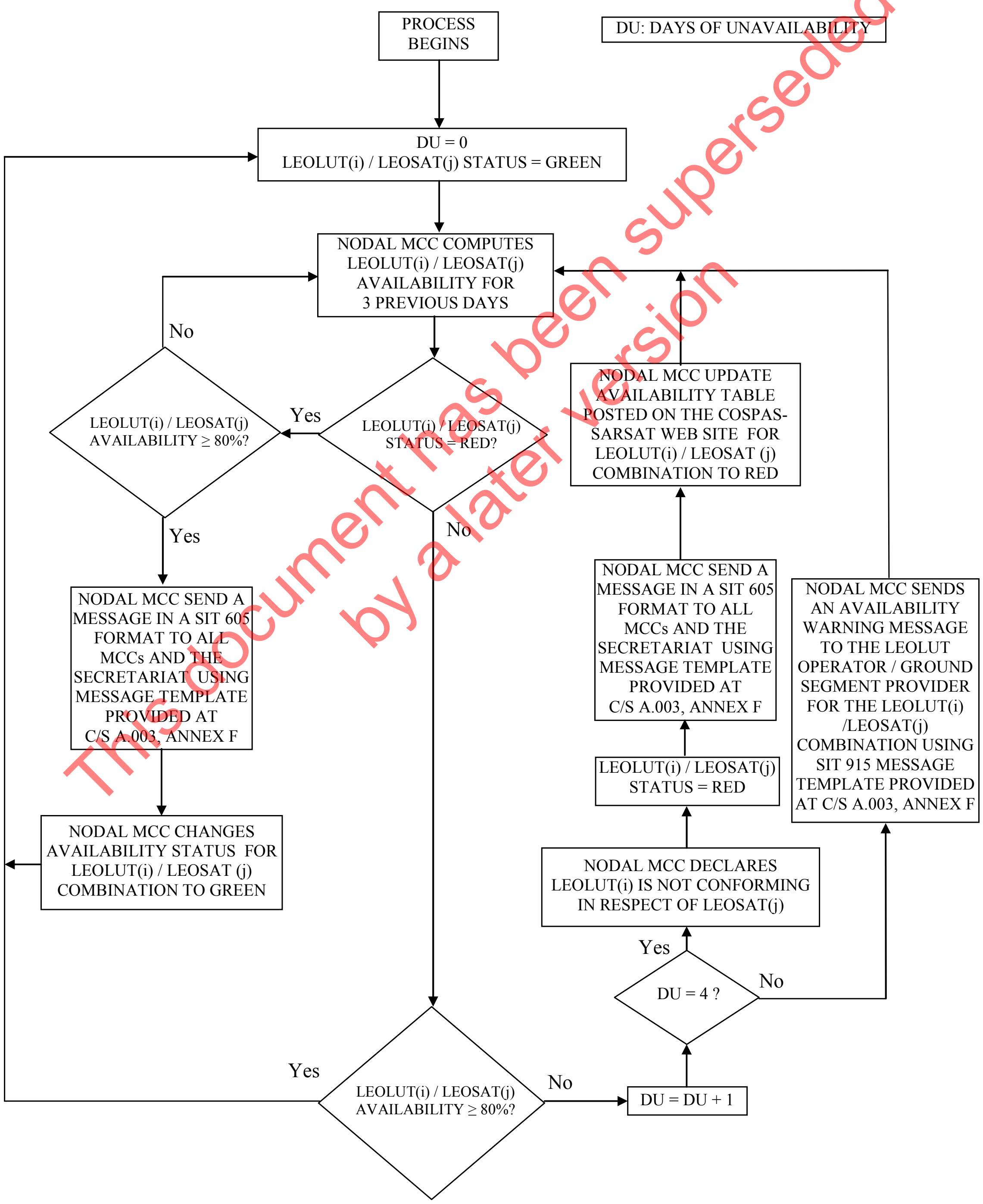
- inform all MCCs and the Cospas-Sarsat Secretariat using a SIT 605 message (see sample at Annex F), and
- update the LUT availability table posted on the Cospas-Sarsat website.

The process described above is depicted in Figure 9.1.

Note: It is recognised that the 3-day data requirement to compute the availability ratio may introduce a 3-day latency after the LUT non-conformity is corrected. This latency is considered acceptable in the case of LEOLUT availability, noting that:

- no data is suppressed as a consequence of the "Red" availability status, and
- the "Red" availability status for a LEOLUT / LEOSAT combination does not affect the availability status of other LEOSAT combinations for the same LEOLUT.

Figure 9.1: LEOLUT Availability Assessment, Status Reporting and Follow-Up Actions



9.5.3 GEOLUT Availability Assessment, Status Reporting and Follow-Up Actions

The GEOLUT availability ratio shall be greater than or equal to 80 %.

If this availability criterion is met, the status of the GEOLUT(i) / GEOSAT(j) combination shown in the LUT availability table posted on the Cospas-Sarsat website is "Green" (see Table 9.1).

If this availability criterion is not met, the nodal MCC shall notify the associated MCC, using the SIT 915 message template provided at Annex F.

If during a period of 4 successive days, the availability ratio for the GEOLUT remains constantly below the availability criterion, the GEOLUT shall be declared non-conforming. The nodal MCC shall:

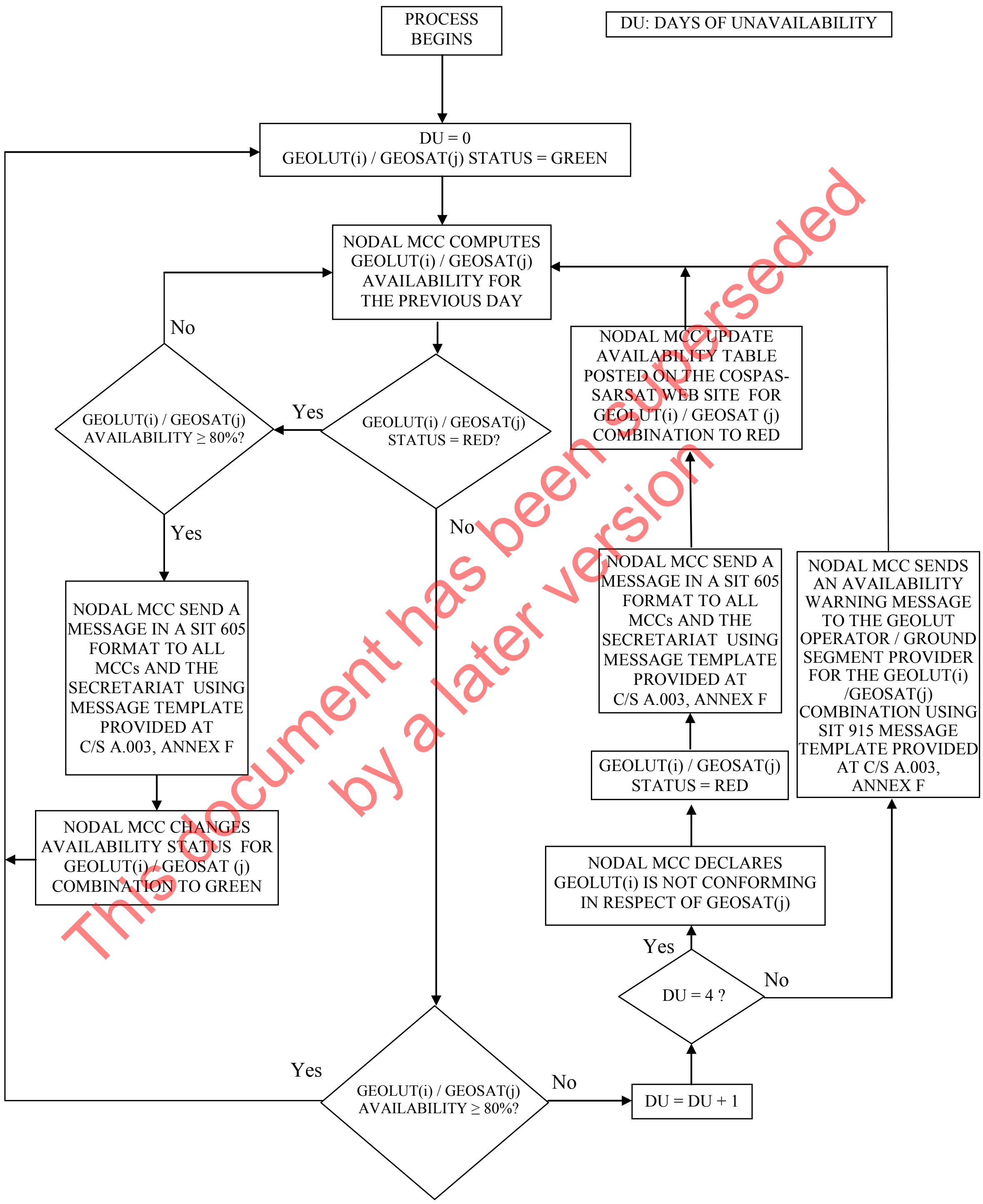
- inform all MCCs and the Cospas-Sarsat Secretariat using a SIT 605 message (see sample at Annex F), and
- update the LUT availability table posted on the Cospas-Sarsat website for the GEOLUT / GEOSAT combination to “Red”.

If the GEOLUT non-conformity is corrected the availability status for the GEOLUT / GEOSAT combination shall be returned to "Green" as soon as the availability criterion is met. The nodal MCC shall:

- inform all MCCs and the Cospas-Sarsat Secretariat using a SIT 605 message (see sample at Annex F), and
- update the LUT availability table posted on the Cospas-Sarsat website.

The process described above is depicted in Figure 9.2.

Figure 9.2: GEOLUT Availability Assessment, Status Reporting and Follow-Up Actions



9.5.4 LEOLUT Location Accuracy Assessment, Status Reporting and Follow-Up Actions

9.5.4.1 Location Accuracy Warning

The 5 km accuracy ratio shall be greater than or equal to 95%.

The 10 km accuracy ratio shall be greater than or equal to 98%.

If these two criteria are met, the status of the LEOLUT(i) / LEOSAT(j) combination shown in the LEOLUT accuracy table posted on the Cospas-Sarsat website is "Green" (see Table 9.2: Template for the LEOLUT Accuracy Table).

If either of these two criteria are not met the nodal MCC shall notify the associated MCC, using the SIT 915 message template provided at Annex F. The status of the LEOLUT(i) / LEOSAT(j) combination shown in the LEOLUT accuracy table posted on the Cospas-Sarsat website is not changed.

9.5.4.2 Unreliable Alert Data Filtering

If the 5 km accuracy ratio falls below 60% and/or the 20 km accuracy ratio falls below 80%, (i.e. $R.5\ (i,j) < 0.6$ and/or $R.20\ (i,j) < 0.8$) for a LEOLUT(i) / LEOSAT(j) combination, the nodal MCC shall:

- process alert messages provided by LEOLUT(i) when processing LEOSAT(j) based only on the 406 MHz beacon message - the Doppler solution data shall not be distributed,
- inform all MCCs and the Secretariat using the SIT 605 message template provided at C/S A.003, Annex F,
- update the LEOLUT accuracy table posted on the Cospas-Sarsat website to show a "Red" accuracy status for the LEOLUT / LEOSAT combination, and
- update the LUT availability table to show a "Red" availability status for the LEOLUT / LEOSAT combination.

9.5.4.3 Resuming Green Accuracy Status

If the LEOLUT non-conformity is corrected, as soon as the LEOLUT(i) / LEOSAT(j) accuracy ratios for 5 km (R.5 (i,j)) and 10 km (R.10 (i,j)) meet respectively the 95% and 98% accuracy criteria, the nodal MCC shall:

- inform all MCCs and the Secretariat using the SIT 605 message template provided at C/S A.003, Annex F,
- resume the distribution of Doppler solution data provided by LEOLUT(i) when processing LEOSAT(j),
- update the LEOLUT accuracy table posted on the Cospas-Sarsat website to show a "Green" accuracy status for the LEOLUT / LEOSAT combination, and

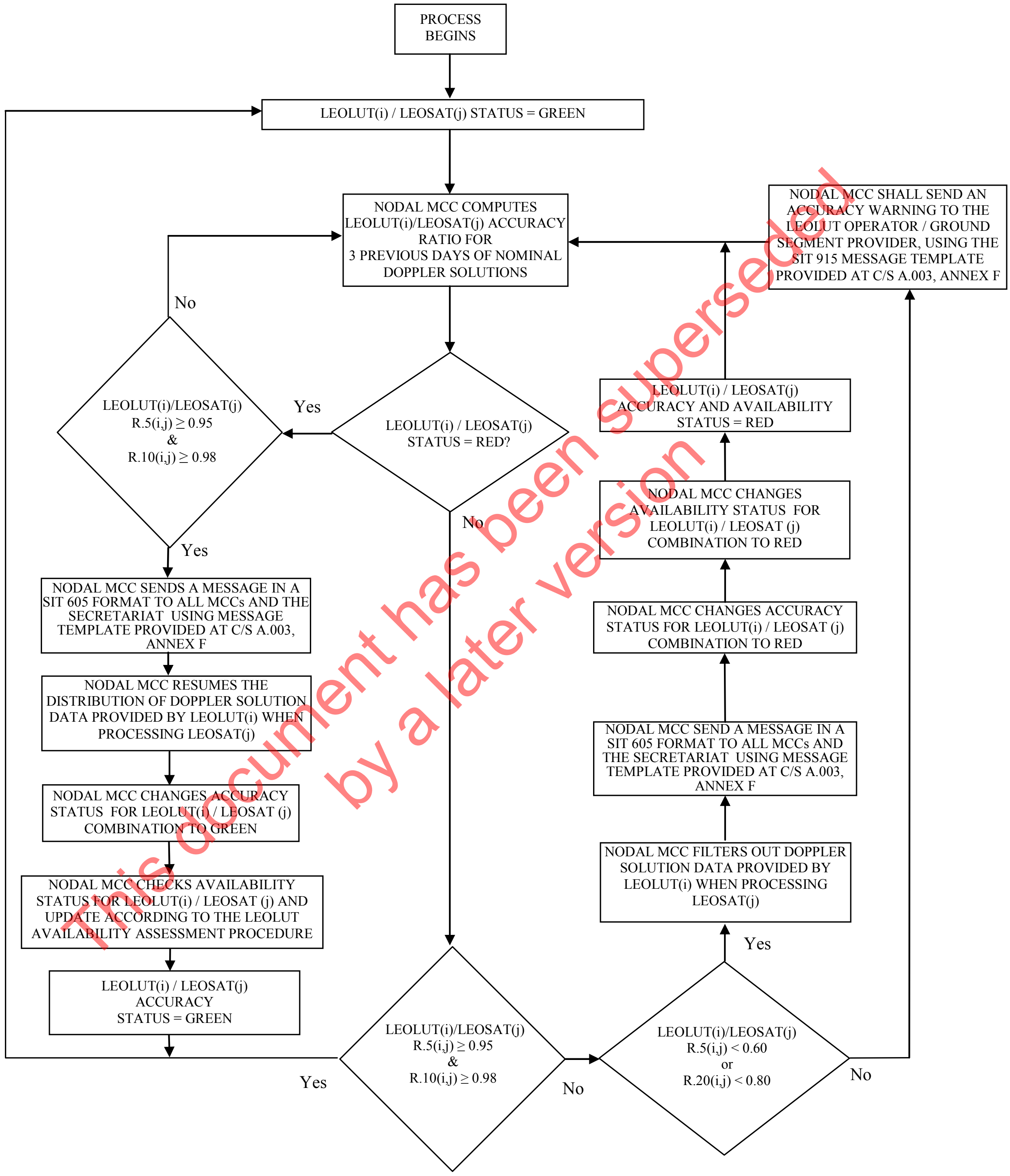
- provided the corresponding availability ratio is also met, update the LEOLUT availability table on the Cospas-Sarsat website to show a "Green" availability status for the LEOLUT / LEOSAT combination.

Note: It is recognised that the 3-day data requirement to compute the accuracy ratio may introduce a 3-day latency for resuming Doppler location data distribution after the LEOLUT nonconformity is corrected. This latency is considered acceptable, noting that:

- the "Red" status for a LEOLUT / LEOSAT combination does not affect the accuracy and availability status of other LEOSAT combinations for the same LEOLUT,
- Doppler location data suppression is implemented after several days of warning and on the basis of continuous evidence of very serious deficiencies concerning the reliability of this location data, therefore, sufficient evidence of a return to conformity must be available; and
- the 3-day latency does not impact the case of LEOLUT returning to normal operation after a total interruption of operation (e.g. for maintenance), as the accuracy ratio computed on a single day of location accuracy data should indicate conformity with the accuracy ratio requirements.

The process described above is depicted in Figure 9.3.

Figure 9.3: LEOLUT Location Accuracy Assessment, Status Reporting and Follow-Up Actions



9.5.5 MCC Availability

MCCs' operational or non-operational status is shown on the Cospas-Sarsat website in the MCC status table illustrated at Table 9-3.

When an MCC, after requiring back-up, has remained non-operational for more than 24 hours, the back-up MCC shall request the nodal MCC to update the MCC status table posted on the Cospas-Sarsat website. A SIT 605 message shall be sent to all MCCs and the Cospas-Sarsat Secretariat confirming the backed-up status of the failed MCC.

The website MCC status table shall be updated by the nodal MCC as soon as the failed MCC returns to normal operations. The back-up MCC shall inform all MCCs and the Secretariat of the change of status of the failed MCC, using a SIT 605 message.

Table 9.3: Template for the MCC Status Table

MCC	OPERATIONAL	BACKED-UP	COMMENTS
MCC 1	√		
MCC 2		√	Temporary back-up by MCC 3
MCC 3	√		
MCC 4	√		
MCC N	√		

- END OF SECTION 9 -

ANNEXES TO
COSPAS-SARSAT
SYSTEM MONITORING
AND REPORTING

ANNEX A

EXPLANATION OF TERMS AND ACRONYMS USED IN C/S A.003

Section 1 - Definitions of Terms

Calibration Factor:

System data provided to LUT operators by Space Segment Providers for the calibration of LUTs, as defined in document C/S A.003.

Processing Anomaly:

An alert message produced by the Cospas-Sarsat System which either should not have been generated or which provided incorrect information. Anomalous alert messages can either be filtered by the System, in which case they are not forwarded to SAR authorities, or unfiltered, in which case they are forwarded to SAR authorities, and may be a cause of false alerts.

Nature of Cospas-Sarsat Distress Alert Data:

a) Distress Alert:

Cospas-Sarsat distress alert received by SAR authorities where an actual or potential distress situation exists. Distress alerts should be designated by RCCs as one of the following categories:

Only alert - Cospas-Sarsat was the unique source of information (alerting and locating).

First alert - Cospas-Sarsat was the source of the first alert received by SAR forces on the distress situation.

Supporting data - Cospas-Sarsat provided alert and location data which was used by SAR services in support of the search and rescue operation.

b) False alert:

Cospas-Sarsat distress alert received by SAR authorities when no distress situation actually exists, and a notification of distress should not have resulted. Operational false alerts are false alerts resulting from beacon activations.

c) Undetermined:

those beacon activations reported to the RCCs, for which the SAR organizations within the MCC service area have not returned SAR incident data, or the source of the signal could not be determined.

<u>Number of validated 121.5 MHz beacon activations reported to RCCs/SPOCs within the MCC service area:</u>

The total number of validated alerts reported to the RCCs/SPOCs within the MCC service area. Real and image positions count as only one alert. A non-validated signal source seen on only one pass is not included in this count. A signal source located on two or more different satellite passes is reported as one event. Locations generated by interferers should not be included in this count.

<u>Number of 406 MHz beacon activations reported to RCCs/SPOCs within the MCC service area:</u>

The total number of alerts with location and those detect-only alerts which have been properly validated by the MCCs. Real and image positions count as only one alert. Those 406 MHz beacons seen on multiple passes, possibly with both location and detect-only alerts, are counted as only one event.

<u>Performance Parameter:</u>

LUT and MCC processing results from one or several satellite passes, as specified in document C/S A.003, characterize the quality of alert data provided to SAR services.

<u>Quality Indicator:</u>

LUT and MCC processing results from one or several satellite passes, as specified in document C/S A.003, characterize the performance of Space or Ground Segment sub-systems (e.g. a satellite SARR and SARP instruments, a LUT, a MCC or an orbitography beacon).

<u>Reporting:</u>

Providing on an annual basis, a summary of the status of System elements and their performance during the reporting period, as defined in document C/S A.003.

<u>Baseline Criteria:</u>

Established performance criteria against which the measurement results of performance parameters and quality indicators should be compared to assess the performance of Space and Ground Segment elements.

<u>Expected Number of Points:</u>

The number of 406 MHz data points (also referred to as bursts) that should be detected on any one pass of a satellite over a beacon. The number of points is dependent on satellite altitude and cross track angle. See Annex D.4 of document C/S A.003 for reference table of expected number of points using 0^{o} or 5^{o} horizons.

Section 2 - List of Acronyms

AGC	automatic gain control
AOS	acquisition of signal
CF	confidence factor
C/S	Cospas-Sarsat
CTA	cross track angle
DA0	date (epoch) of reset to zero of Sarsat-SARP time counter
dB	decibel
DDP	Cospas-Sarsat Data Distribution Plan (C/S A.001)
ELT	emergency locator transmitter
EPIRB	emergency position indicating radio beacon
FCal	frequency calibration (Sarsat only)
FMCC	French mission control centre
ID	identification
ITU	International Telecommunication Union
km	kilometre
LAP	location acquisition probability
LOS	loss of signal
LUT	local user terminal
MCC	mission control centre
MHz	megahertz
ms	millisecond
PDS	processed data stream
PLB	personal locator beacon
RCC	rescue coordination centre
SAR	search and rescue
SARP	search and rescue processor
SARR	search and rescue repeater
SDV	standard deviation
SPOC	SAR point of contact
TBD	to be determined
TCA	time of closest approach
TCal	time calibration (Sarsat only)
TPC	time processing complete
USO	ultra stable oscillator
WF	window flag

- END OF ANNEX A -

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ANNEX B

B-1 FORMAT OF COSPAS-SARSAT REPORT ON SYSTEM STATUS AND OPERATIONS

Date of report:

Origin:

Time period:

I. SYSTEM STATUS and DEVELOPMENT SCHEDULE

1.1 Space Segment

1.1.1 Status of operational spacecraft

1.1.2 Status of 406 MHz payloads

1.1.3 Status of 121.5 MHz payloads

1.1.4 Other payloads (i.e. 406 MHz/243 MHz repeaters)

1.1.5 Readiness and launch schedule of new spacecraft / payloads

1.1.6 Report on significant events (changes in payload configuration of operational satellites, etc.)

1.2 Ground Segment

1.2.1 LUTs operational status

1.2.2 MCCs operational status

1.2.3 Other Ground Segment sub-systems (orbitography network, time reference beacons, etc.)

1.2.4 Schedule of new Ground Segment equipment installation / commissioning

1.2.5 Results of System test per Annex J.

LUT / MCC Reporting Format for System Level Test

Ref Nr.	<MCC Name[1]>	<LUT Name[1]>	<LUT Name[1]>
1			
2			
…			
28			

Nodal MCC Reporting Format for System Level Test
(to be provided only by administrations which operate nodal MCCs)

Ref Nr.	<MCC Name[1]>	<MCC Name[1]>	<MCC Name[1]>	<MCC Name[1]>
1				
2				
…				
28				

The performance of the respective ground segment equipment for each test scenario is indicated with:

"x - number" to denote that the ground segment equipment did not produce the results described in Annex J. An explanation for each anomaly should be provided.

Note: (1) Official name of ground segment equipment being reported upon as detailed in Annex II to document C/S A.001 (DDP) (e.g. the Australian MCC with code 5030 would be indicated in the report as “AUMCC”, and the French LEOLUT with code 2271 would be indicated in the report as “Toulouse (1)”).

1.3 Distress beacons *

1.3.1 Evaluation of 406 MHz beacon population:

Registered EPIRBs _________

Registered ELTs _________

Registered PLBs _________

Registered SSAS beacons _________

Registered Tests _________

Evaluation of new beacons used as a replacement ________

Evaluation of non-registered beacons (where possible) ________

1.3.2 Evaluation of 121.5 MHz beacon population:

ELTs _________

EPIRBs _________

PLBs _________

Tests _________

1.3.3 Changes of regulatory status

1.3.4 Updates of beacon populations forecast:

Year	2015		2020
Frequency / Beacons	406 MHz	121.5 MHz	406 MHz
ELTs			
EPIRBs			
PLBs			
SSAS beacons			

Note: * - To be provided by all Cospas-Sarsat participants, including User States.

1.4 Status of Implementation of System Changes

Ref No/ Report Ref.	Description of Change (Type (a))	System Document Reference	Criticality (b)	Required Implementation Date	Date Implemented

(a) Corrective, Adaptive, Enhancement
(b) Optional, Routine, Critical

II. SYSTEM OPERATIONS

2.1 Number of 406 MHz beacon activations reported to RCCs/SPOCs within the MCC service area

Alert Classifications	EPIRB [1]	ELT [1]	PLB [1]	Sub-Total	Total
Distress alerts					
False alerts					
Unfiltered processing anomalies					
Operational false alerts (beacon activations)					
Beacon mishandling [2]					
Beacon malfunction [2]					
Mounting failure [2]					
Environmental conditions [2]					
Unknown [2]					
Undetermined					
Total					

Note 1: Optional information.

Note 2: See Appendix B.1 for classifications of Cospas-Sarsat alerts and Appendix B.2 for examples of operational false alerts associated with each classification

.

2.2 Number of validated 121.5 MHz beacon activations reported to RCCs/SPOCs within the MCC service area

Alert Classifications	EPIRB [1]	ELT [1]	PLB [1]	Sub-Total	Total
Distress alerts					
False alerts					
Unfiltered processing anomalies					
Interference					
Operational false alerts (beacon activations)					
Beacon mishandling [2]					
Beacon malfunction [2]					
Mounting failure [2]					
Environmental conditions [2]					
Unknown [2]					
Undetermined					
Total					

Note 1: Optional information.

Note 2: See Appendix B.1 for classifications of Cospas-Sarsat alerts and Appendix B.2 for examples of operational false alerts associated with each classification.

2.3 LUT/MCC availability

Availability is expressed as a percentage and is calculated by dividing the amount of time in operation by the time required to be in operation. See section 8.3 for complete instructions.

a. MCC system availability
b. LUT data availability

2.4 Report on significant events or anomalies during period of operation

2.5 Report on 121.5/406 MHz beacon anomalies

a. Non-activation of beacons. Attach a narrative report for each case presented.

b. Operational false alerts. Where possible, provide the data according to Appendix B.1 in order to better track the false alert problem.

c. Other beacon anomalies. Where possible, provide the 15 hexadecimal beacon identifier, the beacon type, the country code, first and last detection, average repetition rate, and calculated frequency.

2.6 False Alert Rate

2.6.1 Cospas-Sarsat System Operation Perspective (406 MHz)

$$= \frac{\text{false alerts + undetermined alerts world-wide with Participant's country code(s)}}{\text{estimated total number of 406 MHz beacons with Participant's country code(s)}^{1}}$$

Note 1: Total provided in section 1.3.1.

	Number of false alerts + undetermined alerts world-wide	Estimated number of beacons	False alert rate
EPIRB			
ELT			
PLB			
Totals			

2.6.2 SAR Response Perspective (121.5/406 MHz)

$$= \frac{\text{false alerts + undetermined transmitted to RCCs/SPOCs in Participants service area}}{\text{total number of alerts transmitted to RCCs/SPOCs in Participants service area}}$$

	Number of false alerts + undetermined alerts transmitted to SPOCs	Total number of alerts	False alert rate
121.5 MHz [2]			
406 MHz [3]			

Note 2: See section 2.2.

Note 3: See section 2.1.

2.6.3 False Alert Rate by 406 MHz Beacon Model

Model Name (1)	**TAC (2)**	**Beacon Type / Activation Method (3)**	**Estimated Number of Beacons (4)**	**Number of False Alerts**	**False Alert Rate**

Notes:
1. Beacon model name.
2. Cospas-Sarsat Type Approval Certificate Number.
3. Beacon type and activation method (e.g. EPIRB/Automatic, ELT/Manual, etc.). Each combination of beacon model / activation method should be reported on a separate line.
4. Estimated total number of 406 MHz beacons of that model, type and activation method with Participant's country code(s).

2.7 Report on educational and regulatory actions to reduce false alerts

Provide a summary of actions undertaken by the Participant working with their national Administrations, and with the Administrations of the SRRs within its MCC service area as applicable, to reduce the number of false alerts and to reduce the impact of false alerts.

2.8 Report on MCC back-up procedure test results

Provide a summary of test results undertaken by the MCC operator according to the existing back-up procedures and agreements.

2.9 Efforts taken in preparation for the phase-out of 121.5 MHz satellite alerting

Provide a summary of the efforts taken by Cospas-Sarsat Participants in preparation for the phase-out of 121.5 MHz satellite alerting services.

Appendix B.1

CLASSIFICATION OF COSPAS-SARSAT ALERTS

Alerts Received By SAR Authorities

- False Alerts
- Distress Alerts
- Undetermined

False Alerts:

Unfiltered Processing Anomalies

121.5 / 243 MHz Interference

- Interference
- Non-distress Voice Transmission

Beacon Activations
(Operational False Alerts)

- Beacon Mishandling
    - Improper installation procedure / location
    - Improper testing and maintenance
    - Improper use
    - Improper disposal of beacon
- Beacon Malfunction
    - Faulty activation switch, i.e., gravity activated, magnetic, mercury, or crash
    - Water ingress
    - Transmitting distress signal while in test position
    - Electronics malfunction
- Mounting Failure
    - Strap or bracket failure
    - Release mechanism malfunction
    - Faulty mounting magnet for externally mounted ELT
- Environmental Conditions
    - Extreme weather conditions
- Unknown
(Confirmed Beacon Activations)
    - No feedback received on why beacon was activated
    - Investigation into beacon activation cause was inconclusive

Appendix B.2

EXAMPLES OF OPERATIONAL FALSE ALERTS

BEACON MISHANDLING

Improper installation procedure / location

Exposed to sea action or ship's work, beacon activated by sea spray or wave, crewman bumped beacon, equipment struck beacon, beacon installed upside down, improperly placing beacon into bracket.

Improper testing and maintenance

Failure to follow proper testing procedures, negligence, poor beacon testing instructions, aircraft in situ test, left beacon in "on" position too long. Inspection by authorised inspector: accidental activation during vessel equipment inspection.

Repair by owner (usually unauthorised) or authorised facility: causing damage to beacon, activation during battery change, changing of hydrostatic release while servicing beacon.

Improper removal from bracket: inspection, test, cleaning, or safe keeping without switching off.

Beacon shipped to / by retailer, owner, repair facility (in transit): shipped while armed, improperly packed, improperly marked, rough handling.

Maintenance of craft: mechanical, electronic, wash down, painting, winterization.

Beacon stored improperly: stored while armed.

Improper use

Illegal activation: hoax, vandalism, theft.

Accidental activation: owner or SAR authorities report accidental activation and no further information.

Demonstration / test not co-ordinated with Cospas-Sarsat / SAR authorities: training, exercise, product demonstration using on position instead of test.

Improper disposal of beacon

Beacon sold with craft for scrap, discarded as trash, abandoned.

BEACON MALFUNCTION

Faulty activation switch, i.e., gravity activated, magnetic, mercury, or crash
Hard landing, excessive craft vibration.

Water ingress
Water leakage due to manufacturing defect, cracked casing, faulty seal.

Transmitting distress signal while in test position
Transmitted non-inverted frame sync while in test mode (406 MHz).

Electronics malfunction
Non-GPS electronics malfunction.

MOUNTING FAILURE

Strap or bracket failure
Strap failure, mounting bolts sheared, retainer pin broken, beacon fell out of bracket.

Release mechanism malfunction
Premature release of hydrostatic release.

Faulty mounting magnet for externally mounted ELT
Switch magnets not effective.

ENVIRONMENTAL CONDITIONS

Extreme weather conditions
Hurricane / cyclone conditions, vessel knocked down, aircraft overturned, heavy seas, ice build-up.

UNKNOWN
(Confirmed Beacon Activations)

No feedback received on why beacon activated

Investigation into beacon activation cause was inconclusive

B-2 FORMAT OF DISTRESS INCIDENT REPORT FOR DOCUMENTATION OF SAR EVENTS AND PERSONS RESCUED

a) Type of incident (aviation, maritime, land etc.) and frequency band (406 MHz, 121.5/243 MHz)

If 406 MHz, beacon ID code (15 hex characters)

b) Date of incident

c) Location of incident

d) Identification / type of craft involved

e) Circumstances of distress situation

f) Nature of Cospas-Sarsat alert data:

- only alert ☐
- first alert ☐
- supporting data ☐

g) Number of persons:

- involved ....
- rescued ....

h) The search and/or rescue operation was assisted by Cospas-Sarsat data:

- Yes ☐
- No ☐

i) Other significant information

....
....
....
....

- END OF ANNEX B -

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ANNEX C

406 MHz INTERFERENCE MONITORING AND REPORTING

C.1 STATUS OF LEOLUT MONITORING CAPABILITIES

The following Cospas-Sarsat LEOLUTs are capable of monitoring 406 MHz interference, using special equipment in the LEOLUT, in conjunction with the 406 MHz repeater on Sarsat satellites. The coverage area of LEOLUTs performing 406 MHz routine interference monitoring is shown at Figure C.1.

LEOLUTs		COMMENTS *
Algeria:	Ouargla Algiers	Routine monitoring Routine monitoring
Argentina:	Parana Rio Grande	Routine monitoring Routine monitoring
Australia:	Albany Bundaberg	Routine monitoring Routine monitoring
Brazil:	Brasilia Manaus Recife	Routine monitoring Routine monitoring Routine monitoring
Canada:	Churchill Edmonton Goose Bay Ottawa (Test facility)	Routine monitoring Routine monitoring Routine monitoring Available
Chile:	Easter Island Punta Arenas Santiago	Available Available Routine monitoring
China (P.R.):	Beijing	Available
France:	Toulouse	Routine monitoring
Greece:	Pentelli	Available
Hong Kong, China:	Hong Kong	Routine monitoring
India:	Bangalore Lucknow	Routine monitoring Routine monitoring
Indonesia:	Jakarta	Periodic monitoring
Italy:	Bari	Routine monitoring
ITDC:	Keelung	Available
Japan:	Gunma	Routine monitoring
Korea (Rep.of):	Incheon	Routine monitoring
New Zealand:	Wellington	Routine monitoring
Norway:	Spitsbergen Tromsoe	Available Routine monitoring

LEOLUTs		COMMENTS *
Pakistan:	Lahore	Periodic monitoring
Peru:	Callao	Routine monitoring
Russia:	Nakhodka	Available
Saudi Arabia:	Jeddah	Routine monitoring
Singapore:	Singapore	Periodic monitoring
South Africa:	Cape Town	Periodic monitoring
Spain:	Maspalomas	Routine monitoring
Thailand:	Bangkok	Routine monitoring
Turkey:	Ankara	Routine monitoring
UK:	Combe Martin	Routine monitoring
USA:	Alaska California Florida Guam Hawaii Maryland (LSE)	Routine monitoring Routine monitoring Routine monitoring Routine monitoring Routine monitoring Periodic monitoring
Vietnam:	Haiphong	Routine monitoring

Notes: * Periodic monitoring: the LEOLUT can be set by the MCC operator to a special operating mode to check for 406 MHz interference periodically as needed.

Routine monitoring: the LEOLUT automatically monitors each scheduled Sarsat satellite pass above 5° for 406 MHz interference.

LSE LEOSAR Support Equipment (located at Suitland, Maryland).

T.B.D. To be determined.

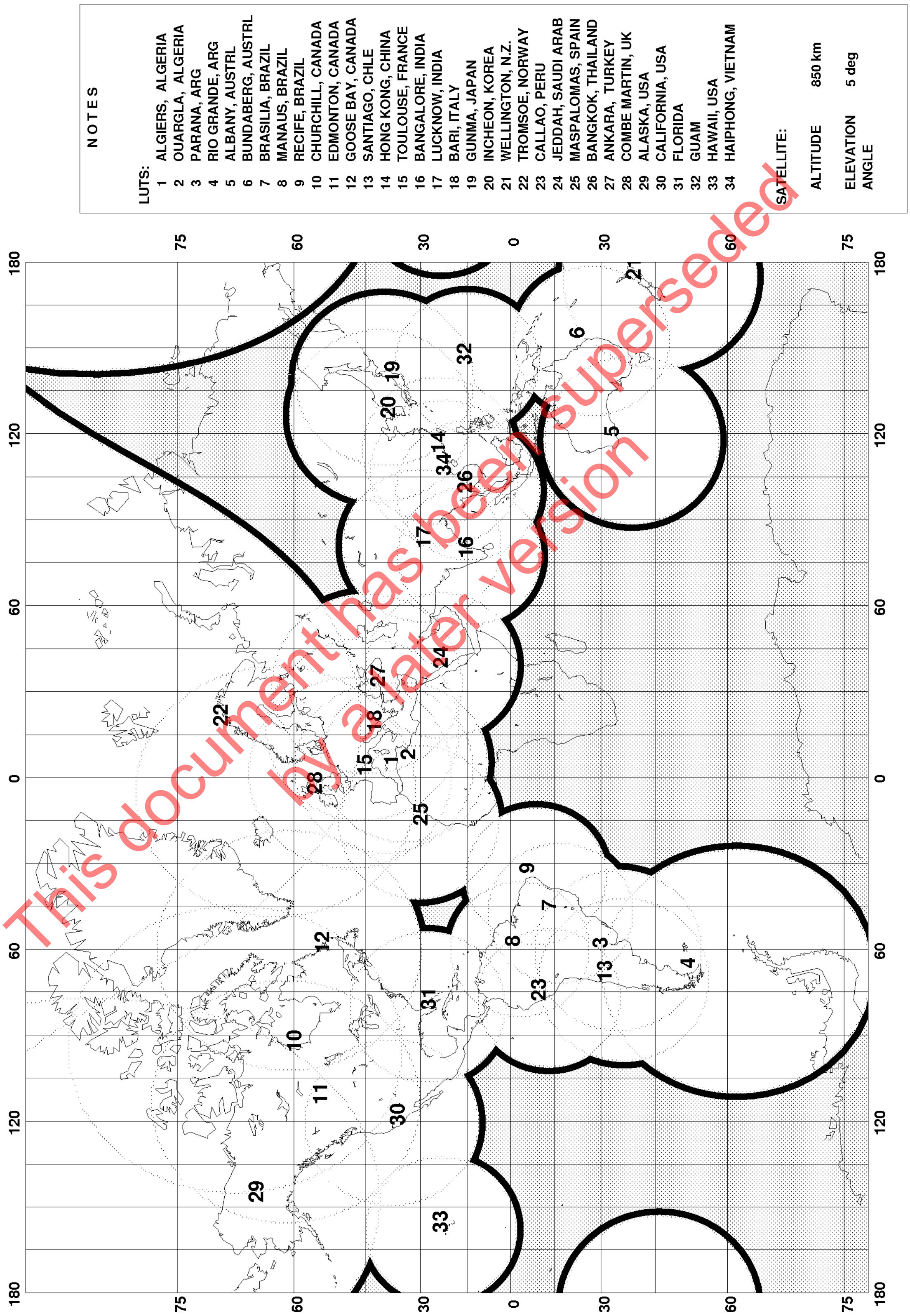

Figure C.1: Coverage Area of LEOLUTs Performing 406 MHz Routine Interference Monitoring

C.2 ITU INTERFERENCE REPORT FORMS (from Recommendation ITU-R SM.1051-2)

C.2.1 Information report concerning interference

a) Mean latitude and longitude

b) Probable search radius from mean location. Country. Nearest city

c) Frequencies

d) Number of observations (total and number since last report)

e) First and last date of occurrences

f) Modulation characteristics

g) Times and days-of-week of occurrences

h) Other details

C.2.2 Feedback report concerning the interference source

a) Latitude and longitude

b) Fundamental frequency of offending source (this may be outside the band)

c) Type of equipment

d) Cause of interference

e) Action taken

Table C.1: 406 MHz Interference Report Format[1]

Reporting Period (DD Month – DD Month YY)

Part1

Site ID Number[2]	Location				Search Area (probable search radius from mean location) (km)	Mean Latitude (d°, 100th of d°)	Mean Longitude (d°, 100th of d°)	Mean Detected Freq. (MHz)	Modulation Charact.[3]	Impact on System[4]	Monthly Detection Ratio[5]	Dates of Observations		Times and Days of Week of Occurrences				Number of Observations (number since last report and total)		Other Details
	Country	Nearest City	Direction from Nearest City	Distance (km)								First Date	Last Date	Date	Day of Week	Start Time	End Time	Current Period	Total	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
MID123456	Text	Text	NE,W, SW, etc.	nn	nn	±nn.nn	±nn.nn	406.nnn	N/ME/PE	H/M/L	0.nn	YYMMDD	YYMMDD	YYMMDD	Sn,Mo, Tu, etc.	HH:MM	HH:MM	nn	nnnn	Text
MID123457																				
etc.																				
	ITU				ITU	ITU	ITU	ITU	ITU	JC-11	JC-11	JC-13		ITU				ITU		JC-13

Part 2 (see Note 6)

Status (open/closed) 1-opn, 0-clsd	Location (Confirmed)				Narrative, including the identification of the source, as available							
	Country	Nearest City	Latitude (d°, 100th of d°)	Longitude (d°, 100th of d°)	Type of Equipment	Assigned Frequency (MHz)	Assigned Frequency Band (MHz)	Class of Emission	Power Characteristics	Cause of Interference	Action Taken	Other Data
22	23	24	25	26	27	28	29	30	31	32	33	34
1	Text	Text	±nn.nn	±nn.nn								
0												
			ITU	ITU	ITU	ITU				ITU	ITU	

Notes:
1. Reporting should be provided in Excel format on a monthly basis. Minimum data is required for the following columns: 1, 2, 3, 7, 8, 9, 12, 13, 14, 19 and 20. Fields for which data is not available can be left blank.
2. Site ID number consists of two parts: 3 digit country code according to ITU MID code of the country of reporting authority plus 6 digits, assigned by the authority to the site.
3. Type of modulation of main carrier: **N** – emission of unmodulated carrier, **ME**- emission of modulated carrier, **PE**- emission of pulses (data optional for Part 1, supplied in case of availability).
4. **H**igh: Reducing throughput of reference beacon in case of mutual visibility by 50% and more, **M**edium – by 25-50%, **L**ow –less than 25%.
5. Monthly DR = N1/(N1+N2), where: N1 – number of passes over emitter at/above 5 degrees, with at least 1 location; N2 – number of passes over emitter at/over 5 degrees, with no location. Interferers that should be reported are the ones with DR $\geq$ 0.1 and with a number of observations over the current reporting period $\geq$ 10/month/LUT.
6. These items depend on feedback report concerning interference source. This is normally provided after the site has been closed and emissions have been stopped.

- END OF ANNEX C –

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ANNEX D

CRITERIA FOR ANOMALY DETECTION

D.1 Performance Parameters

D.2 Quality Indicators

D.3 Calibration Factors

D.4 Number of points transmitted by a 406 MHz distress beacon during a satellite pass

D.1 PERFORMANCE PARAMETERS

Parameter	Criteria (C)	Anomaly	Conditions	Comments
406 MHz SYSTEM				
D.1.1 Single Pass Location Acquisition Probability	100%	N.Loc ---------- < 100% N. Exp	Standard pass over orbitography / reference beacons	N.Loc number located --------- = -------------------- N.Exp number expected
D.1.2 406 MHz Location Accuracy	5 Km	D > 5 Km	. N points > 4 . TCA in window . 1º < CTA < 20º	D = distance (real loc. / computed loc.)
D.1.3 System Timing	PT	PT > 90 min	Processing time (from TCA until transmission from MCC)	- Not applicable to a single pass or any single LUT - 1990 Exercise reference for the alert handling time was = 71 minutes
121.5 MHz SYSTEM				
D.1.4 121.5 MHz Location Accuracy	C = TBD	D > C	Standard pass over a 406 MHz beacon	D = distance (121.5 MHz loc. to 406 MHz loc. of same beacon)

D.2 QUALITY INDICATORS

Quality Indicator	Criteria	Anomaly	Conditions	Baseline (Typical)	Comments
DOWN-LINK					
D.2.1 <u>Received Down-link Power Level</u>	Baseline - 10db	MRP < B. - 10dB	Satellites at elevations above 5º/LUT	-	MRP = AGC value of receiver at maximum received power
D.2.2 <u>Number of LUT Carrier Lock Loses</u>	Baseline + 10%	NCL > B. + 10%	Satellites at elevations above 5º/LUT	-	NCL = number of carrier lock losses during a pass
D.2.3 <u>Percentage of Time LUT does not Maintain Carrier Lock</u>	Baseline +10%	PCL > B. + 10%	Satellites at elevations above 5º/LUT	-	PCL = % of pass duration carrier lock is not maintained
406 MHz SYSTEM					
D.2.4 <u>406 MHz SARP throughput</u>	THRU = 70%	$THRU = \frac{NR}{NE} < 70\%$	Standard pass over orbitography / reference beacons	-	N. Expected = number of expected data points for orbit./reference beacons N. Received = number of received data points for same beacons
D.2.5 <u>406 MHz PDS Data Recovery</u>	FR = 80%	$FR = \frac{NR}{NE} < 80\%$	Sat. passes at elevations above 5º/LUT	-	NR=number of frames received NE=number of frames expected
D.2.6 <u>Number of 406 MHz Single Point Alerts</u>	Baseline + 50%	NSPA > B. + 50%	406 MHz PDS data stream for each pass	-	NSPA=number of single point alerts
D.2.7 <u>406 MHz Bit Error Rate</u>	Baseline + 30%	ANE > B. + 30%	406 MHz beacon messages received during each pass	-	ANE=average number of bit errors in the protected field of 406 MHz messages
D.2.8 <u>Average LUT Processing Time per 406 MHz Loc.</u>	Baseline + TBD	APT > B. + TBD	All passes; 406 MHz locs. only	-	APT=(time 406 MHz processing complete - LOS time)/number of 406 MHz locations

D.2 QUALITY INDICATORS (Cont.)

Quality Indicator	Criteria	Anomaly	Conditions	Baseline (Typical)	Comments
121.5 MHz SYSTEM					
D.2.9 Number of 121.5 MHz Locations Per Pass	Baseline ± 50%	NLPP < B. + 50% NLPP > B. + 50%	Computed for each pass	-	NLPP = number of 121.5 MHz locs. per pass
D.2.10 Absence of Loc. by LUT of 121.5 MHz Signal	100%	No location	-Standard pass over beacon -Sat. pass at elevations above 5°/LUT	-	121.5 MHz signal detected by other means
D.2.11 Average LUT Processing Time per 121.5 MHz Loc.	Baseline + TBD	APT > B. + TBD	All passes; 121.5 MHz locs. only	-	APT = (time 121.5 MHz processing complete - LOS time) / number of 121.5 MHz locs.
LUT/MCC SUBSYSTEM					
D.2.12 LUT/MCC Data Transfer Time	Baseline + TBD	DTT > B. + TBD	All passes (121.5 MHz & 406 MHz)	-	DTT = (time data received at MCC) - (time LUT processing complete)
D.2.13 Pre-pass Check	As above for all parameters & quality indicators checked	As above	Not applicable	-	
D.2.14 Pass Scheduling Accuracy	C = Baseline + 50 ms	/PLOS - ALOS/ ≥C /PAOS - AAOS/ ≥C	Any satellite pass	-	AAOS = actual AOS of satellite ALOS = actual LOS of satellite PAOS = predicted AOS of satellite PLOS = predicted LOS of satellite
D.2.15 Orbit Accuracy	TBD	FF > TBD	Several successive passes	-	FF=number of failures of "orbit upgrade"& SARP calibration routines

D.3 CALIBRATION FACTORS

Quality Indicator	Criteria	Anomaly	Condition	Comments
Sarsat				
D.3.1 Sarsat TCAL	1 ms	EDAO > 10 ms	-	EDA0 = (DA0n -DA0o)[(1)]
D.3.2 Sarsat FCAL	.05 Hz	EUSO > .05 Hz	-	EUSO = (Frn - Fro)/Nd[(1)]
Sarsat & Cospas				
D.3.3 Sarsat and Cospas Orbit Vectors	200 ms	|PoAOS - PnAOS|/Nd > 200 ms |PoLOS - PnLOS|/Nd > 200 ms	-	PoAOS[(1)] AOS computed with previous orbit vectors PnAOS[(1)] AOS computed with present orbit vectors PoLOS[(1)] LOS computed with previous orbit vectors PnLOS[(1)] LOS computed with present orbit vectors

Notes:

(1) DA0 = rollover time, seconds
DA0n = DA0 at present check
DA0o = DA0 at previous check + 2^N*k*N_f/Fro
k = # rollovers from previous to present check
N = 20 for SARP-0, N = 23 for SARP-1 and SARP-2
N_f = 94208 for SARP-0 and SARP-1, N_f = 99360 for SARP-2
Fro = USO frequency at previous check, Hz
Frn = USO frequency at present check, Hz
Nd = # days from previous to present check

PoAOS: AOS computed with previous orbit vectors
PnAOS: AOS computed with present orbit vectors
PoLOS: LOS computed with previous orbit vectors
PnLOS: LOS computed with present orbit vectors

D.4 NUMBER OF POINTS TRANSMITTED BY A 406 MHz DISTRESS BEACON DURING A SATELLITE PASS

CTA (Beacon to Satellite)	Max Elevation Angle Cospas/Sarsat	Cospas Satellites (1000 km Altitude)				Sarsat Satellites (850 km Altitude)			
		0 Degree Horizon		5 Degrees Horizon		0 Degree Horizon		5 Degrees Horizon	
		Duration of Pass (min)	No. of Points	Duration of Pass (min)	No. of Points	Duration of Pass (min)	No. of Points	Duration of Pass (min)	No. of Points
0	90.0/90.0	17.6	21	14.9	17	16.0	19	13.4	16
1	82.6/81.5	17.6	21	14.9	17	16.0	19	13.4	16
2	75.4/73.3	17.5	21	14.8	17	16.0	19	13.4	16
3	68.6/65.7	17.5	20	14.8	17	15.9	19	13.3	15
4	62.2/58.7	17.4	20	14.7	17	15.9	19	13.2	15
5	56.4/52.5	17.3	20	14.6	17	15.8	18	13.1	15
6	51.1/46.9	17.2	20	14.5	17	15.7	18	13.0	15
7	46.3/42.0	17.1	20	14.3	17	15.6	18	12.8	15
8	42.0/37.7	17.0	20	14.2	16	15.4	18	12.6	15
9	38.1/33.8	16.8	20	14.0	16	15.2	18	12.4	14
10	34.6/30.0	16.7	19	13.7	16	15.1	18	12.2	14
11	31.4/27.4	16.5	19	13.5	16	14.8	17	11.9	14
12	28.5/24.6	16.2	19	13.2	15	14.6	17	11.6	13
13	25.9/22.2	16.0	19	12.9	15	14.3	17	11.2	13
14	23.5/19.9	15.7	18	12.6	15	14.0	16	10.9	13
15	21.3/17.8	15.4	18	12.2	14	13.7	16	10.4	12
16	19.2/15.9	15.1	18	11.7	14	13.3	16	9.9	11
17	17.3/14.1	14.7	17	11.2	13	12.9	15	9.4	11
18	15.6/12.5	14.3	17	10.7	12	15.5	14	8.7	10
19	13.9/10.9	13.9	16	10.1	12	12.0	14	8.0	9
20	12.3/9.4	13.4	16	9.4	11	11.5	13	7.1	8
21	10.8/8.1	12.9	15	8.6	10	10.9	13	6.1	7
22	9.4/6.8	12.3	14	7.7	9	10.5	12	4.7	5
23	8.1/5.5	11.7	13	6.6	7	9.4	11	2.6	3
24	6.8/4.3	10.9	13	5.2	6	8.5	10	NA	NA
25	5.6/3.2	10.1	12	3.0	3	7.5	8	NA	NA
26	4.4/2.1	9.2	11	NA	NA	6.2	7	NA	NA
27	3.3/1.0	8.1	9	NA	NA	4.5	5	NA	NA
28	2.2/0.0	6.7	8	NA	NA	0.6	0	NA	NA
29	1.1/NA	5.0	5	NA	NA	NA	NA	NA	NA
30	0.1/NA	1.6	1	NA	NA	NA	NA	NA	NA

Note: * = For orbitography beacons, multiply number of points by 1.6.

- END OF ANNEX D -

ANNEX E

STATUS OF MONITORING ACTIVITIES

Notes:

Y	-	Yes
N	-	No
NA	-	Not applicable
X	-	Agree to do
?	-	Need more information before decision
1	-	Requires software development
2	-	On Tcal beacon
3	-	Orbitography beacon
4	-	LUT level
5	-	Manual check
6	-	On all reference beacons
7	-	Random check
8	-	TPC time recorded
9	-	Feed-back required
10	-	MCC level
11	-	Graphs
12	-	In log files
13	-	Currently done but without data reduction
14	-	Statistically at end of month
15	-	On every pass

MCC	Austra-lia	Canada	Chile	France	Hong Kong	India	Italy	Japan
E.1 Performance Parameters								
406 MHz System								
E.1.1 Single Pass Location Acquis. Probab. (LAP)	N	X(1)		Y(2)	-			
E.1.2 406 MHz Location Accuracy	Y(5)	Y(9)		Y(6)	-			
E.1.3 System Timing	NA	X(12)		NA	NA			
121.5 MHz System								
E.1.4 121.5 MHz Location Accuracy	Y(5,9)	Y(9)		Y	-			
E.2 Quality Indicators								
Down-link								
E.2.1 Receiver Down-link Power Level	Y(5)	N		Y(11)	X(1)			
E.2.2 Number of LUT Carrier Lock Losses	Y(12,15)	X(12)		Y(13)	X(12)			
E.2.3 Percentage of Time LUT does not Maintain Carrier Lock	Y(11,12,15)	X(5)		-	X(12)			
.../...								

MCC	Norway	Pakistan	Russia	Singa-pore	Spain	UK	USA	
E.1 Performance Parameters								
406 MHz System								
E.1.1 Single Pass Location Aquis. Probab. (LAP)	X		Y(3)	Y(4)	X(6)	Y(4)	X	
E.1.2 406 MHz Location Accuracy	Y		Y(3)	Y(4,10)	X(6)	Y(4)	Y(3)	
E.1.3 System Timing	NA		NA	NA	NA	NA	NA	
121.5 MHz System								
E.1.4 121.5 MHz Location Accuracy	Y(5)		X	Y(10)	X	Y(10)	N	
E.2 Quality Indicators								
Down-link								
E.2.1 Receiver Down-link Power Level	X		?	?	X	Y(4)	N	
E.2.2 Number of LUT Carrier Lock Losses	X		?	Y(4)	?	Y(4)	X	
E.2.3 Percentage of Time LUT does not Maintain Carrier Lock	-		-	-	-	-	N	
.../...								

MCC	Austra-lia	Canada	Chile	France	Hong Kong	India	Italy	Japan
E.2 Quality Indicators (Cont.)								
406 MHz System								
E.2.4 406 MHz SARP throughput	N	Y(14)		X	X(5)			
E.2.5 406 MHz PDS Data Recovery	Y(5,12,15)	X		X	X(12)			
E.2.6 Number of 406 MHz Single Point Alerts	Y(5,12)	Y(14)		X	X(12)			
E.2.7 406 MHz Bit Error Rate	N	-		-	-			
E.2.8 Average LUT Processing Time per 406 MHz Loc.	Y(5,12,15)	-		X	X(7)			
121.5 MHz System								
E.2.9 Number of 121.5 MHz Location per Pass	-	X(13)		X	X(13)			
E.2.10 Absence of Loc. By LUT of 121.5 MHz Signal	-	X(12)		-	-			
E.2.11 Average LUT Processing Time per 121.5 MHz Loc.	Y(5,7)	-		X	X(7)			
.../...								

MCC	Norway	Pakistan	Russia	Singa-pore	Spain	UK	USA	
E.2 Quality Indicators (Cont.)								
406 MHz System								
E.2.4 406 MHz SARP throughput	?		X	Y(10)	X	Y(4,10)	Y	
E.2.5 406 MHz PDS Data Recovery	X		X	Y(4)	X(4)	Y(4)	N	
E.2.6 Number of 406 MHz Single Point Alerts	Y		Y(3)	Y(10)	Y	Y(4)	N	
E.2.7 406 MHz Bit Error Rate	-		-	-	-	-	?	
E.2.8 Average LUT Processing Time per 406 MHz Loc.	Y		Y	Y(7)	X(12)	Y(4)	Y	
121.5 MHz System								
E.2.9 Number of 121.5 MHz Location per Pass	-		-	-	-	-	N	
E.2.10 Absence of Loc. by LUT of 121.5 MHz Signal	-		-	-	-	-	Y	
E.2.11 Average LUT Processing Time per 121.5 MHz Loc.	Y		Y	Y(7)	X(12)	Y(4)	Y	
.../...								

MCC	Austra-lia	Canada	Chile	France	Hong Kong	India	Italy	Japan
E.2 Quality Indicators (Cont.)								
LUT/MCC Sub-System								
E.2.12 LUT/MCC Data Transfer Time	Y(5,7)	X		NA	X(7)			
E.2.13 Pre-pass Check	Y(7)	Y		Y(15)	Y(15)			
E.2.14 Pass Scheduling Accuracy	Y(5,12)	X		Y(13)	Y(12)			
E.2.15 Orbit Accuracy	Y(5,12)	X(12)		Y	Y(12)			
E.3 Calibration Factors								
Sarsat								
E.3.1 Sarsat Tcal	Y(12,15)	Y		Y	Y (S-4 only)			
E.3.2 Sarsat Fcal	Y(12,15)	Y		Y	Y (S-4 only)			
Sarsat & Cospas								
E.33 Sarsat and Cospas Orbit Vectors	Y	Y		Y	Y			

MCC	Norway	Pakistan	Russia	Singa-pore	Spain	UK	USA	
E.2 Quality Indicators (Cont.)								
LUT/MCC Sub-System								
E.2.12 LUT/MCC Data Transfer Time	X(8)		Y	Y(7)	X	Y(4)	Y	
E.2.13 Pre-pass Check	Y		X	Y(4)	X	Y(4)	Y	
E.2.14 Pass Scheduling Accuracy	Y		X	X	?	Y(4)	Y	
E.2.15 Orbit Accuracy	Y		X	Y(4)	?	Y(4)	Y	
E.3 Calibration Factors								
Sarsat								
E.3.1 Sarsat TCal	Y		-	-	-	-	Y	
E.3.2 Sarsat FCal	-		-	-	-	-	Y	
Sarsat & Cospas								
E.33 Sarsat and Cospas Orbit Vectors	Y		-	-	-	-	?	

- END OF ANNEX E -

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ANNEX F

ANOMALY NOTIFICATION FORMATS

The System anomaly notification message is transmitted according to the guidance contained in section 3.6 of this document and section 3.7 of Cospas-Sarsat Data Distribution Plan (C/S A.001). For messages to be transmitted to all MCCs, use SIT 605 format. For messages to be transmitted to specific MCCs, use SIT 915 format.

Example of System Anomaly Message to all MCCs:

/00001 00000/2270/94 123 1845

/605/xxx0 (where xxx is the MCC to which this message is transmitted)

/SYSTEM ANOMALY NOTIFICATION MESSAGE

(include narrative test here to describe System anomaly concerning performance paramerters, quality indicators, or calibration factors)

/LASSIT

/ENDMSG

Example of System Anomaly Message to a specific MCC or Ground Segment Provider:

/00001 00000/2270/94 123 1845

/915/3660

/SYSTEM ANOMALY NOTIFICATION MESSAGE

(include narrative test here to describe System anomaly concerning performance parameters, quality indicators, or calibration factors)

/LASSIT

/ENDMSG

F.1 - LEOLUT AVAILABILITY STATUS MESSAGES

F.1.1 - SIT 915 Warning Message

[DATE: HHHH UTC, DD MONTH YEAR]
FROM: XXMCC
TO: YYMCC
SUBJECT: LEOLUT AVAILABILITY STATUS WARNING MESSAGE

1. IN ACCORDANCE WITH COSPAS-SARSAT QMS PLEASE BE ADVISED THAT THE LEOLUT [ID] AND SATELLITE [ID] COMBINATION IS NOT MEETING THE REQUISITE AVAILABILITY CRITERION. [AVAILABILITY: xx% ON DATE: DD MONTH YEAR].
2. REQUEST A CHECK OF THE STATUS OF LEOLUT [ID].
3. CONTINUED REDUCED AVAILABILITY WILL RESULT IN THE AVAILABILITY STATUS OF LEOLUT [ID] AND SATELLITE [ID] BEING CHANGED TO ONE OF NON–CONFORMITY ON THE COSPAS-SARSAT WEB SITE AND THE GROUND SEGMENT BEING ADVISED.

REGARDS

F.1.2 - SIT 605 Status Message
(Advising non-conformity)

[DATE: HHHH UTC, DD MONTH YEAR]
FROM: XXMCC
TO: ALL MCCS

SUBJECT: LEOLUT AVAILABILITY NON-CONFORMITY STATUS MESSAGE

1. IN ACCORDANCE WITH COSPAS-SARSAT QMS PLEASE BE ADVISED THAT THE LEOLUT [ID] AND SATELLITE [ID] COMBINATION IS NOT MEETING THE REQUISITE AVAILABILITY CRITERION AS OF DATE: DD MONTH YEAR.

2. THE CORRESPONDING CHANGE HAS BEEN MADE TO THE COSPAS-SARSAT WEBSITE.

REGARDS

F.1.3 - SIT 605 Status Message
(Advising return to normal operations)

[DATE: HHHH UTC, DD MONTH YEAR]

FROM: XXMCC
TO: ALL MCCS
SUBJECT: LEOLUT AVAILABILITY CONFORMITY STATUS MESSAGE

1. IN ACCORDANCE WITH COSPAS-SARSAT QMS PLEASE BE ADVISED THAT THE LEOLUT [ID] AND SATELLITE [ID] COMBINATION AVAILABILITY HAS RETURNED TO NORMAL AS OF DATE: DD MONTH YEAR.
2. THE CORRESPONDING CHANGE HAS BEEN MADE TO THE COSPAS-SARSAT WEBSITE.

REGARDS

Note: Reference to XXMCC will be the nodal MCC supporting the MCC responsible for the LEOLUT.

F.2 - GEOLUT AVAILABILITY STATUS MESSAGES

F.2.1 - SIT 915 Warning Message

[DATE: HHHH UTC, DD MONTH YEAR]
FROM: XXMCC
TO: YYMCC
SUBJECT: GEOLUT AVAILABILITY STATUS WARNING MESSAGE

1. IN ACCORDANCE WITH COSPAS-SARSAT QMS PLEASE BE ADVISED THAT THE GEOLUT [ID] AND SATELLITE [ID] COMBINATION IS NOT MEETING THE REQUISITE AVAILABILITY CRITERION. [AVAILABILITY: xx% ON DATE: DD MONTH YEAR].
2. REQUEST A CHECK OF THE STATUS OF GEOLUT [ID].
3. CONTINUED REDUCED AVAILABILITY WILL RESULT IN THE AVAILABILITY STATUS OF GEOLUT [ID] AND SATELLITE [ID] BEING CHANGED TO ONE OF NON–CONFORMITY ON THE COSPAS-SARSAT WEB SITE AND THE GROUND SEGMENT BEING ADVISED.

REGARDS

F.2.2 - SIT 605 Status Message (Advising non-conformity)

[DATE: HHHH UTC, DD MONTH YEAR]
FROM: XXMCC
TO: ALL MCCS

SUBJECT: GEOLUT AVAILABILITY NON-CONFORMITY STATUS MESSAGE

1. IN ACCORDANCE WITH COSPAS-SARSAT QMS PLEASE BE ADVISED THAT THE GEOLUT [ID] AND SATELLITE [ID] COMBINATION IS NOT MEETING THE REQUISITE AVAILABILITY CRITERION AS OF DATE: DD MONTH YEAR.

2. THE CORRESPONDING CHANGE HAS BEEN MADE TO THE COSPAS-SARSAT WEBSITE.

REGARDS

F.2.3 - SIT 605 Status Message
(Advising return to normal operations)

[DATE: HHHH UTC, DD MONTH YEAR]

FROM: XXMCC
TO: ALL MCCS
SUBJECT: GEOLUT AVAILABILITY CONFORMITY STATUS MESSAGE

1. IN ACCORDANCE WITH COSPAS-SARSAT QMS PLEASE BE ADVISED THAT THE GEOLUT [ID] AND SATELLITE [ID] COMBINATION AVAILABILITY HAS RETURNED TO NORMAL AS OF DATE: DD MONTH YEAR.
2. THE CORRESPONDING CHANGE HAS BEEN MADE TO THE COSPAS-SARSAT WEBSITE.

REGARDS

Note: Reference to XXMCC will be the nodal MCC supporting the MCC responsible for the GEOLUT.

F.3 - LEOLUT ACCURACY STATUS MESSAGES

F.3.1 - SIT 915 Warning Message

[DATE: HHHH UTC, DD MONTH YEAR]
FROM: XXMCC
TO: YYMCC

SUBJECT: LEOLUT LOCATION ACCURACY STATUS WARNING MESSAGE

1. IN ACCORDANCE WITH COSPAS-SARSAT QMS PLEASE BE ADVISED THAT THE LEOLUT [ID] AND SATELLITE [ID] COMBINATION IS NOT MEETING THE REQUISITE LOCATION ACCURACY CRITERION. [THE PERFORMANCE FOR THIS COMBINATION IS R.5: xx%, R.10: yy% AS OF DATE: DD MONTH YEAR 0000 UTC].
2. REQUEST A CHECK OF THE STATUS OF LEOLUT [ID].
3. A 5-KM. LOCATION ACCURACY WORSE THAN 60% OR A 20-KM. LOCATION ACCURACY WORSE THAN 80% ON NOMINAL SOLUTIONS WILL RESULT IN THE LOCATION ACCURACY AND AVAILABILITY STATUS OF LEOLUT [ID] AND SATELLITE [ID] BEING CHANGED TO ONE OF NON–CONFORMITY ON THE COSPAS-SARSAT WEB SITE AND THE GROUND SEGMENT BEING ADVISED THAT DOPPLER SOLUTION DATA FROM LEOLUT [ID] AND SATELLITE [ID] WILL NOT BE DISTRIBUTED.

REGARDS

F.3.2 - SIT 605 Status Message
(Advising non-conformity)

[DATE: HHHH UTC, DD MONTH YEAR]
FROM: XXMCC
TO: ALL MCCS

SUBJECT: LEOLUT LOCATION ACCURACY NON-CONFORMITY STATUS MESSAGE

1. IN ACCORDANCE WITH COSPAS-SARSAT QMS PLEASE BE ADVISED THAT THE LEOLUT [ID] AND SATELLITE [ID] COMBINATION IS NOT MEETING THE REQUISITE LOCATION ACCURACY CRITERION [THE PERFORMANCE FOR THIS COMBINATION IS R.5: xx%, R.20: yy% AS OF DATE: DD MONTH YEAR 0000 UTC].
2. THE CORRESPONDING CHANGES TO THE LOCATION ACCURACY AND AVAILABILITY STATUS HAVE BEEN MADE TO THE COSPAS-SARSAT WEBSITE AND DOPPLER SOLUTION DATA FOR THE COMBINATION LEOLUT [ID] AND SATELLITE [ID] IS BEING SUPPRESSED.

REGARDS

F.3.3 - SIT 605 Status Message
(Advising return to normal operations)

[DATE: HHHH UTC, DD MONTH YEAR]
FROM: XXMCC
TO: ALL MCCS

SUBJECT: LEOLUT LOCATION ACCURACY CONFORMITY STATUS MESSAGE

1. IN ACCORDANCE WITH COSPAS-SARSAT QMS PLEASE BE ADVISED THAT THE LEOLUT [ID] AND SATELLITE [ID] COMBINATION LOCATION ACCURACY HAS RETURNED TO NORMAL AS OF DATE: DD MONTH YEAR
2. THE CORRESPONDING CHANGE HAS BEEN MADE TO THE COSPAS-SARSAT WEBSITE AND DOPPLER SOLUTION DATA FOR THE COMBINATION LEOLUT [ID] AND SATELLITE [ID] IS NO LONGER BEING SUPPRESSED.

REGARDS

Note: Reference to XXMCC will be the nodal MCC supporting the MCC responsible for the LEOLUT.

- END OF ANNEX F -

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ANNEX G

GUIDELINES FOR DETECTING AND REPORTING ON LARGE LOCATION ERRORS (DOPPLER PROCESSING ANOMALIES)

1. Detecting Large Errors at an MCC

The main sources of information for an MCC are:

i) SPOCs/RCCs or other SAR organisations;
ii) Other Cospas-Sarsat MCCs; and
iii) MCC's data file, by comparison to the complete set of locations received for each operational beacon.

2. Data Items to Be Reported

2.1 By SPOCs/RCCs:

The following data items (as available) should be collected by the reporting SPOC/RCC and forwarded to its associated MCC, no later than two weeks after the incident:

a) Beacon ID;
b) Actual location;
c) How actual location was determined;
d) ID of beacon carrier;
e) Beacon type;
f) Beacon manufacturer/model/serial number;
g) MCC that sent the alert message to the SPOC/RCC;
h) Message sequence number(s) from reporting MCC;
i) Reason for activation; and
j) Narrative description of incident to include amplifying details not specifically requested above.

2.2 By MCCs to another MCC:

a) Message numbers exchanged on suspect location; and
b) Any additional information that may assist the MCC to identify and resolve the problem.

2.3 By MCCs to the Cospas-Sarsat Secretariat:

MCCs should digitally forward to the Cospas-Sarsat Secretariat a quarterly report of large location errors using a Microsoft Access Large Location Error Database and associated entry form (form G.1). The database format and entry form are available digitally from the Secretariat, upon request.

MCCs are encouraged to make every effort to determine the true location of the source and not rely on the MCC merged positions. This may result in each MCC only reporting large location errors in which the actual location is confirmed, likely in their own service areas.

2.3.1 The following conditions should be considered in identifying the causes of large location errors:

a) Marginal conditions

low number of points

extreme CTA

TCA not bracketed by data points

b) Interference

c) Equipment faults

MCC not performing to specification

LEOLUT/GEOLUT not performing to specification

satellite payload instruments not performing to specification

beacon not performing to specification

d) Processing error

incorrect orbit vectors at LEOLUTs

poor SARP calibration (incorrect time or frequency calibration parameters used by LEOLUT)

satellite clock rollover

transposition of data fields (Doppler processing used a data point to calculate the location that did not come from the same beacon event)

e) Beacon activation during satellite pass.

2.3.2 Identifying the cause of large location errors (when it is not obvious) is easier if the following set of data is available:

a) All information received on suspect locations: from directly connected LUTs or from other MCCs (SIT 125, 135);

b) All information received from SAR sources, particularly the beacon ACTUAL POSITION, even if not very accurate;

c) Location summary for this particular beacon (attach summary); and

d) Whenever possible, the time/frequency measurements for the set of data points.

2.4 If the actual position is known (other Cospas-Sarsat locations or SAR sources), MCCs should:

a) Calculate the satellite pass prediction table for this position and period of time; and
   i) Compare actual CTA and location calculated CTA;
   ii) Compare actual TCA and location calculated TCA; and
   iii) Compare actual AOS, LOS and dates of first and last points;

b) Calculate the ratio of received/expected points using Table D.4; and

c) Add an entry to the MS Access Large Location Error table using the data entry form provided by the Secretariat.

2.5 Along with the data documented in the MS Access Large Location Error data entry form, the following data may be useful in analysing large location errors:

a) Orbit vectors used by the LEOLUT at the time

b) LEOLUT SARP calibration data (if SARP data points were used)

c) GEOLUT/LEOLUT calibration data (if GEOSAR data was used)

d) LUT solution data, including time, frequency of data points used

e) Dot plots

f) Beacon information

   beacon manufacturer and model

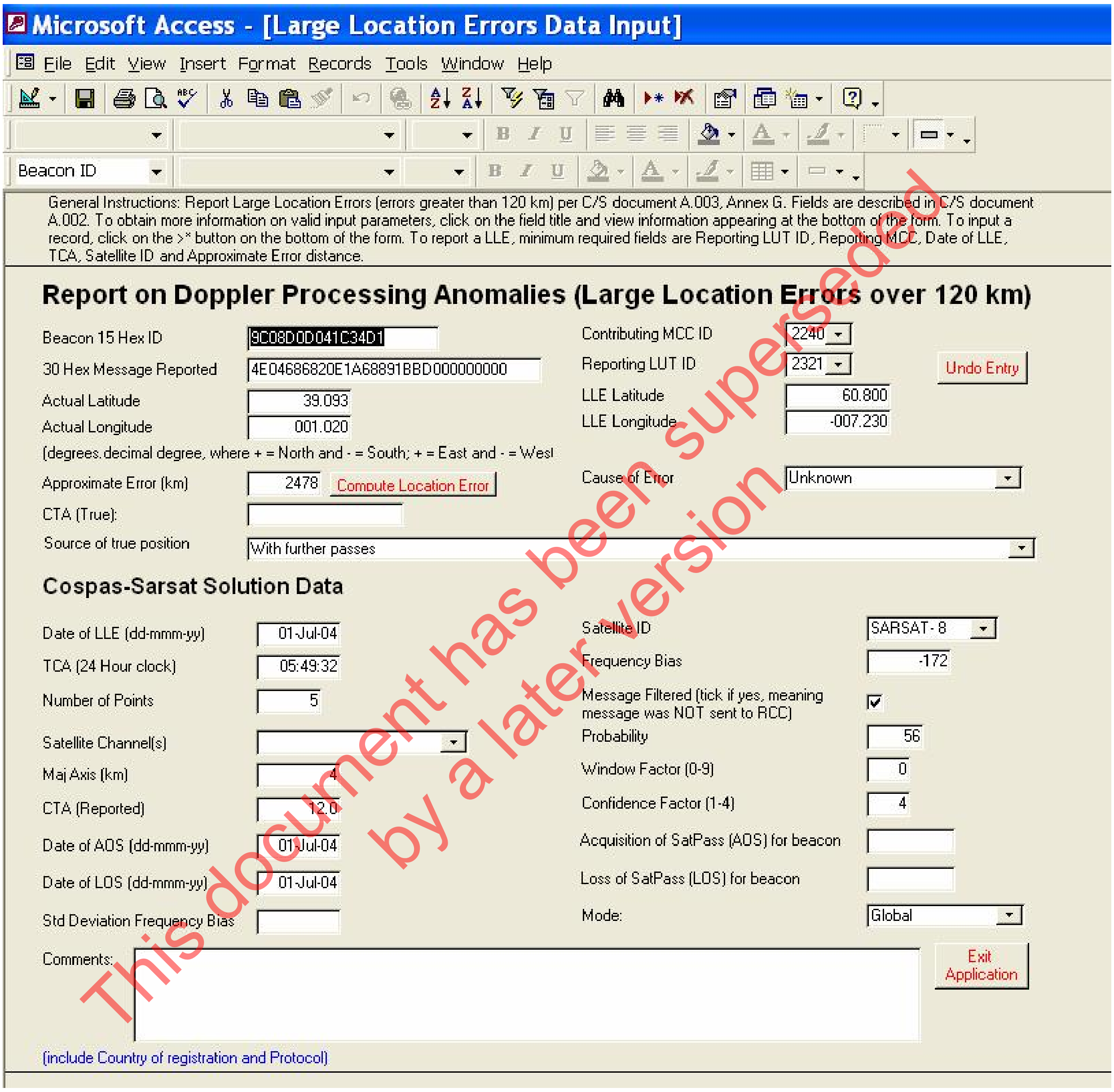
   beacon transmit frequency

   beacon EIRP and antenna characteristics

g) Characterisation data/analysis conducted on interferers and the event.

Note: For large location errors, location calculated CTA and SDV are no more accurate than the calculated positions. Hence they are of little help to identify large errors.

Form G.1: Report on Large Location Errors
(Digital Version Available from the Secretariat)



Microsoft Access - [Large Location Errors Data Input]

File Edit View Insert Format Records Tools Window Help

Beacon ID

General Instructions: Report Large Location Errors (errors greater than 120 km) per C/S document A.003, Annex G. Fields are described in C/S document A.002. To obtain more information on valid input parameters, click on the field title and view information appearing at the bottom of the form. To input a record, click on the >* button on the bottom of the form. To report a LLE, minimum required fields are Reporting LUT ID, Reporting MCC, Date of LLE, TCA, Satellite ID and Approximate Error distance.

Report on Doppler Processing Anomalies (Large Location Errors over 120 km)

Beacon 15 Hex ID	9C08D0D041C34D1	Contributing MCC ID	2240
30 Hex Message Reported	4E04686820E1A68891BBD000000000	Reporting LUT ID	2321
Actual Latitude	39.093	LLE Latitude	60.800
Actual Longitude	001.020	LLE Longitude	-007.230
Approximate Error (km)	2478	Cause of Error	Unknown
CTA (True):			
Source of true position	With further passes		

(degrees.decimal degree, where + = North and - = South; + = East and - = West

Undo Entry

Compute Location Error

Cospas-Sarsat Solution Data

Date of LLE (dd-mmm-yy)	01-Jul-04	Satellite ID	SARSAT-8
TCA (24 Hour clock)	05:49:32	Frequency Bias	-172
Number of Points	5	Message Filtered (tick if yes, meaning message was NOT sent to RCC)	☑
Satellite Channel(s)		Probability	56
Maj Axis (km)	4	Window Factor (0-9)	0
CTA (Reported)	12.0	Confidence Factor (1-4)	4
Date of AOS (dd-mmm-yy)	01-Jul-04	Acquisition of SatPass (AOS) for beacon	
Date of LOS (dd-mmm-yy)	01-Jul-04	Loss of SatPass (LOS) for beacon	
Std Deviation Frequency Bias		Mode:	Global

Comments:

(include Country of registration and Protocol)

Exit Application

- END OF ANNEX G -

ANNEX H

DATA COLLECTION FOR ANALYSIS OF 406 MHz BEACON MESSAGE PROCESSING ANOMALIES

Reporting Period (DD Month YY DD Month YY): ____________
Reporting MCC: ____________
Total number of processed messages (NNNNN): ____________
Number of single point LEOSAR message processing anomalies: ____________
Number of GEOSAR message processing anomalies: ____________
Number of single point LEOSAR processing anomalies filtered: ____________
Number of GEOSAR processing anomalies filtered: ____________

The tabular structure outlined below can be used to assist Ground Segment operators track the data required to derive the number of processed messages, processing anomalies and filtered processing anomalies to be reported (see above). This table, if used, would provide a foundation for more detailed analysis if required. Along with this table, the following data may be useful in analysing message processing anomalies:

a) Calculated Doppler location for both A and B solutions
b) Bias frequency as measured by the LEOLUT and/or GEOLUT
c) LUT solution data, including time, frequency of data points used
d) Dot plots
e) Beacon information
   beacon manufacturer and model
   beacon transmit frequency
   beacon EIRP and antenna characteristics
f) Characterisation data/analysis conducted on interferers and the event.

Beacon Message Received	Beacon Message Transmitted	No of Points/ Integration	LUT	Satellite	Processing Channels	Day and Time of Beacon Msg received	Visibility Time (LEO)	MCC Ref No	Reason for not Passing MCC Validation	Location Data, Lat	Location Data, Long	Number of Corrected Errors in the Message	Approx Power (dBm)	Approx C/N_0 (dB)	Cause	Message Filtered
1	2*	3	4	5	6	7	8	9*	10	11*	12*	13*	14*	15*	16*	17*
30 Hex	30 Hex	nn	nnnn	S,C,G,I	n 1)	Hr/Min/ Year/ Month/ Day	min	nnnn	n 2)	±nn°nn′ (+=N, -=S)	±nnn°nn′ (+=E, -=W)	0/1/2	nn	nn	a 3)	Y/N

Note: * represents optional fields in the table

Table Entry Codes

1) 1 SARP
   2 SARR
   3 GEOSAR

2) 0 Passed MCC validation
   1 Country code <200, >780, or unallocated country code between 200 and 780
   2 Protocol code

3 Baudot characters
4 Binary coded decimal fields
5 Encoded latitude and longitude
6 Beacons whose message indicate the use of SART 9 GHz homer#
7 Non-assigned Cospas-Sarsat type approval number
8 Wrong BCH
9 Other nationally defined
10 Supplementary data bits

3) H High bit error rate
C Synchronisation errors
I Interference
L GEOLUT or LEOLUT not performing to specification
S Satellite payload instruments not performing to specification
B Beacon not performing to specification
M MCC not performing to specification

At the time that this table was created there were no Cospas-Sarsat type approved beacons which used the 9 GHz SART transponder as their only homing device. Consequently, at least one MCC filters alert messages which indicate that this type of beacon is used.

- END OF ANNEX H -

ANNEX I

COLLECTING AND REPORTING DATA FOR SAR EVENT ANALYSIS

I.1 Procedure for Collecting Cospas-Sarsat Data on SAR Incidents

The Cospas-Sarsat Council agreed the following procedure for collecting Cospas-Sarsat data on particular SAR incidents (CSC-15 Report, Annex 5):

a) any Representative of a Cospas-Sarsat Participating Country with direct interest in a particular SAR incident, or representatives from international organisations with responsibilities on SAR matters (ICAO and IMO), may discuss with the Chairperson of the Council, either directly or through the Secretariat, the need for collecting data concerning the particular SAR incident from one or several Ground Segment operators;

b) Administrations from countries not participating in the Cospas-Sarsat System should address any requests for Cospas-Sarsat data on a SAR incident to one of the Cospas-Sarsat Ground Segment Providers or ICAO or IMO, and any such request should be conveyed immediately to the Chairperson of the Council, directly or through the Secretariat;

c) the Council Chairperson, if satisfied that it would be appropriate, will instruct the Secretariat to ask the appropriate MCC operators to provide the required data;

d) the Secretariat will collate all relevant data provided by the Cospas-Sarsat MCCs;

e) the Council Chairperson, after consultation with other Parties' Representatives, will establish an ad-hoc group of experts from the MCC operators involved, to analyse the available Cospas-Sarsat data, either by correspondence or as a splinter group during a regular Cospas-Sarsat meeting, and forward their conclusions to the Secretariat for distribution to, and consideration by, the Parties and the MCC operators involved; and

f) after review by the Council (or by the Parties if the matter is urgent) of the conclusions / recommendations of the ad-hoc group of experts and any further comments from the MCC operators involved, the Chairperson of the Council will direct the Secretariat on the release of the collected Cospas-Sarsat incident data, the conclusions of the analysis by the Cospas-Sarsat experts and/or any official Cospas-Sarsat comments, to the requesting Cospas-Sarsat Participant or the responsible international organisation (ICAO or IMO), as appropriate.

I.2 Data to be Collected and Reported

A general description of the data to be provided to the Secretariat for SAR event analysis is included below. All data is to be provided as available in the specific Ground Segment equipment. When possible the data should be provided in an electronic format, preferably as comma delimited text files or Microsoft Access database tables, accompanied by a description of the data format provided.

I.2.1 General

The following narrative information should be provided:

a) status of associated Ground Segment equipment during time of event;

b) status of Space Segment equipment during time of event (Space Segment Providers);

c) orbitography beacon throughput/accuracy during time of event* (France, USA, and others as possible);

d) 15 character beacon hexadecimal identification* (default value as appropriate) for 406 MHz beacon(s) associated with SAR event;

e) list of other SAR incidents detected/reported during the time period of analysis (121.5 MHz and 406 MHz); and

f) status of interference detected during the time period of analysis.

I.2.2 MCC Data to be Collected and Reported for SAR Incident Investigated

a) input and output messages from/to other MCCs; and

b) formatted input from associated LUTs.

I.2.3 LEOLUT Data to be Collected and Reported

a) pass schedule and tracking result summary for requested period;

b) dot plots, as available, (.bmp, .jpg, or .pcx formats if possible) for LUTs capable of local-mode reception of beacon associated with SAR event; and

c) solution information such as time of data points received and used, as available.

I.2.4 GEOLUT Data to be Collected and Reported*

a) time of first and last detection for specific beacon ID;

b) average frequency bias of 406 MHz beacon transmissions; and

c) any noted anomalies or irregularities with beacon transmission or processing.

Note: * Applies to 406 MHz SAR events only.

- END OF ANNEX I -

ANNEX J

COSPAS-SARSAT GROUND SEGMENT SYSTEM TEST

The following System test will be conducted to help confirm the operational status of commissioned LEOLUTs, GEOLUTs and MCCs in the Cospas-Sarsat System.

Table J.1 identifies the test messages that will be transmitted by a beacon signal simulator generator or test beacon. Operational beacons are used to allow LEOLUTs, GEOLUTs and MCCs to automatically transmit specific data through the System without requiring modifications. A country is specified under the column "Test Bcn" when the test requires that the message be transmitted from a specific geographical location. For LEOSAR testing a single LEOSAR satellite shall be used for receiving all test signals. The satellite selected shall have a fully functional SARP and SARR.

Table J.2 identifies expected LEOLUT and MCC processing and Table J.4 identifies the expected MCC message distribution based on the solutions produced by LEOLUTs, with no GEOLUT data being available to the MCC. Table J.3 identifies possible GEOLUT and MCC processing, assuming no LEOLUT data being available at the MCC. MCC processing may differ from the results depicted in Tables J.2 and J.3 and still conform to Cospas-Sarsat specifications in the following conditions:

- Data for a specific test is reported to the MCC from another satellite prior to the expected satellite (e.g. GEOSAR data is reported prior to expected LEOSAR data).
- Global data is processed by the MCC in a different order than it was transmitted, for a series of tests involving the same beacon ID.
- Combined LEO/GEO processing generates a Doppler location from two (2) transmitted bursts.

In such instances the Ground Segment operator should analyse the MCC output to confirm MCC processing.

GEOLUT processing might differ from the information presented in Table J.3 and still conform to Cospas-Sarsat specifications in the following conditions:

- Multiple uplink bursts for a specific test do not result in confirmed beacon messages, due to the nature of the GEOLUT integration process.
- The uplinked data for a specific test is outside the footprint of the GEOSAR satellite tracked by a GEOLUT. (eg. a GEOLUT tracks GOES-West, which can not detect data uplinked from Toulouse.)
- A GEOLUT sends invalid data to the MCC in accordance with section 4.2.9 of document C/S T.009.

In such cases the GEOLUT operators should analyse the received results to evaluate their correctness.

The Test Coordinator may change the country codes used to test SSAS beacons, provided that:

- The Test Coordinator submits the proposed country code changes prior to the Joint Committee meetings along with the resultant changes to Tables J.1 through J.4 of document C/S A.003, Annex J,
- there is at least one country represented from each Data Distribution Region (DDR),
- both the countries that are affected by the change and their host nodal MCC agree to the proposed change during the test planning phase,
- all MCCs are notified of the changes prior to the test and are provided with a list of the new 406 beacon messages that will be used, and
- all MCCs are provided with changes to Tables J.1 through J.4 that apply for that test.

TABLE J.1: List of 406 MHz Test Messages to be Generated by Beacon Simulator to Support System Level Test

Ref. Num Test Bcn	(Pass) Date/ Time	Transmitted 30 Hex Code; Default 15 Hex Id, bits 26-85 (9 bit Frame Synchronisation)	Number of Bursts; Transmit Freq.	Comments
1	(1) TBD	CC7478A69A69A68C0D498FE0FF0F61 98E8D34D34D34D1	1 406.025	Test Objectives : LUT, MCC beacon message validation. Two (2) bit errors at bits 44, 48. Invalid country code.
2	(1) TBD	96E9B93089C14CDE5215B781000D6D 2DD37261138299B	1 406.025	Test Objectives : LUT, MCC beacon message validation. Spare protocol code in bits 37-40.
3 USA	(1) TBD	96EA0000D8894D7CAD91F79F3C0010 2DD40001BF81FE0	10 406.025	Test Objectives: LUT, MCC beacon message validation. USA National Location Protocol coded beacon with invalid encoded position in PDF-1 and default encoded position in PDF-2.
4 USA	(1) TBD	56E30E1A4324920310DBC000000000 ADC61C348649240	2 406.025	Test Objectives: LUT, MCC beacon message validation. 4 bit errors in BCH-1 (bits 103-106). LUT filtering bad points for Doppler processing.
		56E30E1A4324920310DBC000000000	1 406.029	Same Id as above. Frequency changed.
		56E30E1A4324920310DBC000000000	4 406.025	Same Id as above. Frequency changed.
		56E30E1A4324920310DBC000000000	1 406.029	Same Id as above. Frequency changed.
		56E30E1A4324920310DBC000000000	2 406.025	Same Id as above. Frequency changed.
5 USA	(1) TBD	96E20000007FDFFC4AE03783E0F66C 2DC4000000FFBFF	10 406.025	Test Objectives: MCC.Processing. USA EPIRB with Doppler position in Greenbelt, no encoded position.

Ref. Num **Test Bcn**	**(Pass) Date/ Time**	**Transmitted 30 Hex Code; Default 15 Hex Id, bits 26-85 (9 bit Frame Synchronisation)**	**Number of Bursts; Transmit Freq.**	**Comments**
6 FRANCE	(2) TBD	96E20000002B803713C8F78E010D07 2DC4000000FFBFF	1 406.025	Test Objectives: LEO/GEO LUT combined processing. MCC Processing. USA EPIRB with Encoded position in Toulouse, no Doppler position.
		96E20000002B803713C8F78E010D07	1 406.026	Same Id as above. Frequency changed.
7 USA	(3) TBD	96E2000000272998994637 01261BF1 2DC4000000FFBFF	2 406.025	Test Objectives: MCC Ambiguity Resolution. USA EPIRB with Encoded position in Greenbelt, no Doppler position.
8 USA	(4) TBD	96E200000026A99CDA28B780230987 2DC4000000FFBFF	2 406.025	Test Objectives: MCC Post Ambiguity Resolution. USA EPIRB with Encoded position near Greenbelt, no Doppler position.
9 FRANCE	(1) TBD	8E340000002B803231B3F68C421815 1C68000000FFBFF	3 406.028	Test Objectives: LUT Beacon Message Processing, MCC Ambiguity Resolution. French ELT with Encoded and Doppler positions in Toulouse. Encoded position is (43.551, 1.466)
		8E340000002B803231B3F68E011E5C 1C68000000FFBFF	3 406.028	Encoded position updated to (43.559, 1.482)
10 FRANCE	(2) TBD	8E3401000026A999F853B683E0F00E 1C68000000FFBFF	1 406.028	Test Objectives: LUT Beacon Message Processing, MCC Post Ambiguity Resolution. French ELT with Encoded position in Greenbelt and Doppler position in Toulouse. Default encoded position in PDF-2. Encoded position (38.50, 76.75) is outside the LEO satellite footprint. One (1) bit error at bit 48 in PDF-1.
		8E3401000027299DBB3D3601261D99 1C68000000FFBFF	2 406.028	Encoded position updated to (38.996, 76.851.) One (1) bit error at bit 48 in PDF-1 and two (2) bit errors at bits 141 and 143 in BCH-2.
		8E3401000027299DBB3D3601261D93 1C68000000FFBFF	1 406.028	One (1) bit error at bit 48 in PDF-1.

Ref. Num Test Bcn	(Pass) Date/ Time	Transmitted 30 Hex Code; Default 15 Hex Id, bits 26-85 (9 bit Frame Synchronisation)	Number of Bursts; Transmit Freq.	Comments
11	(1) TBD	8E361100007FDFFDD859F683E0FC0E 1C6C000000FFBFF	1 406.025	Test Objectives: LUT beacon message validation, MCC no Doppler processing. French EPIRB with default encoded position in PDF-1. No Doppler or encoded position present. Two (2) bit errors at bits 44 and 48 in PDF-1. Two (2) bit errors at bit 133 and 134 in BCH-2.
		8E360011107FDFFDD859C600000075 1C6C000000FFBFF	1 406.025	Three (3) bit errors at bits 52, 56 and 60 in PDF-1.
12 FRANCE	(2) TBD	8E360000002B80368171368E011E5C 1C6C000000FFBFF	2 406.025	Test Objective: MCC Encoded position processing. Encoded position in Toulouse.
13 USA	(3) TBD	0E360000007FDFFE20FAF683E0F00E 1C6C000000FFBFF	2 406.025	Test Objectives: LUT Doppler processing beacon validation, MCC Position Conflict and three point Doppler processing. Doppler position in Greenbelt. Short message with no errors and superfluous data in bits 113 – 144.
		0E360000007FDFFE20FAF683E0FC0E 1C6C000000FFBFF	1 406.025	Short message with superfluous data in bits 113 – 144.
14 FRANCE	(4) TBD	8E360000007FDFFDD859D683E0FE29 1C6C000000FFBFF	10 406.025	Test Objective: MCC beacon message validation, beacon message matching and Ambiguity Resolution. MCC should use Doppler position to resolve ambiguity despite an error in fixed bit 107. The standard location protocol beacon message does not conform to fixed bit requirements (bits 107 – 110). Doppler position in Toulouse.
15 USA	(1) TBD	96E8000007815201C84BB4810007CB 2DD000003F81FE0	4 406.037	Test Objective: LUT beacon message validation. MCC Position Conflict Processing. Doppler position in Greenbelt, encoded position in Florida (30, -82). Complete confirmed beacon message.
		96E8000007815201C84BB4810F0255 2DD000003F81FE0	1 406.037	Encoded position updated to (30, -82.003)
		96E8000007815201C84BB4810F0241 2DD000003F81FE0	1 406.037	Two (2) bit errors at bits 140 and 142 in BCH-2.
		96E8000007815201C84BB4810F0253 2DD000003F81FE0	1 406.037	Two (2) bit errors at bits 142 and 143 in BCH-2.

Ref. Num Test Bcn	(Pass) Date/ Time	Transmitted 30 Hex Code; Default 15 Hex Id, bits 26-85 (9 bit Frame Synchronisation)	Number of Bursts; Transmit Freq.	Comments
16 USA	(2) TBD	96E8000007815201C84BB4810007CB 2DD000003F81FE0	4 406.037	Test Objective : LUT beacon message validation. MCC Ambiguity Resolution. Doppler position in Greenbelt, encoded position in Florida (30, -82). Complete confirmed beacon message.
		96E8000007815201C84BB4810F0255 2DD000003F81FE0	3 406.037	Encoded position updated to (30, -82.003).
17	(1) TBD	D6E10E1A4324920458B9D555555555 ADC21C348649240	2 406.022	Test Objective: MCC beacon message validation. USA Orbitography beacon with a pattern of "01" in the long message. No bit errors.
18	(1) TBD	96E400000026E9985C84F683E0F00E 2DC8000000FFBFF	1 406.025	Test Objective: LUT beacon message validation. USA Standard Location Protocol ELT with encoded position (38.750, -76.750) in PDF-1 and PDF-2. Three (3) bit errors at bits 88, 96 and 104 in BCH-1.
		96E411110026E9995D85F683E0F00E 2DC8000000FFBFF	1 406.027	USA Standard Location Protocol ELT with encoded position (38.750, -76.750) in PDF-1 and PDF-2. Four (4) bit errors at bits 44, 48, 52 and 56 in PDF-1.
		96E411101026E9995D85F683E0F00E 2DC8000000FFBFF	1 406.025	USA Standard Location Protocol ELT with encoded position (38.856,-76.750) in PDF-1 and PDF-2. Four (4) bit errors at bits 44, 48, 52 and 60 in PDF-1.
19	(1) TBD	8E38540009B54CE1D106371408066B 1C7000003F81FE0	1 406.025	Test Objective: LUT beacon message validation. French National Location Protocol ELT with encoded position (38.856, -76.931). Three (3) bit errors at bits 42, 44 and 46 in PDF-1.
20	(1) TBD	D6E6C0000000000A7E0CAFE0FF0146 ADCD80000000001 (0 1101 0000)	6 406.027	Test Objective: LUT beacon message validation for LUTs in local coverage area of test beacon. USA Serialized User Aircraft Address coded beacon with no encoded position. The last 8 bits of the frame synchronization are inverted.

Ref. Num **Test Bcn**	**(Pass) Date/ Time**	**Transmitted 30 Hex Code; Default 15 Hex Id, bits 26-85 (9 bit Frame Synchronisation)**	**Number of Bursts; Transmit Freq.**	**Comments**
21 FRANCE	(1) TBD	96EB02EE092E03128C82B70D300F1D 2DD605DC3F81FE0	1 406.017	Test Objective: LUT beacon message processing, Doppler processing with bad frequency. MCC distribution based on encoded position. USA National Location Protocol PLB with encoded position (36.76; 3.08) in Algeria.
		96EB02EE092E03128C82B70D300F1D 2DD605DC3F81FE0	1 406.022	Same Id as above. Frequency changed.
		96EB02EE092E03128C82B70D300F1D 2DD605DC3F81FE0	1 406.027	Same Id as above. Frequency changed.
		96EB02EE092E03128C82B70D300F1D 2DD605DC3F81FE0	1 406.032	Same Id as above. Frequency changed.
22 USA	(1)	BFC0270F000002CA2F4015FFFFFFFE 7F804E1E0000059	5 406.022	Test Objective: MCC beacon message validation. Doppler position in Greenbelt. Multiple invalid beacon messages which decode as an orbitography beacon.
23 FRANCE	(1) TBD	AC6CF423F0A1C2563085369F400819 58D9E847E0FFBFF	6 406.037	Test Objective: SSAS Processing Brazil Country Code - Doppler position in Toulouse, encoded position in South Africa (-33.881, 18.500)
24 FRANCE	(1) TBD	A59C5161502B40353879B6CA420129 4B38A2C2A0FFBFF	6 406.037	Test Objective: SSAS Processing – South Africa Country Code - Doppler position in Toulouse, encoded location in Toulouse
25 FRANCE	(1) TBD	9DDCBDE3102BC032F5FC3630822F69 3BB97BC620FFBFF	6 406.037	Test Objective: SSAS Processing – Hong Kong Country Code – Doppler Position in Toulouse, encoded location in the Toulouse
26 USA	(1) TBD	A5DCA2C2A098D3095DCB7681E9B0B3 4BB9458540FFBFF	6 406.037	Test Objective: SSAS Processing Algeria Country Code - Doppler in USA, encoded location in Australia (-24.758, 152.412)
27 USA	(1) TBD	8E8C87A23026E99E152336BAE6A5B7 1D190F4460FFBFF	6 406.037	Test Objective: SSAS Processing – UK Country Code - Doppler Position in USA, encoded location in USA

Ref. Num Test Bcn	(Pass) Date/ Time	Transmitted 30 Hex Code; Default 15 Hex Id, bits 26-85 (9 bit Frame Synchronisation)	Number of Bursts; Transmit Freq.	Comments
28 USA	(1) TBD	911C6C81C026E99DAF0F3696258F9E 2238D90380FFBFF	6 406.037	Test Objective: SSAS Processing Russia Country Code - Doppler Position in USA, encoded location in USA

TABLE J.2: Expected LEOLUT and MCC Processing for System Level Test

Ref. Num	Message to be Transmitted by LUT (Default 15 Hex Id, bits 26-85)	Doppler Position	Encoded Position	Comments
1	CC7469A69A69A68C0D498FFFFFFFFF (98E8D34D34D34D1)	n/a	n/a	LEOLUT corrects two bit errors and sends corrected message to MCC. Bits 113 to 144 are set to all "1" because PDF-2 is not confirmed. MCC Action code: Sw0 + Invalid Data -> AW0. MCC suppresses message distribution because the country code is invalid and there is only one burst (DDP, Table III/B.5).
2	96E9B93089C14CDE5215B7FFFFFFFF 2DD37261138299B	n/a	39.000 N 76.900 W	LEOLUT sends unconfirmed complete message with bits 113 - 144 all set to 1 to MCC. MCC Action code: Sw0 + Invalid Data -> AW0. MCC suppresses message distribution due to spare protocol code (DDP, Table III/B.5)
3	96EA0000D8894D7CAD91F79F3C0010 (2DD40001BF81FE0)	38.995 N 76.851 W	98.123 N 77.500 W	LEOLUT sends confirmed complete message to MCC. MCC Action code: Sw0 + I2 -> AW2. MCC sends SIT 125 alert based on the "A" and "B" Doppler positions. Even though the encoded position is invalid there are two or more points available for processing (DDP, Table III/B.5 and Table III/B.6)
4	56E30E1A4324920310DBC0FFFFFFFF (ADC61C348649240)	38.995 N 76.851 W	n/a	LEOLUT sends invalid confirmed message with bits 113 - 144 all set to 1 to MCC. MCC ignores bits beyond short message. MCC Action code: Sw0 + I2 -> AW2. MCC sends SIT 125 alert based on the "A" and "B" Doppler positions. Even though there are 4 bit errors in the message there are two or more matching points available for processing (DDP, Table III/B.3).
5	96E20000007FDFFC4AE03783E0F66C (2DC4000000FFBFF)	38.995 N 76.851 W	n/a	LEOLUT sends confirmed complete message to MCC. MCC Action code: Sw0 + I2 -> AW2. MCC sends SIT 125 alert based on the "A" and "B" Doppler positions.
6	96E20000002B803713C8F78E010D07 (2DC4000000FFBFF)	n/a	43.559 N 1.483 E	LEOLUT sends confirmed complete message to MCC. Frequency difference between the two points prevents combined LEO/GEO LUT processing. MCC Action code: Sw2 + I3 -> AW4. MCC sends SIT 123 alert based on the encoded position (DDP, Figure III/B.2 and Figure III/B.3).

Ref. Num	Message to be Transmitted by LUT (Default 15 Hex Id, bits 26-85)	Doppler Position	Encoded Position	Comments
7	96E2000000272998994637012 61BF1 (2DC4000000FFBFF)	n/a	38.995 N 76.851 W	LEOLUT sends confirmed complete message to MCC. MCC Action code: Sw4 + I3 -> AW7. MCC sends SIT 124 alert based on the match of the encoded position and previous Doppler position. (DDP, Figure III/B.2 and Figure III/B.3).
8	96E200000026A99CDA28B780230987 (2DC4000000FFBFF)	n/a	38.500 N 76.800 W	LEOLUT sends confirmed complete message to MCC. MCC Action code: Sw7 + I3 -> Ct0. MCC filters this alert because ambiguity has been resolved.(DDP, Figure III/B.2 and Figure III/B.3). MCC should also note the position conflict to previous locations.
9	8E340000002B803231B3F68E011E5C (1C68000000FFBFF)	43.559 N 1.482 E	43.559 N 1.482 E	LEOLUT sends updated, confirmed complete message for Standard Location Protocol beacon to MCC. MCC Action code: Sw0 + I7 -> AW7. MCC sends SIT 127 alert based on the match of the encoded and Doppler positions (DDP, Figure III/B.2 and Figure III/B.3)
10	8E3400000027299DBB3D36FFFFFFFF (1C68000000FFBFF)	43.559 N 1.482 E	39.000 N 76.750 W (invalid)	LEOLUT sends valid long message to MCC; however, bits 113 to 144 are set to all "1" because PDF-2 is not confirmed. The encoded position is invalid because it is outside the LEO satellite footprint (DDP, Annex III/B.1.4). MCC Action code: Sw7 + I2--> Ct0. MCC filters this alert because ambiguity has been resolved.(DDP, Figure III/B.2 and Figure III/B.3).
11	8E360000007FDFFDD859F6FFFFFFFF (1C6C000000FFBFF)	n/a	n/a	LEOLUT corrects beacon message from burst number one and sends corrected valid message to MCC, however, bits 113 to 144 are set to all "1" because PDF-2 is not confirmed. MCC Action code: Sw0 + I1 -> AW1. MCC sends SIT 122 alert based on the country code of the beacon (DDP, Figure III/B.2 and Figure III/B.3).
12	8E360000002B80368171368E011E5C (1C6C000000FFBFF)	n/a	43.559 N 1.482 E	LEOLUT sends confirmed complete beacon message to MCC. MCC Action code: Sw1 + I3 -> AW3. MCC sends SIT 122 alert based on the encoded position (DDP, Figure III/B.2 and Figure III/B.3).
13	0E360000007FDFFE20FAF600000000 (1C6C000000FFBFF)	38.995 N 76.851 W	n/a	LEOLUT computes Doppler location, and sends most recent valid message with bits 113 to 144 set to all "0" to MCC MCC Action code: Sw3 + I2 -> AW4. MCC sends SIT 126 based on the "A" and "B" Doppler positions. (DDP, Figure III/B.2 and Figure III/B.3)
14	8E360000007FDFFDD859D683E0FE29 (1C6C000000FFBFF)	43.559 N 1.482 E	n/a	LEOLUT sends valid beacon message to MCC. MCC Action code: Sw4 + I2 -> AW7. MCC sends SIT 127 alert based on the match of the Doppler positions. (DDP, Figure III/B.2 and Figure III/B.3).
15	96E8000007815201C84BB4810007CB 2DD000003F81FE0	38.995 N 76.851 W	30.000 N 82.000 W	LEOLUT sends the first message (only complete confirmed message) to MCC and computes Doppler position. MCC Action code: Sw0 + I4 -> AW4. MCC sends SIT 126 alert based on the "A" and "B" Doppler positions and the encoded position. (DDP, Figure III/B.2 and Figure III/B.3)
16	96E8000007815201C84BB4810F0255 2DD000003F81FE0	38.995 N 76.851 W	30.000 N 82.003 W	LEOLUT sends the updated, confirmed complete message to MCC and computes Doppler position. MCC Action code: Sw4 + I4 -> AW6. MCC sends SIT 127 alert based on the match of the Doppler positions. (DDP, Figure III/B.2 and Figure III/B.3).
17	D6E10E1A4324920458B9D555555555 (ADC21C348649240)	n/a	n/a	LEOLUT sends orbitography beacon message without correcting the long message. MCC suppresses message distribution because beacon type is orbitography.

Ref. Num	Message to be Transmitted by LUT (Default 15 Hex Id, bits 26-85)	Doppler Position	Encoded Position	Comments
18	n/a	n/a	n/a	LEOLUT suppresses beacon alert because no valid message exists and no match available for invalid messages.
19	n/a	n/a	n/a	LEOLUT suppresses beacon alert because message has 3 bit errors and is not confirmed.
20	n/a	n/a	n/a	LEOLUT suppresses beacon messages due to the inverted frame synchronization.
21	96EB02EE092E03128C82B70D300F1D (2DD605DC3F81FE0)	n/a	36.76 N 3.08 E	LEOLUT sends confirmed complete message to MCC. No Doppler location is calculated due to bad frequency. MCC Action code: Sw0 + I3 -> AW3. MCC sends SIT 122 alert based on the encoded position (DDP, Figure III/A.7, Figure III/B.2 and Figure III/B.3).
22	BFC0270F000002CA2F4015FFFFFFFF 7F804E1E0000059	38.995 N 76.851 W	N/A	LEOLUT performs invalid beacon message processing, and provides Doppler location at Greenbelt. Ground segment equipment should not suppress the alert. MCC Action code: Sw0 + I2 -> AW2. MCC sends SIT 125 alert based on the "A" and "B" Doppler positions; even though there are uncorrectable bit errors in the PDF-1 there are two or more matching points available for processing (DDP, Table III/B.3). Due to uncorrectable bit errors in PDF-1, no processing is based on beacon message.
23	AC6CF423F0A1C2563085369F400819 58D9E847E0FFBFF	43.559 N 1.482 E	33.881S 18.500E	LEOLUT sends complete confirmed message to the MCC. The encoded position is invalid because it is outside the LEO satellite footprint (DDP, Annex III/B.1.4) MCC Action code: Sw0 + I2 -> AW2. MCC sends SIT 125 alert based on the routing procedures for SSAS alerts
24	A59C5161502B40353879B6CA420129 4B38A2C2A0FFBFF	43.559 N 1.482 E	43.560N 1.467E	LEOLUT sends complete confirmed message to the MCC. MCC Action code: Sw0 + I7 -> AW7. MCC sends SIT 127 alert based on the routing procedures for SSAS alerts
25	9DDCBDE3102BC032F5FC3630822F69 3BB97BC620FFBFF	43.559 N 1.482 E	43.548N 1.464E	LEOLUT sends complete confirmed message to the MCC. MCC Action code: Sw0 + I7 -> AW7. MCC sends SIT 127 alert based on the routing procedures for SSAS alerts
26	A5DCA2C2A098D3095DCB7681E9B0B3 4BB9458540FFBFF	38.995 N 76.851 W	24.758S 152.412E	LEOLUT sends complete confirmed message to the MCC. The encoded position is invalid because it is outside the LEO satellite footprint (DDP, Annex III/B.1.4) MCC Action code: Sw0 + I2 -> AW2. MCC sends SIT 125 alert based on the routing procedure for SSAS alerts
27	8E8C87A23026E99E152336BAE6A5B7 1D190F4460FFBFF	38.995 N 76.851 W	38.996N 76.861W	LEOLUT sends complete confirmed message to the MCC. MCC Action code: Sw0 + I7 -> AW7. MCC sends SIT 127 alert based on the routing procedures for SSAS alerts
28	911C6C81C026E99DAF0F36962558F9E 2238D90380FFBFF	38.995 N 76.851 W	38.75 N 76.75 W	LEOLUT sends complete confirmed message to the MCC. MCC Action code: Sw0 + I7 -> AW7. MCC sends SIT 127 alert based on the routing procedures for SSAS alerts

TABLE J.3: Expected GEOLUT and MCC Processing For System Level Test

Ref. Num	Message to be Transmitted by LUT (Default 15 Hex Id, bits 26-85)	Encoded Position	Comments
1	CC7469A69A69A68C0D498FFFFFFFFF (98E8D34D34D34D1)	n/a	GEOLUT corrects two bit errors and sends unconfirmed message with bits 113-114 all set to 1 to MCC. MCC Action code: Sw0 + Invalid Data -> AW0. MCC suppresses message distribution because the country code is invalid and there is only one burst (DDP, Table III/B.5).
2	96E9B93089C14CDE5215B7FFFFFFFF 2DD37261138299B	39.000 N 76.900 W	GEOLUT sends unconfirmed complete message with bits 113 - 144 all set to 1 to MCC. MCC Action code: Sw0 + Invalid Data -> AW0. MCC suppresses message distribution due to spare protocol code (DDP, Table III/B.5)
3	96EA0000D8894D7CAD91F7FFFFFFFF or 96EA0000D8894D7CAD91F79F3C0010 (2DD40001BF81FE0)	98.133 N 77.500 W or 98.123 N 77.500 W	GEOLUT sends unconfirmed message with bits 113 - 144 all set to 1 or confirmed complete message to MCC. MCC Action code: Sw0 + Invalid Data -> AW0. MCC suppresses message distribution because the encoded position is invalid and there is no Doppler location (DDP, Table III/B.54 and Table III/B.6)
4	n/a	n/a	GEOLUT does not generate an alert due to uncorrectable PDF-1 bit errors
5	96E20000007FDFFC4AE037FFFFFFFF or 96E20000007FDFFC4AE03783E0F66C (2DC4000000FFBFF)	n/a	GEOLUT sends unconfirmed message with bits 113 - 144 all set to 1 or confirmed complete message to MCC. MCC Action code: Sw0 + I1 -> AW1. MCC sends SIT 122 alert based on the encoded country code.
6	96E20000002B803713C8F7FFFFFFFF or 96E20000002B803713C8F78E010D07 (2DC4000000FFBFF)	43.500 N 1.500 E or 43.559 N 1.483 E	GEOLUT sends unconfirmed message with bits 113 - 144 all set to 1 or confirmed complete message to MCC. MCC Action code: Sw1 + I3 -> AW3. MCC sends SIT 122 alert based on the encoded position (DDP, Figure III/B.2 and Figure III/B.3).
7	96E2000000272998994637FFFFFFFF or 96E2000000272998994637012 61BF1 (2DC4000000FFBFF)	39.000 N 76.750 W or 38.995 N 76.851 W	GEOLUT sends unconfirmed message with bits 113 - 144 all set to 1 or confirmed complete message to MCC. MCC Action code: Sw3 + I3 -> AW3. MCC sends SIT 123 alert based on the conflict of the encoded position with previous position. (DDP, Figure III/B.2 and Figure III/B.3).

Ref. Num	Message to be Transmitted by LUT (Default 15 Hex Id, bits 26-85)	Encoded Position	Comments
8	96E200000026A99CDA28B7FFFFFFFF or 96E200000026A99CDA28B780230987 (2DC4000000FFBFF)	38.500 N 76.750 W or 38.500 N 76.800 W	GEOLUT sends unconfirmed message with bits 113 - 144 all set to 1 or confirmed complete message to MCC. <u>MCC Action code</u>: Sw3 + I3 -> AW3. MCC sends a SIT 123 (406 MHz position conflict – encoded location information only) because location is greater than 50 km from previous location information. (DDP, Figure III/B.2 and Figure III/B.3).
9	8E340000002B803231B3F6FFFFFFFF or 8E340000002B803231B3F68C421815 or 8E340000002B803231B3F68E011E5C (1C68000000FFBFF)	43.500 N 1.500 E or 43.551 N 1.466 E or 43.559 N 1.482 E	GEOLUT sends unconfirmed message with bits 113 - 144 all set to 1 or confirmed complete message for Standard Location Protocol beacon to MCC. <u>MCC Action code</u>: Sw0 + I3 -> AW3. MCC sends SIT 122 alert based on the encoded positions (DDP, Figure III/B.2 and Figure III/B.3).
10	8E3400000027299DBB3D36FFFFFFFF (1C68000000FFBFF)	39.000 N 76.750 W (invalid)	GEOLUT sends unconfirmed message with bits 113 - 144 all set to 1 message to MCC. <u>MCC Action code</u>: Sw3 + I1 -> AW0 or Sw3 + I3 -> AW3 depending on whether the encoded position is within the GEO satellite footprint (DDP, Annex III/B.1). The MCC only sends the alert (AW3) when the encoded position is within the GEO satellite footprint (DDP, Figure III/B.2 and Figure III/B.3).
11	8E360000007FDFFDD859F6FFFFFFFF (1C6C000000FFBFF)	n/a	GEOLUT corrects beacon message and sends corrected valid message to MCC, however, bits 113 to 144 are set to all “1" because PDF-2 is not confirmed. <u>MCC Action code</u>: Sw0 + I1 -> AW1. MCC sends SIT 122 alert based on the country code of the beacon (DDP, Figure III/B.2 and Figure III/B.3).
12	8E360000002B8036817136FFFFFFFF or 8E360000002B80368171368E011E5C (1C6C000000FFBFF)	43.500 N 1.500 E or 43.559 N 1.482 E	GEOLUT sends unconfirmed message with bits 113 - 144 all set to 1 or confirmed complete beacon message to MCC. <u>MCC Action code</u>: Sw1 + I3 -> AW3. MCC sends SIT 122 alert based on the encoded position (DDP, Figure III/B.2 and Figure III/B.3).
13	0E360000007FDFFE20FAF600000000 (1C6C000000FFBFF)	n/a	GEOLUT sends unconfirmed or confirmed complete message with bits 113 to 144 set to all “0" to MCC <u>MCC Action code</u>: Sw3 + I1 -> AW0. MCC sends no alert. (DDP, Figure III/B.2 and Figure III/B.3).
14	8E360000007FDFFDD859D683E0FE29 (1C6C000000FFBFF)	n/a	GEOLUT sends valid beacon message to MCC. <u>MCC Action code</u>: Sw3 + I1 -> AW0. MCC sends no alert. (DDP, Figure III/B.2 and Figure III/B.3).

Ref. Num	Message to be Transmitted by LUT (Default 15 Hex Id, bits 26-85)	Encoded Position	Comments
15	96E8000007815201C84BB4810007CB or 96E8000007815201C84BB4FFFFFFFF (2DD000003F81FE0)	30.000 N 82.000 W	GEOLUT sends unconfirmed message with bits 113 - 144 all set to 1 or confirmed complete message to the MCC. <u>MCC Action code</u>: Sw0 + I3 -> AW3. MCC sends SIT 122 alert based on the encoded position. (DDP, Figure III/B.2 and Figure III/B.3).
16	96E8000007815201C84BB4810007CB or 96E8000007815201C84BB4810F0255 (2DD000003F81FE0)	30.000 N 82.000 W or 30.000 N 82.003 W	GEOLUT sends, if confirmed, the updated complete message to the MCC. <u>MCC Action code</u>: Sw3 + I3 -> AW0. MCC sends no alert. (DDP, Figure III/B.2 and Figure III/B.3).
17	D6E10E1A4324920458B9D555555555 (ADC21C348649240)	n/a	GEOLUT sends orbitography beacon message without correcting the long message. MCC suppresses message distribution because beacon type is orbitography.
18	n/a	n/a	GEOLUT suppresses beacon alert because no valid message exists.
19	n/a	n/a	GEOLUT suppresses beacon alert because message has 3 bit errors and is not confirmed.
20	n/a	n/a	GEOLUT suppresses beacon messages due to the inverted frame synchronization.
21	96EB02EE092E03128C82B7FFFFFFFF or 96EB02EE092E03128C82B70D300F1D (2DD605DC3F81FE0)	36.76667 N 3.086667 E or 36.76 N 3.08 E	GEOLUT sends unconfirmed message with bits 113 - 144 all set to 1 or confirmed complete message to the MCC. <u>MCC Action code</u>: Sw0 + I3 -> AW3. MCC sends SIT 122 based on the encoded position (DDP, Figure III/A.7, Figure III/B.2 and Figure III/B.3).
22	n/a	n/a	GEOLUT does not generate an alert due to uncorrectable PDF-1 bit errors.
23	AC6CF423F0A1C2563085369F400819 or AC6CF423F0A1C256308536FFFFFFFF	33.881S 18.500E	GEOLUT sends unconfirmed message with bits 113 - 144 all set to 1 or confirmed complete message to the MCC. <u>MCC Action code</u>: Sw0 + I3 -> AW3. MCC sends SIT 122 alert based on the country code (SSAS procedure)

Ref. Num	Message to be Transmitted by LUT (Default 15 Hex Id, bits 26-85)	Encoded Position	Comments
24	A59C5161502B40353879B6CA420129 or A59C5161502B40353879B6FFFFFFFF	43.560N 1.467E	GEOLUT sends unconfirmed message with bits 113 - 144 all set to 1 or confirmed complete message to the MCC. MCC Action code: Sw0 + I3 -> AW3. MCC sends SIT 122 alert based on the country code (SSAS procedure)
25	9DDCBDE3102BC032F5FC3630822F69 or 9DDCBDE3102BC032F5FC36FFFFFFFF	43.548N 1.464E	GEOLUT sends unconfirmed message with bits 113 - 144 all set to 1 or confirmed complete message to the MCC. MCC Action code: Sw0 + I3 -> AW3. MCC sends SIT 122 alert based on the country code (SSAS procedure)
26	A5DCA2C2A098D3095DCB7681E9B0B3 or A5DCA2C2A098D3095DCB76FFFFFFFF	24.758S 152.412E	GEOLUT sends unconfirmed message with bits 113 - 144 all set to 1 or confirmed complete message to the MCC. MCC Action code: Sw0 + I3 -> AW3. MCC sends SIT 122 alert based on the country code (SSAS procedure)
27	8E8C87A23026E99E152336BAE6A5B7 or 8E8C87A23026E99E152336FFFFFFFF	38.996N 76.861W	GEOLUT sends unconfirmed message with bits 113 - 144 all set to 1 or confirmed complete message to the MCC. MCC Action code: Sw0 + I3 -> AW3. MCC sends SIT 122 alert based on the country code (SSAS procedure)
28	911C6C81C026E99DAF0F36962558F9E or 911C6C81C026E99DAF0F369FFFFFFFF	38.75N 76.75W	GEOLUT sends unconfirmed message with bits 113 - 144 all set to 1 or confirmed complete message to the MCC. MCC Action code: Sw0 + I3 -> AW3. MCC sends SIT 122 alert based on the country code (SSAS procedure)

TABLE J.4: Specific MCC Processing for Messages Transmitted in System Level Test

Reference Numbers 1 - 5

Receiving MCC	Destination MCC(1) / SIT Number				
	Test Reference Number				
	1	2	3	4	5
ALMCC	Suppress	Suppress	SPMCC/125	SPMCC/125	SPMCC/125
ARMCC	Suppress	Suppress	USMCC/125	USMCC/125	USMCC/125
ASMCC	Suppress	Suppress	AUMCC/125	AUMCC/125	AUMCC/125
AUMCC	Suppress	Suppress	USMCC/125	USMCC/125	USMCC/125
BRMCC	Suppress	Suppress	USMCC/125	USMCC/125	USMCC/125
CHMCC	Suppress	Suppress	USMCC/125	USMCC/125	USMCC/125
CMC	Suppress	Suppress	USMCC/125	USMCC/125	USMCC/125
CMCC	Suppress	Suppress	USMCC/125	USMCC/125	USMCC/125
CNMCC	Suppress	Suppress	JAMCC/125	JAMCC/125	JAMCC/125
FMCC	Suppress	Suppress	USMCC/125	USMCC/125	USMCC/125
HKMCC	Suppress	Suppress	JAMCC/125	JAMCC/125	JAMCC/125
IDMCC	Suppress	Suppress	AUMCC/125	AUMCC/125	AUMCC/125
INMCC	Suppress	Suppress	CMC/125	CMC/125	CMC/125
ITMCC	Suppress	Suppress	FMCC/125	FMCC/125	FMCC/125
JAMCC	Suppress	Suppress	USMCC/125	USMCC/125	USMCC/125
KOMCC	Suppress	Suppress	JAMCC/125	JAMCC/125	JAMCC/125
NMCC	Suppress	Suppress	FMCC/125	FMCC/125	FMCC/125
NIMCC	Suppress	Suppress	SPMCC/125	SPMCC/125	SPMCC/125
PAMCC	Suppress	Suppress	CMC/125	CMC/125	CMC/125
PEMCC	Suppress	Suppress	USMCC/125	USMCC/125	USMCC/125
SAMCC	Suppress	Suppress	AUMCC/125	AUMCC/125	AUMCC/125
SIMCC	Suppress	Suppress	AUMCC/125	AUMCC/125	AUMCC/125
SPMCC	Suppress	Suppress	USMCC/125	USMCC/125	USMCC/125
TAMCC	Suppress	Suppress	JAMCC/125	JAMCC/125	JAMCC/125
THMCC	Suppress	Suppress	AUMCC/125	AUMCC/125	AUMCC/125
TRMCC	Suppress	Suppress	FMCC/125	FMCC/125	FMCC/125
UKMCC	Suppress	Suppress	FMCC/125	FMCC/125	FMCC/125
USMCC	Suppress	Suppress	NAT. PROC.	NAT. PROC.	NAT. PROC.
VNMCC	Suppress	Suppress	JAMCC/125	JAMCC/125	JAMCC/125

(1) Only the correct MCC destination is listed, an alert to the image position may also be generated.

Reference Numbers 6 – 10 (Table J.4 cont.)

Receiving MCC	Destination MCC[(1)] / SIT Number				
	Test Reference Number				
	6	7	8	9	10
ALMCC	SPMCC/123	SPMCC/124	Suppress	SPMCC/127	Suppress
ARMCC	USMCC/123	USMCC/124	Suppress	USMCC/127	Suppress
ASMCC	AUMCC/123	AUMCC/124	Suppress	AUMCC/127	Suppress
AUMCC	FMCC/123	USMCC/124 FMCC/124	Suppress	FMCC/127	Suppress
BRMCC	USMCC/123	USMCC/124	Suppress	USMCC/127	Suppress
CHMCC	USMCC/123	USMCC/124	Suppress	USMCC/127	Suppress
CMC	FMCC/123	USMCC/124 FMCC/124	Suppress	FMCC/127	Suppress
CMCC	USMCC/123	USMCC/124	Suppress	USMCC/127	Suppress
CNMCC	JAMCC/123	JAMCC/124	Suppress	JAMCC/127	Suppress
FMCC	NAT. PROC.	USMCC/124 NAT. PROC.	Suppress	NAT. PROC.	Suppress
HKMCC	JAMCC/123	JAMCC/124	Suppress	JAMCC/127	Suppress
IDMCC	AUMCC/123	AUMCC/124	Suppress	AUMCC/127	Suppress
INMCC	CMC/123	CMC/124	Suppress	CMC/127	Suppress
ITMCC	FMCC/123	FMCC/124	Suppress	FMCC/127	Suppress
JAMCC	FMCC/123	USMCC/124 FMCC/124	Suppress	FMCC/127	Suppress
KOMCC	JAMCC/123	JAMCC/124	Suppress	JAMCC/127	Suppress
NMCC	FMCC/123	FMCC/124	Suppress	FMCC/127	Suppress
NIMCC	SPMCC/123	SPMCC/124	Suppress	SPMCC/127	Suppress
PAMCC	CMC/123	CMC/124	Suppress	CMC/127	Suppress
PEMCC	USMCC/123	USMCC/124	Suppress	USMCC/127	Suppress
SAMCC	AUMCC/123	AUMCC/124	Suppress	AUMCC/127	Suppress
SIMCC	AUMCC/123	AUMCC/124	Suppress	AUMCC/127	Suppress
SPMCC	FMCC/123	USMCC/124 FMCC/124	Suppress	JAMCC/127	Suppress
TAMCC	JAMCC/123	JAMCC/124	Suppress	JAMCC/127	Suppress
THMCC	AUMCC/123	AUMCC/124	Suppress	AUMCC/127	Suppress
TRMCC	FMCC/123	FMCC/124	Suppress	FMCC/127	Suppress
UKMCC	FMCC/123	FMCC/124	Suppress	FMCC/127	Suppress
USMCC	FMCC/123	FMCC/124 NAT. PROC.	Suppress	FMCC/127	Suppress
VNMCC	JAMCC/123	JAMCC/124	Suppress	JAMCC/127	Suppress

(1) Only the correct MCC destination is listed, an alert to the image position may also be generated.

Reference Numbers 11 – 15 (Table J.4 cont.)

Receiving MCC	Destination MCC[1] / SIT Number				
	Test Reference Number				
	11	12	13	14	15
ALMCC	SPMCC/122	SPMCC/122	SPMCC/126	SPMCC/127	SPMCC/126
ARMCC	USMCC/122	USMCC/122	USMCC/126	USMCC/127	USMCC/126
ASMCC	AUMCC/122	AUMCC/122	AUMCC/126	AUMCC/127	AUMCC/126
AUMCC	FMCC/122	FMCC/122	USMCC/126	USMCC/127 FMCC/127	USMCC/126
BRMCC	USMCC/122	USMCC/122	USMCC/126	USMCC/127	USMCC/126
CHMCC	USMCC/122	USMCC/122	USMCC/126	USMCC/127	USMCC/126
CMC	FMCC/122	FMCC/122	USMCC/126	USMCC/127 FMCC/127	USMCC/126
CMCC	USMCC/122	USMCC/122	USMCC/126	USMCC/127	USMCC/126
CNMCC	JAMCC /122	JAMCC /122	JAMCC/126	JAMCC/127	JAMCC/126
FMCC	NAT.PROC.	NAT.PROC.	USMCC/126	USMCC/127 NAT.PROC.	USMCC/126
HKMCC	JAMCC/122	JAMCC/122	JAMCC/126	JAMCC/127	JAMCC/126
IDMCC	AUMCC/122	AUMCC/122	AUMCC/126	AUMCC/127	AUMCC/126
INMCC	CMC/122	CMC/122	CMC/126	CMC/127	CMC/126
ITMCC	FMCC/122	FMCC/122	FMCC/126	FMCC/127	FMCC/126
JAMCC	FMCC/122	FMCC/122	USMCC/126	USMCC/127 FMCC/127	USMCC/126
KOMCC	JAMCC/122	JAMCC/122	JAMCC/126	JAMCC/127	JAMCC/126
NMCC	FMCC/122	FMCC/122	FMCC/126	FMCC/127	FMCC/126
NIMCC	SPMCC/122	SPMCC/122	SPMCC/126	SPMCC/127	SPMCC/126
PAMCC	CMC/122	CMC/122	CMC/126	CMC/127	CMC/126
PEMCC	USMCC/122	USMCC/122	USMCC/126	USMCC/127	USMCC/126
SAMCC	AUMCC/122	AUMCC/122	AUMCC/126	AUMCC/127	AUMCC/126
SIMCC	AUMCC/122	AUMCC/122	AUMCC/126	AUMCC/127	AUMCC/126
SPMCC	FMCC/122	FMCC/122	USMCC/126	FMCC/127 USMCC/127	USMCC/126
TAMCC	JAMCC/122	JAMCC/122	JAMCC/126	JAMCC/127	JAMCC/126
THMCC	AUMCC/122	AUMCC/122	AUMCC/126	AUMCC/127	AUMCC/126
TRMCC	FMCC/122	FMCC/122	FMCC/126	FMCC/127	FMCC/126
UKMCC	FMCC/122	FMCC/122	FMCC/126	FMCC/127	FMCC/126
USMCC	FMCC/122	FMCC/122	NAT. PROC.	FMCC/127 NAT. PROC.	NAT. PROC.
VNMCC	JAMCC/122	JAMCC/122	JAMCC/126	JAMCC/127	JAMCC/126

(1) Only the correct MCC destination is listed, an alert to the image position may also be generated.

Reference Numbers 16 – 22 (Table J.4 cont.)

Receiving MCC	Destination MCC(1) / SIT Number				
	Test Reference Number				
	16	17	18 - 20	21	22
ALMCC	SPMCC/127	Suppress	N/A	NAT.PROC	SPMCC/125
ARMCC	USMCC/127	Suppress	N/A	USMCC/122	USMCC/125
ASMCC	AUMCC/127	Suppress	N/A	AUMCC/122	AUMCC/125
AUMCC	USMCC/127	Suppress	N/A	SPMCC/122	USMCC/125
BRMCC	USMCC/127	Suppress	N/A	USMCC/122	USMCC/125
CHMCC	USMCC/127	Suppress	N/A	USMCC/122	USMCC/125
CMC	USMCC/127	Suppress	N/A	SPMCC/122	USMCC/125
CMCC	USMCC/127	Suppress	N/A	USMCC/122	USMCC/125
CNMCC	JAMCC/127	Suppress	N/A	JAMCC/122	JAMCC/125
FMCC	USMCC/127	Suppress	N/A	SPMCC/122	USMCC/125
HKMCC	JAMCC/127	Suppress	N/A	JAMCC/122	JAMCC/125
IDMCC	AUMCC/127	Suppress	N/A	AUMCC/122	AUMCC/125
INMCC	CMC/127	Suppress	N/A	CMC/122	CMC/125
ITMCC	FMCC/127	Suppress	N/A	FMCC/122	FMCC/125
JAMCC	USMCC/127	Suppress	N/A	SPMCC/122	USMCC/125
KOMCC	JAMCC/127	Suppress	N/A	JAMCC/122	JAMCC/125
NMCC	FMCC/127	Suppress	N/A	FMCC/122	FMCC/125
NIMCC	SPMCC/127	Suppress	N/A	SPMCC/122	SPMCC/125
PAMCC	CMC/127	Suppress	N/A	CMC/122	CMC/125
PEMCC	USMCC/127	Suppress	N/A	USMCC/122	USMCC/125
SAMCC	AUMCC/127	Suppress	N/A	AUMCC/122	AUMCC/125
SIMCC	AUMCC/127	Suppress	N/A	AUMCC/122	AUMCC/125
SPMCC	USMCC/127	Suppress	N/A	ALMCC/122	USMCC/125
TAMCC	JAMCC/127	Suppress	N/A	JAMCC/122	JAMCC/125
THMCC	AUMCC/127	Suppress	N/A	AUMCC/122	AUMCC/125
TRMCC	FMCC/127	Suppress	N/A	FMCC/122	FMCC/125
UKMCC	FMCC/127	Suppress	N/A	FMCC/122	FMCC/125
USMCC	NAT. PROC	Suppress	N/A	SPMCC/122	NAT. PROC.
VNMCC	JAMCC/127	Suppress	N/A	JAMCC/122	JAMCC/125

(1) Only the correct MCC destination is listed, an alert to the image position may also be generated.

Specific MCC Processing for Messages Transmitted in System Level Test
(Table J.4 cont.)

Receiving MCC	Destination MCC/SIT Number					
	Test Reference Number					
	23	24	25	26	27	28
ALMCC	SPMCC/125	SPMCC/127	SPMCC/127	Natl Proc	SPMCC/127	SPMCC/127
ARMCC	USMCC/125	USMCC/127	USMCC/127	USMCC/125	USMCC/127	USMCC/127
ASMCC	AUMCC/125	Natl Proc	AUMCC/127	AUMCC/125	AUMCC/127	AUMCC/127
AUMCC	USMCC/125	ASMCC/127	JAMCC/127	SPMCC/125	FMCC/127	CMC/127
BRMCC	Natl Proc	USMCC/127	USMCC/127	USMCC/125	USMCC/127	USMCC/127
CHMCC	USMCC/125	USMCC/127	USMCC/127	USMCC/125	USMCC/127	USMCC/127
CMC	USMCC/125	AUMCC/127	JAMCC/127	SPMCC/125	FMCC/127	Natl Proc
CMCC	USMCC/125	USMCC/127	USMCC/127	USMCC/125	USMCC/127	USMCC/127
CNMCC	JAMCC/125	JAMCC/127	JAMCC/127	JAMCC/125	JAMCC/127	JAMCC/127
FMCC	USMCC/125	AUMCC/127	JAMCC/127	SPMCC/125	UKMCC/127	CMC/127
HKMCC	JAMCC/125	JAMCC/127	Natl Proc	JAMCC/125	JAMCC/127	JAMCC/127
IDMCC	AUMCC/125	AUMCC/127	AUMCC/127	AUMCC/125	AUMCC/127	AUMCC/127
INMCC	CMC/125	CMC/127	CMC/127	CMC/125	CMC/127	CMC/127
ITMCC	FMCC/125	FMCC/127	FMCC/127	FMCC/125	UKMCC/127	FMCC/127
JAMCC	USMCC/125	AUMCC/127	HKMCC/127	SPMCC/125	FMCC/127	CMC/127
KOMCC	JAMCC/125	JAMCC/127	JAMCC/127	JAMCC/125	JAMCC/127	JAMCC/127
NMCC	FMCC/125	FMCC/127	FMCC/127	FMCC/125	UKMCC/127	FMCC/127
NIMCC	SPMCC/125	SPMCC/127	SPMCC/127	SPMCC/125	SPMCC/127	SPMCC/127
PAMCC	CMC/125	CMC/127	CMC/127	CMC/125	CMC/127	CMC/127
PEMCC	USMCC/125	USMCC/127	USMCC/127	USMCC/125	USMCC/127	USMCC/127
SAMCC	AUMCC/125	AUMCC/127	AUMCC/127	AUMCC/125	AUMCC/127	AUMCC/127
SIMCC	AUMCC/125	AUMCC/127	AUMCC/127	AUMCC/125	AUMCC/127	AUMCC/127
SPMCC	USMCC/125	AUMCC/127	JAMCC/127	ALMCC/125	FMCC/127	CMC/127
TAMCC	JAMCC/125	JAMCC/127	JAMCC/127	JAMCC/125	JAMCC/127	JAMCC/127
THMCC	AUMCC/125	AUMCC/127	AUMCC/127	AUMCC/125	AUMCC/127	AUMCC/127
TRMCC	FMCC/125	FMCC/127	FMCC/127	FMCC/125	UKMCC/127	FMCC/127
UKMCC	FMCC/125	FMCC/127	FMCC/127	FMCC/125	Natl Proc	FMCC/127
USMCC	BRMCC/125	AUMCC/127	JAMCC/127	SPMCC/125	FMCC/127	CMC/127
VMMCC	JAMCC/125	JAMCC/127	JAMCC/127	JAMCC/125	JAMCC/127	JAMCC/127

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ANNEX K

REPORTING OF MCC/SPOC COMMUNICATION TEST

Monthly Report on Success of MCC Messages Sent to SPOCs
(Period: Month - Year)

SPOC	Communication Link	Communication Link Address	Successful on first attempt? (Y/N)	On subsequent attempts? (Y/N)	Comments

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