MT00/JC14/0407.doc **Agenda item 4.9**

LUT-MCC SOFTWARE SYSTEM SPECIFICATIONS AND STANDARDS

1. ACTION REQUIRED

The Cospas-Sarsat Joint committee is invited to consider:

1. To define minimum Standard and Specifications for LUT-MCC system software.

2. To freeze the system configuration for a given period of time for ease of operations and maintenance.

2. BACKGROUND

Cospas-Sarsat system has come long way in streamlining the operations and establishing an organised global system. Over the years Cospas-Sarsat laid down several system specifications, procedures, data formats and developed a series of well defined documents for realising the system that we have today. Cospas-Sarsat holds number of meetings with the system operators to discuss and resolve operational and technical issues, and to develop new space and ground systems. As a result of these meetings, Cospas-Sarsat introduces several operational changes in the system for implementation by the ground segment operators.

Such implementations always need assistance from the system designers in the present operational environment. As the Cospas-Sarsat changes are a continuous process, there is a need to have a system which could be supported with minimum external interaction for a long term maintainability and to develop a self supported system. This paper describes general management problems in maintaining the system to current Cospas-Sarsat requirements, their assessment, possible implications and suggests some remedies to overcome these problems with special emphasis for defining software standards and specifications.

3. ASSESSMENT OF THE COSPAS-SARSAT REQUIREMENTS FOR GROUND SYSTEM MAINTENANCE

Broadly the system maintenance may be classified into two categories:

1. Operational changes as envisaged by Cospas-Sarsat, and
2. Hardware System Maintenance

Under the first category, two types of modifications are normally proposed by the Cospas-Sarsat:

a) General operational changes comprising of message formats and routing procedures (related to SID and DDP) and Geosort update.

b) System developmental and technological upgrades involving new SAR payloads, new generation beacons, new processing techniques and other related enhancements.

The "a" category of changes is a routine one and does not call for additional efforts in terms of R&D and implementations. They are straightforward rules very well defined by the Cospas-Sarsat.

The 'b' category of changes occasionally comes from Cospas-Sarsat Secretariat after several deliberations with participants. A great deal of efforts goes into the development of new systems and techniques by Cospas-Sarsat and participating countries. Such technological changes are not frequent.

As far as hardware maintenance is concerned, the equipment used at LUTs and MCCs (antenna and RF systems, timing unit, test equipment, computers etc.) are standard systems except for one or two, which can be easily maintained by having spare units. The experience shows that not many system failures are observed.

The efforts must be made to standardise the proprietary hardware equipment which could be easily made available to system operators to realise a self supported system.

4. MAJOR PLAYERS

In the operations and maintenance of the Cospas-Sarsat Ground Segment systems, following three are the major players:

(A) Cospas-Sarsat

Cospas-Sarsat formulates necessary framework starting from the design, specifications until catering the SAR services to the end-user. It ensures proper interface among various ground segments, designs data formats and lays down distribution rules, reviews operations and brings in further refinements, interfaces with various associated agencies, develops various system documents and ensures availability to all operators/agencies, introduces new technological developments, system monitoring and assessment, and takes care of many other associated tasks.

As we all know Cospas-Sarsat is a very well organized setup today, developed over the years having evolved several concepts, evaluated, tested and finally implemented in designing a global operational system. A very well planned approach is followed while resolving operational and technical issues.

(B) Ground System Managers

System managers are instrumental in implementing Cospas-Sarsat procedures / recommendations and national requirements while operating the system. A lot of under ground efforts by the operators/system managers goes in testing, evaluating and analyzing the performance of the system by constantly monitoring the operations so as to ensure compliance with the Cospas-Sarsat specifications. There are people who keep working throughout the year on these issues to resolve system limitations, anomalies, and software bugs by carefully analyzing the data and reporting to designers with all necessary support inputs.

They also have to go through necessary formalities and procedures to have arrangements with the designers for maintenance of the system.

(C) Designers

Under the maintenance contract with the ground segment operators, the designer/vendor provides software upgrades to implement Cospas-Sarsat amendments made during the year in various Cospas-Sarsat meetings. Under the comprehensive maintenance contract, vendor takes care of complete system maintenance.

5. PROCEDURAL LIMITATIONS IN HAVING SYSTEM MAINTENANCE CONTRACT

To implement the Cospas-Sarsat revisions one has to go through following process:

- To approach the management for getting required funds.
- To approach the designers for making the necessary changes in the software or to have annual maintenance contract with the vendor.
- To carry out number of administrative formalities as per the procedures of the organization.

This also includes writing a proposal with justification giving assessment of the efforts involved, negotiating the cost, getting the funds sanctioned, initiating the purchase procedures etc.

For any such requirements, a local technical sub-committee is formed to review the proposal. The committee goes into every technical and financial aspect of the proposal and makes appropriate recommendations to the management. This is a routine affair on yearly basis.

Sometimes it becomes difficult to convince the management for having annual software maintenance contract for the kind of changes introduced during the year. The expert committee is normally of the opinion that the software must be able to handle the changes related to formatting and routing as being the routine system requirements, by having a standard software design.

By having qualified software system which follow certain standards and with the use of standard hardware equipment, system operations and maintenance do not call for specialized services on routine basis. Specialized services are needed when major technological upgrades are done, and surely no management would be against for such upgrades.

6. NEED FOR SOFTWARE SPECIFICATIONS AND STANDARDIZATION

In a scenario, when no guidelines are made available on software specifications and standards, it poses several management difficulties in terms of technically justifying the requirements and getting funds available on regular basis, and therefore it becomes difficult to cope up with frequent Cospas-Sarsat changes and revisions.

In the light of facilities offered by the current software techniques and tools and with the experience gained over the years by entire Cospas-Sarsat community in the operations and maintenance of the Cospas-Sarsat ground systems, a flexible system may be designed to meet current and future system requirements with several user friendly options. This would help to

- simplify operator interface to introduce Cospas-Sarsat changes easily and quickly,
- take care of national requirements for data formatting and distribution,
- have uniformity among various ground segments. If output data structures is standardized, it will be very useful in carrying out centralized data analysis and collecting specific statistics by considering data from each MCC. This also helps in implementation of general purpose software at each MCC for specific purpose,
- assist system managers in smooth management of the system.

At this stage when most of the developmental cost of the system has been recovered, it is not proper to burden every individual country for a couple software modifications that are uniformly applicable to all the systems supported by a particular vendor.

Even today, people have to depend on the vendor for number of simple and straightforward requirements due to lack of resources made available to them. One cannot easily do the kind of analysis needed for presentation to Cospas-Sarsat meetings as no proper access to data and utilities are available. This is one of the main reasons for not having active participation from some of the participating countries.

In the current software environment with the available techniques and tools, wonders can be done in providing the luxury of user facilities and interfaces. Many things can be done automatically by the software in the field of system monitoring and reporting. There are areas where operators are unable to develop and implement external software utilities for acquiring and modifying the data to suit their national requirements. The system and software are designed in such a way that user become completely dependent. Also the software designs are not optimal having several bottlenecks/limitations while configuring the system for a particular requirement.

In the light of above difficulties, we strongly feel that some guidelines must be developed by the Cospas-Sarsat for the designers/vendors to provide the software with certain given standards taking into account all required flexibilities that could be offered to users.

7. RECOMMENDATIONS

Defining software Specifications is well within the scope of the Cospas-Sarsat , when every minor thing in the system is introduced with so much of thinking and planning.

Joint Committee may take serious view of the implications of the kind of difficulties system managers have to face while maintaining the Cospas-Sarsat ground segment.

Some of the remedies proposed are:

- Frequent and minor changes must be avoided, unless they become absolutely essential. Such changes may not directly offer great advantages in SAR operations. The minor changes may be accumulated over a period of time and may be implemented later along with other major changes.
- Whenever any upgrade is introduced, separate note may be released to each administration operating the ground segment stating the changes to be incorporated, possible implications for not updating the system, implementation schedule and approximate assessment of the work. This would help local administration in decision making.
- Depending upon the number of countries supported by a particular vendor, approximate cost may be worked out by the vendor for each upgrade with the approval from Cospas-Sarsat .
- Frequency of changes should not be more than once in a year for major changes only.
- The system software design and structure must be standardized so that the operator without having much dependency on the designers could control most of the SID/DDP/GEOSORT related changes. The current day software systems and tools are capable of offering any kind of flexibility asked for.
- A team of software experts including vendors may be identified to workout further details on software standardization, and **a task group may be setup to address and discuss issues related to this problem.**
- Particular software may go through type approval by Cospas-Sarsat , as is the case with the beacon manufacturer and beacon test facilities.
- LUT-MCC commissioning standard may be qualified by a particular system and vendor, and not necessarily by the individual LUT-MCC site. Individual ground segment provider may only submit system installation and operational report to check minimum parameters specific to the site.
- As Cospas-Sarsat provides information about the beacon models, approval certificate numbers. and list of approved vendors for the benefit of users, in the same way software system and system supplier details may be furnished in the Cospas-Sarsat documents.