United Nations A/AC.105/827

General Assembly

Distr.: General
10 May 2004

Original: English

Committee on the Peaceful Uses of Outer Space

Report on the United Nations/United States of America Training Course on Satellite-Aided Search and Rescue

(Miami, Florida, United States of America, 2-6 February 2004)

Contents

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I. Introduction

A. Background

1. The Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III), in its resolution entitled "The Space Millennium: Vienna Declaration on Space and Human Development", recommended that activities of the United Nations Programme on Space Applications should promote collaborative participation among Member States, at both the regional and international levels, by emphasizing the development and transfer of knowledge and skills in developing countries and countries with economies in transition.[1]

2. At its forty-fifth session, in 2002, the Committee on the Peaceful Uses of Outer Space endorsed the programme of workshops, training courses, symposiums and conferences planned for 2003.[2] Subsequently, the General Assembly, in its resolution 57/116 of 11 December 2002, endorsed the United Nations Programme on Space Applications for 2003.

3. The present report contains a summary of the programme content of the United Nations/United States of America Training Course on Satellite-Aided Search and Rescue. Organized by the Office for Outer Space Affairs of the Secretariat as part of the activities of the United Nations Programme on Space Applications undertaken in 2003, the Training Course was co-sponsored by the National Oceanic and Atmospheric Administration (NOAA) of the United States of America.[3] It was held in Miami, Florida, United States.

4. With the use of state-of-the-art space technology services, search and rescue (SAR) operations have received international attention. Most of the space-faring nations, including the United States, use SAR as one of their important space programme elements. The International Satellite System for Search and Rescue (COSPAS-SARSAT) provides distress alert and location information for mariners, aviators and land-based users in distress. It supports the international search and rescue objectives of the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO). The system is available to any country and is free of charge for the end-user.

5. COSPAS-SARSAT was initially developed under a memorandum of understanding among agencies of Canada, France, the former Union of Soviet Socialist Republics and the United States, signed in 1979. On 1 July 1988, those four nations signed the International COSPAS-SARSAT Programme Agreement, which ensured the continuity of the System and its availability on a non-discriminatory basis. Since then, a number of other States have associated themselves with the System.

6. The System is comprised of:

(a) A space segment operating in low-Earth orbit and geostationary orbit;

(b) A ground segment consisting of satellite receiving stations, known as local user terminals (LUTs) and data distribution centres, known as mission control centres;

(c) Emergency radio beacons operating at 121.5 megahertz (MHz), 243 MHz and/or 406 MHz, the characteristics of which comply with appropriate provisions of the International Telecommunication Union and COSPAS-SARSAT specifications.

7. Since its inception in 1982, COSPAS-SARSAT has provided distress alert information that has assisted in the rescue of over 17,000 persons in 4,900 distress situations. In 2002 alone, COSPAS-SARSAT data were used to assist in the rescue of almost 1,500 people. Currently, COSPAS-SARSAT is comprised of about one million beacons, 11 satellites, about 50 ground receiving stations and 25 mission control centres and involves 37 States and participating organizations.

8. Approximately 690,000 121.5 MHz and 341,000 406 MHz emergency beacons are presently in use. While many of those beacons are carried by aircraft and maritime vessels in response to national and international carriage requirements, a growing number are carried by non-mandated users.

9. At its forty-sixth session, in 2003, the Committee on the Peaceful Uses of Outer Space noted that COSPAS-SARSAT was a cooperative venture of great significance from both a political and a practical standpoint. Further information on activities related to COSPAS-SARSAT of the United Nations Programme on Space Applications is contained in the reports on the United Nations workshops on space technology for emergency aid/search and rescue satellite-aided tracking system for ships in distress held in Maspalomas, Gran Canaria, Spain, on 24 and 25 September 1998 (A/AC.105/713) and from 23 to 26 November 1999 (A/AC.105/732) and in the report on the United Nations/India Workshop on Satellite-Aided Search and Rescue held in Bangalore, India, from 18 to 22 March 2002 (A/AC.105/783).

10. A new development for COSPAS-SARSAT is the 406 MHz emergency beacon that digitally transmits its identification and position in long-message format. The beacon utilizes either an external or internal electronic navigation receiver, such as a Global Positioning System (GPS) receiver, and can transmit its position with an accuracy of 100 metres. This allows geostationary satellites to combine immediate alerts with precise locations. Polar-orbiting satellites are also capable of receiving these signals, thereby providing global coverage and reducing overall rescue time.

11. In July 2003, the United States approved the use of the personal locator beacon (PLB) to assist SAR efforts in the continental United States. PLB is a small handheld device that emits a signal at 406 MHz that can be detected anywhere in the world using the COSPAS-SARSAT satellite distress alert system. The beacons are designed to be carried by individuals rather than on boats or aircraft and can only be activated manually. Each PLB has a built-in, low-power homing device that transmits on a frequency of 121.5 MHz. This enables rescuers to home in on a beacon once the 406 MHz satellite system has located those in need of rescue within a range of about 3-4 kilometres. Some newer PLBs also have integrated GPS units. GPS-encoded signals dramatically improve accuracy of location to within 100 metres.

12. Another new development for COSPAS-SARSAT is the introduction of a Ship Security Alert System (SSAS). The 406 MHz SSAS consists of two elements: a transmitter for initiating SSAS alerts and a methodology for the distribution of SSAS alert messages in the COSPAS-SARSAT ground segment.

13. A specific 406 MHz beacon coding protocol is used to differentiate between a ship security alert and a distress alert. The specification agreed for the SSAS beacon provides for accurate Global Navigation Satellite System (GNSS)-encoded location information in the beacon message and requires the inclusion of the vessel Maritime Mobile Service Identity number for the beacon identification. The specification prohibits use of a homing device in order to make beacon transmissions covert.

14. The COSPAS-SARSAT specification only deals with the electrical and transmission requirements that ensure the compatibility of the SSAS beacon with the satellite processing system. Administrations, preferably through IMO, should define additional requirements for 406 MHz SSAS beacon activation and installation.

15. SSAS alerts within the COSPAS-SARSAT ground segment will be distributed using a modified version of the standard data distribution procedure. As in normal COSPAS-SARSAT operations, all LUTs will receive the 406 MHz SSAS beacon messages, retrieve the GNSS-encoded location and low-Earth orbit LUTs will generate a Doppler location. The ship security alert data will then be passed to a mission control centre, where it will automatically be routed to the mission control centre that serves the flag State identified in the beacon message, regardless of the physical location of the beacon. That mission control centre will then deliver the ship security alert to a single point of contact identified by the flag State as its "competent authority", under the terms of the International Convention for the Safety of Life at Sea.[4] The COSPAS-SARSAT implementation of SSAS does not permit a vessel to send a ship security alert directly to the company responsible for the ship.

B. Objectives

16. The SAR areas of responsibility in the United States include a large base of users in over 30 countries in that part of the world. While some of those countries have established effective SAR services, many have not drawn on the considerable resources that COSPAS-SARSAT has to offer. Currently, of the member States of the Economic Commission for Latin America and the Caribbean (ECLAC), only Argentina, Brazil, Canada, Chile and Peru participate in COSPAS-SARSAT by providing mission control centres and ground segment equipment. Some countries in the western hemisphere that are lacking in adequate space or ground segments have begun utilizing the COSPAS-SARSAT system for SAR alerting services provided by NOAA by becoming SAR points of contact.

17. In order for ECLAC member States to benefit appropriately from those services, capacity-building in terms of education, training and policy-making needs to be undertaken. Therefore, the main objectives of the Training Course were:

(a) To promote awareness of COSPAS-SARSAT;

(b) To establish a formal interface between those countries operating COSPAS-SARSAT mission control centres that provide distress alerts and those receiving and using the alert data, with a view to improving understanding and coordination of and cooperation in activities and operations;

(c) To improve the usefulness of COSPAS-SARSAT data in SAR operations throughout the ECLAC region.

C. Programme

18. The programme of the Training Course included the following topics: system concept; IMO and ICAO regulations; beacon specifications; beacon coding and registration policies and procedures; data distribution procedures; the COSPAS-SARSAT distress alert formats; guidelines for developing national regulatory policies; system testing and exercising; the phase-out plan for 121.5 and 243 MHz beacons; future system developments; evaluation of the Training Course; and observations and recommendations.

D. Attendance

19. The Training Course was attended by decision makers representing national institutions and programmes related to SAR operations, in particular those involving COSPAS-SARSAT. Participants from the following countries and territories attended the Course: Bermuda, Bolivia, Brazil, British Virgin Islands, Canada, Colombia, Costa Rica, Ecuador, Falkland Islands (Malvinas), France, Guyana, Honduras, Jamaica, Martinique, Mexico, Netherlands Antilles, Panama, Paraguay, United States, Uruguay and Venezuela. The Corporación Centroamericana de Servicios de Navegación Aérea, the secretariat of COSPAS-SARSAT and the Office for Outer Space Affairs were also represented.

E. Financial support

20. Within the limited financial resources available to the co-sponsors, 15 participants from nine States were offered financial support for attending the Training Course. Funded participants were provided with return air travel and room and board.

II. Summary of presentations

21. The Training Course consisted of several sessions, held over a period of five days. Documentation on all the presentations given during the Training Course will be compiled on CD-ROM and distributed to participants, as well as posted on the web site of NOAA (www.sarsat.noaa.gov).

22. A total of 17 national reports explaining current SAR activities and policies on the use of COSPAS-SARSAT, including beacon regulations, were presented by representatives from the following countries and territories: Bermuda, Bolivia, Brazil, British Virgin Islands, Colombia, Costa Rica, Falkland Islands (Malvinas), Guyana, Honduras, Jamaica, Martinique, Mexico, Netherlands Antilles, Panama, Paraguay, Uruguay and Venezuela. The presentations highlighted the SAR efforts made by each country or territory. While it was clear from each national report that the SAR system of each country was tailored to national needs, government,

resources and geography, there were many areas where international cooperation was routinely utilized. Participants had the opportunity to compare systems, share information and identify areas where improvements might be made.

23. The Training Course focused on selected issues, in particular how participants could use the information that they had acquired from the Training Course to improve SAR operations and capabilities in their countries. Four "breakout sessions" were convened, the first focusing on interpreting Subject Indicator Type (SIT) messages and the use of SIT messages in SAR operations; the second focusing on the consequences of interference and how to eliminate sources of interference; the third focusing on using the International Aeronautical and Maritime Search and Rescue Manual, additional SAR resources such as the SAR Contacts web site (www.SARcontacts.com) and the Automated Mutual Assistance Vessel Rescue System; and the fourth focusing on efforts to improve the usefulness of COSPAS-SARSAT data in SAR operations and various issues of importance to many of the participating States.

24. Another important development concerning the future of COSPAS-SARSAT discussed during the Training Course was the phasing out of beacons using 121.5 and 243 MHz. Users of those beacons had to complete the changeover to 406 MHz beacons by 2009.

25. Participants heard presentations by the United States Coast Guard on Maritime Rescue Coordination Centers and from the United States Air Force on Inland Rescue Coordination Centers. A tour of the United States Coast Guard District 7 Rescue Coordination Center and a live SAR demonstration by the United States Coast Guard Group of Miami were also organized.

26. Beacon and ground-segment equipment manufacturers played an active role in increasing knowledge and participants were shown the full process of manufacturing a beacon at a private industry facility. Beacon and ground-station producers also gave technical lectures and demonstrations on current and future technology in the field of SAR. An exhibition of various COSPAS-SARSAT-related products was held at the venue of the Training Course.

27. The final session of the Training Course was dedicated to feedback and discussion of the participants' overall impressions of the Training Course. All participants were given a questionnaire, which provided an opportunity for the participants to give feedback on the quality and relevance of the information supplied during the Training Course and to offer suggestions for improving future courses and further improving coordination among the countries of the participants. The results of the survey are given below.

III. Observations and recommendations

A. General observations

28. The overall assessment of the Training Course was that it had been well-organized and was a success. The Course proved to be effective on a number of levels, in particular with regard to the significant interchange that had been possible among the participants. It brought together many country representatives in an

atmosphere that was conducive to the exchange of information and to the establishment of contacts that would improve coordination and communication in the future between the various States. The Course also took a practical approach to identifying measures that could be taken by participants and their rescue centres to improve SAR operations and response, in particular utilizing COSPAS-SARSAT data, where feasible.

29. Specific observations and comments on the Training Course included the following:

(a) The participants had increased their knowledge of COSPAS-SARSAT;

(b) The participants had gained a deeper appreciation of what making use of a satellite-based SAR capability entailed and what means could be employed within their own countries to utilize COSPAS-SARSAT data;

(c) The national SAR reports had revealed the considerable differences that existed among SAR operations in terms of their missions, capabilities and responsibilities in the participating States;

(d) The information gathered at the Training Course, along with the contacts made there, was a valuable step towards organizing and restructuring the SAR operations and activities of the participating States.

B. Recommendations

30. Although it was not the original intent of the organizers of the Training Course to bring specific recommendations to the attention of any particular authority or agency, participants were given an opportunity to make recommendations on how future training courses and cooperation between the States of the participants could be improved. Among those recommendations, the following were noted:

(a) Information should be exchanged among countries in a more timely manner and real efforts should be made to keep channels of communication open. Such efforts could include regional SAR exercises and bulletins and periodic SAR conferences;

(b) Additional training should be provided for countries without a basic knowledge of the COSPAS-SARSAT system;

(c) The development of an international beacon registration database should be expedited;

(d) Communication links, system technology and logistics support should be improved so that countries could tap into the vast resources that COSPAS-SARSAT data provided;

(e) Further training should be provided for participants of the Training Course to enable them to build upon the knowledge that they had acquired.

C. Conclusion

31. The Office for Outer Space Affairs and NOAA, which serves as the agency for the United States Search and Rescue Satellite-Aided Tracking System, together conducted a highly successful Training Course on Satellite-Aided Search and Rescue for the benefit of countries and territories in the ECLAC region.

32. Through the cooperation and participation of ECLAC member States, the secretariat of COSPAS-SARSAT and partners from industry, as well as the participating countries and territories, the Training Course succeeded in meeting its intended objectives.

Notes

[1] *Report of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space, Vienna, 19-30 July 1999* (United Nations publication, Sales. No. E.00.I.3), chap. I, resolution 1, sect. I, para. 1 (e) (ii), and chap. II, para. 409 (d) (i).

[2] *Official Records of the General Assembly, Fifty-seventh session, Supplement No. 20* (A/57/20), para. 56.

[3] The United Nations/United States of America Training Course on Satellite-Aided Search and Rescue was originally to be held in 2003, but was postponed by the organizers to 2004.

[4] United Nations, *Treaty Series*, vol. 1184, No. 18961.