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Committee on the Peaceful Uses of Outer Space

Report on the United Nations/South Africa Training Course on Satellite-Aided Search and Rescue

(Cape Town, South Africa, 20-24 November 2006)

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I. Introduction

A. Background and objectives

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-fourth session, in 2001, the Committee on the Peaceful Uses of Outer Space agreed that a report on the activities of the International Satellite System for Search and Rescue (COSPAS-SARSAT) should be considered annually by the Committee, as a part of its consideration of the United Nations Programme on Space Applications under the agenda item entitled "Report of the Scientific and Technical Subcommittee".[2]

3. At its forty-eighth session, in 2005, the Committee on the Peaceful Uses of Outer Space endorsed the programme of conferences, symposiums, training courses and workshops planned for 2006.[3] Subsequently, in its resolution 60/99 of 8 December 2005, the General Assembly endorsed the United Nations Programme on Space Applications for 2006, which included the United Nations/South Africa Training Course on Satellite-Aided Search and Rescue.

4. The training course was held in Cape Town, South Africa, from 20 to 24 November 2006. It was organized jointly by the Office for Outer Space Affairs of the Secretariat, as one of the activities of the United Nations Programme on Space Applications, and by the Department of Transport of South Africa.

5. Between 1998 and 2005, the Office for Outer Space Affairs organized a series of regional training courses on satellite-aided search and rescue systems (SAR): the United Nations Workshop on Space Technology for Emergency Aid/Search and Rescue Satellite-Aided Tracking System for Ships in Distress held in Maspalomas, Gran Canaria, Spain, in September 1998 (A/AC.105/713) and November 1999 (A/AC.105/732); the United Nations/India Workshop on Satellite-Aided Search and Rescue, held in Bangalore, India, in March 2002 (A/AC.105/783); the United Nations/United States of America Training Course on Satellite-Aided Search and Rescue, held in Miami, Florida, United States of America in February 2004 (A/AC.105/827); and the United Nations/Australia Training Course on Satellite-Aided Search and Rescue, held in Canberra in March 2005 (A/AC.105/851). The reports of those workshops reflect different aspects in the description and operation of the COSPAS-SARSAT system.

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[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-sixth Session, Supplement No. 20 and corrigendum* (A/56/20 and Corr.1), para. 220.

[3] Ibid., *Sixtieth Session, Supplement No. 20 and corrigendum* (A/60/20 and Corr.1), para. 94.

6. The present report addresses new information on the COSPAS-SARSAT system, aspects that were not described in previous reports, as well as particular features of the operation of the system in the area of the South African Mission Control Centre.

7. Studies show that, while the initial survivors of an aircraft crash have less than a 10 percent chance of survival if rescue is delayed beyond two days, the survival rate is over 60 percent if the rescue can be accomplished within eight hours. Similar urgency applies in maritime distress situations, in particular where injuries have been sustained. As a humanitarian SAR programme, COSPAS-SARSAT has been in place for over 20 years. Throughout that period, the system has provided critical assistance in terms of real-time or near real-time information support, which has helped in the rescue of an estimated 20,531 persons in 5,752 SAR incidents between September 1982 and December 2005.

8. At the regional level, the South African area is divided into two SAR regions, aeronautical and maritime. The aeronautical SAR region covers the continental area of the sovereign territory of Lesotho, Namibia, South Africa and Swaziland. The maritime SAR region is as follows: on the western side, it reaches approximately half way between South Africa and South America and, on the eastern side, approximately half way between Australia and South Africa. On the northern side, it borders Angola, Mozambique, Namibia and South Africa and to the south extends to the South Pole. The total coverage area of the COSPAS-SARSAT system in the South African region for both aeronautical and maritime SAR is approximately 28.5 million square kilometres.

9. Currently, South Africa participates in the COSPAS-SARSAT system by providing ground receiving equipment and the Mission Control Centre in Milnerton, South Africa. Distress signals are detected and relayed back to the Maritime Rescue Coordination Centre in Cape Town and the Aeronautical Rescue Coordination Centre in Johannesburg. Over the years, South Africa has developed its own national SAR system, which is being associated with other countries' systems under bilateral agreements.

10. While some countries and territories in the South African region have established effective SAR services, many others have not yet discovered the benefits offered by the COSPAS-SARSAT system. In order for countries and territories in the region to benefit from its services, there is a need for capacity-building in terms of education, training and policymaking. The main objectives of the training course were therefore:

(a) To promote awareness of the COSPAS-SARSAT programme;

(b) To enhance the formal interface with user countries in order to improve understanding and coordination of the activities and operation of the programme within the region.

B. Programme

11. The training course consisted of an opening session, presentation sessions, a one-day technical tour and a discussion session. It was conducted in English.

12. The opening session included addresses by the head of the South African Search and Rescue Services, the Deputy Director-General of Transport Regulation and Accident and Incident Investigations and, representatives of the COSPAS-SARSAT secretariat, the South African Maritime SAR Operations and the Office for Outer Space Affairs.

13. The presentation sessions included national reports on SAR activities by course participants from South African countries and 21 technical presentations intended to provide a basic practical understanding of the COSPAS-SARSAT system by experts from the Australian Maritime Safety Authority, the Communications Research Centre Canada, the COSPAS-SARSAT secretariat, EMS Technologies Canada, the International Maritime Organization (IMO), South African Maritime SAR Operations, South African Aeronautical SAR Operations, Telkom SA Limited and the United States Coast Guard. The presentations focused on providing the information necessary to integrate the COSPAS-SARSAT system services effectively into national SAR systems. The presentations made at the training course are available on the website of the Office for Outer Space Affairs (www.unoosa.org).

14. At the end of the training course, participants were given an opportunity to discuss regional SAR issues, including ways to improve SAR response in the region and to foster cooperative relationships.

15. The programme of the training course also included a visit to the South African Maritime Rescue Coordination Centre, the South African Mission Control Centre and a rescue tug. This gave participants an opportunity to observe the real-time operation of those facilities and to discuss practical details of SAR.

C. Attendance and financial support

16. Over 45 decision-makers, operational-level SAR managers and technical personnel from the following countries and organizations participated in the training course: Australia, Botswana, Canada, Democratic Republic of the Congo, Kenya, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Uganda, United Republic of Tanzania, United States, Zambia and Zimbabwe; and COSPAS-SARSAT, IMO and the Office for Outer Space Affairs. Representatives of private industry, including EMS Technology Canada and Telkom SA Limited, also participated.

17. Funds allocated by the United Nations and South Africa were used to defray the cost of logistics, air travel, accommodation and daily subsistence allowance for 13 participants from developing countries in the region.

II. Summary of presentations

18. The first part of the programme consisted of national reports from participants, which provided information on local SAR arrangements, current policies and legislation, areas of responsibility, use of distress beacons and points of contact details. Delegates presented a total of 12 national reports, from Botswana, the Democratic Republic of the Congo, Kenya, Lesotho, Malawi, Mozambique,

Namibia, Swaziland, Uganda, the United Republic of Tanzania, Zambia and Zimbabwe:

(a) *Botswana*. The Gaborone SAR region followed the international boundary of the country, serviced from the Rescue Coordination Centre based at the Sir Seretse Khama Airport. Three other airports, Francistown, Maun and Kasane, are designated sub-centres. Even though there was no legislation obliging aircraft to carry emergency locator transmitters (ELTs), an aeronautical engineering notice had been issued in September 2003 specifically for carriage of 406 Megahertz (MHz) and 121.5 MHz ELTs. Currently, 38 percent of aircraft were equipped with 406 MHz beacons and the Airworthiness Division maintained a database;

(b) *Democratic Republic of the Congo*. The National Transport Agency (ONATRA) was a tool of policy of the country in the field of maritime and river transport;

(c) *Kenya*. The Civil Aviation Authority and the marine authority bore responsibility for aeronautical and maritime SAR respectively. The Aeronautical Rescue Coordination Centre was located in Nairobi and the Maritime Rescue Coordination Centre in Mombasa. Most aircrafts were equipped with 121.5 MHz ELTs (civil aircraft) and 243 MHz ELTs (military aircraft) and only two aircraft were registered with 406 MHz emergency position indication radio beacons (EPIRBs). No personal locator beacons (PLBs) had been registered in the country. The Civil Aviation Authority was building a database for all aircraft with ELTs;

(d) *Lesotho*. The country benefited from coordination and cooperation with South Africa under a bilateral agreement on SAR signed in 2005. The country was now using the 121.5 MHz frequency in emergencies and was planning to put 406 MHz in place in order to comply with the COSPAS-SARSAT requirements before 2009;

(e) *Malawi*. The Department of Civil Aviation had overall responsibility for SAR operation within its territorial limits and the country was in the process of developing an internal SAR agreement with local agencies and other states. The Rescue Coordination Centre was based at Kamuzu International Airport, Lilongwe. The estimated beacon population on the civil aviation register was around 30 aircraft and 50 maritime vessels and was expected to grow by 30 percent in the next five years. Malawi monitored the 121.5 MHz frequency on a 24-hour basis and planned to implement 406 MHz in order to comply with the COSPAS-SARSAT requirements before 2009;

(f) *Mozambique*. The Rescue Coordination Centre was located at Beira International Airport and there were two sub-centres, one at the Maputo Control Centre and the other in Nampula. The Rescue Coordination Centre and sub-centres were equipped with only basic means of communication. The SAR services had recently been handed over to Aeroportos de Moçambique, that is, separated from airport management. SAR was implemented in cooperation with national airlines, navies, air forces and local administrative authorities;

(g) *Namibia*. The Maritime Rescue Sub-centre and the Aeronautical Rescue Sub-centre were located in Walvis Bay and Windhoek respectively. In 2000, an agreement regarding the coordination of SAR services had been signed between Namibia and South Africa. Under that agreement, either of the countries could

request assistance from the other for the provision of an aircraft, vessel, personnel and equipment. In 2006, the two countries established a joint bilateral SAR committee to improve management of SAR issues in their countries;

(h) *Swaziland*. The Directorate of Civil Aviation was responsible for aeronautical SAR in the country. SAR activities were not supported by any legislation, but the country benefited from excellent coordination and cooperation with a permanent rescue sub-centre located at Matsapha International Airport. A bilateral SAR agreement between Swaziland and South Africa was awaiting approval before signature and a similar agreement with Mozambique was in preparation. Swaziland monitored the 121.5 MHz frequency for emergencies and planned to implement 406 MHz in order to comply with the COSPAS-SARSAT requirements before 2009;

(i) *Uganda*. Aeronautical and maritime SAR for inland waterways was the responsibility of the Civil Aviation Authority, which had developed an SAR contingency plan together with an SAR operations manual. Civil Aviation Regulation 2006 had incorporated laws pertaining to SAR. Kenya, Uganda and the United Republic of Tanzania had signed an agreement on cooperation in SAR, including training, joint training exercises and development of procedures, techniques, equipment or facilities;

(j) *United Republic of Tanzania*. The Civil Aviation Authority provided aeronautical SAR and the maritime authority provided maritime SAR. All aircraft in the country were equipped with 121.5 MHz ELTs (civil aircraft) and 243 MHz ELTs (military aircraft). The Rescue Coordination Centre based at Dar es Salaam International Airport received SAR alerts from the Cape Town (South Africa) and Bangalore (India) Mission Control Centres. The Civil Aviation Authority had begun the process of beacon registration in order to establish a database that could be used for SAR and for reducing the impact of false alerts;

(k) *Zambia*. SAR organization was not well defined in the country, as it was not supported by legislation. A memorandum of understanding between stakeholders had been signed, but it often failed to work when it came to actual SAR activities. There was a Rescue Coordination Centre at Lusaka International Airport and three sub-centres at Ndola, Livingstone and Mfuwe Airports. Each controlled airport had SAR-trained staff. Alerts from COSPAS-SARSAT were received on aircraft fitted with ELTs. Zambia intended to reorganize its SAR organization with help from the African Civil Aviation Commission project, including SAR legislation;

(l) *Zimbabwe*. SAR was the responsibility of the Civil Aviation Authority in conjunction with the Ministry of Defence. SAR legislation had been drafted and was awaiting promulgation by the Attorney General's Office. An SAR agreement between South Africa and Zimbabwe had been drafted and was awaiting signature by ministers of the two Governments. The Rescue Coordination Centre was based at Harare International Airport and sub-centres were located at the Victoria Falls, J. M. Nkomo, Kariba, Buffalo Range and Charles Prince Airports. The Civil Aviation Authority did not have a record of beacons, but there was a regulation in place for operators to carry automatically activated ELTs on board in accordance with the International Civil Aviation Organization (ICAO) guideline;

19. Technical presentations by invited experts were made on components of the COSPAS-SARSAT system, including: (a) an overview of the COSPAS-SARSAT

system; (b) the space segment; (c) the ground segment; (d) distress beacons, beacon registration and future beacon technologies; (e) new developments for COSPAS-SARSAT, including the Ship Security Alert System, the Long-Range Identification and Tracking System and the Global Maritime Distress Safety System; and (f) SAR operational issues.

20. Four presentations were made as part of the overview of the COSPAS-SARSAT system, including an update of the current status of the system, statistics and regulatory measures, and the operation of the system, especially in South Africa.

21. As at October 2006, there were 38 countries and two organizations formally associated with the COSPAS-SARSAT programme, including the four parties to the International COSPAS-SARSAT Programme Agreement, which provided and operated the space segment of the system. Currently, the system comprised approximately one million emergency beacons (550,000 of 121.5/243 MHz and 430,000 of 406 MHz), 12 satellites (7 in low-Earth orbit (LEOSAR) and 5 in geostationary orbit (GEOSAR)), 64 ground receiving stations (46 local user terminals in a LEOSAR (LEOLUTs)) and 18 local user terminals in a GEOSAR (GEOLUTs)) and 26 mission control centres for the worldwide distribution of distress alerts.

22. In 2005, the COSPAS-SARSAT system had provided assistance in rescuing 1,666 persons in 435 SAR incidents, including aviation distress (109 persons in 57 SAR incidents), maritime distress (1,408 persons in 274 SAR incidents) and land distress (149 persons in 104 SAR incidents). At the end of 2005, the estimated number of 406 MHz beacons in use worldwide was over 429,000, an increase of 13.3 percent over 2004.

23. South Africa, as a signatory body to the International COSPAS-SARSAT Programme Agreement, had provided distress alert data to the appropriate SAR points of contact in South Africa's COSPAS-SARSAT area of responsibility, including in Angola, Botswana, Burundi, the Democratic Republic of the Congo, Lesotho, Malawi, Mozambique, Namibia, Rwanda, Saint Helena, Swaziland, Uganda, Zambia and Zimbabwe. The South African Mission Control Centre and LEOLUT had entered initial operational capability on 7 February 2001 by the Maritime Division of Telkom SA Limited on behalf of the South African Department of Transport. The Mission Control Centre was integrated into the South-West Pacific data distribution region with the Australian Mission Control Centre.

24. Participants were briefed on current issues relevant to SAR arising from the work of IMO. It was noted that some 37 African States had ratified the International Convention for the Safety of Life at Sea[4] and 18 had ratified the International Convention on Maritime Search and Rescue.[5] Information on recent amendments to both the conventions was provided. Participants were also briefed on intergovernmental oversight of the proposed possible future mobile satellite service providers to the Global Maritime Distress and Safety System and the new measures regarding handling of undocumented migrants, asylum-seekers or refugees rescued at sea. The proposed amendment to ICAO's policies on charges for airports and air

[4] United Nations, *Treaty Series*, vol. 1184, No. 18961.
[5] Ibid., vol. 1405, No. 23489.

navigation services enabling a portion of costs to be used for provision of SAR services was also described. Information was given on the ongoing preparations for a meeting of African ministers responsible for maritime transport, to be held in early 2007.

25. Two presentations were made on the space segment of the COSPAS-SARSAT system, in particular on the future evolution of the system. To take full advantage of the geostationary satellite alerting capability, the 406-MHz beacons had been designed to transmit position data derived from global navigation satellite systems (GNSS) in distress messages. The GNSS support to SAR operations would not only make possible the near real-time reception of distress messages transmitted from anywhere on Earth and the identification of the precise location of their origin, but it would also introduce a new SAR function – a return link from the operator to the distress beacon. To accomplish this, each satellite would be equipped with a transponder able to transfer the distress signals from the user transmitters to the rescue coordination centre, which would then initiate the rescue operation. At the same time, the system would provide a signal to the user, informing him/her that his/her situation had been detected and help was on the way. Having that function built in would definitely help in improving the efficiency of the system, resulting in many more lives being saved. The satellite payloads were being designed and the prototype local user terminals for the system were being developed. Preliminary testing with experimental payloads on some Global Positioning System (GPS) satellites was now under way and international testing of the system had been planned for the period 2007-2010.

26. Two presentations were made on the ground segment of the COSPAS-SARSAT system, including the role of mission control centres. The presentations covered the functions of LEOLUTs and GEOLUTs as the basic ground component of the system. Participants were provided with the boundary maps of the data distribution regions and the service areas of the respective mission control centres.

27. Four presentations were made on beacon-related issues. Participants were provided with detailed interpretations of the standardized message formats that were being used between mission control centres and rescue coordination centres. Proper registration of beacons was singled out as one of the most crucial factors in determining the success or failure of SAR missions and in reducing the impact of false alerts.

28. Out of every 50 alerts received by the satellites, only one was a genuine call for help. This was the primary reason why the COSPAS-SARSAT programme had made the decision to terminate its 121.5/243 MHz satellite alert services by 2009: all alerts would be broadcast on 406 MHz, which was digital. Accordingly, the price of 406 MHz beacons might be expected to decrease slightly. ICAO and IMO required all 406 MHz ELTs and EPIRBs to be registered. Each State should provide COSPAS-SARSAT with the details of its 406 MHz beacon register, including address, telephone and facsimile or telex number. The International Beacon Registration Database (IBRD) allowed users to register directly if no national registration had been implemented and allowed SAR services to access registration data through the Internet (www.406registration.com). Currently, over 3,000 beacons were registered in the IBRD.

29. Three presentations were made on new developments in the COSPAS-SARSAT system. In 2004, the COSPAS-SARSAT programme implemented the Ship Security Alert System (SSAS), based on 406 MHz transmitters, in compliance with IMO specifications. The System was intended to provide means to alert authorities to acts of piracy or terrorism directed against vessels. The SSAS alerts were processed according to the same procedures that applied for 406 MHz distress alerts, except that the resulting ship security alert message was forwarded to security officials rather than to SAR services. Administrations should define their national requirements for the activation and installation of 406 MHz SSAS beacons, should register their competent authority with IMO and request their supporting mission control centre to establish an appropriate method of disseminating the SSAS alerts. Currently seven administrations were allowed to use the COSPAS-SARSAT SSAS and two types of approved SSAS beacon were available for commercial sale.

30. The IMO Maritime Safety Committee, at its 81st session, in May 2006, had adopted new regulations for the Long-Range Identification and Tracking System (LRIT), together with performance standards and functional requirements. The tracking of any applicable ship began with LRIT positional data being transmitted from ship-borne equipment, including the ship's GNSS position, the time and identification. Then LRIT data centres processed all the LRIT data from the ship and disseminated them to LRIT data users according to the data distribution plan. LRIT data users might be entitled to receive or request LRIT data in their capacity as a port State, coastal State or SAR authority. LRIT data would provide the SAR authority with details of the ships within the requested vicinity in an SAR incident.

31. The International Convention for the Safety of Life at Sea, amended in 1992, set up the Global Maritime Distress and Safety System (GMDSS) as a basic tool to alert SAR authorities ashore to provide a rapid response to an SAR incident at sea. GMDSS consisted of a number of sub-systems such as the Digital Selective Calling System, the SAR Transponder System, satellite communications systems, maritime safety information systems and the EPIRB system. The Digital Automatic Alerting System listened to ships in distress on the very high frequency, medium frequency and high frequency band and passed the information (position, identity of ship and type of distress) to operators at the coastal radio stations or rescue coordination centres. The daily transmission of maritime safety information such as weather forecasts, navigation warnings and safety information to ships was done mainly through the SafetyNET and NAVTEX systems. The Inmarsat system provided priority access to satellite channels in emergency situations and provided an alert to SAR personnel. South Africa, as a party to the International Convention, had provided the SafetyNET Maritime Safety Information service via Goonhilly Station in the United Kingdom of Great Britain and Northern Ireland or Burum Station in the Netherlands and the NAVTEX maritime safety information service via Cape Town, Port Elizabeth and Durban.

32. Five presentations were made on operational matters related to SAR. Participants learned how the national SAR authority could establish effective rescue coordination centres or rescue sub-centres from the point of view of functional and technical requirements. In particular, reliable communication links between national rescue coordination centres and the nodal mission control centre, including

provision of contact information (address, electronic mail (e-mail) and telephone and facsimile numbers) to the national SAR point of contact, was stressed as the basic requirement for delivery of COSPAS-SARSAT distress alerts to any country. The question of what should be taken into account at each stage of planning and execution in the establishment of a national SAR operation mechanism was also addressed.

33. The experience and lessons learned from the SAR exercise held by the Aeronautical Rescue Coordination Centre of South Africa in February 2004 were described to participants who were also given an opportunity to study new technologies in SAR management, including the incident command system, real-time sensor data acquisition, the self-locating datum marker buoy, the Australian Coastwatch "Eye In The Sky", computer-aided SAR and so on.

34. Participants visited the Mission Control Centre and Maritime Rescue Coordination Centre in Cape Town in order to explore the practical linkage between the COSPAS-SARSAT system and national SAR operation services. They also visited the *Smit Amandla*, an SAR tug ship that was used to respond to emergency marine rescue operations under a contract with the Government of South Africa.

35. Finally, training course feedback and discussion sessions were held to assess the overall quality of the course and to discuss the observations and recommendations of participants. A questionnaire was distributed and the results were discussed during the final discussion session.

III. Observations and recommendations

A. General observations

36. The training course was considered very successful and well organized. A particular feature of the course was the interaction between participants in a relatively informal atmosphere, as the group was small enough to facilitate active participation and networking.

37. In general, all participants improved their understanding of the operation of the COSPAS-SARSAT system, with some participants being exposed to the system for the first time. The training course provided an opportunity for participants to develop working relationships that would continue in the operational environment. The interaction between States and the country coordinating the SAR in which they were located was notable. These discussions continued beyond the formal course hours.

38. The opportunity for participants to update details about SAR points of contact was valuable. Participants highlighted in particular the value of sharing, under bilateral agreements, the services and facilities the South African Mission Control Centre and the rescue coordination centres with neighbouring countries in the region that did not have the resources to establish their own centres.

B. Recommendations

39. Participants recommended: (a) that mutual cooperation and coordination among SAR authorities, including rescue coordination centres, be promoted; (b) that Kenya, Uganda and the United Republic of Tanzania which had received SAR distress alerts from India and Italy, receive SAR distress alerts directly from the Mission Control Centre of South Africa under bilateral agreements between the countries; (c) that COSPAS-SARSAT consider a possible adjustment of the data distribution region at the next meeting of the COSPAS-SARSAT Joint Committee; (d) that an in-depth training course on COSPAS-SARSAT for developing countries to understand trends in SAR technology applications be organized; (e) that a future training course be conducted in French for French-speaking countries; (f) that regular communication exercises be conducted to ensure that all contact information was up to date; and (g) that an exercise-based training course on COSPAS-SARSAT to increase the efficiency of the training be organized. In that connection, a representative of the Aeronautical Rescue Coordination Centre of South Africa announced that an invitation letter would be despatched to the neighbouring countries in the region inviting them to participate in the next SAR exercise (between February and March 2007).

C. Conclusion

40. According to the evaluation made by participants, the Office for Outer Space Affairs and the Department of Transport of South Africa had conducted a highly successful training course on satellite-aided SAR for the benefit of the countries in the Southern African region. Will the cooperation and participation of the Southern African countries, the secretariat of COSPAS-SARSAT and partners from industry, the training course had attained its stated objectives.