For discussion
on 8 April 2014

Legislative Council Panel on Security
Proposed Procurement of Ground Receiving Station of the Medium Earth Orbit Search and Rescue Satellite System for the Hong Kong Maritime Rescue Coordination Centre by Marine Department

Purpose

This paper consults the Panel on the proposal of Marine Department (MD) to procure and install the Cospas-Sarsat Medium Earth Orbit Search and Rescue (MEOSAR) satellites ground receiving station to replace the existing Cospas-Sarsat Low Earth Orbit Search and Rescue (LEOSAR) satellites ground receiving station.

Background

2. Cospas-Sarsat is an international organisation established in 1988 to provide rescue coordination centres with alerts and location data of distressed vessels and aircraft through dedicated satellites and network of ground receiving stations.

3. MD installed a Cospas-Sarsat ground receiving station in 1992 to receive data from Cospas-Sarsat's LEOSAR satellites. The data, after processing, is sent to the Hong Kong Maritime Rescue Coordination Centre (MRCC) and the Hong Kong Aeronautical Rescue Coordination Centre (ARCC) for their investigation and coordination of search and rescue (SAR) operations. MRCC is responsible for SAR operations for vessels while ARCC is responsible for SAR operations for aircraft. Both MRCC and ARCC have the international obligation to provide SAR service.

4. As technology evolves, Cospas-Sarsat is progressing into utilising another set of satellites, namely MEOSAR satellites, to detect distress signals transmitted from vessels and aircraft. The MEOSAR system is far more effective than the existing LEOSAR system having regard to the increased number of satellites and their higher revolution altitude. The LEOSAR system will be phased out when the MEOSAR system becomes fully operational. Correspondingly, all ground receiving stations for the LEOSAR system will be obsolete and need to be

replaced.

5. Brazil, Canada, Cyprus, France, Norway, Russia, Spain, Turkey, United Kingdom and United States of America have already installed their ground receiving stations for the MEOSAR system. In addition, Australia, South Africa and Japan have indicated that they will install the MEOSAR ground receiving stations as well.

6. The MEOSAR system is now in the demonstration and evaluation phase. This phase is scheduled for completion by the end of 2015 and the MEOSAR system will then become Initial Operational Capability[1]. The tentative implementation time table is at **Appendix**.

Justifications for the Proposed Procurement of MEOSAR Ground Receiving Station

7. MD proposes to replace the LEOSAR ground receiving station with the MEOSAR ground receiving station for following reasons:

(a) Benefit to SAR operations for vessels and aircraft in distress

(i) Immediate detection of distress alerts

Detection of distress alerts and subsequent data updates relies on availability of visible satellites in sky. Currently, due to limited number of LEOSAR satellites in orbit, the time between passages of two visible LEOSAR satellite is about 1.5 hours; but the visible duration for receiving distress data and updates is only about 10 minutes. On the other hand, MEOSAR system will always have at least four to five satellites visible in sky, and distress signals can be received immediately and continuously. In other words, when a vessel or aircraft triggers off its distress signal, the MEOSAR system will detect it immediately whilst LEOSAR system can only detect it at 1.5 hour-interval. The sooner the distress alert is received means the sooner the SAR resources can be deployed to assist the distressed target.

[1] Initial Operational Capability (IOC) is a declaration by MEOSAR satellites providers and Cospas-Sarsat that, prior to full deployment, alert data from the MEOSAR system can be used operationally. The MEOSAR system need not necessarily provide global coverage during the IOC phase. This could be due to an incomplete satellite constellation or an incomplete ground segment. However, MEOSAR distress alert data will have already been proven to be reliable, and therefore, should be provided to SAR services for their use. (Definition provided by Cospas-Sarsat)

(ii) Better positioning accuracy

Position of the vessel or aircraft in distress can be calculated by the Cospas-Sarsat system. For the LEOSAR system, the position reckoning has a deviation of five nautical miles (i.e. nine kilometres (km)), whereas the deviation of the MEOSAR system is less than 100 metres (i.e. 0.1 km). An accurate position data will save time and efforts for searching the target. Since the MEOSAR system provides a much better positioning accuracy, it will enhance the overall efficiency in SAR operations.

(iii) More reliable system

Amongst the six existing LEOSAR satellites, five of them are operating beyond their designed life[2]. The United States of America, Russia and European Union have pledged to send a total of more than 70 MEOSAR satellites into medium earth orbit in the years to come to substitute the retiring LEOSAR satellites. The larger number of MEOSAR satellites in orbit will allow each distress message to be relayed at the same time by several satellites to several ground receiving stations. Hence, the MEOSAR system is much more reliable than the LEOSAR system.

(b) Phasing out of LEOSAR system

Cospas-Sarsat will phase out the LEOSAR system after the MEOSAR system becomes fully operational. Without the replacement of Hong Kong ground receiving station, distress alerts from vessels and aircraft cannot be detected; and Hong Kong has to depend on relay of distress information from other countries.

(c) Share use between MD and Civil Aviation Department (CAD)

Although the LEOSAR ground receiving station is installed and operated by MD, a slave terminal is also installed at the ARCC of CAD for monitoring distress alerts from aircraft. Staff of MRCC will, through the Cospas-Sarsat network, obtains additional information of the distressed aircraft and vessels from other countries. Information of distressed aircraft will be channelled

[2] The five LEOSAR satellites are currently operating beyond their expected design life : Sarsat-7 (design end-of-life was 2001), Sarsat-8 (2003), Sarst-10 (2008), Sarsat-11 (2012) and Sarsat-12 (2012). This information is extracted from the Cospas-Sarsat meeting paper JC-27/3/1.

to CAD for rescue action. If the MEOSAR system is not installed, both MRCC and ARCC will reduce the capability of monitoring distress alerts.

Specifications of MEOSAR Ground Receiving Station

8. Specifications of the MEOSAR ground receiving station will fully comply with the requirements of the Cospas-Sarsat standard. The MEOSAR ground receiving station will include the following major elements:

(a) Four 2.4-meter diameter dish antennae and accessories are required to track four individual MEOSAR satellites

To ensure good reception of signal from MEOSAR satellites, one pair of antennae will be installed at Cape D'Aguilar radio station while another pair will be installed at Mount Butler radio station. No extra land allocation is required.

(b) Data lines to connect the antenna sites with MRCC

The data received from the antenna sites will be fed to the central servers at MRCC via data leased lines and microwave link. Dual communication links will be provided between antenna sites and MRCC to ensure high reliability of the overall system.

(c) Dual redundant servers will be installed at MRCC

The servers will process the beacon data to obtain the beacon identity and position. The beacon information will be forwarded to a special terminal, called the Mission Control Centre (MCC), which is situated and operated within MRCC. If the distressed beacon is related to an aircraft within Hong Kong's Flight Information Region, the beacon information will be sent to CAD. Other beacon information which are not within the scope of Hong Kong will be sent to responsible MCC of other countries through the Cospas-Sarsat data distribution network.

Financial Implications

Non-recurrent Expenditure

9. MD estimates that the capital cost for procuring and installing the MEOSAR ground receiving equipment is $41.4 million, breakdown of which are shown below:

		$'000
(a)	Supply, installation, testing and commissioning of a 4-antenna MEOSAR ground receiving station with training and initial critical spares	31,000
(b)	Associated networking infrastructure, structural survey, builder's works and building services works	1,850
(c)	Electrical and Mechanical Services Trading Fund project management fee	5,250
(d)	Contingency (10% of items (a) & (b) above)	3,300
	Total	**41,400**

10. The estimated cash flow requirement is as follows –

Year	**$'000**
2014 – 15	3,375
2015 – 16	32,800
2016 – 17	5,225
Total	**41,400**

Recurrent Expenditure

11. The proposed MEOSAR ground receiving station will not require additional manpower to operate. After the warranty period in 2016-17, MD estimates that the recurrent maintenance cost for the MEOSAR ground receiving station will be $3.0 million from 2017-18 onwards, which will be partly offset by saving of the maintenance cost of $0.9 million for the LEOSAR system which is to be obsolete in 2018. Therefore, an additional recurrent expenditure of only $2.1 million will be required from 2019-20 onwards. Such requirement will be reflected in the Estimates of the relevant years.

Implementation Timetable

12. Subject to Members' views on the proposal, we plan to seek funding approval from the Finance Committee of the Legislative Council in May 2014. Subject to funding approval, the implementation timetable is as follows:

	Activity	Tentative Implementation date
(a)	Preparation of tender specifications	July 2014
(b)	Invitation of tender	November 2014
(c)	Tender evaluation	January 2015
(d)	Contract award and product delivery	April 2015
(e)	On-site installation work	October 2015
(f)	Testing for acceptance	April 2016
(g)	Training	June 2016
(h)	Commence operation	July 2016

Advice Sought

13. Members are invited to comment on the above proposal.

Security Bureau
April 2014

Appendix

Tentative Implementation Time Table of MEOSAR

2000-2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
MEOSAR Planning	Demonstration & Evaluation Planning		Demonstration and Evaluation			IOC (Note 1)		FOC (Note 2)	

Note 1 : IOC = Initial Operational Capability, which is a declaration by MEOSAR satellites providers and Cospas-Sarsat that, prior to full deployment, alert data from the MEOSAR system can be used operationally. The MEOSAR system need not necessarily provide global coverage during the IOC phase. This could be due to an incomplete satellite constellation or an incomplete ground segment. However, MEOSAR distress alert data will have already been proven to be reliable, and therefore, should be provided to SAR services for their use. (Definition provided by Cospas-Sarsat)

Note 2 : FOC = Full Operational Capability, which is a declaration by Cospas-Sarsat that the MEOSAR system should be considered fully operational. (Definition provided by Cospas-Sarsat)