ITEM FOR FINANCE COMMITTEE

CAPITAL WORKS RESERVE FUND

HEAD 708 – CAPITAL SUBVENTIONS AND MAJOR SYSTEMS AND EQUIPMENT

Marine Department

New Subhead "Procurement of Ground Receiving Station of the Medium Earth Orbit Search and Rescue Satellite System"

> Members are invited to approve a new commitment of \$41,400,000 for the procurement of the ground receiving station of the Medium Earth Orbit Search and Rescue Satellite System for the Hong Kong Maritime Rescue Coordination Centre of the Marine Department.

PROBLEM

The Marine Department (MD) needs to procure the ground receiving station of the Cospas-Sarsat's¹ Medium Earth Orbit Search and Rescue (MEOSAR) Satellite System for the Hong Kong Maritime Rescue Coordination Centre (MRCC).

PROPOSAL

2. The Director of Marine, with the support of the Secretary for Security, proposes to procure the ground receiving station of the Cospas-Sarsat's MEOSAR Satellite System at an estimated cost of \$41,400,000.

/JUSTIFICATION

¹ 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.

JUSTIFICATION

Need for Procurement of MEOSAR Ground Receiving Station

3. MD installed a Cospas-Sarsat ground receiving station in 1992 to receive data from Cospas-Sarsat's Low Earth Orbit Search and Rescue (LEOSAR) satellites. 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.

4. The United States of America (USA) began to study the MEOSAR in 2000 and installed the first MEOSAR ground receiving station in 2005. Shortly afterwards, Canada and France built their MEOSAR ground receiving stations and joined in the study as well. Results of the study convinced Cospas-Sarsat in 2011 that MEOSAR is far more effective than the existing LEOSAR system and it should replace the LEOSAR eventually. When the MEOSAR system becomes fully operational, all ground receiving stations for the LEOSAR system, including the station of Hong Kong, will become obsolete and need to be replaced.

5. The MEOSAR system is now in the demonstration and evaluation phase, which is scheduled for completion by the end of 2015. The MEOSAR system will then become Initial Operational Capability (IOC)². The tentative Encl. implementation time table of MEOSAR system is at the Enclosure.

6. Currently, the following countries have already installed ground receiving stations for the MEOSAR system in respective years; Canada (2006), France (2007), the United Kingdom (2008), Brazil (2009), Turkey (2010), Cyprus (2013), Norway (2013), Russia (2013), Spain (2013), and the USA (built three stations in 2005, 2011 and 2014). In addition, Australia, South Africa and Japan have indicated that they will install the MEOSAR ground receiving stations as well. Coupled with the lead time required for the procurement, we should start to arrange for a similar installation in Hong Kong.

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² 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).

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 the following reasons –

- (a) Benefits to search and rescue (SAR) operations for vessels and aircraft in distress
 - (i) <u>Immediate detection of distress alerts</u>

Detection of distress alerts and subsequent data updates rely 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 satellites 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.

(ii) <u>Better positioning accuracy</u>

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 in searching for the target. Since the MEOSAR system provides a much better positioning accuracy, it will enhance the overall efficiency in SAR operations.

(iii) Ability to calculate altitude

Apart from the ability to calculate geographical position in latitude and longitude, the MEOSAR is able to calculate the altitude of a distressed aircraft if its distressed beacon is switched on. This new ability gives a three-dimensional track of a distressed aircraft.

(iv) More reliable system

Amongst the six existing LEOSAR satellites, five of them are operating beyond their designed life³. The USA, Russia and European Union have pledged to send a total of more than 70 MEOSAR satellites into medium earth orbit in the coming six years 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. If Hong Kong does not procure the MEOSAR ground receiving station, distress alerts from vessels and aircraft cannot be detected after the LEOSAR system is phased out. We then have to depend on relay of distress information from other countries. Hong Kong will also not be able to select the best satellites that would provide the best signal quality pertaining to our SAR region.

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

Currently, the LEOSAR ground receiving station is installed and operated by MD. In addition, a slave terminal is installed at the Hong Kong Aeronautical Rescue Coordination Centre (ARCC) of CAD for monitoring distress alerts from aircraft. Information of distressed aircraft will be channelled to CAD for rescue action. Similarly, a slave terminal will also be installed at ARCC of CAD in the future configuration of the proposed MEOSAR system of Hong Kong. If the MEOSAR system is not installed, both MRCC and ARCC will have reduced capability of monitoring distress alerts.

/Specifications

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

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 increase the chance of seeing more 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 is 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 \$41,400,000, broken down as follows –

/\$'000

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

10. On paragraph 9(a) above, the estimated expenditure of \$31,000,000 is for the supply, installation, testing and commissioning of the four 2.4-meter diameter dish antennae, dual redundant servers, accessories and initial critical spare parts for the MEOSAR ground receiving station and training.

11. On paragraph 9(b) above, the estimated expenditure of \$1,850,000 is for the networking infrastructure including communication network and data lines to connect the antenna sites with MRCC and ARCC, structural survey, builder's works and building services works.

12. On paragraph 9(c) above, the estimated expenditure of \$5,250,000 is for meeting the charges of EMSTF for providing project management services, which include system configuration and network design; preparing and conducting the tender exercise; and supervision of system installation, related tests and commissioning of the MEOSAR ground receiving station.

13. On paragraph 9(d) above, the estimated provision of \$3,300,000 represents about 10% of the contingency on the estimated requirements for items 9(a) and (b).

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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

15. The proposed MEOSAR ground receiving station will not require additional manpower to operate. However, the annual maintenance costs will be higher under the new system, given more expensive spare parts, more dish antenna being required and dish antenna having to be installed at two different locations. After the warranty period in 2016-17, MD estimates that the recurrent maintenance cost for the MEOSAR ground receiving station will be \$3,000,000 from 2017-18 onwards, which will be partly offset by saving of the maintenance cost of \$900,000 for the LEOSAR system which is to be obsolete in 2018. Therefore, an additional recurrent expenditure of \$2,100,000 will be required from 2019-20 onwards. The annual recurrent requirements will be reflected in the Estimates of the relevant years.

IMPLEMENTATION PLAN

16. Subject to the approval of the Finance Committee, we plan to implement the project according to the following schedule –

	Activity	Target completion 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

/**PUBLIC**

FCR(2014-15)7

PUBLIC CONSULTATION

17. We consulted the Legislative Council Panel on Security on 8 April 2014. Members supported the proposal.

BACKGROUND

18. 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 MRCC and the ARCC for their investigation and coordination of SAR operations. MRCC and ARCC are responsible for SAR operations for vessels and aircraft respectively. Both MRCC and ARCC have the international obligation to provide SAR service.

Security Bureau April 2014

Enclosure to FCR(2014-15)7

Tentative Implementation Time Table of MEOSAR

2000-10		2011	2012	2013		2014	2015	2016	2017	2018	2019
MEOSAR Planning		Demonstrat	emonstration and Evaluation		Demonstration and Evaluation		IOC (Note 1)		FOC (Note 2)		
		Planning									

- 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)
