

## ITEM FOR FINANCE COMMITTEE

### **CAPITAL WORKS RESERVE FUND HEAD 708 – CAPITAL SUBVENTIONS AND MAJOR SYSTEMS AND EQUIPMENT**

#### **Hong Kong Observatory**

#### **New Subhead “Replacement and Upgrading of meteorological facilities for the Hong Kong International Airport”**

Members are invited to approve the creation of a new commitment of \$154 million for replacing and upgrading the meteorological facilities of the Hong Kong Observatory for the Hong Kong International Airport.

### **PROBLEM**

Aviation safety is critical to the further development of Hong Kong as an aviation hub in the region. The Hong Kong Observatory (HKO) needs to replace the ageing meteorological equipment to maintain its aviation weather services. HKO also has to upgrade its meteorological facilities to meet the growth in air traffic and demands for higher quality aviation weather services.

### **PROPOSAL**

2. The Director of HKO, with the support of the Secretary for Commerce and Economic Development, proposes to create a new commitment of \$154 million to –

- (a) replace the ageing Terminal Doppler Weather Radar (TDWR), a key equipment for detection of windshear; and

/(b) .....

- (b) replace and upgrade the other meteorological and related infrastructural facilities of HKO for the Hong Kong International Airport (HKIA), taking into account the need to provide enhanced aviation-specific weather information services and to integrate these facilities with the replacement Air Traffic Control (ATC) system of the Civil Aviation Department (CAD).

## JUSTIFICATION

### Replacement of the Terminal Doppler Weather Radar

3. Windshear is a hazardous weather phenomenon that has brought about aircraft accidents around the world. Issuance of windshear alerts in good time is of paramount importance to ensure aviation safety.

4. Installed in 1996, the present TDWR is approaching the end of its serviceable life. Its annual unserviceable time has been increasing in recent years<sup>1</sup>. Maintenance work has become increasingly difficult as many components are already out of production. While the TDWR is still offering reliable service, we should plan ahead to ensure that the facility is replaced at the right time.

5. HKO proposes to install in 2013 a new TDWR to ensure timely and uninterrupted provision of accurate windshear warnings to aircraft. After the new TDWR is in place, the existing one will be turned into a backup for as long as its economical useful life permits.

6. The operation of the existing TDWR must remain intact until the new equipment is fully functional. Hence, the new TDWR has to be installed on a separate site. The related capital works for the formation of the new site, estimated at \$122 million at this stage, are to be funded as a separate item under the Capital Works Reserve Fund. As the site design would depend on investigation work and require inputs from the supplier of the new TDWR, we would only be able to finalise the design and refine the estimated cost for the capital works at a later stage. We will seek funding approval from the Finance Committee (FC) separately when ready.

**/Replacement .....**

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<sup>1</sup> The average annual unserviceable time of the present TDWR has increased from 27 hours for the period 2000-2003 to 47 hours for the period 2004-2007.

## **Replacement and Upgrading of Other Meteorological and Infrastructural Facilities**

7. The other existing aviation meteorological and infrastructural facilities of HKO have been in operation since the opening of HKIA in 1998. Many of these facilities are approaching the end of their serviceable lives<sup>2</sup>. There are also evolving demands for higher quality and user-oriented services from pilots, airlines, CAD, and the Airport Authority (AA).

8. Apart from having to replace the ageing facilities in a timely manner, HKO proposes to bring in added facilities to enable the department to –

- (a) develop more accurate, reliable and sophisticated aviation-specific weather information and services<sup>3</sup>, in response to users' demands and in support of safe and more efficient flight operations in the years ahead; and
- (b) plan and implement the integration of the meteorological and related infrastructural facilities with CAD's replacement ATC system<sup>4</sup> in information technology terms, thereby ensuring seamless delivery of reliable and efficient aviation weather services to users.

### **Anticipated Benefits**

9. The proposal would enable the continuous provision of more timely and reliable aviation weather information to the aviation community as well as uninterrupted delivery of mission-critical windshear warnings. It would also enable us to keep abreast of the latest technology in the field and enhance our services. The upgraded facilities would allow more room for each relevant party to take prompt response actions, thus enhancing the efficiency of flight operations whilst maintaining aviation safety. By integrating the new facilities with CAD's replacement ATC system, the proposal would also facilitate air traffic management. These improvements are important because weather changes are affecting more flights as a result of the growth in air traffic<sup>5</sup>.

/10. ....

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<sup>2</sup> The normal serviceable life of most meteorological facilities is between 10 to 15 years.

<sup>3</sup> An example of one such desired new service is an improved system which would provide more comprehensive advice to air traffic control personnel and pilots about expected weather changes along the flight paths, mitigating flight delays due to thunderstorms.

<sup>4</sup> Funding approval for the replacement ATC system was obtained from the FC vide FCR(2007-08)9 in May 2007.

<sup>5</sup> Given the heavy volume of air traffic using HKIA, any backlog caused by suspension of activities due to inclement weather is liable to take a long time to clear.

10. In short, the proposal helps ensure safe, efficient and reliable flight operations at HKIA and across Hong Kong's airspace, and is in the interest of upholding Hong Kong's position as a leading aviation hub in the region.

## FINANCIAL IMPLICATIONS

### Non-recurrent Expenditure

11. Based on the latest market information, we estimate that the proposal as a whole would require \$154,000,000, with a breakdown as follows –

		2009-10	2010-11	2011-12	2012-13	2013-14	Total	
		\$ million	\$ million	\$ million	\$ million	\$ million	\$ million	
<b>(a)</b>	<b><i>Replacement of TDWR</i></b>							
	(i)	Hardware	-	9.3	11.6	-	25.6	46.5
	(ii)	Software	-	4.6	5.8	-	12.6	23.0
	(iii)	Delivery, installation, testing, commissioning, documentation and training	-	3.5	4.4	-	9.6	17.5
	(iv)	Initial spare parts, consumables and test equipment	-	2.6	3.2	-	7.2	13.0
	<b><i>Sub-total of (a)</i></b>		<b>-</b>	<b>20.0</b>	<b>25.0</b>	<b>-</b>	<b>55.0</b>	<b>100.0</b>
<b>(b)</b>	<b><i>Replacement and upgrading of other meteorological and infrastructural facilities</i></b>							
	(i)	Facilities for development of enhanced aviation-specific weather services	-	6.0	6.0	-	-	12.0
	(ii)	Facilities to replace ageing equipment and to facilitate integration with CAD's replacement ATC system	1.8	18.5	6.0	1.1	0.6	28.0
	<b><i>Sub-total of (b)</i></b>		<b>1.8</b>	<b>24.5</b>	<b>12.0</b>	<b>1.1</b>	<b>0.6</b>	<b>40.0</b>
<b>(c)</b>	<b><i>Contingency (10 % of ((a)+(b)))</i></b>		<b>0.2</b>	<b>4.5</b>	<b>3.7</b>	<b>0.1</b>	<b>5.5</b>	<b>14.0</b>
	<b>Total ((a)+(b)+(c))</b>		<b>2.0</b>	<b>49.0</b>	<b>40.7</b>	<b>1.2</b>	<b>61.1</b>	<b>154.0</b>

12. On paragraph 11(a), the estimate of \$100 million is for acquisition of the new TDWR and related costs.

Encl. 13. On paragraph 11(b), the estimate of \$40 million is for development, replacement and upgrading of the other meteorological and infrastructural facilities. The enclosure gives brief descriptions about the functions and cost breakdown of the facilities concerned.

14. On paragraph 11(c), the estimate of \$14 million represents a 10% contingency on the items set out in paragraphs 11(a)-(b).

#### **Other Non-recurrent Cost**

15. Implementation of the proposal will require the creation of three time-limited non-directorate civil service posts (namely, one Scientific Officer and two Scientific Assistants) from 2009-10 to 2014-15. It will entail a total non-recurrent staff cost of \$10,296,000 over the six-year period, with a breakdown as follows –

<b>Financial Year</b>	<b>\$ '000</b>
2009-10	936
2010-11	1,872
2011-12	1,872
2012-13	1,872
2013-14	1,872
2014-15	1,872
<b>Total</b>	<b>10,296</b>

16. The three time-limited posts are needed to help oversee and provide support in following through various steps including the drafting of tenders, liaison with relevant parties including CAD and AA, the testing, implementation and commissioning of the facilities. Given the scale of the exercise (which entails the replacement or upgrading of nearly all the aviation meteorological facilities now in use), internal deployment of staff alone could not absorb the additional workload.

**/Recurrent .....**

### Recurrent Expenditure

17. We estimate that the proposal will entail an annual recurrent expenditure of \$15,069,000 upon full implementation in 2014-15, with a breakdown as follows –

		2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16 & beyond	
		\$ '000	\$ '000	\$ '000	\$ '000	\$ '000	\$ '000	\$ '000	
(a)	<i>Staff cost</i>	1,154	2,309	2,309	2,309	2,309	2,309	2,309	
(b)	<i>Cost for maintaining the facilities</i>								
	(i)	Light and power	-	377	753	753	1,003	1,003	1,003
	(ii)	Rental of communication links	-	123	245	245	1,745	1,745	1,745
	(iii)	Specialised spare parts and consumables	-	5	11	11	11	4,011	4,011
	(iv)	Maintenance and other professional services	-	188	3,501	3,501	3,501	6,001	6,001
	<i>Sub-total of (b)</i>		-	693	4,510	4,510	6,260	12,760	12,760
	<b>Total ((a)+(b))</b>		<b>1,154</b>	<b>3,002</b>	<b>6,819</b>	<b>6,819</b>	<b>8,569</b>	<b>15,069</b>	<b>15,069</b>

18. On paragraph 17(a), the annual expenditure of \$2,309,000 is for the creation of three permanent non-directorate civil service posts (namely, one Scientific Officer, one Experimental Officer and one Radar Specialist Mechanic). The additional staff will help develop new aviation-specific weather services and drive research for improvements on a continuous basis having regard to best practices elsewhere and advances in technology; oversee the procurement and subsequent operation as well as maintenance of both the new and the backup TDWR; and operate and maintain the additional meteorological and infrastructural facilities, including the administration of routine upgrading in the course of time.

19. On paragraph 17(b), the annual expenditure of \$12,760,000 is for the necessary light and power, communication links, specialised supplies and service contracts for maintaining the operation of the facilities.

20. We will make available sufficient provisions in the annual Estimates of HKO to cover the other non-recurrent and recurrent expenditure in paragraphs 15 and 17 above.

### **Impact on Fees and Charges**

21. Under the existing “user pays” principle, the costs for HKO to provide aviation weather services will be fully recovered from AA for aircraft landing at HKIA and from airlines for overflying aircraft without landing at HKIA (as part of en-route navigation charges). Since HKO’s service charges only constitute about 2.6% of the overall airport charges of HKIA, the effect of HKO’s proposal on the airport charges should be minimal. As a result of the present proposal and the other on-going aviation weather services, HKO estimates that the annual weather service charges collected from AA would gradually increase to around \$99 million in 2013, or \$18 million more than would otherwise be the case. Similarly, it is not envisaged that the en-route navigation charges, currently pitched at \$4.8 per nautical mile, will see a significant change as a result of the proposal since aviation weather services only constitute about 6% of the charges.

### **IMPLEMENTATION PLAN**

22. We plan to implement the proposal according to the following schedule –

<b>Activity</b>	<b>Target Completion Date</b>		
	<b>TDWR</b>	<b>Facilities needed to replace ageing equipment and to facilitate integration with CAD’s replacement ATC system</b>	<b>Facilities for development of enhanced aviation-specific weather services</b>
Tender preparation and invitation	December 2009	December 2009	June 2010
Contract award	October 2010	March 2010	March 2011
Finalisation of system design	June 2011	-	-
Delivery, installation and commissioning	October 2013	in phases by December 2012 and January 2015 respectively	March 2012

**PUBLIC CONSULTATION**

23. The proposal has the strong backing of the Windshear and Turbulence Warning System Working Group and the Liaison Group on Aviation Weather Services. The two user groups include representatives from airlines, pilots and/or air traffic controllers. AA also supports the need for acquiring the facilities.

24. The Administration consulted the Legislative Council Panel on Economic Development on 16 December 2008. The Panel supported the proposal and urged the Administration to expedite the replacement and upgrading of the meteorological facilities. The implementation plan shown in paragraph 22 above reflects a compressed timetable, having regard to the various constraints including the need for careful planning and professional inputs throughout the process. The Panel also requested the Administration to provide more information on the proposed creation of the six non-directorate civil service posts. The information sought was circulated to the Panel in January 2009 (ref: CB(1)517/08-09(01)).

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Commerce and Economic Development Bureau  
February 2009

**Functions and Estimated Costs of the Proposed Replacement or Upgraded  
Meteorological and Infrastructural Facilities**  
*(other than the Terminal Doppler Weather Radar)*

	Item	Description	Estimated cost (\$ million)
<i>(a)</i>	<i>Meteorological and infrastructural facilities for development of enhanced aviation-specific weather services</i>		
	(i) Computing hardware and software	This is for development of enhanced aviation-specific weather forecasting information and services for the aviation community, covering high-impact weather phenomena including thunderstorm, wind and visibility.	12.0
<i>(b)</i>	<i>Meteorological and infrastructural facilities needed to replace ageing equipment and to facilitate integration with the replacement ATC system of CAD</i>		
	(i) Meteorological Data Processing System	This is a computing system for the acquisition, processing, and distribution of weather information to support the operation of the HKIA.  It interfaces with the ATC system of CAD. It includes the Aviation Meteorological Information Dissemination System, which is a web-based system for processing and disseminating aviation meteorological information to subscribed users (including CAD, airlines, pilots and ground operators).	3.6

	<b>Item</b>	<b>Description</b>	<b>Estimated cost (\$ million)</b>
	(ii) Aerodrome Meteorological Observing System (AMOS) and Wind Profiler	<p>These are two sets of equipment installed in the vicinity of HKIA for weather observation and measurement.</p> <p>AMOS is a system for observing the weather conditions along the two airport runways and neighbouring areas. The Wind Profiler is a sensor for measuring the wind flow above the ground.</p>	7.1
	(iii) Light Detection And Ranging (LIDAR) and Windshear and Turbulence Warning System (WTWS)	<p>These are two closely related sets of equipment installed at HKIA for detecting windshear and turbulence.</p> <p>LIDAR is a specialised equipment to detect windshear when there is no rainfall. WTWS integrates data from a host of meteorological sensors including TDWR, LIDAR, AMOS and Wind Profilers, and provides timely alerts, including warnings of windshear, for the landing and departure areas of HKIA.</p>	8.1
	(iv) Meteorological satellite and weather radar processing and display workstations	<p>These are workstations for processing and displaying information from various meteorological satellites and weather radars.</p>	3.2
	(v) Other hardware and software to facilitate integration with the replacement ATC system of CAD	<p>Additional hardware and software are needed for development, generation and display of aviation weather information from various meteorological facilities to facilitate integration with the replacement ATC system of CAD.</p>	2.5

	<b>Item</b>	<b>Description</b>	<b>Estimated cost (\$ million)</b>
	(vi) Other communication facilities, networking equipment and uninterruptible power supply systems	<p>The communication facilities and networking equipment are for transmission of meteorological data and weather information among different meteorological facilities, and for dissemination of weather information to the replacement ATC system of CAD.</p> <p>The uninterruptible power supply systems provide a stable source of electricity power for the meteorological facilities.</p>	3.5
		<b>Total</b>	<b>40.0</b>

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