For discussion
on 26 April 2021

Legislative Council Panel on Economic Development

Replacement of Long-range Light Detection and Ranging Systems and Procurement of Wake Turbulence Detection Equipment for the Existing North and South Runways of Hong Kong International Airport

PURPOSE

This paper seeks Members' support for the proposal of the Hong Kong Observatory (HKO) to replace two existing long-range Light Detection and Ranging (LIDAR) Systems and to procure new wake turbulence detection equipment for the existing North and South Runways of the Hong Kong International Airport (HKIA), so as to sustain and enhance aviation safety and support future airport development.

JUSTIFICATIONS

2. Aviation safety is critical to the development of Hong Kong as an international aviation hub. As the designated meteorological authority in Hong Kong under the framework of the International Civil Aviation Organization, HKO provides weather services for international air navigation to ensure safe flight operations. To this end, HKO manages a range of aviation meteorological systems and facilities, and regularly replaces or upgrades them to ensure latest operational needs arising from such services are met and to enhance aviation safety.

Replacement of Long-range LIDARs

3. Windshear is a hazardous weather phenomenon which has brought about aircraft accidents around the world. It is caused by a sudden change in wind direction or strength, resulting in a change in lift on aircrafts. When encountered close to the ground during take-off or landing, windshear could impact the control of aircrafts and lead to serious accidents. Timely windshear alerts are thus of paramount importance to aviation safety.

4. Windshear under non-rainy conditions are detected by long-range LIDARs[1]. Currently, two long-range LIDARs are installed at the existing North and South Runways[2] respectively and serve as backup for each other. These long-range LIDARs were commissioned in early 2016. Taking into account the impacts from the Three Runway System construction works which will accelerate the deterioration of the long-range LIDARs' bearings and gears[3], they need to be replaced by around 2024 to ensure the high quality of weather services. Early adoption of latest LIDARs technologies would also help improve quality of weather data collected by HKO.

[1] Windshear under rainy conditions are detected by Terminal Doppler Weather Radars.

[2] The Legislative Council Finance Committee (FC) approved funding for installing similar long-range LIDARs at the Third Runway in June 2020 (please refer to FC Paper FCR(2020-21)4). They could not serve the existing North and South Runways at the same time because the Third Runway, whilst parallel to the existing North and South Runways, is staggered to the west due to terrain.

[3] Long-range LIDARs continuously change their tilts and rotate during their operation to measure wind along glide paths and areas in the vicinity. Their typical serviceable life is about 10 years. However, sand and dust from the Three Runway System construction sites will accelerate the deterioration of the long-range LIDARs' bearings and gears, affecting their pointing accuracy and hence performance. It is therefore necessary to replace the existing long-range LIDARs by 2024 to ensure the high quality of weather services.

New Wake Turbulence Detection Equipment

5. Wake turbulence is caused by a pair of intense vortices generated behind an aircraft in motion. When encountered in full strength by a following aircraft, wake turbulence may cause severe rolling motions and endanger aviation safety. As the vortices will dissipate or be blown away from the flight path by background winds after some time, wake turbulence encounter can be avoided by maintaining a safe distance between the leading and following aircrafts during take-off, en-route and landing (namely wake turbulence separation minima). A smaller wake turbulence separation minima is conducive to increasing the throughput of runways. Specialised short-range Doppler weather radars (SRDWRs) and short-range LIDARs (SRLs) are used for monitoring wake turbulence under rainy and non-rainy conditions respectively.

6. At present, HKO has not installed any SRDWRs and SRLs for the existing North and South Runways for wake turbulence monitoring[4]. To enable the provision of new wake turbulence detection services, HKO would need to procure two sets of new SRDWRs and SRLs, i.e. one set each for the existing North and South Runways[5]. Coupled with forecasts from HKO's Airport Meteorological Office, such new services will enable HKO to better support HKIA's future efforts in implementing weather-dependent wake turbulence separation minima standards, so as to manage air traffic demand and airport capacity more effectively.

[4] The FC approved funding for installing similar SRDWRs and SRLs at the Third Runway in June 2020 (please refer to FC Paper FCR(2020-21)4). They could not serve the existing North and South Runways at the same time because the Third Runway, whilst parallel to the existing North and South Runways, is staggered to the west due to terrain.

[5] One set of SRDWRs and SRLs is comprised of two SRDWRs and two SRLs.

FINANCIAL IMPLICATIONS

Capital Expenditure

7. The proposal is estimated to incur a capital expenditure of $102 million, with the following breakdown –

		$ million
(a)	**Long-range LIDARs**	
	(i) Site surveying and preparation	0.1
	(ii) Hardware, installation services and initial spares	57.2
	(iii) Software development	1.1
	(iv) Contingency (10%)	5.8
	Subtotal	64.2
(b)	**SRDWRs and SRLs**	
	(i) Site surveying and preparation	0.1
	(ii) Hardware, installation services and initial spares	33.2
	(iii) Software development	1.1
	(iv) Contingency (10%)	3.4
	Subtotal	37.8
	Total	**102.0**

The cashflow projection of the capital expenditure is as follows –

Financial Year	**Long-range LIDARs $ million**	**SRDWRs and SRLs $ million**
2021-22	0.1	0.1
2022-23	-	2.1
2023-24	-	5.2
2024-25	57.7	26.6
2025-26 and onwards	6.4	3.8
Sub-total	64.2	37.8
Total	**102.0**	

Recurrent Expenditure

8. It is estimated that the proposal will entail an annual recurrent expenditure of $0.3 million in 2023-24, rising to $6.2 million per annum in 2025-26 and onwards, with breakdown as follows –

Financial Year	2023-24 ($ million)	2024-25 ($ million)	2025-26 and onwards ($ million)
Long-range LIDARs			
(a) Light and power	-	0.1	0.3
(b) Maintenance service	-	-	0.5
(c) Spare parts	-	3.4	3.4
(d) Consumables	-	0.4	0.8
Subtotal	-	3.9	5.0
SRDWRs and SRLs			
(e) Light and power	0.1	0.2	0.2
(f) Maintenance service	-	0.4	0.8
(g) Spare parts	0.1	0.1	0.1
(h) Consumables	0.1	0.1	0.1
Subtotal	0.3	0.8	1.2
Total	**0.3**	**4.7**	**6.2 per annum**

9. According to the Government's "user pays" principle, the costs for HKO to provide the relevant aviation weather services will be fully recovered from the Airport Authority Hong Kong (AAHK) through services charges for aviation weather services for aircrafts taking off or landing at HKIA. The additional depreciation and recurrent costs arising from the project will be included in setting the aviation weather services charges for AAHK in future.

IMPLEMENTATION PLAN

10. Subject to funding approval, HKO plans to proceed with the procurement and installation immediately in accordance with the standard procurement procedures of the Government and take into account the latest technological developments during the process. The project will be completed in phases by end 2024. Tentative implementation timetables are provided below. Installation works involving the existing North Runway will tie in with the works for reconfiguring the existing North Runway into the future Centre Runway[6].

		Target completion date for long-range LIDARs	**Target completion date for SRLs**	**Target completion date for SRDWRs**
(a)	Site surveying and preparation[7]	March 2022	March 2022	March 2022
(b)	Main tender invitation	May 2022	June 2022	June 2023
(c)	Award of main contract	November 2022	October 2022	December 2023
(d)	Delivery, installation and post-installation testing of equipment at existing South Runway	September 2024	February 2023	March 2024

[6] The commissioning of the Third Runway is scheduled for 2022, after which the existing North Runway will be closed for about two years from 2022 to 2024 for reconfiguration into the new Centre Runway.

[7] Site surveying and preparation of long-range LIDARs, SRDWRs and SRLs will be conducted in one go for better coordination.

		Target completion date for long-range LIDARs	Target completion date for SRLs	Target completion date for SRDWRs
(e)	Commissioning of equipment at existing South Runway	December 2024	April 2023	August 2024
(f)	Delivery, installation and post-installation testing of equipment at existing North Runway	September 2024	October 2024	July 2024
(g)	Commissioning of equipment at existing North Runway	December 2024	December 2024	December 2024

PUBLIC CONSULTATION

11. HKO has consulted aviation users through the Liaison Group on Aviation Weather Services, comprising representatives from AAHK, pilots and airlines. They are supportive of the proposal.

WAY FORWARD

12. Subject to Members' support for the above proposal, we plan to seek funding approval from the Legislative Council Finance Committee in mid 2021.

Commerce and Economic Development Bureau
Hong Kong Observatory
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