

For discussion
on 5 May 2009

Legislative Council Panel on Security

Replacement of Two Fixed-wing Aircraft and the Associated Mission Equipment for the Government Flying Service

PURPOSE

This paper seeks Members' support for the proposal to replace two existing fixed-wing aircraft and the associated mission equipment with two new jet planes and new mission equipment for the Government Flying Service (GFS).

BACKGROUND

2. With a fleet of nine aircraft comprising two fixed-wing aircraft and seven helicopters, GFS provides search and rescue (SAR) service and air ambulance service round the clock, and supports the work of various government departments. The two fixed-wing Jetstream 41 (J-41) aircraft, which were introduced into service in 1999, are mainly deployed for long-range SAR operations outside Hong Kong waters and provide top cover for helicopters during such offshore operations, provide assistance to other government departments (e.g. in aerial geographical surveys and law enforcement operations). They each fly an average of about 1 550 hours a year.

3. GFS has a multi-role mission with few parallel worldwide. To meet GFS's unique operational requirements, the two existing J-41 aircraft were modified extensively to accommodate different types of important mission equipment¹ that are essential to GFS's operations. To ensure the serviceability and reliability of the J-41 aircraft which are of utmost importance to the success

¹ The equipment installed on the J-41 aircraft includes a 360-degree search radar, a forward looking infra-red (FLIR) detection system, FLIR/radar operator station, video data downlink, satellite communication and other secure mission radio systems, emergency beacon locating system, observation station, in-flight dropping system for dispensing flare/smoke and dropping liferafts to survivors at sea, aerial survey camera and other supporting equipment.

and safe conduct of emergency operations, GFS relies heavily on the technical support of the aircraft manufacturer and equipment manufacturers, qualified spares suppliers and providers of repair and overhaul service for the timely supply of the required components and parts, technical advice and repair of certain major components that cannot be carried out by the engineering staff of GFS.

JUSTIFICATIONS

Need for replacing two fixed-wing aircraft and the associated mission equipment

4. In 2008, GFS conducted a review of the conditions of its aircraft fleet. The review concluded that the two existing J-41 aircraft are approaching the end of their serviceable lives with the following problems identified –

- (a) Owing to the unique nature of their operations, the two J-41 aircraft are constantly subject to hostile operating environments, including extreme weather, turbulence and highly corrosive salt-laden atmosphere prevailing at low altitudes over the sea. These conditions have placed great strain on the structural integrity of the J-41 aircraft and imposed an abnormal rate of wear and tear on the components;
- (b) The aircraft manufacturer has ceased production of J-41 aircraft and the model is being gradually phased out worldwide. As a result, the level of technical support available from the manufacturers and spares suppliers has been on a gradual decline. GFS has been experiencing problems of long delivery time and unavailability of some spare parts. We understand that other operators of J-41 aircraft elsewhere experience the same problems;
- (c) GFS estimates that its stock of essential spare parts for the J-41 aircraft will be depleted in about four years. When the defective components/parts cannot be replaced, the two J-41 aircraft will not be able to meet the required safety standards, some of which are mandatory. As a result, the aircraft will have to be grounded and GFS's SAR capability will be seriously affected;
- (d) The mission equipment installed on the two J-41 aircraft has been in use since the aircraft came into service in 1999. Most of the equipment has become obsolete and the production of some spare

parts has already ceased; and

- (e) Most of the mission equipment installed on the two J-41 aircraft is analogue-based². This limits the sharing of data among different systems such as the Global Positioning System, the Flight Management System, the FLIR Detection System and the 360-degree Search Radar. Currently, the crew on the J-41 aircraft has to extract data from the 360-degree Search Radar and the FLIR Detection System, process/analyse the data manually, and input the required information into the flight management or navigation systems. Such manual mode of operation is inefficient and may affect the precision of an operation.

5. Since 2007, GFS has taken the following measures to alleviate the problems of long delivery time and unavailability of certain spare parts of the J-41 aircraft –

- (a) increasing the stock level of spare parts that are still available from the manufacturers and spares suppliers;
- (b) liaising closely with the manufacturers for alternative solutions; and
- (c) exploring the possibility of procuring spare parts from other J-41 aircraft operators.

However, the results of measures (b) and (c) above are not as satisfactory as expected. GFS has, therefore, conducted market research on possible replacement for the J-41 aircraft and the associated mission equipment. The research indicates that it will take approximately three years to build and modify an aircraft to the standards required for the operations of GFS.

The proposed jet planes

6. GFS's research indicates that the market for fixed-wing aircraft that will be able to meet GFS's requirements in terms of capability, performance, size and cost-effectiveness is dominated by small jet planes. We, therefore, propose to replace the two existing J-41 aircraft with two small jet planes of similar size.

² Full digitisation and integration of the avionics and navigation systems were introduced for the whole aviation industry only in the 2000s when their performance and reliability were proven.

7. In taking forward the replacement project, GFS will adopt the following measures to address some of the problems identified in paragraph 4 above –

- (a) The segment of the aircraft market that meets the general requirements of GFS is dominated by commercial aircraft which does not offer more durable and robust aircraft that suits GFS's unique operational needs. GFS will specify the requirement for the manufacturer to provide technical advice and support for maritime anti-corrosion treatment in the maintenance of the new aircraft. GFS will also make reference to the practices adopted by overseas emergency response units to maintain their aircraft which are constantly subject to hostile operating environments;
- (b) GFS will specify the requirement for the latest proven models capable of further upgrading for the mission equipment to be installed on the new aircraft so as to maximize the serviceable life of the equipment without compromising the safety and reliability of GFS's operations;
- (c) GFS will specify the requirement for full integration capability for all the electronic equipment on board the new aircraft to optimise their performance, efficiency and reliability;
- (d) In drawing up the technical specifications, GFS will consider requesting the relevant manufacturers/suppliers for a longer guarantee period for spares and technical support beyond the normal ten-year period; and
- (e) Since spares and technical support for an aircraft are driven by market demand, GFS will take into account the overall fleet size of the aircraft model worldwide as well as its sustainability in the tender evaluation process.

Benefits of jet planes

8. The proposed jet planes and the mission equipment will outperform the existing J-41 aircraft and mission equipment in the following aspects –

- (a) Jet planes fly significantly faster and can remain airborne longer than the J-41 aircraft. For comparison, the speed of the proposed jet planes is 70% faster than that of the J-41 aircraft and their endurance is 56%-400% (subject to the distance of the scene)

longer than that of the J-41 aircraft. This will improve GFS's performance in SAR operations, in terms of effectiveness and efficiency, because faster speed and longer endurance allow the aircraft to reach the scene of the incident much quicker and remain on scene for longer and more thorough search. This will increase the chance of locating survivors, reducing their exposure time in a hostile environment and increasing their chance of survival;

- (b) As the performance parameters of jet planes will be similar to those of airliners flying in and out of the Hong Kong International Airport (HKIA), the data collected by the jet planes will be of high reference value to aircraft using HKIA. To enhance aviation safety within Hong Kong, GFS plans to liaise with the Hong Kong Observatory (HKO) for the installation of a metrological measuring system onto the new aircraft to collect metrological data (e.g. wind speed and direction, air temperature, relative humidity, etc.) for wind shear and turbulence analysis by HKO and subsequent dissemination to other aircraft;
- (c) The mission equipment to be installed on the new aircraft adopts digital technology and can be fully integrated with the flight management and navigation systems on board. This will enable real-time data sharing among the different systems on board as well as communication between the aircraft and the ground stations, such as GFS's Air Command and Control Centre and HKO's metrological stations. The new facilities will greatly improve GFS's operational efficiency and enhance flight safety as follows –
 - (i) Through the real-time data up-link function, the ground station can provide up-to-date weather information and other useful information for the SAR operations to the pilot. Such information can help reduce the risks faced by the GFS crew when operating under hostile, ever-changing weather conditions and improve the operational efficiency in conducting long-range SAR operations;
 - (ii) By integrating the FLIR detection system with the global positioning system of the new aircraft, the pilot can locate the exact position of the target more speedily (e.g. a vessel in distress), and enhances the chance of success of an SAR operation;
 - (iii) Through the integration of the FLIR detection system with the satellite communication system, the GFS crew can transfer

information about the operation scene to the ground mission control centre, thus facilitating more effective decision-making in the course of the operation; and

- (iv) Through the real-time data down-link function, metrological data collected by the new aircraft can be transferred real-time to HKO to enable it to provide more accurate and timely turbulence and windshear warnings to aircraft flying in and out of HKIA;
- (d) The new mission equipment is more sophisticated and offers better protection to the crew working under hostile environment. For example, clarity of communication will be enhanced with the new radio systems and the new inflight dropping system will improve the precision of liferaft dropping to survivors at sea and reduce exposure of the crew to the hostile environment.

FINANCIAL IMPLICATIONS

Non-recurrent expenditure

9. Based on the latest market information, we estimate that the non-recurrent expenditure of two small jet planes and the associated mission equipment will be about \$776 million over a three-year period from 2010-11 to 2012-13. The estimate includes the costs of two small multi-purpose jet planes with mission equipment, modification and certification work for the installation of mission equipment, the initial batch of essential spare parts and tools, and training of the aircrew and engineering staff for the operation, maintenance and repair of the aircraft. A breakdown is at **Annex A**.

Recurrent expenditure

10. We estimate that the recurrent expenditure for repair and maintenance and fuel consumption of the replacement jet planes will be similar to that for the existing J-41 aircraft, which is about \$15 million a year.

IMPLEMENTATION PLAN

11. Subject to Members' views on the proposal, we plan to seek funding approval from the Finance Committee in June 2009 with a view to commencing the tendering exercise in the latter half of 2009. We expect that

the new aircraft will be commissioned in 2013. An implementation plan is at **Annex B**.

Security Bureau
Government Flying Service
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Annex A

Non-recurrent Expenditure on the Replacement of J-41 Aircraft

	2010–11 \$'000	2011–12 \$'000	2012-13 \$'000	Total \$'000
(a) Two small multi-purpose jet planes	106,400	106,400	53,200	266,000
(b) Mission equipment <ul style="list-style-type: none">• a 360-degree search radar• FLIR detection system• FLIR/radar operator station• video data downlink• satellite communication system• secure mission radio systems• emergency beacon locating system• observation station• in-flight dropping system• aerial survey camera• other supporting equipment	65,600	65,600	32,800	164,000
(c) Modification work with certification	77,600	77,600	38,800	194,000
(d) Spare parts and tools			43,000	43,000
(e) Training for aircrew and engineering staff			8,000	8,000
(f) Contingency (15% of items (a) – (e) above)	40,400	40,400	20,200	101,000
Total	290,000	290,000	196,000	776,000

Annex B

Implementation Plan for GFS's Proposed Procurement of Jet Planes

<u>Activity</u>	<u>Target Completion Date</u>
Tender preparation	June 2009
Tender invitation	December 2009
Tender evaluation	September 2010
Award of contract	December 2010
Delivery of two jet planes (aircraft only)	December 2011
Delivery of mission equipment, installation and modification work	December 2012
Training for pilots and engineering staff	December 2012
Commissioning of new aircraft	March 2013