

27 August 2019

Dr Lam Pin Min

Senior Minister of State, Ministry of Transport and Ministry of Health

Dear *Dr Lam,*

RECOMMENDATIONS ON THE REGISTRATION OF UNMANNED AIRCRAFT (UA)

1. Singapore is a small country with a crowded urban environment where airspace is limited but an extremely precious resource with many competing uses. To promote the beneficial uses of UA, it is important that we ensure that UA operators/users fly responsibly and safely. We must address the risks that UA pose to the public and aviation safety and establish an operational system which enables all stakeholders to fulfil their expectations.

2. Earlier this year, under your good office, the UA Systems Advisory Panel (UASAP) was established as an independent body comprising of representatives from key stakeholder groups to help the Civil Aviation Authority of Singapore (CAAS) review and recommend enhancements to Singapore's UA regulatory framework. The recent intrusions by unauthorized UA into Changi Airport underscore the urgency of the UASAP's work.

3. To instil a sense of responsibility and accountability among UA operators/users, the UASAP strongly recommends the implementation of a **mandatory UA registration regime** in Singapore. In developing our recommendations over a 3-month period, the UASAP studied UA registration regimes around the world and conducted Focus Group Discussions (FGDs) with the UA and aviation industry, hobbyists and members of the public to seek their views. In summary, we propose the following key features for the registration regime:

- (a) **The registration regime should cover all operators/users and UA types.** We note the diversity of UA types operating in Singapore's airspace. To ensure public and aviation safety, the registration regime should cover all UA whether it is commercial-off-the-shelf or self-assembled. This includes multi-rotors, aeroplanes and helicopters. All operators/users, including foreigners and tourists, should be required to register before operating their UA in Singapore.
- (b) **Total take-off weight of UA as the primary criterion for registration.** To strike a balance between safety and practicality, we propose that the registration regime covers UA with a total take-off weight above 250g. A scientific study

conducted by CAAS in collaboration with Nanyang Technological University (NTU) had concluded that a UA above 250g would result in serious injury if it falls on a person's head. This study is corroborated by a study by the US Federal Aviation Authority (FAA)¹. This weight threshold is aligned to that set by other countries that have implemented UA registration, such as China and the US. Most participants at our FGDs were also supportive of this weight criterion.

- (c) **A registered UA needs to be identifiable and traceable.** To ensure public confidence in the registration regime with particular regard to accountability, every registered UA should be identifiable on close inspection. The registered UA should be able to be traced to the registrant to facilitate investigations if the need arises. There are a number of ways this could be done. One possible way would be through the affixation of a tamper-proof registration sticker to the UA upon registration.
- (d) **Registration should be easy, convenient and affordable.** Registration should not deter operators/users, especially hobbyists, from flying UA. We should make the registration process easy in order to encourage compliance by all UA operators/users. We propose that registrants be provided with different options, including online, to register their UA. We also note the need to strike a balance between affordability, especially for those with multiple UA, and the need to ensure the long-term sustainability of maintaining and improving the registration regime. Taking reference from the cost of registration around the world, and the cost of registering e-scooters in Singapore, we recommend that the registration fee for each UA not exceed SGD\$20.
- (e) **A reasonable grace period should be given to encourage registration.** While time should be given for UA registrants to comply with the new regulations, we are mindful of the urgency for enforcement of the registration regime to be effected. We hence propose a 3-month grace period for operators/users to register their devices, after which effective enforcement should take place. CAAS could also consider partnering hobbyist clubs and training organisations to encourage registration.
- (f) **Registrants should be of a minimum age.** We propose setting a minimum age for UA registration to ensure registrants are of sufficient maturity, given the potential consequences arising from the errant flying of UA. We suggest that this minimum age be set at 16 years, which strikes a reasonable balance between maturity while ensuring that UA can continue to be flown for educational purposes at tertiary institutions. Persons below 16 years of age should only be allowed to fly an UA under adult supervision.

¹ UAS Ground Collision Severity Evaluation Final Report (2017), FAA Centre of Excellence for UAS Alliance for System Safety of UAS through Research Excellence.

4. The UASAP continues to meet regularly to review other related areas and will submit further recommendations when ready.

Yours sincerely,

A handwritten signature in blue ink, appearing to read "Timothy De Souza".

Mr Timothy De Souza

Chairman, Unmanned Aircraft Systems Advisory Panel

Enclosures

Annex A – Global Scan of UA Registration Regimes

Annex B – Summary of Focus Group Discussions

Global Scan of UA Registration Regimes

1. The rapid proliferation of UA has posed new challenges for civil aviation authorities (CAAs) worldwide. Many CAAs have responded by introducing mandatory registration regimes for UA. These include Canada, China, Ireland, the United Arab Emirates (UAE) and the United States (US). Australia and the United Kingdom (UK) have also announced their intent to introduce UA registration regimes.
2. Registration criterion. Most CAAs that have implemented UA registration regimes have determined that the take-off weight of the UA be used as the primary criterion for registration:
 - (a) Weight criterion. There appears to be a global convergence on 250g¹ as the weight threshold for UA registration.
 - (b) Age criterion. The minimum age for UA registration varies, ranging from 13 to 21 years of age.²
3. Identification of registered UA. All the regimes which the UASAP studied required the registered UA to be issued a unique identification number. The unique identification number had to be affixed on the UA before flying. However, requirements on displaying the identification number of the UA differed. In Ireland, the CAA issues a decal/sticker with the identification number which has to be affixed to the UA upon successful online registration. In China, Canada and the US, users are allowed to decide how to display the identification number on the UA, such as through engraving, affixing a self-printed permanent label or using permanent marker. However, drawbacks of this method included users mislabelling their UA or “gaming” the system by writing the same registration number on multiple UA.
4. Method and cost of registration. In all the registration regimes studied, registration was done through an online portal. The registration fee varies (ranging from SGD\$7 – SGD\$45). For simplicity, most regimes charged the same fee for all UA registrants. The exceptions were Australia and the UAE where differential registration costs applied to recreational and commercial users, with commercial users typically being charged more.

¹ A notable exception is Ireland (1kg). However, they are planning the revision of minimum weight threshold to 250g.

² The minimum age for UA registration in the respective countries are as follows: 13 years for the USA, 16 for Australia and Ireland, 18 for the UK, and 21 for the UAE (for UA that weigh above 25kg).

Summary of Focus Group Discussions (FGDs)

1. FGDs were conducted with the industry and the general public to seek views on the mandatory registration of UA. In the industry FGD, approximately 50 participants attended while for the general public FGD approximately 100 participants attended, comprising mostly of hobbyists. The panel is very appreciative of this high level of interest and participation.

2. There was strong support for mandatory UA registration to be implemented quickly to instil a sense of responsibility and accountability in every UA user, given the risks to aviation and public safety. It was agreed that registration should not be too onerous, especially for beneficial UA uses such as research and education.

Registration Criteria

3. There was consensus that the take-off weight of the UA should be the main criterion for UA registration. Most participants agreed that a 250g weight threshold was appropriate, taking into consideration: (a) the weight threshold other CAAs around the world had implemented, and (b) a scientific study conducted by the Civil Aviation Authority of Singapore (CAAS) in collaboration with the Nanyang Technological University (NTU) which concluded that a UA above 250g would result in serious injury if it falls on a person's head.

4. Other criteria that focused on the performance and capabilities of the UA (e.g. maximum speed, maximum height, flight time, range) were also discussed. However, participants felt that these were less appropriate and would also increase the complexity of the scheme.

Identification of Registered UA

5. Most participants agreed on the need for a registered UA to be identifiable on close inspection to ensure public confidence in the registration regime. To facilitate investigations, the registered UA should be traceable to the registrant with reasonable certainty.

6. A variety of suggestions were raised on how the unique identification number should be affixed/labelled on the UA to ensure ease of compliance. These included: (a) allowing users to self-print/label their identification numbers¹, (b) registration to be tagged to the manufacturer serial number², and (c) tamper-proof stickers to be

¹ This would facilitate the quick and convenient replacement of broken or torn labels quickly, particularly for registrants with multiple UA. However, others shared difficulties in compliance for tourists and amateur users, particularly those without access to a printer at home, or those who do not have water-proof stickers/prints.

² Others pointed out that some commercial off-the-shelf UA do not have unique serial numbers due to a lack of international standardisation. DIY UA also do not have serial numbers.

issued by the authority via post or over-the-counter, similar to LTA's e-scooter registration regime. Participants agreed that the tamper-proof sticker approach would be preferred if the sticker could withstand wear and tear, and could be obtained easily and affordably.

Mode of Registration

7. There was agreement that online registration would be the most convenient and efficient mode of registration. Most UA users would be digitally literate enough, and that online registration could be easily done in the comfort of home. Some suggested that over-the-counter options could also be made available to cater to less savvy-IT users (e.g. grandparents buying UA for their grandchildren) to allow users who were willing to travel to distribution centres to register their UA immediately, but at an extra cost. This will also benefit tourists who can register their UA at over-the-counter options upon arrival in Singapore, especially if made available at the airport.

Minimum Age and Competency

8. Given the potential risks involved, participants agreed on the need for a minimum age rule for UA registration. For those below the minimum age, it would be important for them to be accompanied by adult supervision at all times while flying their UA. Most agreed that setting the minimum age for registration at 16 years would strike a good balance between maturity while ensuring that UA can continue to be flown for educational purposes at tertiary institutions. Further, all agreed that registration should be accompanied by acknowledgement from all registrants on the dos and don'ts of operating a UA.

Other issues

9. Besides UA registration, most agreed that pilot skill was an important factor in ensuring the safe operation of UA across the board, and noted CAAS' public consultation in 2018 on implementing a pilot licensing framework.

10. Most agreed on the need to put in place stronger deterrents to prevent errant flying of UA, including harsher penalties for those who did not register, and also those who did not fly in accordance with regulations. Some participants also emphasised the need for this to be complemented by a sustained outreach and publicity campaign to raise awareness and educate the public on the need for safe flying. To achieve this, they suggested that CAAS partner with the People's Association (through community centres), hobbyist and interest groups and retailers.

11. Most agreed that it would be useful for CAAS to consider developing a mobile application ("App") to provide easy access to all information related to the safe flying of UAs, and be a one-stop resource for all regulatory processes related to the flying of UAs, including registration and permit applications. This could be similar to FAA's "Register Your Drone" page on its website. Others requested for non-UA users to have

access to the App, with features to allow them to identify if the UA flying in the vicinity is registered, and also report errant flying of UA.