Final Report

HEXADRONE TUNDRA 2 (URBAN) UNCONTROLLED FLYAWAY

19 July 2024

TIB/AAI/CAS.234

Transport Safety Investigation Bureau
Ministry of Transport
Singapore

23 July 2025

The Transport Safety Investigation Bureau of Singapore

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ABBREVIATIONS

AP	Activity Permit
C2	Command Centre System
C2 UI	C2 User Interface
FCC	Flight Control Computer
GNSS	Global Navigation Satellite System
OPT	C2 system operator
OP	Operator Permit
OPH	Operator Permit Holder
RC	Remote controller
RTH	Return to home
RTL	Return to launch
UA	Unmanned aircraft
UA-OM	UA Operational Manual
UAP	Unmanned aircraft pilot

SYNOPSIS

On 19 July 2024, an unmanned aircraft (UA) was undergoing a flight test from the roof top of a building in a built-up area. Soon after the UA took off for the eighth flight of the day, it could not be controlled and flew in an erratic manner instead of following the pre-programmed flight path.

The UA pilot and a remote control station operator were not able to regain control of the UA, which subsequently crashed into a residential building about 200m from the operational area. The UA dropped to the ground, landed about 1m from a person, and a fire ensued.

The Transport Safety Investigation Bureau of Singapore classified this occurrence as a serious incident.

AIRCRAFT DETAILS

Unmanned aircraft type	:	Hexadrone Tundra 2 (Urban)
Operator	:	H3 Dynamics
Date and time of incident	:	19 July 2024 1800LT
Location of occurrence	:	1.3018948°N 103.7896472°E
Type of flight	:	Flight test

1 **FACTUAL INFORMATION**

All times used in this report are Singapore Local Time (LT) unless otherwise stated. Singapore Local Time is eight hours ahead of Coordinated Universal Time (UTC).

1.1 History of the flight

1.1.1 A UA Operator Permit holder[1] (OPH) had an Operator Permit (OP) granted by the regulator for its Hexadrone Tundra 2 (Urban) quadcopter UA (see **Figure 1**).

(Source: UA manufacturer)

Figure 1: Hexadrone Tundra 2 (Urban) UA (not the incident UA)

1.1.2 On 19 July 2024, the UA was undergoing a flight test from the roof top of a building (about 6.9m above ground) in a built-up area. The OPH was developing an online system, known as Command Centre System (C2 system)[2], for remotely controlling and monitoring the status of the UA via a

[1] An Operator Permit (OP) is granted to an organisation by the regulator after it has evaluated the organisation's equipment, procedures and UAs that the organisation proposes to operate, and is satisfied that the organisation can conduct UA operations safely.

[2] Components of the C2 system include User Interface (UI), Companion Computer, GSM Router and Server (see paragraph 1.5.2).

laptop. The flight test was performed as part of the development and consisted of eight flights for that day.

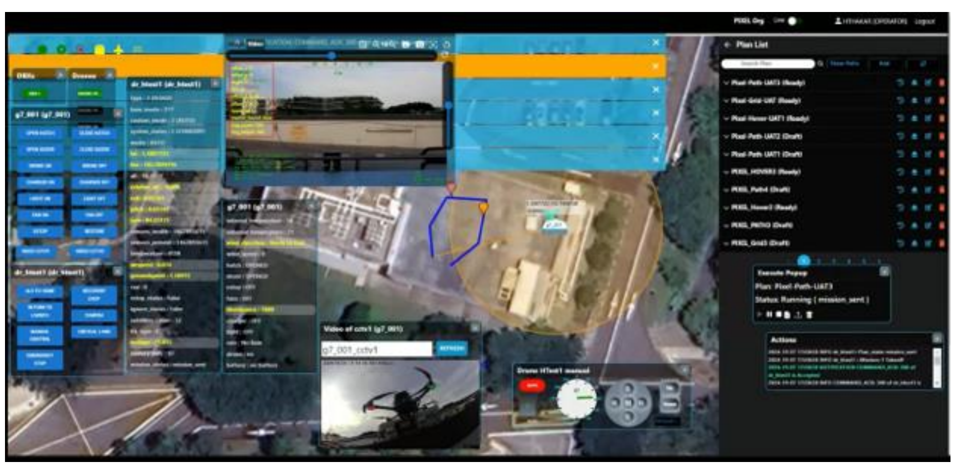
1.1.3 The persons involved in the flight test were as follows:

(a) A UA pilot (UAP) at the roof top, who could control the UA via a remote controller (RC) (see **Figure 2**);

(Source: OPH)

Figure 2: Remote controller

(b) A C2 system operator (OPT1) at a remote location, who could control the UA via his C2 system user interface (C2 UI)[3] (see **Figure 3**); and



(Source: OPH)

Figure 3: C2 System User Interface

[3] The C2 UI allowed a C2 system operator to control the UA via the internet. Multiple C2 system operators can access the C2 server through different C2 UIs to control the same UA. When multiple C2 UI commands are issued in quick succession by different C2 UIs, only the last command issued would be carried out by the UA.

(c) A C2 system operator (OPT2) at the roof top, who was a flight test observer. OPT2 was about 3-5m away from UAP and his role was to monitor the data feedback from the UA via another C2 UI and to relay messages between UAP and OPT1 but not to provide any input[4] to the C2 system.

1.1.4 Before every flight, UAP would use the RC to set the Flight Control Computer (FCC) on board the UA to GUIDED mode (more on FCC modes in paragraph 1.5.1.2). OPT1 would upload a mission to the FCC via his C2 UI and initiate the flight via his C2 UI. The FCC would then command the UA to take off and fly the mission's route autonomously. UAP would take over control of the UA via the RC when necessary.

1.1.5 The flight test began at about 1130LT. Prior to the first flight, UAP had defined a geofence[5] of radius 60m from the take-off position on the roof top using the RC. If the UA flew beyond the geofence, the FCC's Failsafe Function should automatically set the FCC to the Return to Launch (RTL) mode whereby the FCC would command the UA to fly back to the take-off position and land. This geofence was applicable to all test flights of the day, including the incident flight.

1.1.6 At about 1757LT, OPT1 uploaded a mission[6] for the eighth test flight (i.e. the incident flight)[7]. About two minutes later, the UA took off. However, instead of flying towards the first waypoint, the UA flew in an erratic manner (see **Figure 4**).

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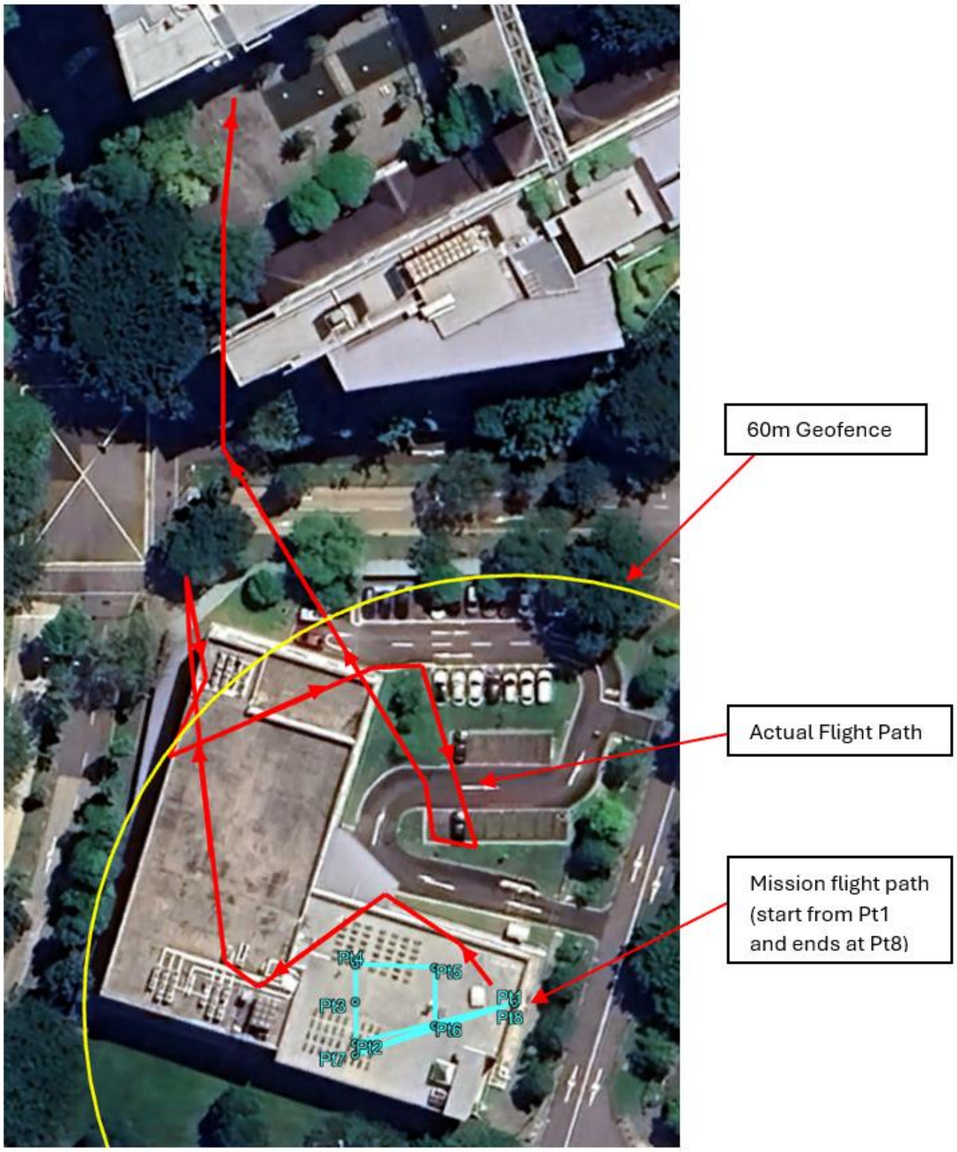
[4] OPT2 did not provide any input on his C2 UI during this occurrence.
[5] A geofence is a virtual geographic boundary which acts as a fence to prevent the UA from flying into unauthorised areas. The geofence is defined with the use of Global Navigation Satellite System (GNSS) technology. GNSS is a satellite constellation system which provides positioning and navigation services on a global basis.
[6] OPT1 performed Start Mission on his C2 UI (see paragraph 1.5.2.3).
[7] According to the OPH, seven test flights had been conducted successfully prior to the incident flight, with no breaching of the geofence.



(Source: Google maps) (Annotation: TSIB)

Figure 4: Mission flight path (cyan) and actual flight path (red)

1.1.7 UAP noticed the UA's erratic behaviour. To regain control of the UA, UAP used the RC to switch the FCC from GUIDED mode to LOITER mode (see **Figure 5**). This action was to hold the UA at its current position and altitude (i.e. hover) (see paragraph 1.5.1.2), but it did not work. The flight log of the C2 system server (hereinafter referred simply as the flight log) indicated that the FCC received LOITER mode command and there was no error message displayed on the C2 UI.

(Source and annotation: TSIB)

Figure 5: UA RC Mode Switch in three positions: “G” (GUIDED mode), “A” (ALT_HOLD mode) and “L” (LOITER mode)

1.1.8 For some 20 seconds, UAP re-engaged FCC’s LOITER mode several times by switching back and forth between ALT_HOLD mode and LOITER mode (i.e. toggling the RC Mode Switch between “L” and “A” positions in **Figure 5**), but he still could not regain control of the UA, and the UA was still flying erratically.

1.1.9 During this time, the UA had flown beyond the roof top of the building, over the public roads and out of the view of UAP and OPT2. According to UAP, while he was aware that he could cut the power to the UA’s motors via the RC to end the flight and let it fall vertically down, he did not do so as he was concerned that the UA might hit somebody or something since he could not see what was below the UA.

1.1.10 The table below summarises the sequence of events thereafter.

Time after take-off	Events	Remarks
25s	Unable to regain control of the UA, UAP switched back to GUIDED mode with a view to letting OPT1 regain control of the UA via the C2 UI. UAP told OPT2 to instruct OPT1 to activate RTH (Return to Home) mode via OPT1's C2 UI (more on C2 UI commands in paragraph 1.5.2.3) to command the UA to fly back to the take-off position. OPT2 did so accordingly and OPT1 complied with OPT2's instruction. However, the UA did not fly back to the take-off position and continued to fly erratically. There was no error message displayed on the C2 UI.	
29s	The UA went out of the view of UAP and OPT2 and breached the geofence. Although later the UA flew back to the operational area[8], the UA did not return to the take-off position.	
39s	The UA came into the view of UAP and OPT2. OPT2 reported to OPT1 that the UA was "not steady" and "going in a different direction".	
45s	The UA had returned to within the geofence.	As indicated by the flight log.

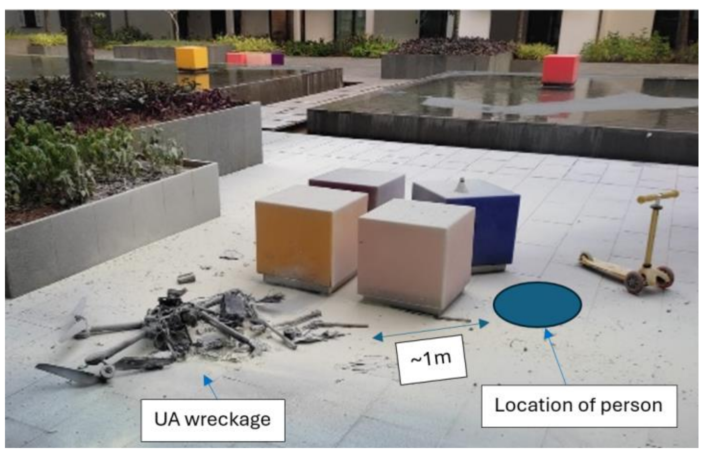
[8] The operational area is the roof top area (see paragraph 1.1.2).

Time after take-off	Events	Remarks
49s	Noticing that the UA was still not responding to his inputs to the C2 UI and without specifically seeking UAP's consent, OPT1 activated Pause Mission mode via the C2 UI to try to hold the UA at its current. The UA did not respond to this mode change.	According to OPT1, he was just repeating UAP's instruction given at 25s (i.e. to activate RTH mode) using an alternate method, i.e. by first activating Pause Mission mode before activating RTH mode.
63s	OPT1 activated RTH mode. At around this time, UAP switched the FCC from GUIDED to LOITER mode to try to take control of the UA, but the FCC did not hold the UA at its current position and altitude (i.e. hover).	The C2 UI was designed to ignore RTH mode command when the FCC is in LOITER mode (see paragraph 1.5.2.3). Hence, there was no effect from OPT1's input of RTH mode.
68s	UAP activated RTL mode using the RC touchscreen. The UA flew away towards the geofence boundary.	
Around 71s	The UA breached the geofence again, resulting in the FCC transiting to Failsafe Function RTL Mode. However, the UA started to fly further away from the operational area. Realising this, OPT1 activated Stop Mission mode via his C2 UI and informed OPT2 of his actions.	The UA disregarded Stop Mission command as FCC's Failsafe Function RTL Mode took precedence.

1.1.11 Eventually, at 85s after take-off, while the FCC was in RTL mode, the UA flew towards, and hit, a residential building about 200m from the flight test area (see **Figure 6**). It then dropped to the ground, about 1m from a person, and a fire ensued. **Figure 7** shows the crash site.

(Source and annotation: TSIB)

Figure 6: First and second point of impact



(Source: OPH) (Annotation: TSIB)

Figure 7: Crash site of the UA

1.2 Injuries to persons

1.2.1 There was no injury to any person.

1.3 Damage to UA

1.3.1 The UA was destroyed by the post-crash fire.

1.4 Personal information

1.4.1 UAP information

Age	33
Licence type	Unmanned Aircraft Pilot Licence (UAPL) (Class A)
Issuing authority	Civil Aviation Authority of Singapore
Licence validity date	9 December 2026
Last flight handling test date	9 December 2022
Total flying hours	36hr
Aircraft types flown	DJI M300 DJI Phantom 4 Hexadrone Tundra 2 (Urban) Freefly Astro
Total hours on type	25hr
Flying in last 90 days	22.5hr
Flying in last 7 days	1hr 54min
Flying in last 24 hours	40min
Duty time in last 48 hours	15hr 30min
Rest period in last 48 hours	32hr 30min

1.4.2 OPT1 did not hold a UAPL.

Age	40
Years of service with OPH	3 years

1.4.3 OPT2 did not hold a UAPL.

Age	36
Years of service with OPH	1 year 2 months

1.5 UA system information

1.5.1 Original UA system

1.5.1.1 The UA system procured by the OPH comprised a UA and an RC. The UA was a quadcopter of dimensions 665mm x 665mm x 513mm and weighed about 7.3kg with batteries attached. It was capable of carrying a payload of up to 3kg.

1.5.1.2 A UA pilot can control the UA by selecting various flight modes on the RC. Four FCC modes of interest, viz. RTL, GUIDED, LOITER and ALT_HOLD are described below:

FCC mode	Input means	Remarks
RTL	RC touchscreen, or when the UA breaches geofence	The FCC will guide the UA from its current position directly back to its take-off position and land. RTL mode will also be triggered automatically as a Failsafe Function of the FCC when the UA has breached geofence or has lost the RC link during flight.
GUIDED	RC Mode Switch	The FCC will fly a pre-determined flight path as defined by the mission or respond to commands (e.g. Stop Mission) sent from the C2 UIs.
LOITER		Using the Global Navigation Satellite System (GNSS) and altitude data from its onboard position sensors, the FCC will hold the UA at its current position and altitude (i.e. hover) when there is no input from the RC. In this mode, a UA pilot may control and change the UA's position using the RC.
ALT_HOLD	RC Mode Switch or when there is a fault in the navigation sensor	The FCC will hold the UA's altitude but external forces (e.g. wind) may move the UA laterally. A UA pilot may control and change the UA's position using the RC.

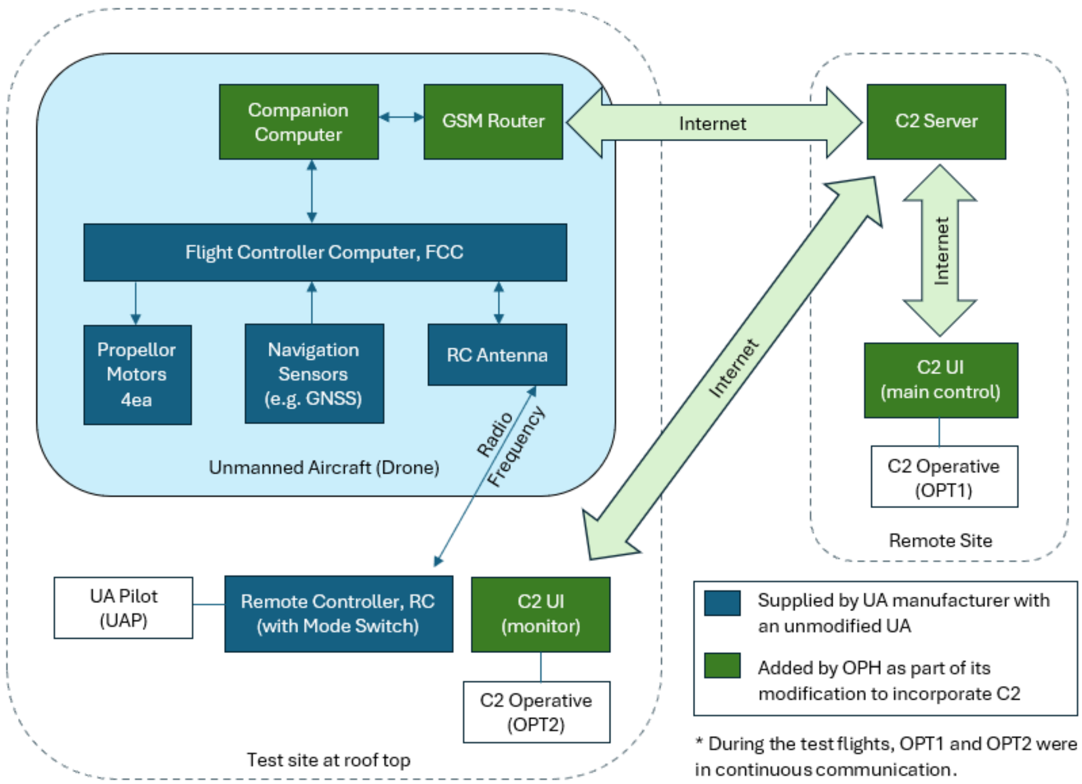
1.5.1.3 The RC Mode Switch is a 3-way toggle switch (see **Figure 5**). The toggle switch can be configured by a UA pilot to assign a specific mode to each of the switch positions. The UAP had configured the switch in the sequence shown below.

Toggle switch position	Mode selected	Remark
Top	LOITER	Nil
Middle	ALT_HOLD	When the switch is toggled from LOITER to GUIDED (and vice versa), the switch will transition through ALT_HOLD mode. During the transition, ALT_HOLD mode will be active momentarily.
Bottom	GUIDED	Nil

1.5.2 OPH's modification to the UA system

1.5.2.1 The OPH was developing the C2 system to remotely control and monitor the status of the UA via a laptop. The development of the C2 system required a Companion Computer[9] to be integrated onboard the UA (see **Figure 8**). The Companion Computer was connected to the internet through the mobile cellular network so that it could receive commands from the C2 UI and relay them to the FCC. There can be more than one C2 UI being operated simultaneously to control/monitor the same UA.

[9] Companion Computer is a miniature computer in the form of a small printed circuit board.



(Source: TSIB)

Figure 8: OPH's modification to the UA system

1.5.2.2 The OPH communicated with the UA manufacturer for technical advice on best practices in developing and integrating the C2 system into the UA system. The OPH followed an integration manual provided by the UA manufacturer and integrated the Companion Computer into the UA.

1.5.2.3 The C2 UI may send, among others, the following commands:

Command	Description	Remarks
Start Mission	A sequence of waypoints will be uploaded to the FCC as a mission. The UA will take off and fly this mission once the upload is completed. After flying to the last waypoint, the UA will return to land at the take-off position.	

Command	Description	Remarks
RTH	The UA will fly back to its take-off position and land.	If the UA is in LOITER mode or a Failsafe Function is activated, the C2 UI will disregard this command.
Pause Mission	The UA will hold at its current position.	The FCC will only accept these commands in GUIDED mode.
Stop Mission	The UA will fly back to its take-off position and hover above take-off position.	

1.5.2.4 According to the OPH, it did not make any software modifications to the RC and FCC.

1.5.2.5 The OPH began flight testing on 15 May 2024 and performed a total of 252 flights (including the incident flight) at various locations. A breakdown of the flights at different locations is shown below:

Date		Test location	Number of flights	Remarks
From	To			
15 May 2024	27 May 2024	In an open field	114	UA was attached to a tether.
28 May 2024	30 May 2024	Roof top of a building (same roof top as the incident)	53	UA was attached to a tether.
31 May 2024	17 July 2024		77	UA operated without a tether (According to the OPH, it had gained confidence in operating the UA system without the tether).
19 July 2024	19 July 2024		8	UA operated without a tether. It operated 7 flights without any incident and crashed on the 8th flight.
		Total	252	

1.5.2.6 According to the regulator, the development of the C2 system is considered a modification. The regulator required that “if a UA is customised or significantly modified such that there is impact to its critical functions … information should be provided to support the airworthiness of the UA”. However, the OPH considered that its development of the C2 system was not a customised or significant modification that would have an impact to its critical functions, and hence did not submit additional information regarding the airworthiness of the modified UA.

1.6 Meteorological Information

1.6.1 At the time of the occurrence, the visibility was good and there was no precipitation. The temperature was about 30°C and wind was about 7kts, both were within the safe operating range of the UA.

1.7 Flight recordings

1.7.1 There were three locations where flight data could be recorded – at the C2 server, the UA and the RC. The data recorded at these locations were not identical.

(a) The C2 server stored the flight log as well as the UA’s camera video footages sent from the UA. The data was available to the investigation team.

(b) The UA stored past flight data files. However, these data files were not available as the UA was destroyed by fire.

(c) The RC had not been configured by the OPH to record the UA flight details.

1.7.2 According to the flight log, about four seconds after the UA took off for the eighth flight, the X/Y[10] Position Control parameters[11] changed from ‘1’(Healthy) to ‘0’(Unhealthy), then back to ‘1’ a second later. Two seconds later, this change repeated one more time (i.e. ‘1’ to ‘0’, and then ‘0’ to ‘1’).

1.7.3 The flight log showed that the communication links between the FCC and the RC, and between the FCC and C2 UIs, were stable throughout the incident flight.

[10] X/Y refers to longitude(X) and latitude(Y).
[11] Sensor Health parameters were recorded once every second.

1.8 Medical and pathological information

1.8.1 UAP, OPT1 and OPT2 were not sent for medical and toxicological examination.

1.9 Additional information

1.9.1 Activity Permit (AP)[12] application

1.9.1.1 An AP applicant is required to provide information listed below[13] to illustrate its operation process. The regulator will review the information and assess whether all foreseen hazards are addressed before considering issuing the AP.

(a) Type(s) of operations the applicant intends to conduct

(b) Flight planning (e.g. take-off/landing, hover/flight path, height, speed)

(c) Map or floor place of the activity site

(d) Whether the activity is conducted for or within proximity of an organised event where crowds are expected

(e) How the unmanned aircraft will drift in the event of power failure at maximum operating height

1.9.1.2 The OPH indicated in its AP application that the purpose of seeking the AP was to carry out flight test. The OPH submitted a brief description of the flight test profile. However, the OPH did not indicate that its UA had been modified (as described in paragraph 1.5.2) and that the flight test was to test the C2 system.

1.9.1.3 The regulator granted the AP to the OPH based on the documents submitted by the OPH. According to the regulator, its considerations were as follows:

(a) The UA was procured commercially off-the-shelf and the OPH did not indicate any modification that had been carried out on it.

(b) The airworthiness of the UA was already approved at the OP level.

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[12] In addition to an Operator Permit (OP), the OPH needed to obtain an AP from the regulator to conduct its operation at a permitted date, time, location and operating altitude.
[13] This in addition to the information required in the regulator’s online application for permits.

(c) All test flights would be conducted with the UA directly over the roof top (i.e. the UA will not operate outside the lateral boundary of the roof top).

(d) The operations area, i.e. the roof top, was not located in a populated area.

1.9.2 OPH's submission of documents to the regulator

1.9.2.1 The OPH applied to the regulator to extend the coverage of its OP[14] to include the occurrence UA that it was acquiring. Before it received delivery of the UA, it applied to the regulator for its OP to be extended to cover the UA. For this application, it submitted to the regulator a copy of the UA manufacturer's UA Operational Manual (UA-OM). After it had received delivery of the UA, it discovered that the UA-OM stated that the UA had a feature (called a trigger) which, when pressed, could cut the power to the UA's motors for the purpose of ending a flight. However, the UA received did not come with the trigger. The OPH approached the UA manufacturer and was told that the trigger was an optional item. The OPH did not pursue further with the UA manufacturer. It did not inform the regulator about the discrepancy in the UA-OM and its UA as regards the trigger.

[14] The regulator grants an OP to an organisation or individual that demonstrate the ability to operate the UA safely.

2 ANALYSIS

The investigation looked into the following:

(a) Erratic UA flight

(b) Operator Permit (OP) and Activity Permit (AP) application

(c) Requirement for OPT1 to hold UAPL

(d) Applicant's care when submitting documents to the regulator

2.1 Erratic UA flight

2.1.1 The UA started to fly erratically almost immediately after it took off for the eighth flight. The flight log indicated that the parameter X/Y Position Control had momentarily changed to 'unhealthy' on two occasions.

2.1.2 According to the UA manufacturer, an 'unhealthy' X/Y Position Control status could be the result of either a faulty navigation sensor (e.g. GNSS receiver, altimeter, accelerometer) or an invalid data from the navigation sensors. The investigation team reviewed the recording of the C2 UI's screen display and did not find any indication of navigation sensor failure or invalid navigation data. Furthermore, should there be a fault with a navigation sensor, the FCC's Failsafe Function would automatically set the FCC to ALT_HOLD mode. The investigation team reviewed the flight log and found that none of the mode changes to ALT_HOLD mode were due to the FCC's Failsafe Function.

2.1.3 The manufacturer shared that when ALT_HOLD mode is selected by the RC, the X/Y Position Control status will also indicate 'unhealthy' even when there is no navigation sensor failure and valid navigation data is received. Based on the recorded data, at about the same time when the X/Y Position Control became 'unhealthy', the UAP was switching between LOITER and GUIDED modes (see paragraph 1.1.8) which resulted in a transient selection of ALT_HOLD mode (see paragraph 1.5.1.3). It is likely that the X/Y Position Control indicated 'unhealthy' due to the transient selection of ALT_HOLD mode.

2.1.4 There were several instances where UAP and OPT1 intervened and attempted to regain control of the UA. Based on recorded data, the commands from the RC and C2 UI were received and accepted by the FCC. There was no evidence of any radio or network interference that could have adversely affected the RC or C2 UI's communication with the UA (see paragraph 1.7.3).

2.1.5 Given that the UA was destroyed in the post-incident fire and only limited data was available, the investigation team was not able to determine the cause of the UA's erratic flying, or the reason why the FCC received but did not execute the commands from UAP and OPT1.

2.2 Operator Permit (OP) and Activity Permit (AP) application

2.2.1 The regulator required additional information to be provided if a UA is customised or significantly modified such that there is impact to its "critical functions". However, it was not clear what constitutes "customised or significant modification", and what UA functions are considered critical. The OPH did not seek clarification from the regulator and assumed that its modifications (i.e. integration of the C2 system components such as the Companion Computer) were not significant. As a result, the OPH did not indicate to the regulator that the UA had been modified. It would be desirable for the regulator to clarify these terms to avoid misinterpretation.

2.2.2 In its AP application, the OPH stated that it will be carrying out flight test but did not state that the flights involved the testing of the C2 system. If this had been declared, it was likely that the regulator would have required the OPH to submit additional documents for its consideration with a view to identifying any necessary safety measures (e.g. conducting the flight in a remote area).

2.3 Requirement for OPT1 to hold UAPL

2.3.1 The regulator required all persons having "operational control" over a UA to be UAPL holders. However, the definition of this term was not found in the regulation. The regulator shared with the investigation team that the term "operational control" includes activities essential to the operation of the remotely piloted aircraft, such as manipulating the flight controls as appropriate during flight time. Since OPT1 was able to send commands from the C2 UI to manipulate the flight controls, the regulator deemed that OPT1 had operational control and that it was inappropriate for OPT1 to perform such operational control without a UAPL.

2.3.2 The OPH, however, understood “operational control” as duties that a person on the ground performs to directly control a UA as appropriate during flight time. The OPH considered that OPT1 did not need to have a UAPL in view of the following:

(a) The OPH regarded UAP as the only person who had operational control of the UA via the RC and OPT1 as only an ancillary supporter sending mission plans and some commands (e.g. Start Mission, Pause Mission, RTH) to the UA via the C2 UI; and

(b) OPT1 was never intended to replace UAP to directly control the UA via the C2 UI.

2.3.3 This difference in the understanding of “operational control” resulted in OPT1 operating the UA, via the C2 UI, without a UAPL. It would be desirable for the regulator to provide more guidance on the meaning of “operational control”.

2.4 Applicant’s care when submitting documents to the regulator

2.4.1 The UA-OM stated that the UA had a trigger that could be used to cut off the power to the UA’s motors for the purpose of ending a flight. When the OPH discovered that the UA actually did not come with the trigger, it did not inform the regulator about the discrepancy in the UA Operational Manual.

2.4.2 UAP knew how to cut off the powers to the UA motors via the RC, so the unavailability of the trigger was not an issue in the incident. Nevertheless, it is worth reminding that inaccurate information has the potential to lead the regulator to make a decision that it would otherwise not make. Manufacturers should make it very clear whether a feature is an integral part of their products or whether it is an optional item, and organisations submitting information to the regulator have a duty to ensure that the information they submit is accurate.

3 CONCLUSIONS

From the information gathered, the following findings are made. These findings should not be read as apportioning blame or liability to any particular organisation or individual.

3.1 Due to lack of sufficient evidence and recorded data, the investigation team is not able to determine why the UA started to fly erratically shortly after take-off on the eighth flight and why the FCC's Failsafe Function RTL Mode failed to perform to expectation.

3.2 While the regulator required an OP applicant to provide information to support the airworthiness of the UA if the UA is customised or significantly modified such that there is impact to its critical function, the regulation did not explain what constitutes "customised or significant modifications" and what functions were considered critical. The OPH did not regard its modification of its UA was a modification which would affect the UA's airworthiness.

3.3 OPT1 did not hold a UAPL when the regulator expected that a person in his role should hold a UAPL.

3.4 When making an application for the OP, the OPH submitted to the regulator the UA-OM which stated that the UA had a trigger that could be used to cut off power to the UA's motors for the purpose of ending a flight. When the OPH discovered that the UA actually did not come with the trigger, it did not inform the regulator about the discrepancy in the UA-OM.

4 SAFETY ACTIONS

4.1 The regulator had taken the following safety actions:

(a) Required, on 23 July 2024, all UA OP holders to review its safety procedures and processes. As of 17 September 2024, all UA OP holders had reported to the regulator that the safety review had been conducted.

(b) Implemented, on 30 September 2024, an on-site audit programme for UA OP holders who have a sizeable fleet of UAs. The regulator will continually assess and identify such organisations and conduct on-site audits on them.

(c) Updated, on 8 October 2024, its guidance for permit application which covers the following:

(i) Introducing three Flight Test categories to differentiate Flight Test operations of varying risk levels. The information and documents required to be provided by an applicant will vary according to the activities conducted during the Flight Test;

(ii) UA OP holders must now apply to update its OP when a previously approved UA configuration has been changed; and

(iii) Reminding organisations that every person involved in flying a UA (whether in a single-piloted or multi-piloted configuration) is required to hold a UAPL.

4.2 The regulator updated its guidance material on 3 July 2025 to provide more clarity on the terms “modification”, “flight critical systems”[15] and “operational control”. The term “customised” was removed.

[15] The term “flight critical systems” replaces “critical functions” in the new guidance material.

5 SAFETY RECOMMENDATIONS[16]

A safety recommendation is for the purpose of preventive action and shall in no case create a presumption of blame or liability.

5.1 It is recommended that the UA manufacturer identify clearly in its documents to be provided to operators of its UA the equipment items that are optional for the UA's operation. [TSIB Recommendation RA-2025-001]

[16] The investigation team considered making safety recommendations to the operator. However, no safety recommendations were issued as the operator had ceased UA operations.