

CanberraUAV

Deliverable 3

Autonomous Flight Record



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2 Flight Logs

2.1 Flight Log Book

The following is an extract from our flight log book.

Date	Aircraft	Start Time	AUTO time	Flight Comments	DroneShare link
30/04/14	Bushmaster	10:09	0:04:57	D2 video capture. First flight with enlarged tail – handled very well.	www.droneshare.com/mission/11495
11/05/14	Bushmaster	9:52	0:03:39	Tuned the airspeed sensor and tested ground handling.	www.droneshare.com/mission/11488
18/05/14	Bushmaster	10:25	0:27:32	Tested new (bigger) fuel tanks.	www.droneshare.com/mission/11503
18/05/14	Bushmaster	11:35	1:00:41	First long-endurance flight. All went well.	www.droneshare.com/mission/11502
25/05/14	Bushmaster	10:47	0:01:51	Second endurance flight. Aborted due to crash	www.droneshare.com/mission/11510
05/07/14	Bushmaster	10:18	0:11:02	First AUTO flight of repaired airframe.	www.droneshare.com/mission/11509
06/07/14	Bushmaster	8:35	0:17:21	Flight test before endurance flights	www.droneshare.com/mission/11508
06/07/14	Bushmaster	9:31	1:00:57	First endurance flight	www.droneshare.com/mission/11512
06/07/14	Bushmaster	11:25	1:00:15	Second endurance flight	www.droneshare.com/mission/11511
13/07/14	Bushmaster	9:38	1:00:37	Endurance flight with camera and image processing on-board	www.droneshare.com/mission/11516
20/07/14	Bushmaster	14:04	0:06:32	Flight with remote ground station > 5km away.	www.droneshare.com/mission/11518
20/07/14	Bushmaster	11:14	0:48:22	Endurance flight with camera and image processing on-board	www.droneshare.com/mission/11515
02/08/14	Bushmaster	10:16	1:00:09	Endurance flight with camera and image processing on-board	www.droneshare.com/mission/12016
02/08/14	Bushmaster	13:10	0:14:47	Bottle drop test	www.droneshare.com/mission/12015
03/08/14	Bushmaster	10:59	0:11:07	Bottle drop and ground station test	www.droneshare.com/mission/12107
03/08/14	Bushmaster	12:22	0:06:02	Bottle drop and ground station test	www.droneshare.com/mission/12106
03/08/14	Bushmaster	13:12	0:07:03	Bottle drop and ground station test	www.droneshare.com/mission/12108
	Total		7:42:54		

Our full flight logs are available at www.droneshare.com/vehicle/1085 and <http://uav.tridgell.net/Bushmaster/OBC-2014-auto/>. They contain the full GPS tracks (in kml and gpx format) and flight telemetry (in tlog format).

2.2 GPS Telemetry

A KML log from a flight on the 20th June 2014 is shown below:



The full file is available from <https://api.dronehub.com/api/v1/mission/11515/messages.kmz>.

2.3 Video




A video showing the aircraft during autonomous flight and the operational ground station is available at <http://youtu.be/fzzPpzbPj0>.

2.4 Static Images

The following are a set of static images showing the ground station, aircraft and team members during flight operations from a number of flights over the last 3 months.



		Pre-flight checks
		Pre-flight checks
		Engine start
		Monitoring the UAV during flight

	Flying the search pattern
	Dropping a bottle to Joe
	Approach to landing
	Ground station test



Landing



Packing the UAV away after test flights

3 RF Transmitters

3.1 2.4 GHz RC Link

This link is used for manual RC control of the UAV's throttle and flight control surfaces.

Specification	Value
Model	FrSky Taranis 2.4 GHz (using a FrSky X9D transmitter module)
Transmission Frequency	2400 – 2483.5 MHz
Transmitter Power	60 mW (17 dBm)
Transmitter antenna gain	< 5 dBi
Calculated EIRP	< 23 dBm
Covering licence	Radiocommunications (Low Interference Potential Devices) Class Licence 2000. Part 45A, 53, 54

3.2 900 MHz Telemetry Link

This is a low bandwidth link for transmitting telemetry from the UAV to Ground Station. Commands can be sent from the Ground Station to UAV when necessary. They have been calibrated and tested for LIPD-2000 (Part 52) compliance by RFDesigns RF lab in Brisbane.

Specification	Value
Model	RFD900 Telemetry Radio
Transmission Frequency	915 – 928 MHz, 20 Channel Hopping
Transmitter Power	27 dBm (UAV) 24 dBm (Ground)
Transmitter antenna gain	3 dBi (UAV) 6 dBi (Ground)
Calculated EIRP	30 dBm (UAV) 30 dBm (Ground)
Covering licence	Radiocommunications (Low Interference Potential Devices) Class Licence 2000. Part 52

3.3 433 MHz Telemetry Link

This is a low bandwidth link for transmitting telemetry to the Tracking Antenna from the Ground Station. This is in order to provide the position of the UAV so the Antenna knows which direction to point.

Specification	Value
Model	3D Robotics 433MHz Radio
Transmission Frequency	433.05 – 434 MHz, channel hopping
Transmitter Power	10 dBm (Antenna) 10 dBm (Ground)
Transmitter antenna gain	2 dBi (Antenna) 2 dBi (Ground)
Calculated EIRP	12 dBm (Antenna) 12 dBm (Ground)
Covering licence	Radiocommunications (Low Interference Potential Devices) Class Licence 2000. Part 17

3.4 5.8 GHz Image and Telemetry Link

This is a high bandwidth link for transmitting images from the UAV's on-board cameras to the Ground Station. As a backup, the telemetry and command datastream also uses this link.

Specification	Value
Model	Ubiquiti Rocket
Transmission Frequency	5795 MHz
Transmitter Power	26 dBm (UAV) 8 dBm (Ground)
Transmitter antenna gain	10 dBi (UAV) 28 dBi (Ground)
Calculated EIRP	36 dBm (UAV) 36 dBm (Ground)
Covering licence	Radiocommunications (Low Interference Potential Devices) Class Licence 2000. Part 45B, 55 "C-tick" No. N14691

3.5 Voice Communications

This is a voice radio link using CB radios. It will be used to facilitate communications between the pilot and ground station during setup, takeoff, landing and pack-up.

Specification	Value
Model	Uniden UH015SX and Uniden UH078SX handheld CB
Transmission Frequency	476.425 -477.400 MHz
Transmitter Power	6.9 dBm
Transmitter antenna gain	3 dBi
Calculated EIRP	9.9 dBm
Covering licence	Radiocommunications (Citizen Band Radio Stations) Class Licence 2002. "C-tick" No. N32Z068

4 Aircraft Specifications and Performance

The Aircraft platform used by Canberra UAV is a custom built aircraft called the “Bushmaster”. It has the following specifications:

Specification	Value
Maximum Airspeed	64 kts (115 Km/h)
Cruise Airspeed	56 kts (100 Km/h)
Endurance at maximum airspeed	Estimated 60 minutes
Endurance at cruise airspeed	90 minutes
Maximum take off weight	20 Kg
Competition take off weight	15 Kg
Wingspan	2.6 m
Airframe length	2 m
Identifying marks	White with red trim
Aircraft platform and configuration	High wing V-tail tractor aircraft