
FS DUENNA

V3.0



Flight Monitoring Software for Flight Simulator

By: Eamonn Watson

Overview

The FS Duenna application was originally created by Johannes Mueller in 2004. It is a small tool to help validate flights during the FS RTW (Round the World) Race. It was found that the integrated Flight Analysis Window in Flight Simulator 2004 did not provide sufficient information to validate flights and that it sometimes displayed flights as invalid although everything was done correctly. This tool will check for specific conditions before, during and after a flight. It will create a validation graphic and validation text which may be used as proof of validation.

However with the release of Lockheed Martin's Prepar3D as well as Flight Simulator X Steam Edition, updates needed to be made to the application. Mr. Mueller however did not have the needed time to make these changes so the application was handed over to me. Upon receiving the application source code I immediately updated it to utilize the .NET framework as the old application relied on old VB6 libraries. It was also updated for the new simulators.

While this worked, it was in desperate need of a refresh as well as a code overhaul as it wasn't originally written with object oriented programming in mind. Version 3 is a from the ground up refresh of the application written to take advantage of current windows technologies.

Eamonn Watson

System Requirements

The FS Duenna is quite a small application but there are some requirements it does have.

- Windows 7 or higher
- .NET Framework Version 4.5.2 or higher
- Microsoft Flight Simulator 2004/X/X:Steam Edition or Lockheed Martin Prepar3D Versions 2/3/4
- FSUIPC Version 3.999z9b is required for FS2004
- FSUIPC Version 4.950 is required for FSX/FSX-SE/P3D V2/V3
- FSUIPC Version 5.1 is required for P3DV4
- 5MB Disk space (for application), 50+ MB needed for flight validations
- Internet Connection (for flight tracking)

Please NOTE: FSUIPC need not be a purchased copy, a non-registered version will work just fine.

User Interface

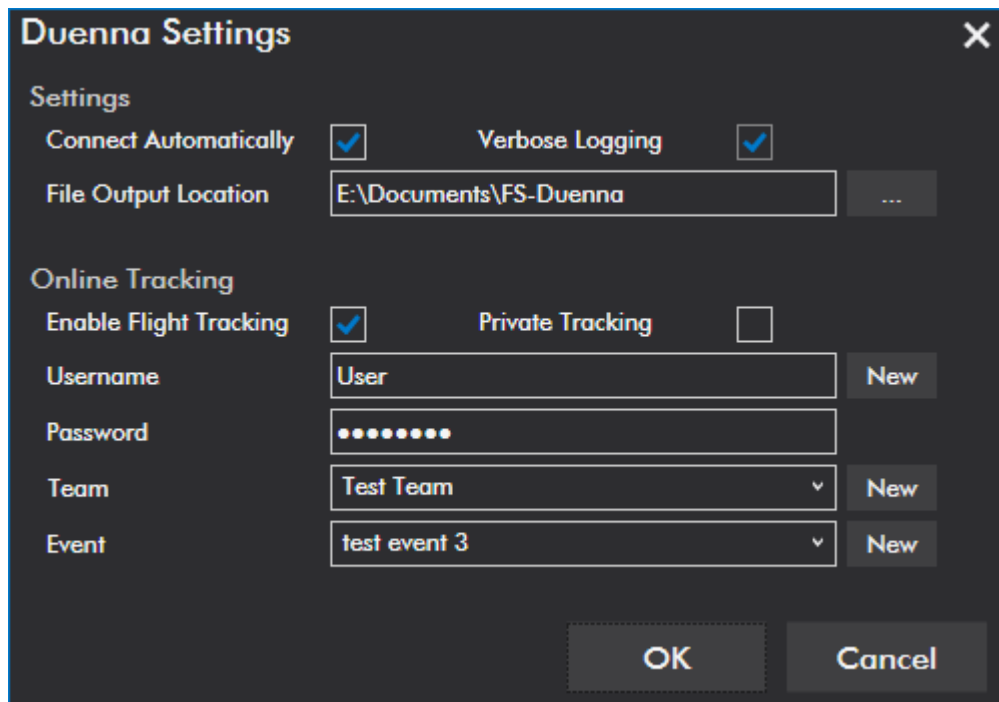
Main Interface



1. Miscellaneous Commands
 - a. Flight Link Button (Plane Icon) – If flight tracking is enabled, this will open a browser with your current flight.
 - b. Top up Fuel Button (Fuel Pump Icon) – Tops up current fuel level to 100% (only enabled before baton capture)
 - c. Sync Date/Time (Clock Icon) – Sync’s flight simulators date / time UTC to your systems current UTC. (only enabled before baton capture)
 - d. About Button (i Icon) – Shows the About Duenna window.
 - e. Settings Button (Gear Icon) – Brings up the Duenna Settings (only enabled before baton capture)
 - f. Always On Top (Up Arrow Icon) – Will keep Duenna on top of other windows.
2. The main Application Buttons
 - a. Connect – Connects to Flight Simulator if available
 - b. Take Baton – Starts the flight tracking
 - c. Drop Baton – Ends flight tracking. NOTE: If not on the ground and stopped this will abort flight.
 - d. Reset Baton – Resets flight tracking for a new flight
3. Additional Toggle Switches
 - a. Auto-Baton : Automatically capture baton at 50 knots while on the ground

- b. Baton or Wingman : Only available if Flight Tracking is enabled. This will trigger the baton/wingman flag on fs-duenna.com flight tracking.
 - c. Autopilot : Enables or disables the flight simulator autopilot. If this is disabled, the default autopilot will not function for the entire flight. Please NOTE: 3rd party autopilots (eg, PMDG) will still function as they do not rely on the built in autopilot functionality.
4. Current Duenna Status – Consult Duenna Status for further information
 5. Current Flight Information
 - a. Location – Current Long/Lat/Altitude/Ground speed of the aircraft. Will also show closest airport before baton is captured and departure airport once captured.
 - b. Aircraft – Current Aircraft Name currently loaded and number of engines and type of engine
 - c. Max Values – The maximum ground speed, indicated airspeed, true altitude, and mach achieved during the current flight.
 - d. Overspeed – The number of times and amount of time spent in overspeed (minutes:seconds)
 - e. Inverted – The number of times and amount of time spent inverted >= 145 degrees bank (minutes:seconds)
 - f. Time / Date UTC – The current date and time UTC as reported by flight simulator.
 - g. Baton – The system time UTC the baton was grabbed, the amount of time you’ve had the baton and the distance that you have moved since baton capture.
 6. Connection Status – The FSUIPC version connected to, the time taken to process and the flight simulator version connected.

Settings Window



1. Connect Automatically – Attempts connection to flight simulator when the Duenna is first started
2. Verbose Logging – (BETA FORCED ON) Outputs a very verbose log file containing lots of information called duenna_YYYYMMDD.log outputted into the File Output Location

3. File Output Location – Folder where the main log file as well as all the flight logs will be exported. To change click the button to the right. NOTE: You must be able to write to this folder.
4. Enable Flight Tracking – Will log all flights to fs-duenna.com
5. Private Tracking – Will mark all tracking private, you can access the tracking via the link but it will not appear in the primary list on the fs-duenna.com site.
6. Username – Username used to log into fs-duenna.com. Click New to create a new user.
7. Password – Password used to log into fs-duenna.com.
8. Team – The team you are using on fs-duenna.com. Click New to create a new team.
9. Event – The current event you wish the flight associated with on fs-duenna.com. Click New to create a new Event.

Duenna Status

Initial State



Duenna has not been connected to Flight Simulator. Press CONNECT to initiate a connection.

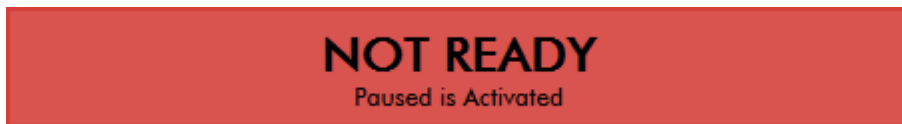
Before Baton Capture



Duenna is ready to capture baton.



Duenna is ready to capture baton however this is a warning that there is a potential error. (ie. Sim Time out of sync)



Duenna is not ready to capture baton. You must satisfy requirements to be able to capture baton. Note: This may require a restart of the Duenna if the issue is related to config files.

Baton Armed



Baton is armed for capture. This will occur if AutoBaton is set and you are on the ground with a ground speed > 5 knots and haven't violated any other rules.

Baton Captured



Flight is currently valid and within the rules. This will result in "Green Duenna" if this state is maintained until baton drop.



Flight has had a caution thrown. This will result in a "Yellow Duenna" if this state is maintained until baton drop. This flight will have to be examined more closely.



Flight is invalid as a rule has been violated. This will result in "Red Duenna".

End of Flight

FLIGHT ABORTED

Flight was aborted before it could be completed. Results in “Red Duenna”

FLIGHT CRASHED

Flight simulator reported a plane crash. This terminates the flight immediately. Results in “Red Duenna”

CONNECTION LOST

Duenna has lost connection with the flight simulator for at least 30 seconds.

Duenna Rules

The following rules govern how Duenna will behave before and during your flight and are used to determine the state of the application while it is running. If any of these rules are violated either a “Red” or “Yellow” Duenna will be generated or you will not be permitted to capture the baton.

Prior to Baton Capture

- Aircraft.CFG file must be valid (must be readable)
- Aircraft is not currently crashed
- Flight Simulator INI File must be valid
 - Must be readable
 - Under [REALISM] CrashTolerance must be set to 1
 - Under [REALISM] General must be set to 1
 - Under [REALISM] StressDamage must be set to true
 - Under [REALISM] UnlimitedFuel must be set to false
 - Under [REALISM] CrashDetection must be set to true (1 in FS2004)
- Aircraft must be on the ground
- Aircraft must not be moving
- Simulator must not be paused
- Simulator must be “Ready” so not in the initial menu
- Sim Rate must be set to 1x
- Slew must not be on
- Time must be in sync with real world (NOTE: This one will not prevent you from grabbing the baton nor will it prevent a “Green Duenna”, it is just a warning).

Baton ARMED

If you have selected AutoBaton to Enabled, this will cause the Baton to go into armed mode when your ground speed reaches 5 knots while on the ground and not violating any of the Prior to Baton Capture rules. Once in Baton Armed mode, the following rules apply

- Slew must not be on
- Simulator must not be paused
- Aircraft is not currently crashed
- Sim Rate must be set to 1x
- Aircraft cannot jump laterally or vertically
- Aircraft cannot refuel
- Aircraft must remain on the ground

If any of these are violated, the Duenna will disarm the baton capture and re-enter the prior to baton capture mode. You will need to stop the aircraft to re-arm the baton or to Press the “Take Baton” button to capture baton.

If however you do not violate these, the baton will be captured at 50 knots automatically as long as you do not leave the ground before that. If you are flying an aircraft that will takeoff < 50 knots or a helicopter, it is suggested you press the “Take Baton” button rather than use the AutoBaton function. Please remember to drop baton when you are finished with your flight as it will not happen automatically unless AutoBaton was used to capture the baton.

Baton Captured (In Flight)

The following rule violations will result in a “Red Duenna” upon leg completion

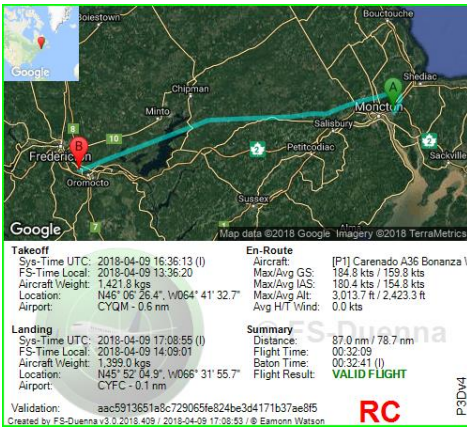
- Pressing Drop Baton (unless aircraft is on the ground and stopped)
- Aircraft changes
- Aircraft jumps laterally or vertically
- Aircraft exceeds 60 second overspeed limit (30 seconds in FS2004)
- Aircraft exceeds M1.05
- Aircraft refuels
- Slew is activated
- Sim Rate is changed from 1x
- Sim Time is changed
- Loosing Sim connection for 30 seconds

The following will result in a “Yellow Duenna” upon leg completion

- Aircraft reloaded
- Airport Name Display toggled

The only thing that will end your flight immediately and trigger a “Red Duenna” immediately is an airplane crash.

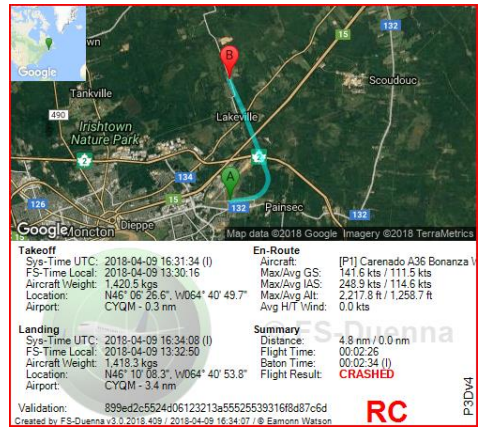
Duenna Output Graphics



Valid Duenna

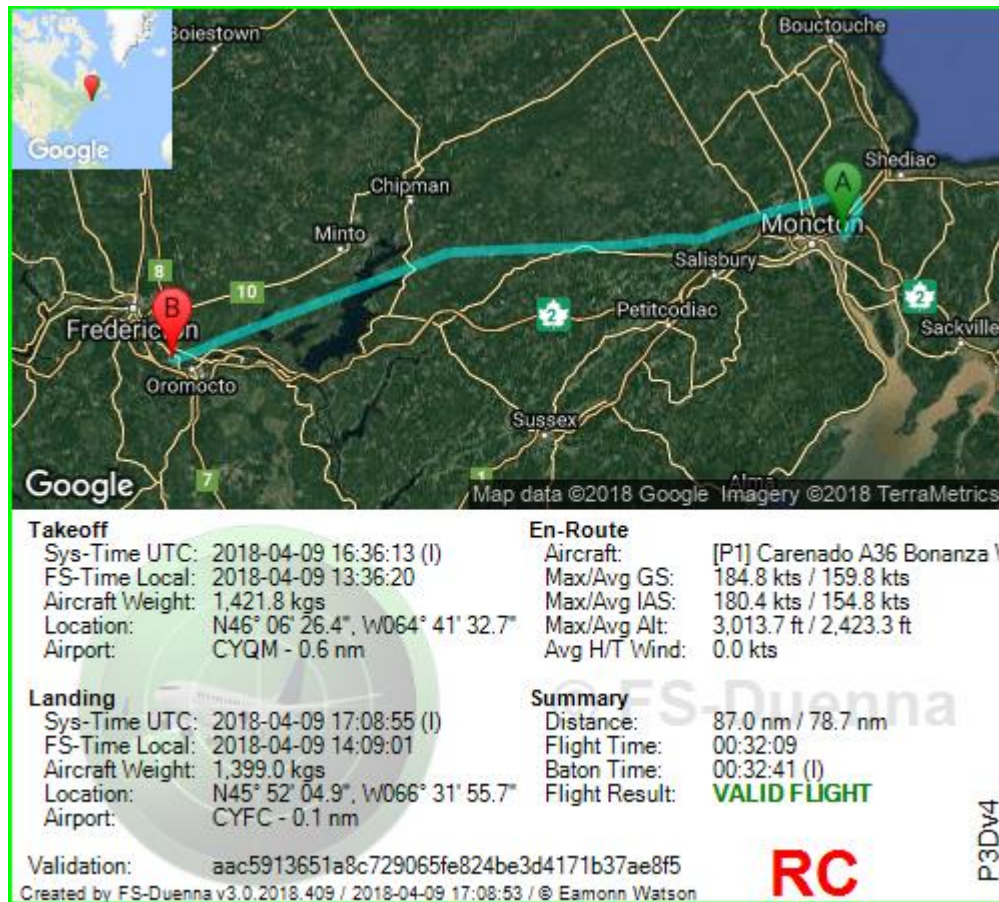


Possible Violation



Invalid Duenna

Duenna Output PNG file



1. Small Map – Shows the general location on the Earth where the larger map is based.
2. Large Map – Shows the flight path taken during the Duenna tracking. A is origin and B is destination.

3. Summary Data – An overview of the critical information for the flight
 - a. Takeoff – Your baton capture point, not necessarily when your gear left the ground.
 - i. Sys-Time UTC: The System (or Internet) time UTC of your takeoff
 - ii. FS-Time Local : The Flight Simulator local time of your takeoff
 - iii. Aircraft Weight : The aircraft gross weight at takeoff in kgs
 - iv. Location : The Latitude / Longitude coordinates of the takeoff
 - v. Airport : The closest airport to your takeoff point based off the default scenery for your simulator.
 - b. Landing – Your baton drop point, not necessarily when your gear touched the ground. Same information as takeoff
 - c. En-Route
 - i. Aircraft – The aircraft flown for this flight formatted in the following way :
“[Type of Engine # of Engines] Aircraft Name”
 - ii. Max/Avg GS – Maximum and average ground speed for the flight in knots
 - iii. Max/Avg IAS – Maximum and average indicated airspeed for the flight in knots
 - iv. Max/Avg Alt – Maximum and average altitude of the flight in feet
 - v. Avg H/T Wind – Average head or tail wind of the flight in knots. +ve for head, -ve for tail
 - d. Summary
 - i. Distance – Total distance flown and direct distance between takeoff and landing airports in nautical miles.
NOTE: Distance between airports is taken using the airport reference points and is using the haversine formula
 - ii. Flight Time – Total time taken anytime the plane registered off the ground, in hours:minutes:seconds
 - iii. Baton Time – Total time from start of flight to end in hours:minutes:seconds
 - iv. Flight Result – The result of the flight, possible values are : ABORTED FLIGHT, CRASHED, INVALID FLIGHT, POSSIBLE VIOLATION, VALID FLIGHT
 - e. Validation – This is a hash validation value used to validate flight values.

Duenna Output Text

The Duenna outputs a text file at the completion of every flight. It gives far more information than the graphic and can be used to determine why a flight was invalid. The text file contains 10 sections, 11 if the flight resulted in a crash.

```

Flight Log -- from FS-Duenna v3.0.2018.409
RELEASE CANDIDATE VERSION
-----
Please do not change anything below this line.
[CERTIFY]
Simulation:
FSUIPC Version :          5.123e
FSUIPC Client Version :   3.1.1.300
AirportFinder Version :   2.1.2018.404
Airport Database :        3.2
Flight Simulator :        Prepar3D v4
Simulator Version # :     4.2.21.24048
Simulator Location :      F:\P3D\Prepar3D v4\
CFG File Location :       C:\Users\Eamonn\AppData\Roaming\Lockheed Martin\Prepar3D v4\Prepar3D.cfg
CFG File Last Updated :   2018-04-09 16:28:07 UTC
CFG File Size :           17,314 bytes

CrashDetection :          True [OK]
CrashTolerance :          1.000000 [OK]
General :                  1.000000 [OK]
StressDamage :            True [OK]
UnlimitedFuel :            False [OK]

```

Simulation

- FSUIPC Version – The version number of the FSUIPC installed in flight simulator
- FSUIPC Client Version – The version number of the FSUIPC .NET Client used by the Duenna, courtesy of Paul Henty <http://fsuipc.paulhenty.com>
- AirportFinder Version – The version number of the airport finder utility used by the Duenna, written by Eamonn Watson.
- Airport Database Version – The version number of the current airport database used by the airport finder.
- Flight Simulator – The flight simulator used for this flight
- Simulator Version # -The version number of the main executable of your flight simulator
- Simulator Location – Current path to the running flight simulator
- CFG File Location – Current path to the currently loaded config file in flight simulator
- CFG File Last Updated – Date / Time UTC the config file was last written to (Flight simulator does write this file even if no changes are actually made)
- CFG File Size – The size in bytes of the config file
- Crash Detection – The value of the crash detection setting within the config file (Should be True / 1 in FS9)
- Crash Tolerance – The value of the crash tolerance setting within the config file (Should be 1)
- General – The value of the general (realism) setting within the config file (Should be 1)
- Stress Damage – The value of the stress damage setting within the config file (should be True)
- Unlimited Fuel – The value of the unlimited fuel setting within the config file (should be False)

```

Aircraft:
Aircraft :                Carenado A36 Bonanza white (1 PISTON)
Aircraft CFG File :       F:\P3D\Prepar3D v4\SimObjects\Airplanes\Carenado A36 BONANZA P3D\aircraft.cfg
Aircraft CFG Last Update : 2017-05-25 01:08:16 UTC
Aircraft CFG Size :       18,861 bytes
ATC Type / Model :        Beechcraft / A36
Airfile :                 A36.air - 2017-05-25 01:08:10 UTC - 7,646 bytes
Airfile HASH :            6d0a78e9df83715e42492580d2fd449f798b369e
Aircraft - Reference :    Vne=184KIAS, VCruise=150KTAS, Mmo=M, Empty weight=2295 lbs, ffs=0.8, ps=1.0, ts=1.0, mdmp=0
Autopilot / Autothrottle : Yes / No

Takeoff:
System Time UTC :         2018-04-09 16:31:34 UTC (INTERNET)
FS Time UTC :             2018-04-09 16:30:16 UTC
FS Time Local :           2018-04-09 13:30:16 UTC
Aircraft gross weight :   1,420.5 kgs / 3,131.6 lbs
Fuel weight :             216.2 kgs / 476.6 lbs
Location :                N46° 06' 26.557", W064° 40' 49.701"
Airport :                 CYQM (Greater Moncton Intl) - 0.3 nm
Weather :                 WIND: 000@00 VIS: P6SM CLOUD: FEW056 TEMP: 15/04 PRES: A2992 / Q1013

```

Aircraft

- Aircraft – The name / number of engines and engine type of the aircraft flown
- Aircraft CFG File – Current path to the config file of the current aircraft
- Aircraft CFG Last Update – Date and Time UTC the aircraft config file was last written to
- Aircraft CFG Size – File size in bytes of the aircraft config file
- ATC Type / Model – The aircraft type and model according to the config file
- Airfile – Name / Date time UTC of last write and size in bytes of the .AIR file associated with current aircraft
- Airfile HASH – Hash of the airfile (MAY BE USED IN FUTURE VERSION TO DETERMINE IF FILE HAS BEEN ALTERED)
- Aircraft – Reference - Various data points taken from the aircraft config file
 - Vne – Never exceed speed (taken from Max IAS)
 - VCruise – Cruising speed (taken from Cruise Speed)
 - Mmo – Maximum mach speed (taken from Max Mach)
 - Empty Weight – Weight of aircraft without fuel and payload in pounds (taken from Empty Weight)
 - ffs – Fuel flow scaler
 - ps = Power scaler
 - ts = Thrust scaler
 - mdmp = Max Design Manifold Pressure
- Autopilot / Autothrottle – Yes / No flag on if the aircraft has an autopilot and/or autothrottle

Takeoff

- System Time UTC – Date / Time UTC of the baton capture and the source of the time (Internet/System). Internet time is taken from ntp.org and if it is not available system time is used. If internet time and system time are out of sync a message stating how far ahead or behind your system is to internet time in seconds.
- FS Time UTC – Flight simulators UTC time at baton capture
- FS Time Local – Flight simulators local time (based on aircraft location) at baton capture
- Aircraft gross weight – Total aircraft weight at baton capture in kgs and lbs
- Fuel weight – Total fuel weight at baton capture in kgs and lbs
- Location – The latitude and longitude taken at baton capture
- Airport – The name / ICAO code and distance of the closest airport to baton capture based on the default scenery of your flight simulator
- Weather – The wind / visibility / cloud coverage / temperature / dew point and pressure taken at baton capture. Formatted to look similar to a METAR


```

Enroute:
Min/Max G Force :      0.00G / 4.40G
Max Groundspeed :     141.6 kts
Max IAS :              248.9 kts
Max Altitude :        2,217.8 ft
Max Mach :             M0.374
Avg Groundspeed :     111.5 kts
Avg IAS :              114.6 kts
Avg Altitude :        1,258.7 ft
Avg Altitude AGL :    1,054.4 ft
Avg Head / Tailwind : 0.0 kts
Roll count / Time :   1 / 00:00:06
Overspeed Count / Time : 1 / 00:00:03
Mach Time :           00:00:00
WEP Time :            00:00:00
Flight aborted :      NO
Error count :         1 Error(s)

```

Enroute

- Min/Max G Force – The minimum and maximum G forces experienced during the flight
- Max Groundspeed – The maximum ground speed achieved during the flight in knots
- Max IAS – The maximum indicated airspeed achieved during the flight in knots
- Max Altitude – The maximum true altitude achieved during the flight in feet
- Max Mach – The maximum mach achieved during the flight
- Avg Groundspeed – The average ground speed of the flight in knots
- Avg IAS – The average indicated airspeed of the flight in knots
- Avg Altitude – The average true altitude of the flight in feet
- Avg Altitude AGL – The average altitude above ground level of the flight in feet
- Avg Head / Tailwind – The average head or tailwind of the flight in knots. +ve for head, -ve for tail
- Roll count / Time – Count and Time spent inverted in flight >= 145 degrees of bank
- Overspeed Count / Time – Count and time spend in overspeed
- Mach Time – Total time spent at or exceeding M1.00
- WEP Time – Total time spent with War Emergency Power (if modelled) engaged
- Flight Aborted – Did you abort the flight (Pressing Drop baton during flight triggers this)
- Error Count – Number of flight related errors during the flight

```

Landing:
System Time UTC :      2018-04-09 16:34:08 UTC (INTERNET)
FS Time UTC :         2018-04-09 16:32:50 UTC
FS Time Local :       2018-04-09 13:32:50 UTC
Aircraft gross weight : 1,418.3 kgs / 3,126.9 lbs
Fuel weight :         214.1 kgs / 471.9 lbs
Location :            N46° 10' 08.315", W064° 40' 53.818"
Airport :             CYQM (Greater Moncton Intl) - 3.4 nm
Weather :             WIND: 000@00 VIS: P6SM CLOUD: FEW056 TEMP: 14/00 PRES: A2992 / Q1013

```

Landing

The landing data is identical to the takeoff data and is captured at Baton drop. Please refer to the takeoff data above for definitions.

Summary:

```

Baton Auto Pickup :      YES
Autopilot Disabled :    NO
Direct Distance :       0.0 nm
Flight Distance :       4.8 nm
Flight Time :           00:02:26
Baton Time :           00:02:34 (INTERNET)

VALID :                 CRASHED
validation ID :         899ed2c5524d06123213a55525539316f8d87c6d
    
```

Summary

- Baton Auto Pickup – Was autobaton armed for this flight
- Autopilot disabled – Was the autopilot disabled for this flight
- Direct Distance – The direct distance from closest departure airport to closest arrival airport.
- Flight Distance – The flown distance calculated during the flight from baton pickup to baton drop
- Flight Time – The total time aircraft spent in the air (Not on ground)
- Baton Time – The total time from baton pickup to baton drop
- VALID – The end result of the flight. Possible values are : ABORTED FLIGHT, CRASHED, INVALID FLIGHT, POSSIBLE VIOLATION, VALID FLIGHT
- Validation ID - This is a hash validation value used to validate flight values

```

Flight Errors:
Date / Time(UTC):      Latitude:      Longitude:      Altitude:      GS: ERROR / WARNING
2018-04-09 16:31:39;  N46° 06' 27.735";  W064° 40' 36.876";  236.5;  77.7; (No Error) Aircraft flying state changed [ON_GROUND: False, STALL: False, G-FORCE: 1.02, VS: 10.8]
2018-04-09 16:34:05;  N46° 10' 08.315";  W064° 40' 53.818";  162.8;  0.0; (No Error) Aircraft flying state changed [ON_GROUND: True, STALL: False, G-FORCE: 4.40, VS: -21,999.5]
2018-04-09 16:34:06;  N46° 10' 08.315";  W064° 40' 53.818";  162.8;  0.0; Aircraft Crashed 3.4nm N of CYQM
    
```

Flight Errors

Output of all errors (and flying state changes) during the flight. Errors include rule violations whereas state changes are not errors and are only output for informational purposes and output when you leave or touch the ground or enter and leave stalls. The information output is the Date/Time UTC, Latitude, Longitude, Altitude (true), and groundspeed

```

Flight-Points:
Date / Time(UTC):      Latitude:      Longitude:      Altitude:      Hdg(T):      VS:      GS:      TAS:      IAS:      Mach:      Fuel(kgs):      wind Dir:      wind Speed:      Headwind:      Pitch:      Bank:      OnGround:      Stall:
2018-04-09 16:31:31;  N46° 06' 26.557";  W064° 40' 49.701";  236.2;  79;  0.8;  50.1;  50.1;  50.0;  0.076;  216.2;  0;  0.0;  0.0;  3.0;  -0.1;  True;  False;
2018-04-09 16:31:33;  N46° 06' 26.888";  W064° 40' 46.913";  236.2;  82;  0.8;  57.7;  57.7;  57.6;  0.087;  216.1;  0;  0.0;  0.0;  2.9;  0.2;  True;  False;
2018-04-09 16:31:35;  N46° 06' 27.191";  W064° 40' 43.997";  236.2;  84;  0.8;  64.5;  64.5;  64.3;  0.098;  216.1;  0;  0.0;  0.0;  2.8;  0.2;  True;  False;
2018-04-09 16:31:37;  N46° 06' 27.455";  W064° 40' 40.760";  236.3;  85;  2.3;  71.0;  70.9;  70.7;  0.107;  216.1;  0;  0.0;  0.0;  3.8;  0.1;  True;  False;
2018-04-09 16:31:39;  N46° 06' 27.716";  W064° 40' 37.142";  236.5;  85;  10.0;  77.2;  76.9;  76.7;  0.117;  216.0;  0;  0.0;  0.0;  5.9;  0.0;  True;  False;
2018-04-09 16:31:44;  N46° 06' 28.428";  W064° 40' 27.111";  247.6;  84;  275.3;  89.4;  89.2;  89.0;  0.135;  216.0;  0;  0.0;  0.0;  6.5;  0.1;  False;  False;
2018-04-09 16:31:49;  N46° 06' 29.345";  W064° 40' 15.815";  265.2;  82;  302.2;  99.2;  99.0;  98.8;  0.150;  215.9;  0;  0.0;  0.0;  6.6;  2.5;  False;  False;
2018-04-09 16:31:54;  N46° 06' 30.621";  W064° 40' 04.731";  324.7;  78;  1,161.9;  102.9;  103.3;  103.1;  0.157;  215.8;  0;  0.0;  0.0;  11.3;  3.9;  False;  False;
2018-04-09 16:31:59;  N46° 06' 32.586";  W064° 39' 52.967";  473.8;  73;  2,113.8;  97.1;  99.0;  98.6;  0.150;  215.8;  0;  0.0;  0.0;  16.9;  5.9;  False;  False;
2018-04-09 16:32:04;  N46° 06' 35.189";  W064° 39' 42.490";  658.6;  65;  2,131.5;  88.7;  90.7;  90.0;  0.138;  215.7;  0;  0.0;  0.0;  18.0;  9.0;  False;  False;
2018-04-09 16:32:09;  N46° 06' 38.683";  W064° 39' 33.349";  799.5;  54;  1,319.5;  86.7;  87.2;  86.3;  0.133;  215.6;  0;  0.0;  0.0;  13.2;  13.0;  False;  False;
2018-04-09 16:32:14;  N46° 06' 43.646";  W064° 39' 25.271";  863.8;  40;  451.4;  93.6;  93.3;  92.3;  0.142;  215.6;  0;  0.0;  0.0;  7.2;  15.5;  False;  False;
2018-04-09 16:32:19;  N46° 06' 50.549";  W064° 39' 18.618";  891.9;  27;  441.4;  103.2;  103.0;  101.9;  0.156;  215.5;  0;  0.0;  0.0;  7.0;  8.3;  False;  False;
2018-04-09 16:32:24;  N46° 06' 58.678";  W064° 39' 13.564";  967.9;  17;  1,140.3;  106.1;  106.4;  105.2;  0.162;  215.4;  0;  0.0;  0.0;  9.9;  17.2;  False;  False;
2018-04-09 16:32:29;  N46° 07' 07.558";  W064° 39' 11.732";  1,055.6;  357;  317.4;  108.4;  108.5;  107.1;  0.165;  215.4;  0;  0.0;  0.0;  8.3;  22.2;  False;  False;
2018-04-09 16:32:34;  N46° 07' 16.516";  W064° 39' 13.997";  1,142.1;  344;  1,194.9;  109.8;  110.3;  108.8;  0.168;  215.3;  0;  0.0;  0.0;  9.6;  7.8;  False;  False;
2018-04-09 16:33:04;  N46° 08' 10.071";  W064° 39' 43.158";  1,619.6;  338;  768.2;  122.9;  123.0;  120.6;  0.187;  214.9;  0;  0.0;  0.0;  5.5;  -0.2;  False;  False;
2018-04-09 16:33:34;  N46° 09' 10.319";  W064° 40' 17.539";  1,984.7;  338;  700.5;  134.9;  135.0;  131.7;  0.205;  214.5;  0;  0.0;  0.0;  4.2;  -0.1;  False;  False;
2018-04-09 16:34:03;  N46° 10' 08.950";  W064° 40' 55.155";  1,141.7;  334;  -17,432.8;  82.8;  208.6;  207.4;  0.317;  214.1;  0;  0.0;  0.0;  -71.7;  -171.6;  False;  False;
2018-04-09 16:34:05;  N46° 10' 08.315";  W064° 40' 53.818";  162.8;  143;  -21,999.5;  0.0;  0.0;  0.0;  0.374;  214.1;  0;  0.0;  0.0;  -59.2;  -4.2;  True;  False;
    
```

Flight Points

A list of all major flight points captured during the flight. Points are captured more frequently closer to the ground and less often when in straight and level flight.

Data captured is Date / Time(UTC), Latitude, Longitude, Altitude, Hdg (True), VS, GS, TAS, IAS, Mach, Fuel(kgs), Wind Dir, Wind Speed, Headwind, Pitch (+ve up, -ve down), Bank (+ve right, -ve left), OnGround flag, Stall flag.

