Record Claim

Snowbird Human-Powered Ornithopter

Todd Reichert
Cameron Robertson

University of Toronto Institute for Aerospace Studies
Canada

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This document gives the details of the record setting flight of the Snowbird Human-Powered Ornithopter. Though the aircraft sustained flight on several occasions, this claim will focus on the longest and most indisputable flight. The flight took place at Great Lakes Gliding Club in Tottenham, Ontario, Canada on August 2nd, 2010 at 6:35AM, under the power and piloting of Todd Reichert. The portion of the flight where both altitude and airspeed were sustained lasted 19.3 seconds, covering a distance of $145m$ at an average speed of $25.6kph$. As far as the authors are aware this is the first sustained flight of a human-powered ornithopter worldwide as well as the first sustained flight of a human-powered aircraft in Canada. The following documents are included in the dossier:

No. 1:	Aircraft Overview.pdf	Description of the aircraft
No. 2:	Flight Analysis.xls	Spreadsheet file used to analyze flight data
No. 3:	Logbook.xls	Flight logs of all aircraft tests and flight attempts
No. 4:	Side Video.mpg	Stationary camera footage from the side of the runway
No. 5:	Tow Video SD.mpg	Standard definition video from the tow car
No. 6:	Tow Video HD.mpg	High definition video from the tow car

Contents

Form 1: General Claim Declaration

Organizing NAC:	Aero Club of Canada
Date of record attempt:	August 2, 2010
Claimed performance:	First sustained flight of a human-powered ornithopter
Location of record attempt:	Great lakes Gliding Club, Tottenham, Ontario, Canada
Pilot:	Todd Reichert
Aircraft class:	Human-Powered Ornithopter

General Declaration **We certify this information is correct and that the attempt was made in accordance with the general practices and regulations of the FAI Sporting Code.**

Pilot Signature	Date
Observer Signature	Date

Form 2: Pilot Information

Name:	Todd Reichert
Address:	980 Galaxie Ave., Navan, ON, Canada
Phone No:	613-835-4224
E-mail:	todd.reichert@gmail.com
Sex:	M
Date of Birth:	Jan 30, 1982
Citizen of:	Canada
FAI Sporting Licence issued by:	Aero Club of Canada
Number:	10-096
Expiry Date:	Dec 31, 2010

We certify this information is correct.

Pilot Signature Date

Observer Signature Date

Form 3: Observer Information

Name:	Jack Humphreys
Address:	9235 Jane St., Unit 1014, Maple, ON, Canada, L6A 0J8
Phone No:	416-402-2812
E-mail:	jack.humphreys@sympatico.ca
NAC Observer number:	FAI Vice President for Canada

I certify this information is correct.

Controlling NAC: Aero Club of Canada
Name of controlling NAC official: Jack Humphreys
Title: FAI Vice President E-mail: jack.humphreys@sympatico.ca
Signature: Date:

Form 4: Aircraft Information

Aircraft name:	Snowbird Human-Powered Ornithopter
Manufacturer:	University of Toronto Human-Powered Vehicle Design Team
Model of Engine:	Human

Additional information provided in attachment No. 1: Aircraft Overview

We certify this information is correct.

Pilot Signature Date

Observer Signature Date

Form 5: Takeoff Point

Takeoff point *(Lat - Lon)*:	44.04282333, 79.84272333
Date:	August 2, 2010
Time:	6:34:58.6 AM
Takeoff point altitude:	$251m$ above sea level
Place:	Ronan Aerodrome, Great Lakes Gliding Club
Gross weight of aircraft at takeoff:	$114.3kg$

We certify this information is correct.

Pilot Signature	Date
Observer Signature	Date

Form 6: Start Line

Start line position *(Lat - Lon)*:	44.042405, 79.84478333
Place:	Ronan Aerodrome, Great Lakes Gliding Club
Time the aircraft crossed the start line:	6:35:15.3 AM
Altitude of aircraft at start line:	4.87m above takeoff point
Airspeed of aircraft at start line:	7.43m/s

We certify this information is correct.

Pilot Signature	Date
Observer Signature	Date

Form 7: Finish Line

Finish line position *(Lat - Lon)*:	44.04242667, 79.84469167
Place:	Ronan Aerodrome, Great Lakes Gliding Club
Time the aircraft crossed the finish line:	6:35:34.6 AM
Altitude of aircraft at finish line:	4.90m above takeoff point
Airspeed of aircraft at start line:	7.52m/s

The aircraft's altitude at the finish line was greater than its altitude at the start line.
The aircraft's airspeed at the finish line was greater than its airspeed at the start line.

We certify this information is correct.

Pilot Signature	Date
Observer Signature	Date

Form 8: Landing Point

Landing point position *(Lat - Lon)*:	44.04187667, 79.84753833
Place:	Ronan Aerodrome, Great Lakes Gliding Club
Time of landing:	6:35:48.3 AM
Landing point altitude:	$2.31m$ above takeoff point

No ballast or other disposable items were jettisoned between tow release and landing.

We certify this information is correct.

Pilot Signature	Date
Observer Signature	Date

Form 9: In Flight Performance

Weather Conditions

Temperature:	$19°C$
Pressure:	$99700Pa$
Air Density:	$1.176kg/m^3$
Wind:	$0kph$, dead calm

Course Description

Straight line over runway from start line to finish line.

Performance Summary

Sustained flight time:	$19.3s$
Flight distance:	$145m$
Average flight speed:	$25.6kph$

We certify this information is correct.

Pilot Signature	Date
Observer Signature	Date

Form 10: Data Acquisition

Speed Data

Speed data was collected using the EagleTree Flight Data Recorder Pro, with a GPS V4 expander. Data is measured every 0.1 seconds over the length of the run, with an error of less than 0.1 m/s. Since the wind was dead calm, ground speed measured from the GPS is taken to be equivalent to the airspeed. The raw EagleTree data, including GPS speed, is available on the "FDR" tab of the flight analysis spreadsheet.

Altitude Data

Neither a GPS receiver or barometric altimeter could give the precision required for the altitude measurement. Therefore the altitude was calculated from precise measurements of the aircraft's height above the ground, and the elevation profile of the runway itself, as described below.

Relative Height Data

The aircraft's height relative to the ground was measured by analyzing the "side view" video footage, taken from a stationary camera at a distance of 200 metres. Sighting from the same location as the video was taken, a graduate surveyor's measure was used to determine the height above ground throughout the entire flight. The error of this measurement is estimated to be less than $5cm$. The raw height data is available on the "Height" tab of the flight analysis spreadsheet.

Runway Elevation Data

The elevation of the runway, relative to the aircraft's starting position was measured with a transit and a graduated surveyor's measure, with an estimated error of less than $1cm$. From the start line to the finish line the elevation increased by $0.55m$, which was taken into account when computing the altitude during the flight. The raw elevation data is available on the "Elevation" tab of the flight analysis spreadsheet.

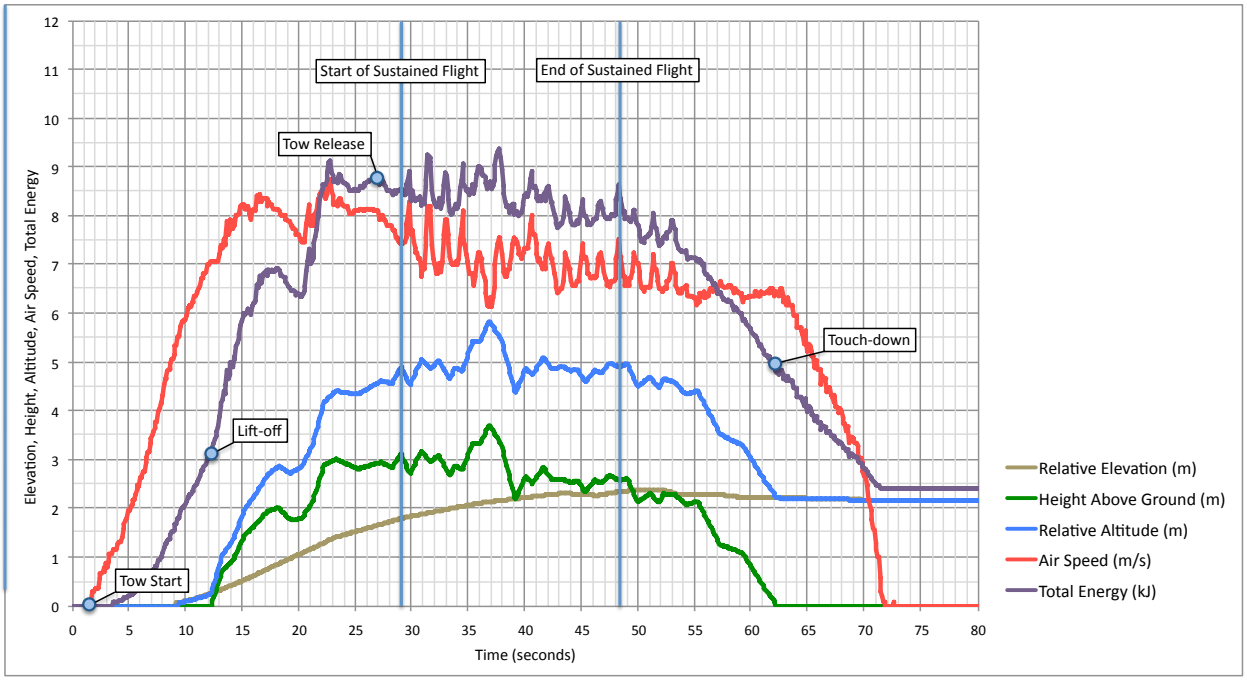
We certify this information is correct.

Pilot Signature Date

Observer Signature Date

Form 11: Flight Analysis

The height relative to the ground and the runway elevation are combined to give the relative altitude, which is plotted alongside airspeed for the duration of the flight. Key points, such as the position of tow release are marked on the plot. The flapping began shortly after release. The period of sustained flight, over which both altitude and airspeed are maintained, lasted 19.3 seconds, starting from the beginning of the first stroke. The combination of the kinetic and gravitational potential energy is plotted as "total energy", which was also maintained over the same 19.3 second interval. Past the finish line, the power from the fatigued pilot was insufficient to continue sustaining level flight.



We certify this information is correct.

Pilot Signature Date

Observer Signature Date