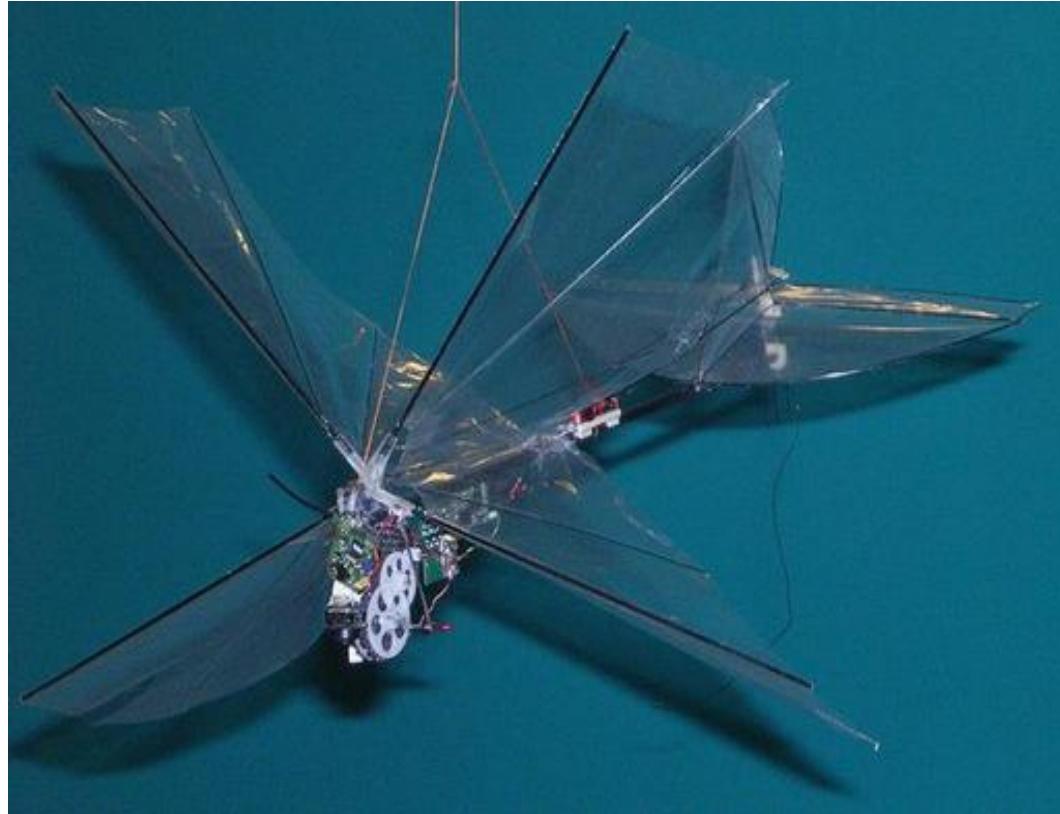


DelFly II



Ir. Rick Ruijsink
Ing. Bart Remes
Ir. Christophe de Wagter
Ir. David Lentink
Ir. Meine Oosten
René Lagarde
Stefan Jongerius
Ir. Nancy Bradshaw
Ir. Bert Bijnens
Todd Reichert
Prof. Bob Mulder

DelFly II: Contents



- 1/ Introduction**
- 2/ Current status DelFly II**
- 3/ Aerodynamics**
- 4/ Mechanics**
- 5/ Image processing**
- 6/ Future Technology**

DelFly II: Introduction



Delfly I (2005)



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TU Delft

DelFly II: Aerodynamics



Research by:

PhD student :

Ir. David Lentink Wageningen University

Ir. Frank Bos TU Delft

Together with MSc. students TU Delft:

Nancy Bradshaw

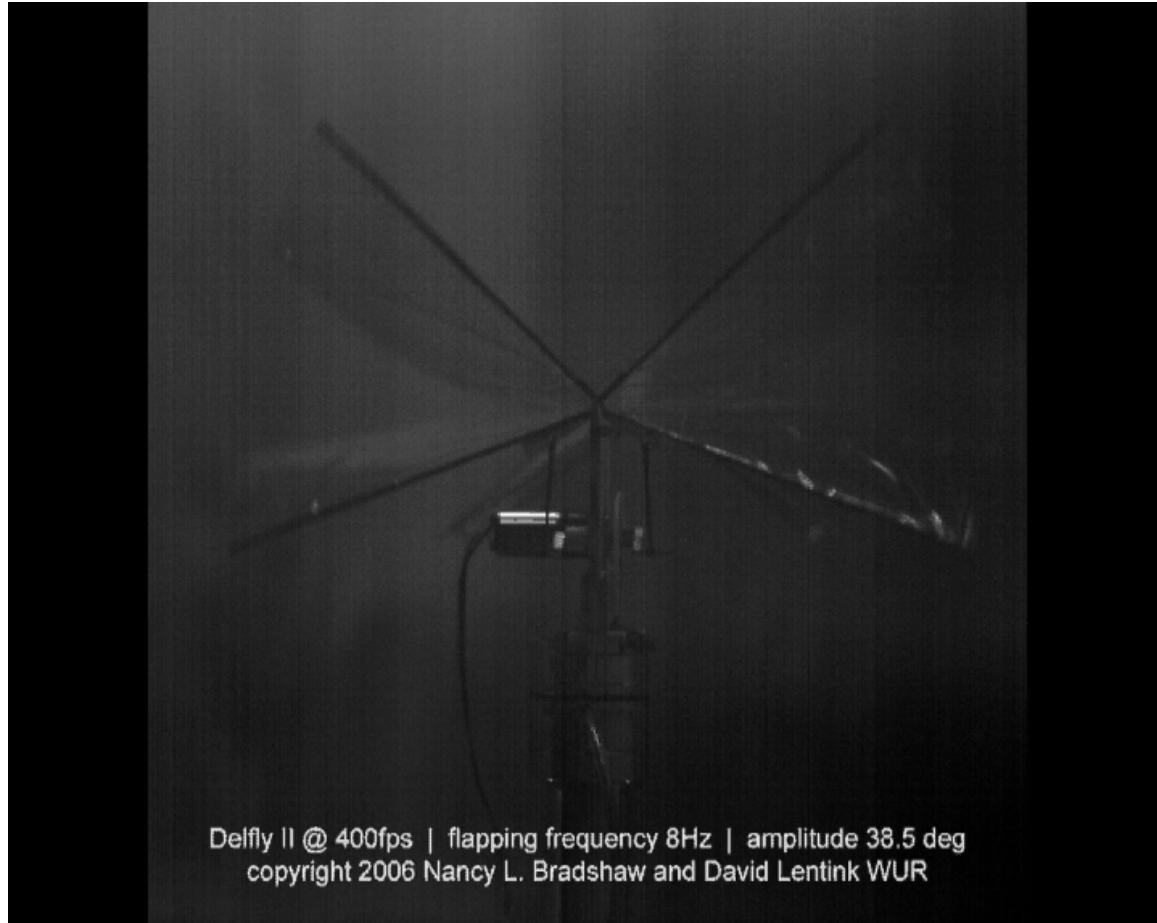
Stefan Jongerius

Nonthipat Thaweewat

University of Toronto

Todd Reichert

DelFly II: Aerodynamics



Delfly II @ 400fps | flapping frequency 8Hz | amplitude 38.5 deg
copyright 2006 Nancy L. Bradshaw and David Lentink WUR

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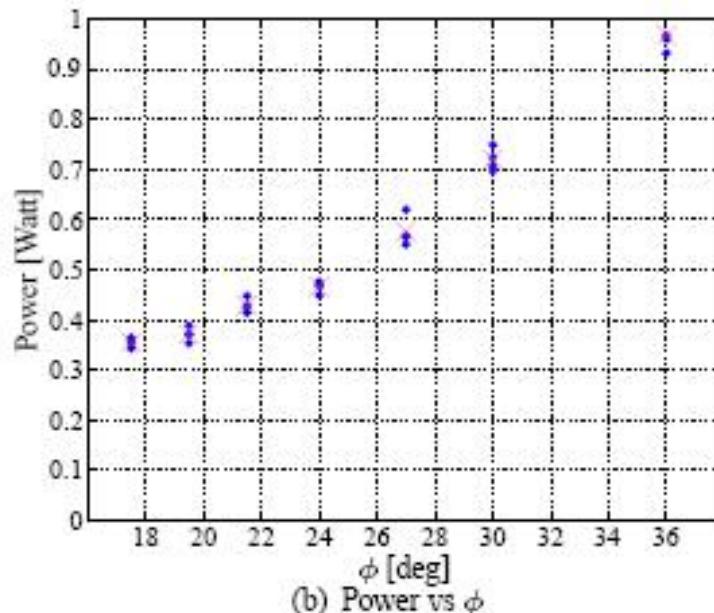
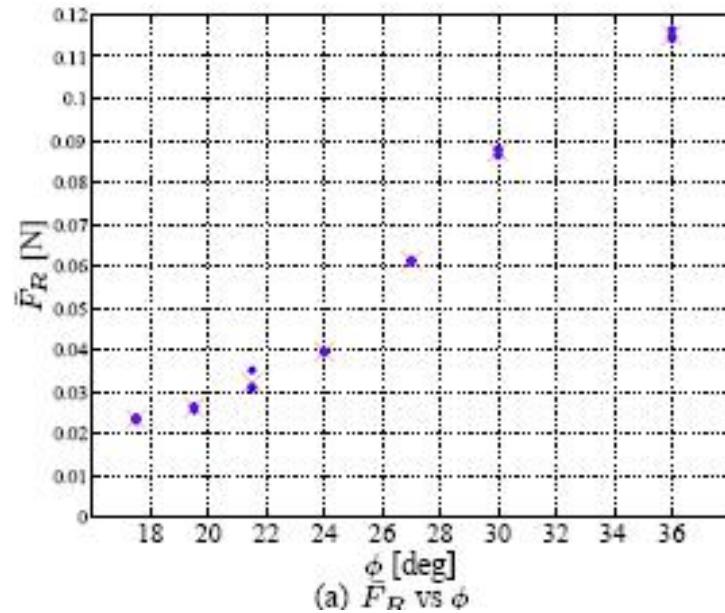
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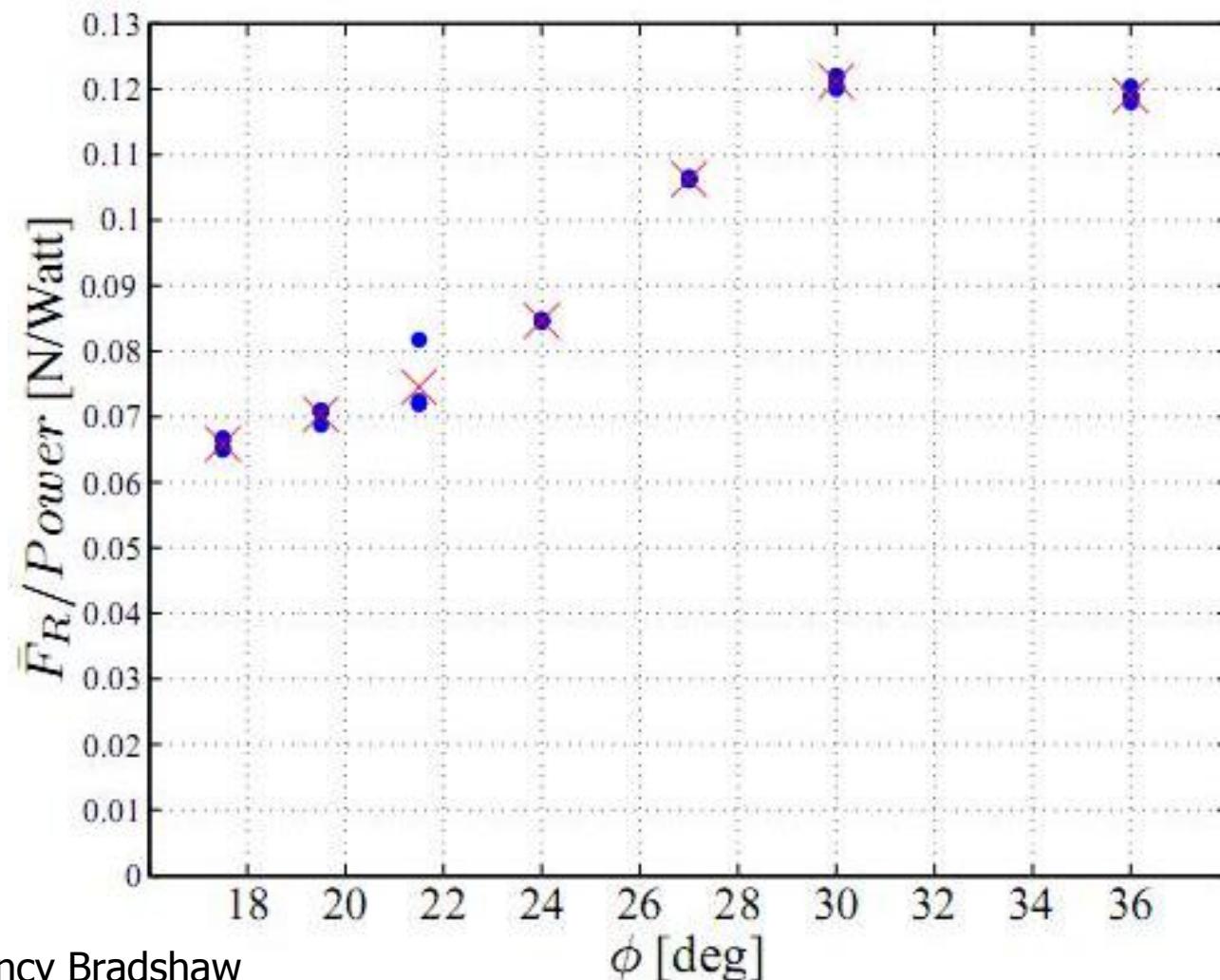
TU Delft

DelFly II: Aerodynamics



Source: Nancy Bradshaw

DelFly II: Aerodynamics



Source: Nancy Bradshaw

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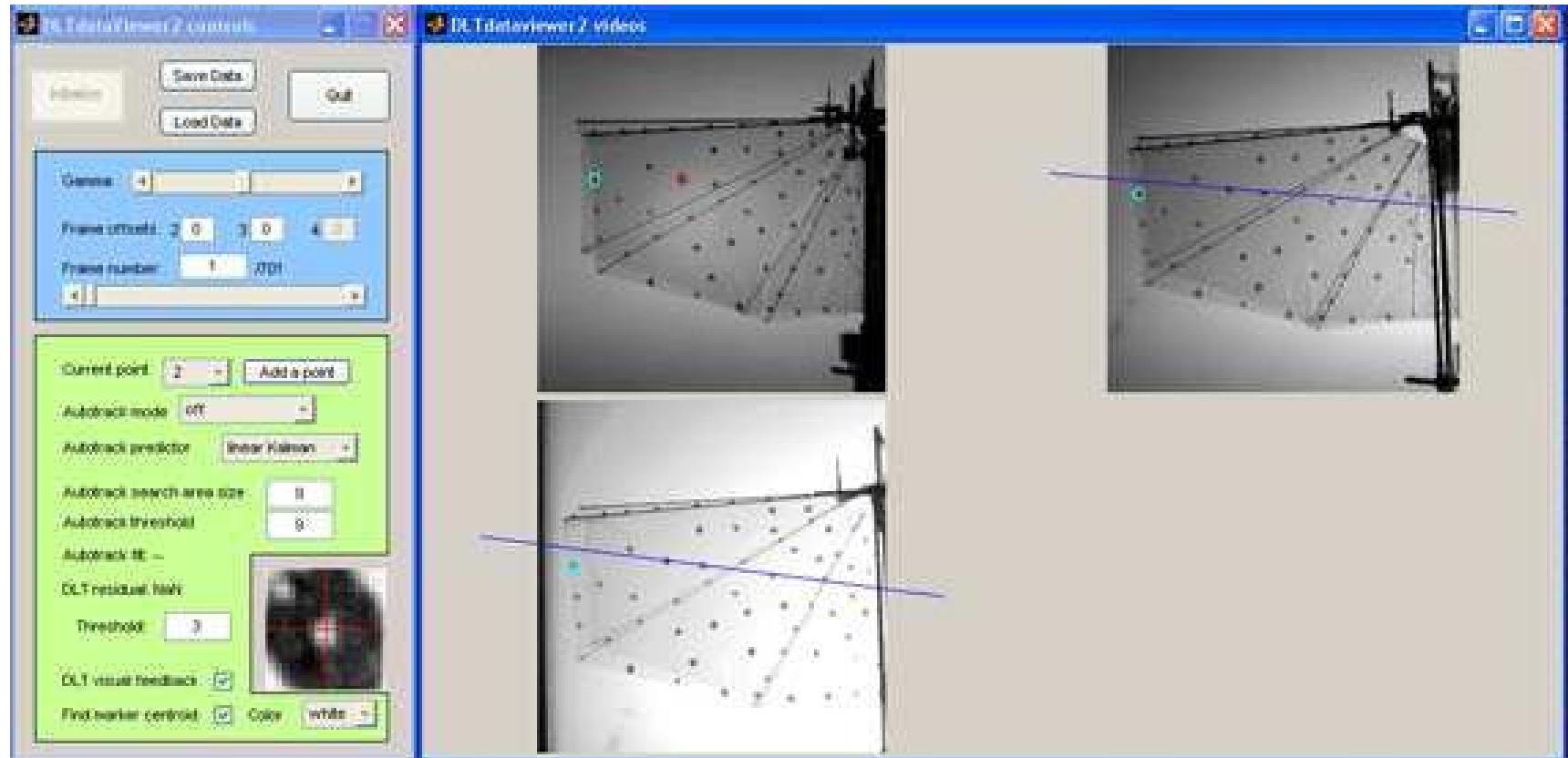
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DelFly II: Aerodynamics



Source: Nancy Bradshaw

DelFly II: Aerodynamics



Source: Nancy Bradshaw

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DelFly II: Mechanics



Research by:

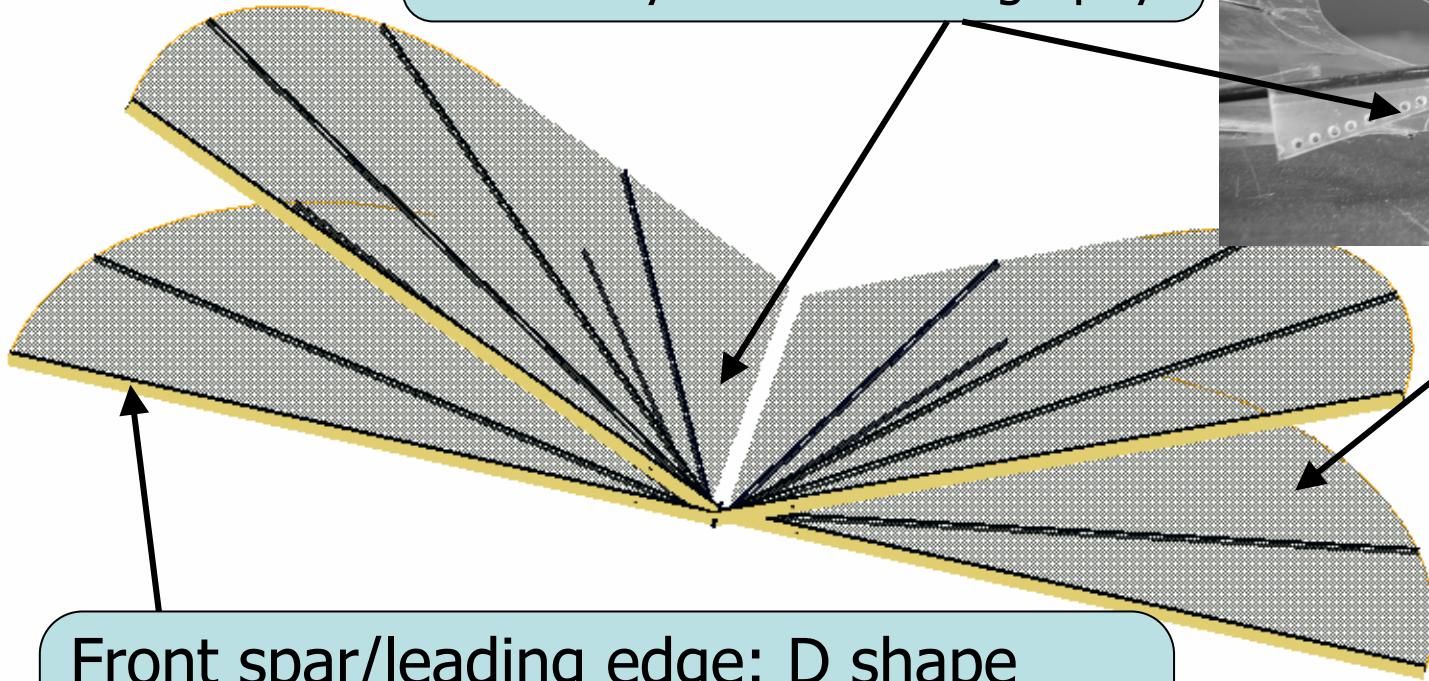
Ir. Rick Ruijsink

Ing. Bart Remes

DelFly II: Wing design



Evaluation version in epoxy
For DelFly II Stereolithography



Front spar/leading edge: D shape

- Stiff in flap direction
- Flexible in flight direction for wake recovery

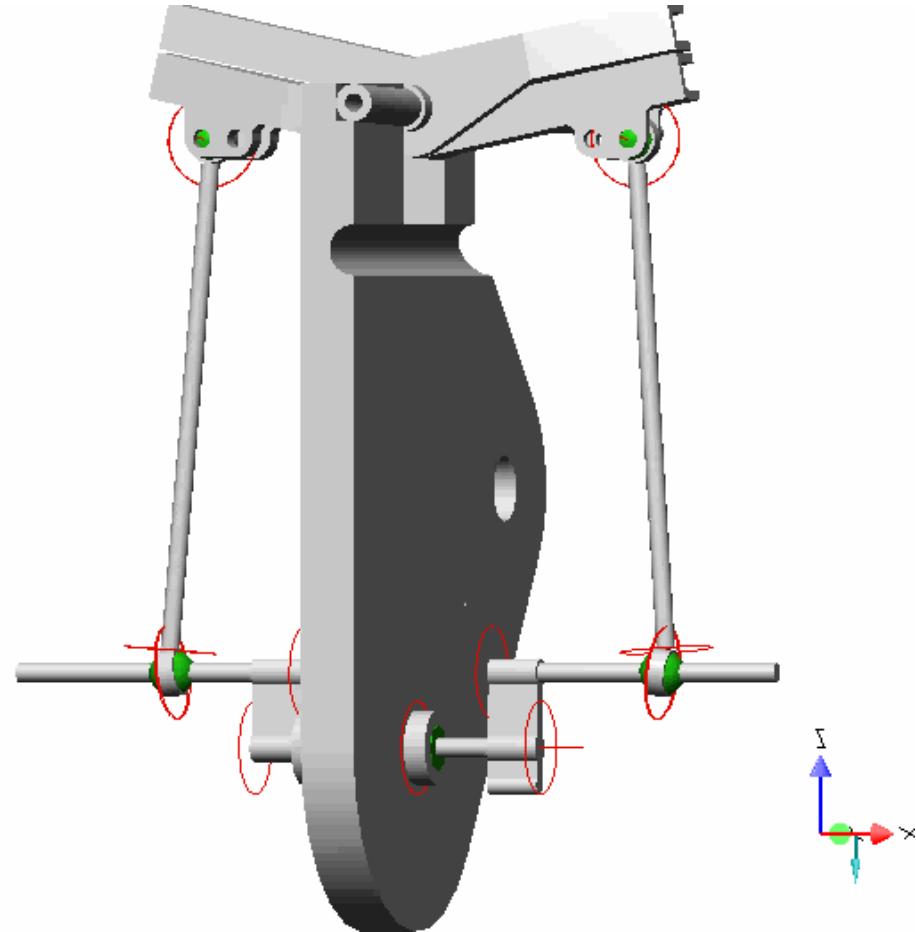
Mylar foil
Stiffness
tuned through
thickness of
carbon spars

DelFly II: Simulation drive geometry



Variables:

- Maximum flap angle
- Crank length
- Angle connecting rods
- Angle ruby bearings



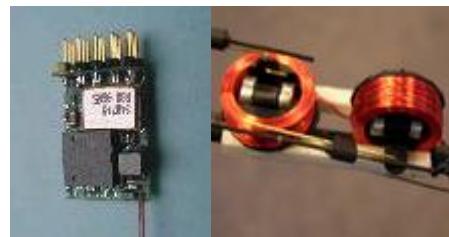
DelFly II: Components



Battery



Receiver &
Actuators



Motor &
Controller



Camera &
Transmitter



3.0 gr.

High power

0.9 + 2.3 gr.

Fast data link
smooth control

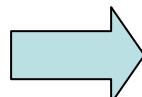
1.5 + 1.0 gr.

High efficiency
High power

1.0 + 1.3 gr.

Color 380
lines

Low
voltage
5 mw



Total weight all components: 11 gram

Total weight of complete MAV: 15 gram

DelFly II: Brushless Motor



Motor development
Ir. Rick Ruijsink
DC Enterprises, India

1.5 gram, 1.5 W O/P
 $\eta = 60\%$



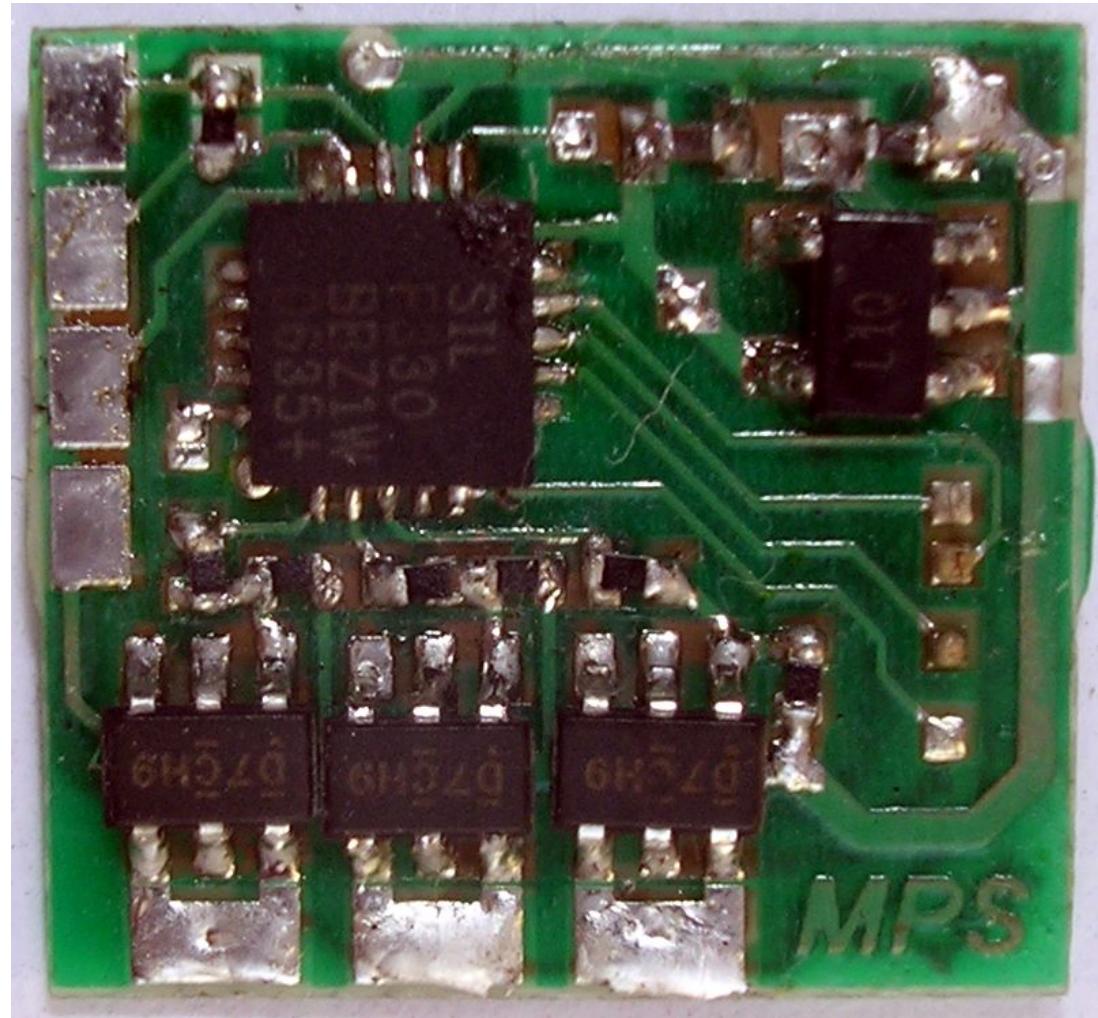
Design changes i.c.w.
Dr. Ir. Elena Lomonova, TU Eindhoven

DelFly II: BL controller, sensorless



Specially tuned for the
small Uttam / Ruijsink
1.5 gram BL Motor

i.c.w.
Jean Louis Coural
Micro Plane Solutions
France.



DelFly II: Image processing



Image recognition and Vision Based Control

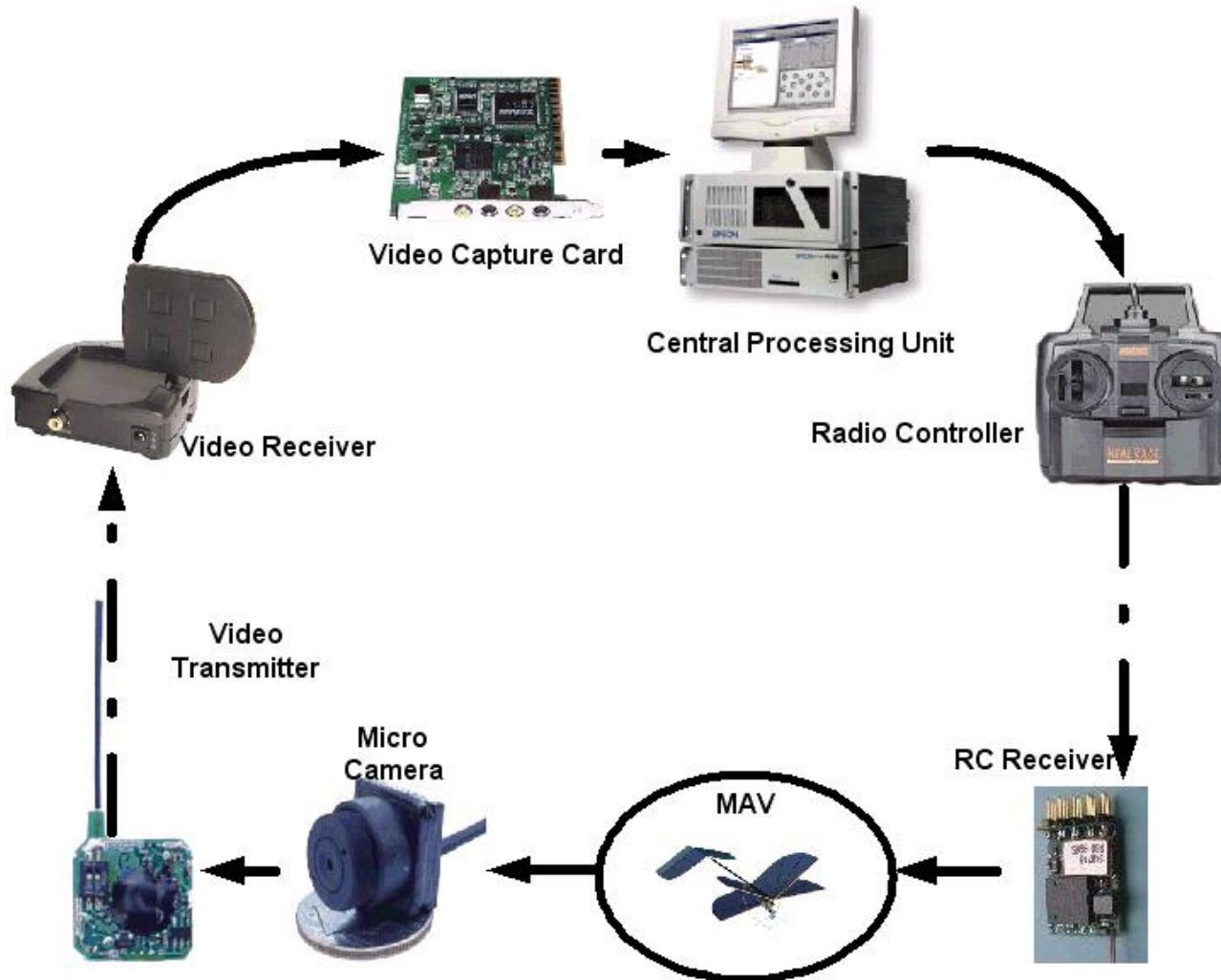
Ir. Christophe de Wagter

with:

Ir. Bert Bijnens PhD Student TU Delft

René Lagarde Msc Student TU Delft

DelFly II: Image processing



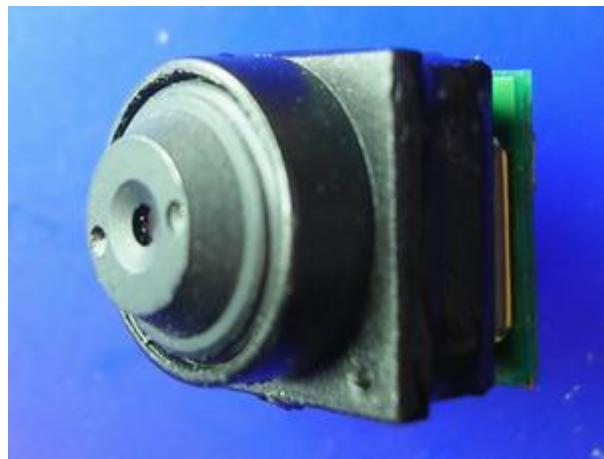
Control loop
based on
images:

CPU calculates
control signals
from image
analysis

DelFly II: Camera system



- Balance: Resolution - Viewing angle - Sensitivity - Color
- NTSC 1.5 Lux - EIA 0.05 Lux
- 5.0 V Stabilized from 3.7 - 2.7 V LiPo battery
- Camera Resolution 400 x 288
- Rigidly attached to fuselage



8 x 8 x 8 mm³

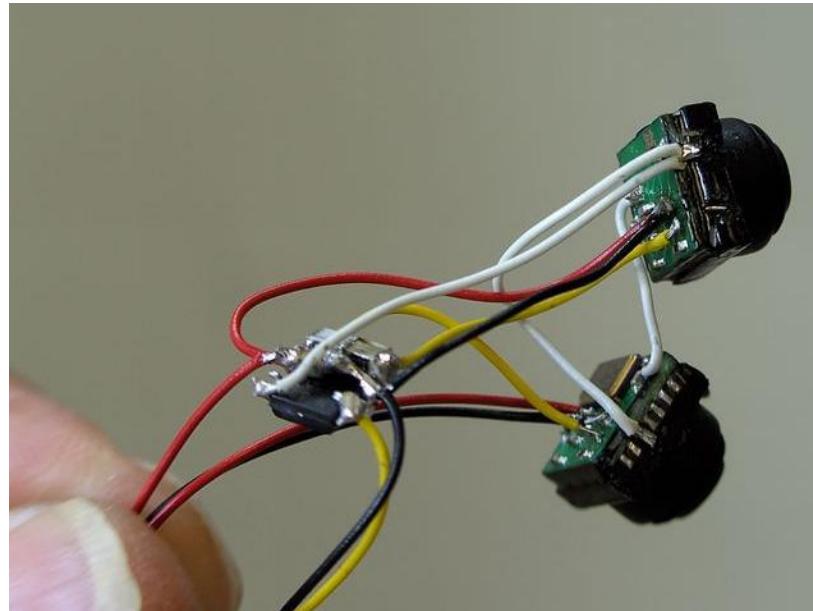


DelFly II: Dual Camera system

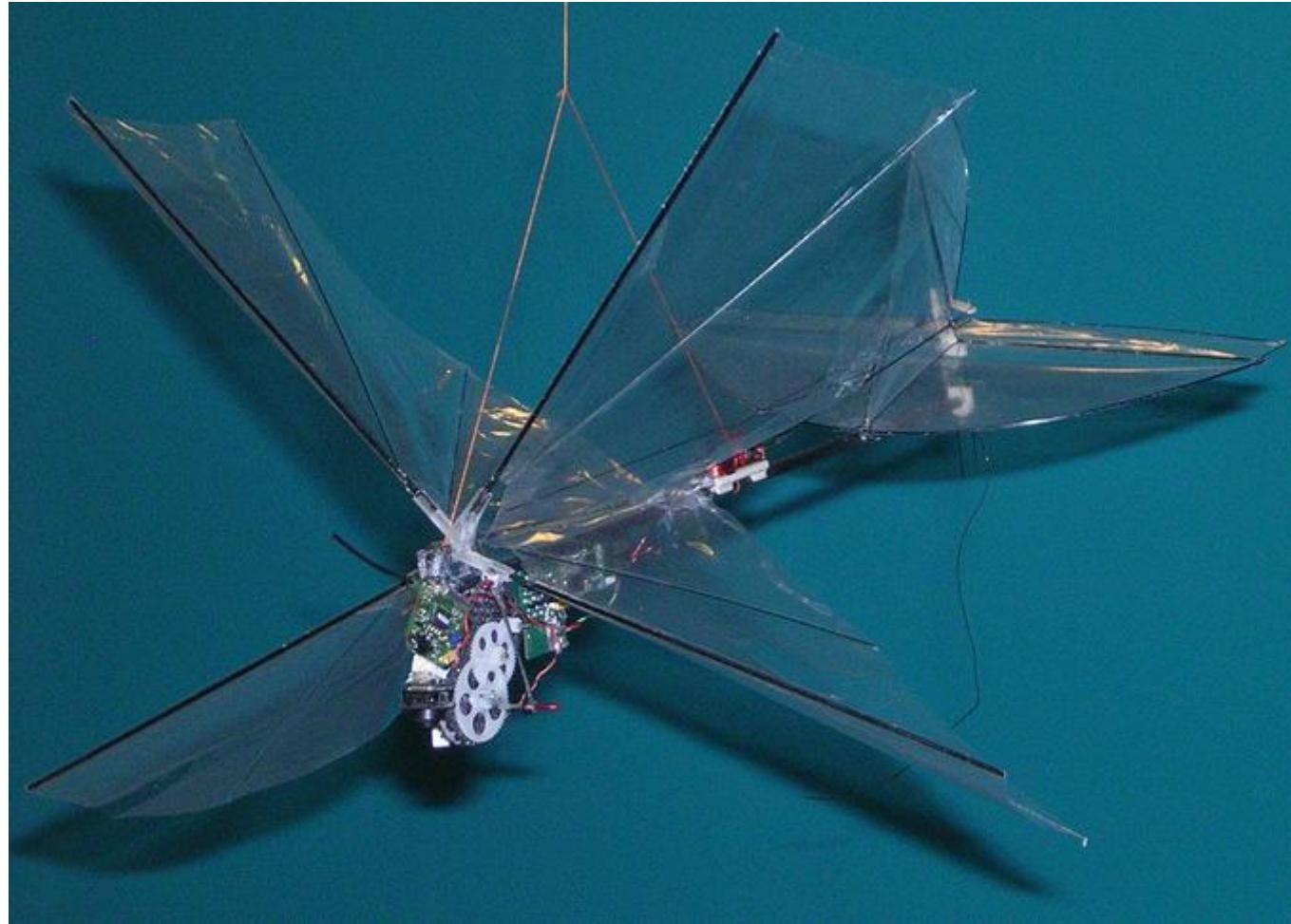


- 2 Camera's perfectly synchronized on one transmitter
- Each camera delivers full frames at 30 Hz.
- For bigger field of view or stereo vision
- Light weight: 2 camera's + 1 transmitter < 3 grams

First working
test system on
flying leads



DelFly II: Flight Demo



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But also a new start



of a much smaller aircraft

DelFly II – Future Technology



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