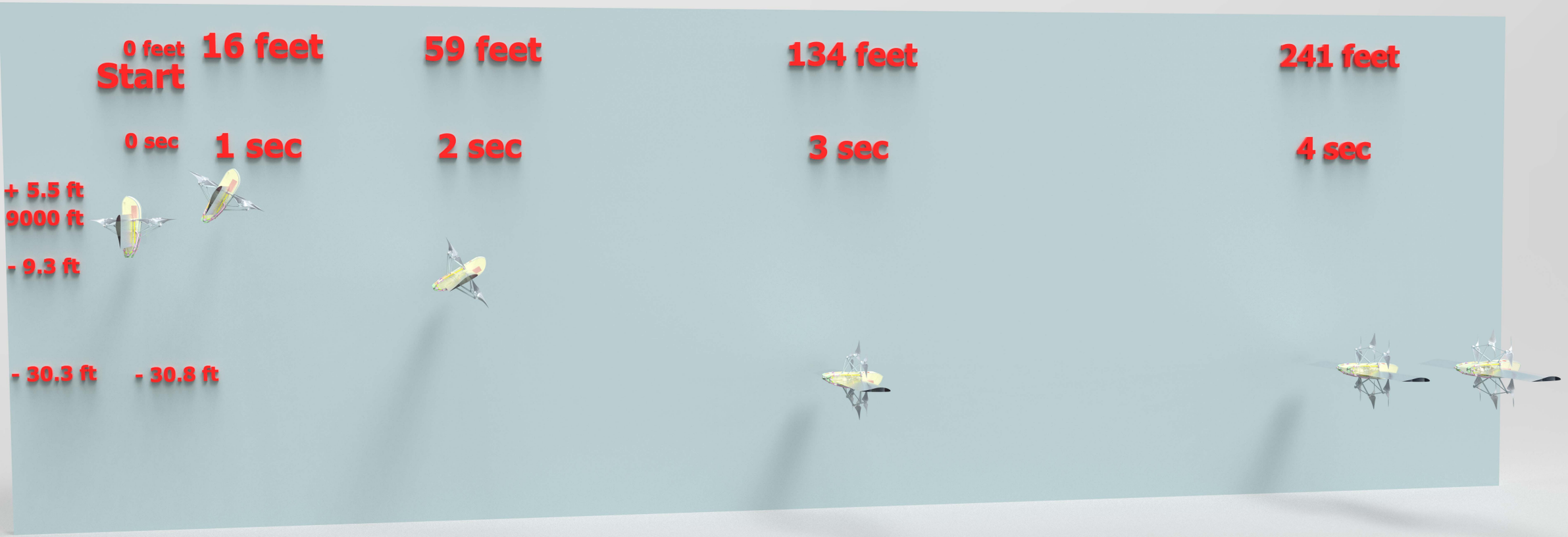

0 feet
Start
16 feet
59 feet
134 feet
241 feet
0 sec
1 sec
2 sec
3 sec
4 sec
+ 5.5 ft
9000 ft
- 9.3 ft
- 30.3 ft
- 30.8 ft

0 feet

16 feet

59 feet

Start

0 sec

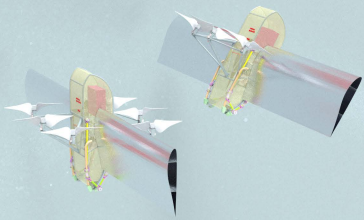
1 sec

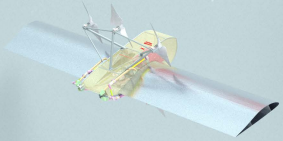
2 sec

+ 5.5 ft

9000 ft

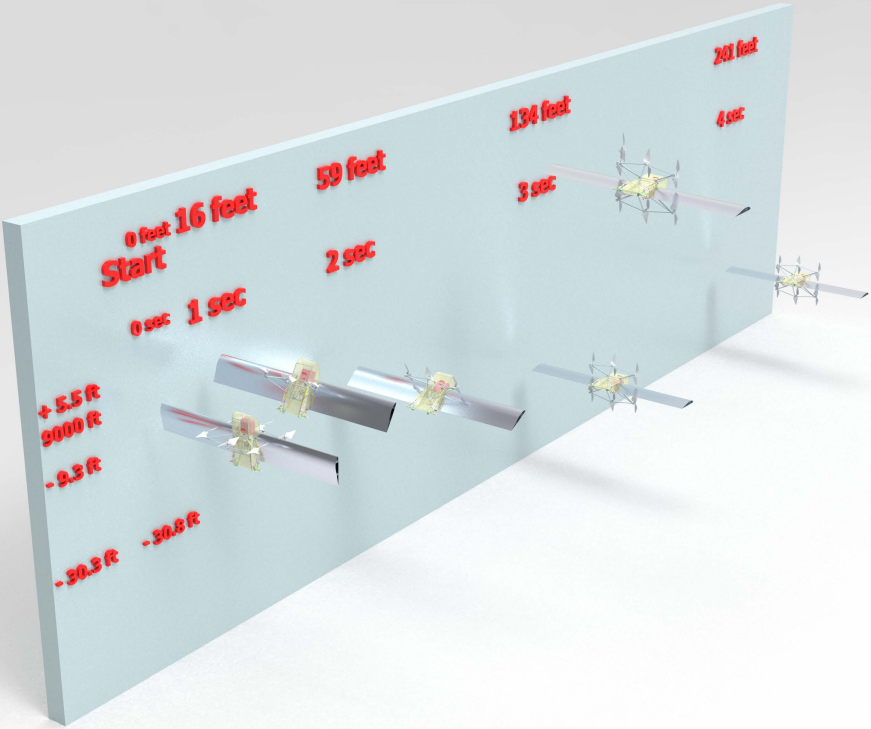
- 9.3 ft





- 30.3 ft

- 30.8 ft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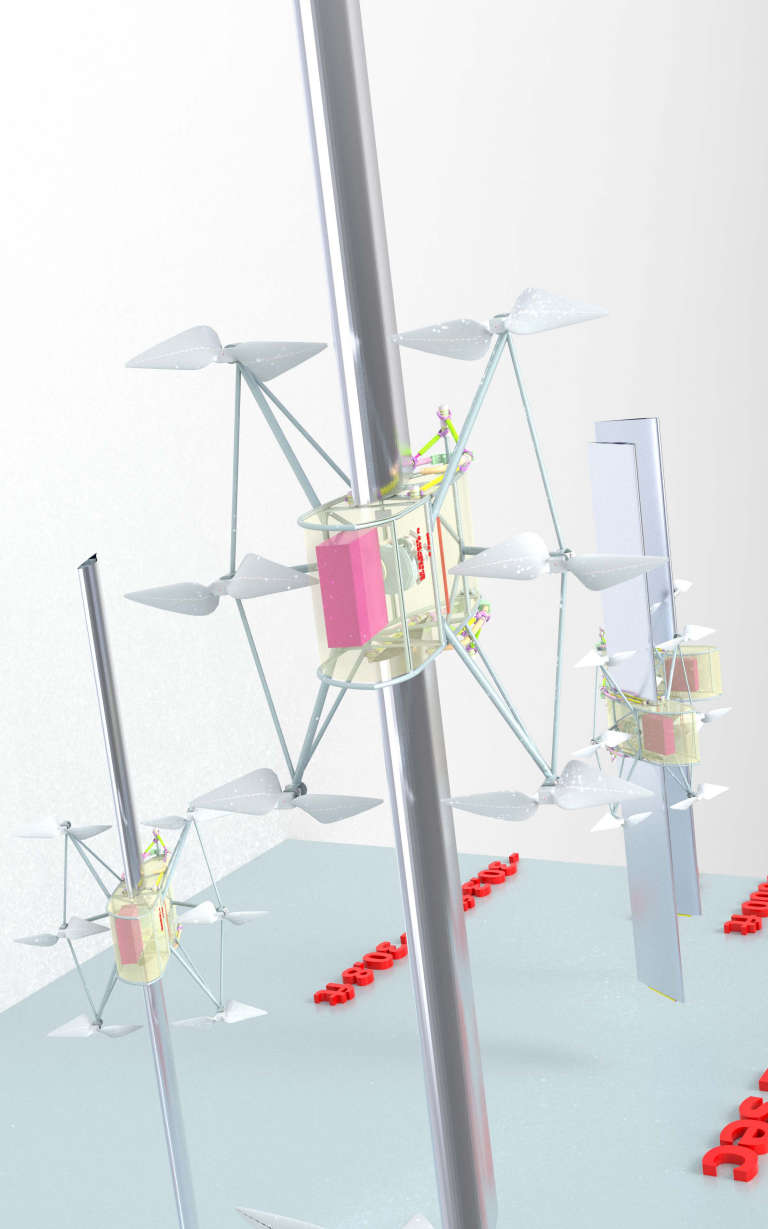
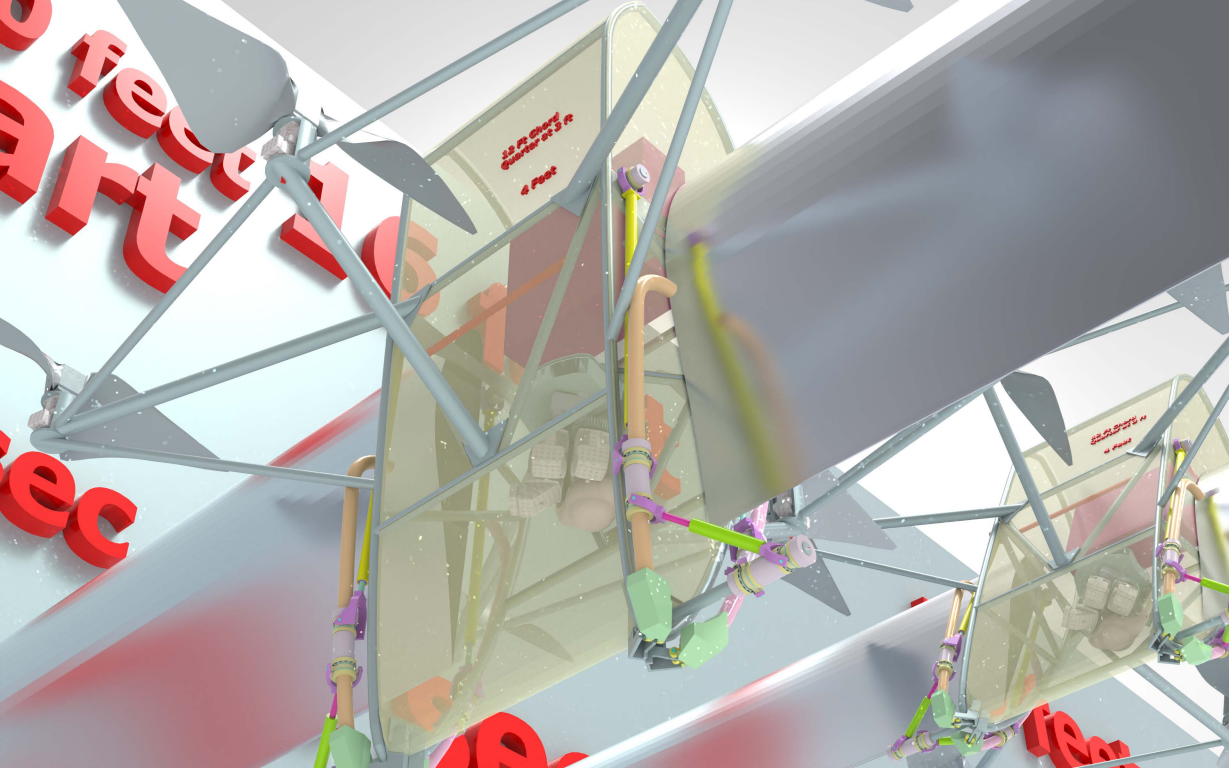
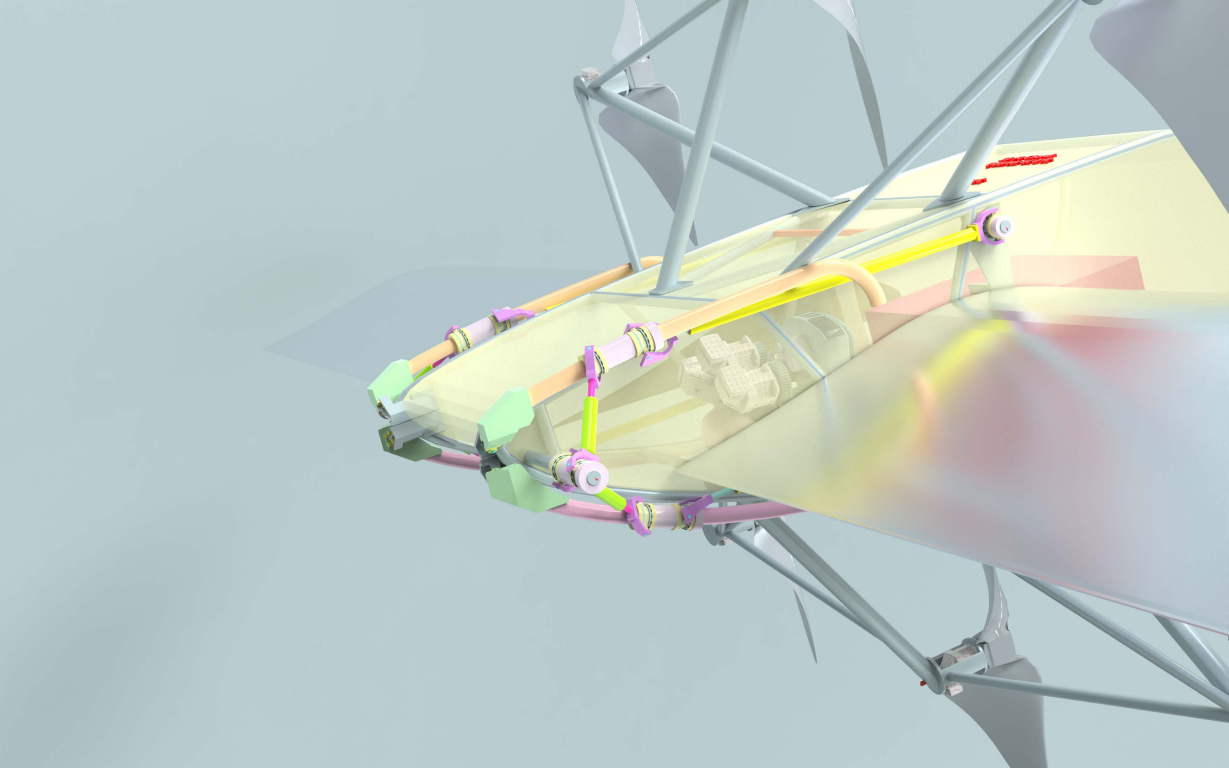



4 Feet



Drone Flying - Transition to Level Flight at 9000ft altitude

Start Point: Drone Flying straight up - NOSE UP TAIL DOWN

We define NOSE STRAIGHT UP as Nose at 90 degrees

Step #1) Add power to upper props, decrease power to lower props

Step #2) Because of Step #1), Drone rotates Nose towards horizontal

In one second Drone rotates from :

NOSE at 0 degrees to NOSE at 60 degrees

NOSE at 60 degrees = NOSE is rotated 60 deg up from horizontal

Step #3) Prop thrust remains at 3200lbs

But PROP thrust is now at 30 degrees off of straight down

Step #4) Component of horizontal thrust becomes 1600lbs

Component of vertical thrust becomes 2771lbs

Step #5) The vertical velocity was at 3 m/sec up, or 9.8 ft/sec up

The apparent wt of the drone is 3200lb - 2771lb =429 lb

The accel down from wt=429 lbs is 4.3 ft/sec^2

Vertical velocity effect in one sec = 9.8ft/sec - 4.3 ft/sec 5.5 ft/sec

The drone will thus move up 5.5 ft in this one second

The drone will have a vertical velocity of 5.5 ft/sec up

Step #6) In this one second, component of horizontal thrust = 1600lbs

Horizontal accel from this thrust is 16ft/sec^2

Horizontal velocity becomes 16 ft/sec

WING AOA is 60 degrees, thus NO LIFT from the WINGS

Drone Flying - Transition to Level Flight at 9000ft altitude

Start Point: Drone Flying straight up - NOSE UP TAIL DOWN

We define NOSE STRAIGHT UP as Nose at 90 degrees

Drone has rotated to NOSE at 60 degrees,
means NOSE is rotated 60 degrees up from horizontal

Step #7) The angle of the nose in the next one second
rotates to 30 degrees (NOSE at 30 degrees)

Step #8) Component of vertical thrust becomes 1600 lbs

Apparent wt becomes 3200lbs-1600lbs = 1600 lbs

Accel down from this apparent wt is 10.5 ft/sec²

The vertical velocity was 5.5 ft/sec up

The new vertical velocity is 5.5 ft/sec - 10.5 ft/sec = 5 ft/sec down

The drone will move vertically 5 ft down

Step #9) Component of horizontal thrust becomes 2771 lbs

Accel from horiz thrust becomes 27 ft/sec² horizontally

Horizontal velocity was 16 ft/sec

Thus in this one second horizontal velocity is 16+27 = 43 ft/sec

Lift from the WINGS at 43 ft/sec is 0, because AOA is too large

Step #10) In the next one second the angle of the Nose
rotates from NOSE at 30 degrees to NOSE at 0 degrees
Nose angle of 0 degrees means the drone is
oriented horizontally, back up, stomach down

Drone Flying - Transition to Level Flight at 9000ft altitude

Drone Started at: Flying with NOSE at 90 degrees

Currently the Drone is rotated to NOSE at 30 degrees

Drone now rotates from NOSE at 30 degrees to LEVEL

LEVEL = BACK UP STOMACH DOWN, NOSE at 0 degrees

Step #11) Component of vertical thrust from PROPS now = 0

Step #12) Component of horizontal thrust is 3200 lbs

Horizontal accel is now 32 ft/sec²

In this next one second horizontal velocity becomes

43 ft/sec already present + 32 ft/sec = 75 ft/sec

The drone may now go to its level flying normal AOA of 9.4 degrees

Lift from the WINGS becomes 1549 lbs

Apparent wt of the drone is 3200lbs - 1549lbs = 1651 lbs

Accel down from this apparent wt is 16 ft/sec²

Initial vertical velocity in this one second was 5 ft/sec

New vertical velocity in this one second is 5+16 = 21 ft/sec

In this one second the drone travels down 21 ft

Step #13) The drone does no further rotation of the nose

In this next one second horiz accel remains at 32 ft/sec²

In this one second horiz velocity becomes:

Original horizontal velocity of 75 + add 32 = new 107 ft/sec

Lift from the WINGS at this 107 ft/sec = 3154 lbs

Drone apparent wt is now 3200-3154 = 46 lbs

Drone accel down becomes 0.5 ft/sec² down

Drone Flying - Transition to Level Flight at 9000ft altitude

Start Point: Flying straight up Oriented Nose up and tail down

We will define Nose straight up as Nose at 90 degrees

Drone started at NOSE UP TAIL DOWN, nose at 90 degrees
and Drone is now changed to LEVEL FLYING

LEVEL FLYING = BACK UP STOMACH DOWN, nose at 0 degrees

Step #14) In one more second PROP power adjusted to increase horizontal velocity of 107 to 108 ft/sec = 70.6 mph

Step #15) The drone is now in stable level flight, at 108 ft/sec

Note: Jet engine power was at 468 kW = 627 HP
until the drone was flying stable and level at 108 ft/sec

Note: Jet engine power was reduced to 67.7 kW = 90.8 HP
once stable level flight at 108 ft/sec was achieved