**Hover Fz Lift** as a Function of **AoA and Airspeed**

Completed on 9/03/2023

Using lift\_hover\_prop.m

## Wind Tunnels Test Data Used:

* Actuator effectiveness (elevator and wing attaced) --> AE

## Modifications to data

* Removing entries with non-zero control surfaces
* Removing entries with non-zero pusher motor
* Removing entries with angle of attack higher than 15 deg --> Remove stall condition (non-linear)
* Select skew = 0 : for current log flight, skew is at 0 deg
* Select entries with the same hover motor commands

## Correct for NAN RPM Values

* For all NAN RPM values, the NAN values are replaced by the mean of other RPM values for the hover motors

## Isolate Hover Prop Drag

% Fz = body lift + Hover\_motors lift

% Hover\_motors lift = Fz-body lift

%Drag without hover props (only body drag)

lift\_body\_coeff = [1.569286184145456E-3 -5.989835400355119E-3 2.346715949355502E-1 -6.611857425073364E-2]; %all airspeeds without hover props with skew

Fz\_body = @(alpha,skew,V) (lift\_body\_coeff(1) .\* cos(skew)+...

lift\_body\_coeff(2)+...

lift\_body\_coeff(3) .\* alpha+...

lift\_body\_coeff(4) .\* alpha.^2).\*V.^2;

## Fit for 4 motors being used at the same time

* Select entries with the same hover motor commands

Fit for all 4 motors being used at the same time

% Fz = K1\*RPM^2

% s\_hover =

%

% -3.589843749999992e-06

%

%

% RMS\_hover =

%

% 2.036971398488984



The limitation for this method is that each motor is assumed to be the same while they are not.

## Fit for each motor separately

This model assumes each motor is different. It is harder to plot it

% Fz = K1\*RPM\_F^2+K2\*RPM\_R^2+K3\*RPM\_B^2+K4\*RPM\_L^2

% s\_all =

%

% 1.0e-06 \*

%

% -0.860837964793260

% -0.945014166165622

% -0.879672747114793

% -0.839096487406381

%

%

% RMS\_all =

%

% 1.670030715025816