Q-2, Stability derivatives

Problem

Estimate all possible longitudinal stability and control derivative.

MATLAB code

>> cm_de_main.m

```
clc
clear all
close all

% Balance center location (m)
x = 0.02985;          % CG location for Body+TF case
y = 0;
z = 0;

% Geometrical data (constant)
S = 0.009677;
l = 0.884;

% Angle of Attack
alpha = 5.947917;
beta = 0;

% Consider AOA = 5.947917 degrees for Cm_δe analysis

CM =[63.080043      0.144499      -0.206795      1.354260      1.630051      4.275882
-0.123649      150.309342      0.592082      -0.725847      0.030856      0.393628
0.024098      -0.689773      151.831777      0.096597      -0.571799      -4.414537
0.152944      -2.334107      0.037781      77.595997      0.445712      5.841784
-0.006030      0.114642      -0.574072      -0.065800      79.176337      0.322466
0.047415      0.466131      0.099431      0.208017      0.190935      44.877349];

Y = [-1 0 0 0 0 0
   0 1 0 0 0 0
   0 0 -1 0 0 0
   0 -z y 1 0 0
   z 0 -x 0 1 0
   -y x 0 0 0 1];

tf_cm_de_1
tf_cm_de_2
tf_cm_de_3
```

```
tf_cm_de_4
tf_cm_de_5      % 6686_Bomb Model-II_Body_TF_-10
tf_cm_de_6      % 6687_Bomb Model-II_Body_TF_+15
tf_cm_de_7      % 6689_Bomb Model-II_Body_TF_-15
tf_cm_de_8      % 6690_Bomb Model-II_Body_TF_+20
tf_cm_de_9      % 6691_Bomb Model-II_Body_TF_-20
tf_cm_de_10     % 6692_Bomb Model-II_Body_TF_+25
tf_cm_de_11     % 6693_Bomb Model-II_Body_TF_-25

plot_cm_de
```

>> tf_cm_de_1.m

```
%% δe = 0 [6682_Bomb Model-II_Body_TF_0]

k1 = wind_tunnel_data(11);
k2 = wind_tunnel_data(12);
k3 = wind_tunnel_data(13);

NW = no_wind_data(1);
NW = NW';

q1 = head_data(11);
q2 = head_data(12);
q3 = head_data(13);

% a = [af; n1; n2; s1; s2; rm] for pitch angle = 5.947917
a1 = k1(10,2:7);
a2 = k2(10,2:7);
a3 = k3(10,2:7);

a1 = a1';   a2 = a2';   a3 = a3';

% A = [Ax; N1; N2; S1; S2; Rm] in kg and kg-m
A1 = CM*[a1 - NW];
A2 = CM*[a2 - NW];
A3 = CM*[a3 - NW];

Af1 = A1(1);    Af2 = A2(1);    Af3 = A3(1);
N11 = A1(2);    N12 = A2(2);    N13 = A3(2);
N21 = A1(3);    N22 = A2(3);    N23 = A3(3);
S11 = A1(4);    S12 = A2(4);    S13 = A3(4);
S21 = A1(5);    S22 = A2(5);    S23 = A3(5);
Rm1 = A1(6);    Rm2 = A2(6);    Rm3 = A3(6);

% FM = [fx; fy; fz; mx; my; mz]
FM1 = [-Af1; (S11+S21); -(N11+N21); Rm1; (N11-N21)*0.065; (S11-S21)*0.065]*9.81;
FM2 = [-Af2; (S12+S22); -(N12+N22); Rm2; (N12-N22)*0.065; (S12-S22)*0.065]*9.81;
FM3 = [-Af3; (S13+S23); -(N13+N23); Rm3; (N13-N23)*0.065; (S13-S23)*0.065]*9.81;
```

```
% CG = [Fx Fy Fz Mx My Mz] @cg
CG1 = Y*FM1;
CG2 = Y*FM2;
CG3 = Y*FM3;


% For lift curve slope
Cfx1 = (1/q1/S)*(-1)*CG1(1,1);   Cfy1 = (1/q1/S)*(-1)*CG1(2,1);   Cfz1 = (1/q1/S)*(-
1)*CG1(3,1);
Cfx2 = (1/q1/S)*(-1)*CG2(1,1);   Cfy2 = (1/q1/S)*(-1)*CG2(2,1);   Cfz2 = (1/q1/S)*(-
1)*CG2(3,1);
Cfx3 = (1/q1/S)*(-1)*CG3(1,1);   Cfy3 = (1/q1/S)*(-1)*CG3(2,1);   Cfz3 = (1/q1/S)*(-
1)*CG3(3,1);

CL11 = sind(alpha)*Cfx1 - cosd(alpha)*Cfz1;
CL12 = sind(alpha)*Cfx2 - cosd(alpha)*Cfz2;
CL13 = sind(alpha)*Cfx3 - cosd(alpha)*Cfz3;

CD11 = -cosd(alpha)*Cfx1 - sind(alpha)*Cfz1;
CD12 = -cosd(alpha)*Cfx2 - sind(alpha)*Cfz2;
CD13 = -cosd(alpha)*Cfx3 - sind(alpha)*Cfz3;


% 5th element in array is Cmy
My1 = CG1(5,1);
My2 = CG2(5,1);
My3 = CG3(5,1);

% Cmy
Cmy11 = (1/q1/S/l)*My1;
Cmy12 = (1/q2/S/l)*My2;
Cmy13 = (1/q3/S/l)*My3;
```

>> tf_cm_de_2.m

```
%% δe = +5 [6683_Bomb Model-II_Body_TF_+5]

k1 = wind_tunnel_data(21);
k2 = wind_tunnel_data(22);
k3 = wind_tunnel_data(23);

NW = no_wind_data(2);
NW = NW';

q1 = head_data(21);
q2 = head_data(22);
q3 = head_data(23);

% a = [af; n1; n2; s1; s2; rm] for pitch angle = 5.947917
```

```
a1 = k1(10,2:7);
a2 = k2(10,2:7);
a3 = k3(10,2:7);

a1 = a1';   a2 = a2';   a3 = a3';

% A = [Ax; N1; N2; S1; S2; Rm] in kg and kg-m
A1 = CM*[a1 - NW];
A2 = CM*[a2 - NW];
A3 = CM*[a3 - NW];

Af1 = A1(1);    Af2 = A2(1);    Af3 = A3(1);
N11 = A1(2);    N12 = A2(2);    N13 = A3(2);
N21 = A1(3);    N22 = A2(3);    N23 = A3(3);
S11 = A1(4);    S12 = A2(4);    S13 = A3(4);
S21 = A1(5);    S22 = A2(5);    S23 = A3(5);
Rm1 = A1(6);    Rm2 = A2(6);    Rm3 = A3(6);

% FM = [fx; fy; fz; mx; my; mz]
FM1 = [-Af1; (S11+S21); -(N11+N21); Rm1; (N11-N21)*0.065; (S11-S21)*0.065]*9.81;
FM2 = [-Af2; (S12+S22); -(N12+N22); Rm2; (N12-N22)*0.065; (S12-S22)*0.065]*9.81;
FM3 = [-Af3; (S13+S23); -(N13+N23); Rm3; (N13-N23)*0.065; (S13-S23)*0.065]*9.81;

% CG = [Fx Fy Fz Mx My Mz] @cg
CG1 = Y*FM1;
CG2 = Y*FM2;
CG3 = Y*FM3;



% For lift curve slope
Cfx1 = (1/q1/S)*(-1)*CG1(1,1);   Cfy1 = (1/q1/S)*(-1)*CG1(2,1);   Cfz1 = (1/q1/S)*(-
1)*CG1(3,1);
Cfx2 = (1/q1/S)*(-1)*CG2(1,1);   Cfy2 = (1/q1/S)*(-1)*CG2(2,1);   Cfz2 = (1/q1/S)*(-
1)*CG2(3,1);
Cfx3 = (1/q1/S)*(-1)*CG3(1,1);   Cfy3 = (1/q1/S)*(-1)*CG3(2,1);   Cfz3 = (1/q1/S)*(-
1)*CG3(3,1);

CL21 = sind(alpha)*Cfx1 - cosd(alpha)*Cfz1;
CL22 = sind(alpha)*Cfx2 - cosd(alpha)*Cfz2;
CL23 = sind(alpha)*Cfx3 - cosd(alpha)*Cfz3;

CD21 = -cosd(alpha)*Cfx1 - sind(alpha)*Cfz1;
CD22 = -cosd(alpha)*Cfx2 - sind(alpha)*Cfz2;
CD23 = -cosd(alpha)*Cfx3 - sind(alpha)*Cfz3;


% 5th element in array is Cmy
My1 = CG1(5,1);
My2 = CG2(5,1);
```

```
My3 = CG3(5,1);

% Cmy
Cmy21 = (1/q1/S/l)*My1;
Cmy22 = (1/q2/S/l)*My2;
Cmy23 = (1/q3/S/l)*My3;
```

>> tf_cm_de_3.m

```
%% δe = -5 [6684_Bomb Model-II_Body_TF_-5]

k1 = wind_tunnel_data(31);
k2 = wind_tunnel_data(32);
k3 = wind_tunnel_data(33);

NW = no_wind_data(3);
NW = NW';

q1 = head_data(31);
q2 = head_data(32);
q3 = head_data(33);

% a = [af; n1; n2; s1; s2; rm] for pitch angle = 5.947917
a1 = k1(10,2:7);
a2 = k2(10,2:7);
a3 = k3(10,2:7);

a1 = a1';   a2 = a2';   a3 = a3';

% A = [Ax; N1; N2; S1; S2; Rm] in kg and kg-m
A1 = CM*[a1 - NW];
A2 = CM*[a2 - NW];
A3 = CM*[a3 - NW];

Af1 = A1(1);    Af2 = A2(1);    Af3 = A3(1);
N11 = A1(2);    N12 = A2(2);    N13 = A3(2);
N21 = A1(3);    N22 = A2(3);    N23 = A3(3);
S11 = A1(4);    S12 = A2(4);    S13 = A3(4);
S21 = A1(5);    S22 = A2(5);    S23 = A3(5);
Rm1 = A1(6);    Rm2 = A2(6);    Rm3 = A3(6);

% FM = [fx; fy; fz; mx; my; mz]
FM1 = [-Af1; (S11+S21); -(N11+N21); Rm1; (N11-N21)*0.065; (S11-S21)*0.065]*9.81;
FM2 = [-Af2; (S12+S22); -(N12+N22); Rm2; (N12-N22)*0.065; (S12-S22)*0.065]*9.81;
FM3 = [-Af3; (S13+S23); -(N13+N23); Rm3; (N13-N23)*0.065; (S13-S23)*0.065]*9.81;

% CG = [Fx Fy Fz Mx My Mz] @cg
CG1 = Y*FM1;
CG2 = Y*FM2;
CG3 = Y*FM3;
```

```
% For lift curve slope
Cfx1 = (1/q1/S)*(-1)*CG1(1,1);   Cfy1 = (1/q1/S)*(-1)*CG1(2,1);   Cfz1 = (1/q1/S)*(-
1)*CG1(3,1);
Cfx2 = (1/q1/S)*(-1)*CG2(1,1);   Cfy2 = (1/q1/S)*(-1)*CG2(2,1);   Cfz2 = (1/q1/S)*(-
1)*CG2(3,1);
Cfx3 = (1/q1/S)*(-1)*CG3(1,1);   Cfy3 = (1/q1/S)*(-1)*CG3(2,1);   Cfz3 = (1/q1/S)*(-
1)*CG3(3,1);

CL31 = sind(alpha)*Cfx1 - cosd(alpha)*Cfz1;
CL32 = sind(alpha)*Cfx2 - cosd(alpha)*Cfz2;
CL33 = sind(alpha)*Cfx3 - cosd(alpha)*Cfz3;

CD31 = -cosd(alpha)*Cfx1 - sind(alpha)*Cfz1;
CD32 = -cosd(alpha)*Cfx2 - sind(alpha)*Cfz2;
CD33 = -cosd(alpha)*Cfx3 - sind(alpha)*Cfz3;


% 5th element in array is Cmy
My1 = CG1(5,1);
My2 = CG2(5,1);
My3 = CG3(5,1);

% Cmy
Cmy31 = (1/q1/S/l)*My1;
Cmy32 = (1/q2/S/l)*My2;
Cmy33 = (1/q3/S/l)*My3;
```

>> tf_cm_de_4.m

```
%% δe = +10 [6685_Bomb Model-II_Body_TF_+10]

k1 = wind_tunnel_data(41);
k2 = wind_tunnel_data(42);
k3 = wind_tunnel_data(43);

NW = no_wind_data(4);
NW = NW';

q1 = head_data(41);
q2 = head_data(42);
q3 = head_data(43);

% a = [af; n1; n2; s1; s2; rm] for pitch angle = 5.947917
a1 = k1(10,2:7);
a2 = k2(10,2:7);
a3 = k3(10,2:7);

a1 = a1';   a2 = a2';   a3 = a3';
```

```
% A = [Ax; N1; N2; S1; S2; Rm] in kg and kg-m
A1 = CM*[a1 - NW];
A2 = CM*[a2 - NW];
A3 = CM*[a3 - NW];

Af1 = A1(1);    Af2 = A2(1);    Af3 = A3(1);
N11 = A1(2);    N12 = A2(2);    N13 = A3(2);
N21 = A1(3);    N22 = A2(3);    N23 = A3(3);
S11 = A1(4);    S12 = A2(4);    S13 = A3(4);
S21 = A1(5);    S22 = A2(5);    S23 = A3(5);
Rm1 = A1(6);    Rm2 = A2(6);    Rm3 = A3(6);

% FM = [fx; fy; fz; mx; my; mz]
FM1 = [-Af1; (S11+S21); -(N11+N21); Rm1; (N11-N21)*0.065; (S11-S21)*0.065]*9.81;
FM2 = [-Af2; (S12+S22); -(N12+N22); Rm2; (N12-N22)*0.065; (S12-S22)*0.065]*9.81;
FM3 = [-Af3; (S13+S23); -(N13+N23); Rm3; (N13-N23)*0.065; (S13-S23)*0.065]*9.81;

% CG = [Fx Fy Fz Mx My Mz] @cg
CG1 = Y*FM1;
CG2 = Y*FM2;
CG3 = Y*FM3;

% For lift curve slope
Cfx1 = (1/q1/S)*(-1)*CG1(1,1);   Cfy1 = (1/q1/S)*(-1)*CG1(2,1);   Cfz1 = (1/q1/S)*(-
1)*CG1(3,1);
Cfx2 = (1/q1/S)*(-1)*CG2(1,1);   Cfy2 = (1/q1/S)*(-1)*CG2(2,1);   Cfz2 = (1/q1/S)*(-
1)*CG2(3,1);
Cfx3 = (1/q1/S)*(-1)*CG3(1,1);   Cfy3 = (1/q1/S)*(-1)*CG3(2,1);   Cfz3 = (1/q1/S)*(-
1)*CG3(3,1);

CL41 = sind(alpha)*Cfx1 - cosd(alpha)*Cfz1;
CL42 = sind(alpha)*Cfx2 - cosd(alpha)*Cfz2;
CL43 = sind(alpha)*Cfx3 - cosd(alpha)*Cfz3;

CD41 = -cosd(alpha)*Cfx1 - sind(alpha)*Cfz1;
CD42 = -cosd(alpha)*Cfx2 - sind(alpha)*Cfz2;
CD43 = -cosd(alpha)*Cfx3 - sind(alpha)*Cfz3;

% 5th element in array is Cmy
My1 = CG1(5,1);
My2 = CG2(5,1);
My3 = CG3(5,1);

% Cmy
Cmy41 = (1/q1/S/l)*My1;
Cmy42 = (1/q2/S/l)*My2;
Cmy43 = (1/q3/S/l)*My3;
```

>> tf_cm_de_5.m

```
%% δe = -10 [6686_Bomb Model-II_Body_TF_-10]

k1 = wind_tunnel_data(51);
k2 = wind_tunnel_data(52);
k3 = wind_tunnel_data(53);

NW = no_wind_data(5);
NW = NW';

q1 = head_data(51);
q2 = head_data(52);
q3 = head_data(53);

% a = [af; n1; n2; s1; s2; rm] for pitch angle = 5.947917
a1 = k1(10,2:7);
a2 = k2(10,2:7);
a3 = k3(10,2:7);

a1 = a1';   a2 = a2';   a3 = a3';

% A = [Ax; N1; N2; S1; S2; Rm] in kg and kg-m
A1 = CM*[a1 - NW];
A2 = CM*[a2 - NW];
A3 = CM*[a3 - NW];

Af1 = A1(1);    Af2 = A2(1);    Af3 = A3(1);
N11 = A1(2);    N12 = A2(2);    N13 = A3(2);
N21 = A1(3);    N22 = A2(3);    N23 = A3(3);
S11 = A1(4);    S12 = A2(4);    S13 = A3(4);
S21 = A1(5);    S22 = A2(5);    S23 = A3(5);
Rm1 = A1(6);    Rm2 = A2(6);    Rm3 = A3(6);

% FM = [fx; fy; fz; mx; my; mz]
FM1 = [-Af1; (S11+S21); -(N11+N21); Rm1; (N11-N21)*0.065; (S11-S21)*0.065]*9.81;
FM2 = [-Af2; (S12+S22); -(N12+N22); Rm2; (N12-N22)*0.065; (S12-S22)*0.065]*9.81;
FM3 = [-Af3; (S13+S23); -(N13+N23); Rm3; (N13-N23)*0.065; (S13-S23)*0.065]*9.81;

% CG = [Fx Fy Fz Mx My Mz] @cg
CG1 = Y*FM1;
CG2 = Y*FM2;
CG3 = Y*FM3;

% For lift curve slope
Cfx1 = (1/q1/S)*(-1)*CG1(1,1);   Cfy1 = (1/q1/S)*(-1)*CG1(2,1);   Cfz1 =
(1/q1/S)*(-1)*CG1(3,1);
Cfx2 = (1/q1/S)*(-1)*CG2(1,1);   Cfy2 = (1/q1/S)*(-1)*CG2(2,1);   Cfz2 =
(1/q1/S)*(-1)*CG2(3,1);
Cfx3 = (1/q1/S)*(-1)*CG3(1,1);   Cfy3 = (1/q1/S)*(-1)*CG3(2,1);   Cfz3 =
(1/q1/S)*(-1)*CG3(3,1);

CL51 = sind(alpha)*Cfx1 - cosd(alpha)*Cfz1;
CL52 = sind(alpha)*Cfx2 - cosd(alpha)*Cfz2;
CL53 = sind(alpha)*Cfx3 - cosd(alpha)*Cfz3;

CD51 = -cosd(alpha)*Cfx1 - sind(alpha)*Cfz1;
CD52 = -cosd(alpha)*Cfx2 - sind(alpha)*Cfz2;
CD53 = -cosd(alpha)*Cfx3 - sind(alpha)*Cfz3;
```

```
% 5th element in array is Cmy
My1 = CG1(5,1);
My2 = CG2(5,1);
My3 = CG3(5,1);

% Cmy
Cmy51 = (1/q1/S/l)*My1;
Cmy52 = (1/q2/S/l)*My2;
Cmy53 = (1/q3/S/l)*My3;
```

>> tf_cm_de_6.m

```
%% δe = +15 [6687_Bomb Model-II_Body_TF_+15]

k1 = wind_tunnel_data(61);
k2 = wind_tunnel_data(62);
k3 = wind_tunnel_data(63);

NW = no_wind_data(6);
NW = NW';

q1 = head_data(61);
q2 = head_data(62);
q3 = head_data(63);

% a = [af; n1; n2; s1; s2; rm] for pitch angle = 5.947917
a1 = k1(10,2:7);
a2 = k2(10,2:7);
a3 = k3(10,2:7);

a1 = a1';   a2 = a2';   a3 = a3';

% A = [Ax; N1; N2; S1; S2; Rm] in kg and kg-m
A1 = CM*[a1 - NW];
A2 = CM*[a2 - NW];
A3 = CM*[a3 - NW];

Af1 = A1(1);    Af2 = A2(1);    Af3 = A3(1);
N11 = A1(2);    N12 = A2(2);    N13 = A3(2);
N21 = A1(3);    N22 = A2(3);    N23 = A3(3);
S11 = A1(4);    S12 = A2(4);    S13 = A3(4);
S21 = A1(5);    S22 = A2(5);    S23 = A3(5);
Rm1 = A1(6);    Rm2 = A2(6);    Rm3 = A3(6);

% FM = [fx; fy; fz; mx; my; mz]
FM1 = [-Af1; (S11+S21); -(N11+N21); Rm1; (N11-N21)*0.065; (S11-S21)*0.065]*9.81;
FM2 = [-Af2; (S12+S22); -(N12+N22); Rm2; (N12-N22)*0.065; (S12-S22)*0.065]*9.81;
FM3 = [-Af3; (S13+S23); -(N13+N23); Rm3; (N13-N23)*0.065; (S13-S23)*0.065]*9.81;

% CG = [Fx Fy Fz Mx My Mz] @cg
```

```
CG1 = Y*FM1;
CG2 = Y*FM2;
CG3 = Y*FM3;

% For lift curve slope
Cfx1 = (1/q1/S)*(-1)*CG1(1,1);   Cfy1 = (1/q1/S)*(-1)*CG1(2,1);   Cfz1 = (1/q1/S)*(-
1)*CG1(3,1);
Cfx2 = (1/q1/S)*(-1)*CG2(1,1);   Cfy2 = (1/q1/S)*(-1)*CG2(2,1);   Cfz2 = (1/q1/S)*(-
1)*CG2(3,1);
Cfx3 = (1/q1/S)*(-1)*CG3(1,1);   Cfy3 = (1/q1/S)*(-1)*CG3(2,1);   Cfz3 = (1/q1/S)*(-
1)*CG3(3,1);

CL61 = sind(alpha)*Cfx1 - cosd(alpha)*Cfz1;
CL62 = sind(alpha)*Cfx2 - cosd(alpha)*Cfz2;
CL63 = sind(alpha)*Cfx3 - cosd(alpha)*Cfz3;

CD61 = -cosd(alpha)*Cfx1 - sind(alpha)*Cfz1;
CD62 = -cosd(alpha)*Cfx2 - sind(alpha)*Cfz2;
CD63 = -cosd(alpha)*Cfx3 - sind(alpha)*Cfz3;


% 5th element in array is Cmy
My1 = CG1(5,1);
My2 = CG2(5,1);
My3 = CG3(5,1);

% Cmy
Cmy61 = (1/q1/S/l)*My1;
Cmy62 = (1/q2/S/l)*My2;
Cmy63 = (1/q3/S/l)*My3;
```

>> tf_cm_de_7.m

```
%% δe = -15 [6689_Bomb Model-II_Body_TF_-15]

k1 = wind_tunnel_data(71);
k2 = wind_tunnel_data(72);
k3 = wind_tunnel_data(73);

NW = no_wind_data(7);
NW = NW';

q1 = head_data(71);
q2 = head_data(72);
q3 = head_data(73);

% a = [af; n1; n2; s1; s2; rm] for pitch angle = 5.947917
a1 = k1(10,2:7);
a2 = k2(10,2:7);
a3 = k3(10,2:7);
```

```
a1 = a1';   a2 = a2';   a3 = a3';

% A = [Ax; N1; N2; S1; S2; Rm] in kg and kg-m
A1 = CM*[a1 - NW];
A2 = CM*[a2 - NW];
A3 = CM*[a3 - NW];

Af1 = A1(1);    Af2 = A2(1);    Af3 = A3(1);
N11 = A1(2);    N12 = A2(2);    N13 = A3(2);
N21 = A1(3);    N22 = A2(3);    N23 = A3(3);
S11 = A1(4);    S12 = A2(4);    S13 = A3(4);
S21 = A1(5);    S22 = A2(5);    S23 = A3(5);
Rm1 = A1(6);    Rm2 = A2(6);    Rm3 = A3(6);

% FM = [fx; fy; fz; mx; my; mz]
FM1 = [-Af1; (S11+S21); -(N11+N21); Rm1; (N11-N21)*0.065; (S11-S21)*0.065]*9.81;
FM2 = [-Af2; (S12+S22); -(N12+N22); Rm2; (N12-N22)*0.065; (S12-S22)*0.065]*9.81;
FM3 = [-Af3; (S13+S23); -(N13+N23); Rm3; (N13-N23)*0.065; (S13-S23)*0.065]*9.81;

% CG = [Fx Fy Fz Mx My Mz] @cg
CG1 = Y*FM1;
CG2 = Y*FM2;
CG3 = Y*FM3;

% For lift curve slope
Cfx1 = (1/q1/S)*(-1)*CG1(1,1);   Cfy1 = (1/q1/S)*(-1)*CG1(2,1);   Cfz1 = (1/q1/S)*(-
1)*CG1(3,1);
Cfx2 = (1/q1/S)*(-1)*CG2(1,1);   Cfy2 = (1/q1/S)*(-1)*CG2(2,1);   Cfz2 = (1/q1/S)*(-
1)*CG2(3,1);
Cfx3 = (1/q1/S)*(-1)*CG3(1,1);   Cfy3 = (1/q1/S)*(-1)*CG3(2,1);   Cfz3 = (1/q1/S)*(-
1)*CG3(3,1);

CL71 = sind(alpha)*Cfx1 - cosd(alpha)*Cfz1;
CL72 = sind(alpha)*Cfx2 - cosd(alpha)*Cfz2;
CL73 = sind(alpha)*Cfx3 - cosd(alpha)*Cfz3;

CD71 = -cosd(alpha)*Cfx1 - sind(alpha)*Cfz1;
CD72 = -cosd(alpha)*Cfx2 - sind(alpha)*Cfz2;
CD73 = -cosd(alpha)*Cfx3 - sind(alpha)*Cfz3;

% 5th element in array is Cmy
My1 = CG1(5,1);
My2 = CG2(5,1);
My3 = CG3(5,1);

% Cmy
Cmy71 = (1/q1/S/l)*My1;
Cmy72 = (1/q2/S/l)*My2;
Cmy73 = (1/q3/S/l)*My3;
```

>> tf_cm_de_8.m

```
%% δe = +20 [6689_Bomb Model-II_Body_TF_-15]

k1 = wind_tunnel_data(81);
k2 = wind_tunnel_data(82);
k3 = wind_tunnel_data(83);

NW = no_wind_data(8);
NW = NW';

q1 = head_data(81);
q2 = head_data(82);
q3 = head_data(83);

% a = [af; n1; n2; s1; s2; rm] for pitch angle = 5.947917
a1 = k1(10,2:7);
a2 = k2(10,2:7);
a3 = k3(10,2:7);

a1 = a1';   a2 = a2';   a3 = a3';

% A = [Ax; N1; N2; S1; S2; Rm] in kg and kg-m
A1 = CM*[a1 - NW];
A2 = CM*[a2 - NW];
A3 = CM*[a3 - NW];

Af1 = A1(1);    Af2 = A2(1);    Af3 = A3(1);
N11 = A1(2);    N12 = A2(2);    N13 = A3(2);
N21 = A1(3);    N22 = A2(3);    N23 = A3(3);
S11 = A1(4);    S12 = A2(4);    S13 = A3(4);
S21 = A1(5);    S22 = A2(5);    S23 = A3(5);
Rm1 = A1(6);    Rm2 = A2(6);    Rm3 = A3(6);

% FM = [fx; fy; fz; mx; my; mz]
FM1 = [-Af1; (S11+S21); -(N11+N21); Rm1; (N11-N21)*0.065; (S11-S21)*0.065]*9.81;
FM2 = [-Af2; (S12+S22); -(N12+N22); Rm2; (N12-N22)*0.065; (S12-S22)*0.065]*9.81;
FM3 = [-Af3; (S13+S23); -(N13+N23); Rm3; (N13-N23)*0.065; (S13-S23)*0.065]*9.81;

% CG = [Fx Fy Fz Mx My Mz] @cg
CG1 = Y*FM1;
CG2 = Y*FM2;
CG3 = Y*FM3;

% For lift curve slope
Cfx1 = (1/q1/S)*(-1)*CG1(1,1);   Cfy1 = (1/q1/S)*(-1)*CG1(2,1);   Cfz1 = (1/q1/S)*(-
1)*CG1(3,1);
Cfx2 = (1/q1/S)*(-1)*CG2(1,1);   Cfy2 = (1/q1/S)*(-1)*CG2(2,1);   Cfz2 = (1/q1/S)*(-
1)*CG2(3,1);
Cfx3 = (1/q1/S)*(-1)*CG3(1,1);   Cfy3 = (1/q1/S)*(-1)*CG3(2,1);   Cfz3 = (1/q1/S)*(-
1)*CG3(3,1);
```

```
CL81 = sind(alpha)*Cfx1 - cosd(alpha)*Cfz1;
CL82 = sind(alpha)*Cfx2 - cosd(alpha)*Cfz2;
CL83 = sind(alpha)*Cfx3 - cosd(alpha)*Cfz3;

CD81 = -cosd(alpha)*Cfx1 - sind(alpha)*Cfz1;
CD82 = -cosd(alpha)*Cfx2 - sind(alpha)*Cfz2;
CD83 = -cosd(alpha)*Cfx3 - sind(alpha)*Cfz3;

% 5th element in array is Cmy
My1 = CG1(5,1);
My2 = CG2(5,1);
My3 = CG3(5,1);

% Cmy
Cmy81 = (1/q1/S/l)*My1;
Cmy82 = (1/q2/S/l)*My2;
Cmy83 = (1/q3/S/l)*My3;
```

>> tf_cm_de_9.m

```
%% δe = -20 [6691_Bomb Model-II_Body_TF_-20]

k1 = wind_tunnel_data(91);
k2 = wind_tunnel_data(92);
k3 = wind_tunnel_data(93);

NW = no_wind_data(9);
NW = NW';

q1 = head_data(91);
q2 = head_data(92);
q3 = head_data(93);

% a = [af; n1; n2; s1; s2; rm] for pitch angle = 5.947917
a1 = k1(10,2:7);
a2 = k2(10,2:7);
a3 = k3(10,2:7);

a1 = a1';   a2 = a2';   a3 = a3';

% A = [Ax; N1; N2; S1; S2; Rm] in kg and kg-m
A1 = CM*[a1 - NW];
A2 = CM*[a2 - NW];
A3 = CM*[a3 - NW];

Af1 = A1(1);    Af2 = A2(1);    Af3 = A3(1);
N11 = A1(2);    N12 = A2(2);    N13 = A3(2);
N21 = A1(3);    N22 = A2(3);    N23 = A3(3);
S11 = A1(4);    S12 = A2(4);    S13 = A3(4);
```

```
S21 = A1(5);    S22 = A2(5);    S23 = A3(5);
Rm1 = A1(6);    Rm2 = A2(6);    Rm3 = A3(6);

% FM = [fx; fy; fz; mx; my; mz]
FM1 = [-Af1; (S11+S21); -(N11+N21); Rm1; (N11-N21)*0.065; (S11-S21)*0.065]*9.81;
FM2 = [-Af2; (S12+S22); -(N12+N22); Rm2; (N12-N22)*0.065; (S12-S22)*0.065]*9.81;
FM3 = [-Af3; (S13+S23); -(N13+N23); Rm3; (N13-N23)*0.065; (S13-S23)*0.065]*9.81;

% CG = [Fx Fy Fz Mx My Mz] @cg
CG1 = Y*FM1;
CG2 = Y*FM2;
CG3 = Y*FM3;

% For lift curve slope
Cfx1 = (1/q1/S)*(-1)*CG1(1,1);   Cfy1 = (1/q1/S)*(-1)*CG1(2,1);   Cfz1 = (1/q1/S)*(-
1)*CG1(3,1);
Cfx2 = (1/q1/S)*(-1)*CG2(1,1);   Cfy2 = (1/q1/S)*(-1)*CG2(2,1);   Cfz2 = (1/q1/S)*(-
1)*CG2(3,1);
Cfx3 = (1/q1/S)*(-1)*CG3(1,1);   Cfy3 = (1/q1/S)*(-1)*CG3(2,1);   Cfz3 = (1/q1/S)*(-
1)*CG3(3,1);

CL91 = sind(alpha)*Cfx1 - cosd(alpha)*Cfz1;
CL92 = sind(alpha)*Cfx2 - cosd(alpha)*Cfz2;
CL93 = sind(alpha)*Cfx3 - cosd(alpha)*Cfz3;

CD91 = -cosd(alpha)*Cfx1 - sind(alpha)*Cfz1;
CD92 = -cosd(alpha)*Cfx2 - sind(alpha)*Cfz2;
CD93 = -cosd(alpha)*Cfx3 - sind(alpha)*Cfz3;

% 5th element in array is Cmy
My1 = CG1(5,1);
My2 = CG2(5,1);
My3 = CG3(5,1);

% Cmy
Cmy91 = (1/q1/S/l)*My1;
Cmy92 = (1/q2/S/l)*My2;
Cmy93 = (1/q3/S/l)*My3;
```

>> tf_cm_de_10.m

```
%% δe = +25 [6692_Bomb Model-II_Body_TF_+25]

k1 = wind_tunnel_data(101);
k2 = wind_tunnel_data(102);
k3 = wind_tunnel_data(103);

NW = no_wind_data(10);
NW = NW';
```

```
q1 = head_data(101);
q2 = head_data(102);
q3 = head_data(103);

% a = [af; n1; n2; s1; s2; rm] for pitch angle = 5.947917
a1 = k1(10,2:7);
a2 = k2(10,2:7);
a3 = k3(10,2:7);

a1 = a1';   a2 = a2';   a3 = a3';

% A = [Ax; N1; N2; S1; S2; Rm] in kg and kg-m
A1 = CM*[a1 - NW];
A2 = CM*[a2 - NW];
A3 = CM*[a3 - NW];

Af1 = A1(1);    Af2 = A2(1);    Af3 = A3(1);
N11 = A1(2);    N12 = A2(2);    N13 = A3(2);
N21 = A1(3);    N22 = A2(3);    N23 = A3(3);
S11 = A1(4);    S12 = A2(4);    S13 = A3(4);
S21 = A1(5);    S22 = A2(5);    S23 = A3(5);
Rm1 = A1(6);    Rm2 = A2(6);    Rm3 = A3(6);

% FM = [fx; fy; fz; mx; my; mz]
FM1 = [-Af1; (S11+S21); -(N11+N21); Rm1; (N11-N21)*0.065; (S11-S21)*0.065]*9.81;
FM2 = [-Af2; (S12+S22); -(N12+N22); Rm2; (N12-N22)*0.065; (S12-S22)*0.065]*9.81;
FM3 = [-Af3; (S13+S23); -(N13+N23); Rm3; (N13-N23)*0.065; (S13-S23)*0.065]*9.81;

% CG = [Fx Fy Fz Mx My Mz] @cg
CG1 = Y*FM1;
CG2 = Y*FM2;
CG3 = Y*FM3;

% For lift curve slope
Cfx1 = (1/q1/S)*(-1)*CG1(1,1);   Cfy1 = (1/q1/S)*(-1)*CG1(2,1);   Cfz1 = (1/q1/S)*(-
1)*CG1(3,1);
Cfx2 = (1/q1/S)*(-1)*CG2(1,1);   Cfy2 = (1/q1/S)*(-1)*CG2(2,1);   Cfz2 = (1/q1/S)*(-
1)*CG2(3,1);
Cfx3 = (1/q1/S)*(-1)*CG3(1,1);   Cfy3 = (1/q1/S)*(-1)*CG3(2,1);   Cfz3 = (1/q1/S)*(-
1)*CG3(3,1);

CL101 = sind(alpha)*Cfx1 - cosd(alpha)*Cfz1;
CL102 = sind(alpha)*Cfx2 - cosd(alpha)*Cfz2;
CL103 = sind(alpha)*Cfx3 - cosd(alpha)*Cfz3;

CD101 = -cosd(alpha)*Cfx1 - sind(alpha)*Cfz1;
CD102 = -cosd(alpha)*Cfx2 - sind(alpha)*Cfz2;
CD103 = -cosd(alpha)*Cfx3 - sind(alpha)*Cfz3;

% 5th element in array is Cmy
```

```
My1 = CG1(5,1);
My2 = CG2(5,1);
My3 = CG3(5,1);

% Cmy
Cmy101 = (1/q1/S/l)*My1;
Cmy102 = (1/q2/S/l)*My2;
Cmy103 = (1/q3/S/l)*My3;
```

>> tf_cm_de_11.m

```
%% δe = -25 [6693_Bomb Model-II_Body_TF_-25]

k1 = wind_tunnel_data(111);
k2 = wind_tunnel_data(112);
k3 = wind_tunnel_data(113);

NW = no_wind_data(11);
NW = NW';

q1 = head_data(111);
q2 = head_data(112);
q3 = head_data(113);

% a = [af; n1; n2; s1; s2; rm] for pitch angle = 5.947917
a1 = k1(10,2:7);
a2 = k2(10,2:7);
a3 = k3(10,2:7);

a1 = a1';   a2 = a2';   a3 = a3';

% A = [Ax; N1; N2; S1; S2; Rm] in kg and kg-m
A1 = CM*[a1 - NW];
A2 = CM*[a2 - NW];
A3 = CM*[a3 - NW];

Af1 = A1(1);    Af2 = A2(1);    Af3 = A3(1);
N11 = A1(2);    N12 = A2(2);    N13 = A3(2);
N21 = A1(3);    N22 = A2(3);    N23 = A3(3);
S11 = A1(4);    S12 = A2(4);    S13 = A3(4);
S21 = A1(5);    S22 = A2(5);    S23 = A3(5);
Rm1 = A1(6);    Rm2 = A2(6);    Rm3 = A3(6);

% FM = [fx; fy; fz; mx; my; mz]
FM1 = [-Af1; (S11+S21); -(N11+N21); Rm1; (N11-N21)*0.065; (S11-S21)*0.065]*9.81;
FM2 = [-Af2; (S12+S22); -(N12+N22); Rm2; (N12-N22)*0.065; (S12-S22)*0.065]*9.81;
FM3 = [-Af3; (S13+S23); -(N13+N23); Rm3; (N13-N23)*0.065; (S13-S23)*0.065]*9.81;

% CG = [Fx Fy Fz Mx My Mz] @cg
CG1 = Y*FM1;
CG2 = Y*FM2;
```

```
CG3 = Y*FM3;

% For lift curve slope
Cfx1 = (1/q1/S)*(-1)*CG1(1,1);   Cfy1 = (1/q1/S)*(-1)*CG1(2,1);   Cfz1 = (1/q1/S)*(-
1)*CG1(3,1);
Cfx2 = (1/q1/S)*(-1)*CG2(1,1);   Cfy2 = (1/q1/S)*(-1)*CG2(2,1);   Cfz2 = (1/q1/S)*(-
1)*CG2(3,1);
Cfx3 = (1/q1/S)*(-1)*CG3(1,1);   Cfy3 = (1/q1/S)*(-1)*CG3(2,1);   Cfz3 = (1/q1/S)*(-
1)*CG3(3,1);

CL111 = sind(alpha)*Cfx1 - cosd(alpha)*Cfz1;
CL112 = sind(alpha)*Cfx2 - cosd(alpha)*Cfz2;
CL113 = sind(alpha)*Cfx3 - cosd(alpha)*Cfz3;

CD111 = -cosd(alpha)*Cfx1 - sind(alpha)*Cfz1;
CD112 = -cosd(alpha)*Cfx2 - sind(alpha)*Cfz2;
CD113 = -cosd(alpha)*Cfx3 - sind(alpha)*Cfz3;

% 5th element in array is Cmy
My1 = CG1(5,1);
My2 = CG2(5,1);
My3 = CG3(5,1);

% Cmy
Cmy111 = (1/q1/S/l)*My1;
Cmy112 = (1/q2/S/l)*My2;
Cmy113 = (1/q3/S/l)*My3;
```

>> head_data.m

```
function q = head_data(int)

switch int

   % 6682_Bomb Model-II_Body_TF_0
   case 11
      q = 963.625;    % Dynamic head [in kg/m*s2]    % 40 m/s
   case 12
      q = 1499.386364;    % 50 m/s
   case 13
      q = 2161.352273;    % 60 m/s

   % 6683_Bomb Model-II_Body_TF_+5
   case 21
      q = 968.113636;
   case 22
      q = 1508.818182;
   case 23
      q = 2169.738636;
```

```
% 6684_Bomb Model-II_Body_TF_-5
case 31
    q = 946;
case 32
    q = 1501.136364;
case 33
    q = 2158.284091;

% 6685_Bomb Model-II_Body_TF_+10
case 41
    q = 958.181818;
case 42
    q = 1496.454545;
case 43
    q = 2162.159091;

% 6686_Bomb Model-II_Body_TF_-10
case 51
    q = 955.397727;
case 52
    q = 1499.204545;
case 53
    q = 2155.000000;

% 6687_Bomb Model-II_Body_TF_+15
case 61
    q = 971.136364;
case 62
    q = 1501.613636;
case 63
    q = 2156.000000;

% 6689_Bomb Model-II_Body_TF_-15
case 71
    q = 969.715909;
case 72
    q = 1493.329545;
case 73
    q = 2160.931818;

 % 6690_Bomb Model-II_Body_TF_+20
case 81
    q = 952.795455;
case 82
    q = 1494.534091;
case 83
    q = 2150.534091;

 % 6691_Bomb Model-II_Body_TF_-20
case 91
```

```
        q = 945.375;
    case 92
        q = 1479.590909;
    case 93
        q = 2155.625000;

     % 6692_Bomb Model-II_Body_TF_+25
    case 101
        q = 972.090909;
    case 102
        q = 1493.204545;
    case 103
        q = 2164.659091;

     % 6693_Bomb Model-II_Body_TF_-25
    case 111
        q = 959.215909;
    case 112
        q = 1508.863636;
    case 113
        q = 2155.909091;

end
end
```

>> no_wind_data.m

```
function NW = no_wind_data(int)

switch int

    case 1  % 6682_Bomb Model-II_Body_TF_0
        NW = [-0.000122          -0.000856       0.000737        -0.000887       -0.000321
            0.00054];

    case 2  % 6683_Bomb Model-II_Body_TF_+5
        NW = [0.000176 -0.000758       0.000311        0.001223        0.000471        0.000796];

    case 3  % 6684_Bomb Model-II_Body_TF_-5
        NW = [0.000761 -0.000269       -0.000213       0.000323        0.001154        0.001504];

    case 4  % 6685_Bomb Model-II_Body_TF_+10
        NW = [0.000913 -0.000361       -0.000542       0.000175        0.001508        0.001359];

    case 5  % 6686_Bomb Model-II_Body_TF_-10
        NW = [0.001164 -0.000152       -0.001091       -0.000283       -0.000726       -
0.001041];

    case 6  % 6687_Bomb Model-II_Body_TF_+15
```

```
    NW = [-0.000581        0.000769        0.000178        0.001345        0.000025        -
0.000342];

  case 7  % 6689_Bomb Model-II_Body_TF_-15
    NW = [0.000234 0.001138        -0.000113       0.000821        0.000607        0.000418];

  case 8  % 6690_Bomb Model-II_Body_TF_+20
    NW = [0.000648 0.001307        -0.000417       0.000376        0.001049        0.000623];

  case 9  % 6691_Bomb Model-II_Body_TF_-20
    NW = [0.000727 0.001383        -0.00071        0.000064        0.00123         0.00046];

  case 10 % 6692_Bomb Model-II_Body_TF_+25
    NW = [-0.000356        0.000863        0.000397        -0.00113        0.00092
      0.000653];

  case 11 % 6693_Bomb Model-II_Body_TF_-25
    NW = [-0.000655        0.00058         -0.000061       0.001303        0.000511
      0.000551];

end
end
```

>> wind_tunnel_data.m

```
function k = wind_tunnel_data_projectile(int)

switch int

%% 6682_Bomb Model-II_Body_TF_0 (11,12,13)
  case 11

k = [-9.9479170.004041        0.010666        -0.025613       0.000252        -0.001648
      0.000556
-8.052083       0.004303        0.008047        -0.019603       0.000321        -0.00189
      0.000534
-6.052083       0.004447        0.00559         -0.013974       0.000369        -0.002227
      0.000534
-4.0625         0.004555        0.003472        -0.00907        0.000284        -0.002226
      0.000534
-2.0625         0.004576        0.001695        -0.004794       0.000163        -0.002093
      0.00055
-0.052083       0.004651        0.000305        -0.001106       0.00012         -0.002148
      0.000567
0.052083        0.004584        0.000547        -0.001454       0.000067        -0.00203
      0.000546
1.947917        0.004693        -0.000915       0.002245        -0.000069       -0.001849
      0.000555
```

3.947917 0.004635 -0.002199 0.005815 -0.000038 -0.001871
0.000523
5.947917 0.004555 -0.003961 0.010213 -0.00002 -0.002064
0.00051
7.947917 0.004402 -0.006041 0.015162 0.000073 -0.002172
0.00051
9.947917 0.004198 -0.008423 0.020711 0.000142 -0.002359
0.000489
11.947917 0.003985 -0.011058 0.026797 0.000099 -0.002414
0.000472
13.947917 0.003639 -0.013887 0.033287 -0.000001 -0.002484
0.000497
15.9375 0.00319 -0.016762 0.040025 -0.000171 -0.002655
0.000532
17.947917 0.002619 -0.019732 0.046936 -0.000346 -0.002734
0.000544
19.947917 0.002035 -0.022735 0.05403 -0.000156 -0.003364
0.000573
21.947917 0.001441 -0.025527 0.060936 0.000338 -0.004356
0.000604
23.947917 0.000957 -0.028028 0.067456 0.000961 -0.005535
0.000605
25.947917 0.000578 -0.0304 0.073778 0.00176 -0.006996
0.000559];

case 12

k = [-9.9479170.006192 0.017118 -0.040181 0.000769 -0.002234
0.000427
-8.052083 0.006619 0.012885 -0.030711 0.000806 -0.002535
0.00041
-6.052083 0.006860 0.009008 -0.021985 0.000831 -0.002845
0.00042
-4.062500 0.006959 0.005793 -0.014346 0.000839 -0.003119
0.000437
-2.062500 0.007005 0.003054 -0.007697 0.000672 -0.002936
0.000459
-0.052083 0.007247 0.000935 -0.002148 0.000640 -0.002946
0.000453
0.052083 0.007197 0.001408 -0.002803 0.000683 -0.003116
0.000353
1.947917 0.007292 -0.000859 0.002949 0.000351 -0.002659
0.000453
3.947917 0.007147 -0.002855 0.008485 0.000383 -0.002782
0.000404
5.947917 0.006977 -0.005520 0.015198 0.000453 -0.003028
0.000383
7.947917 0.006738 -0.008735 0.022893 0.000535 -0.003259
0.000389

9.947917 0.006384 -0.012340 0.031270 0.000529 -0.00335
0.000388
11.947917 0.005978 -0.016281 0.040472 0.000398 -0.003254
0.000395
13.947917 0.005398 -0.020568 0.050442 0.000122 -0.003142
0.000422
15.937500 0.004632 -0.024889 0.060678 -0.000161 -0.003173
0.000425
17.947917 0.003812 -0.029468 0.071419 -0.000126 -0.003874
0.000452
19.947917 0.002842 -0.034292 0.082750 0.000341 -0.004938
0.000484
21.947917 0.001930 -0.038580 0.093416 0.000817 -0.006238
0.000512
23.947917 0.001100 -0.042682 0.103847 0.001550 -0.007834
0.000488
25.947917 0.000524 -0.046475 0.113832 0.002517 -0.009531
0.000386];

case 13

k = [-9.9479170.008836 0.024858 -0.057997 0.001269 -0.0026
0.000182
-8.052083 0.009400 0.018713 -0.044275 0.001252 -0.003004
0.000222
-6.052083 0.009780 0.013089 -0.031601 0.001283 -0.003549
0.000215
-4.062500 0.009910 0.008425 -0.020681 0.001316 -0.003819
0.000239
-2.062500 0.010055 0.004581 -0.011271 0.001129 -0.003798
0.000268
-0.052083 0.010363 0.001638 -0.003413 0.001218 -0.003882
0.000298
0.052083 0.010244 0.002471 -0.004727 0.001314 -0.004084
0.00018
1.947917 0.010392 -0.000876 0.003781 0.000918 -0.003675
0.000277
3.947917 0.010159 -0.003681 0.011638 0.000994 -0.003892
0.00022
5.947917 0.009890 -0.007414 0.021119 0.001058 -0.004055
0.000184
7.947917 0.009468 -0.011798 0.031753 0.001049 -0.004277
0.00018
9.947917 0.008968 -0.016698 0.043510 0.000856 -0.004142
0.000195
11.947917 0.008362 -0.022478 0.057013 0.000479 -0.003784
0.000237
13.947917 0.007455 -0.028467 0.071065 0.000064 -0.003655
0.000255

15.947917 0.006470 -0.034854 0.085985 -0.000013 -0.004102
0.000282
17.947917 0.005251 -0.041448 0.101465 0.000233 -0.005264
0.000327
19.947917 0.003784 -0.048530 0.118006 0.000826 -0.00689
0.000381
21.947917 0.002409 -0.054638 0.133241 0.001423 -0.008337
0.000397
23.947917 0.001174 -0.060368 0.148189 0.002554 -0.010377
0.000379
25.947917 0.000092 -0.065645 0.162470 0.003253 -0.011682
0.000273];

%% 6683_Bomb Model-II_Body_TF_+5 (21,22,23)
case 21

k = [-9.9479170.003811 0.002096 -0.012558 0.0029 -0.002029 0.000955;
-8.052083 0.004287 0.0002 -0.007678 0.002928 -0.002193 0.000948;
-6.041667 0.004682 -0.001249 -0.003577 0.002796 -0.002172
0.000949;
-4.0625 0.005048 -0.002249 -0.0003 0.002634 -0.001922
0.000944;
-2.0625 0.005233 -0.003332 0.002951 0.002457 -0.001771
0.000912;
-0.052083 0.00537 -0.004791 0.0067 0.002451 -0.001807 0.000912;
0.052083 0.005318 -0.004419 0.006116 0.002404 -0.001759
0.000852;
1.947917 0.00561 -0.006696 0.0111 0.002517 -0.002000 0.000917;
3.947917 0.005822 -0.008906 0.016038 0.002584 -0.002229
0.000912;
5.947917 0.006032 -0.011399 0.021569 0.002627 -0.002284
0.000892;
7.9375 0.006167 -0.013974 0.027252 0.002634 -0.002489 0.000911;
9.947917 0.006285 -0.016765 0.033317 0.002536 -0.002359
0.000926;
11.947917 0.006397 -0.019761 0.039954 0.002471 -0.002437
0.000945;
13.947917 0.006475 -0.022992 0.047069 0.002199 -0.002277
0.000974;
15.9375 0.006476 -0.026473 0.054689 0.001908 -0.002203
0.00101;
17.9375 0.006415 -0.029603 0.061855 0.001815 -0.002376
0.001005;
19.947917 0.006476 -0.032243 0.068344 0.001902 -0.002955
0.001072;
21.947917 0.006676 -0.03462 0.07445 0.002248 -0.003789
0.001115;
23.947917 0.006768 -0.037284 0.081065 0.002908 -0.004867
0.001046;

25.947917 0.006663 -0.039409 0.086947 0.003775 -0.006322
0.000971];

case 22

k = [-9.9479170.005748 0.003753 -0.019898 0.00396 -0.003512
0.000924;
-8.052083 0.006479 0.000801 -0.012296 0.00397 -0.003869
0.000899;
-6.041667 0.007069 -0.001494 -0.005886 0.003722 -0.003767
0.00089;
-4.052083 0.007640 -0.003056 -0.000694 0.003504 -0.003566
0.000874;
-2.062500 0.007869 -0.004693 0.004328 0.003234 -0.003223
0.000866;
-0.052083 0.008143 -0.006913 0.010081 0.003269 -0.003286
0.000814;
0.052083 0.007999 -0.006073 0.008742 0.002967 -0.002811
0.000686;
1.947917 0.008456 -0.009767 0.016754 0.003292 -0.003407
0.000835;
3.947917 0.008679 -0.013039 0.024157 0.003288 -0.00351
0.000845;
5.947917 0.008851 -0.016757 0.032437 0.00319 -0.003522
0.00087;
7.947917 0.009069 -0.020634 0.041111 0.003003 -0.003394
0.000879;
9.947917 0.009244 -0.024949 0.050578 0.002707 -0.003114
0.00089;
11.947917 0.009469 -0.029742 0.061162 0.002617 -0.003178
0.000895;
13.947917 0.009580 -0.034870 0.072378 0.002232 -0.003072
0.000906;
15.937500 0.009521 -0.040487 0.08453 0.001928 -0.003015
0.000956;
17.937500 0.009430 -0.045484 0.095939 0.001786 -0.003452
0.000958;
19.947917 0.009441 -0.049606 0.10613 0.001876 -0.004229
0.000998;
21.947917 0.009729 -0.053261 0.115615 0.002266 -0.005256
0.001119;
23.947917 0.009749 -0.057161 0.125528 0.003288 -0.007107
0.000997;
25.947917 0.009476 -0.060532 0.134794 0.004514 -0.009201
0.000895];

case 23

k = [-9.9479170.008034 0.005631 -0.028565 0.004893 -0.004977
0.000817;

```
-8.052083	0.009089	0.001307	-0.017579	0.004877	-0.005321
	0.000772;
-6.052083	0.009956	-0.001959	-0.008347	0.004708	-0.005375
	0.000763;
-4.052083	0.010722	-0.004133	-0.001082	0.004393	-0.005198
	0.000746;
-2.062500	0.011167	-0.006391	0.005941	0.004063	-0.004887
	0.000711;
-0.052083	0.011450	-0.009464	0.013988	0.004131	-0.004973
	0.000703;
0.052083	0.011084	-0.007485	0.010787	0.003411	-0.003824
	0.00062;
1.947917	0.011824	-0.013280	0.023079	0.004014	-0.004873
	0.000702;
3.947917	0.012100	-0.017517	0.033009	0.003826	-0.004655
	0.000708;
5.947917	0.012294	-0.022822	0.044852	0.003635	-0.00463
	0.000769;
7.947917	0.012629	-0.028679	0.057786	0.003347	-0.004439
	0.000806;
9.947917	0.012924	-0.034964	0.071603	0.002875	-0.003969
	0.000815;
11.947917	0.013182	-0.041762	0.086592	0.002757	-0.00408
	0.00083;
13.947917	0.013280	-0.049129	0.102719	0.002329	-0.003994
	0.000851;
15.937500	0.013182	-0.056952	0.119838	0.002002	-0.004281
	0.000897;
17.937500	0.012962	-0.064293	0.136441	0.001672	-0.00465
	0.000938;
19.947917	0.012784	-0.070131	0.150938	0.002007	-0.005877
	0.000984;
21.947917	0.012842	-0.075252	0.164435	0.002516	-0.007332
	0.001179;
23.947917	0.012709	-0.080272	0.177978	0.004442	-0.010249
	0.000988;
25.947917	0.012207	-0.084801	0.190966	0.005519	-0.011866
	0.000883];

%% 6684_Bomb Model-II_Body_TF_-5 (31,32,33)
   case 31

k = [-9.9479170.006456	0.017847	-0.036680	0.00143	0.00019
	0.001461;
-8.052083	0.00636	0.014861	-0.030127	0.00129	0.000222
	0.001463;
-6.0625	0.006216	0.012131	-0.024199	0.001209	0.000096
	0.001421;
-4.0625	0.006074	0.009475	-0.018501	0.00111	0.000089
	0.001411;
```

-2.0625 0.005929 0.007104 -0.013347 0.001091 0.000106 0.001401;
-0.0625 0.005786 0.005105 -0.008771 0.001079 -0.000034 0.001396;
0.052083 0.00574 0.005256 -0.009179 0.001246 -0.000297 0.001239;
1.947917 0.005658 0.003545 -0.004884 0.001087 -0.000041 0.001386;
3.947917 0.005591 0.00244 -0.001624 0.001042 -0.000052 0.00137;
5.947917 0.005306 0.001535 0.001439 0.001117 -0.000283 0.001363;
7.947917 0.00506 0.000346 0.005060 0.001009 -0.000186 0.00135;
9.958333 0.0047 -0.001313 0.009469 0.000978 -0.000139 0.001349;
11.947917 0.004247 -0.003217 0.014427 0.000978 -0.000243 0.001348;
13.947917 0.003647 -0.005333 0.019808 0.000818 -0.000206 0.001365;
15.947917 0.002879 -0.007418 0.025293 0.000644 -0.000137 0.001366;
17.947917 0.001992 -0.00964 0.031100 0.000427 -0.000125 0.001371;
19.947917 0.001033 -0.01207 0.037246 0.000338 -0.000343 0.001373;
21.947917 0.000018 -0.014544 0.043608 0.0005 -0.000882 0.001409;
23.947917 -0.001028 -0.017251 0.050447 0.000834 -0.001816 0.001419;
25.947917 -0.001975 -0.019732 0.056896 0.001439 -0.002943 0.001374];

case 32

k = [-9.9479170.009553 0.027956 -0.057174 0.001977 -0.000086 0.001226;
-8.052083 0.009368 0.023217 -0.046901 0.001766 -0.000066 0.001231;
-6.041667 0.009196 0.018905 -0.037524 0.001564 -0.000135 0.001193;
-4.062500 0.008936 0.014733 -0.028551 0.001414 -0.000326 0.001182;
-2.062500 0.008711 0.011037 -0.020512 0.001325 -0.000338 0.001162;
-0.052083 0.008585 0.007952 -0.013536 0.001434 -0.000572 0.001176;
0.052083 0.008491 0.008483 -0.014296 0.001828 -0.001113 0.001011;
1.947917 0.008373 0.005532 -0.0075 0.001532 -0.000831 0.001166;

```
3.947917    0.008217    0.003909    -0.002544    0.001558    -0.000894
    0.001151;
5.947917    0.00781     0.002582    0.002191     0.001644    -0.001114
    0.001123;
7.937500    0.007378    0.000732    0.007789     0.001467    -0.001002
    0.00113;
9.947917    0.006838    -0.001646   0.014391     0.001377    -0.00098
    0.00113;
11.947917   0.006072    -0.004417   0.021854     0.001171    -0.000679
    0.00114;
13.947917   0.005028    -0.007485   0.02998      0.00074     -0.000259
    0.001154;
15.947917   0.003708    -0.010704   0.038472     0.000277    0.000041
    0.001185;
17.947917   0.002313    -0.014234   0.047641     0.000052    -0.000152
    0.001231;
19.947917   0.000839    -0.018081   0.057455     0.000163    -0.00083
    0.001242;
21.947917   -0.000735   -0.022066   0.067663     0.000297    -0.001462
    0.001244;
23.947917   -0.002419   -0.026401   0.078573     0.000774    -0.002652
    0.001256;
25.947917   -0.004007   -0.030357   0.089028     0.001464    -0.004129
    0.001193];

  case 33

k = [-9.9479170.013065    0.040243    -0.081985    0.002229    0.000085
    0.000985;
-8.052083   0.012863    0.033314    -0.067116    0.002044    -0.000123
    0.001003;
-6.052083   0.012564    0.027066    -0.053551    0.001803    -0.000167
    0.000991;
-4.062500   0.01224     0.021072    -0.040698    0.001573    -0.000301
    0.000988;
-2.062500   0.012052    0.015803    -0.02911     0.0015 -0.000408    0.000985;
-0.052083   0.011823    0.011466    -0.0192      0.001638    -0.000816
    0.000986;
0.052083    0.01174     0.012201    -0.020353    0.002289    -0.001858
    0.000848;
1.947917    0.011637    0.008009    -0.010578    0.001909    -0.001313
    0.000951;
3.947917    0.011338    0.005804    -0.003685    0.002126    -0.00177
    0.000957;
5.947917    0.010817    0.003946    0.002966     0.002291    -0.002195
    0.000936;
7.937500    0.010084    0.001567    0.010611     0.002018    -0.001939
    0.000934;
9.958333    0.009286    -0.001537   0.01954      0.001516    -0.001274
    0.000947;
```

```
11.947917	0.00814	-0.005274	0.029831	0.000902	-0.000457
	0.000979;
13.947917	0.006547	-0.00978	0.041686	0.000161	0.000215
	0.001015;
15.947917	0.004786	-0.014631	0.054293	-0.000281	0.000276
	0.001064;
17.947917	0.002779	-0.019705	0.067455	-0.000399	-0.000237
	0.001111;
19.947917	0.000613	-0.025204	0.081564	-0.000167	-0.001175
	0.001141;
21.947917	-0.001647	-0.030872	0.096217	-0.000058	-0.002034
	0.001165;
23.947917	-0.00406	-0.036943	0.111691	0.000764	-0.003688
	0.001129;
25.947917	-0.00648	-0.042696	0.126836	0.001306	-0.004864
	0.001107];

%% 6685_Bomb Model-II_Body_TF_+10 (41,42,43)
   case 41

k = [-9.9479170.005181	-0.003885	-0.003347	0.002374	-0.002069
	0.001527;
-8.052083	0.005762	-0.004723	-0.000098	0.002393	-0.002248
	0.00154;
-6.052083	0.006197	-0.005502	0.002942	0.002058	-0.001917
	0.001529;
-4.0625	0.006581	-0.006434	0.006048	0.002046	-0.001971
	0.001487;
-2.0625	0.007044	-0.007872	0.009845	0.002089	-0.002099
	0.001491;
-0.052083	0.007502	-0.009867	0.014327	0.002132	-0.002185
	0.001502;
0.052083	0.007216	-0.009061	0.013033	0.00177	-0.001569
	0.00146;
1.947917	0.007999	-0.012209	0.01928	0.002238	-0.002366
	0.001499;
3.947917	0.008414	-0.014671	0.024522	0.002251	-0.002411
	0.001511;
5.947917	0.008787	-0.017265	0.030132	0.002253	-0.002483
	0.001534;
7.947917	0.009197	-0.020208	0.036317	0.002262	-0.002695
	0.001571;
9.958333	0.009622	-0.023162	0.042663	0.002221	-0.002679
	0.001579;
11.947917	0.010133	-0.026363	0.049512	0.002058	-0.002538
	0.001592;
13.947917	0.010577	-0.029674	0.056697	0.002257	-0.003044
	0.001599;
15.947917	0.010940	-0.032685	0.063559	0.002187	-0.003261
	0.001645;
```

```
17.947917	0.011362	-0.035288	0.069845	0.002169	-0.003416
	0.001585;
19.947917	0.011824	-0.037859	0.076121	0.002944	-0.004847
	0.001573;
21.947917	0.012148	-0.040343	0.082316	0.003661	-0.0062
	0.00164;
23.947917	0.012250	-0.04208	0.08758	0.004227	-0.007284
	0.001653;
25.947917	0.012190	-0.04328	0.091916	0.004713	-0.008308
	0.001627];

  case 42

k = [-9.9479170.007453	-0.005782	-0.005208	0.003709	-0.004179
	0.001495;
-8.041667	0.008414	-0.007098	-0.000118	0.003648	-0.004267
	0.001484;
-6.041667	0.00903	-0.008243	0.004541	0.003124	-0.003759
	0.001448;
-4.062500	0.009508	-0.00956	0.009225	0.00308	-0.003873
	0.001424;
-2.062500	0.010149	-0.011685	0.014864	0.003126	-0.004063
	0.001407;
-0.052083	0.010885	-0.014566	0.021527	0.003163	-0.004142
	0.00142;
0.052083	0.010503	-0.013516	0.019769	0.002441	-0.002882
	0.001317;
1.947917	0.0115 -0.018018	0.028958	0.003179	-0.004257	0.001427;
3.947917	0.012028	-0.021812	0.037076	0.0031 -0.00416	0.001444;
5.947917	0.012562	-0.025931	0.04587	0.003082	-0.004209
	0.00147;
7.947917	0.01328	-0.030702	0.055855	0.003167	-0.004493
	0.0015;
9.958333	0.013961	-0.035504	0.066062	0.003181	-0.004748
	0.001536;
11.947917	0.014724	-0.040496	0.076864	0.003106	-0.004788
	0.001536;
13.947917	0.015423	-0.045847	0.088298	0.003331	-0.005381
	0.001555;
15.947917	0.015977	-0.050616	0.099094	0.003216	-0.005646
	0.001625;
17.937500	0.016573	-0.054931	0.109293	0.003088	-0.00601
	0.001584;
19.947917	0.017338	-0.05854	0.118485	0.00425	-0.007957
	0.001493;
21.947917	0.017765	-0.062498	0.128365	0.005477	-0.01026
	0.001615;
23.947917	0.017873	-0.065001	0.13613	0.006425	-0.012047
	0.001652;
```

```
25.947917    0.017777    -0.066992    0.14326    0.007371    -0.013655
    0.001633];

  case 43

k = [-9.9479170.010127    -0.008206    -0.007272    0.005177    -0.006554
    0.001354;
-8.052083    0.011529    -0.01008    0.000018    0.005062    -0.00674
    0.001378;
-6.052083    0.012419    -0.011633    0.00658    0.004486    -0.006177
    0.001361;
-4.062500    0.01305    -0.013332    0.01294    0.004307    -0.006105
    0.001305;
-2.062500    0.013998    -0.016157    0.02068    0.004291    -0.006101
    0.001273;
-0.052083    0.014879    -0.020018    0.029824    0.004065    -0.005745
    0.001302;
0.052083    0.014344    -0.01883    0.027852    0.003098    -0.004214
    0.001183;
1.947917    0.015743    -0.024924    0.040469    0.004019    -0.005801
    0.001335;
3.947917    0.016499    -0.030641    0.052533    0.004097    -0.006126
    0.001358;
5.947917    0.01731    -0.0367    0.065424    0.004202    -0.006444
    0.001374;
7.947917    0.018319    -0.043602    0.079797    0.004352    -0.006937
    0.001409;
9.958333    0.019244    -0.050475    0.09444    0.004376    -0.007186
    0.00146;
11.947917    0.020315    -0.057751    0.110149    0.004386    -0.007445
    0.00151;
13.947917    0.02126    -0.065311    0.126484    0.004419    -0.00791
    0.001562;
15.947917    0.022043    -0.072548    0.142586    0.004378    -0.008651
    0.001629;
17.947917    0.022798    -0.07876    0.157281    0.004441    -0.009426
    0.001602;
19.947917    0.023825    -0.083338    0.169653    0.006458    -0.012711
    0.001467;
21.947917    0.022628    -0.07989    0.170199    0.007159    -0.014057
    0.001548;
23.947917    0.019887    -0.073039    0.165952    0.007137    -0.013973
    0.001486;
25.947917    0.016817    -0.066046    0.161622    0.007191    -0.013886
    0.001401];

%% 6686_Bomb Model-II_Body_TF_-10 (51,52,53)
  case 51
```

k = [-9.9479170.01022 0.026161 -0.049913 0.000706 -0.001285 -
0.000974;
-8.041667 0.009762 0.022913 -0.043106 0.000524 -0.00121 -
0.000971;
-6.052083 0.009278 0.019838 -0.036594 0.000398 -0.001244 -
0.000976;
-4.0625 0.008789 0.016792 -0.030323 0.000179 -0.001099 -
0.000978;
-2.0625 0.008318 0.013991 -0.024589 0.000141 -0.001066 -
0.000979;
-0.052083 0.007867 0.011487 -0.019289 0.000084 -0.001073 -
0.000967;
0.052083 0.007931 0.011871 -0.019913 0.000243 -0.001462 -
0.001014;
1.947917 0.007448 0.009294 -0.014481 0.000006 -0.001055 -
0.000972;
3.947917 0.006983 0.007593 -0.01036 0.00004 -0.00118 -
0.000952;
5.947917 0.006599 0.006463 -0.006965 0.000195 -0.001513 -
0.000969;
7.947917 0.006353 0.005659 -0.003971 0.000165 -0.001563 -
0.000957;
9.958333 0.005912 0.005056 -0.001094 -0.000014 -0.00136 -
0.000969;
11.947917 0.005399 0.004142 0.002352 -0.000129 -0.001234 -
0.000997;
13.947917 0.004739 0.0029 0.006414 -0.000288 -0.001157 -0.000993;
15.947917 0.003921 0.001488 0.010883 -0.000439 -0.001058 -
0.000989;
17.947917 0.0029 -0.000163 0.015797 -0.000555 -0.001267 -0.00098;
19.947917 0.001749 -0.001826 0.020799 -0.000743 -0.001307 -
0.000967;
21.947917 0.000392 -0.003508 0.025987 -0.000871 -0.001289 -
0.000953;
23.947917 -0.001034 -0.00541 0.03164 -0.000572 -0.002022 -
0.000988;
25.947917 -0.002507 -0.007592 0.037669 -0.000094 -0.003045 -
0.000982];

case 52

k = [-9.9479170.015073 0.041016 -0.0775 0.000926 -0.001076 -
0.001111;
-8.041667 0.014317 0.035925 -0.066719 0.000616 -0.00089 -
0.001119;
-6.041667 0.013569 0.031029 -0.056488 0.000473 -0.000977 -
0.001121;
-4.062500 0.012839 0.026321 -0.046709 0.000167 -0.000801 -
0.001099;

-2.062500 0.012118 0.021918 -0.037678 0.000047 -0.000871 -0.001104;
-0.052083 0.011486 0.018014 -0.029418 0.000027 -0.000939 -0.001081;
0.052083 0.011538 0.018559 -0.030339 0.00039 -0.001665 -0.001223;
1.947917 0.010746 0.014614 -0.021971 -0.000067 -0.000999 -0.00108;
3.947917 0.01005 0.011979 -0.015562 0.000005 -0.00124 -0.001097;
5.947917 0.009488 0.010281 -0.010358 0.000433 -0.00199 -0.001094;
7.947917 0.00903 0.009021 -0.005693 0.000436 -0.002096 -0.001094;
9.958333 0.008348 0.008046 -0.001248 0.000121 -0.001737 -0.001102;
11.947917 0.007513 0.006811 0.003956 -0.00003 -0.001544 -0.001136;
13.947917 0.006481 0.005093 0.009993 -0.000371 -0.001161 -0.001174;
15.937500 0.005224 0.003041 0.016714 -0.000881 -0.00078 -0.001175;
17.937500 0.003565 0.000635 0.024135 -0.001372 -0.000504 -0.001145;
19.947917 0.001615 -0.001924 0.032017 -0.001672 -0.000479 -0.001149;
21.947917 -0.000434 -0.00468 0.040298 -0.001753 -0.000775 -0.001162;
23.947917 -0.002613 -0.007814 0.049401 -0.001199 -0.001957 -0.001184;
25.947917 -0.004925 -0.01121 0.058993 -0.00061 -0.003255 -0.001202];

case 53

k = [-9.9479170.020666 0.058713 -0.110431 0.000839 -0.000199 -0.001442;
-8.052083 0.019487 0.051385 -0.095008 0.000398 -0.000026 -0.001433;
-6.041667 0.018457 0.044376 -0.080299 0.000194 -0.000223 -0.001432;
-4.052083 0.017529 0.0376 -0.066252 -0.000126 -0.000171 -0.001421;
-2.062500 0.016602 0.031348 -0.053356 -0.00027 -0.000339 -0.001412;
-0.052083 0.015663 0.025784 -0.04161 -0.000256 -0.000499 -0.001358;
0.052083 0.015701 0.026299 -0.042493 0.000356 -0.001532 -0.001505;
1.947917 0.01464 0.020826 -0.030807 -0.000316 -0.00063 -0.00136;

```
3.947917	0.013597	0.017123	-0.021706	-0.000194	-0.000981	-
0.001376;
5.947917	0.012848	0.014791	-0.0144	0.000653	-0.002354	-
0.00137;
7.947917	0.01221	0.013093	-0.007872	0.000729	-0.00262	-
0.001397;
9.958333	0.011255	0.011817	-0.001666	0.000323	-0.002227	-
0.001389;
11.947917	0.01002	0.010343	0.005275	-0.000005	-0.001768	-
0.001433;
13.947917	0.008573	0.008081	0.01363	-0.000894	-0.000674	-
0.00144;
15.947917	0.006683	0.005341	0.023028	-0.001943	0.000404	-
0.001459;
17.947917	0.004181	0.001843	0.03378	-0.002562	0.000679	-
0.001436;
19.947917	0.001349	-0.002014	0.045368	-0.00267	0.000253	-
0.001443;
21.947917	-0.001561	-0.006044	0.057513	-0.002696	-0.000252	-
0.001425;
23.947917	-0.004638	-0.010517	0.070638	-0.002024	-0.001617	-
0.001503;
25.947917	-0.007985	-0.015357	0.084406	-0.001674	-0.002479	-
0.001455];

%% 6687_Bomb Model-II_Body_TF_+15 (61,62,63)

    case 61

k = [-9.9479170.005062	-0.007229	0.00403	0.002283	-0.001543
        0.000011;
-8.052083	0.005558	-0.007977	0.007181	0.002391	-0.00192	-
0.000005;
-6.052083	0.006197	-0.009038	0.010653	0.002413	-0.002155	-
0.000004;
-4.052083	0.007039	-0.010792	0.015021	0.002501	-0.002428
        0.000009;
-2.0625	0.007883	-0.012946	0.019882	0.002686	-0.002793
        0.000011;
-0.052083	0.008644	-0.015448	0.025191	0.002792	-0.003007
        0.000008;
0.052083	0.00849	-0.01512	0.024594	0.002692	-0.002785
        0.000085;
1.947917	0.009521	-0.01822	0.030788	0.00297	-0.003316
        0.000011;
3.947917	0.010327	-0.021406	0.037131	0.003201	-0.003765
        0.000015;
5.947917	0.011149	-0.02452	0.043428	0.003309	-0.004104
        0.000078;
```

7.947917 0.011934 -0.027557 0.049831 0.003598 -0.004687 0.000096;
9.947917 0.012694 -0.030305 0.055848 0.003621 -0.004803 0.000151;
11.947917 0.013566 -0.03309 0.062106 0.003848 -0.005177 0.000158;
13.947917 0.014558 -0.035752 0.06817 0.003616 -0.004997 0.000097;
15.947917 0.015337 -0.038181 0.073975 0.003663 -0.005099 0.000006;
17.947917 0.01588 -0.040764 0.080133 0.004498 -0.006712 0.000056;
19.947917 0.016155 -0.042497 0.085131 0.004937 -0.007494 0.000039;
21.947917 0.016316 -0.039177 0.082384 0.000713 -0.000203 -0.000553;
23.947917 0.016419 -0.033719 0.076493 -0.008499 0.014807 -0.001292;
25.947917 0.016358 -0.034365 0.080069 -0.01091 0.018257 -0.001223];

case 62

k = [-9.9479170.00801 -0.011311 0.005743 0.002704 -0.002395 0.000126;
-8.052083 0.008701 -0.012511 0.01061 0.002834 -0.002723 0.0001;
-6.052083 0.00964 -0.014095 0.015861 0.002898 -0.003069 0.00008;
-4.052083 0.010937 -0.016761 0.022506 0.00305 -0.003537 0.000094;
-2.052083 0.012172 -0.020099 0.029958 0.003282 -0.004062 0.000127;
-0.052083 0.013423 -0.023932 0.038063 0.003475 -0.00444 0.000139;
0.052083 0.013209 -0.023375 0.037216 0.003313 -0.004256 0.000208;
1.947917 0.014675 -0.028063 0.046584 0.003685 -0.004872 0.000163;
3.947917 0.015831 -0.03279 0.056108 0.004044 -0.005569 0.000203;
5.947917 0.017057 -0.03778 0.066136 0.004243 -0.006111 0.000278;
7.947917 0.018187 -0.042591 0.07615 0.004764 -0.00713 0.000269;
9.947917 0.019333 -0.046956 0.085669 0.004727 -0.007252 0.000336;
11.947917 0.020674 -0.051193 0.095254 0.005015 -0.007839 0.000379;

13.947917 0.022265 -0.055377 0.104781 0.004857 -0.007698 0.000242;
15.947917 0.023428 -0.058914 0.113436 0.005169 -0.008404 0.000109;
17.947917 0.024175 -0.063017 0.123145 0.006928 -0.011368 0.00015;
19.947917 0.024672 -0.065818 0.131061 0.006843 -0.011569 0.00013;
21.947917 0.02499 -0.05053 0.111145 -0.010514 0.018322 -0.001945;
23.947917 0.025063 -0.051658 0.116872 -0.014084 0.023277 -0.001904;
25.947917 0.024917 -0.052834 0.122679 -0.01795 0.028666 -0.001833];

case 63

k = [-9.9479170.011526 -0.016313 0.007733 0.003226 -0.003213 0.00026;
-8.052083 0.01254 -0.01806 0.014757 0.003476 -0.003839 0.000199;
-6.052083 0.013841 -0.020336 0.022333 0.003492 -0.004261 0.000177;
-4.052083 0.015555 -0.023918 0.031557 0.003639 -0.004768 0.000206;
-2.062500 0.017437 -0.028676 0.042214 0.003952 -0.005475 0.000246;
-0.052083 0.019166 -0.034229 0.053899 0.004273 -0.006165 0.000313;
0.052083 0.018879 -0.033508 0.052684 0.00411 -0.005824 0.000317;
1.947917 0.020961 -0.04005 0.066042 0.004622 -0.006985 0.000342;
3.947917 0.022532 -0.046764 0.079547 0.00518 -0.007999 0.000393;
5.947917 0.024103 -0.053804 0.093687 0.005475 -0.008757 0.000474;
7.947917 0.02574 -0.060975 0.108372 0.006303 -0.010258 0.000485;
9.947917 0.02736 -0.067291 0.12213 0.006223 -0.01045 0.00056;
11.947917 0.029251 -0.073236 0.135677 0.00664 -0.011276 0.000583;
13.947917 0.031537 -0.079085 0.149283 0.006847 -0.011736 0.000501;
15.947917 0.032777 -0.082801 0.159711 0.007065 -0.012328 0.000328;
17.947917 0.030173 -0.077851 0.157374 0.006176 -0.011336 0.00025;

19.947917 0.027411 -0.072264 0.154483 0.005885 -0.011076 0.000141;
21.947917 0.034017 -0.065955 0.149089 -0.015942 0.026746 -0.002777;
23.947917 0.032962 -0.061387 0.148113 -0.021666 0.035263 -0.002747;
25.947917 0.032008 -0.056914 0.147372 -0.026767 0.042815 -0.002634];

%% 6689_Bomb Model-II_Body_TF_-15 (71,72,73)

case 71

k = [-9.9479170.014995 0.036722 -0.063144 -0.000789 0.00451 0.000247;
-8.052083 0.014056 0.033893 -0.056928 -0.000834 0.004238 0.000232;
-6.052083 0.013146 0.030923 -0.050654 -0.000851 0.004005 0.000203;
-4.0625 0.0123 0.027724 -0.044101 -0.000783 0.00381 0.000219;
-2.0625 0.011415 0.024586 -0.037908 -0.000874 0.003835 0.000225;
-0.052083 0.010421 0.021335 -0.031523 -0.000749 0.003435 0.000242;
0.052083 0.010513 0.021525 -0.031854 -0.000745 0.00333 0.000167;
1.947917 0.009484 0.018602 -0.025926 -0.000693 0.003261 0.000252;
3.947917 0.008637 0.016286 -0.02083 -0.000674 0.003173 0.000243;
5.947917 0.007741 0.014344 -0.016181 -0.000555 0.002911 0.000241;
7.947917 0.0069 0.012824 -0.012072 -0.000434 0.002666 0.000251;
9.947917 0.00634 0.011859 -0.008703 -0.000729 0.003069 0.000264;
11.947917 0.005858 0.011162 -0.005549 -0.000694 0.002976 0.000258;
13.947917 0.005139 0.01057 -0.002406 -0.000877 0.003123 0.000274;
15.947917 0.004301 0.009967 0.000881 -0.00095 0.003031 0.00027;
17.947917 0.003297 0.008956 0.004876 -0.001028 0.002966 0.000263;
19.947917 0.00213 0.007718 0.009296 -0.001134 0.002788 0.000279;
21.947917 0.000689 0.006387 0.013972 -0.001138 0.002465 0.00028;
23.947917 -0.000927 0.005063 0.018859 -0.00098 0.002012 0.000264;

25.947917 -0.002577 0.003527 0.024019 -0.000774 0.001455
0.000259];

case 72

k = [-9.9479170.022431 0.055668 -0.096759 -0.001835 0.006725 -
0.000093;
-8.052083 0.021042 0.051508 -0.087524 -0.001928 0.006497 -
0.000079;
-6.041667 0.019651 0.046626 -0.077351 -0.002459 0.006866 -
0.000135;
-4.052083 0.018344 0.04172 -0.067317 -0.001995 0.005961 -
0.000101;
-2.052083 0.017032 0.036811 -0.057668 -0.001994 0.005781 -
0.000099;
-0.052083 0.01566 0.031858 -0.04789 -0.001669 0.005129 -
0.000054;
0.052083 0.015847 0.032279 -0.048399 -0.001542 0.004892 -
0.000133;
1.947917 0.014225 0.027805 -0.039474 -0.0016 0.004923 -
0.000042;
3.947917 0.012865 0.024218 -0.031636 -0.001556 0.004618 -
0.000042;
5.947917 0.011489 0.021247 -0.024601 -0.00127 0.004184 -
0.000034;
7.947917 0.010236 0.018897 -0.018258 -0.001036 0.00371 -
0.000015;
9.958333 0.009381 0.017495 -0.013128 -0.001464 0.00417 -
0.000008;
11.947917 0.00867 0.01647 -0.008291 -0.001457 0.004121 -
0.000012;
13.947917 0.007613 0.015572 -0.003474 -0.001587 0.004217
0.000007;
15.947917 0.006266 0.014674 0.001549 -0.001957 0.004398
0.000006;
17.947917 0.004706 0.013198 0.00759 -0.002054 0.004125 -
0.000004;
19.947917 0.002846 0.011468 0.01419 -0.002136 0.003802
0.00002;
21.947917 0.00054 0.009526 0.021312 -0.00235 0.003862
0.000022;
23.947917 -0.001868 0.007479 0.028742 -0.002193 0.003185
0.000026;
25.947917 -0.004379 0.005223 0.036592 -0.002013 0.002645
0.000028];

case 73

k = [-9.9479170.031497 0.079374 -0.138797 -0.003877 0.010787 -
0.000474;

-8.052083 0.02958 0.073432 -0.125532 -0.004004 0.010492 -0.000471;
-6.052083 0.027599 0.066302 -0.110734 -0.004375 0.010511 -0.000496;
-4.052083 0.02584 0.059415 -0.096672 -0.003945 0.009431 -0.000463;
-2.062500 0.023979 0.051983 -0.082039 -0.003536 0.008542 -0.00042;
-0.052083 0.022088 0.045067 -0.06837 -0.003125 0.007773 -0.00039;
0.052083 0.022261 0.04543 -0.068894 -0.002819 0.007211 -0.000505;
1.947917 0.020001 0.039229 -0.056234 -0.003034 0.007387 -0.000354;
3.947917 0.018089 0.03407 -0.045005 -0.002749 0.00672 -0.00036;
5.947917 0.016056 0.029712 -0.034686 -0.002054 0.005603 -0.000325;
7.947917 0.014421 0.026486 -0.025811 -0.001904 0.005255 -0.000298;
9.958333 0.013222 0.024522 -0.018535 -0.00246 0.005844 -0.000283;
11.947917 0.012199 0.02305 -0.011589 -0.002367 0.005539 -0.000294;
13.947917 0.010708 0.021821 -0.004773 -0.002593 0.005717 -0.00028;
15.947917 0.008849 0.020657 0.00222 -0.003018 0.005895 -0.000279;
17.947917 0.006452 0.018729 0.010737 -0.003382 0.005764 -0.00027;
19.947917 0.003641 0.01635 0.02014 -0.003586 0.005583 -0.000261;
21.947917 0.000374 0.013735 0.030108 -0.003997 0.005696 -0.000247;
23.947917 -0.003116 0.010898 0.040649 -0.003738 0.00492 -0.000261;
25.947917 -0.006734 0.007717 0.051916 -0.003723 0.00451 -0.000252];

%% 6690_Bomb Model-II_Body_TF_+20 (81,82,83)

case 81

k = [-9.9479170.007927 -0.011527 0.011167 0.001486 -0.001004 0.000773;
-8.052083 0.008935 -0.012865 0.015131 0.001693 -0.001424 0.000741;
-6.052083 0.010027 -0.014441 0.019401 0.001724 -0.001683 0.000725;

-4.0625 0.011158 -0.016412 0.023965 0.001802 -0.001871 0.000739;
-2.052083 0.012311 -0.018763 0.029017 0.001957 -0.002207 0.000758;
-0.052083 0.013553 -0.021365 0.034428 0.002072 -0.002518 0.000755;
0.052083 0.013241 -0.020925 0.03378 0.001802 -0.002132 0.000622;
1.947917 0.014878 -0.024286 0.040274 0.002269 -0.002757 0.000773;
3.947917 0.016027 -0.026923 0.045736 0.002178 -0.002804 0.000836;
5.947917 0.017137 -0.02971 0.051536 0.002161 -0.002896 0.000838;
7.947917 0.018258 -0.032256 0.057072 0.00234 -0.003274 0.000856;
9.947917 0.019075 -0.034157 0.061745 0.002336 -0.003312 0.000908;
11.947917 0.019682 -0.035878 0.066342 0.002209 -0.003145 0.000857;
13.947917 0.020985 -0.037772 0.071034 0.001572 -0.002451 0.000913;
15.947917 0.021636 -0.040162 0.076772 0.001374 -0.002387 0.000921;
17.947917 0.021813 -0.040994 0.08024 0.001726 -0.00311 0.000916;
19.947917 0.021318 -0.033777 0.071192 -0.003304 0.006438 -0.000126;
21.947917 0.021506 -0.033687 0.073525 -0.00617 0.010647 -0.000163;
23.947917 0.021487 -0.033466 0.075683 -0.008479 0.013719 -0.000133;
25.947917 0.020201 -0.02646 0.067414 -0.004714 0.006653 0.000456];

case 82

k = [-9.9479170.011725 -0.018427 0.017005 0.002078 -0.002057 0.000615;
-8.052083 0.013248 -0.020523 0.023166 0.002346 -0.002741 0.000587;
-6.052083 0.014925 -0.023016 0.02984 0.002335 -0.002938 0.000561;
-4.052083 0.016665 -0.02603 0.037008 0.002546 -0.003395 0.00055;
-2.052083 0.018418 -0.029665 0.044919 0.002549 -0.003685 0.000579;
-0.052083 0.020365 -0.033703 0.053299 0.002673 -0.003935 0.000611;

0.052083 0.020071 -0.033339 0.052645 0.002386 -0.003646 0.000401;
1.947917 0.022265 -0.038071 0.062138 0.002812 -0.00433 0.000645;
3.947917 0.024105 -0.042458 0.071041 0.002811 -0.004482 0.000734;
5.947917 0.025893 -0.047077 0.080476 0.002896 -0.004738 0.000752;
7.947917 0.02762 -0.051299 0.089505 0.003118 -0.00523 0.000808;
9.947917 0.028928 -0.054378 0.096966 0.003154 -0.005537 0.000861;
11.947917 0.029955 -0.057213 0.104415 0.003018 -0.00529 0.000785;
13.947917 0.031924 -0.060346 0.112048 0.002618 -0.005142 0.000871;
15.947917 0.033083 -0.064148 0.121047 0.002149 -0.004911 0.0009;
17.947917 0.03351 -0.066011 0.127395 0.002184 -0.00543 0.00088;
19.947917 0.03232 -0.05372 0.111857 -0.005739 0.009565 -0.000826;
21.947917 0.032585 -0.05386 0.116009 -0.009447 0.015043 -0.000861;
23.947917 0.032667 -0.053714 0.119697 -0.013573 0.020921 -0.000848;
25.947917 0.031153 -0.045661 0.111274 -0.012874 0.018247 -0.000197];

case 83

k = [-9.9479170.016243 -0.026686 0.023984 0.002733 -0.003538 0.000436;
-8.052083 0.018407 -0.029546 0.032635 0.002968 -0.004177 0.000426;
-6.052083 0.020706 -0.033226 0.04231 0.003026 -0.004583 0.000402;
-4.052083 0.023154 -0.037656 0.052766 0.003409 -0.005389 0.000411;
-2.062500 0.025693 -0.042888 0.064101 0.003296 -0.005455 0.000435;
-0.052083 0.028465 -0.048793 0.076278 0.00334 -0.005659 0.000489;
0.052083 0.028046 -0.048328 0.07562 0.003595 -0.005872 0.000369;
1.947917 0.031223 -0.054932 0.088824 0.00356 -0.006186 0.000581;
3.947917 0.033742 -0.061209 0.101596 0.003619 -0.006539 0.000674;

5.947917 0.036286 -0.067781 0.115097 0.003714 -0.006917 0.00075;
7.947917 0.038708 -0.074174 0.128496 0.004073 -0.00764 0.000827;
9.947917 0.040729 -0.078855 0.139708 0.004277 -0.008266 0.000909;
11.947917 0.042156 -0.082755 0.150134 0.004361 -0.00828 0.000857;
13.947917 0.043024 -0.08148 0.152617 0.001837 -0.004954 0.000897;
15.947917 0.042452 -0.076677 0.150193 -0.000401 -0.001982 0.000935;
17.947917 0.041113 -0.071712 0.147886 -0.001616 -0.000494 0.000883;
19.947917 0.042537 -0.066066 0.143545 -0.01059 0.017102 -0.001494;
21.947917 0.042071 -0.06166 0.142499 -0.016218 0.025483 -0.001583;
23.947917 0.04144 -0.056861 0.141073 -0.020535 0.031718 -0.001513;
25.947917 0.040608 -0.050287 0.136278 -0.018475 0.025763 -0.000248];

%% 6691_Bomb Model-II_Body_TF_-20 (91,92,93)

case 91

k = [-9.9479170.019949 0.039156 -0.066704 -0.001723 0.005208 0.000169;
-8.041667 0.019144 0.037317 -0.062043 -0.001725 0.005071 0.000182;
-6.052083 0.018143 0.035149 -0.057025 -0.001509 0.00455 0.000168;
-4.052083 0.017 0.032764 -0.051806 -0.00138 0.004308 0.000178;
-2.052083 0.01582 0.030077 -0.046313 -0.001411 0.004189 0.000214;
-0.052083 0.014585 0.027225 -0.040558 -0.001353 0.004083 0.000231;
0.052083 0.014726 0.02743 -0.040926 -0.001274 0.003943 0.000238;
1.947917 0.013291 0.024417 -0.034925 -0.001345 0.004001 0.00026;
3.947917 0.012081 0.022052 -0.029851 -0.001372 0.003931 0.000275;
5.947917 0.010924 0.020057 -0.025202 -0.001265 0.003699 0.000303;
7.947917 0.009798 0.018379 -0.0209 -0.001387 0.003763 0.00028;
9.947917 0.008784 0.016708 -0.016575 -0.001991 0.004571 0.000282;

11.947917 0.007839 0.015765 -0.013087 -0.001838 0.004298 0.000302;
13.947917 0.006967 0.014992 -0.009761 -0.002004 0.004402 0.000294;
15.947917 0.006285 0.014629 -0.00691 -0.002157 0.004514 0.000305;
17.947917 0.005386 0.014427 -0.004169 -0.002204 0.004295 0.00031;
19.947917 0.004464 0.014153 -0.00125 -0.002264 0.004129 0.000312;
21.947917 0.003334 0.013695 0.002065 -0.001992 0.00356 0.00031;
23.947917 0.001942 0.012986 0.005843 -0.001726 0.002947 0.000293;
25.947917 0.000335 0.012153 0.009898 -0.001272 0.002027 0.000249];

case 92

k = [-9.9479170.030342 0.06033 -0.103765 -0.00323 0.00831 -0.000076;
-8.052083 0.029116 0.057559 -0.09668 -0.003133 0.007953 -0.00005;
-6.052083 0.02749 0.054154 -0.088732 -0.0026 0.006984 -0.000062;
-4.052083 0.025762 0.050157 -0.080249 -0.002414 0.006471 -0.000063;
-2.052083 0.023892 0.045939 -0.071621 -0.002352 0.006189 -0.00002;
-0.052083 0.022067 0.041543 -0.062779 -0.002334 0.006009 -0.000023;
0.052083 0.02229 0.041805 -0.063227 -0.002182 0.005708 -0.000106;
1.947917 0.020004 0.037259 -0.054072 -0.002404 0.006055 -0.000003;
3.947917 0.0181 0.033566 -0.04614 -0.002443 0.005948 0.000052;
5.947917 0.016315 0.030465 -0.038899 -0.002203 0.005497 0.000047;
7.947917 0.014607 0.027716 -0.032 -0.002399 0.005659 0.000083;
9.947917 0.013023 0.025074 -0.025174 -0.003279 0.006661 0.000118;
11.947917 0.011538 0.023701 -0.01988 -0.003231 0.00654 0.000082;
13.947917 0.010233 0.022564 -0.014768 -0.003189 0.006344 0.000068;
15.947917 0.00918 0.021978 -0.010335 -0.003454 0.006423 0.000086;
17.947917 0.007767 0.021711 -0.006136 -0.003514 0.006085 0.000068;

19.947917 0.006261 0.021383 -0.001649 -0.003365 0.005482
0.000049;
21.947917 0.004424 0.020732 0.003478 -0.003248 0.005052
0.00004;
23.947917 0.00225 0.019677 0.009375 -0.002536 0.003692
0.000005;
25.947917 -0.000203 0.018413 0.015664 -0.002198 0.002934
0.000001];

case 93

k = [-9.9479170.043195 0.087039 -0.150581 -0.005229 0.012298 -
0.000586;
-8.052083 0.041316 0.082795 -0.139971 -0.005004 0.011711 -
0.000532;
-6.052083 0.038961 0.077854 -0.128536 -0.004076 0.009931 -
0.000514;
-4.052083 0.036439 0.071775 -0.115743 -0.003705 0.009093 -
0.0005;
-2.052083 0.033843 0.065851 -0.103488 -0.003664 0.008766 -
0.000438;
-0.052083 0.031203 0.05943 -0.090573 -0.003575 0.008516 -
0.000426;
0.052083 0.031411 0.059606 -0.090765 -0.003384 0.008017 -
0.000472;
1.947917 0.028276 0.053166 -0.077861 -0.003704 0.008399 -
0.000365;
3.947917 0.025572 0.047862 -0.066444 -0.003726 0.008309 -
0.000324;
5.947917 0.02289 0.043257 -0.05577 -0.003709 0.00804 -
0.000296;
7.947917 0.020459 0.039077 -0.04547 -0.003814 0.008097 -
0.000252;
9.947917 0.01825 0.035761 -0.036285 -0.004652 0.009063 -
0.000228;
11.947917 0.016077 0.033547 -0.02823 -0.004726 0.009009 -
0.000227;
13.947917 0.014282 0.032021 -0.021014 -0.004657 0.008638 -
0.000227;
15.947917 0.012761 0.031212 -0.014533 -0.004887 0.008523 -
0.000214;
17.947917 0.010709 0.030927 -0.008557 -0.005004 0.008044 -
0.000198;
19.947917 0.008479 0.030527 -0.002143 -0.004921 0.007563 -
0.000217;
21.947917 0.005748 0.02969 0.005191 -0.004479 0.006486 -
0.00026;
23.947917 0.00265 0.028406 0.013406 -0.003733 0.005128 -
0.000297;

25.947917 -0.000966 0.026728 0.022376 -0.003745 0.004747 -0.000258];

%% 6692_Bomb Model-II_Body_TF_+25 (101,102,103)

case 101

k = [-9.9479170.011514 -0.02002 0.023965 -0.000042 -0.001629 0.000989;
-8.052083 0.012936 -0.021507 0.028123 -0.000094 -0.001782 0.000976;
-6.052083 0.014503 -0.02334 0.032722 -0.000228 -0.001722 0.000991;
-4.052083 0.016034 -0.025392 0.037407 -0.000543 -0.001439 0.001005;
-2.052083 0.017543 -0.027501 0.042086 -0.000836 -0.001135 0.000987;
-0.052083 0.019032 -0.029703 0.046821 -0.00107 -0.000881 0.000992;
0.052083 0.018708 -0.029485 0.046407 -0.001205 -0.000933 0.000941;
1.9375 0.020279 -0.031521 0.050873 -0.001094 -0.000844 0.000982;
3.947917 0.021433 -0.03317 0.054788 -0.001356 -0.000666 0.000971;
5.947917 0.022547 -0.03439 0.058239 -0.001424 -0.000446 0.000972;
7.947917 0.023208 -0.034992 0.060727 -0.001399 -0.000419 0.000869;
9.947917 0.02324 -0.034828 0.061969 0.000206 -0.002205 0.000679;
11.947917 0.022362 -0.029996 0.056116 -0.004916 0.005999 0.000449;
13.947917 0.02172 -0.026752 0.053118 -0.006644 0.008086 0.000531;
15.947917 0.021819 -0.025329 0.053097 -0.006856 0.008224 0.00058;
17.947917 0.022184 -0.024997 0.05488 -0.00745 0.00877 0.000603;
19.947917 0.022535 -0.024823 0.056979 -0.009167 0.011117 0.000597;
21.947917 0.0227 -0.024723 0.0593 -0.010519 0.012974 0.000588;
23.947917 0.022755 -0.023791 0.060498 -0.010032 0.011908 0.000604;
25.947917 0.022608 -0.022602 0.061409 -0.01098 0.013106 0.000604];

case 102

k = [-9.9479170.01744 -0.030766 0.035787 0.000144 -0.002688 0.001097;

-8.052083 0.019605 -0.033067 0.042263 -0.000072 -0.002775
0.001109;
-6.052083 0.021957 -0.035967 0.049435 -0.000132 -0.002889
0.001129;
-4.062500 0.024246 -0.039097 0.056697 -0.000615 -0.00243
0.001169;
-2.052083 0.026563 -0.042381 0.063906 -0.000989 -0.002029
0.001181;
-0.052083 0.028889 -0.045832 0.071263 -0.001309 -0.001568
0.001202;
0.052083 0.028545 -0.045617 0.07081 -0.001482 -0.001432
0.001176;
1.947917 0.030833 -0.048633 0.077656 -0.001342 -0.001611
0.001179;
3.947917 0.032427 -0.051109 0.083508 -0.001945 -0.000644
0.001185;
5.947917 0.034132 -0.053473 0.089393 -0.002314 -0.000107
0.00112;
7.947917 0.035407 -0.054572 0.093514 -0.002036 -0.00041
0.001025;
9.958333 0.035876 -0.055229 0.096934 -0.000287 -0.002613
0.000851;
11.947917 0.03405 -0.047435 0.087265 -0.00561 0.006524
0.000412;
13.947917 0.033663 -0.04356 0.084327 -0.009878 0.012684
0.000373;
15.947917 0.033676 -0.041139 0.084 -0.010931 0.013831 0.000439;
17.947917 0.034158 -0.040488 0.08645 -0.012468 0.015609
0.000458;
19.947917 0.03447 -0.039655 0.088911 -0.014515 0.018396
0.000461;
21.947917 0.034595 -0.038788 0.091423 -0.015797 0.020029
0.000488;
23.947917 0.034621 -0.037022 0.092774 -0.01539 0.019003
0.000567;
25.947917 0.034356 -0.035346 0.094343 -0.017842 0.022516
0.000644];

case 103

k = [-9.9479170.024874 -0.044521 0.050749 0.00045 -0.003735
0.001326;
-8.052083 0.028023 -0.047878 0.060182 0.000013 -0.003443
0.001329;
-6.052083 0.031351 -0.05226 0.070772 -0.000336 -0.003351
0.001357;
-4.052083 0.034736 -0.056819 0.081326 -0.00075 -0.003101
0.001401;
-2.052083 0.038092 -0.061491 0.09171 -0.001193 -0.002756
0.001439;

-0.052083 0.041439 -0.066648 0.102662 -0.00171 -0.002044
0.001456;
0.052083 0.040994 -0.066367 0.102119 -0.001806 -0.001993
0.001432;
1.947917 0.044301 -0.070899 0.112162 -0.00159 -0.002299
0.001435;
3.947917 0.046609 -0.074314 0.120457 -0.002425 -0.001249
0.001423;
5.947917 0.048981 -0.077889 0.129182 -0.003076 -0.000156
0.001335;
7.947917 0.050951 -0.079729 0.135574 -0.002806 -0.000441
0.00119;
9.947917 0.05174 -0.080572 0.140475 -0.000546 -0.003195
0.000997;
11.947917 0.049317 -0.070936 0.129187 -0.005693 0.006469
0.00029;
13.947917 0.050301 -0.068622 0.130034 -0.014863 0.020421 -
0.000128;
15.947917 0.049223 -0.062685 0.12567 -0.01584 0.020801
0.000148;
17.947917 0.049561 -0.060517 0.127438 -0.018507 0.024103
0.000192;
19.947917 0.049645 -0.05808 0.129038 -0.020279 0.02618
0.000331;
21.947917 0.049778 -0.056411 0.13213 -0.021786 0.027982
0.000437;
23.947917 0.049683 -0.053807 0.133961 -0.022787 0.029146
0.000549;
25.947917 0.049193 -0.05056 0.135127 -0.025958 0.033655
0.000688];

%% 6693_Bomb Model-II_Body_TF_-25 (111,112,113)

case 111

k = [-9.9479170.021777 0.033186 -0.057296 0.001557 -0.000092 -
0.000164;
-8.052083 0.022442 0.037271 -0.062123 0.000017 0.003641
0.000297;
-6.052083 0.021778 0.036613 -0.059497 0.000075 0.003545
0.000334;
-4.052083 0.020809 0.035519 -0.056306 0.000113 0.003513
0.000338;
-2.052083 0.019609 0.033644 -0.052074 -0.000297 0.004014
0.000384;
-0.052083 0.018422 0.03193 -0.048075 -0.000199 0.003754
0.000382;
0.052083 0.018491 0.031951 -0.048218 -0.000029 0.003539
0.000446;

1.947917 0.01704 0.029709 -0.043361 -0.000146 0.003648 0.00041;
3.947917 0.015583 0.027574 -0.038683 -0.00011 0.003545 0.000397;
5.947917 0.01403 0.025283 -0.033689 -0.00039 0.003832 0.000411;
7.9375 0.012571 0.023547 -0.029351 -0.000307 0.003735 0.000432;
9.947917 0.011271 0.021943 -0.025056 -0.000154 0.003417 0.000456;
11.947917 0.009931 0.020656 -0.021059 -0.000462 0.003734 0.000448;
13.947917 0.008624 0.019379 -0.016982 -0.00041 0.003649 0.000455;
15.947917 0.007431 0.018479 -0.013342 -0.000459 0.003479 0.000446;
17.947917 0.006422 0.018096 -0.010366 -0.000667 0.003468 0.000435;
19.947917 0.00554 0.017885 -0.007572 -0.000637 0.003163 0.00045;
21.947917 0.004511 0.017891 -0.004935 -0.000524 0.002868 0.000403;
23.947917 0.003364 0.018054 -0.002415 -0.000142 0.002143 0.000347;
25.947917 0.002111 0.018032 0.000416 0.000161 0.001447 0.000355];

case 112

k = [-9.9479170.034333 0.052063 -0.090538 0.000906 0.000731 -0.000686;
-8.052083 0.035208 0.05797 -0.097375 -0.001903 0.007314 0.000121;
-6.052083 0.034068 0.056973 -0.093192 -0.00187 0.007181 0.000176;
-4.052083 0.032557 0.055046 -0.087883 -0.001548 0.006623 0.000179;
-2.052083 0.030702 0.052356 -0.081566 -0.001529 0.006553 0.000228;
-0.052083 0.028885 0.049538 -0.075148 -0.001372 0.006237 0.000239;
0.052083 0.029078 0.049603 -0.075287 -0.00109 0.005772 0.000242;
1.947917 0.026661 0.046061 -0.067752 -0.001308 0.006005 0.000261;
3.947917 0.024415 0.042704 -0.060391 -0.001302 0.005902 0.000255;
5.947917 0.022026 0.039222 -0.052685 -0.001883 0.006589 0.000281;
7.947917 0.019746 0.03651 -0.045937 -0.001803 0.006338 0.000301;

9.947917 0.017695 0.034189 -0.039451 -0.001393 0.005637 0.00032;
11.947917 0.015632 0.031816 -0.032685 -0.001439 0.005548 0.000313;
13.947917 0.013567 0.029896 -0.026397 -0.001512 0.005464 0.000363;
15.947917 0.011719 0.028612 -0.020868 -0.001652 0.005378 0.000357;
17.947917 0.010187 0.028019 -0.016178 -0.001949 0.005326 0.000344;
19.947917 0.008765 0.027729 -0.011739 -0.001777 0.00474 0.000301;
21.947917 0.007171 0.02782 -0.007761 -0.001662 0.004328 0.000278;
23.947917 0.005344 0.028086 -0.003797 -0.001149 0.003367 0.000242;
25.947917 0.003315 0.028127 0.00057 -0.000863 0.002646 0.000216];

case 113

k = [-9.9479170.048923 0.07455 -0.130087 -0.000565 0.002799 -0.001296;
-8.052083 0.050152 0.082497 -0.13904 -0.004123 0.011352 -0.00017;
-6.052083 0.048387 0.081027 -0.132997 -0.003853 0.010803 -0.00013;
-4.052083 0.046215 0.078035 -0.125042 -0.003401 0.010173 -0.000063;
-2.052083 0.043588 0.074216 -0.116142 -0.003198 0.00976 0.000006;
-0.052083 0.040983 0.07032 -0.107164 -0.002919 0.009199 -0.000019;
0.052083 0.041148 0.07019 -0.10705 -0.002664 0.008875 -0.000072;
1.947917 0.037753 0.065202 -0.096397 -0.002851 0.009073 0.000044;
3.947917 0.034587 0.060414 -0.085885 -0.002959 0.008917 0.000072;
5.947917 0.031271 0.055632 -0.075086 -0.003861 0.010063 0.000138;
7.947917 0.028065 0.051762 -0.065407 -0.003311 0.009167 0.000093;
9.947917 0.025219 0.048251 -0.055918 -0.002883 0.008308 0.000129;
11.947917 0.022179 0.044842 -0.046236 -0.002846 0.008165 0.000133;
13.947917 0.019223 0.04216 -0.037278 -0.002854 0.007875 0.00016;

```
15.947917	0.016658	0.040427	-0.02963	-0.003071	0.007699
	0.000159;
17.947917	0.014518	0.039551	-0.022854	-0.00326	0.007371
	0.000153;
19.947917	0.012444	0.039257	-0.016776	-0.003067	0.00663
	0.0001;
21.947917	0.010138	0.039502	-0.011174	-0.00296	0.006179
	0.000056;
23.947917	0.007504	0.039988	-0.005606	-0.002226	0.004834	-
0.000036;
25.947917	0.00461	0.040129	0.000598	-0.001939	0.004068	-
0.000063];

end
end
```

Output (Body + TF)

CL_de = 0.1071 /rad or 6.1381 /deg (v = 40 m/s)

CL_de = 0.1652 /rad or 9.4661 /deg (v = 50 m/s)

CL_de = 0.2364 /rad or 13.5421 /deg (v = 60 m/s)

Cm_de = -0.0327 /rad or -1.8731 /deg (v = 40 m/s)

Cm_de = -0.0325 /rad or -1.8613 /deg (v = 50 m/s)

Cm_de = -0.0322 /rad or -1.8475 /deg (v = 60 m/s)

Output (Body + NF + TF)

CL_de = 0.1105 /rad or 6.3283 /deg (v = 40 m/s)

CL_de = 0.1704 /rad or 9.7642 /deg (v = 50 m/s)

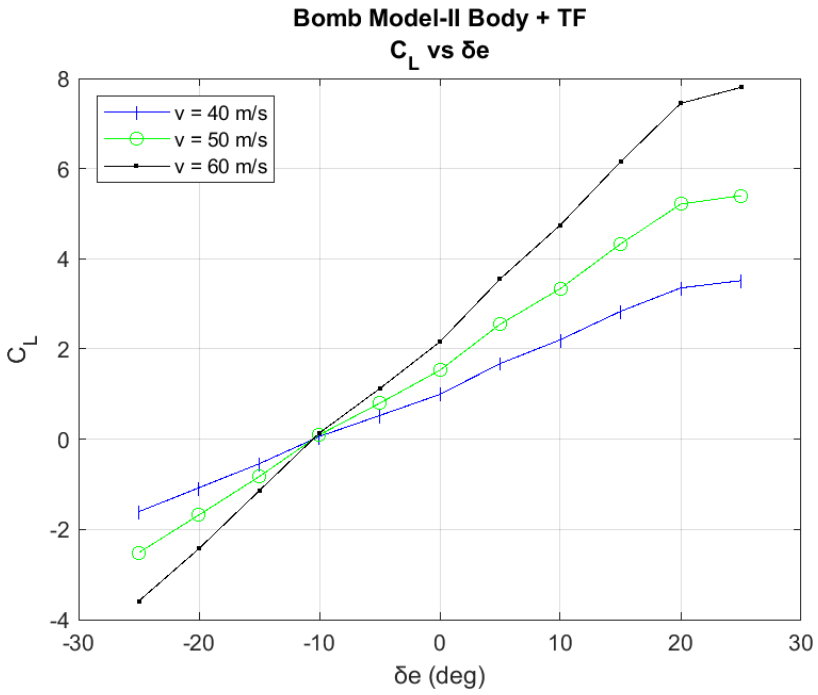
CL_de = 0.2366 /rad or 13.5546 /deg (v = 60 m/s)

Cm_de = -2.4416 /rad or -0.0426 /deg (v = 40 m/s)

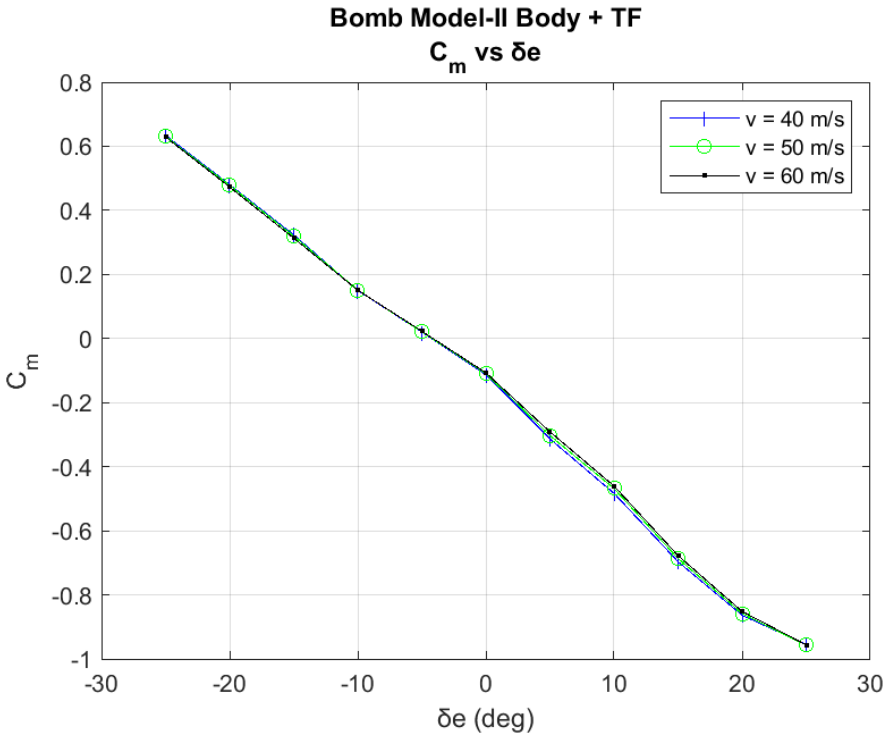
Cm_de = -2.3789 /rad or -0.0415 /deg (v = 50 m/s)

Cm_de = -2.3652 /rad or -0.0413 /deg (v = 60 m/s)

Plots (Body + TF)

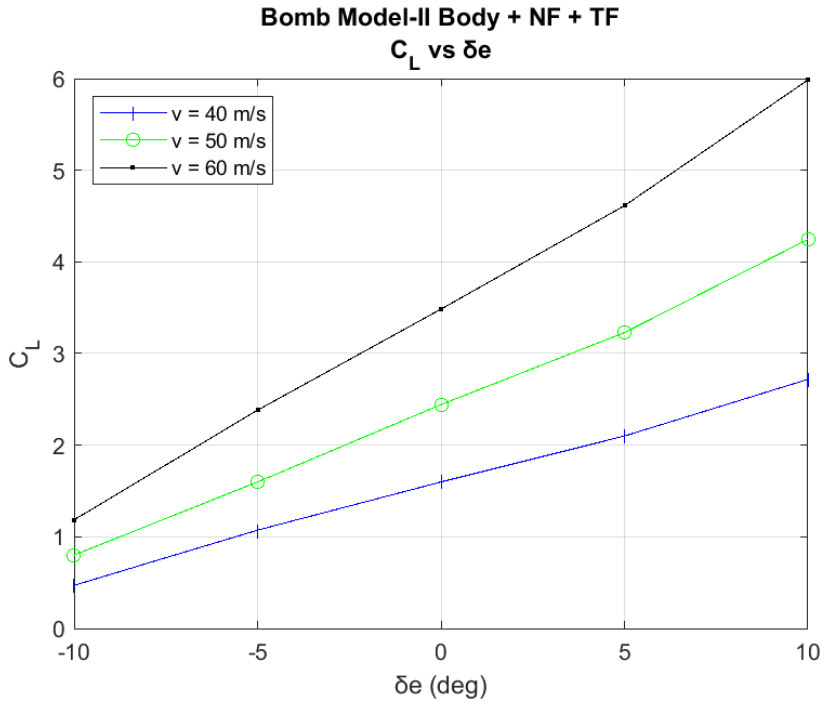


C_L v/s δe for Body +TF

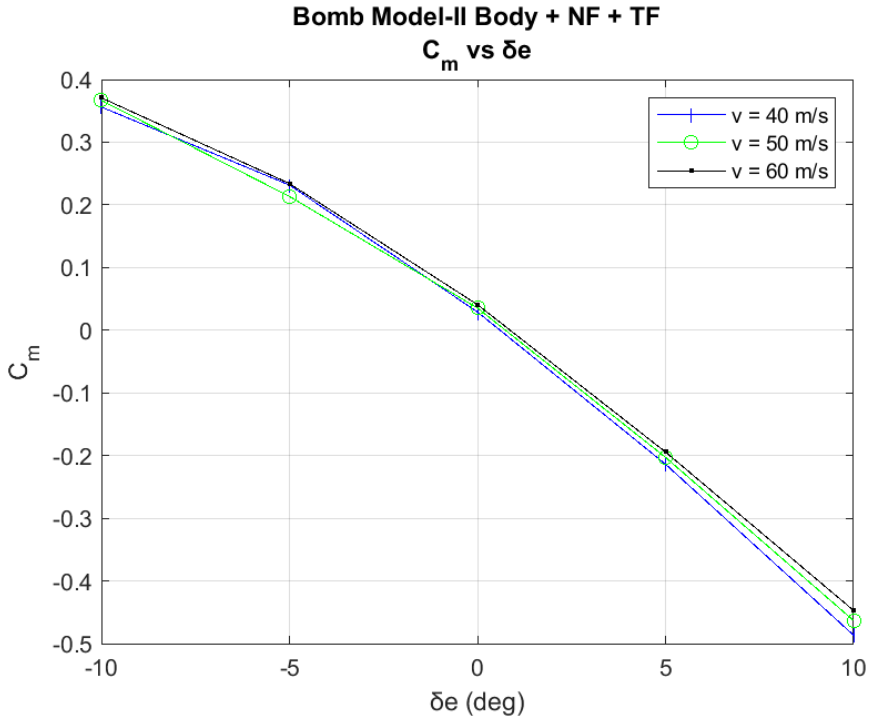


C_M v/s δe for Body +TF

Plots (Body + NF + TF)



C_L v/s δe for Body + NF + TF



C_M v/s δe for Body + NF + TF

Procedure to determine stability derivatives

1. Fix one Angle of attack
2. Measure CM for different deflections of elevator.
3. Plot CM v/s δe.
4. Find slope.