

Aircraft Dynamics Assignment 8

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Question 4

Set up workspace

```
clear
close
clc
```

Declare constants

```
global Constants Conv DStabDer nDlatDer fConds
B747LatValues()
```

Part a

From Table 4.5,

```
DLatDer.v.Y = 0.5 * fConds.rho * fConds.u0 * fConds.S * nDlatDer.Beta.Cy;
DLatDer.v.L = 0.5 * fConds.rho * fConds.u0 * fConds.b * fConds.S * nDlatDer.Beta.Cl;
DLatDer.v.N = 0.5 * fConds.rho * fConds.u0 * fConds.b * fConds.S * nDlatDer.Beta.Cn;

DLatDer.p.Y = 0.25 * fConds.rho * fConds.u0 * fConds.b * fConds.S * nDlatDer.pHat.Cy;
DLatDer.p.L = 0.25 * fConds.rho * fConds.u0 * (fConds.b)^2 * fConds.S * nDlatDer.pHat.Cl;
DLatDer.p.N = 0.25 * fConds.rho * fConds.u0 * (fConds.b)^2 * fConds.S * nDlatDer.pHat.Cn;

DLatDer.r.Y = 0.25 * fConds.rho * fConds.u0 * fConds.b * fConds.S * nDlatDer.rHat.Cy;
DLatDer.r.L = 0.25 * fConds.rho * fConds.u0 * (fConds.b)^2 * fConds.S * nDlatDer.rHat.Cl;
DLatDer.r.N = 0.25 * fConds.rho * fConds.u0 * (fConds.b)^2 * fConds.S * nDlatDer.rHat.Cn;

% Values calculated above
disp(DLatDer.v)
```

```
Y: -1.6095e+04
L: -3.0615e+05
N: 2.1300e+05
```

```
disp(DLatDer.p)
```

```
Y: 0
L: -1.0757e+07
N: -1.3296e+06
```

```
disp(DLatDer.r)
```

```
Y: 0
L: 9.9242e+06
N: -8.9253e+06
```

```
% Values given by book
disp(DStabDer.v)
```

```
Y: -1.6100e+04
L: -306200
N: 2.1310e+05
```

```
disp(DStabDer.p)
```

```
Y: 0
L: -10760000
N: -1330000
```

```
disp(DStabDer.r)
```

```
Y: 0
L: 9925000
N: -8934000
```

Part b

(i)

```
deltap = 0.05; % [rad/s], change in roll rate
deltaL = deltap * DLatDer.p.L % [N*m]
```

```
deltaL = -5.3783e+05
```

(ii)

```
deltar = -0.05; % [rad/s], change in yaw rate
deltaN = deltar * DLatDer.r.N % [N*m]
```

```
deltaN = 4.4626e+05
```

(iii)

```
deltar = 0.01; % [rad/s], change in yaw rate
deltaL = deltar * DLatDer.r.L % [N*m]
```

```
deltaL = 9.9242e+04
```

(iv)

```
deltap = -0.7; % [rad/s], change in roll rate
deltaN = deltap * DLatDer.p.N % [N*m]
```

```
deltaN = 9.3075e+05
```

(v)

```
deltap = 0.15; % [rad/s], change in roll rate
deltav = 2.04; % [m/s], change in side velocity
deltaY = deltap * DLatDer.p.Y + deltav * DLatDer.v.Y % [N]
```

```
deltaY = -3.2834e+04
```

(vi)

```
deltav = -1.3; % [m/s], change in side velocity
deltap = 0.5; % [rad/s], change in roll rate
deltar = 0.37; % [rad/s], change in yaw rate
deltaL = deltav * DLatDer.v.N + deltap * DLatDer.p.N + ...
```

```
deltar * DLatDer.r.N % [N*m]
```

```
deltaL = -4.2441e+06
```