```
% airplane level flight
clear


m = 1000;     %kg
l = 20;
I=(1/20)*m*l^2;
DL = 1;
DC = .2;
Db = 0;
s=16;        %sq m.



dt = .2;
n = 1100;


px(1) = 0;

py(1) = 1000;
vy(1) = 0;
a(1) = 5*pi/180;
ar(1) = 0;

% compute initial velocity estimate

%CL at 5 deg is 1, lift is 0.5*air*v2*s*CL + T*sin(a), so need v to be

vxest = sqrt(m*10/(.5*1.4*s*1))

%CD at 5 deg is .7, drag is 0.5*air*v2*s*CD, so need T to be

T = 0.5*1.4*vxest^2*s*0.7/cos(a(1));


T=7500

% refine velocity estimate

vx(1) = sqrt((m*10 - T*sin(a(1)))/(.5*1.4*s*1))




thrust=zeros(1,n+1);

elevator=zeros(1,n+1);
t=0;
for i=1:n+1

  thrust(i) = T;
end

for i=100:120
   elevator(i) = 0;
   elevatof(i+21)= 0;
end
```

```
for i=2:n+1



 v(i-1) =  sqrt(vx(i-1)^2 + vy(i-1)^2);

 vangle(i-1) = asin(vy(i-1)/v(i-1));
 AoA(i-1) = (a(i-1) - vangle(i-1))*180/pi;

 CL(i-1) = 0.5 + 0.1*AoA(i-1);

 if (AoA(i-1) <= 5) CD = (5 - AoA(i-1))*0.1 + 0.7;
 end

 if (AoA(i-1) > 5) CD = (AoA(i-1) - 5)*0.1 + 0.7;
 end



  air(i-1) = (1 - py(i-1)/30000)*1.4;

 lift(i-1)=0.5*air(i-1)*v(i-1)^2*s*CL(i-1);
 drag= Db + 0.5*air(i-1)*v(i-1)^2*s*CD;

 liftx = lift(i-1)*cos(a(i-1) + pi/2);
 lifty = lift(i-1)*sin(a(i-1) + pi/2);

 dragx = drag*cos(vangle(i-1) + pi);
 dragy = drag*sin(vangle(i-1) + pi);

 thrustx = thrust(i-1)*cos(a(i-1));
 thrusty = thrust(i-1)*sin(a(i-1));


 ax(i-1) = (liftx + dragx + thrustx)/m;
 ay(i-1) = (lifty + dragy + thrusty)/m - 10;

 px(i) = px(i-1) + vx(i-1)*dt;
 py(i) = py(i-1) + vy(i-1)*dt;

 vx(i) = vx(i-1) + ax(i-1)*dt;
 vy(i) = vy(i-1) + ay(i-1)*dt;

 a(i) = a(i-1) + ar(i-1)*dt;
 ar(i) = ar(i-1) + elevator(i-1)/I*dt;

end



plot(px,py)
```