x=input("rocket length between 0 to 1000 mm:");

while x>1000

 disp('please input a value between 0 and 1000 mm:');

 x=input('');

end

list={'mini motor','standred motor','c motor ','d motor','e motor','f motor','g motor','water','air','PLA','ABS','cardboard','plastic bottle','paper'};

n=listdlg('ListString',list);

if n(2)==10

 density=1.25 ;

 density\_body=1.25;

 density\_cone=1.25;

 density\_fin=1.25;

 material='PLA'

elseif n(2)==11

 density=1.07;

 density\_body=1.07;

 density\_cone=1.07;

 density\_fin=1.07;

 material='ABS'

elseif n(2)==12 | n(2)==13 | n(2)==14

 density\_fin=0.689;

 density\_body=1.36;

 density\_cone=1.2;

 density=0;

end

y= randi([0,x],2,1);

while y(1)+y(2)~=x

y=randi([0,x],2,1);

 end

 while y(1)<2\*y(2)

 y(1)=y(1)+1;

 y(2)=y(2)-1;

 end

 if n(1)==1

 r\_case1= 20/2;

 h\_case=45;

 r\_body= 20/2;

 r\_cone=20/2;

 elseif n(1)==2

 r\_case1=30/2;

 h\_case=70;

 r\_body=30/2;

 r\_cone=30/2;

 elseif n(1)==3 | n(1)==4

 r\_case1=40/2;

 h\_case=70;

 r\_body=40/2;

 r\_cone=40/2 ;

 elseif n(1)==5 | n(1)==6 | n(1)==7

 r\_case1=45/2;

 h\_case=90;

 r\_body=45/2;

 r\_cone=45/2;

 else

 r\_case1=0;

 h\_case=0;

 r\_body=randi([20,45]) ;

 r\_cone=r\_body ;

 end

 r\_case2=r\_body;

 A\_case=pi\*(r\_case1+r\_case2)\*sqrt((r\_case1-r\_case2)^2+h\_case^2)+pi\*(r\_case1^2+r\_case2^2);

 V\_case=pi\*h\_case/12\*((r\_case1\*2)^2+r\_case1\*r\_case2+(r\_case2^2));

 M\_case=V\_case\*density ;

 COM\_case=(h\_case\*(3\*(r\_case1)^2+2\*r\_case1\*r\_case2+(r\_case2)^2))/4\*((r\_case1)^2+r\_case1\*r\_case2+(r\_case2)^2);

 W\_case=M\_case\*9806.65;

 h\_body=y(1);

 A\_body=2\*pi\*r\_body\*h\_body+2\*pi\*r\_body^2;

 V\_body=pi\*(r\_body)^2\*(h\_body/3);

 COM\_body= h\_body /2;

 if n(2) >11

 o=1;

 else

 o=randi([1,2]);

 end

 h\_cone=y(2);

 if o==1

 A\_cone= pi\*r\_cone\*(r\_cone+sqrt(h\_cone^2+r\_cone^2));

 V\_cone=pi\*r\_cone^2\*(h\_cone/3);

 COM\_cone = h\_cone/4;

 M\_cone=V\_cone\*density\_cone;

 nose='cone';

 elseif o==2

 fun= @(x) 2.\*pi.\*((-h\_cone/r\_cone^2).\*x.^2).\*sqrt(1+(-2.\*(h\_cone/r\_cone^2).\*x).^2);

 A\_cone=integral(fun,-r\_cone,r\_cone);

 fun=@(y) pi.\*y./-h\_cone;

 V\_cone= integral(fun,0,h\_cone);

 M\_cone=V\_cone\*density\_cone ;

 COM\_cone=3/5\*h\_cone;

 nose='parabolic cone';

 end

 A=A\_cone+A\_body+A\_case;

 l=A\_cone\*COM\_cone+A\_body\*COM\_body+A\_case\*COM\_case;

 cp=l/A;

 M\_body=V\_body\*density\_body;

 M\_cone=V\_cone\*density\_cone ;

 W\_body=M\_body\*9806.65;

 W\_cone=M\_cone\*9806.65 ;

 W=W\_body+W\_cone+W\_case ;

 i=W\_cone\*COM\_cone+W\_body\*COM\_body+W\_cone\*COM\_case;

 CG=i/W;

 z=randi([1,3]);

 thickness=10 ;

h\_fin=h\_cone/6;

b\_fin=10;

a\_fin=0;

 while CG< (cp+10)

if z==1

 A\_fin= 1/2 \*b\_fin\*h\_fin ;

 V\_fin=A\_fin\*t;

 COM\_fin=h\_fin/3;

elseif z==2

 a\_fin=10

 A\_fin=1/2\*(b\_fin+a\_fin)\*h\_fin;

 V\_fin=A\_fin\*t ;

 COM\_fin=h\_fin/3\*((2\*a\_fin+b\_fin))/(a\_fin+b\_fin);

elseif z==3

 A\_fin=b\_fin\*h\_fin ;

 V\_fin=A\_fin\*t ;

 COM\_fin=h\_fin/2;

end

 b\_fin=b\_fin+5;

 a\_fin=a\_fin+5;

 h\_fin=h\_fin+5;

 A=A\_cone+A\_body+3\*A\_fin;

 l=A\_cone\*COM\_cone+3\*A\_fin\*COM\_fin+A\_body\*COM\_body;

 cp=l/A;

 M\_fin=V\_fin\*density\_fin ;

 M\_body=V\_body\*density\_body;

 M\_cone=V\_cone\*density\_cone ;

 W\_fin=M\_fin\*9806.65;

 W\_body=M\_body\*9806.65;

 W\_cone=M\_cone\*9806.65;

 W=W\_fin+W\_body+W\_cone ;

 i=W\_cone\*COM\_cone+3\*W\_fin\*COM\_fin+W\_body\*COM\_body ;

 CG=i/W;

 end

 if b\_fin<a\_fin

 f=b\_fin;

 b\_fin=a\_fin;

 a\_fin=f;

 end

if z==1

 fin='triangle';

elseif z==2

 fin='right angle trapozieod';

elseif z==3

 fin='rectangle';

end

figure

 hold on

 % set(gca,'visible','off')

 rectangle('position',[b\_fin,0,r\_body,h\_body]);

 w=linspace(b\_fin,b\_fin+r\_cone/2,50);

 W=linspace(b\_fin+r\_cone,b\_fin+r\_cone/2,50);

 p=linspace(h\_body,h\_body+h\_cone,50);

 plot(w,p);

 plot(W,p);

 axis([-50,500,-100,2500]);

 if z==1

 s=linspace(0,b\_fin,50);

 S=linspace(b\_fin+r\_body+b\_fin,b\_fin+r\_body,50) ;

 v=linspace(1,h\_fin,50);

 line([0,b\_fin],[1,1]);

 plot(s,v);

 line([b\_fin+r\_body,b\_fin+r\_body+b\_fin],[1,1]);

 plot(S,v);

 g=[0,b\_fin,b\_fin,0];

 b=[0,0,h\_fin,0];

 fill(g,b,'y');

elseif z==2

 plot ([0,b\_fin],[1,1],'y');

 plot([b\_fin+r\_body,b\_fin+r\_body+b\_fin],[1,1],'y');

 q=linspace(0,b\_fin-a\_fin,50);

 Q=linspace(2\*b\_fin+r\_body,b\_fin+r\_body+a\_fin,50);

 V=linspace(1,h\_fin,50);

 plot([b\_fin-a\_fin,a\_fin+b\_fin-a\_fin],[h\_fin,h\_fin],'y') ;

 plot([b\_fin+r\_body,b\_fin+r\_body+a\_fin],[h\_fin,h\_fin],'y');

 plot(q,V);

 plot(Q,V);

 b=[0,b\_fin,b\_fin,b\_fin-a\_fin,0];

 B=[0,0,h\_fin,h\_fin,0];

 fill(b,B,'y');

elseif z==3

 rectangle('position',[0,0,b\_fin,h\_fin]);

 rectangle('position',[b\_fin+r\_body,0,b\_fin,h\_fin]);

 end

 x=[b\_fin,b\_fin+r\_body/2,b\_fin+r\_body,b\_fin];

 y=[h\_body,h\_body+h\_cone,h\_body,h\_body];

 fill(x,y,'c');

 set(gca,'Color','w');

i=0 ;

 for t=[1:200]

 if t==30

 i=1;

 end

 l=rectangle('position',[b\_fin,t+i,r\_body,h\_body],'FaceColor','m','edgecolor','r');

 w=linspace(b\_fin,b\_fin+r\_cone/2,50);

 W=linspace(b\_fin+r\_cone,b\_fin+r\_cone/2,50);

 p=linspace(h\_body+t+i,h\_body+h\_cone+t+i,50);

 plot(w,p,'c');

 plot(W,p,'c');

 if z==1

 s=linspace(0,b\_fin,50);

 S=linspace(b\_fin+r\_body+b\_fin,b\_fin+r\_body,50) ;

 v=linspace(1+t,h\_fin+t+i,50);

 plot([0,b\_fin],[t+i,t+i],'y');

 plot(s,v,'y');

 plot([b\_fin+r\_body,b\_fin+r\_body+b\_fin],[t+i,t+i],'y');

 plot(S,v,'y');

 elseif z==2

 plot ([0,b\_fin],[t+i,t+i],'y');

 plot([b\_fin+r\_body,b\_fin+r\_body+b\_fin],[t+i,t+i],'y');

 q=linspace(0,b\_fin-a\_fin,50);

 Q=linspace(2\*b\_fin+r\_body,b\_fin+r\_body+a\_fin,50);

 V=linspace(t+i,h\_fin+t+i,50);

 plot([b\_fin-a\_fin,a\_fin+b\_fin-a\_fin],[h\_fin+t+i,h\_fin+t+i],'y') ;

 plot([b\_fin+r\_body,b\_fin+r\_body+a\_fin],[h\_fin+t+i,h\_fin+t+i],'y');

 plot(q,V,'y');

 plot(Q,V,'y');

 elseif z==3

 rectangle('position',[0,t+i,b\_fin,h\_fin],'FaceColor','y','EdgeColor','y') ;

 rectangle('position',[b\_fin+r\_body,t+i,b\_fin,h\_fin],'FaceColor','y','EdgeColor','y');

 end

drawnow limitrate

c=rectangle('position',[b\_fin,0,r\_body,t+i],'FaceColor','w','edgecolor','w');

m=plot([b\_fin+r\_body,b\_fin+r\_body+b\_fin+1],[t-1+i,t-1+i],'w');

x=rectangle('position',[0,0,b\_fin,t+i],'FaceColor','w','EdgeColor','w');

 n=plot([-1,b\_fin],[t-1+i,t-1+i],'w');

x=rectangle('position',[b\_fin+r\_body,0,b\_fin,t+i],'FaceColor','w','EdgeColor','w');

 i=t^2/5;

 end

 fprintf('the rocket body is a cylinder with height %f and radius %.2f \n\n and the nose of the rocket is a %s with a radius %.2f and a height %.2f\n\n and the fin of the rocket is a %s with a height %.2f and base %.2f and second base %.2f and a thicknees of %f\n\n',h\_body,r\_body,nose,r\_cone,h\_cone,fin,h\_fin,b\_fin,a\_fin,thickness)