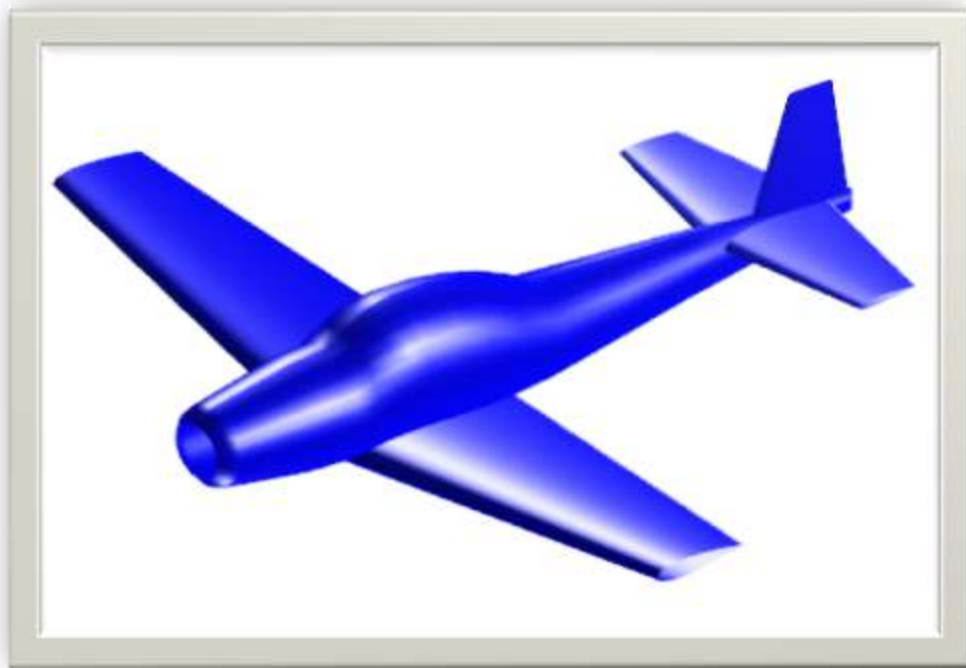


Embry-Riddle Aeronautical University

datcom3d

USAF Digital DATCOM Aircraft Configuration Plots using MATLAB



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Version 1.1

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Introduction

The USAF Digital DATCOM allows a user to model an aircraft in order to analyze the stability and control of aircraft at different angles of attack and flight regimes. The details of creating this model can be found in the USAF Digital DATCOM Volume I. This document assumes that a model has already been created, or each parameter for creating the model has been defined.

The process of creating a model in Digital DATCOM is somewhat tedious and how the components of the aircraft are put together can be a mystery. This program is useful in order to quickly check and debug the configuration and ensure the model is created correctly. Obviously, an inaccurate model can lead to inaccurate results from Digital DATCOM.

At the end of this document, there are appendices featuring Digital DATCOM input files (for005.dat) and the datcom3d input files for certain aircraft.

MATLAB Code

In order to execute the MATLAB Aircraft Configuration plots, 5 files need to be present:

1. datcom3d Input File (.m file)
2. plotWing.m
3. plotHT.m
4. plotVT.m
5. plotFuselage.m

You will need at least MATLAB 7.1 to run these plots.

Creating an Input File

A template has provided to facilitate creating an input file. There are examples in the appendices at the end of this document to demonstrate the proper way to create an input file.

The first three lines of code, beginning with `clear`, wipes out any preexisting variables and plots that may exist within the MATLAB workspace.

1. Visualization and Resolution

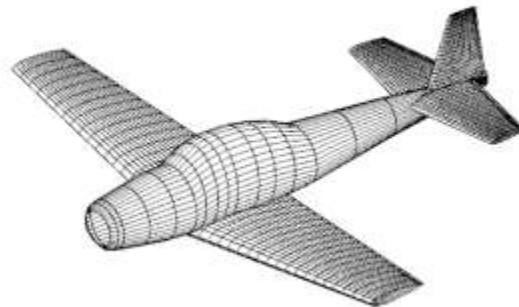
This block is coded as follows:

```
%% VISUALIZATION and RESOLUTION %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
wframe = 1;                      %0 = Shaded model
                                %1 = Wireframe model (default)

fusres = 20;                     %Fuselage resolution
wgres  = 20;                     %Wing,HT,VT resolution
```

The variable *wframe* allows a user to select whether a shaded model or a gridded black and white model should be plotted. The variables *fusres* and *wgres* allow a user to define the resolution of the surface of the fuselage and wings (i.e. number of points defining the surface). The greater the resolution, the smoother the model will be. However, MATLAB tends to operate slower when the resolution increases.

Below are examples of a shaded Navion model (left) and a wireframe model (right).



2. The “Do Not Edit” Parameters

This block is coded as follows:

```
%% (DO NOT CHANGE VALUES IN THIS BOX) %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
XW=0;ZW=0;ALIW=0;XH=0;ZH=0;ALIH=0;XV=0;YV=0;numVT=1;VERTUP=1;           %%
NX=0;X=zeros(20);S=zeros(20);R=zeros(20);ZU=zeros(20);ZL=zeros(20);       %%
CHRDW_WG=0;CHRDWP_WG=0;CHRDTP_WG=0;SSPN_WG=0;SSPNOP_WG=0;SAVSI_WG=0;      %%
SAVSO_WG=0;CHSTAT_WG=0;DHDADI_WG=0;DHDADO_WG=0;TC_WG=.12;                %%
CHRDW_HT=0;CHRDWP_HT=0;CHRDTP_HT=0;SSPN_HT=0;SSPNOP_HT=0;SAVSI_HT=0;      %%
SAVSO_HT=0;CHSTAT_HT=0;DHDADI_HT=0;DHDADO_HT=0;TC_HT=.12;                %%
CHRDW_VT=0;CHRDWP_VT=0;CHRDTP_VT=0;SSPN_VT=0;SSPNOP_VT=0;SAVSI_VT=0;     %%
SAVSO_VT=0;CHSTAT_VT=0;TC_VT=.12;                                         %%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

This block of code initializes all of the datcom3d input variables to zero to ensure the required model generation variables exist. A few assumptions are taken from these statements:

- There is only one vertical tail
- The vertical tail is above the centerline (VERTUP = 1) and centered on the FRL
- The wing, HT, and VT airfoils have a t/c of 0.12 (TC_WG=0.12, etc.)

Modifying the code within this box may adversely alter the operation of the program.

3. Input Parameters

This space of code starts as follows:

```
%% INPUT PARAMETERS BELOW %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

These values can be taken directly from the Digital DATCOM for005.dat file. The following namelists need to be inputted:

- SYNTHS
- BODY
- WGPLNF
- HTPLNF
- VTPLNF

Note that for the wing, horizontal tail, and vertical tail parameters a suffix follows each parameter. For example, the semi-span of the wing is given by the parameter, *SSPN_WG*. The semi-span of the horizontal tail is given by *SSPN_HT*. The root chord of the vertical tail is given by *CHRDW_VT*, and so on.

If there are twin vertical tails, specify this with the expression `numVT = 2;`. Then specify the distance from the FRL to the starboard vertical tail apex using the variable *YV*. For example, if the twin vertical tails were located at the tips of the horizontal tail, enter:

```
numVT = 2;  
YV = SSPN_HT;
```

The body parameters should be entered into MATLAB as arrays. It is a MATLAB convention that when a statement is continued on a new line, ellipses (...) are used. See the appendices for more details.

4. Plotting Statements

This block is coded as follows:

```
%% PLOTTING %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%  
warning off MATLAB:divideByZero  
hold on  
  
plotFuselage(NX,X,S,R,ZU,ZL,fusres)  
plotWing(XW,ZW,ALIW,CHRDW_WG,CHRDWP_WG,CHRDTP_WG,SSPN_WG,SSPNOP_WG,...  
    SAVSI_WG,SAVSO_WG,CHSTAT_WG,DHDADI_WG,DHDADO_WG,TC_WG,wgres)  
plotHT(XH,ZH,ALIH,CHRDH_HT,CHRDHP_HT,CHRDTP_HT,SSPN_HT,SSPNOP_HT,...  
    SAVSI_HT,SAVSO_HT,CHSTAT_HT,DHDADI_HT,DHDADO_HT,TC_HT,wgres)  
plotVT(XV,YV,ZV,CHRDV_VT,CHRDVP_VT,CHRDTP_VT,SSPN_VT,SSPNOP_VT,...  
    SAVSI_VT,SAVSO_VT,CHSTAT_VT,VERTUP,TC_VT,wgres)  
if numVT > 1  
    plotVT(XV,-YV,ZV,CHRDV_VT,CHRDVP_VT,CHRDTP_VT,SSPN_VT,SSPNOP_VT,...  
        SAVSI_VT,SAVSO_VT,CHSTAT_VT,VERTUP,TC_VT,wgres)  
end
```

These values need not be edited. These statements call the appropriate plot files and pass the required parameters.

5. Viewport Properties

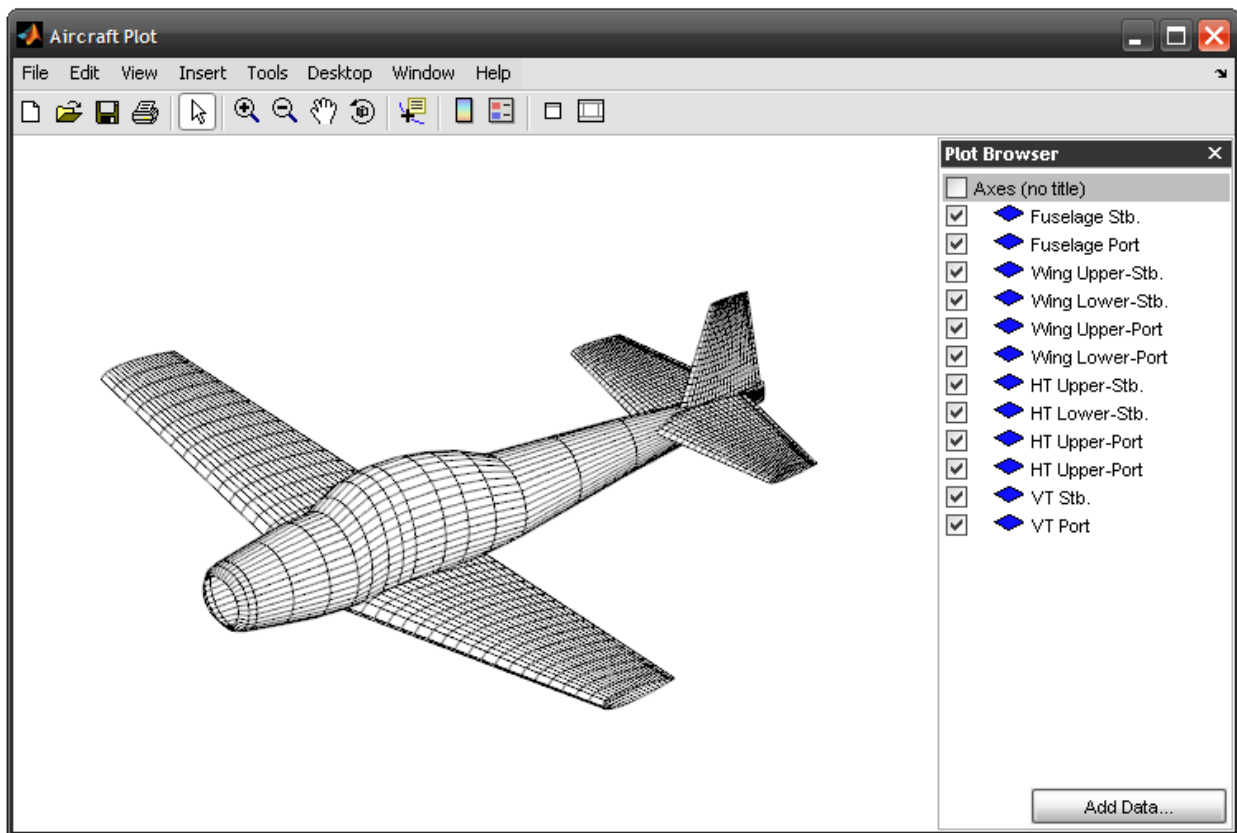
There are options available to customize the appearance of a three dimensional plot in MATLAB. Please see the MATLAB website for a complete list of options available.

The options presented in the datcom3d input file simply set the color and lighting of the figure. Also, the plot browser is enabled by default.

Figure Properties

When the figure appears on the screen, the plot browser should be enabled. In the plot browser, components of the model can be hidden by unchecking the checkbox next to name of the component (i.e. right side of fuselage, upper-right wing section, etc.). If the plot browser is not automatically enabled, it can be found under the “View” menu.

The following figure illustrates the Navion model in wireframe mode with the plot browser enabled.



APPENDIX A: Navion Example

- Digital DATCOM Input File
- Datcom3d Input File

Digital DATCOM Input File (for005.dat)

```
CASEID NAVION
$FLTCON
  NMACH=2,
  MACH(1)=0.1,0.6,
  NALPHA=20.0,
  ALSCHD(1)=-4.0,-3.0,-2.0,-1.0,0.0,1.0,2.0,3.0,4.0,5.0,
              7.0,8.0,9.0,10.0,11.0,12.0,13.0,14.0,15.0,16.0,
  NALT=2,
  ALT(1)=0.0,1000.0,
  GAMMA=0.0,WT=2750.0,LOOP=1$
$OPTINS SREF=184.0,CBARR=5.7,BLREF=33.4$
$SYNTHS XCG=7.03,ZCG=-0.47,XW=5.80,ZW=-2.12,ALIW=0.0,XH=21.64,
        ZH=0.78,ALIH=0.0,XV=23.21,ZV=0.0,XVF=19.76,ZVF=1.25,VERTUP=.TRUE.$
$BODY NX=18.0,ITYPE=1.0,
  ZU(1)=1.019,1.372,1.490,1.764,2.038,2.078,2.509,2.979,3.136,3.215,
        3.136,2.900,2.470,1.686,1.450,1.215,0.862,0.548,
  ZL(1)=-1.019,-1.372,-1.490,-1.764,-2.038,-2.117,-2.156,-2.195,
        -2.195,-2.195,-2.195,-2.156,-2.117,-1.960,-1.568,-1.176,-0.862,
        -0.392,
  X(1)=0.0,0.314,0.666,2.352,4.077,5.449,6.115,6.939,7.644,8.311,
        9.840,11.055,12.505,14.191,17.327,20.503,23.639,27.755,
  S(1)=3.765,6.422,7.433,9.992,12.799,13.815,15.802,17.685,
        18.552,18.823,18.384,17.130,14.969,10.887,6.881,3.904,2.163,0.125,
  P(1)=6.913,8.999,9.668,11.207,12.683,13.176,14.114,15.019,15.399,
        15.533,15.003,14.765,13.749,11.702,9.299,7.039,5.618,2.292,
  R(1)=1.176,1.490,1.568,1.803,1.999,2.097,2.156,2.176,2.215,2.215,
        2.195,2.156,2.078,1.901,1.470,1.039,0.627,0.078$
NACA-W-6-643-618
  $WGPLNF CHRDT=3.73,SSPNE=14.43,SSPN=16.70,CHRD=7.29,SAVSI=1.0,CHSTAT=0.25,
  TWISTA=0.0,DHDADI=8.5,DHDADO=0.0,TYPE=1.0$
NACA-H-6-631-012
  $HTPLNF CHRDT=2.51,SSPNE=6.19,SSPN=6.59,CHRD=5.02,SAVSI=6.0,CHSTAT=0.25,
  TWISTA=0.0,DHDADI=0.0,DHDADO=0.0,TYPE=1.0$
NACA-V-6-631-012
  $VTPLNF CHRDT=1.88,SSPNE=4.39,SSPN=5.02,CHRD=4.47,SAVSI=13.5,
  CHSTAT=.25,TYPE=1.0$
PLOT
TRIM
NEXT CASE
```


datcom3d Input File (datcom3d_navion.m)

```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% datcom3d NAVION Input File                                           %
% March 10, 2008                                                       %
% Works with Version datcom3d v1.1                                     %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

clear
clc
clf

%% VISUALIZATION and RESOLUTION %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
wframe = 1;                  %0 = Shaded model
                             %1 = Wireframe model

fusres = 20;                 %Fuselage resolution
wgres  = 20;                 %Wing,HT,VT resolution

%% (DO NOT CHANGE VALUES IN THIS BOX) %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
XW=0;ZW=0;ALIW=0;XH=0;ZH=0;ALIH=0;XV=0;YV=0;numVT=1;VERTUP=1;      %%
NX=0;X=zeros(20);S=zeros(20);R=zeros(20);ZU=zeros(20);ZL=zeros(20); %%
CHRDW_WG=0;CHRDWP_WG=0;CHRDTP_WG=0;SSPN_WG=0;SSPNOP_WG=0;SAVSI_WG=0; %%
SAVSO_WG=0;CHSTAT_WG=0;DHDADI_WG=0;DHDADO_WG=0;TC_WG=.12;          %%
CHRDW_HT=0;CHRDWP_HT=0;CHRDTP_HT=0;SSPN_HT=0;SSPNOP_HT=0;SAVSI_HT=0; %%
SAVSO_HT=0;CHSTAT_HT=0;DHDADI_HT=0;DHDADO_HT=0;TC_HT=.12;          %%
CHRDW_VT=0;CHRDWP_VT=0;CHRDTP_VT=0;SSPN_VT=0;SSPNOP_VT=0;SAVSI_VT=0; %%
SAVSO_VT=0;CHSTAT_VT=0;TC_VT=.12;                                   %%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

%% INPUT PARAMETERS BELOW %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

% SYNTHS parameters
XW = 5.80;
ZW = -2.12;
ALIW = 0.0;
XH = 21.64;
ZH = 0.5;
ALIH = 0.0;
XV = 23.21;
ZV = 0.0;

% BODY parameters
NX = 18;
X = [0.0,0.314,0.666,2.352,4.077,5.449,6.115,6.939,7.644,8.311,9.840,...
     11.055,12.505,14.191,17.327,20.503,23.639,27.755];
ZU = [1.019,1.372,1.490,1.764,2.038,2.078,2.509,2.979,3.136,3.215,...
     3.136,2.900,2.470,1.686,1.450,1.215,0.862,0.548];
ZL = [-1.019,-1.372,-1.490,-1.764,-2.038,-2.117,-2.156,-2.195,-2.195,...
     -2.195,-2.195,-2.156,-2.117,-1.960,-1.568,-1.176,-0.862,-0.392];
R = [1.176,1.490,1.568,1.803,1.999,2.097,2.156,2.176,2.215,2.215,2.195,...
     2.156,2.078,1.901,1.470,1.039,0.627,0.078];
S = [3.765,6.422,7.433,9.992,12.799,13.815,15.802,17.685,18.552,...
```

```

18.823,18.384,17.130,14.969,10.887,6.881,3.904,2.163,0.125];

% WING parameters
CHRDTP_WG = 3.73;
SSPNE_WG = 14.43;
SSPN_WG = 16.7;
CHRDW_WG = 7.29;
SAVSI_WG = 0.0;
CHSTAT_WG = .25;
TWISTA_WG = 0.0;
DHDADI_WG = 8.5;
DHDADO_WG = 0.0;
TC_WG = .18;

% HORIZONTAL TAIL parameters
CHRDTP_HT = 2.51;
SSPNE_HT = 6.19;
SSPN_HT = 6.59;
CHRDW_HT = 5.02;
SAVSI_HT = 6.0;
CHSTAT_HT = 0.25;
TWISTA_HT = 0.0;
DHDADI_HT = 0.0;
DHDADO_HT = 0.0;

% VERTICAL TAIL parameters
CHRDTP_VT = 1.88;
SSPNE_VT = 4.39;
SSPN_VT = 5.02;
CHRDW_VT = 4.47;
SAVSI_VT = 13.5;
CHSTAT_VT = .25;

%%% PLOTTING %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
warning off MATLAB:divideByZero
hold on

plotFuselage(NX,X,S,R,ZU,ZL,fusres)
plotWing(XW,ZW,ALIW,CHRDW_WG,CHRDWP_WG,CHRDTP_WG,SSPN_WG,SSPNOP_WG,SAVSI_WG,
SAVSO_WG,CHSTAT_WG,DHDADI_WG,DHDADO_WG,TC_WG,wgres)
plotHT(XH,ZH,ALIH,CHRDW_HT,CHRDWP_HT,CHRDTP_HT,SSPN_HT,SSPNOP_HT,SAVSI_HT,
SAVSO_HT,CHSTAT_HT,DHDADI_HT,DHDADO_HT,TC_HT,wgres)
plotVT(XV,YV,ZV,CHRDW_VT,CHRDWP_VT,CHRDTP_VT,SSPN_VT,SSPNOP_VT,SAVSI_VT,
SAVSO_VT,CHSTAT_VT,VERTUP,TC_VT,wgres)

%%% VIEWPORT/FIGURE PROPERTIES %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
if wframe == 0
    %colormap([1 .7 .1])      %Set a/c to gold
    colormap([0 0 1])        %Set a/c to blue
    shading interp            %Interpolated shading
    lighting gouraud          %Smooth airplane mesh
    %camlight right           %Apply a light source

    %Custom Lighting Options, Note:[X Y Z]
    light('Position',[1 -2 1],'Style','infinite');

```

```

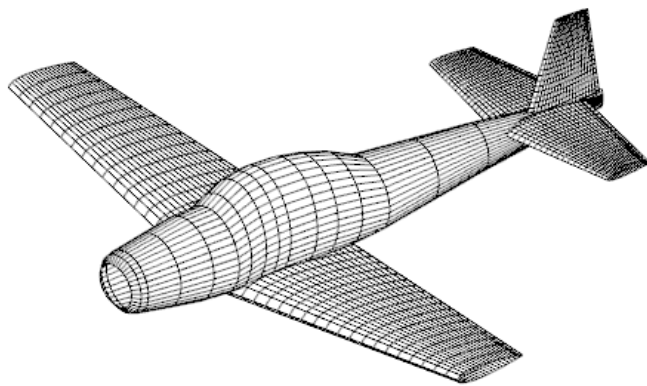
    light('Position',[1 2 1],'Style','infinite');
    light('Position',[0 0 -6],'Style','infinite');
else
    colormap([1 1 1])           %Set a/c to white
end

axis off                       %Turn off axis
axis equal                     %Correct aspect ratio
camva(4.5)                     %Zoom in a/c to fit figure
view(3)                        %Apply initial viewport rotation
%camproj('perspective')       %Perspective viewing (not R2006a compatible)
rotate3d on                    %Rotate icon enabled at start up

showplottool('plotbrowser')
set(gcf,'NumberTitle','off','Name','Aircraft Plot','Color',[1 1 1]);

```

Shaded and Wireframe Model



Wireframe model



Shaded Model

APPENDIX B: MiG-17 Example

- Digital DATCOM Input File
- Datcom3d Input File

Digital DATCOM Input File (for005.dat)

```
CASEID ----- MIKOYAN-GUREVICH MiG-17 -----
$FLTCON NMACH=1.0,MACH(1)=0.6,NALPHA=10.0,ALSCHD(1)=-4.0,-2.0,
  0.0,2.0,4.0,6.0,8.0,10.0,12.0,14.0,NALT=1.0,ALT(1)=5000.0,
  WT=13395.0,LOOP=1.$
$SYNTHS XCG=11.17,ZCG=0.0,XW=3.63,ZW=0.42,ALIW=1.0,XH=28.73,
  ZH=5.24,ALIH=0.0,XV=18.3,ZV=0.0,HINAX=29.85$
$OPTINS SREF=243.0$
$BODY NX=8.0,
  X(1)=0.0,0.74,8.35,13.14,19.35,24.41,28.41,30.77,
  S(1)=5.19,9.32,16.89,16.89,15.94,11.12,5.85,2.5$
NACA-W-6-66-012
$WGPLNF CHRDT=7.02,SSPNOP=11.32,SSPNE=13.41,SSPN=15.71,
  CHRDBP=8.4,CHDR=14.0,SAVSI=45.0,SAVSO=45.0,CHSTAT=0.25,
  TWISTA=0.0,DHDADI=-3.0,DHDADO=-3.0,TYPE=1.0$
NACA-H-6-66-009
$HTPLNF CHRDT=1.86,SSPNE=5.42,SSPN=5.43,CHDR=4.69,SAVSI=45.0,
  CHSTAT=0.25,TYPE=1.0$
NACA-V-6-66-009
$VTPLNF CHRDT=3.76,SSPNE=6.05,SSPN=8.18,CHDR=12.47,SAVSI=55.0,
  CHSTAT=0.25,TYPE=1.0$
DIM FT
BUILD
TRIM
NEXT CASE
```

datcom3d Input File (datcom3d_mig17.m)

```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% datcom3d MIG-17 Input File                                           %
% March 10, 2008                                                         %
% Works with Version datcom3d v1.1                                       %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

clear
clc
clf

%% VISUALIZATION and RESOLUTION %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
wframe = 1;                    %0 = Shaded model
                                %1 = Wireframe model

fusres = 20;                   %Fuselage resolution
wgres  = 20;                   %Wing,HT,VT resolution

%% (DO NOT CHANGE VALUES IN THIS BOX) %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
XW=0;ZW=0;ALIW=0;XH=0;ZH=0;ALIH=0;XV=0;YV=0;numVT=1;VERTUP=1;          %%
NX=0;X=zeros(20);S=zeros(20);R=zeros(20);ZU=zeros(20);ZL=zeros(20);    %%
CHRDW_WG=0;CHRDWP_WG=0;CHRDTP_WG=0;SSPN_WG=0;SSPNOP_WG=0;SAVSI_WG=0;    %%
SAVSO_WG=0;CHSTAT_WG=0;DHDADI_WG=0;DHDADO_WG=0;TC_WG=.12;              %%
CHRDW_HT=0;CHRDWP_HT=0;CHRDTP_HT=0;SSPN_HT=0;SSPNOP_HT=0;SAVSI_HT=0;    %%
SAVSO_HT=0;CHSTAT_HT=0;DHDADI_HT=0;DHDADO_HT=0;TC_HT=.12;              %%
CHRDW_VT=0;CHRDWP_VT=0;CHRDTP_VT=0;SSPN_VT=0;SSPNOP_VT=0;SAVSI_VT=0;  %%
SAVSO_VT=0;CHSTAT_VT=0;TC_VT=.12;                                       %%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

%% INPUT PARAMETERS BELOW %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

% SYNTHS parameters
XW = 3.63;
ZW = 0.42;
ALIW = 1.0;
XH = 28.73;
ZH = 5.24;
ALIH = 0.0;
XV = 18.3;
ZV = 0.0;

% BODY parameters
NX = 8;
X = [0.0,0.74,8.35,13.14,19.35,24.41,28.41,30.77];
S = [5.19,9.32,16.89,16.89,15.94,11.12,5.85,2.5];

% WING parameters
CHRDTP_WG = 7.02;
SSPNOP_WG = 11.32;
SSPNE_WG = 13.41;
SSPN_WG = 15.71;
CHRDWP_WG = 8.4;
```

```

CHRDR_WG = 14.0;
SAVSI_WG = 45.0;
SAVSO_WG= 45.0;
CHSTAT_WG = .25;
TWISTA_WG = 0.0;
DHDADI_WG = -3.0;
DHDADO_WG = -3.0;

% HORIZONTAL TAIL parameters
CHRDTP_HT = 1.86;
SSPNE_HT = 5.42;
SSPN_HT = 5.43;
CHRDR_HT = 4.69;
SAVSI_HT = 45.0;
CHSTAT_HT = .25;
DHDADI_HT = 0.0;

% VERTICAL TAIL parameters
CHRDTP_VT = 3.76;
SSPNE_VT = 6.05;
SSPN_VT = 8.18;
CHRDR_VT = 12.47;
SAVSI_VT = 55.0;
CHSTAT_VT = .25;

%%% PLOTTING %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
warning off MATLAB:divideByZero
hold on

plotFuselage(NX,X,S,R,ZU,ZL,fusres)
plotWing(XW,ZW,ALIW,CHRDR_WG,CHRDBP_WG,CHRDTP_WG,SSPN_WG,SSPNOP_WG,SAVSI_WG,
SAVSO_WG,CHSTAT_WG,DHDADI_WG,DHDADO_WG,TC_WG,wgres)
plotHT(XH,ZH,ALIH,CHRDR_HT,CHRDBP_HT,CHRDTP_HT,SSPN_HT,SSPNOP_HT,SAVSI_HT,
SAVSO_HT,CHSTAT_HT,DHDADI_HT,DHDADO_HT,TC_HT,wgres)
plotVT(XV,YV,ZV,CHRDR_VT,CHRDBP_VT,CHRDTP_VT,SSPN_VT,SSPNOP_VT,SAVSI_VT,
SAVSO_VT,CHSTAT_VT,VERTUP,TC_VT,wgres)

%%% VIEWPORT/FIGURE PROPERTIES %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
if wframe == 0
    %colormap([.1 .1 .1])      %Set a/c to gold
    colormap([0 0 1])          %Set a/c to blue
    shading interp              %Interpolated shading
    lighting gouraud            %Smooth airplane mesh
    %camlight right             %Apply a light source

    %Custom Lighting Options, Note:[X Y Z]
    light('Position',[2 -2 1],'Style','infinite');
    light('Position',[2 2 1],'Style','infinite');
    light('Position',[0 0 -6],'Style','infinite');
else
    colormap([1 1 1])          %Set a/c to white
end

axis off                      %Turn off axis
axis equal                    %Correct aspect ratio

```

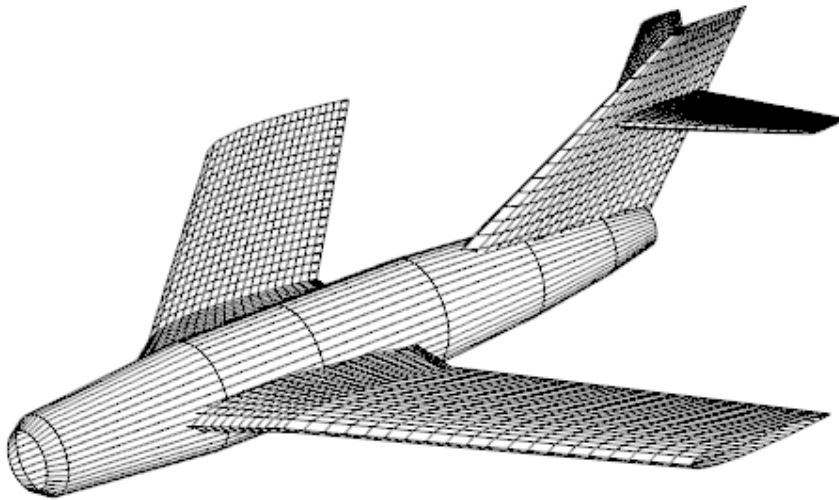
```

camva(5.5)                                %Zoom in a/c to fit figure
view(3)                                    %Apply initial viewport rotation
%camproj('perspective')                    %Perspective viewing (not R2006a compatible)
%rotate3d on                               %Rotate icon enabled at start up

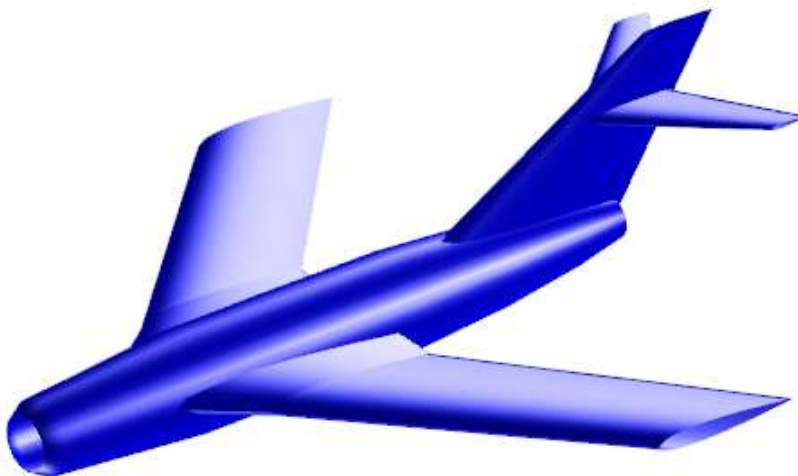
showplottool('plotbrowser')               %Enable the plot browser on startup
set(gcf,'NumberTitle','off','Name','Aircraft Plot','Color',[1 1 1]);

```

Shaded and Wireframe Model



Wireframe Model



Shaded Model