



# **High Resolution Bathymetry and Fly-Through Visualization**

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Corps of Engineers**



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# Why Visualize?



- See scour and accretion patterns
- See structures
- Determine hazards
- Examine habitat
- Differentiate bottom type (hard vs. soft)
- Added value to survey
- View surveys in unprecedented details from virtually any angle

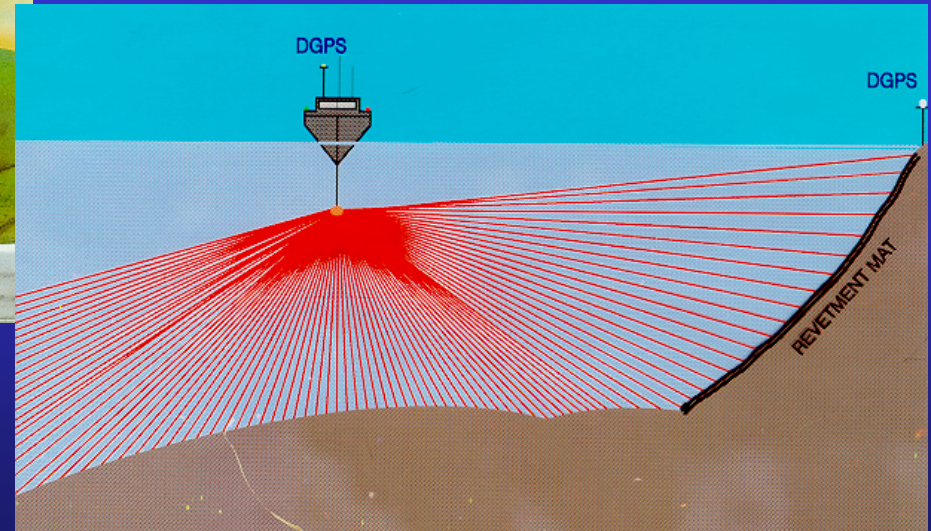


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# Bathymetry



- The measurement of depths of a body of water



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# Bathymetric Data Collection



- Data is collected in an X Y Z format
- Produces a copious amount of data points
- Several million points per river mile
- 1 million dimes placed end to end would stretch over 11 miles!
- 1 million dimes stacked on top of each other would be over 1/2 mile tall!



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# St. Louis District's High Resolution Surveying Vessels



M/V Boyer  
Multi-beam

M/V Simpson  
Multi-transducer

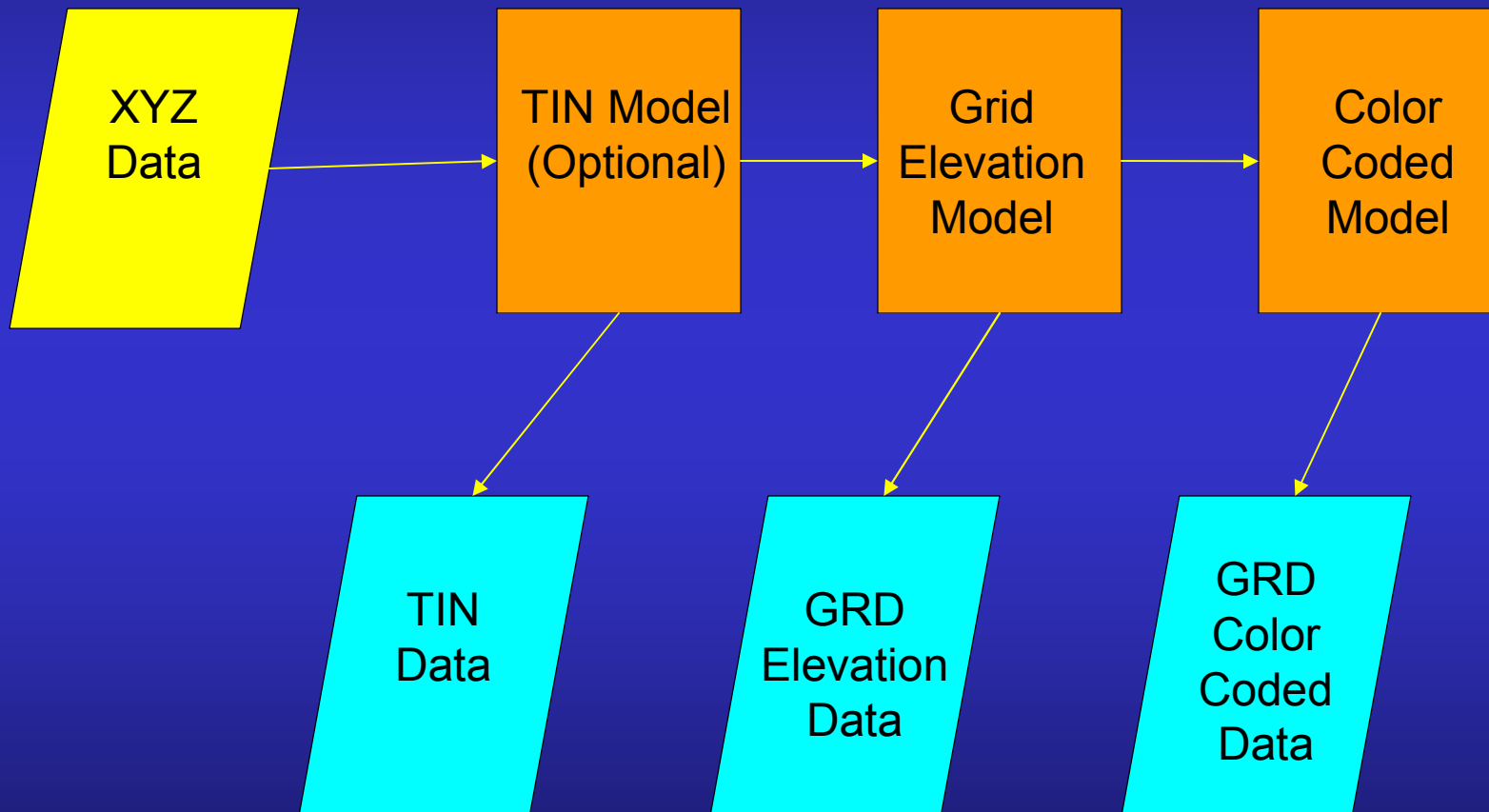


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# Bathymetric Modeling

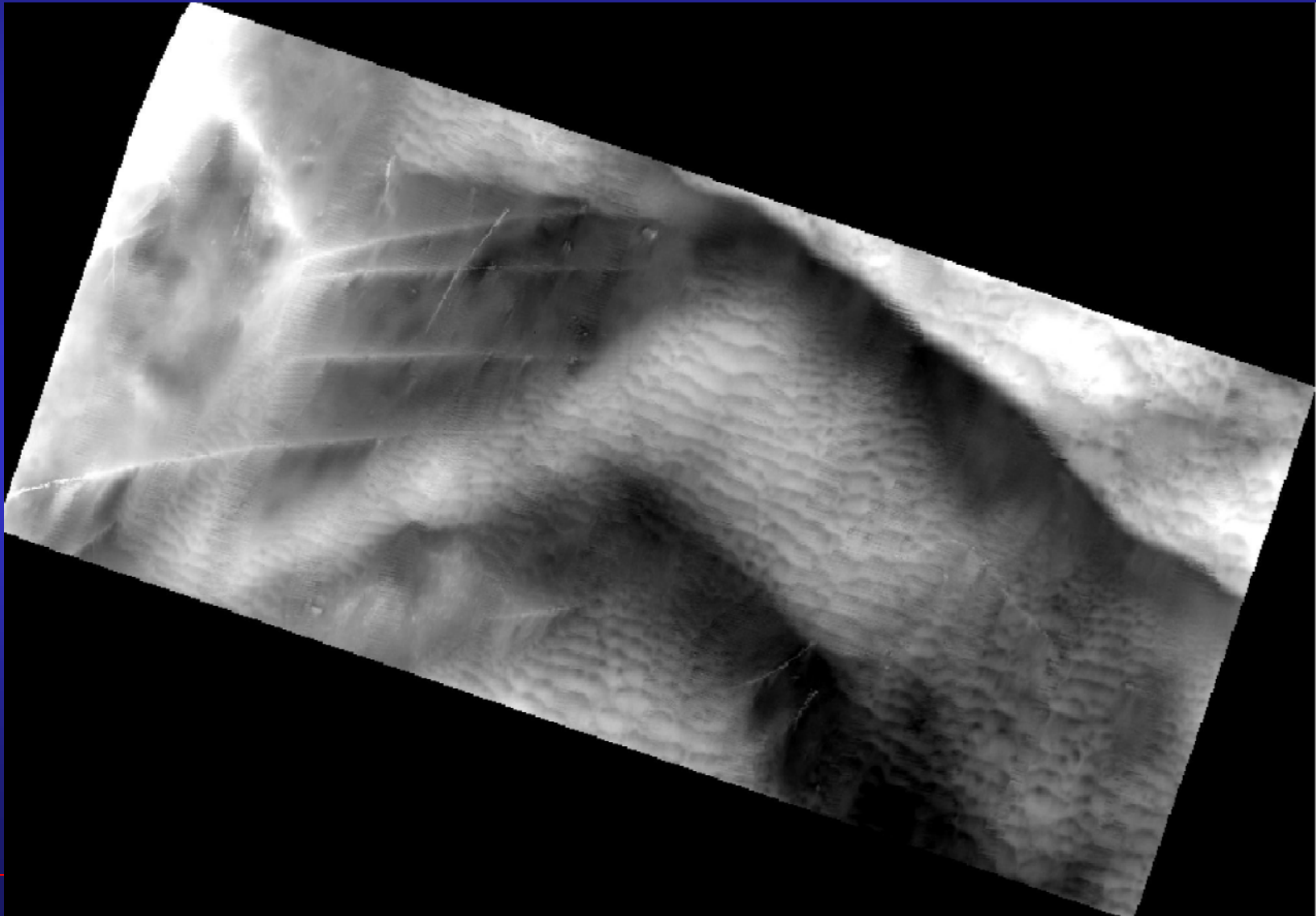


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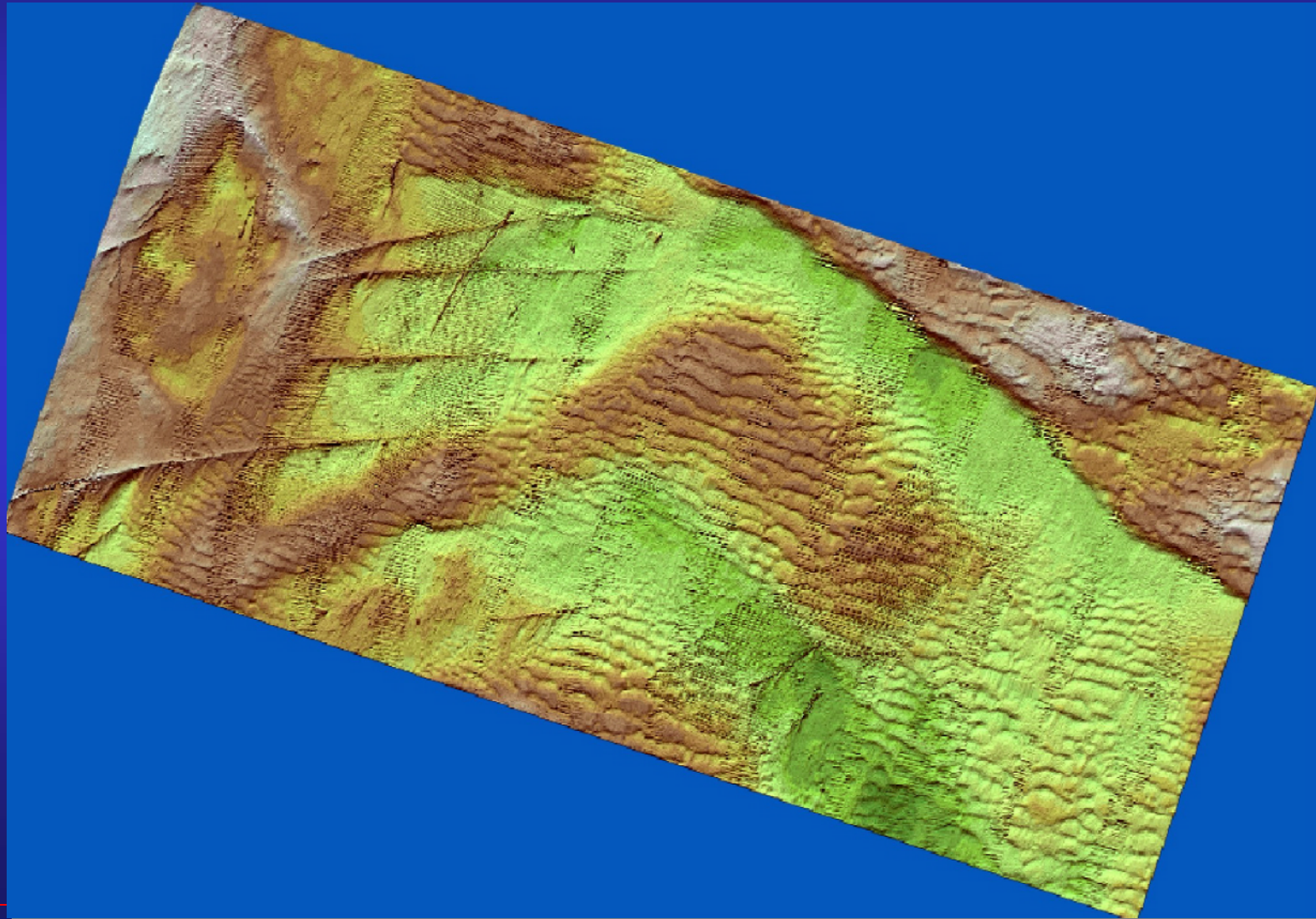
# Grid Model





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# Color Coded Model







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# Methods for Visualization



- **Static Fly Through**
- **Interactive**

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# Visualization Workflow



- Setup the scene
- Setup up the flight
- Record the flight



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# Scene Properties



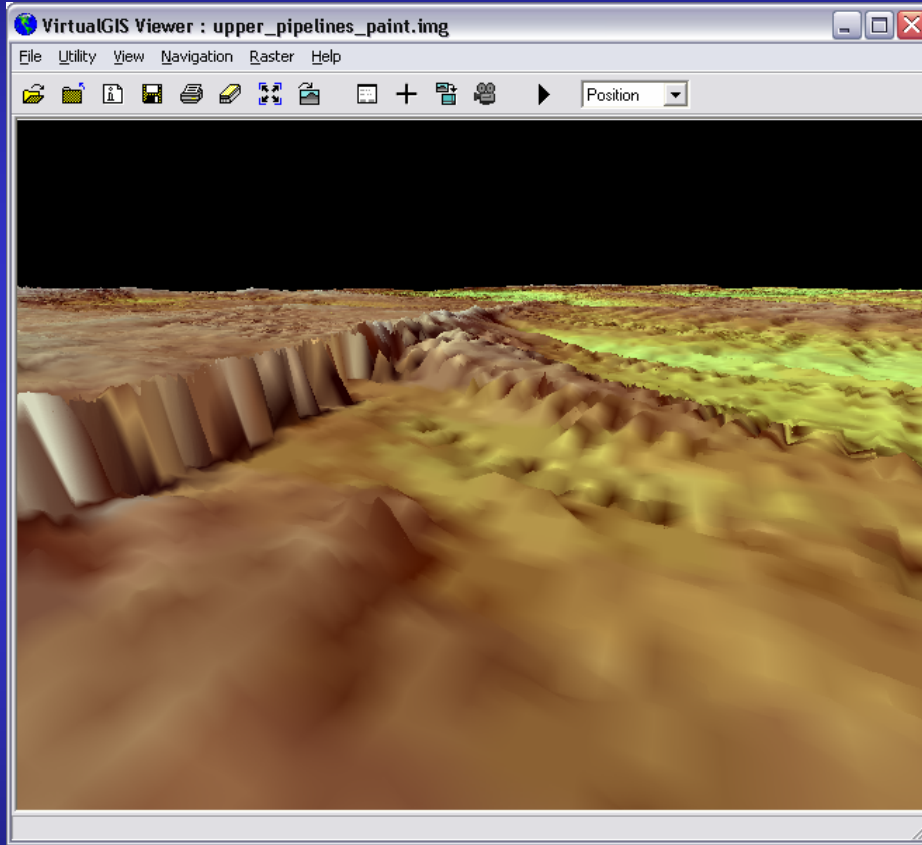
- **Vertical Exaggeration**
- **Sun Elevation**
- **Sun Azimuth**



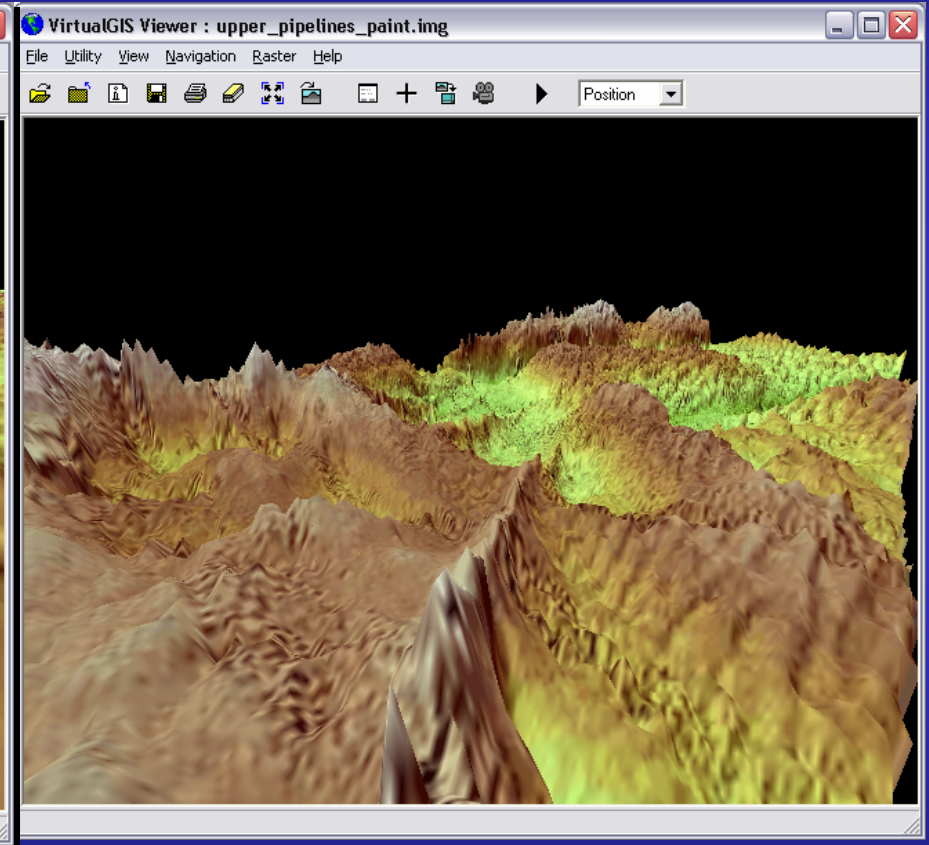
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# Scene Properties

## Vertical Exaggeration



Normal



10x Exaggeration

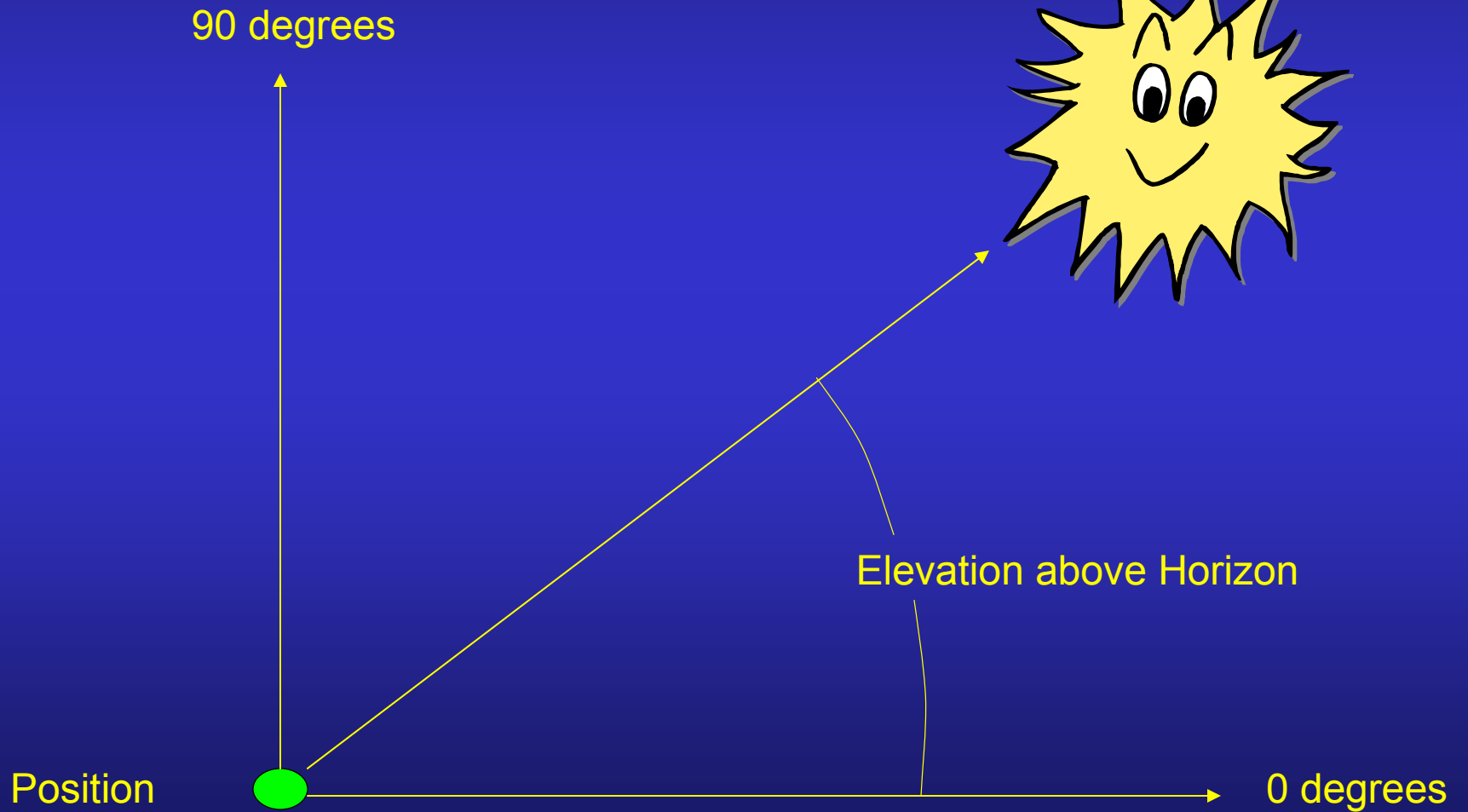
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# Scene Properties

## Sun Positioning – Elevation



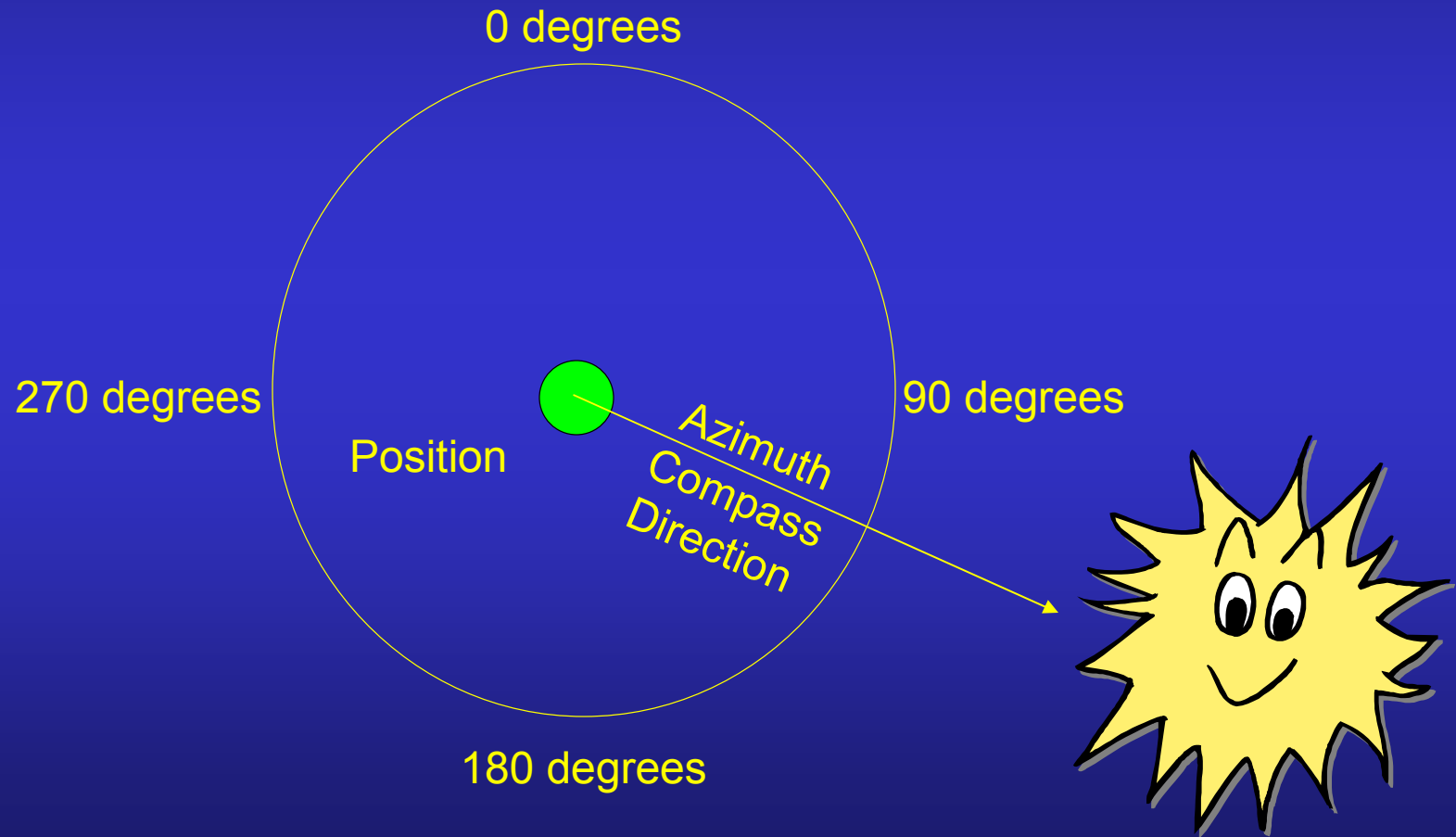
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# Scene Properties

## Sun Positioning – Azimuth



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# Flight Properties



- Flight Path
- ASL & AGL
- Look Azimuth
- Look Pitch
- Field of View
- Roll
- Speed



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# Flight Properties Flight Path



Flight Path Editor

File Edit Utility Flight Help

1 2 3 4 5 6 7

Point #	X	Y
1	566966.512	979556.998
2	567182.432	979646.491
3	567294.653	979680.584
4	567350.053	979683.425
5	567389.828	979664.958
6	567428.182	979625.183
7	567490.685	979535.690
8		

Key in X Y Coordinates

Viewer #2 : upper\_pipelines\_paint.img (:Layer\_3)(:Layer\_2)(:L...

File Utility View AOI Raster Help

Digitize

Digitize

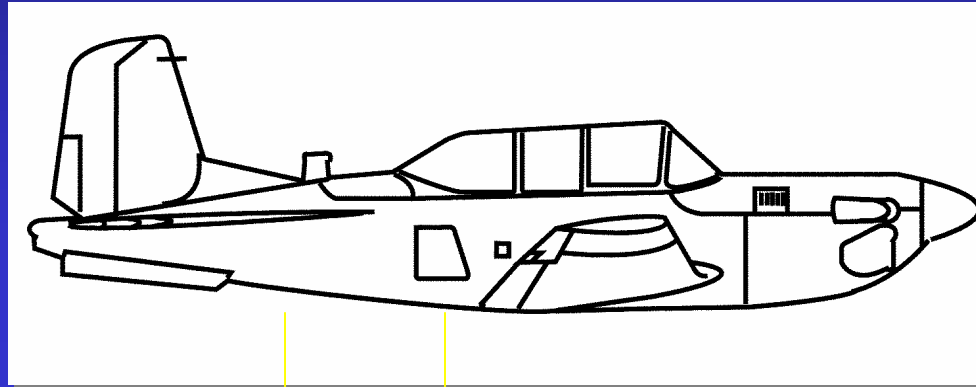
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# Flight Properties ASL & AGL



Elevation  
Above Sea  
Level

Elevation  
Above Ground  
Level

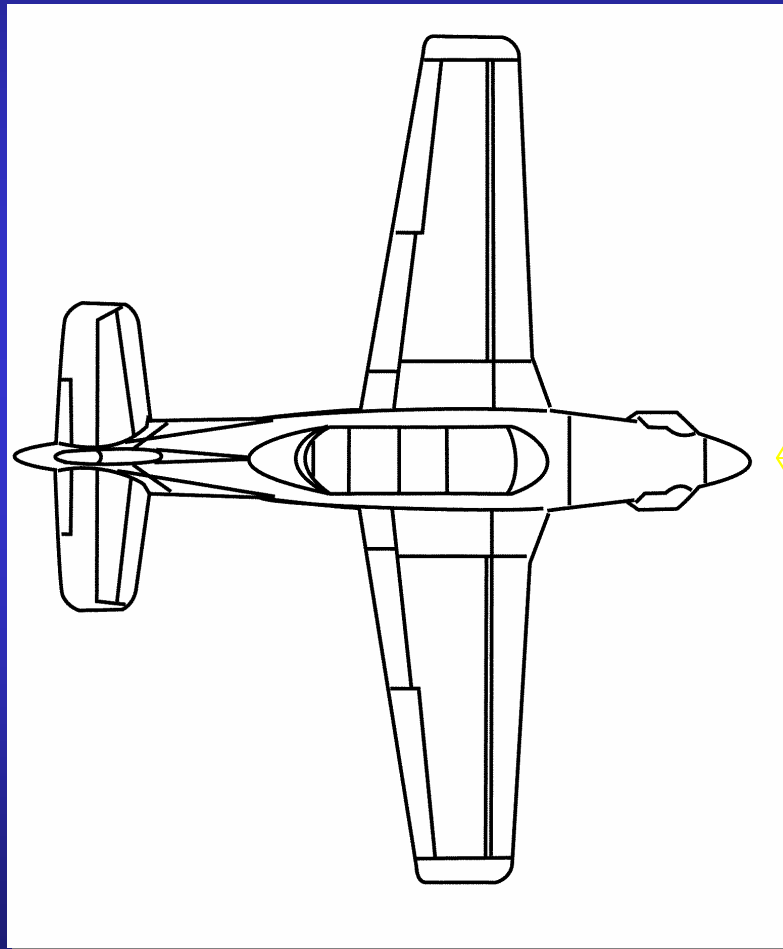
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# Flight Properties

## Look Azimuth



- degrees

0 degrees

+ degrees

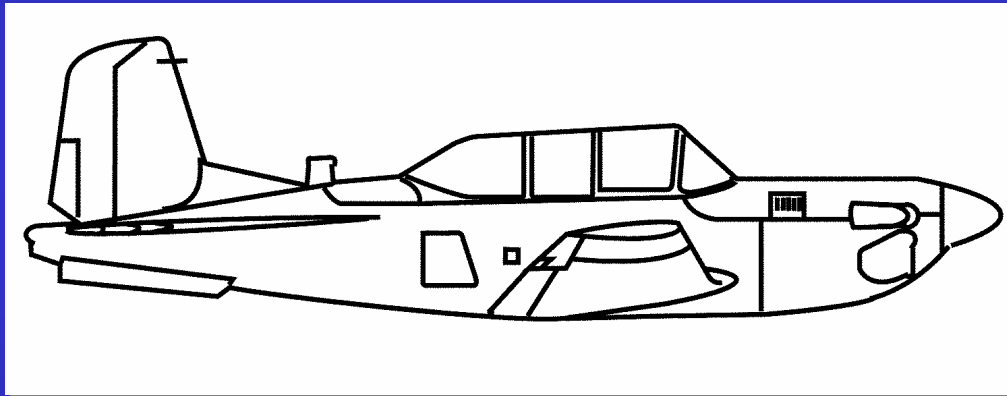
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# Flight Properties

## Look Pitch



+ degrees

0 degrees

- degrees

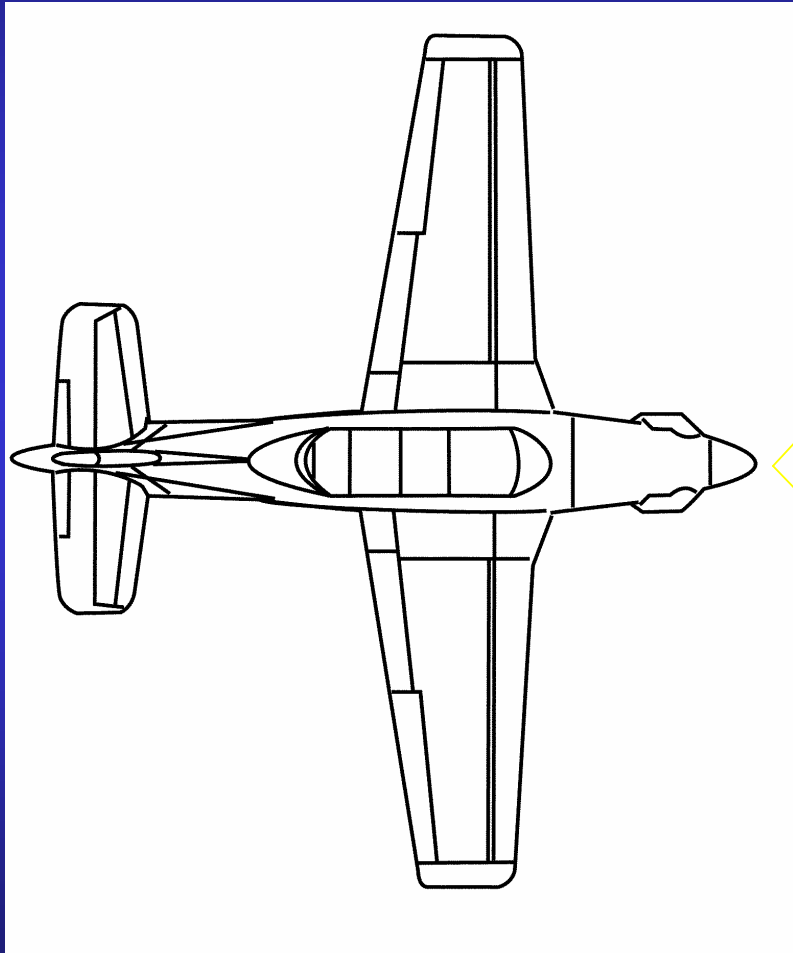
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# Flight Properties

## Field of View



Total Angle in degrees

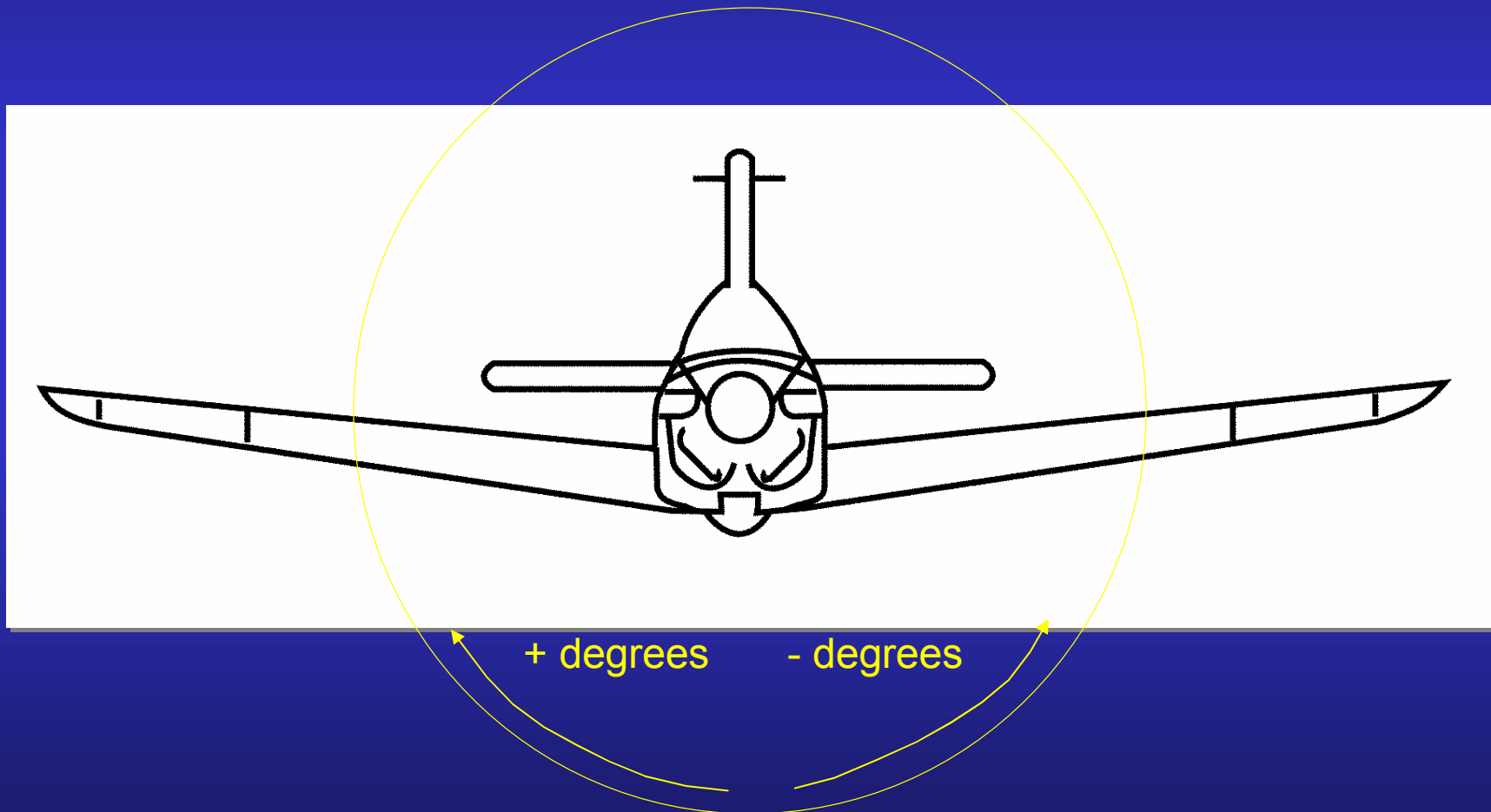
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# Flight Properties

## Roll

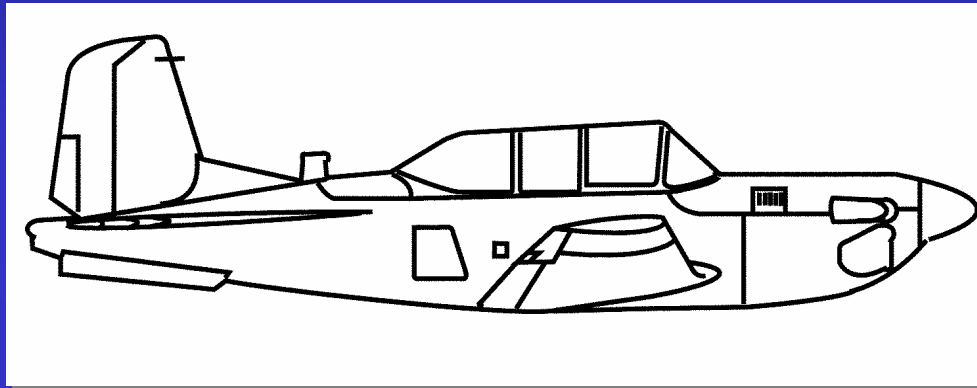


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# Flight Properties Speed



Motion

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# Completed Flight Properties



Flight Path Editor

File Edit Utility Flight Help

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Point #	X	Y	ASL	AGL	Look Azimuth	Look Pitch	FOV	Roll	Speed
1	2197868.8371	282214.014	645.00	20.63	60.00	-35.00	90.00	0.00	0.30
2	2197888.128	281911.788	645.00	25.63	60.00	-35.00	90.00	0.00	0.30
3	2197894.558	281812.117	645.00	25.42	60.00	-35.00	90.00	0.00	0.30
4	2197904.204	281670.650	645.00	21.20	60.00	-35.00	90.00	0.00	0.30
5	2197910.634	281574.195	645.00	17.09	60.00	-35.00	90.00	0.00	0.30
6	2197923.495	281464.879	645.00	16.81	60.00	-35.00	90.00	0.00	0.30
7	2197933.141	281352.348	645.00	14.72	60.00	-35.00	90.00	0.00	0.30
8	2197946.001	281249.462	645.00	17.05	60.00	-35.00	90.00	0.00	0.30
9	2197949.216	281156.222	645.00	17.69	60.00	-35.00	90.00	0.00	0.30
10	2197949.216	281069.412	645.00	16.66	60.00	-35.00	90.00	0.00	0.30
11	2197936.356	280989.033	645.00	15.76	60.00	-35.00	90.00	0.00	0.30
12	2197884.913	280960.096	645.00	15.82	60.00	-35.00	90.00	0.00	0.30
13	2197823.825	280982.602	645.00	15.63	60.00	-35.00	90.00	0.00	0.30
14	2197759.521	281072.627	645.00	14.91	90.00	-35.00	90.00	0.00	0.30
15	2197749.876	281143.361	645.00	17.90	60.00	-35.00	90.00	0.00	0.30
16	2197743.445	281249.462	645.00	19.15	60.00	-35.00	90.00	0.00	0.30
17	2197733.800	281358.778	645.00	14.89	60.00	-35.00	90.00	0.00	0.30
18	2197720.939	281458.448	645.00	18.91	60.00	-35.00	90.00	0.00	0.30
19	2197708.078	281596.701	645.00	16.46	60.00	-35.00	90.00	0.00	0.30
20	2197701.648	281696.371	645.00	18.30	60.00	-35.00	90.00	0.00	0.30
21	2197688.787	281824.978	645.00	27.68	60.00	-35.00	90.00	0.00	0.30
22	2197692.002	281915.003	645.00	25.94	60.00	-35.00	90.00	0.00	0.30
23	2197692.002	282133.635	645.00	24.98	150.00	-60.00	90.00	0.00	0.30
24									

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23

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# Recording a Flight



- **Set the output movie type i.e. mpg or avi**
- **Set the output file**
- **Begin the flight**





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# Anaglyph



- A moving or still picture consisting of two slightly different perspectives of the same subject in contrasting colors that are superimposed on each other, producing a three dimensional effect when viewed through two correspondingly colored filters.



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# Anaglyphs are Child's Play





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**Warning: Some  
visualizations may make  
you dizzy or cause  
headaches and nausea**



If you experience symptoms, please remove your  
anaglyph glasses and close your eyes

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# Anaglyph Test

Can you see 3D?

**Hint: The top coin  
should be floating above  
the bottom coin**







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# Learning to Fly

## *The Movie*

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# Questions??



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# Contact Information



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