Houdini
Light, Shade, Render

M11: Camera Objects
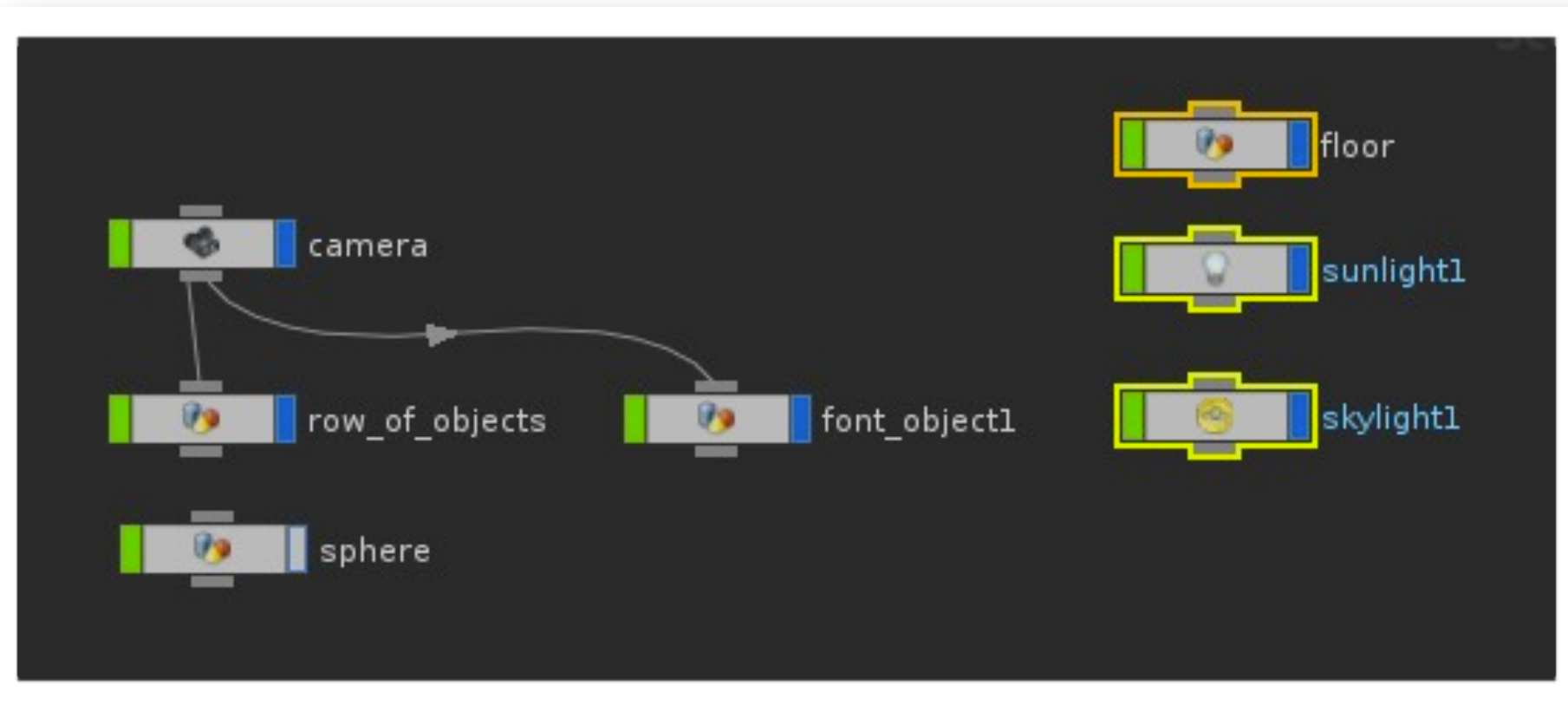
Ari Danesh
ari@sidefx.com

SIDE EFFECTS
SOFTWARE

- ▸ Depth of Field
- ▸ Motion Blur
  - ▸ Object Motion Blur
  - ▸ Deformed Geometry Motion Blur
  - ▸ Velocity Vector Based Motion Blur
  - ▸ Per Object Based Motion Blur
- ▸ Background Images in Viewport
- ▸ Deep Camera Maps as Background Images
- ▸ Camera Controls
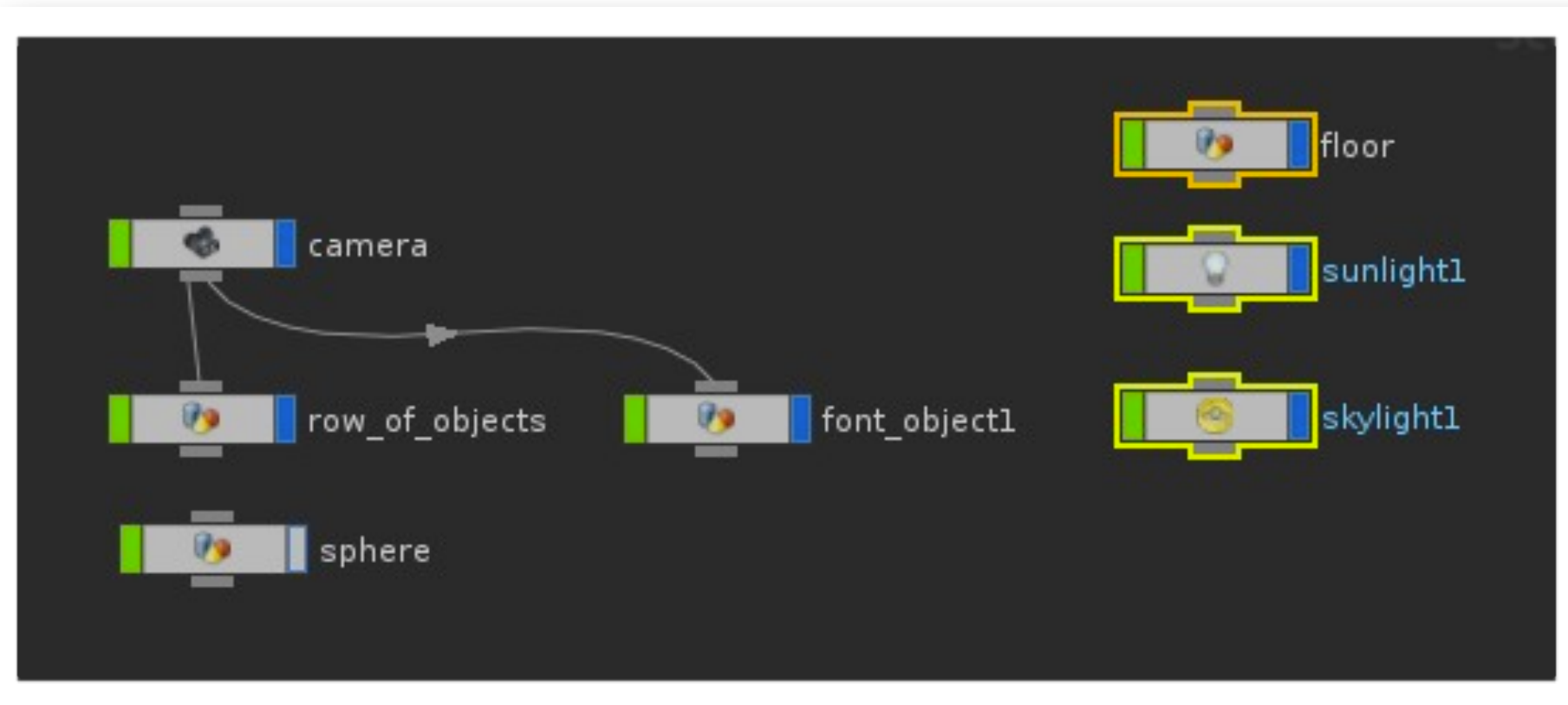- ▸ Constraints
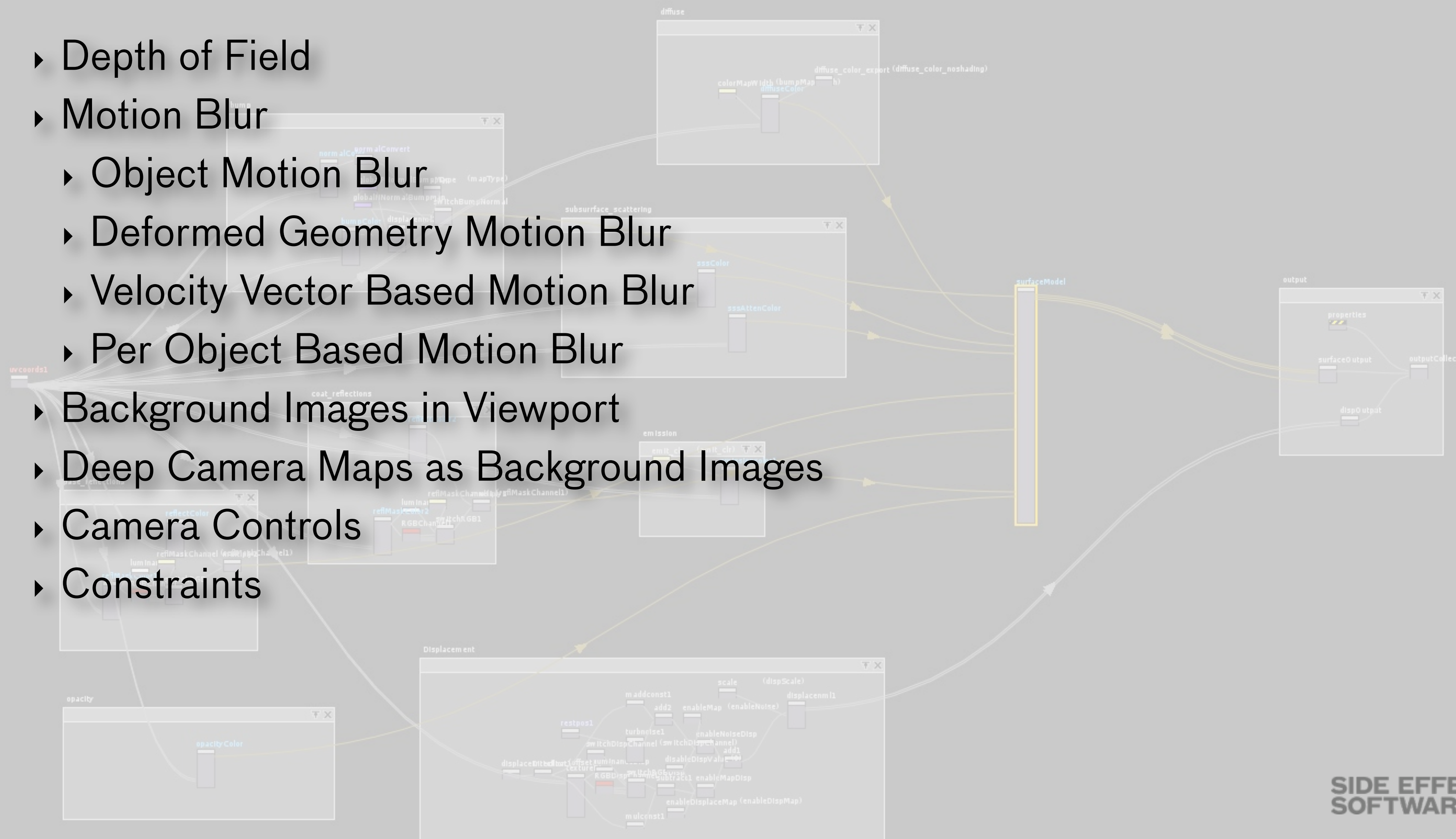
SIDE EFFECTS
SOFTWARE

Depth of Field Setup

- ‣ Drop down a sphere or tube
  - ‣ If tube make into a cone
- ‣ Drop down a Geometry
  - ‣ Dive into the Geometry
  - ‣ Delete the File SOP
  - ‣ Drop down an Object Merge
  - ‣ Link the Sphere or Cone to the Object Merge
  - ‣ Append a COPY SOP
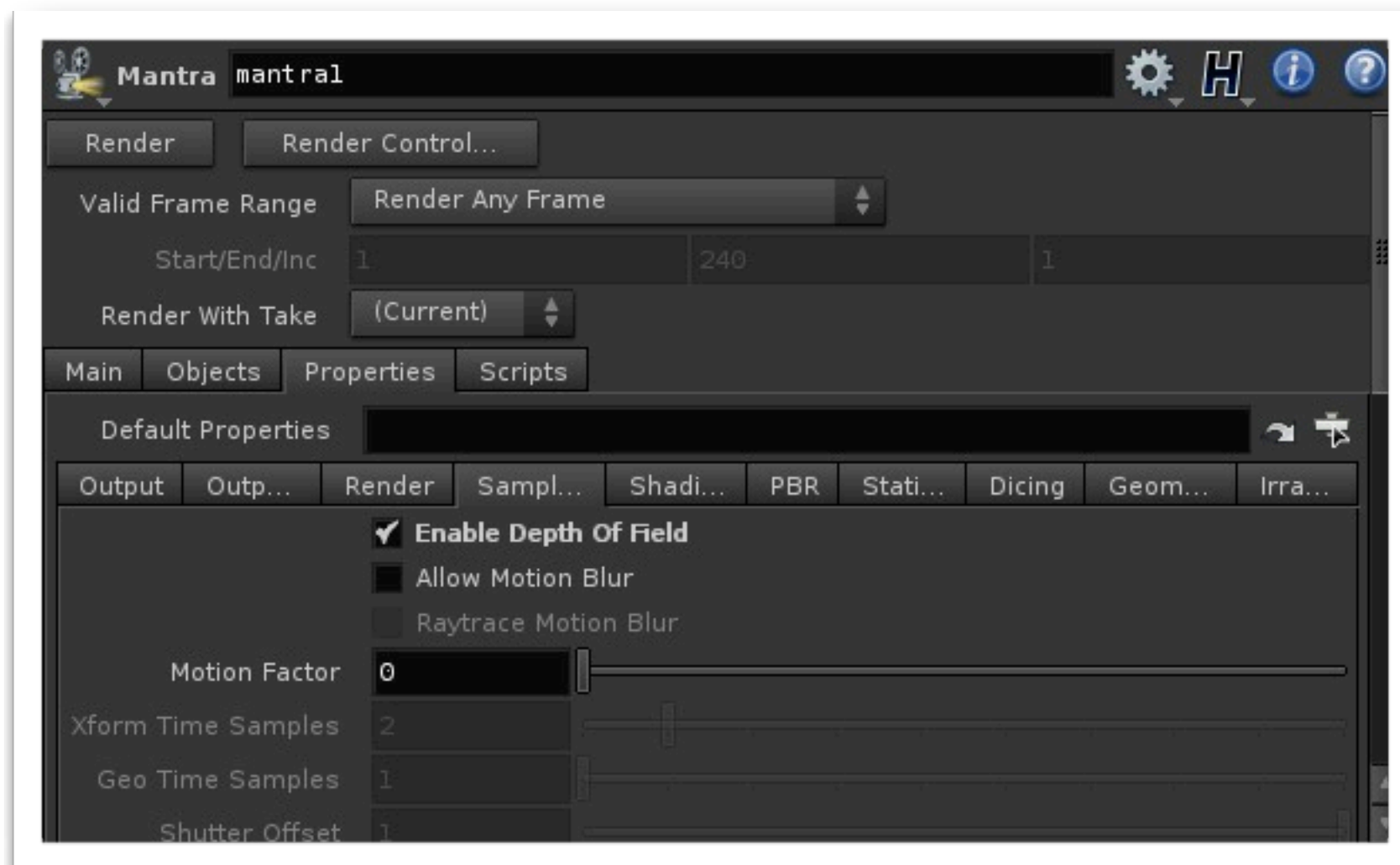   - ‣ Number of Copies - 15
    - ‣ Translate Z - -$SIZEZ

SIDE EFFECTS SOFTWARE
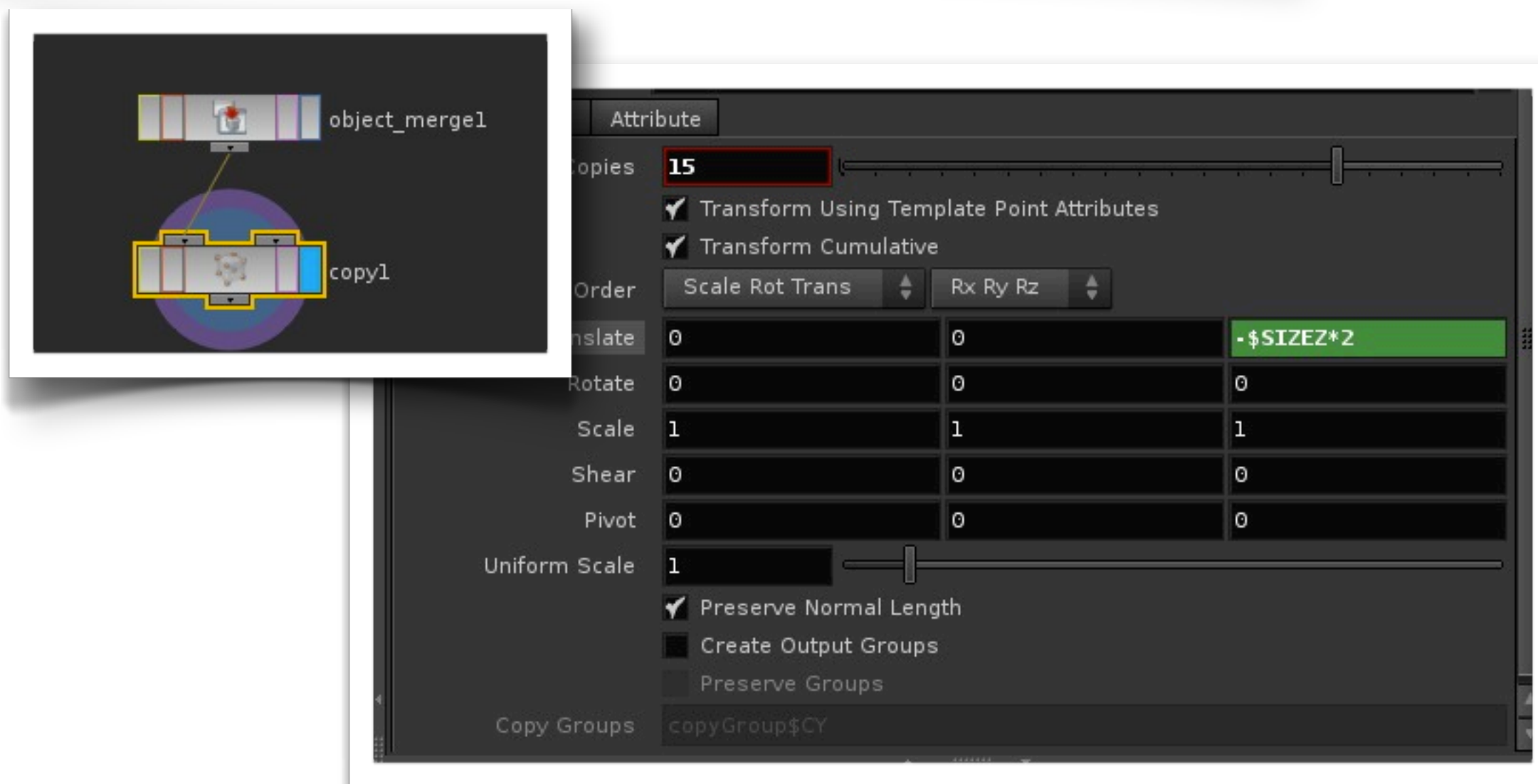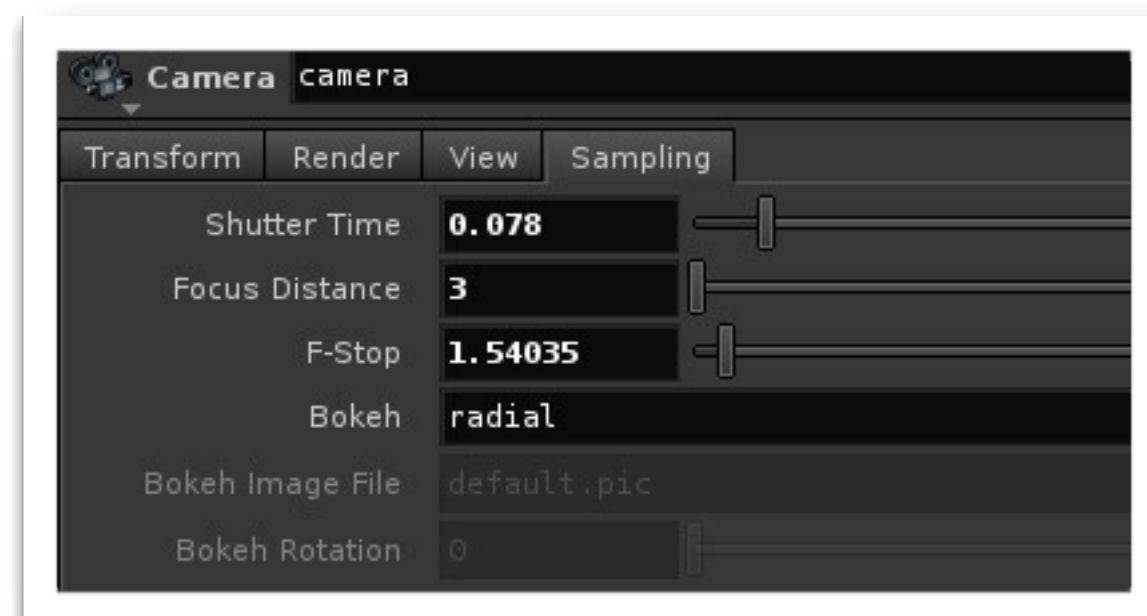
Depth of Field Setup (cont.)

- ‣ Back at object level
- ‣ Add a grid large enough to contain row of objects
- ‣ Drop down a camera
  - ‣ Parent row of objects to camera
    - ‣ Select "Keep Position When Parenting"
- ‣ Add a Skylight
  - ‣ Increase Sampling Quality for both lights to 30.
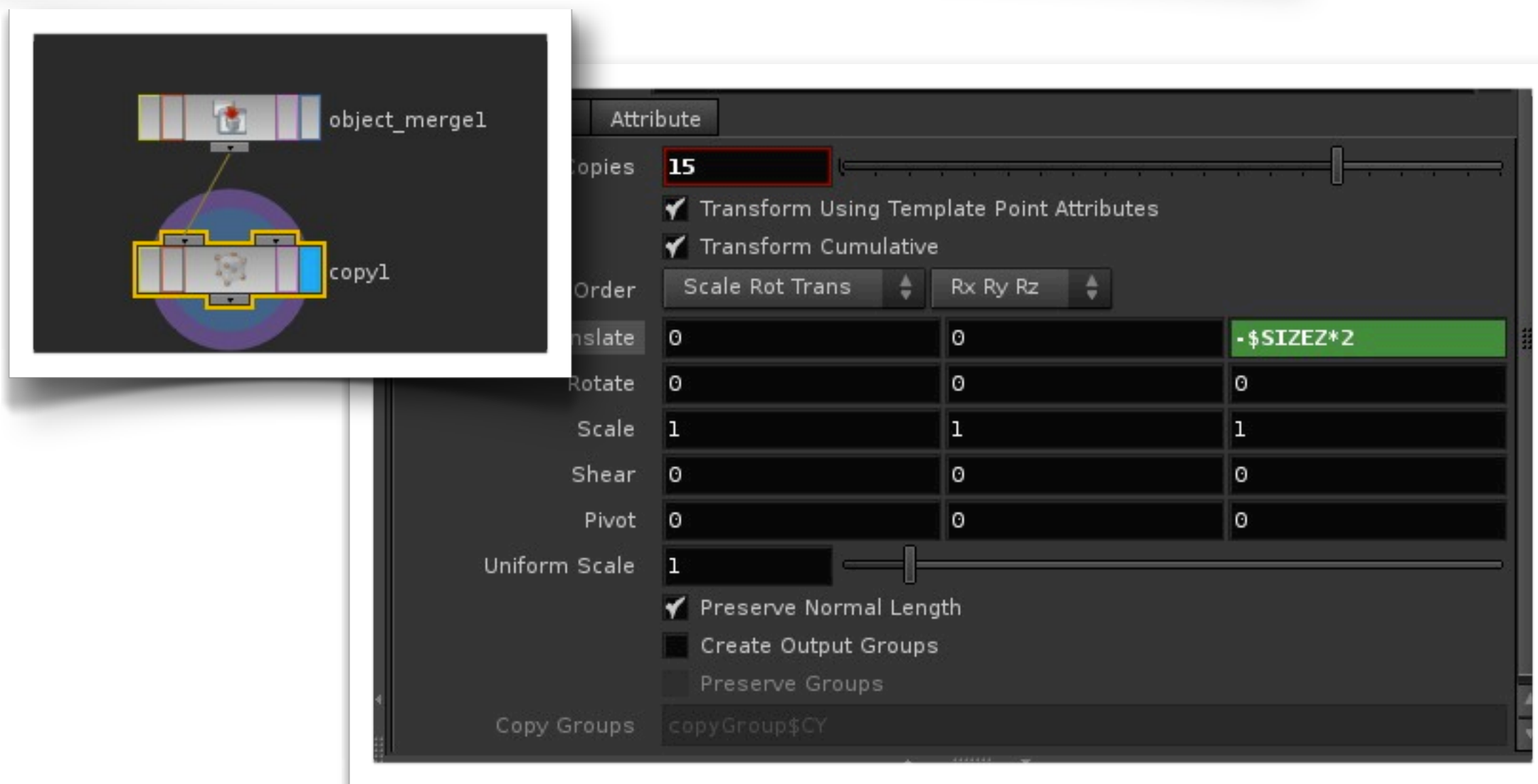
Depth of Field

- ‣ To turn on Depth of Field you must add a Render Driver.

- ‣ In the out context drop down a Mantra node. I used a Ray Trace but it does not matter.

- ‣ In the Properties-->Sampling Tab

  - ‣ Select - Enable Depth of Field

- ‣ Back at the obj/Camera Level

  - ‣ Shutter time has no effect on DOF

  - ‣ Focus Distance the distance in Houdini units from the camera that is in focus

 - ‣ F-Stop - The small the number the greater the blur

SIDE EFFECTS
SOFTWARE

for Depth of Field...
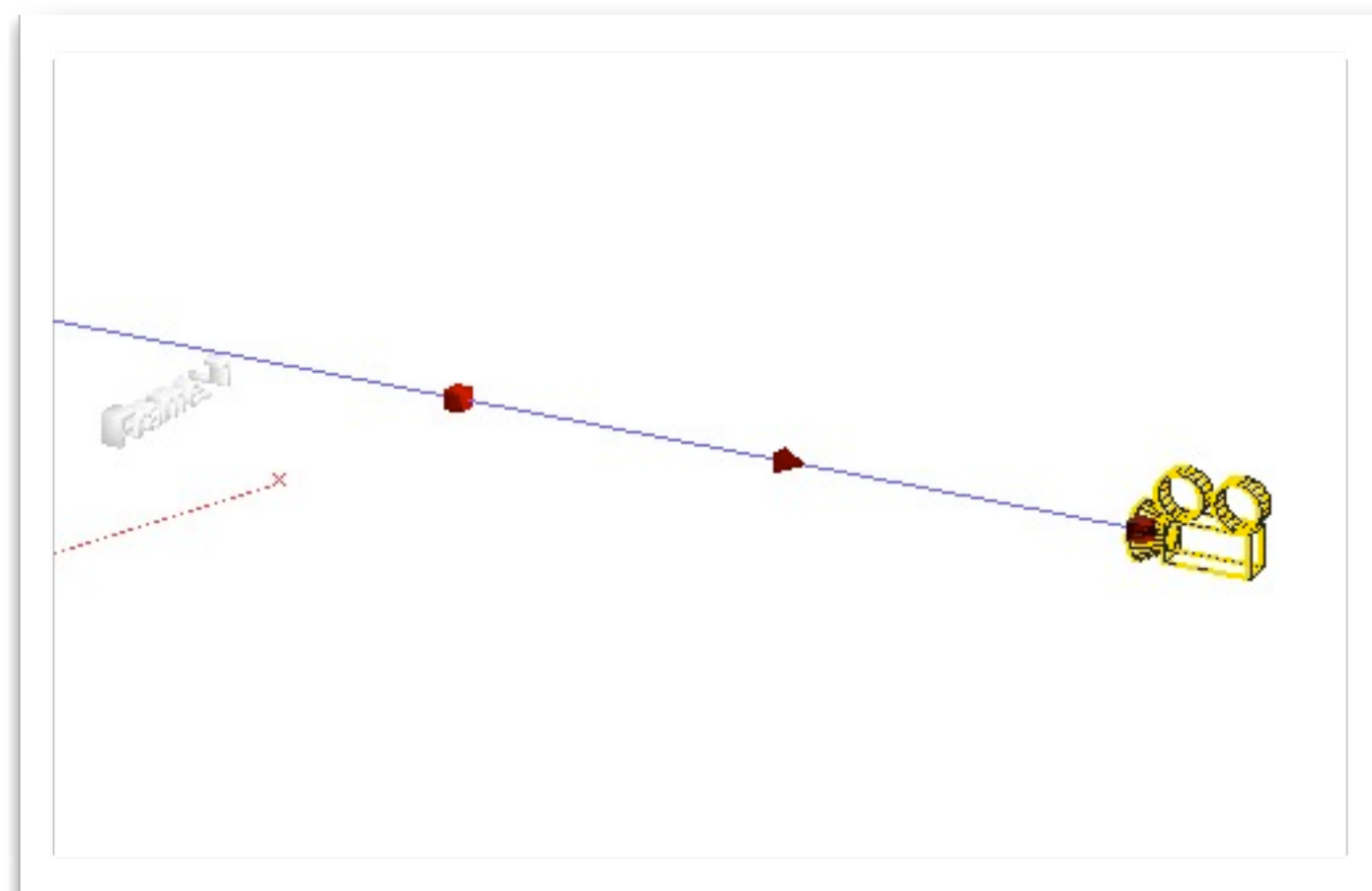
‣ Select the camera object in the Scene View

  ‣ Right Click on the icon

  ‣ Select - Focus Handle "Z"

   ‣ Middle box controls Distance

    ‣ End Arrows control F-Stop

- In the Mantra Node under Properties -> Sampling

- The more the object is in motion/blurred

  - Texture Sampling will be done les

- You can buy back some render time that you increased with increasing pixel samples by increasing Motion Factor
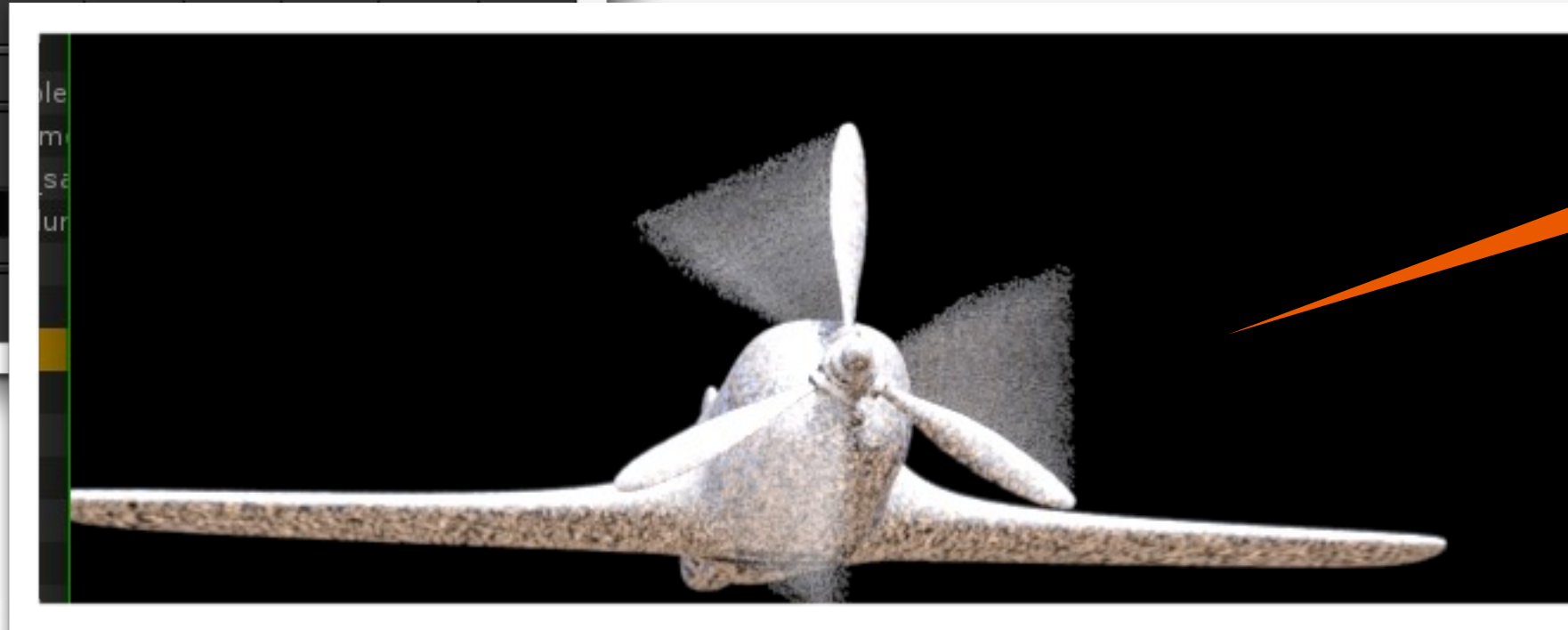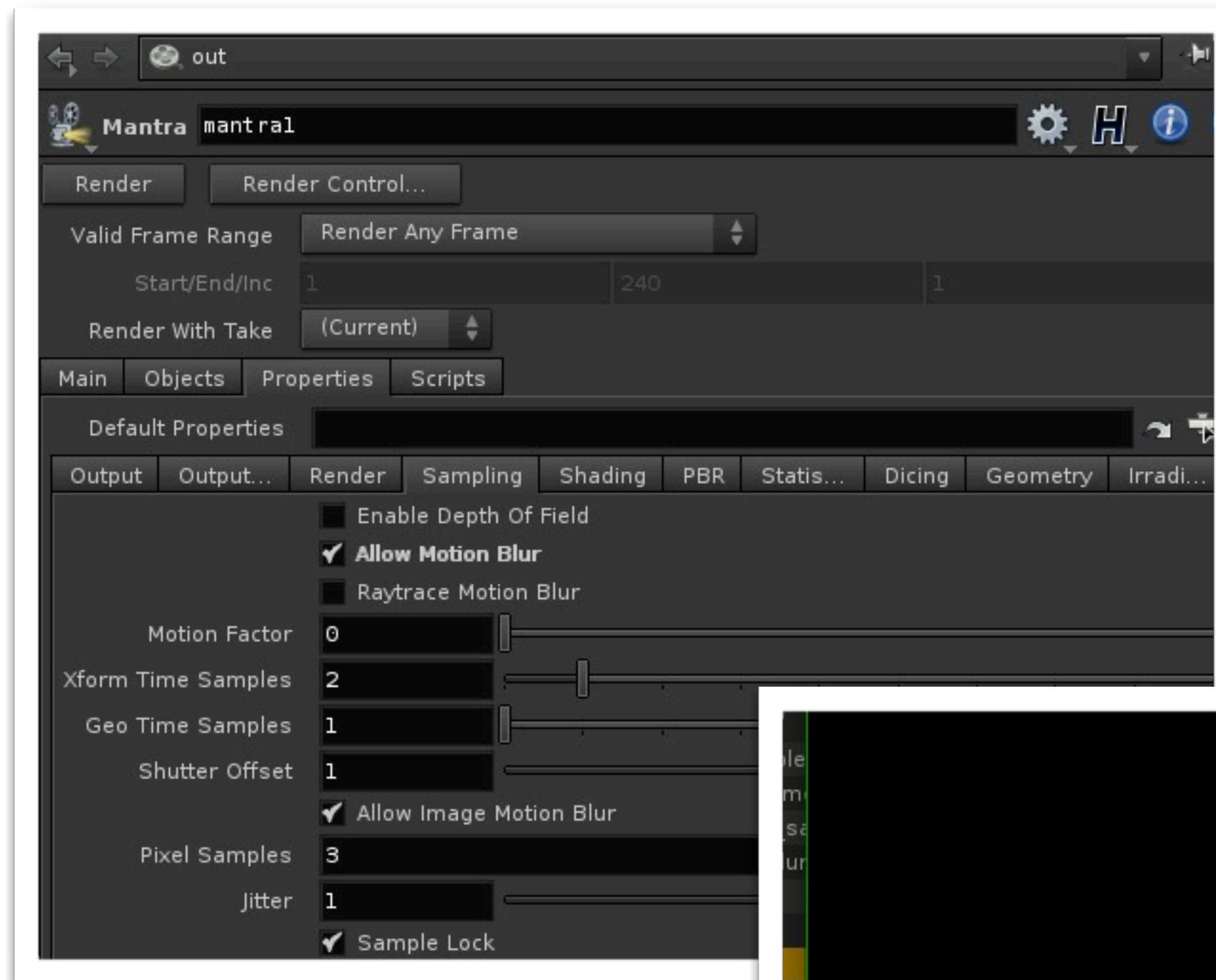
- Works on all render engines
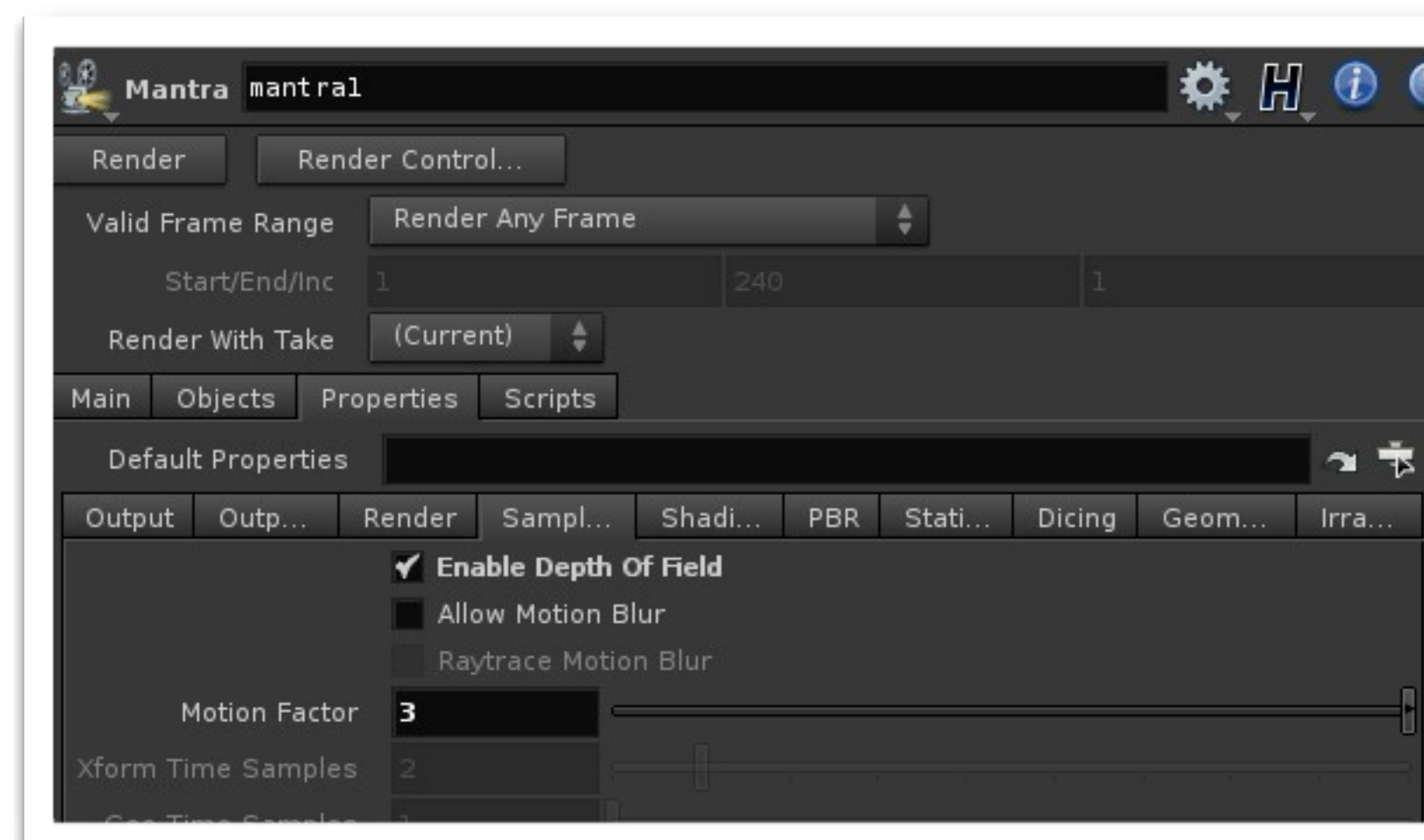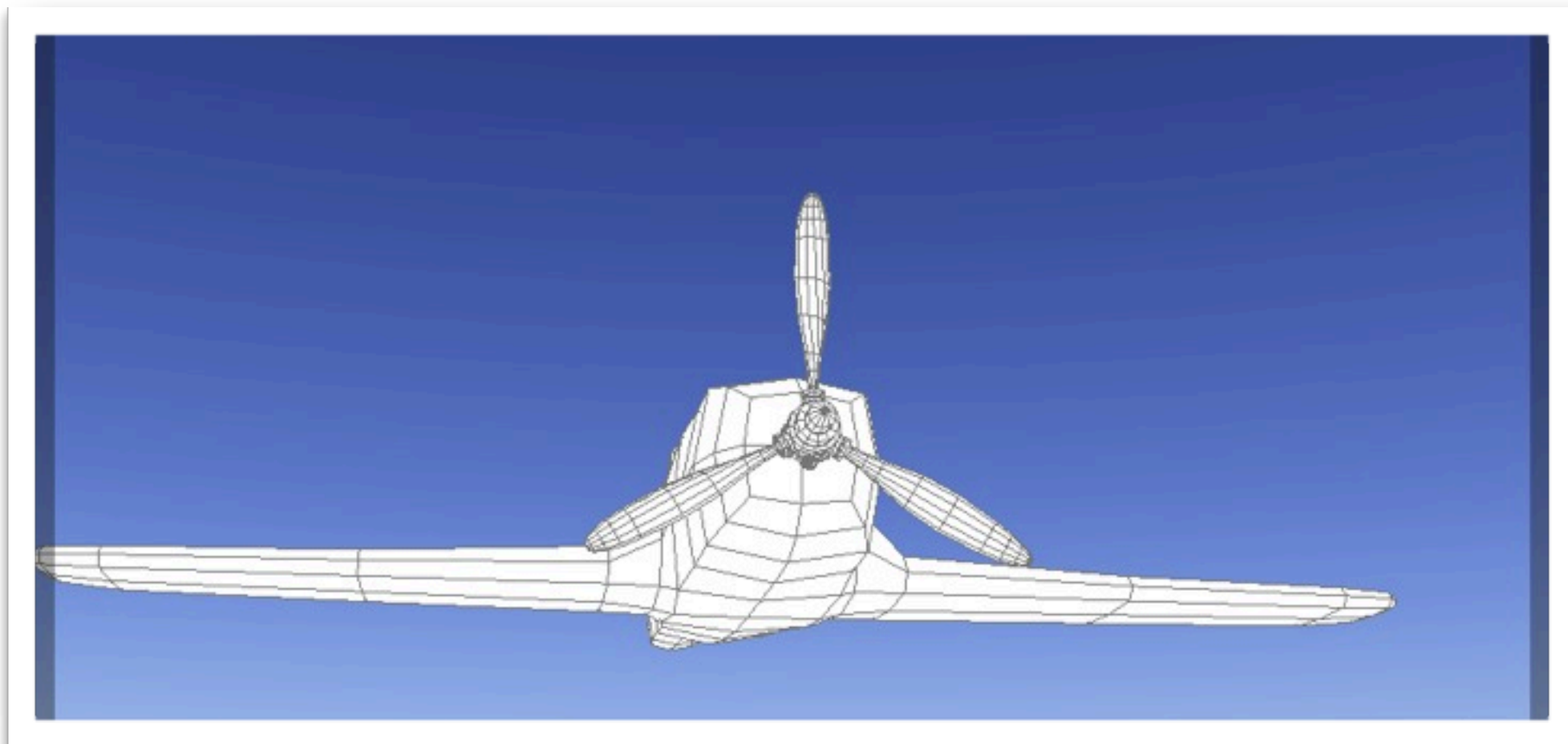
- ‣ Propeller is animated at object level
  - ‣ On parent object "Root_Animated"
- ‣ Camera has a keyframe animation applie
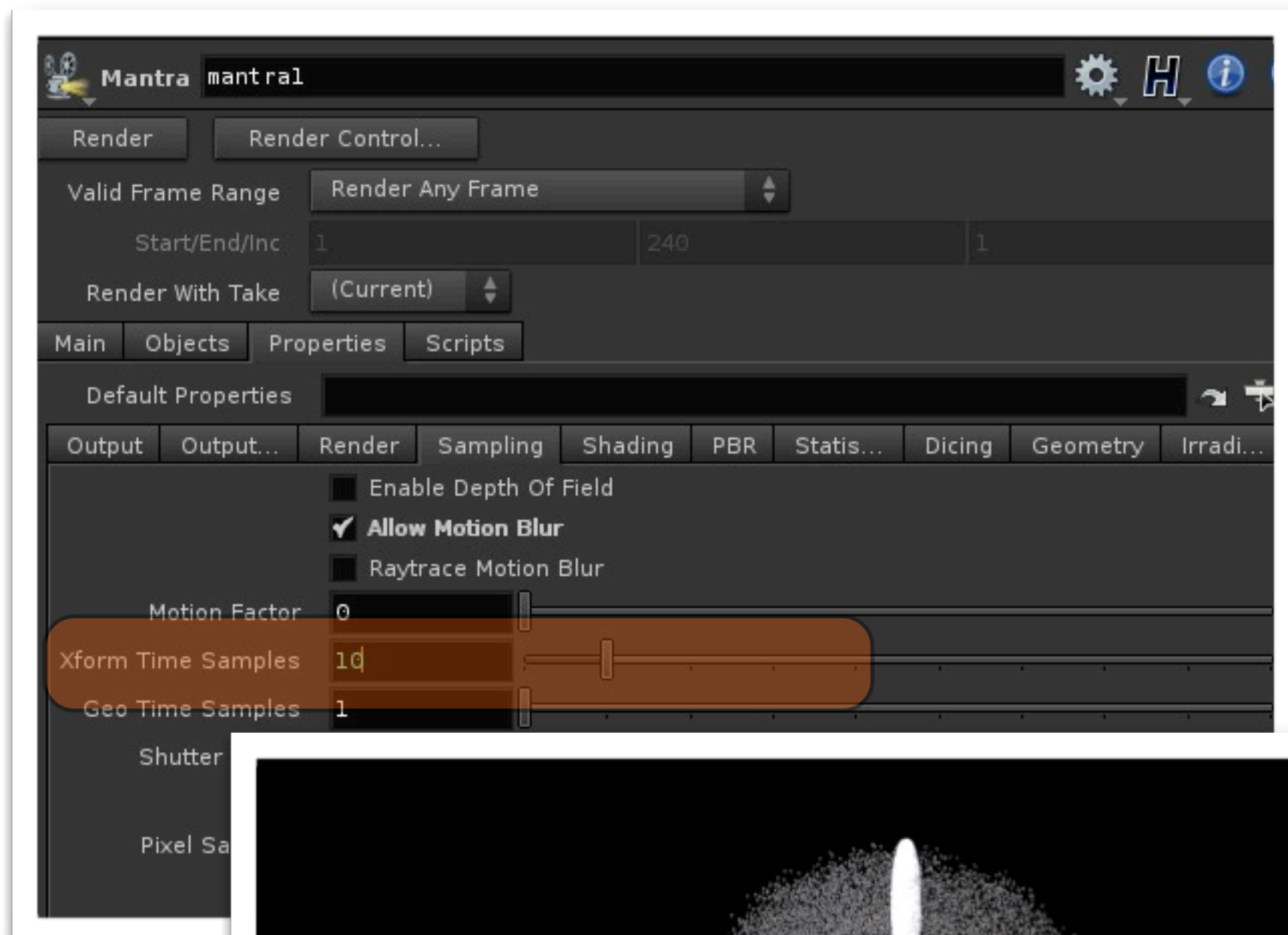- ‣ Scene lit with Sky Light
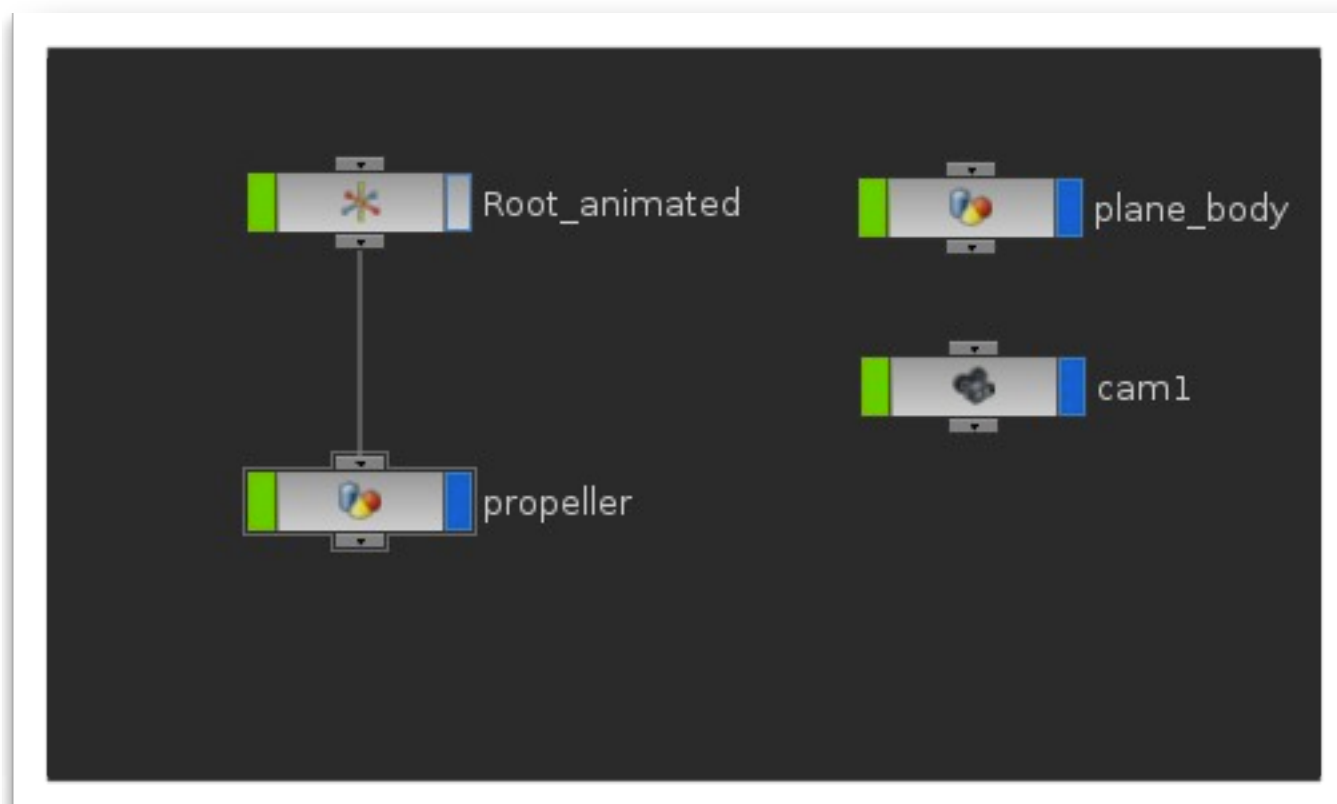
Enable Motion Blur

- Drop down a Mantra Node
- In Properties --> Sampling
 - Select Motion Blur
- Do a test render

Results are not Great!

Enable Motion Blur (cont.)

- In the Parameter xForm Time Samples increase value to 10
- **"xForm Time Samples" is only for non-deformed Geometry.**
  - This means motion at the Object Level
  - You might think that a transform node at the geometry level does not deform geometry. But for Motion Blur it acts as deformed Geometry
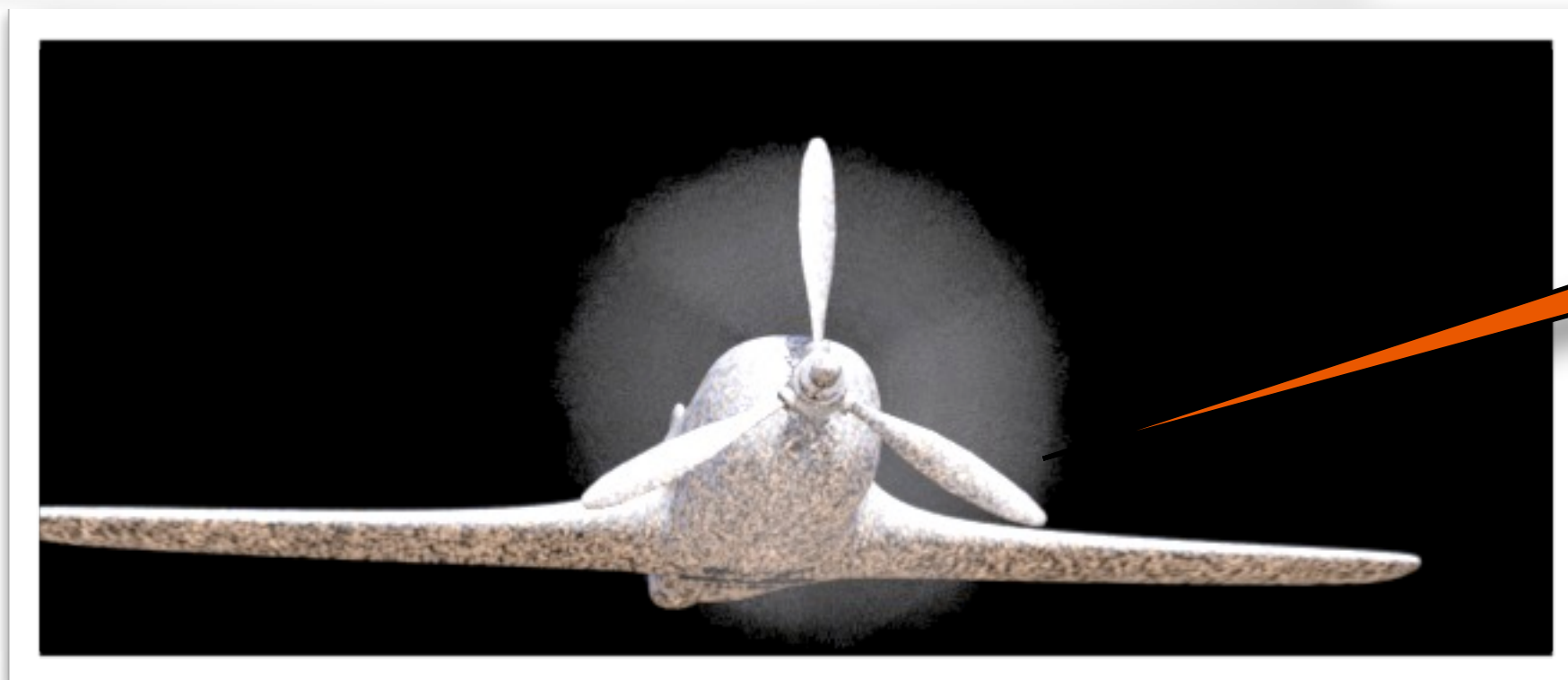 - Re-render scene
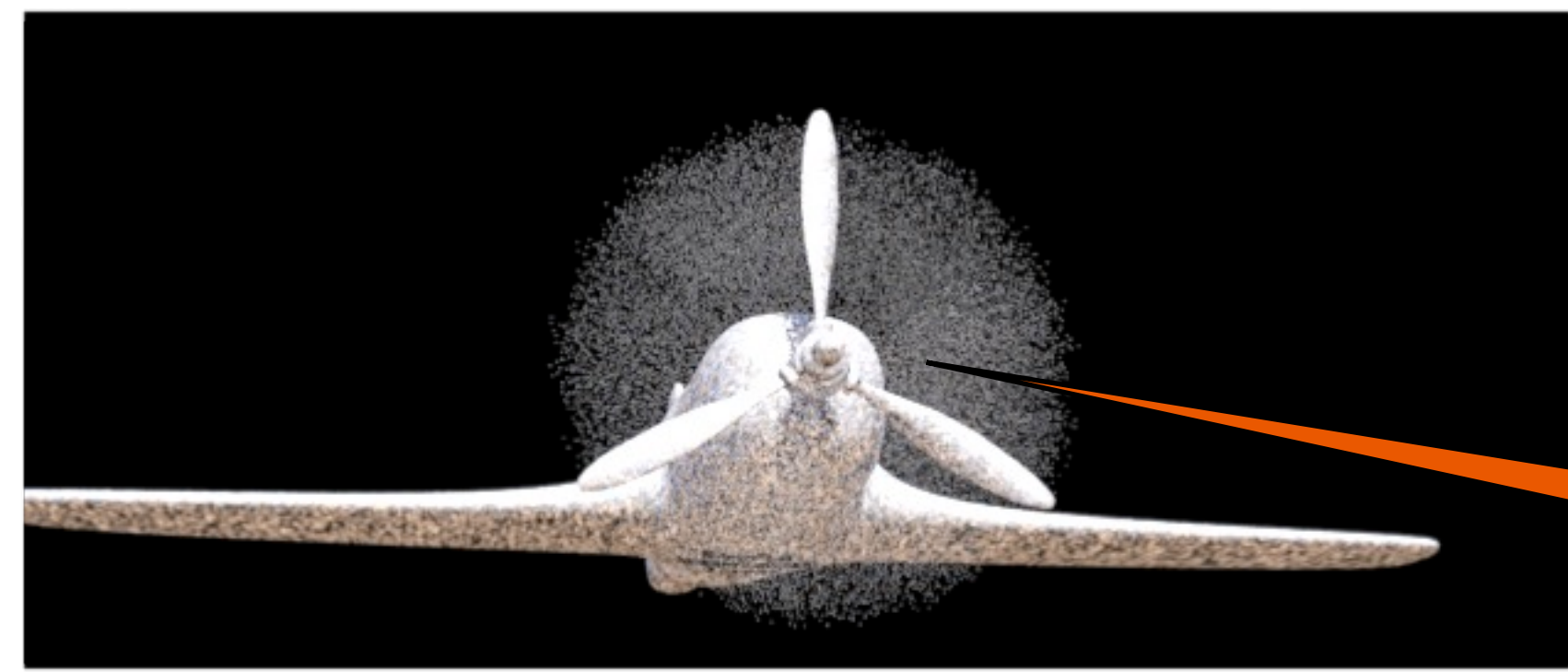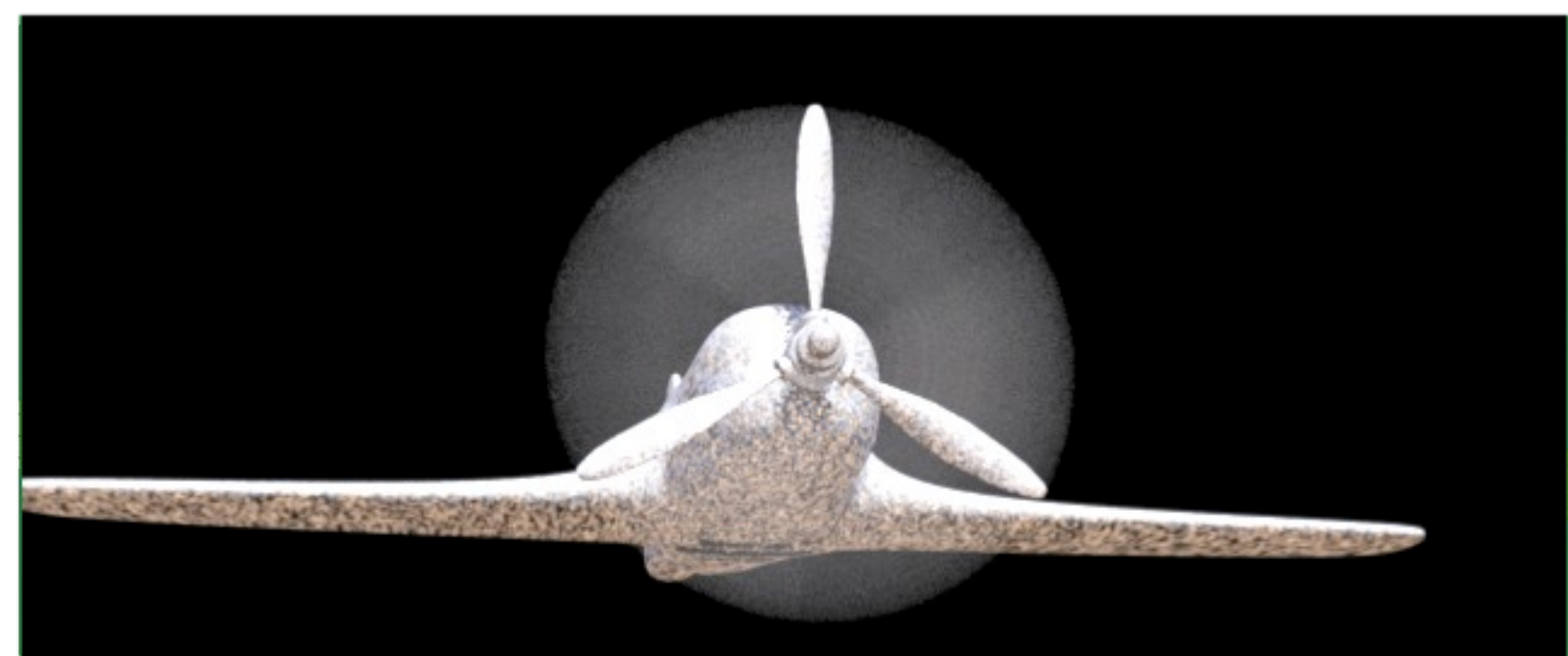
Better, but not Great!

SIDE EFFECTS
SOFTWARE
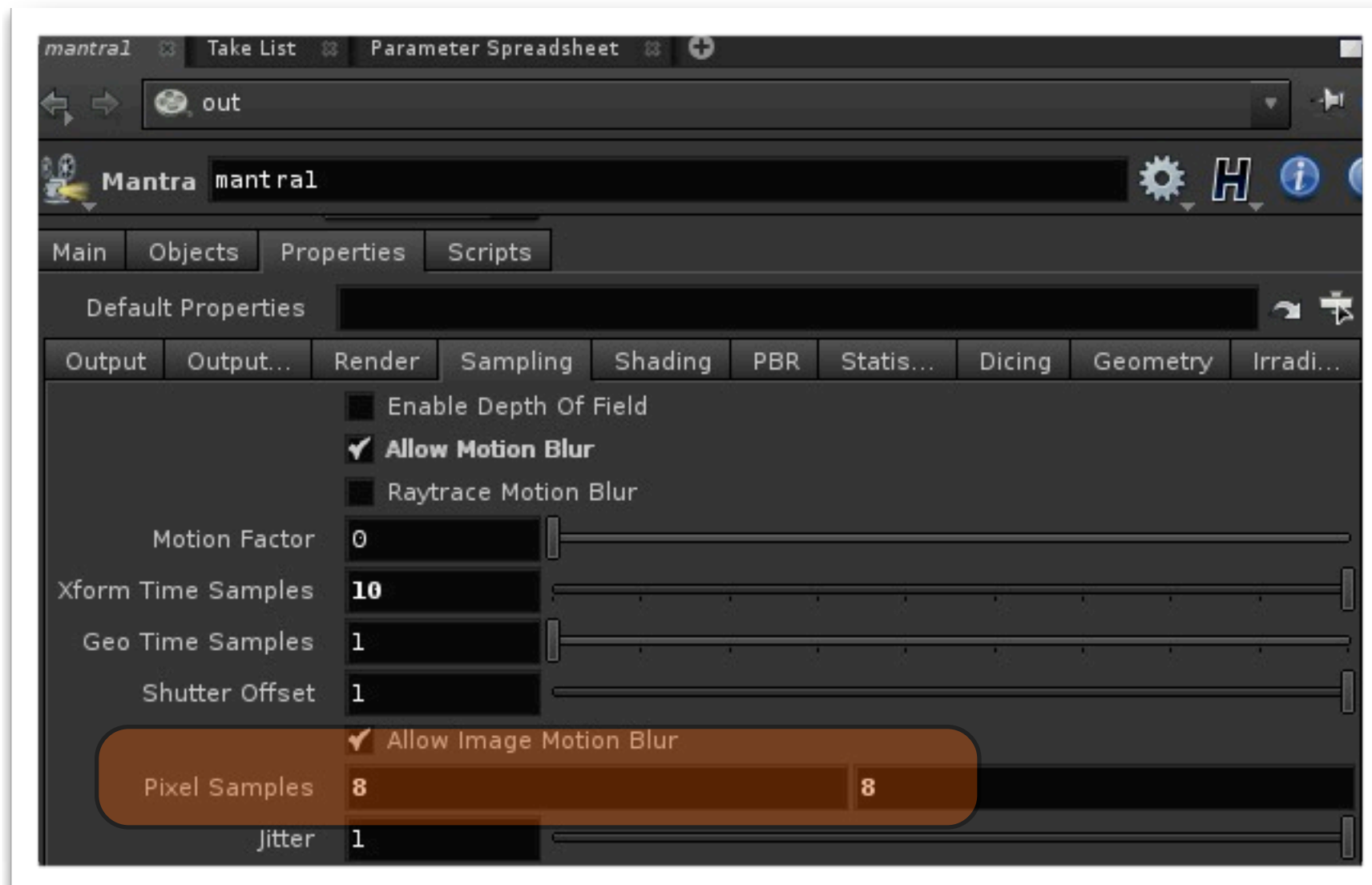
- To increase quality
  - Just like Depth of Field to increase render quality increase pixel samples
 - here I used 8x8

Much Better

‣ Here I gave "xform Time Samples" a value of 50

  ‣ What is happening internally to get better results?

    ‣ The ifd is written out with 50 different transforms

    ‣ Basically 50 samples are being rendered for each frame and blended together

  ‣ If you have textures applied just like Depth of Field you can use Motion Factor to reduce render times
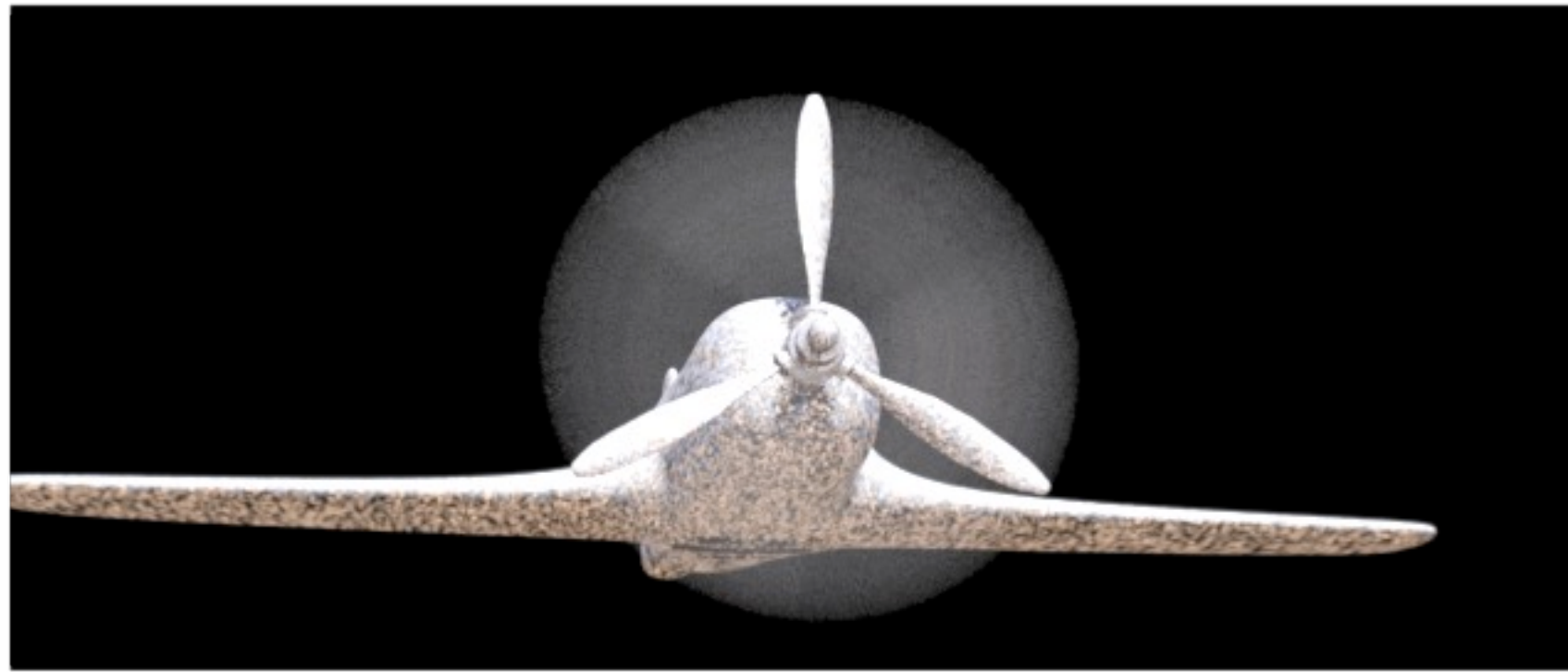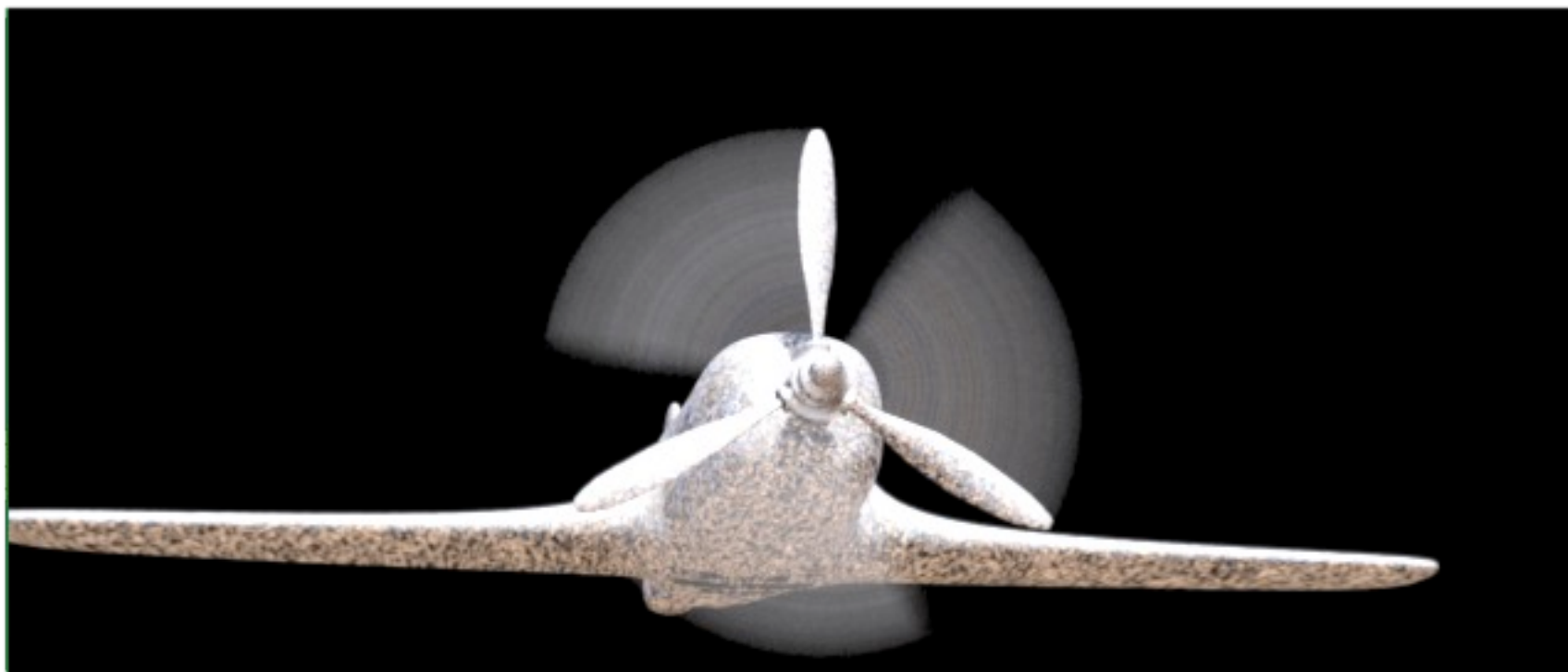
SIDE EFFECTS
SOFTWARE
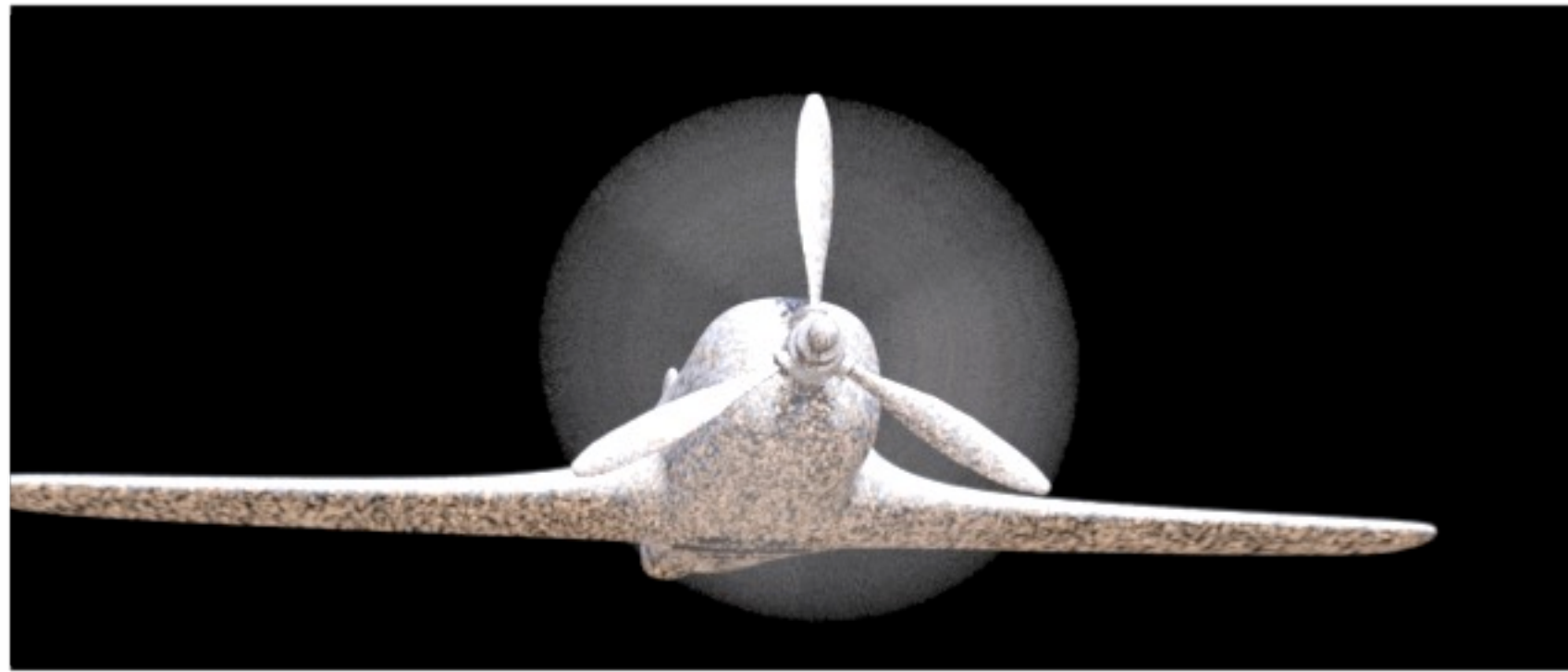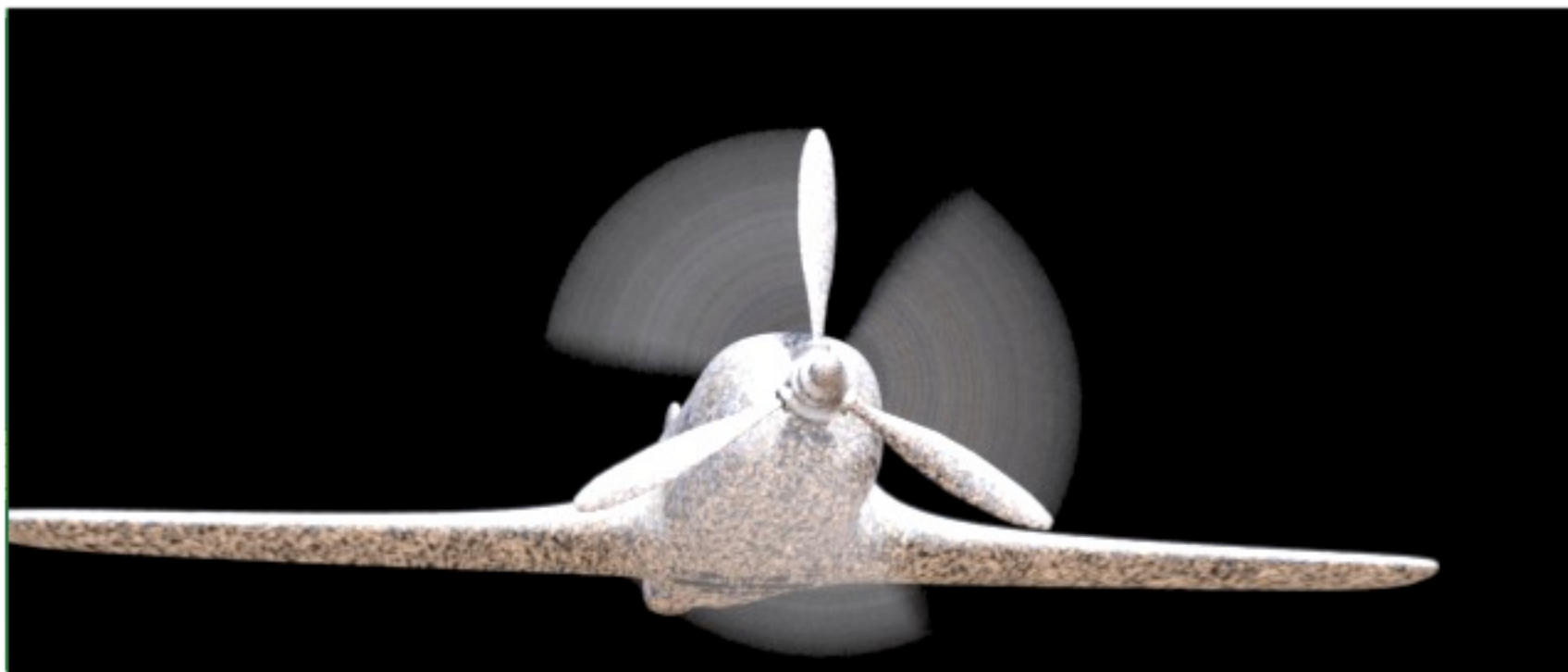
Shutter = 0.5 - Normal Camera

Shutter = 0.1 - High Speed Camera

- Unlike Depth of Field Shutter Time does work with Motion Blur
- The lower the value, the higher the speed of the lens.
  - Sports cameras where everything is in focus has a high speed lens
- You can have a value greater then 1 which in the real world makes no sense but in CG will give exaggerated blurs

Shutter = 0.5 - Normal Camera

Shutter = 0.1 - High Speed Camera

‣ Unlike Depth of Field Shutter Time does work with Motion Blur

‣ The lower the value, the higher the speed of the lens.

   ‣ Sports cameras where everything is in focus has a high speed lens

‣ You can have a value greater then 1 which in the real world makes no sense but in CG will give exaggerated blurs

SIDE EFFECTS
SOFTWARE

‣ Controls where the blur occurs in the image relative to the position of the object at the current frame. A value of -1 blurs from the position at the previous frame to the position in the current frame. A value of O blurs from halfway to the previous frame to halfway to the next frame. A value of 1 blurs from the current position to the position at the next frame. You can use fractional frame values and values greater than -1 or 1 to move the blur less or more.

‣ This parameter replaces the old Motion blur style (motionstyle) parameter, which only allows values of "before" (shutter offset=-1), "center" (shutter offset=O), and "after" (shutter offset=1).
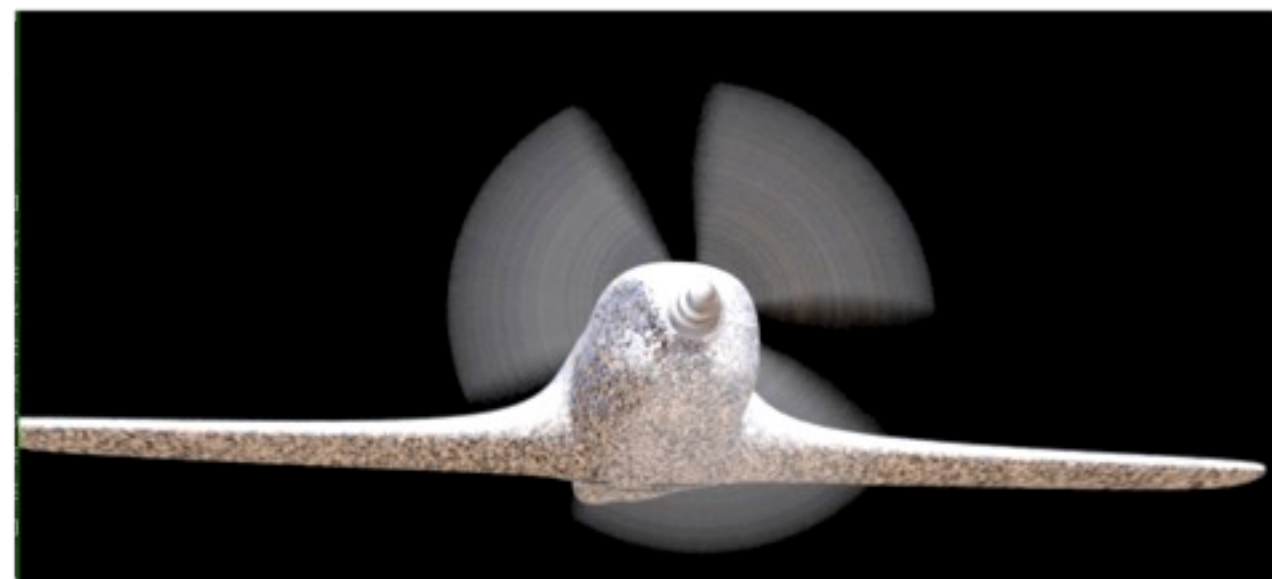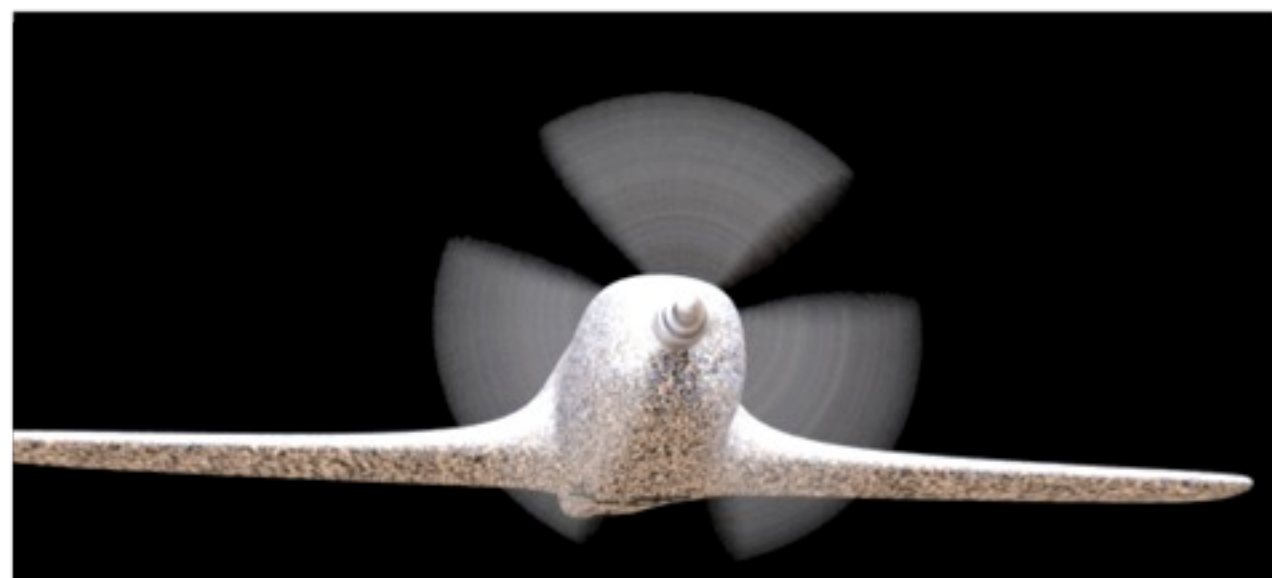
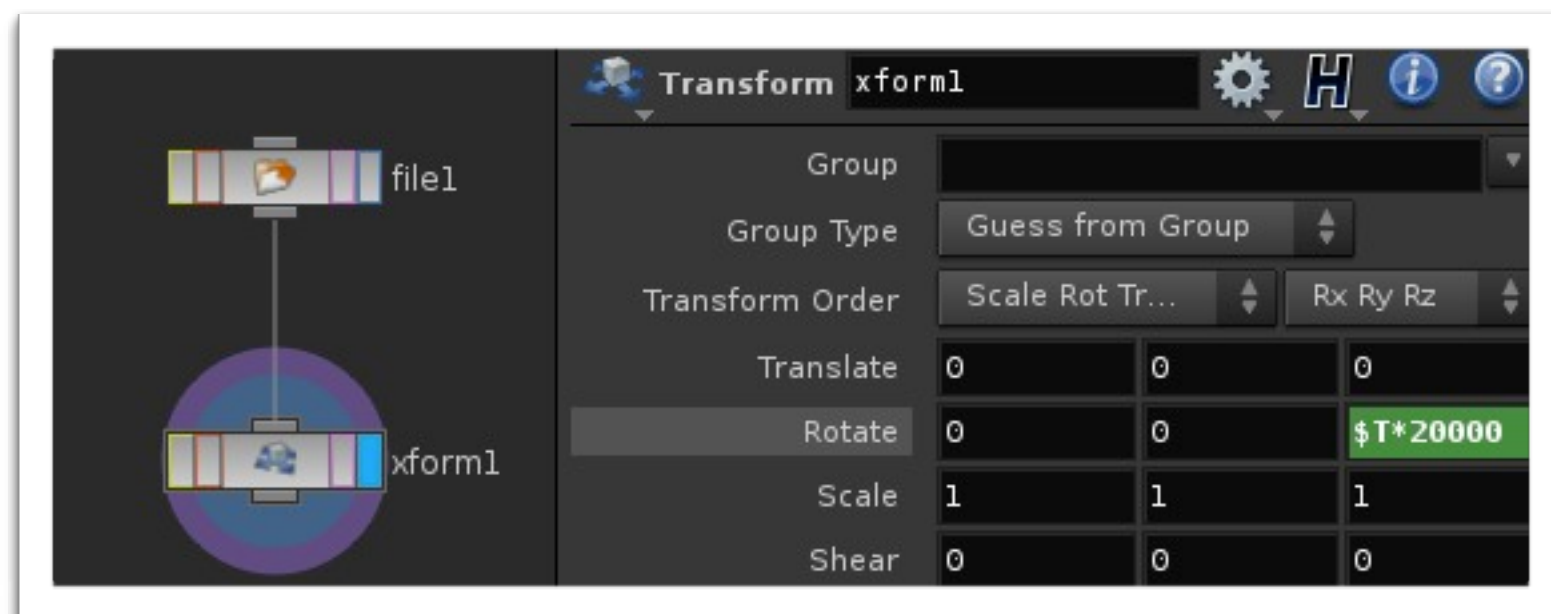To Match a render in H11 set value to 0

SIDE EFFECTS
SOFTWARE
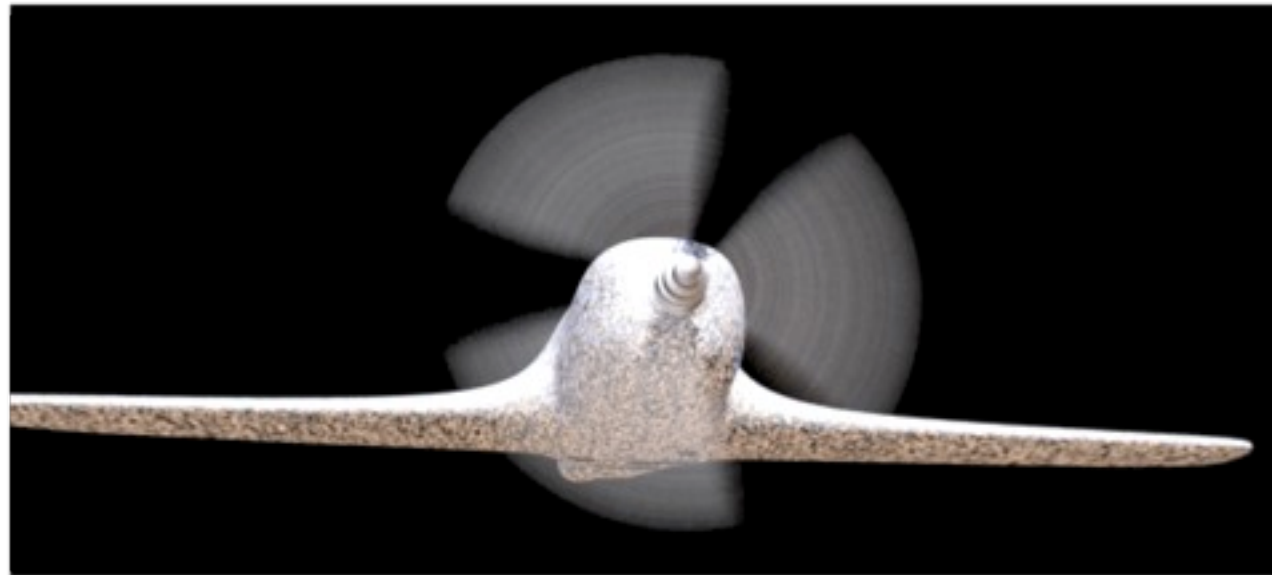
Shutter Offset = -1

Shutter Offset = 0

Shutter Offset = 1

Use Shutter Offset to Match real world cameras or other Render Engines such as Renderman

SIDE EFFECTS SOFTWARE
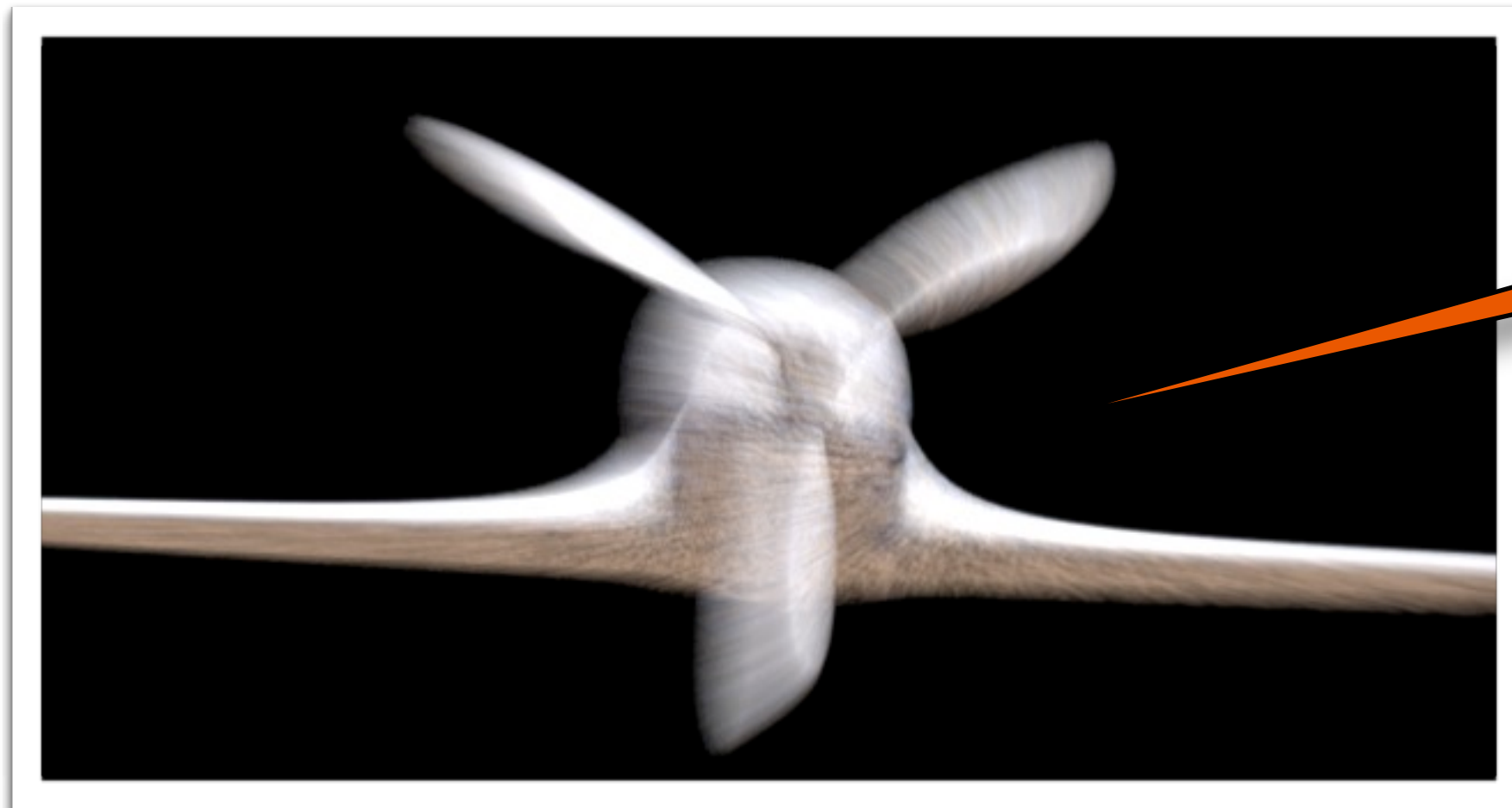
Motion Blur on Deformed Geometry

- ‣ Same scene except we will move the rotate transform inside the propeller geometry
- ‣ Do a test render - NO MOTION BLUR
  - ‣ xform Time Samples only works at object level
 - ‣ does not work on deformed geometry
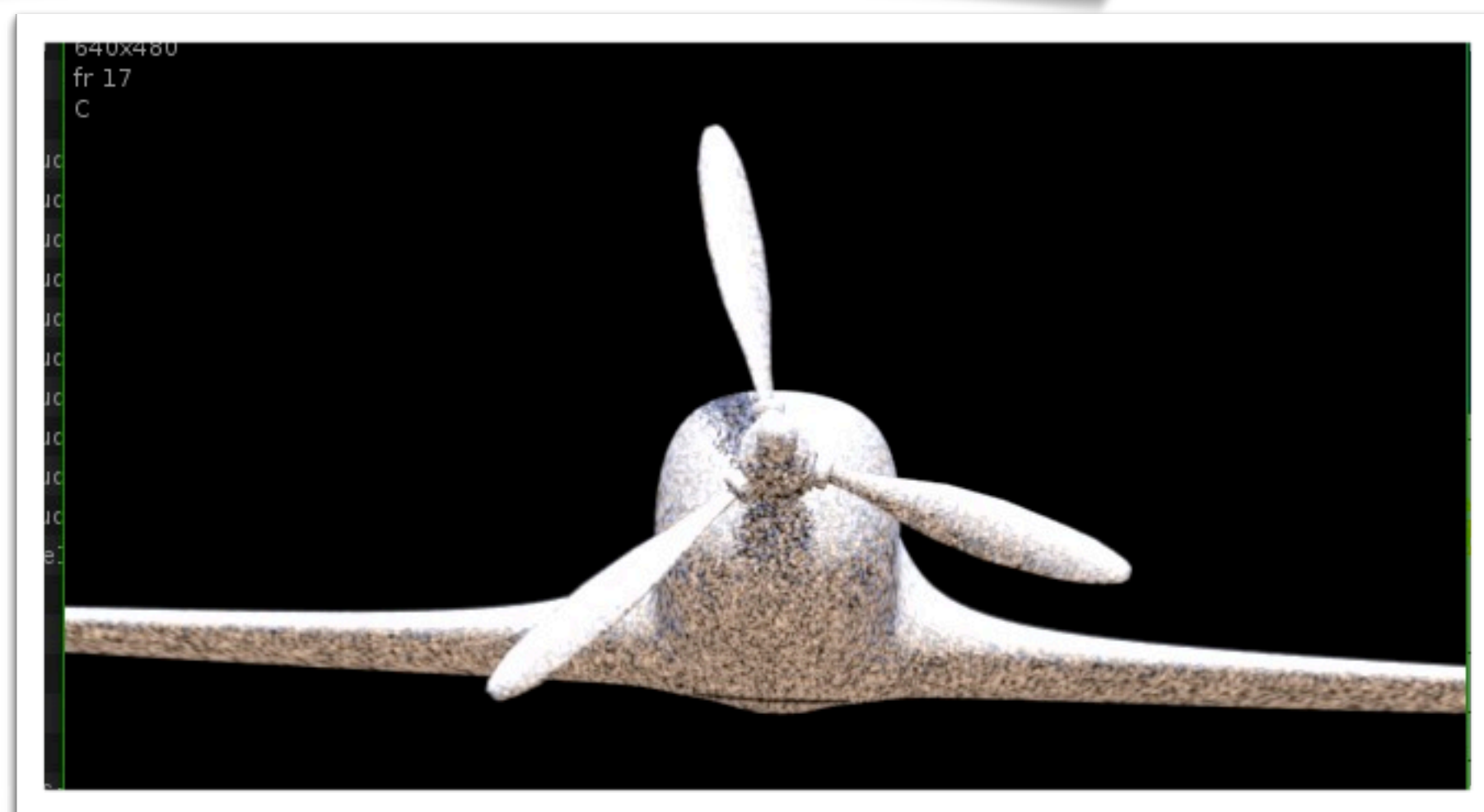
‣ Is there Motion Blur due to the Camera Motion?

    ‣ Test by increasing Shutter time to 1O

    ‣ Render and you will see camera blur but no propeller blur

Blur due to Camera Motion not deformed geometry (propeller)

SIDE EFFECTS
SOFTWARE

Motion Blur on Deformed Geometry (cont.)

▸ Doing it the correct way

▸ Set xform Time Samples to a low number like 3

   ▸ This allows for camera blur of the plane

▸ Set Geo Time Samples to 30

   ▸ This blurs the deformed geometry
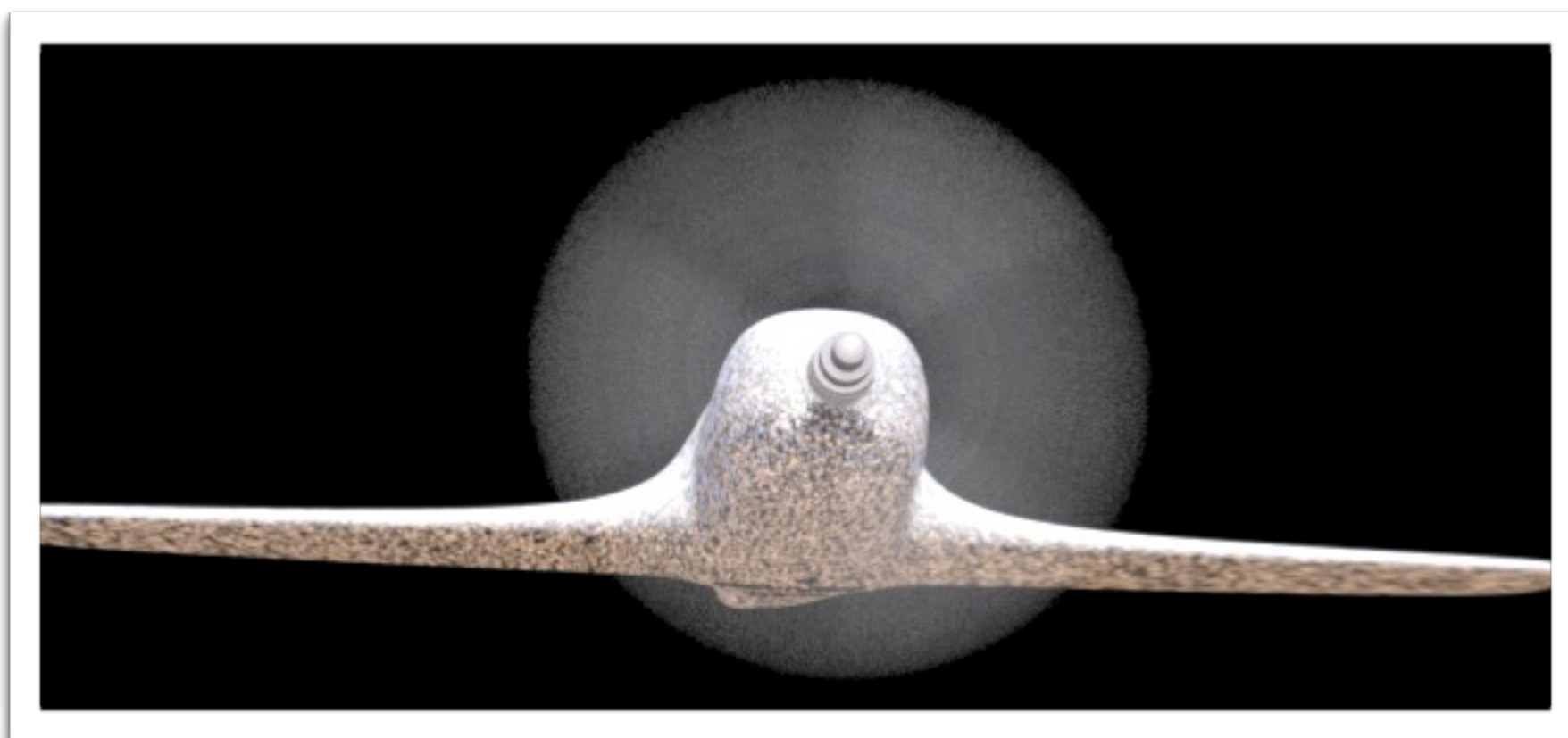
‣ With xform Time Samples the ifd got 30 transforms to do the subsampling for the blur

‣ With Geo Time Samples 30 copies of the geometry are written to the ifd

Which method do you think is more efficient?
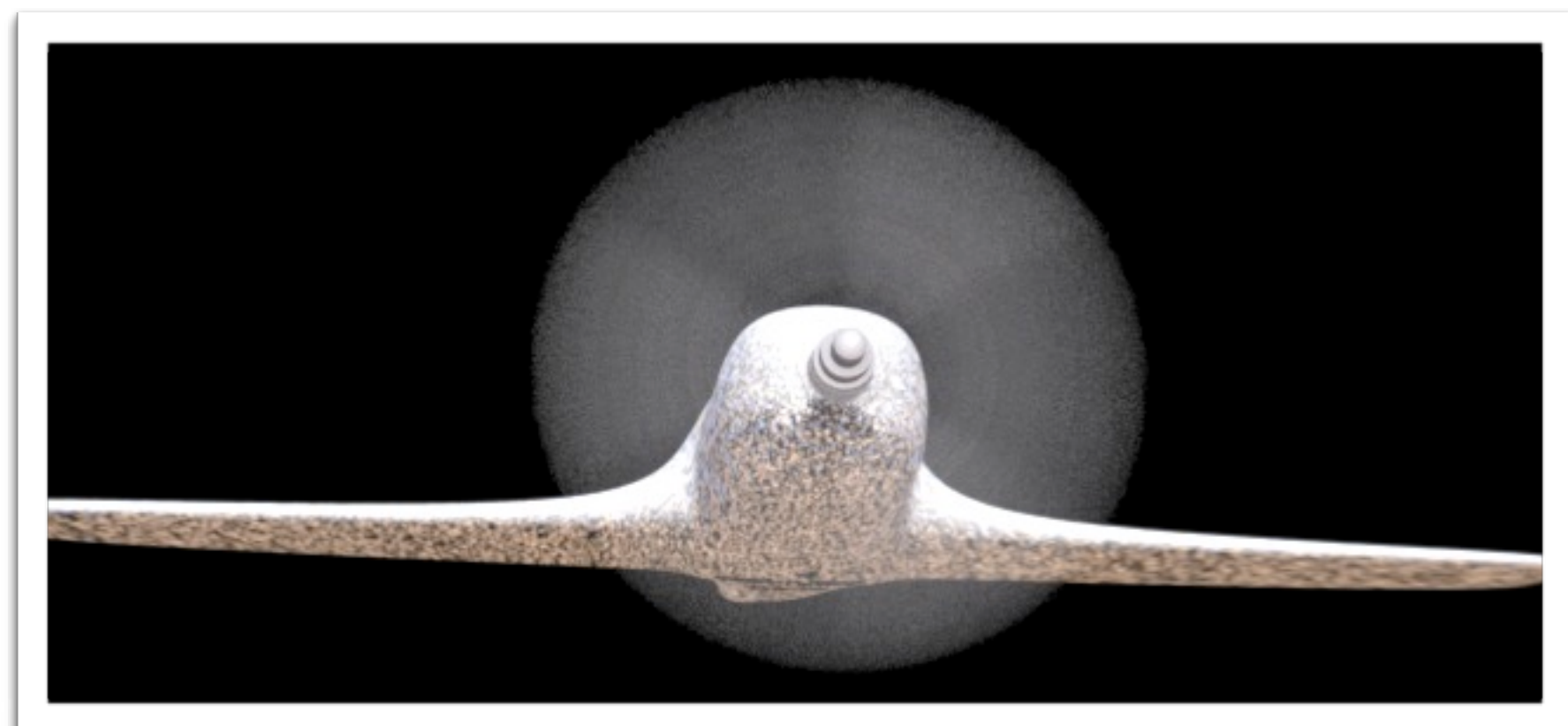
‣ **Geometry Deformation Blurs will not work with procedurals like delayed load shader**

SIDE EFFECTS
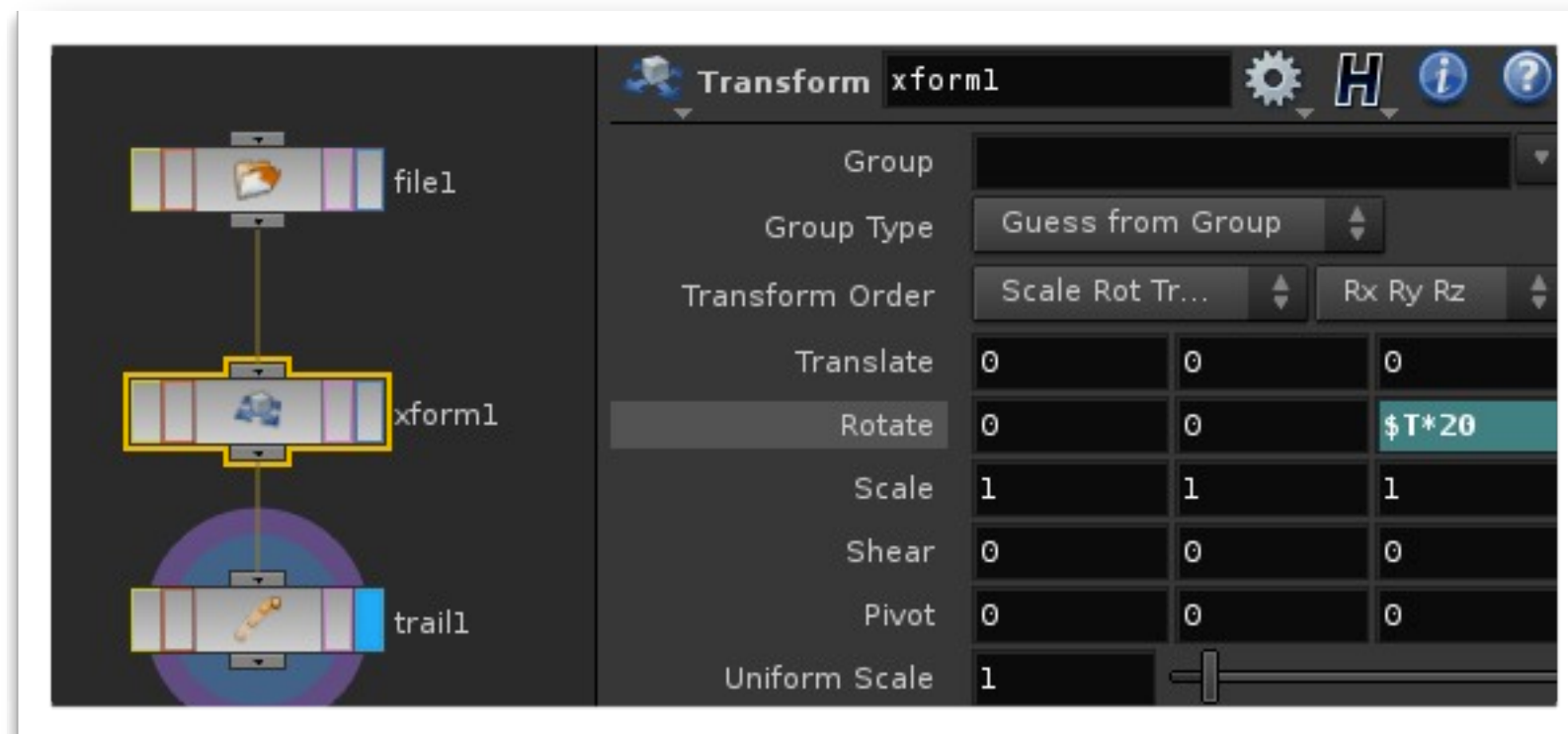SOFTWARE

Velocity Vector Based Motion Blur
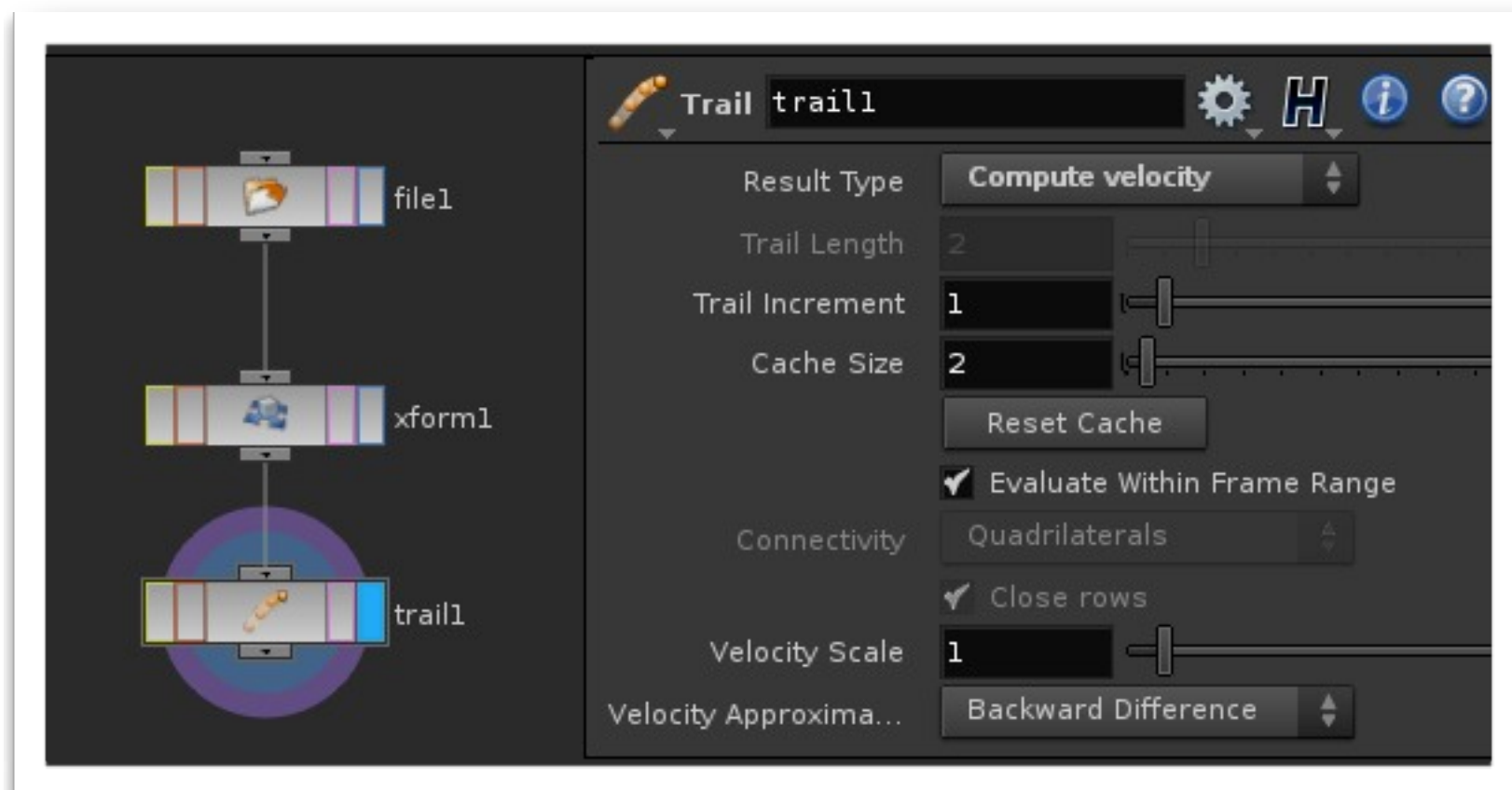
- ‣ There is another option for blurring
  - ‣ Append a Trail SOP to the Transform
  - ‣ In the "Result Type" parameter
    - ‣ Set to "Compute Velocity"
- ‣ In your display options select Custom Attributes
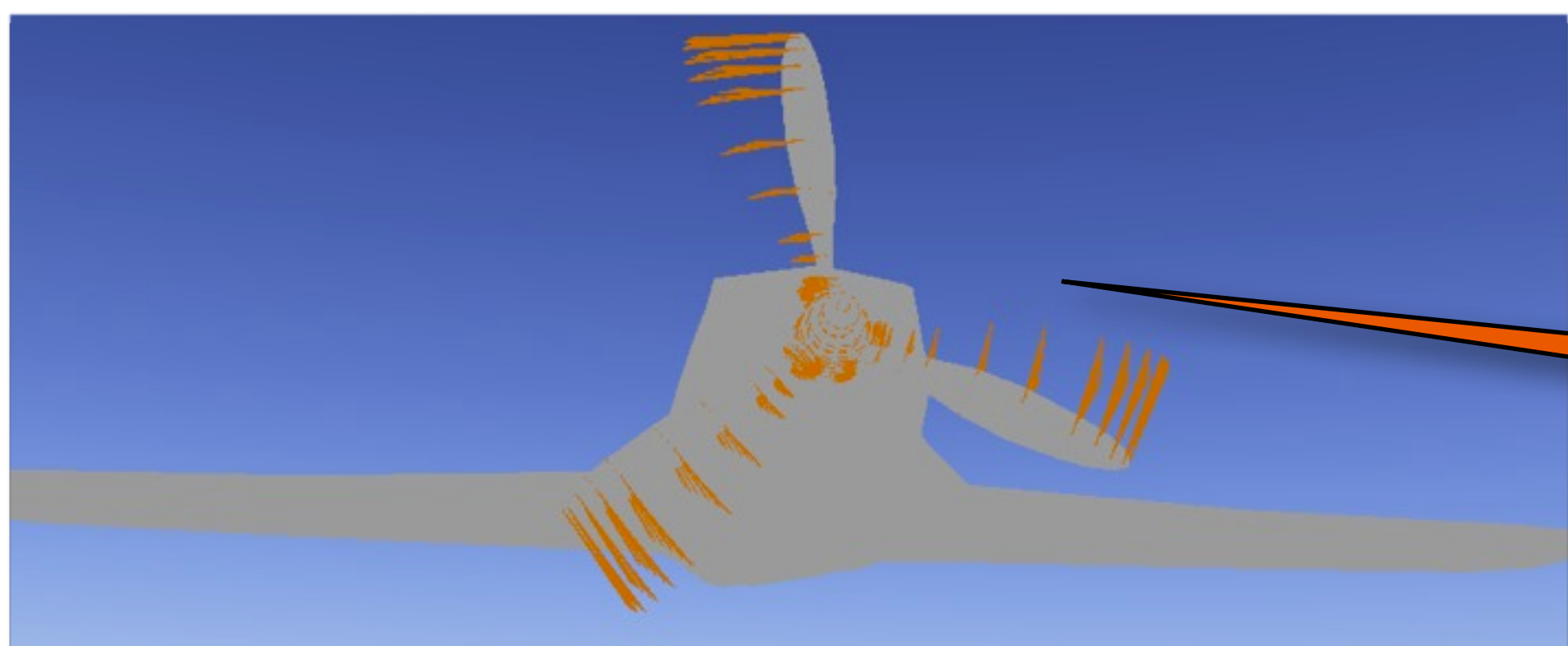 - ‣ Display Velocity
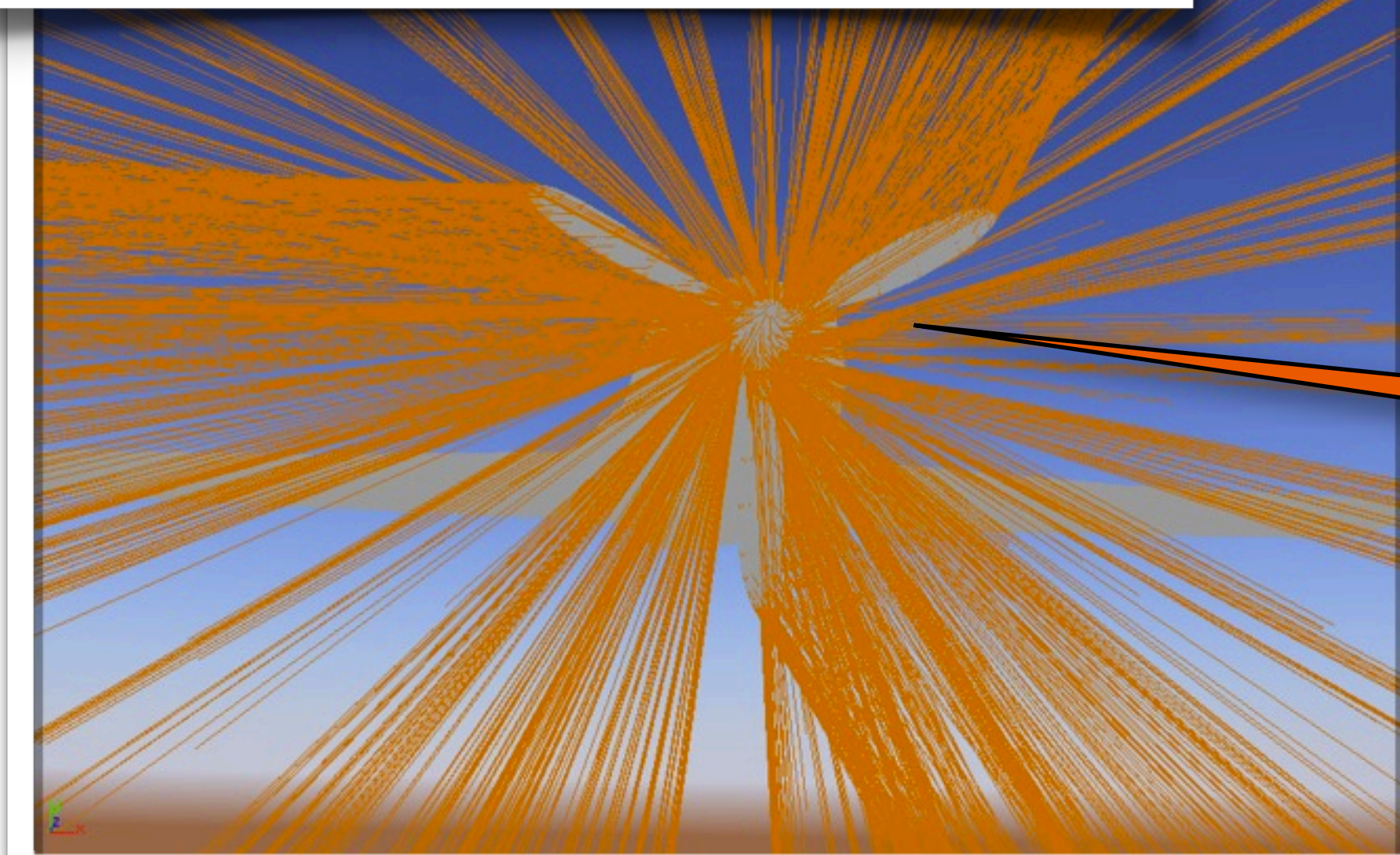
That's a lot of velocity!

SIDE EFFECTS
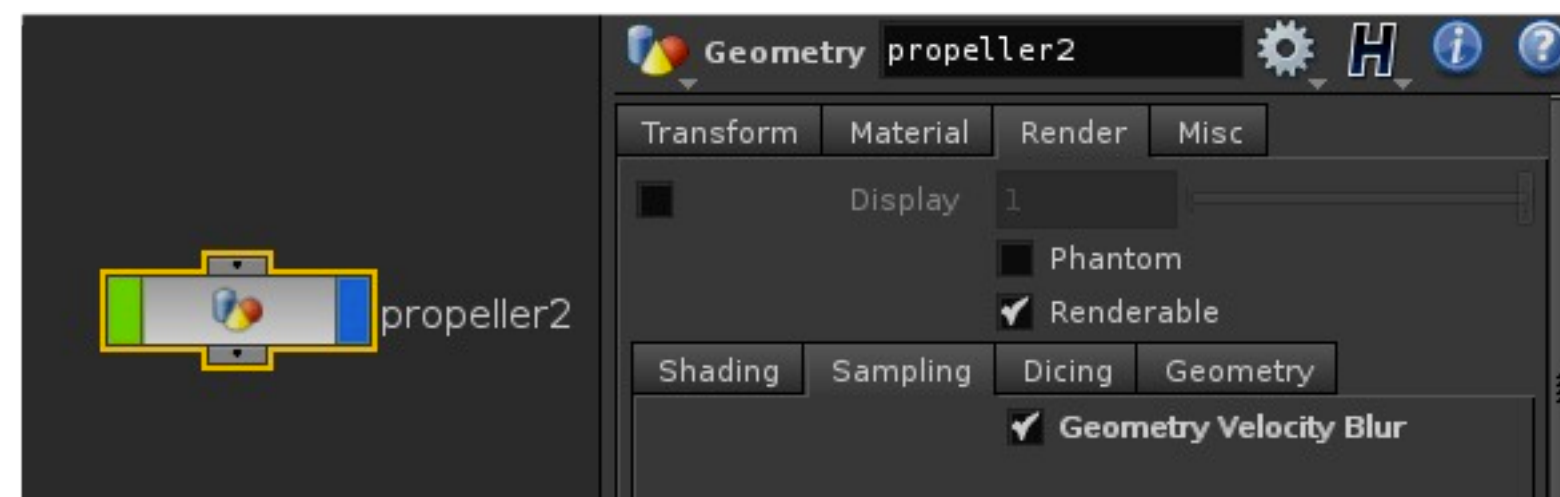SOFTWARE

Velocity Vector Based Motion Blur (cont.)

- ‣ Reduce the rotational velocity - t*20 instead of t*2000

- ‣ There are no arcs blurs in velocity based motion

- ‣ Propellers are not ideal candidate for velocity based blur

Much more reasonable

SIDE EFFECTS
SOFTWARE

# Velocity Vector Based Motion Blur (cont.)

- ‣ Do a test render
  - ‣ No Blur rendered
- ‣ Jump back to the object level
  - ‣ In the render tab for the propeller
    - ‣ Select Geometry Velocity Blur
- ‣ Crank up Shutter time (Remember propellers are not a good candidate for velocity based blur)
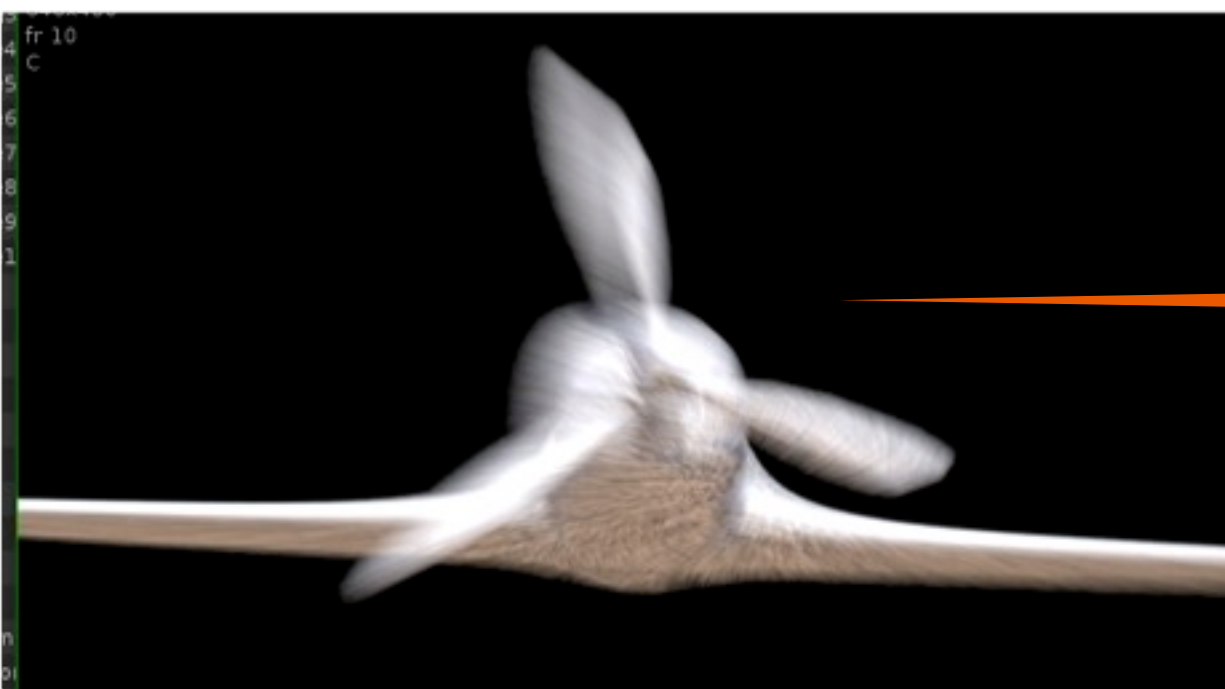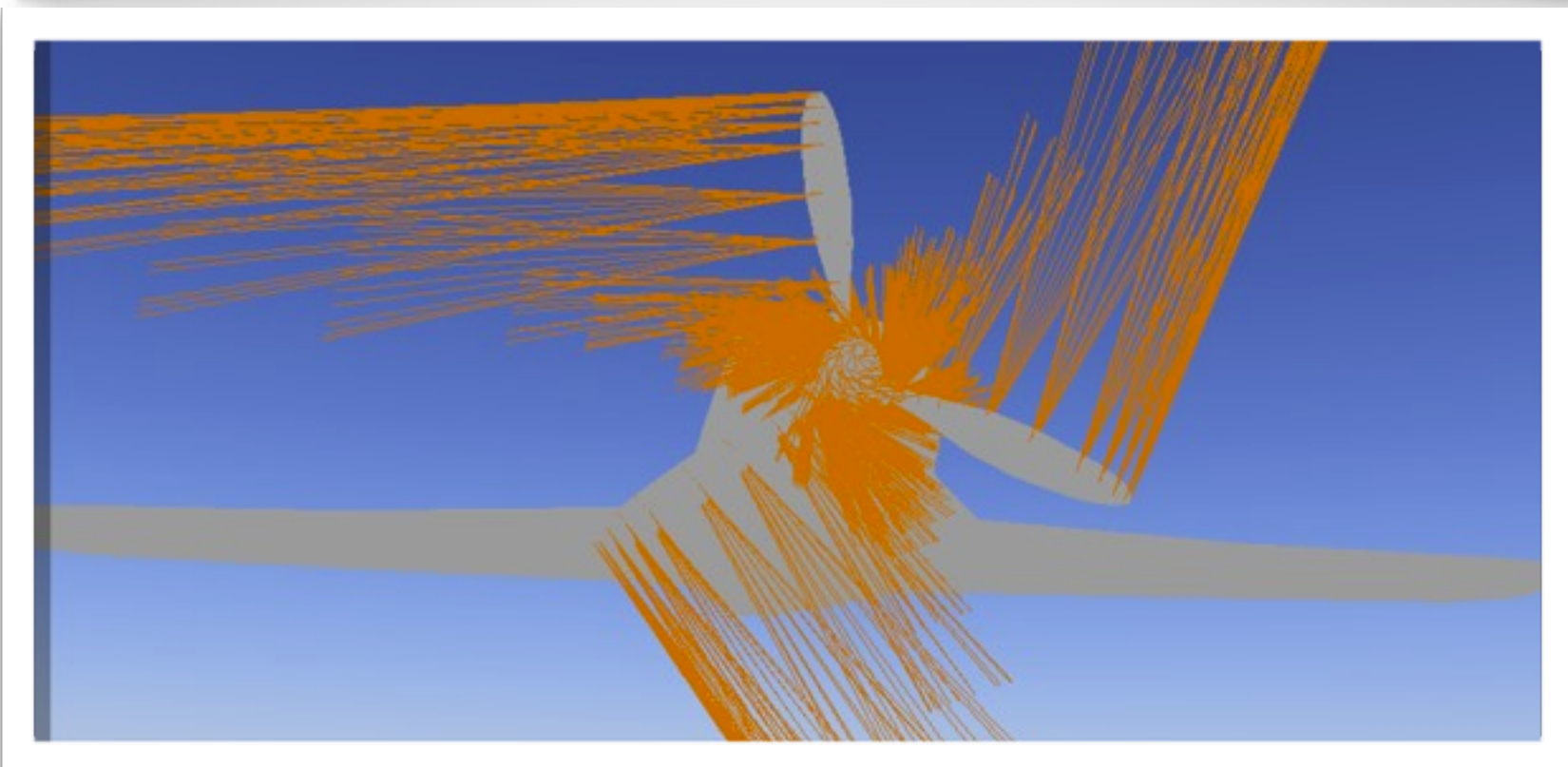
Notice lack of arcs!

SIDE EFFECTS
SOFTWARE

Velocity Vector Based Motion Blur (cont.)

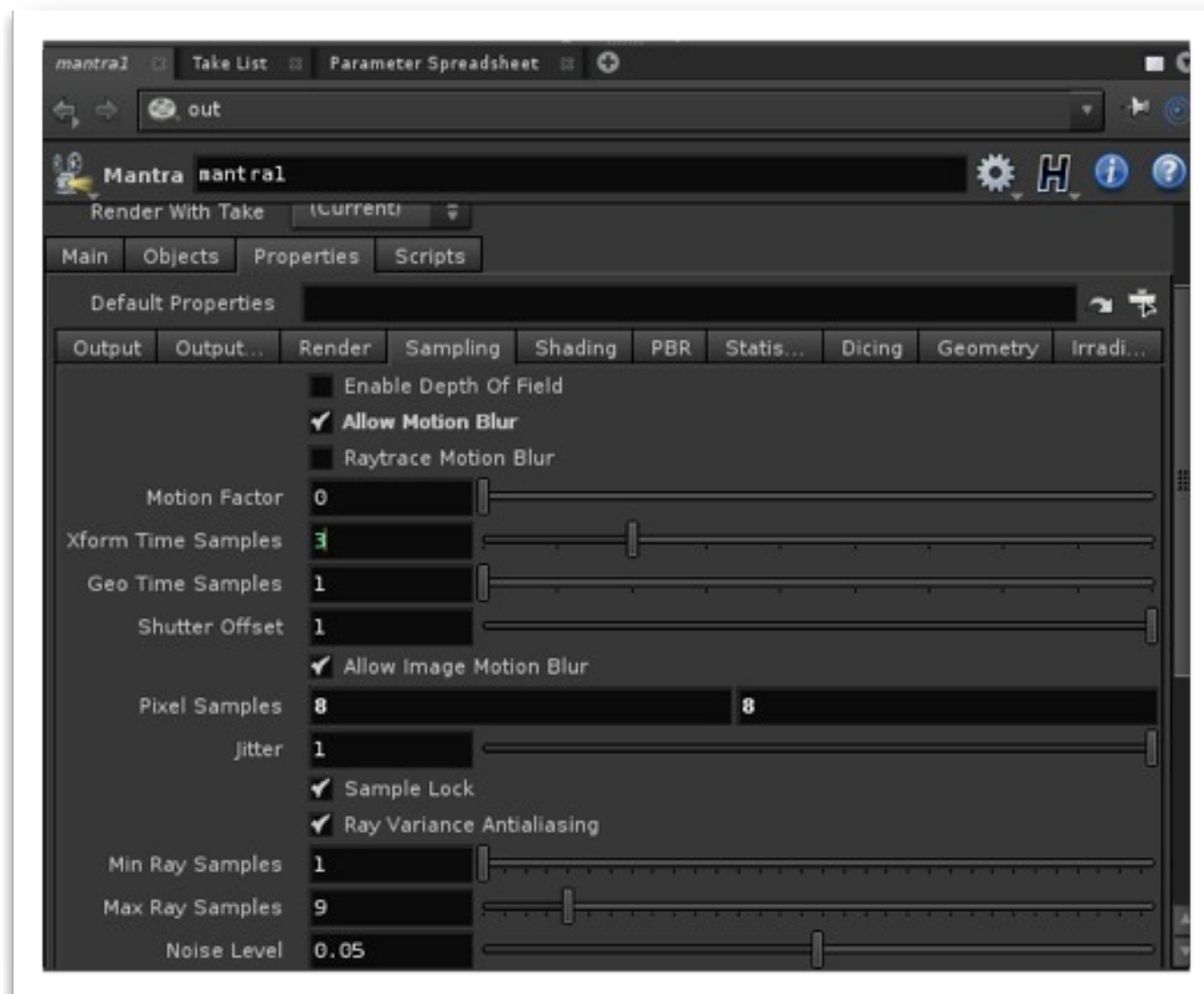*Instead of Cranking up Shutter Time...*
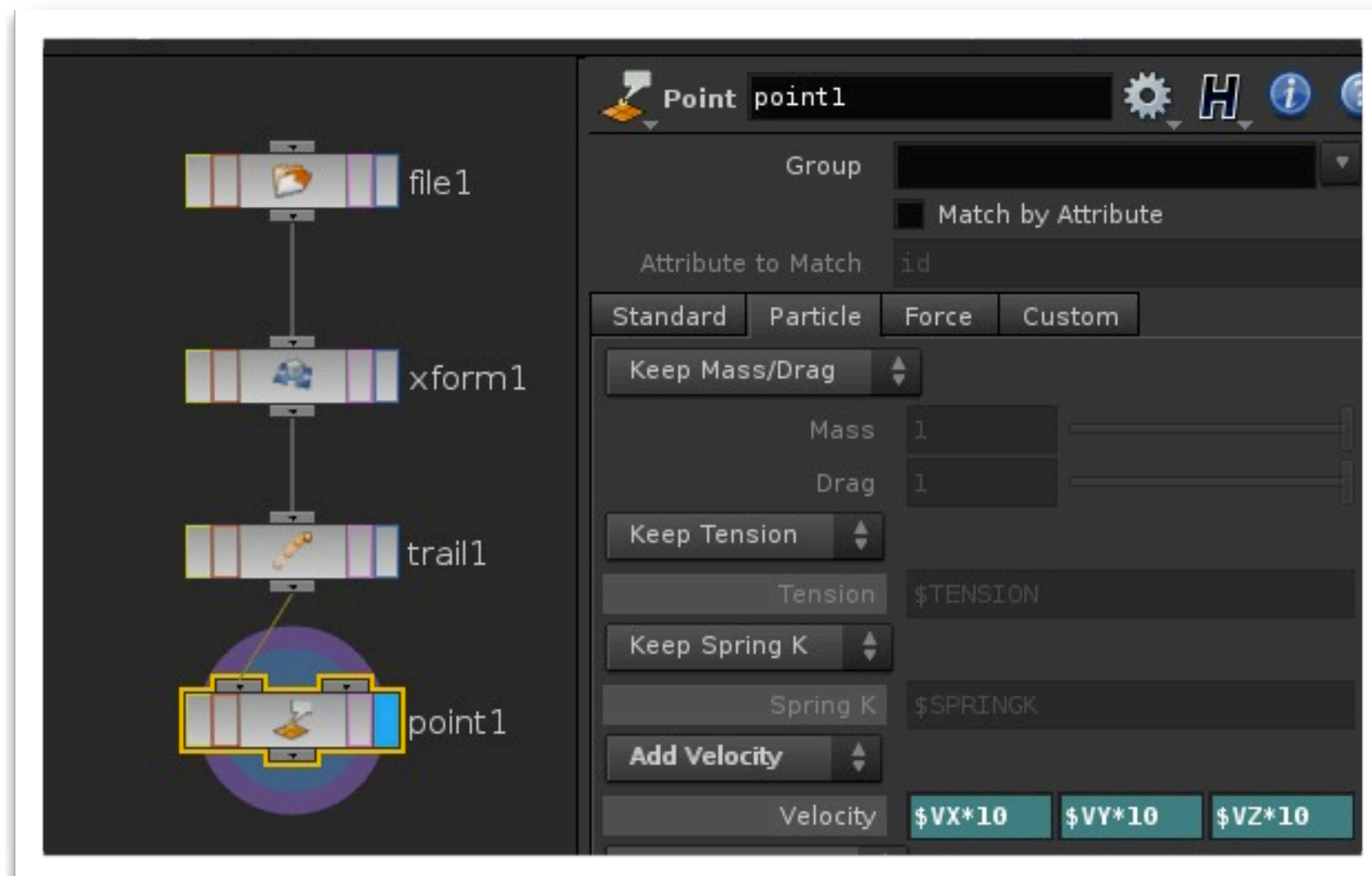
- ‣ Reset Shutter Time to 0.5
- ‣ Dive into the Propeller Geometry
  - ‣ Append a Point SOP
    - ‣ In the Particles Tab - Add Velocity
    - ‣ Increase Velocity - $VX*20, $VY*20, $VZ*20
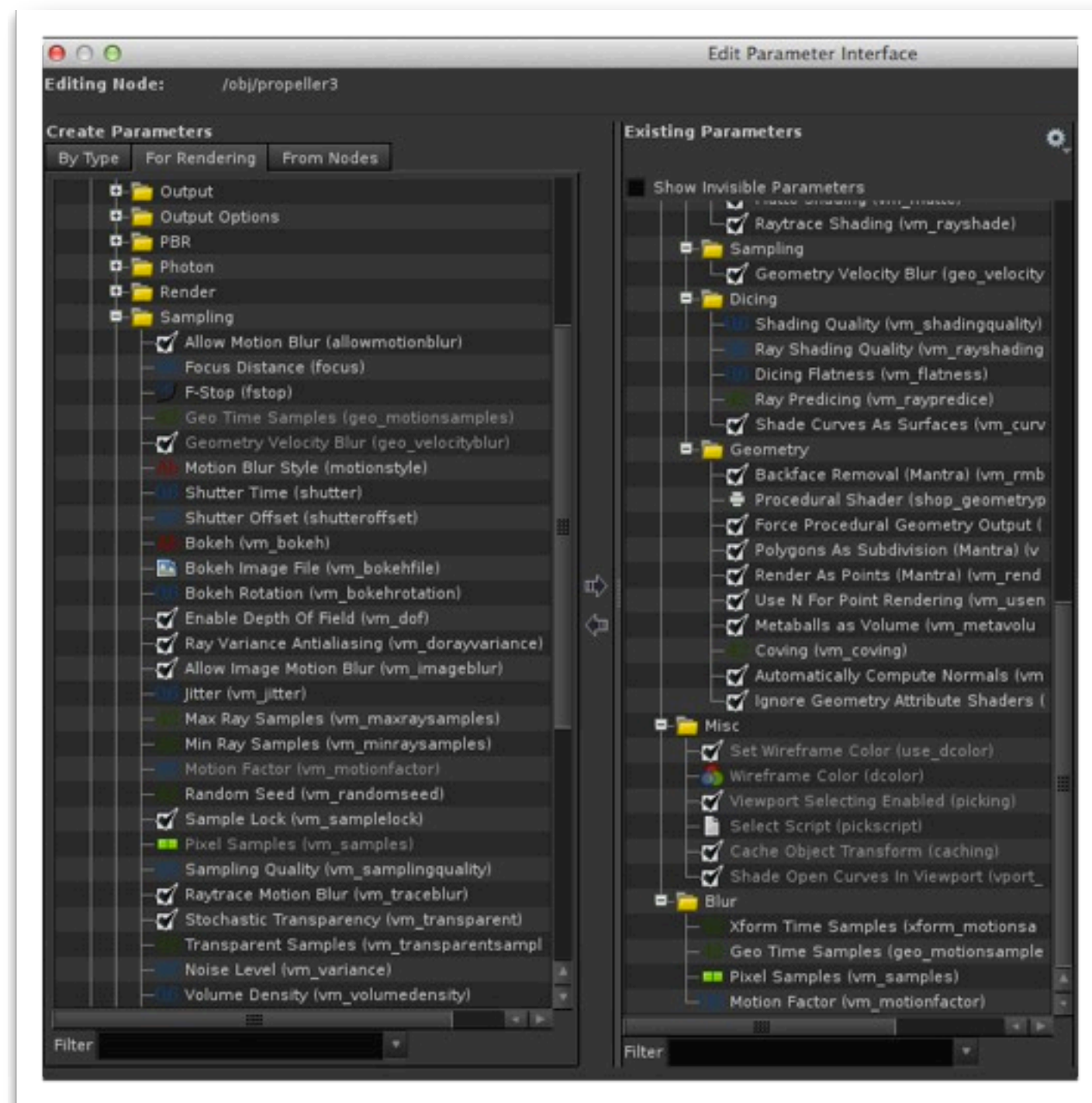
Final Result

Works with Procedurals

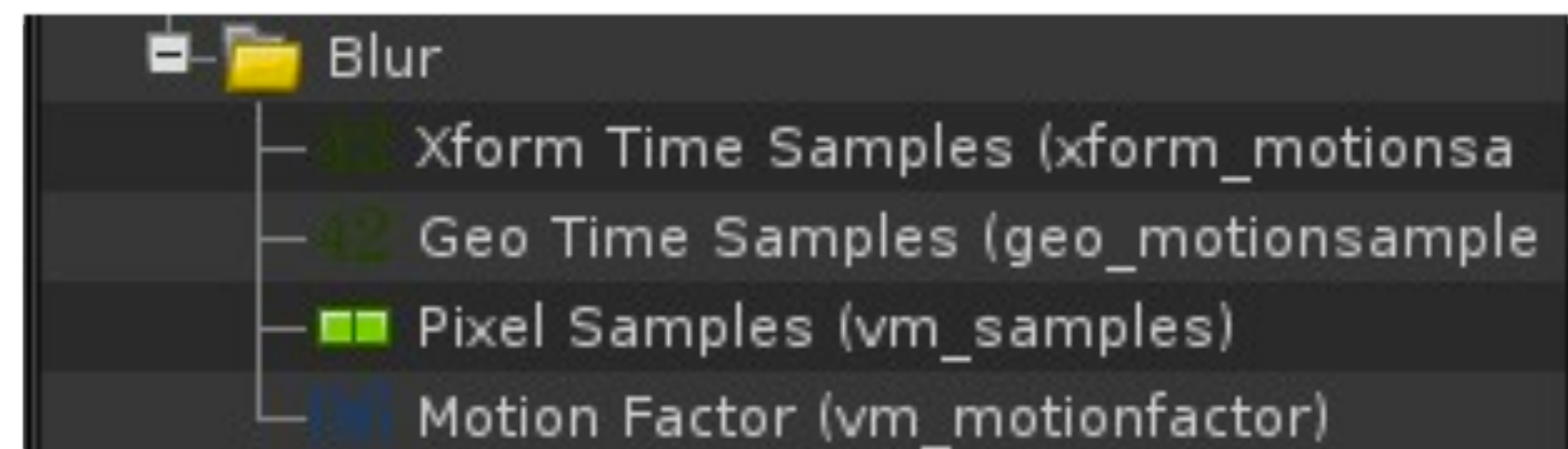# If you only have one high speed motion do you want large pixel samples and xForm Time Sample for the whole scene?

‣ Let's use pixel samples/xform Time Sample on a per-object basis

‣ Reset Mantra 1 to more standard values

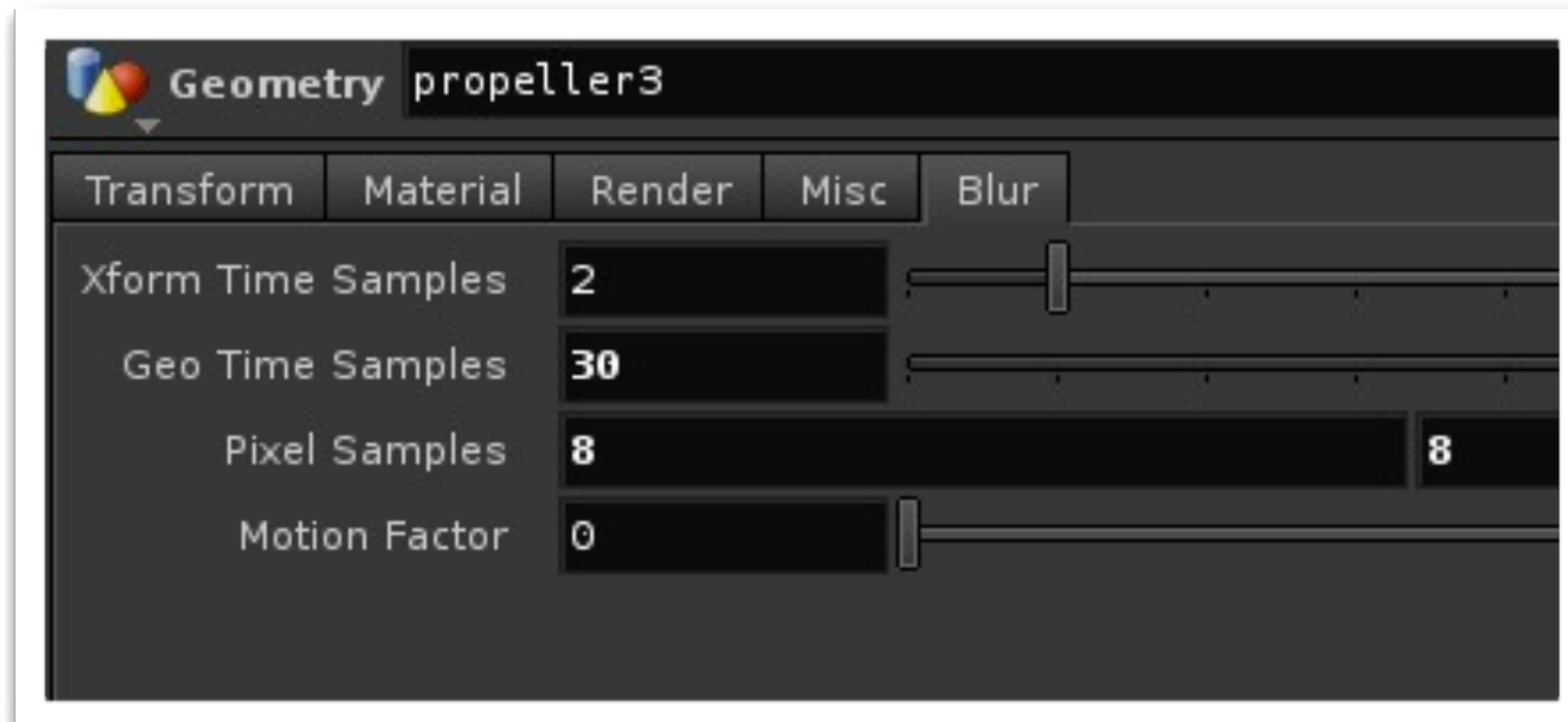‣ Delete the Trail SOP and Point SOP of the Previous Example

Per Object Based Blur (cont.)

- ‣ At the Object Level for the Propeller
- ‣ Open the Parameter Interface
- ‣ Add a Folder
  - ‣ Label it Blur
- ‣ Go to the Rendering Tab
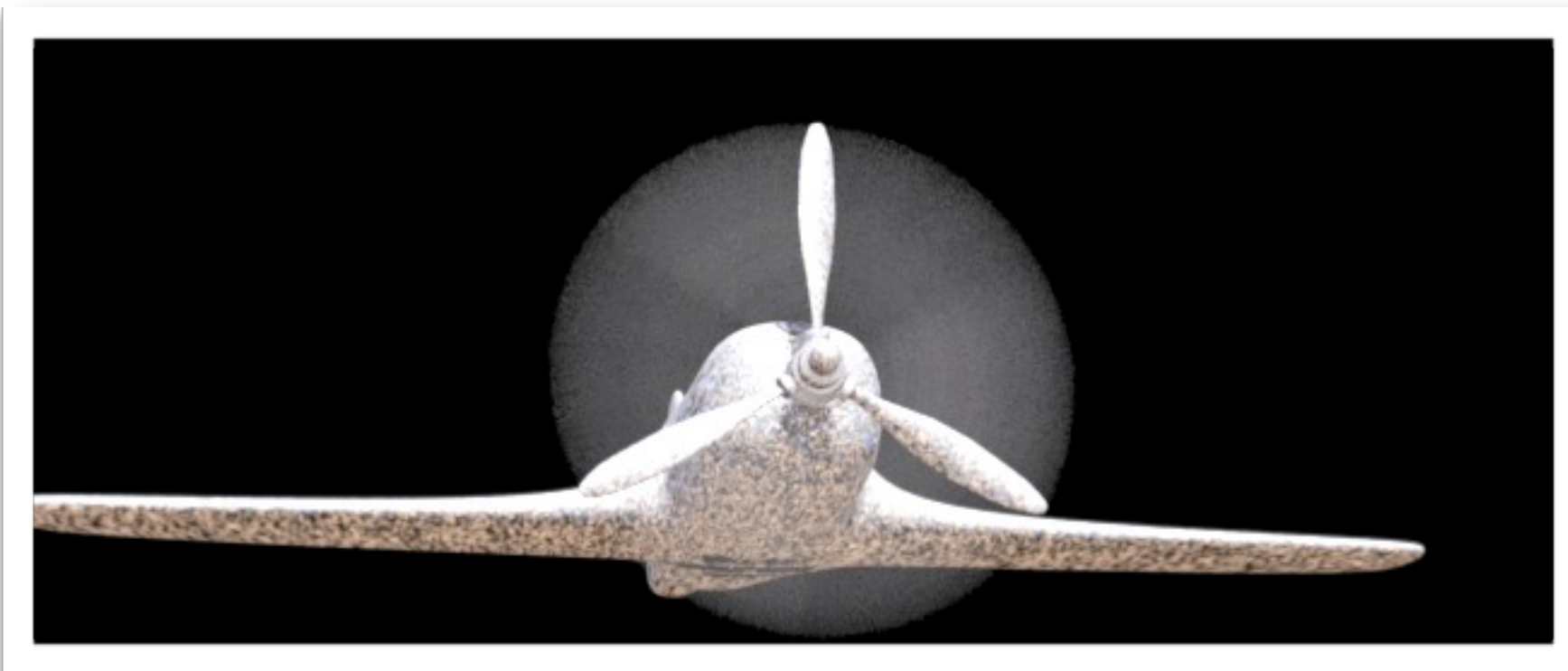 - ‣ Under Mantra-->Sampling Add as shown in image below
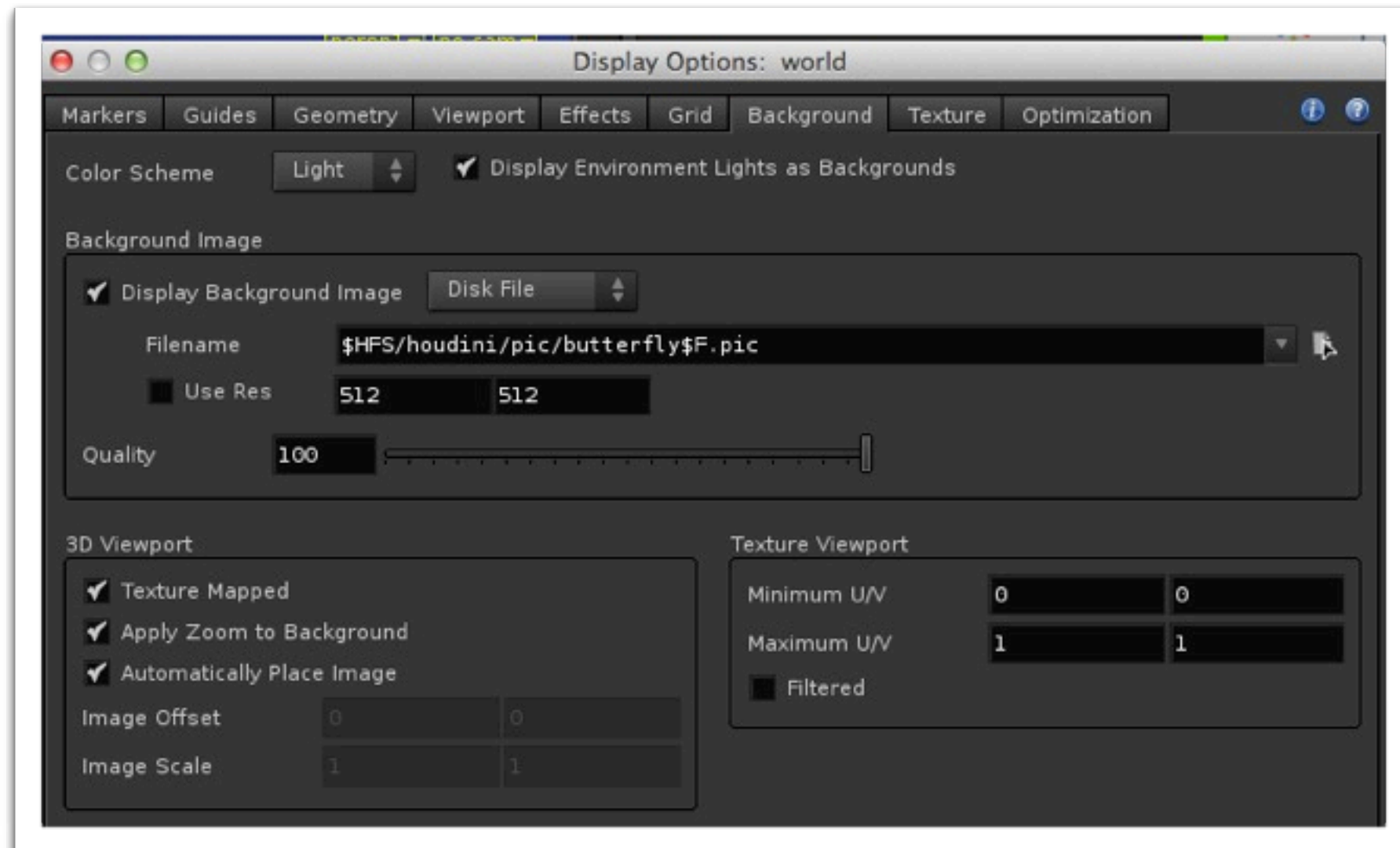- ‣ Hit Accept

- ‣ Now in the Blur Tab add your values
- ‣ Render

Blurs only
propeller

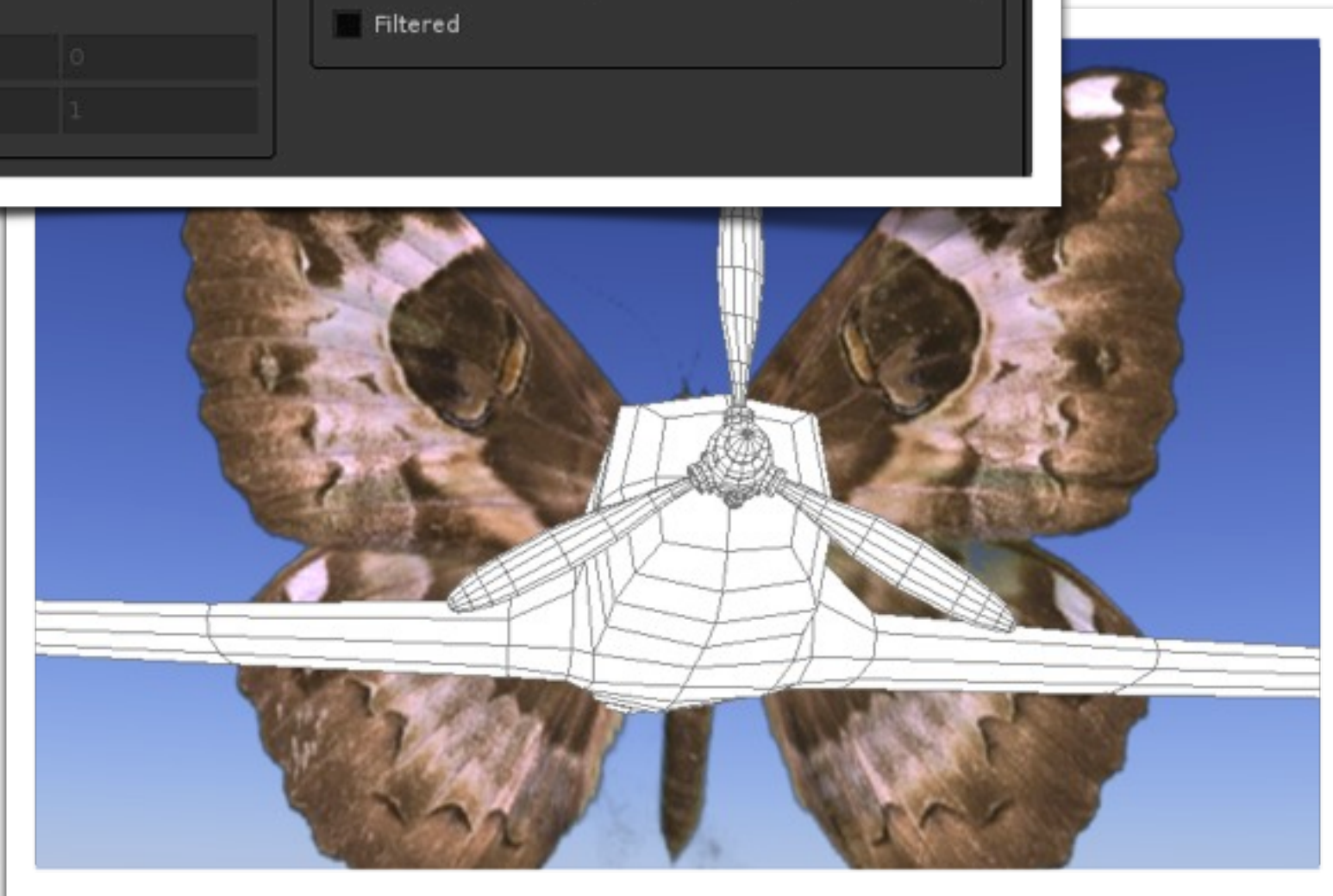SIDE EFFECTS
SOFTWARE

Background Images
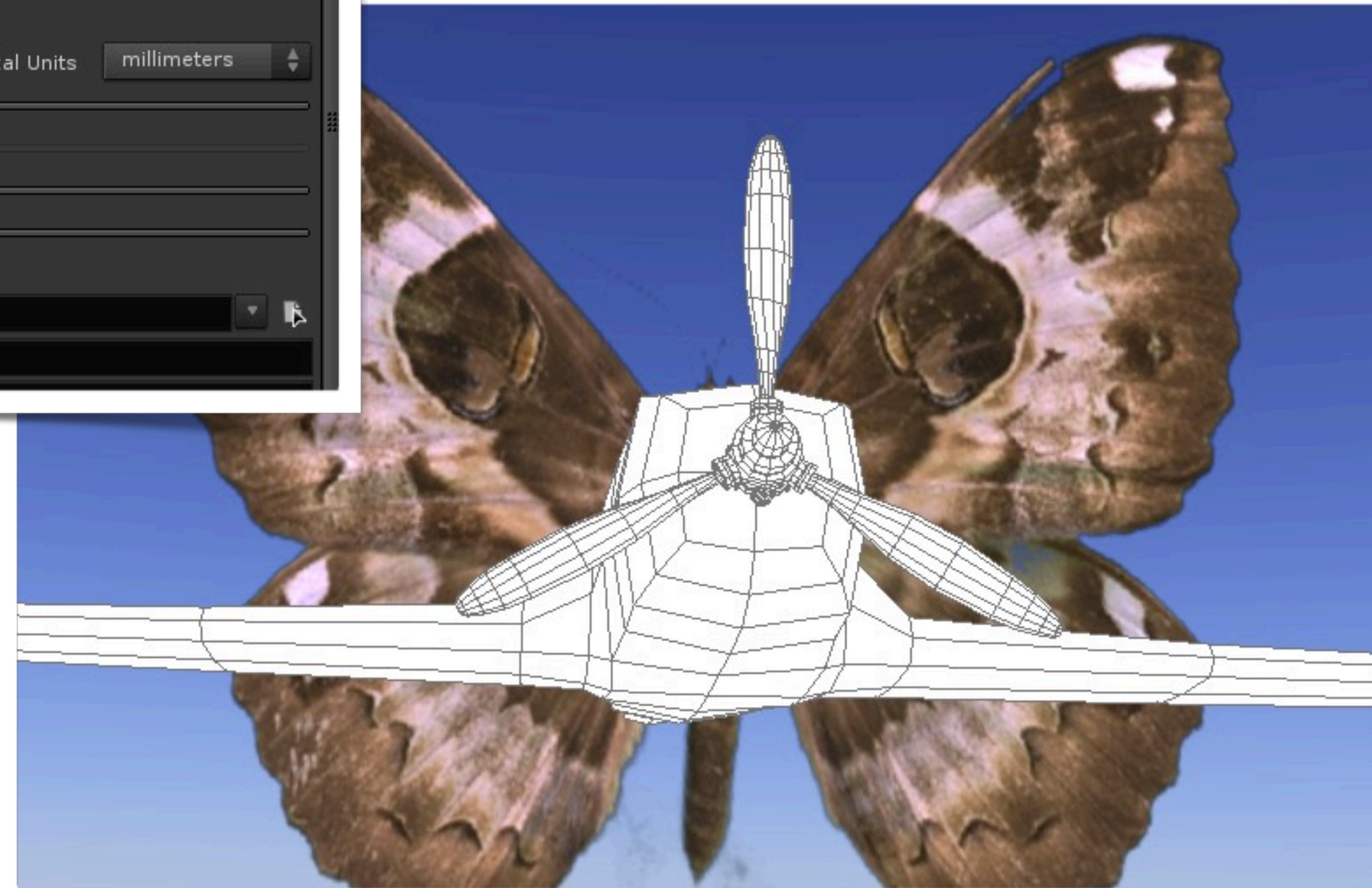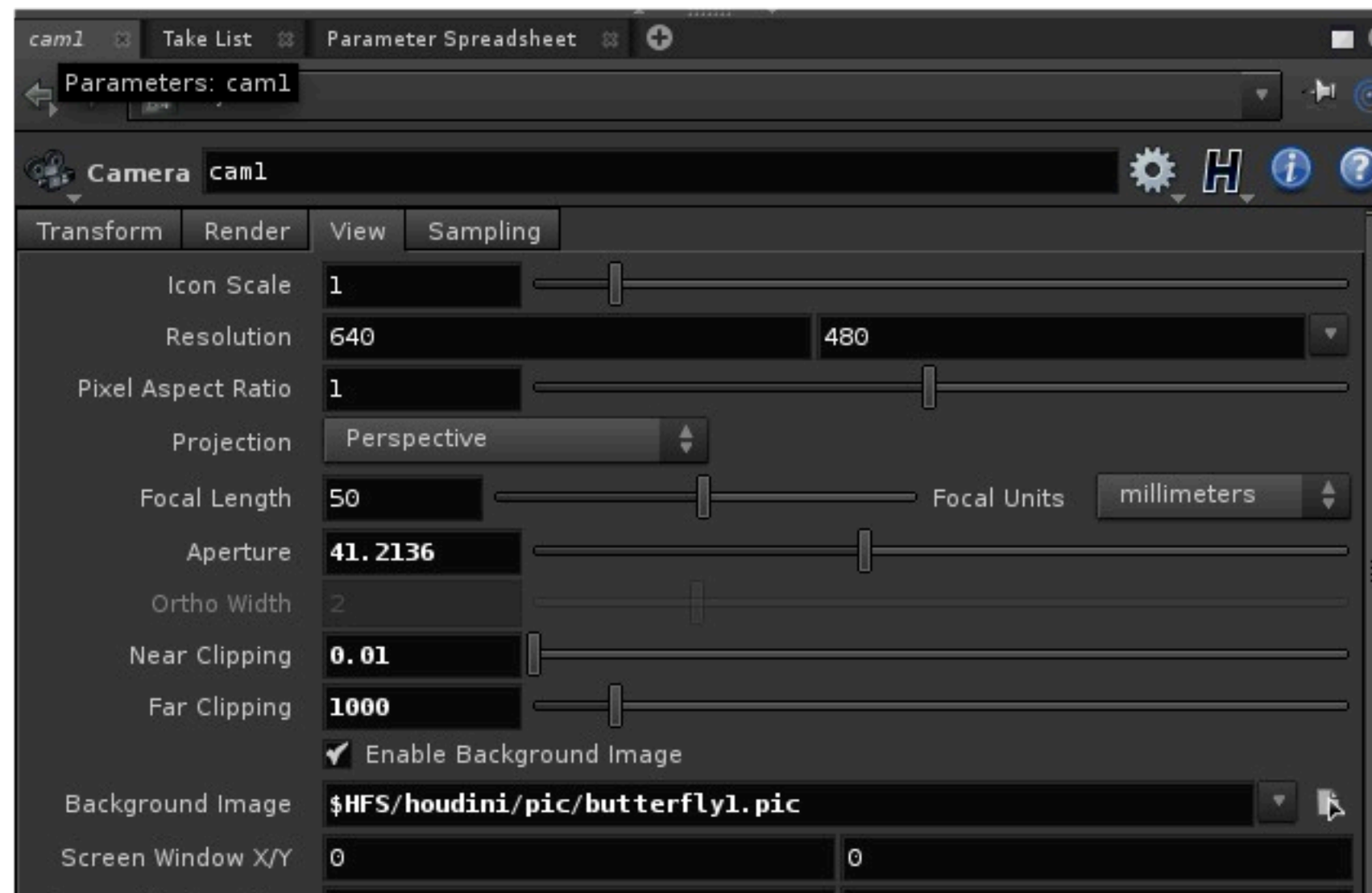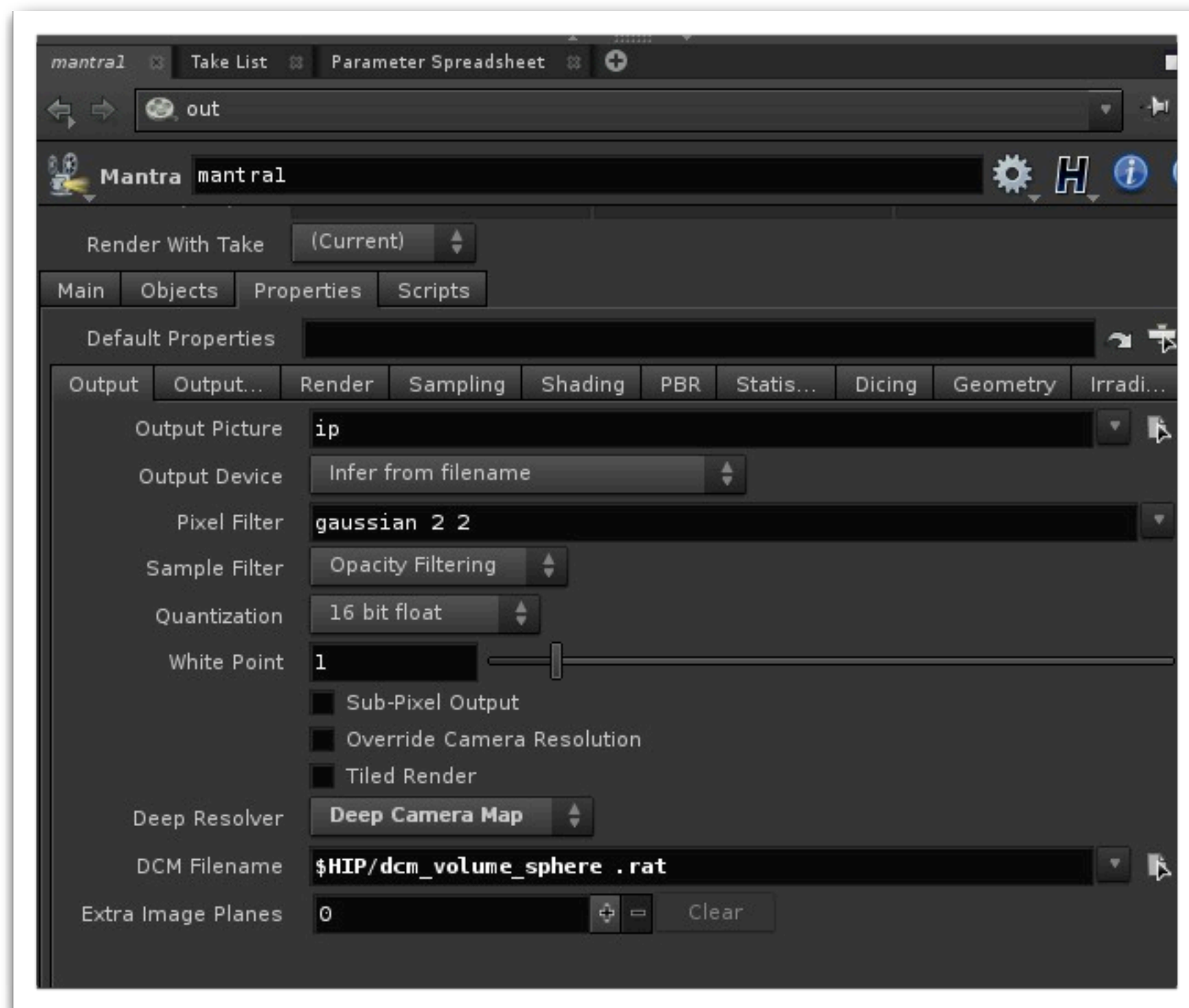
- In Scene View
  - Enter Display Options - "D"
- Does Not Render

▸ Use Camera Object to render background images

Deep Camera Maps as Background Images

- ‣ Drop Down a Sphere
- ‣ Append a isoOffset
  - ‣ Make it a fog volume
- ‣ Drop Down a Camera
- ‣ Drop Down a Mantra
  - ‣ Enable DCM
  - ‣ Save to .ratfile
- ‣ Drop Down a box
- ‣ Disable Sphere
- ‣ In Camera Object load as background .rat file
- ‣ Go to render view

SIDE EFFECTS
SOFTWARE