# PLANETI









#### **GDPR PRIVACY NOTICE**

European law requires us to tell you: when you authorize X-Plane using a product key, Laminar Research collects your computer's IP address. We use this information only to verify that your product key has not been stolen. We do not sell or share this information with anyone else.

If you select "Accept," X-Plane will continue to contact Laminar Research's servers to authorize your digital download copy of X-Plane. If you select "Cancel," we will not contact our servers, and X-Plane will revert to demo mode in 14 days.

Cancel

Accept





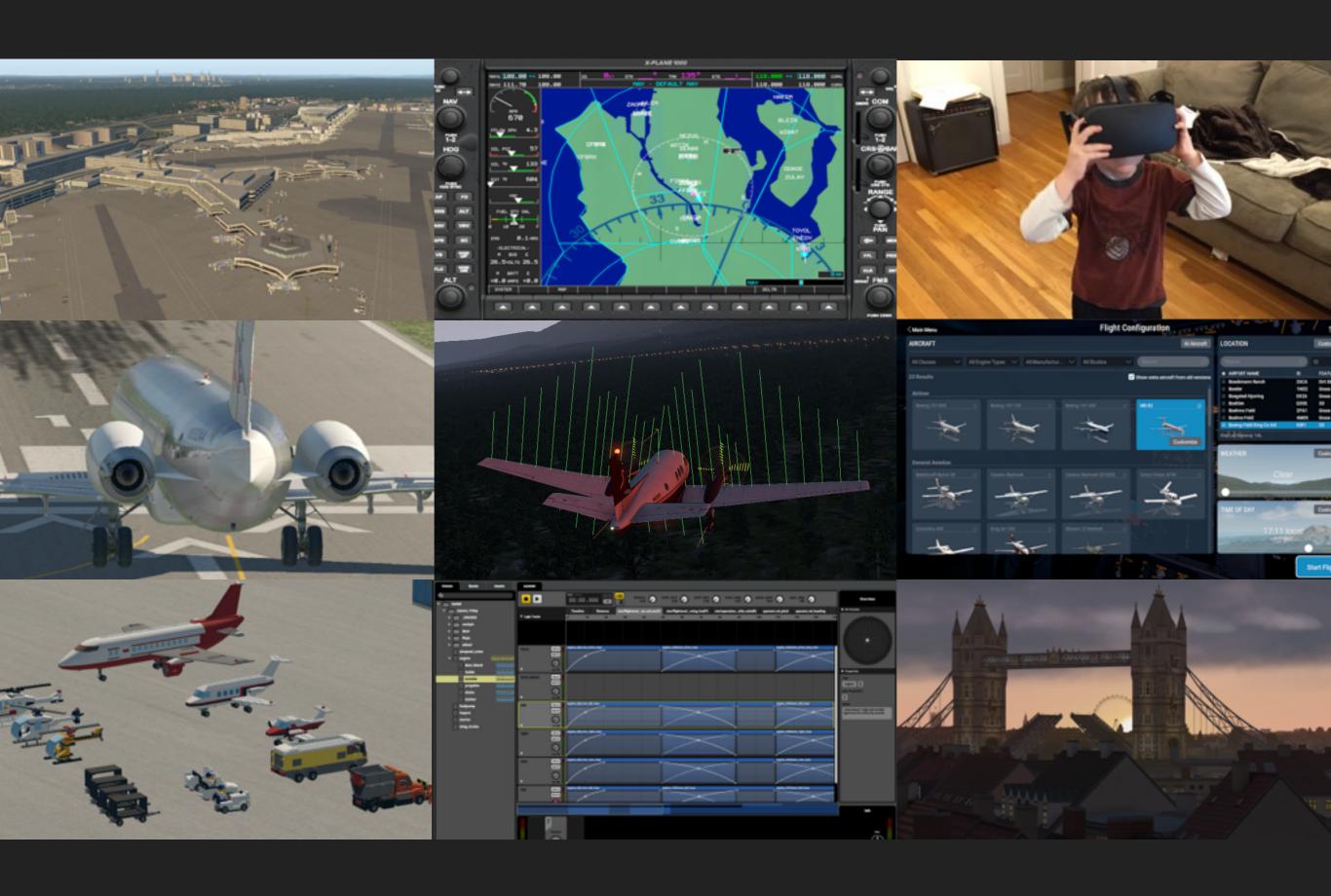




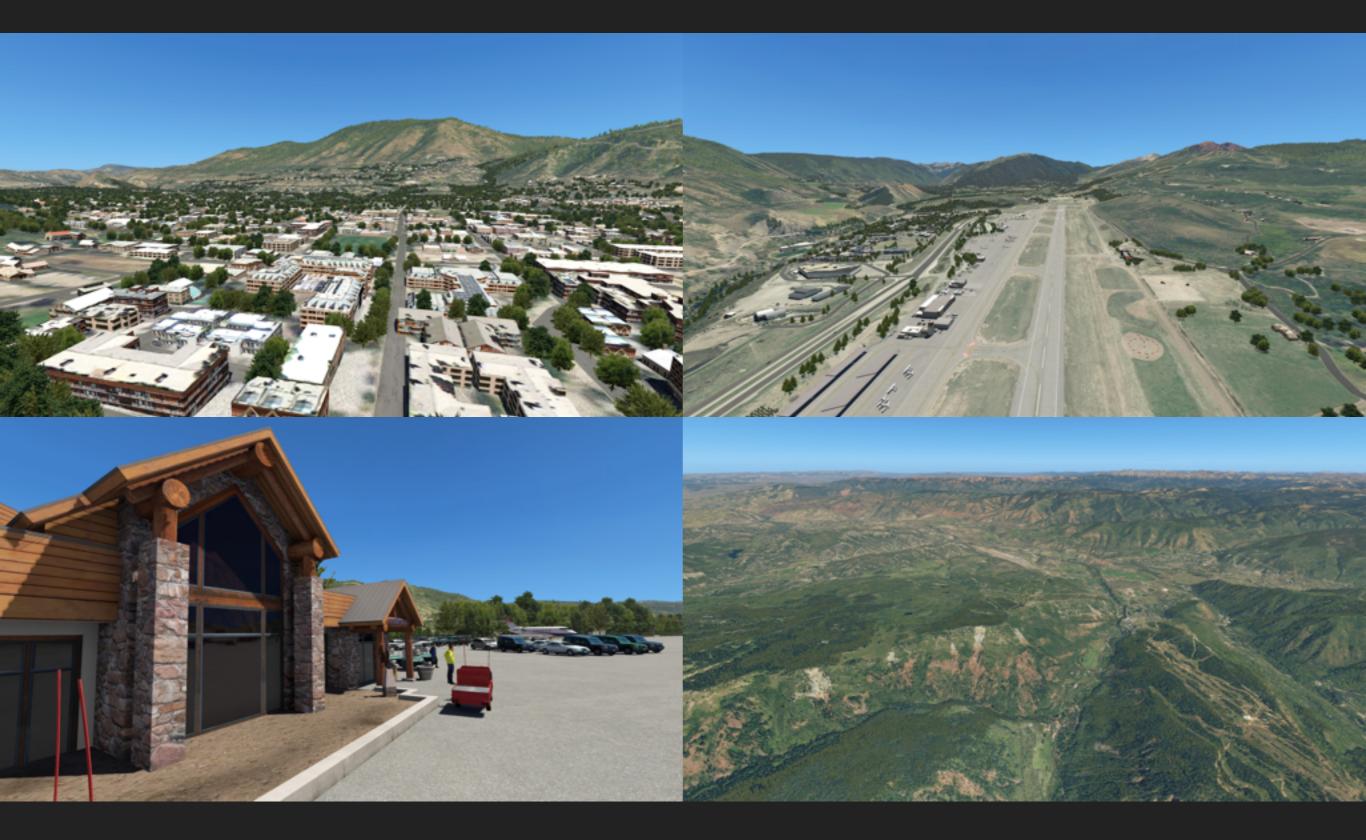
AIRCRAFT

Flight Configuration



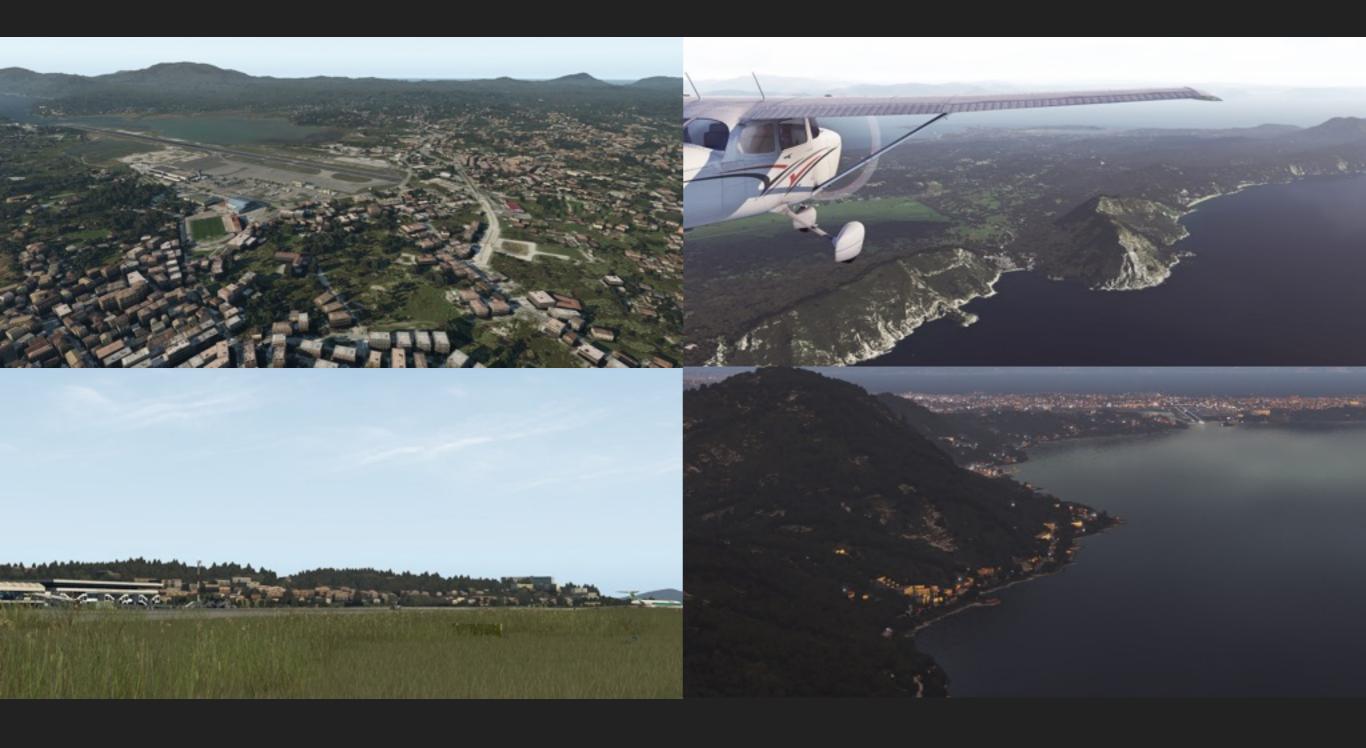






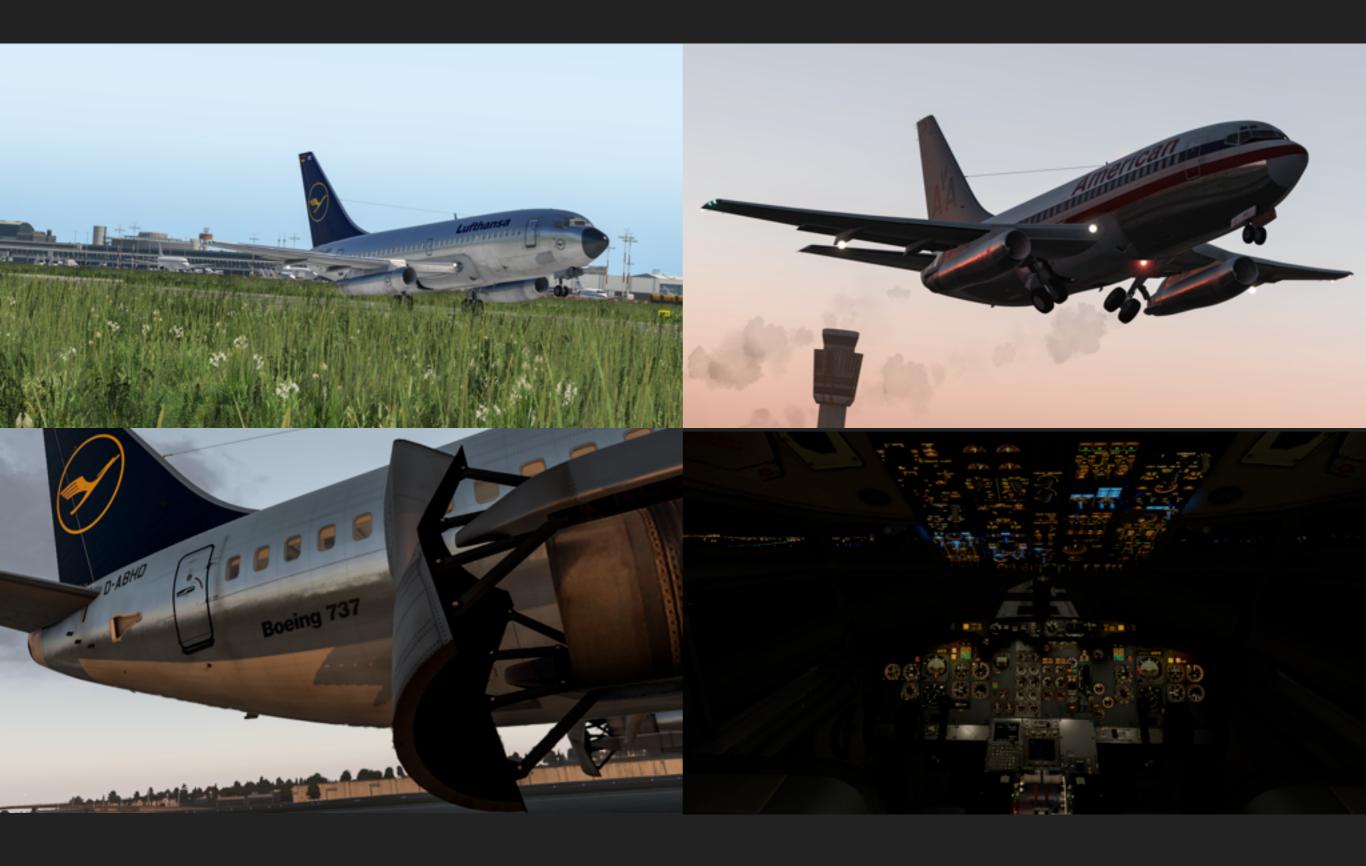
Aerosoft - Aspen XP





FlyTampa - Corfu



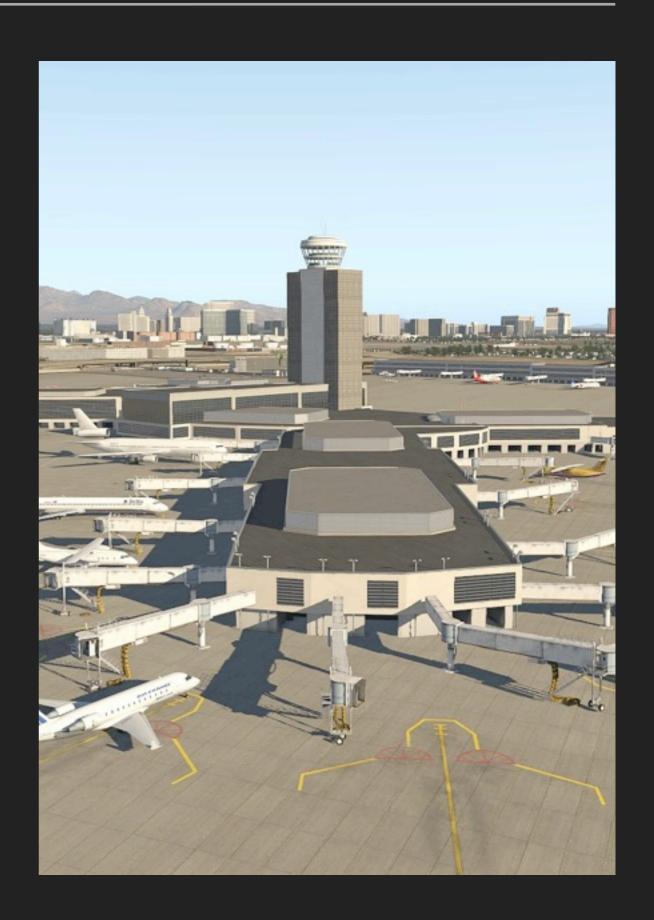


FlyJSim - 737-200



### **COMMUNITY-CREATED AIRPORTS**

- ▶ 3D Airports: 7310
- New 3D Airports in 11.20: 1315
- New 3D Airports in 11.25: 645
- ▶ Top 50 busiest airports world-wide
- All 37 Class B US Airports
- Users Contributing to 11.25: 668



#### **EDDH Hamburg**

#### KPHL Philadelphia



MMMY General Mariano Escobedo

**KDCA Washington National** 



**TNCM Princess Juliana** 

**EDDM Munich** 

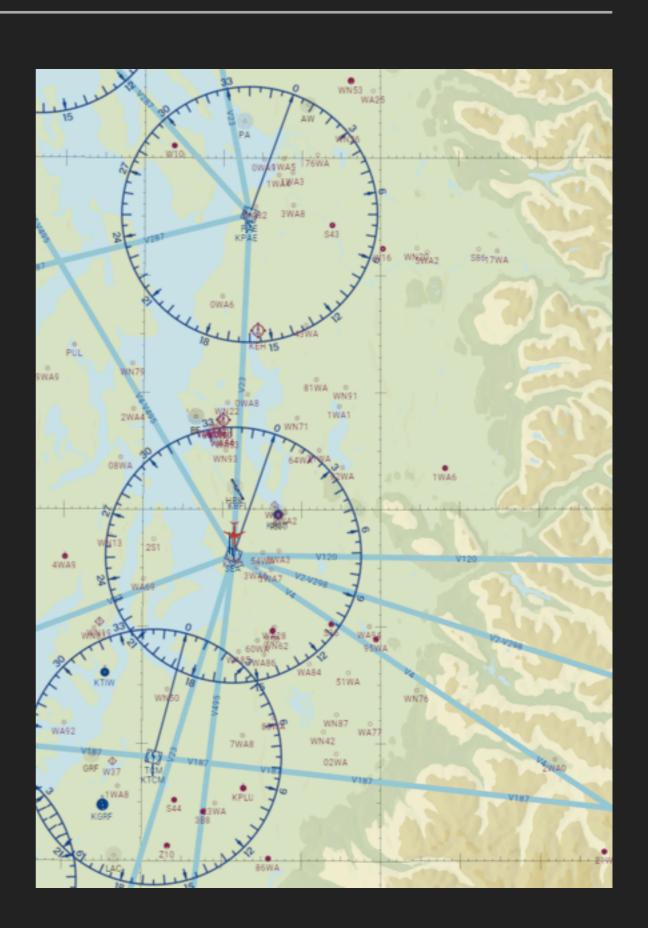


# HANG®VER



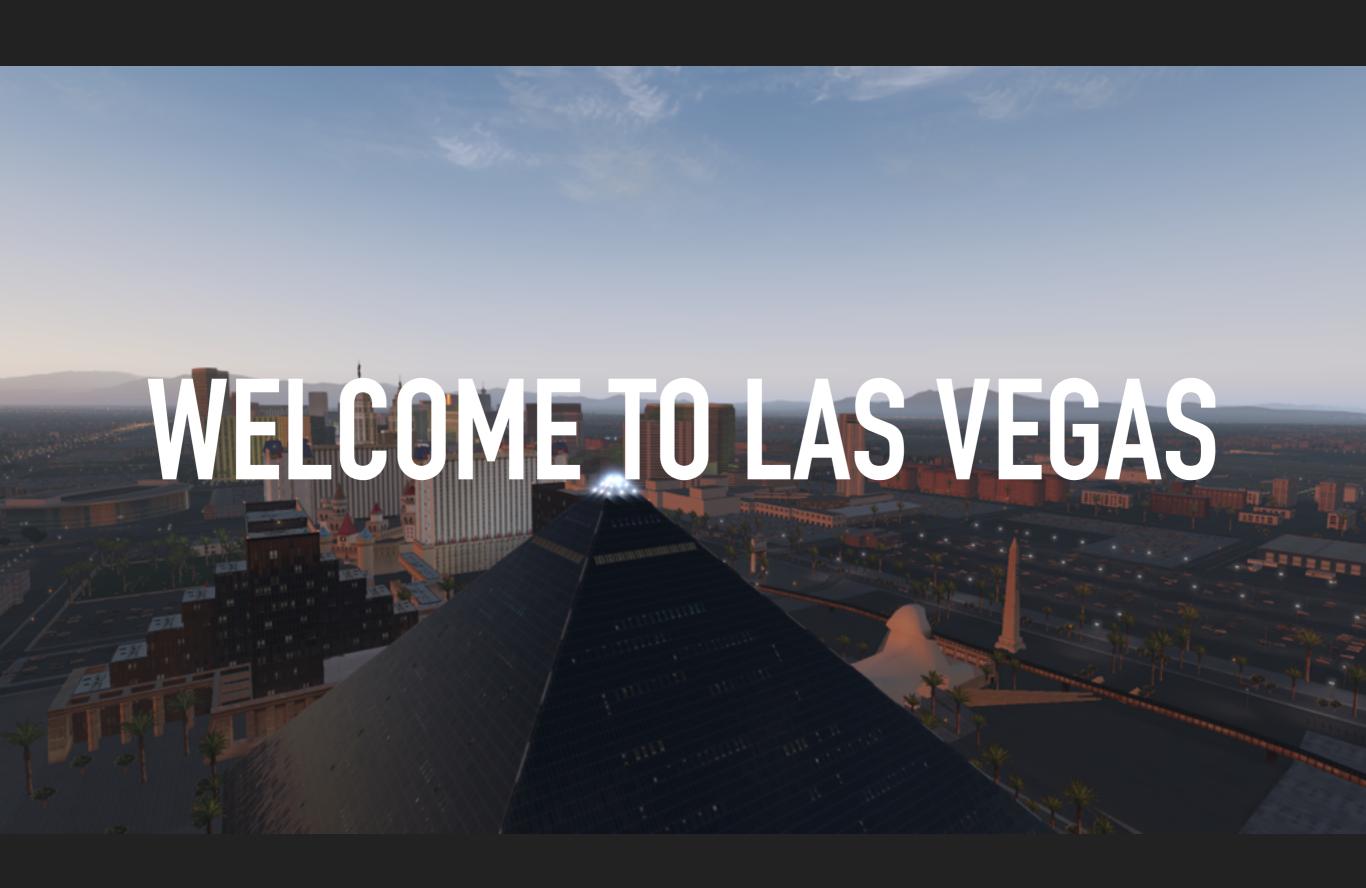
## **ROAD MAP**

- New Features
- What We're Working On
- Vulkan Road Map
- Making Stuff



## ALEX UNRUH, ART DIRECTOR

# ART UPDATE

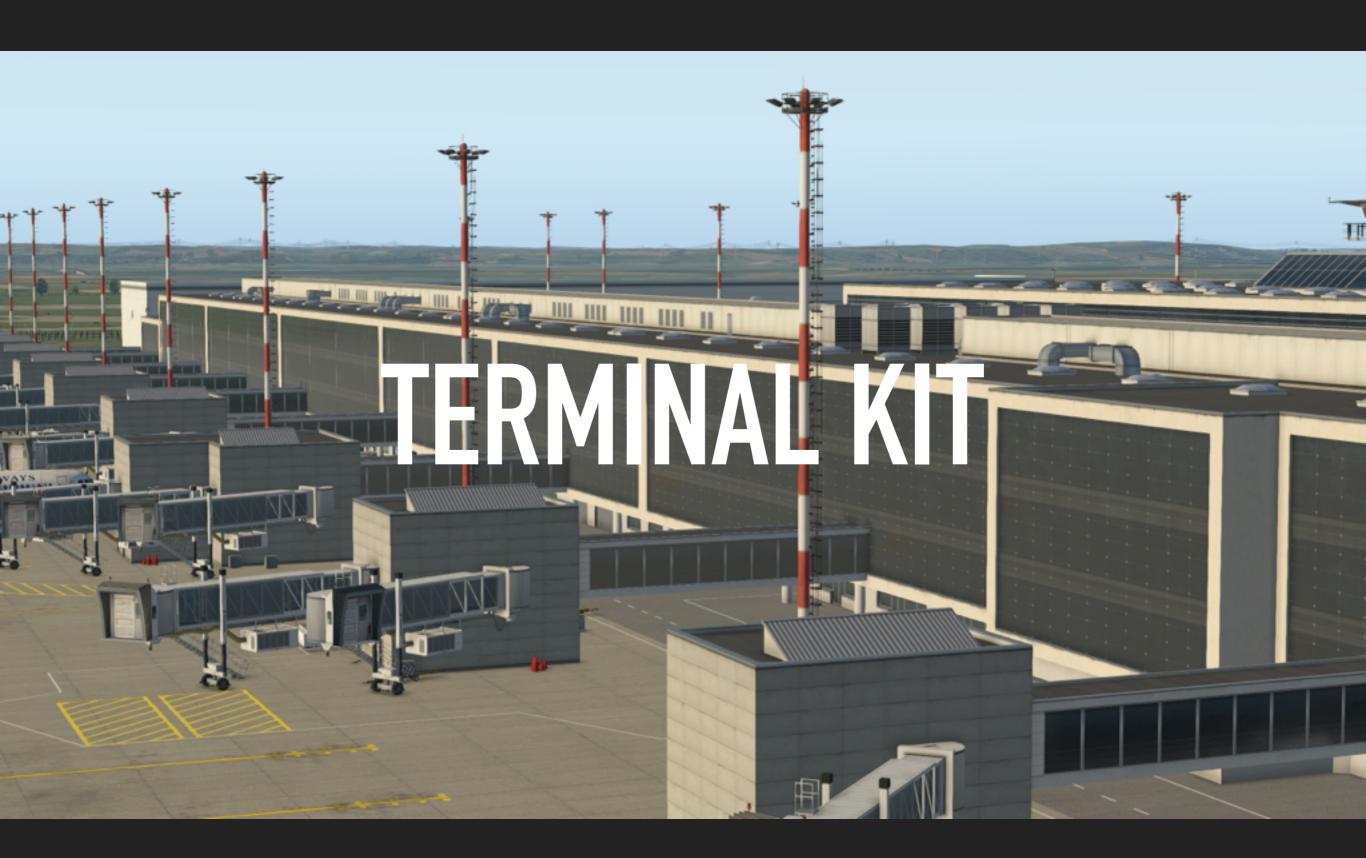








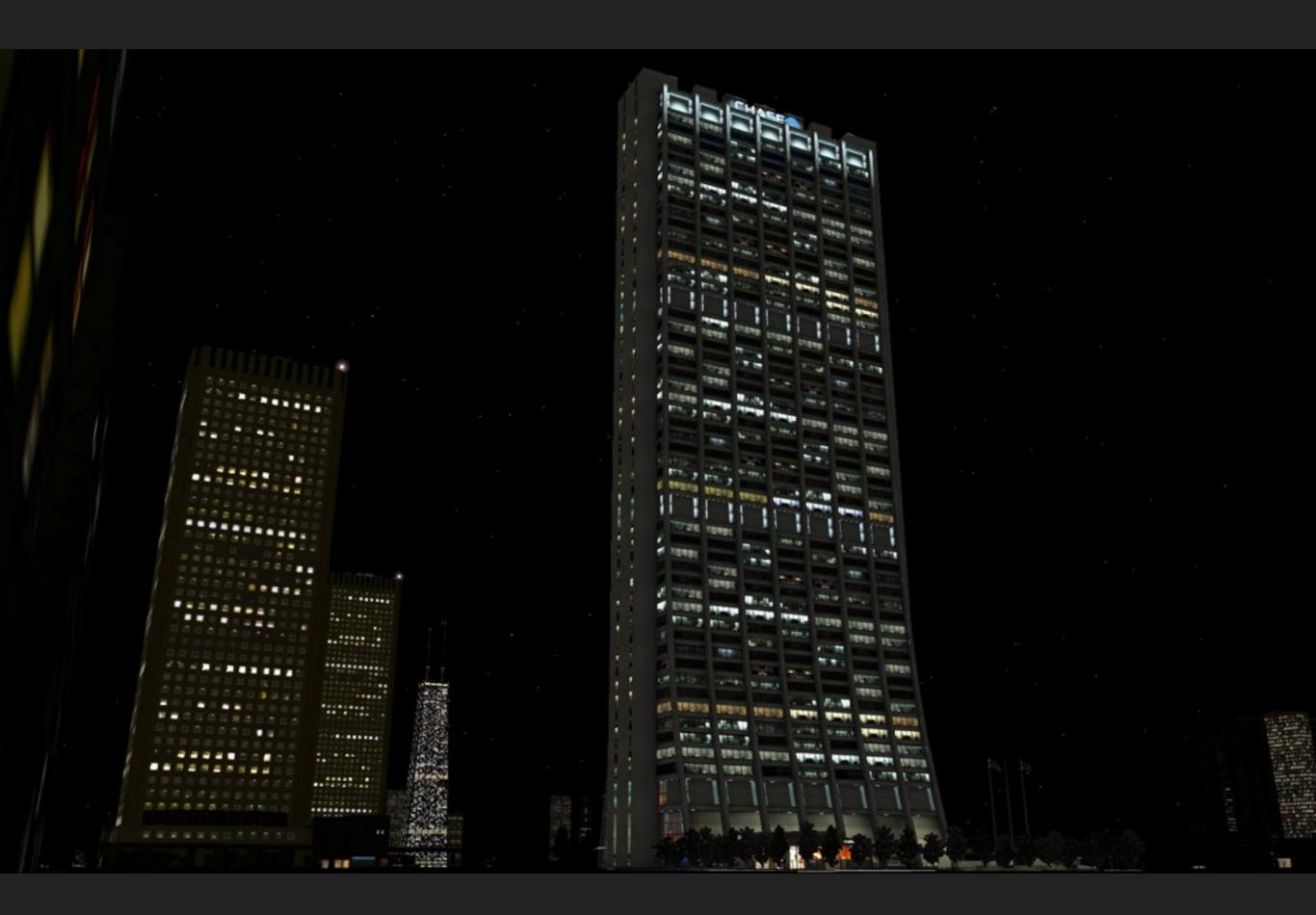


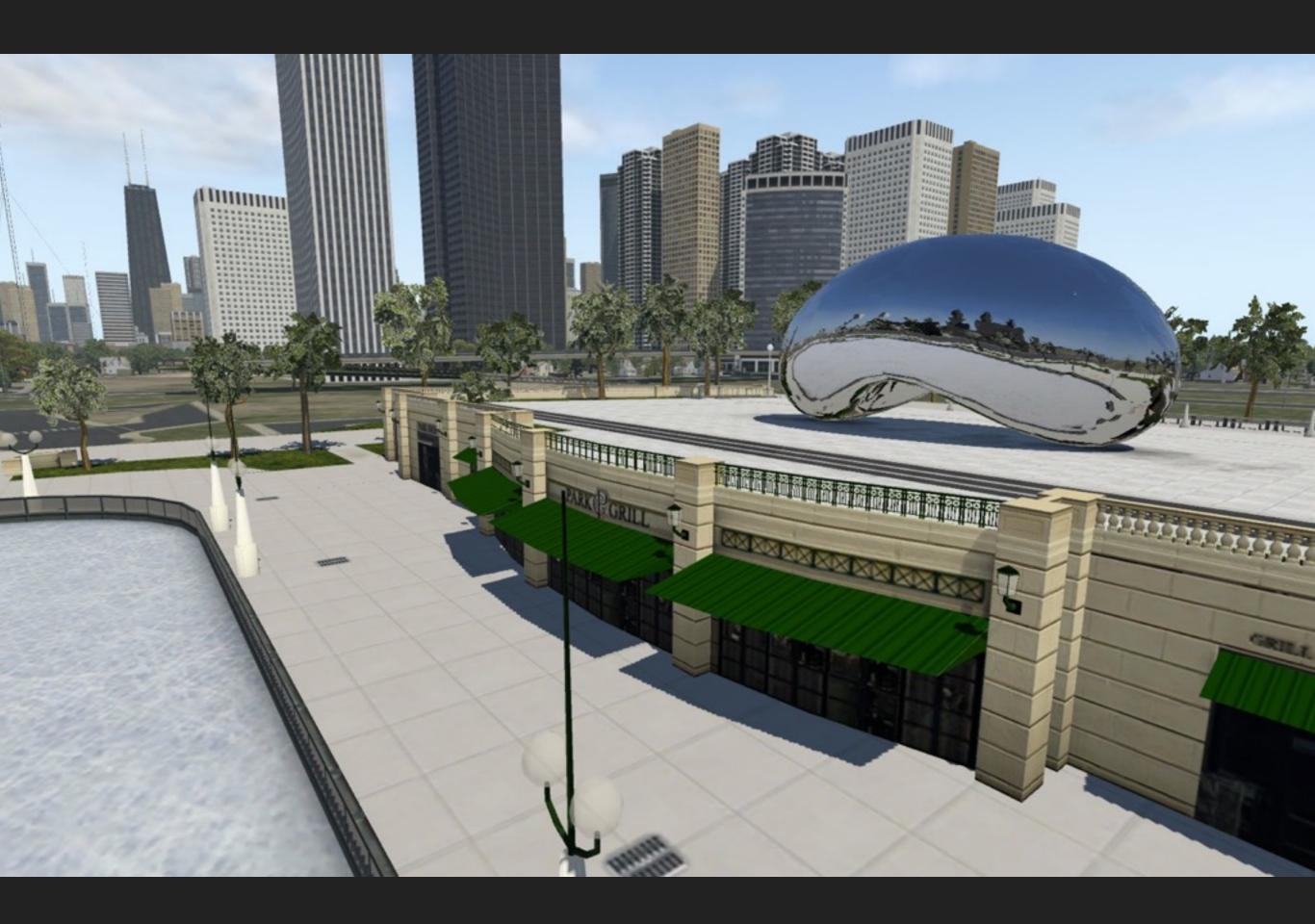














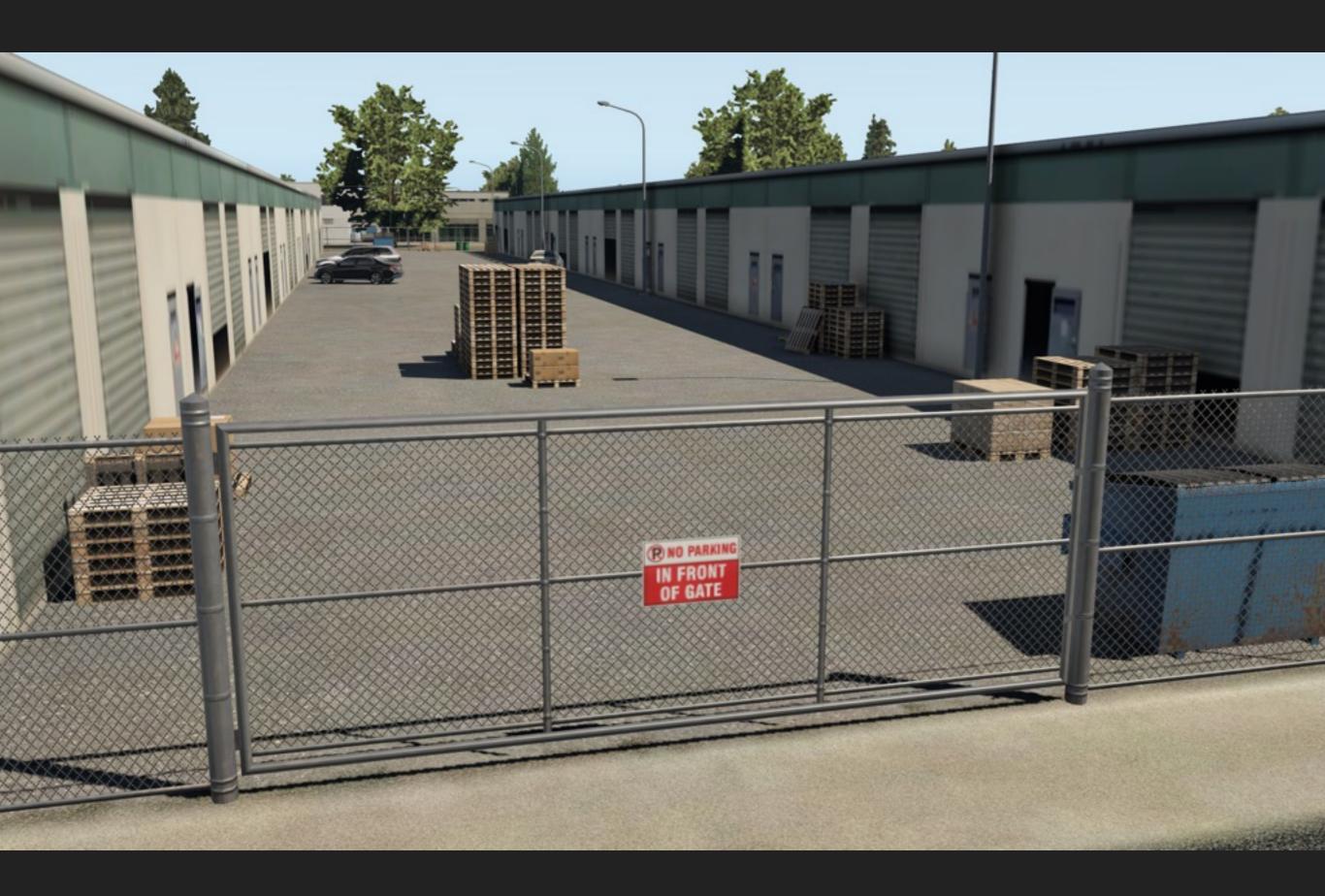










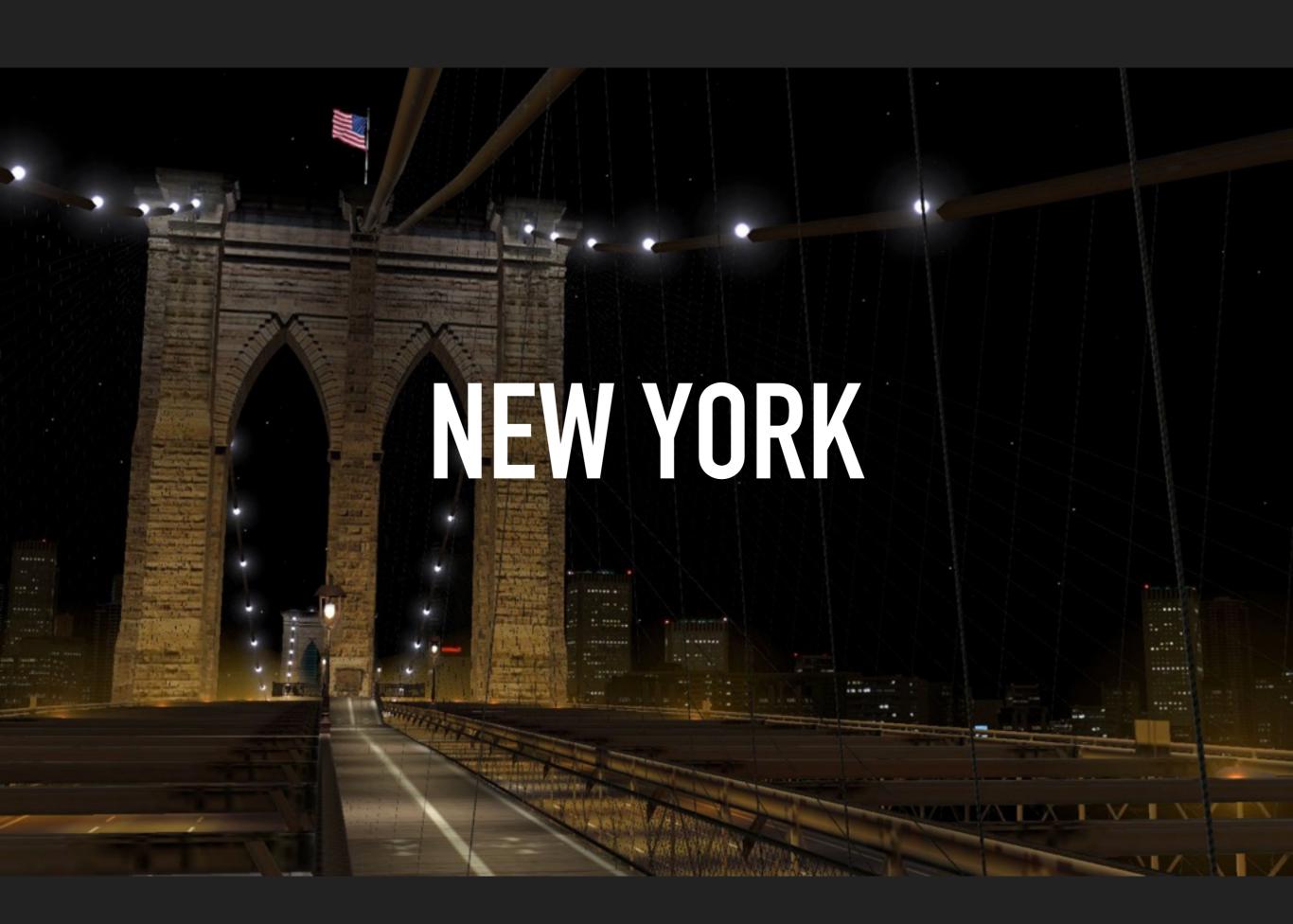




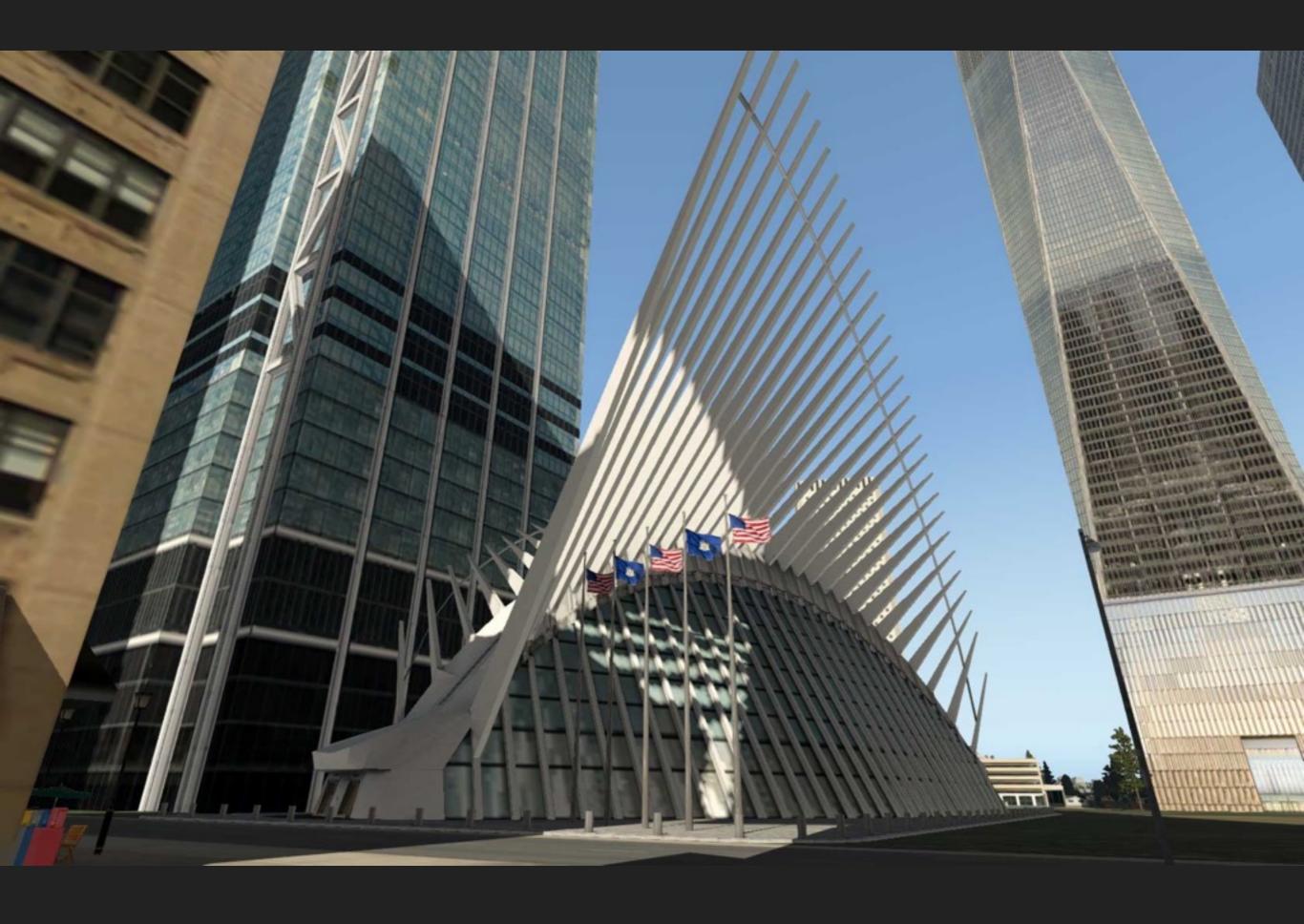














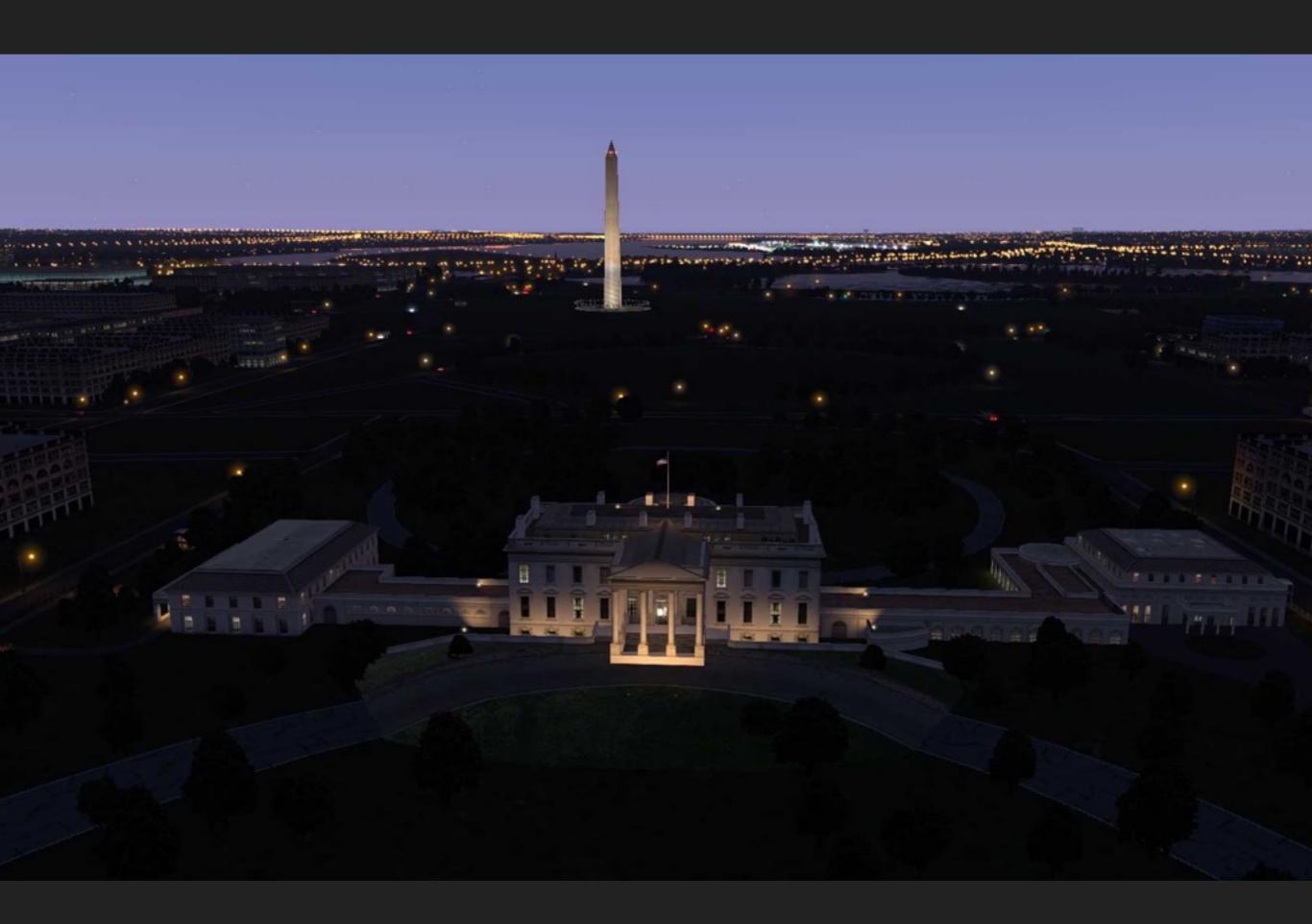


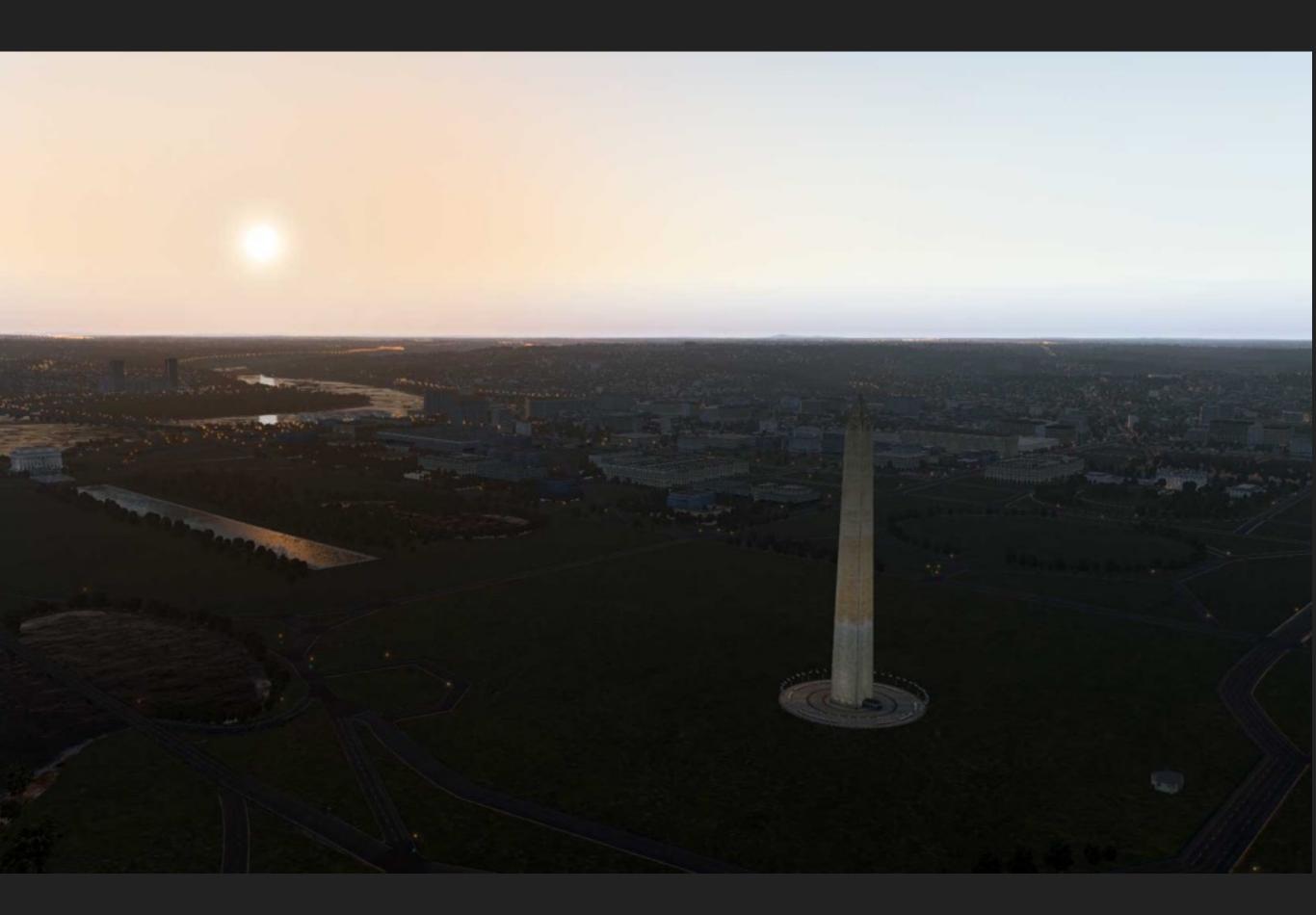










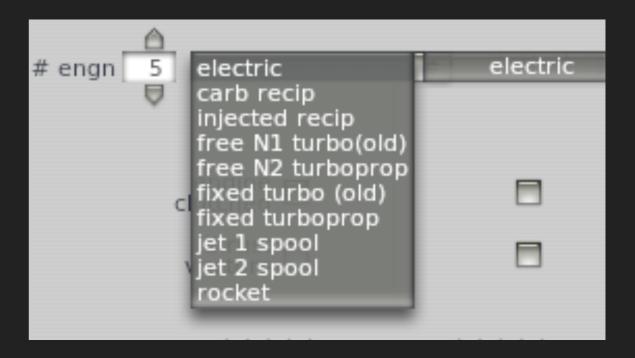


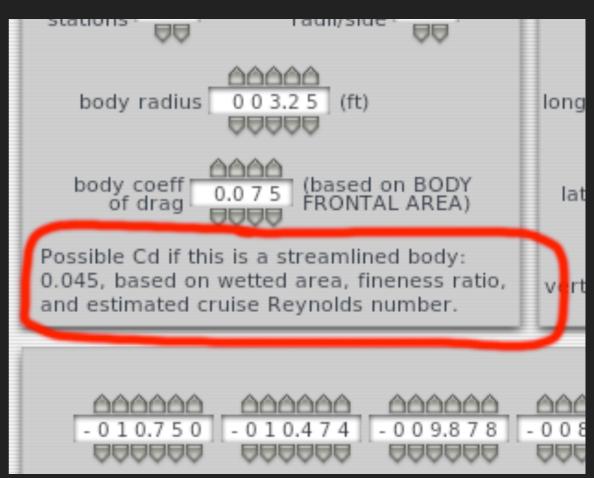
### AUSTIN MEYER, FOUNDER & KING

# PHYSICS

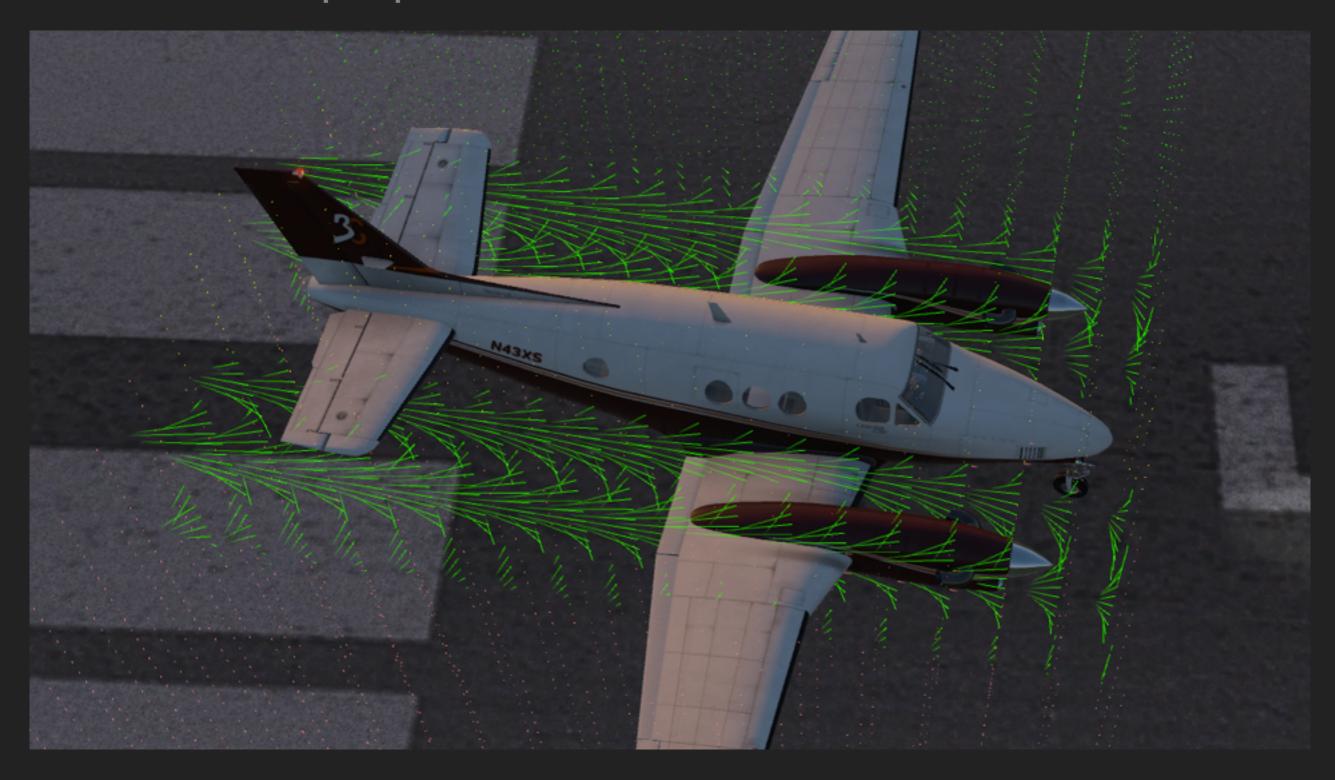
### **NEW PLANE-MAKER FEATURES**

- Better jet engine modeling: We now have singlespool and twin-spool jets selectable in Plane-Maker!
- Now there is a RECOMMENDED Cd (coefficient of drag) for that body!
- You can see that recommended Cd and use that as your Cd if you like.
- This Cd looks at the V-speeds of the plane to estimate Reynolds number, which it then uses to estimate skin friction drag, which it then applies across the surface area of the body, which it then multiplies based on the thickness of the body compared to its' length, which it then compares to the frontal area of the body to predict a reasonable coefficient of drag if the body is streamlined and in un-disturbed airflow.



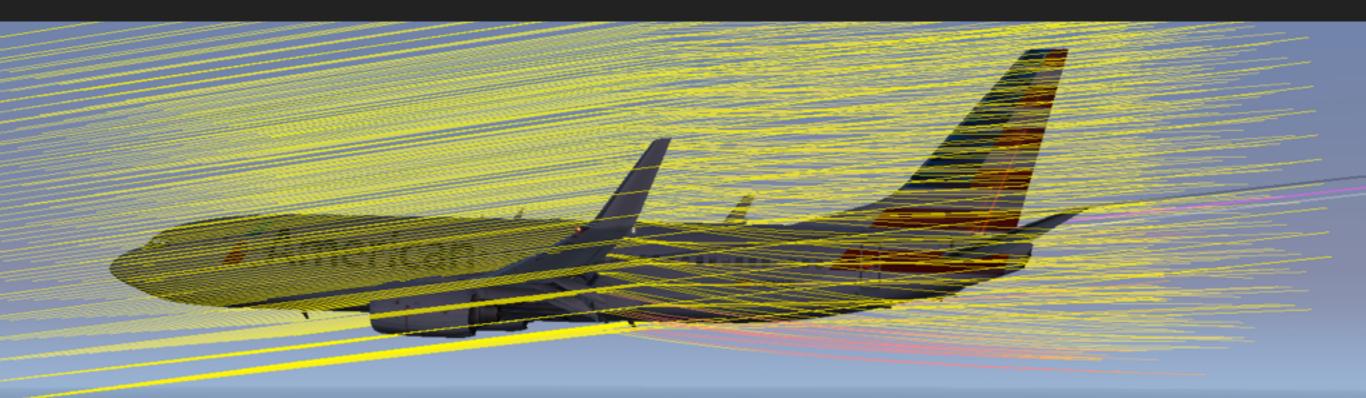


Prop wash accelerates air leading to the prop as well as behind the prop.



#### X-PLANE PHYSICS

- I've combined data from a number of NACA tech-reports, and confirmed them as follows:
- Flight-test on the Boeing 707 in the 60's showed that the reduced downwash over the tail due to ground-effect threw the nose down about 2.5 degrees if you never flared:
- With update from NACA tech reports on observed downwash, we now see the same thing on airliners of that configuration in X-Plane!

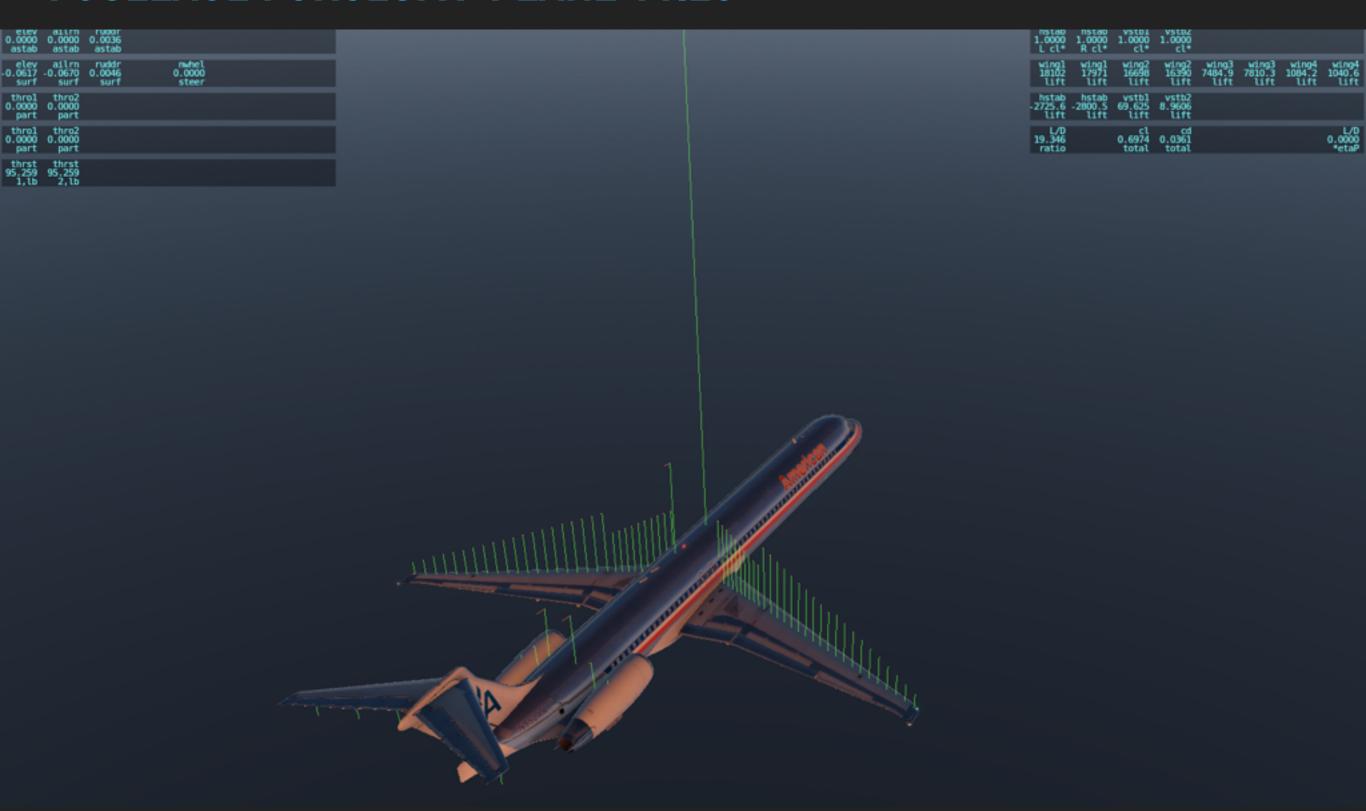


### **BODY LIFT AND SIDE-FORCE**

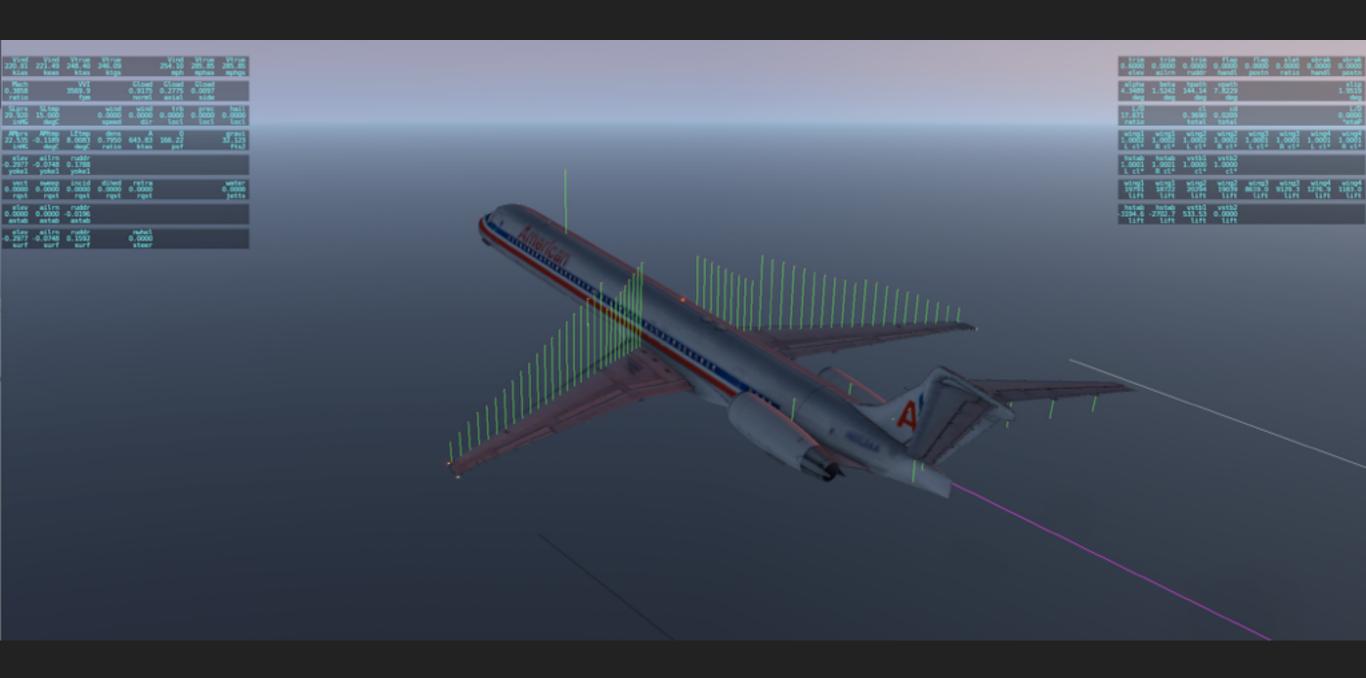
- Also, we have refined the side-force on bodies tp be more accurate, and also improved WHERE on the fuselage that side-force is applied!
- I found pretty decent references for fuselage (or other slender body) lift and drag and side forces, but I could find few references clearly showing WHERE those forces act.
- So how to find out?
- ▶ I needed to find the pivot point of a streamlined body at various angles of attack... how to do that?
- I needed w wind tunnel, preferably a mobile one that could drive in smooth air, with access to un-disturbed air above the vehicle, preferably on autopilot so I could focus on my tests.
- What would such a test and vehicle look like?



### **FUSELAGE FORCES: X-PLANE 11.20**

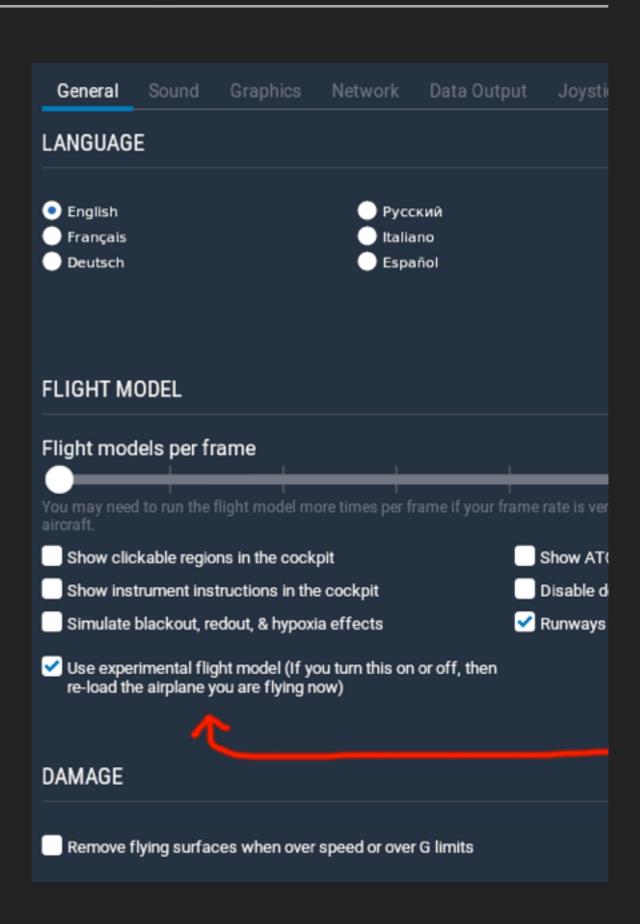


### **FUSELAGE FORCES: X-PLANE 11.30**



### RESEARCH MODE

- Opt-in check-box for the very latest physics.
- Not meant for shipping pay ware aircraft. (Not set in Plane-Maker.)
- Good for designing vehicles.
- Good for providing feedback about new physics.
- Will become official once timetested.



### PHILIPP RINGLER, CFI

## SYSTEMS AND AVIONICS

### **NEW AND IMPROVED AIRCRAFT SYSTEMS**

- Oxygen
- Anti-Ice and De-Ice
- Propellers and Governors
- Autopilots
  - General Aviation
  - Airliners

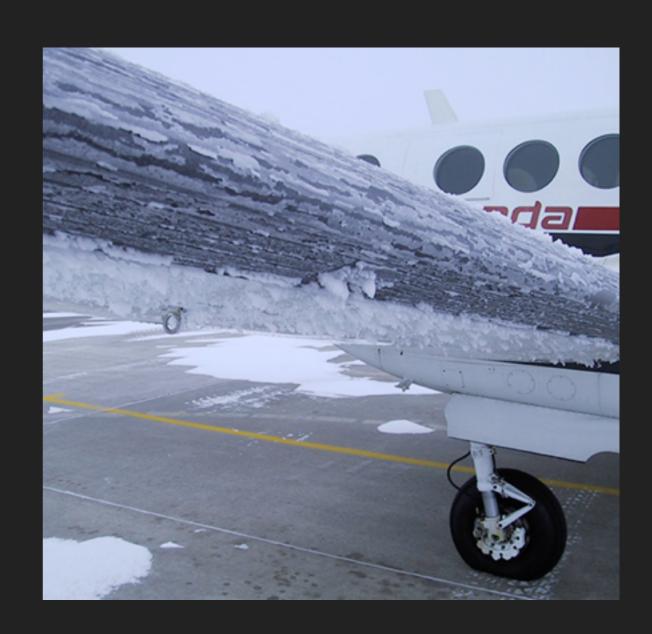
### **OXYGEN**

- Crew and passenger oxygen
- Chemical and high-pressure bottled
- Physical units
- Modeled after real equipment we personally use



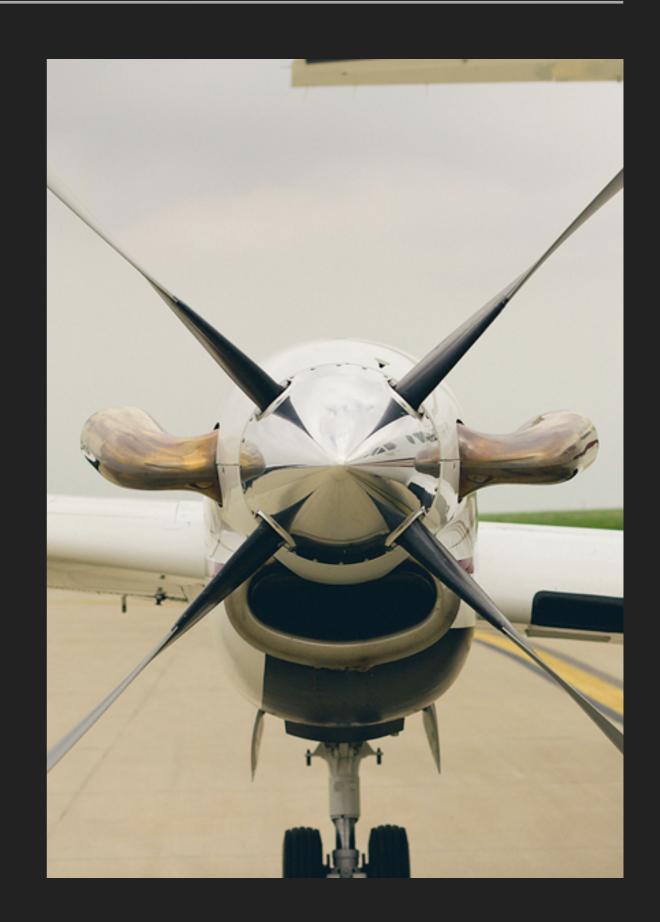
### ANTI-ICE

- Electric anti-ice
- Bleed air thermal anti-ice
- ▶ TKS chemical anti-ice
- Pneumatic boots de-ice
- Physical units
- System interaction



### PROPELLER GOVERNORS

- Failure modes
  - fine pitch
  - anti-feathering springs
  - full feather
  - auto feather
- Start locks and unfeather pumps
  - Negative Torque Sensing
- Fuel-topping governor and overspeed governor





# AUTOPILOTS

### **GENERAL AVIATION**

- Position-based autopilots
  - GFC-700
  - KFC-250/Century/custom
- Rate-based autopilots
  - S-Tec 55, KAP-140
  - Piper Autocontrol
  - single or dual axis
  - with or without altitude pre-select
- With or without electric trim



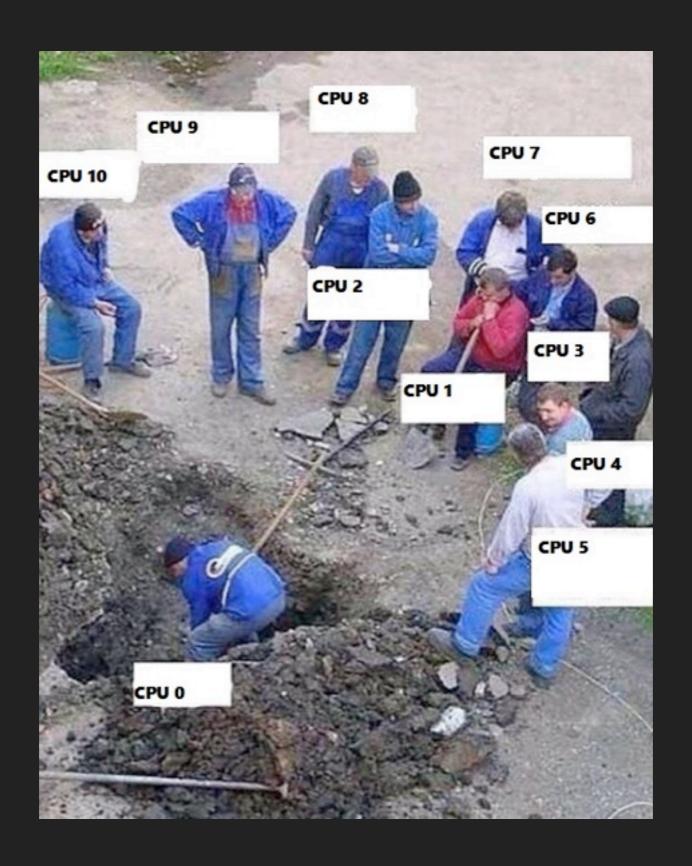
### **AIRLINER**

- auto-throttle N1/EPR modes
- Boeing-style CWS
- master FD vs. source selection
- real dual and triple channel preconditions and checks
- flare and rollout guidance
- three-axis/DAS



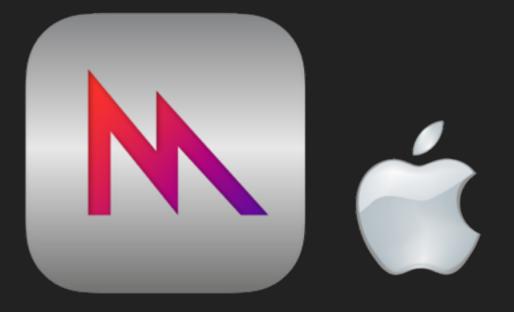


# VULKAN UPDATE











## ARE WE THERE YET?

-- /r/flightsim

### **REBUILDING X-PLANE FOR VULKAN**

- Adding Vulcan to existing renderer would just be more layers.
- We are restructuring the rendering engine to use modern APIs like
   Vulkan directly and efficiently.
- Move to Vulkan by making things faster and leaner, not slower and heavier.



### **VULKAN PORTING CHECKLIST**

- Constant Buffers
- Vertex Buffers
- Descriptor Sets
- Textures
- Pipelines/Shaders

- Query Buffers
- Render Passes/Framebuffers
- Swap Chains
- Command Encoder
- Pixel Buffers

### **VULKAN PORTING CHECKLIST**

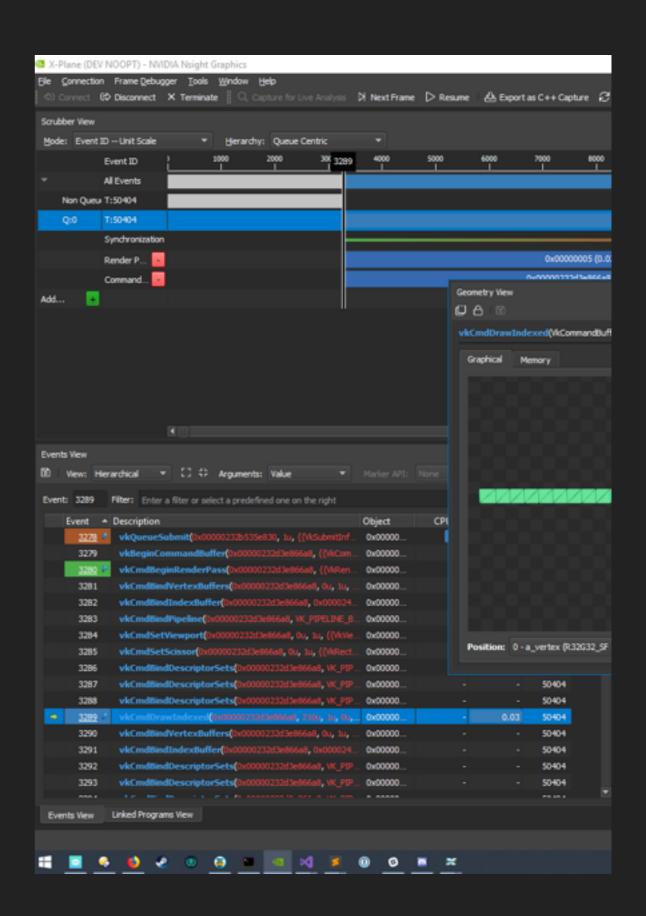
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About AOA-20 AOA-180 Wing L/D Section Re 4.50 M 0 4.5 0 (meg) 20000 New Lower Re New Higher Re intercept slope linear range lift power OpenGL 00000 00000 00000 15000 0.2 5 0 0 0.1020 1 0.0 0 0 1.4000 88888 88888 88888 Vulkan 00000 maximum stall drop stall power stalled drop 00000 1.6 0 0 0 0.1000 0.8000 1.4 0 0 0 88888 99999 99999 88888 10000 cd-min min-cd cl cd alpha=10 cd power 00000 00000 00000 00000 0.0065 0.2000 0.0 1 1 4 2.3 0 0 0 88888 88888 00000 00000 5000 buck power buck cl buck width buck depth 00000 2.0 0 0 0 0.0000 0.00000.000088888 88888 88888 88888 alpha 1 alpha 2 00000 **DRIVER CALLS** - 1 0.0 0 0 16.000 00000 00000 cm -20 cm alpha 1 cm alpha 2 cm 20 00000 00000 0.0500 - 0.0 5 0 0 - 0.0 2 5 0 - 0.0 7 5 0 00000 88888 00000 00000 alpha min alpha max 00000 00000 - 15.000 15.000 00000 99999 cl:-0.1274 cd:0.0068 cm:-0.0439 alpha:-3.66 untitled.afl

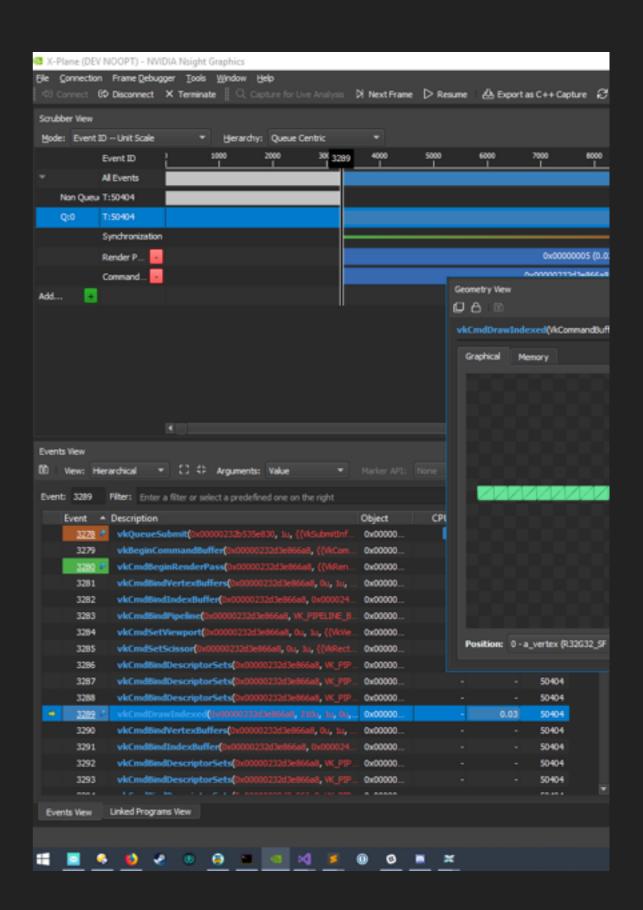
### WHAT VULKAN WILL NOT DO

- Vulkan will not bring world peace.
- Vulkan will not cure disease.
- Vulkan will not make Democrats and Republicans get along better.
- Vulkan will not make my kids like eggplant.
- Vulkan will not fix the ATC system.

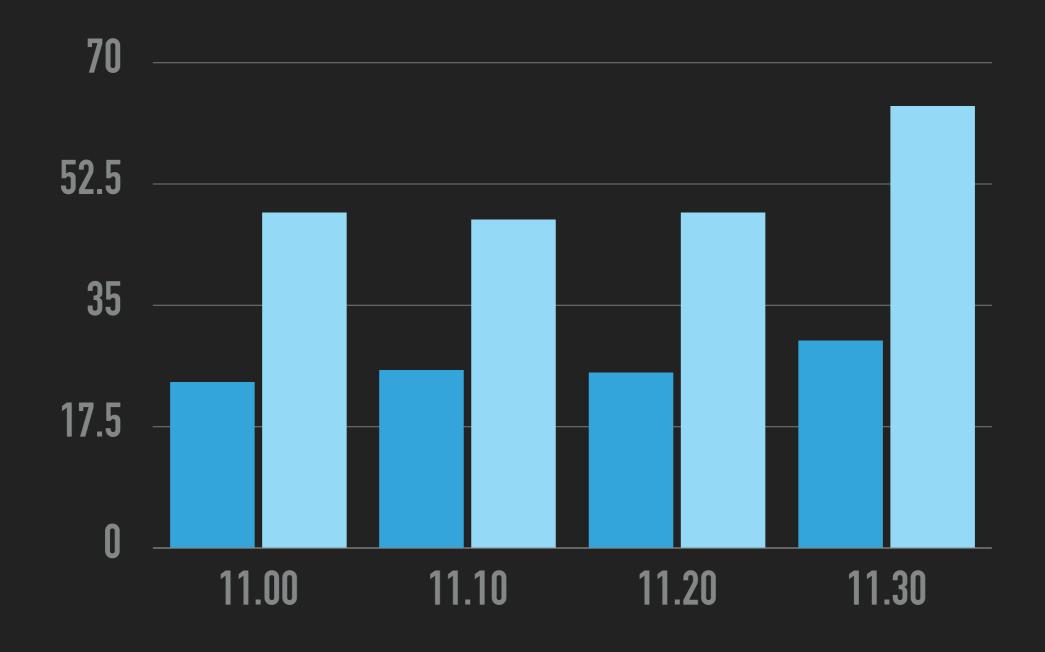


### WHAT VULKAN WILL NOT DO

- Vulkan will not fix rendering artifacts.
  - (Same rendering but faster.)
- Vulkan will not run X-Plane at 500 fps on your 8 year old computer.
- Vulkan will not improve multi-core use.
  - It does make it possible to fix this in the future!
- Vulkan is about getting some room to grow.



### **PERFORMANCE**

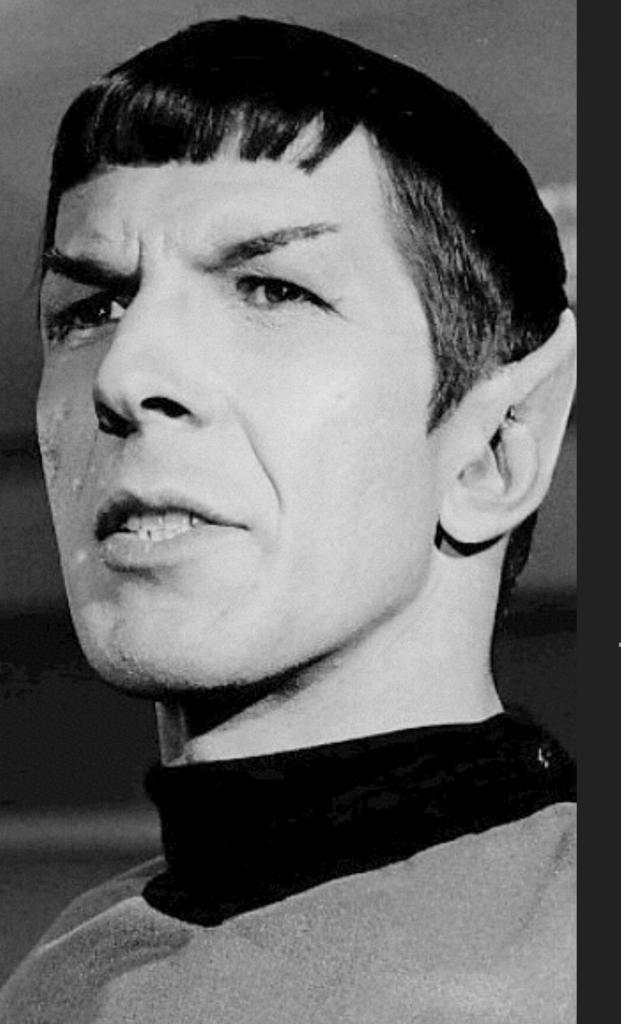


### WHAT ABOUT MY ADD-ONS?

— Concerned X-Plane User

### WHAT ABOUT ADD-ONS?

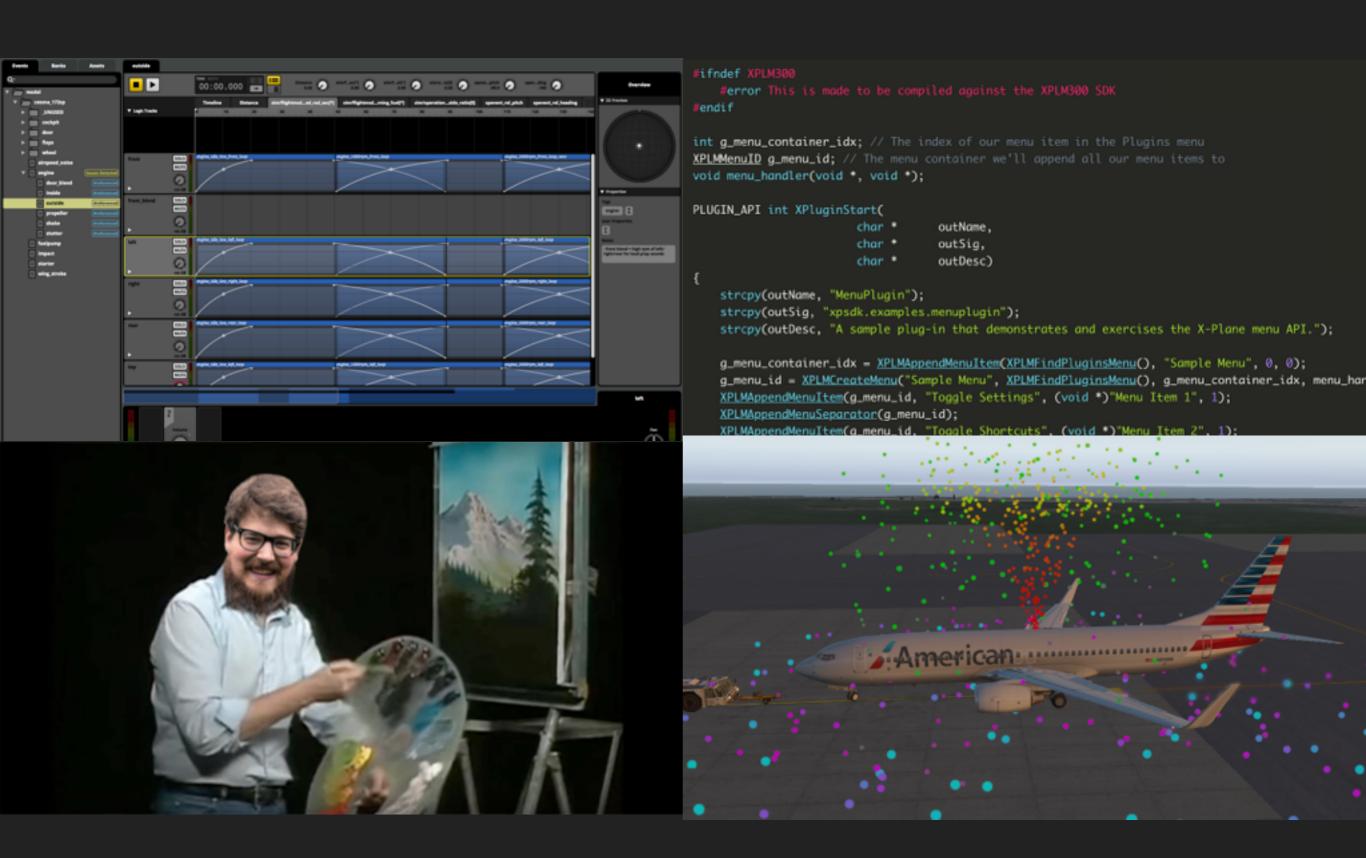
- ▶ 2-D OpenGL add-ons should "just work™".
  - No change required for UI, 2-D panels.
- Add-ons that draw models in 3-D (push trucks, etc.) just work if using the *newest* APIs. Modernize now!
- Add-ons that draw in 3-D must be rewritten to use X-Plane's native API - no 3-D access via OpenGL.
- OpenGL available for the life of X-Plane 11.



### **VULKAN UPDATE**

# BETA IN 2018? MAYBE.

### TOOLS FOR DEVELOPERS



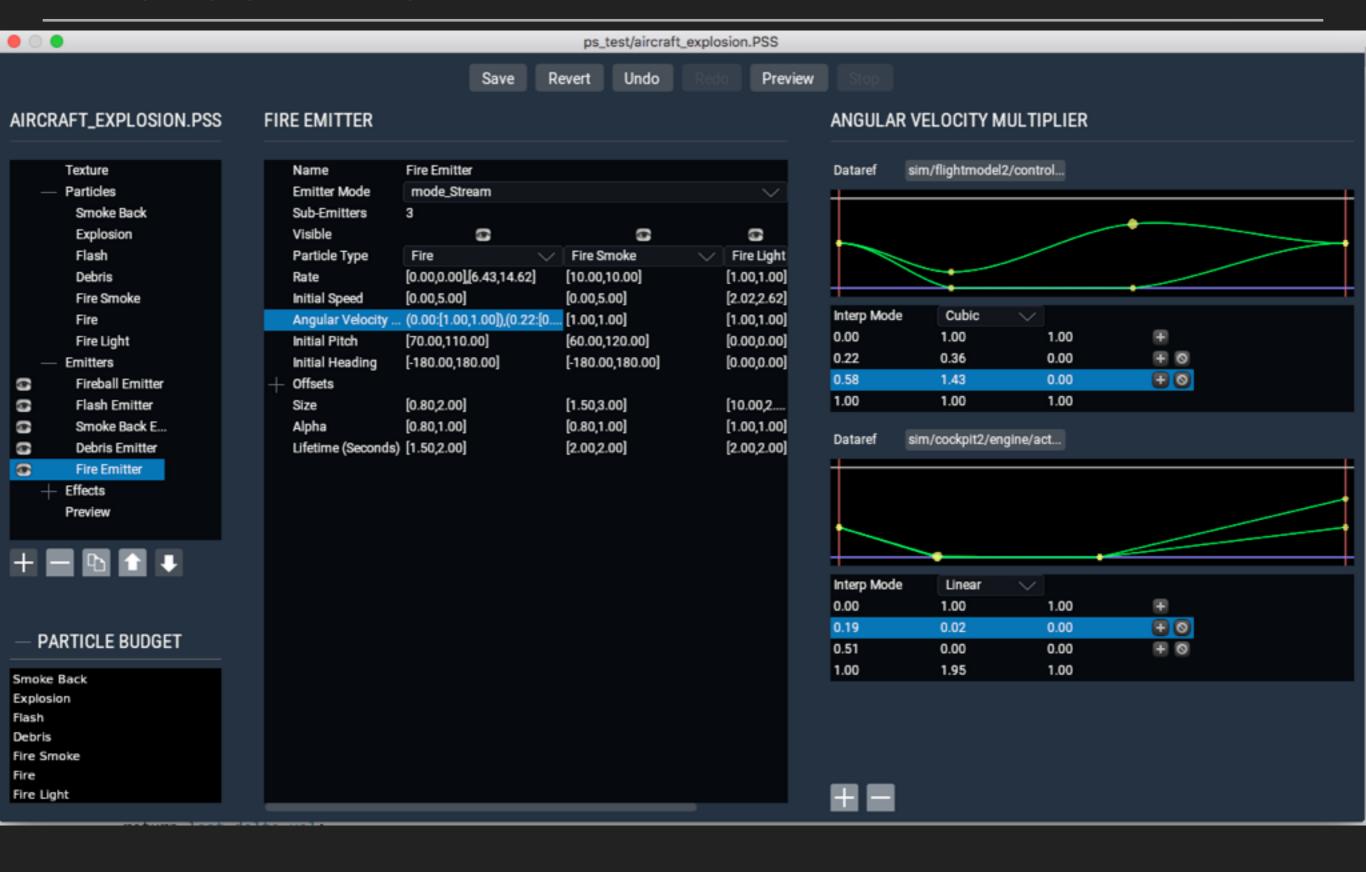
### PARTICLE SYSTEM DESIGN

- Artists make particle effects.
- Particle emitters attached to objects.
- Particle parameters controlled by key frame tables.
- ▶ A lot like FMOD!





#### PARTICLE SYSTEM EDITOR



### **CONTROLLING EFFECTS**

- All particle system parameters are controlled by key-frame tables.
- The input to key frame tables are... datarefs!
- Use as many data refs as you want.
- This means plugins can directly control particle effects.
- You can script your particle systems.

#### sim engine actu

sim/cockpit2/engine/actuators/N1\_target\_bug sim/cockpit2/engine/actuators/afterburner\_enabled sim/cockpit2/engine/actuators/auto\_ignite\_on sim/cockpit2/engine/actuators/beta\_ratio sim/cockpit2/engine/actuators/carb\_heat\_ratio sim/cockpit2/engine/actuators/clutch\_engage sim/cockpit2/engine/actuators/clutch\_ratio sim/cockpit2/engine/actuators/cowl\_flap\_ratio sim/cockpit2/engine/actuators/cyclic\_aileron\_deg sim/cockpit2/engine/actuators/cyclic\_elevator\_deg sim/cockpit2/engine/actuators/fadec\_on sim/cockpit2/engine/actuators/fire\_extinguisher\_on sim/cockpit2/engine/actuators/fuel\_pump\_on sim/cockpit2/engine/actuators/governor\_on sim/cockpit2/engine/actuators/idle\_speed sim/cockpit2/engine/actuators/idle\_speed\_ratio sim/cockpit2/engine/actuators/igniter\_on sim/cockpit2/engine/actuators/ignition\_key sim/cockpit2/engine/actuators/ignition\_on desim/cockpit2/engine/actuators/manual\_feather\_prop sim/cockpit2/engine/actuators/mixture\_ratio sim/cockpit2/engine/actuators/mixture\_ratio\_all sim/cockpit2/engine/actuators/primer\_on sim/cockpit2/engine/actuators/primer\_ratio sim/cockpit2/engine/actuators/prop\_angle\_degrees oim (analynit? (angina (agtuatora (aran, angla, dagrasa, all

#### DATAREF DRIVEN PARTICLE EFFECTS



Change particle parameters while you fly.



Particles emit spill light - light up nearby scenery.



Particles blur the background - heat shimmer effects.



### HEAT-BLUR PARTICLES

▶ Heat blur affected by zoom - telephoto blur.



Control shape and location of heat exhaust





### WHEN DO I GET THIS STUFF?

— Very Patient X-Plane User

### **UPCOMING RELEASES**

- ▶ 11.25 Airports, Landmarks
  - Beta NOW
- ▶ 11.30 Physics, Systems, Autogen, Particles, Art
  - Late Summer or Early Fall
- Vulkan Maybe beta this year. Or not.

## Q & A