Hello gents, 3D modellers, Falconeers,

how to 3D model for our beloved simulation, has often been asked on Falcon BMS related forums.
Therefore I made this WIP report in order to show how I did the C-17A for BMS 4.36/4.37.

This WIP has been started around mid of 2018 where BMS 4.34 was the actually version,
and continued until today, mid 2023 to match new BMS versions, features and workflows.

During the WIP I got some great help from the BMS team on animation, flight model, some first hand info,
and even code support for gears behaviour and lights.
So the result is not my work, but work of the whole BMS team !

I'm just a hobby 3D modeler and my skills are far away from the real professionals out there.
And I'm sure some things could be done better or easier, maybe even faster, but I took my time to do it nicely as I could.

The software used is:
- Photoshop incl. plugins to save the textures in .dds format
- 3dsMax with LOD exporter installed
- BodyPaint 3D (optionally but helpful)

LOD Exporter:
https://onedrive.live.com/?authkey=%21ALtn4GstRA0fJQ4&id=454D0138A0656698%21234&cid=454D0138A0656698

There exist no BMS exporter for other 3D software like Blender, Solidworks, etc. as yet,
so 3dsMax is needed to export 3D models for BMS to the needed LOD/BML format.
Here I've seen so many guys on public forums who said: "I'll 3D model in Blender and do the export from 3dsMax finally."
Sadly many of those models have not made it into BMS for several reasons. Please keep that in mind!

Regardless which software you use, I've seen also to many guys who lost their hard work because of HDD/SSD
hardware fail, or somehow porked files or for whatever reason.
So I strongly suggest to save your files incremented and do now and then a backup of the WIP to another disk.
Please keep that also in mind! … once you've lost your WIP … it's to late!

My goal was to create a coherent looking C-17A including animation of gears, flaps, etc. at a relative low tri- count.
And while I knew not much about this aircraft, I've collected reference material for a couple of days.
I've found a nicely detailed blueprint for free, although it took some time and efforts to correct and cut it in Photoshop for use in 3dsMax.

A few words on blueprints…
They are never 100% correct, as far as I know.
So they need some work in Photoshop to get straight lines, and a straight picture at all.
Please take your time and try to get the things correct as possible from the beginning.

The better the blueprint, the better the results on the 3D model !

And while the blueprints are never 100% correct, we need a lot of RL reference pictures (the more the better) and a good eye.

On Boeing's website I've found a small .pdf with some nice detailed measured values, ... sadly that link is actually down.
https://www.boeing.com/resources/boe...a-brochure.pdf

But with this I want to say that I've searched and collected (m)any info I could find on this aircraft.

It's always a problem for me to find such useful info and if I search for similar,
I end up with a spare parts list or other (for modeling) useless garbage.

I was especially interested in values and schematic views for flight control elements,
which explain their max. angle or why the rudder are 2 parts (which act differently ?),
or if those spoiler on the top wing, in front of the flaps act as airbrake …

Getting our hands additionally on similar docs for gear animation, thrust reverse, all kind of lights and sensors,
any docs that helps to model this aircraft accurate as possible, would be always useful.

OK, at this point we should be roughly familiar with the aircraft from all the docs and pictures we've collected,
and we should have an nicely prepared blueprint.

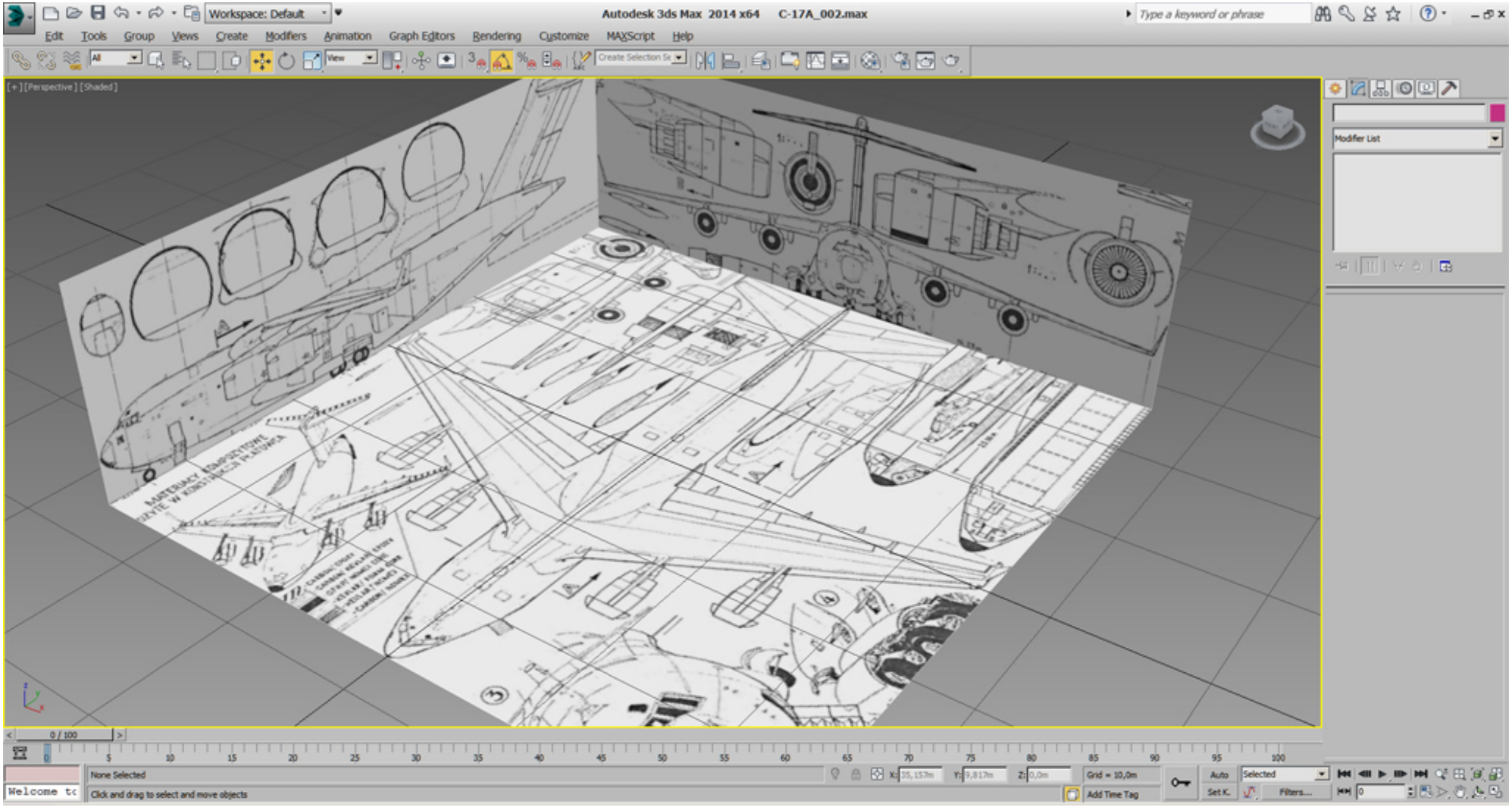
We're ready to fire up 3dsMax and the first thing we do is to setup units.
Click "Customize" -> "Units Setup …" -> "System Unit Setup" and make sure it is set to "Feet" and click OK.
The "Display Unit Scale" should be set at "US Standard/ Decimal Feet".
Using these settings might help to avoid issues in future.

Sadly me noob started the C-17 with System Unit in "Meter".

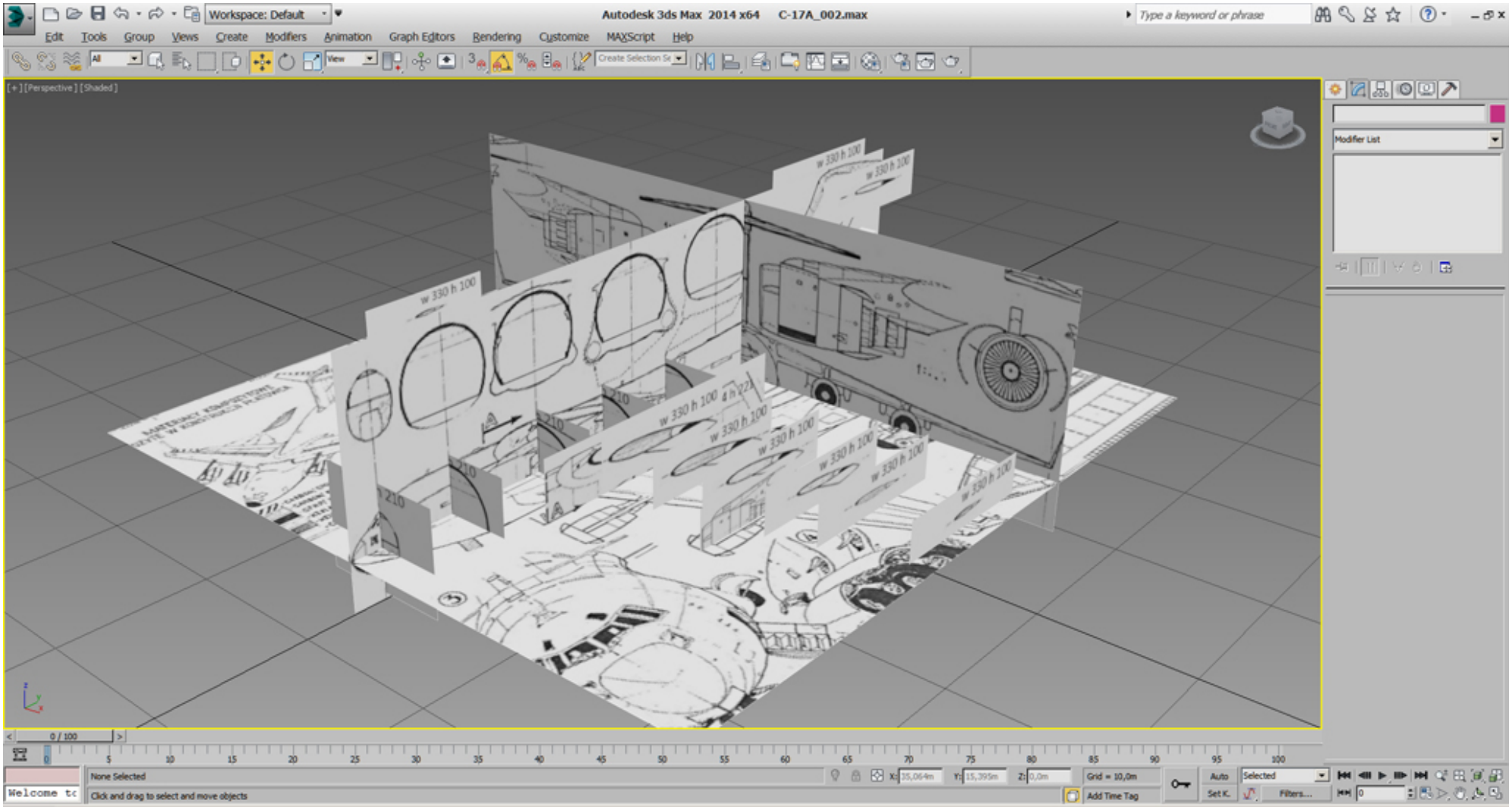
Helpful, at least for me was always to enable “Customize” -> “Preferences…” -> “Viewports” -> “Backface Cull on Object Creation”.
(see 3dsMax help for more info)

Now first we want to setup our blueprint(s) in 3dsMax. I don’t show the howto here, because there is really good info on the www.

Here is how my blueprints setup looks in 3dsMax:
A simple Box, which I did already in exact aircraft dimensions, simply planar UVW mapped and all Polys flipped.



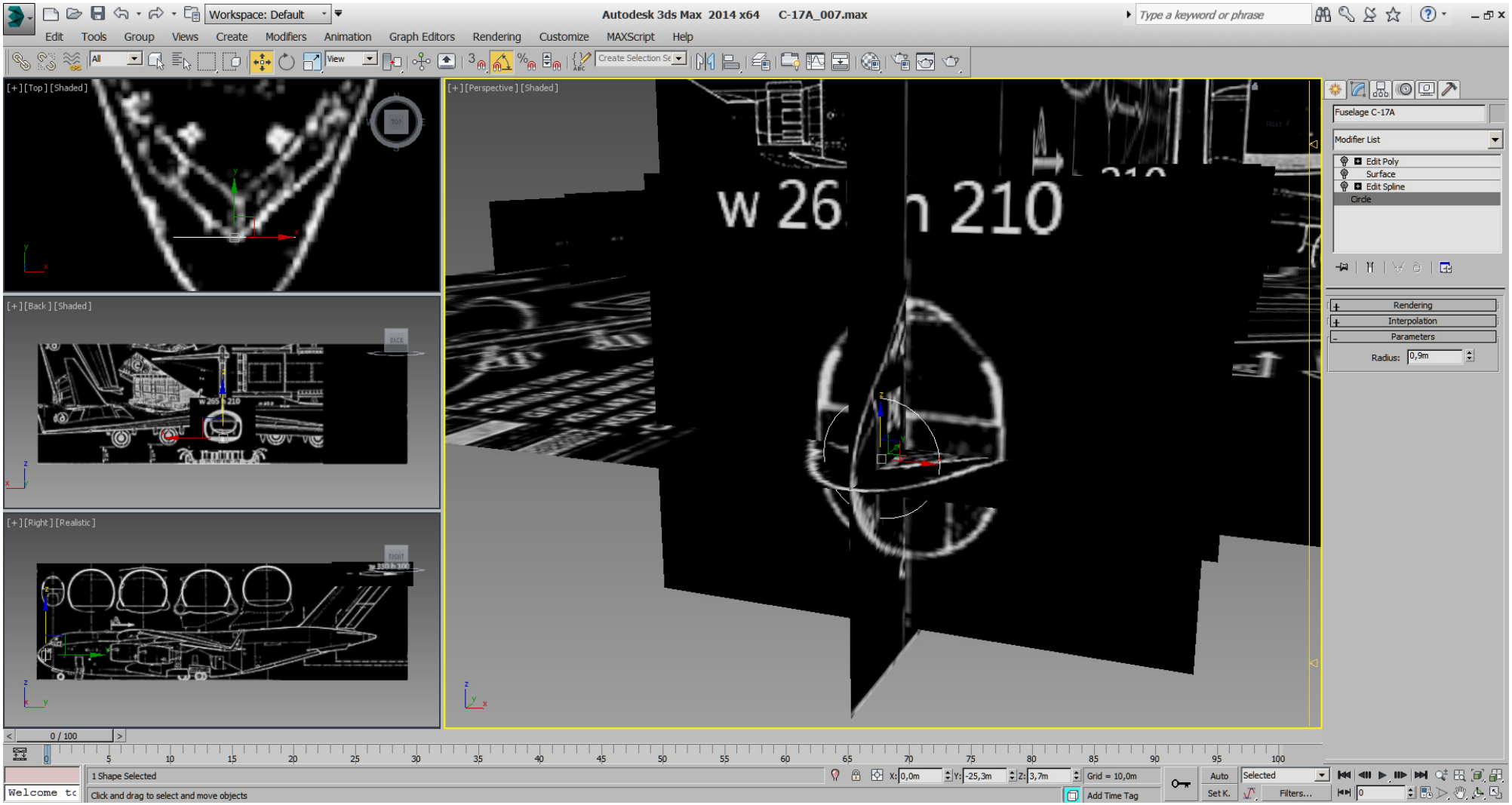
Additionally we can setup a more advanced scene, including some profiles for the fuselage and the wings, etc..



To control which of the actually 2 blueprint setups is shown, we can organize them using “Layers”.

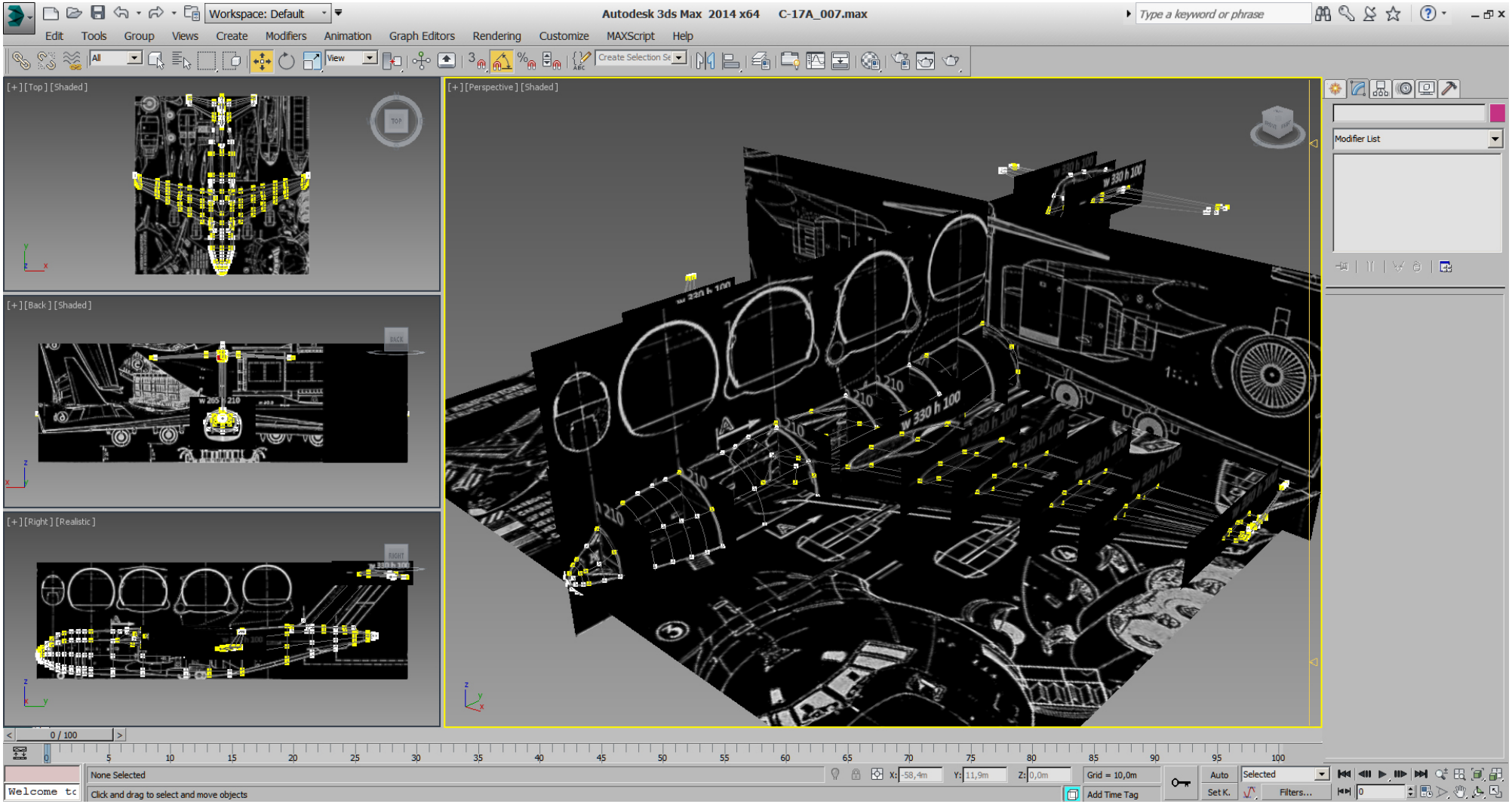
We’re ready to start, … I'm sure we'll learn a lot about this AC while going deeper into it during modeling.

Spline modeling for me, ... so we start with a 2D circle. Hint: it’s worth to watch always the “Stack” of used “Modifiers” on the right side. Here the “Circle” is selected and all other “Modifiers” above are disabled.

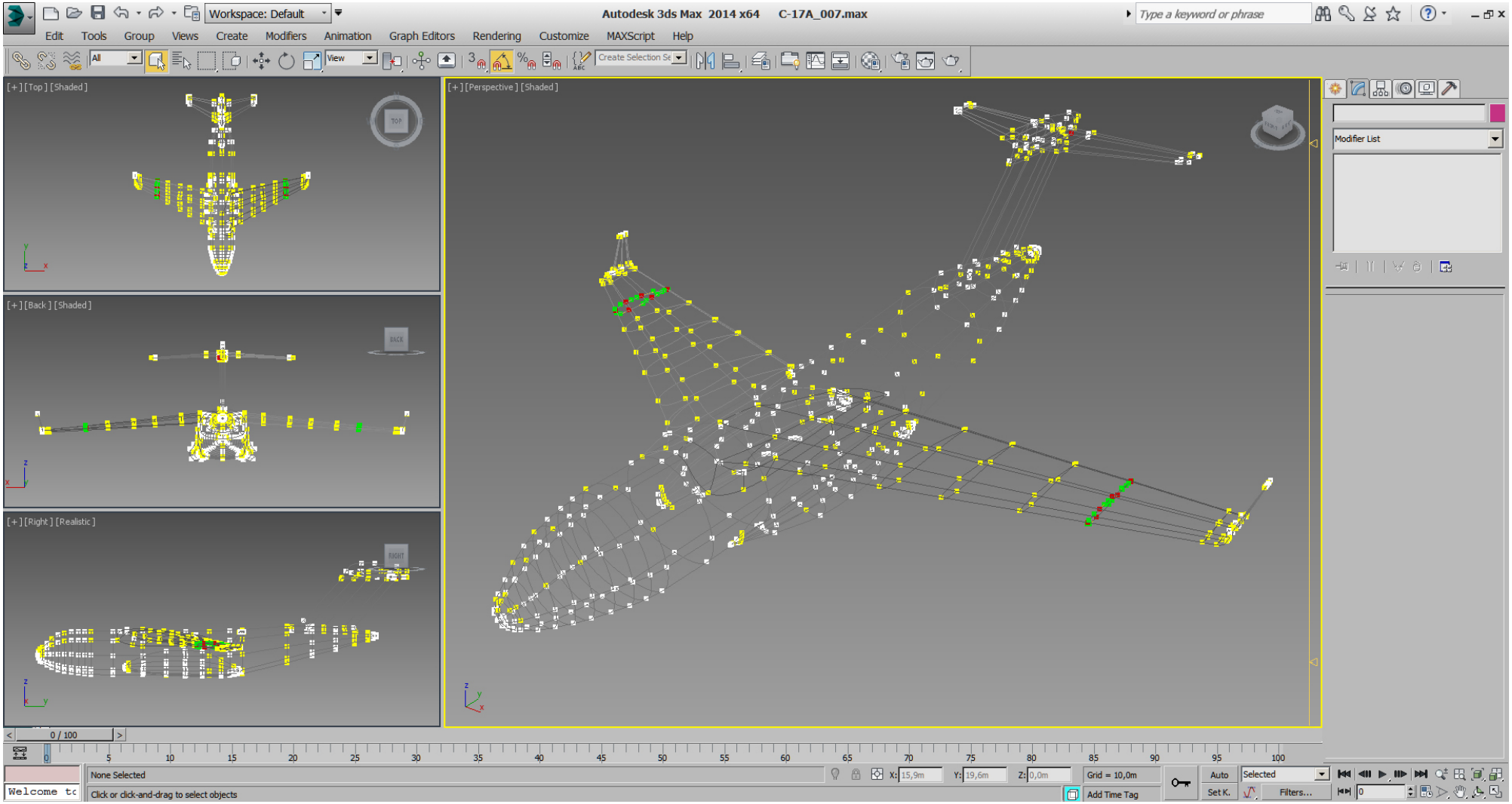


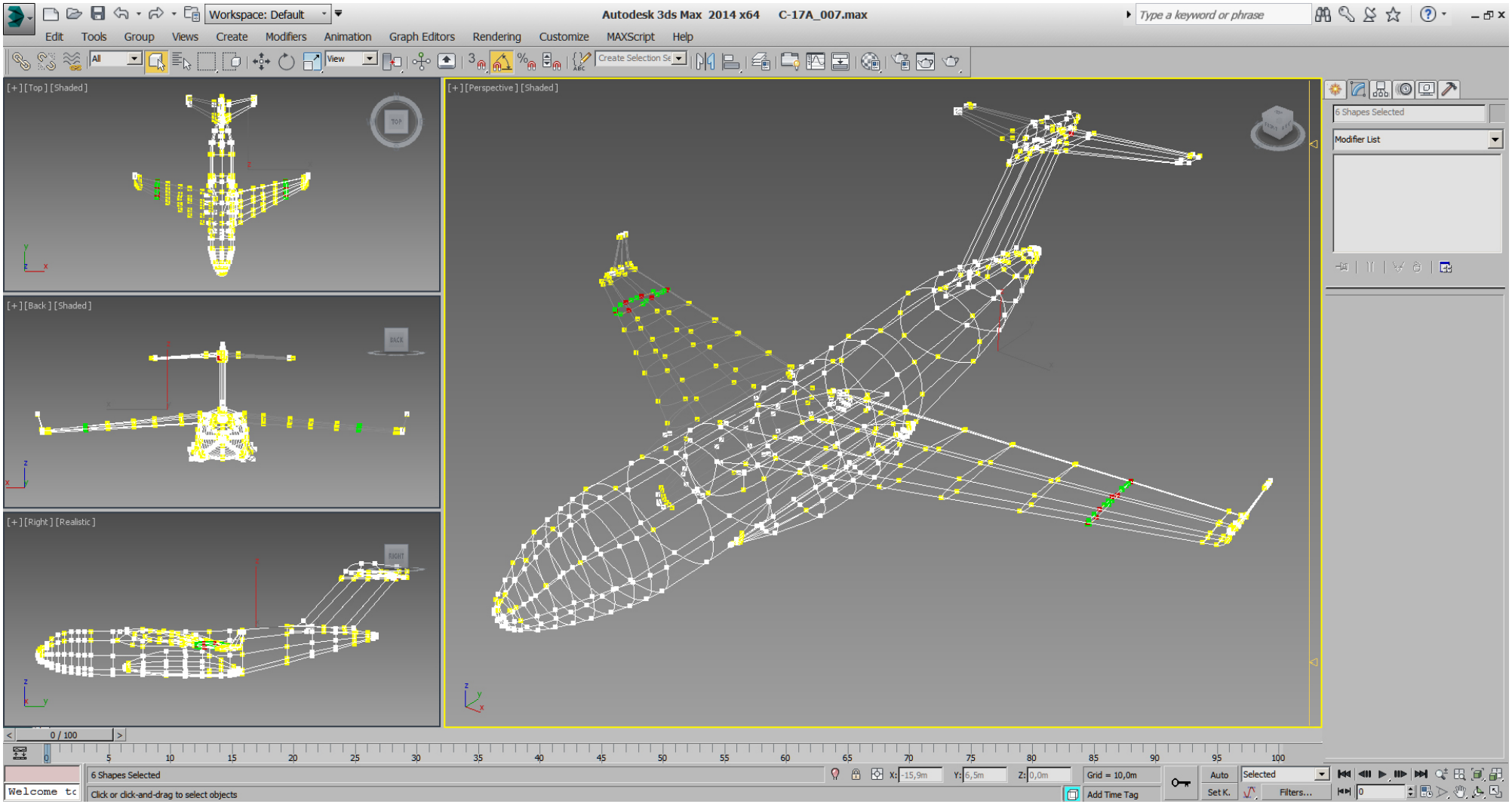
After adding an “Edit Spline” modifier on top of that circle, we can adjust that circle and copies of them into shape to match the blueprint.

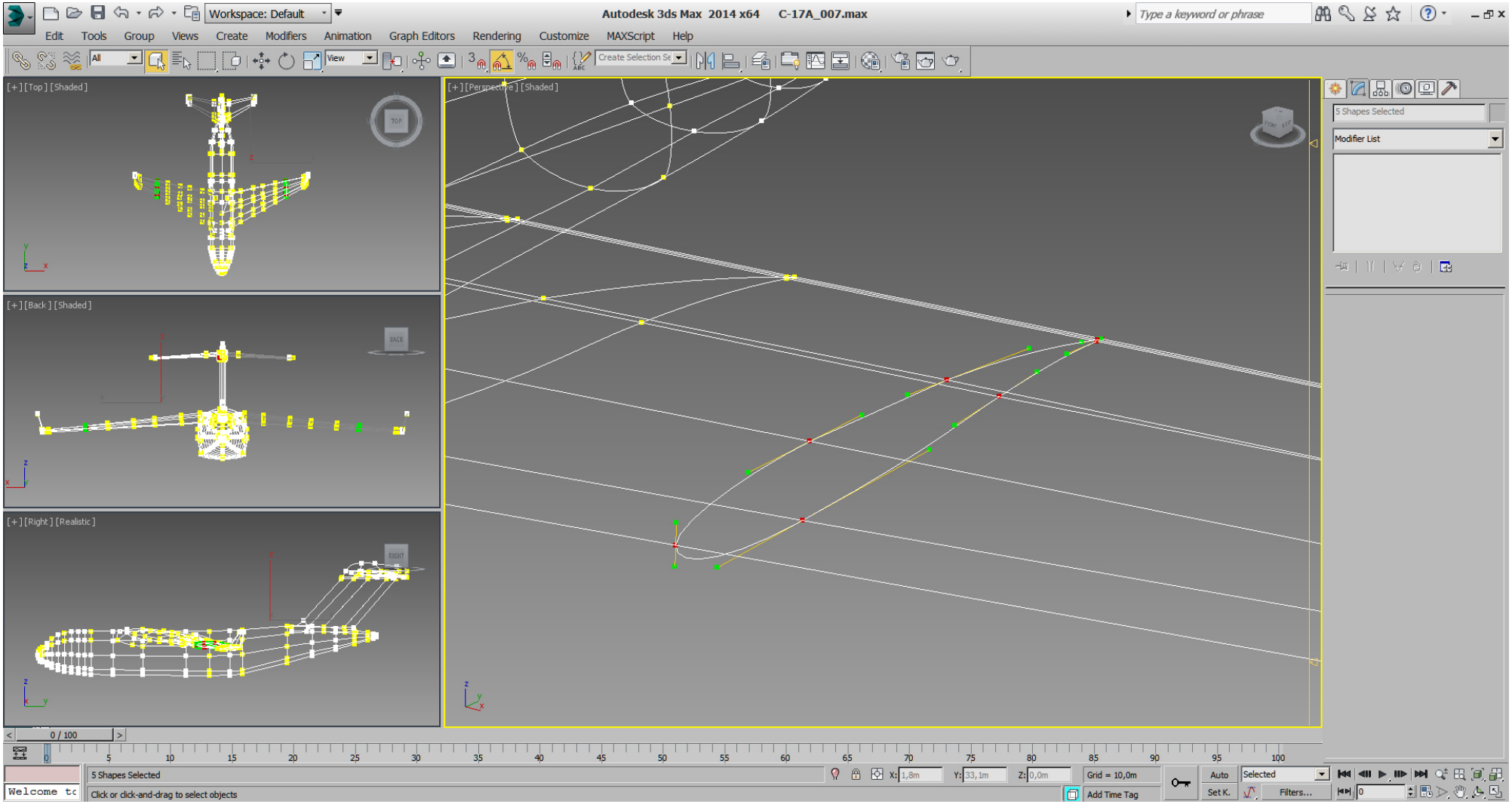
Next we “Attach” all copies of those circles to the first one, then we connect the circles with lines.



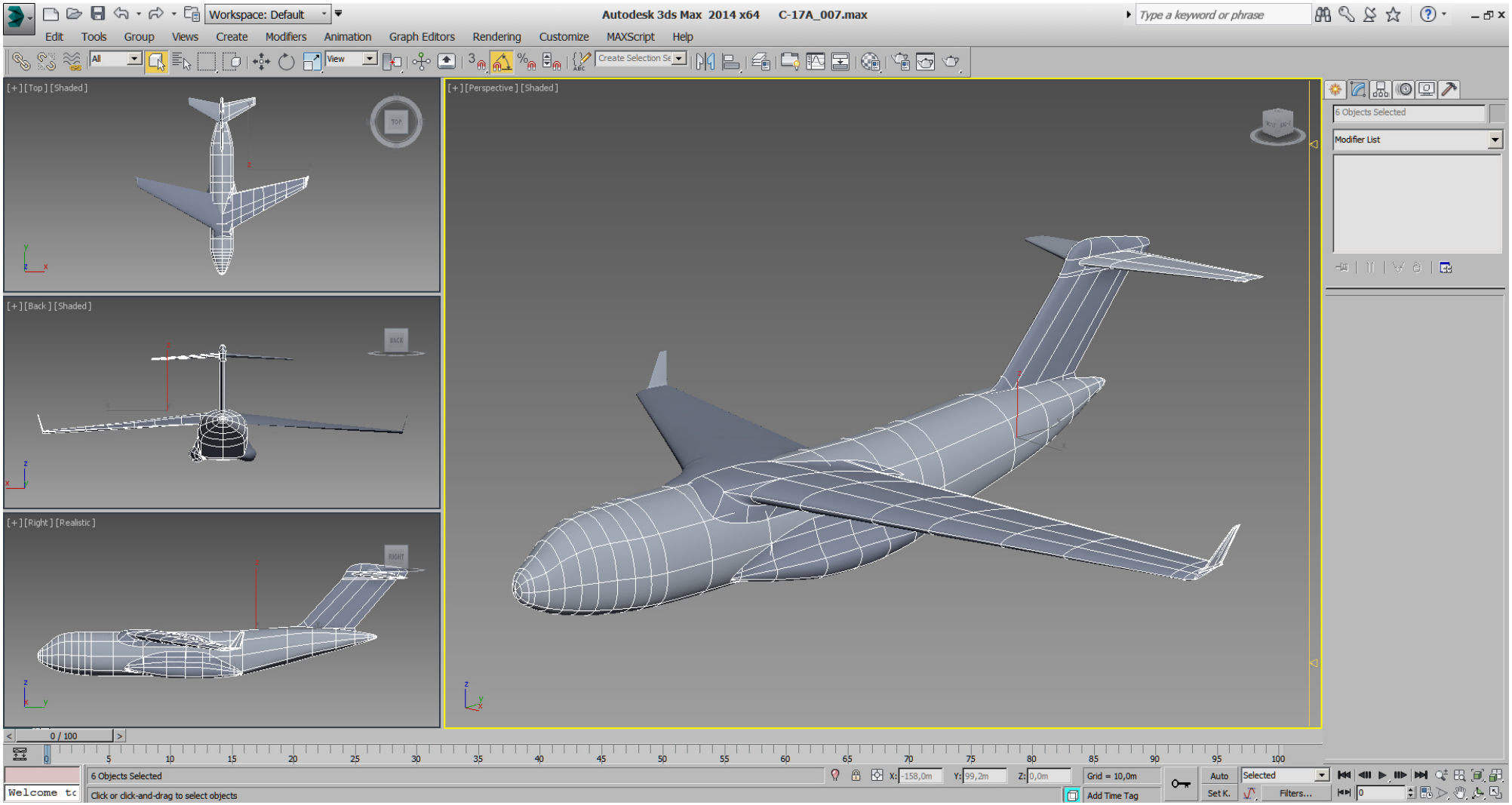
Each of those “Spline- Vertex” can be changed to be a “Corner”, “Smooth”, “Bezier”, or “Bezier- Corner” and can be adjusted at any time.



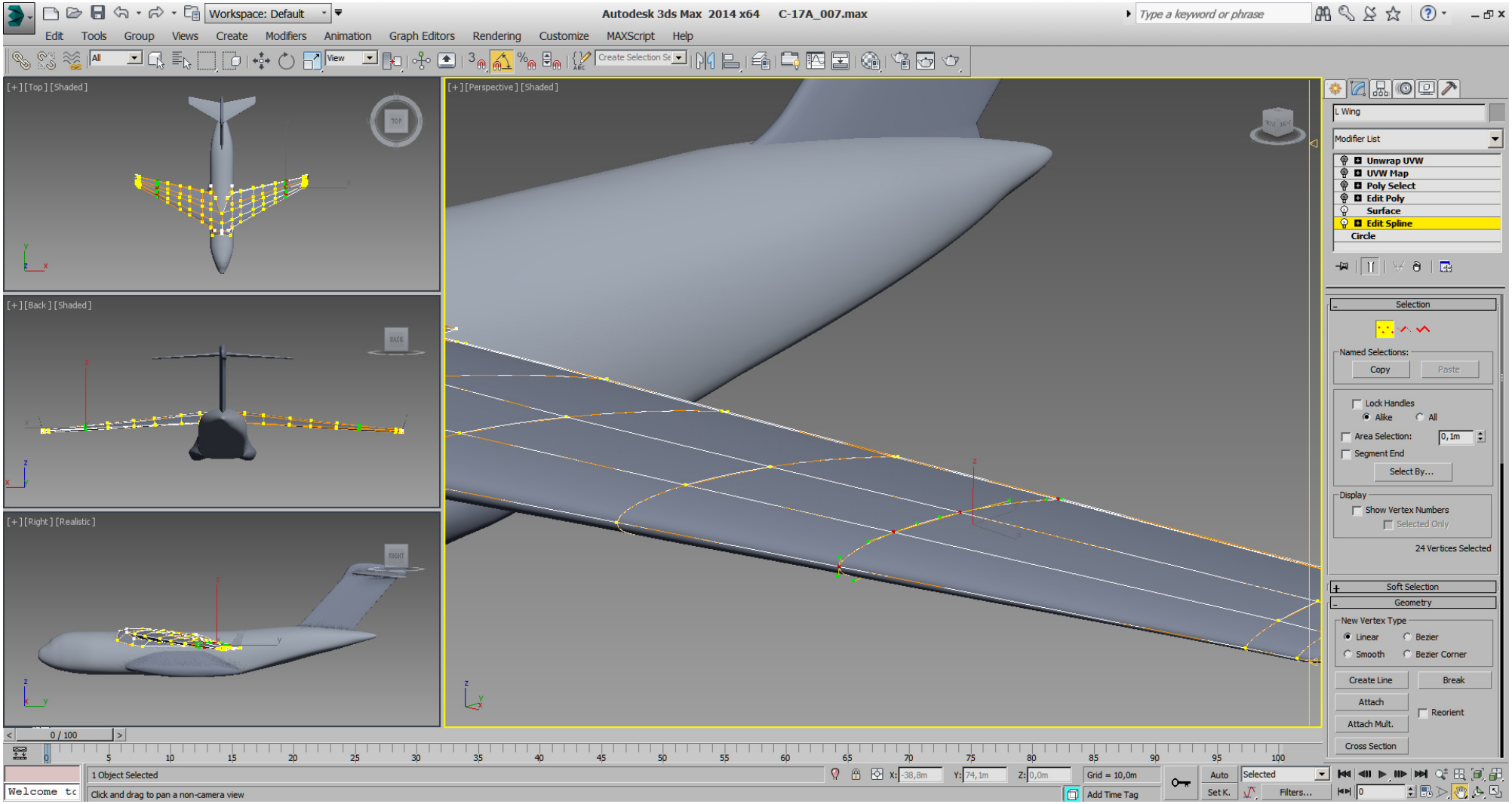

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_007.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Back][Shaded]
[+][Right][Realistic]
[+][Perspective][Shaded]
6 Shapes Selected
Modifier List
0 / 100
6 Shapes Selected
Click or click-and-drag to select objects
Add Time Tag
Grid = 10,0m
Auto
Selected
Set K.
Filters...


Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_007.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Back][Shaded]
[+][Right][Realistic]
[+][Perspective][Shaded]
5 Shapes Selected
Modifier List
0 / 100
Welcome to
Click or click-and-drag to select objects
Add Time Tag
Grid = 10,0m
Auto
Selected
Set K.
Filters...

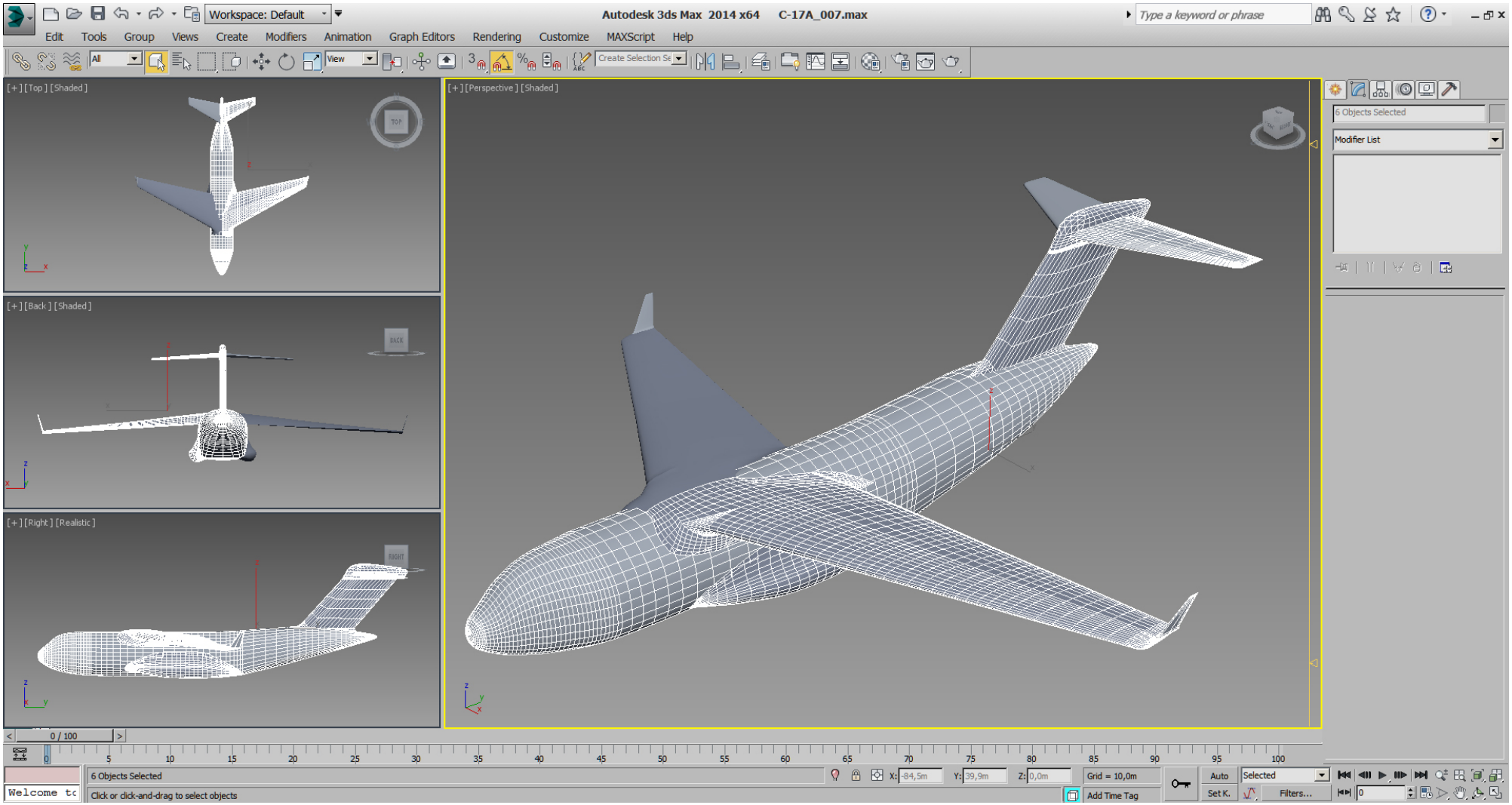
After adding a "Surface” modifier on top it looks like this:



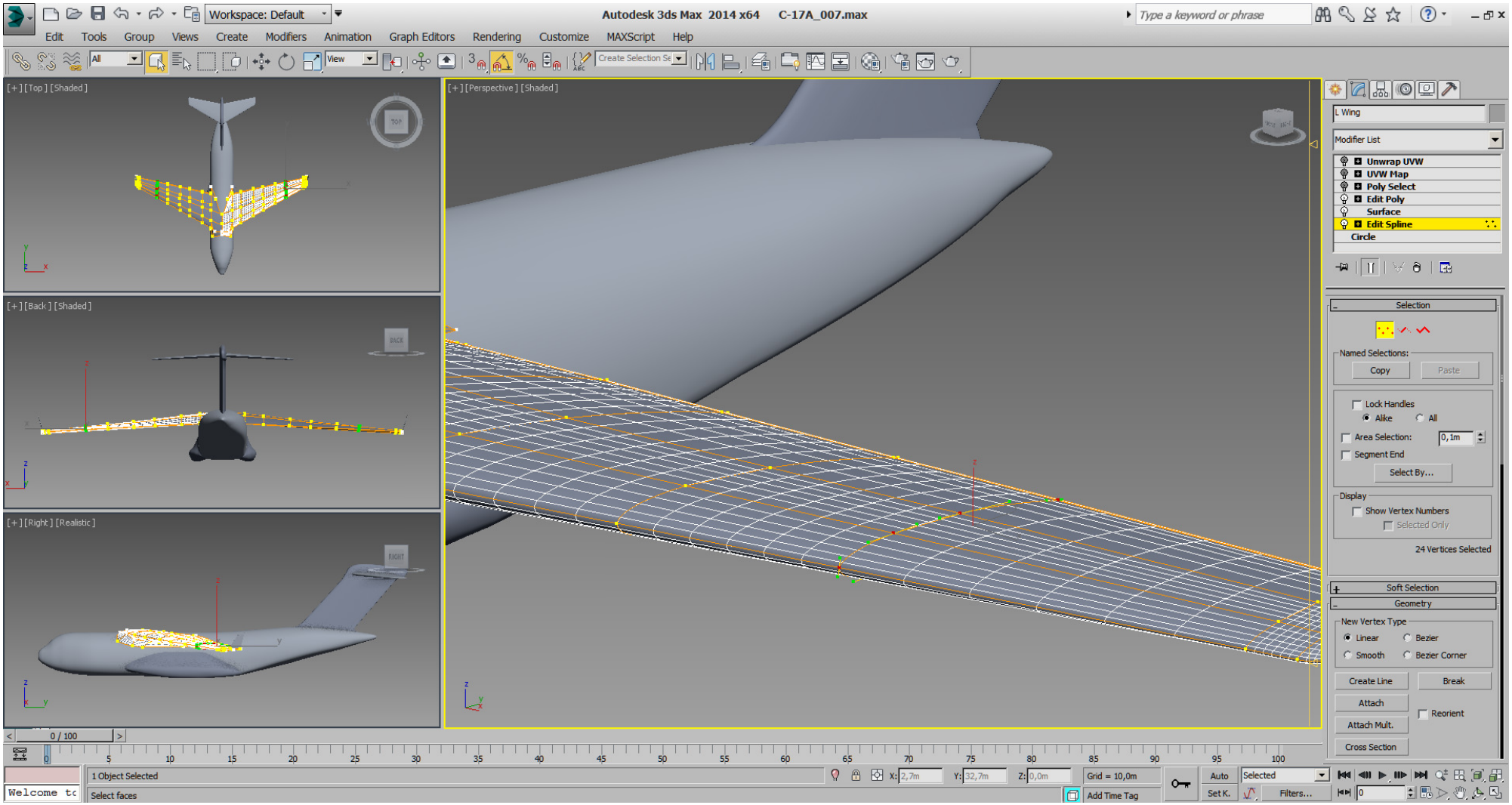
With the “Show End Results” enabled and “Edit Spline” modifier selected in the “Stack” while in “Vertex” sub- mode, we can still modify the splines and see the result of the surface.



Now let's have an “Edit Poly” modifier on top ...

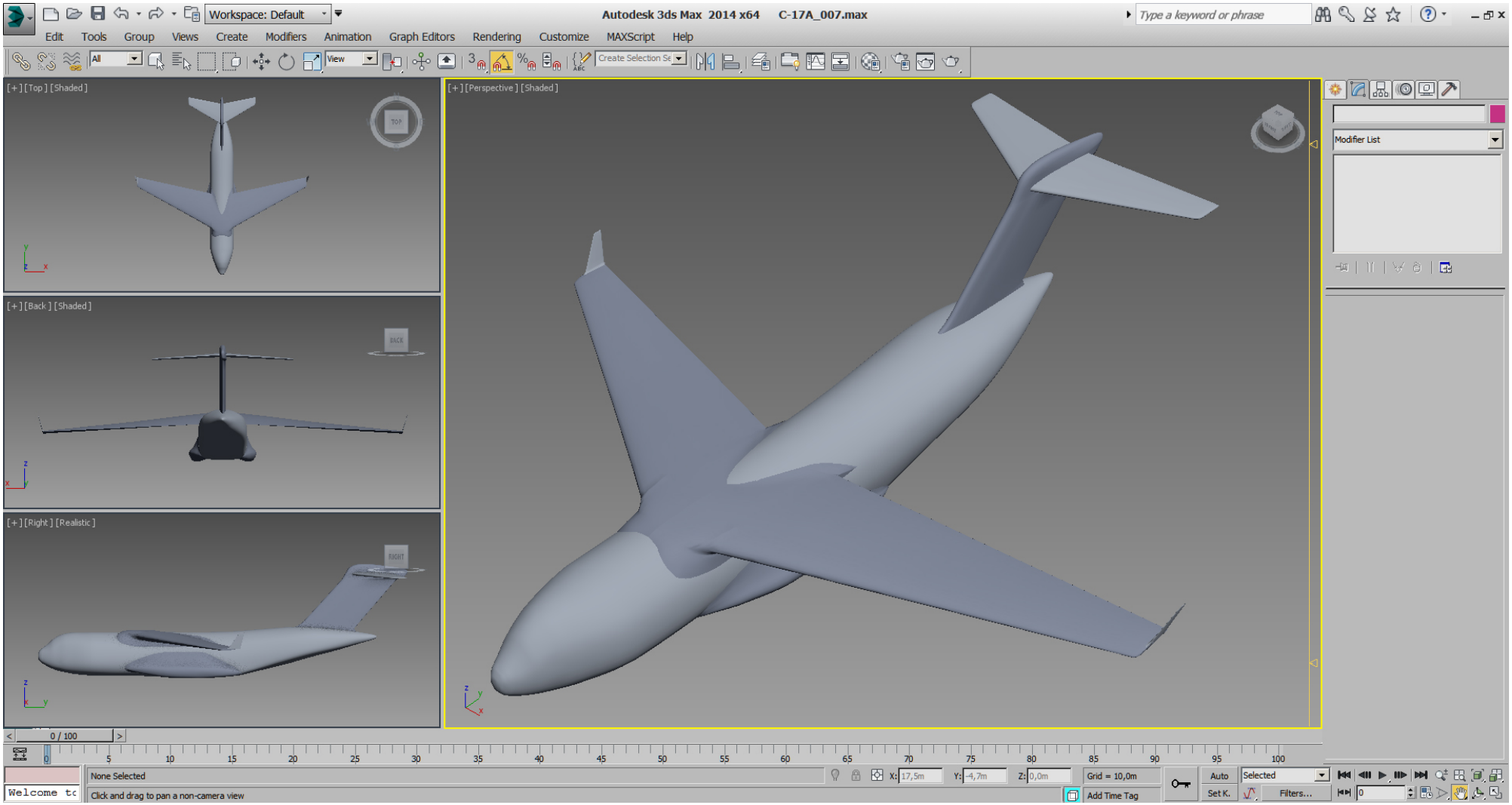


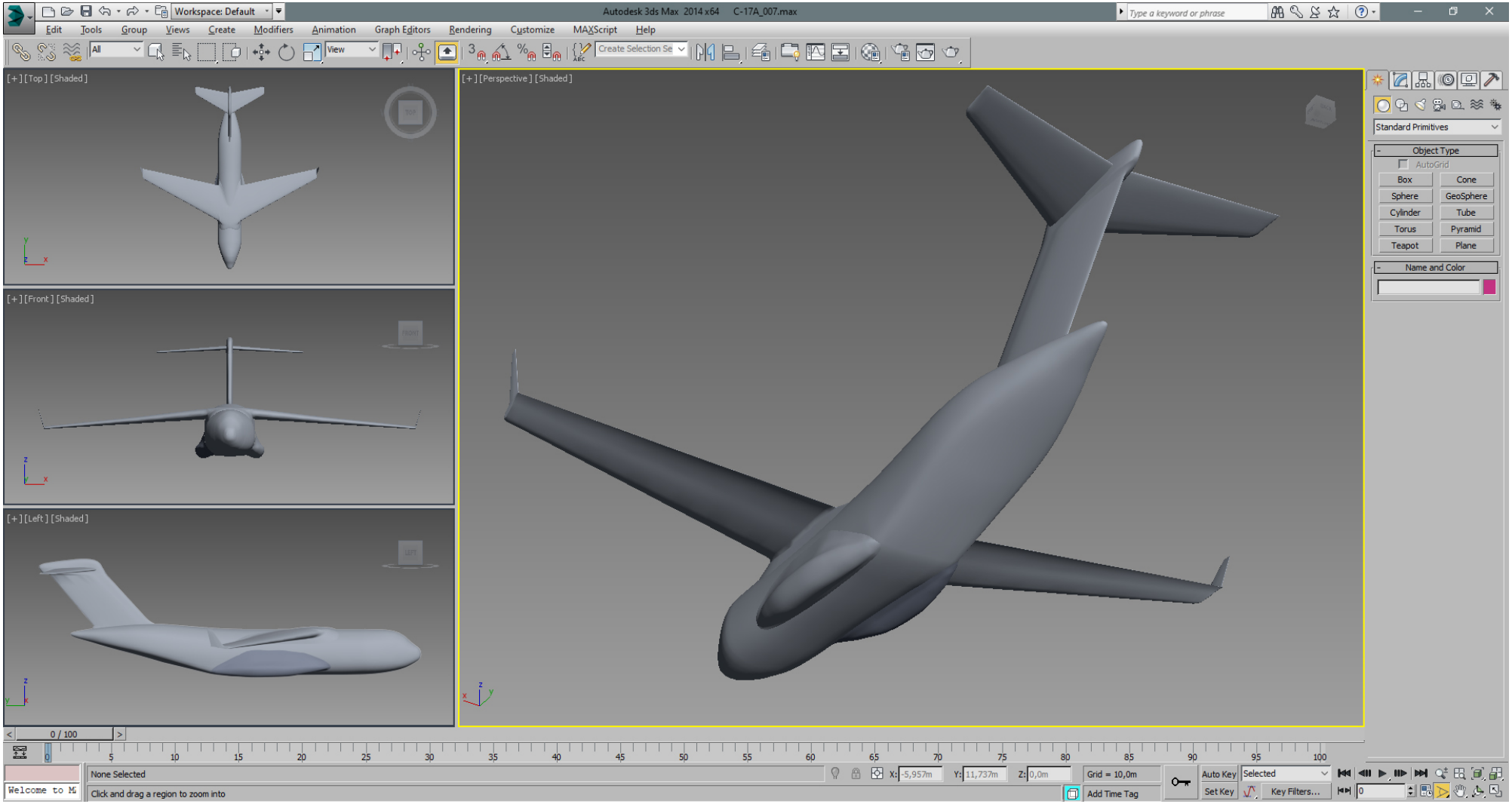
... and being still able to control the splines vertices.



ATM. right wing, right winglet, right stabilizer and right gearbox/sponson are mirrored “Instances” of the left geometry.

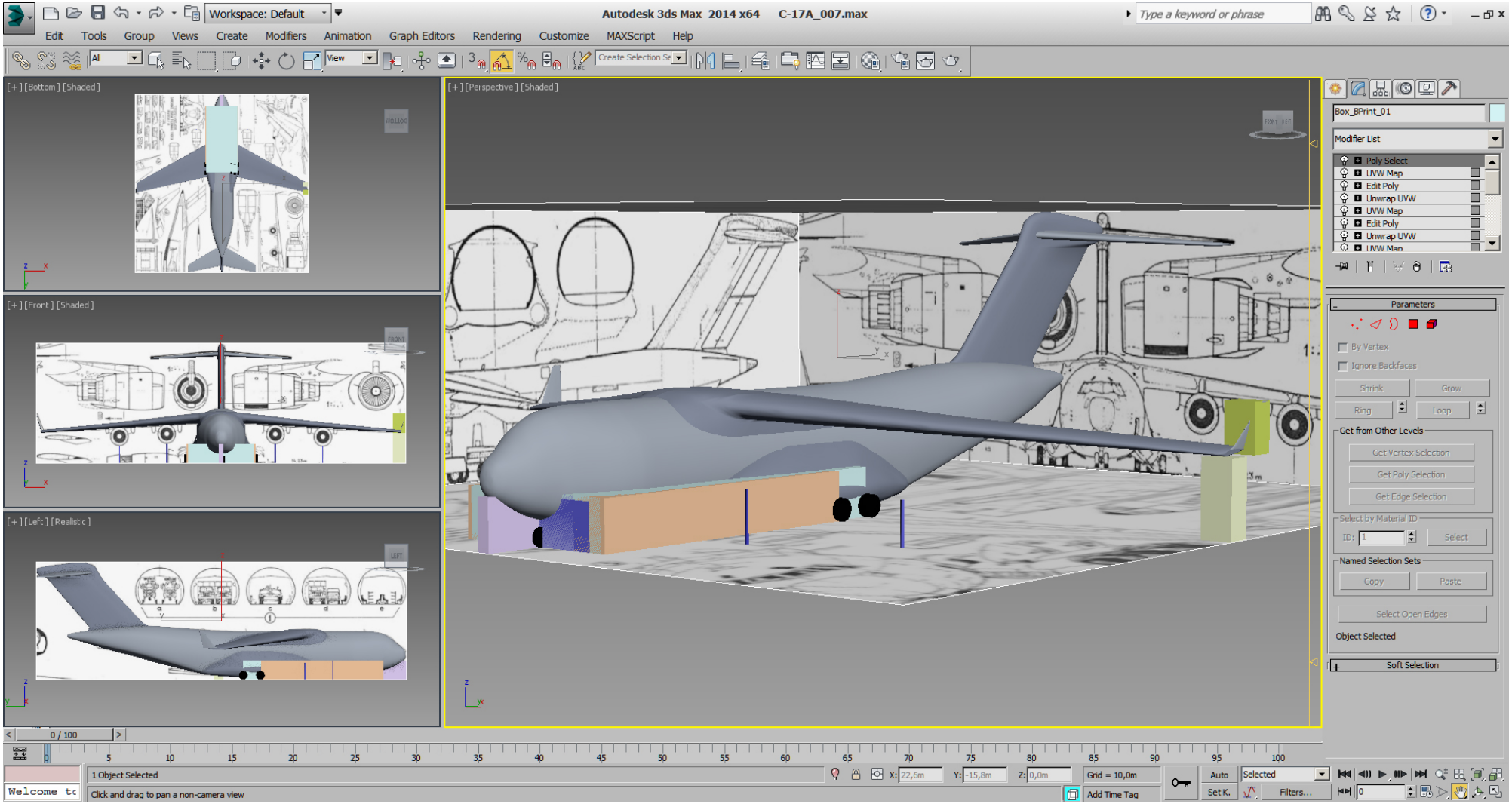
With this workflow I try to match the real thing good as possible.
Especially the nose, the wings- shoulder and the gearbox needs some more love.



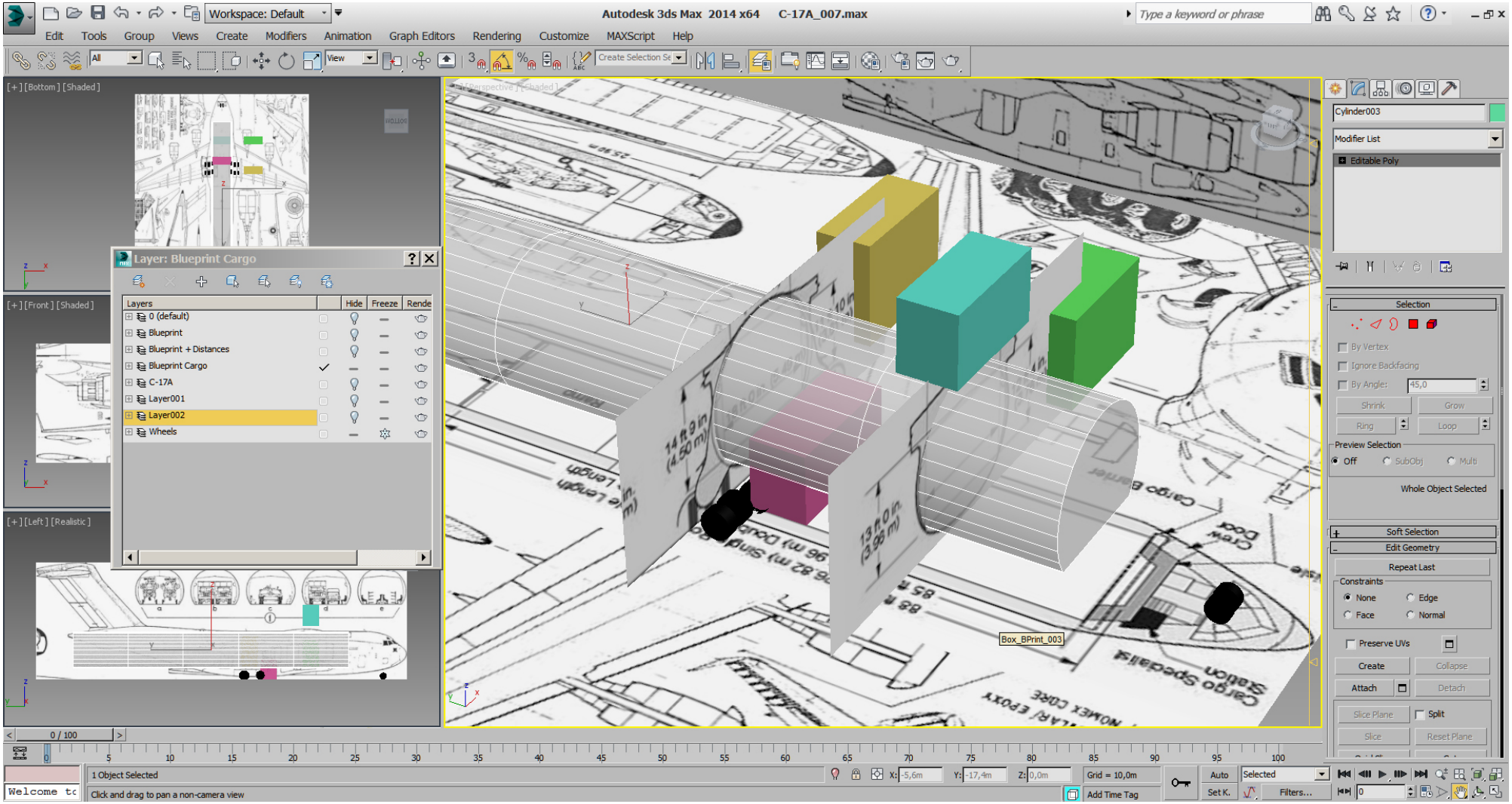

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_007.max
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Left][Shaded]
[+][Perspective][Shaded]
Standard Primitives
Object Type
AutoGrid
Box Cone
Sphere GeoSphere
Cylinder Tube
Torus Pyramid
Teapot Plane
Name and Color
0 / 100
None Selected
Click and drag a region to zoom into
Grid = 10,0m
Auto Key
Selected
Set Key
Key Filters...
Add Time Tag

In addition to the blueprint, we're also using measured RL values.

The blueprint- box holds already RL width, height and length.
The colored boxes are known distance values from collected docs.
I had some more boxes temporary, but deleted them quickly when check was done.



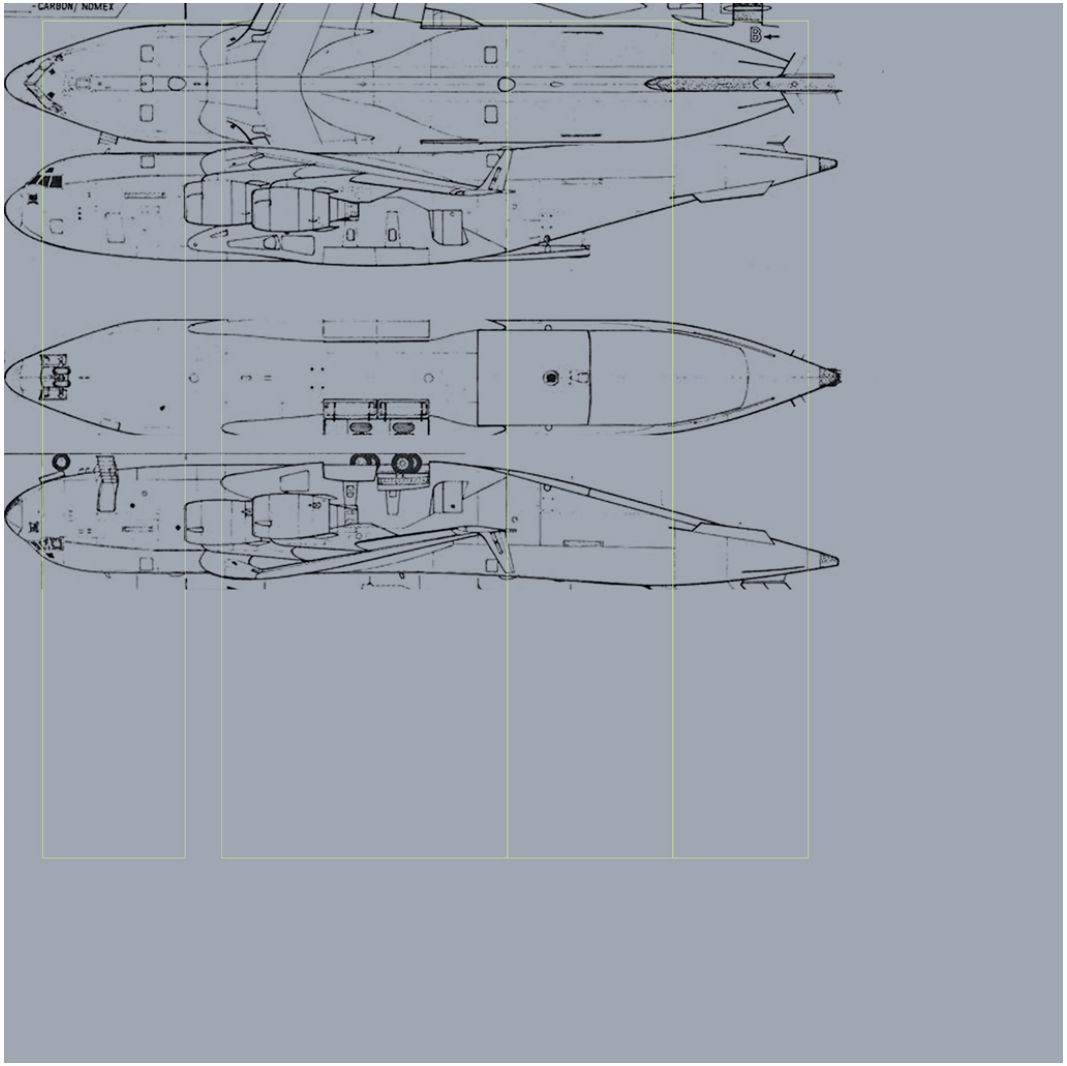
Although the cargo ramp will be closed for this model, we need to get the fuselage shape accurate as possible,
... for skinning and/or eventually cutting the ramp doors later.
So a little cargo- blueprint got prepared, ... to get even more references.



Additionally we've placed simple cylinders as placeholder for the wheels, sure according to known RL dimensions and distances.

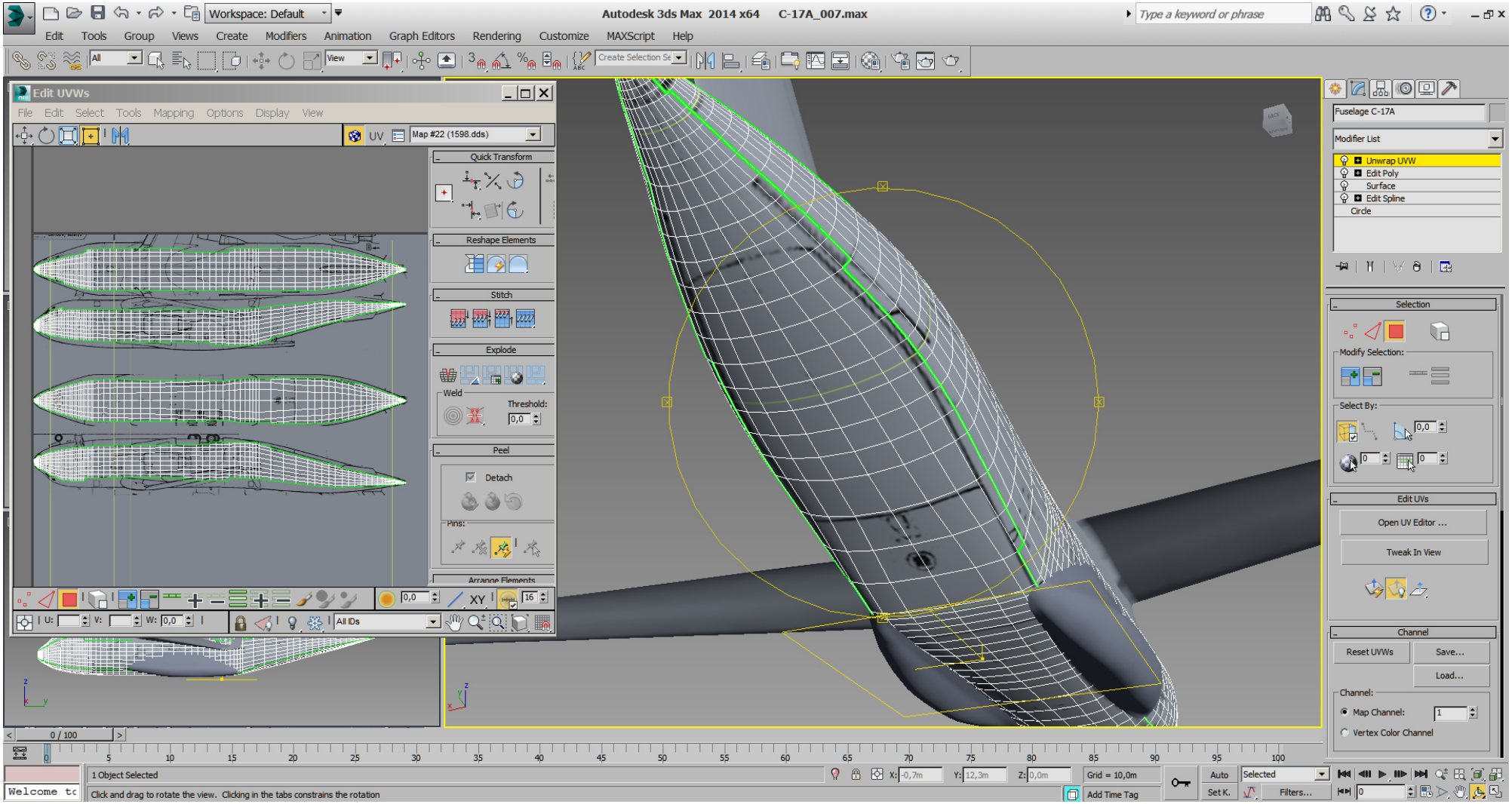
Next we want to check how the cargo door area looks, therefore I mostly do a first temporary UVW mapping early, ... for references.

So we've prepared a texture with blueprint parts, assigned a material using that texture to our model,
then added an “Unwrap UVW” modifier on the fuselage and did a quick
“UV- Editor -> Mapping -> Normal Mapping -> Box No Top Mapping”



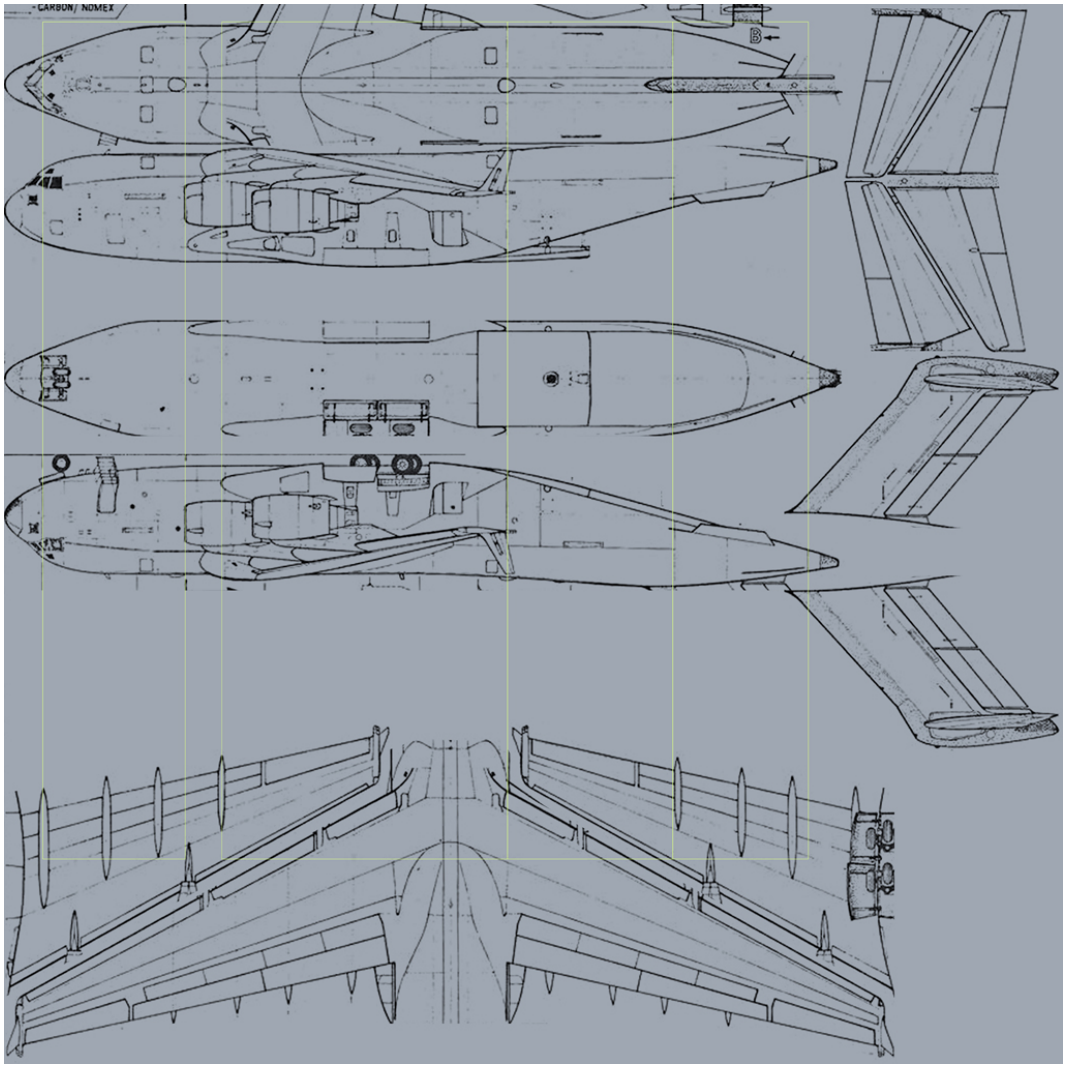
Note the yellow lines on the texture, which helps us to align the UVW mapping on the model.

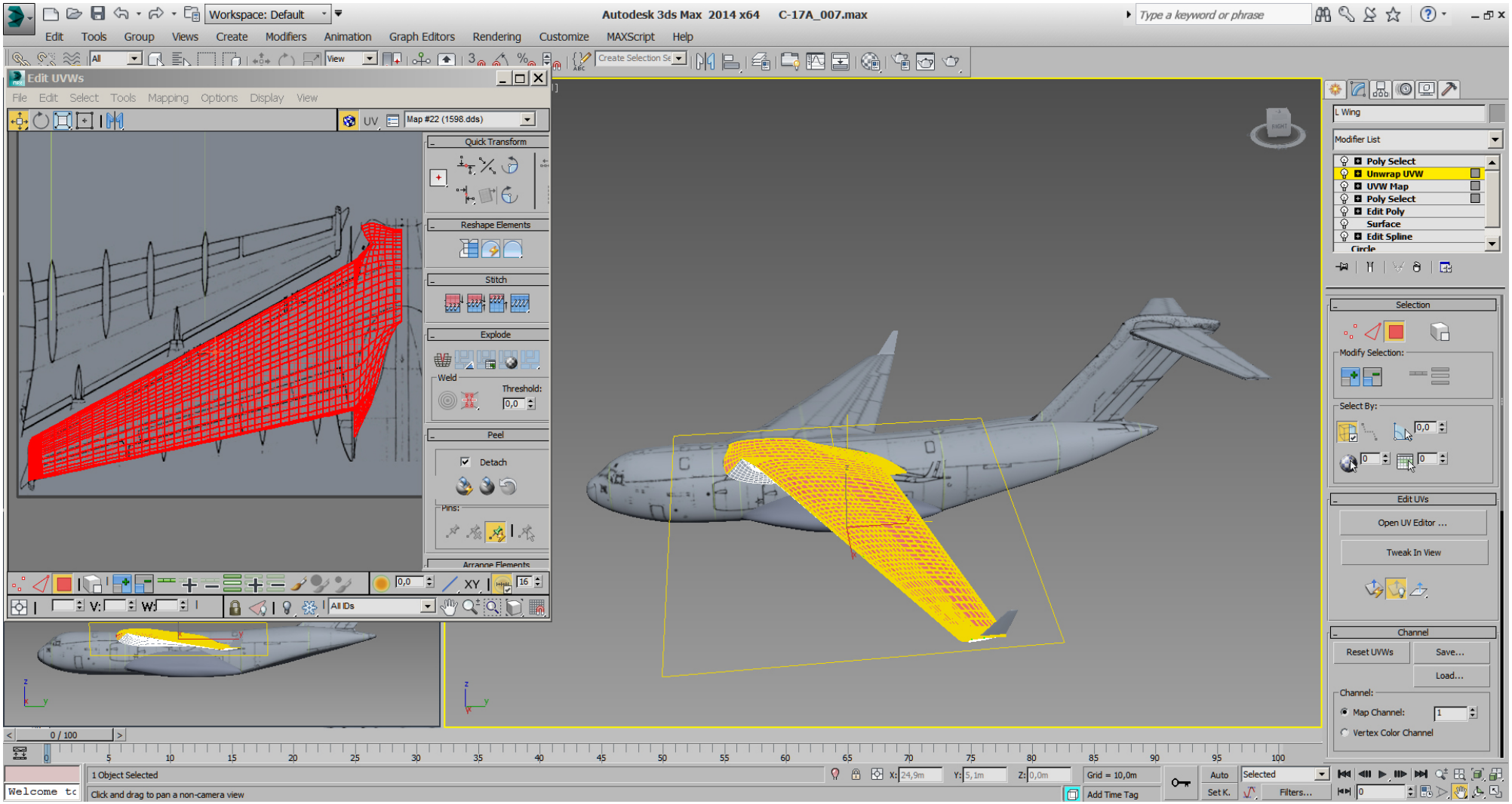
Results are not so bad, so this area is OK so far.

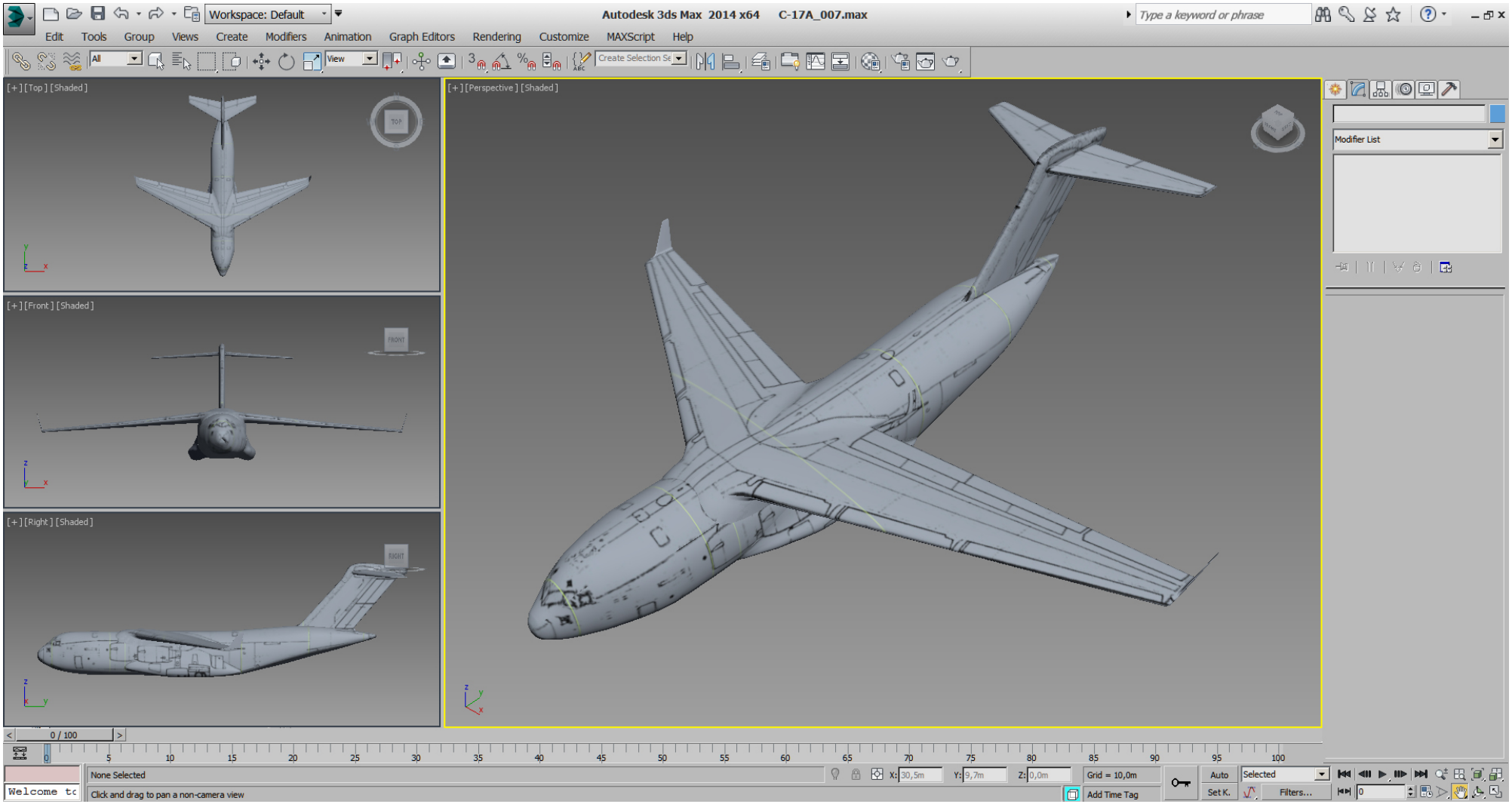


And for sure I couldn't resist to map a few parts more, not only for fun but also to get more references directly on the model.

Wing, stabilizer, fin and gearbox are just manually planar mapped, using:
- “Poly select” modifier (I always do that, even if I have an “Edit Poly” modifier before) and select all polys we want to map.
- “UVW Map” modifier, Mapping -> Planar, Alignment -> Y -> Click “Fit”
- “Unwrap UVW” modifier



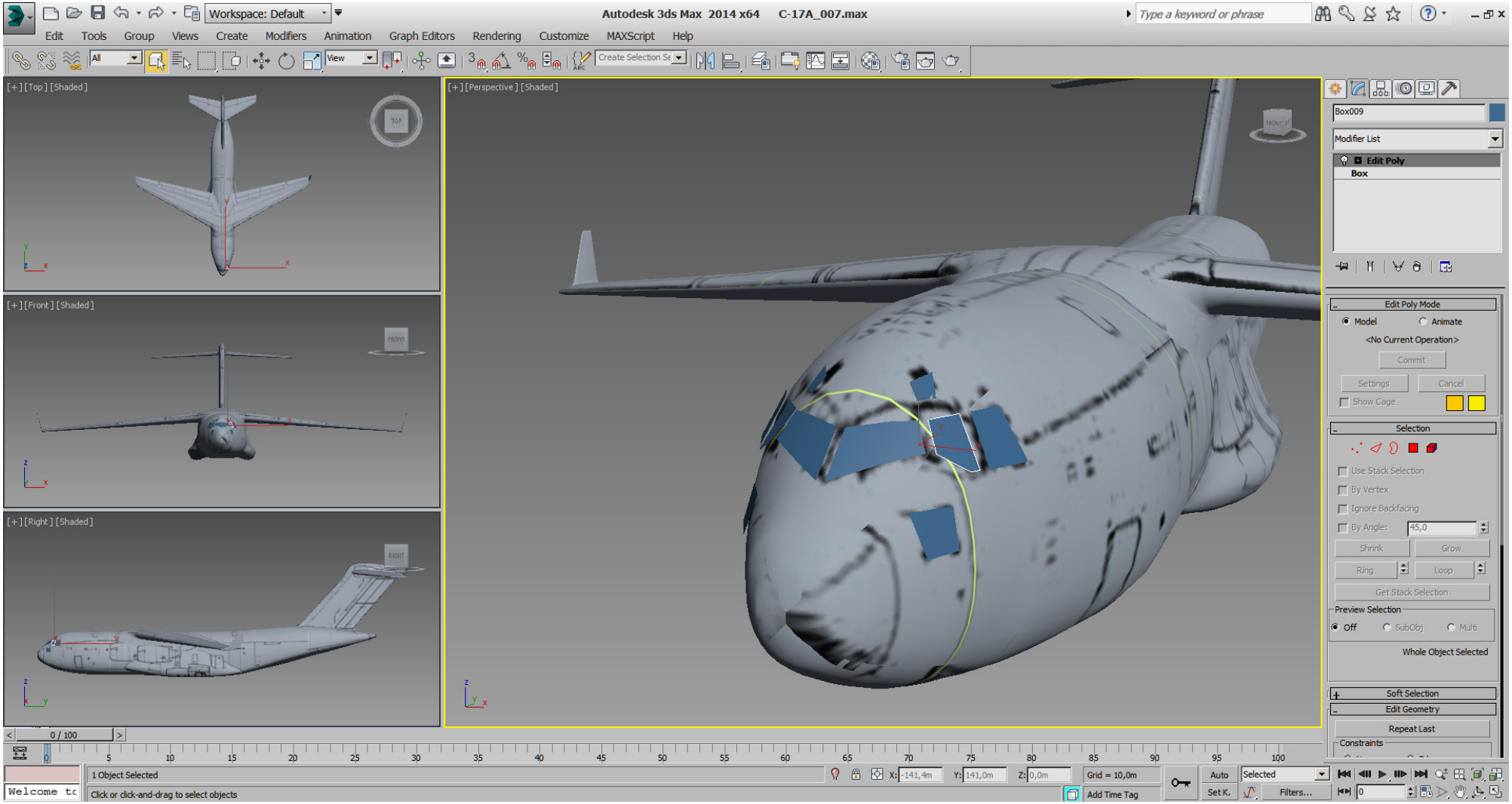

Workspace: Default
Autodesk 3ds Max 2014 x64
C-17A_007.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
Edit UVWs
File Edit Select Tools Mapping Options Display View
Map #22 (1598.dds)
Quick Transform
Reshape Elements
Stitch
Explode
Weld
Threshold:
Peel
Detach
Pins:
Arrange Elements
L Wing
Modifier List
Poly Select
Unwrap UVW
UVW Map
Poly Select
Edit Poly
Surface
Edit Spline
Selection
Modify Selection:
Select By:
Edit UVs
Open UV Editor ...
Tweak In View
Channel
Reset UVWs
Save...
Load...
Channel:
Map Channel:
Vertex Color Channel
1 Object Selected
Click and drag to pan a non-camera view
Add Time Tag
Welcome to



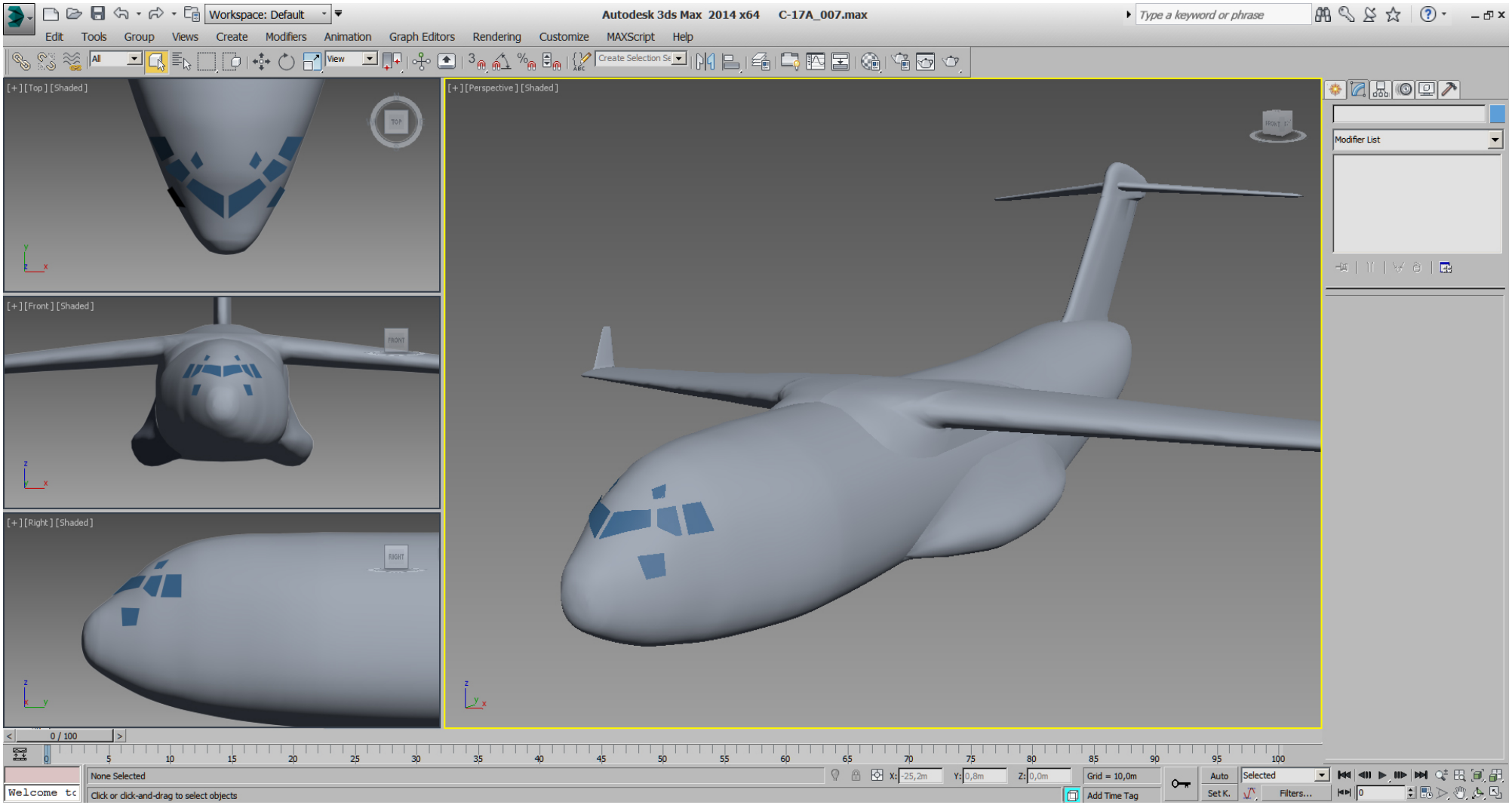
Now after the fun let's go back to work. The front section needs some attention.

Especially the placement of the windows will be tricky, and cutting into the surface at that early state is NOT an option.
Therefore we're just placing simple planes or modified boxes as windows placeholders on top of the fuselage geometry for now.

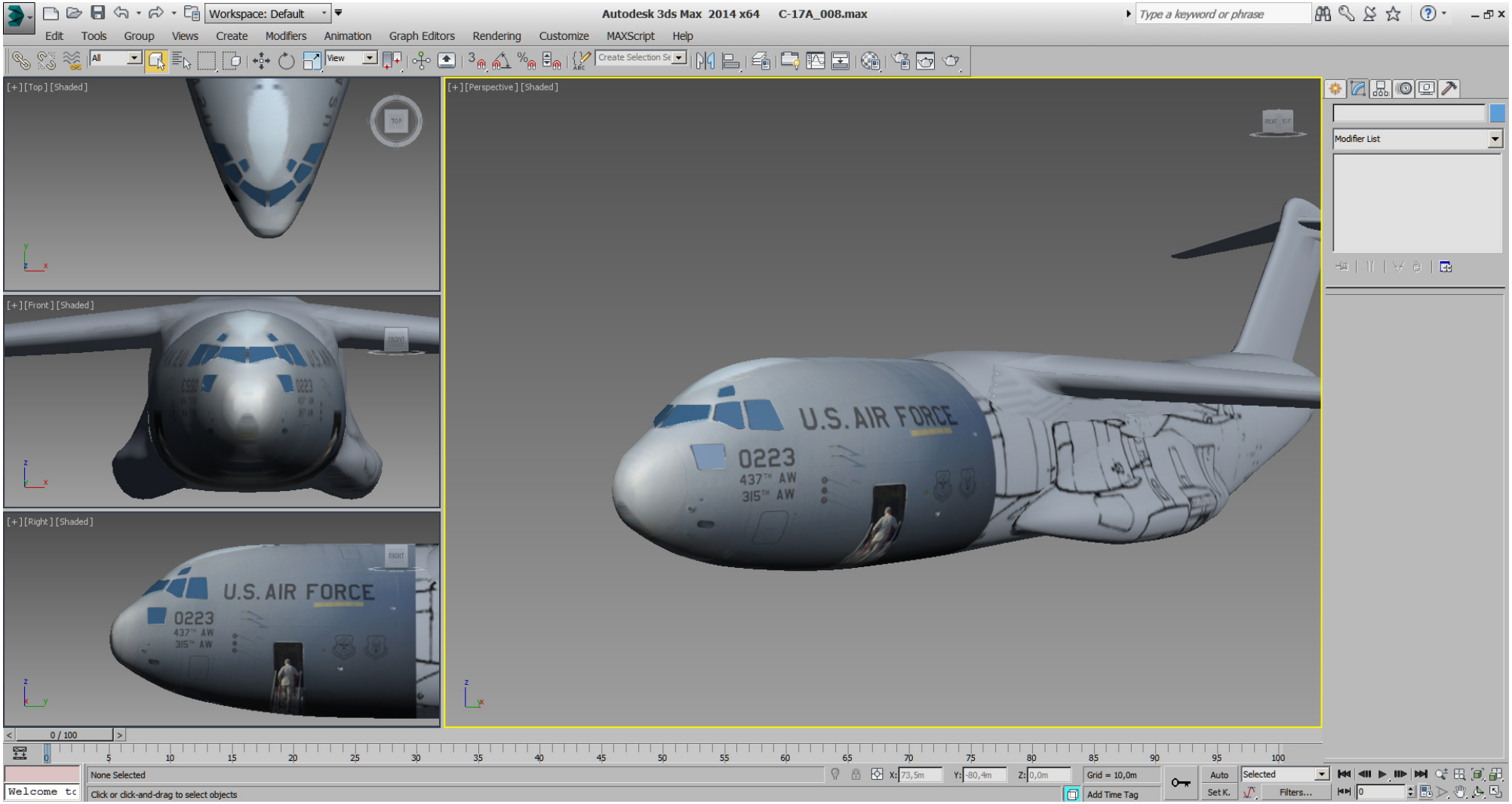
- They are flexible without doing any harm to the fuselage.
- They can be refined and can be used for boolean cutting later.



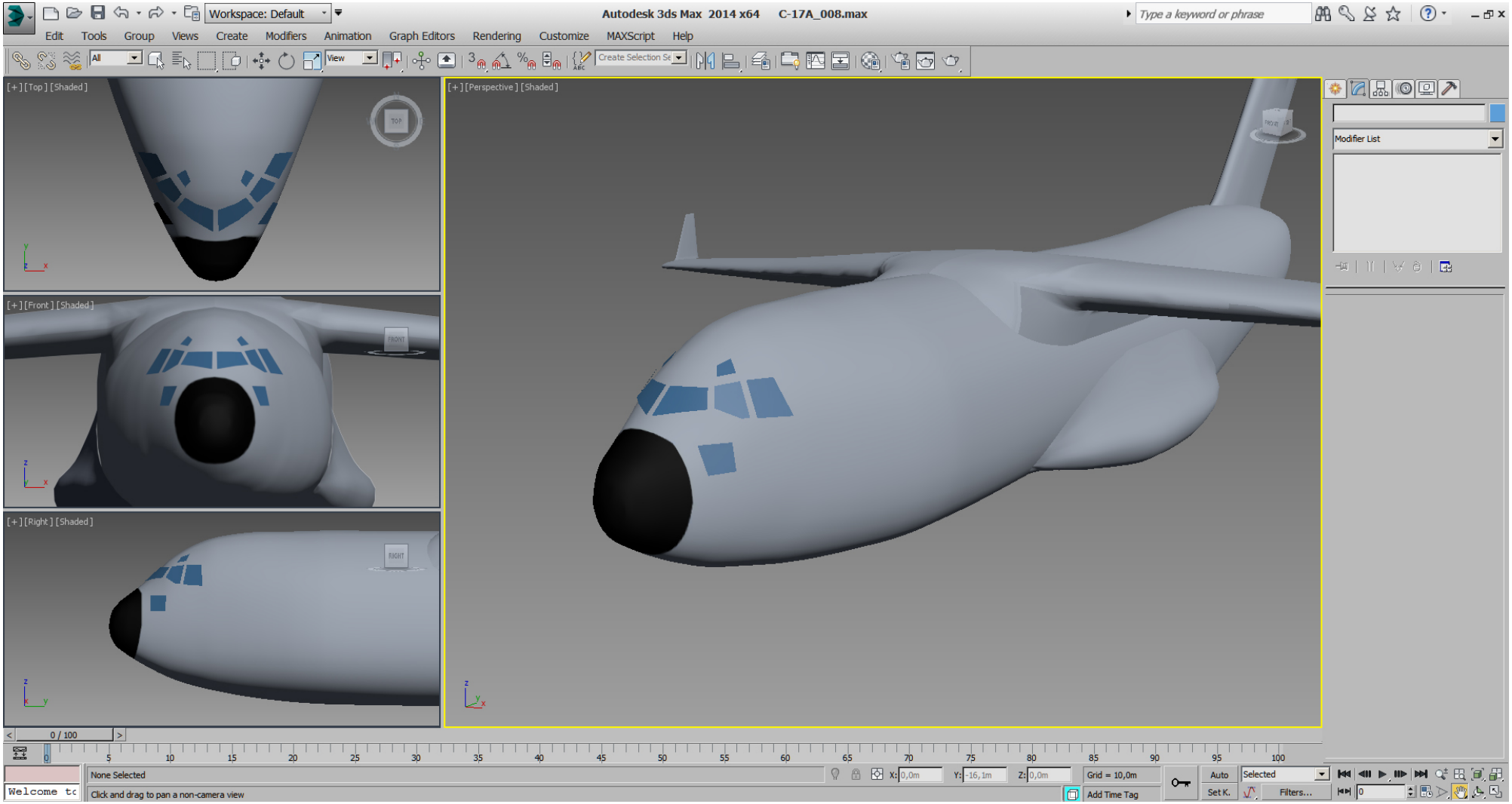
Removed the blueprint from the texture ...



But this blueprint (and some others as well) are not helpful here, so we can UVW map a RL picture (manually, planar left/right) for reference and adjust the windows to that.



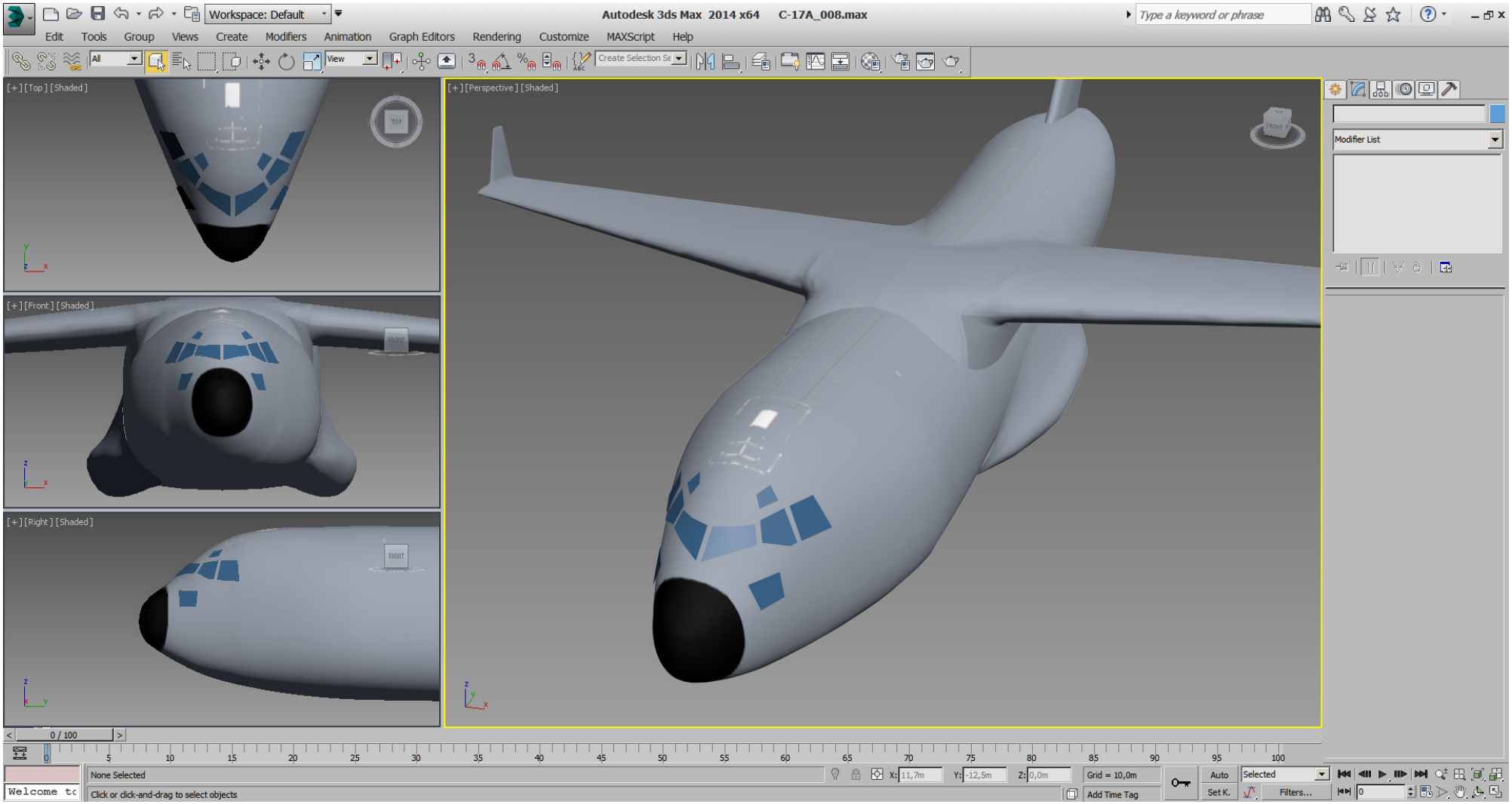
While actually left/ right mapped and with the RL picture on the texture I've painted the nose in black, then set the RL picture to hidden on the texture.



The “Stack” looks like this atm.:
8 - Poly Select (get rid of seams shown, and be ready to select next polys)
7 - Unwrap UVW (adjust left/ right mapping UV)
6 - UVW Map (planar projection)
5 - Poly Select (select all polys)
4 - Unwrap UVW (4 sides mapping)
3 - Edit Poly
2 - Surface
1 - Edit spline
0 - Circle (starting circle, better don't change anymore at this state of the model)

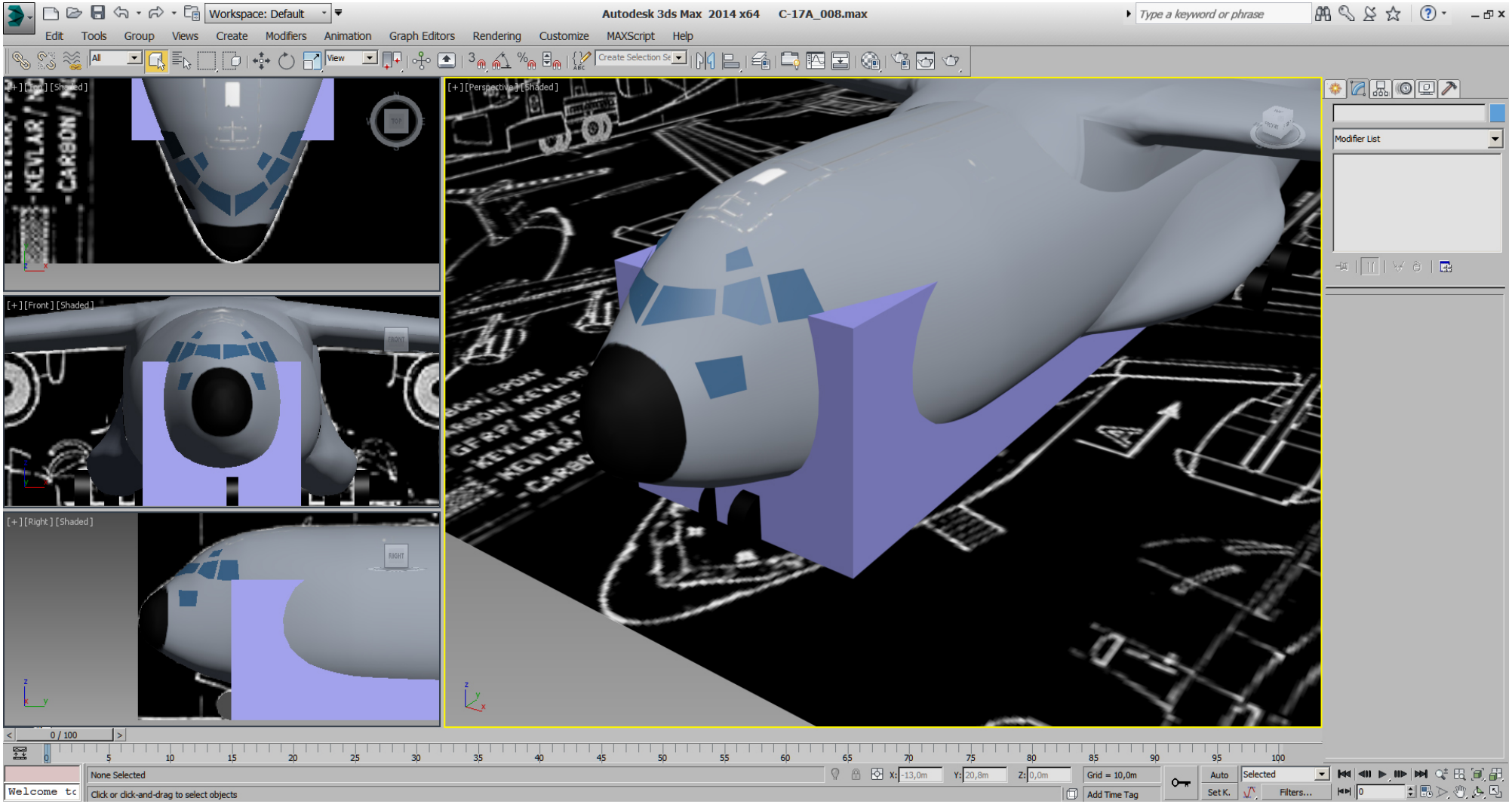
Atm. we can switch between 4 sides mapping or L/R mapping by simply setting modifier 6 - 8 on/off in the “Stack”.
We disable modifier 6 - 8 and we are back in 4 sides mapping, and paint the nose on the texture to get it (nearly) identically with the L/R mapping look.

Additionally we've painted some AAR markings (thanks to Revell paintscheme)


Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_008.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
0 / 100
None Selected
Click or click-and-drag to select objects
Add Time Tag
Auto
Set K.
Filters...
Selected

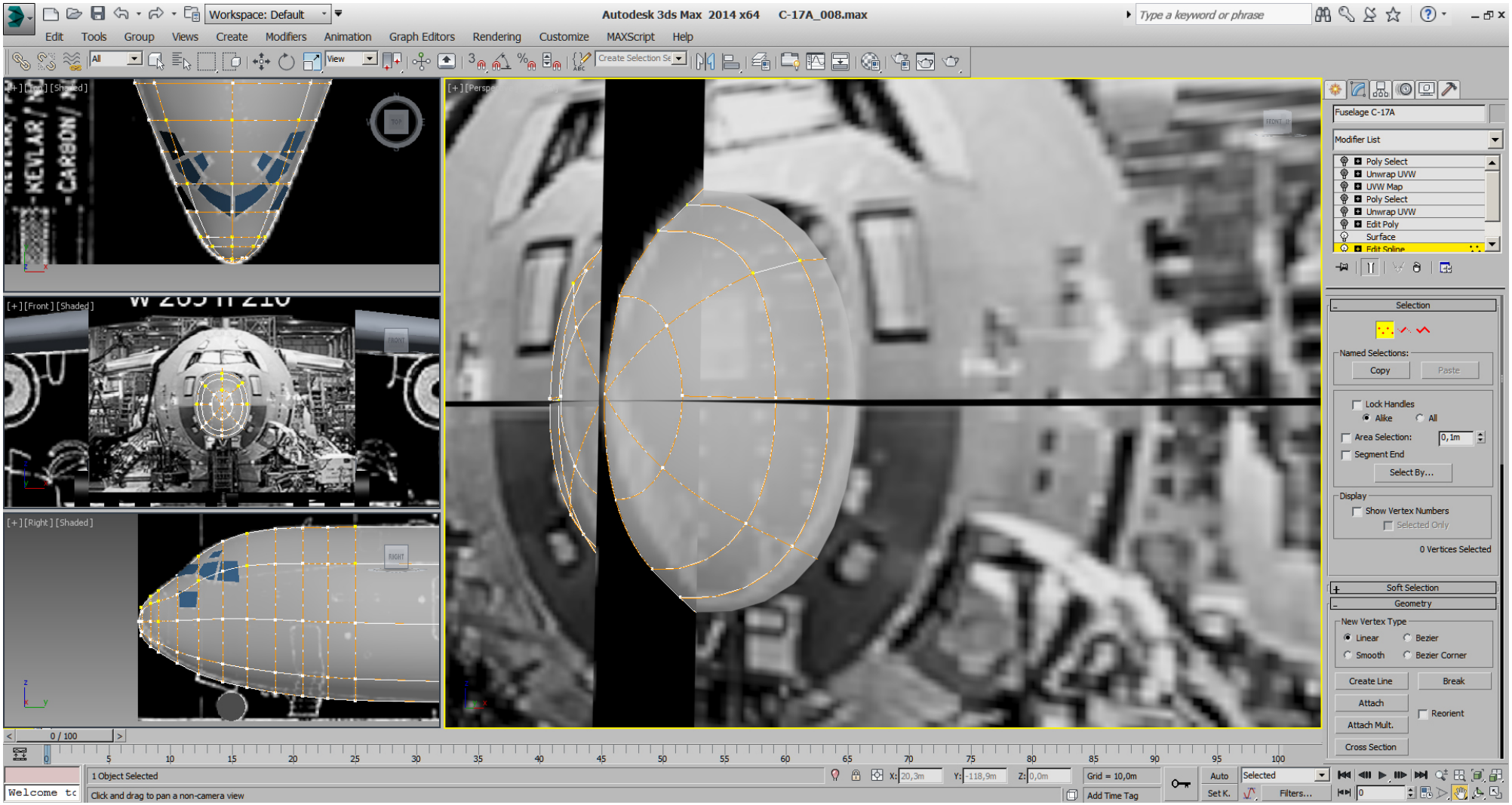
Now if we look at RL pictures we see that an imagined vertical line from the nose wheel ends approximately in the middle of the last window.

Having the footprint from Boeing, I've already set some cylinders as wheels, and having already a box aligned to measure distances from front wheels to the main wheels, ... I've simply adjusted the height of that box.

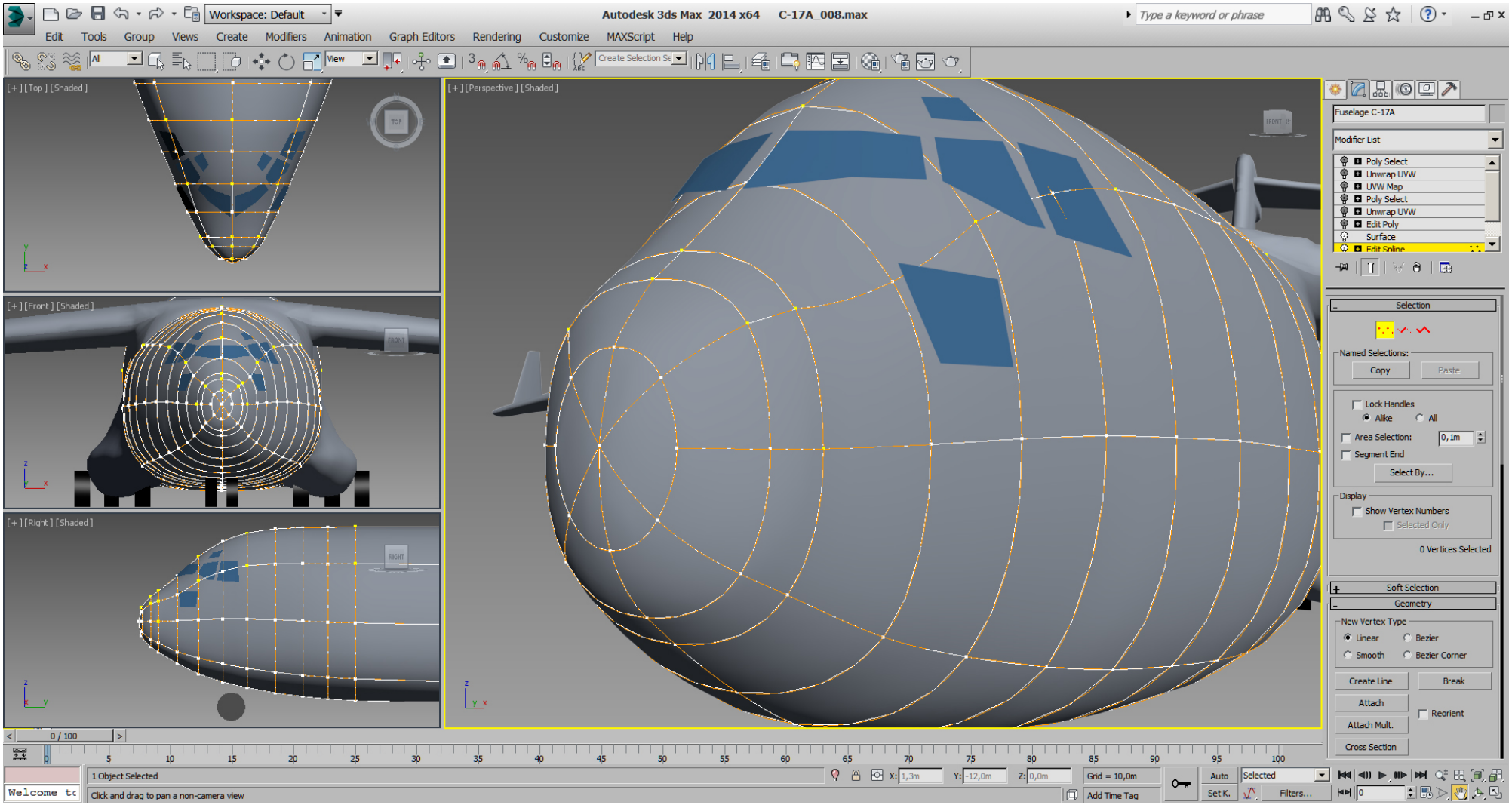


With these references I think we're not that far from RL position with the windows.

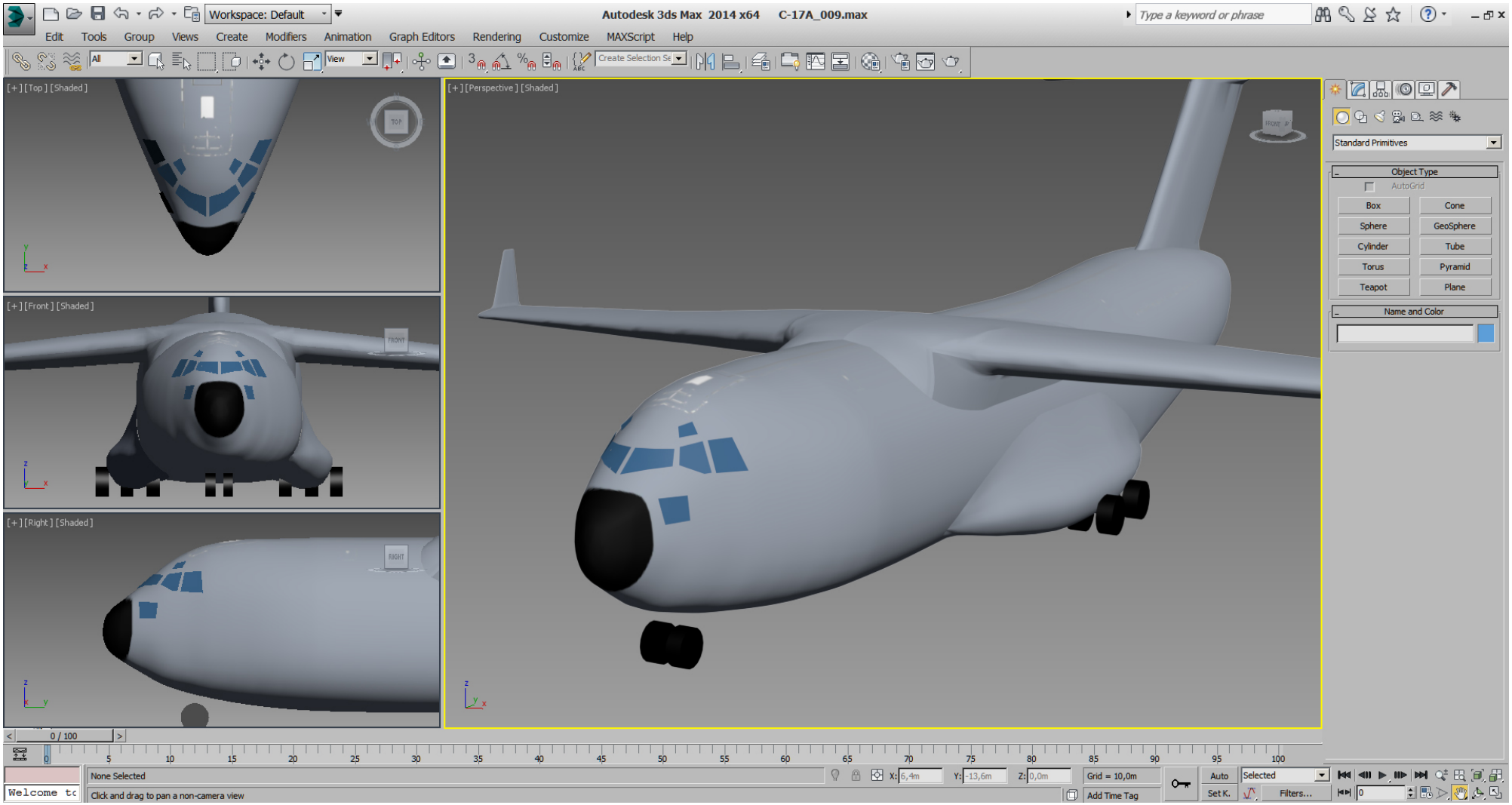
Plus, ... we have also a better reference for the nose itself, which looks horrible in front view atm..
For the nose correction I've set another "blueprint- cut" with a nice maintenance front picture, and there we see clearly where the surface don't match.
Although it's nearly impossible to place that cut 100% correct, it helps to get that nose in shape.



This is the nose before modifying:



Then I've adjusted some nose spline vertices, and could quickly see a better result.

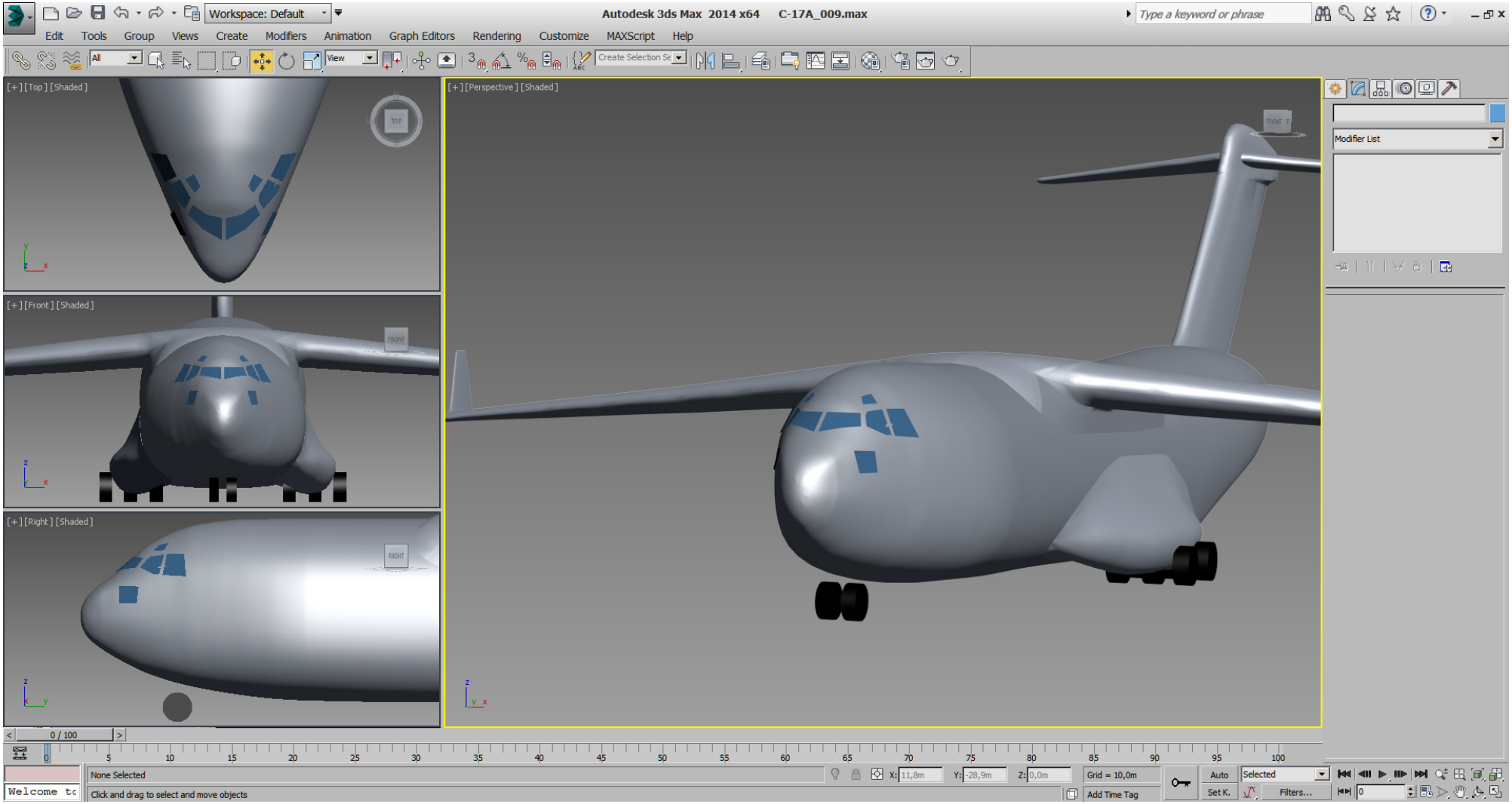


While I did those adjustments, I've also adjusted the windows whenever their corner vertex was to far or to close to the fuselage.

During some optimizing of the “Splines”, I've lost my UVW mapping, but I'm already nearly happy with that nose shape,
... needs just a little polish.

So we can increase the "Specular Level" of our material to see the errors on the surface better.

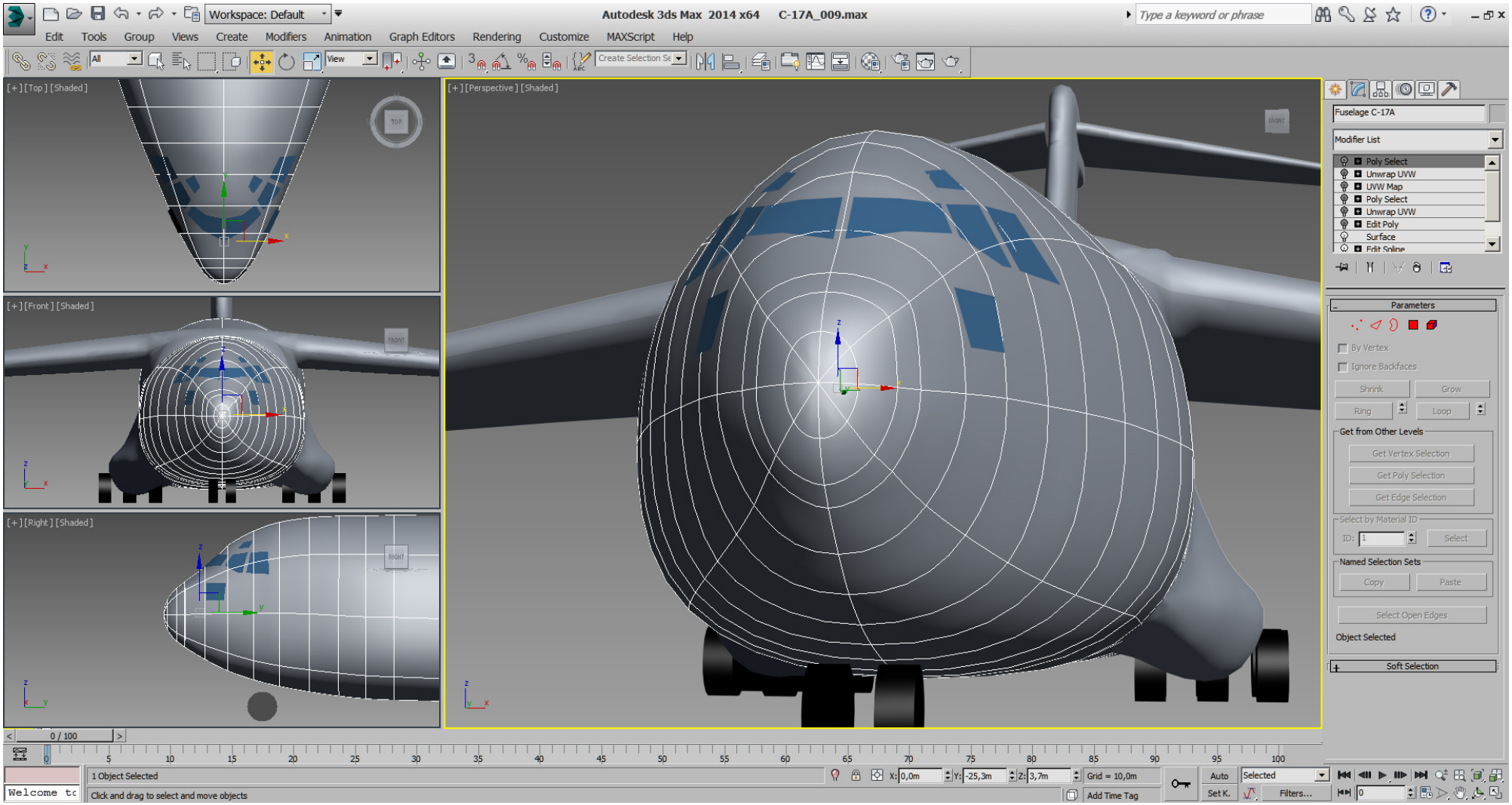
And after some carefully corrections it looks cleaner and smoother:



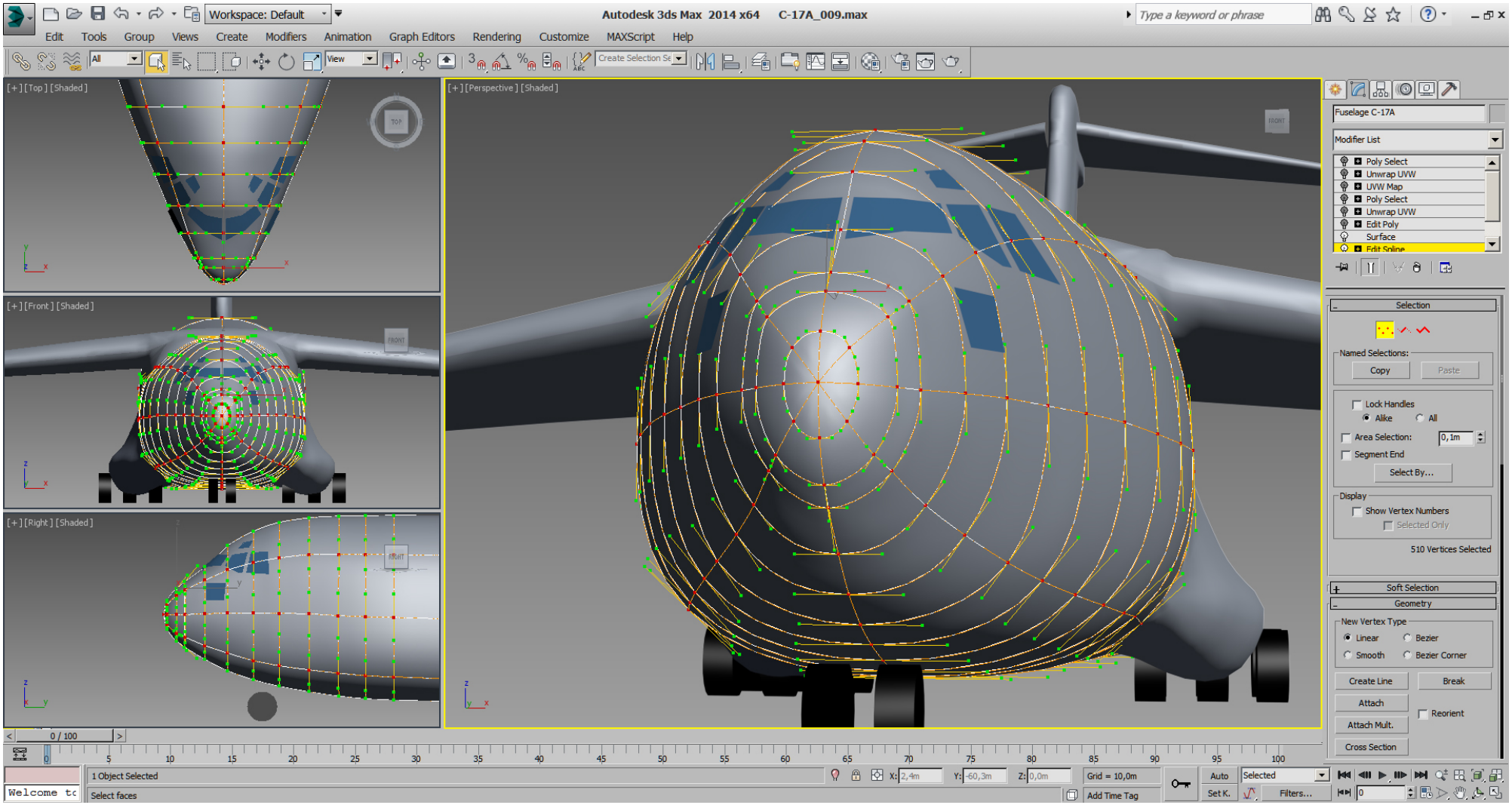
With the UVW modifiers still in the “Stack”, I've quickly remapped the fuselage 4- sides and L/R so the “Stack” is at the same state as before I've lost UVW mapping.

Then I did some slightly adjustments for the nose on the texture, and checked the result.

These are the nose splines after modifying:



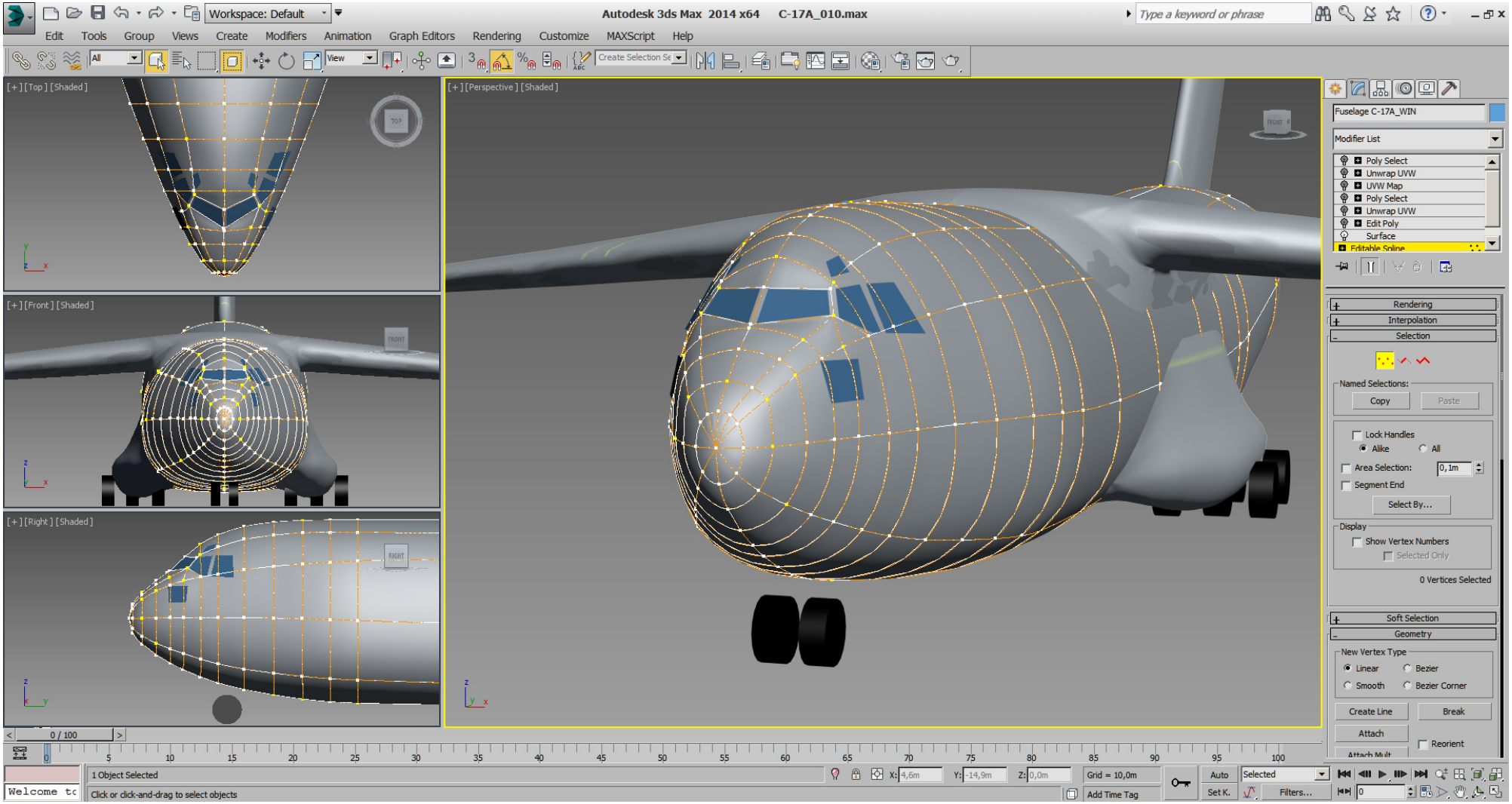
And with all spline vertex selected, so you can see the "Bezier":



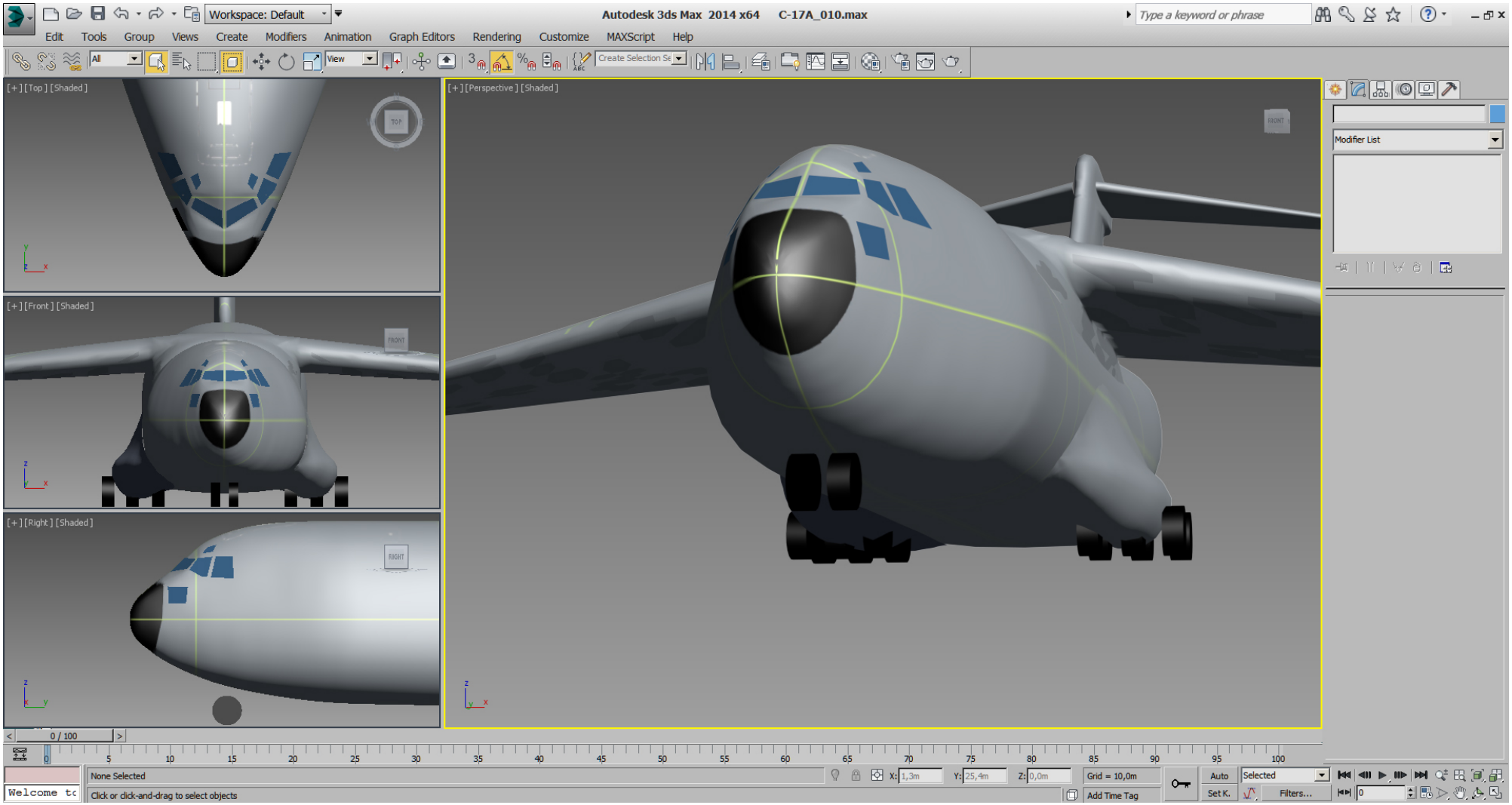
While I was looking at the 3dsMax help for the “Edit Spline” modifier, they say in short it's better to use an "Editable Spline" than the modifier. So with the “Edit Spline” modifier selected in the “Stack”, I've used the “Collapse to” command.
As result the originally "Circle is gone, and the first modifier in the “Stack” is now an “Editable Spline”.

Now with the nose in place, back to the windows area again. In RL the front windows are planar and the fuselage front top section is narrower. See how we can take control of the splines for the front windows.

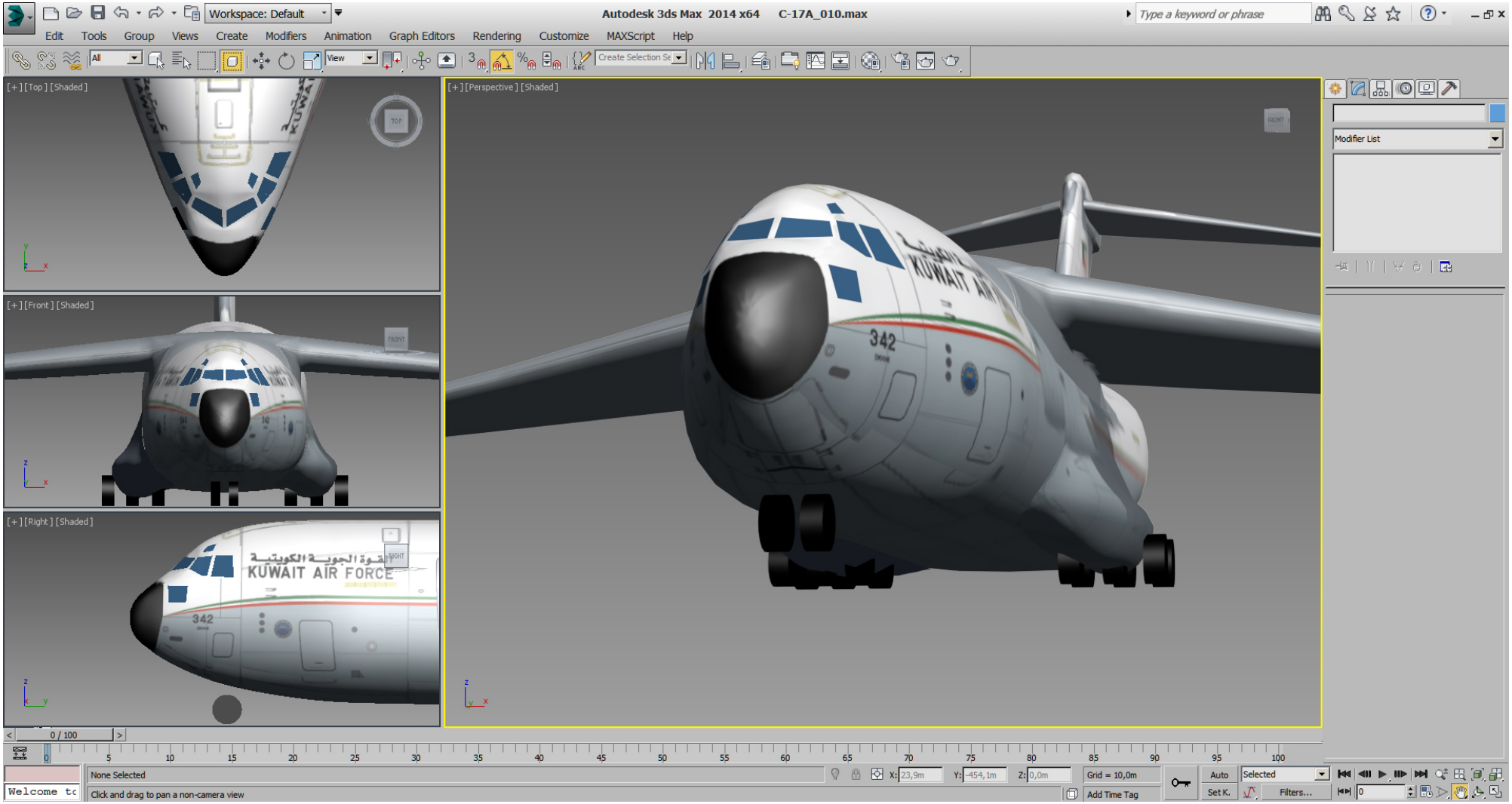
Also note the shape of the front section generally and compare to an earlier modeling state.
Those modifications are based on watching RL pictures, because the blueprint(s) just gives the outlines only.

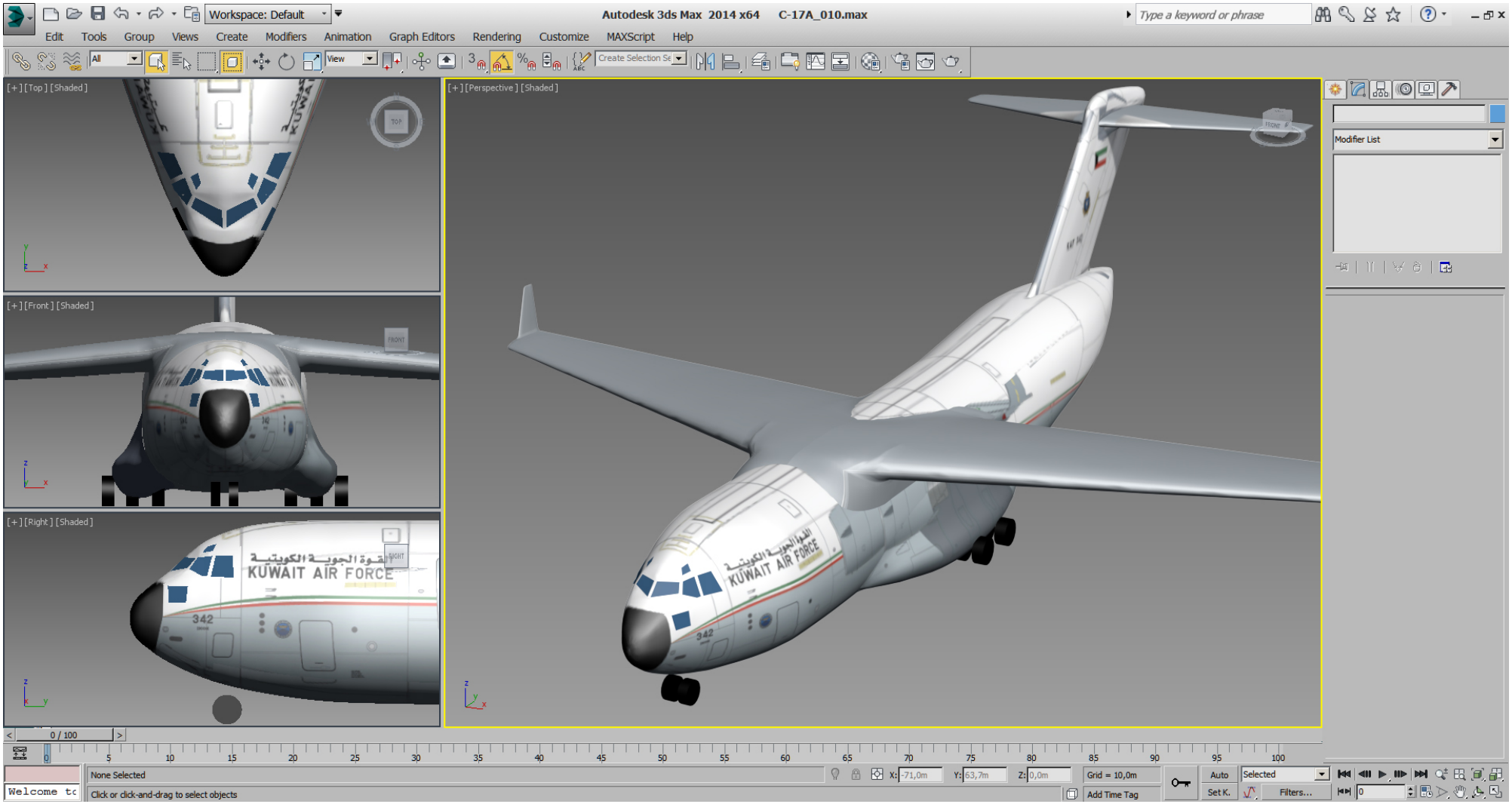


Whenever we add or delete a spline vertex/ line the UVW mapping get lost, which is expected,
but I want it on the model in early state for comparison/ reference.
Like I've said earlier, ... a quick mapping is done fast, and to match the positions on re- mapping even quicker,
I've painted some more yellow lines on the texture.



Then we can have some fun by a simple copy/paste on the texture in Photoshop.
(Thank's to "Draw Decals" for the paintscheme)



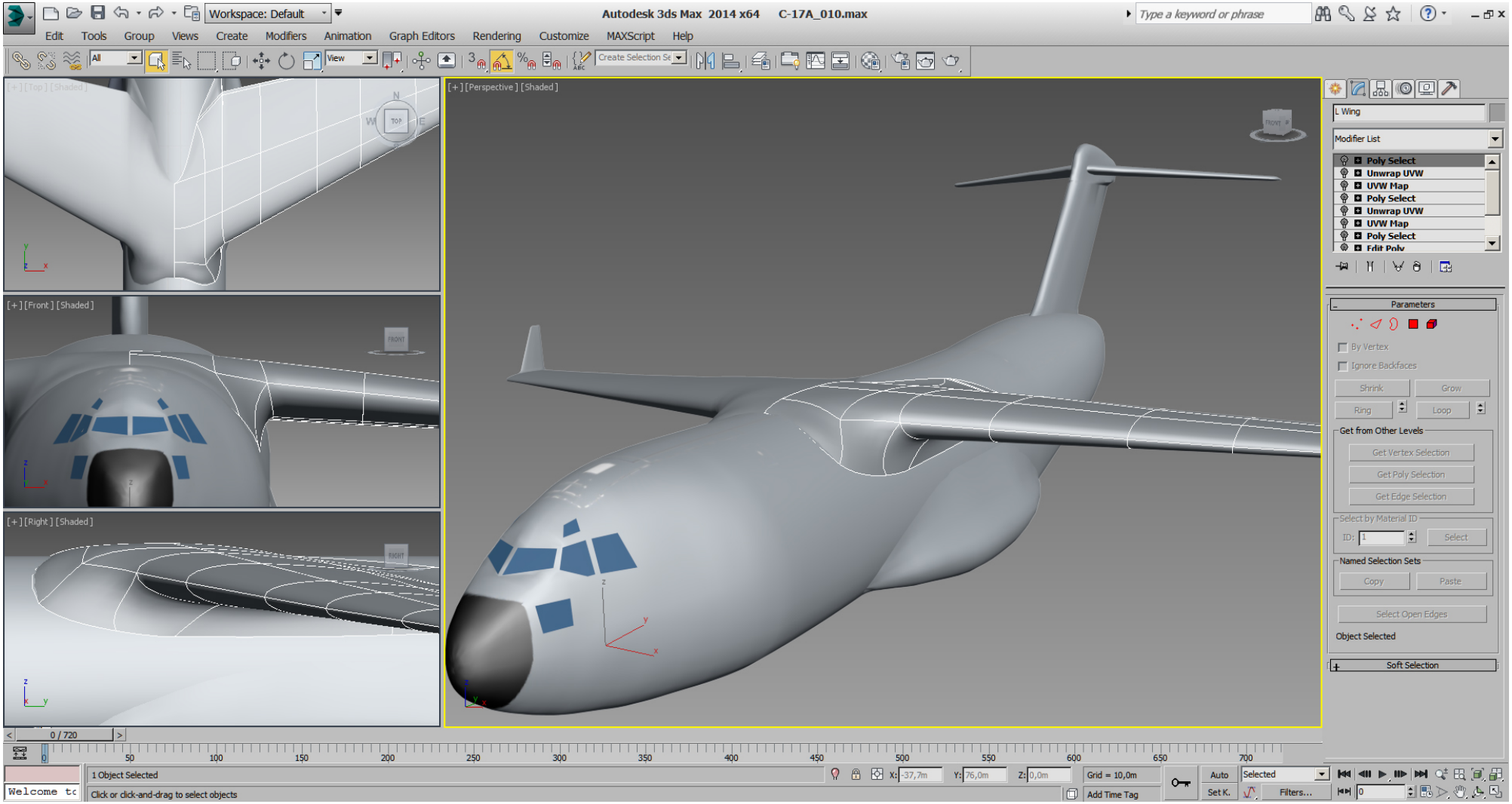


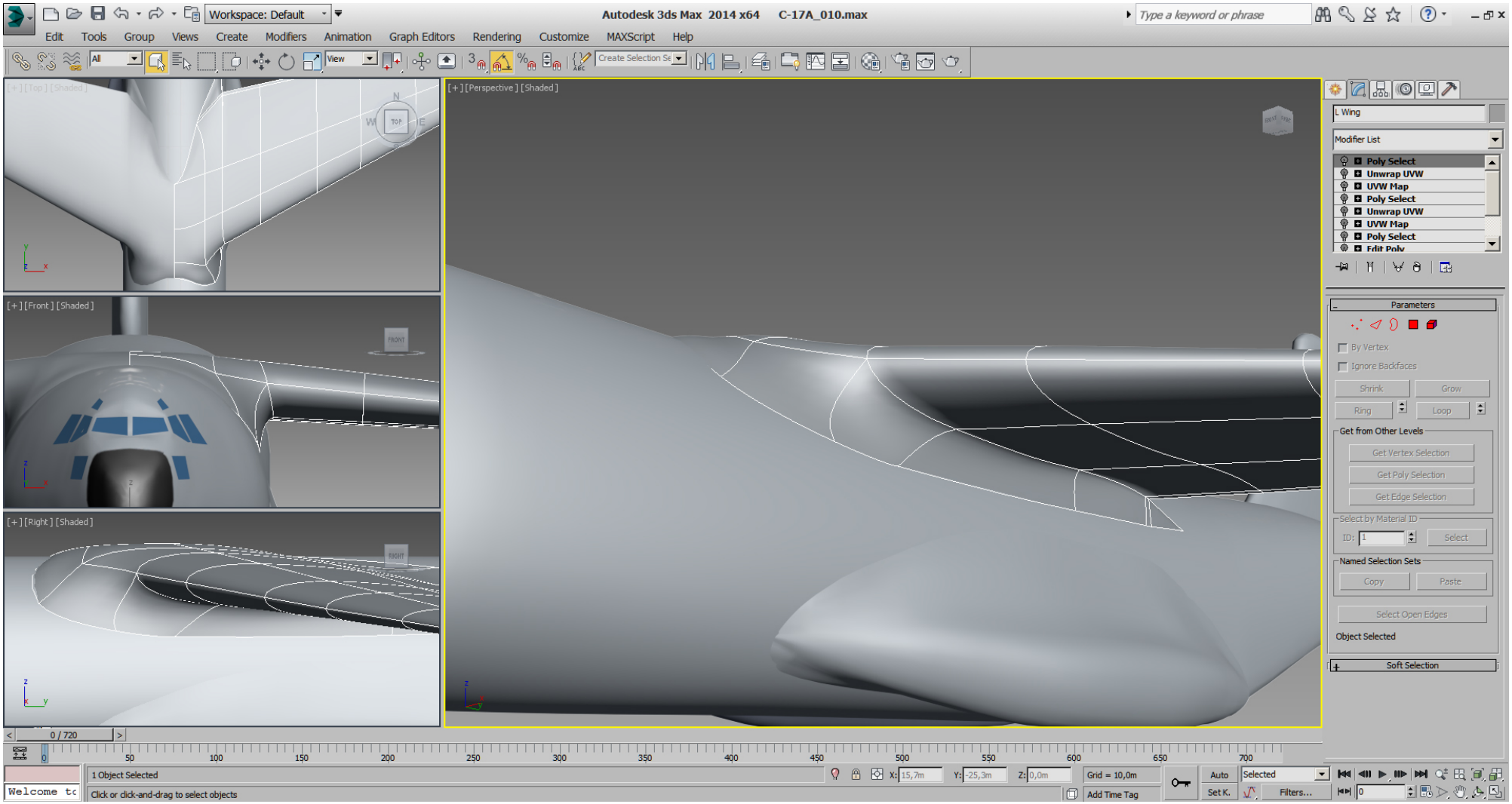
Here we render the UVW mapping to texture to place it on the texture.psd for quicker remapping using
UV Editor -> Tools -> Render UV Template -> 4096 x 4096
... save render as .tif.

After some additionally slightly overall polish, I'm relatively happy with the fuselage for now.

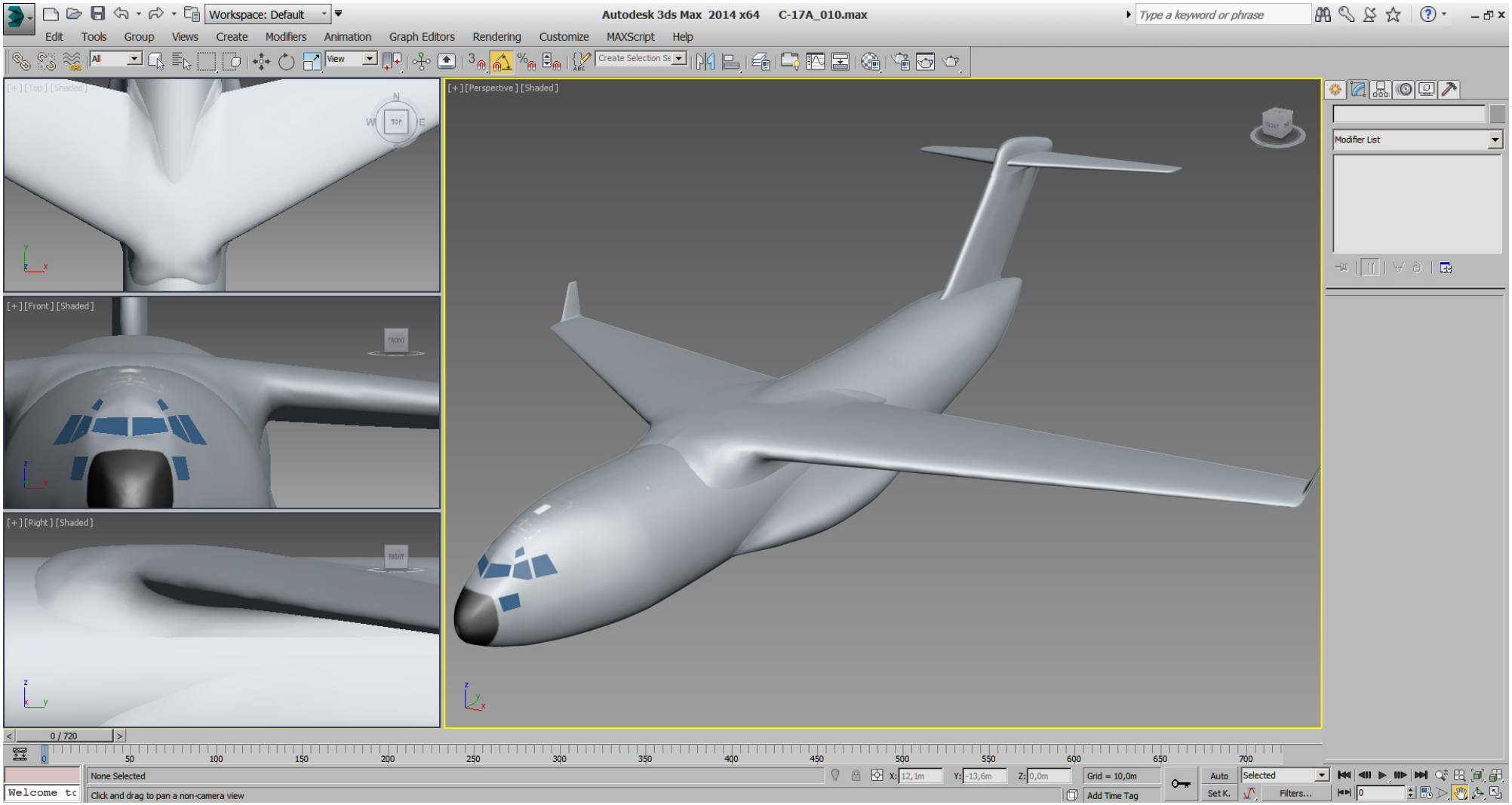
We'll do more refining later in “Edit Poly” mode.

Next I did some adjustments on the wings shoulder (compare to pictures above) and on the airfoil profile, whereat the profile might need further adjustments later, when we cut the flaps, etc..

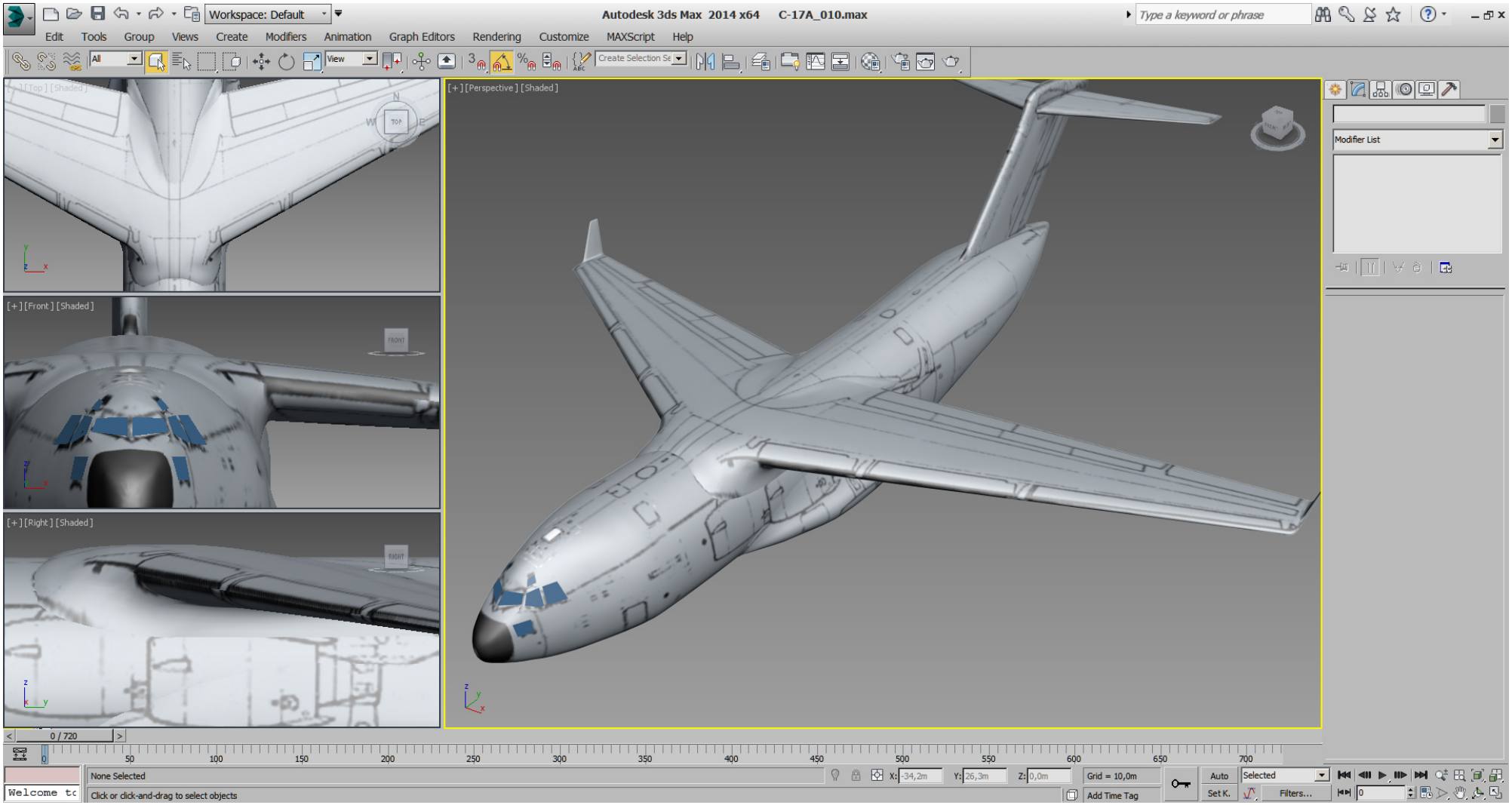



Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_010.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
L Wing
Modifier List
Poly Select
Unwrap UVW
UVW Map
Poly Select
Unwrap UVW
UVW Map
Poly Select
Edit Poly
Parameters
By Vertex
Ignore Backfaces
Shrink
Grow
Ring
Loop
Get from Other Levels
Get Vertex Selection
Get Poly Selection
Get Edge Selection
Select by Material ID
Select
Named Selection Sets
Copy
Paste
Select Open Edges
Object Selected
Soft Selection
0 / 720
1 Object Selected
Click or click-and-drag to select objects
Add Time Tag
Auto
Set K.
Filters...
Selected
Welcome to

Checking the shoulder with a slightly more shiny material, ...



... and blueprint textured.



That's all I wanted to do on wings shoulder for now.

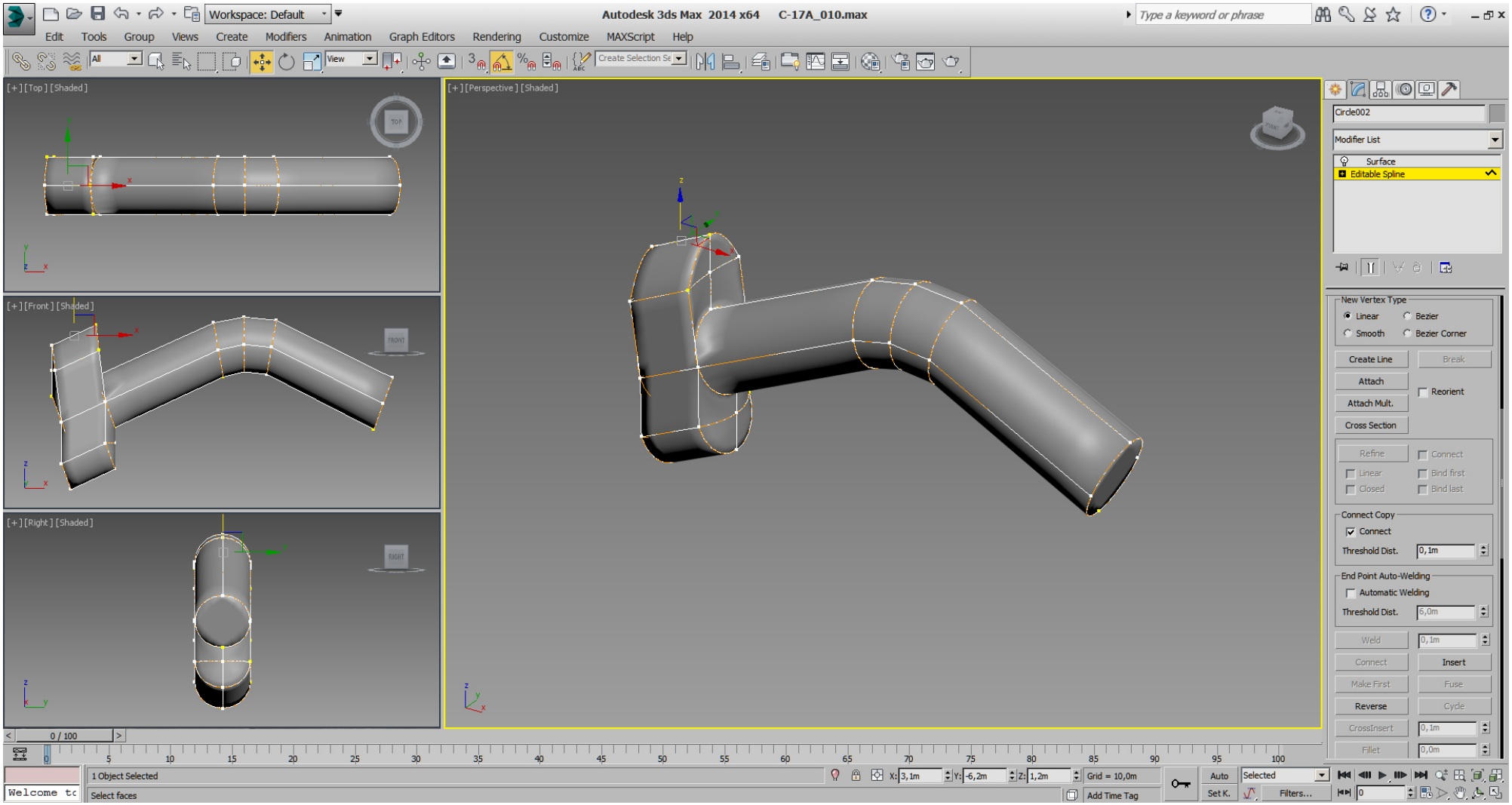
Now on the gear boxes, or like my source .pdf says: the sponsons.

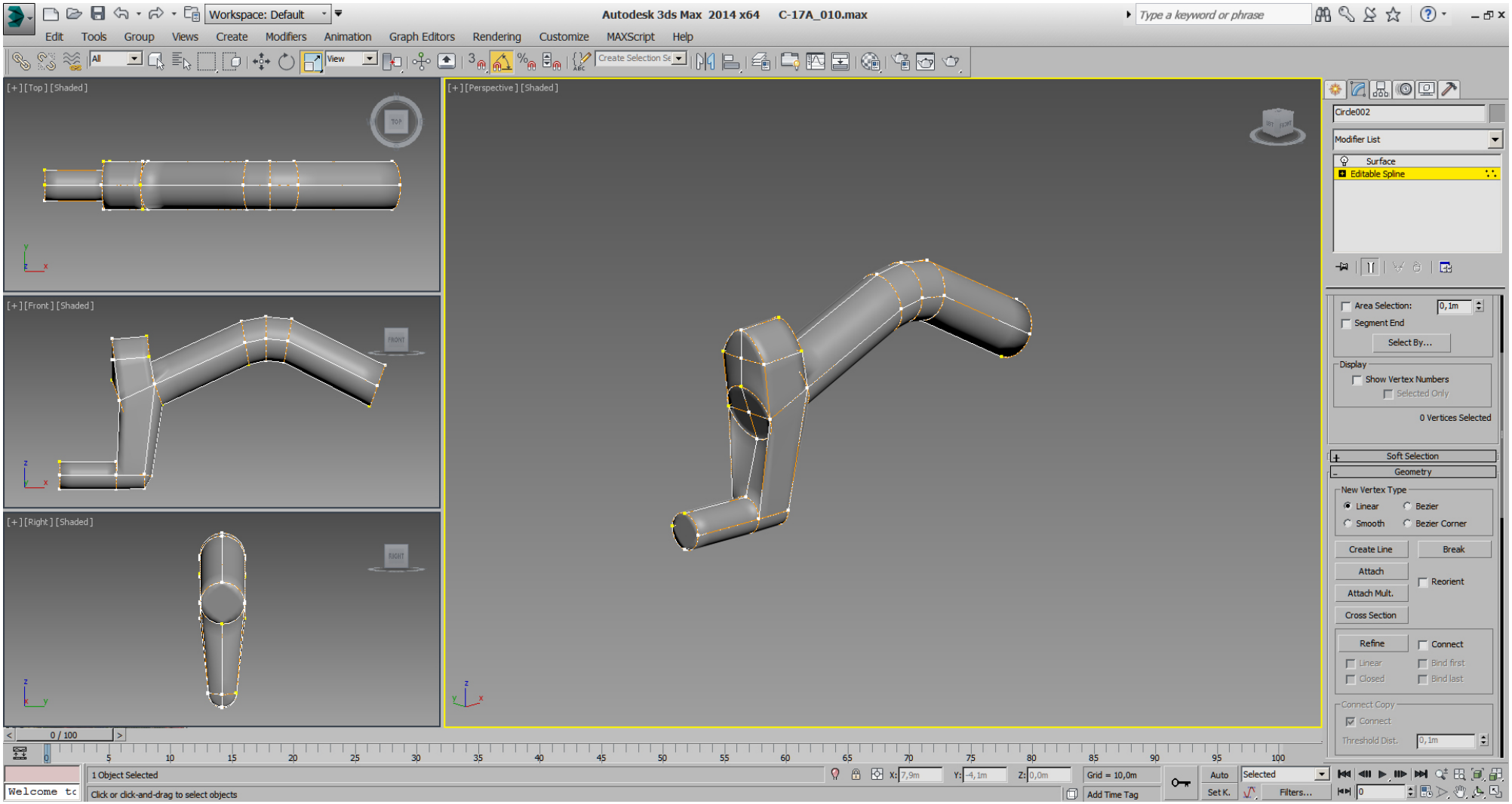
Those sponsons and the main landing gear (MLG) and the animation might be the trickiest part of that model.

So before we do any further on the sponsons, we want to get a MLG to see how the things will (or won't) fit together.

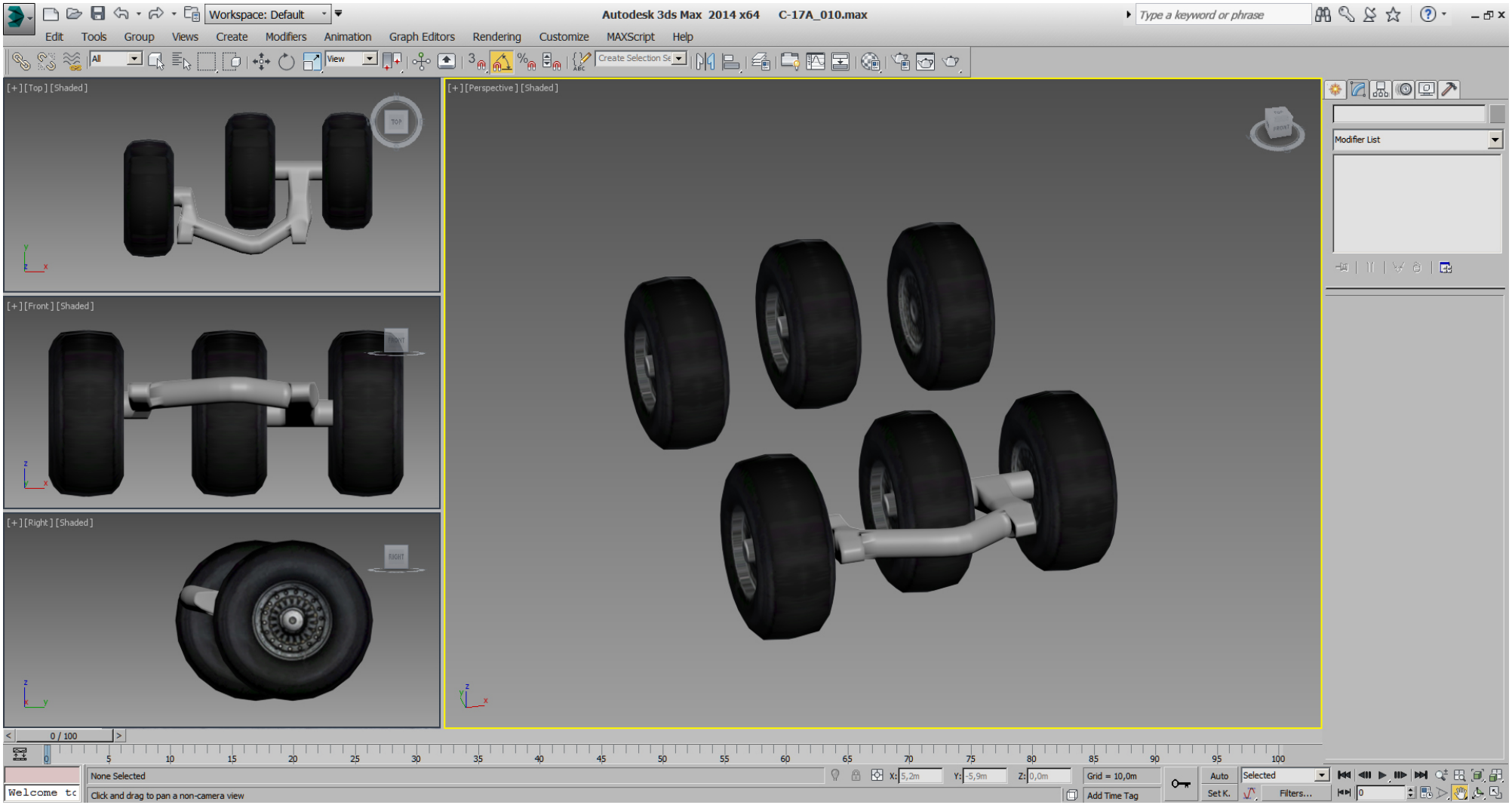
I've got a footprint from Boeing, which holds some wrong values. (WTF ?)
But with the footprint errors identified and fixed, it's good to go for reference.

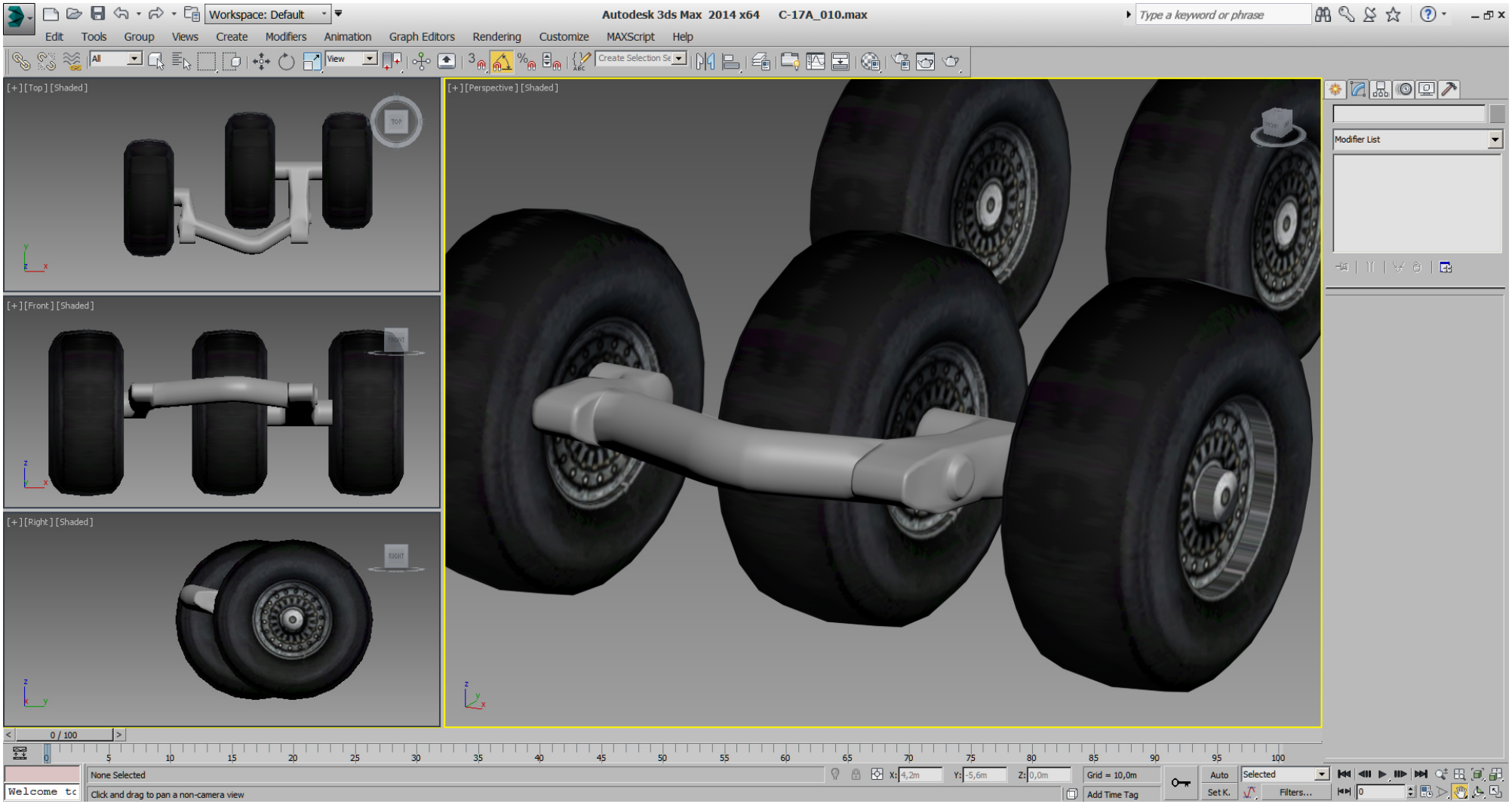
And for the MLG itself someone has to start somewhere, ... with splines again.

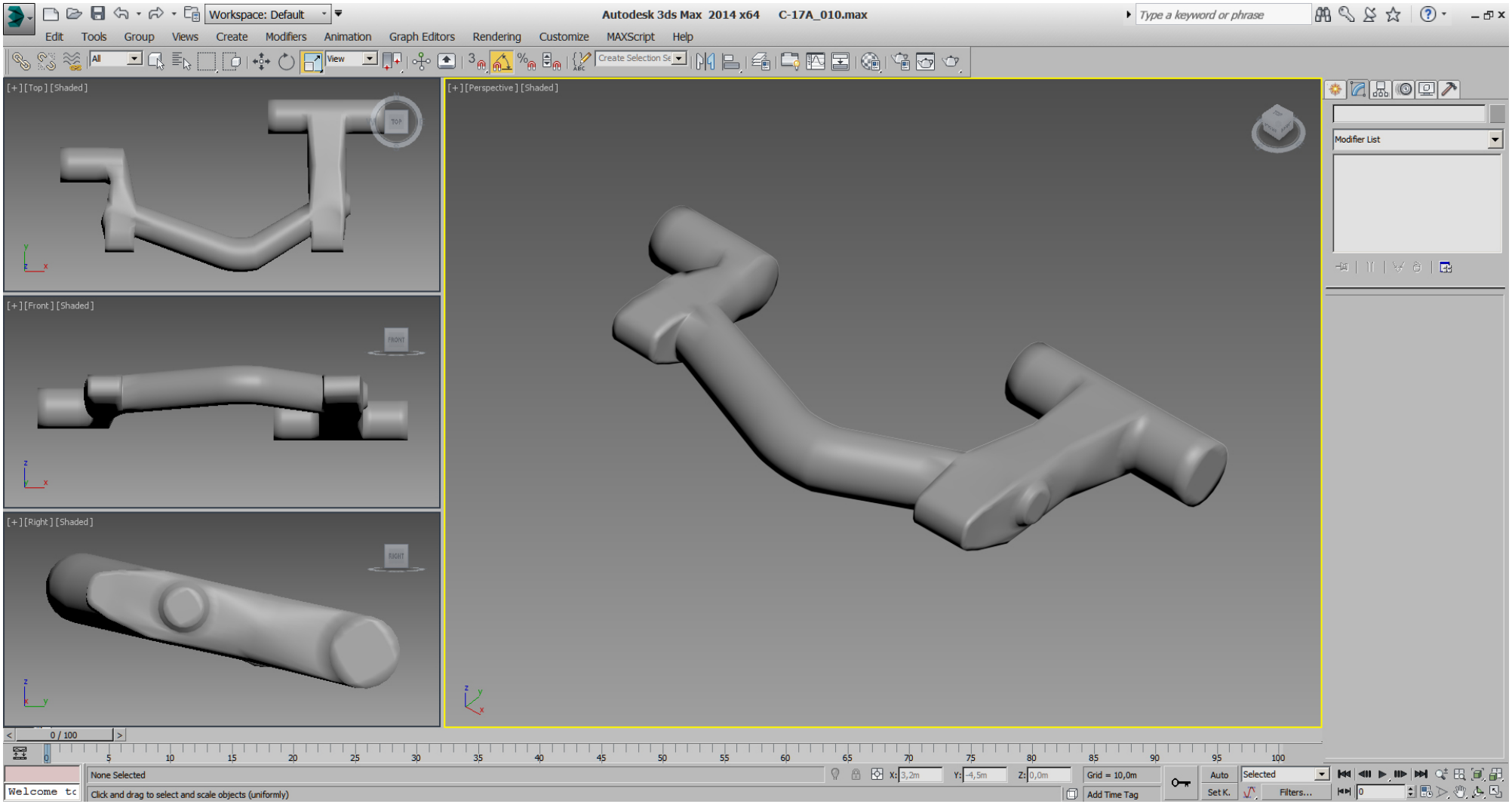


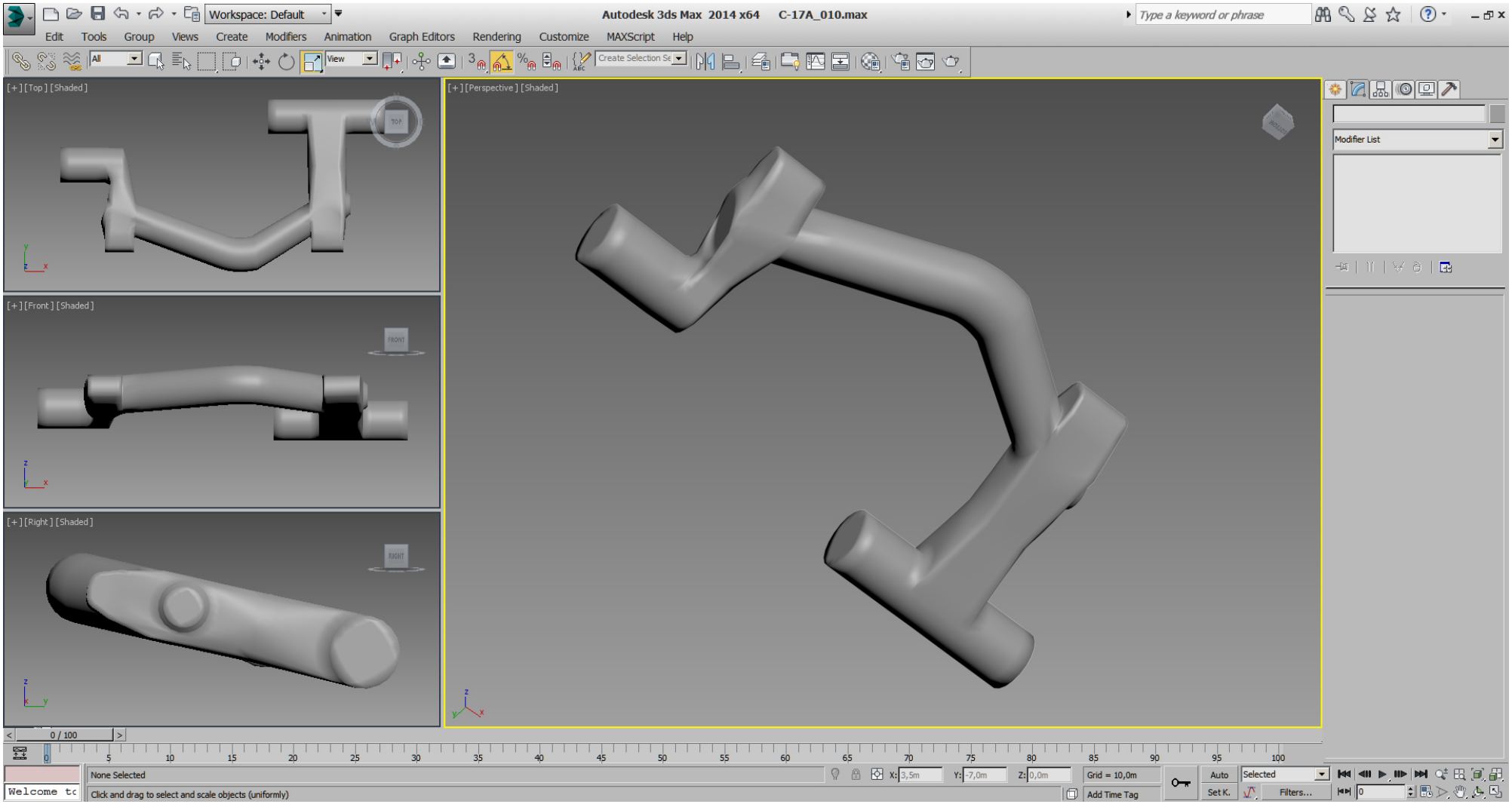

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_010.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Circle002
Modifier List
Surface
Editable Spline
Area Selection:
Segment End
Select By...
Display
Show Vertex Numbers
Selected Only
0 Vertices Selected
Soft Selection
Geometry
New Vertex Type
Linear
Bezier
Smooth
Bezier Corner
Create Line
Break
Attach
Reorient
Attach Mult.
Cross Section
Refine
Connect
Linear
Bind first
Closed
Bind last
Connect Copy
Connect
Threshold Dist.
0 / 100
1 Object Selected
Click or click-and-drag to select objects
Add Time Tag
Grid = 10,0m
Auto
Set K.
Filters...
Selected
Welcome to

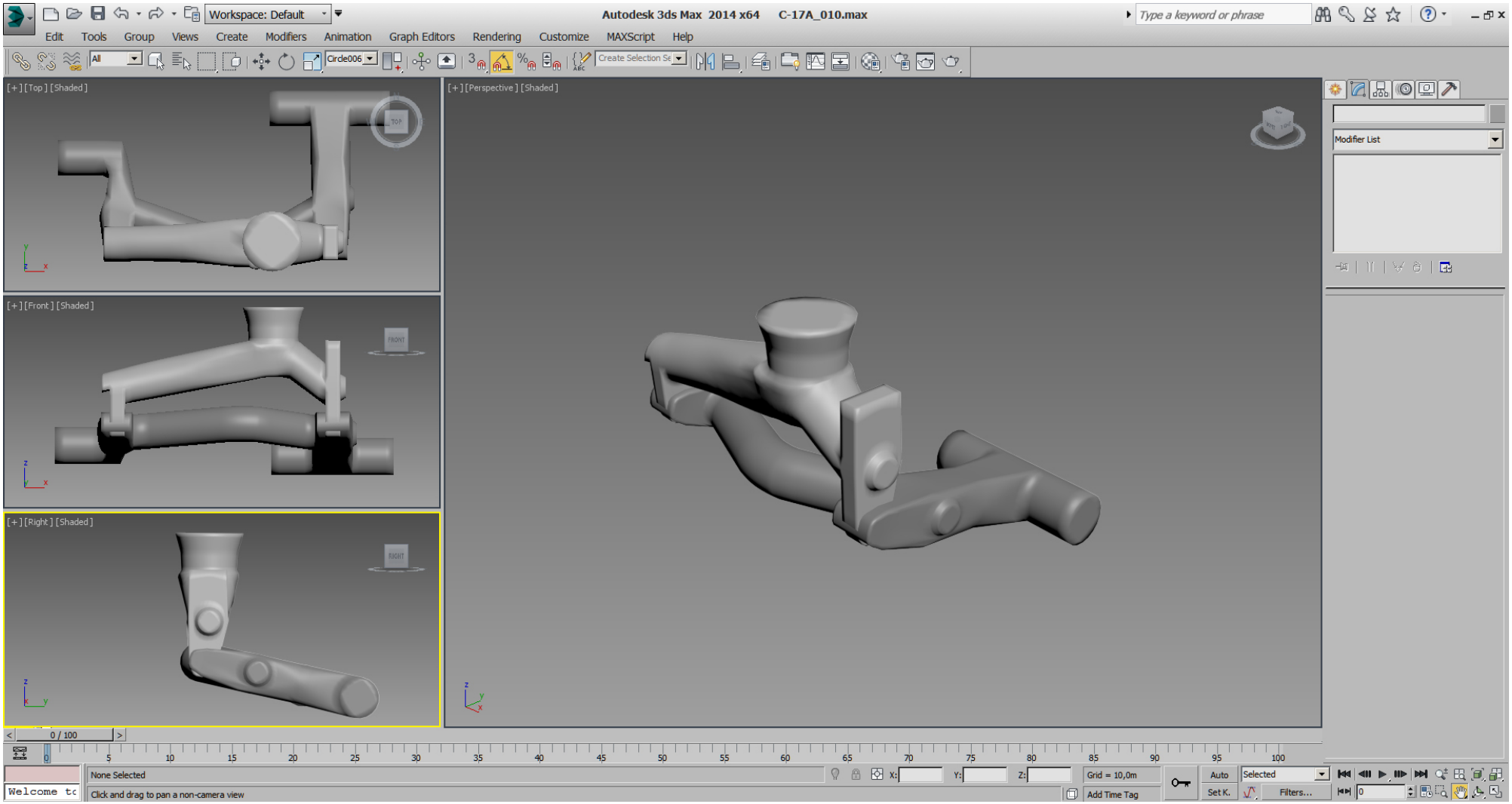
The wheels are quick and dirty modeled and UVW mapped, but better than former used placeholder cylinders.

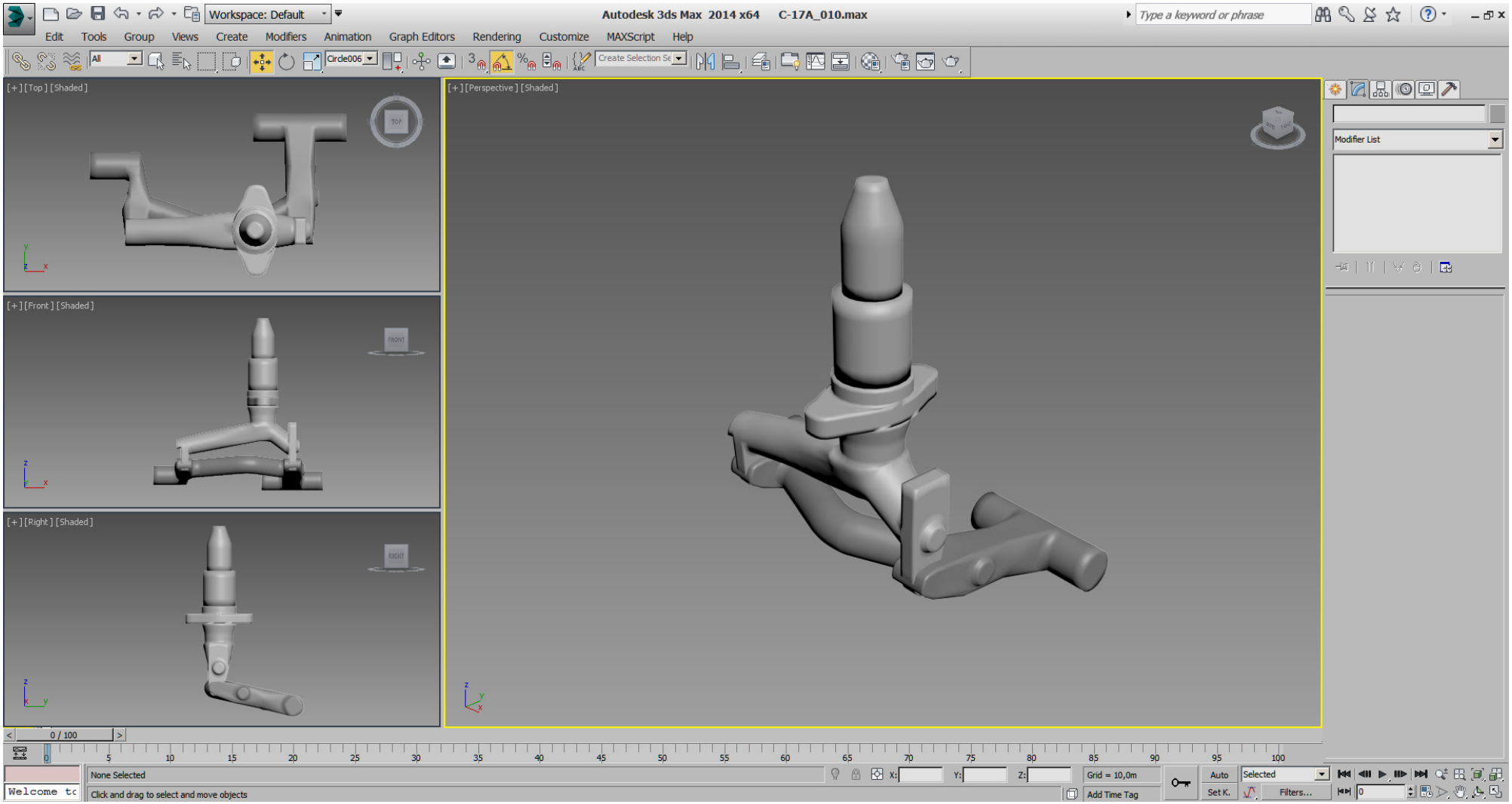


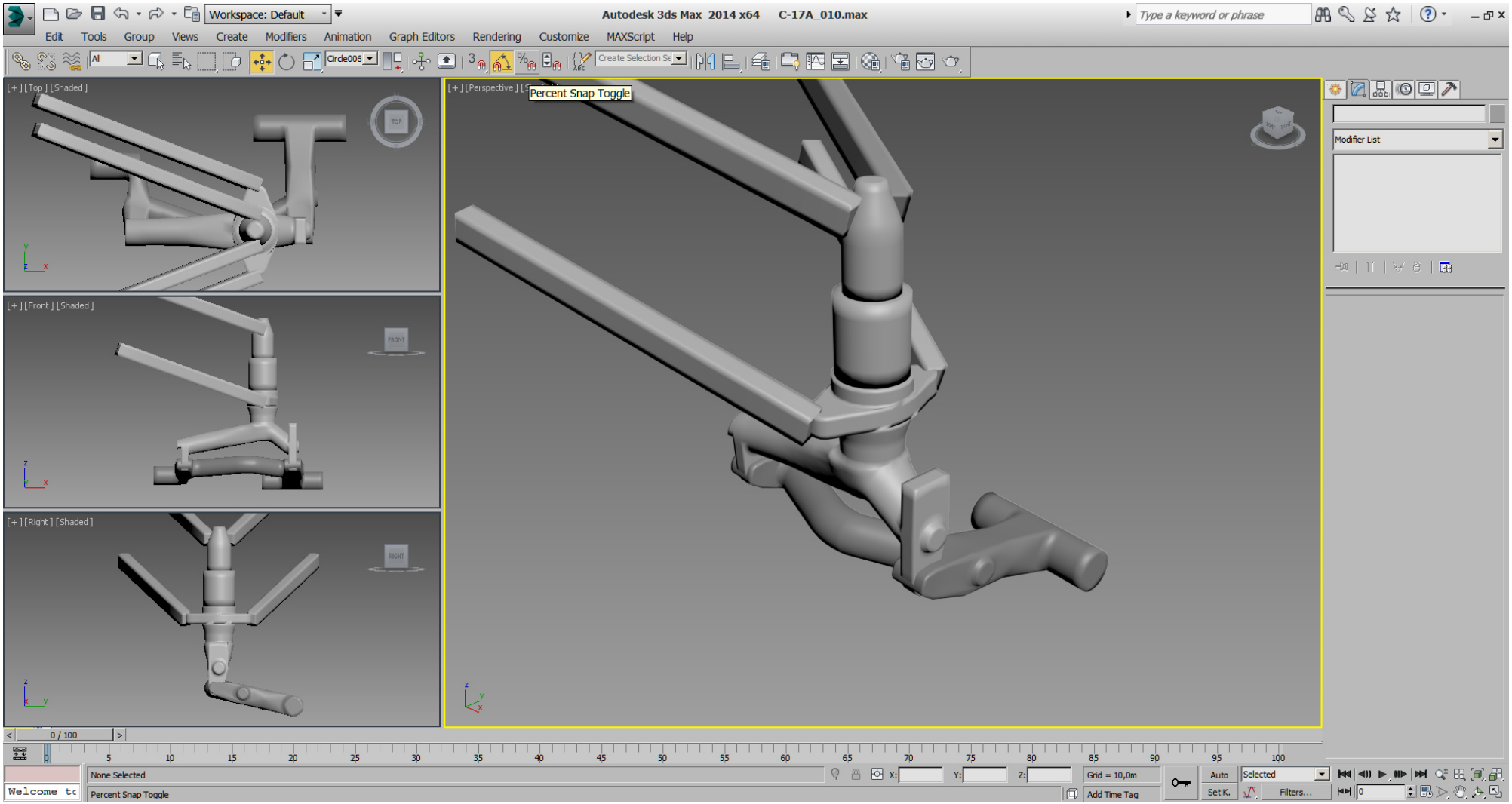

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_010.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
0 / 100
None Selected
Click and drag to pan a non-camera view
Add Time Tag
Grid = 10,0m
Auto
Set K.
Selected
Filters...
Welcome to

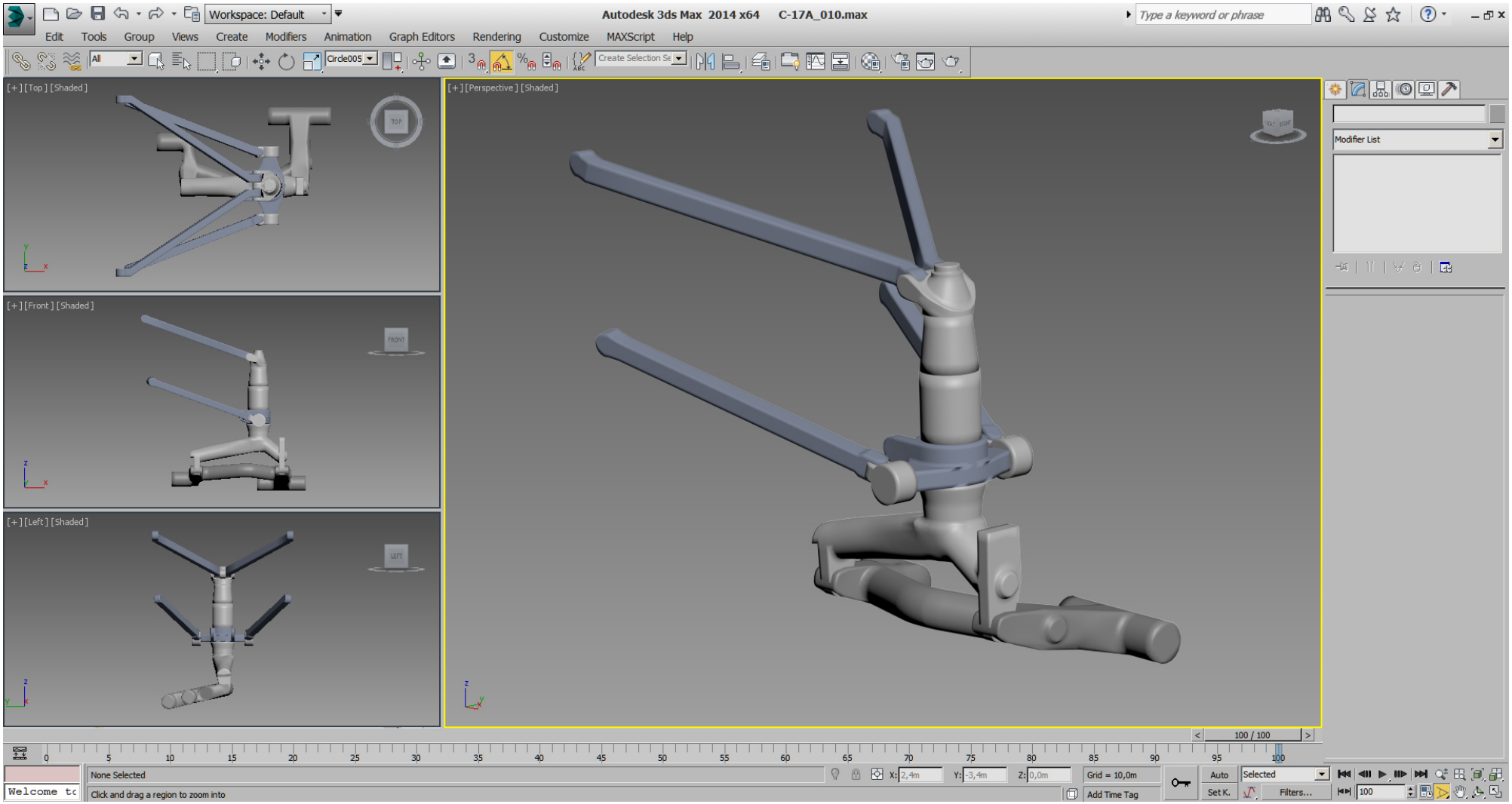

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_010.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
0 / 100
None Selected
Click and drag to select and scale objects (uniformly)
Add Time Tag
Grid = 10,0m
Auto
Selected
Set K.
Filters...
Welcome to

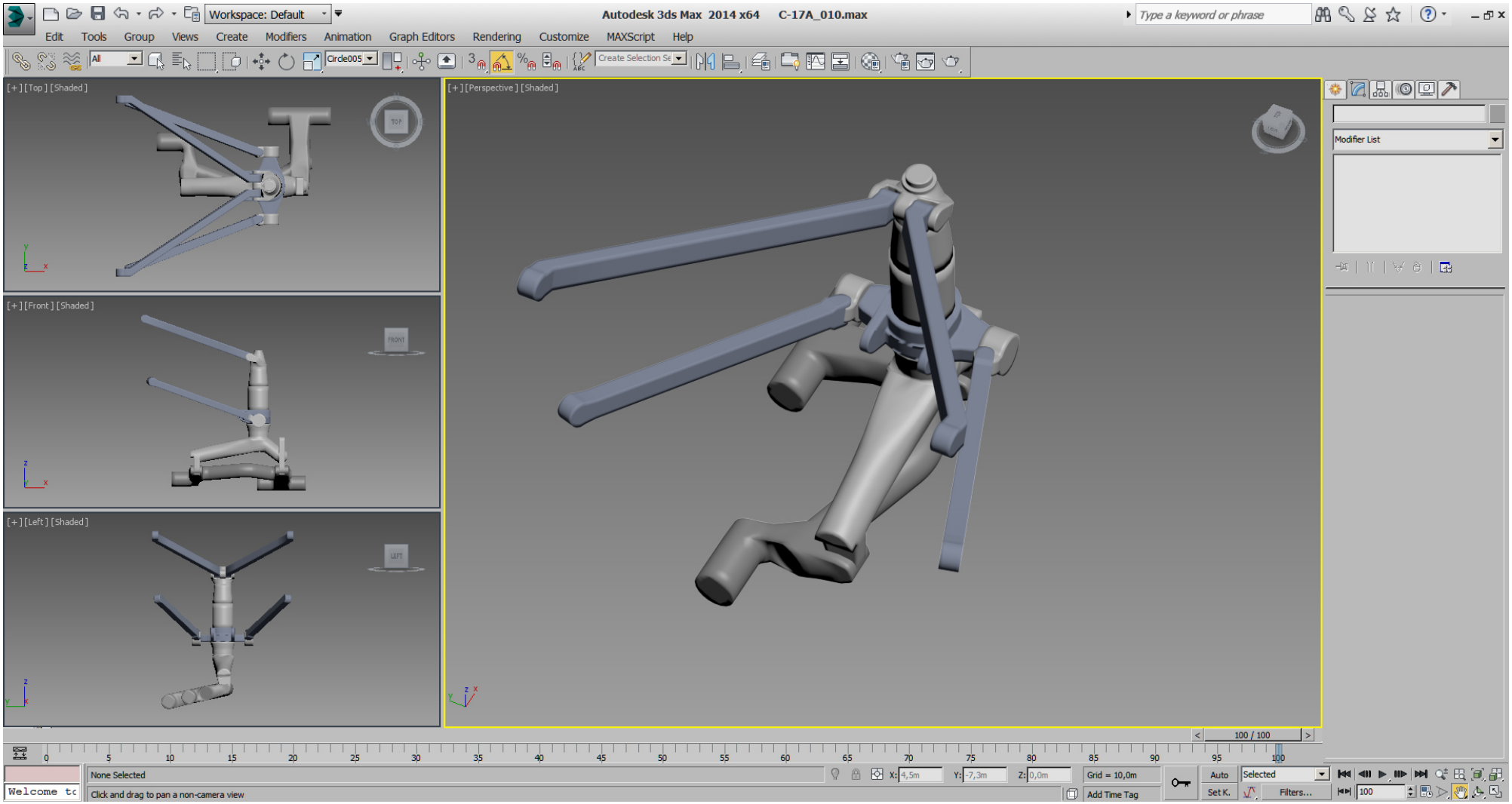

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_010.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
0 / 100
None Selected
Click and drag to select and scale objects (uniformly)
Grid = 10,0m
Add Time Tag
Auto
Set K.
Selected
Filters...
Welcome to

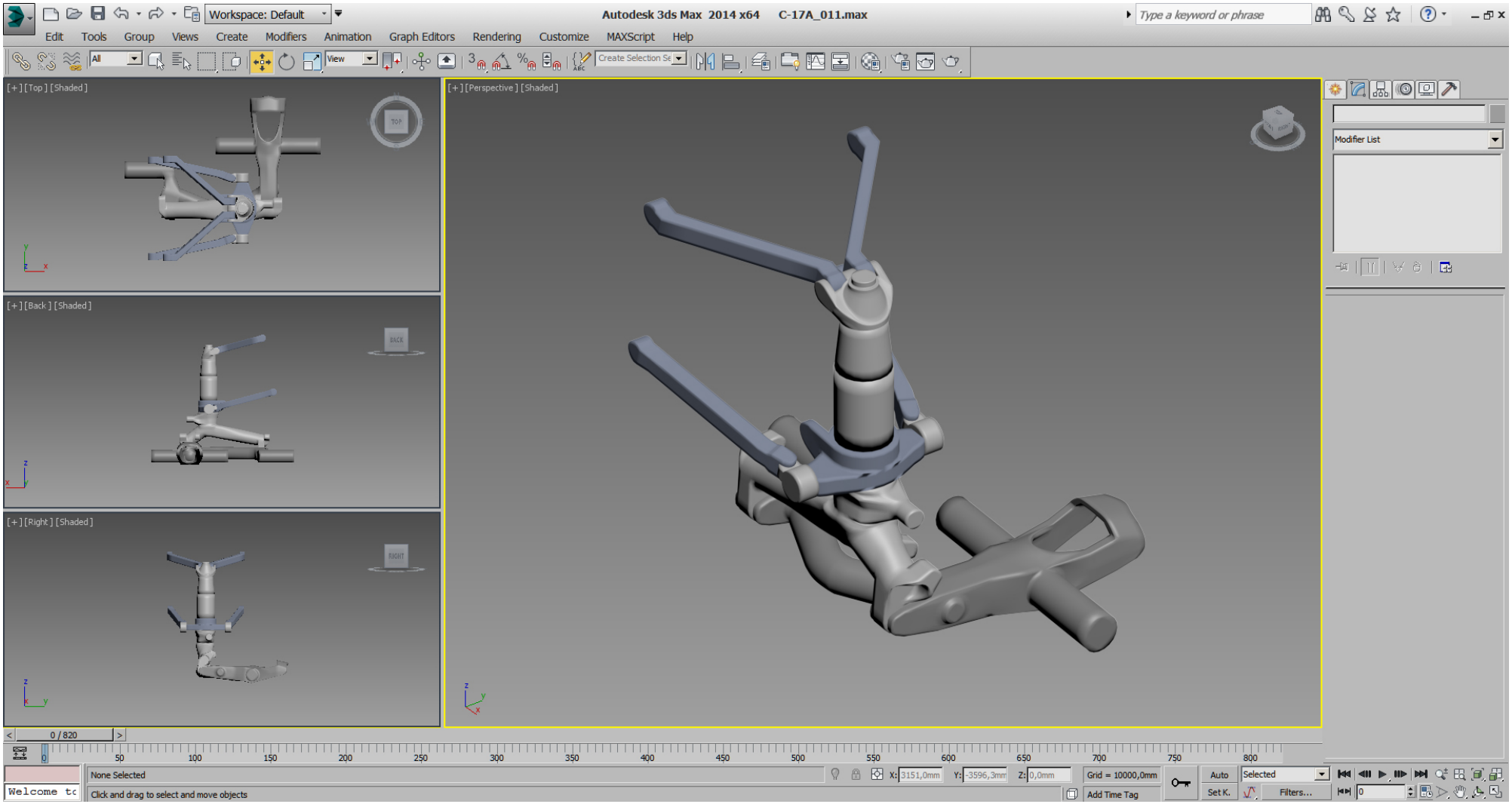

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_010.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
0 / 100
None Selected
Click and drag to pan a non-camera view
Grid = 10,0m
Add Time Tag
Auto
Set K.
Selected
Filters...
Welcome to


Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_010.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
0 / 100
None Selected
Click and drag to select and move objects
Welcome to
Grid = 10,0m
Add Time Tag
Auto
Set K.
Selected
Filters...

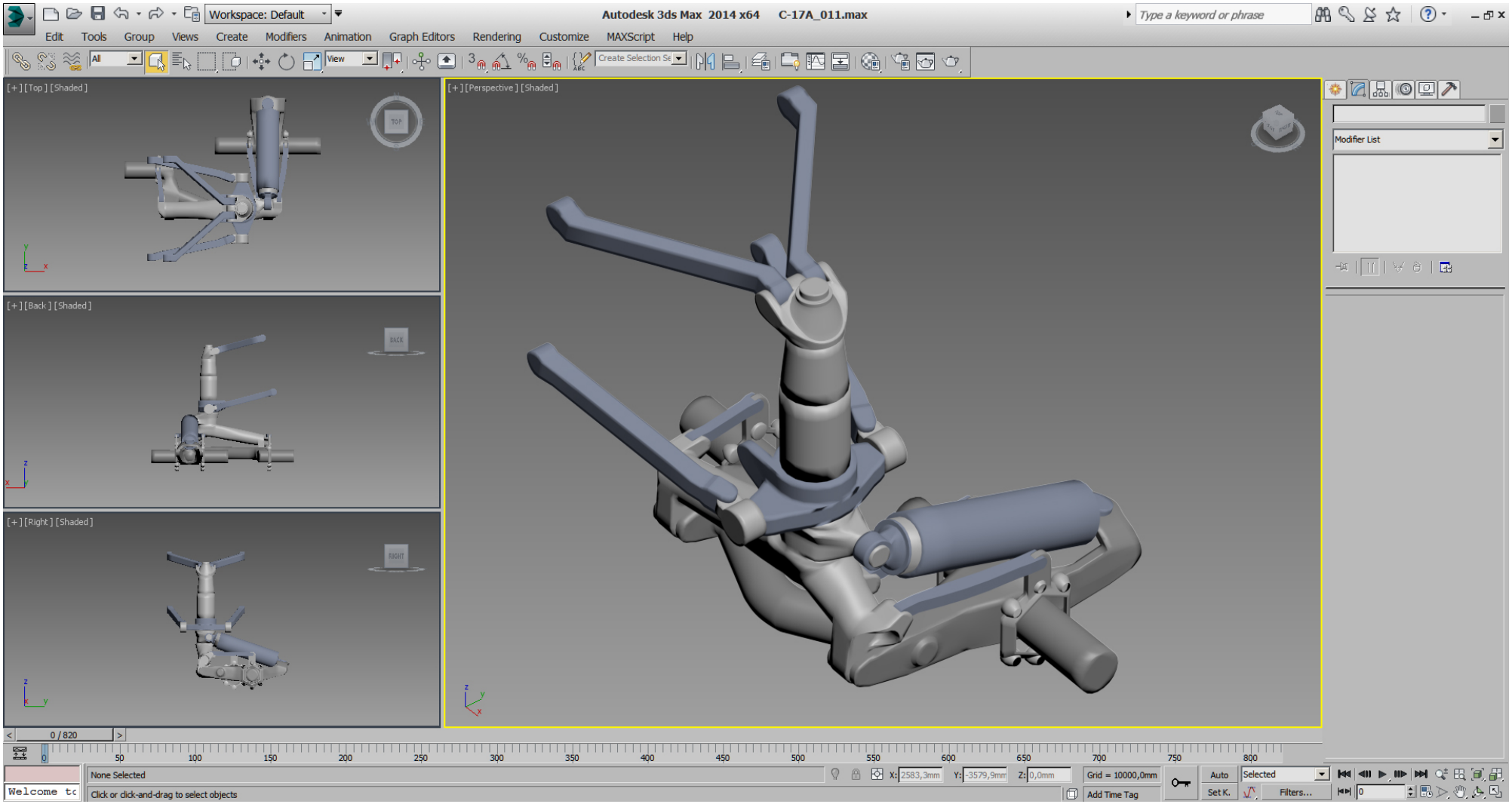

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_010.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective]
Percent Snap Toggle
Modifier List
0 / 100
None Selected
Percent Snap Toggle
Add Time Tag
Grid = 10,0m
Auto
Set K.
Selected
Filters...
Welcome to

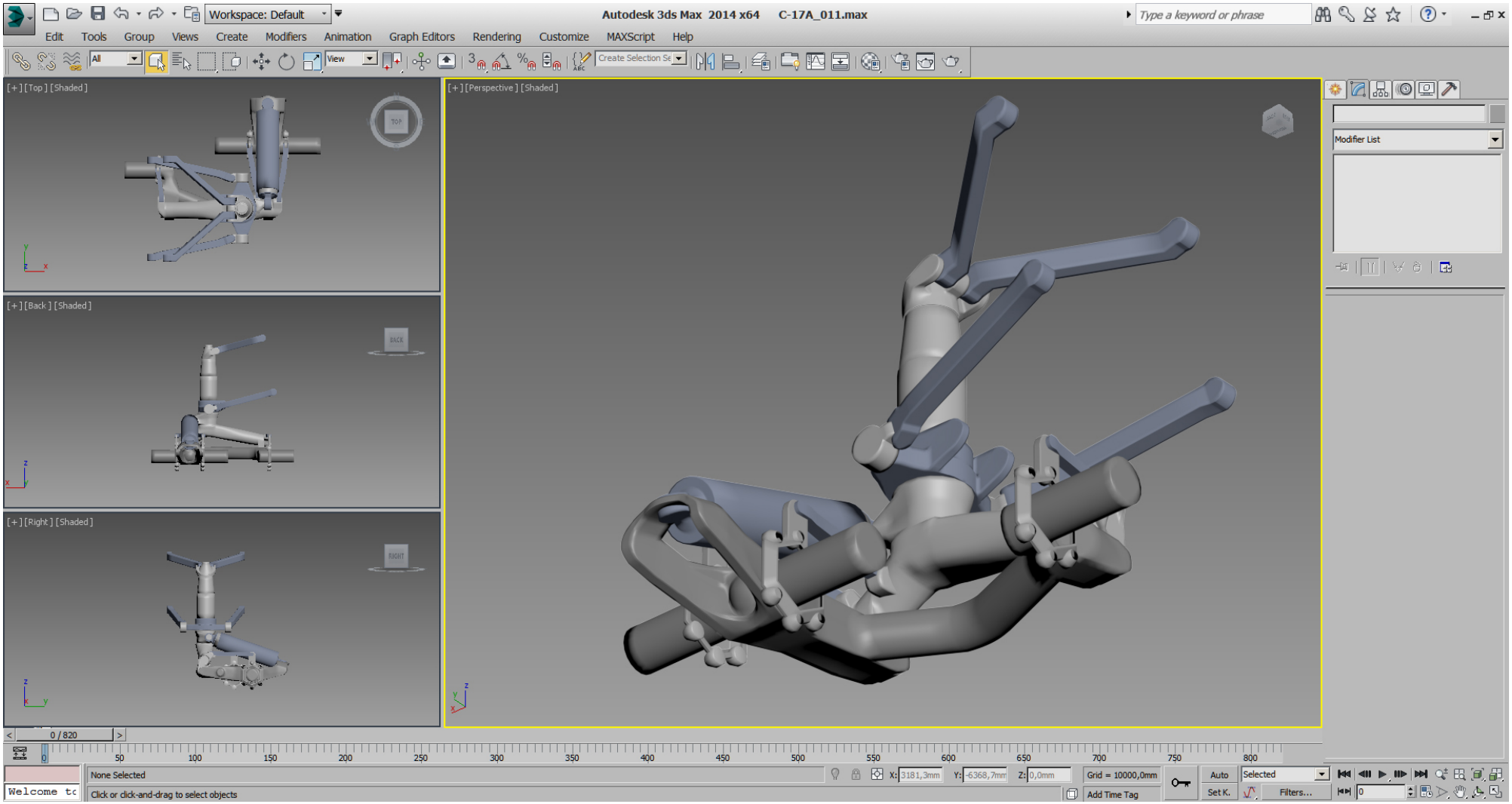

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_010.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Left][Shaded]
[+][Perspective][Shaded]
Modifier List
100 / 100
None Selected
Click and drag a region to zoom into
Add Time Tag
Welcome to

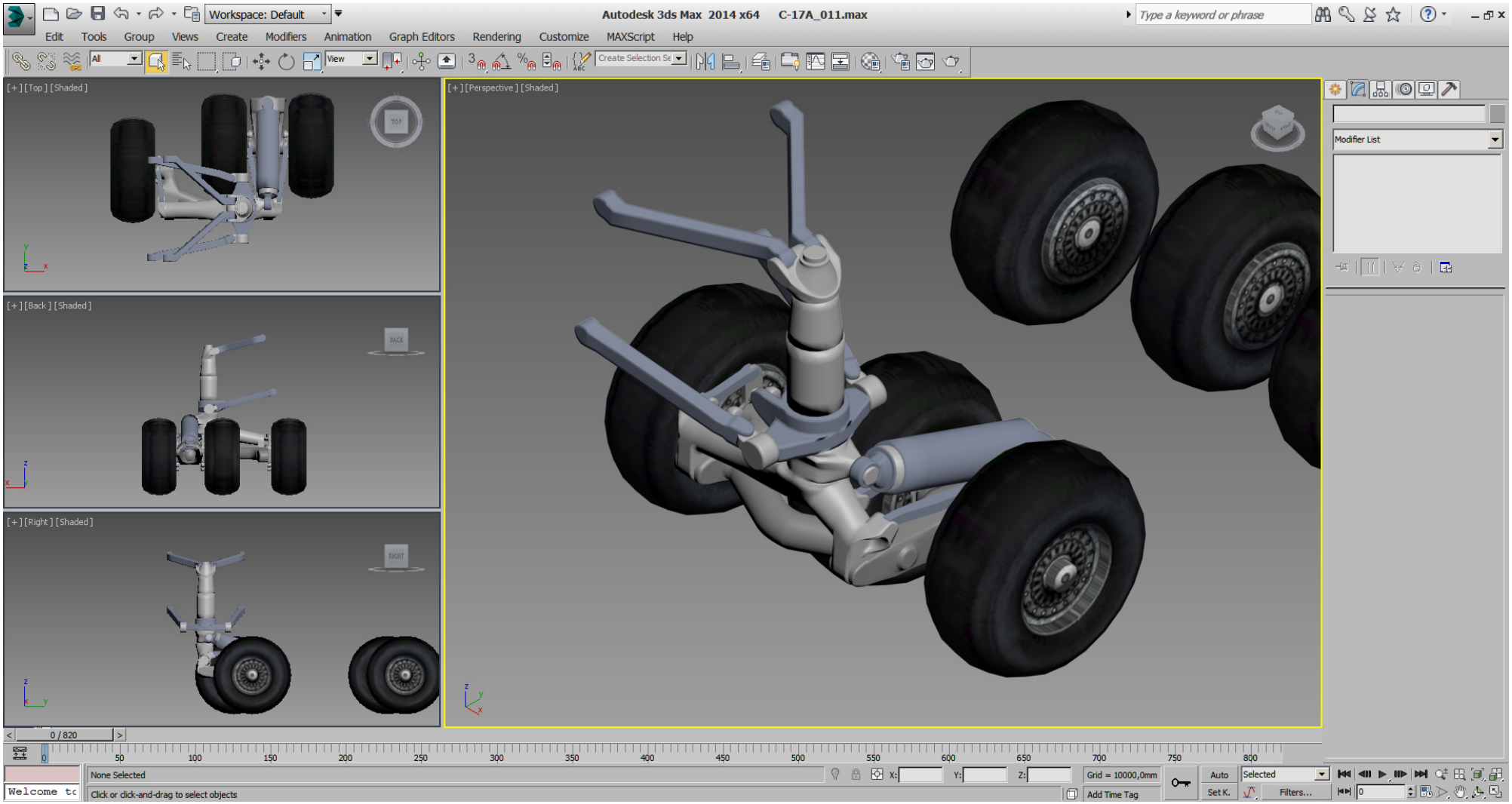

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_010.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Left][Shaded]
[+][Perspective][Shaded]
Modifier List
100 / 100
None Selected
Click and drag to pan a non-camera view
Add Time Tag
Grid = 10,0m
Auto
Set K.
Selected
Filters...
Welcome to

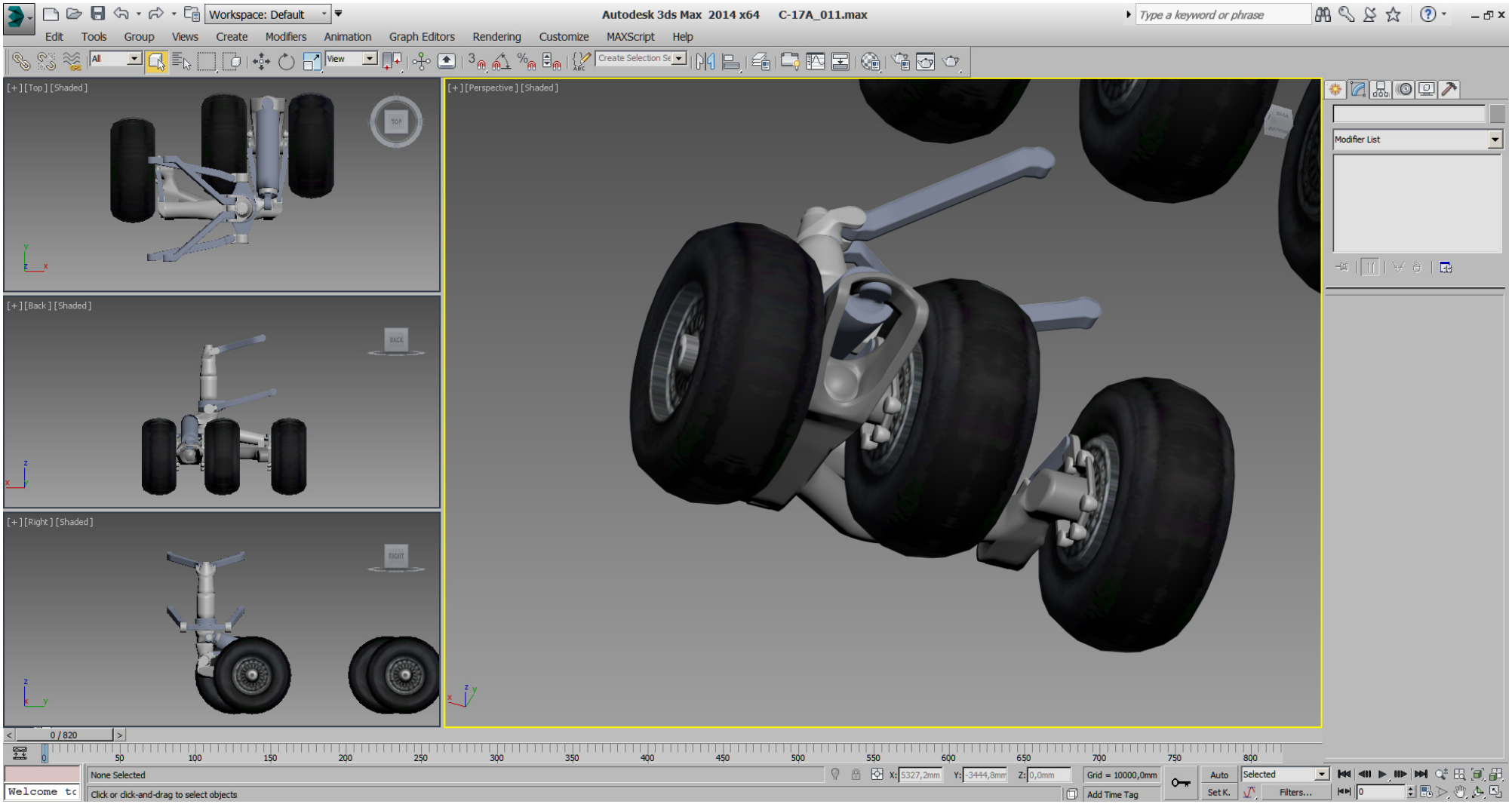

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_011.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Back][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
0 / 820
None Selected
Click and drag to select and move objects
Add Time Tag
Auto
Set K.
Selected
Filters...

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_011.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Back][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
0 / 820
None Selected
Click and drag to select and move objects
Add Time Tag
Auto
Set K.
Filters...
Selected


Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_011.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Back][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
0 / 820
None Selected
Click or click-and-drag to select objects
Add Time Tag
Auto
Set K.
Selected
Filters...


Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_011.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Back][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
0 / 820
None Selected
Click or click-and-drag to select objects
Add Time Tag
Auto
Set K.
Selected
Filters...


Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_011.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Back][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
0 / 820
None Selected
Click or click-and-drag to select objects
Welcome to
Grid = 10000,0mm
Add Time Tag
Auto
Set K.
Selected
Filters...

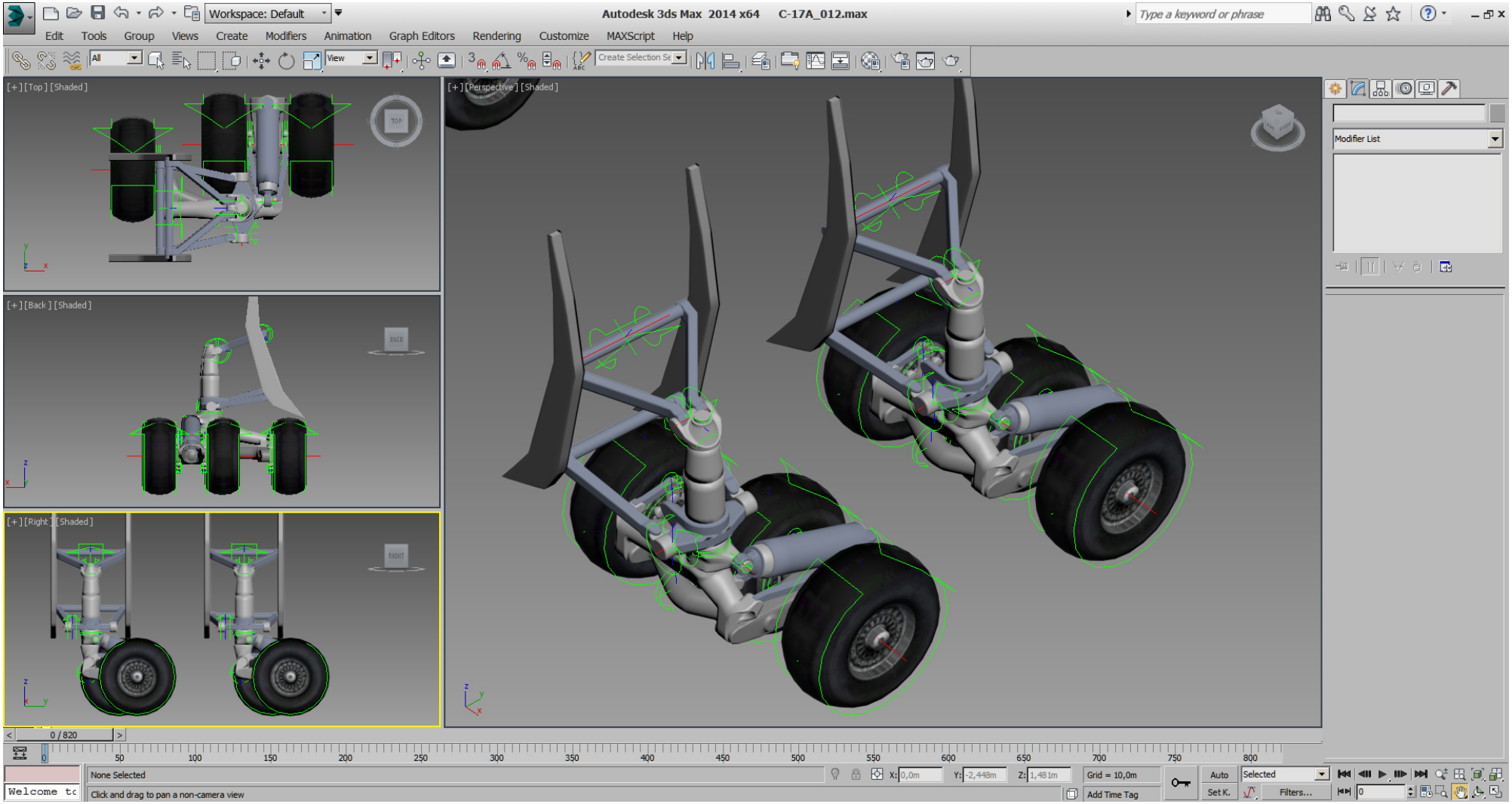


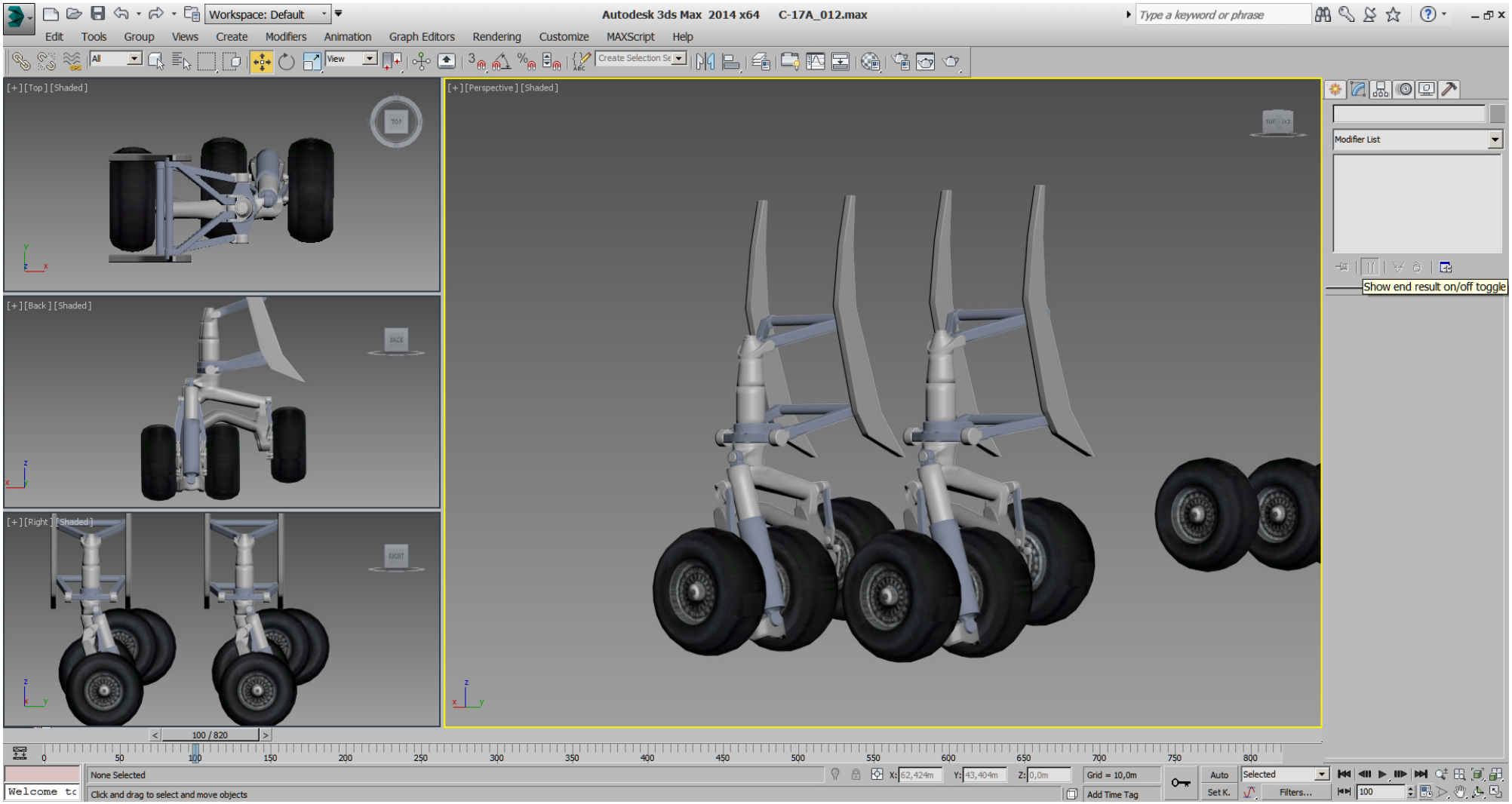
The MLG is in a “rough” state now, ... needs more work later surely.

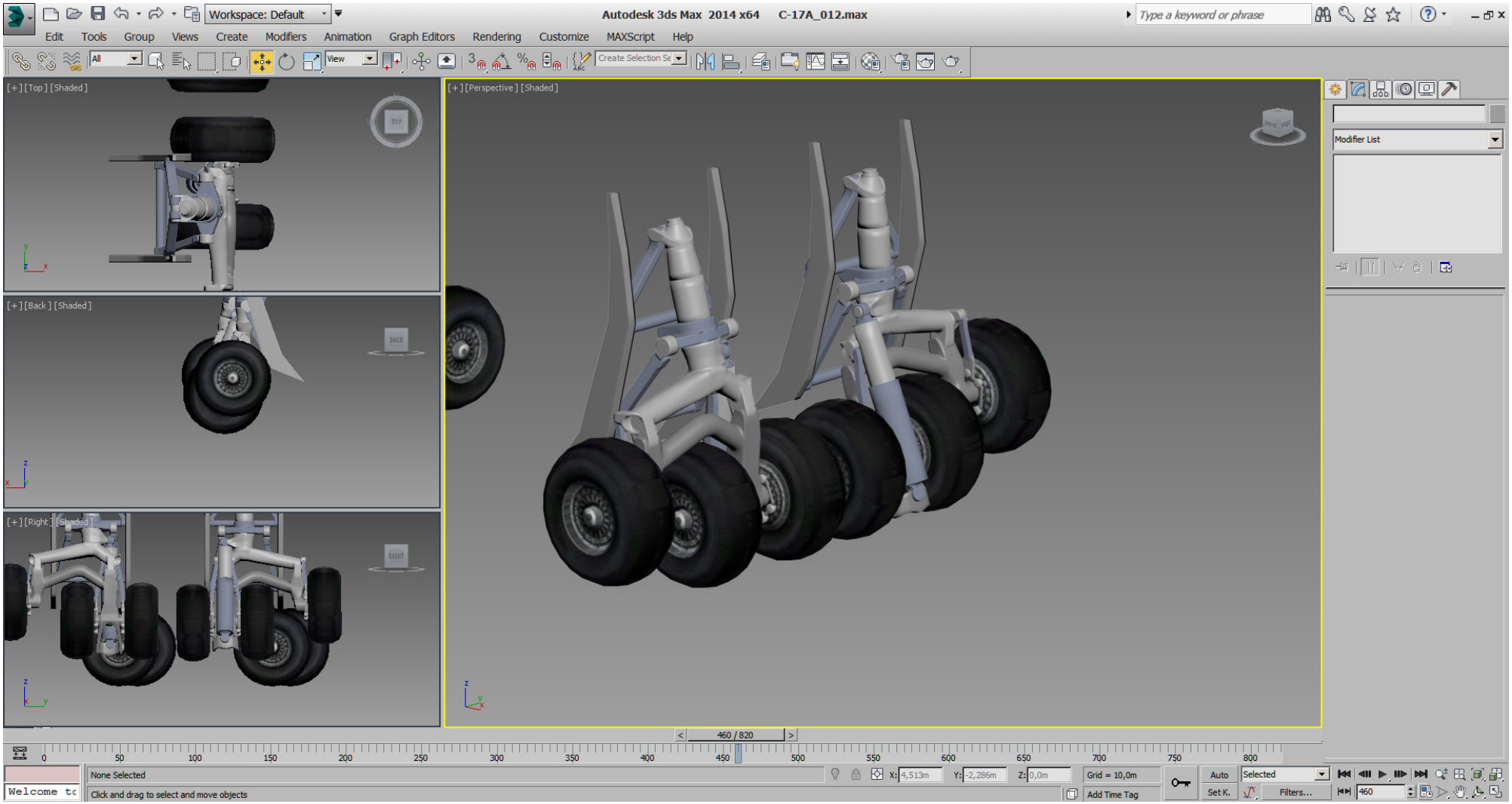
A generally note,...
You might spot some shading issues on the surfaces, which are mostly result of splines with a high “tension” on the “Bezier”.

We could fix this with some effort, but it's not necessary atm., because it will get nearly self- fixed when we do finalizing in “Edit Poly” mode later.

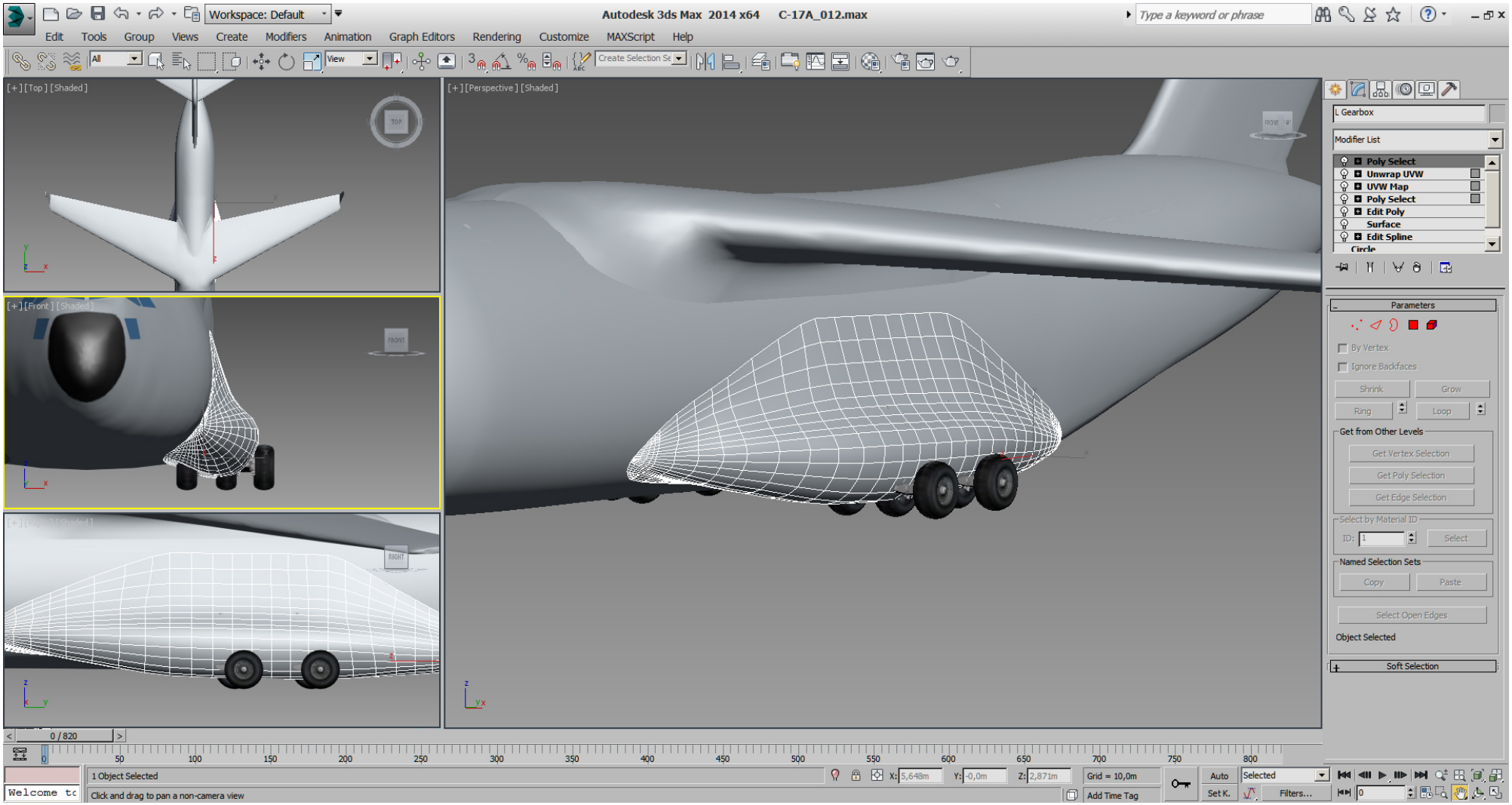
After placing some DOF helpers, I did a basic key- frame animation of those DOFs for the MLG, so we can see eventually issues/collisions in 3dsMax. (more details on BMS Exporter DOF helpers later)
The key- frame animation works just in 3dsMax, but helps to model the thing.
While doing the animation, I did some corrections to some parts,
but the problem to solve here was to find the hinge points near the fuselage.

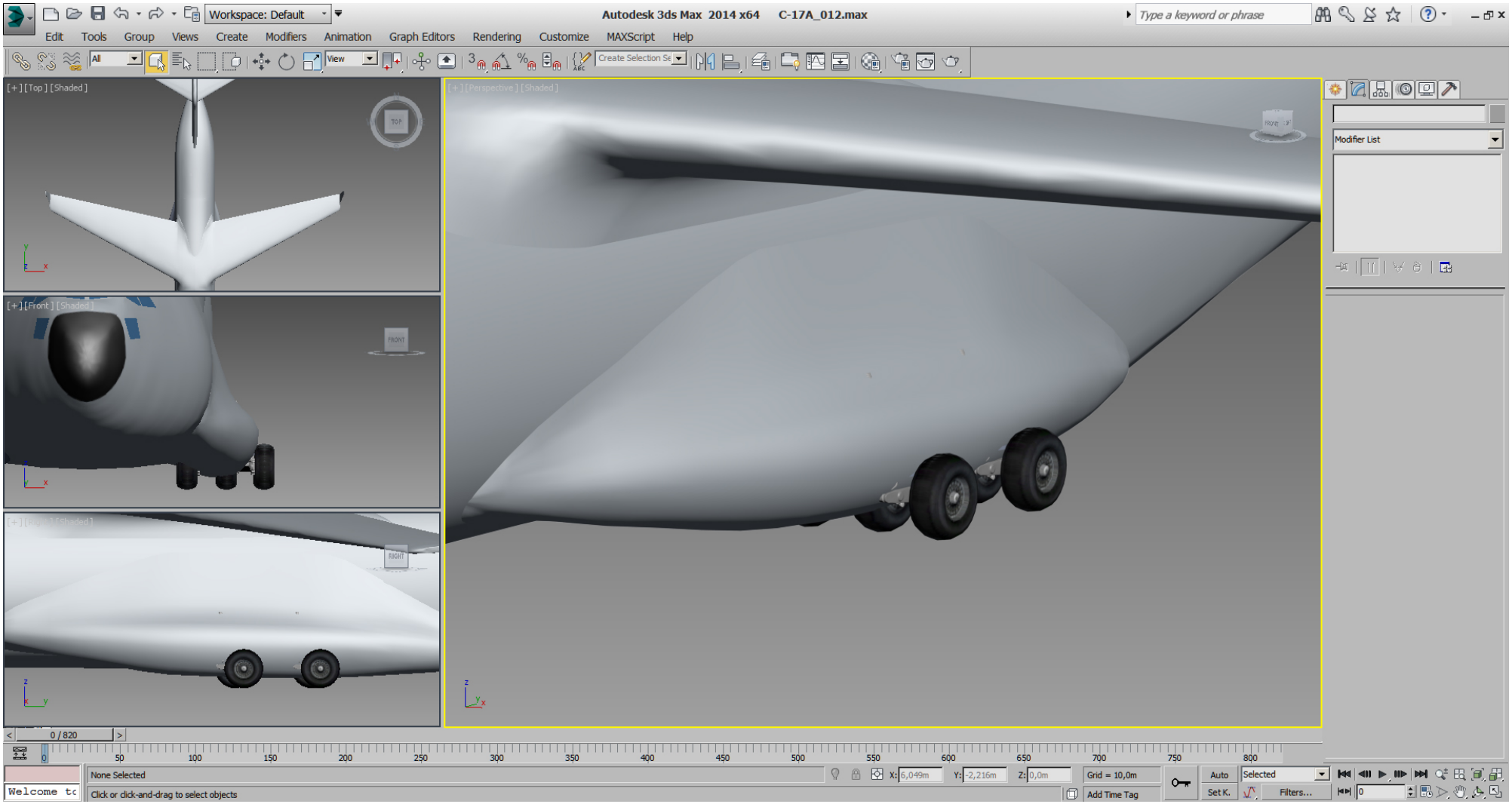



Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_012.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Back][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
Show end result on/off toggle
100 / 820
None Selected
Click and drag to select and move objects
Add Time Tag
Grid = 10,0m
Auto
Set K.
Selected
Filters...
Welcome to


Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_012.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Back][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
460 / 820
None Selected
Click and drag to select and move objects
Add Time Tag
Grid = 10,0m
Auto
Set K.
Selected
Filters...
Welcome to

And now with that basic MLG animation done, we've been able to do some corrections and some polish on the sponson.

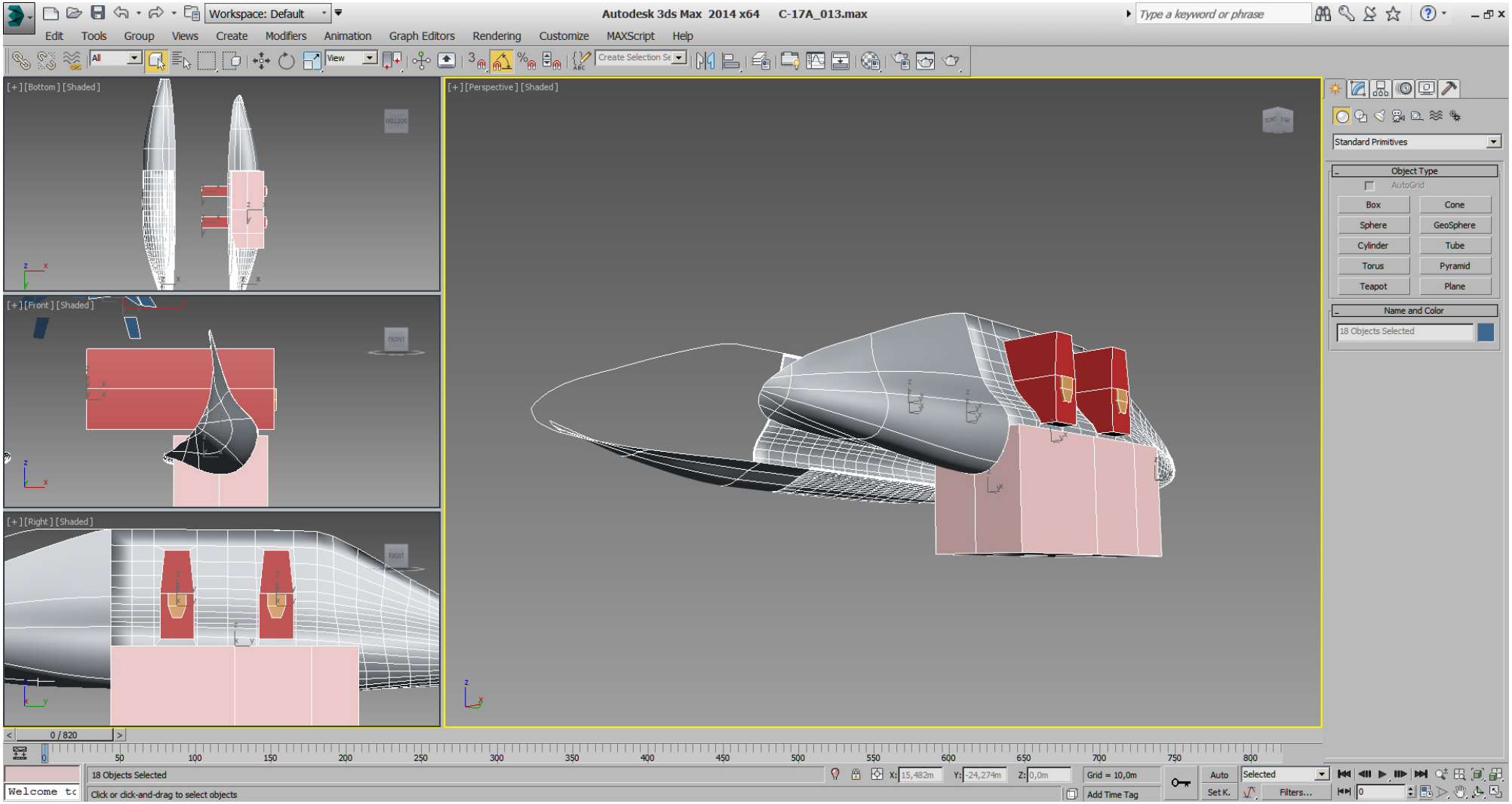



Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_012.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Perspective][Shaded]
Modifier List
0 / 820
None Selected
Click or click-and-drag to select objects
Add Time Tag
Auto
Set K.
Filters...
Selected
Welcome to

Here I've cutted the front of the sponsons and modeled the longer one on the starboard side.

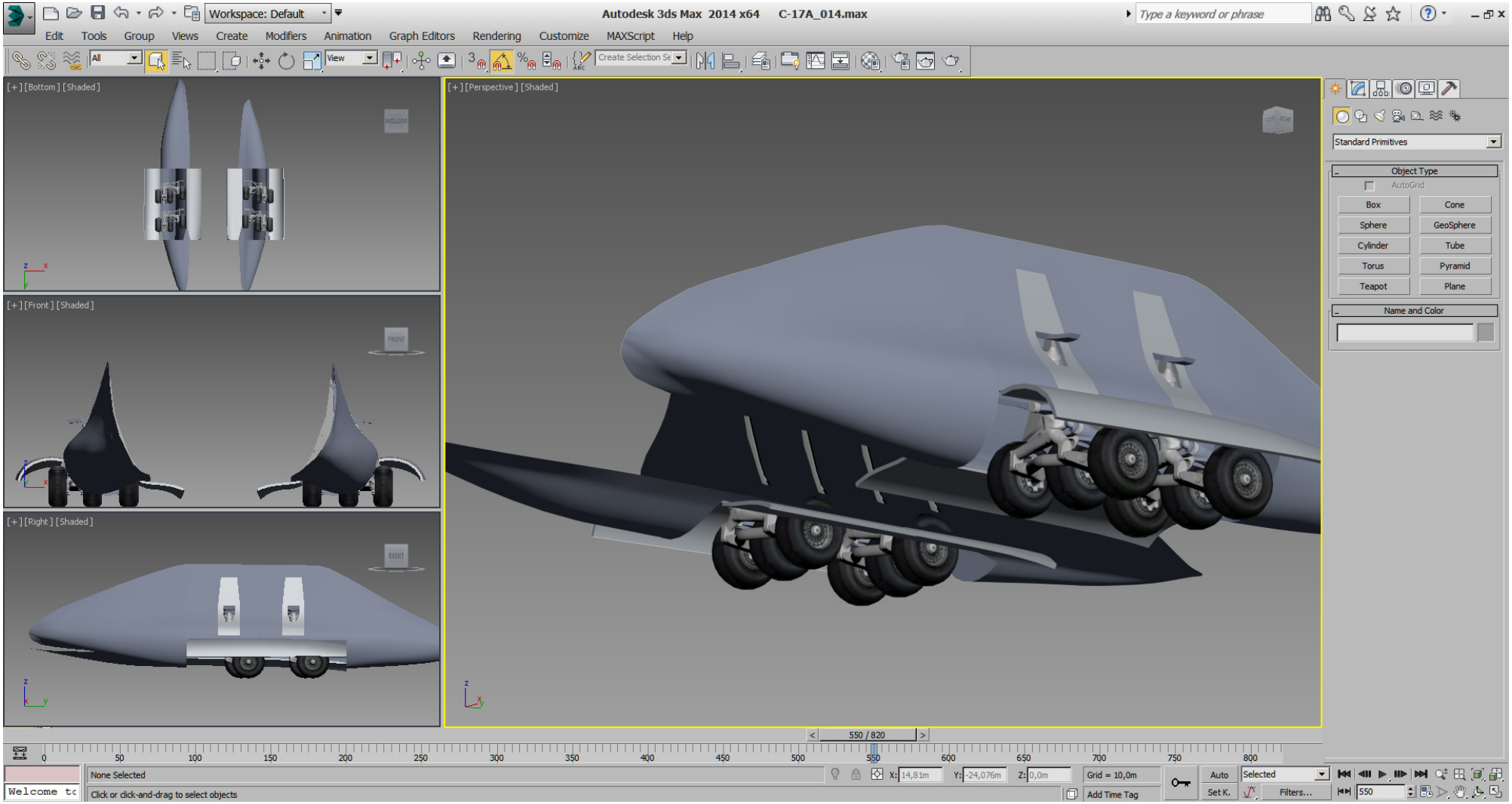
The back part of the sponsons, which are identically on both sides, got a thickness (inner wall) modeled in “Edit Poly” mode.

Those weird boxes you see will be used to cut the hatches and gear doors using “Create-> Compound Objects -> Boolean -> cut”.



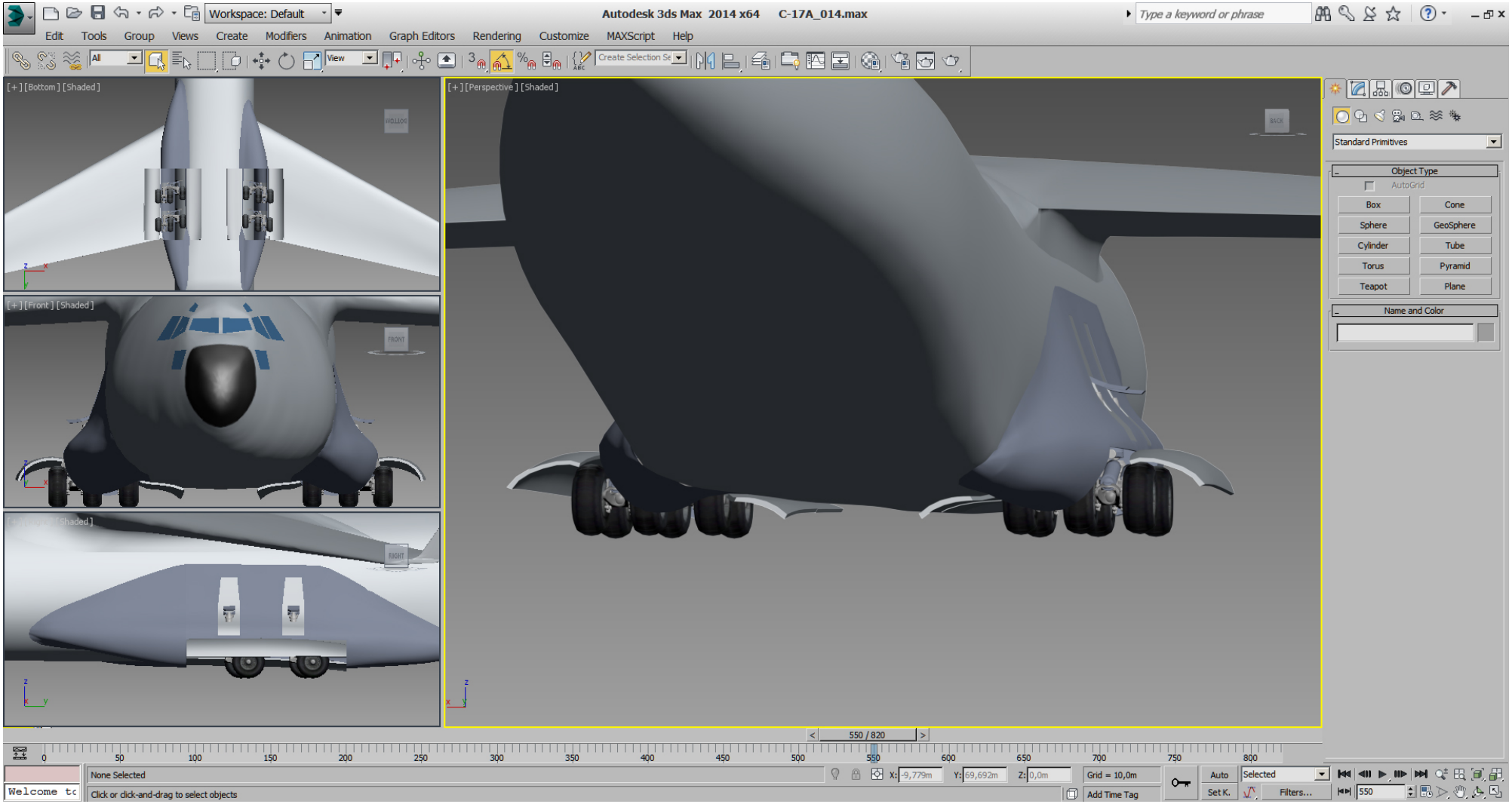
After the boolean operations we can model the gear bay and add some DOF helpers to animate the new parts in 3dsMax.

Note: The right back part of the sponson including MLG etc. is a referenced mirror to the left part of the sponson including MLG atm..



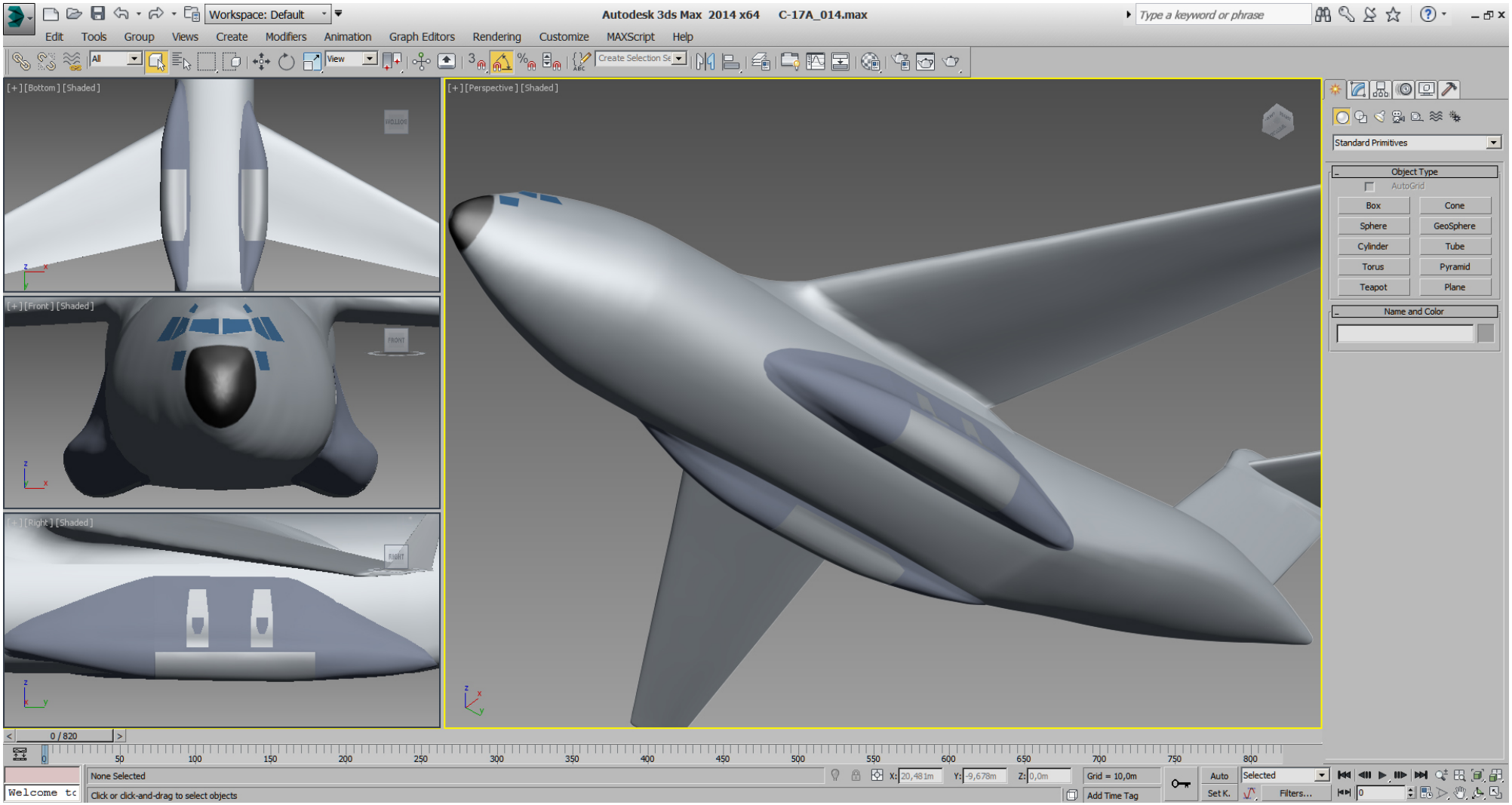
Beside some further modifications on the sponsons and even parts of the MLG itself, it took quite a few attempts for cutting and proof until I thought the result would be acceptable.

A good orientation point for cutting the MLG doors were the inner aft doors in relationship to the fuselage and the ground.

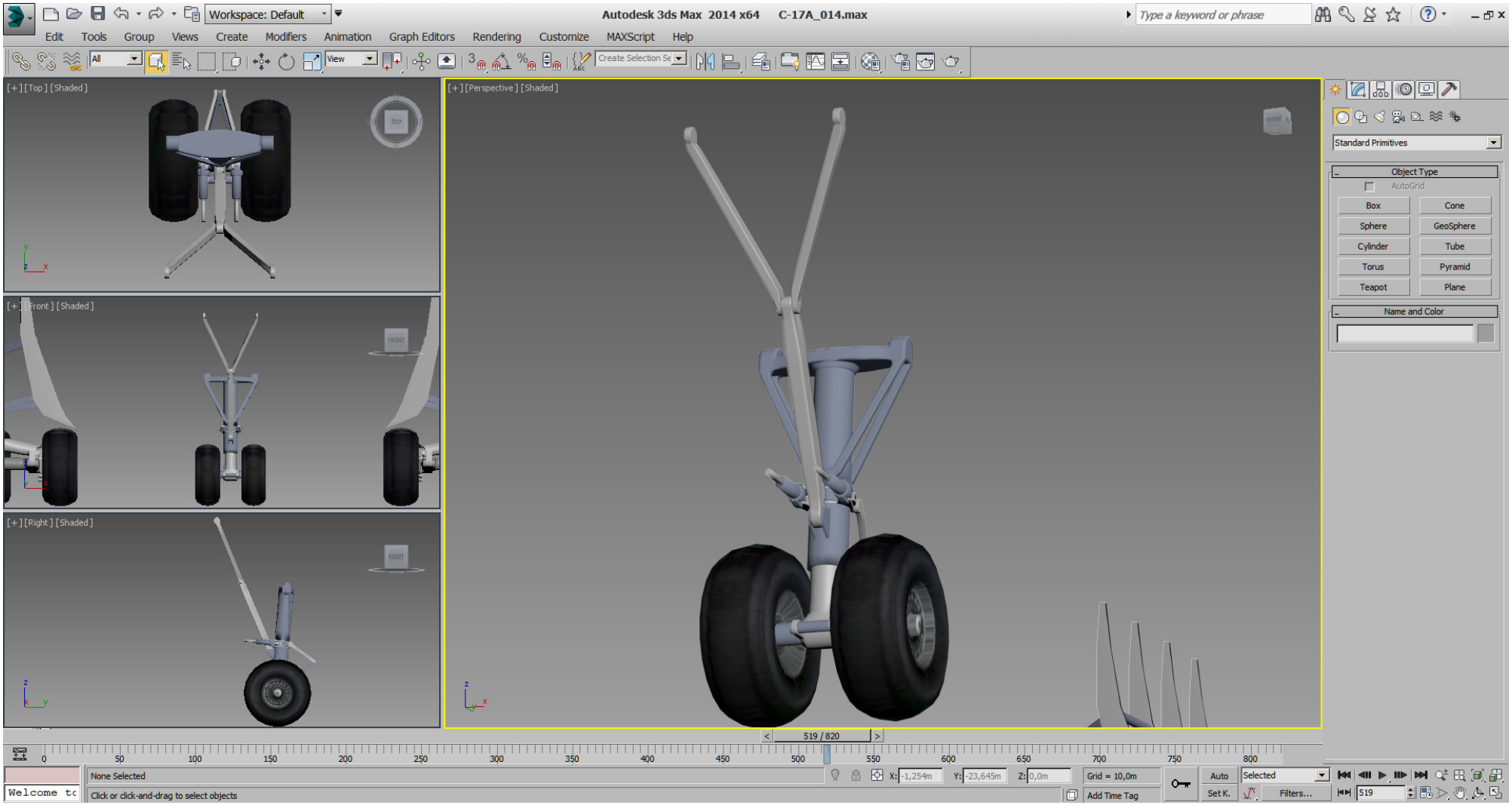


To complete the sponson and MLG stuff for now, I've rebuild and reversed the 3dsMax animation, so although we've modeled the MLG in extended (wheels on ground) state, the MLG is now retracted in frame 0 (null) which is the state for LOD export.

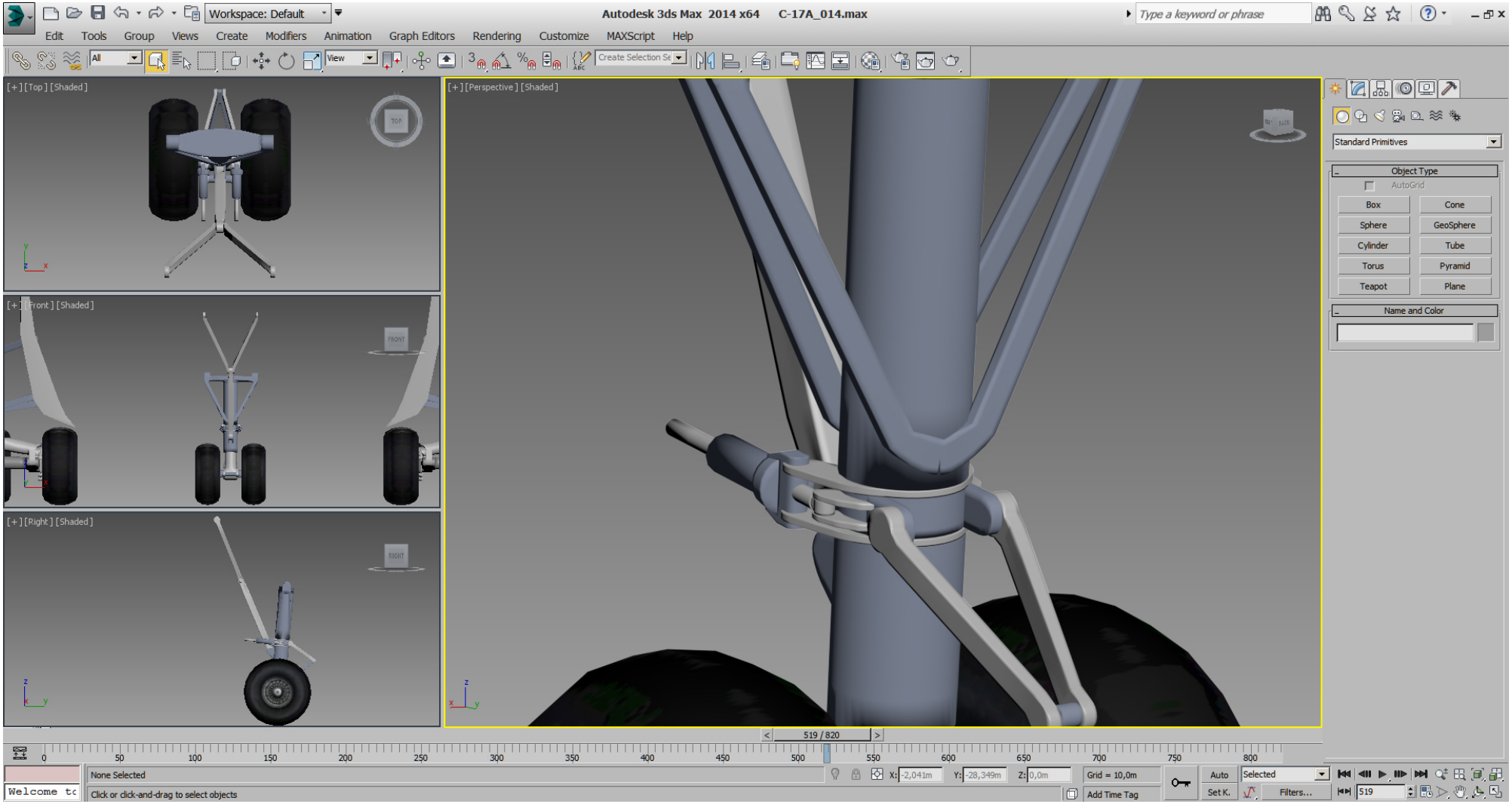
So at frame 0 (and on 3dsMax start) the MLG is retracted, with hatches and doors closed.

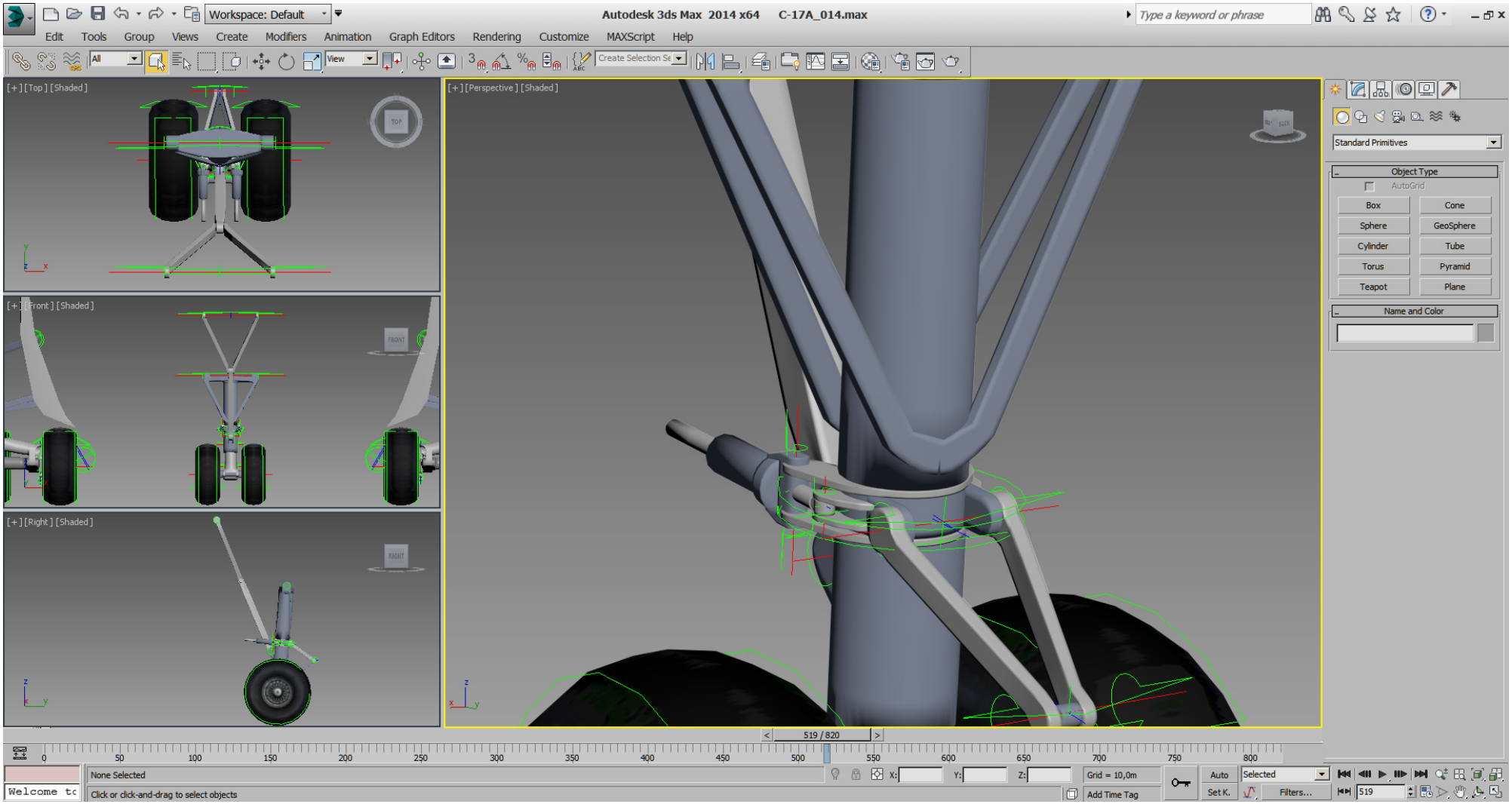


With the MLG roughly done and 3dsMax animated, I couldn't resist to model and animate the FLG.



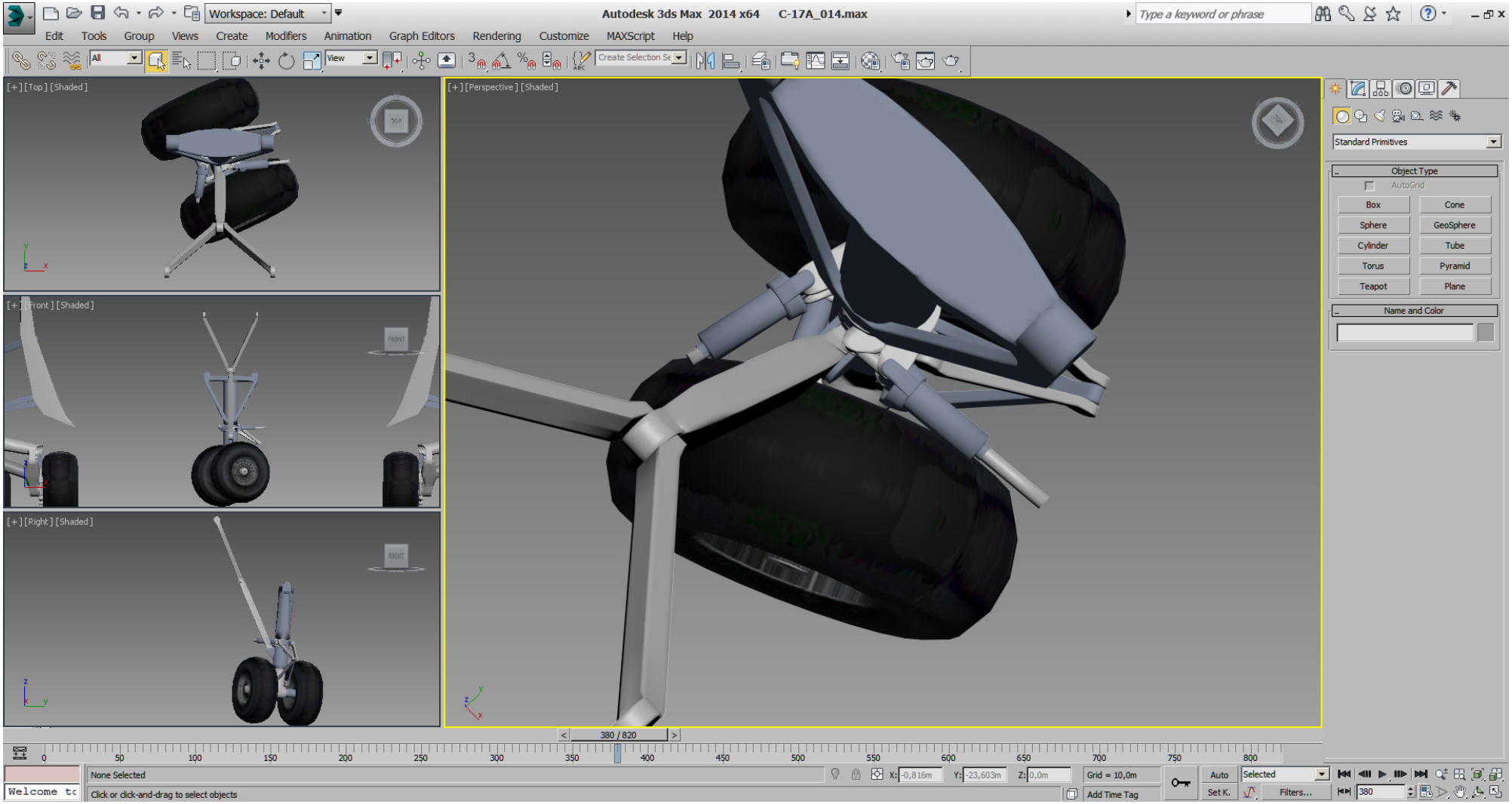
The interesting thing here are those steering actuators, and we want to see them animated insim, because I think they will be good visible during taxi.

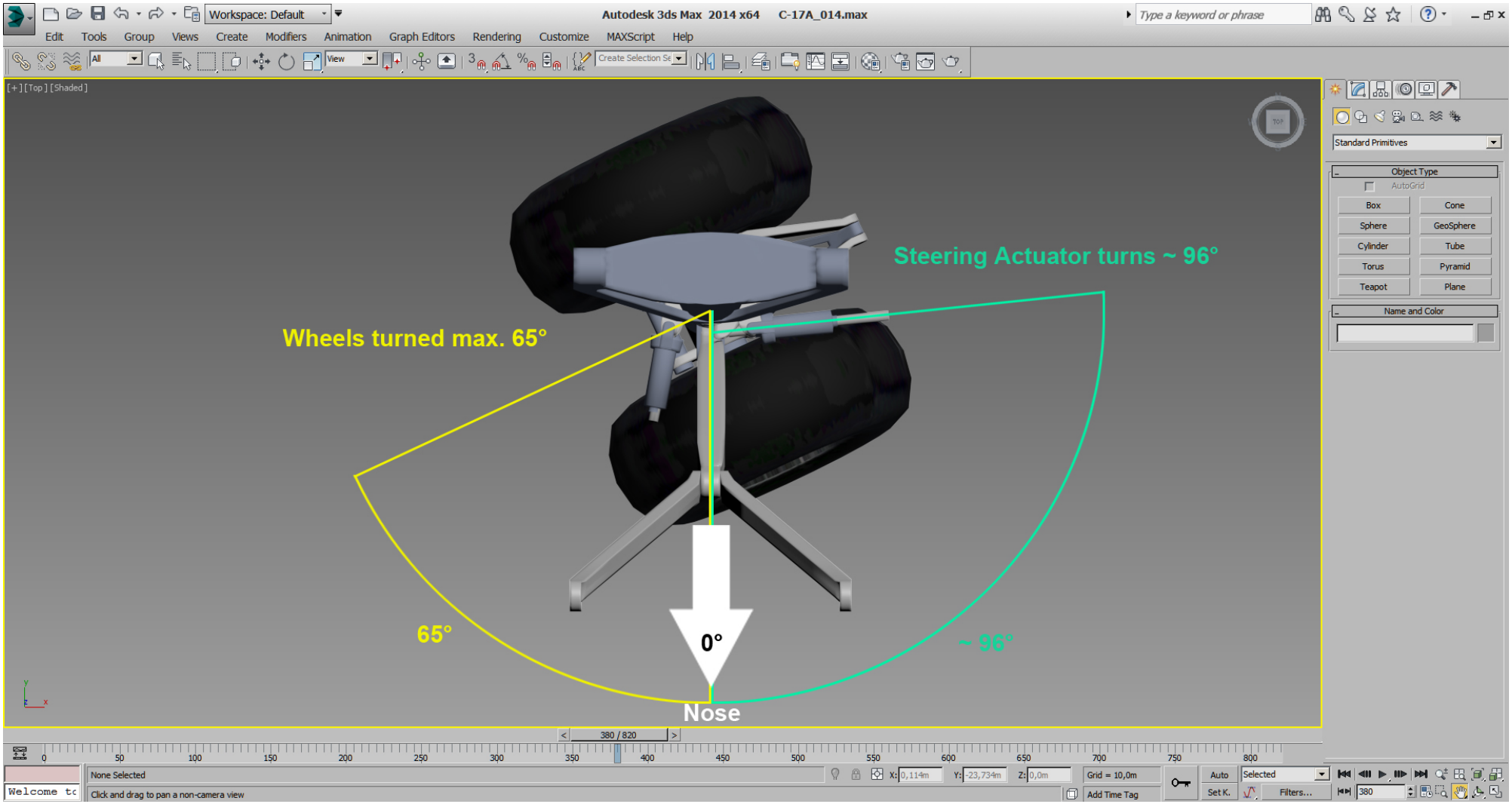



Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_014.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Standard Primitives
Object Type
AutoGrid
Box Cone
Sphere GeoSphere
Cylinder Tube
Torus Pyramid
Teapot Plane
Name and Color
519 / 820
None Selected
Click or click-and-drag to select objects
Add Time Tag
Grid = 10,0m
Auto
Set K.
Selected
Filters...
Welcome to

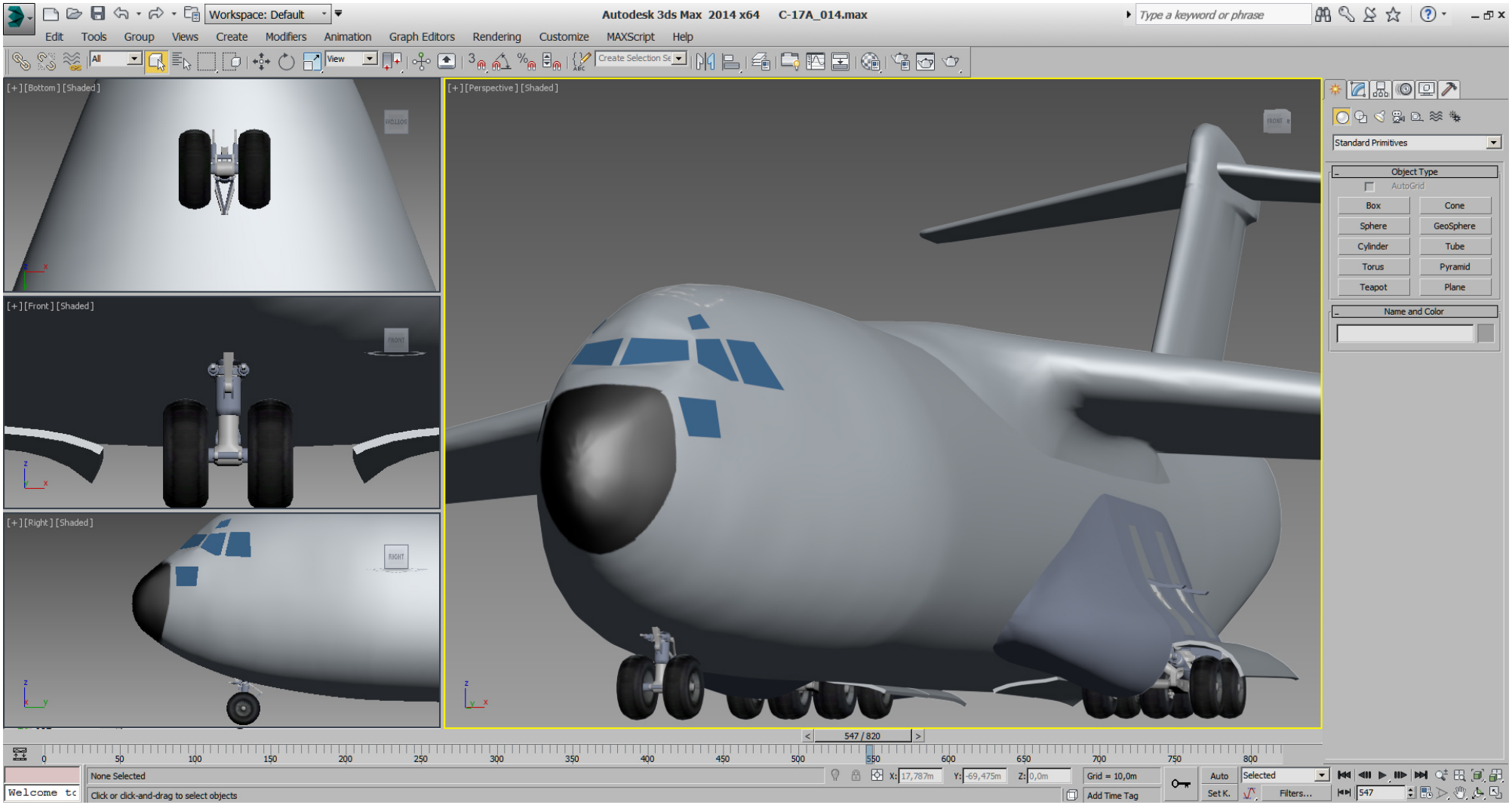
Based on RL pictures I was able to get them working in 3dsMax (as intended ???).

See how they turn if FLG is rotated 65° max.




Autodesk 3ds Max 2014 x64 C-17A_014.max
Workspace: Default
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
Steering Actuator turns ~ 96°
Wheels turned max. 65°
65°
0°
~ 96°
Nose
Standard Primitives
Object Type
AutoGrid
Box
Cone
Sphere
GeoSphere
Cylinder
Tube
Torus
Pyramid
Teapot
Plane
Name and Color
380 / 820
None Selected
Click and drag to pan a non-camera view
Add Time Tag
Grid = 10,0m

Anyway, she stands on her (roughly modeled and 3dsMax animated) own 14 wheels, so I'm happy for now.

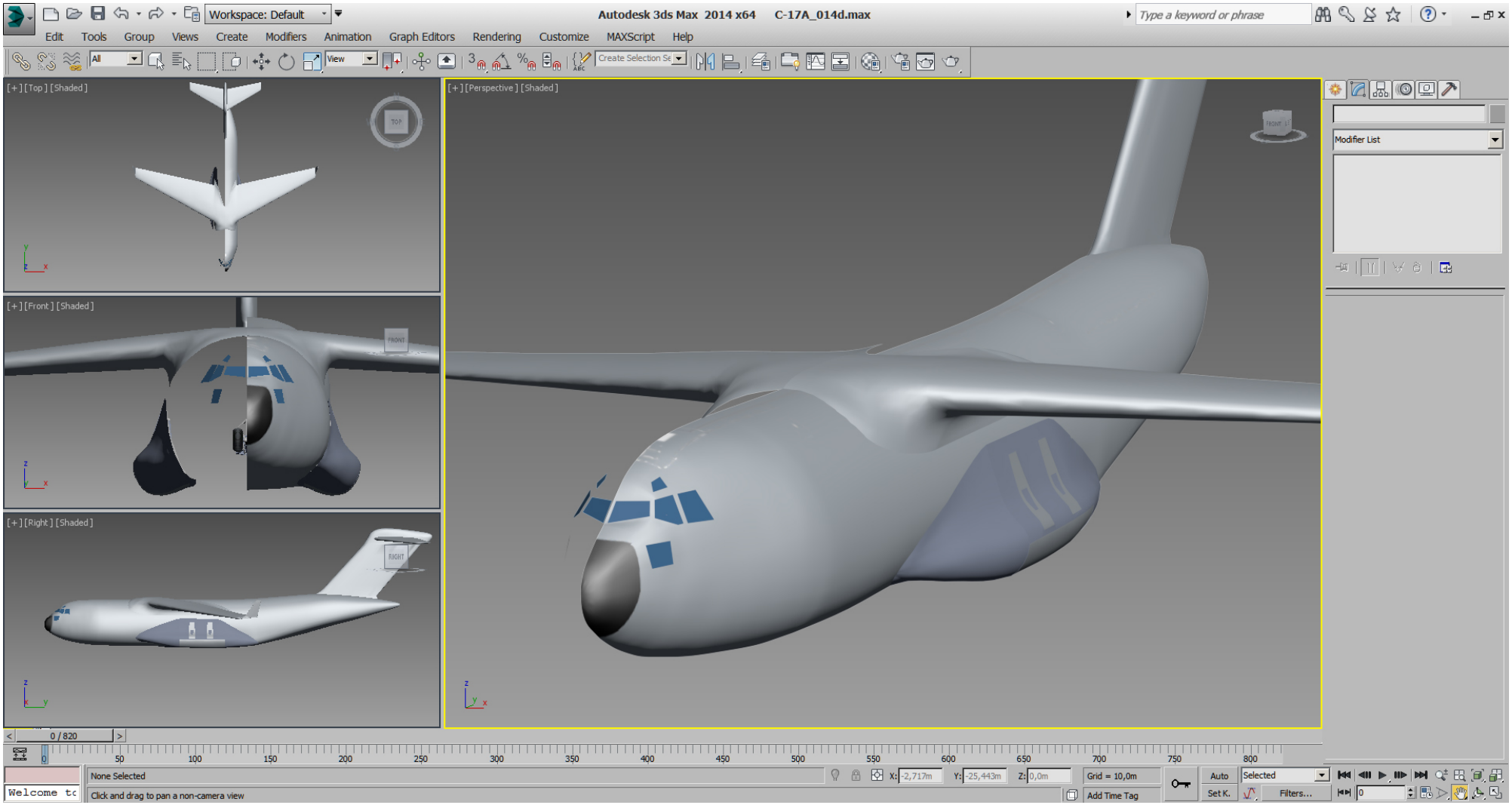


While being happy with the fuselage so far, the windows are is still the worst area.

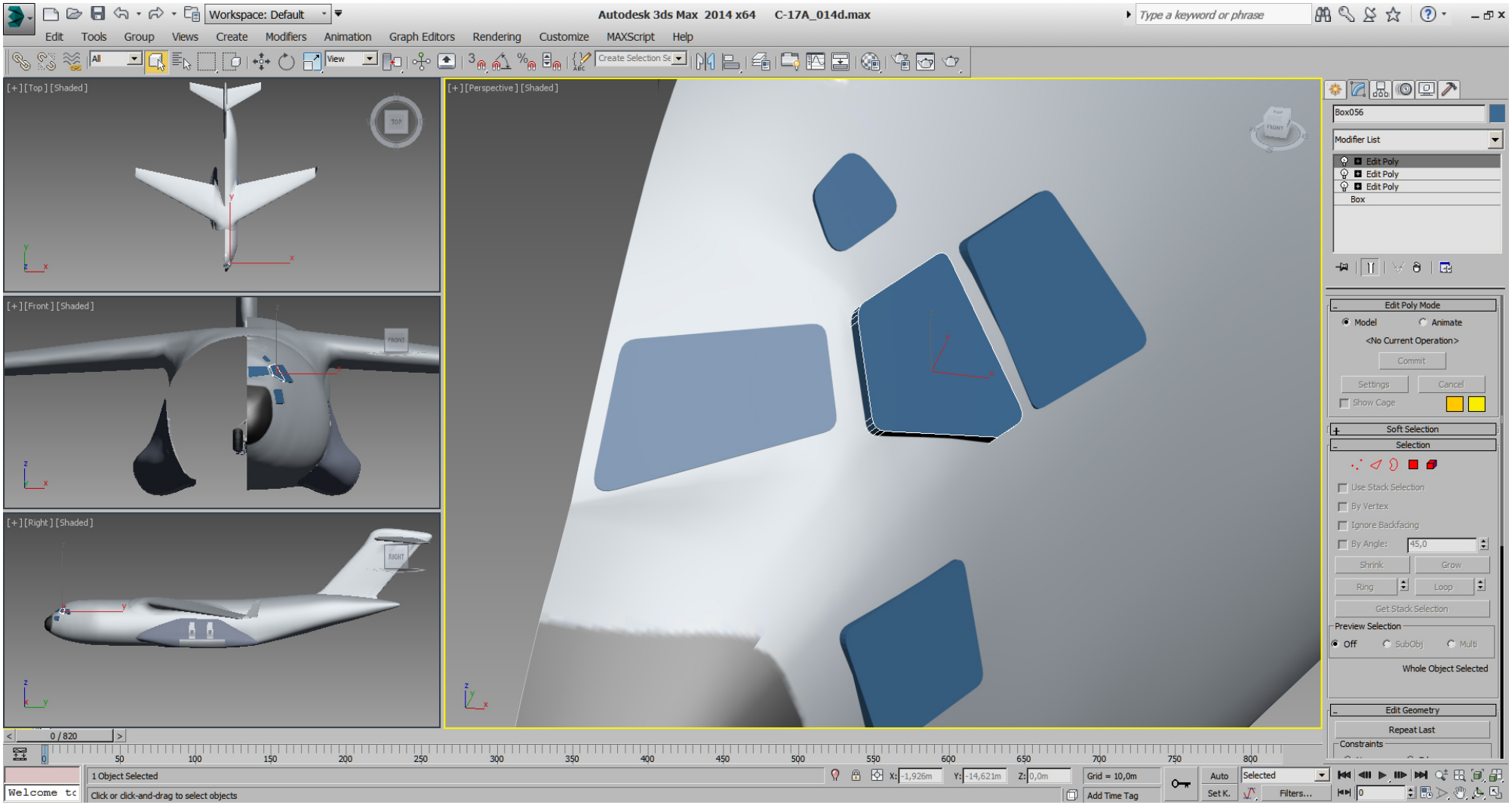
We need to cut them into the fuselage, so bye bye spline modeling mode, and hello “Edit Poly” modifier.

So the first step is to select all polys of the starboard side of the fuselage and delete them.

Later we'll then mirror the port side instanced, so everything we do on one side of the fuselage will have identically effects on the other side.



Then we modify and “Extrude” those former placeholder planes in “Edit Poly” mode to be used as cutting parts for boolean operation.

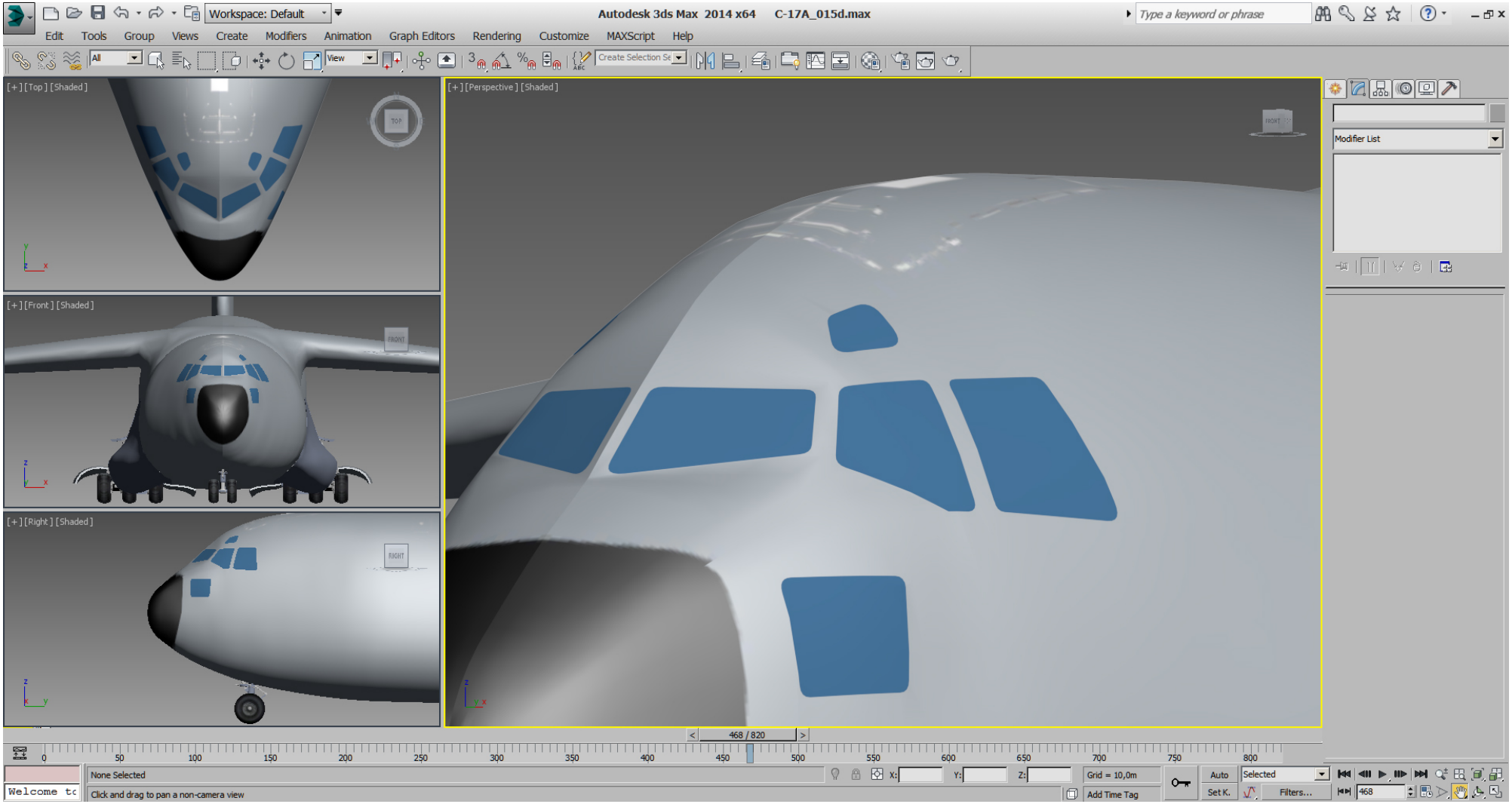


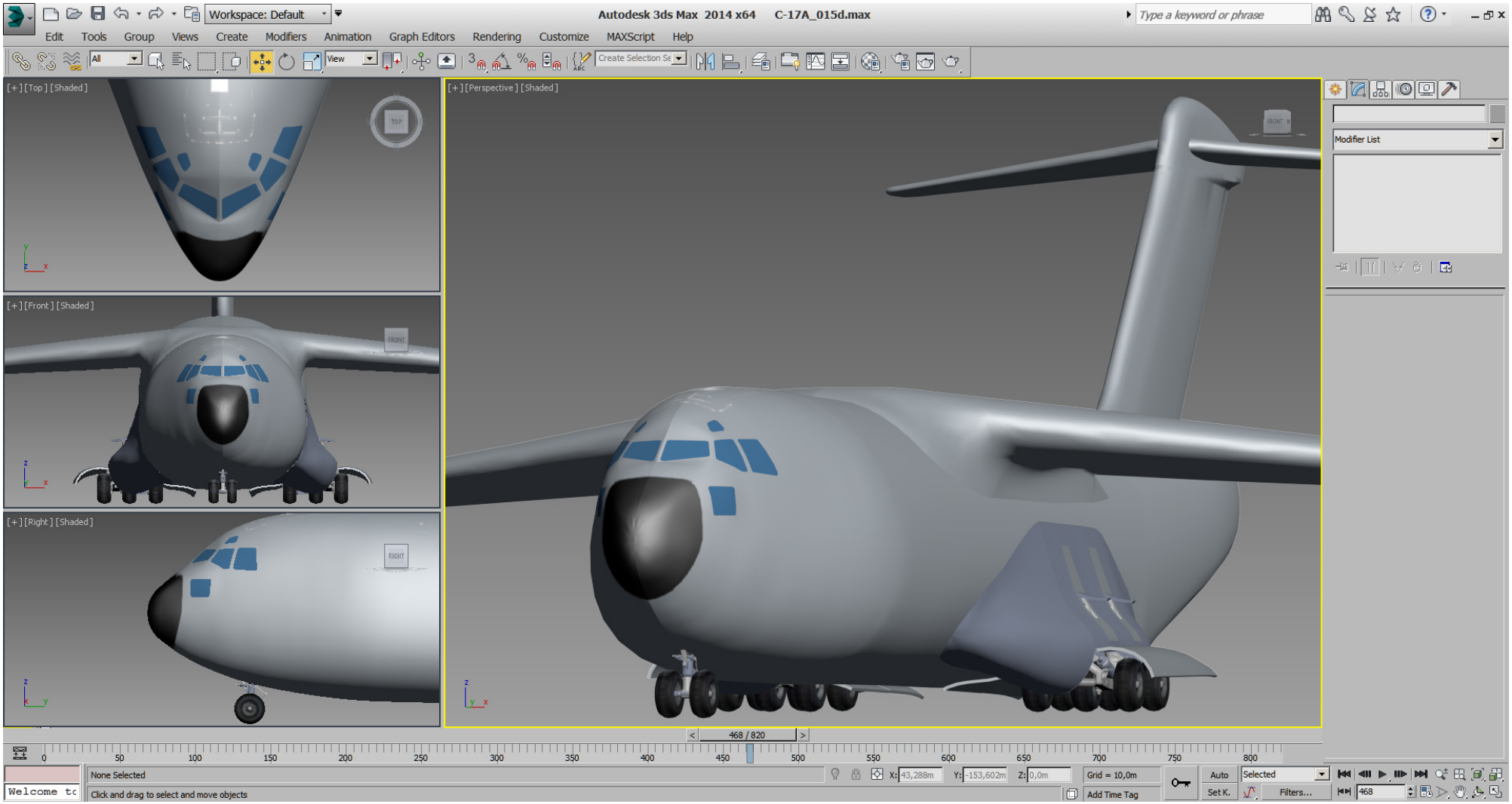
After the boolean cutting, which took me about 5 attempts for cutting position and quite some carefully single vertex position corrections to get nearly satisfied, I gave the windows polys another Material- ID and gave them a blue color using a “Multi- Material”.

The advantage of a “Multi- Material” over a “Standard- Material” is that we can select all objects of the AC and assign one material to it.
Disclaimer: better prefer multiple “Standard- Materials” instead of “Multi- Material” in future, … easier to handle later, IMHO.

Those windows are now part of the fuselage mesh and placed on their final position. They will be also used after some poly- optimizing later to be extruded into the fuselage to build a wall thickness and then the cockpit.

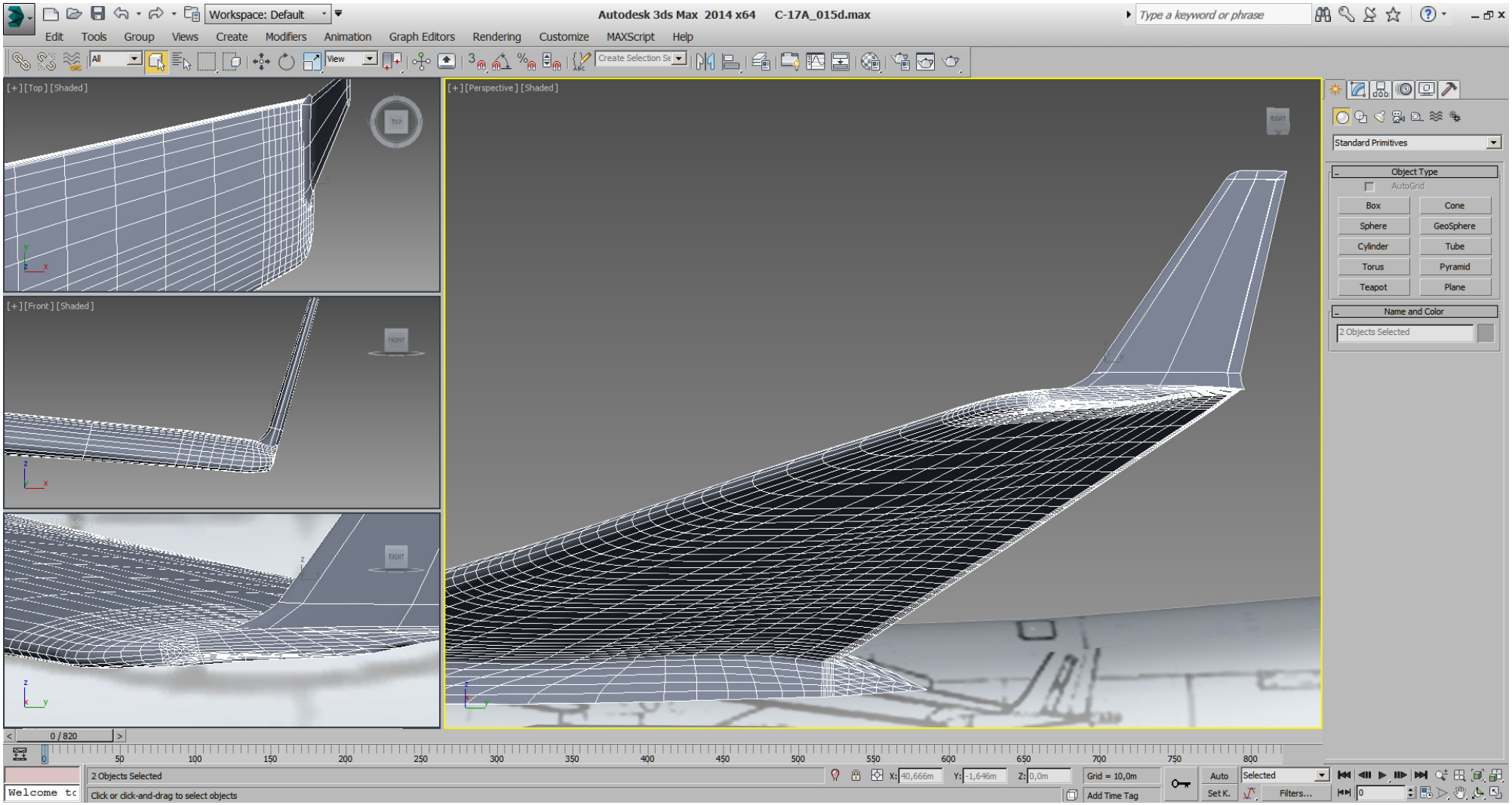
Also in that picture note, or better ignore that visible edge in the center of the fuselage, which is a result of the instanced and mirrored 2- parts fuselage atm. As soon as the fuselage will be one piece again, that edge will get fixed.




Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_015d.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
468 / 820
None Selected
Click and drag to select and move objects
Add Time Tag
Welcome to

The next bad area atm. is the wingtip.

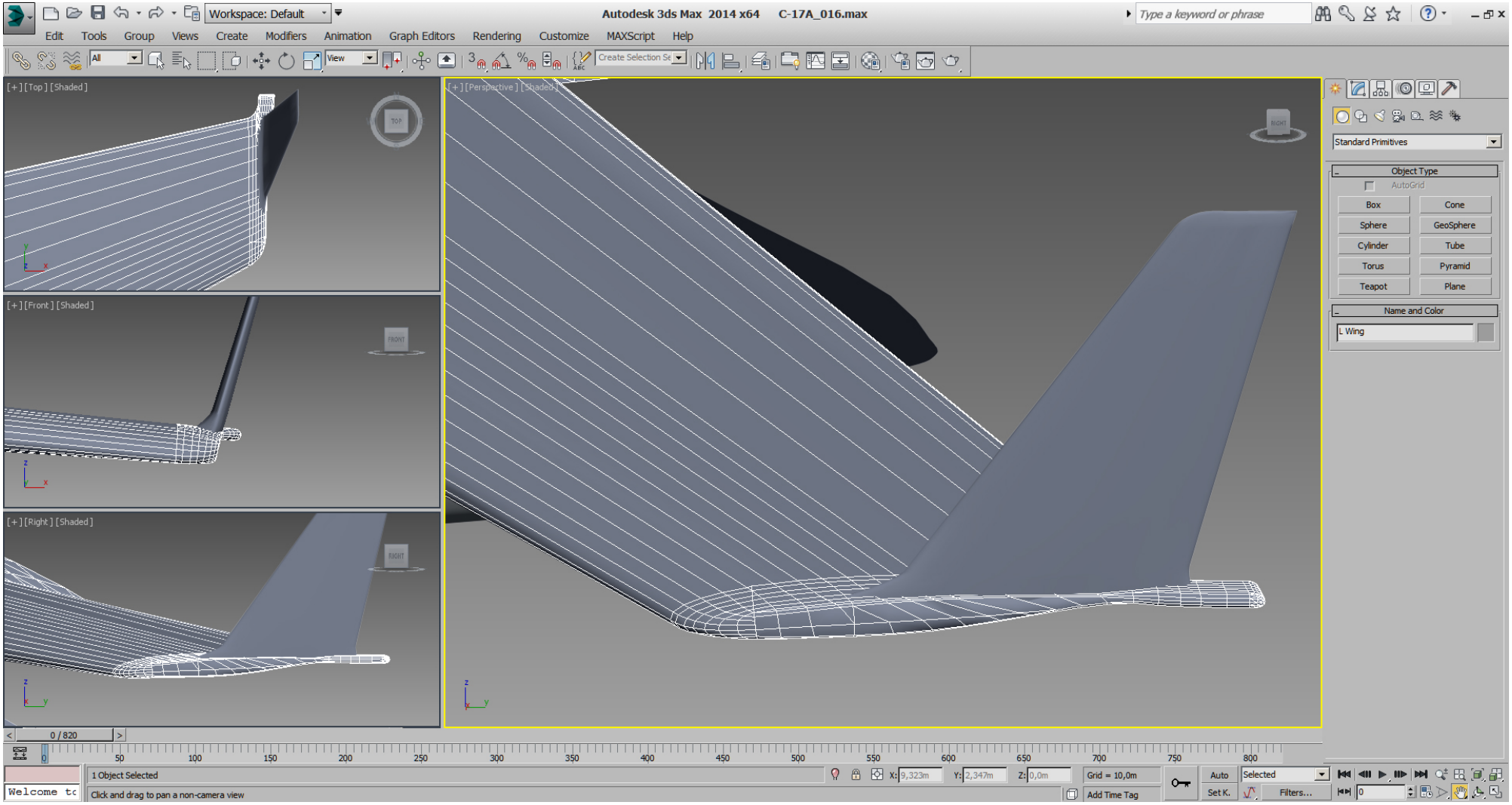
This is the actually situation:
The wing and the winglet, which are still in spline mode are two objects. The geometry for the lights facing backwards is missing.



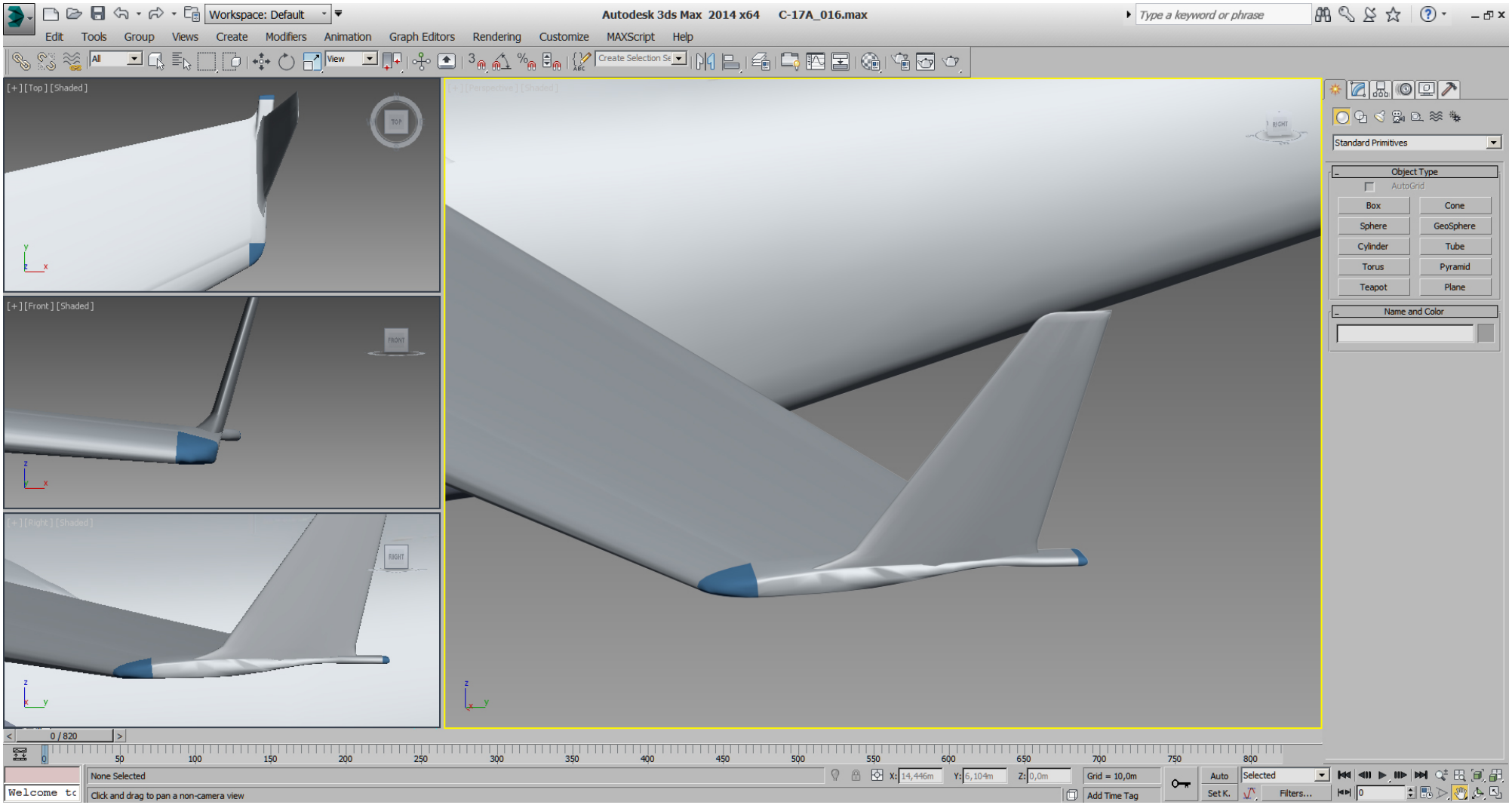
In the next picture please note that I've deleted many of those edges which were in Y- direction to form the wings airfoil.
I've just kept those edges on the shoulder and a few on the wingtip.

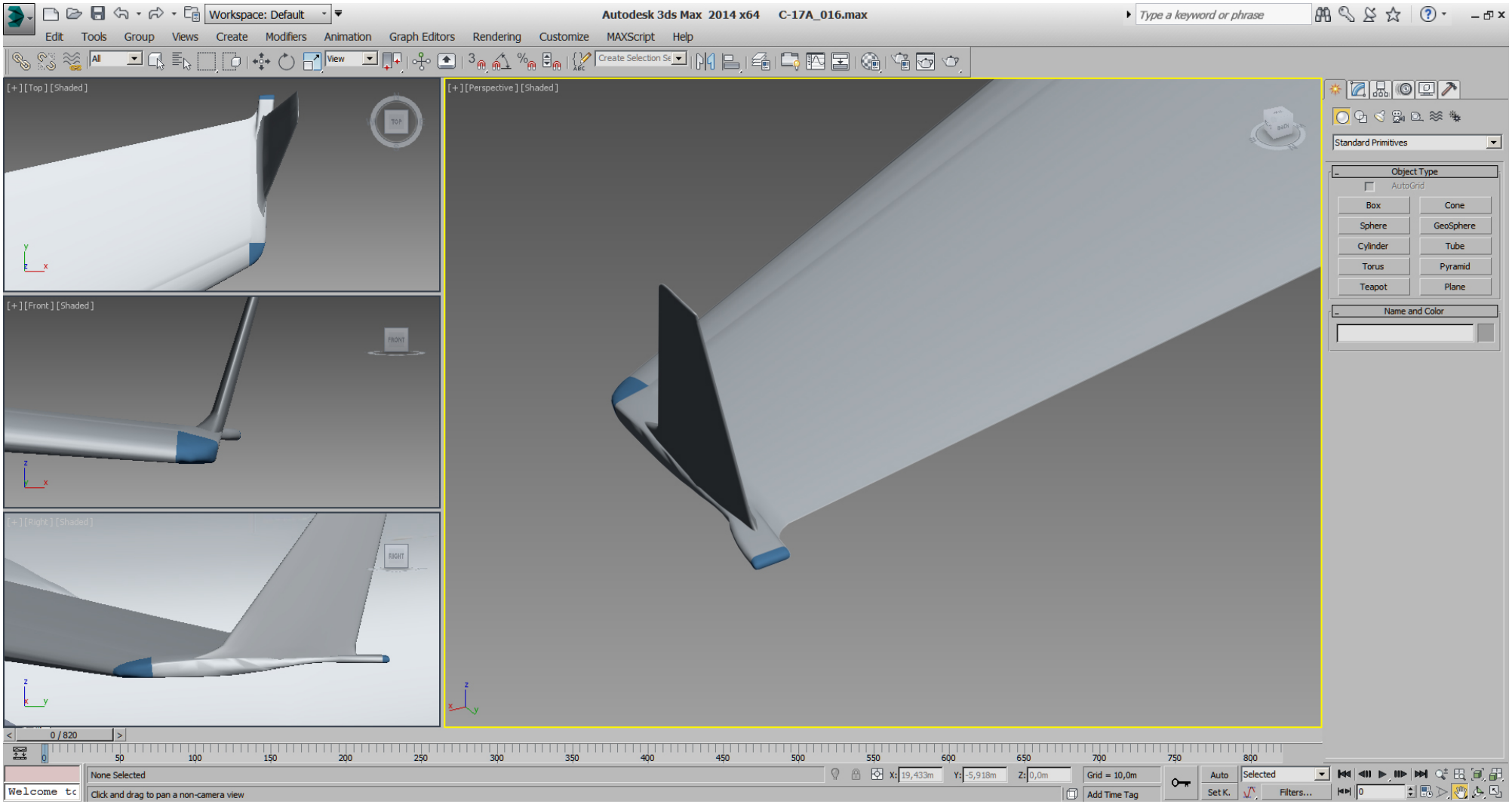
Then I've modeled that geometry for the lights facing backwards, using a “Capsule Extended Primitive” as a start, then modified that using the “Edit Poly” modifier.

Next I did a boolean operation to connect this to the wing object, collapsed the stack to “Editable Poly” and started to form this area roughly.
Additionally I did a cut on the front of the wingtips for the lights there, using boolean operation again, similar to the method we've used to cut the gear doors and stuff from the sponsons.

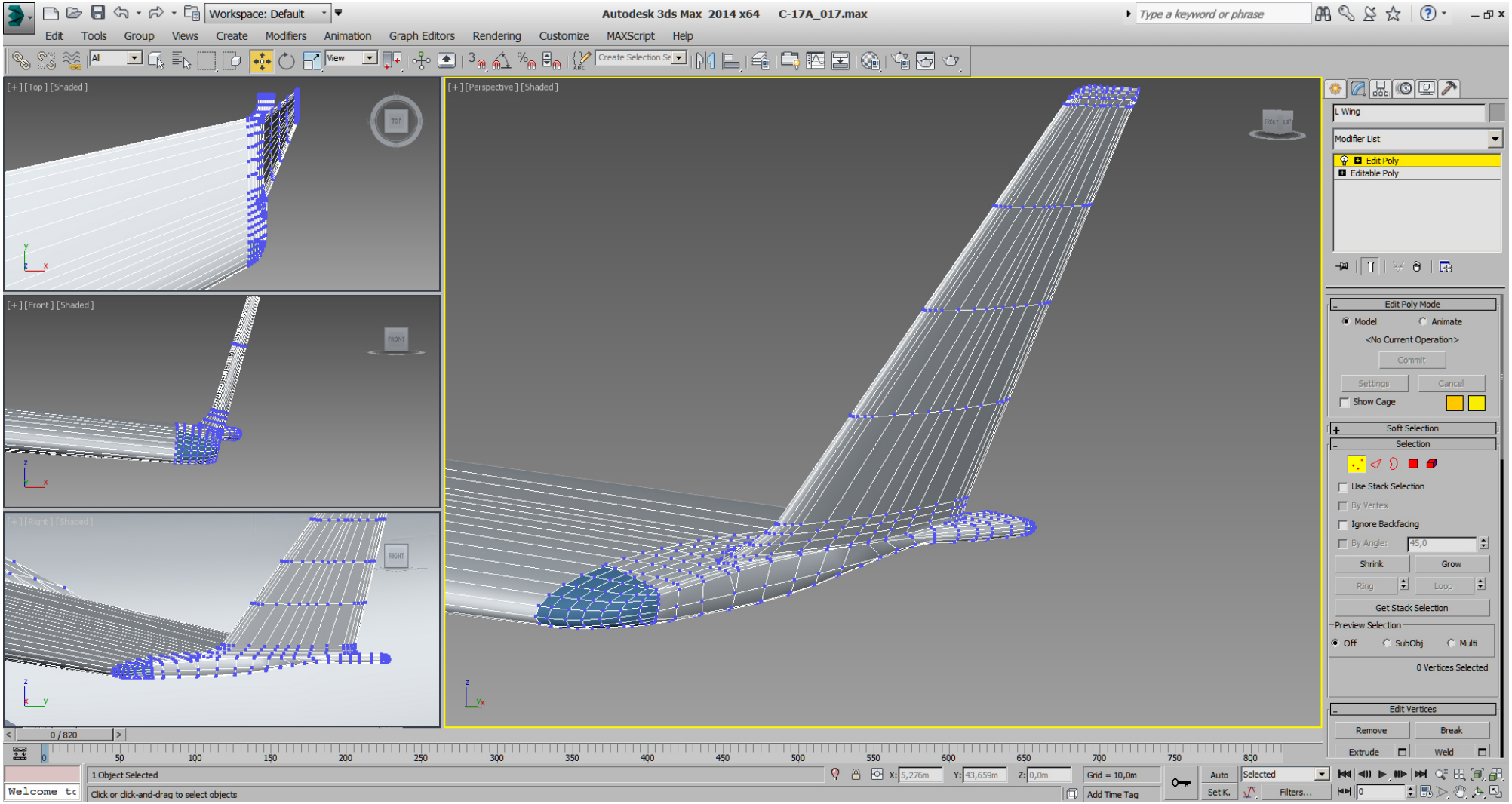


Prepared the "Material- IDs" for our "Multi - Material" and it looks like this:

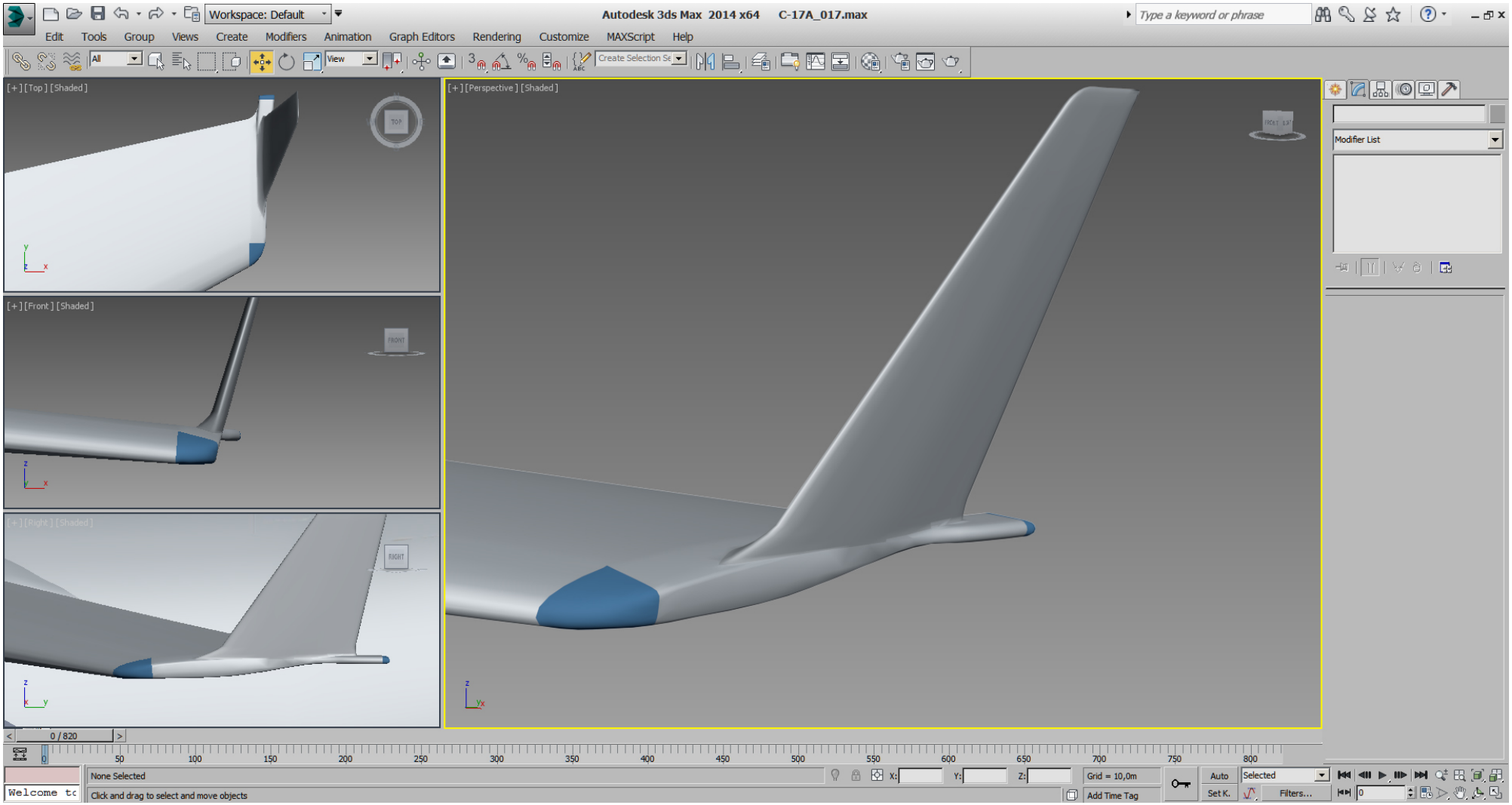


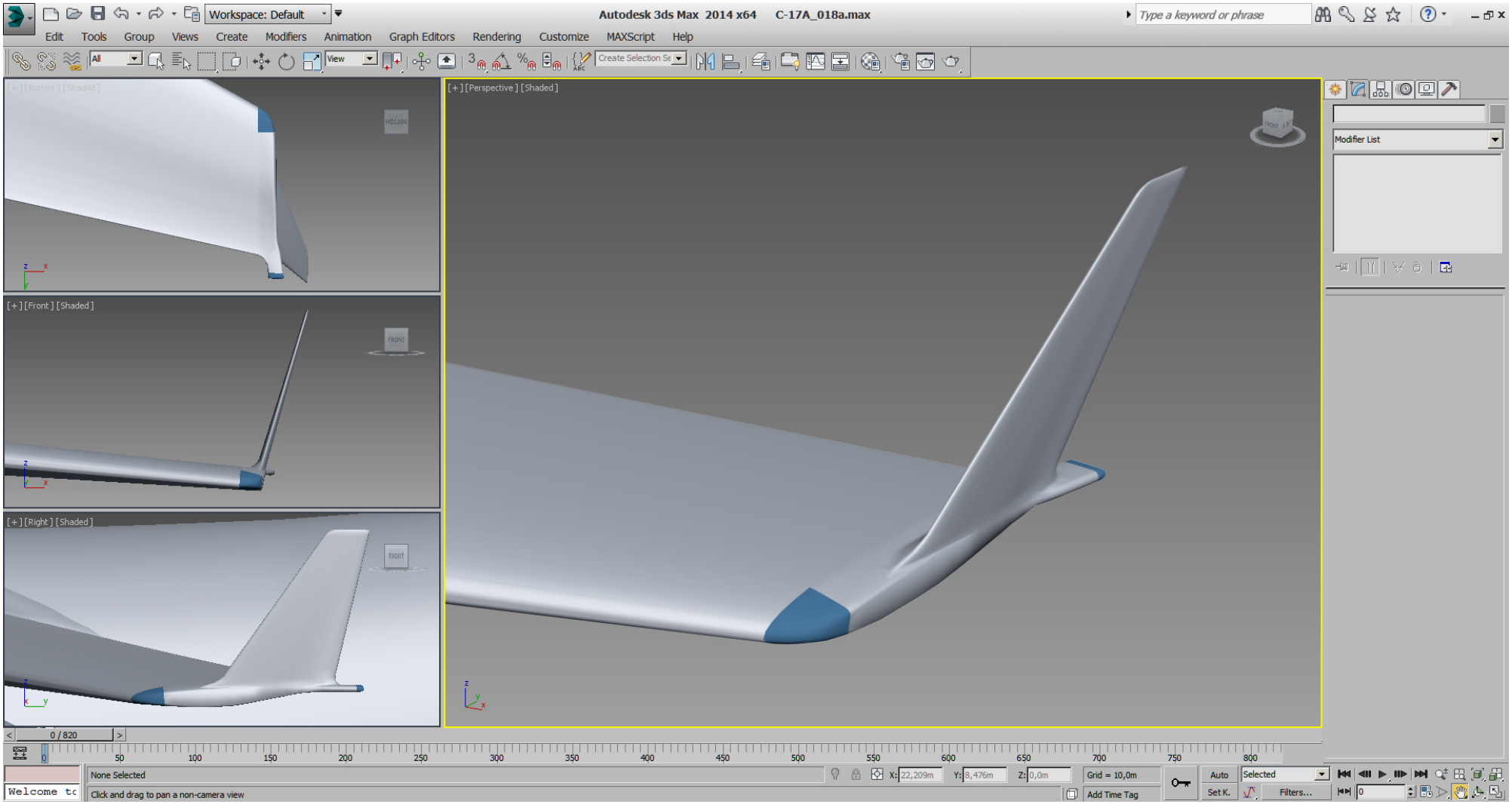

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_016.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Standard Primitives
Object Type
AutoGrid
Box Cone
Sphere GeoSphere
Cylinder Tube
Torus Pyramid
Teapot Plane
Name and Color
0 / 820
None Selected
Click and drag to pan a non-camera view
Welcome to
Grid = 10,0m
Add Time Tag
Auto
Set K.
Selected
Filters...

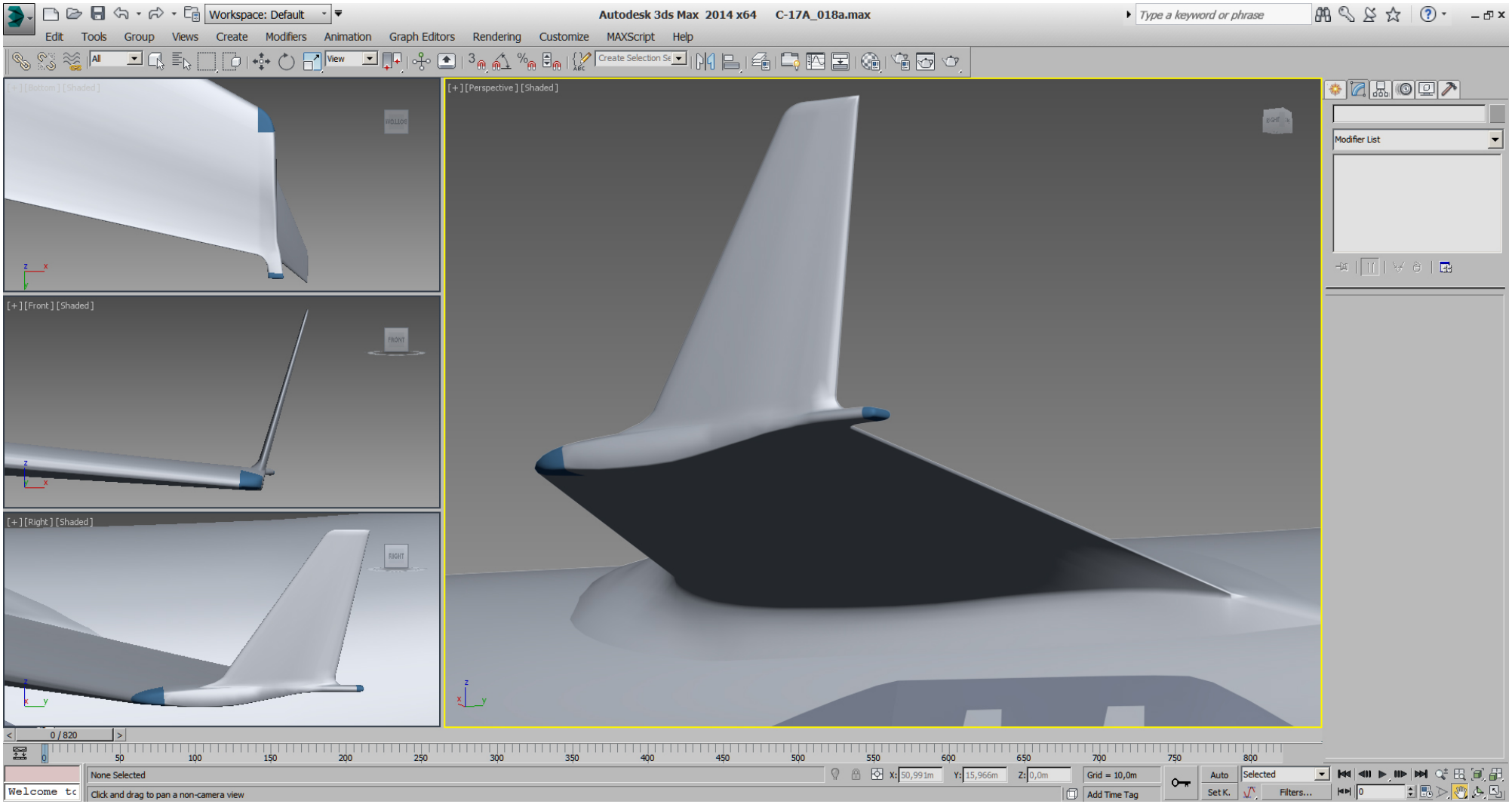
In the next step, I've connected the winglet to the wing the same way.
After using boolean operation and some "Edit Poly" modifications the mesh looks like this.

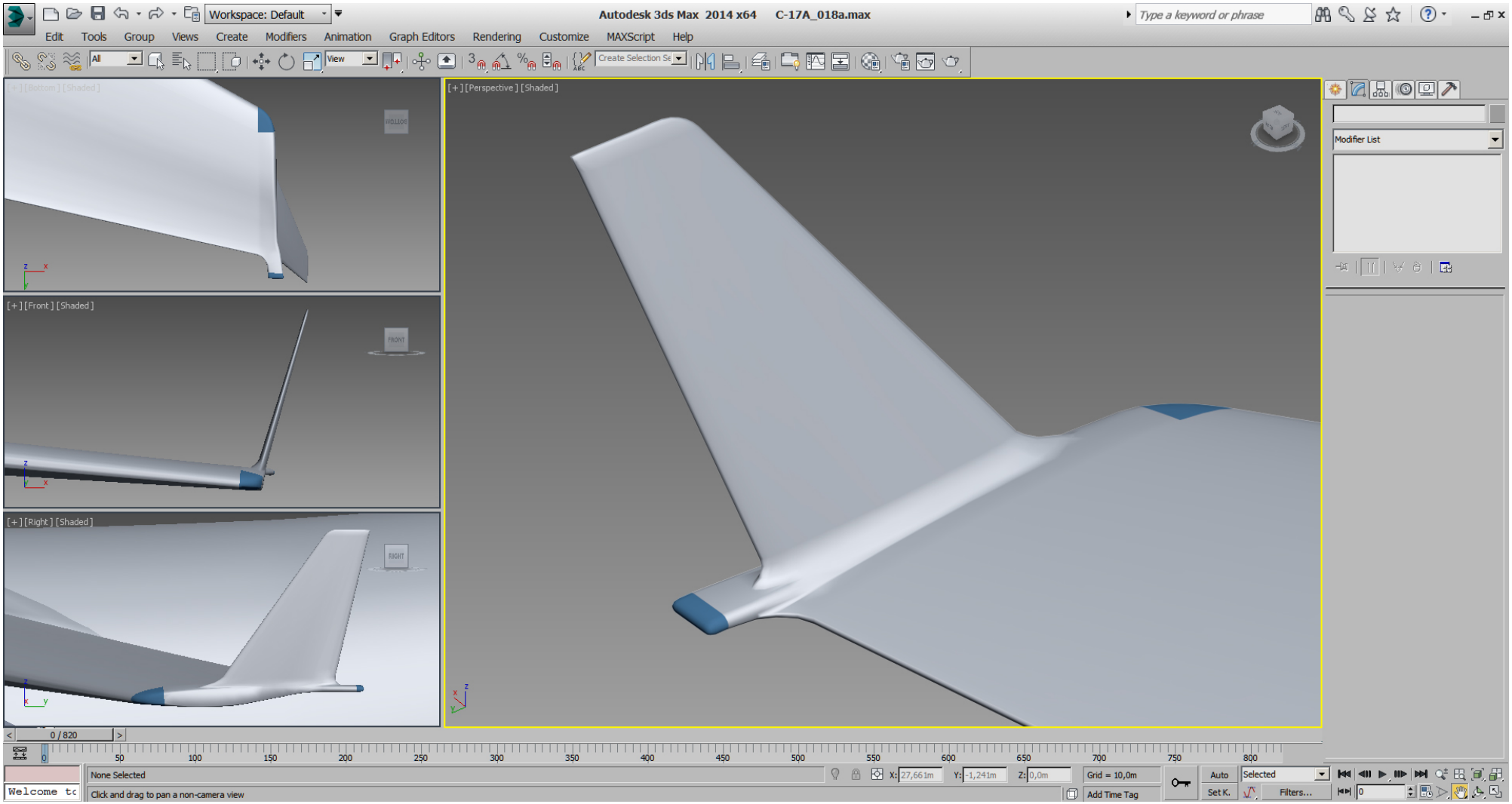


... result for now:

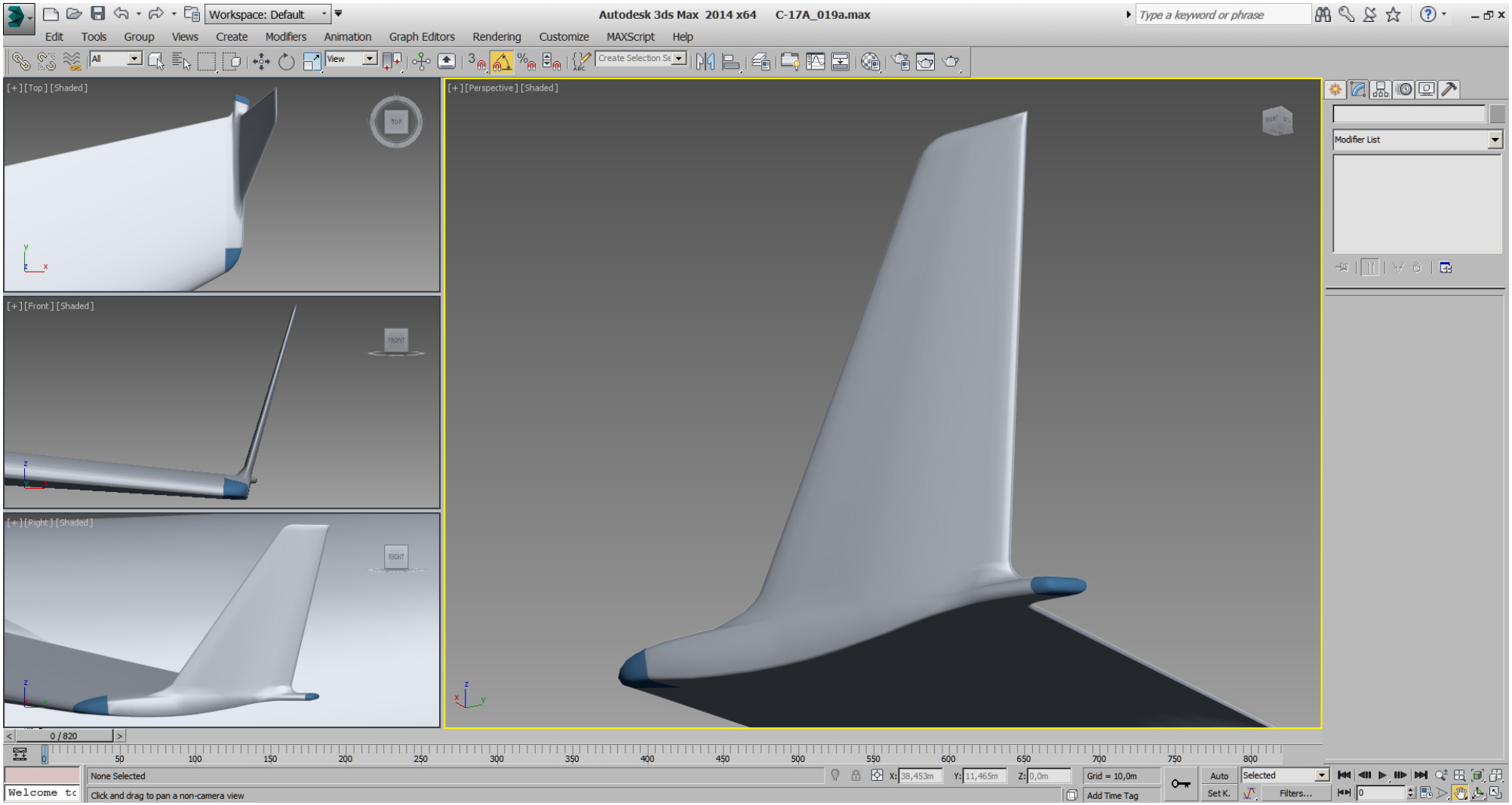


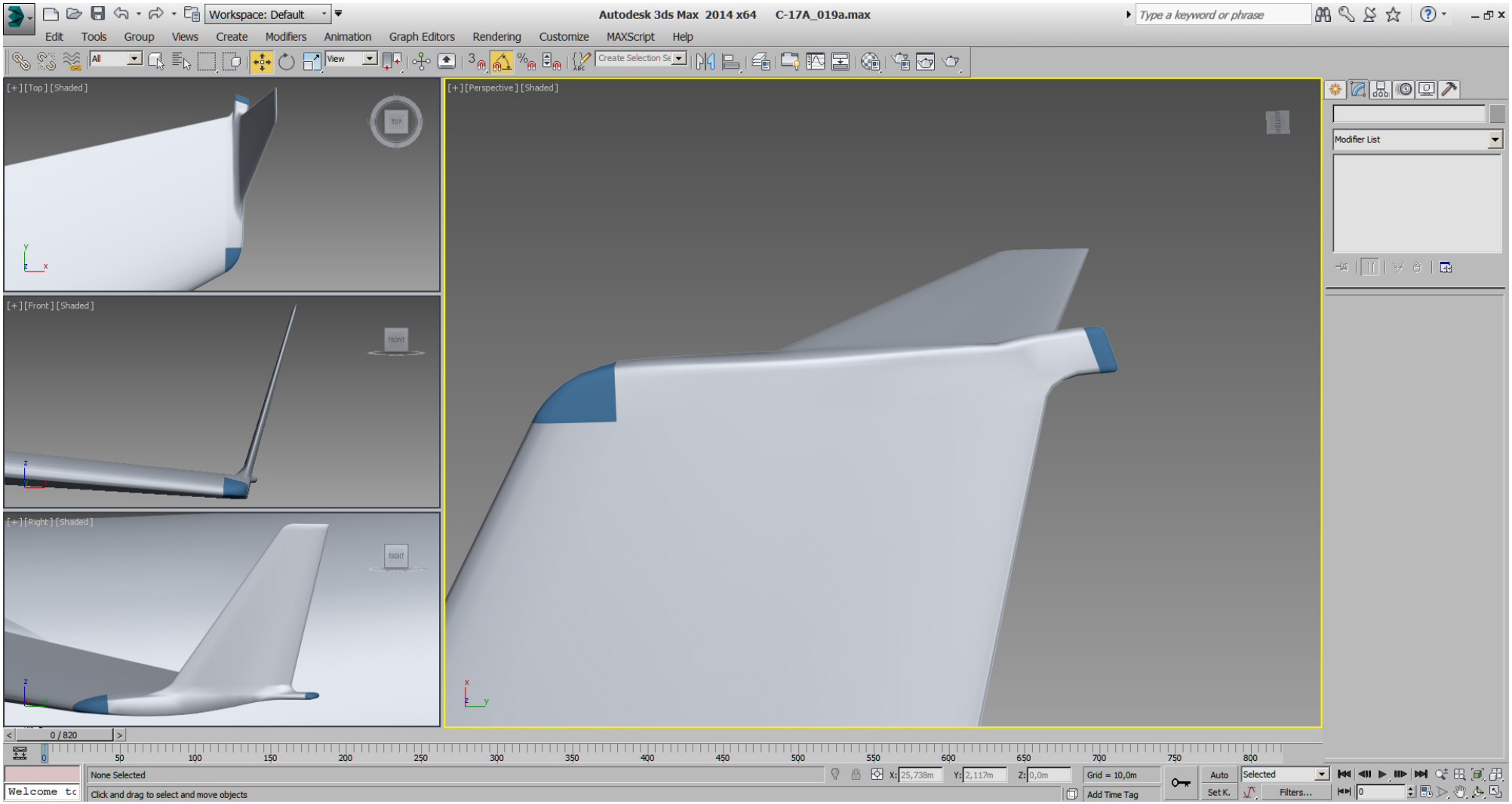

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_018a.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Bottom][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
0 / 820
None Selected
Click and drag to pan a non-camera view
Welcome to
Grid = 10,0m
Add Time Tag
Auto
Set K.
Selected
Filters...

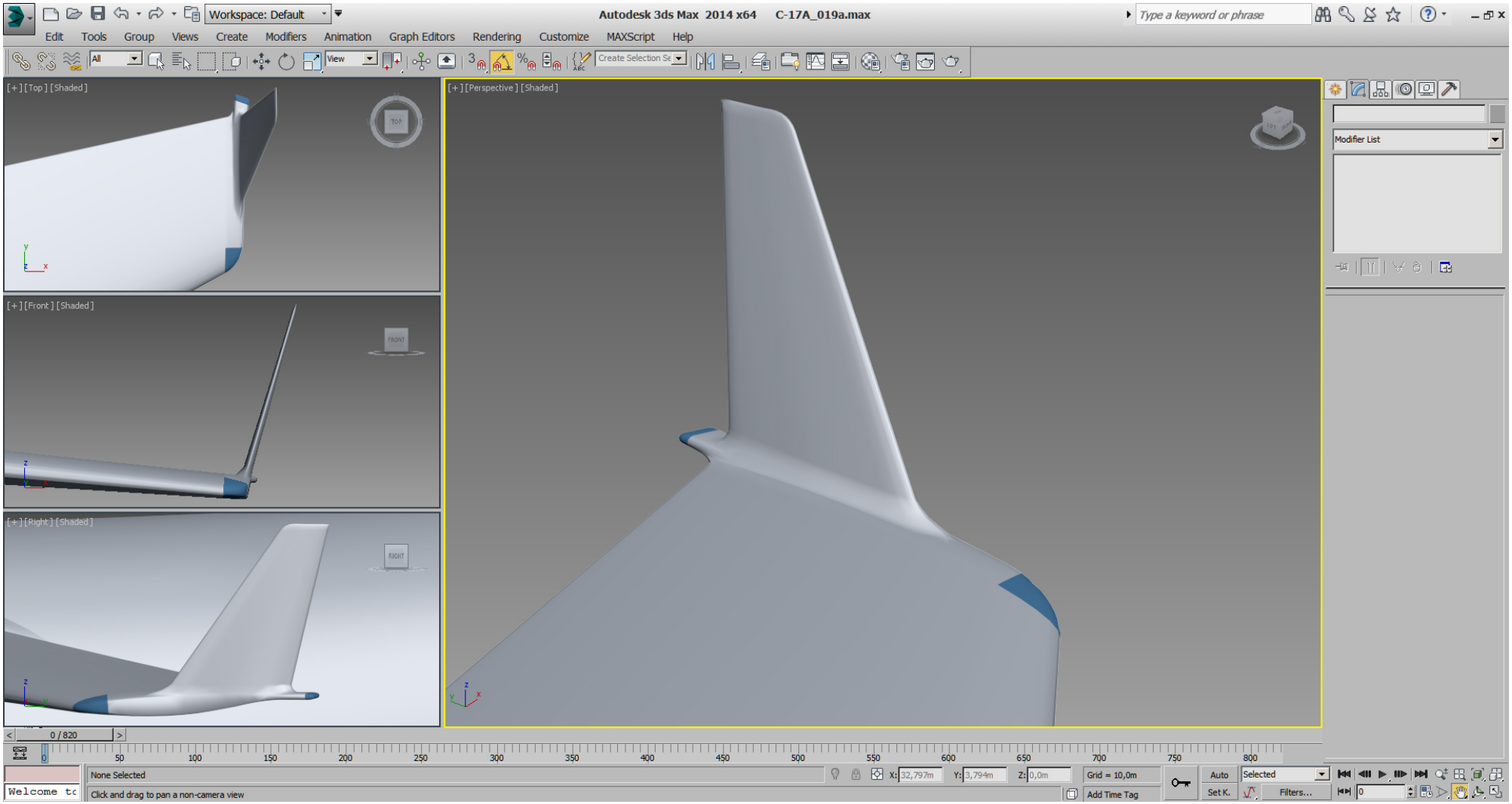

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_018a.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Bottom][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
0 / 820
None Selected
Click and drag to pan a non-camera view
Welcome to
Add Time Tag
Auto
Set K.
Filters...
Selected

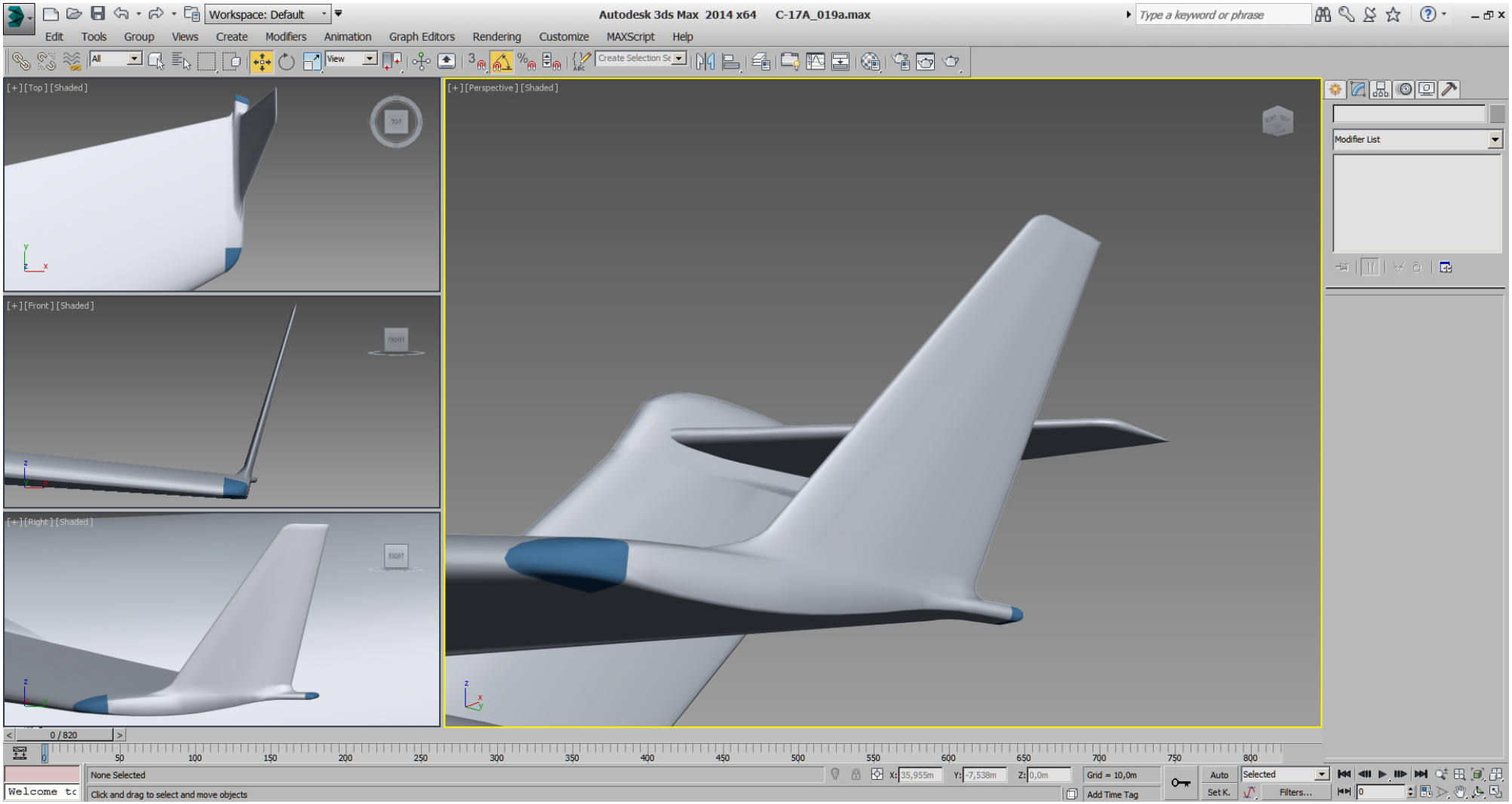

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_018a.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Bottom][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
0 / 820
None Selected
Click and drag to pan a non-camera view
Welcome to
Add Time Tag
Auto
Set K.
Filters...
Selected

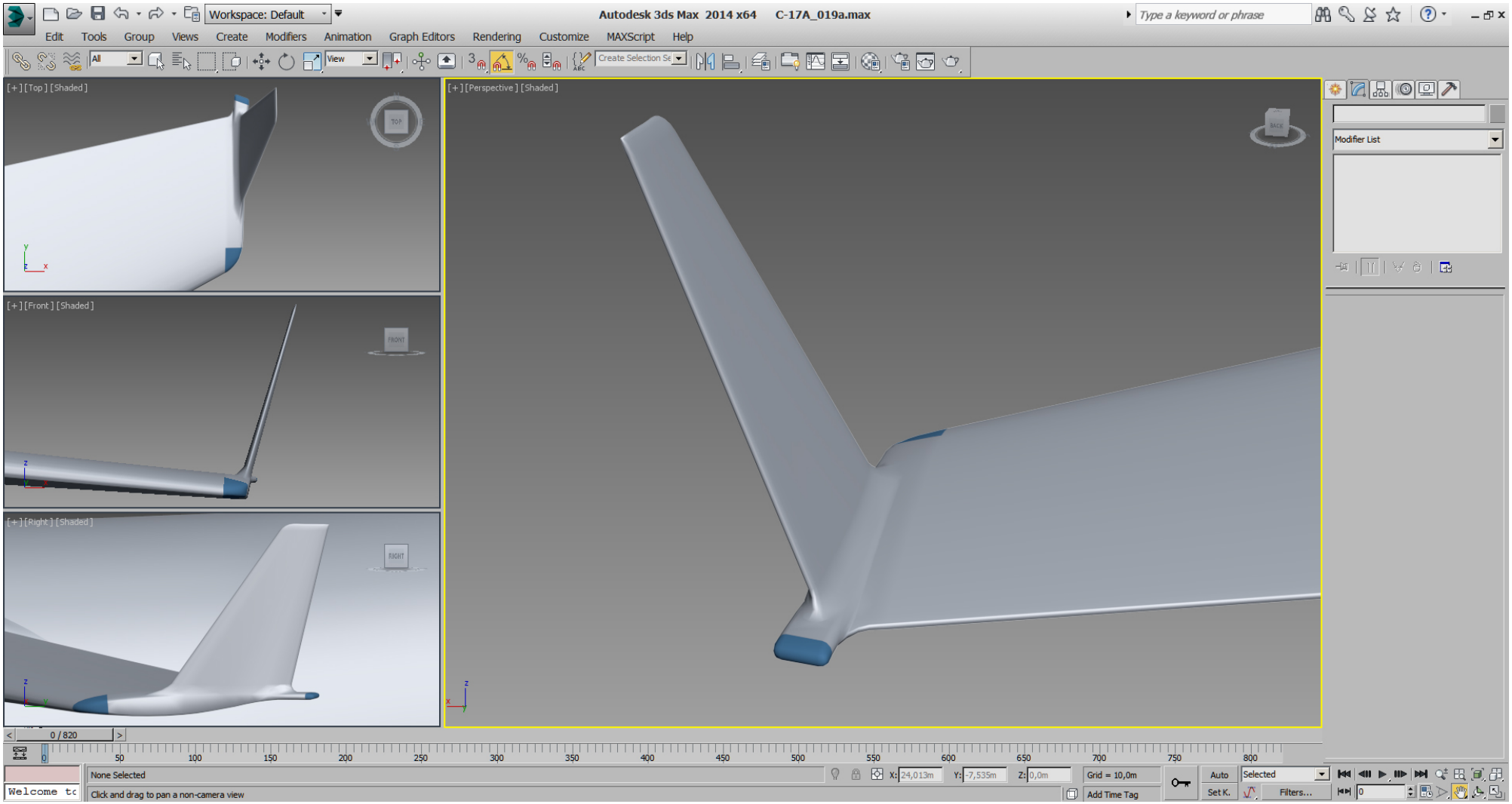
While looking at RL pictures, I wasn't happy with the look of that area, so I've modified it further.




Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_019a.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
0 / 820
None Selected
Click and drag to select and move objects
Add Time Tag
Auto
Set K.
Filters...
Selected
Welcome to


Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_019a.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
0 / 820
None Selected
Click and drag to pan a non-camera view
Welcome to
Grid = 10,0m
Add Time Tag
Auto
Set K.
Selected
Filters...


Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_019a.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
0 / 820
None Selected
Click and drag to select and move objects
Welcome to
Grid = 10,0m
Add Time Tag
Auto
Set K.
Selected
Filters...



I'm still not 100% happy with the look of that backlight geometry, but can't decide where to improve atm..
If I don't get some "inspiration" later, then it's good to go I think.

At this state of the WIP I've been asked by BMS team members about the actually tri- count, which is 300 K !
... but what about that 300K polys?

With my workflow and spline modeling I'm coming always from the top with the tri count.
So I've a high tri count at the start, which will be reduced and optimized later.

For now the goal is to get the shapes right.
Later, we'll get rid of tris that don't hurt the overall geometry as first, then get rid of tris that hurt less.

At some point we'll have a tri optimized model which will still use more than 30k max. tris.
This will be my LOD 0a (advanced), to be used personally, or aggressively distance LODed to keep details on close view.

Once we have build that LOD 0a, we'll reduce the tris even more to keep the 30k max. limit for a "standard" LOD 0.
The process to build LOD 0 from LOD 0a is similar to building LOD 1 from LOD 0.

At the end the DB- and coder- guys can decide which LODs will be used.

So again, we don't worry about the tri count at this state of WIP, ... we've just started modeling and there is lot's of work in front.

The C-17 is an experiment for me as well, where I don't really know where we'll end with the tris for LOD 0(a).

To fill the space here, …

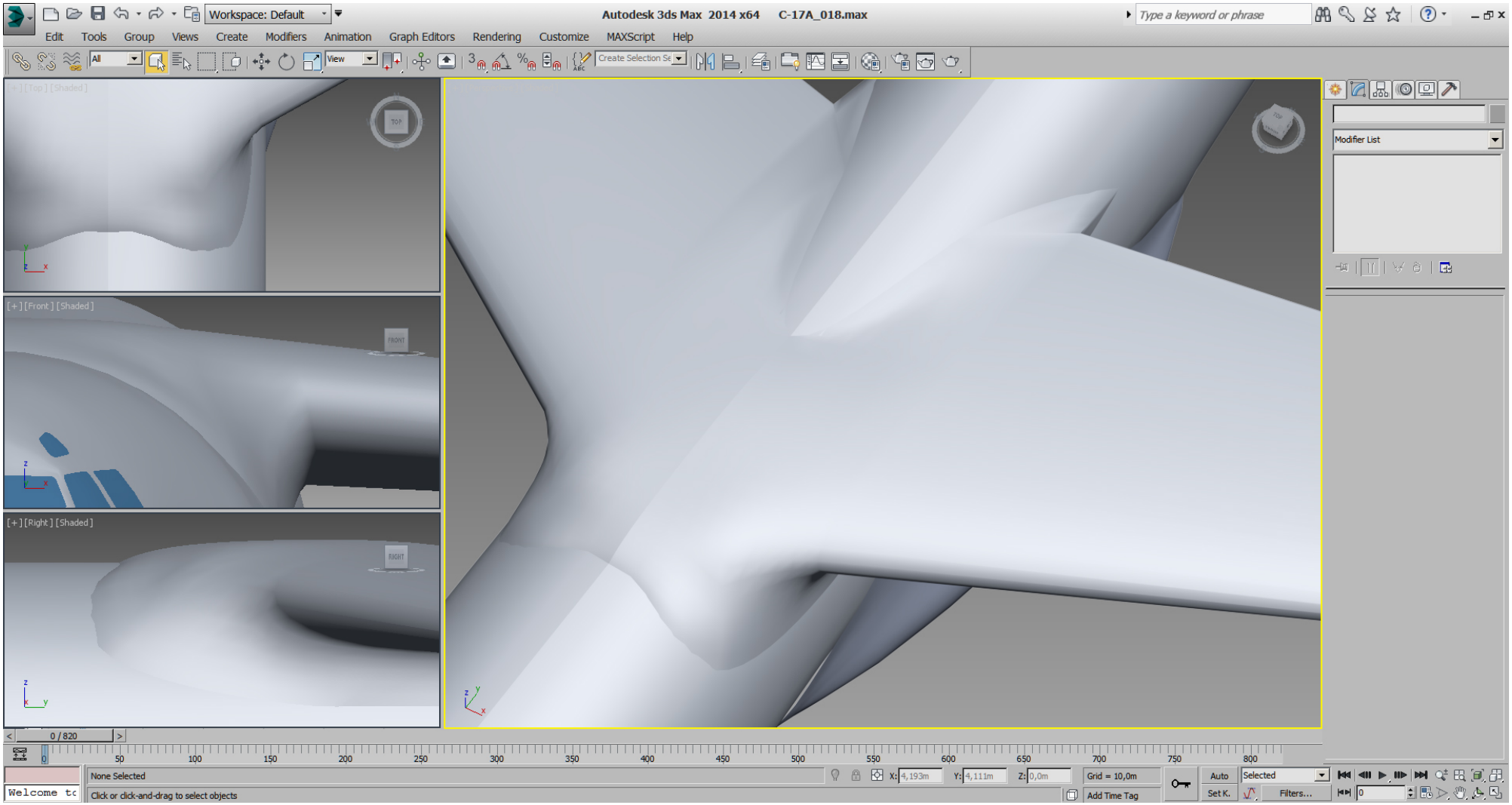
In the WIP as yet, we have modeled in "Edit Spline" mode at the beginning, and do the fine work with the "Edit Poly" modifier.

To me, the "Edit Poly" modifier is my best friend and you'll see more from it later, … we'll use it often.
I suggest to get familiar with it generally anyway.

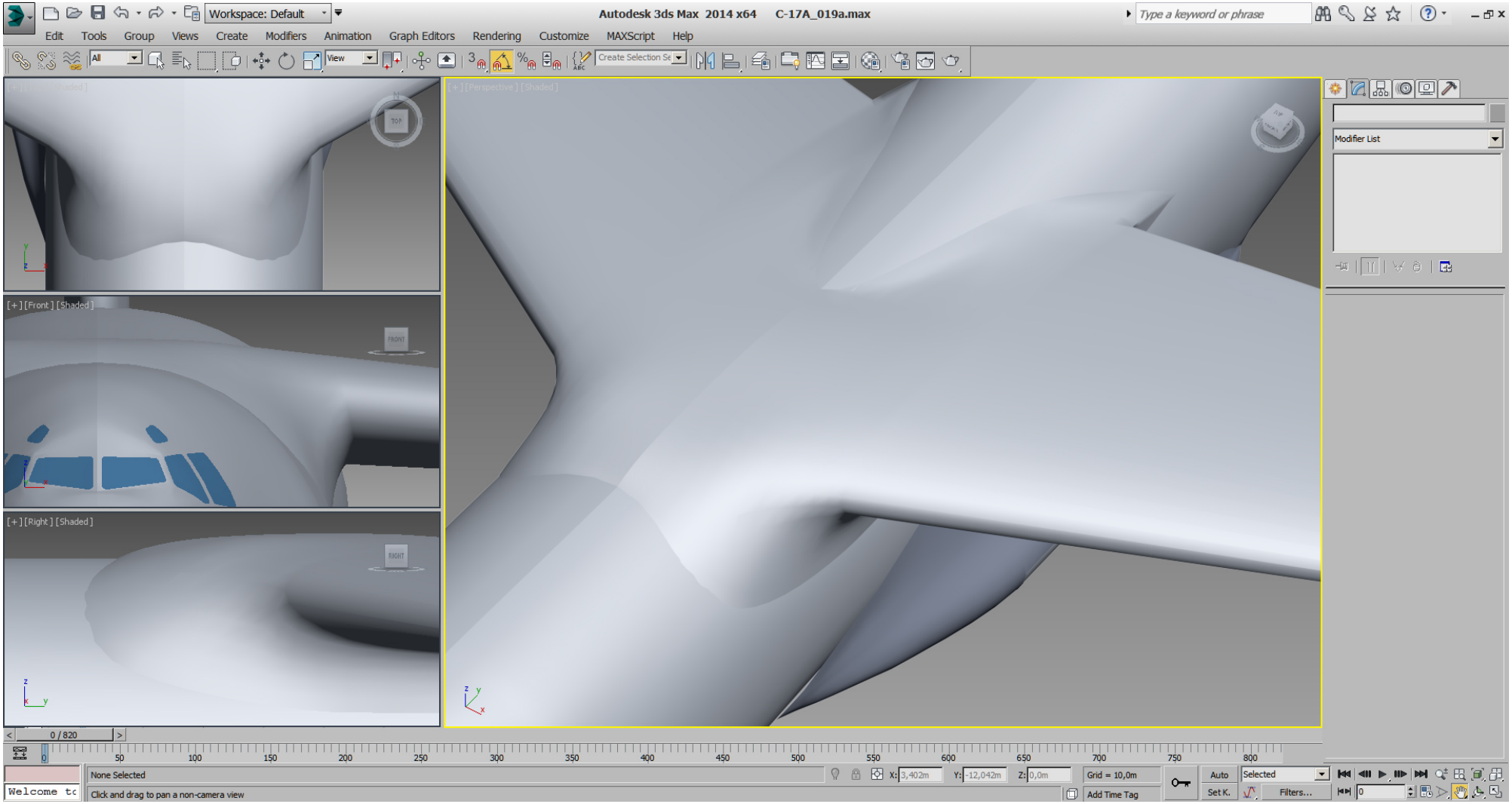
Also I'll show more on the "boolean" operation (we've used already) later.

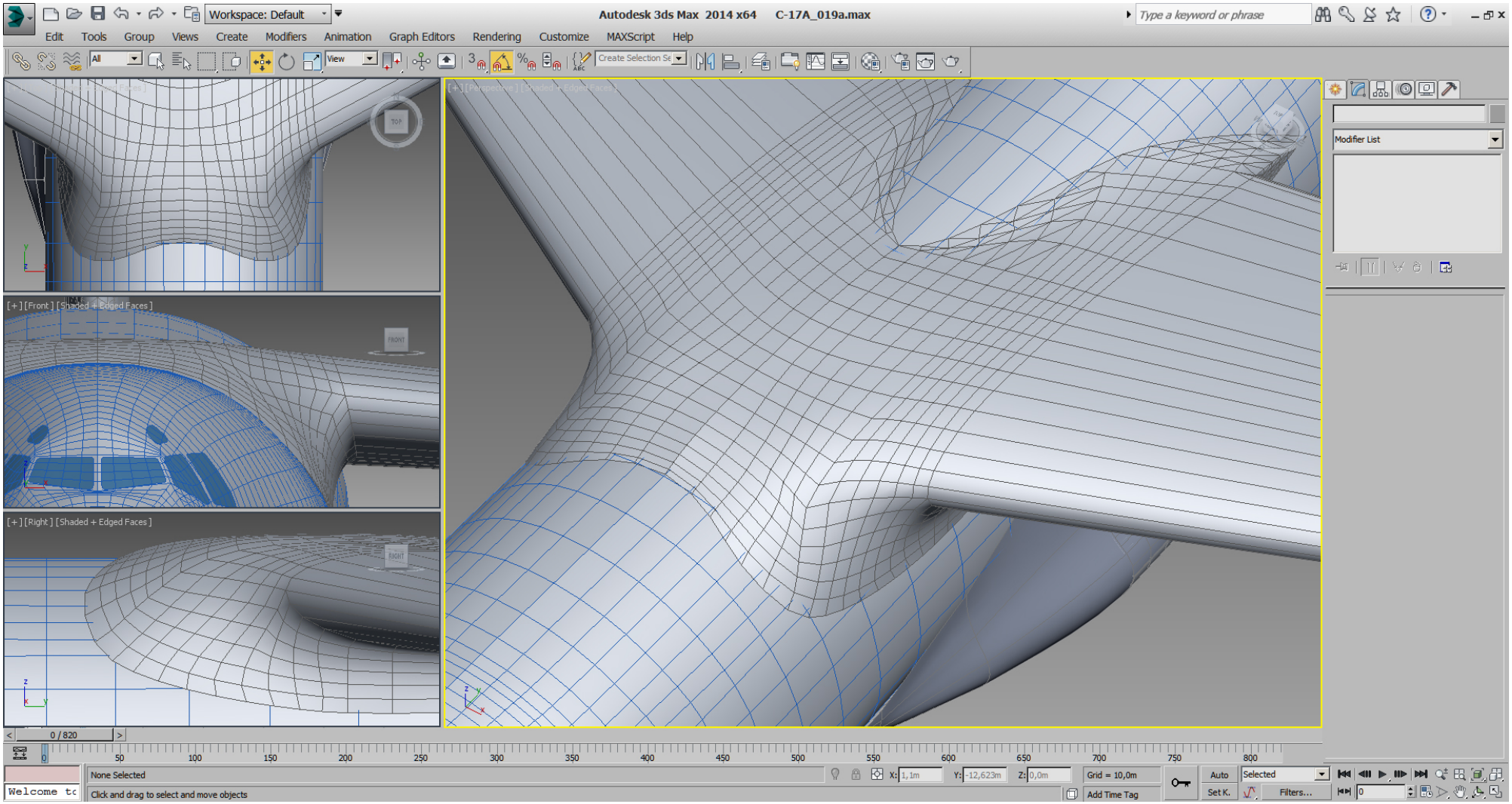
In the next pictures look also on the left side (top, front, side view)
to see the bumpiness of the shoulder, which is a result high tension when spline modeling.

Maybe you remember when I've said it would need some adjustment later during “Edit Poly” modeling.



Using the “Edit Poly” modifier I've adjusted and fine tuned that shape carefully and be happy with the results of the wing shoulder so far.



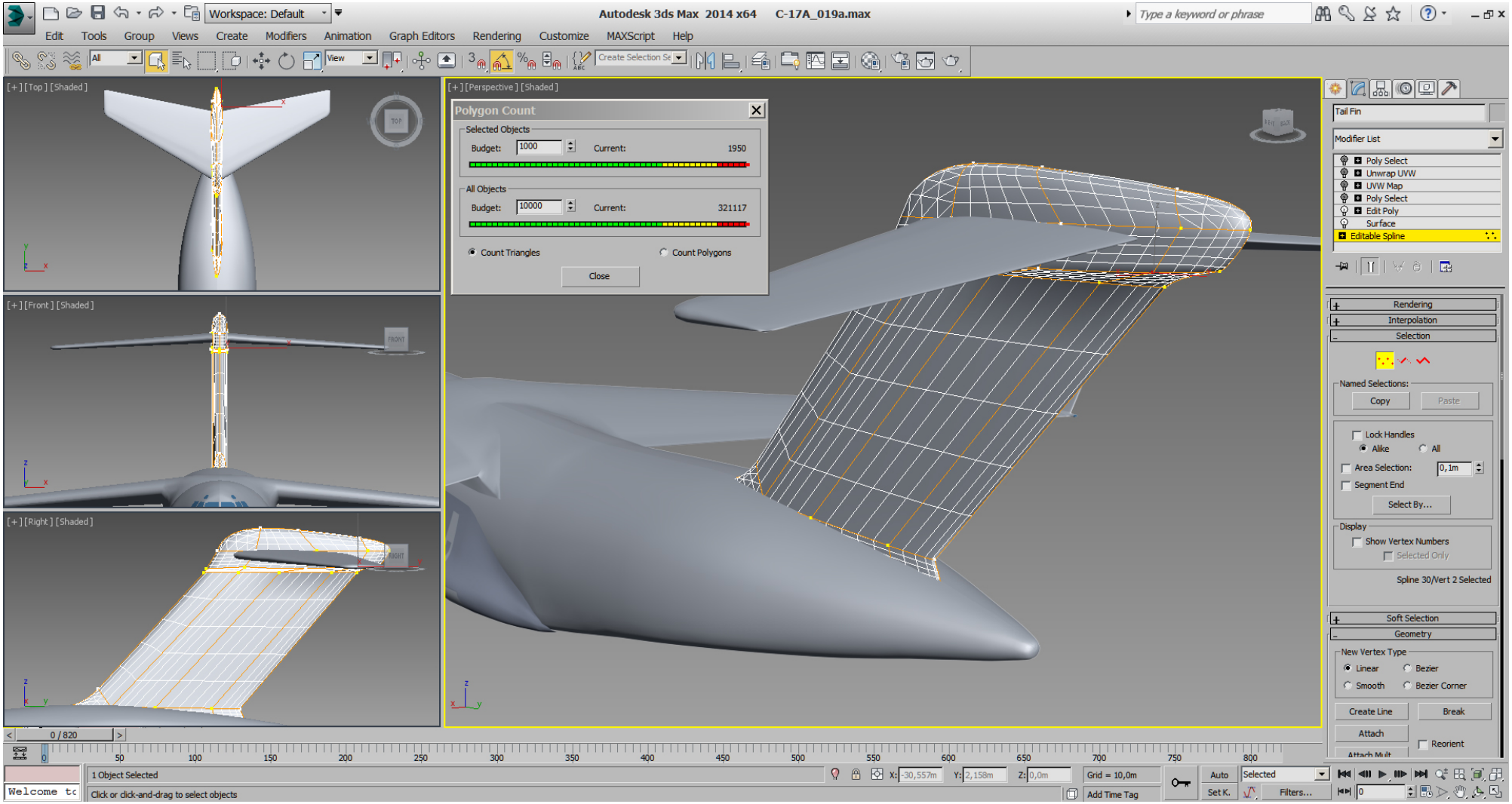


Side note also the look- through between fuselage and the left sponson,
which will get fixed when the sponsons will get “boolean” mesh- connected also later.

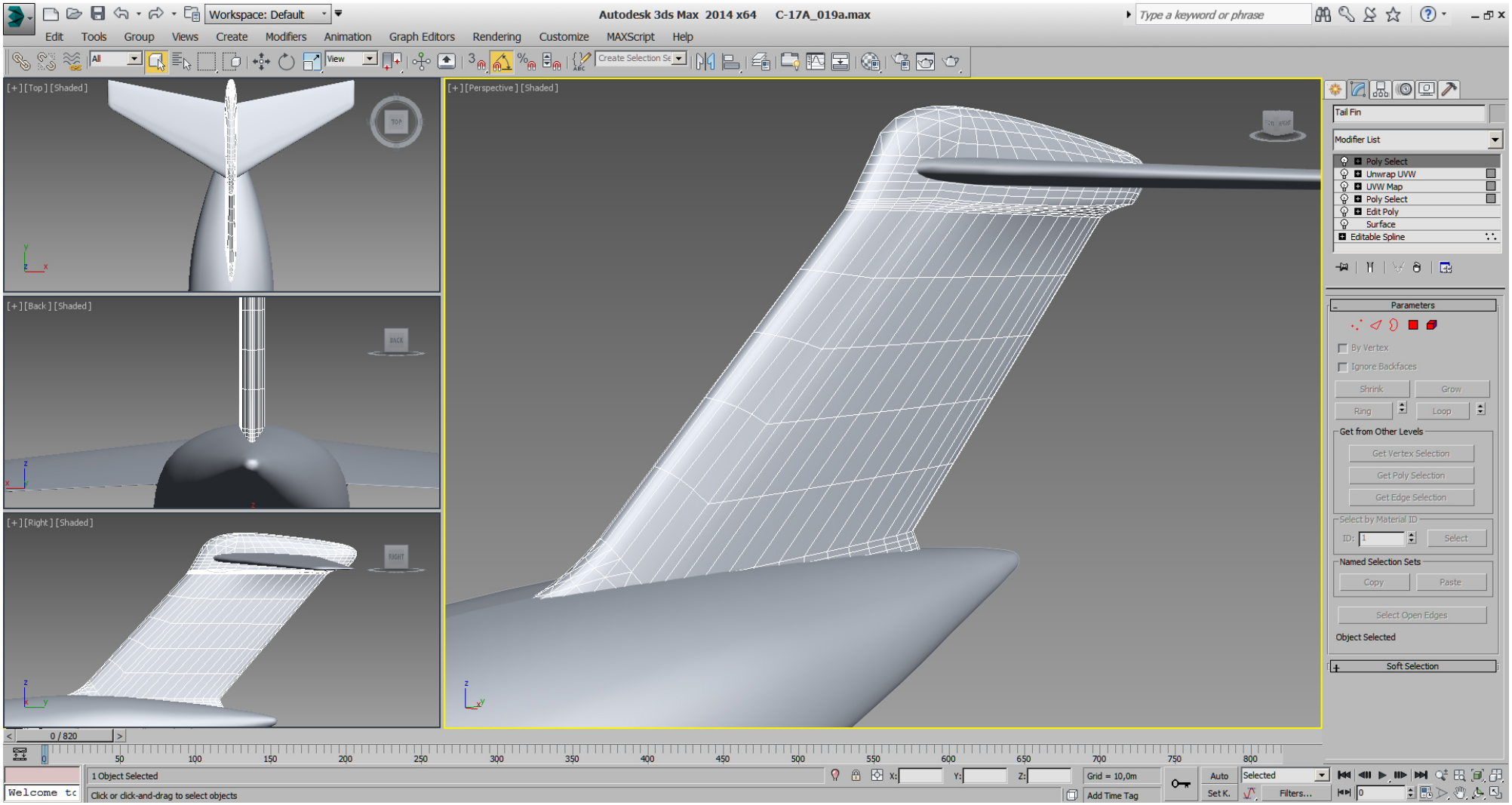
The vertically stabilizer will be a good example to show some tri- optimizing
for those who care about the high tri- count as result of spline modeling.

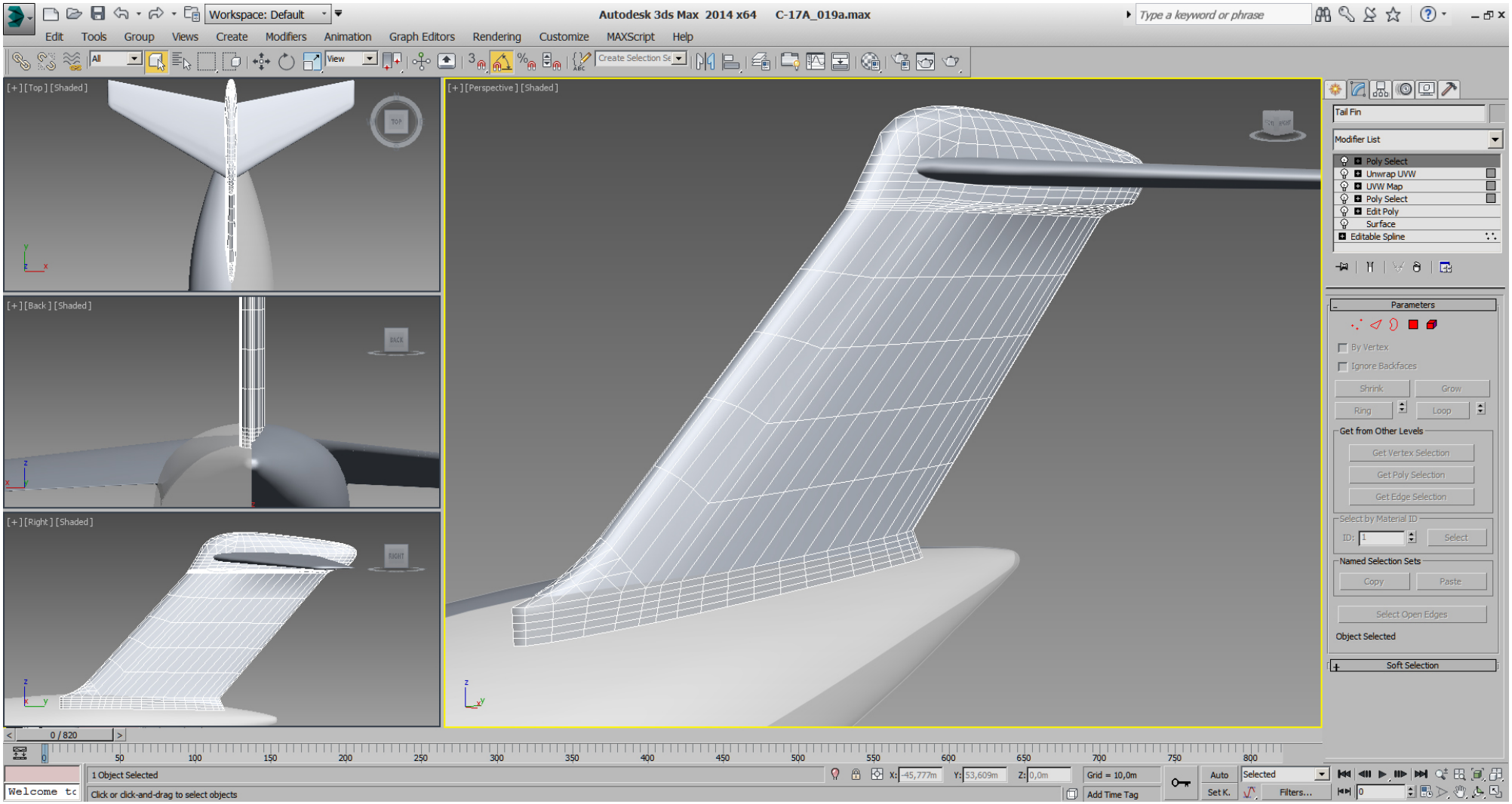
Looking closer at RL pictures again, I've found some small mistakes and while the vertically stabilizer can be still modified in “Edit Spline” mode, I did some modifications there first.

This is the actually situation.
Note the “Stack” and note the Poylcounter which shows 1950 tris for the selected object.

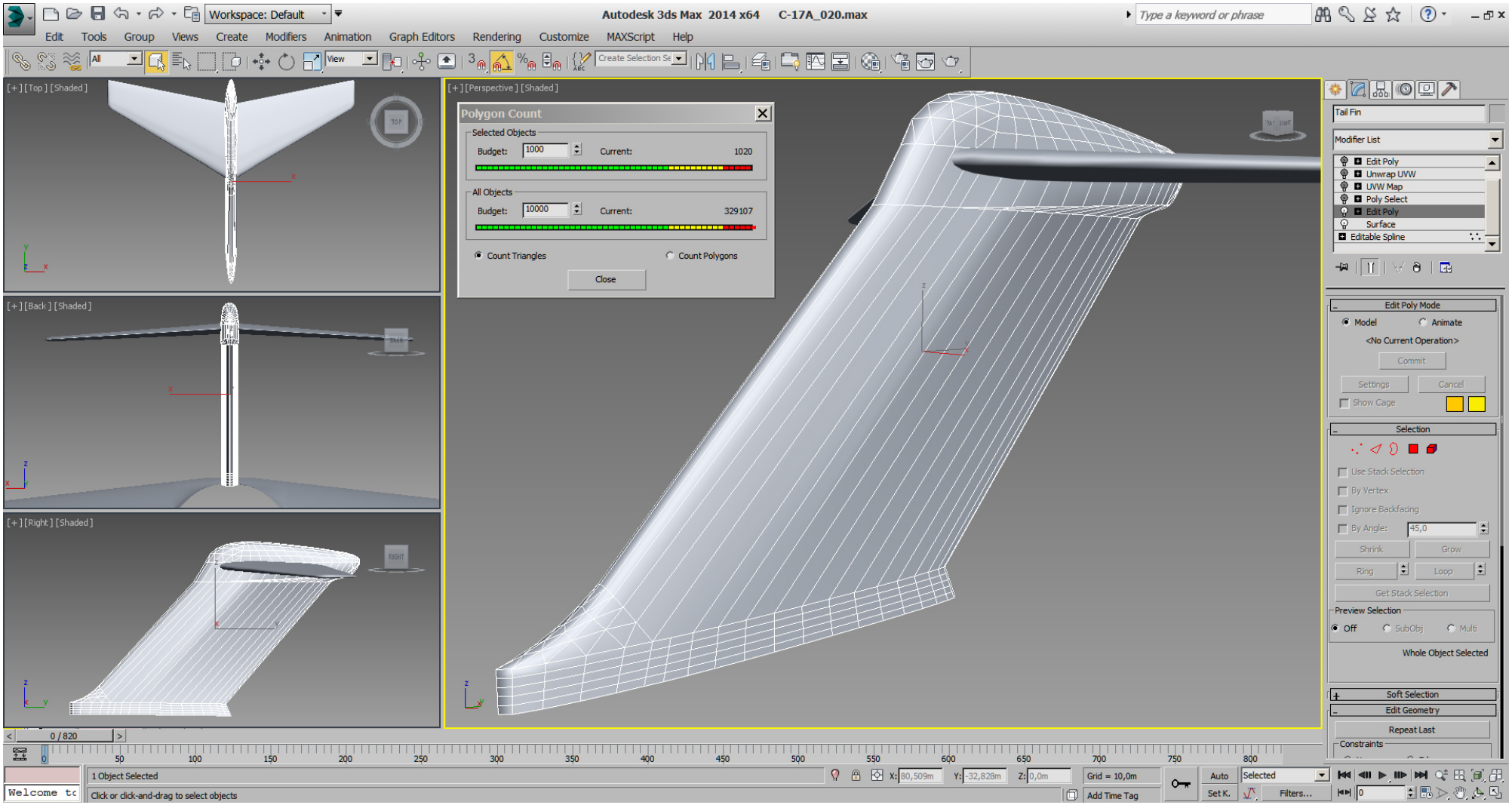


Please note also how many tris are hidden inside the fuselage.

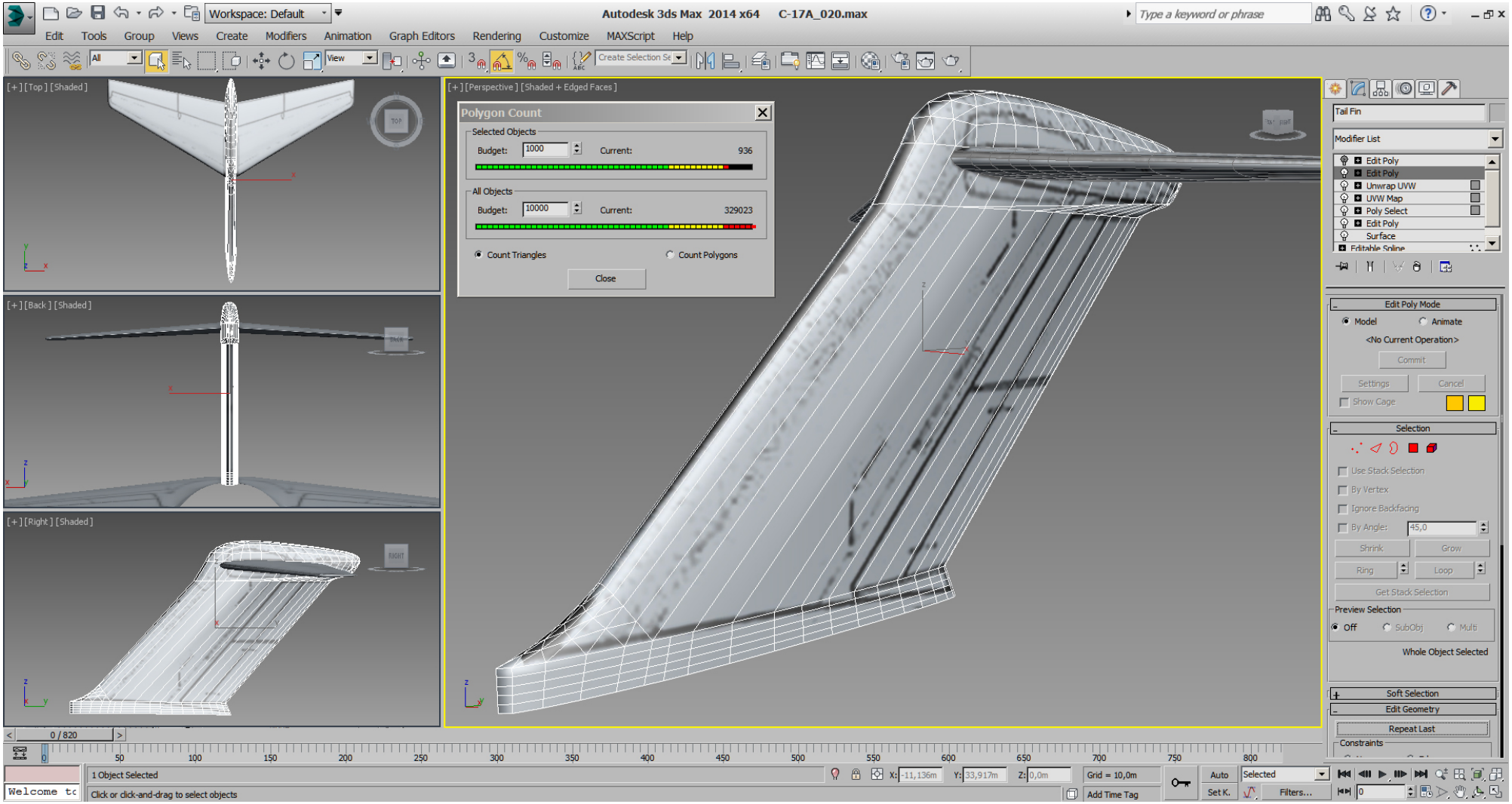



Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_019a.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Back][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Tail Fin
Modifier List
Poly Select
Unwrap UVW
UVW Map
Poly Select
Edit Poly
Surface
Editable Spline
Parameters
By Vertex
Ignore Backfaces
Shrink
Grow
Ring
Loop
Get from Other Levels
Get Vertex Selection
Get Poly Selection
Get Edge Selection
Select by Material ID
Select
Named Selection Sets
Copy
Paste
Select Open Edges
Object Selected
Soft Selection
0 / 820
1 Object Selected
Click or click-and-drag to select objects
Add Time Tag
Auto
Set K.
Filters...
Selected
Welcome to

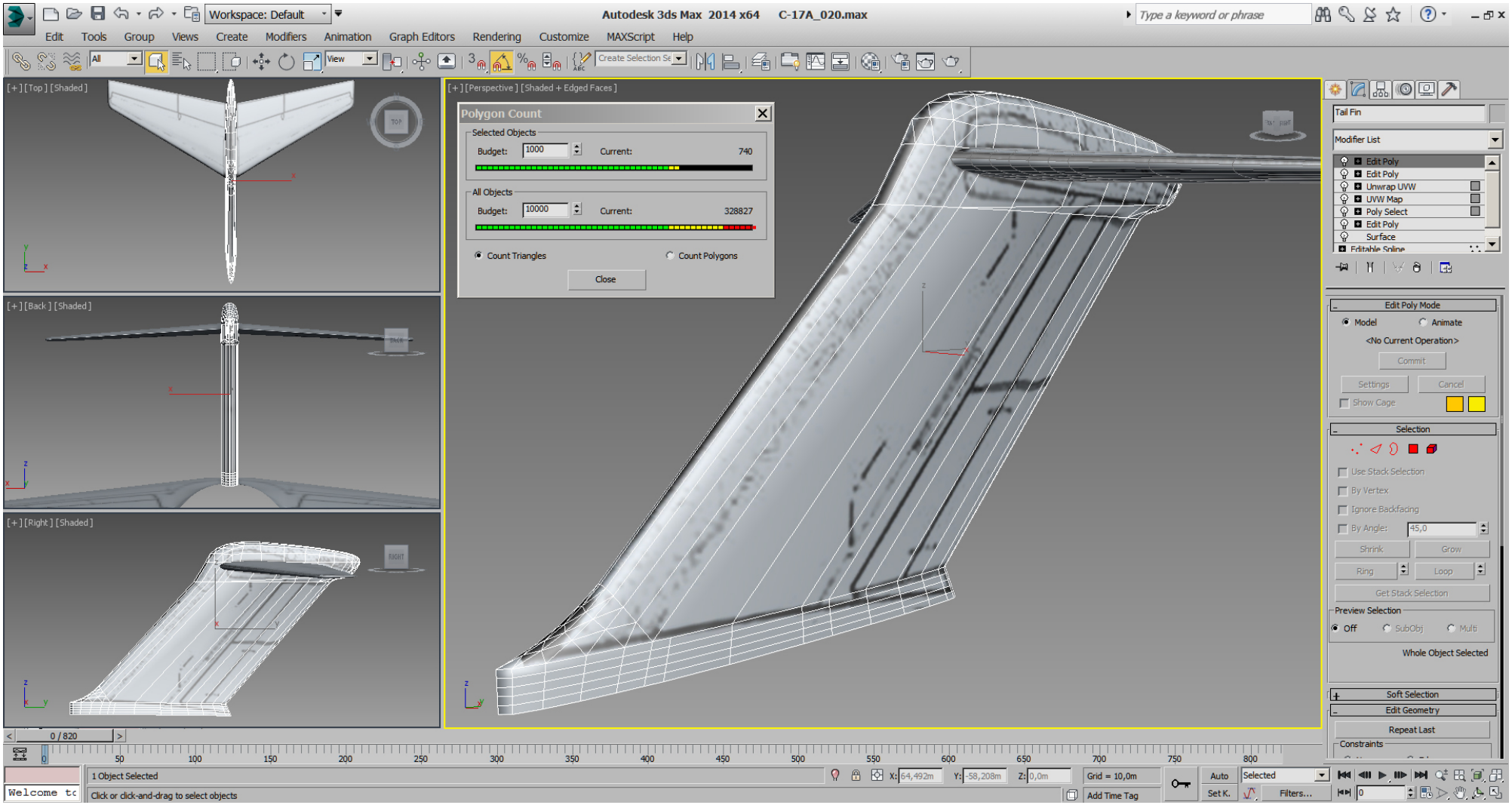
Well, after doing first modifications in “Edit Spline” mode, then getting rid of some edges in “Edit Poly” mode, the tri- count is at 1020.



After a quick planar UVW remap for check and orientation, and with another “Edit Poly” modifier on top (note the “Stack”),
I did some adjustments plus some optimizing, so tri- count is 936.



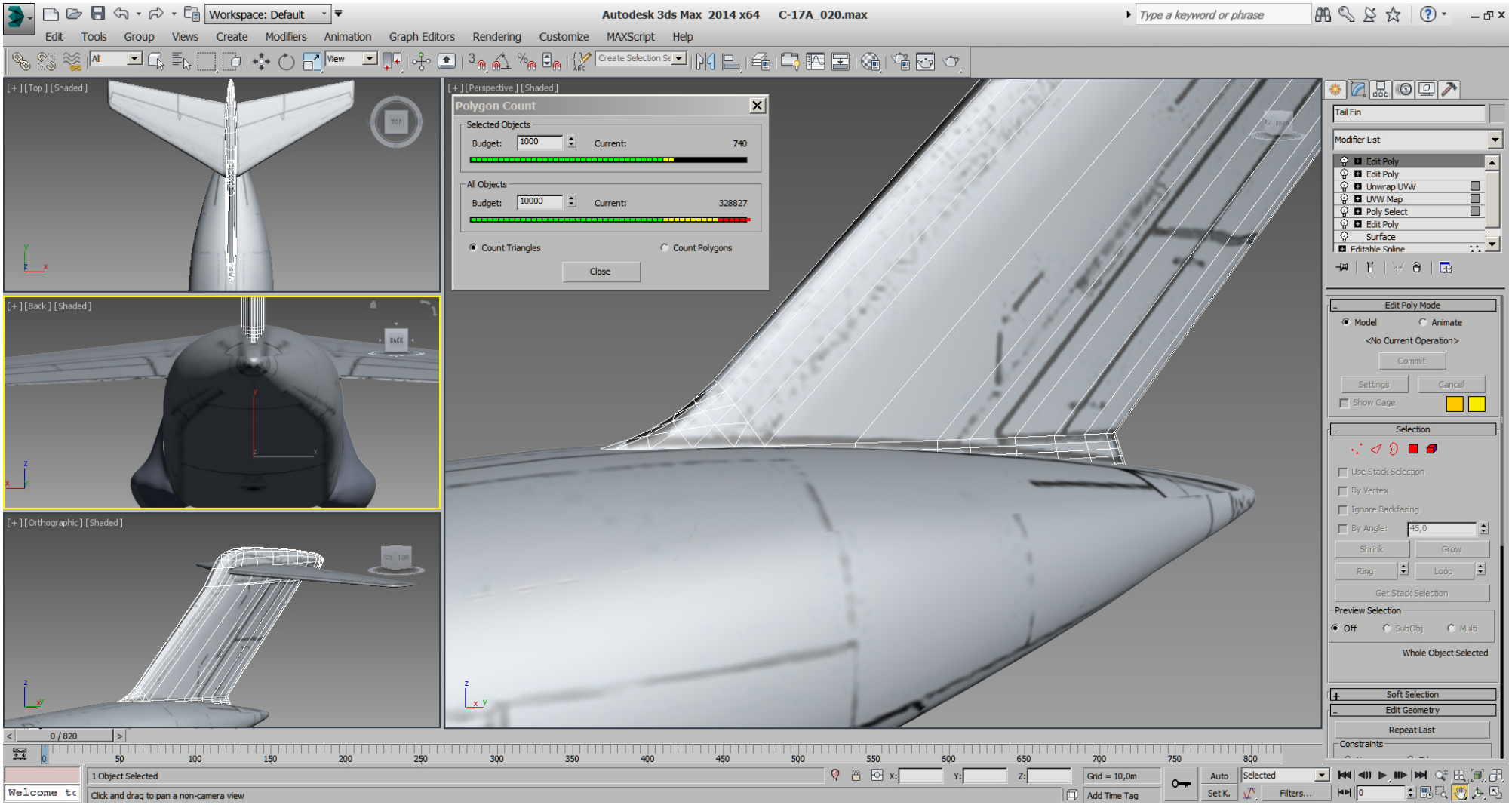
With another “Edit Poly” modifier on top (note the “Stack” again), I did further adjustments plus some optimizing, so tri- count is 740.



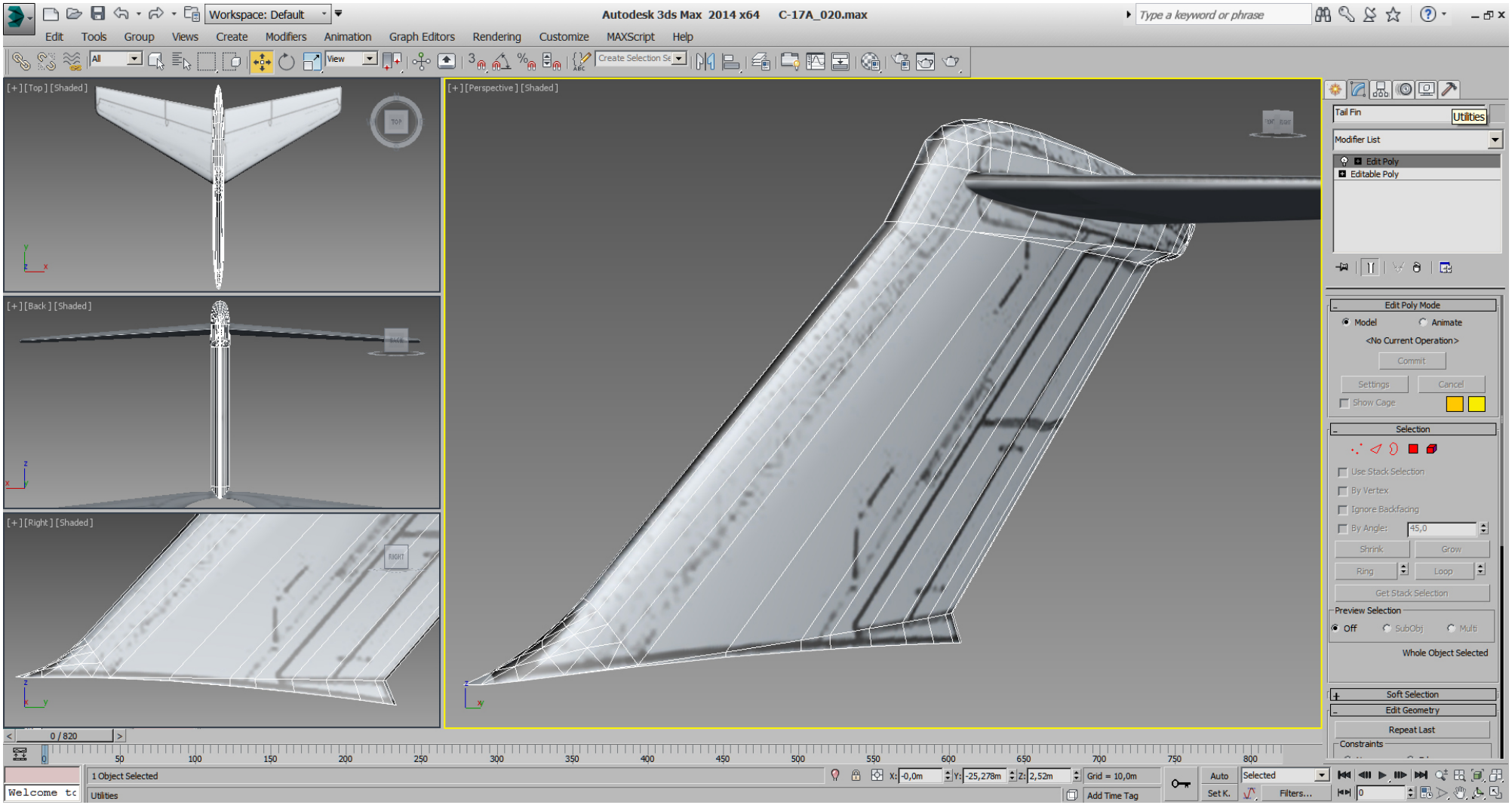
Btw. you might ask why I'm using multiple “Edit Poly” modifier on top of each other, while everything could be done with just one modifier. The reason is that I use them like a backup. If there is something that goes wrong or I don't like, then I simply delete the last modifier from the “Stack” and start again at that point.

To get rid of the polys which are hidden in the fuselage, I'm using a boolean operation again.
Therefore I did a copy of the fuselage and moved it slightly down, to get some safe distance to keep the bottom of the vertically stabilizer inside the fuselage after the boolean cut.

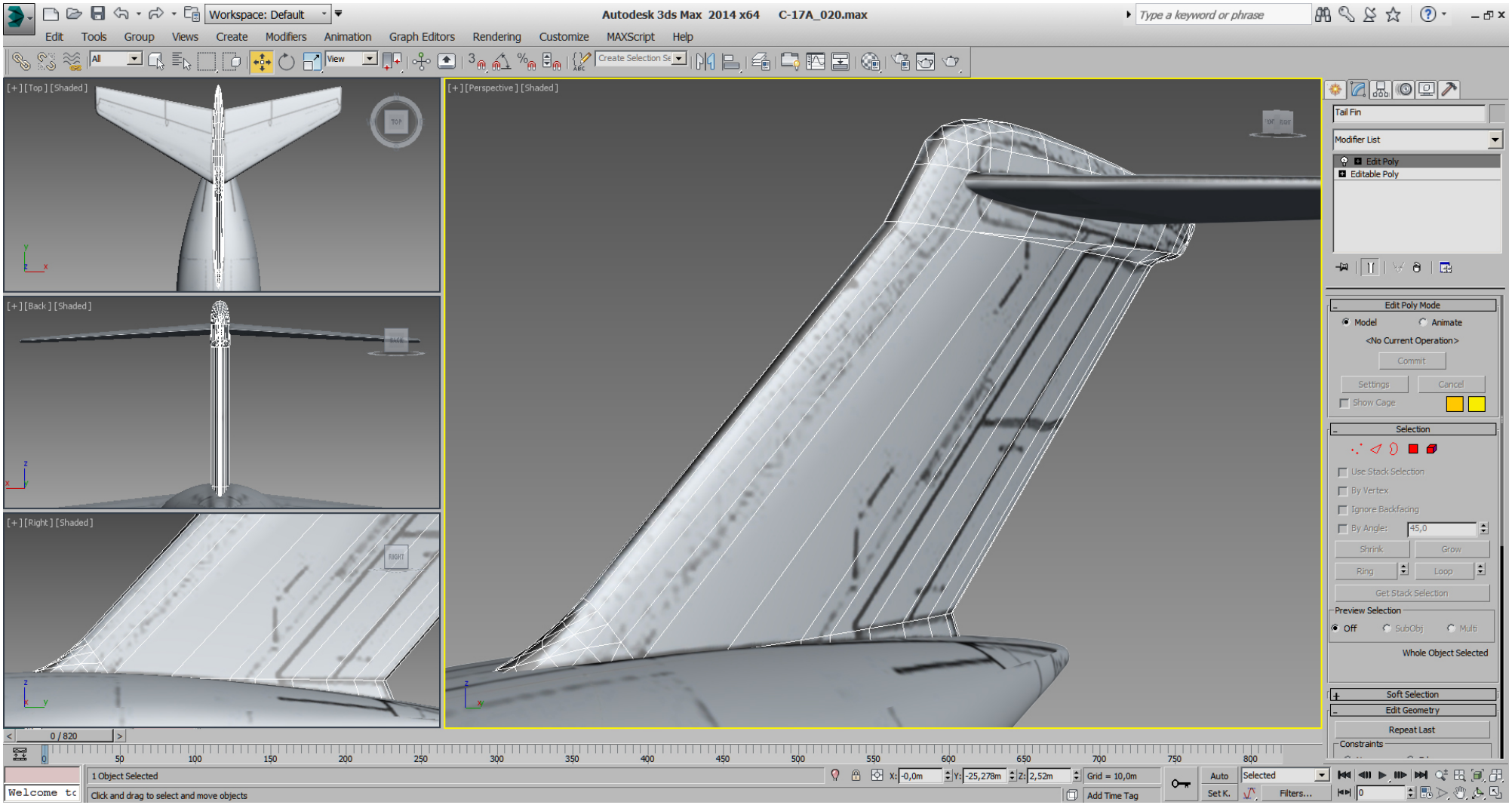
Here I placed the copy of the fuselage for boolean cutting operation:



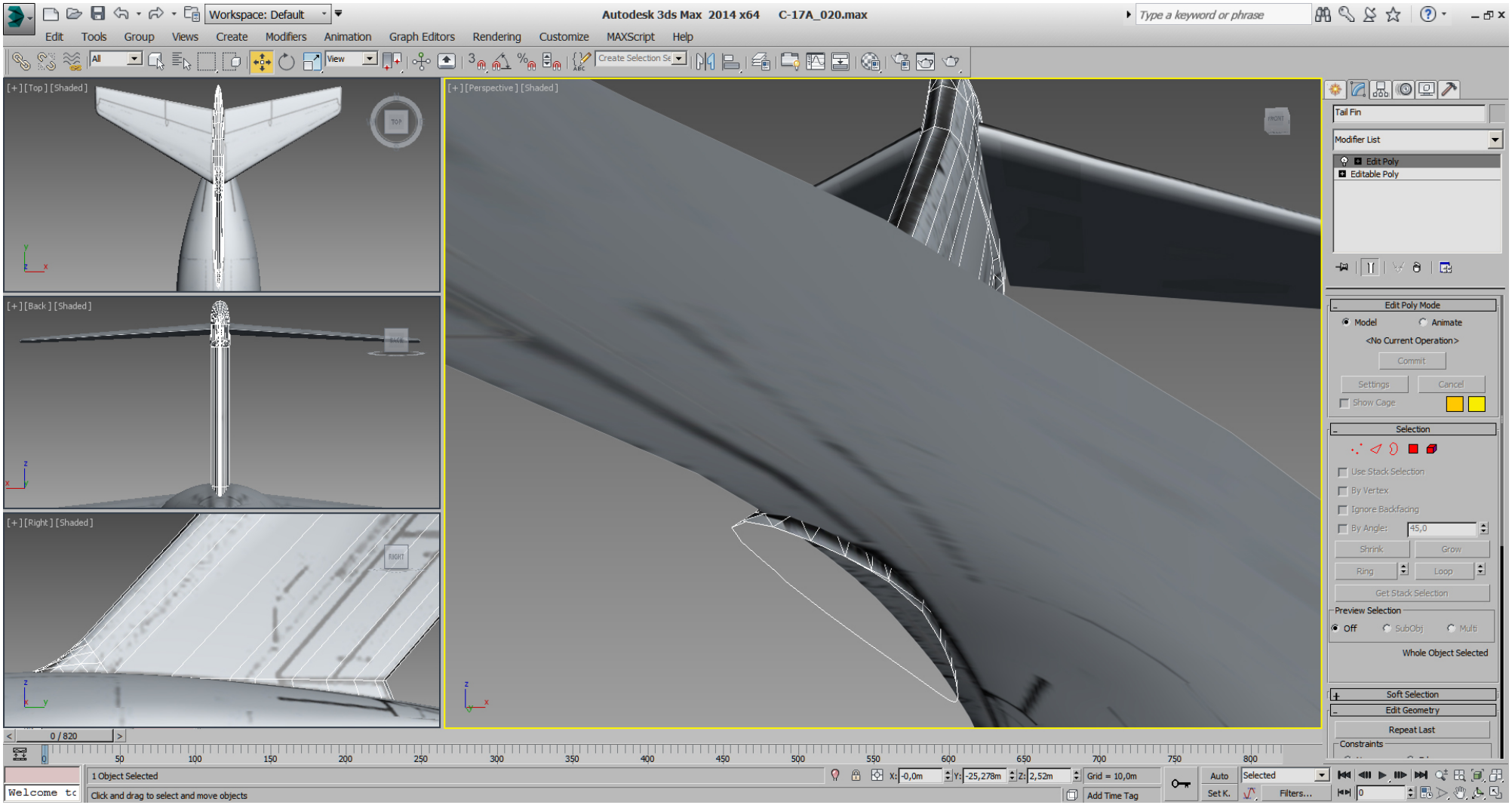
After the boolean operation and getting rid of more useless tris:



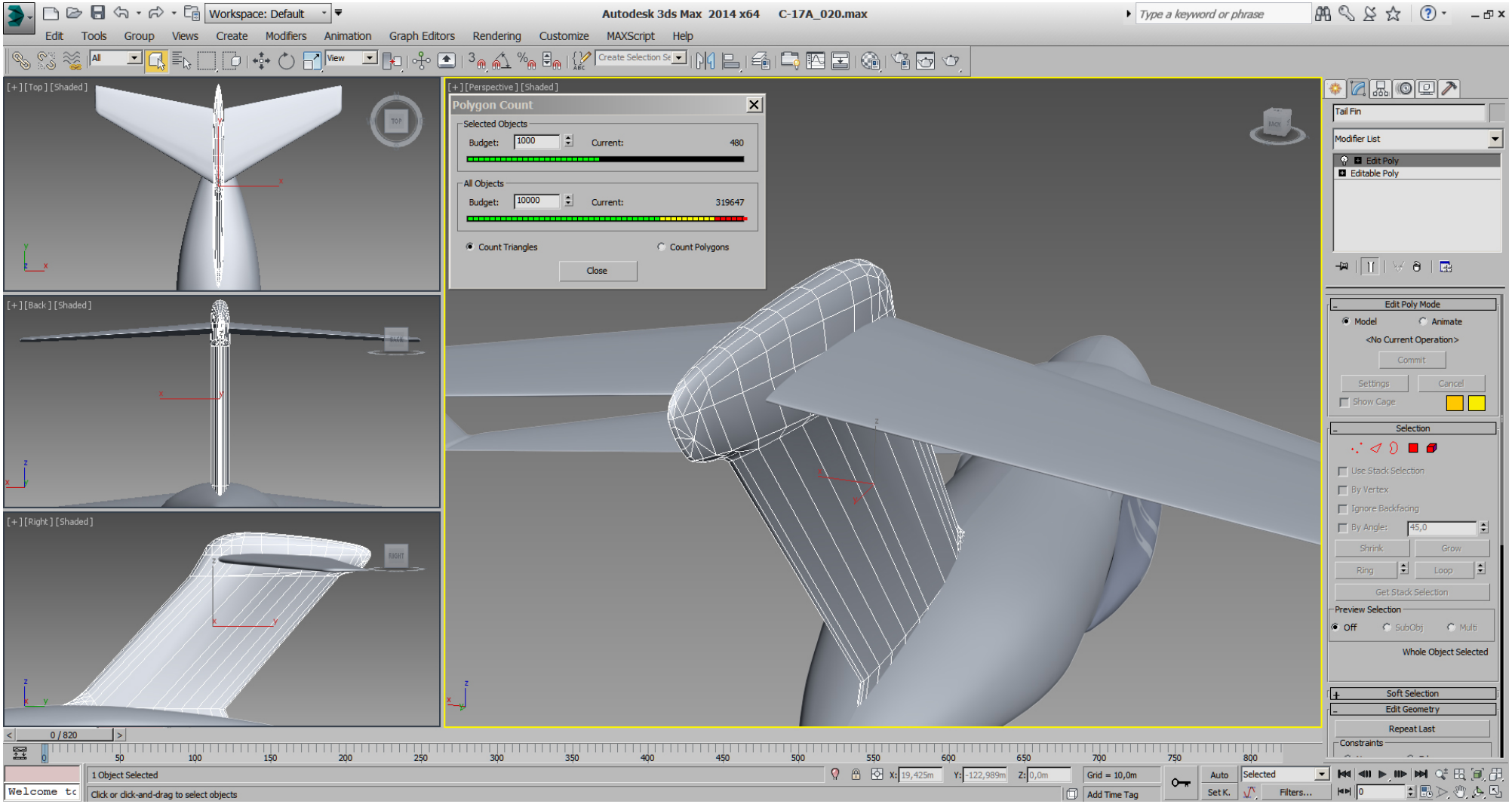
With the original fuselage back in place:



... and checking from inside the fuselage:



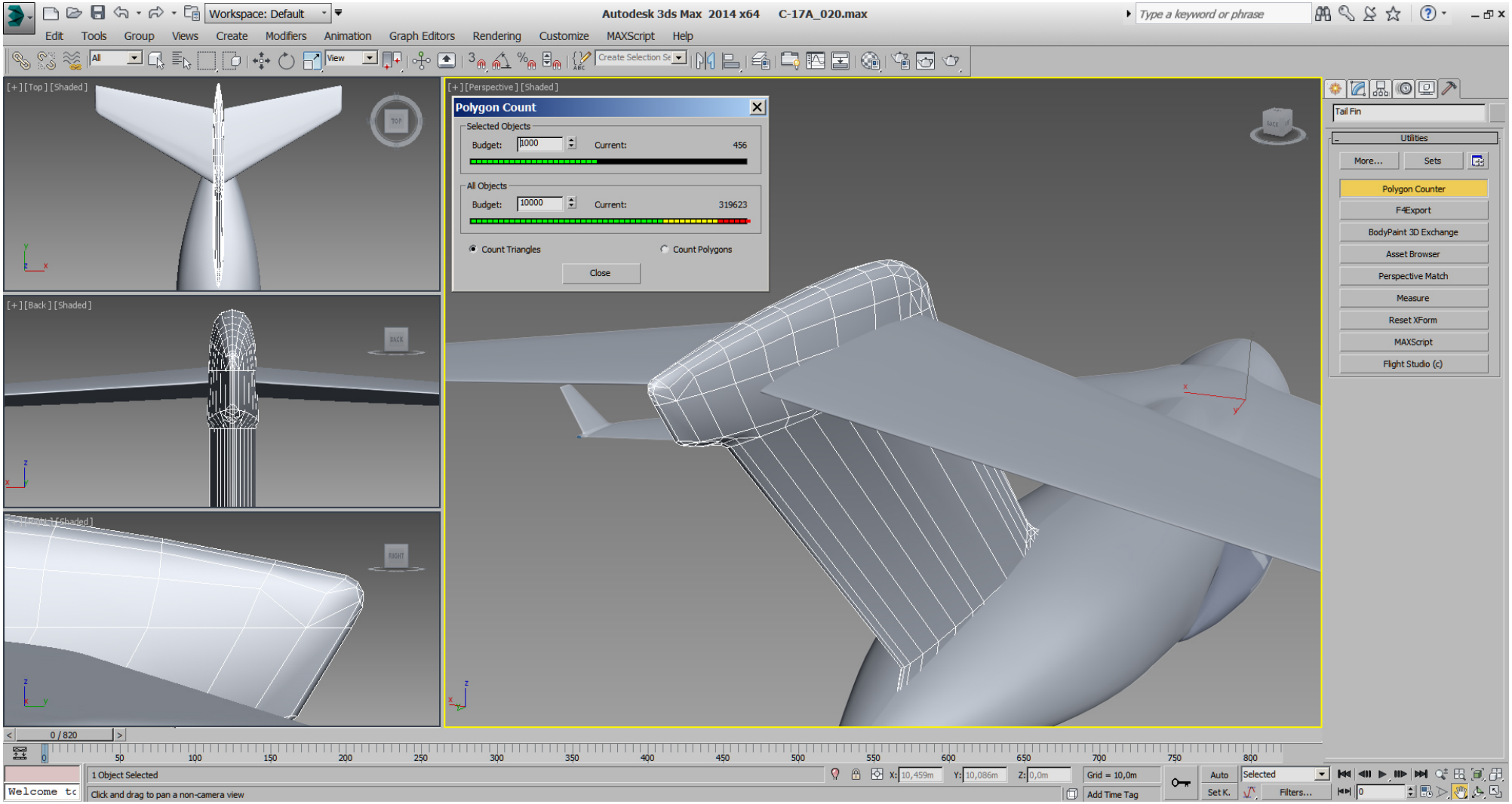
Atm. we are at 480 tris and I'll stop the optimizing at this point although there would be enough potential to go ahead, but I want to do that later, after the rudder has been cutted.

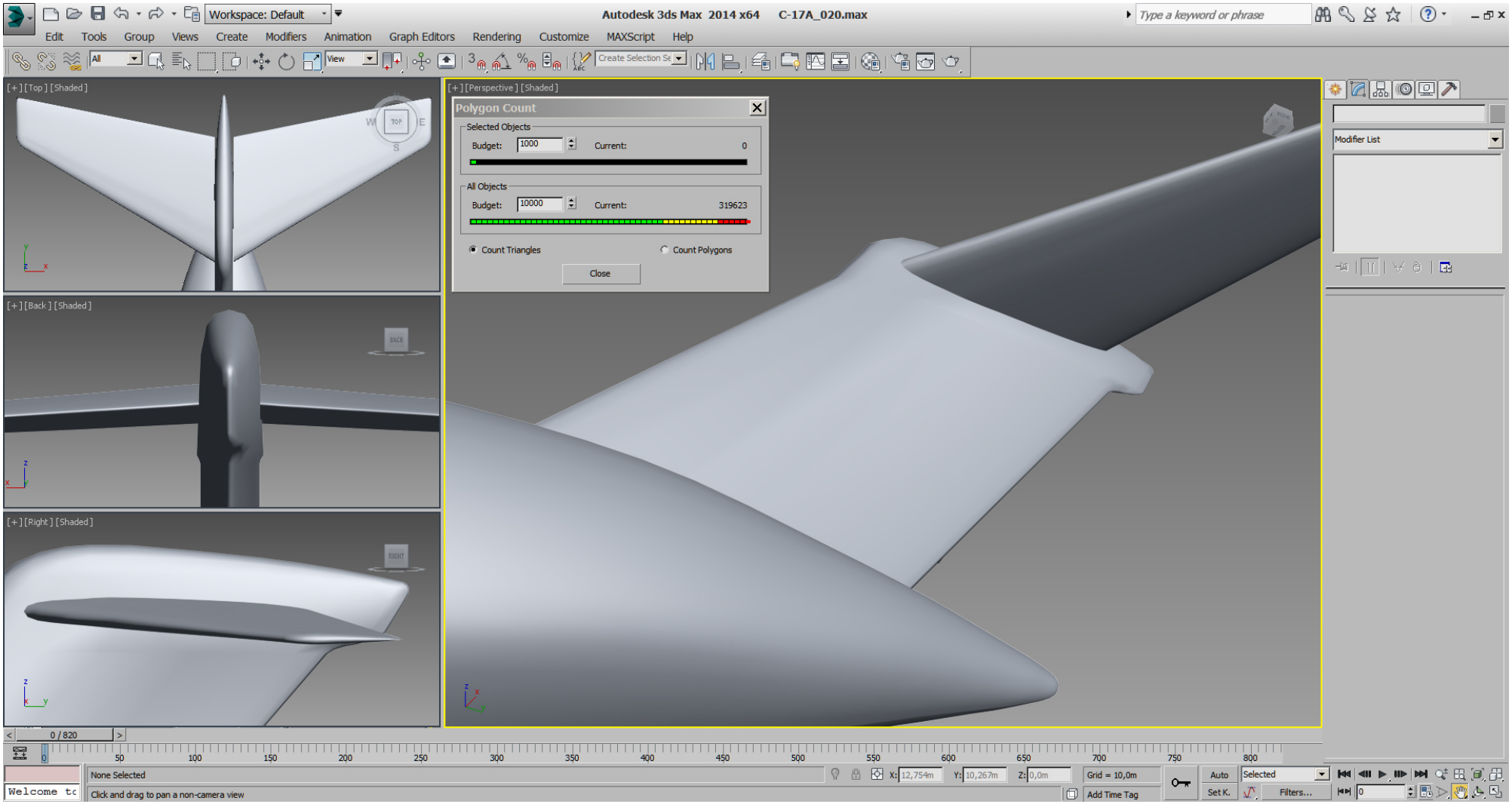


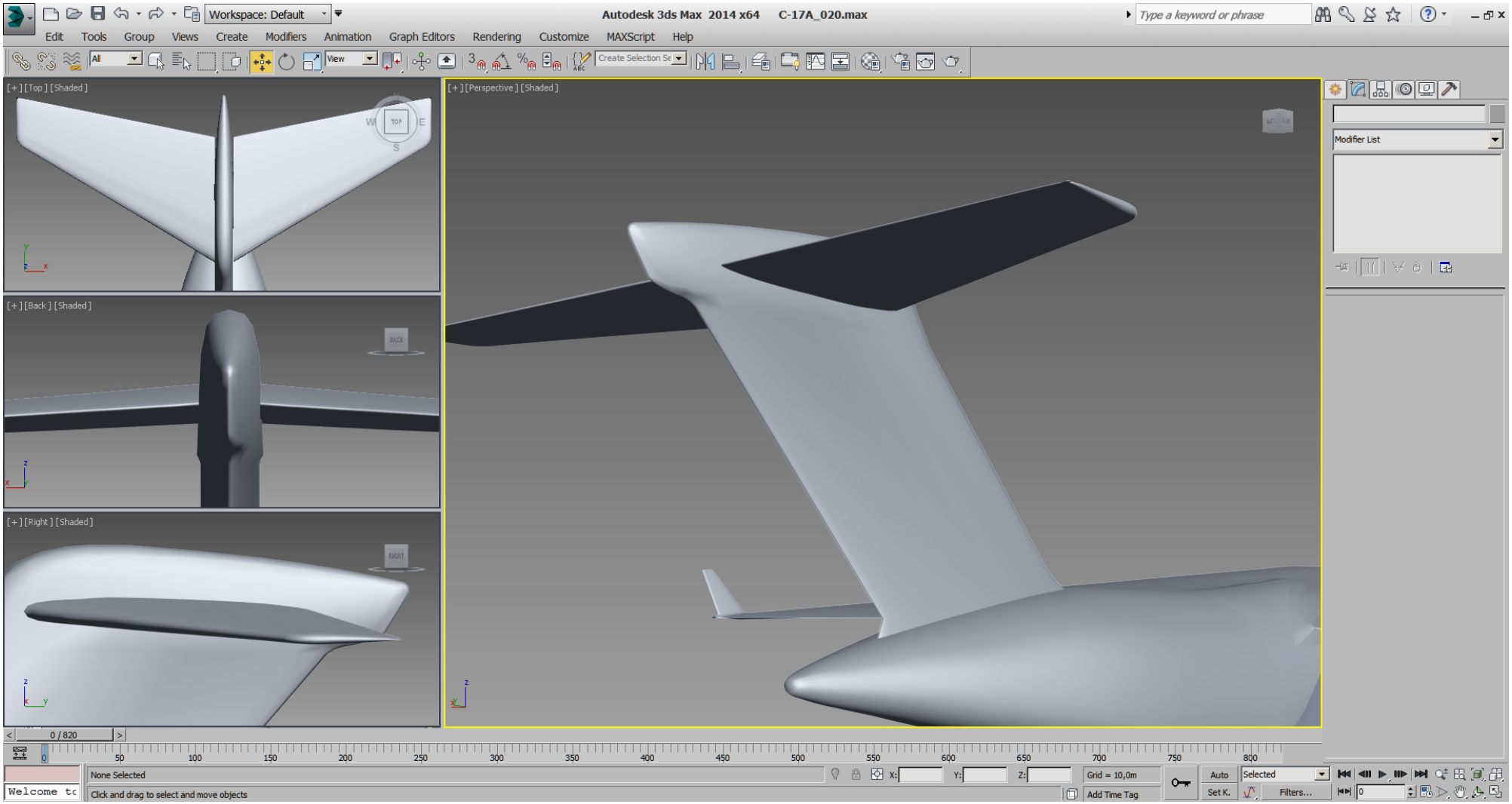
Anyway, you've seen the process of tri- optimizing so far, while coming from the “Edit Spline” modeling high tri- count.

There is no problem to optimize it down to the bone, so the question on tri optimizing for me is at what state do we stop. Surely at least when it start to hurt the geometry to much.

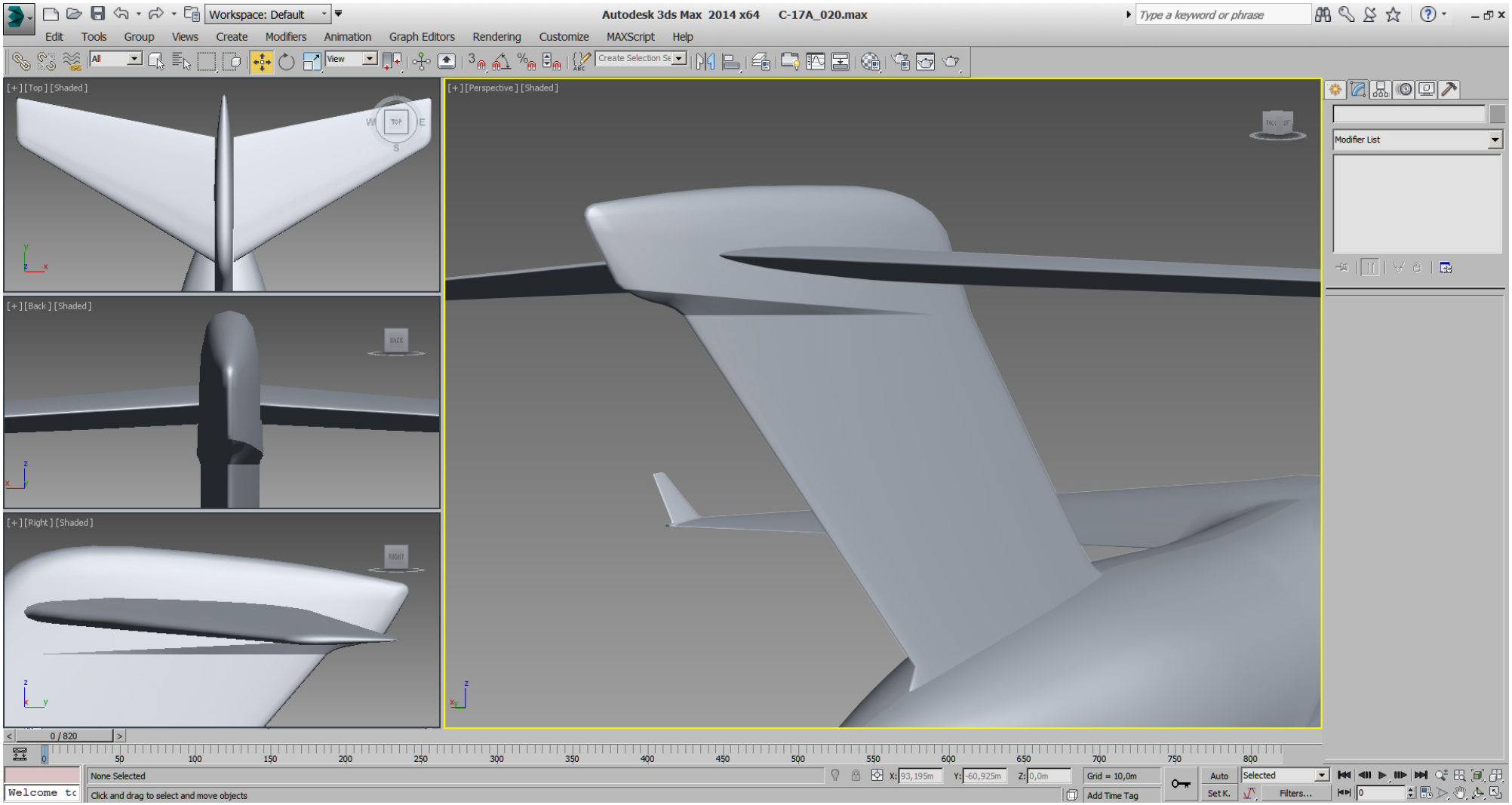
Comparing the vertically stabilizer to RL pictures, I've modified the back top end even more to get a smaller radius at the top end and been able to get rid of some more tris for modeling reasons. (not essentially for tri- count reasons)




Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_020.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Back][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Polygon Count
Selected Objects
Budget: 1000 Current: 0
All Objects
Budget: 10000 Current: 319623
Count Triangles
Count Polygons
Close
Modifier List
0 / 820
None Selected
Click and drag to pan a non-camera view
Add Time Tag
Auto
Set K.
Filters...
Selected

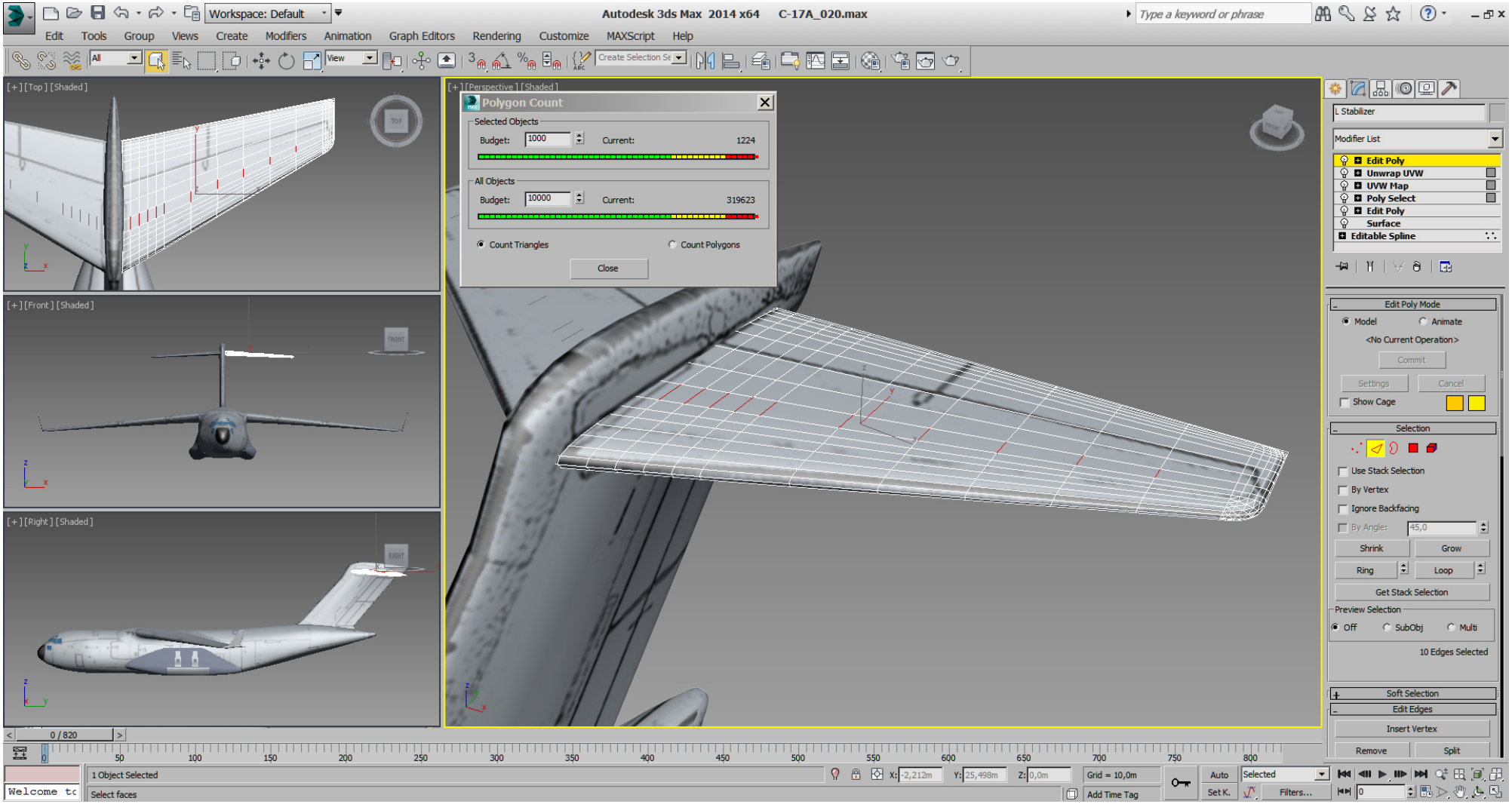

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_020.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Back][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
0 / 820
None Selected
Click and drag to select and move objects
Welcome to
Grid = 10,0m
Add Time Tag
Auto
Set K.
Selected
Filters...

One more thing, ... the vertically stabilizers geometry is all “Smoothing Group 1” atm.,
so some details are not shown. Therefore I gave the area of interest a (temporary) “Smoothing Group 2”,
so you can spot it better.
I'll not keep that SG, but do those effects on the texture instead.

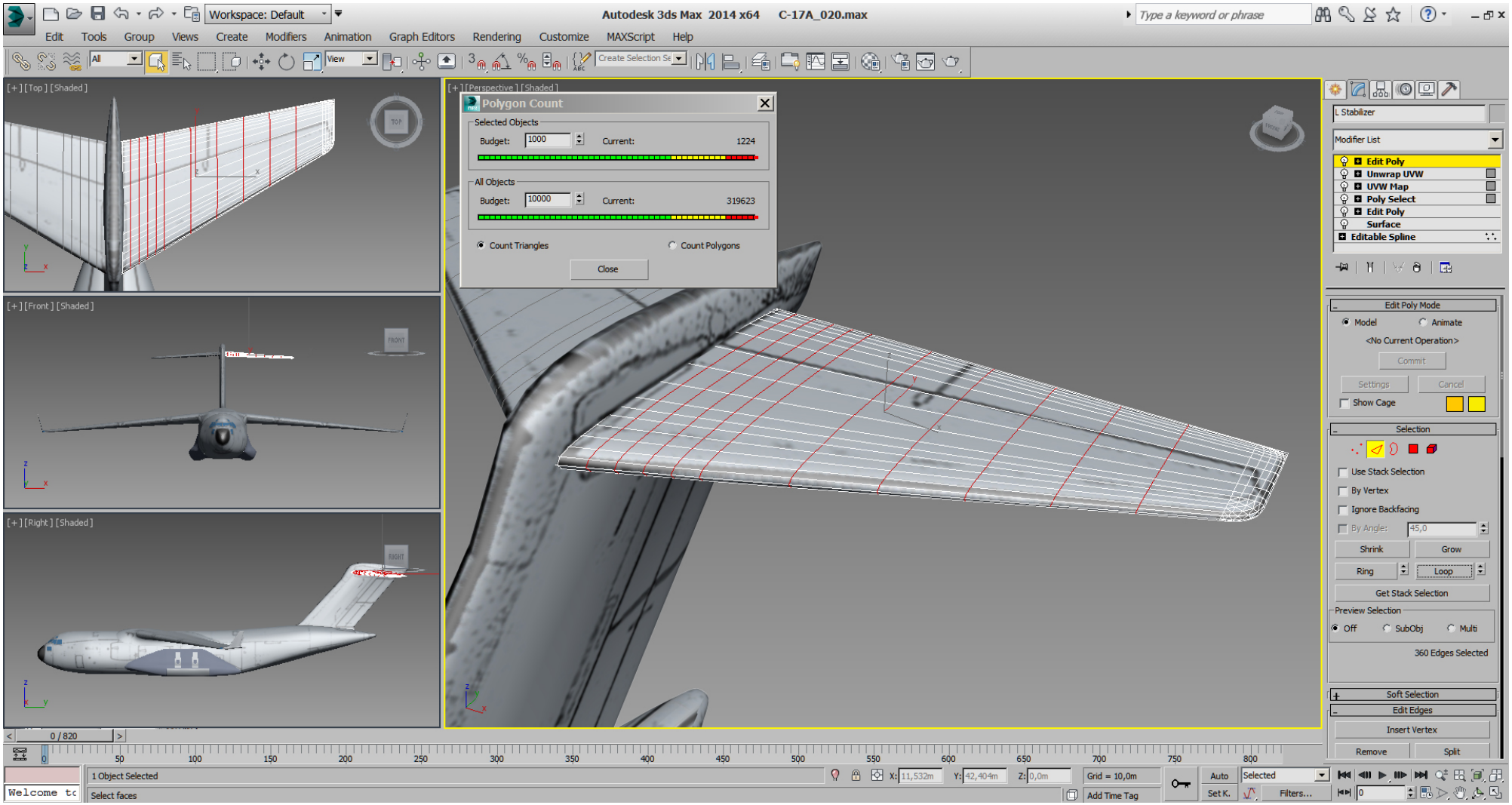


Next I did similar to the horizontally stabilizers.

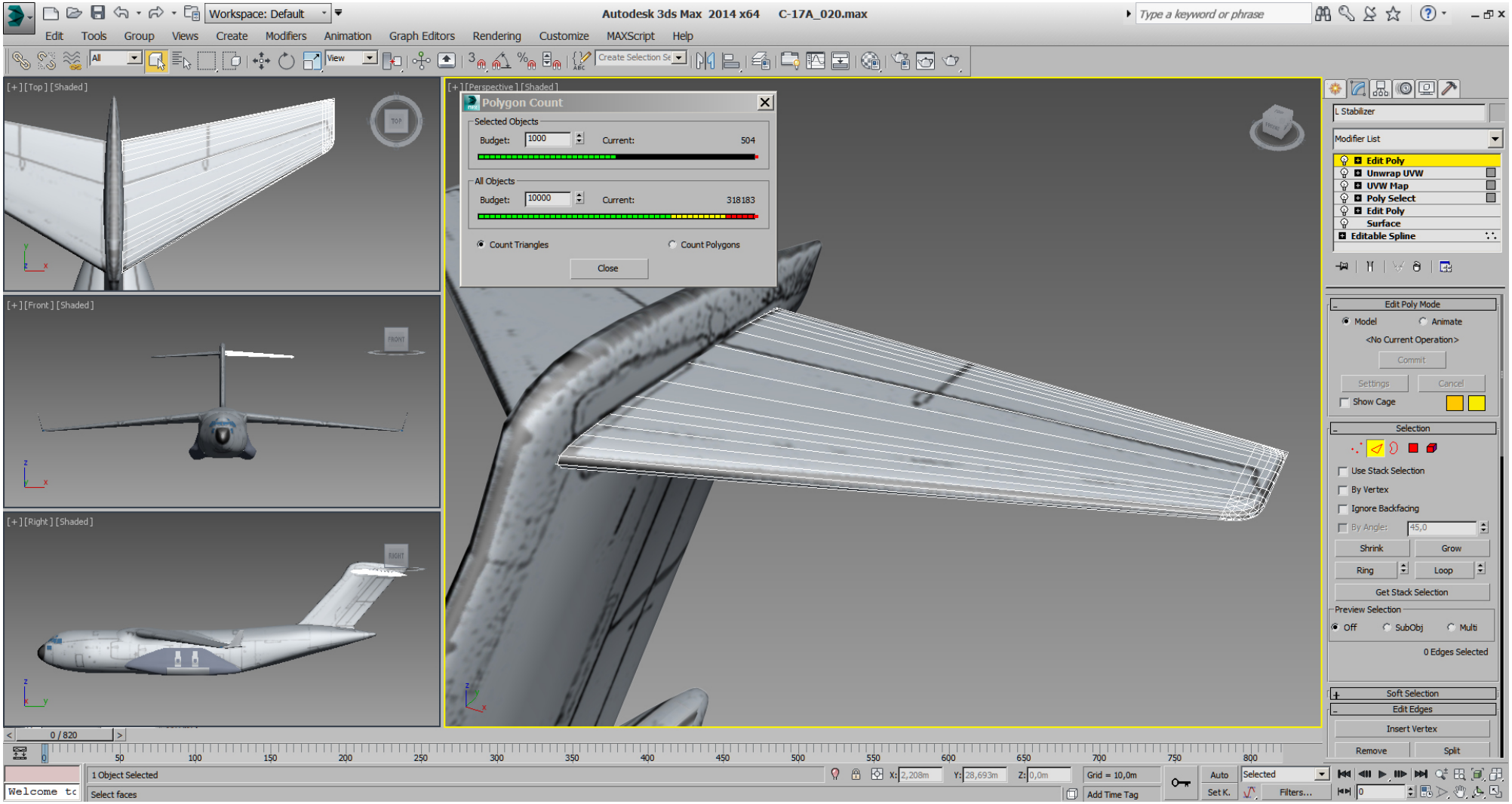
This is the actually situation.
Note the “Stack” and note the Poylcounter which shows 1224 tris for the selected object.
We are in “Edit Poly” mode -> subObject “Edge” and have selected some of those Y- direction edges.



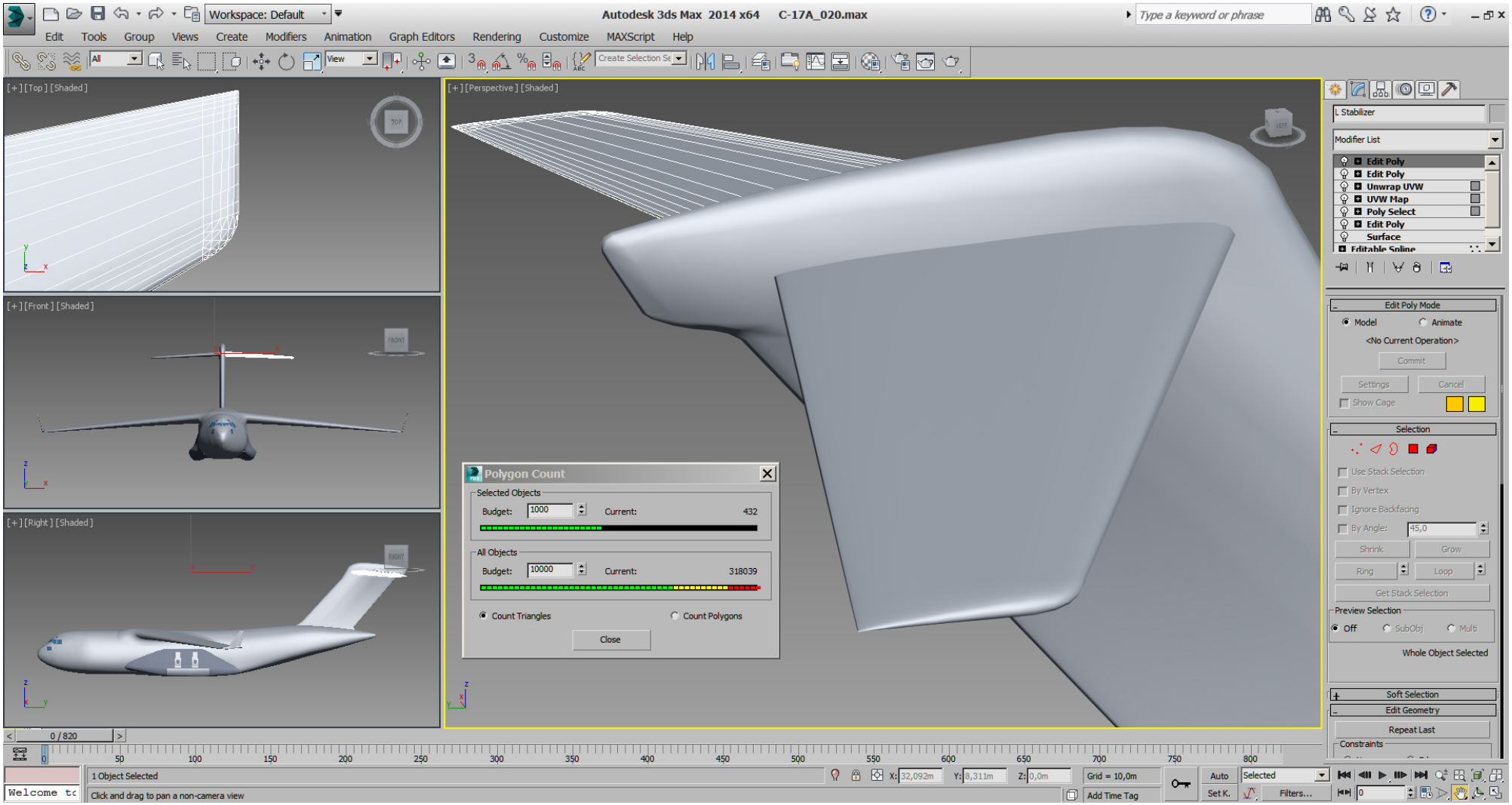
Next click “Loop” and got all the Y- direction edges selected.



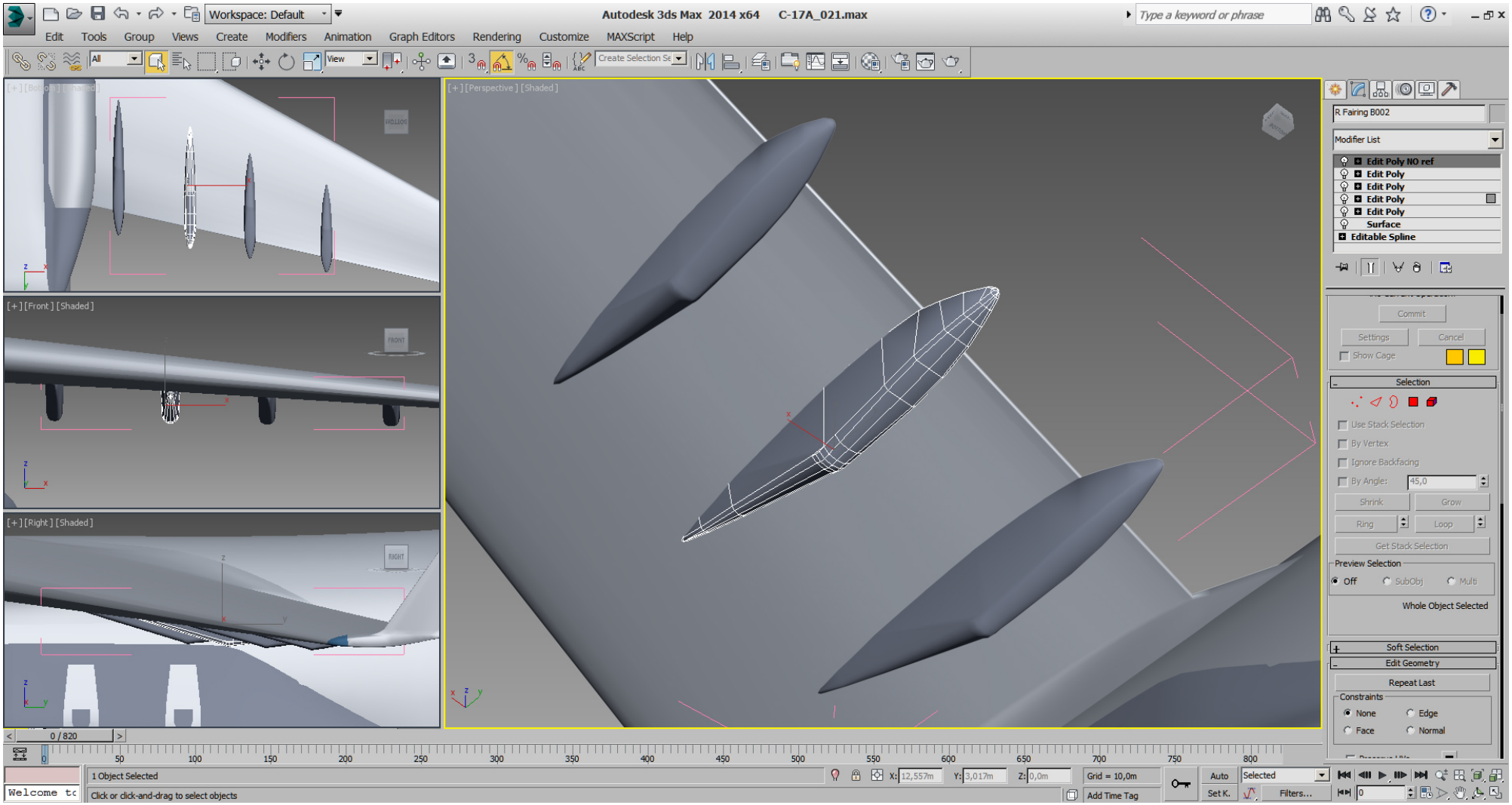
After pressing CTRL + BKSP they are gone, ... tri- count is 504 now.

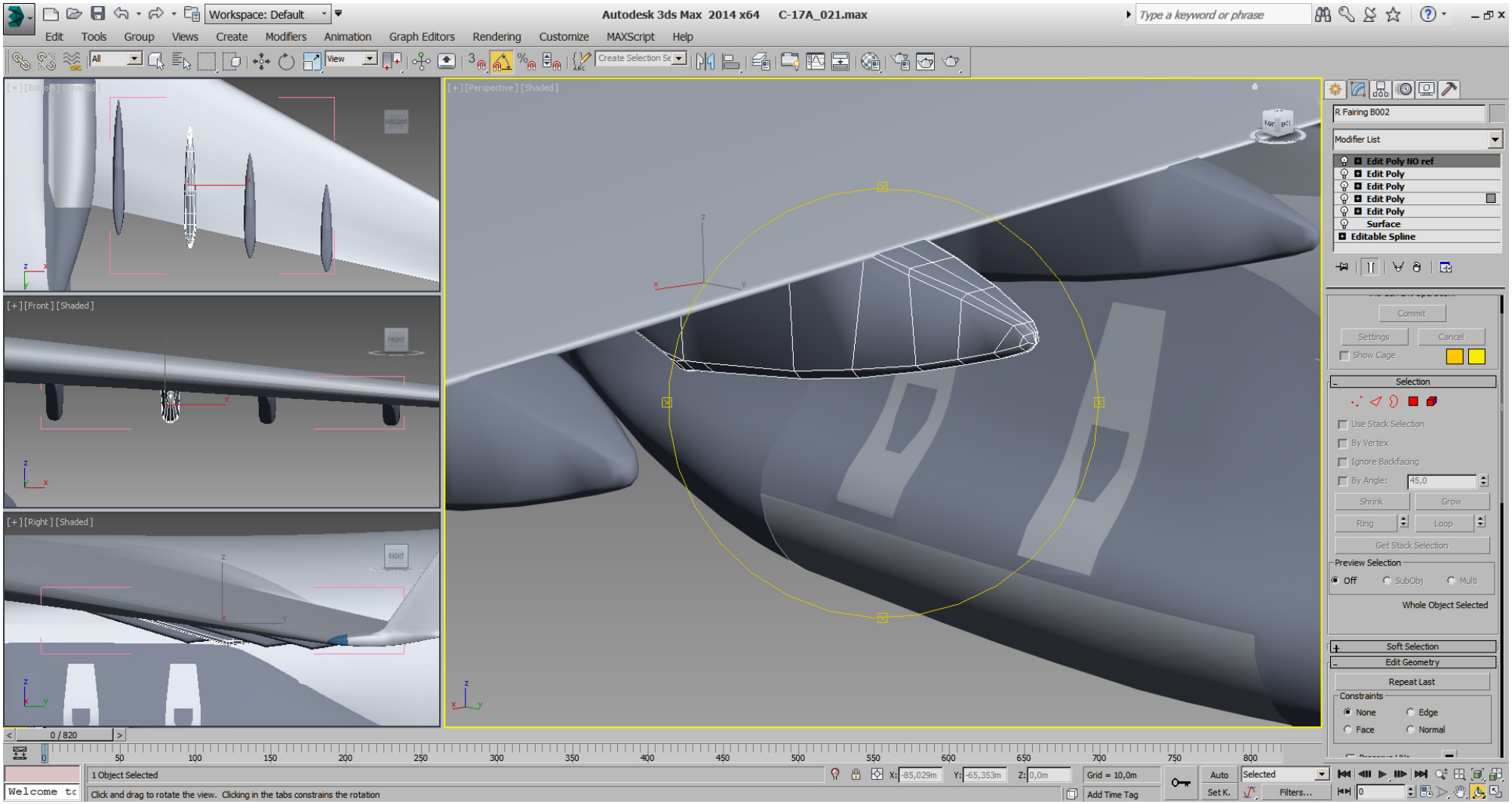


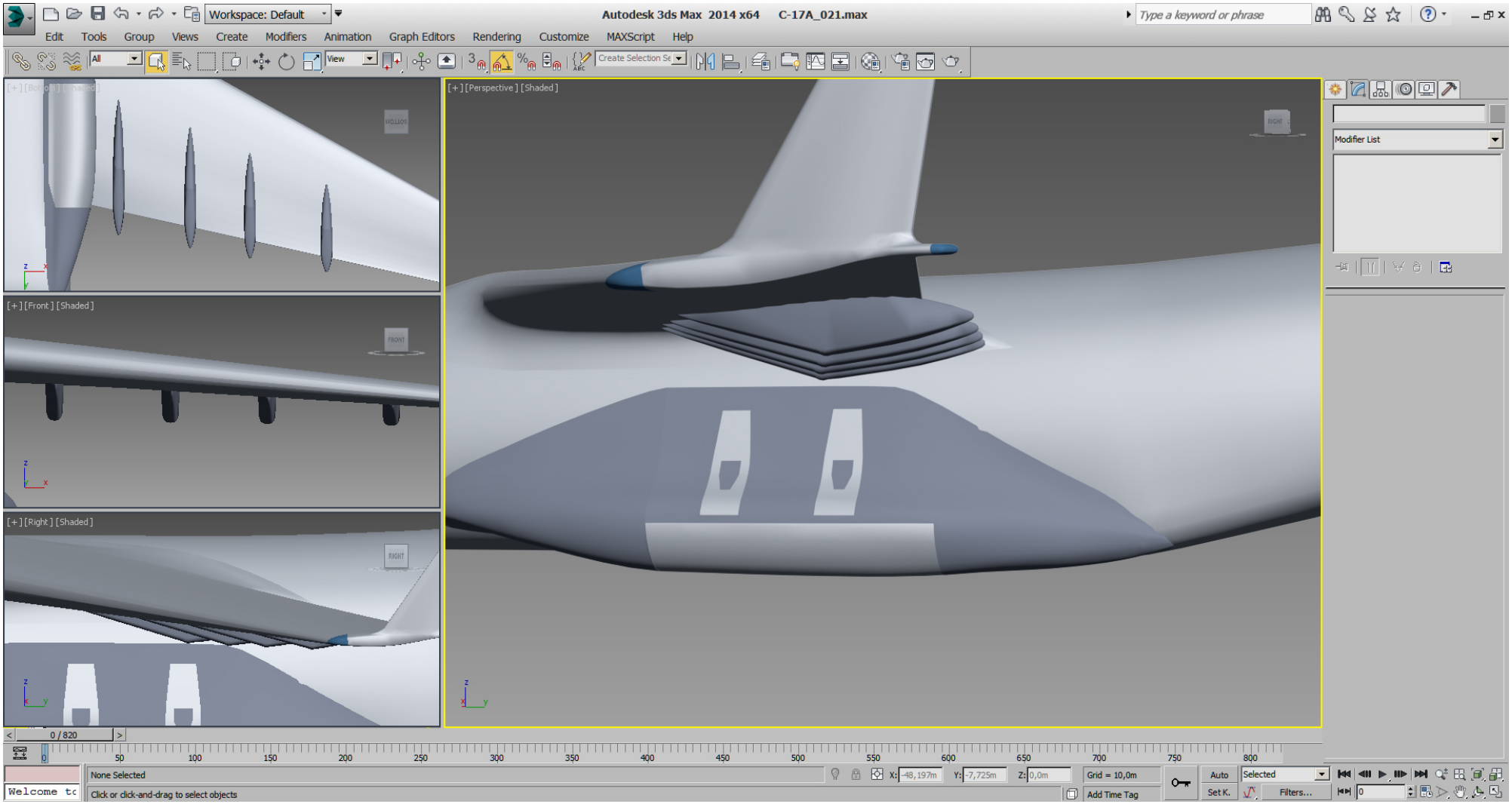
But my main concern was to make corrections and fine tuning to the shape, especially on the wingtip.



With the main model in good shape so far, we can add the fairings to the wings.



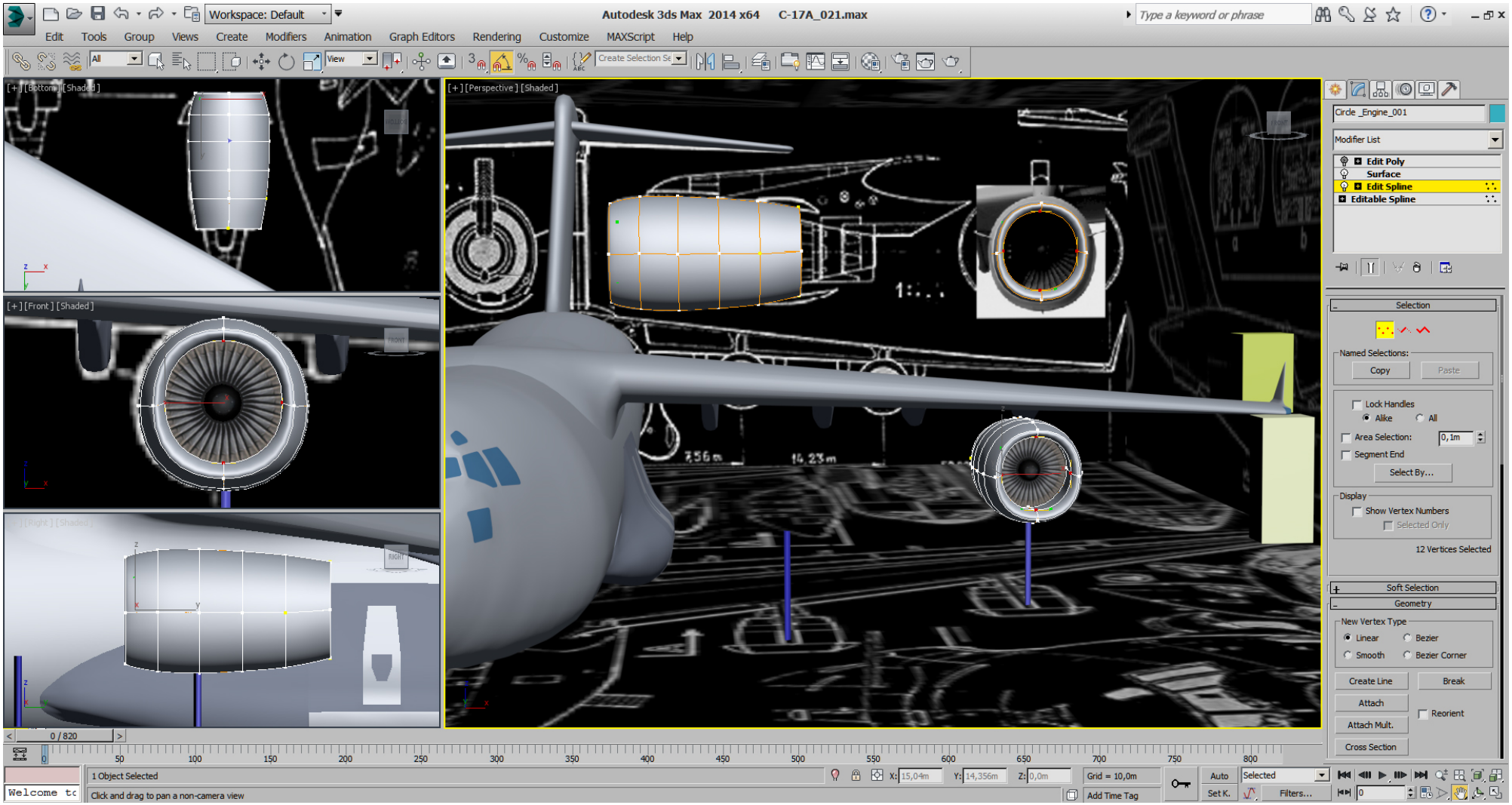

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_021.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
R Fairing B002
Modifier List
Edit Poly NO ref
Edit Poly
Edit Poly
Edit Poly
Edit Poly
Surface
Editable Spline
Commit
Settings
Cancel
Show Cage
Selection
Use Stack Selection
By Vertex
Ignore Backfacing
By Angle:
Shrink
Grow
Ring
Loop
Get Stack Selection
Preview Selection
Off
SubObj
Multi
Whole Object Selected
Soft Selection
Edit Geometry
Repeat Last
Constraints
None
Edge
Face
Normal
0 / 820
1 Object Selected
Click and drag to rotate the view. Clicking in the tabs constrains the rotation
Grid = 10,0m
Add Time Tag
Auto
Set K.
Filters...
Selected



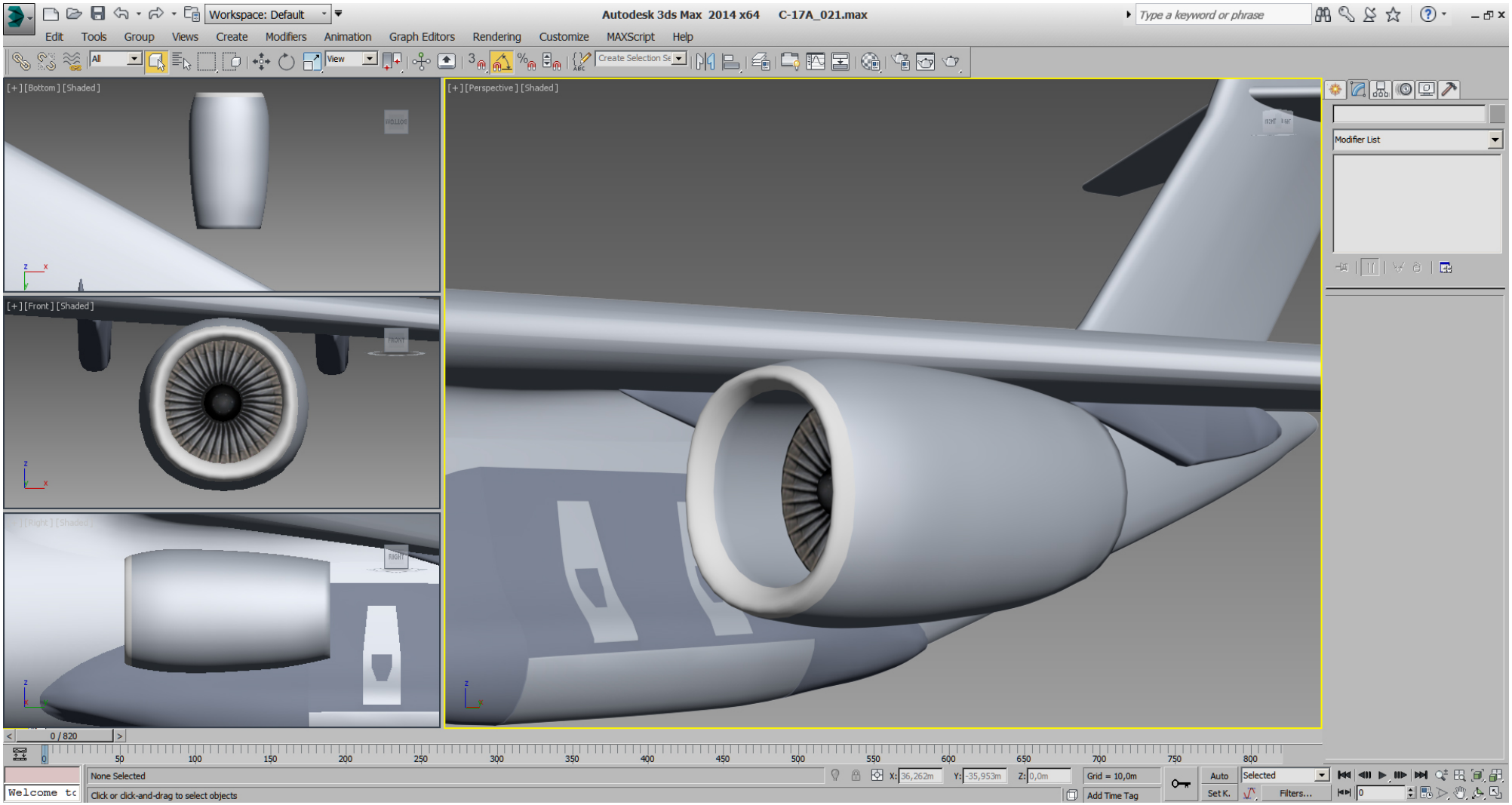
They are not final at all, and need more work when we'll cut the flaps.

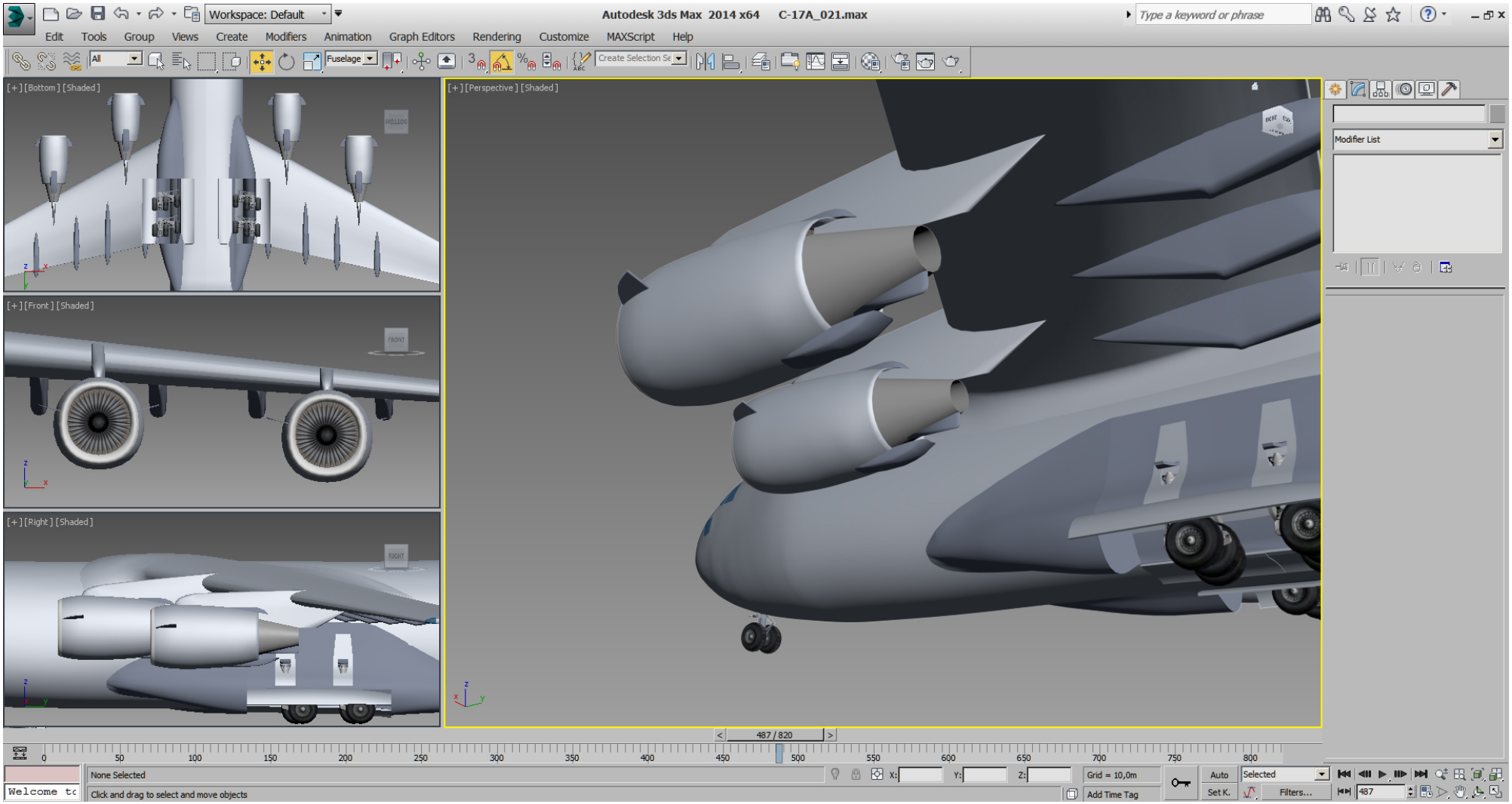
Next are the Pratt & Whitney F117-PW-100 engines. And in the next picture are few things to spot.
Beside some cylinders and boxes for measuring purpose, it started with some circles in spline modeling again.

I've moved/aligned two instanced copies to the back wall blueprint and put the best front view RL- picture I had on the blueprint texture.
So I hope I've got that engine shape nearly correct, especially the front shape of the engine.
The fan disc texture is just a quick and dirty one, which doesn't turn well if rotated, but good as placeholder for the moment.

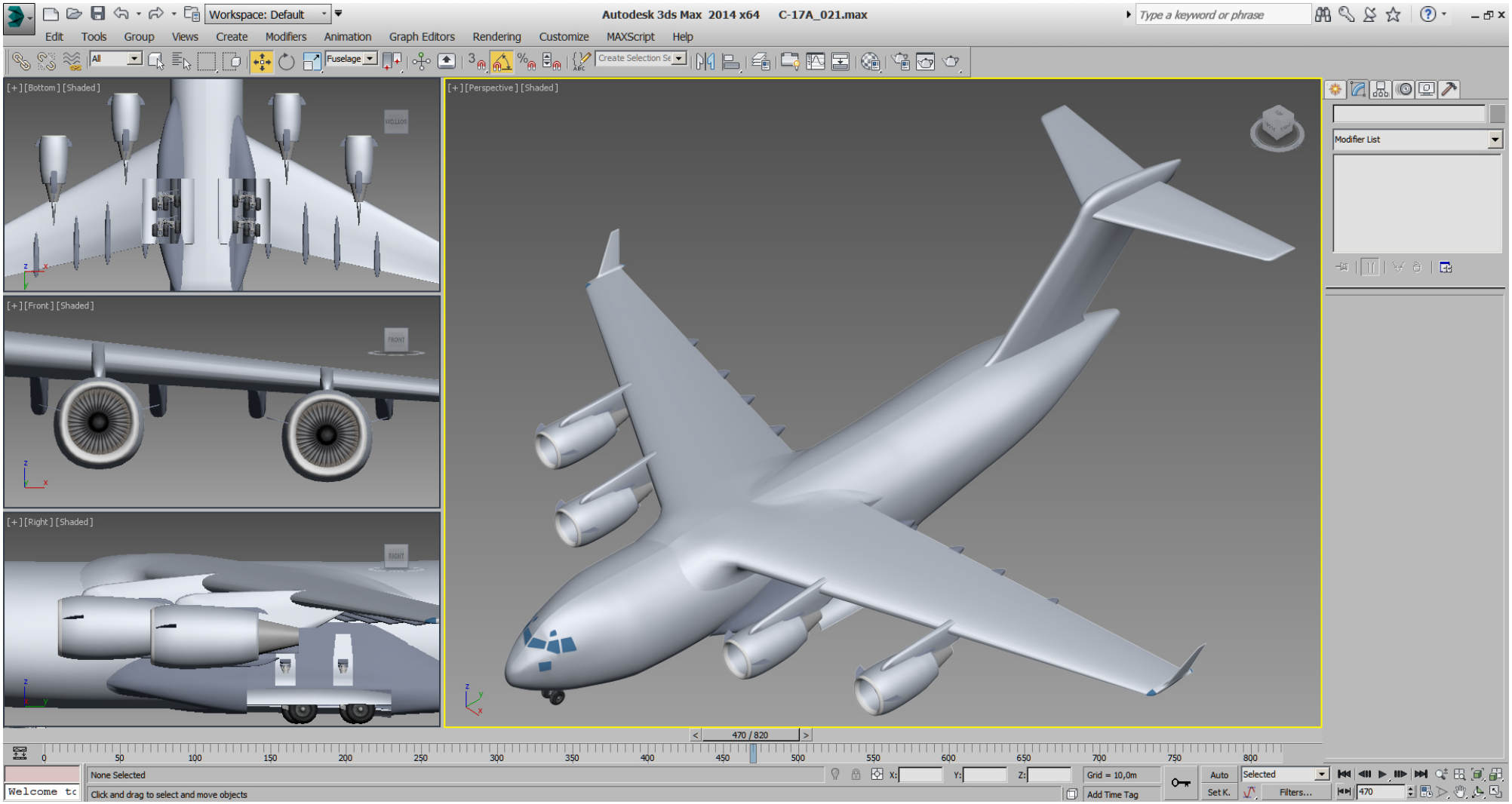


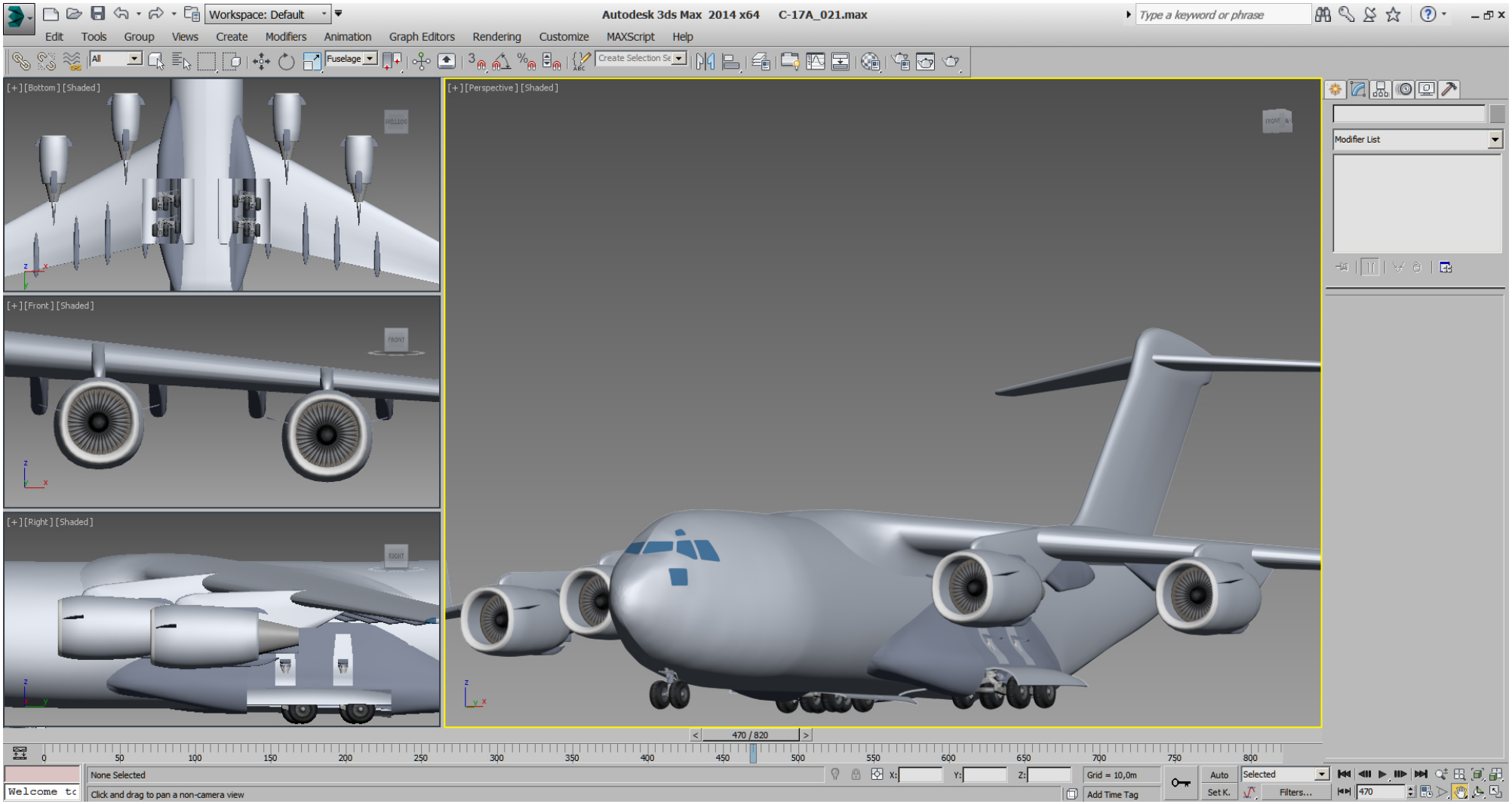
To spot the shape of the front better during modeling, I've added a pure white material to the "Multi- Material" and adjusted the front tris to that material ID, using an "Edit Poly" modifier on top of the "Stack".




Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_021.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Bottom][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
487 / 820
None Selected
Click and drag to select and move objects
Add Time Tag
Grid = 10,0m
Auto
Set K.
Selected
Filters...
Welcome to

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_021.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Bottom][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
343 / 820
None Selected
Click and drag to select and move objects
Add Time Tag
Grid = 10,0m
Auto
Set K.
Selected
Filters...
Welcome to


Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_021.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Bottom][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
470 / 820
None Selected
Click and drag to select and move objects
Welcome to
Grid = 10,0m
Add Time Tag
Auto
Set K.
Selected
Filters...

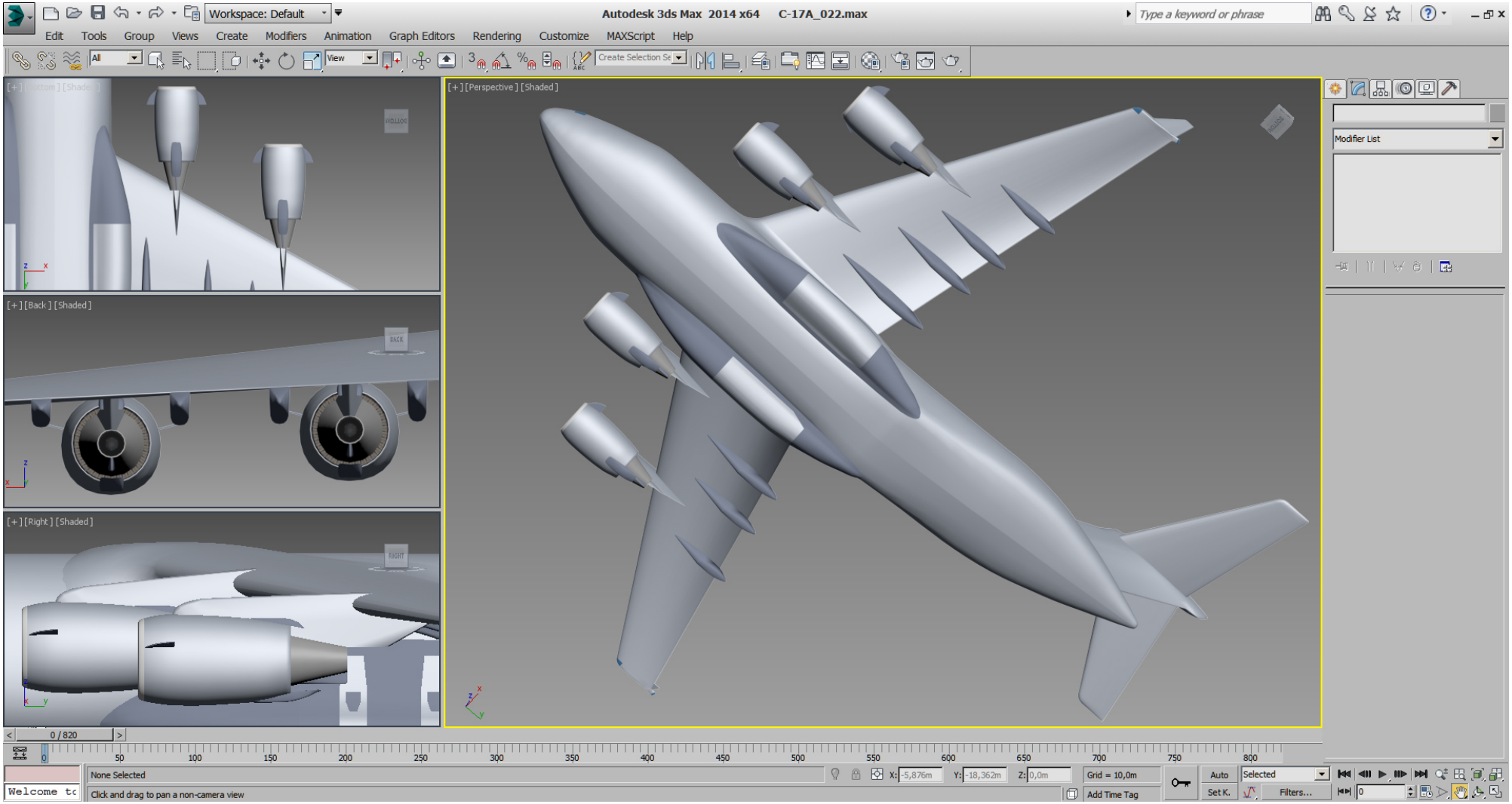


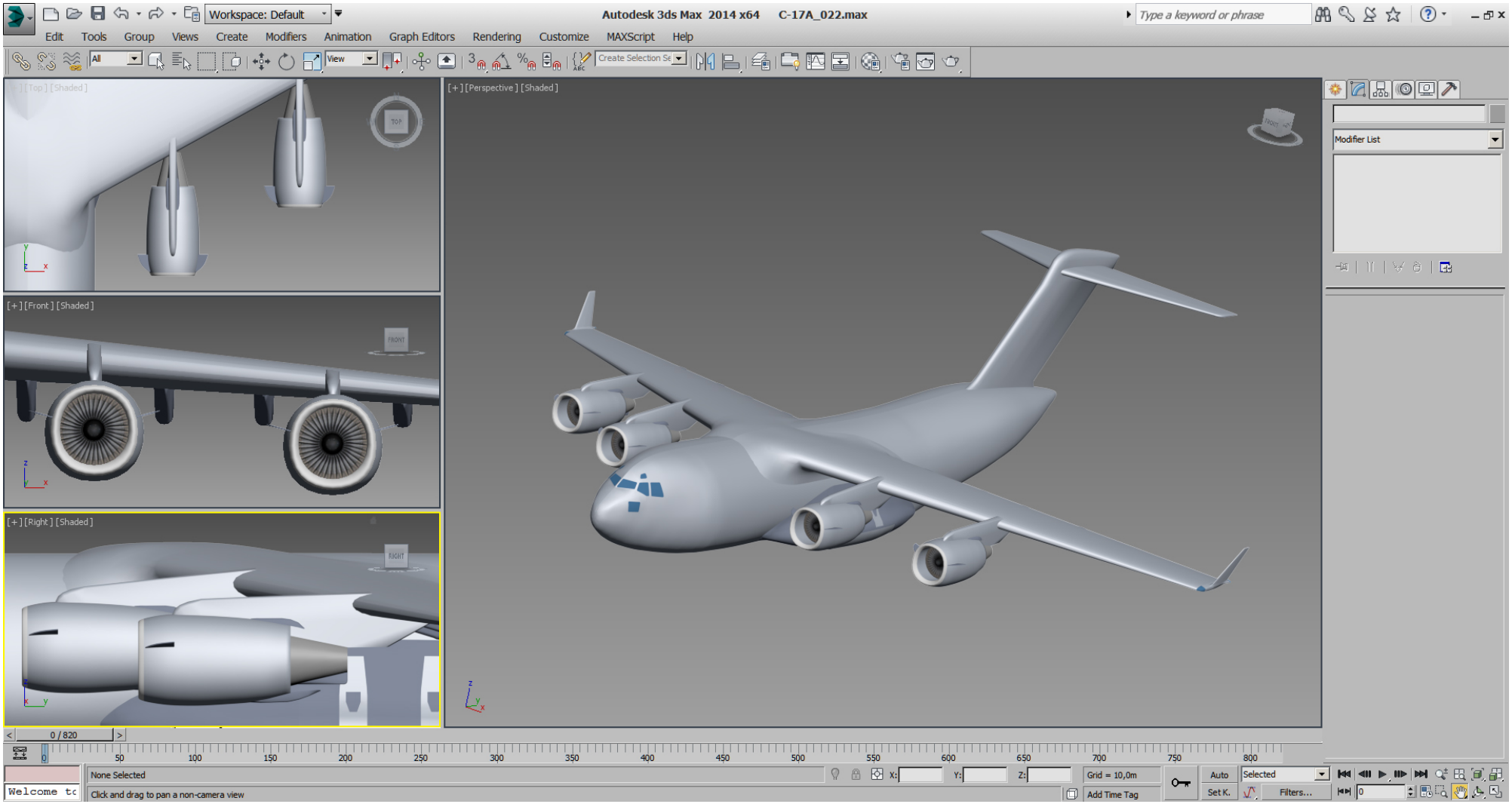
Atm. I'm not happy with the outer engines position, compared to the fairings which is especially visible in front view, where the engine is not centered between them.

Here is something wrong and needs to get fixed before we start to prepare the cutting of the flaps and slats.

And after some investigation it turns out that the blueprint is wrong here.
So I've adjusted all engines in X- and Y- position to known RL measured values and proofed that even with a good top RL reference picture UVW mapped directly on the wing.

Then I've adjusted the fairings positions accordingly.
Here are the corrected results:




Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_022.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
0 / 820
None Selected
Click and drag to pan a non-camera view
Grid = 10,0m
Add Time Tag
Auto
Set K.
Selected
Filters...
Welcome to

Well, if we would now cut the flaps and stuff according to the wrong blueprint, then we would muck up our wing completely.

I've already UVW remapped (planar) the wing with more care, to compare and fix the engines position in the last step.
Additionally to the blueprint I've some RL pictures in place on the texture.

So instead of cutting relative uncontrolled into the wing, we can mark the area to cut by using the mapped texture,
... and have the markings directly on the model like we would do when we work with wood.

To paint panel lines and stuff on the texture, I use “Paths” in Photoshop.

A “Path” in Photoshop can be created and modified in similar way of any vector graphic software like CorelDraw.
Need a circle, a quad or a line, etc., create/modify it, and copy/paste and place it multiple times, no problem.
Paths in PS can be used in many ways, ... you can fill closed paths with any color, you can make an selection from a closed path,
(both useful for camo creation).
You can even make a path from a RGB selection.

And you can create lines or rivets from open or closed paths using a line brush or a rivets brush. (... any brush)

Once all (for example) panel lines are created as paths, it's just a few mouse clicks to make a RGB layer out of them.
Now if some lines or the brush needs a change, I delete the lines from RGB layer, adjust the line paths in Path layer,
and then recreate the RGB layer from that modified Path layer with a new brush setting.

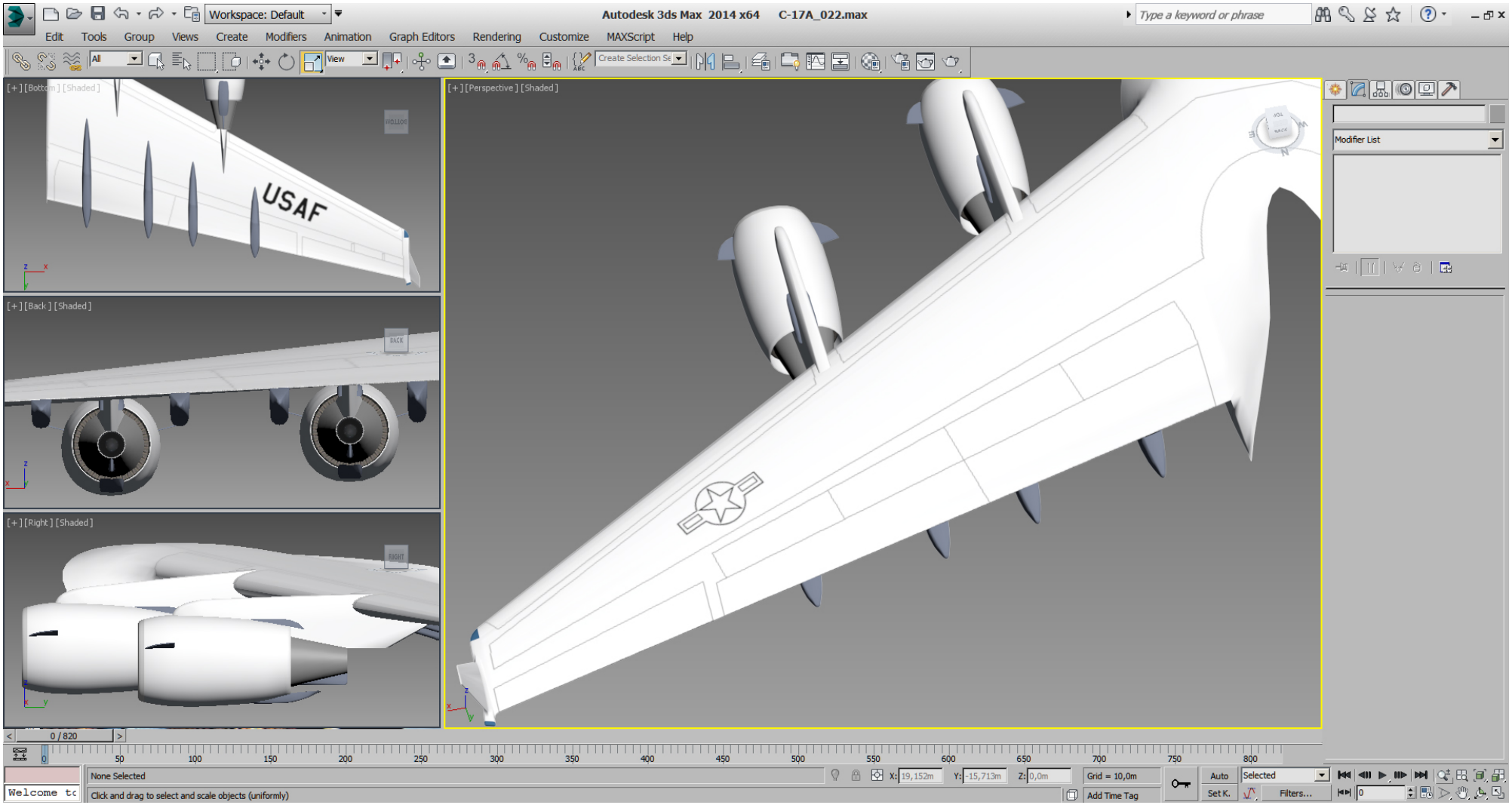
RGB layer means a standard layer, the "Path" layer is an extra layer which holds no pixel info, but vector info,
and you work with both layers.

I could list some more examples, and for sure paths in PS might be not that comfortable to use as in CorelDraw,
but I use "Paths" whenever I need them, because they are that useful.

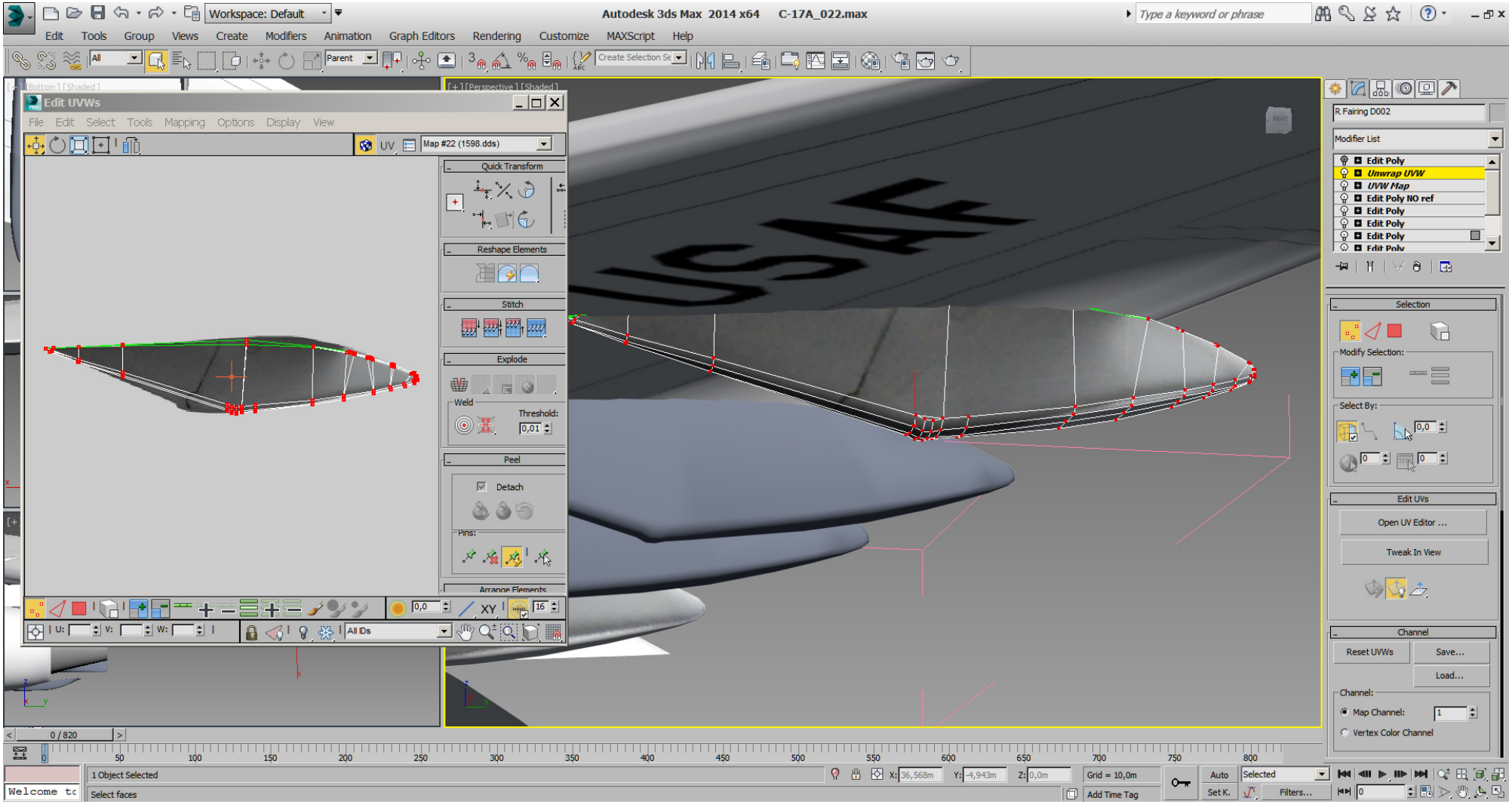
Beside the lines to mark the flaps, slats and aileron for cutting, I did some more lines and even the USAF marking
(using Amarillo USAF font) which will be needed later anyway, so no work is useless or lost.

And no, neither the UVW mapping nor the place on the texture is final, but good for doing some paintjob now,
to get also more references on the wing.

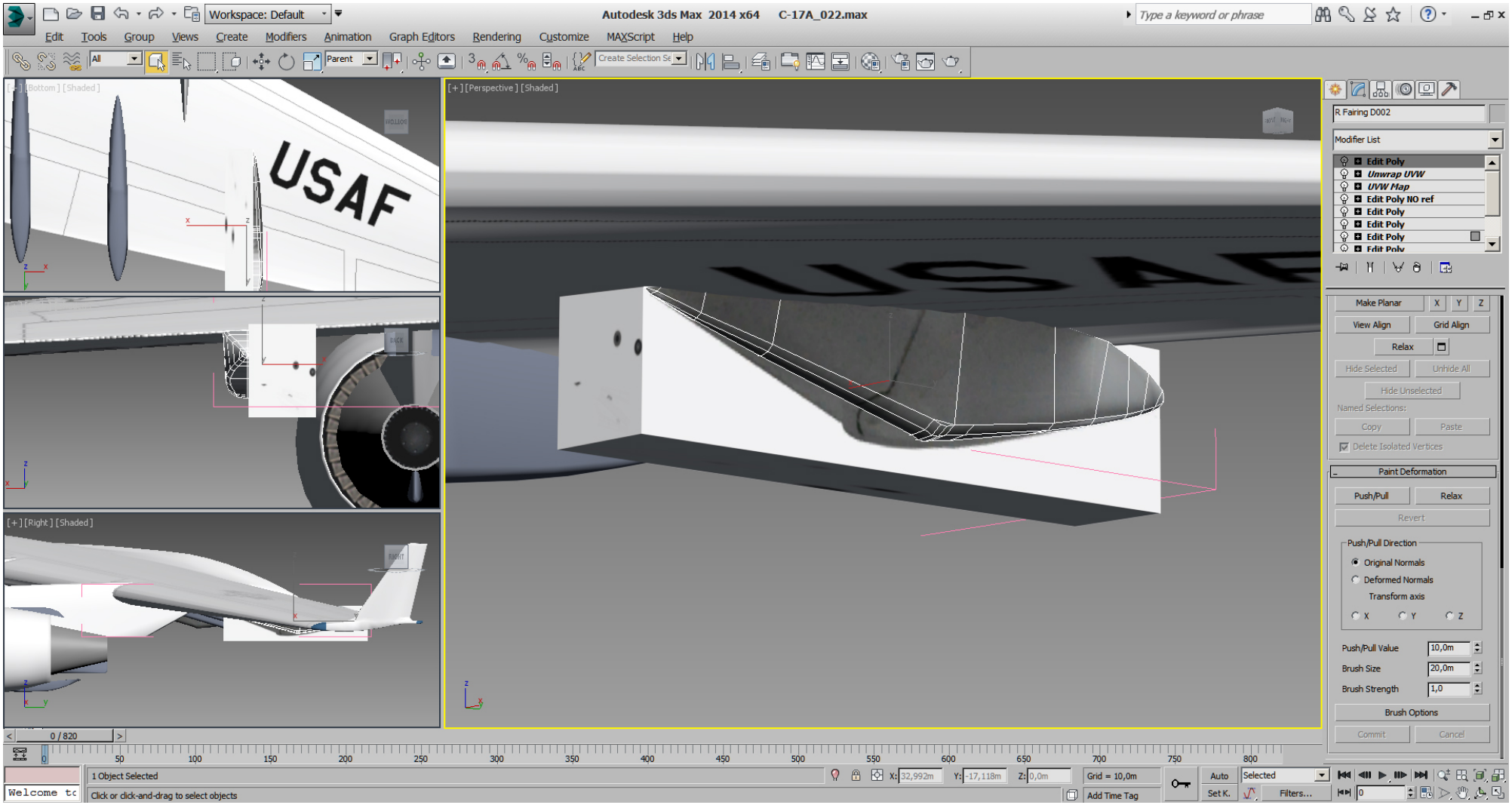
The first goal here is to get top wing lines and bottom wing lines of the control elements in sync.



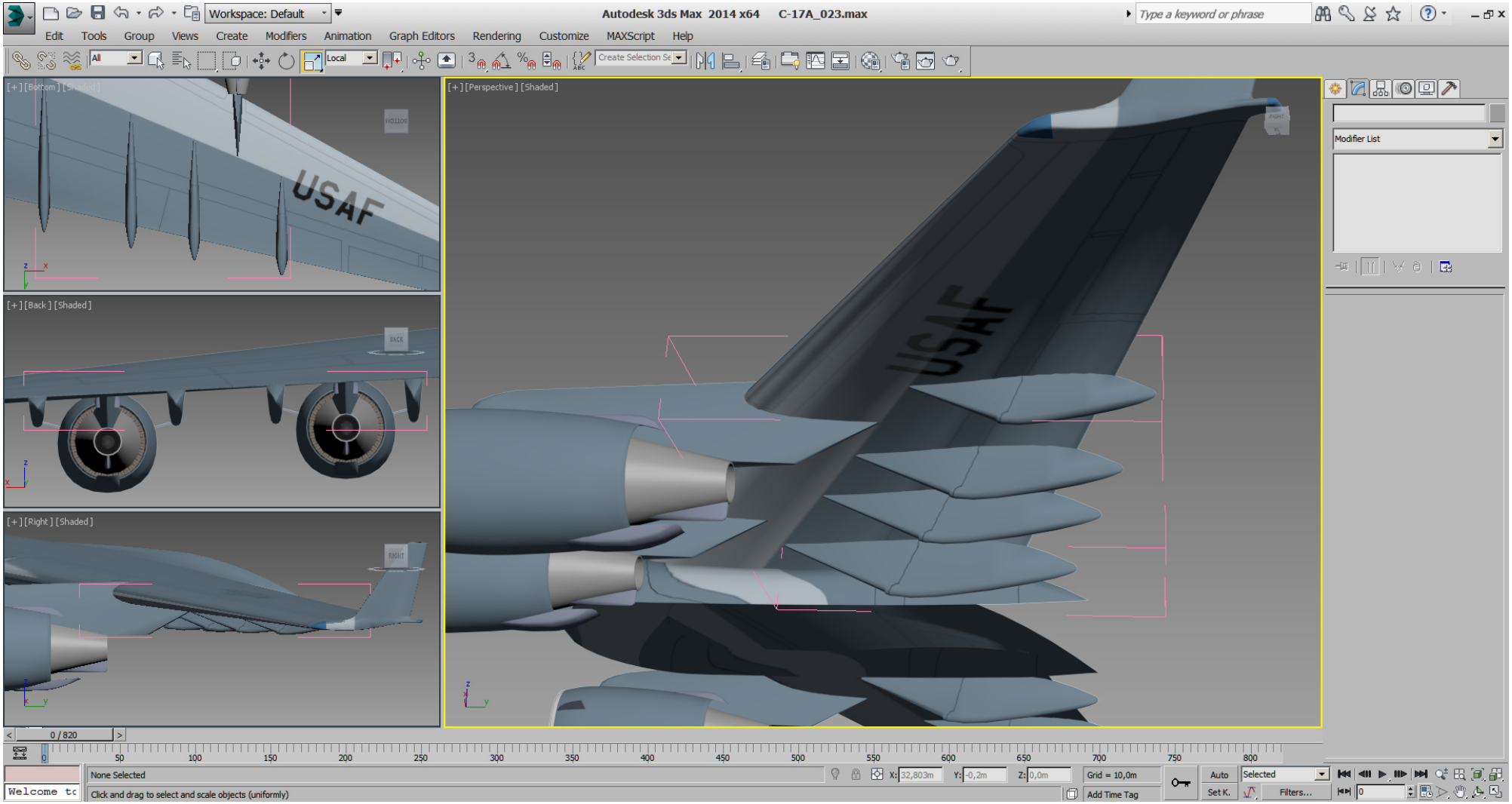
In the next picture, I've tried to get the fairing in sync.
But look how wrong the blueprint was here again, compared to a RL photo on the texture.



To fix this, I did a simple (temporary) box and UVW mapped that photo part on it for reference.



To fix the fairings, I put also a temporary white area on a grey background on the wing texture to align the front of them.
Additionally I did the Photoshop “Path” lines on the fairings texture where they should be cutted later.

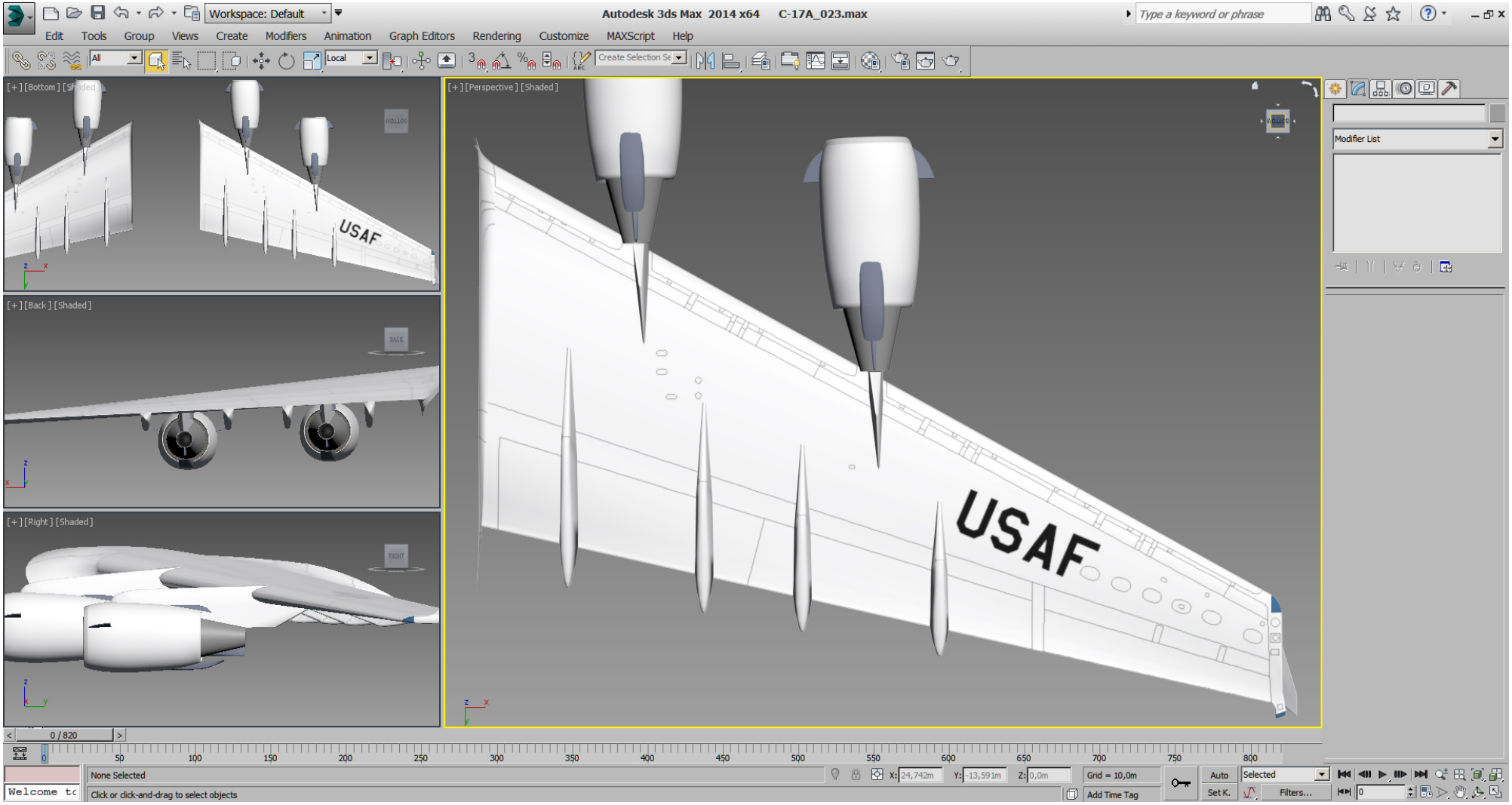


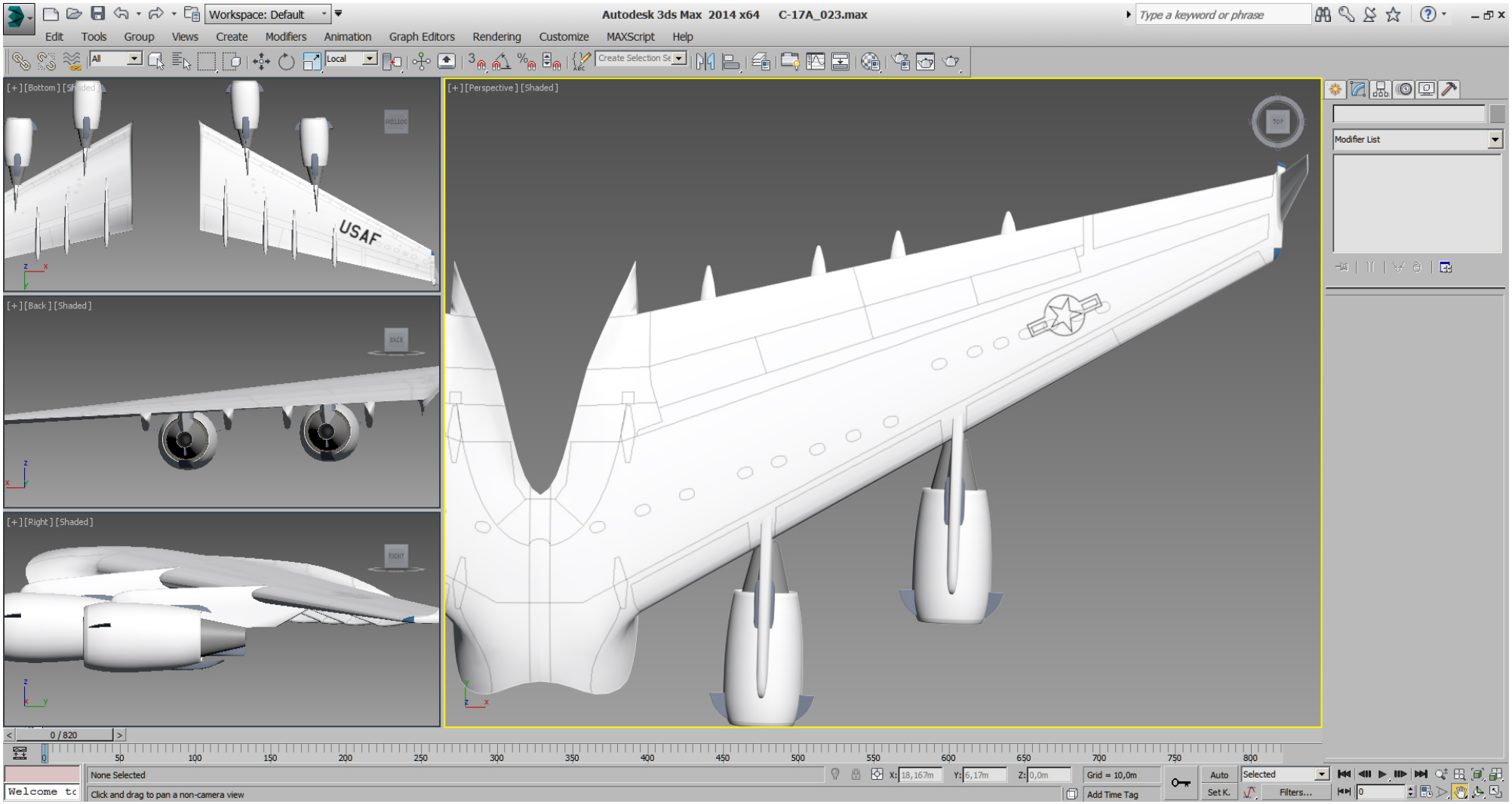
I want to do more paintwork on the wing to get much stuff as possible in sync and for reference, before cutting any stuff from the wing.
On the one hand to be better safe than sorry, on the other hand to learn more about the AC while watching many RL pictures.

Where are the panel lines, lids and rivets in relation to each other?
And how are these placed in relation to the aileron, flaps, slats, spoilers, fairings, engines, ... ?

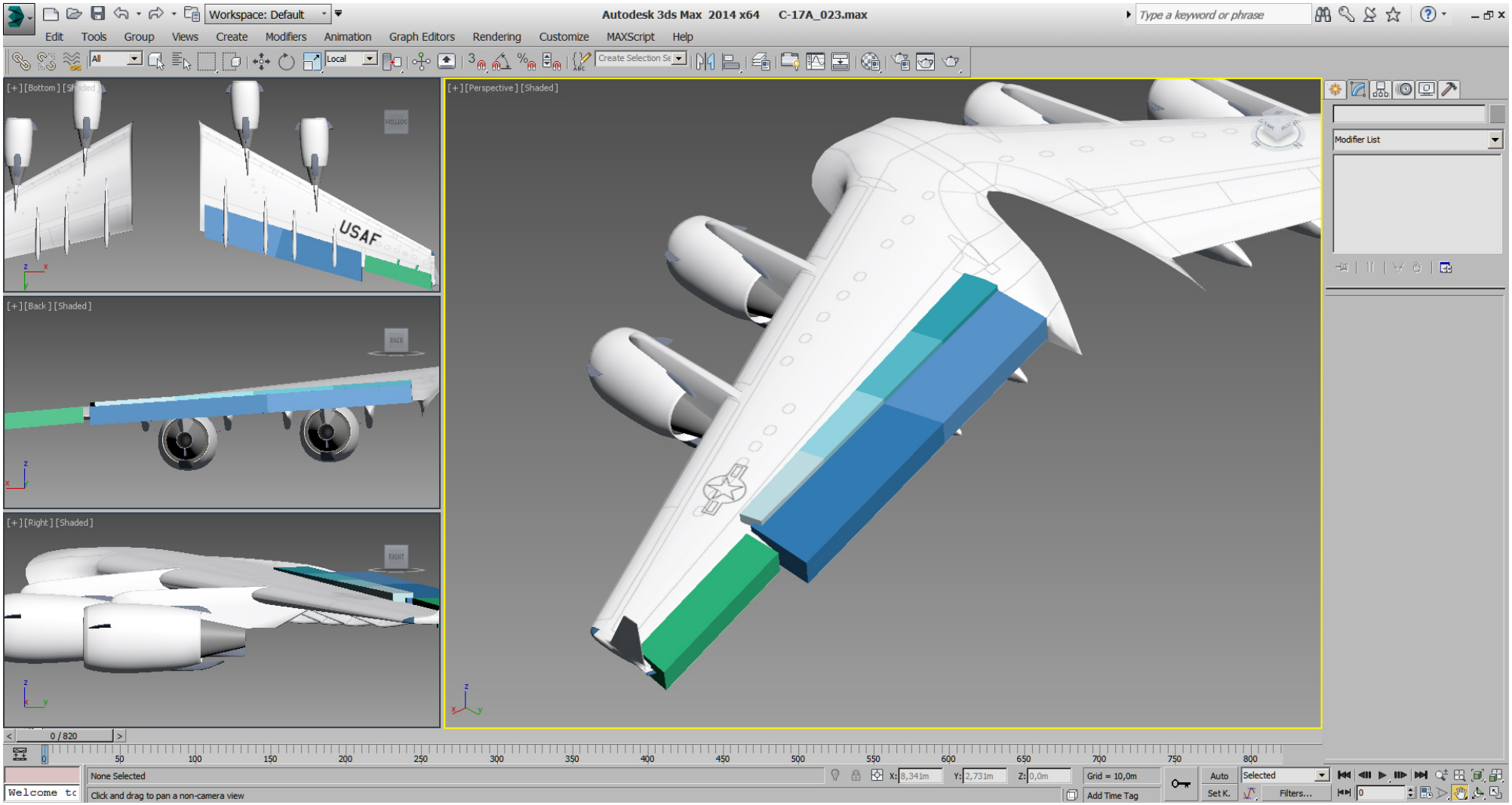
It's some kind of a puzzle game to get these things from RL pictures on the whole wing model nearly correctly.

At this point I've got a nice hint from the BMS team, that on the heavies sometimes the engines are turned in 1 or 2 degrees in.
Until now I've neither noticed nor read about a engine turn in for the C-17, but checking RL top pictures it's clearly visible.
So I've turned the engines in **by 2 degrees** and corrected the painted slats. While browsing through the RL reference pictures anyway, I've also painted other stuff I've found, before I need to search for it later again.

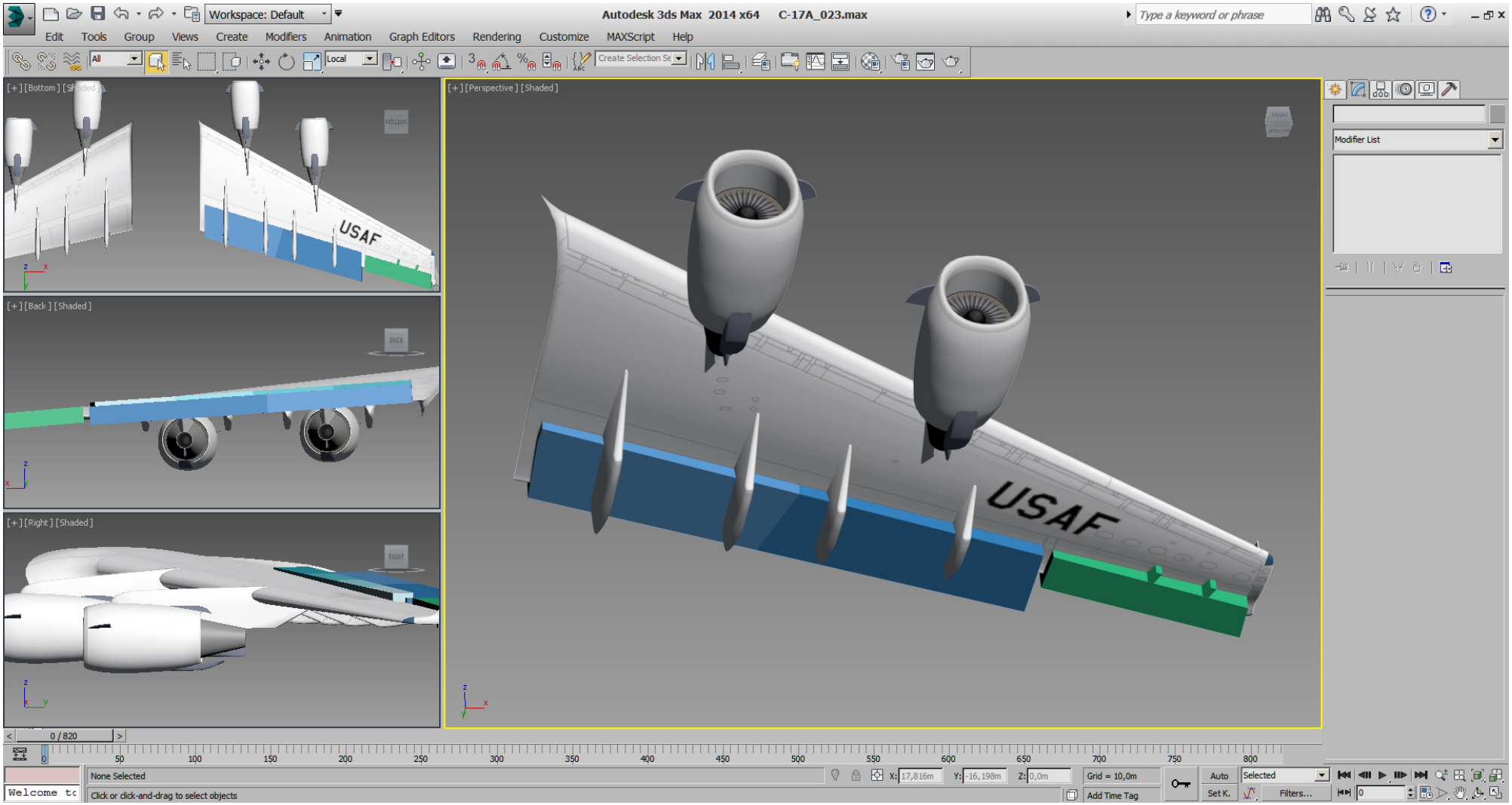



Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_023.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Bottom][Shaded]
[+][Back][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
USAF
Modifier List
0 / 820
None Selected
Click and drag to pan a non-camera view
Add Time Tag
Auto
Set K.
Filters...
Selected

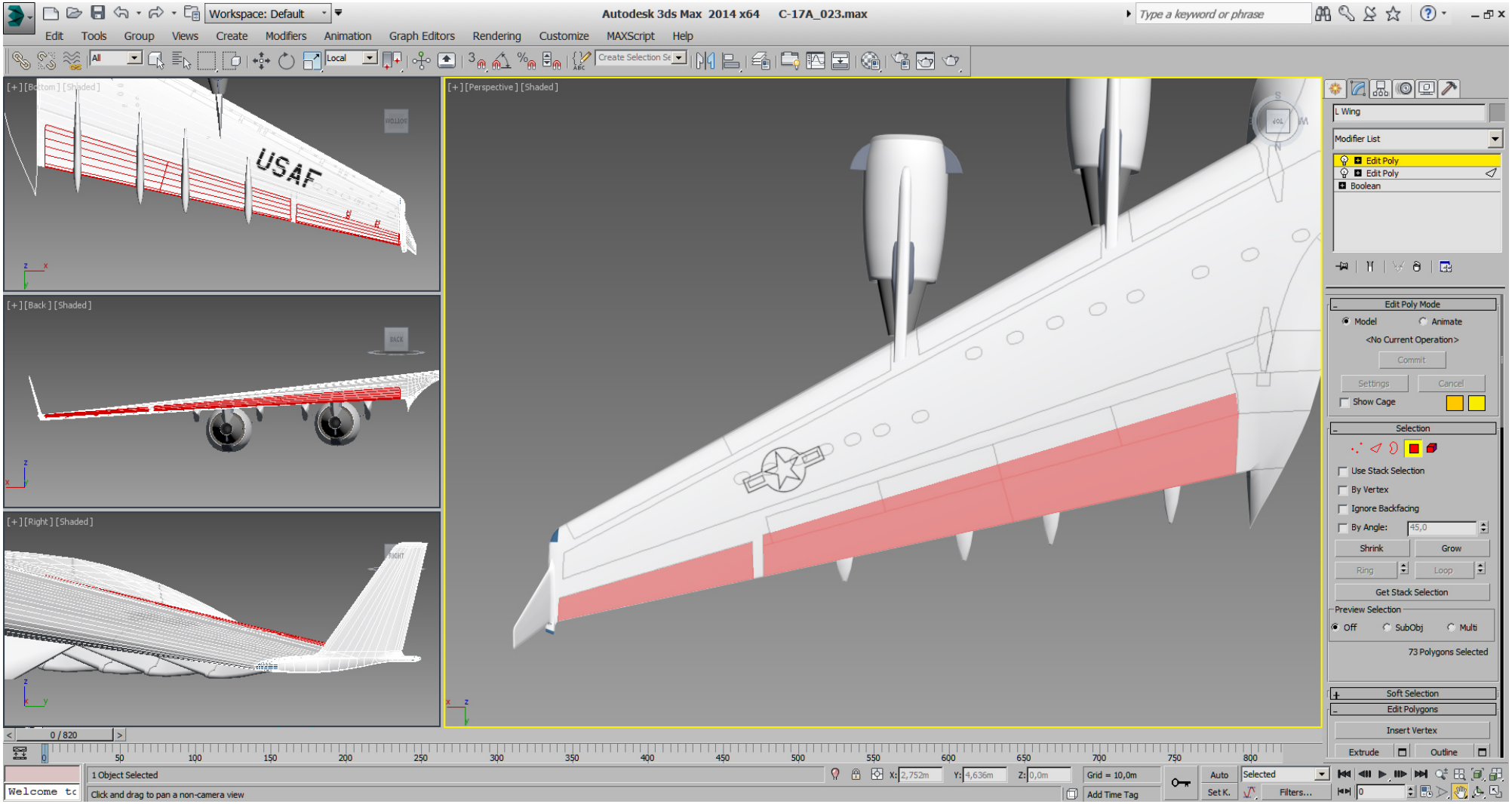
I think we have good references on the wing model now, so we can create and place some cutting geometry for boolean operations.

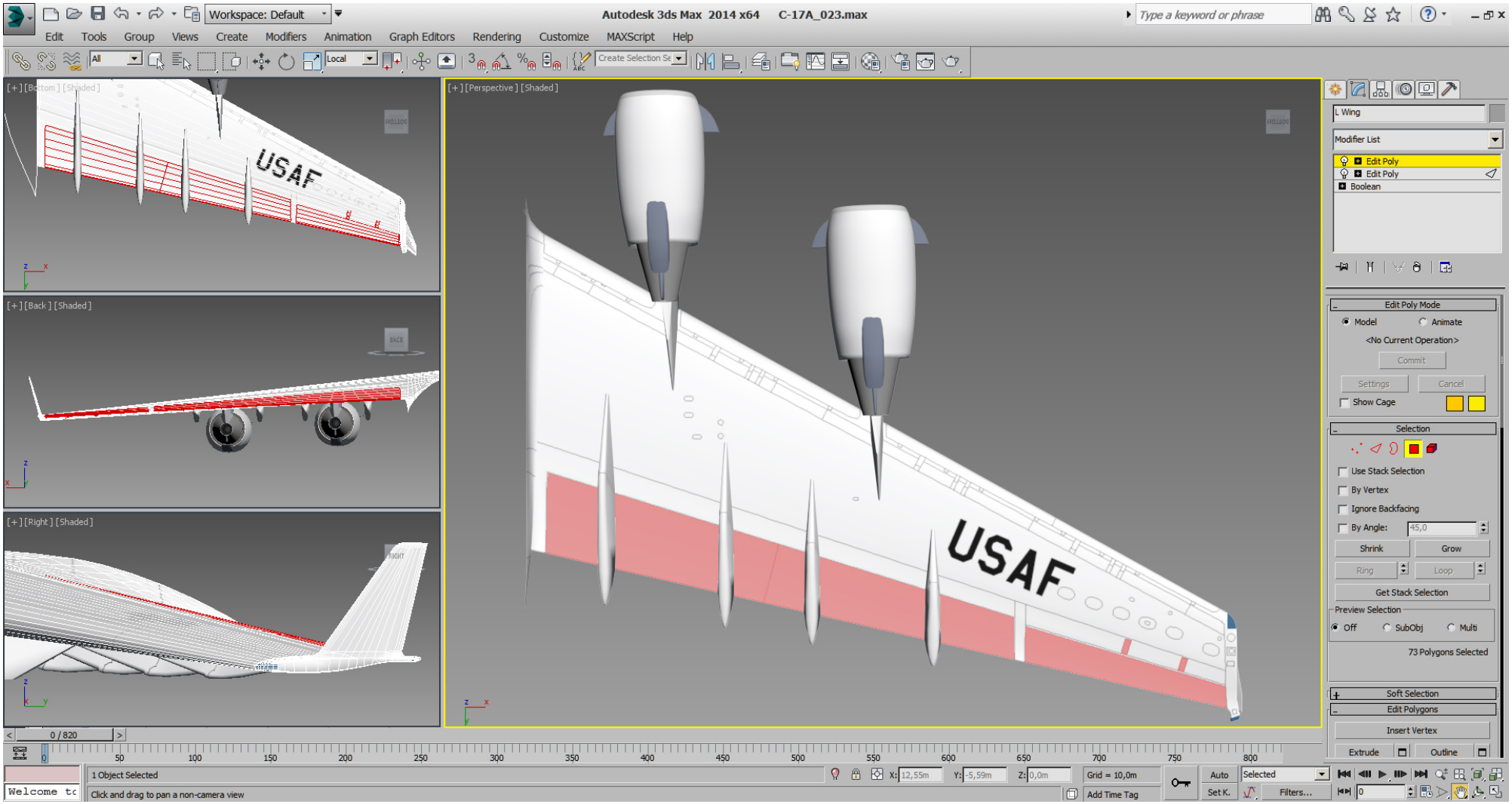


The cutting geometry is rotated to match approx the wing angle, and is in sync with top/bottom lines.

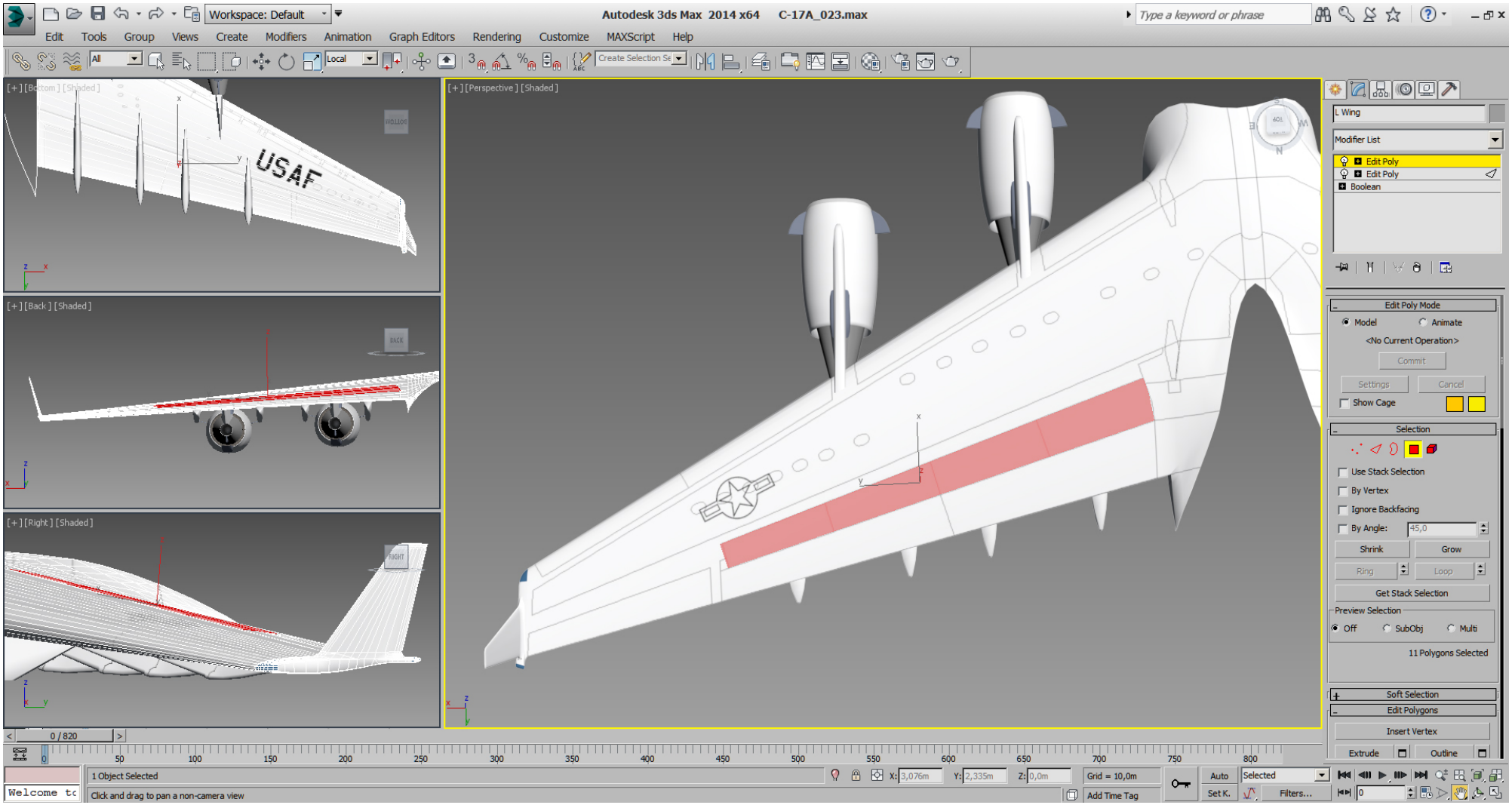


Note how the spoilers do overlap the flaps in top view.
See selected tris of the flaps and aileron after the boolean cut and a some cleaning in "Edit Poly" mode.



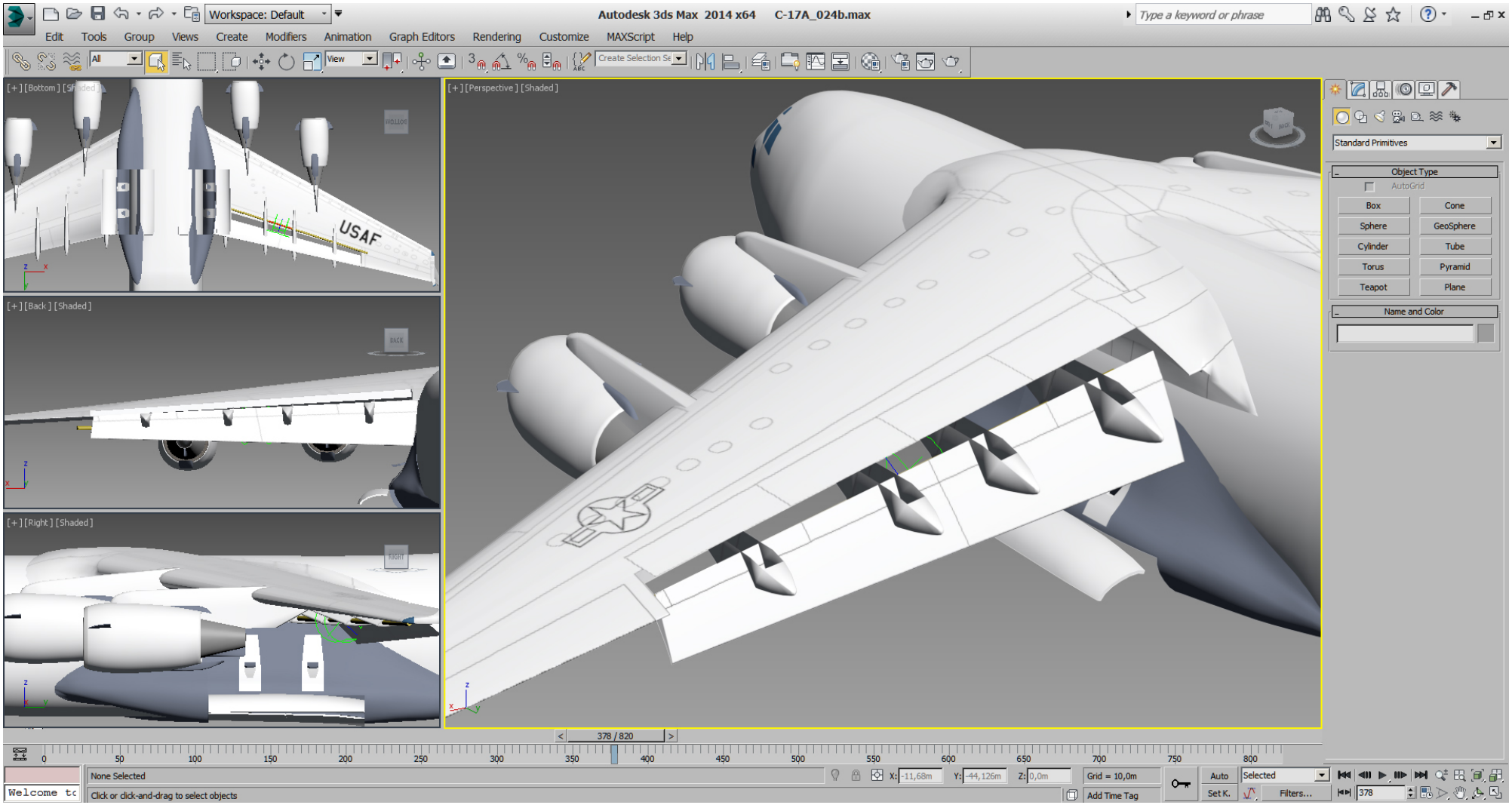

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_023.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Bottom][Shaded]
[+][Back][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
USAF
L Wing
Modifier List
Edit Poly
Edit Poly
Boolean
Edit Poly Mode
Model Animate
<No Current Operation>
Commit
Settings Cancel
Show Cage
Selection
Use Stack Selection
By Vertex
Ignore Backfacing
By Angle: 45,0
Shrink Grow
Ring Loop
Get Stack Selection
Preview Selection
Off SubObj Multi
73 Polygons Selected
Soft Selection
Edit Polygons
Insert Vertex
Extrude Outline
0 / 820
1 Object Selected
Click and drag to pan a non-camera view
Grid = 10,0m
Add Time Tag
Auto Selected
Set K. Filters...
Welcome to

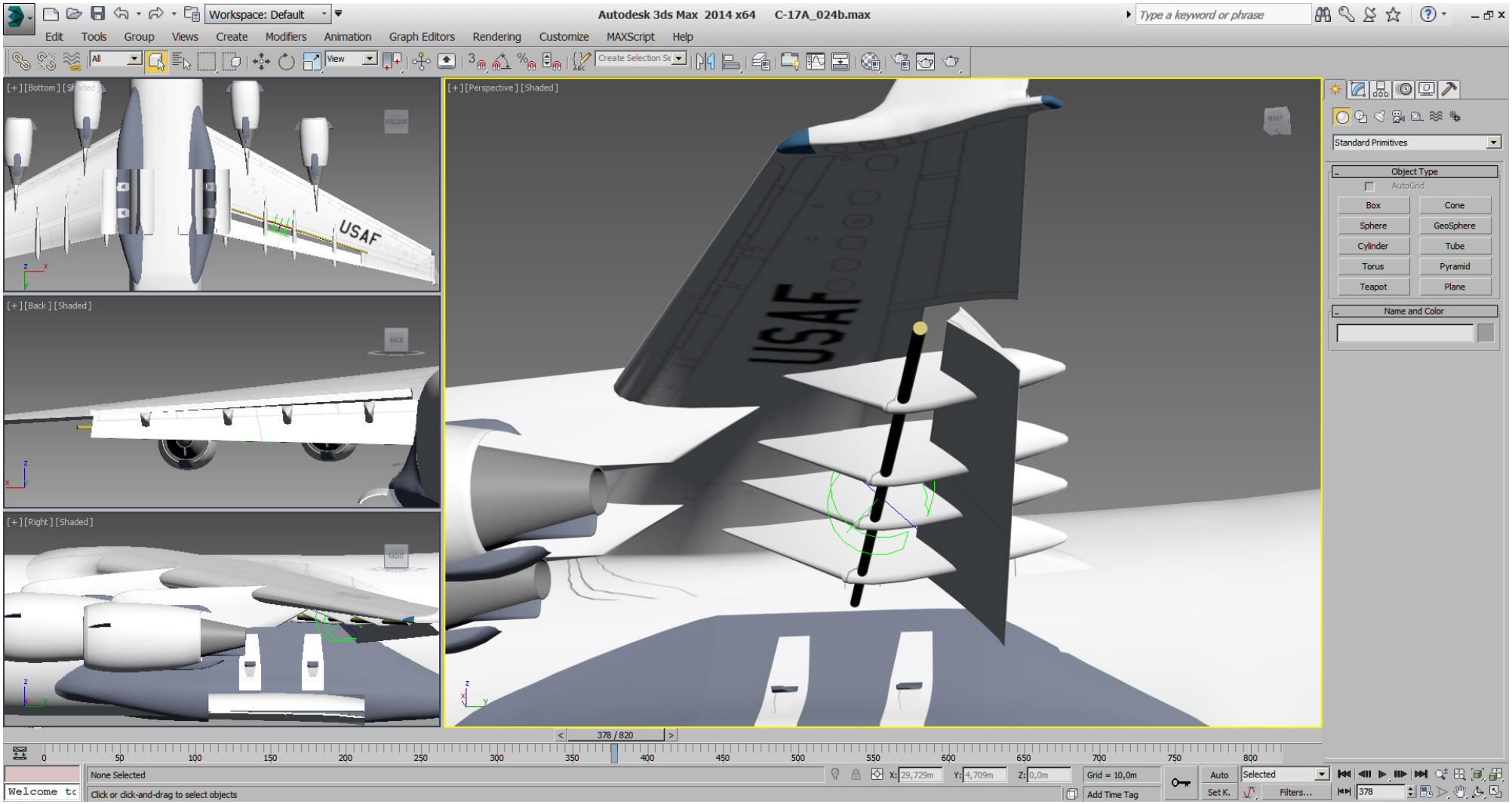
See selected tris of the spoilers after the boolean cut and a some cleaning in "Edit Poly" mode.



I've detached a copy of the selected tris of the spoilers as new object, and detached the selected tris of the flaps as new object.

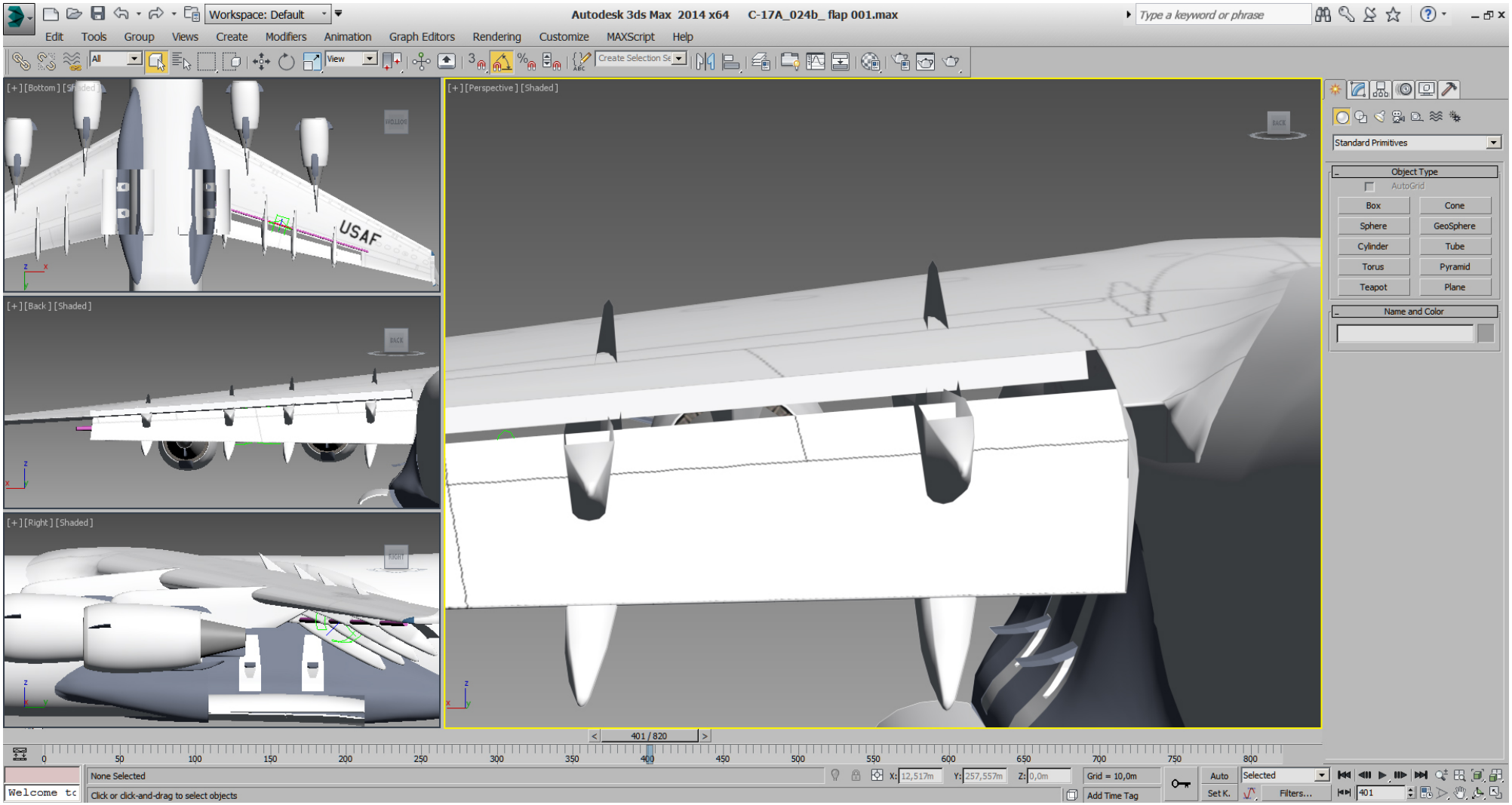
With the flaps I made a first animation in 3dsMax while trying to find the correct rotating angle using a cylinder as helping object.
A DOF helper has been placed as well.

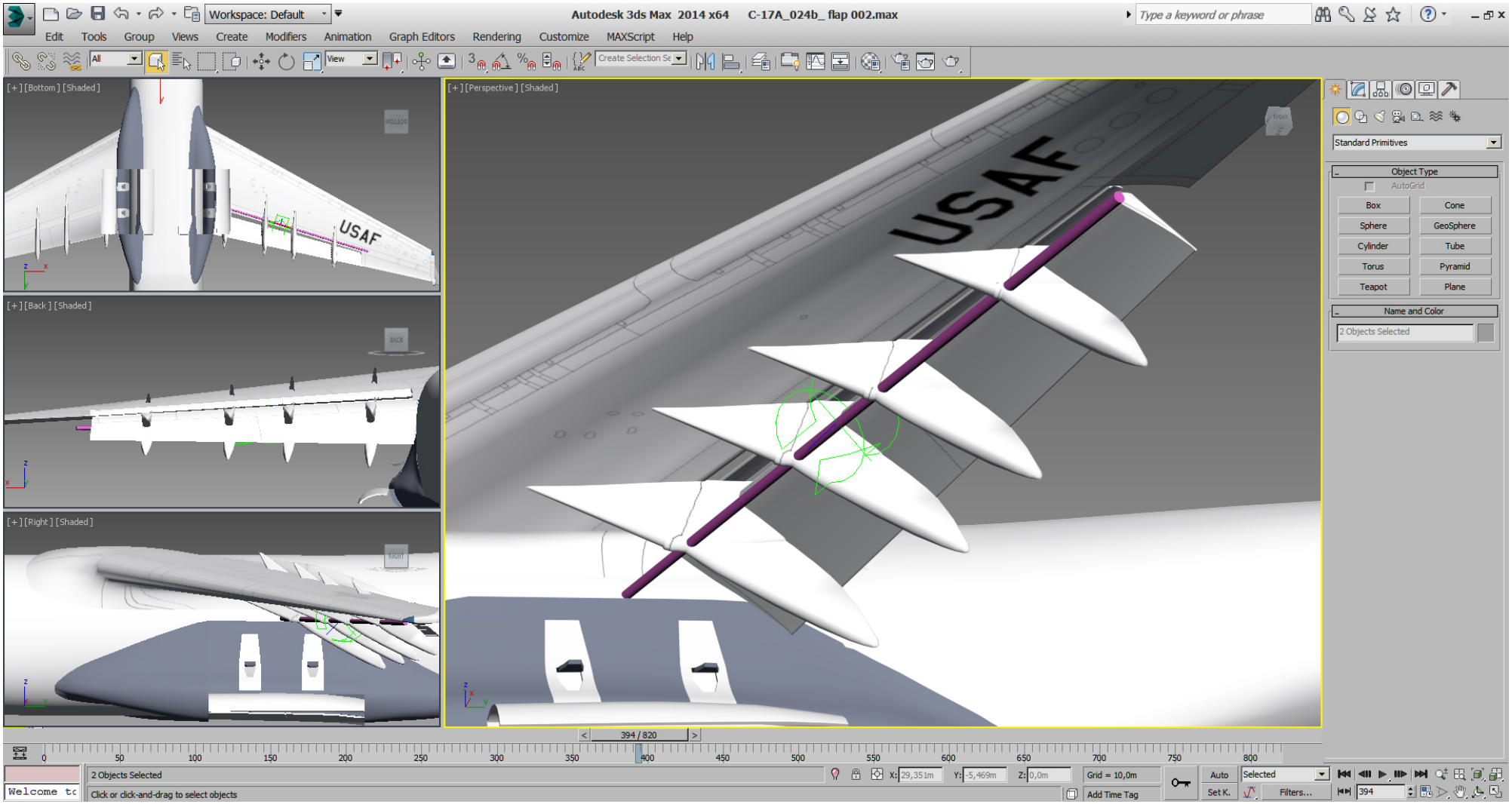



Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_024b.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Bottom][Shaded]
[+][Back][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
USAF
Standard Primitives
Object Type
AutoGrid
Box Cone
Sphere GeoSphere
Cylinder Tube
Torus Pyramid
Teapot Plane
Name and Color
378 / 820
None Selected
Click or click-and-drag to select objects
Add Time Tag
Grid = 10,0m
Auto
Set K.
Selected
Filters...
Welcome to

The problem with the animation of the flaps is that with the more or less given rotating angle, the flap moves into the wing- shoulder.
So I've modified the bottom side of flap and wing according to RL pictures.

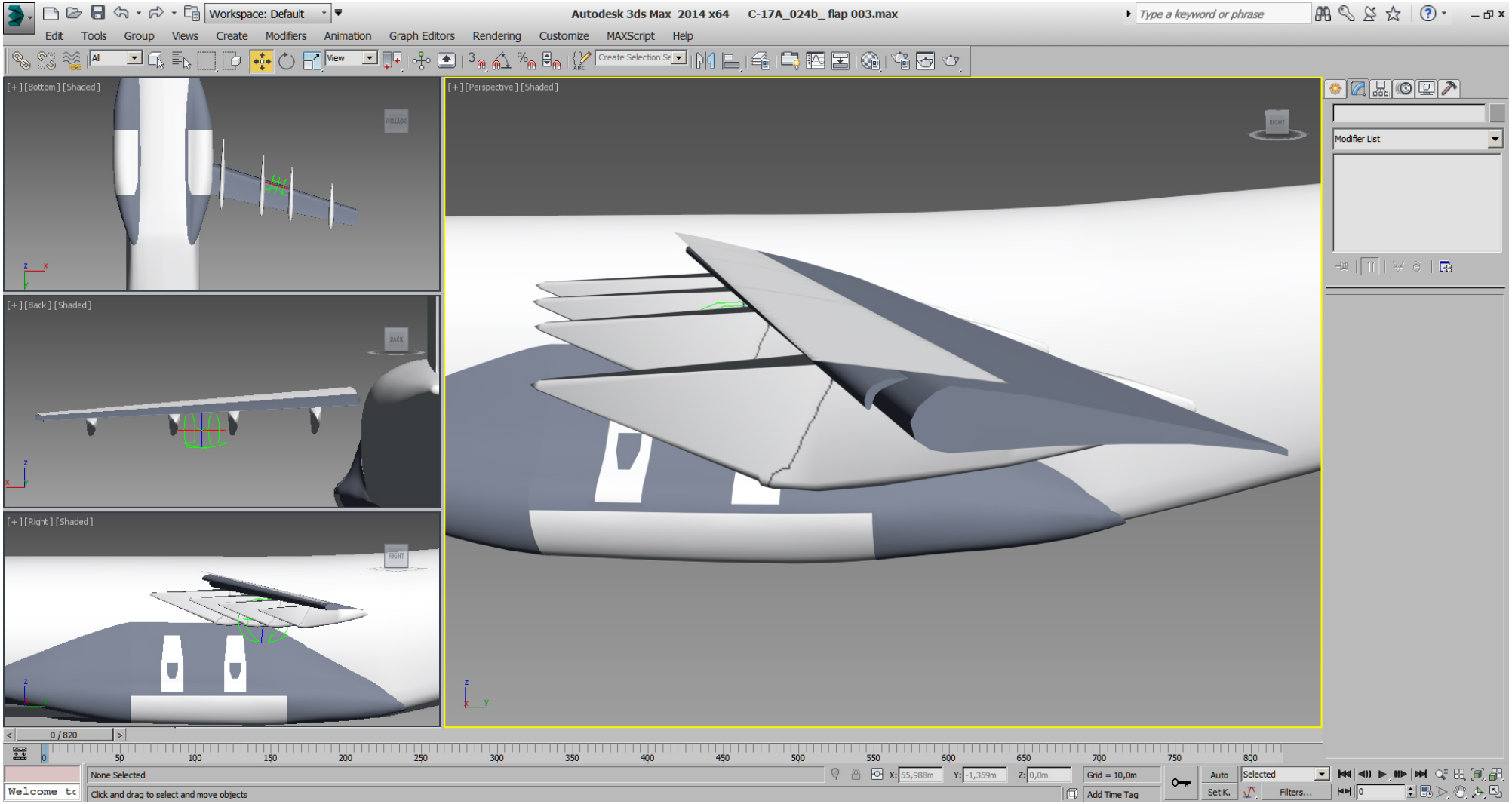
Then I've added a copy of the fairings and linked them to the animated DOF helper to see the behavior of the fairings.



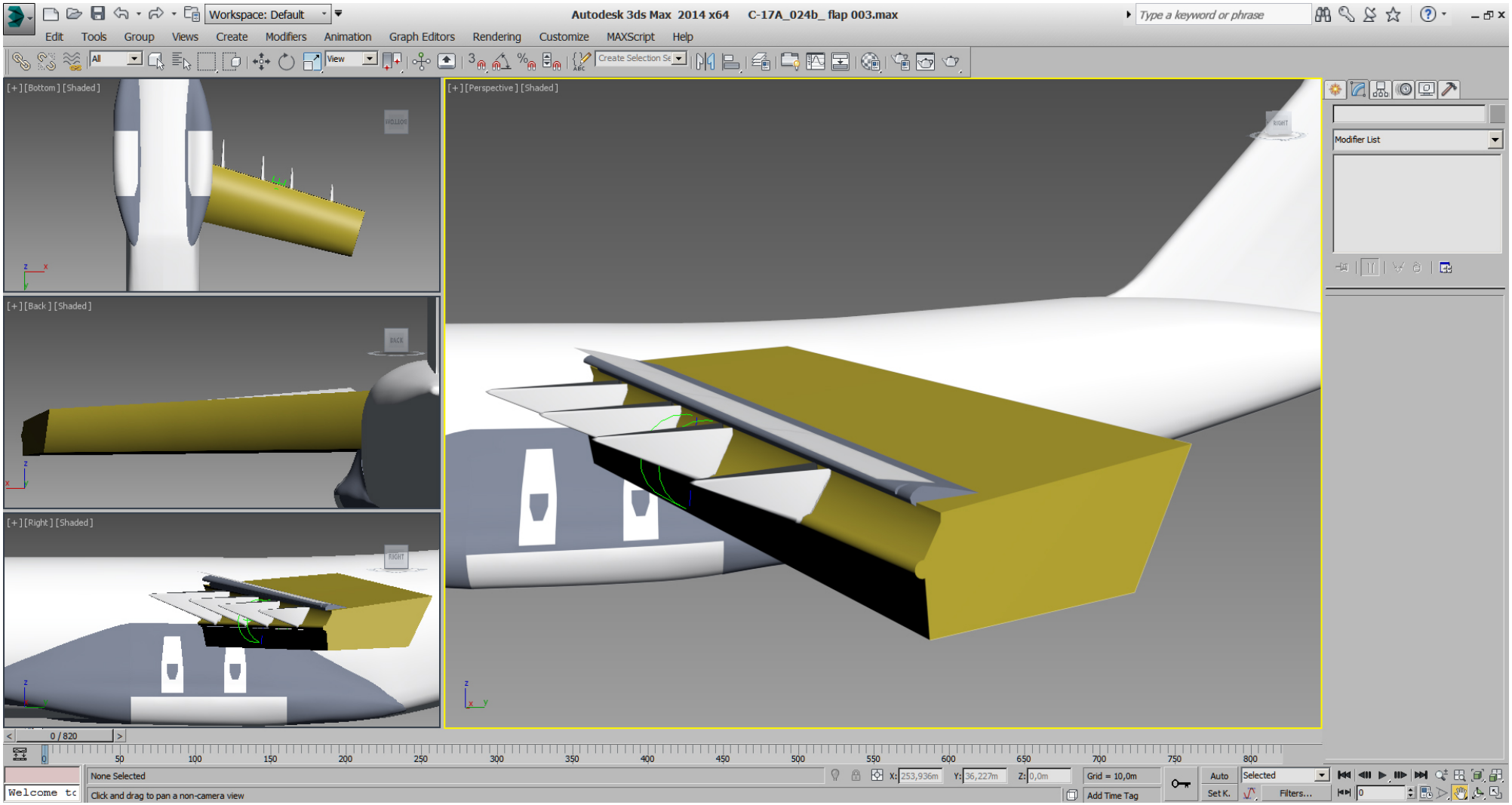

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_024b_ flap 002.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Bottom][Shaded]
[+][Back][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
USAF
Standard Primitives
Object Type
AutoGrid
Box Cone
Sphere GeoSphere
Cylinder Tube
Torus Pyramid
Teapot Plane
Name and Color
2 Objects Selected
394 / 820
2 Objects Selected
Click or click-and-drag to select objects
Add Time Tag
Grid = 10,0m
Auto
Set K.
Filters...
Selected

Here I wasn't happy with the fairings, so I've adjusted them once again, then I've build the rounded front shape of the flap, and created that little secondary flap.

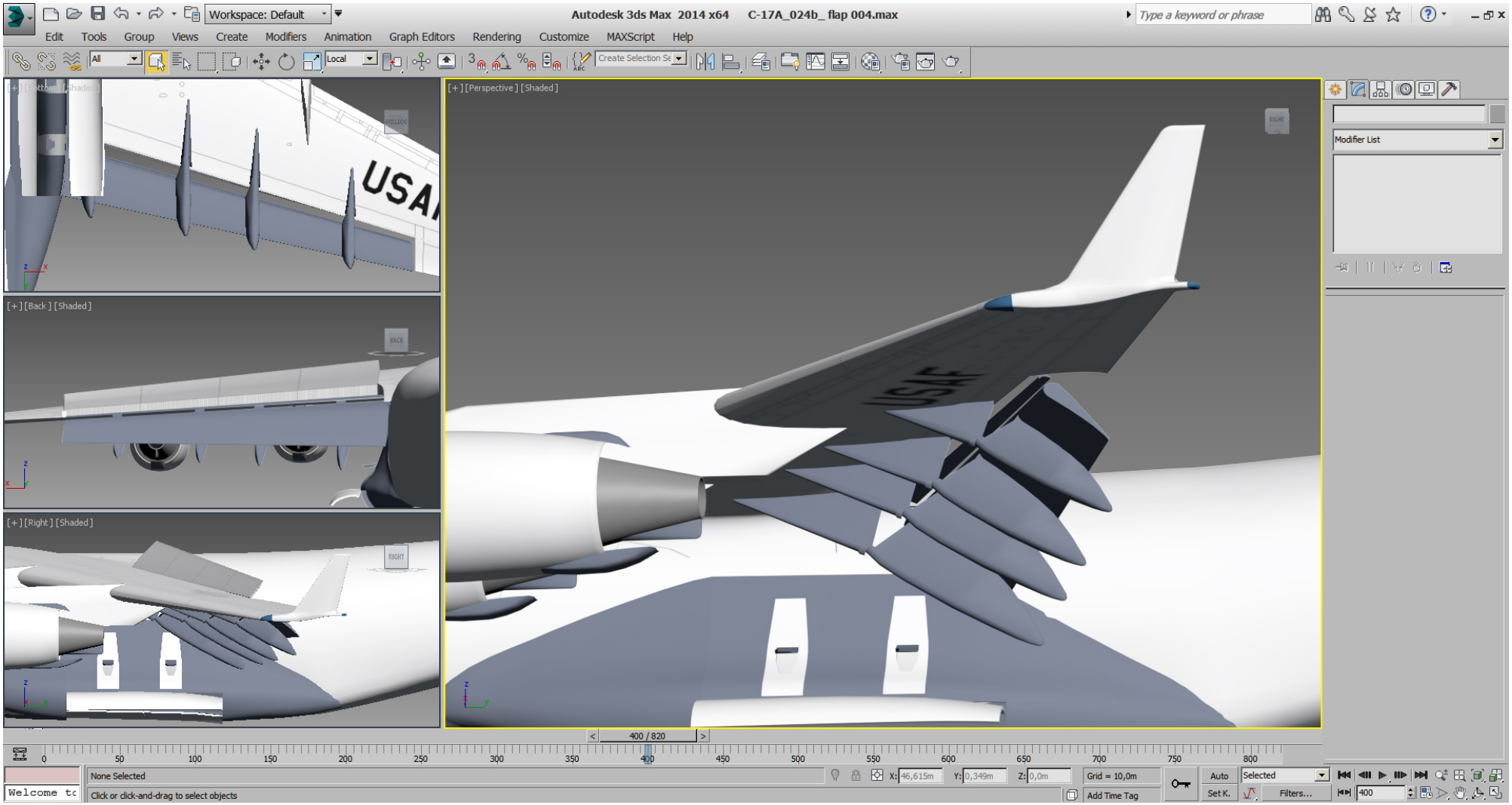
The white rectangle on top are the spoiler tris, cutted from the wing.
It's there to see a possible wrong placement of that little secondary flap during 3dsMax animation.



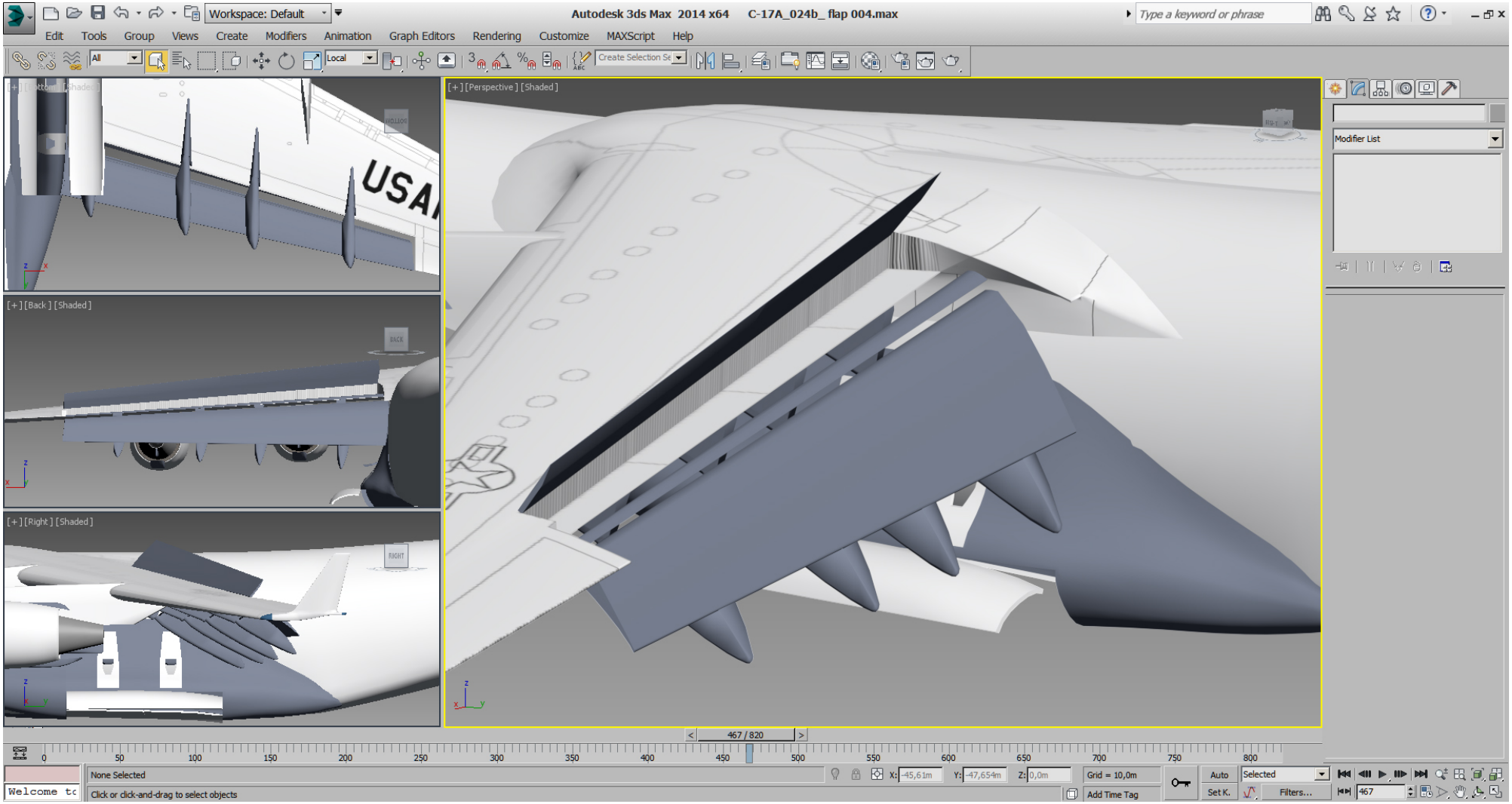
Now we can create and place the geometry for boolean cutting the fairings.



Here the result after the boolean cut.



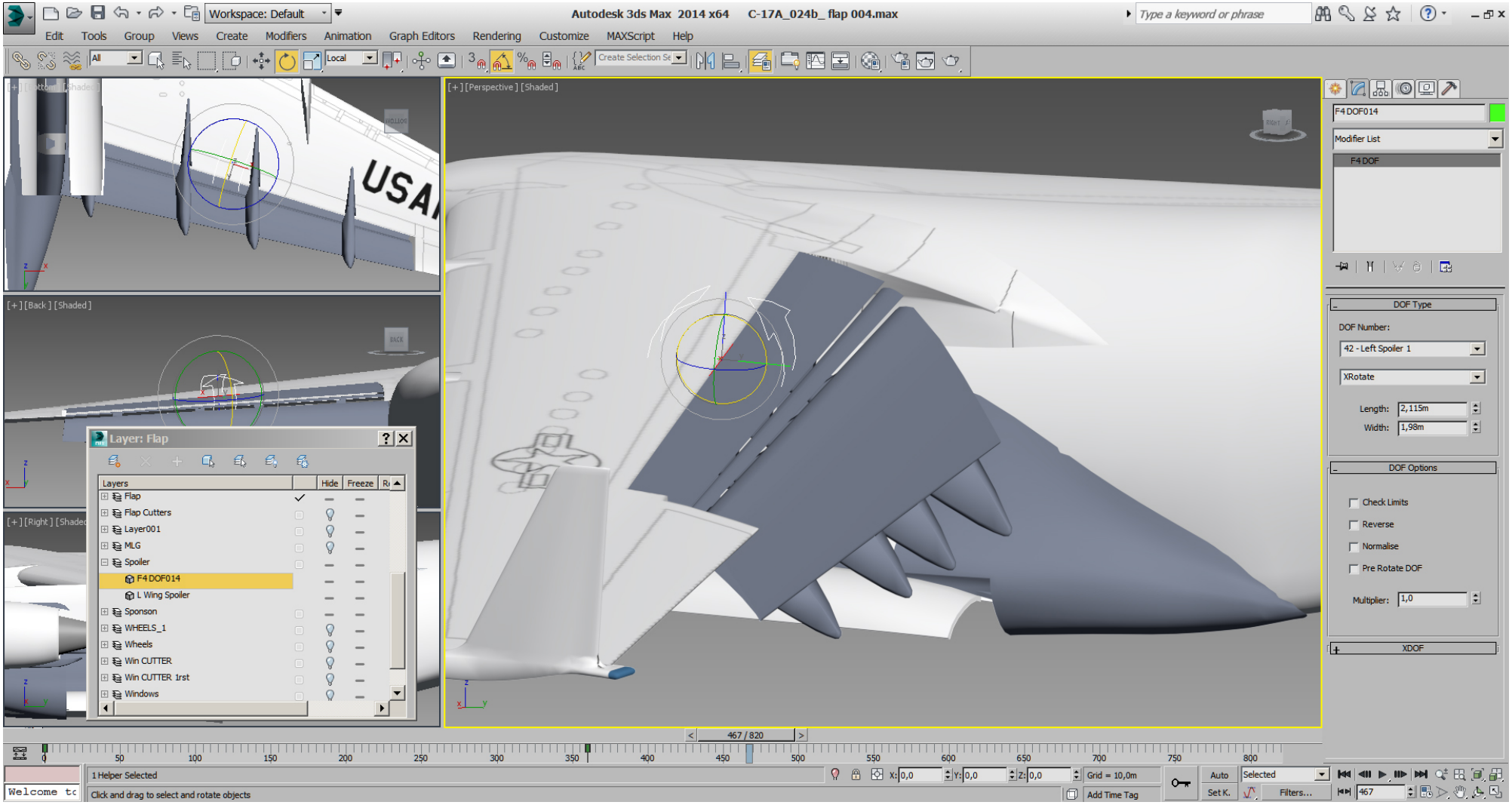
Then we've placed the spoiler DOF helper (hidden here), did an animation, gave the spoiler tris a first width shape and did build the bay below the spoilers.



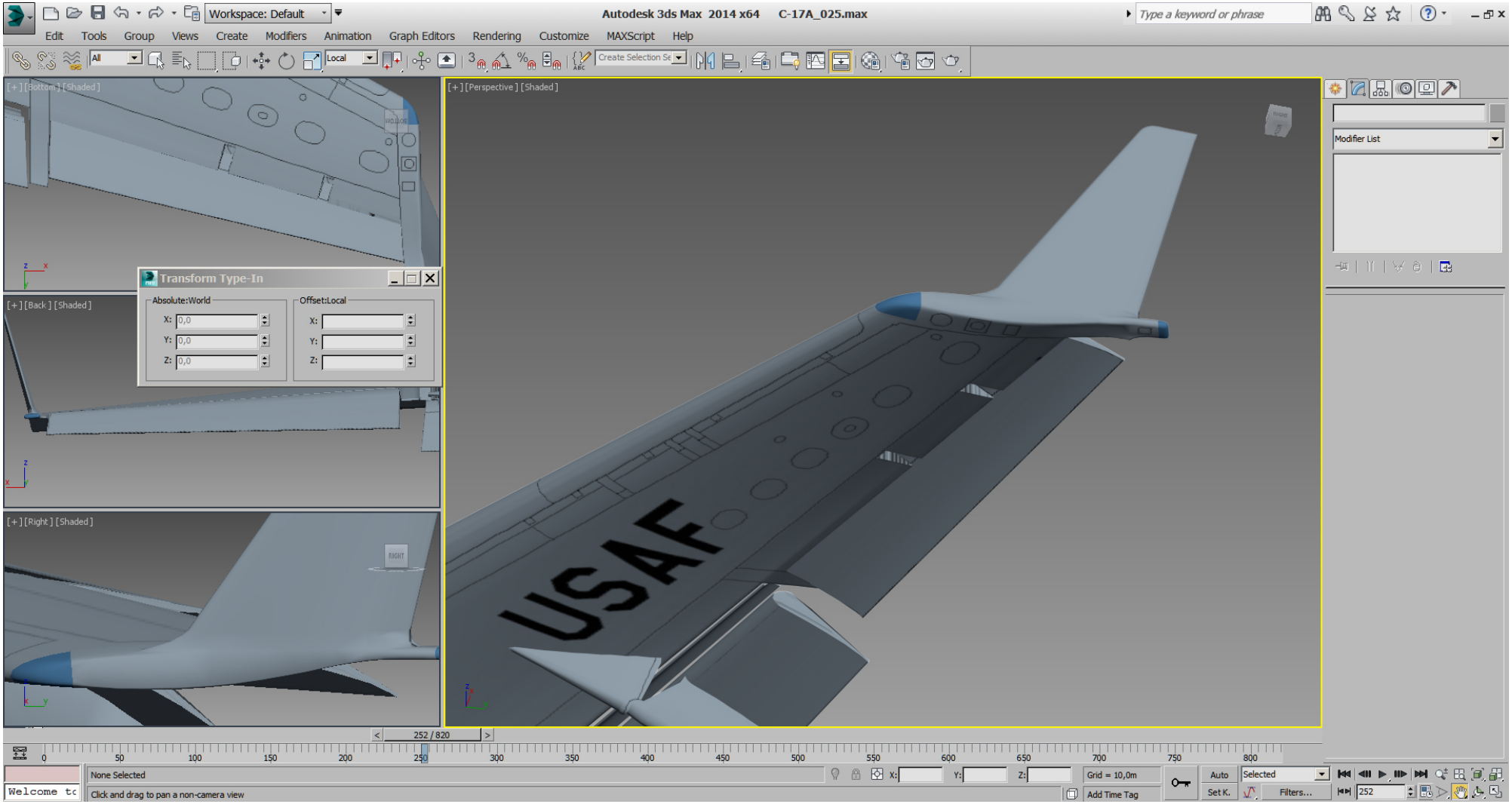
And finally a picture with spoiler at -5 degrees when flaps are fully extended at 40,5 degrees.

The spoiler rotation angles are 11° to 16° as speed brakes, 60° as spoilers, and -5° when flaps are fully extended and spoilers neither in use as speed brakes nor as spoilers.

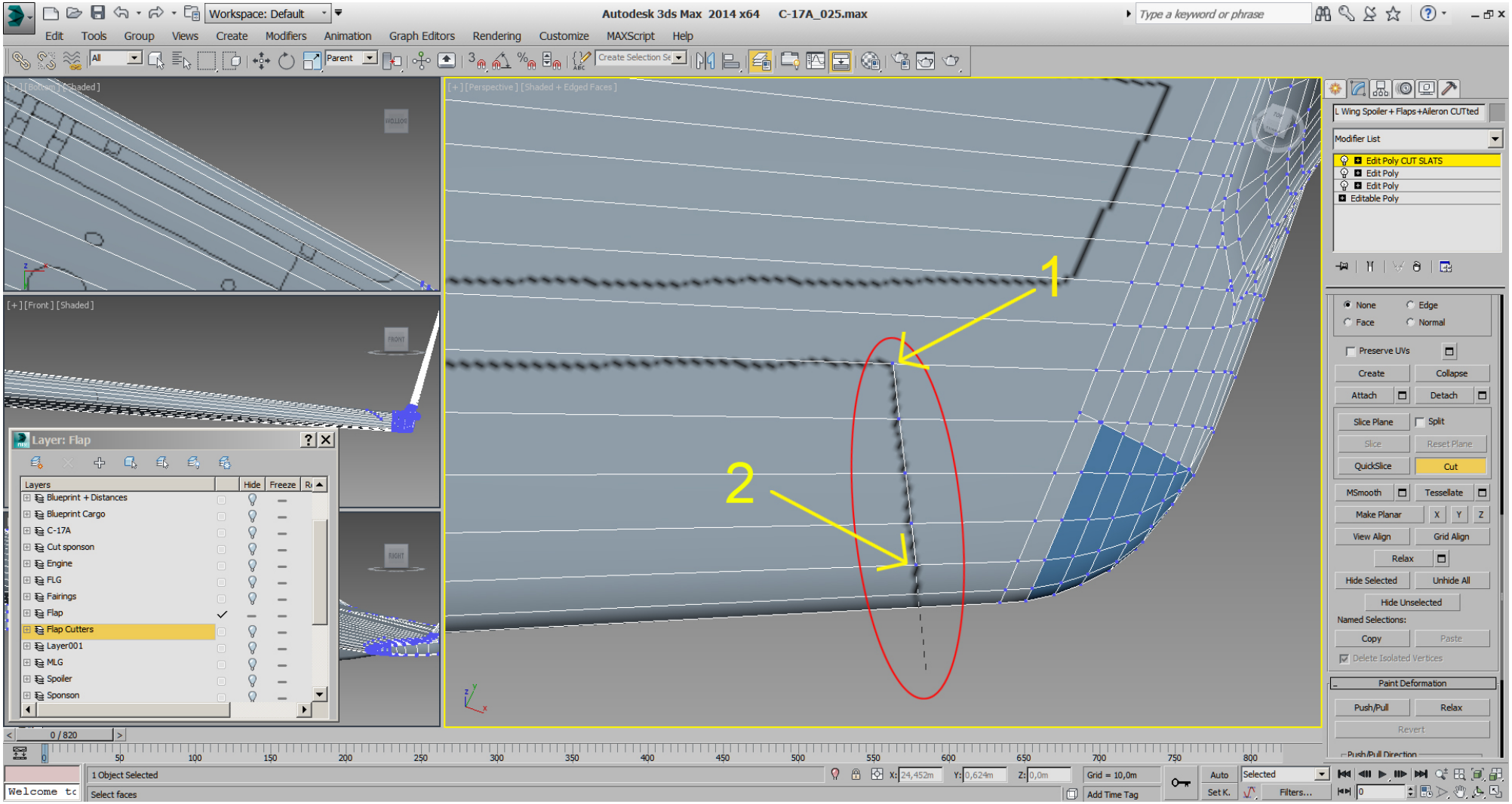
Btw. the slat segment extension angles are 18° inboard, 23° center, 25°outboard pair. (for later)



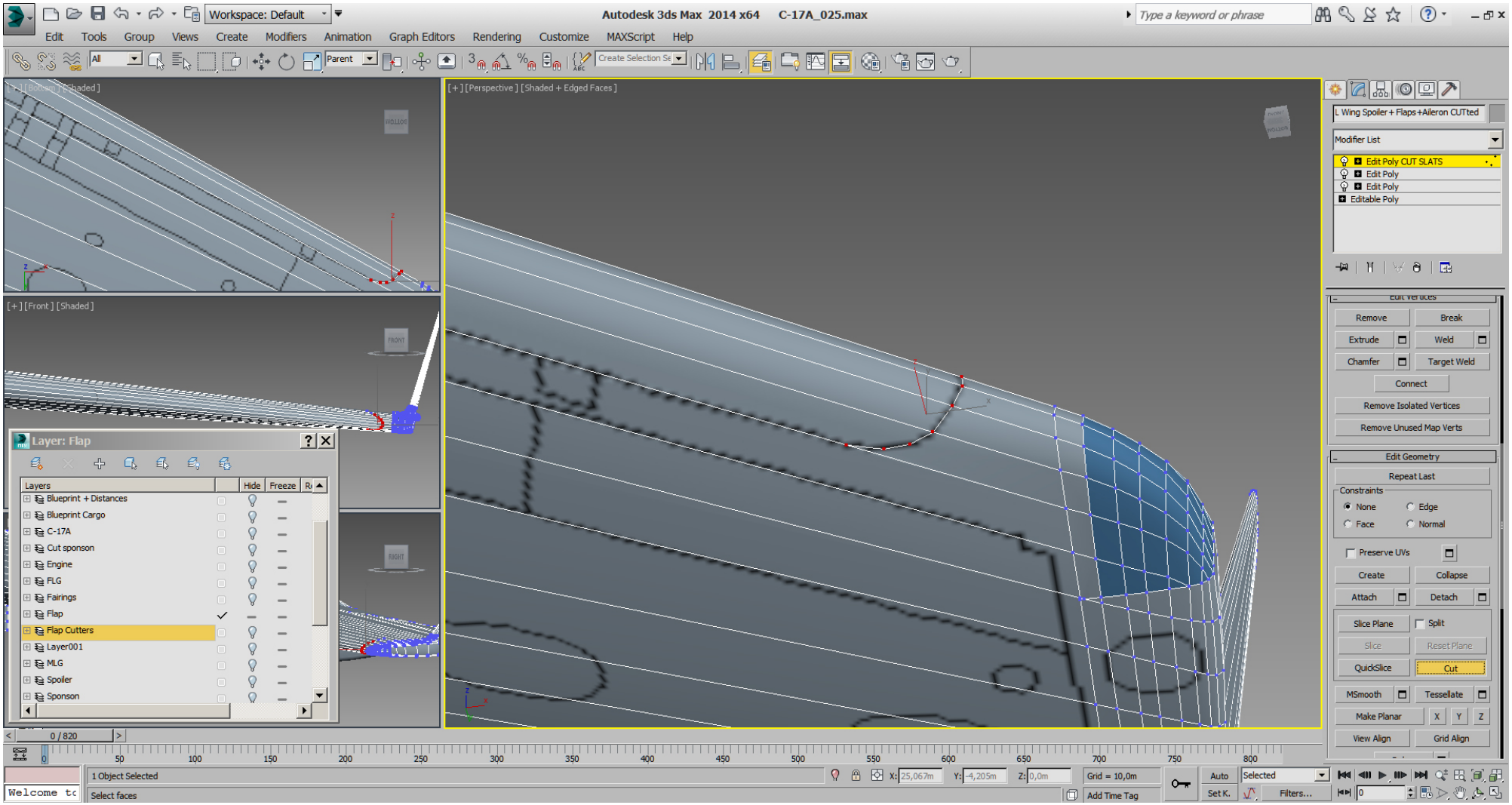
The aileron got been already boolean cutted the same way as the spoiler and flaps.
Therefore it was no problem to finish the aileron, place a DOF helper for it and animate it in 3dsMax.



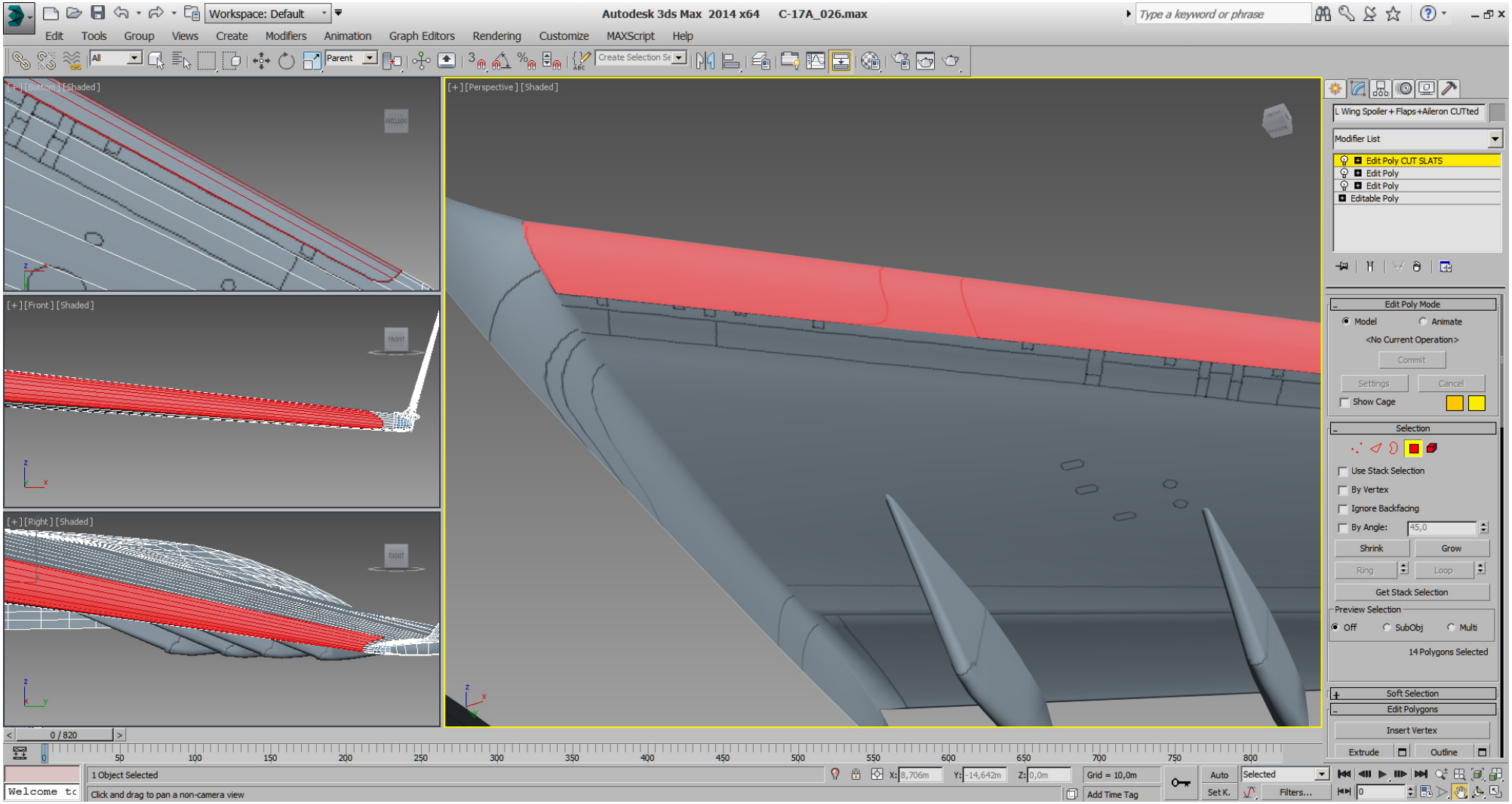
We'll add another “Edit Poly” modifier (note the “Stack”) to cut the slats by hand in “Vertex” sub- mode -> “Cut”.
The starting point for the cut is at point 1 and ends at point 2.

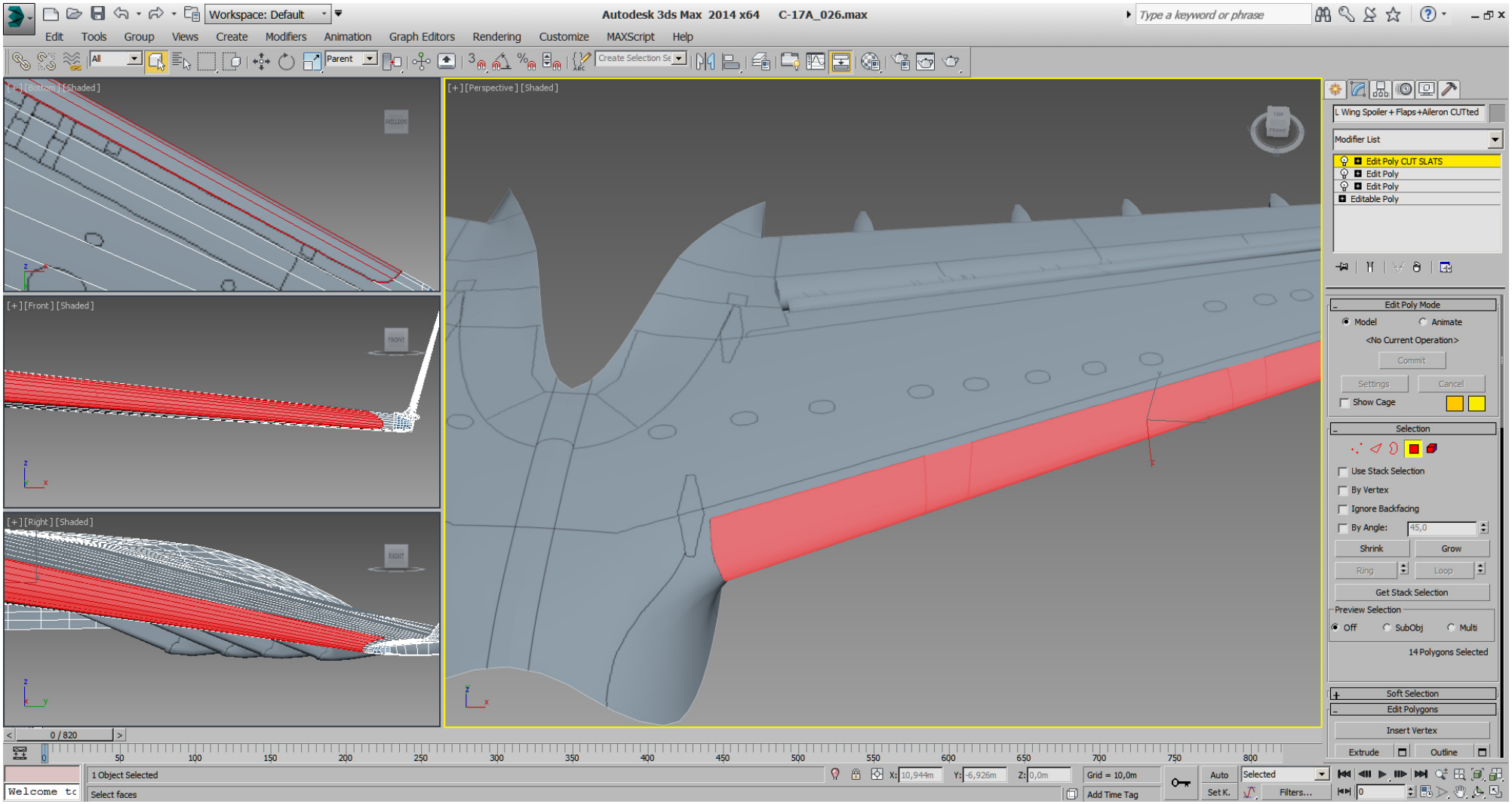


After rotating the viewport, the front and bottom got cutted.

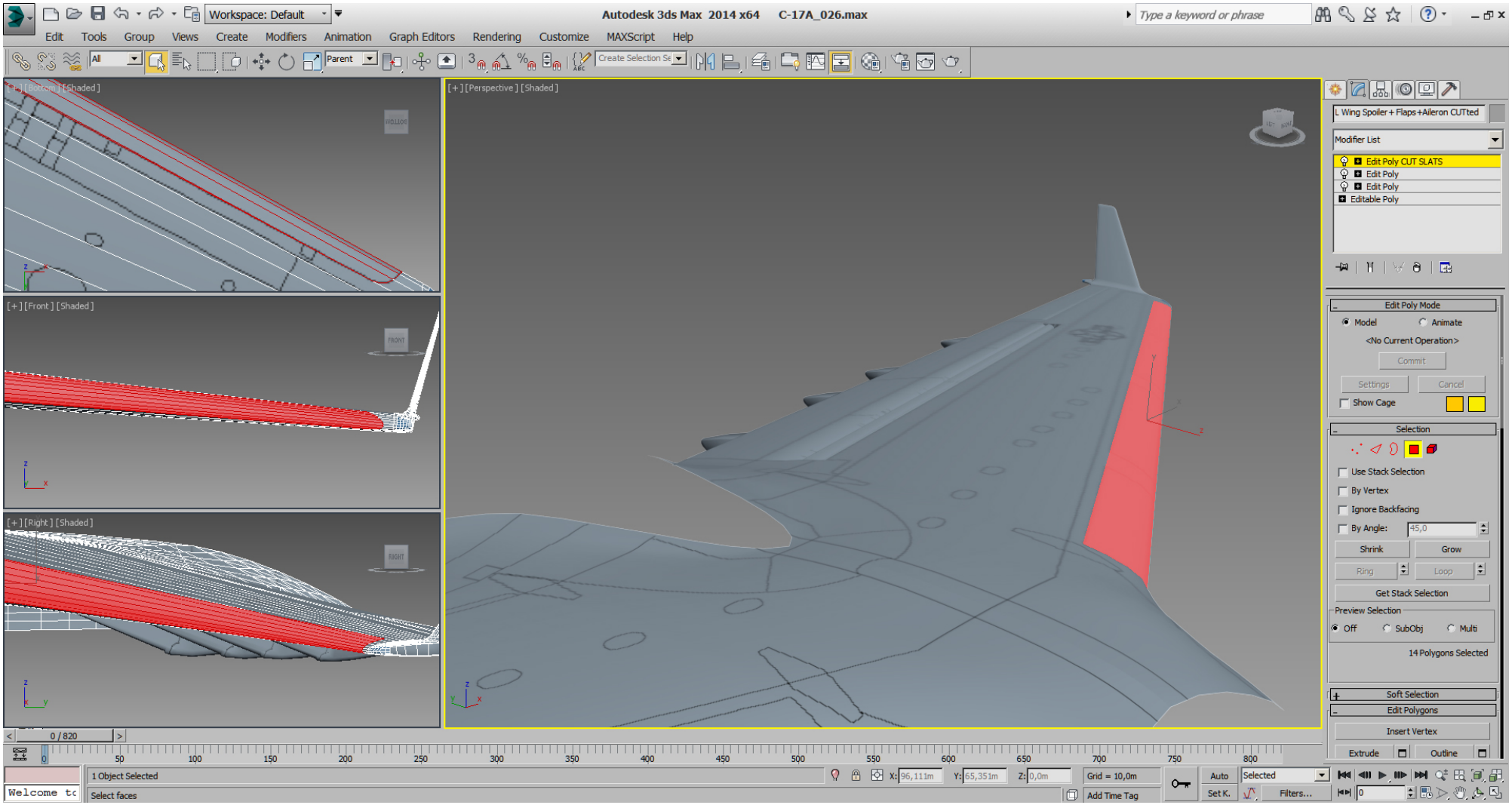


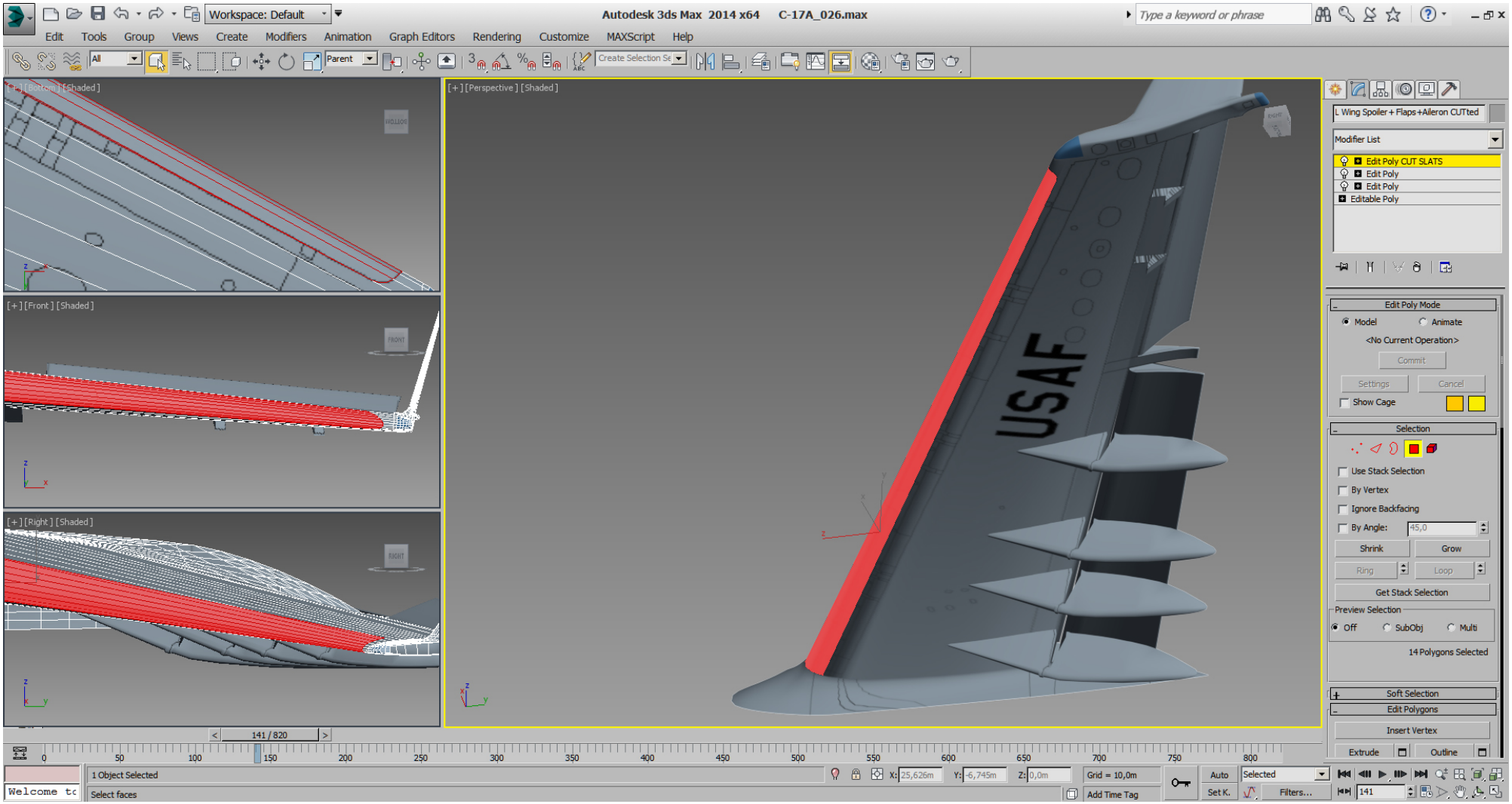
We do similar to the shoulder side, then we've cutted along the painted slats in x direction,
to get a straight edge from the shoulder side to the other (wingtip) side.
After selecting the polys it looks like this on the shoulder.



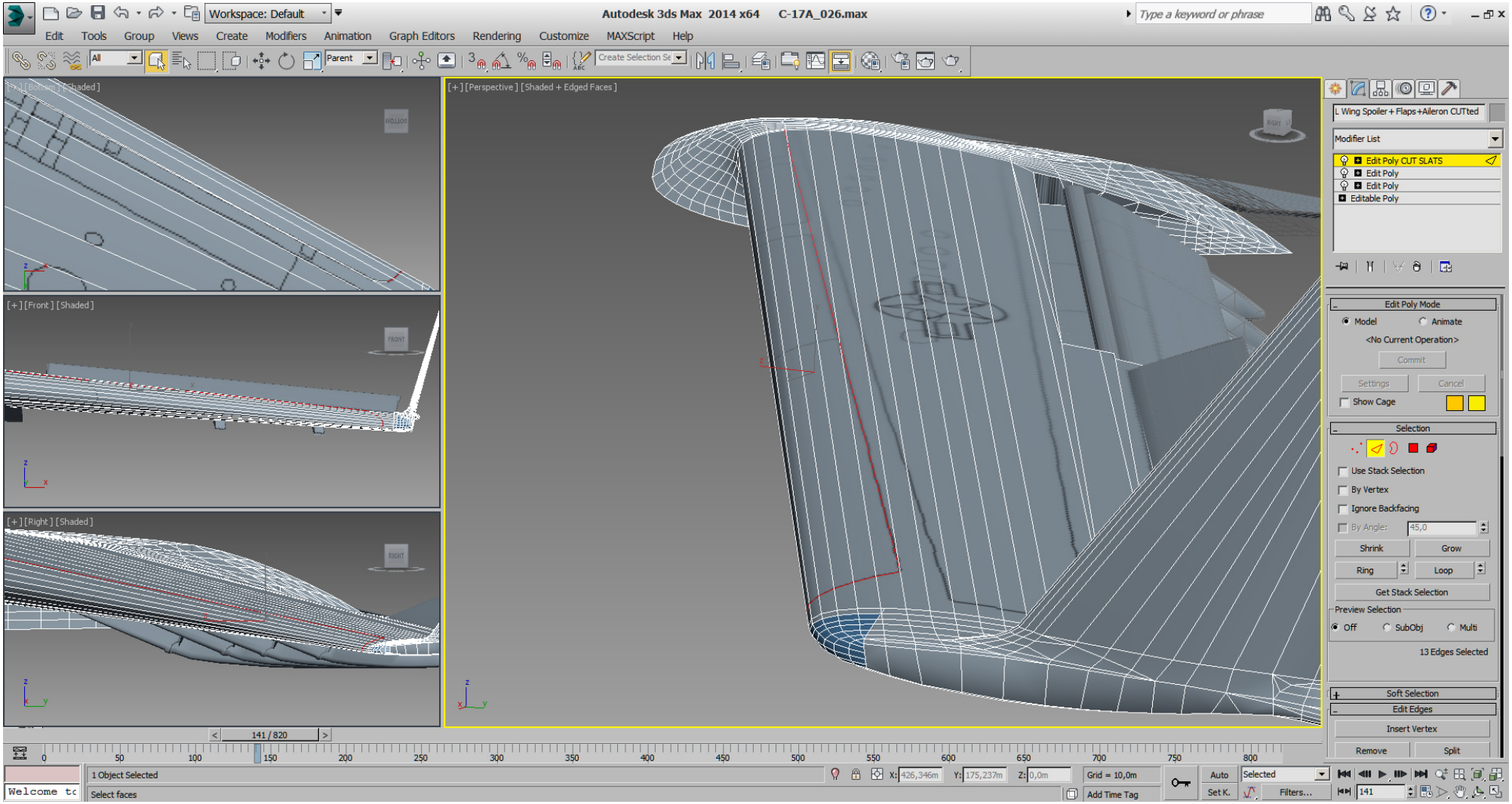

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_026.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Bottom][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
L Wing Spoiler + Flaps+Aileron CUTted
Modifier List
Edit Poly CUT SLATS
Edit Poly
Edit Poly
Editable Poly
Edit Poly Mode
Model
Animate
<No Current Operation>
Commit
Settings
Cancel
Show Cage
Selection
Use Stack Selection
By Vertex
Ignore Backfacing
By Angle:
Shrink
Grow
Ring
Loop
Get Stack Selection
Preview Selection
Off
SubObj
Multi
14 Polygons Selected
Soft Selection
Edit Polygons
Insert Vertex
Extrude
Outline
0 / 820
1 Object Selected
Select faces
Add Time Tag
Grid = 10,0m
Auto
Set K.
Filters...
Selected

And it looks like this along the whole wing:



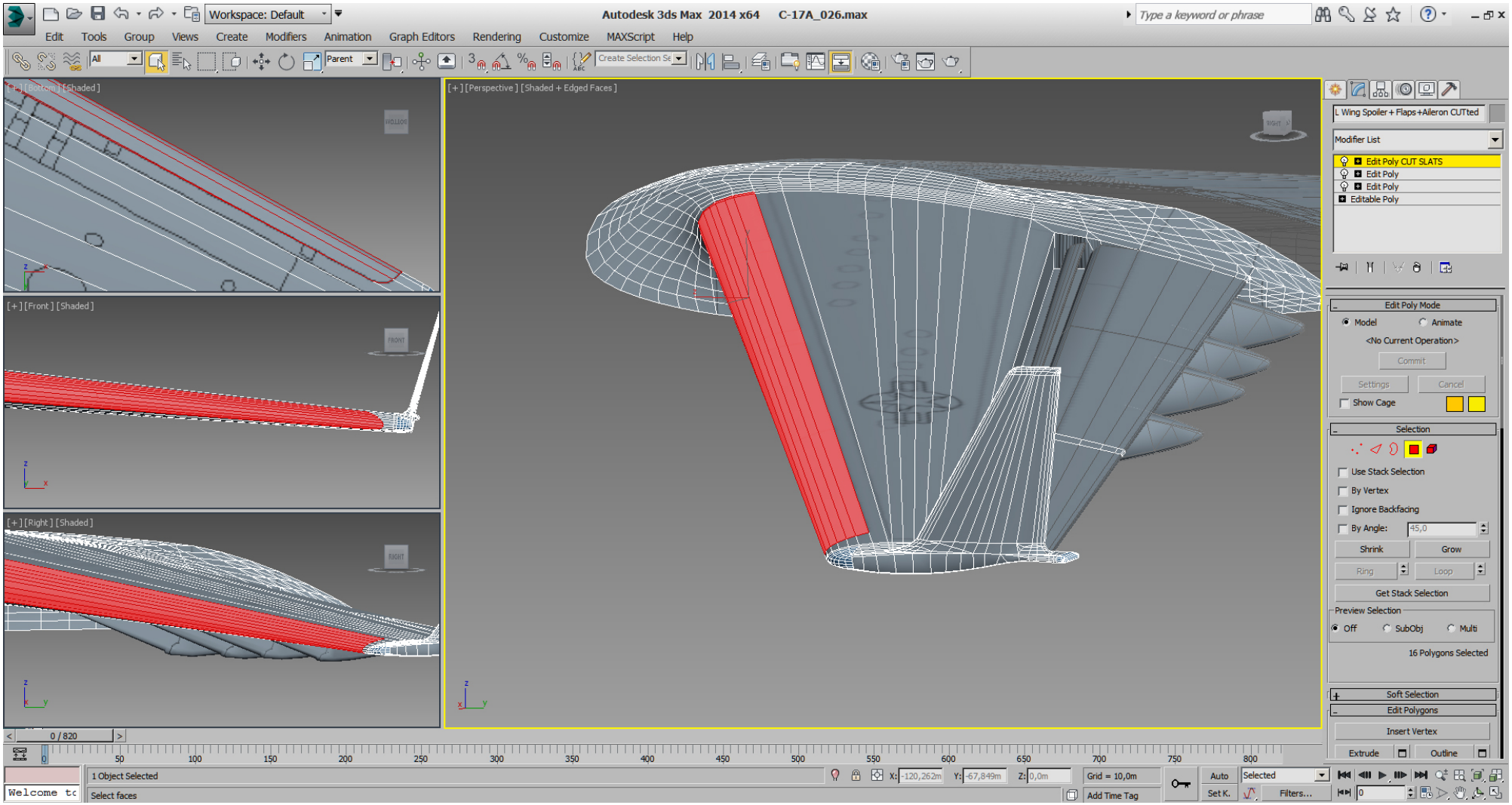

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_026.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Bottom][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
USAF
L Wing Spoiler + Flaps+Aileron CUTted
Modifier List
Edit Poly CUT SLATS
Edit Poly
Edit Poly
Editable Poly
Edit Poly Mode
Model Animate
<No Current Operation>
Commit
Settings Cancel
Show Cage
Selection
Use Stack Selection
By Vertex
Ignore Backfacing
By Angle: 45,0
Shrink Grow
Ring Loop
Get Stack Selection
Preview Selection
Off SubObj Multi
14 Polygons Selected
Soft Selection
Edit Polygons
Insert Vertex
Extrude Outline
141 / 820
1 Object Selected
Select faces
Grid = 10,0m
Add Time Tag
Auto
Set K.
Selected
Filters...
Welcome to

But wait, if we look at the edges already there from spline modeling, we see that they aren't in sync with our cutted slats, (selected edges) and that needs correction before doing more work on slats.



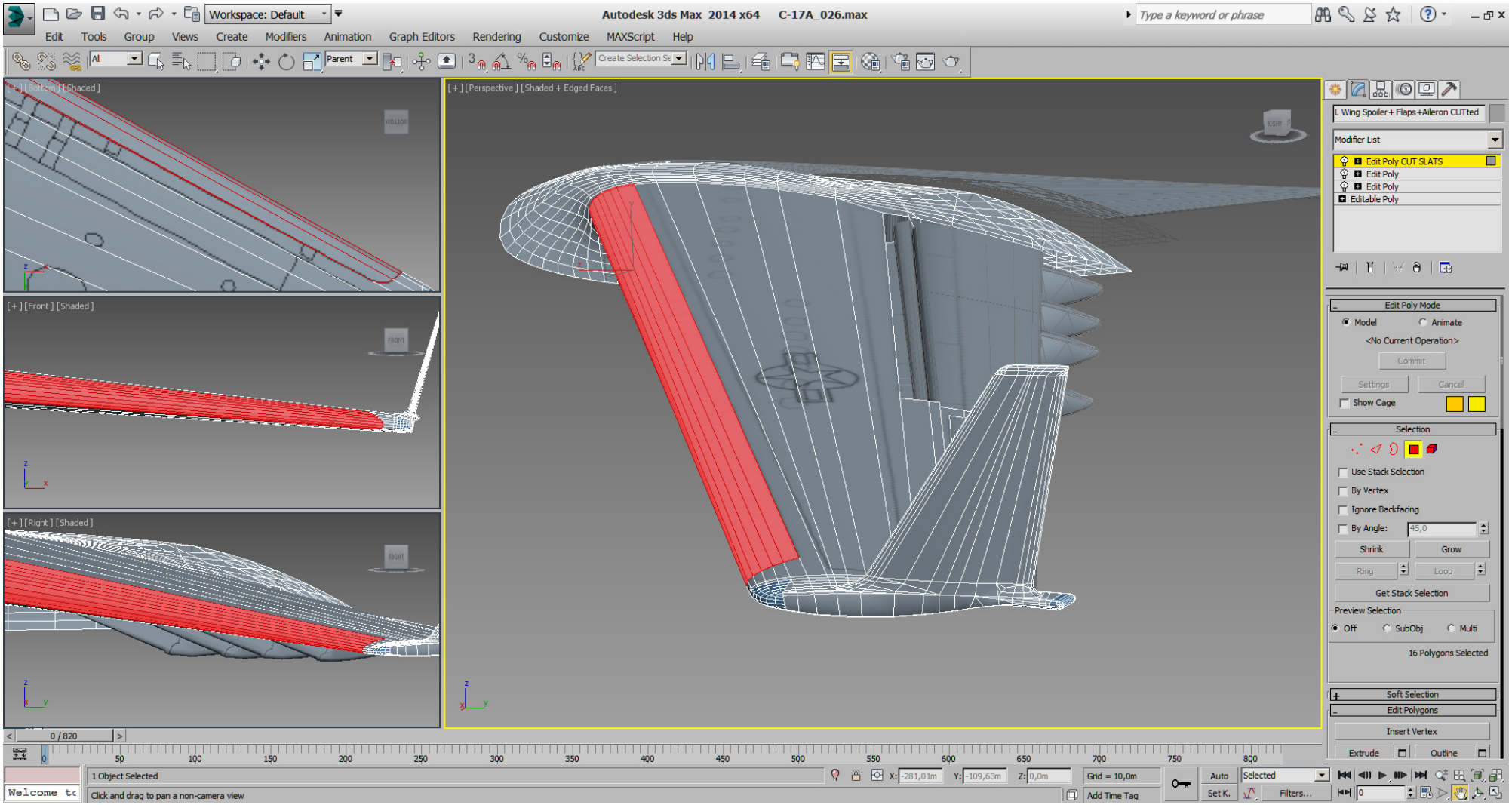
So we should cut new edges first, then delete old edges.
Doing it the other way around, will result in more loss of the shape.

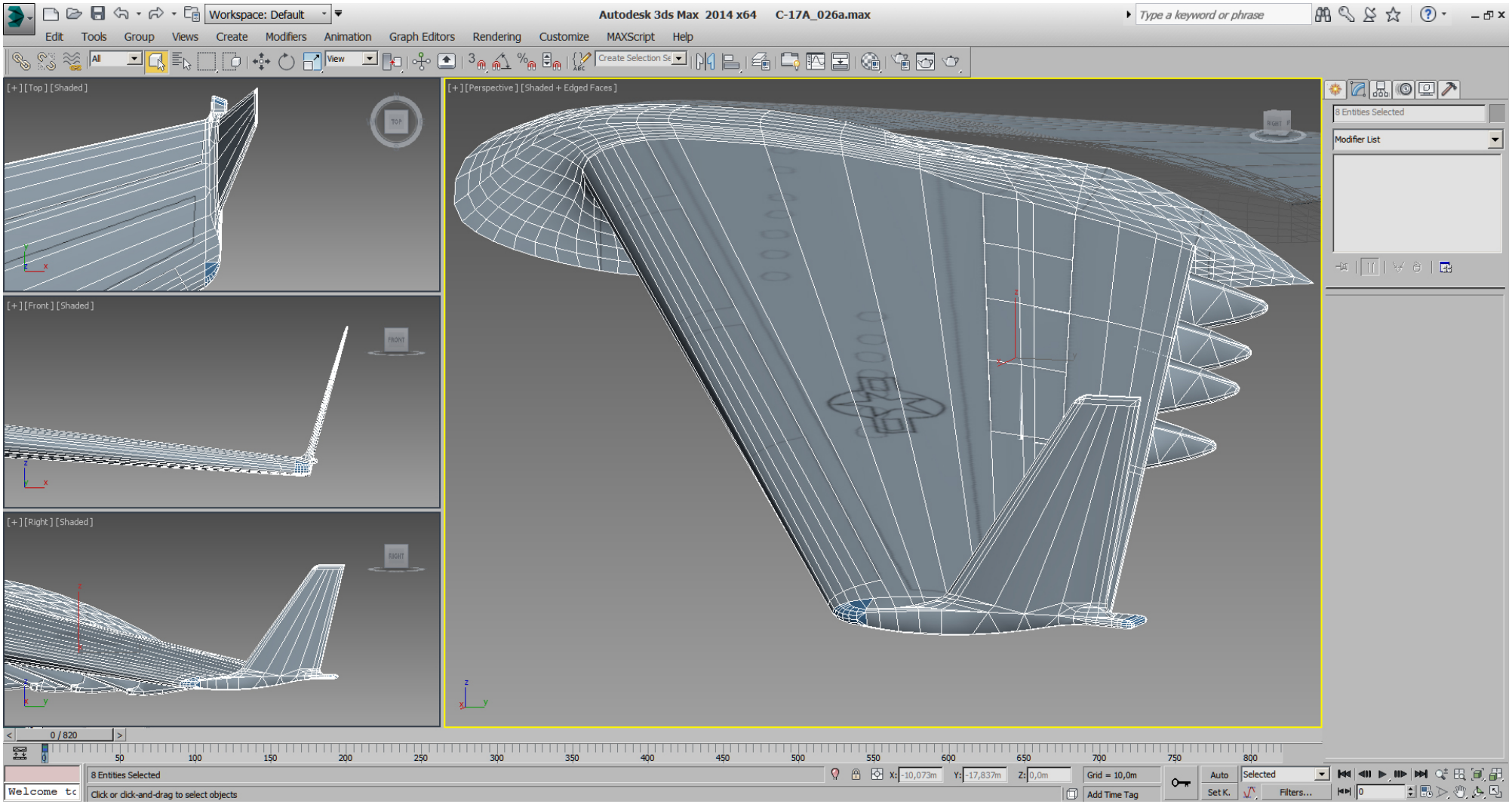
To cut a new “Edge” line between two “Vertices”, we use the “Edit Poly” in “Vertex” sub- mode -> “Cut” again.
To delete old “Edge”, select the “Edge” in “Edge" sub- mode, and press CTRL + BKSP.
Check for eventually useless “Vertices” in “Vertex” sub- mode, select them and press CTRL + BKSP to delete them.
Note how the new edges follow the slats now.



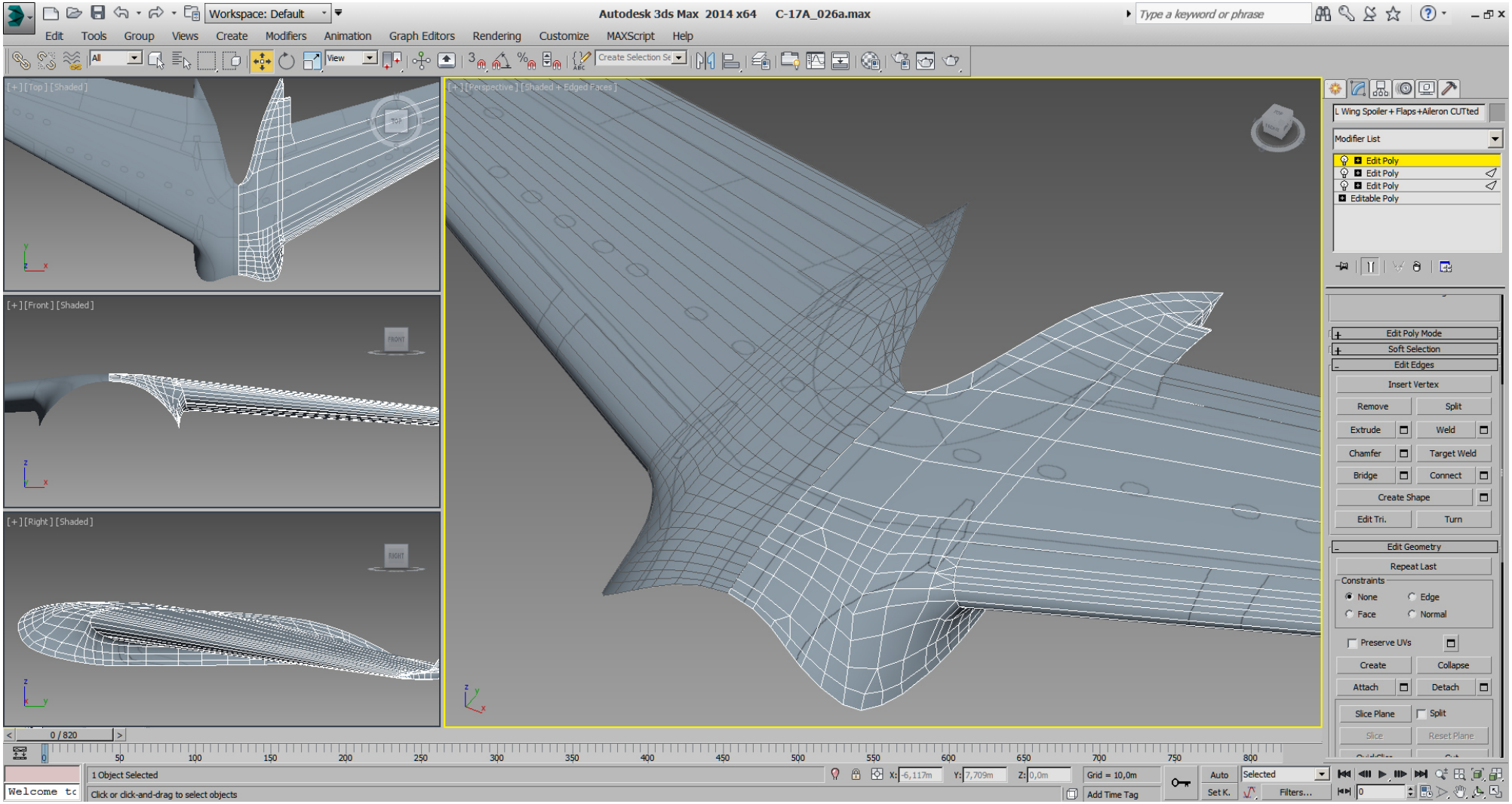
And while I was re- cutting the edges anyway, I was in the mood to tri- optimize the wing a little,
but mostly to bring some order into the edges. A first tri optimizing step on the wings, without losing much quality, if at all.

Compare to above pictures and note how some edges change to more useful positions while others got removed.

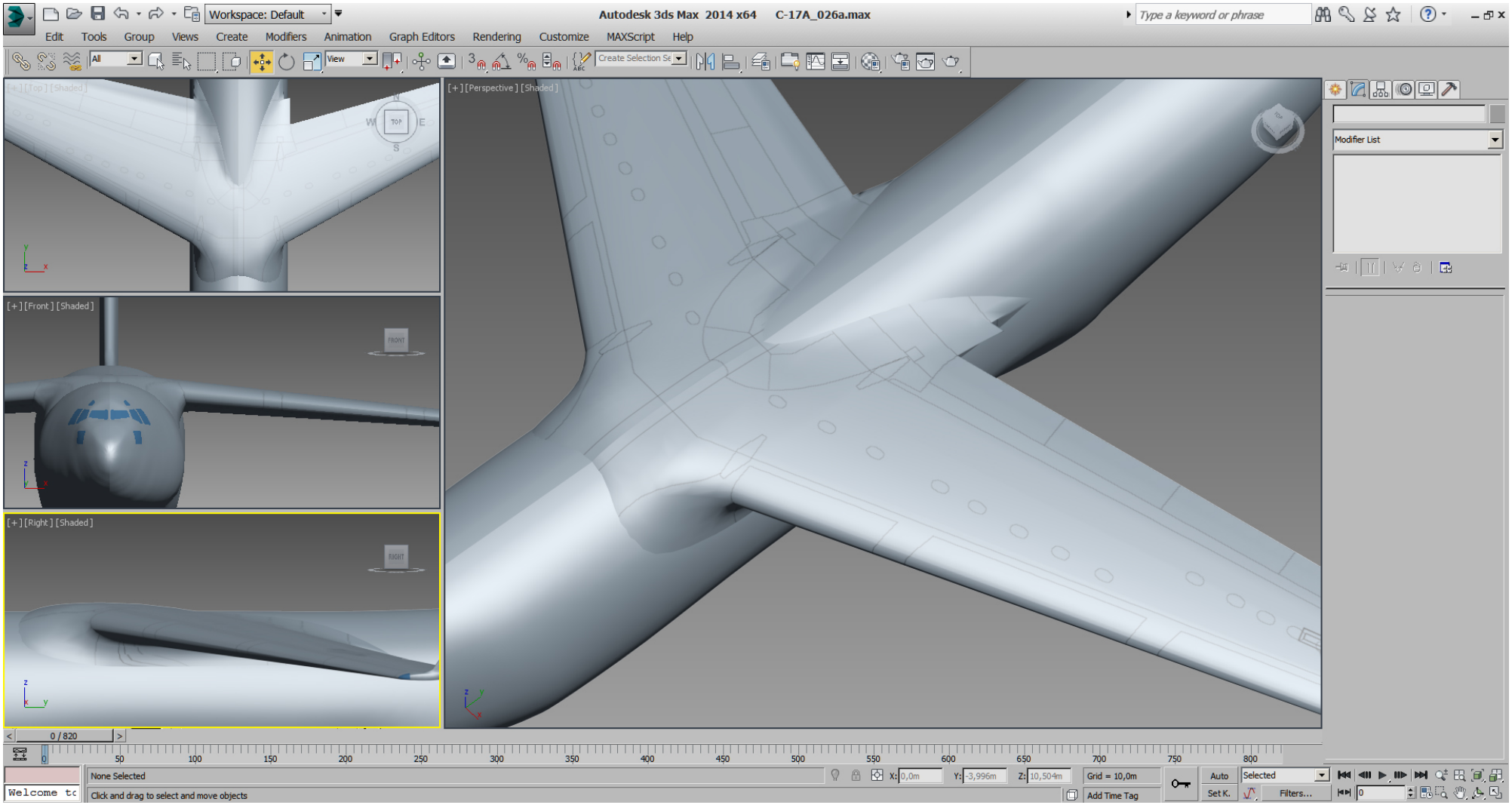



Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_026a.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded + Edged Faces]
8 Entities Selected
Modifier List
0 / 820
8 Entities Selected
Click or click-and-drag to select objects
Add Time Tag
Grid = 10,0m
Auto
Set K.
Filters...
Selected

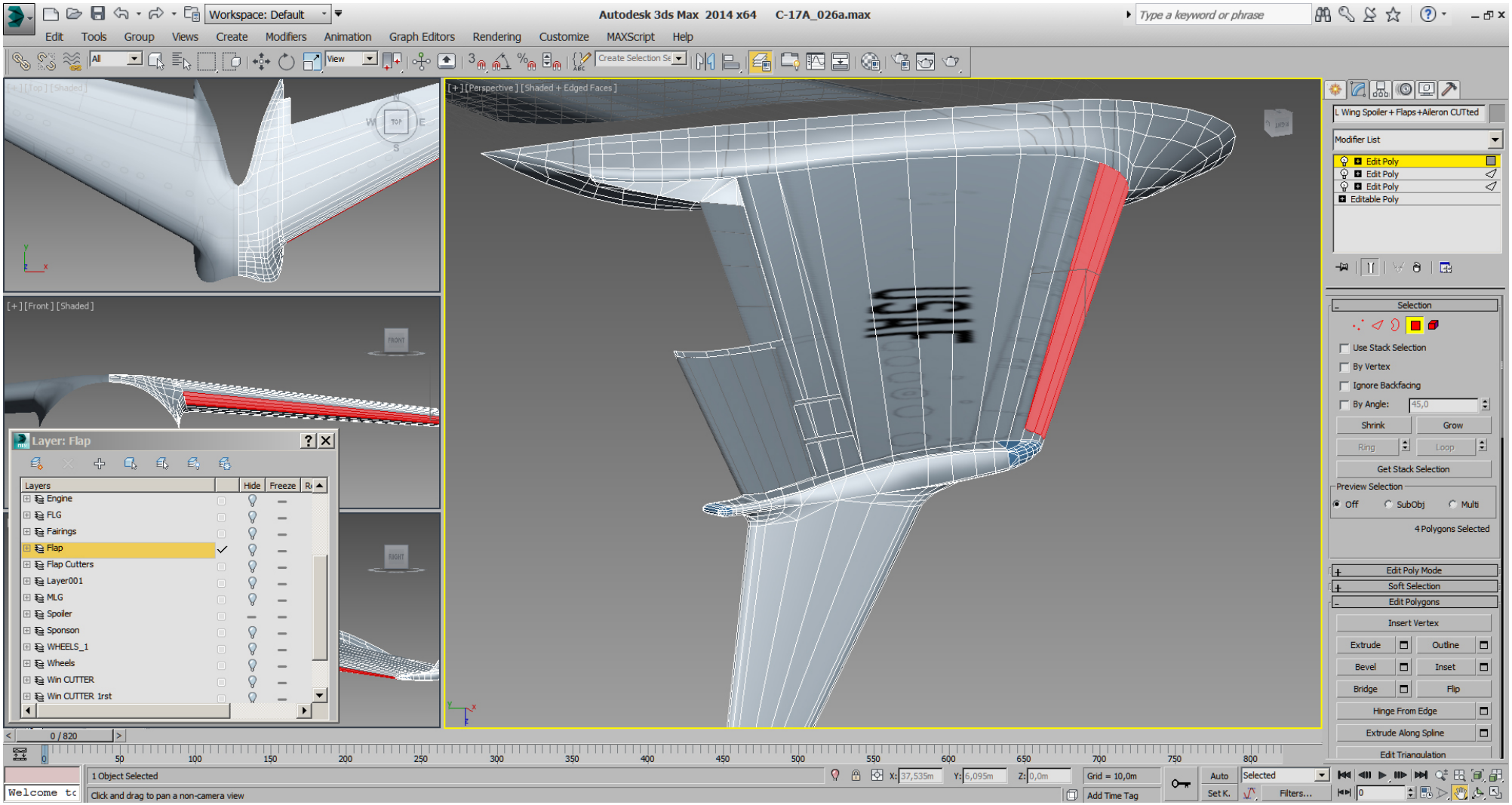
Some work on the shoulder again, ... compare to the (unselected) right wing.
Still using “Edit Poly” to “Cut” new ”Edges” and delete useless ones.
Additionally we can use “Collapse” to collapse selected ”Vertices” or selected “Edges”.



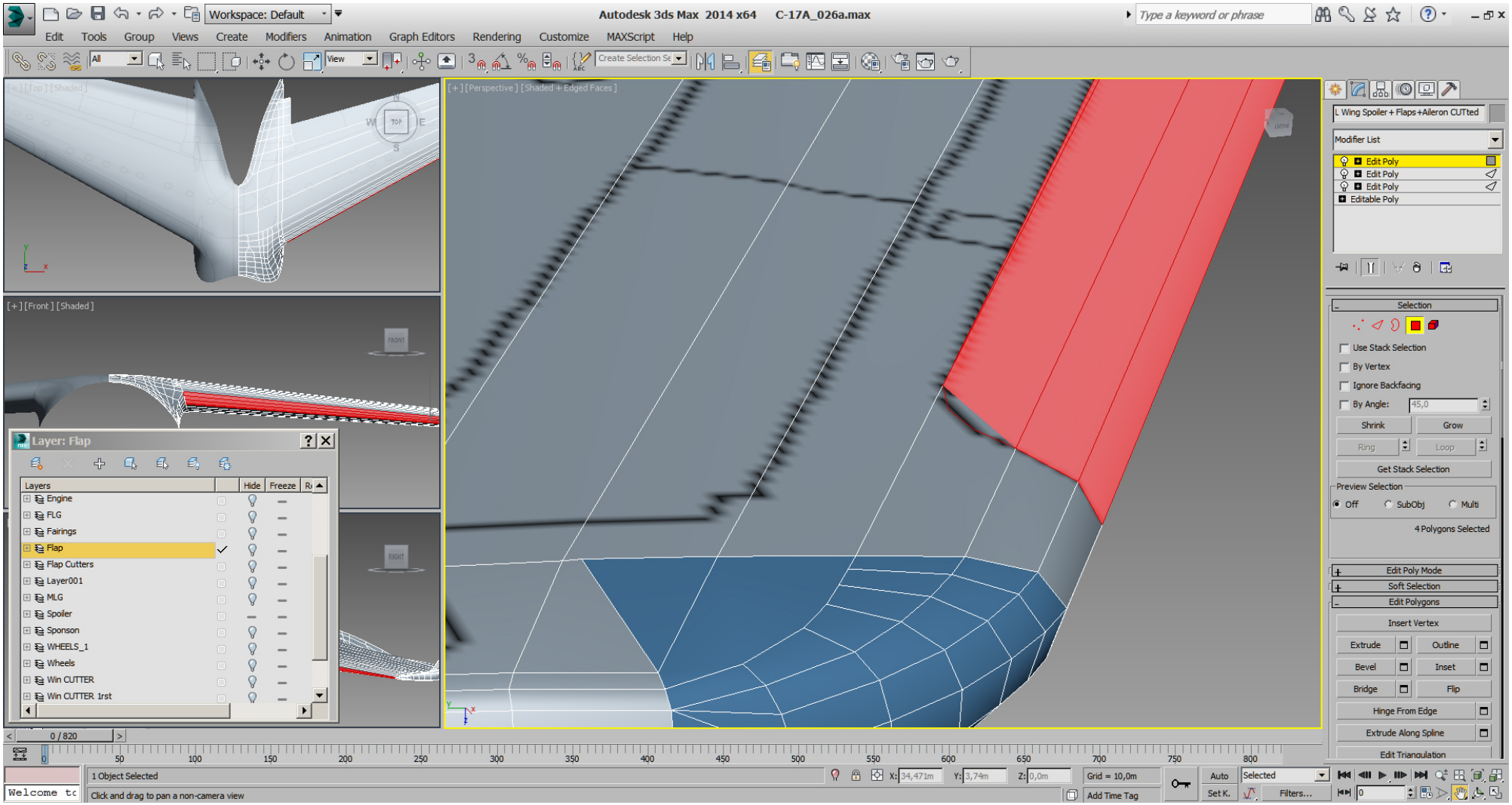
Checking results with a shiny material, ... no harm done.



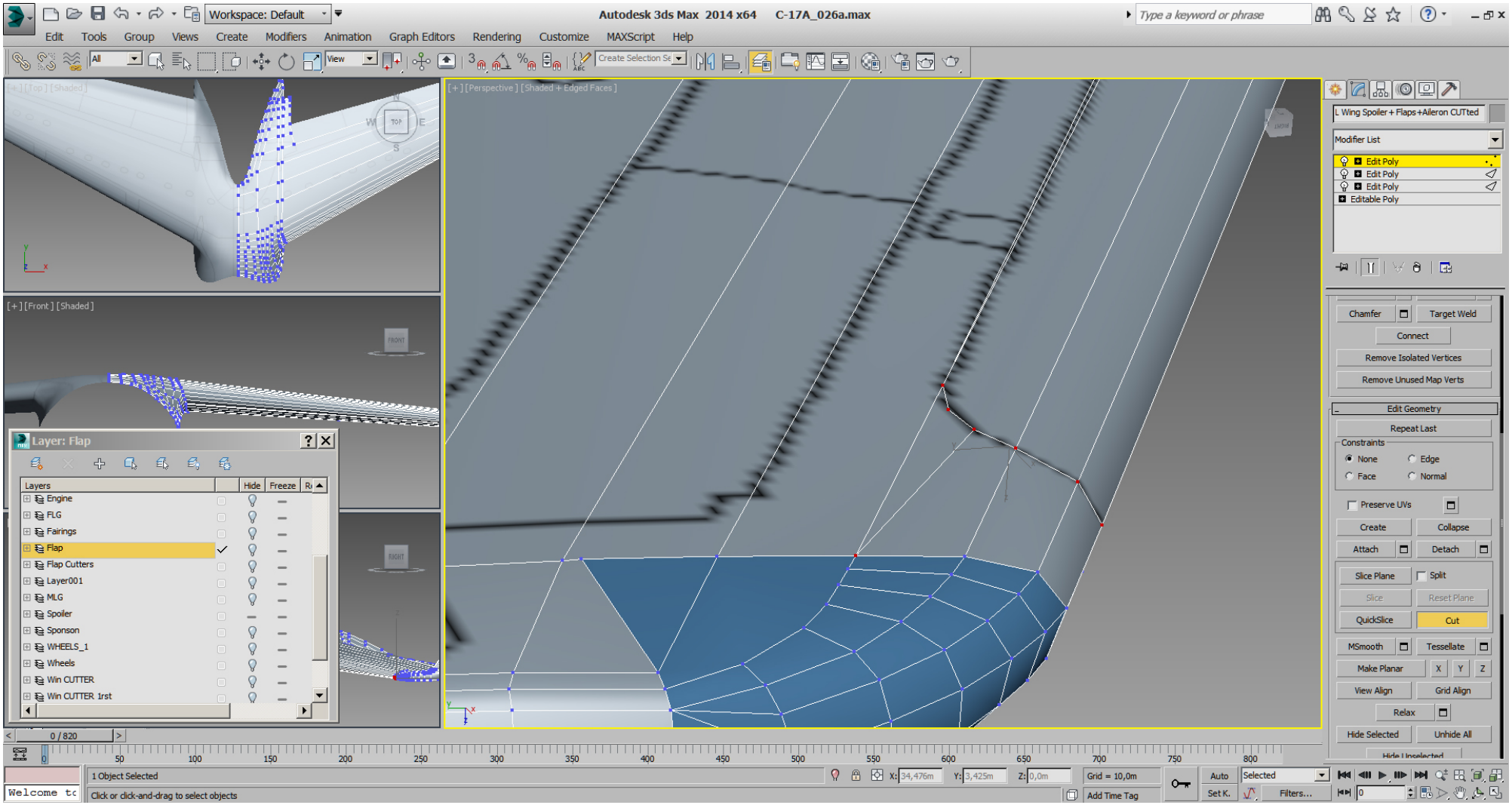
Bottom slat needs also work on the ”Edges”.



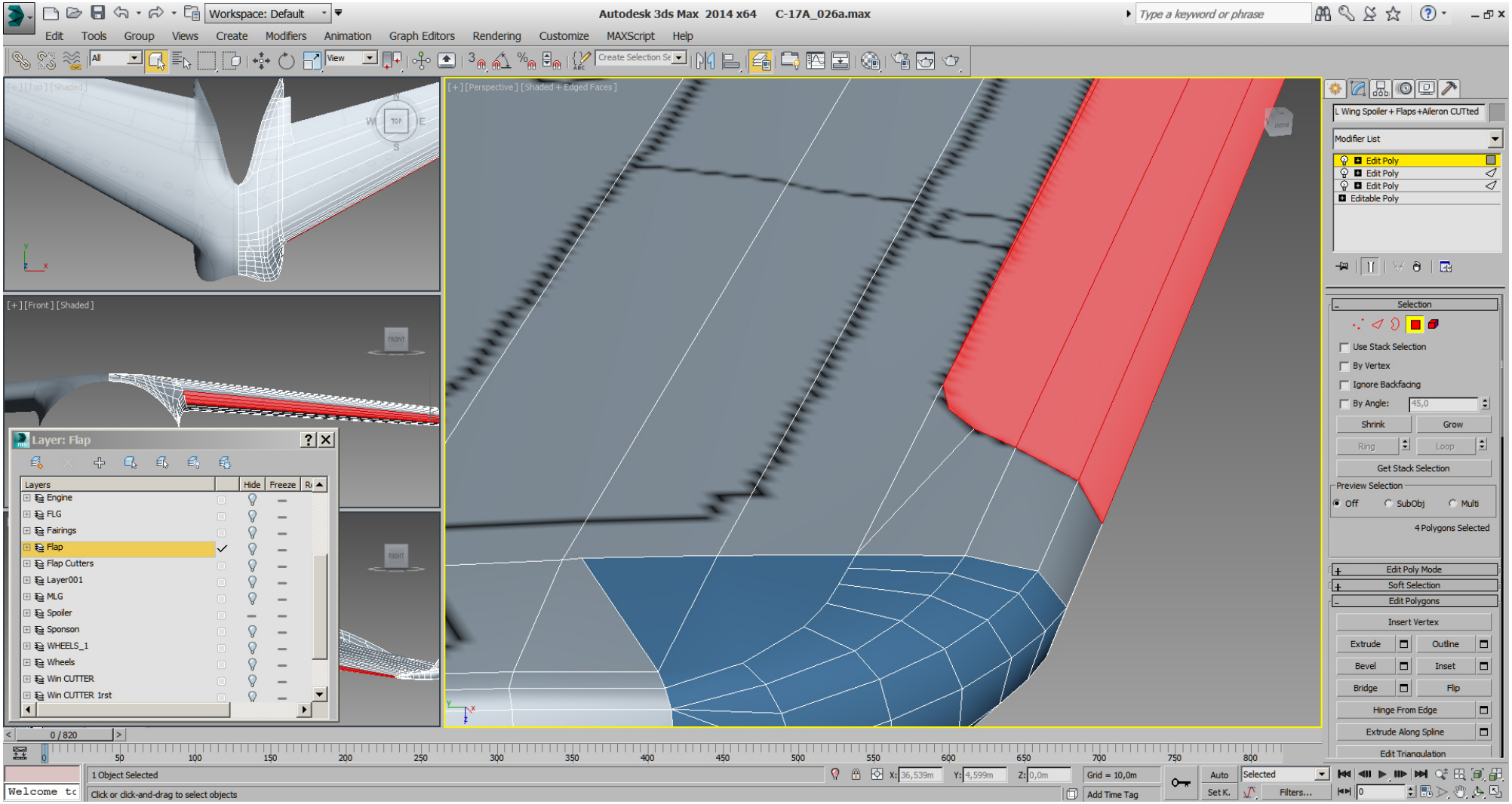
Looking closer there is a small issue, where 3dsMax is confused.



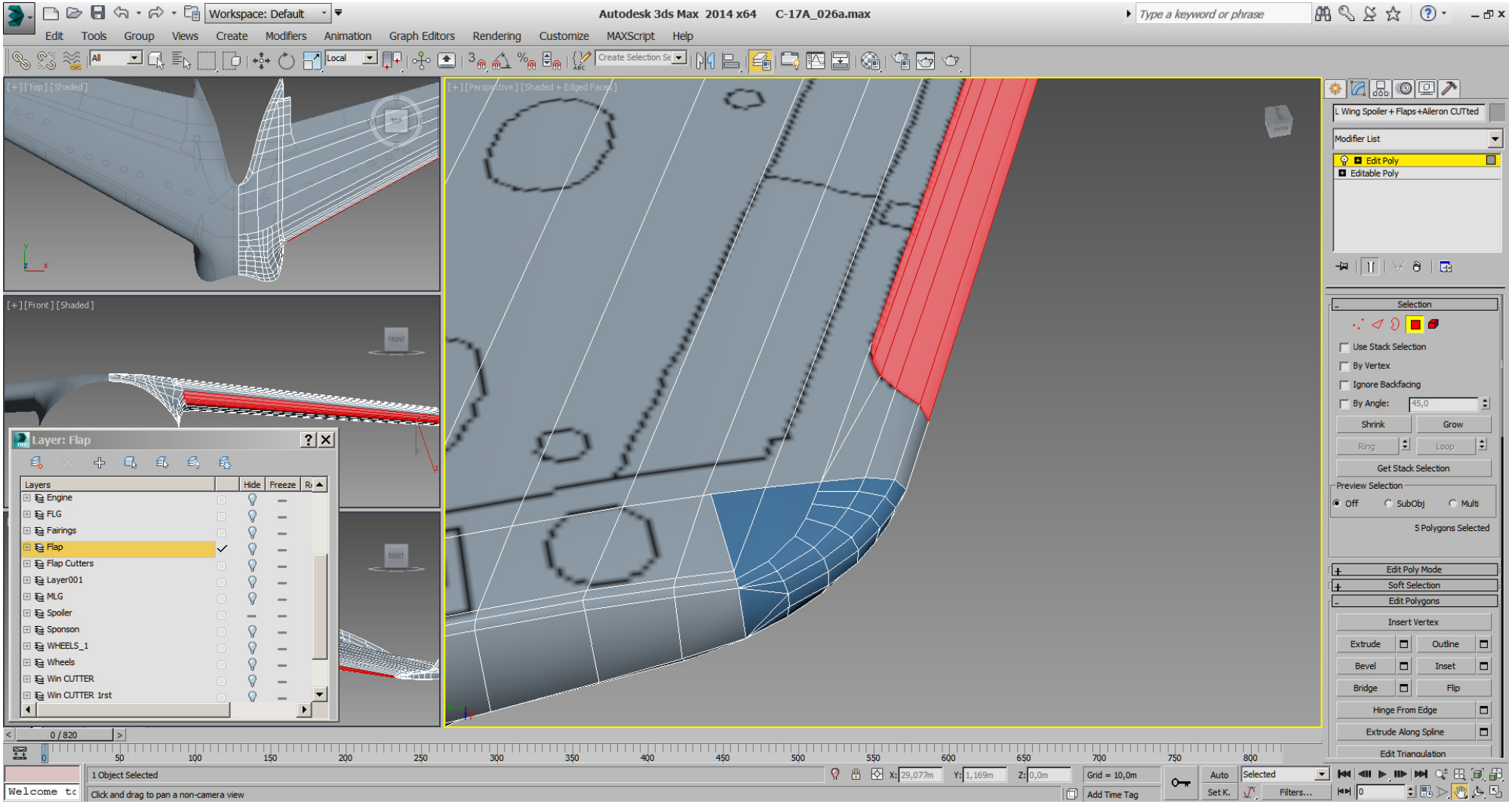
We just cut a little ”Edge” to the next ”Vertex”, ...

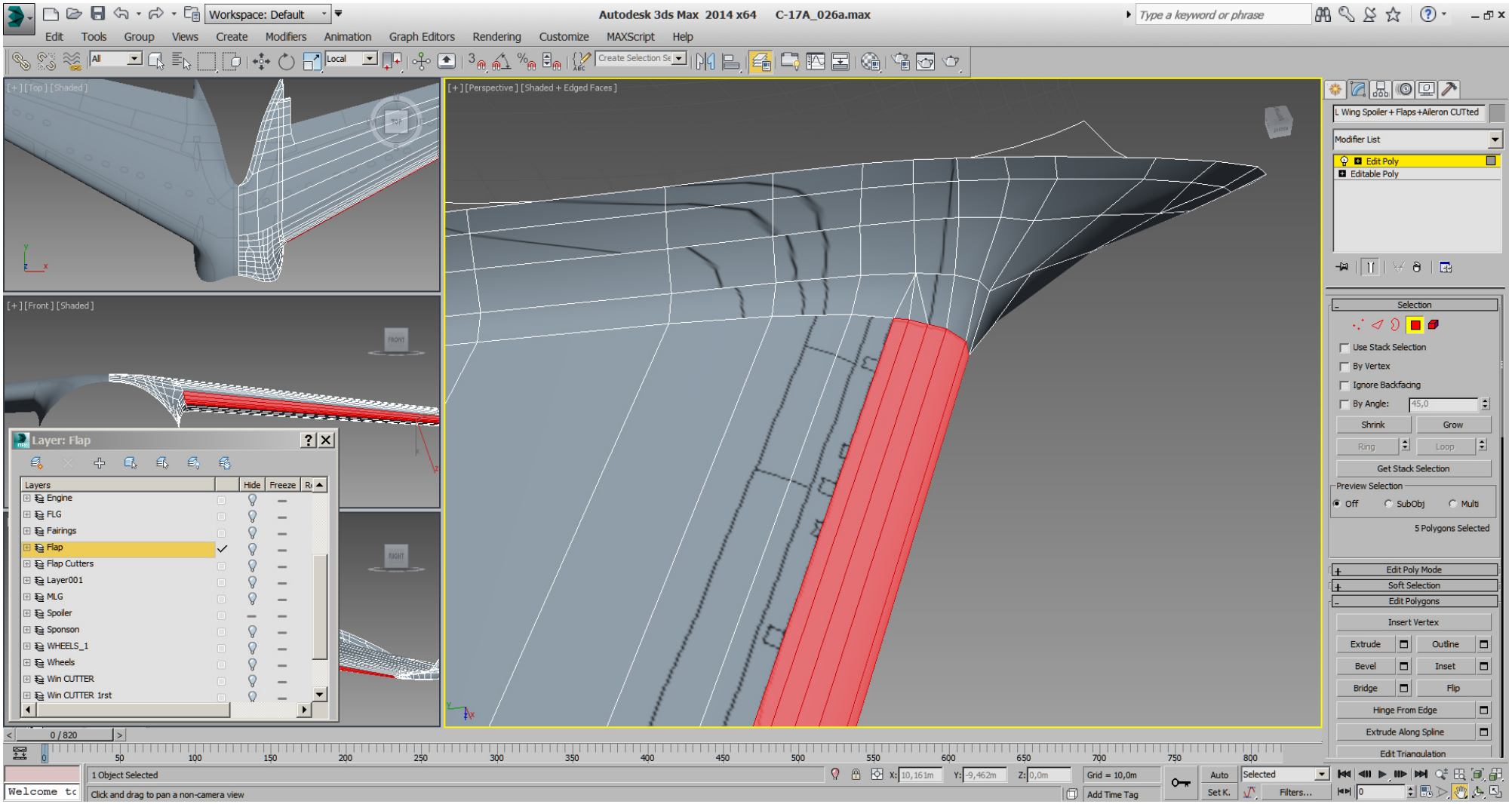


That helps.

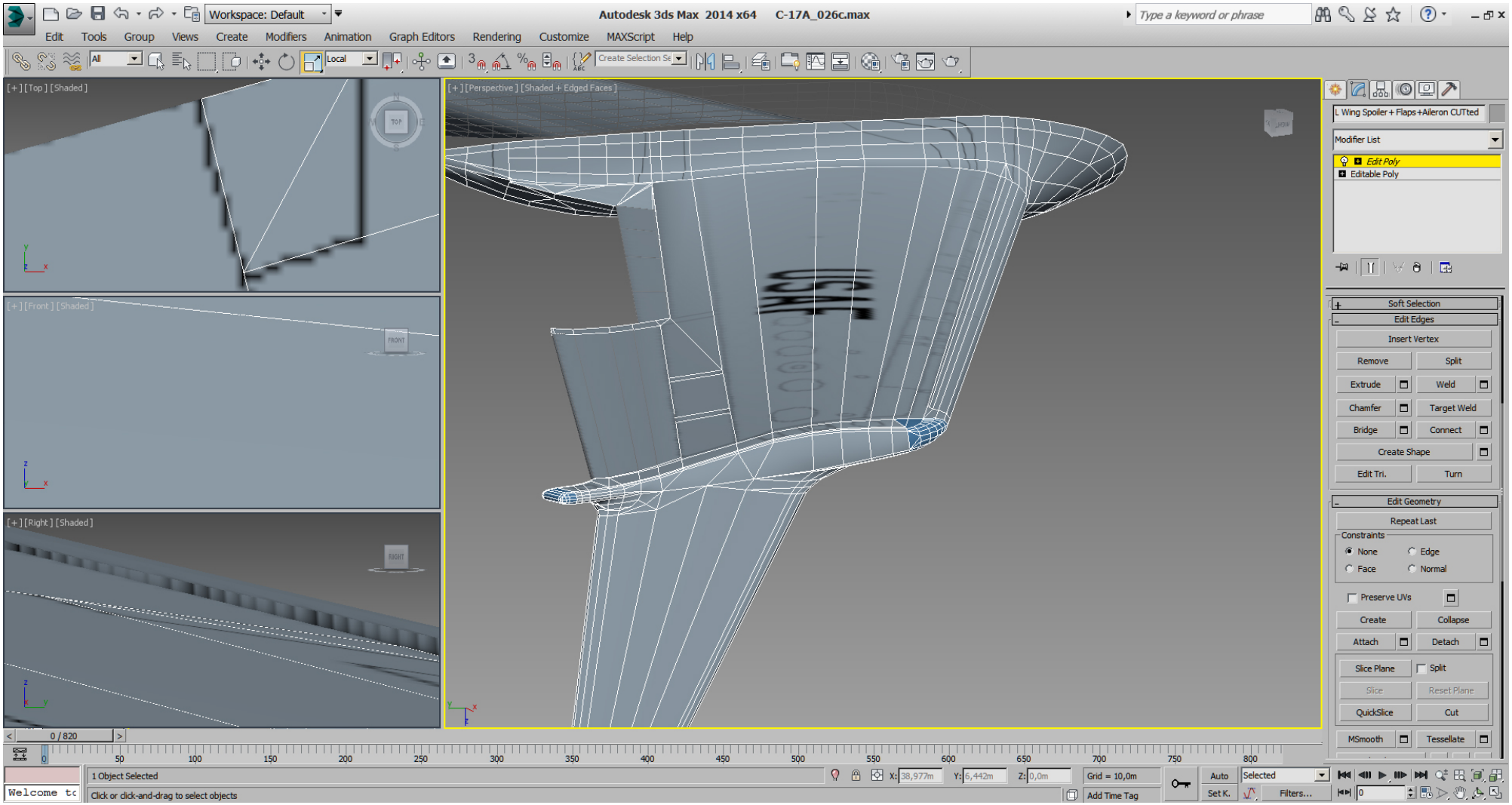

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_026a.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Perspective][Shaded + Edged Faces]
Layer: Flap
Layers Hide Freeze
Engine
FLG
Fairings
Flap
Flap Cutters
Layer001
MLG
Spoiler
Sponson
WHEELS_1
Wheels
Win CUTTER
Win CUTTER 1rst
L Wing Spoiler + Flaps +Aileron CUTted
Modifier List
Edit Poly
Edit Poly
Edit Poly
Editable Poly
Selection
Use Stack Selection
By Vertex
Ignore Backfacing
By Angle:
Shrink
Grow
Ring
Loop
Get Stack Selection
Preview Selection
Off
SubObj
Multi
4 Polygons Selected
Edit Poly Mode
Soft Selection
Edit Polygons
Insert Vertex
Extrude
Outline
Bevel
Inset
Bridge
Flip
Hinge From Edge
Extrude Along Spline
Edit Triangulation
0 / 820
1 Object Selected
Click or click-and-drag to select objects
Add Time Tag
Auto
Set K.
Filters...
Selected
Welcome to

Additionally we've cutted 2 ”Edges” from each curve vertex to the shoulder end of the slats.




Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_026a.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Perspective][Shaded + Edged Faces]
Layer: Flap
Layers Hide Freeze
Engine
FLG
Fairings
Flap
Flap Cutters
Layer001
MLG
Spoiler
Sponson
WHEELS_1
Wheels
Win CUTTER
Win CUTTER 1rst
L Wing Spoiler + Flaps+Aileron CUTted
Modifier List
Edit Poly
Editable Poly
Selection
Use Stack Selection
By Vertex
Ignore Backfacing
By Angle:
Shrink
Grow
Ring
Loop
Get Stack Selection
Preview Selection
Off
SubObj
Multi
5 Polygons Selected
Edit Poly Mode
Soft Selection
Edit Polygons
Insert Vertex
Extrude
Outline
Bevel
Inset
Bridge
Flip
Hinge From Edge
Extrude Along Spline
Edit Triangulation
0 / 820
1 Object Selected
Click and drag to pan a non-camera view
Add Time Tag
Grid = 10,0m
Auto
Set K.
Selected
Filters...
Welcome to

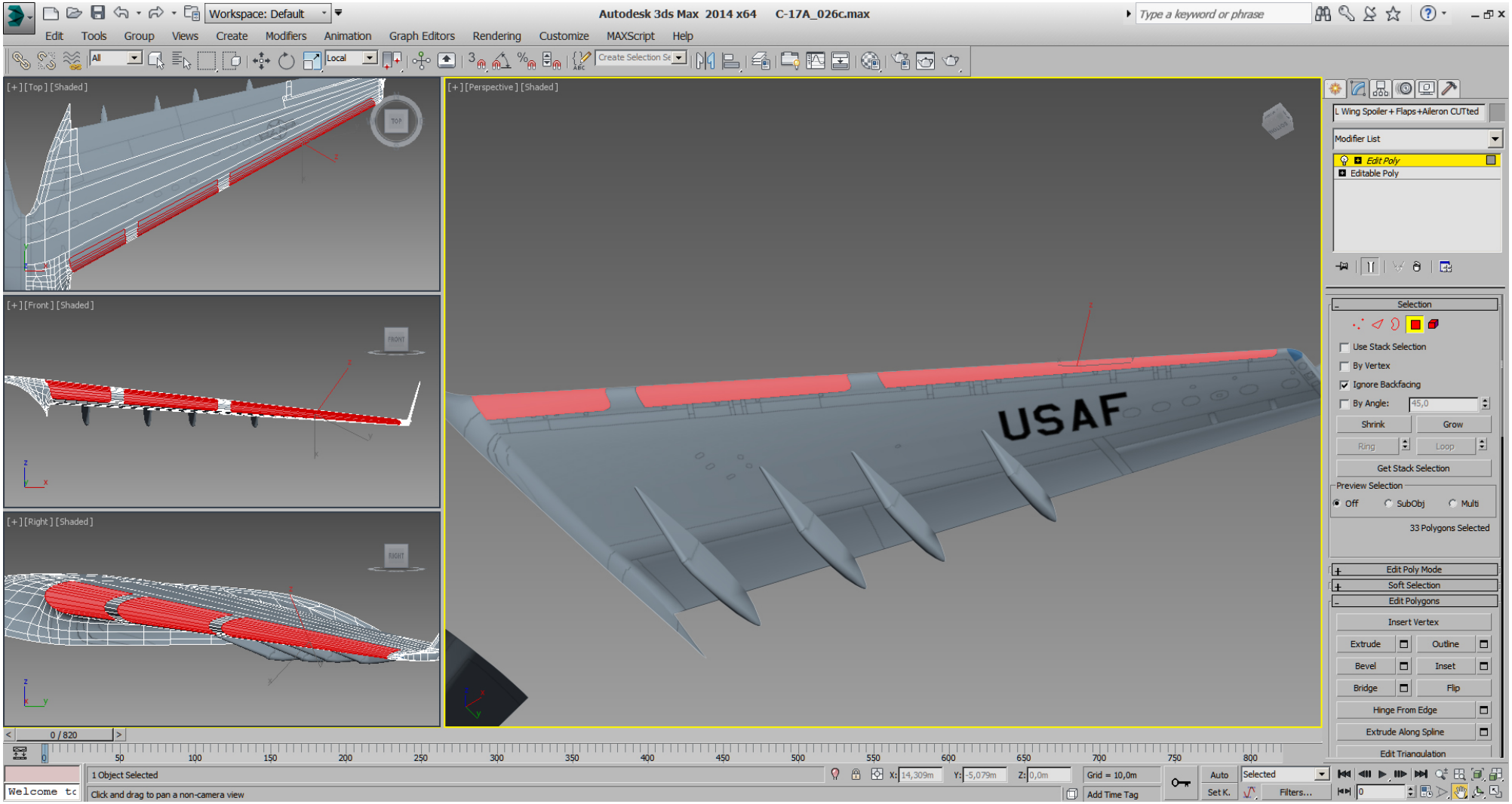
The bottom after some optimizing, while taking care of the characteristic rounded bottom wingtip, and airfoil.

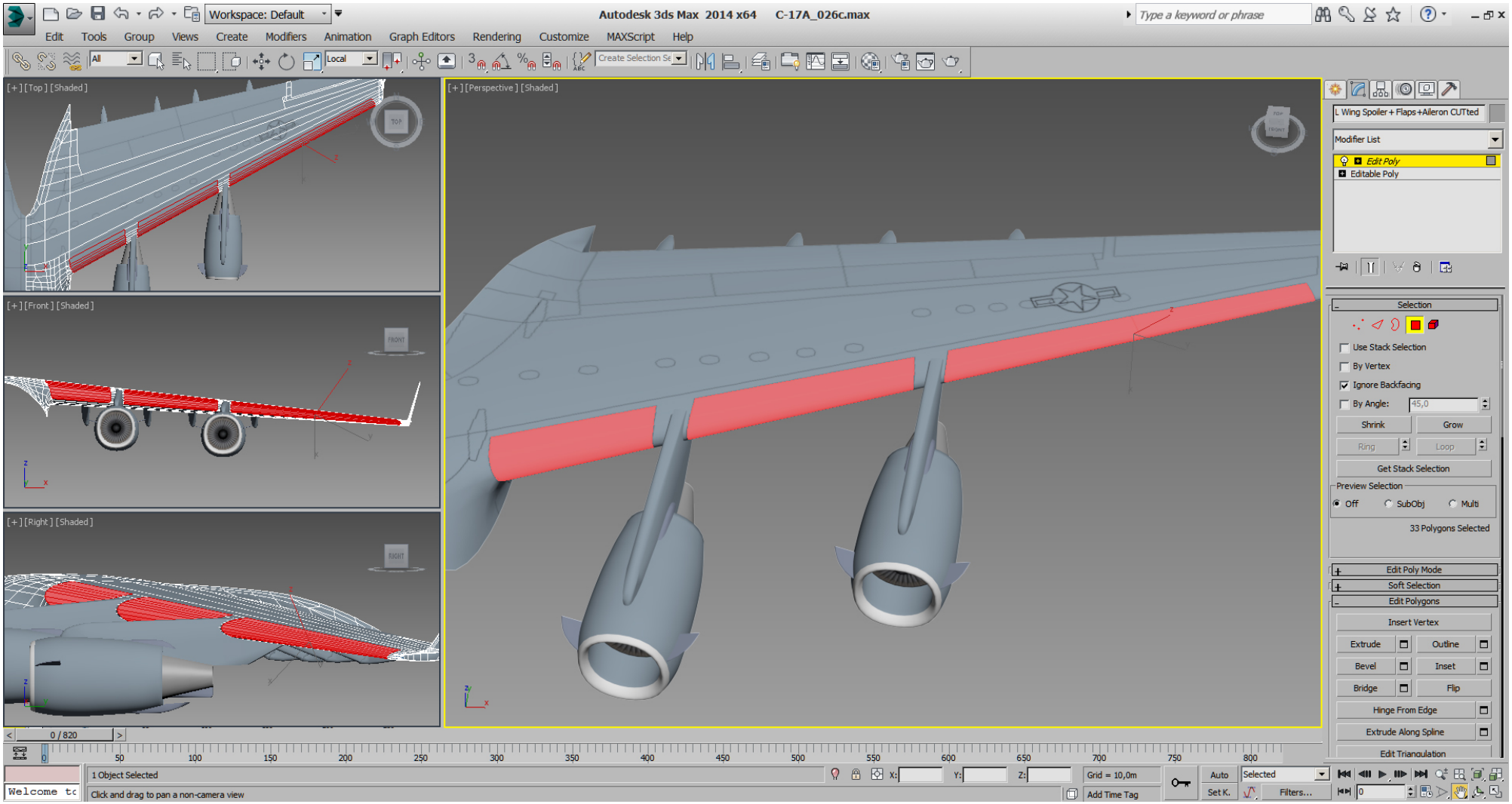


While doing that first ”cleanup”, I've also fine tuned some stuff by doing gently adjustments wherever I saw the need to do so.

During the whole process I’ve used multiple ”Edit Poly” modifiers on top.
Just in case something goes wrong , then I just delete the last modifier and tried again.
When I was happy with a few steps and had 4 - 5 modifiers in the ”Stack”, I've ”collapsed” the ”Stack” to an “Editable Poly”.

Now with this work done, back to the slats, where we can cut the remaining needed edges easily.
In RL they are 4 pieces whereat the outer 2 slats move together anyway, so the outer 2 are one piece.



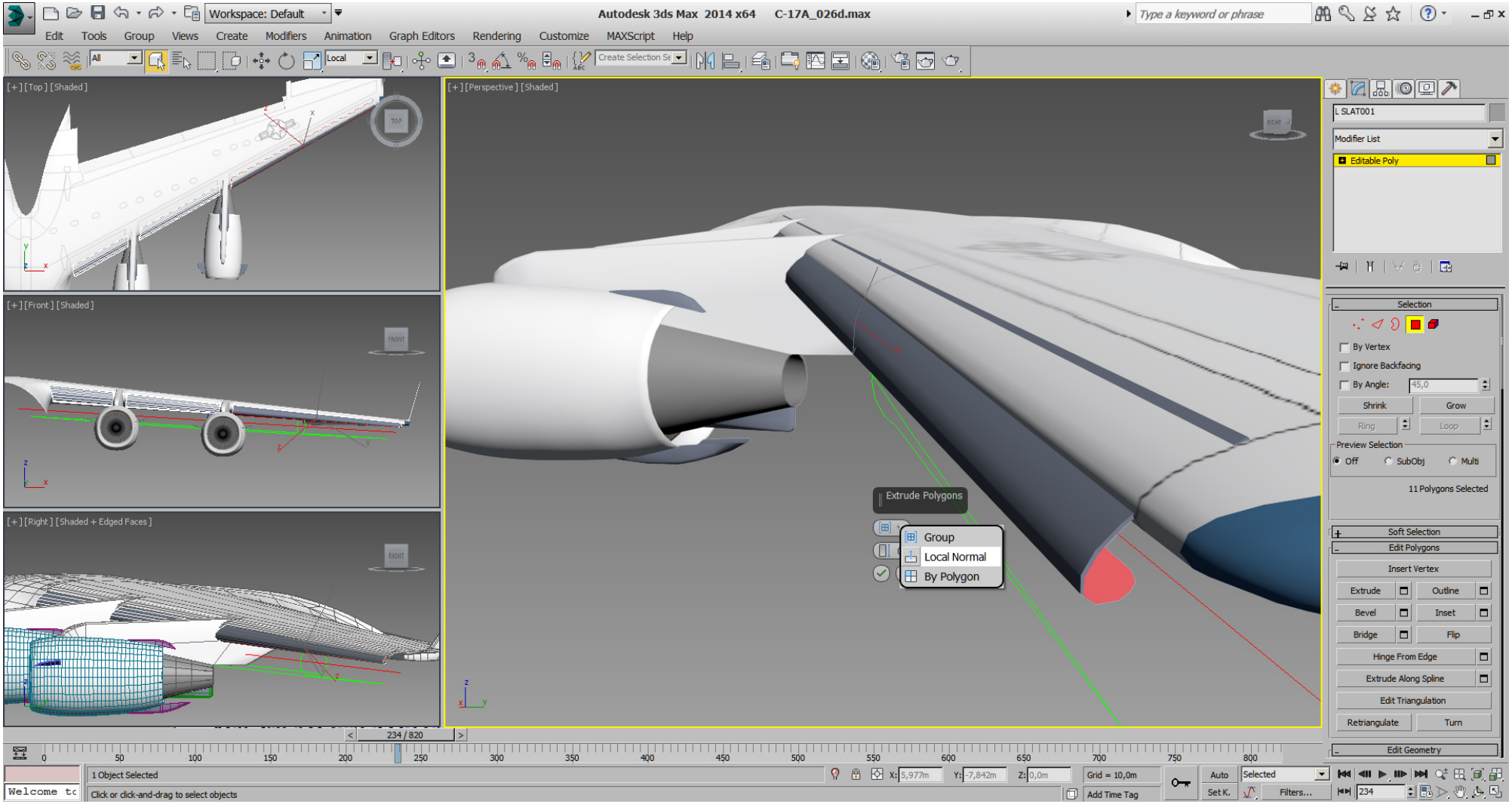


With a detached **copy** of those selected polys, named "L SLATS", I did another copy "L SLATS001", then selected all polys -> "Flip".
Next I've extruded the selected polys by a value of 0,01 and with the option "Local Normal" ... to get a width for the slats.
Then I've attached "L SLATS001" to "L SLATS", selected all vertex and did a "Weld" by a value of 0,001m on them.

Btw. use "Weld" by a value of 0,001m often during the modeling process on any object to make sure all vertex which are sharing the same coordinates are welded. (if you work in feet (ft) then use 0,001 ft)

Atm. I'm not sure if I keep that width- polys for tri- count reason finally, ... we'll see.

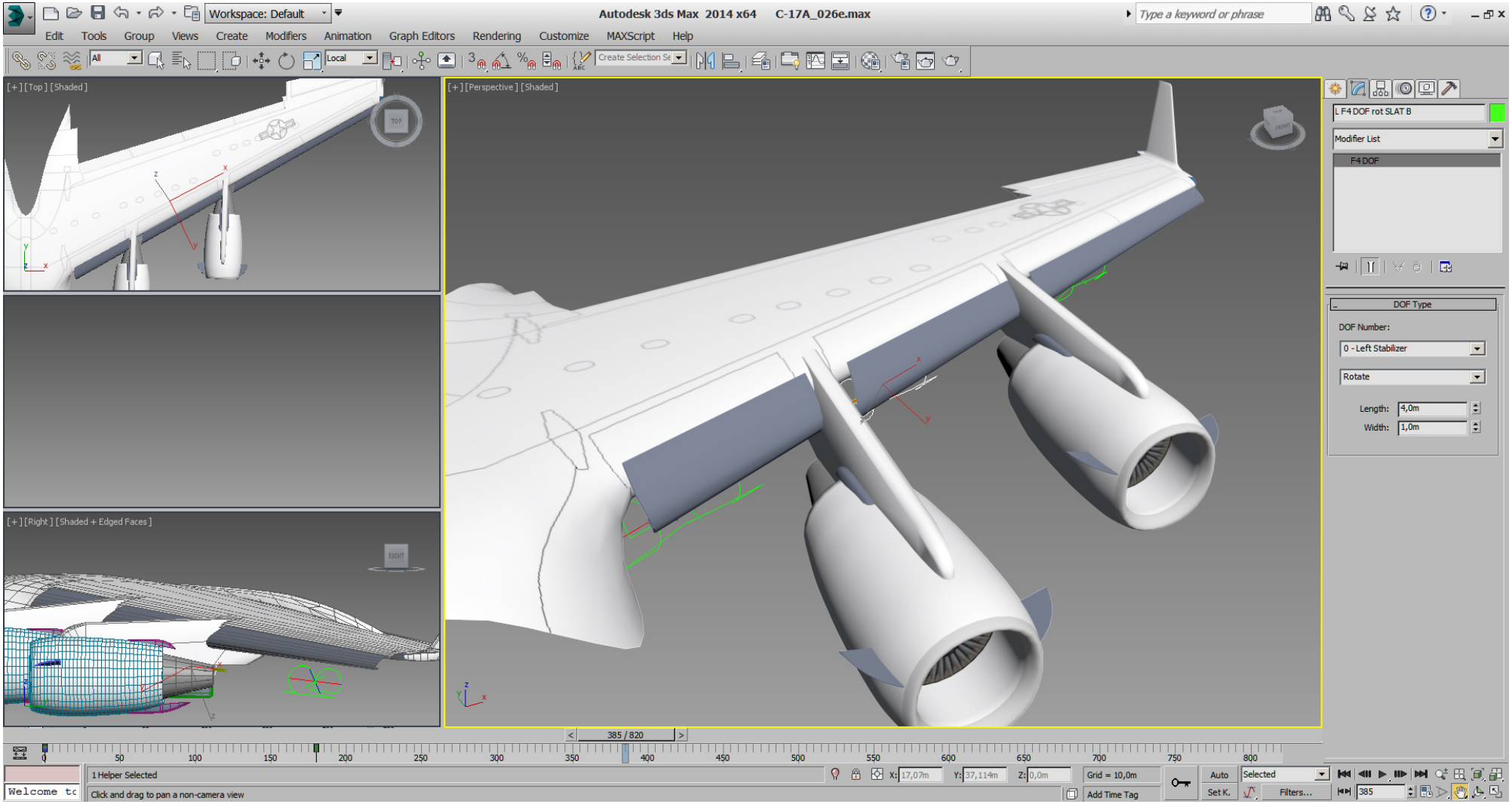
Note also in this picture a first try to find the position for the DOF helper.
Seeing the slats through the wing is helpful at this state.

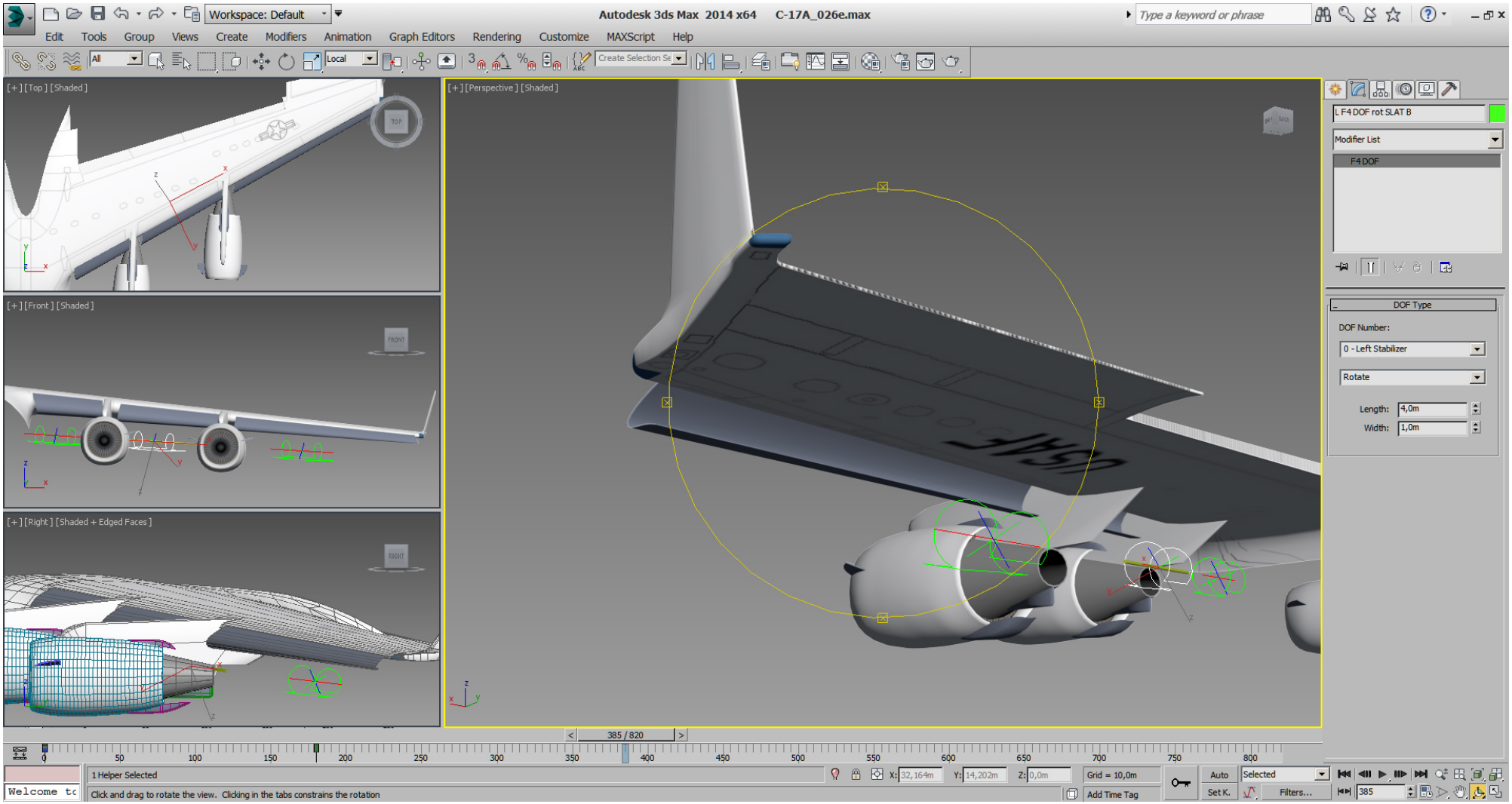


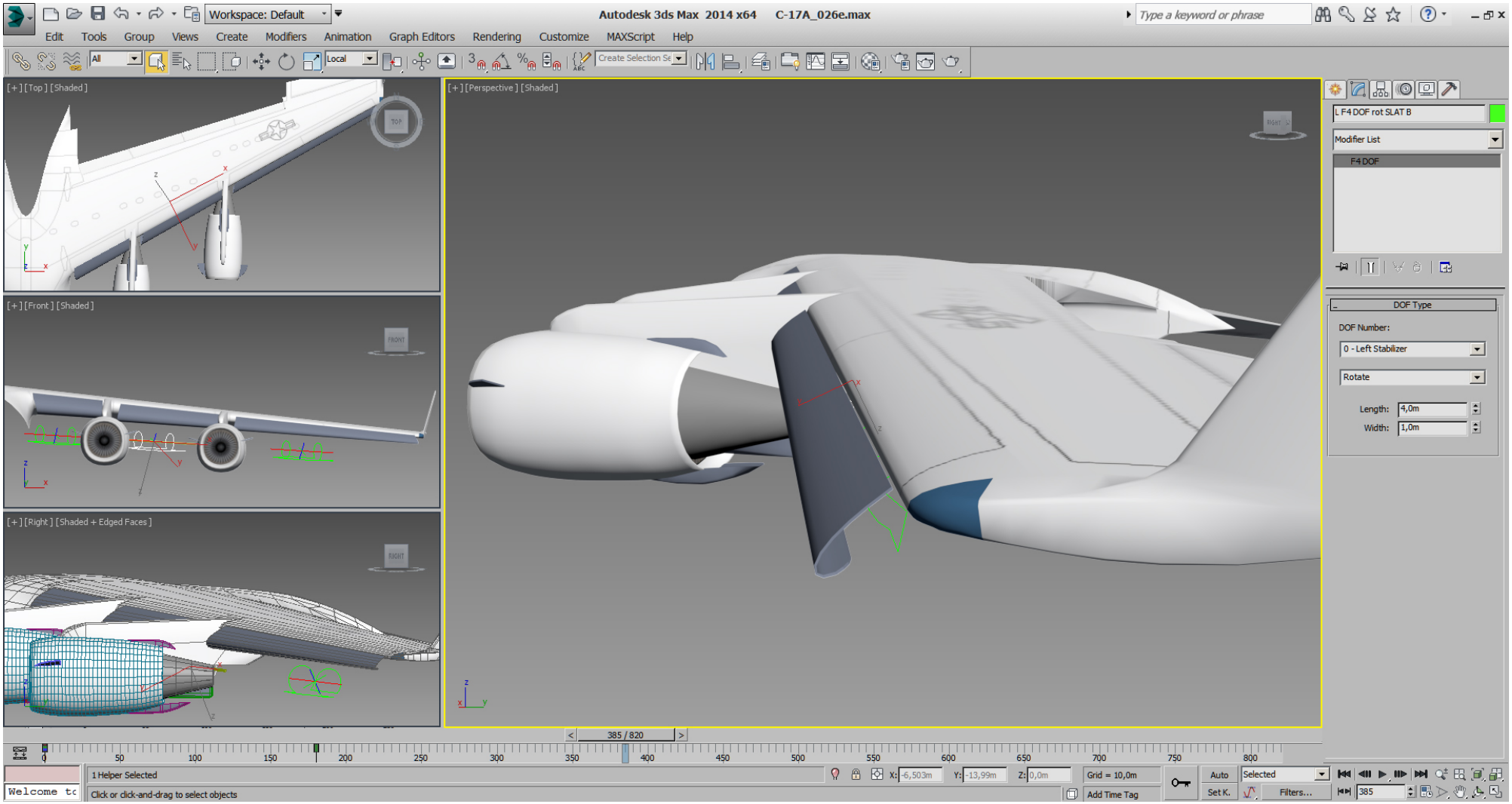
A little later I've found a good spot for the DOF helper, which I've duplicated two times
Then I've splitted the whole “L SLATS” object into “L SLAT A”, “L SLAT B” and “L SLAT C”.

After linking the 3 slat objects to the DOF helpers, I've adjusted the animation in 3dsMax to known rotation values. L SLAT A -> 18°, L SLAT B -> 23°, and L SLAT C 25°.

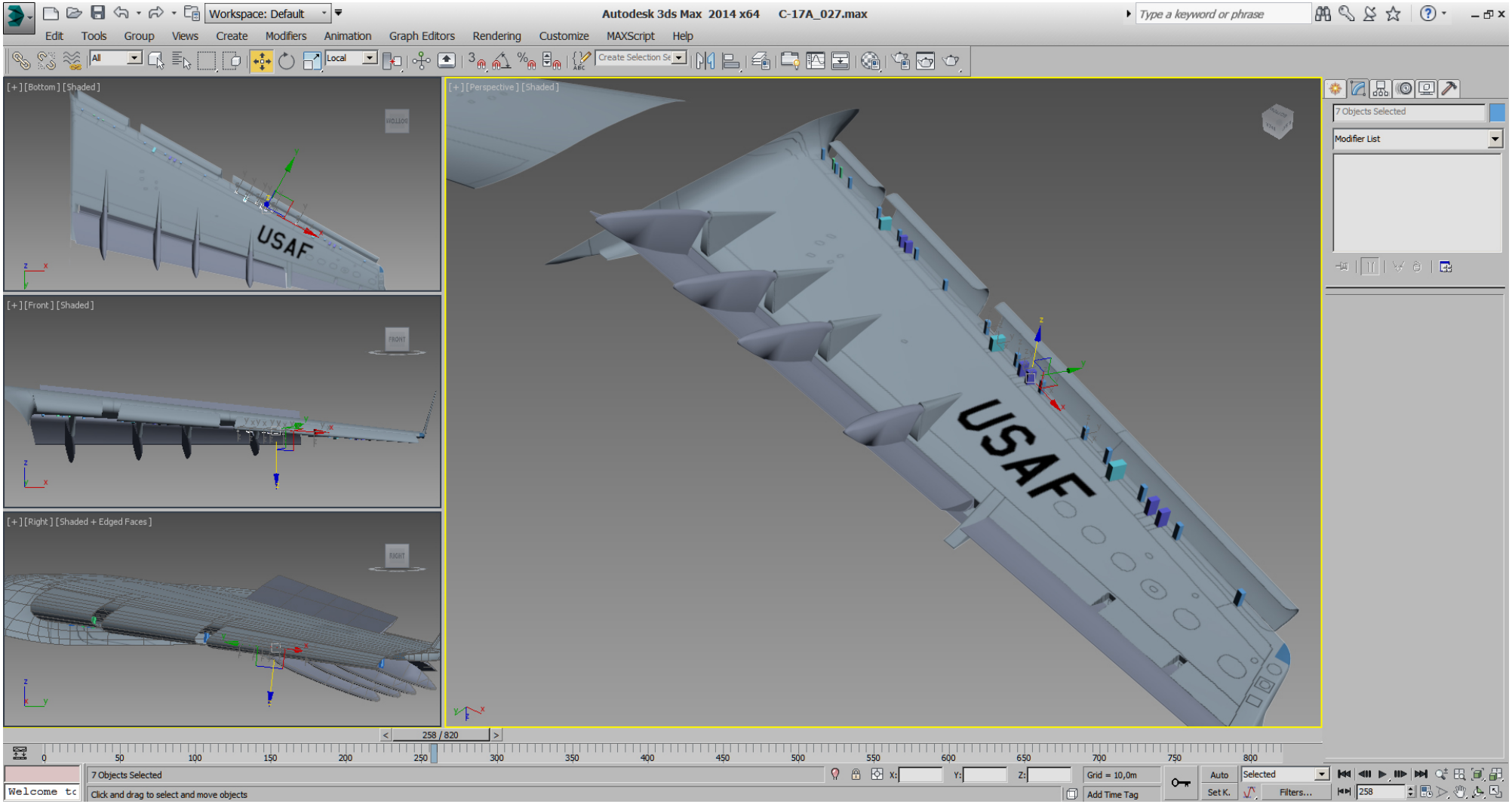
Results looks like this:



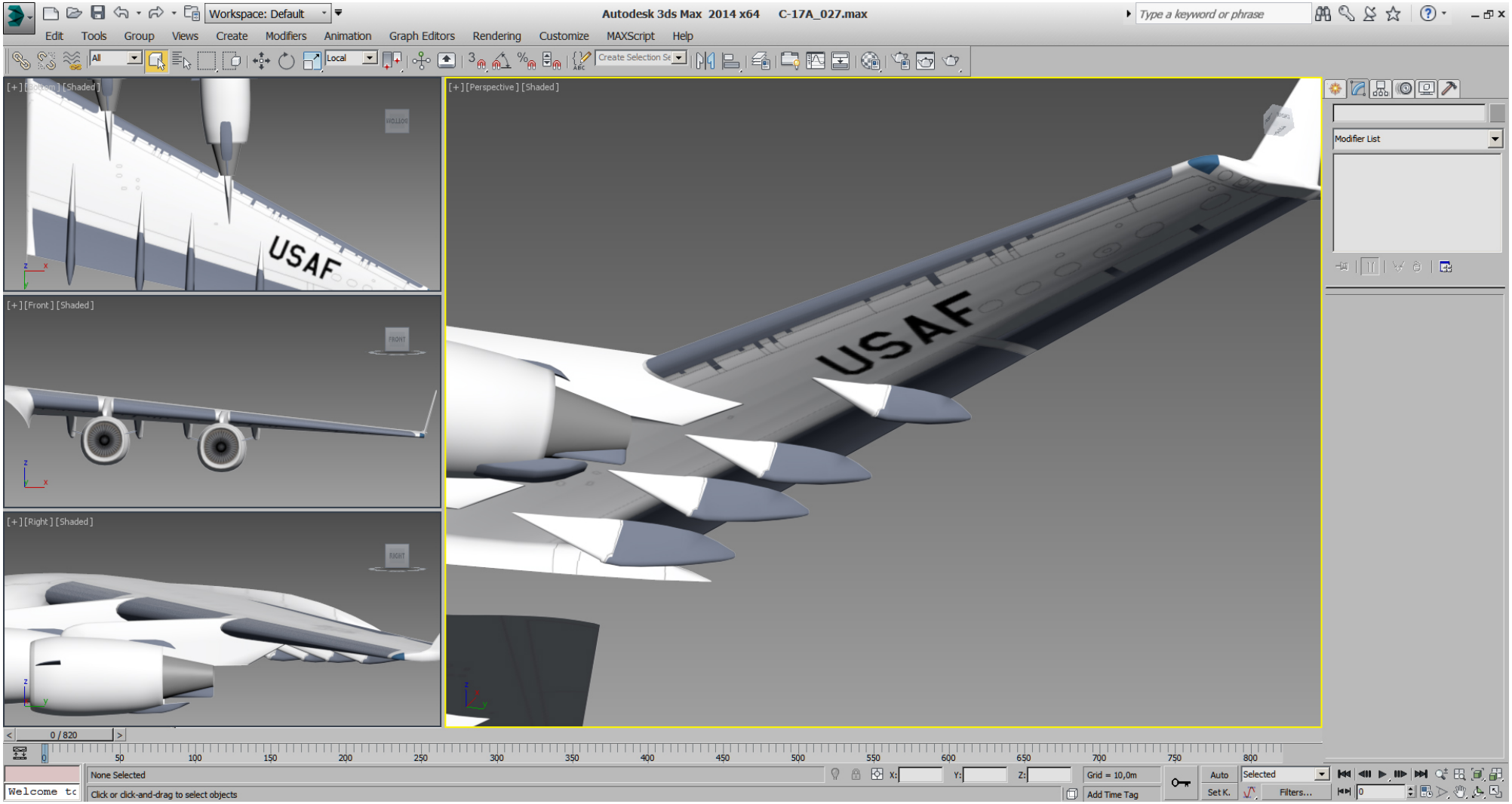

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_026e.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Right][Shaded + Edged Faces]
[+][Perspective][Shaded]
L F4 DOF rot SLAT B
Modifier List
F4 DOF
DOF Type
DOF Number:
0 - Left Stabilizer
Rotate
Length: 4,0m
Width: 1,0m
385 / 820
1 Helper Selected
Click and drag to rotate the view. Clicking in the tabs constrains the rotation
Grid = 10,0m
Add Time Tag
Auto
Set K.
Selected
Filters...
Welcome to


Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_026e.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Right][Shaded + Edged Faces]
[+][Perspective][Shaded]
L F4 DOF rot SLAT B
Modifier List
F4 DOF
DOF Type
DOF Number:
0 - Left Stabilizer
Rotate
Length: 4,0m
Width: 1,0m
385 / 820
1 Helper Selected
Click or click-and-drag to select objects
Add Time Tag
Grid = 10,0m
Auto
Set K.
Selected
Filters...
Welcome to

For LOD 0a (advanced), I want to get those little parts of the bottom slats, so I've placed a few boxes for boolean cutting.
This cutting will be done from a wing object copy, so the primary wing object will be not affected from that cut.

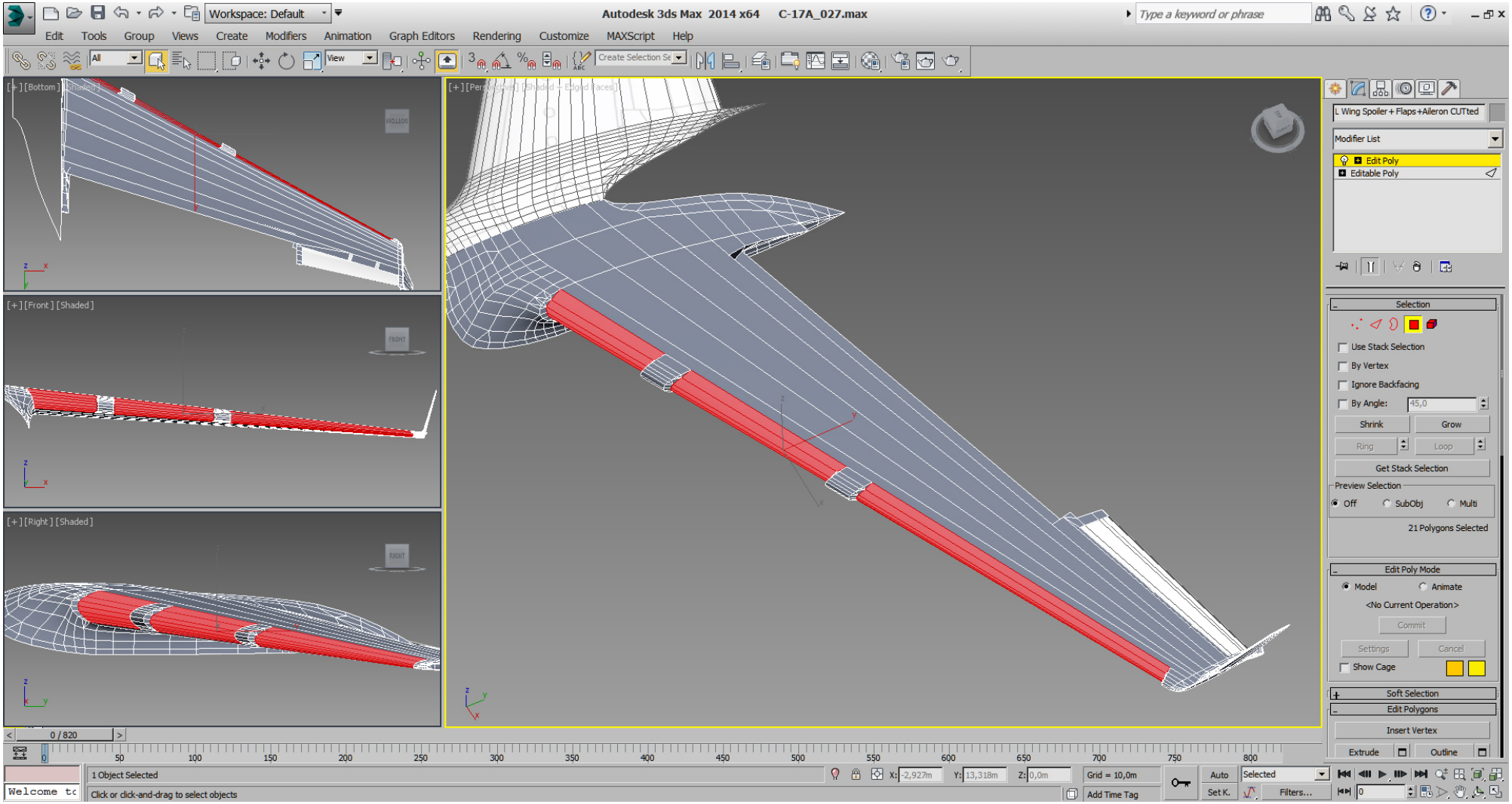


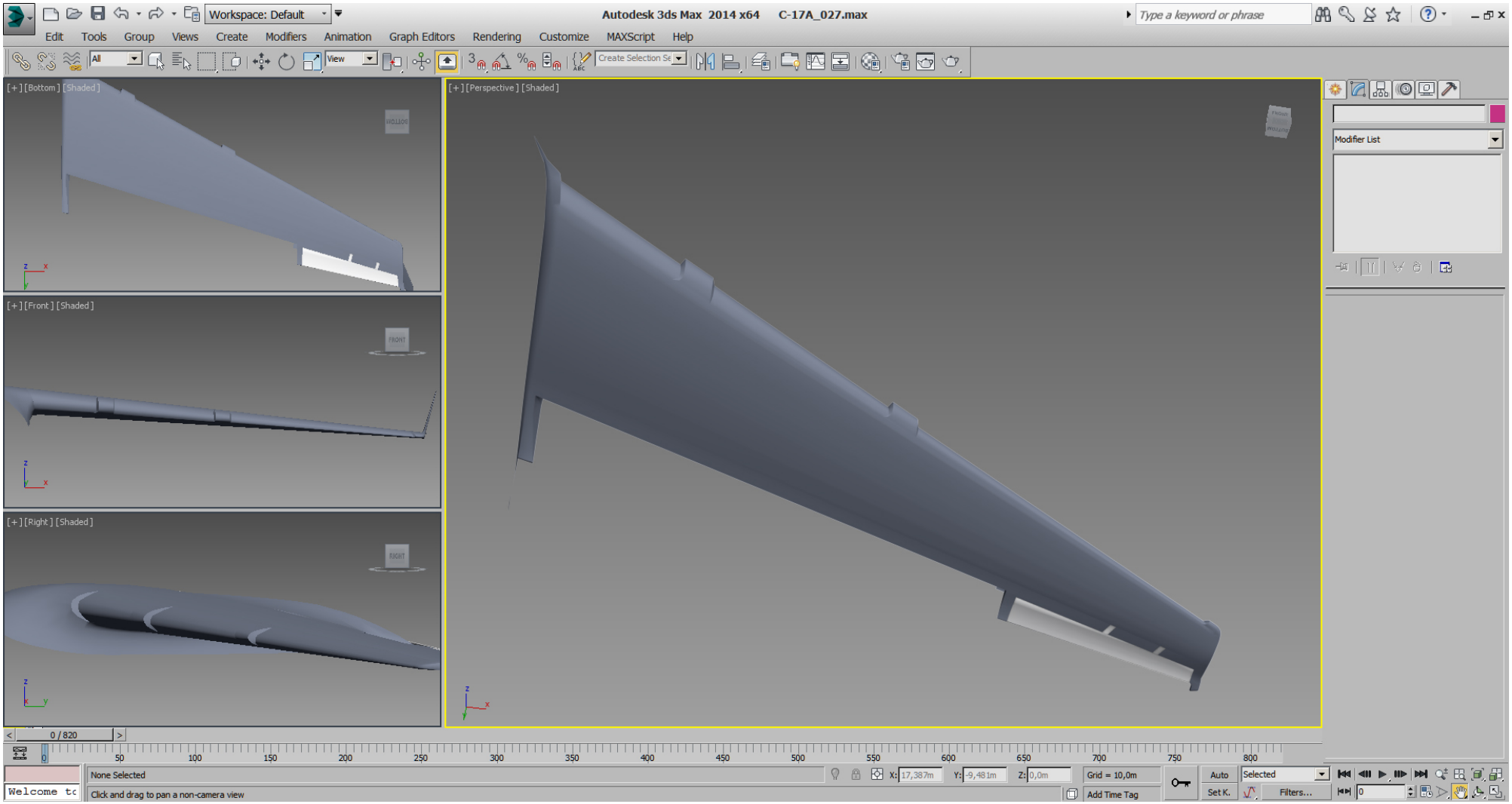
Those little parts are made in a way that they can be removed easily (also for lower LODs later) and therefore also don't affect the slats itself at all.



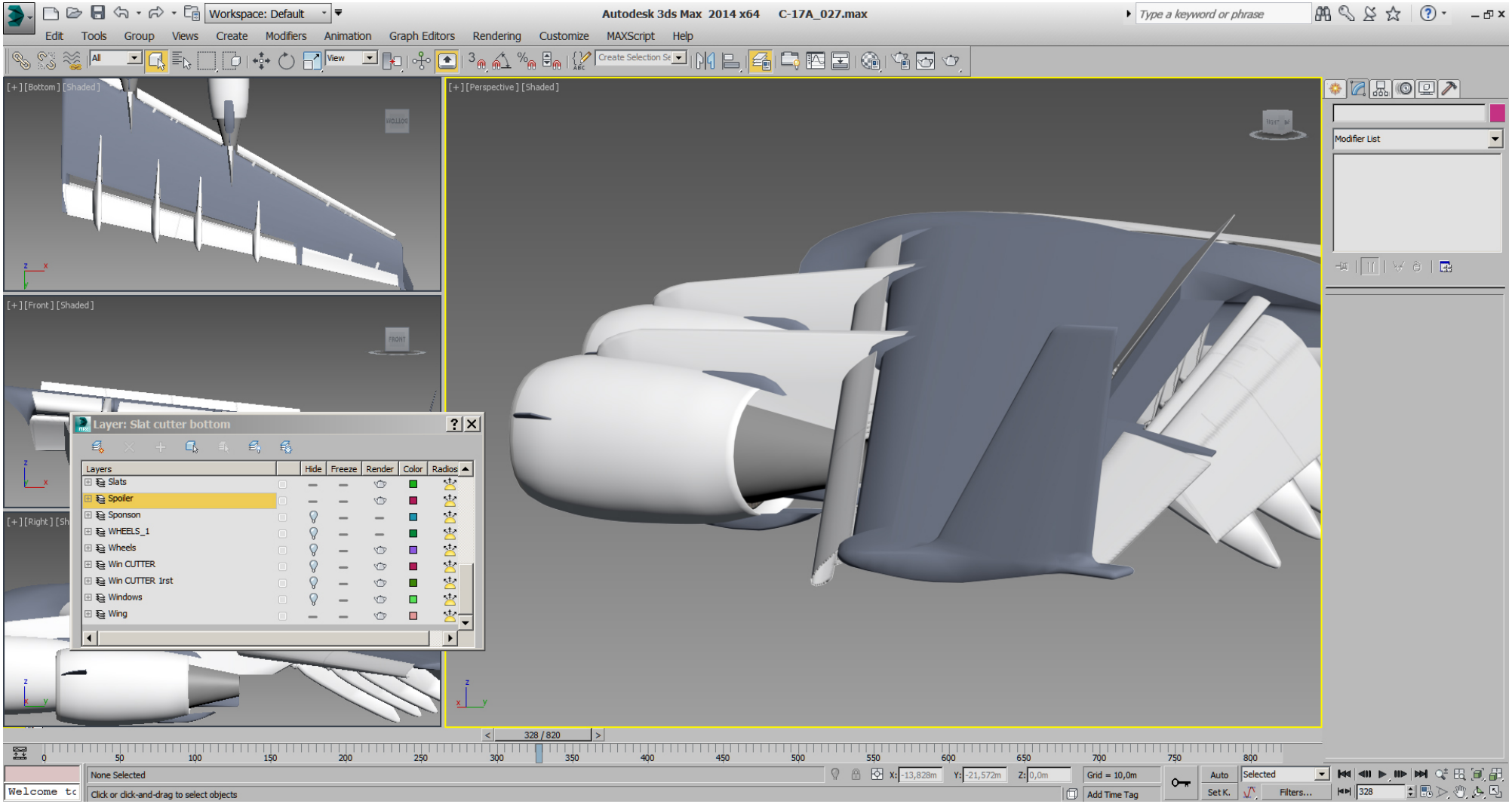
Now we've got the slats, but the wing itself needs work on the slats area.

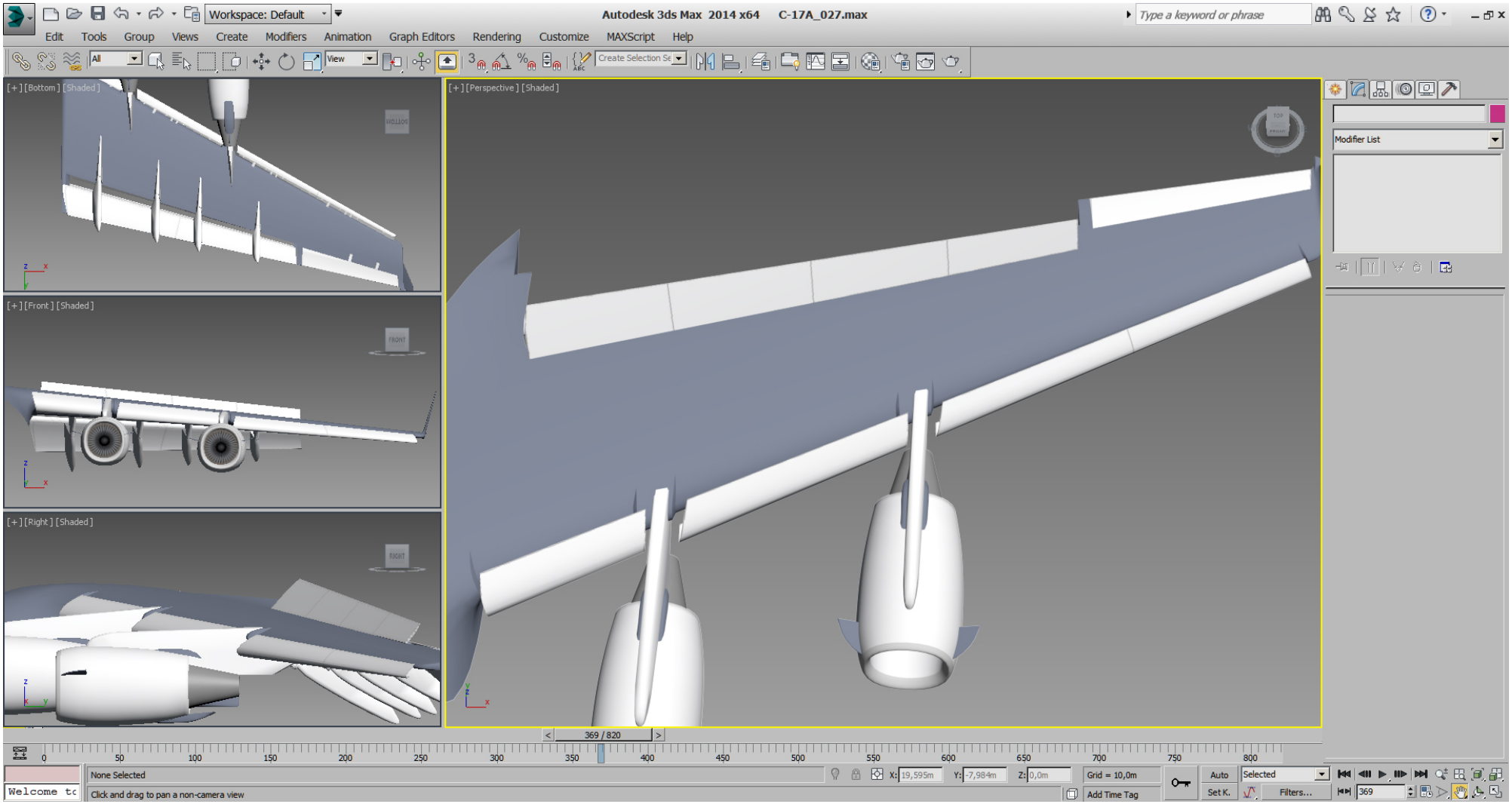
With the slats on the wing already cutted it was not hard to model that area by hand, ... means push/ pull the tris and vertex into place.



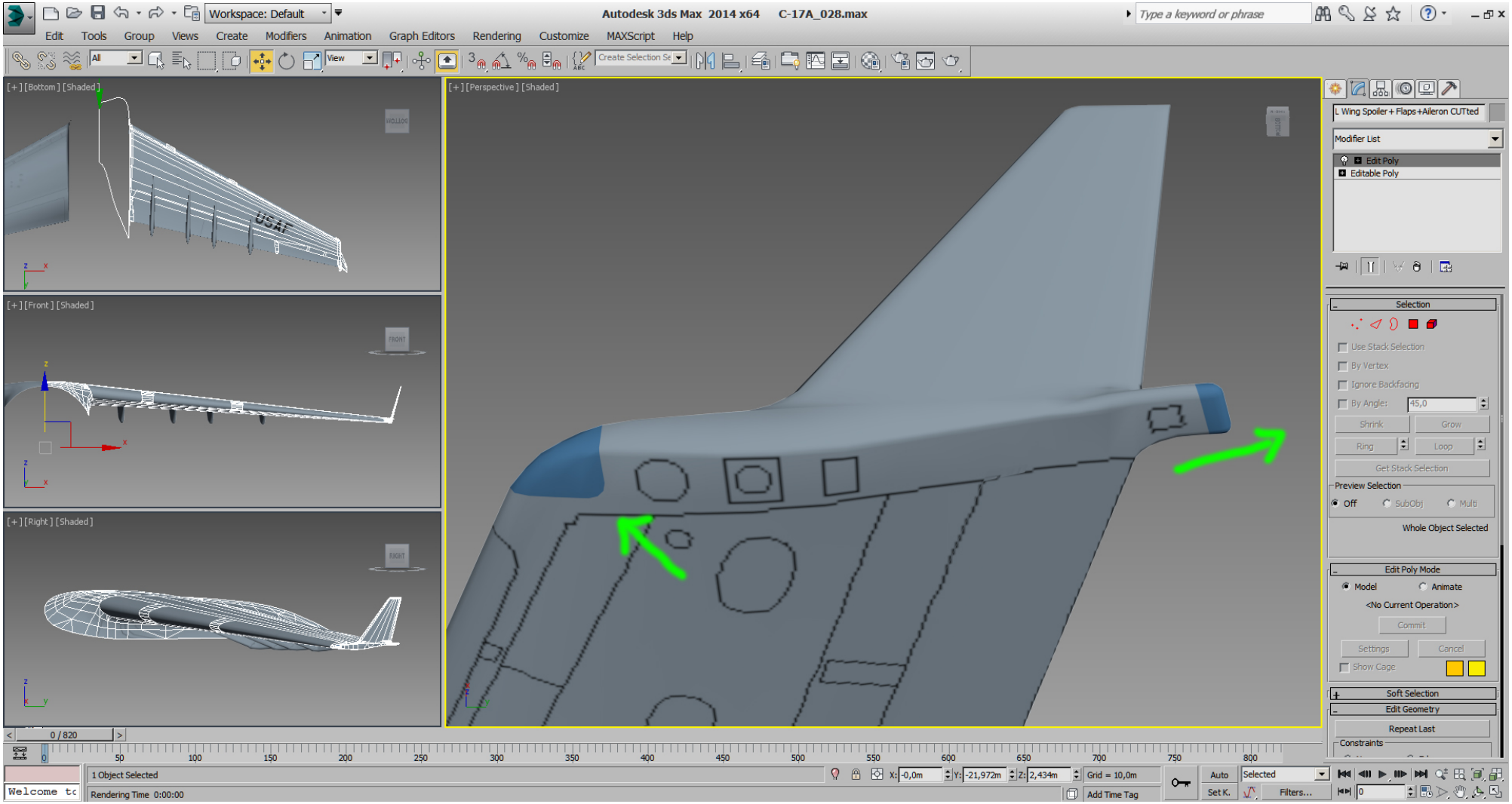

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_027.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Bottom][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
0 / 820
None Selected
Click and drag to pan a non-camera view
Add Time Tag
Auto
Set K.
Selected
Filters...
Welcome to

After that wing modification the slats were visually to far away from the wing if fully extended,
so a careful re-adjustment/ fine tune was needed on the slat- DOF helper positions once again.



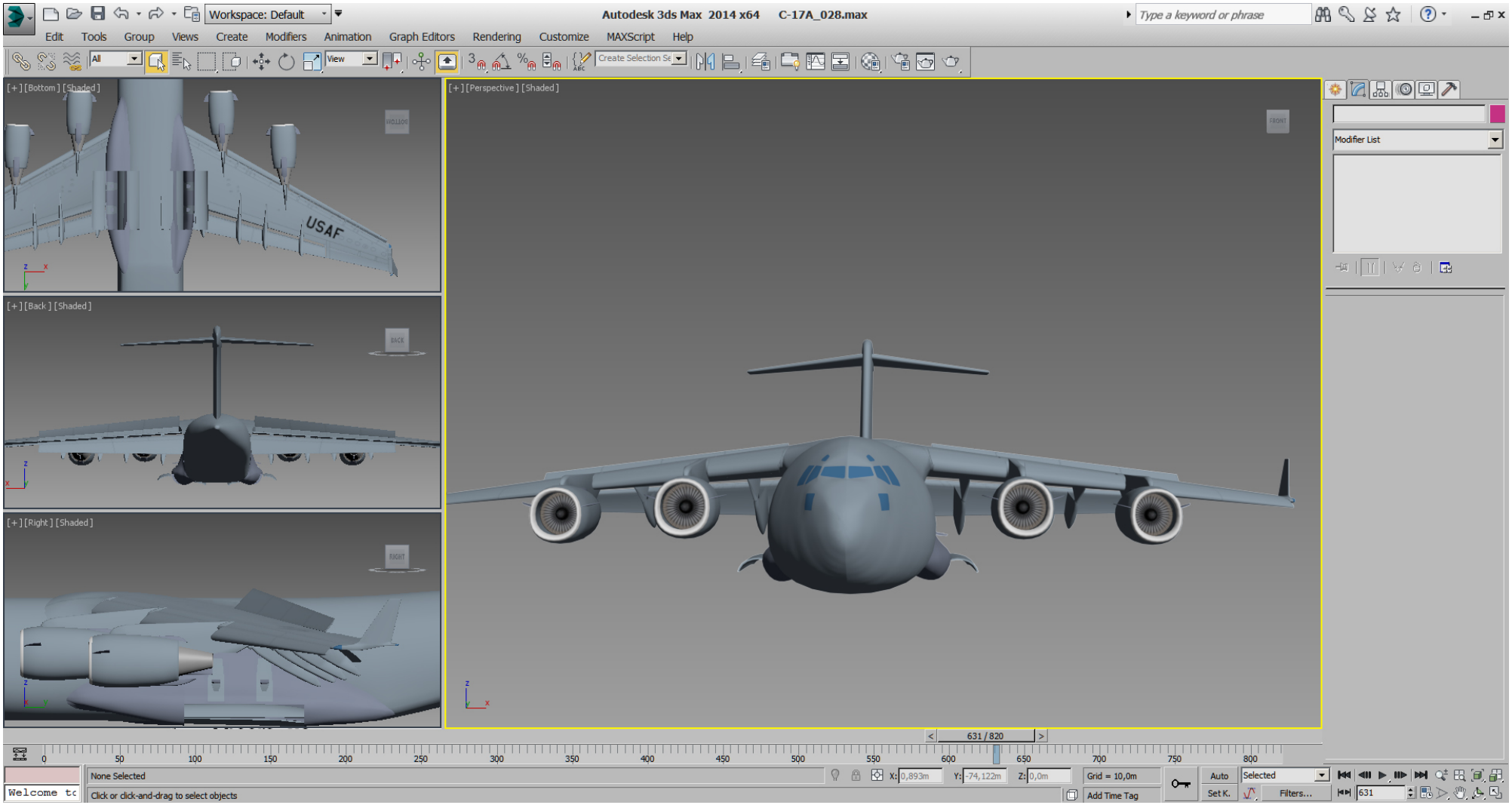

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_027.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+] [Bottom] [Shaded]
[+] [Perspective] [Shaded]
[+] [Front] [Shaded]
[+] [Right] [Shaded]
Modifier List
369 / 820
None Selected
Click and drag to pan a non-camera view
Grid = 10,0m
Add Time Tag
Auto
Selected
Set K.
Filters...
Welcome to

Then the forward facing light got a rounding cutted, and the back facing light got gently moved to the back.
(Yeah, twiddle on that back light once again)
Beside that, the wing got a further tri- optimizing on the bottom shoulder area.

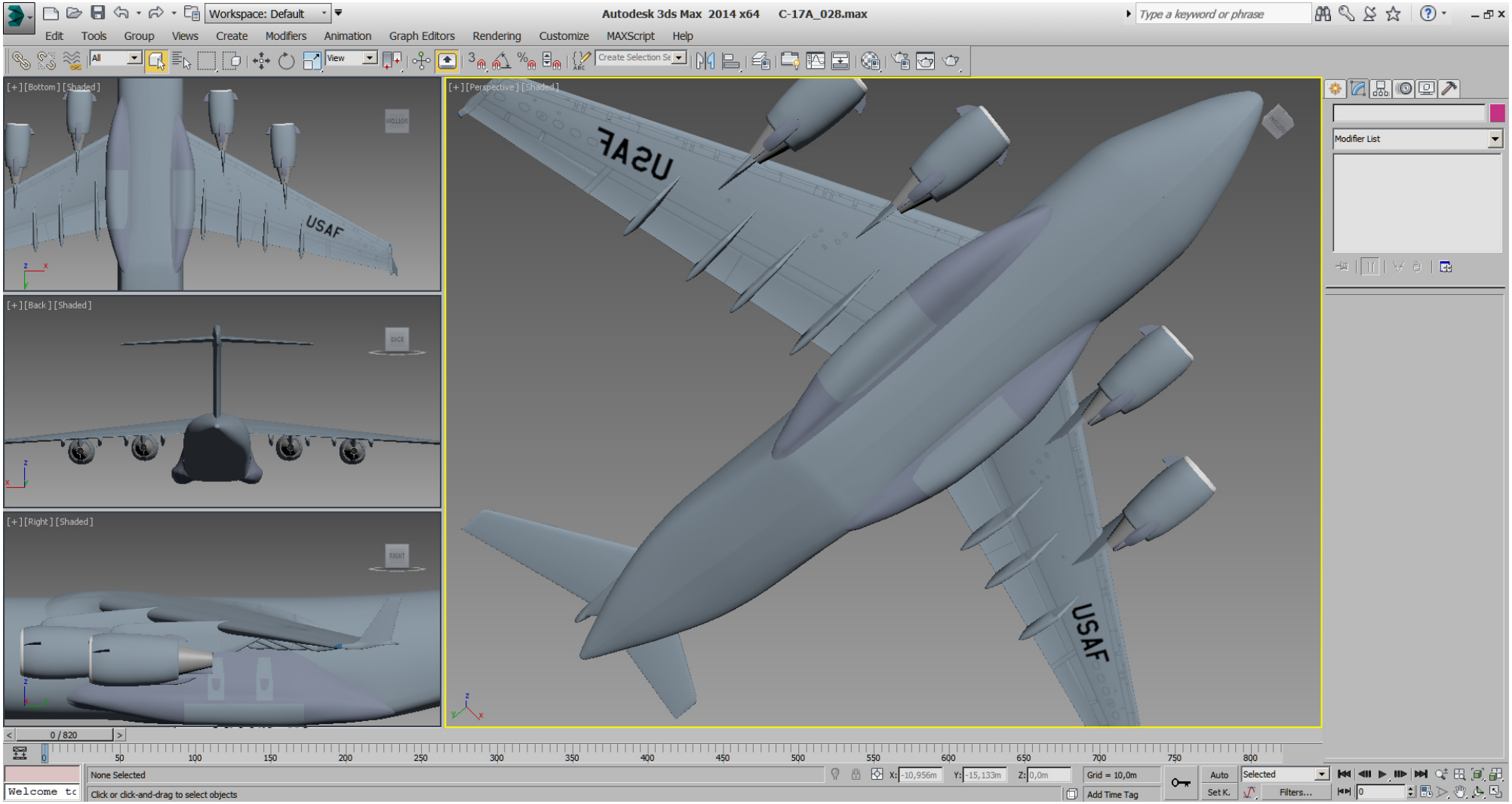


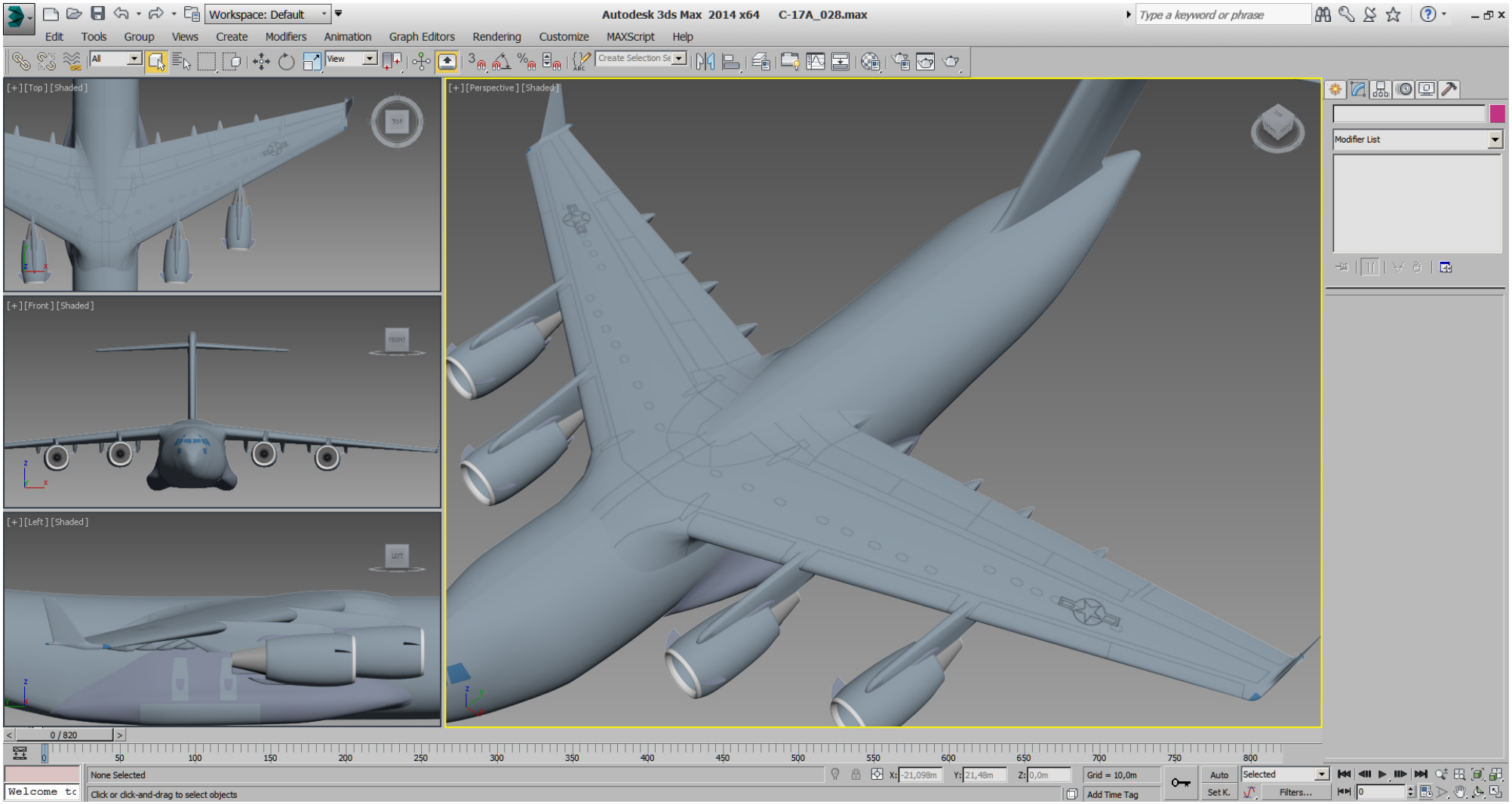
While being happy with the cutting of the control elements and the work on the wing at all so far,
I've grouped the whole wing, it's control elements, and the DOF helpers to mirror this “Group” (as instance), then saved the file.

WARNING: you can expect weird results insim if you mirror "translate", "scale" DOF helpers or “SLOT “helpers.
So try to avoid that !
Mirroring only "rotation" DOF helpers instead seems to work fine.



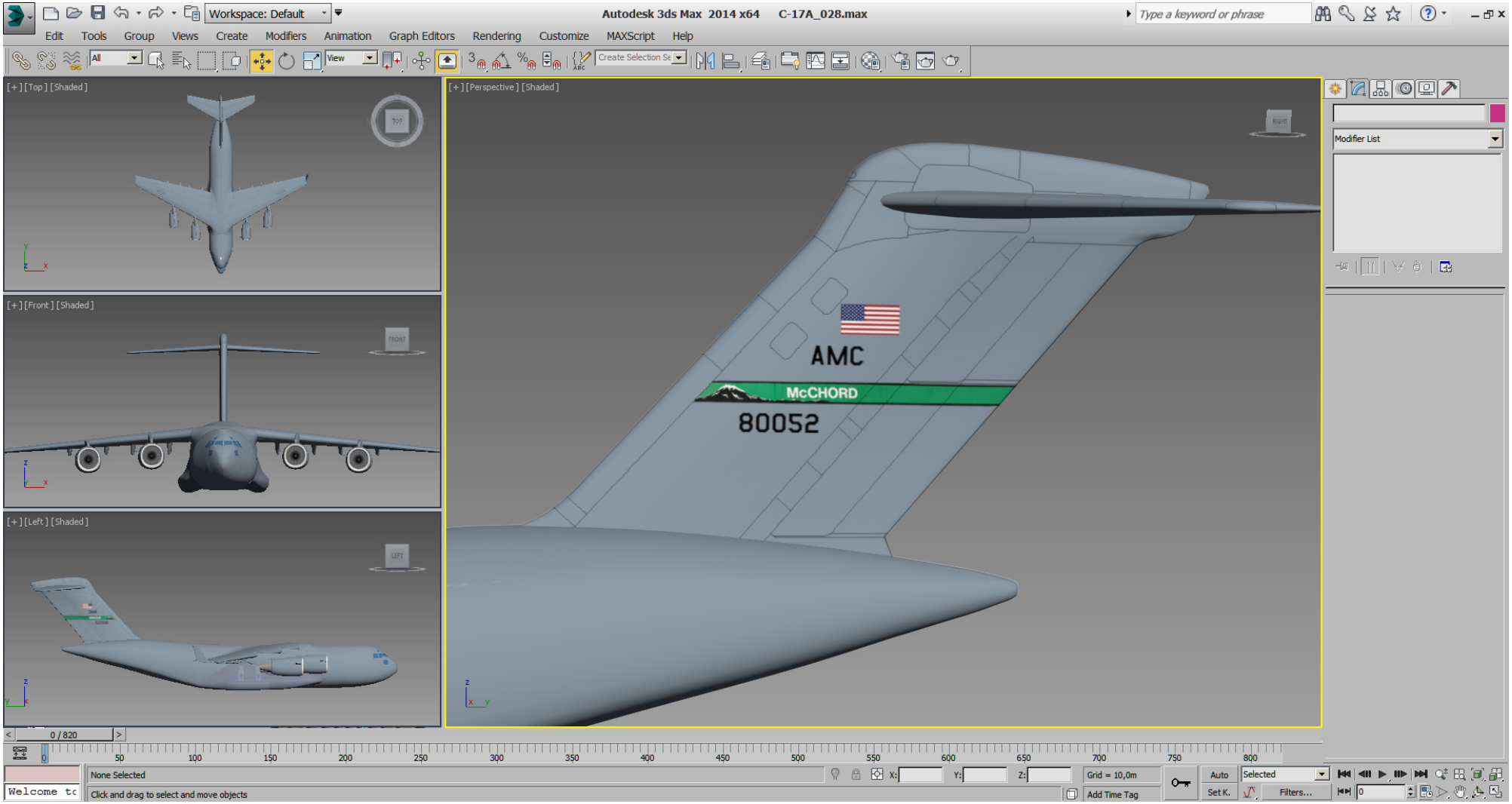
When all control elements are retracted, then there is not much difference compared to the pictures before we started cutting the wing.
So our model is in good shape.



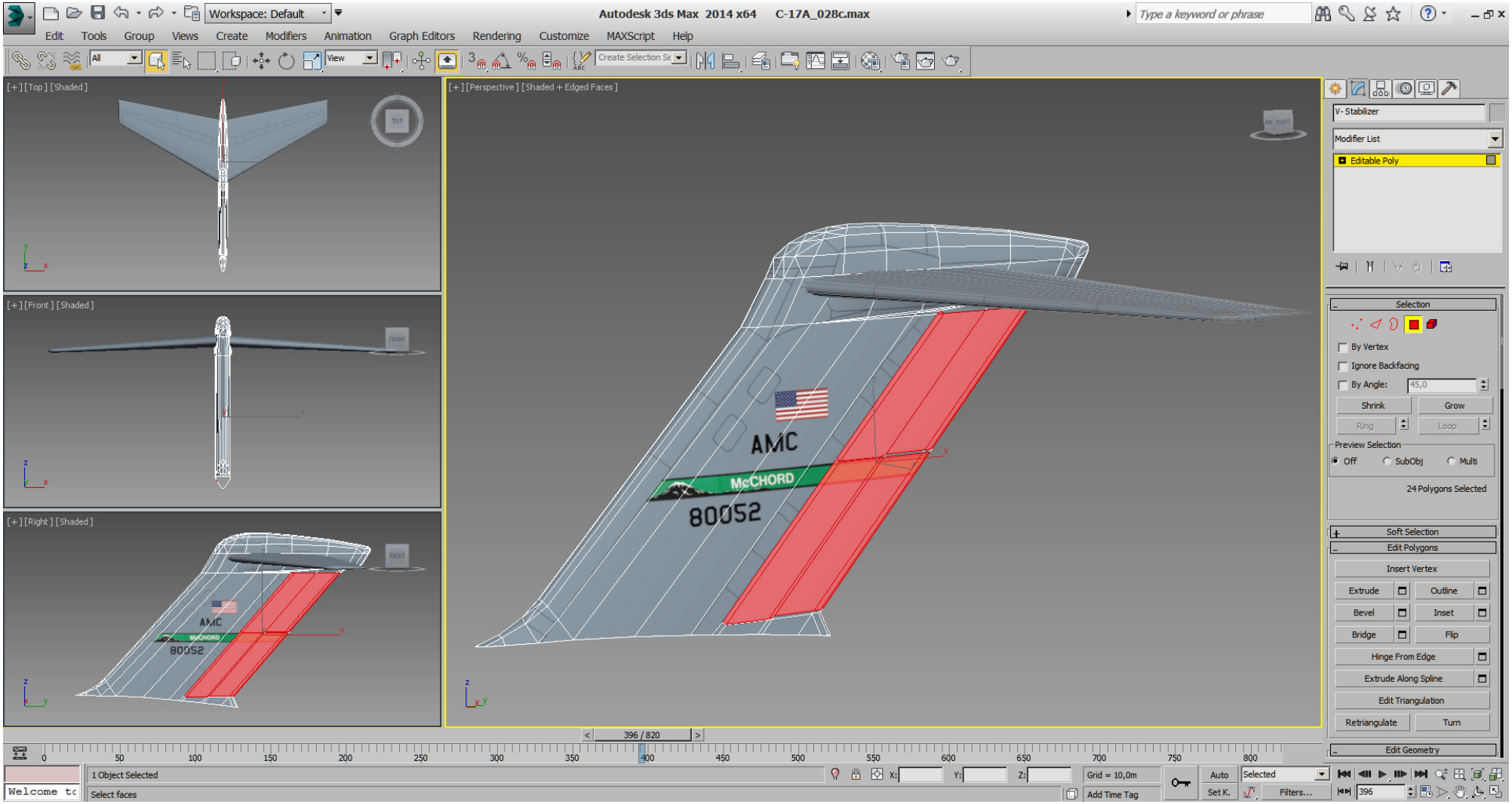

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_028.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Left][Shaded]
[+][Perspective][Shaded]
Modifier List
0 / 820
None Selected
Click or click-and-drag to select objects
Add Time Tag
Auto
Set K.
Filters...
Selected

With the same workflow used for cutting the wings, some more work on the vertical stabilizer.

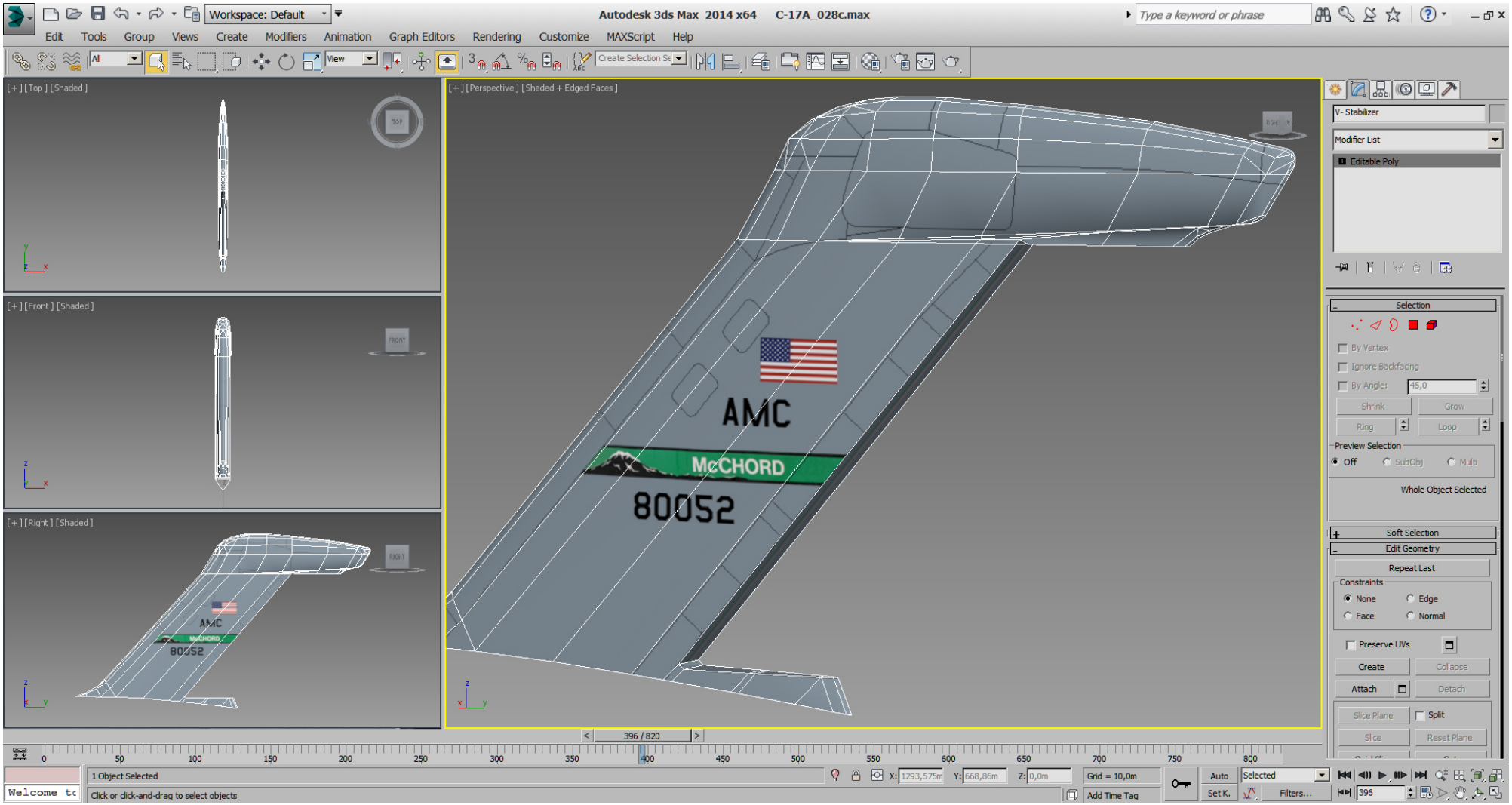
Painting the references on the model texture after a planar UVW mapping.



The rudders are defined after multiple boolean cutting operations,
then re- cutted some edges and did some tri- optimize and fine tune in “Edit Poly” mode.



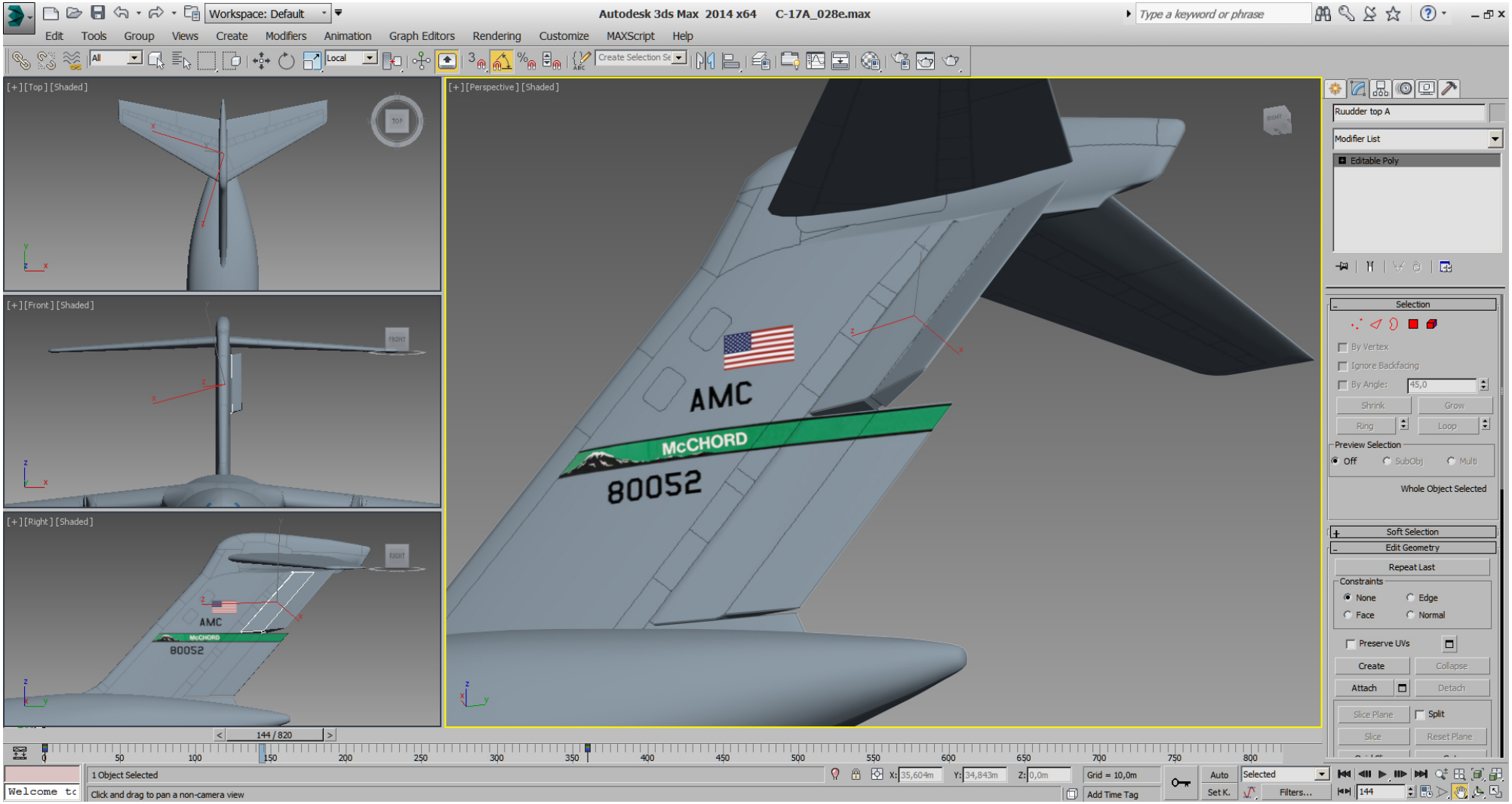
Detached the selected rudder poly to a new object, then prepared the vertical stabilizer in “Edit Poly” mode.



Prepared the rudders also in "Edit Poly" mode, placed the DOF helpers, linked the rudders to them, and did a quick keyframe animation in 3dsMax to see their behavior.

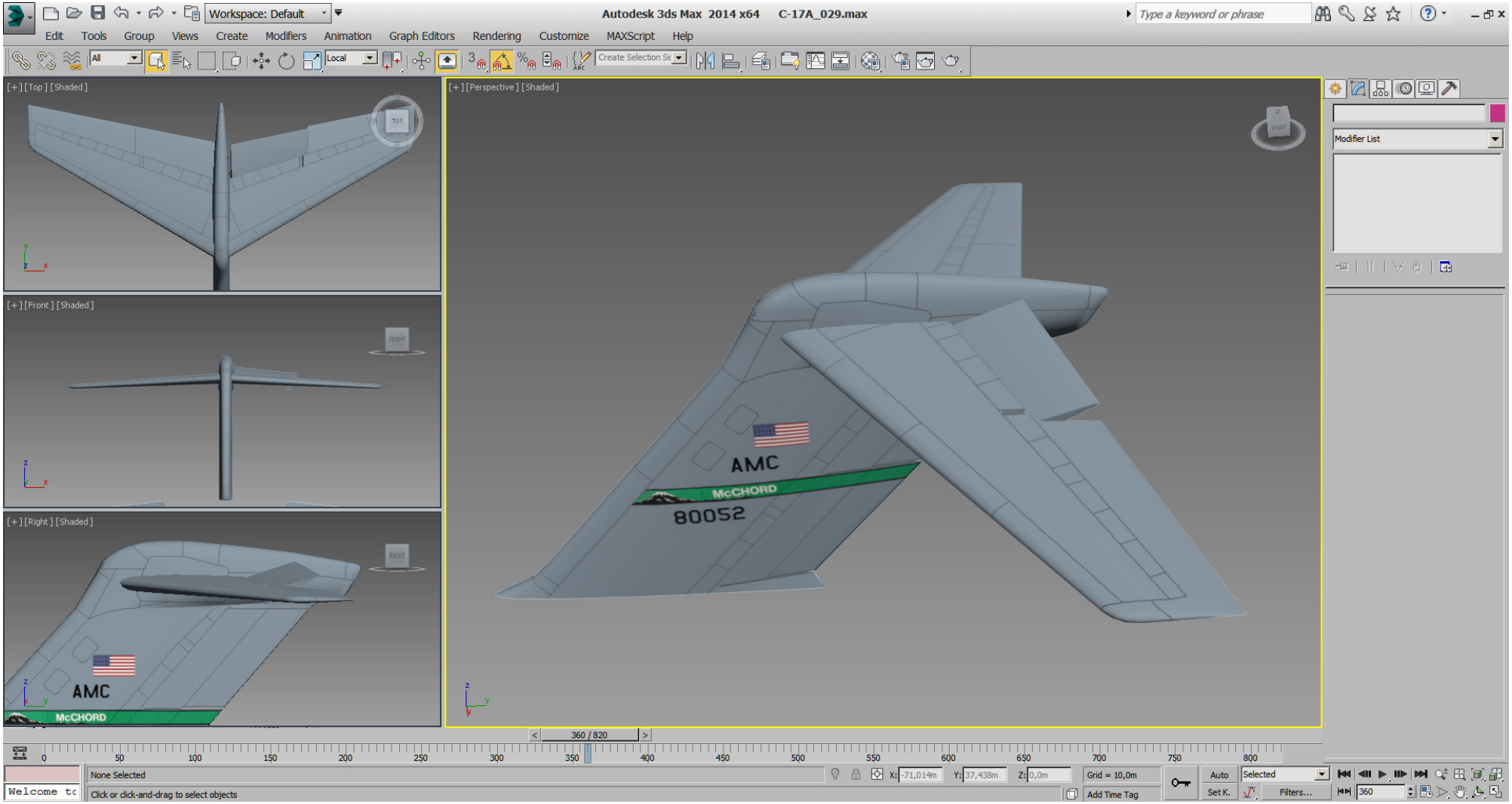
The rudders are redundant systems, so we’ll only animate the upper ones.

Rudder rotation angles:
forward segment 28.2° (25° with EFCS off)
aft segment 26° (relative to the forward segment)

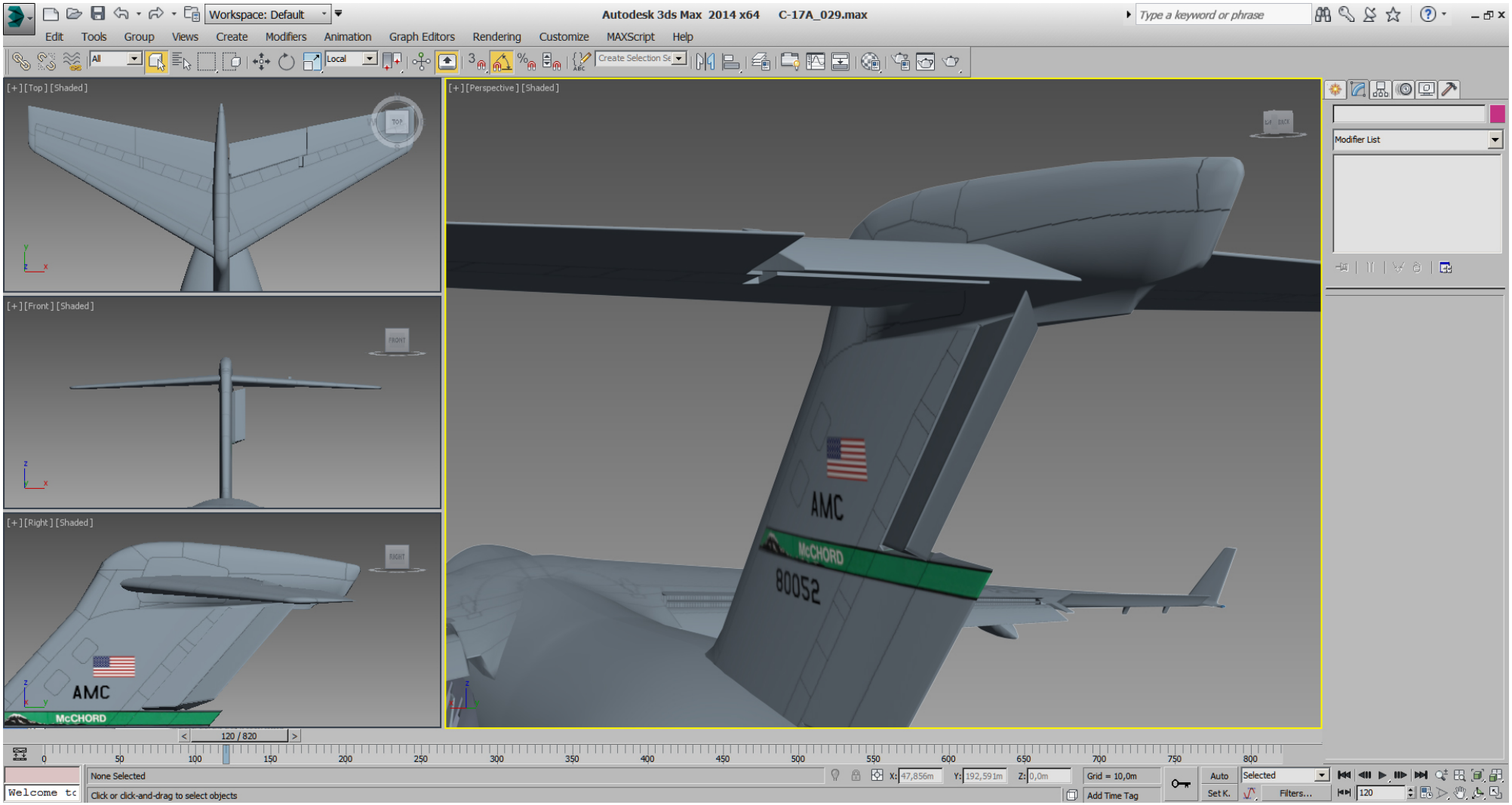


And the same workflow for the horizontally stabilizers, here with the elevator 25° max. up.

The elevators are also redundant systems, so we'll only animate the inner ones.

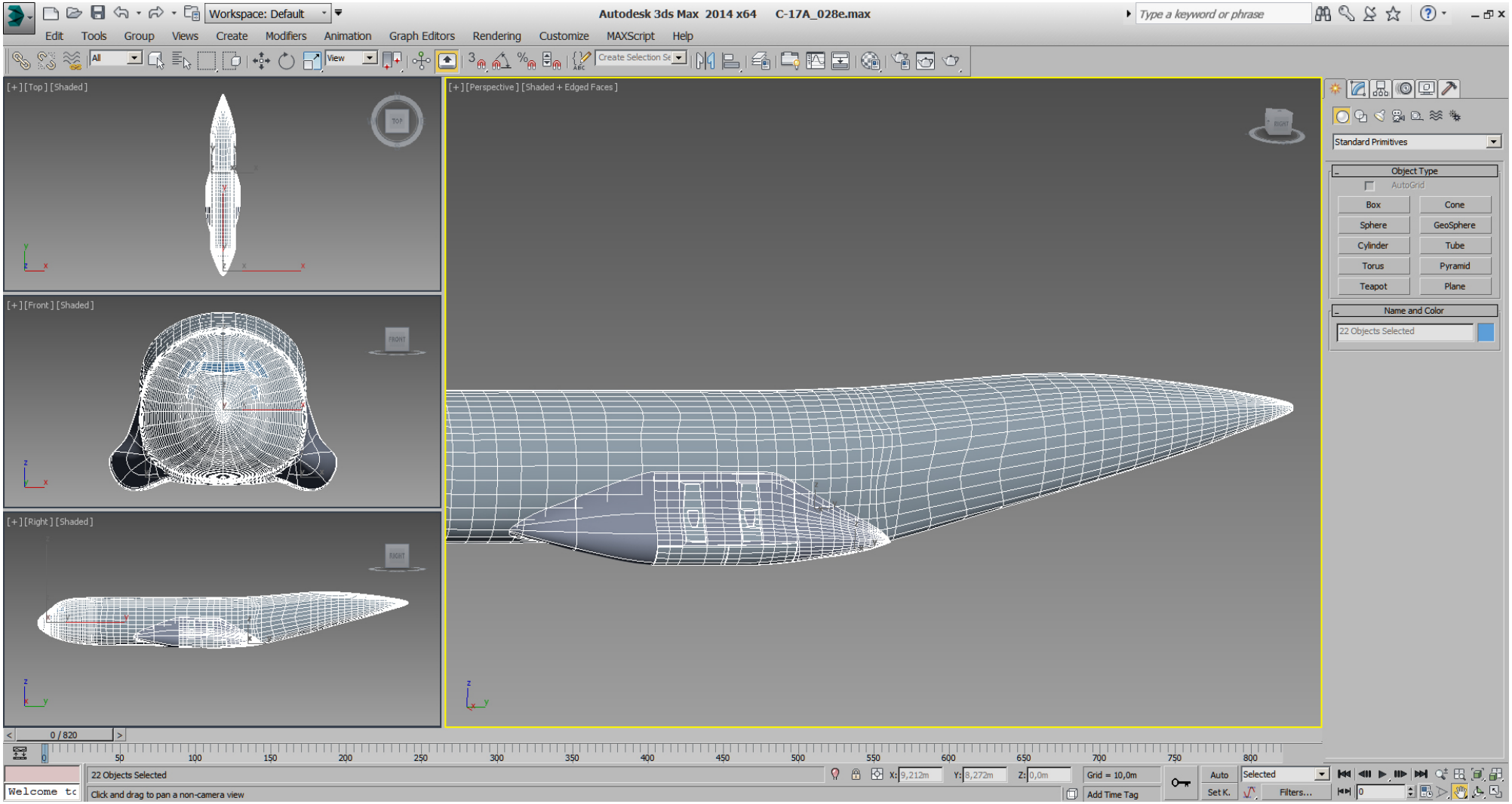


Here with elevator 15° max. down and checking for conflicts with the rudders full scale deflection.



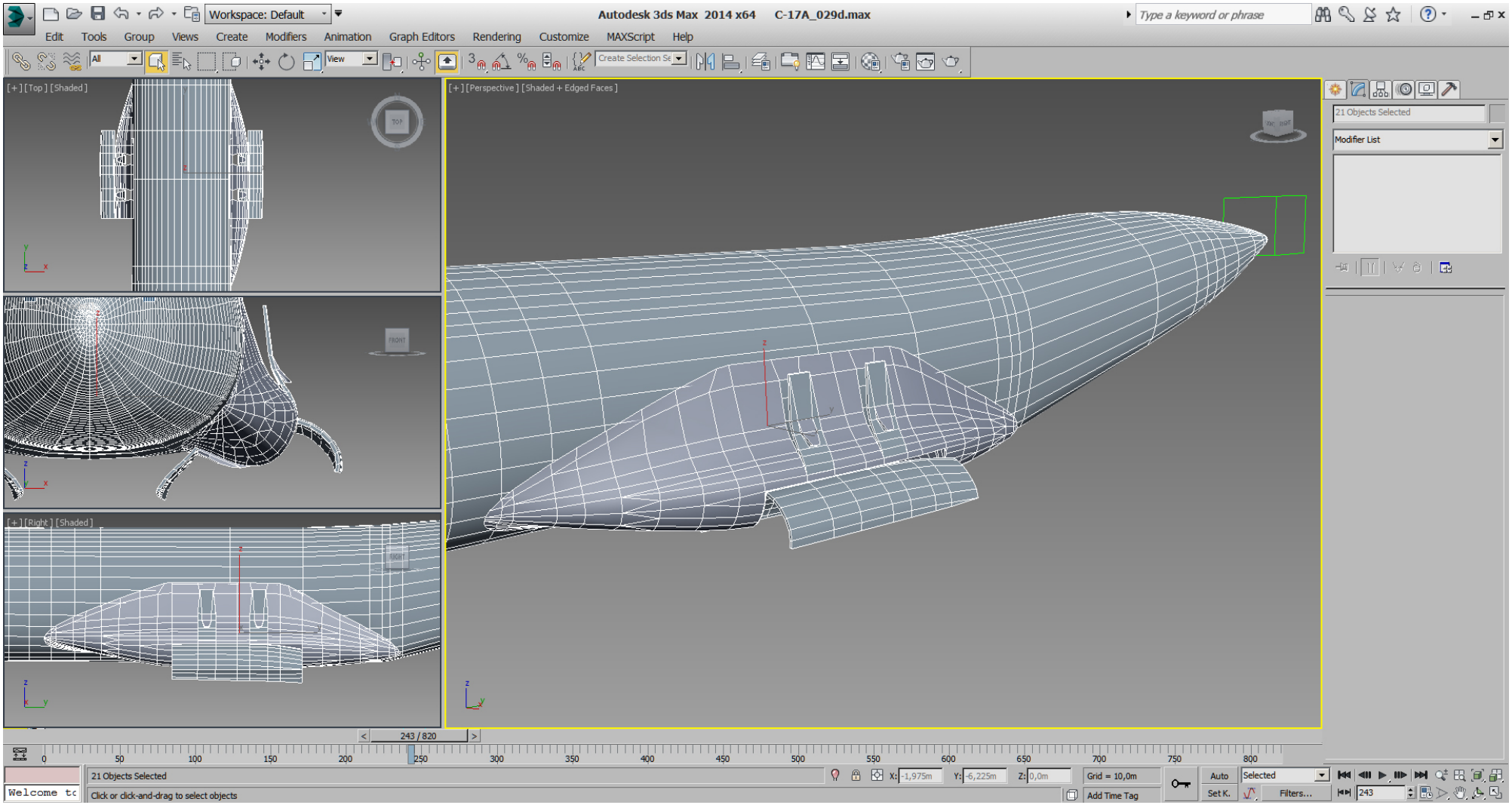
While we are on the back end of the model, let's start a pre - tri optimize of the fuselage, before we'll have further attention on the sponsons again.

Here is the actually situation. The fuselage has way to many rings from the “Edit Spline” - > “Surface” - creating process.
Earlier we’ve cutted the gear doors of the sponsons, but the edges are bad placed, and the front of the sponsons are still in “Edit Spline” mode.

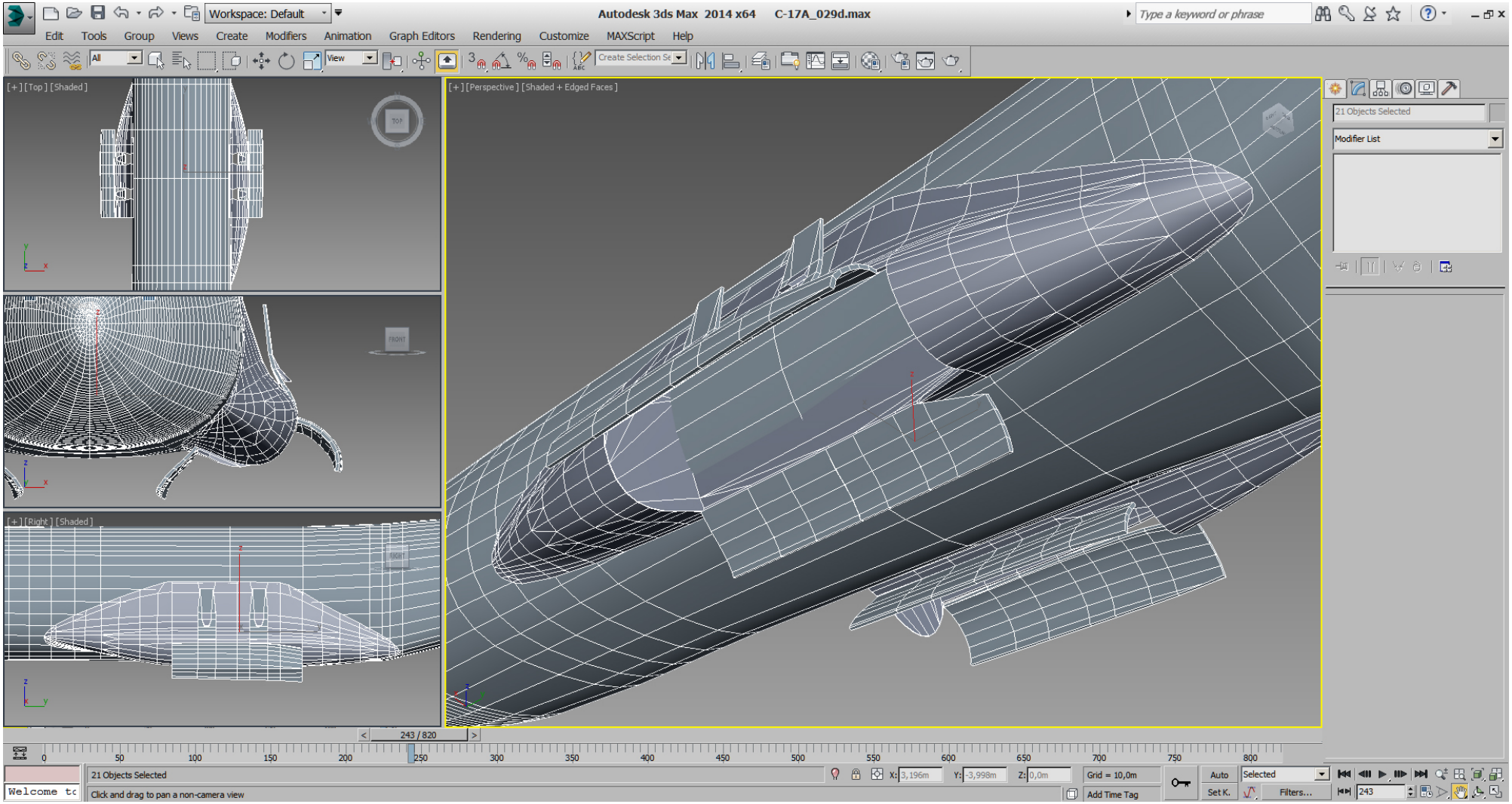


After changing the sponson front into an “Editable Poly”, a basic tri- optimize and re- cutting some edges of the fuselage and the sponson, it looks way better.
I've kept some rings to hold the shape where necessary, plus some "to play with" for now.

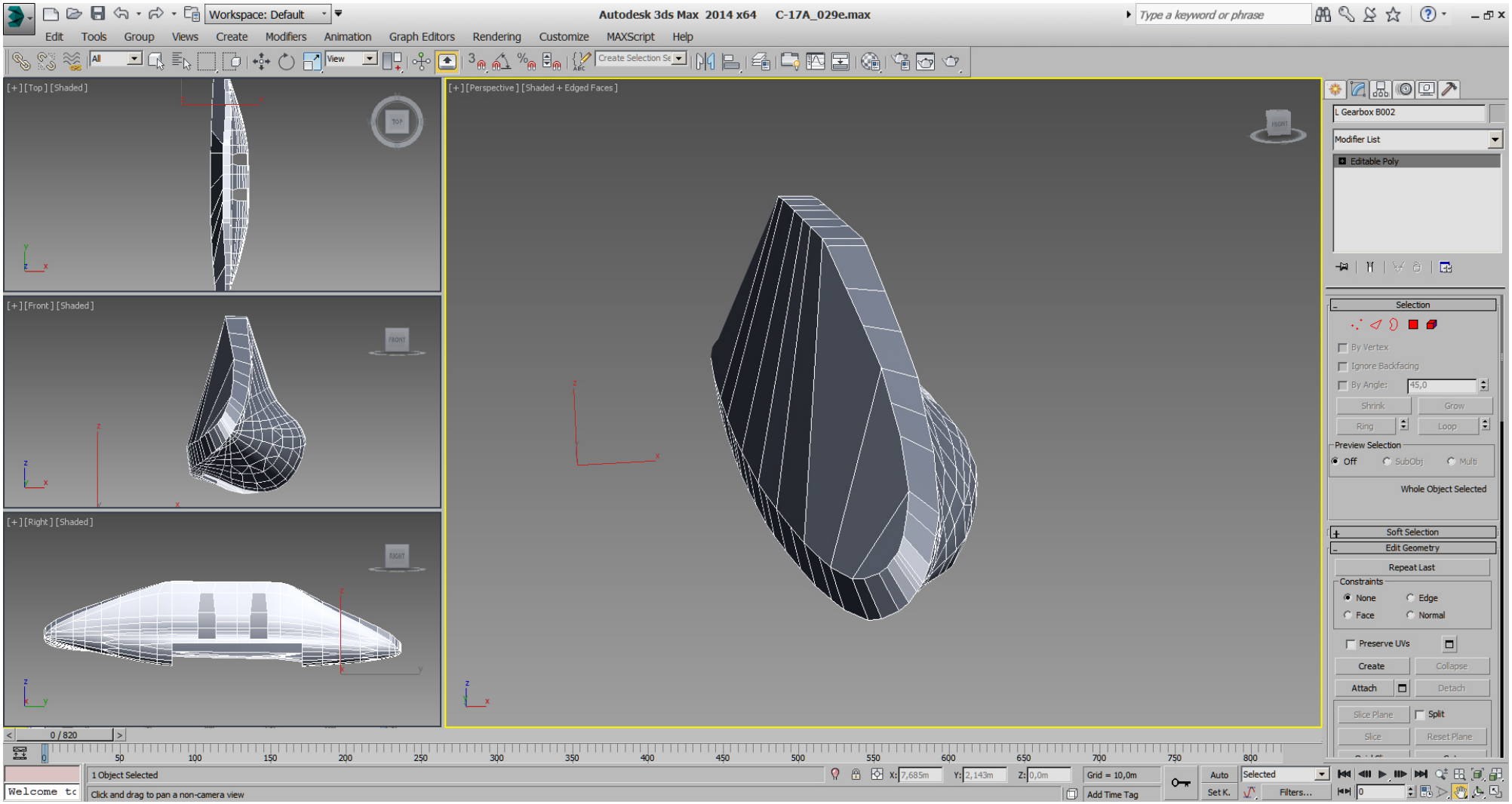
Note also the green "Dummy" which I use to compensate another 3dsMax 2014 bug, where you can't always zoom and rotate the view around selected sub- objects like a single vertex. As workaround I place and select the dummy where needed and zoom/ rotate the view around it.



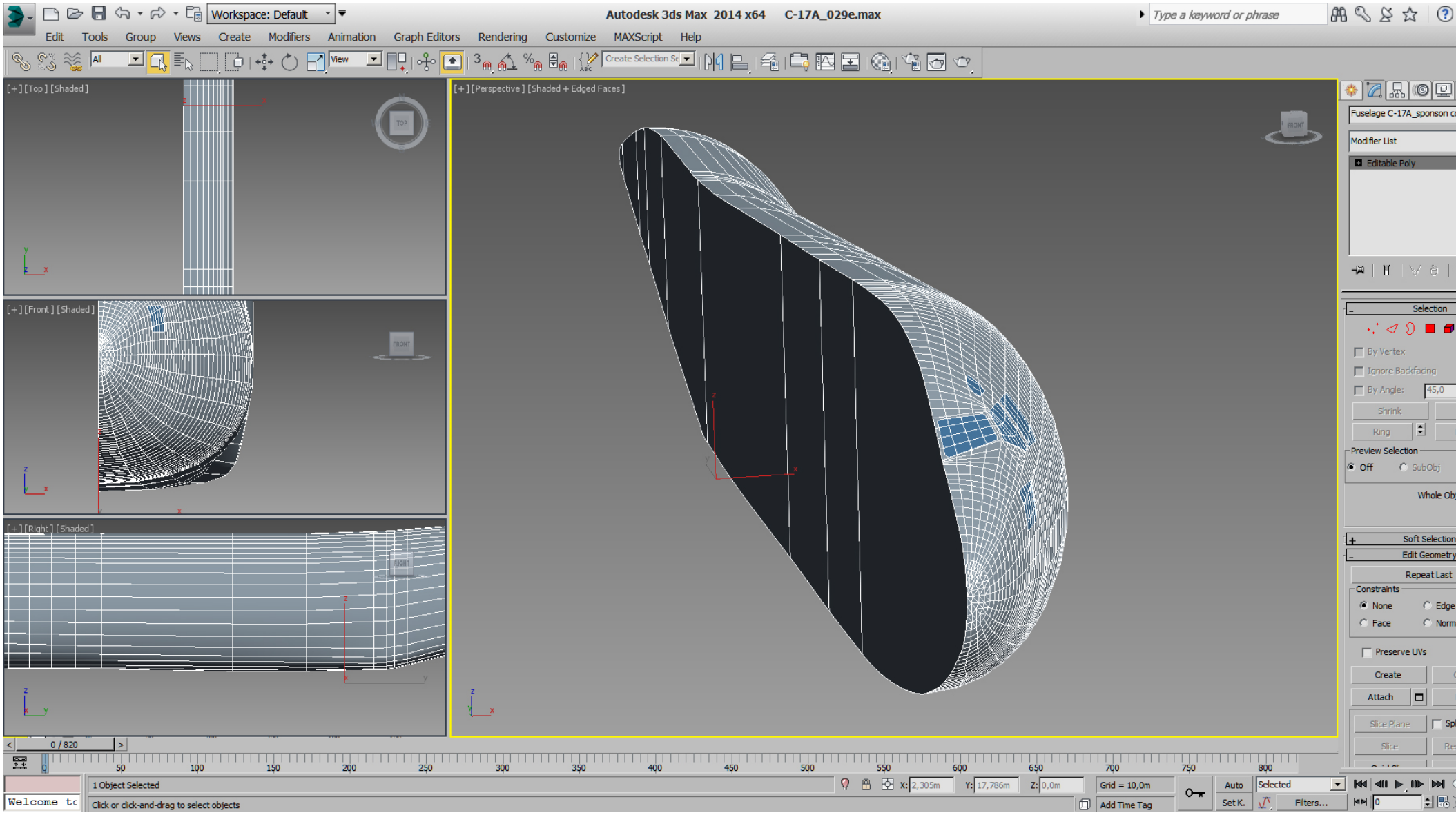
Note how some bright grey tris of the fuselage are shown in the gear bay in this picture.
We need to take care to get rid of them when we connect the sponsons to the fuselage mesh.



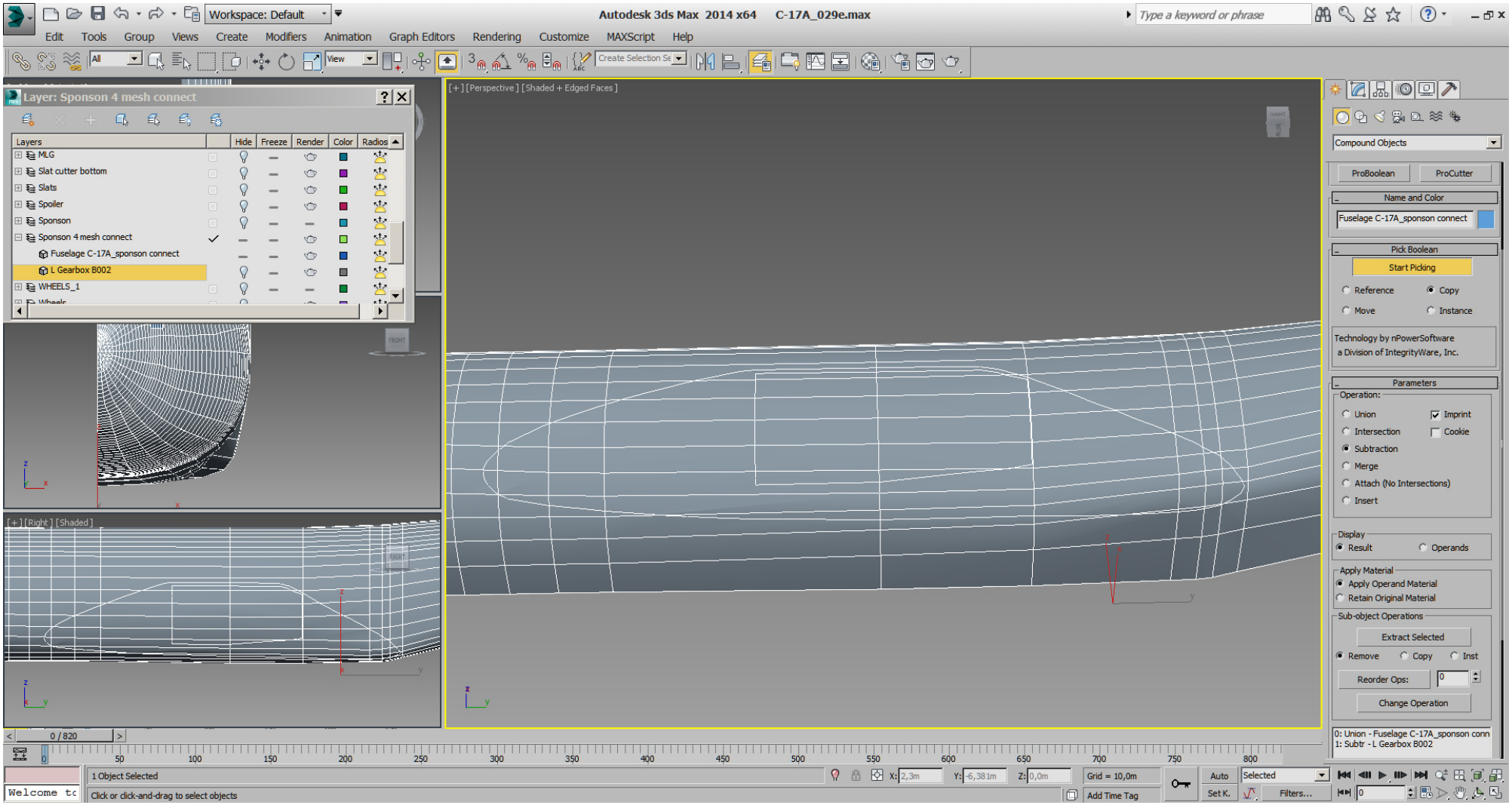
Until now the sponsons don't touch the fuselage, so there is always a risk for a see through.
Before the sponsons can be mesh connected to the fuselage, using boolean operation(s),
we need to prepare them to overlap with the fuselage.
Additionally we better close both objects, because boolean works best with closed objects.

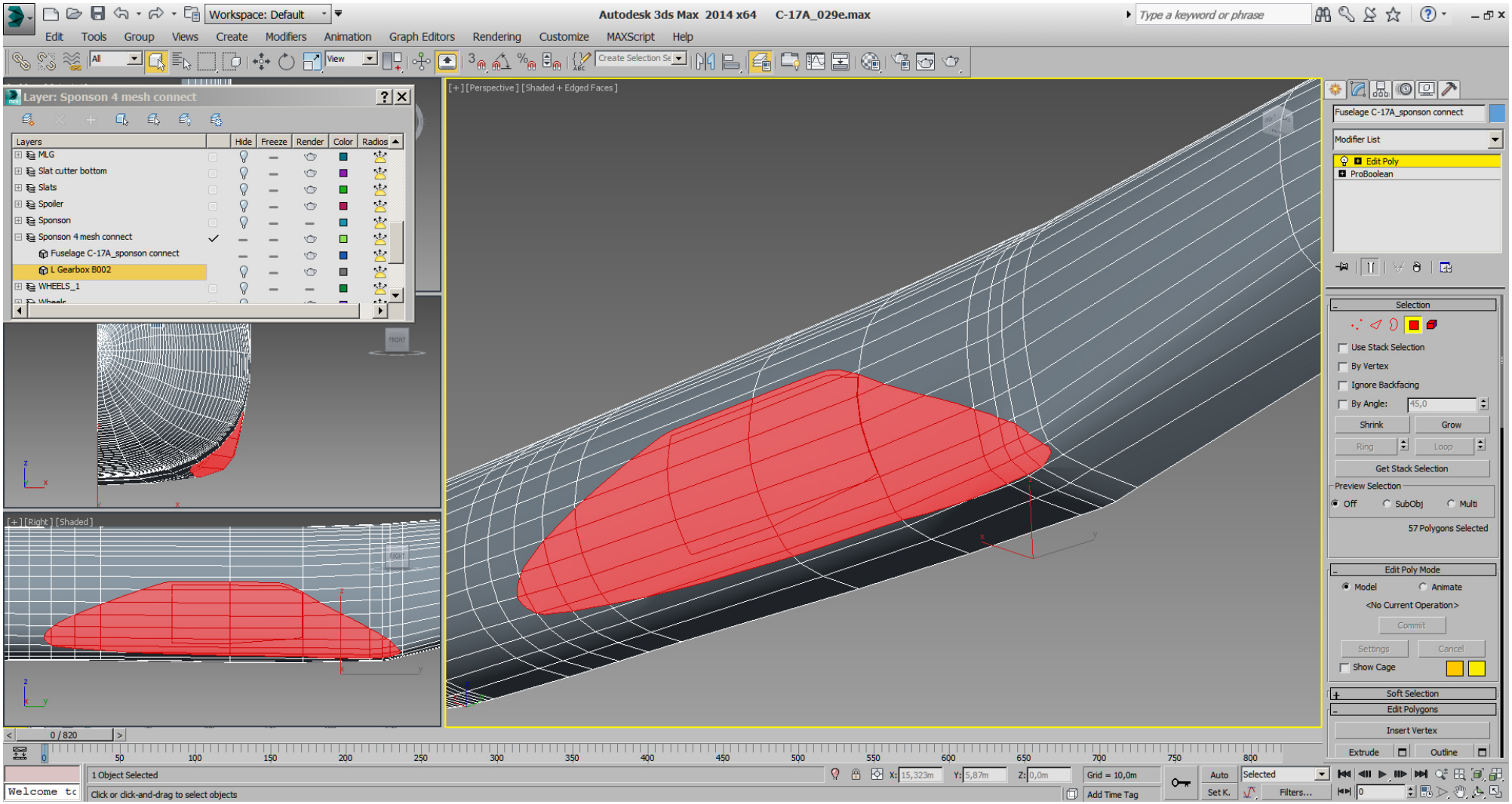

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_029e.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded + Edged Faces]
L Gearbox B002
Modifier List
Editable Poly
Selection
By Vertex
Ignore Backfacing
By Angle:
Shrink
Grow
Ring
Loop
Preview Selection
Off SubObj Multi
Whole Object Selected
Soft Selection
Edit Geometry
Repeat Last
Constraints
None Edge
Face Normal
Preserve UVs
Create
Collapse
Attach
Detach
Slice Plane
Split
Slice
Reset Plane
0 / 820
1 Object Selected
Click and drag to pan a non-camera view
Add Time Tag
Auto
Set K.
Filters...
Selected
Welcome to

The left side of the fuselage got also some temporary tris to close the object.

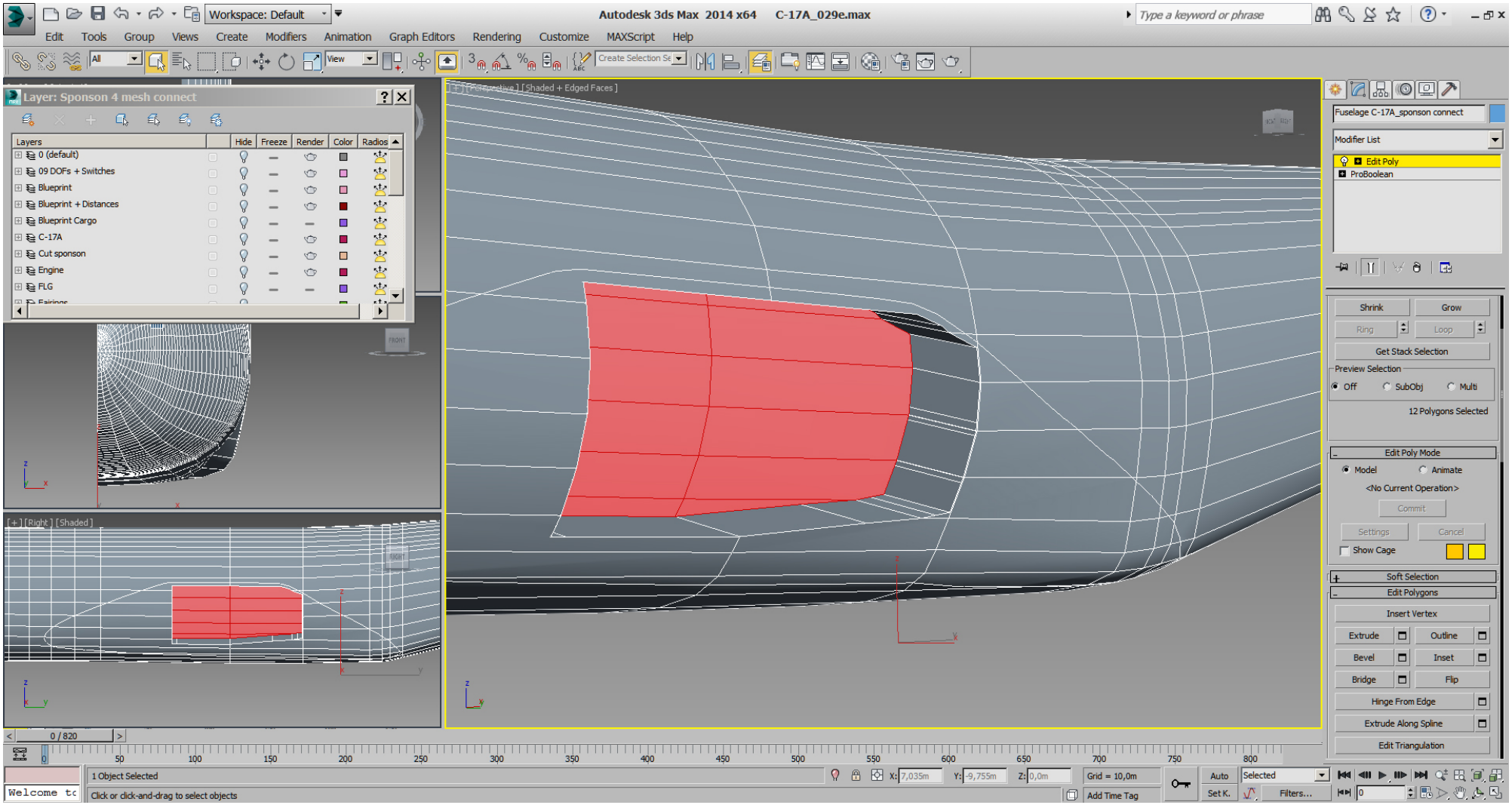


Well, I've tried to cut the sponsons into the fuselage, but failed using "Boolean". Luckly using "ProBoolean" did the trick.
Note the “ProBoolean” parameters on the menu for the first cutting.

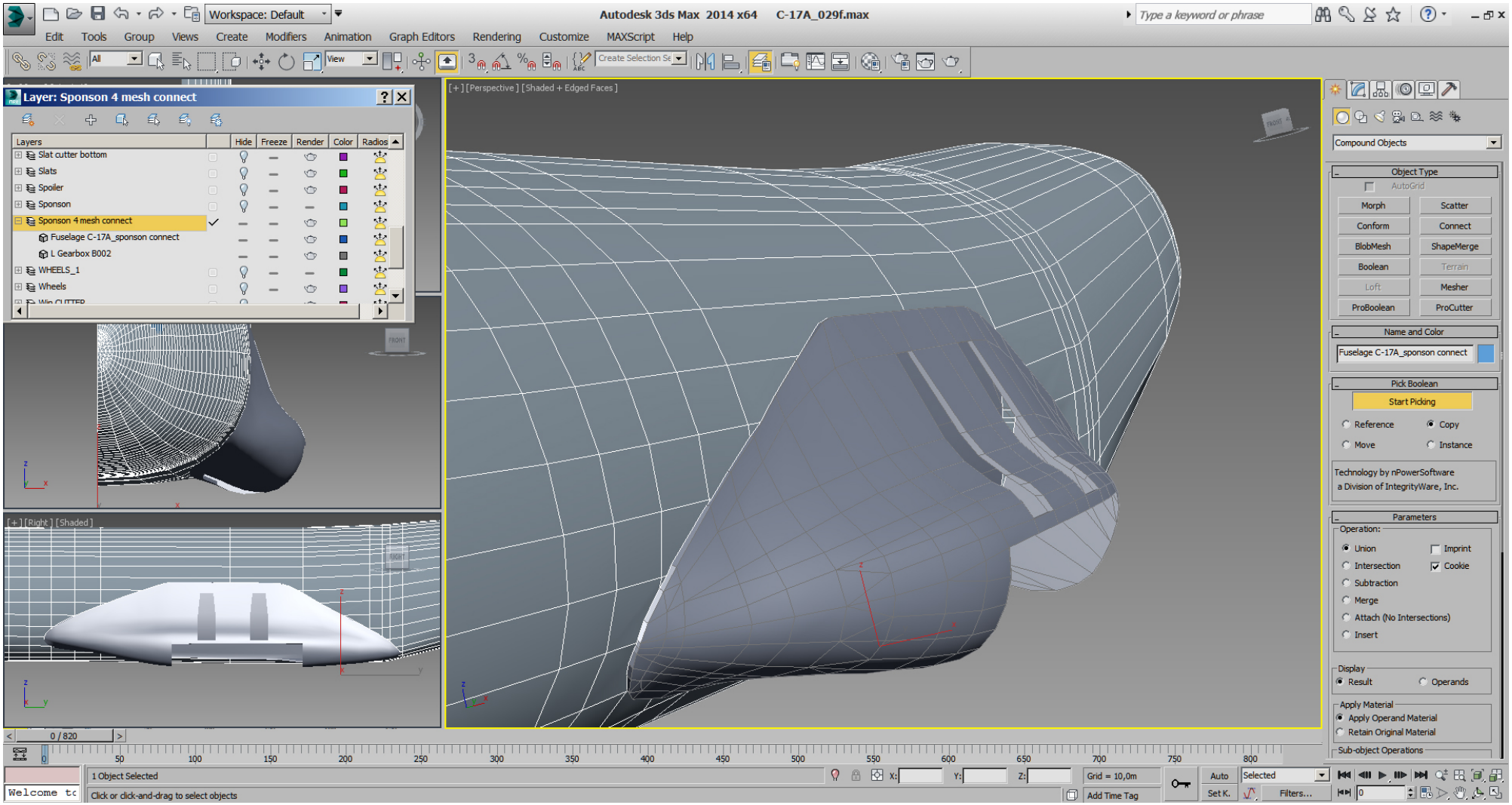



Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_029e.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
Layer: Sponson 4 mesh connect
Layers Hide Freeze Render Color Radios
MLG
Slat cutter bottom
Slats
Spoiler
Sponson
Sponson 4 mesh connect
Fuselage C-17A_sponson connect
L Gearbox B002
WHEELS_1
[+] [Perspective] [Shaded + Edged Faces]
[+] [Right] [Shaded]
Fuselage C-17A_sponson connect
Modifier List
Edit Poly
ProBoolean
Selection
Use Stack Selection
By Vertex
Ignore Backfacing
By Angle:
Shrink
Grow
Ring
Loop
Get Stack Selection
Preview Selection
Off SubObj Multi
57 Polygons Selected
Edit Poly Mode
Model Animate
<No Current Operation>
Commit
Settings
Cancel
Show Cage
Soft Selection
Edit Polygons
Insert Vertex
Extrude
Outline
0 / 820
1 Object Selected
Click or click-and-drag to select objects
Add Time Tag
Grid = 10,0m
Auto
Set K.
Filters...
Selected
Welcome to

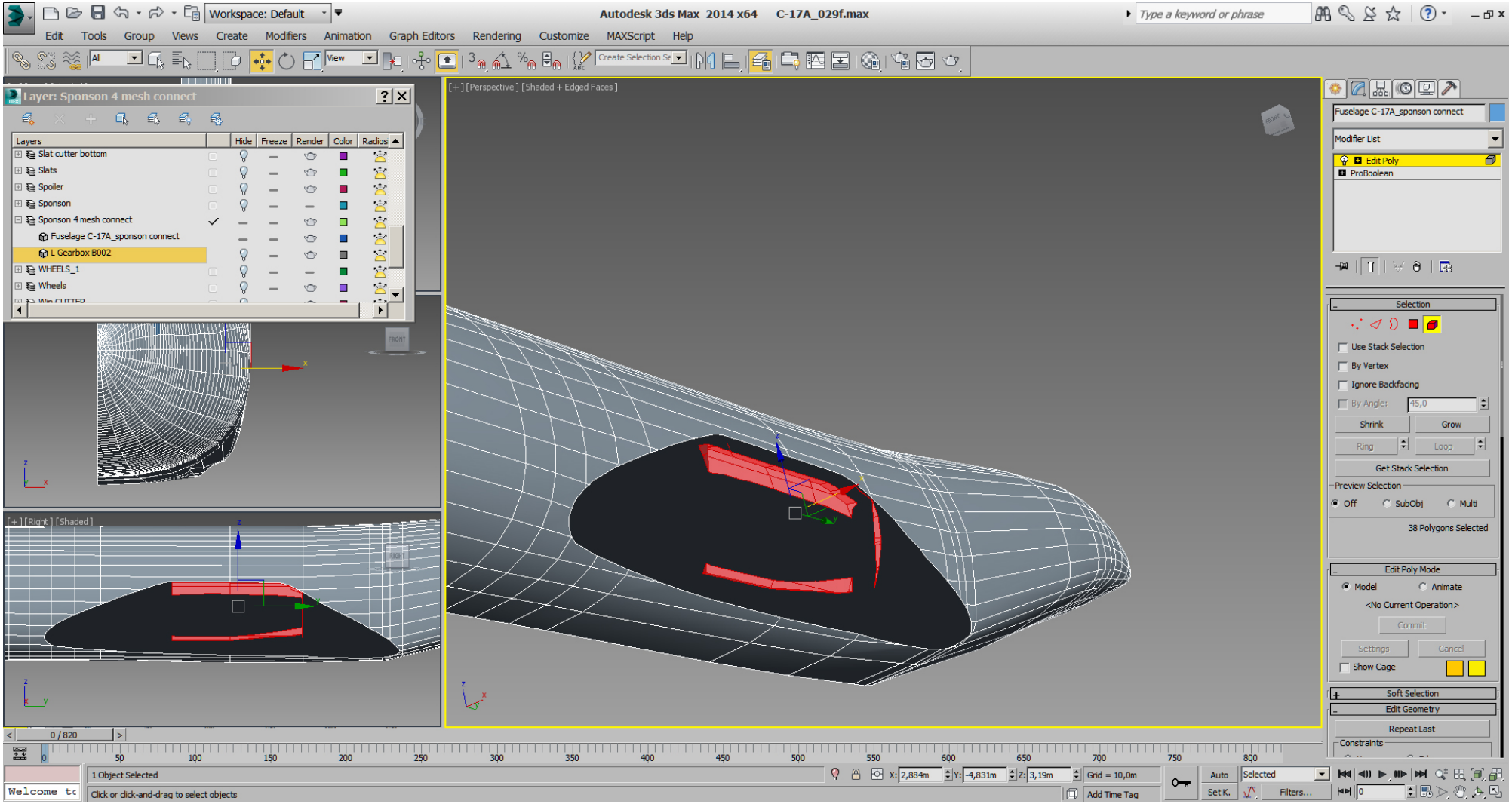
To get that part of the fuselage (shown wrongly in the gear bay) out of the way, a simple extrude into fuselage will do it for now.



And here are the parameters for the second “ProBoolean” cutting.



Such boolean operation(s) leave often lot's of useless vertex, tris, and other garbage.
Getting rid of garbage and doing a cleanup using “Edit Poly” is necessary here.



In the picture for the second ProBoolean cut (2 pics) above, we see the sponson have now tris, where was a look through before.

To get rid of those tris, we use "Edit Poly" -> Vertex sub object -> "Target Weld",
to select a vertex from the sponson and target weld it to the corresponding vertex on the fuselage.

Attention: It is important to do it this way. Doing ot the other way,
means select vertex on fuselage and target weld that to the sponson results in a porked fuselage surface.

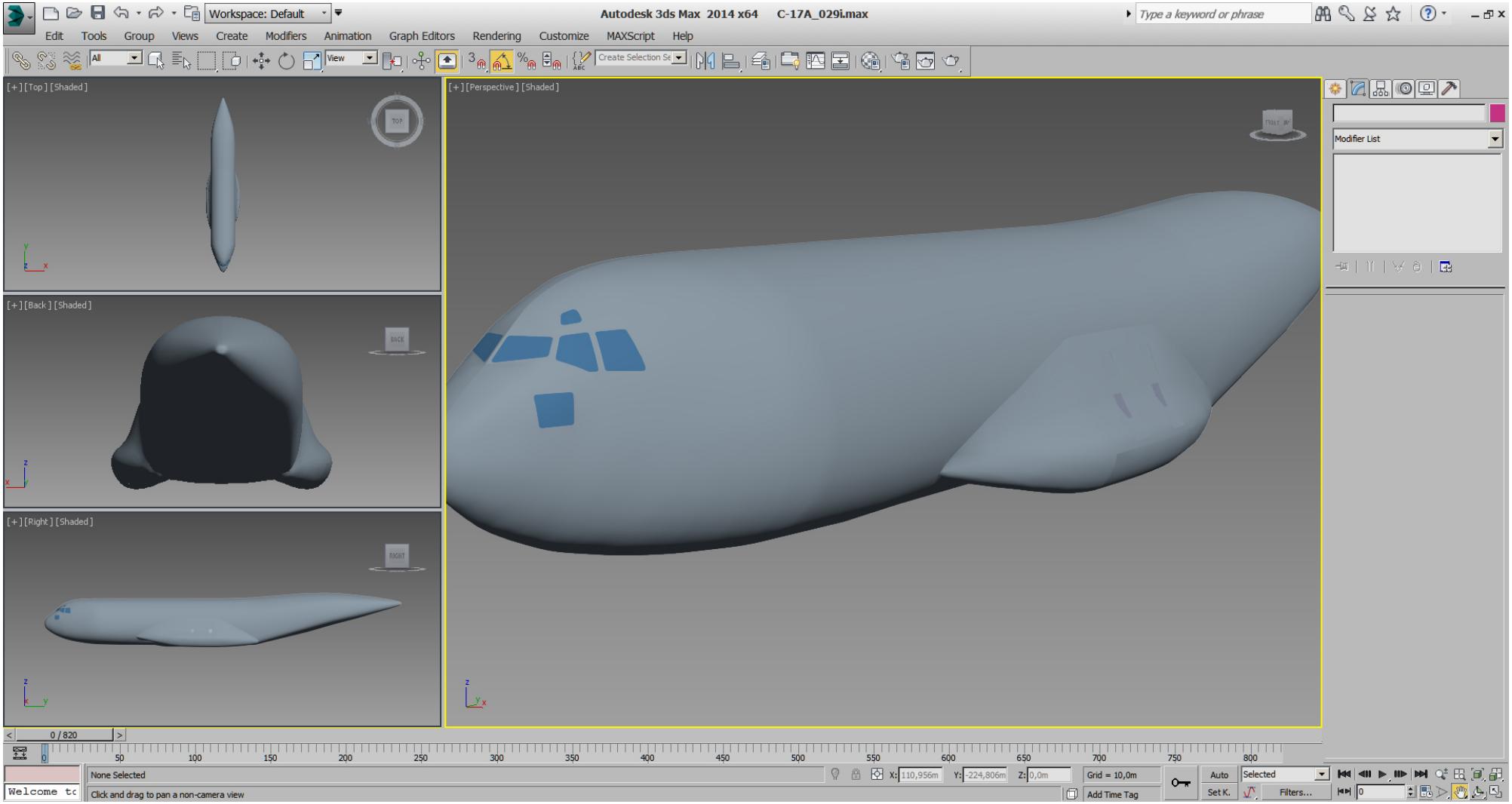
Beside the "Target Weld" function, we use "Cut" function to cut new edges where necessary, and use "Weld" on all selected vertex with a value of 0,001m (or ft) often. Then we select useless vertices or edges and press CTRL + BKSP to get rid of them.

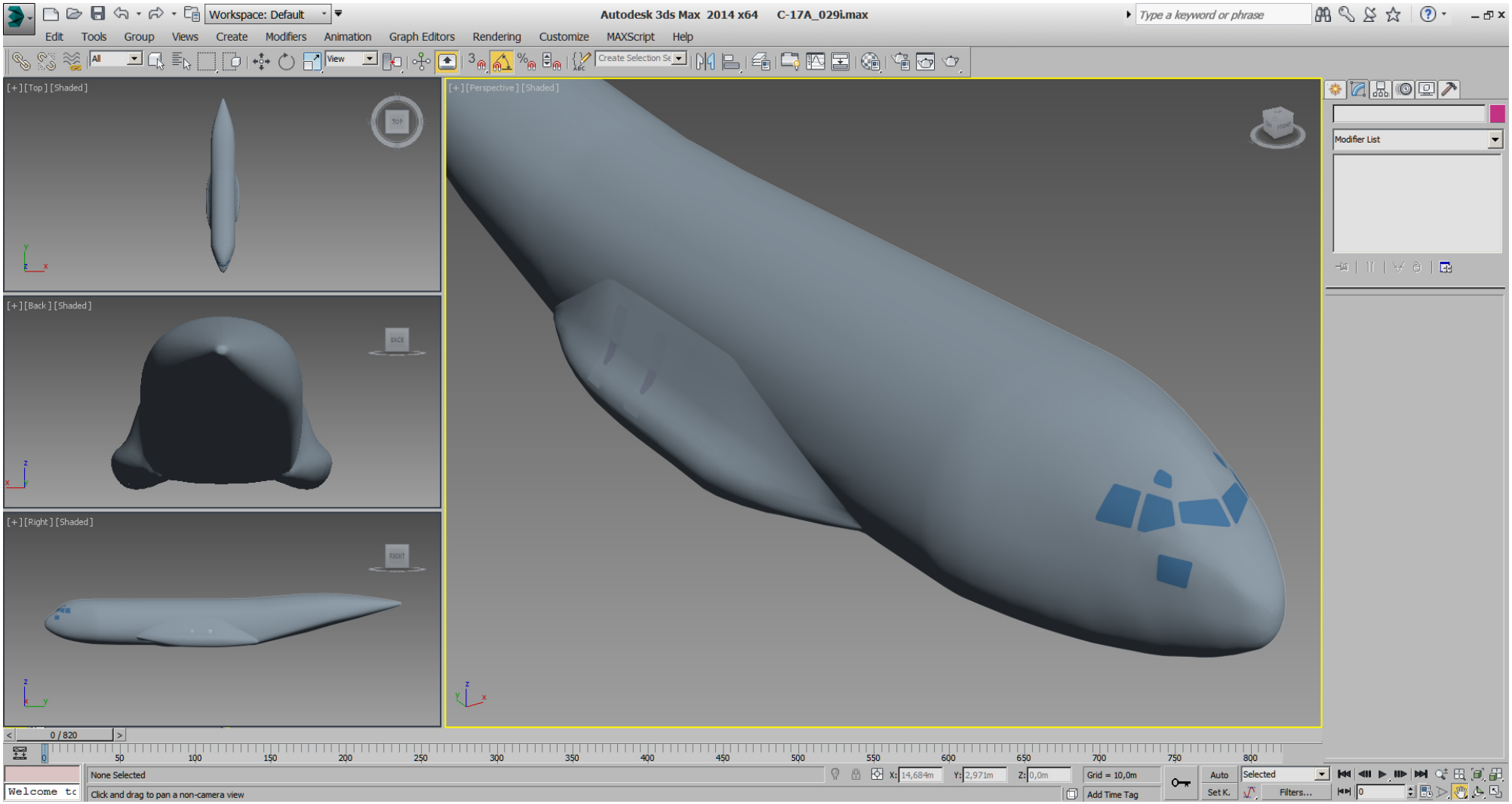
All the effort to clean up the boolean mess, but keep the important vertex and connect them with edges, ...
Sure without porking the shape of the model.

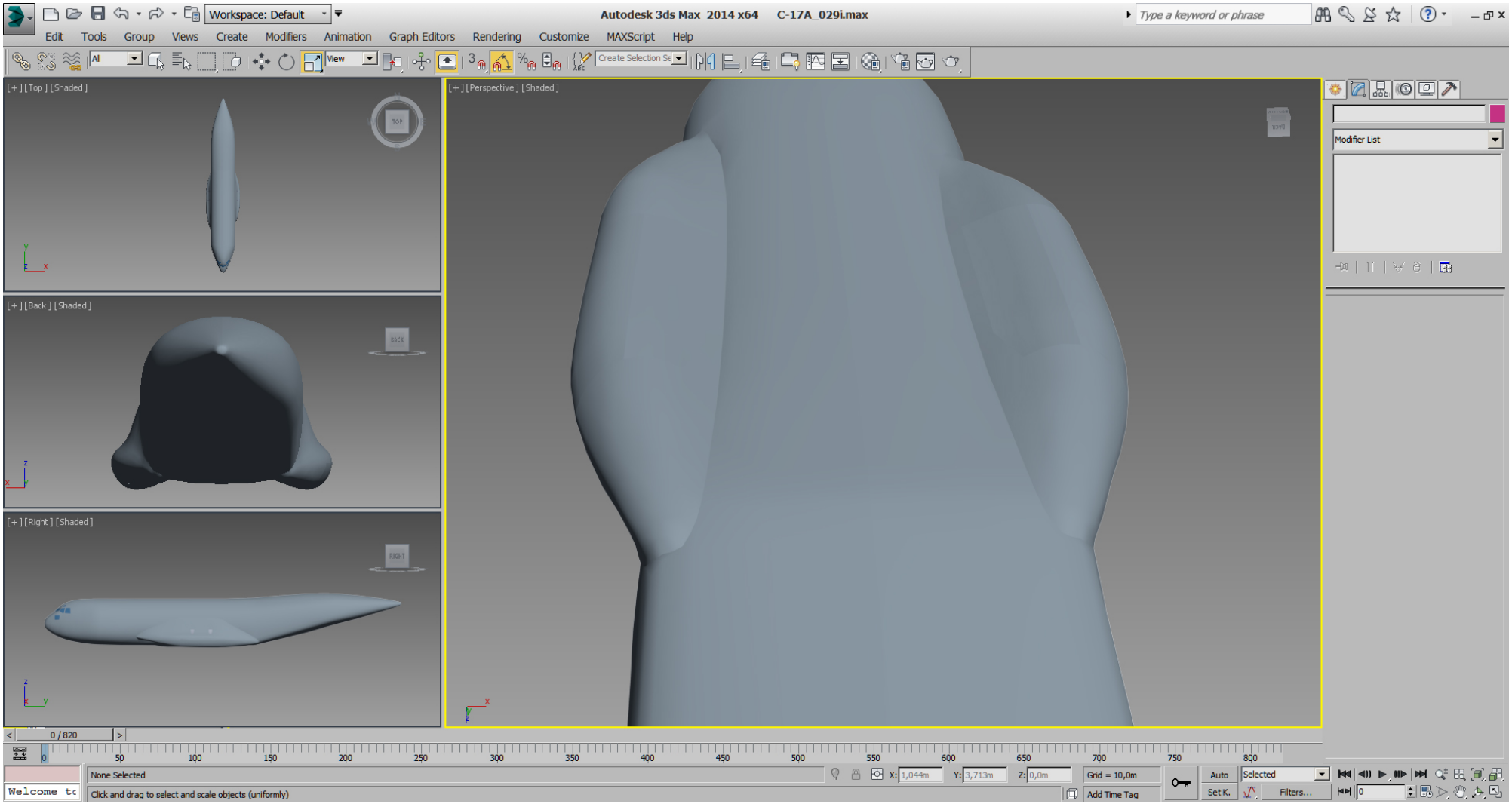
We take special care to get a "clean" geometry (no useless vertex or tris, etc..) left from the boolean mess and the cleanup.
Additionally we take care of the “Smoothing Groups”.

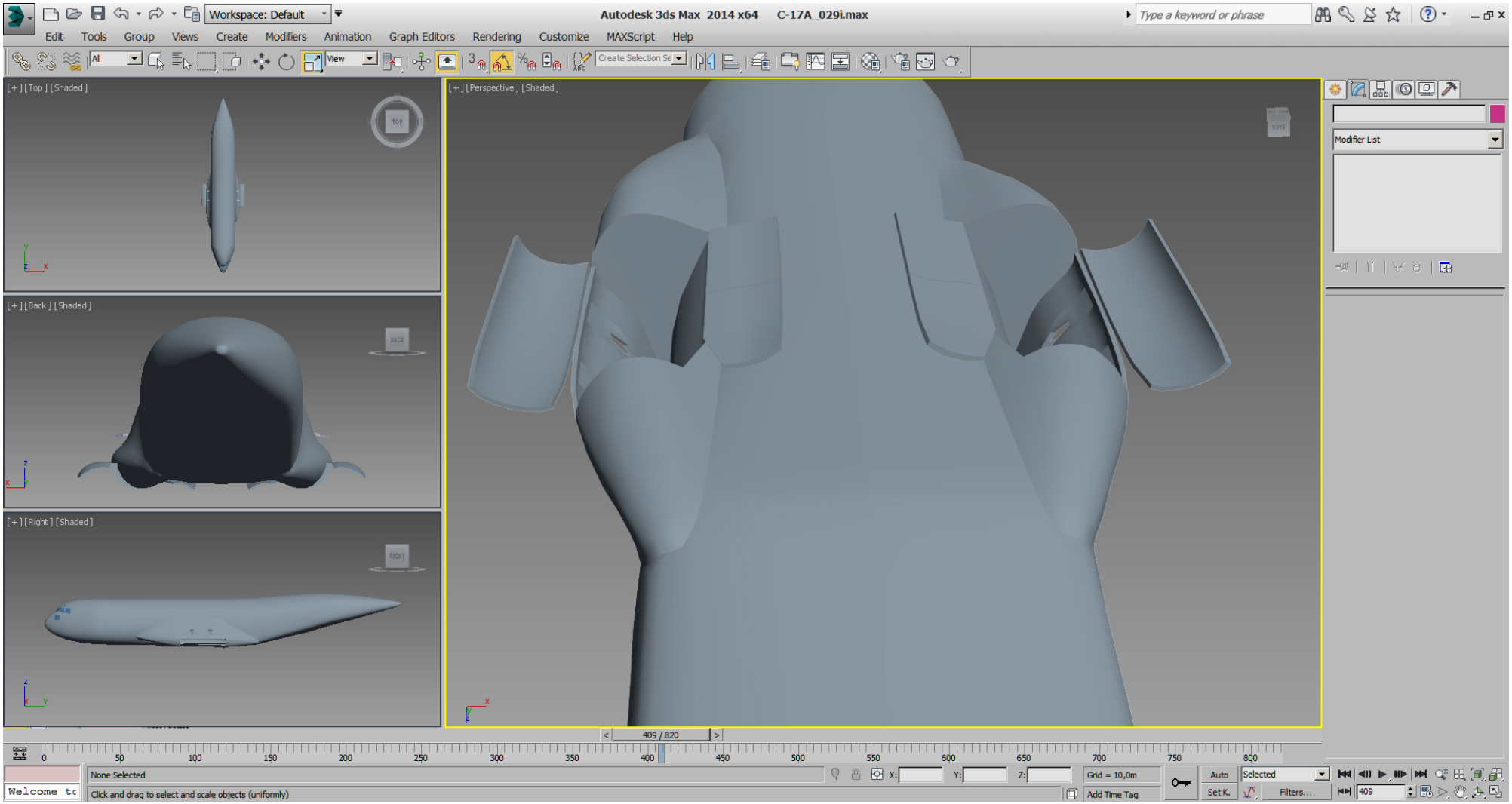
And yes, there is still potential to save some more tris, but for now it's just pre- tri optimized, a first pass so to speak.

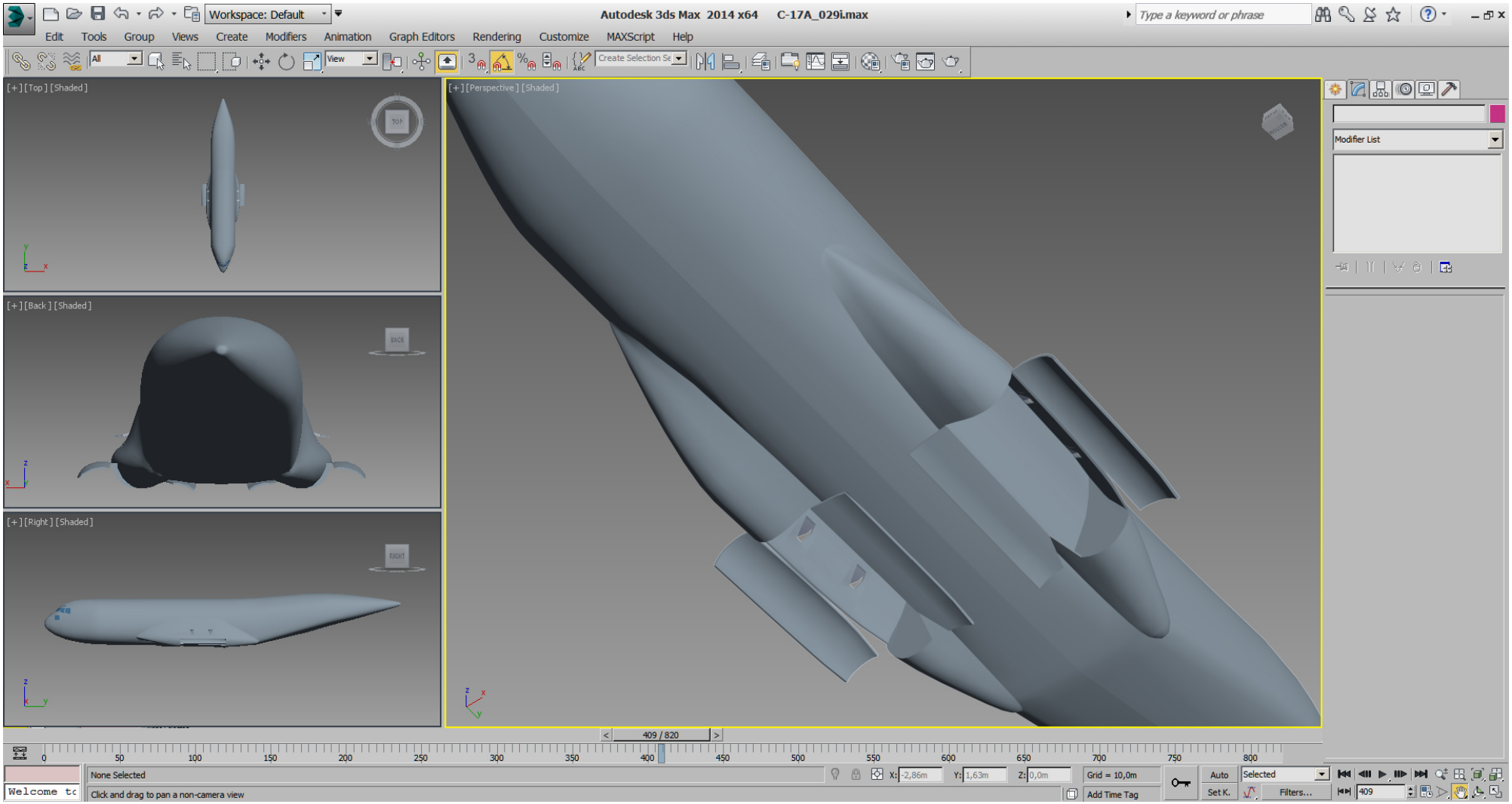
If the whole process is done correctly and with great care, the result of both sponsons can look like this:

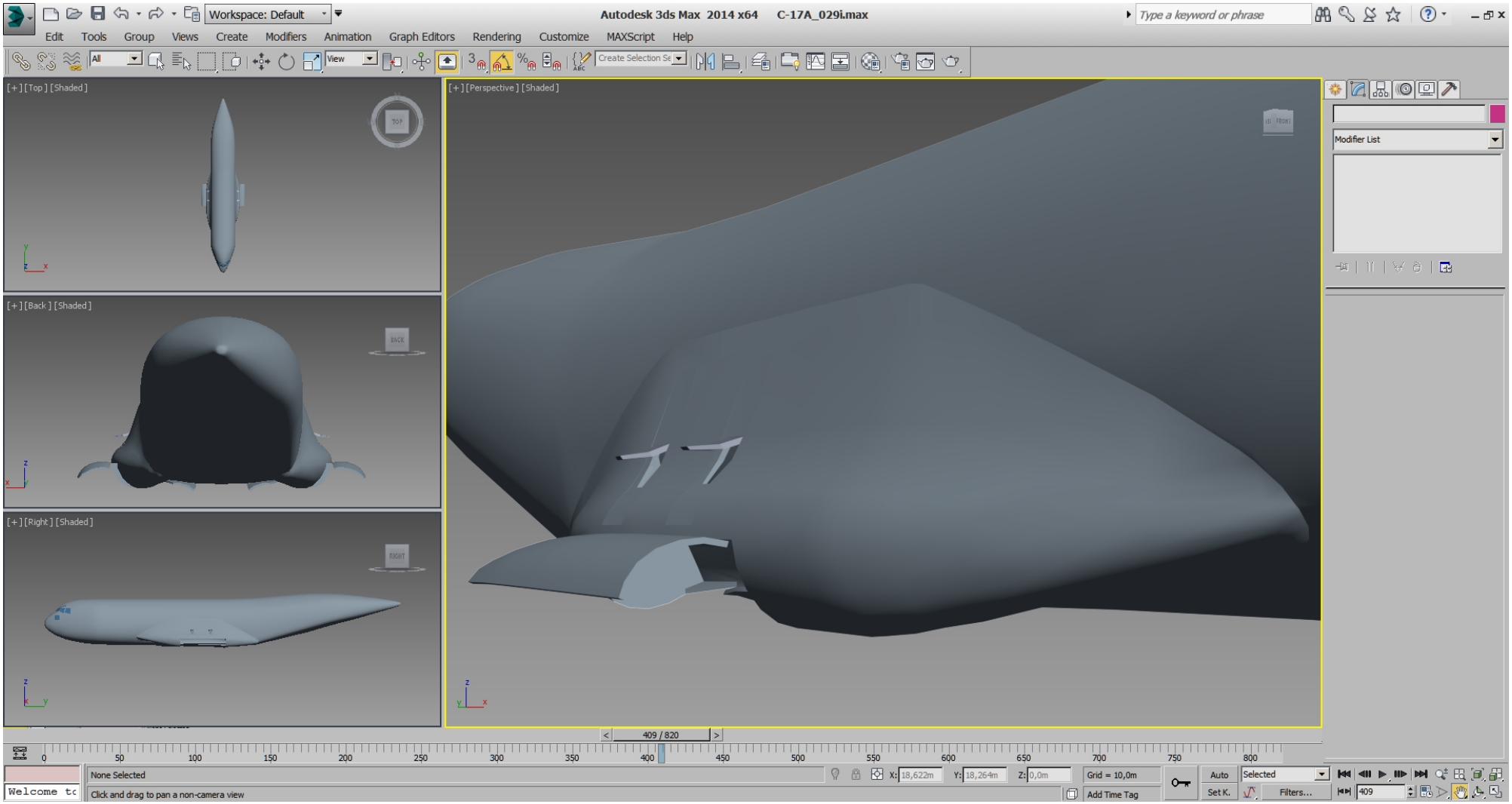


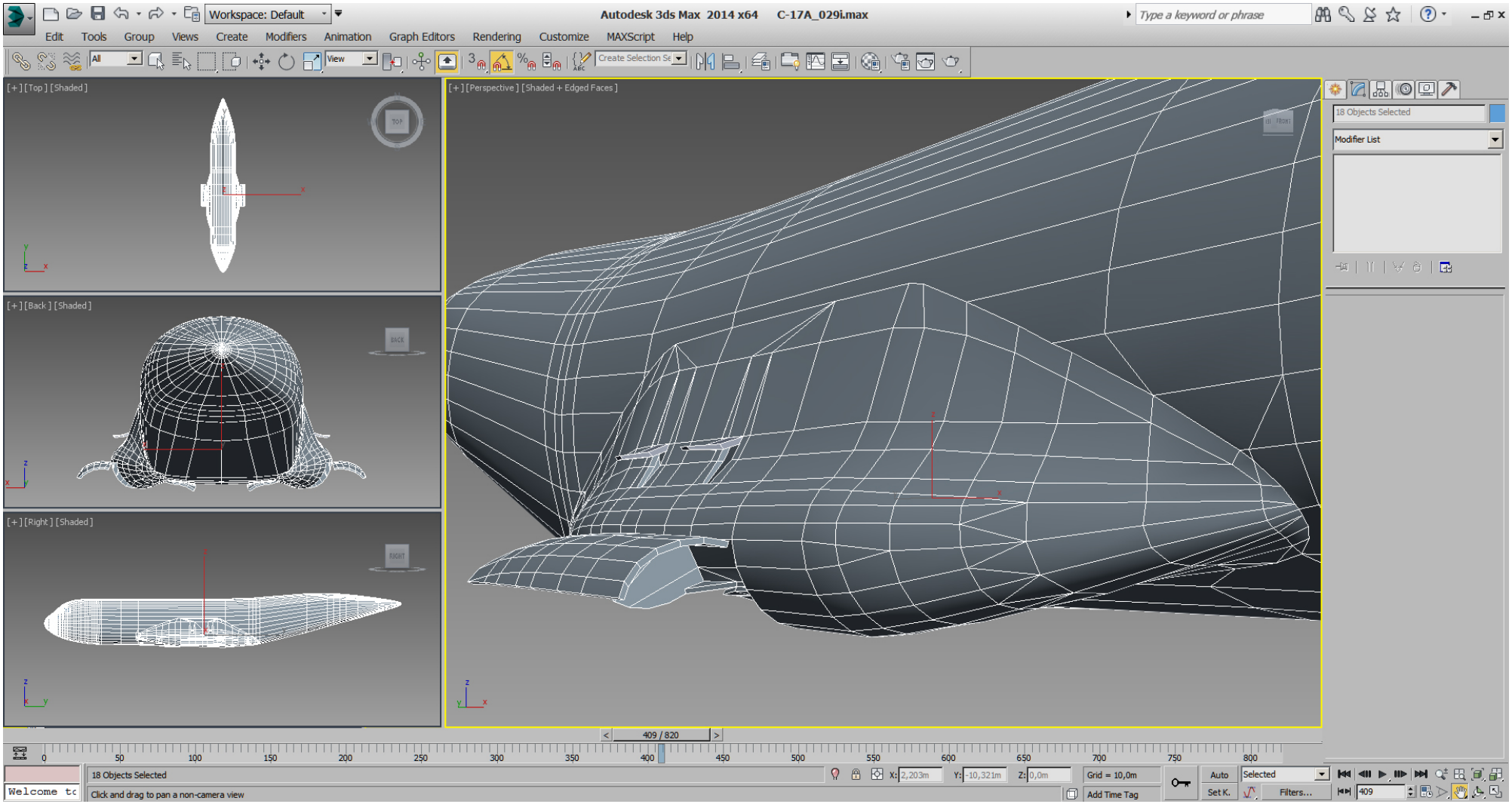

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_029i.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Back][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
0 / 820
None Selected
Click and drag to pan a non-camera view
Add Time Tag
Welcome to

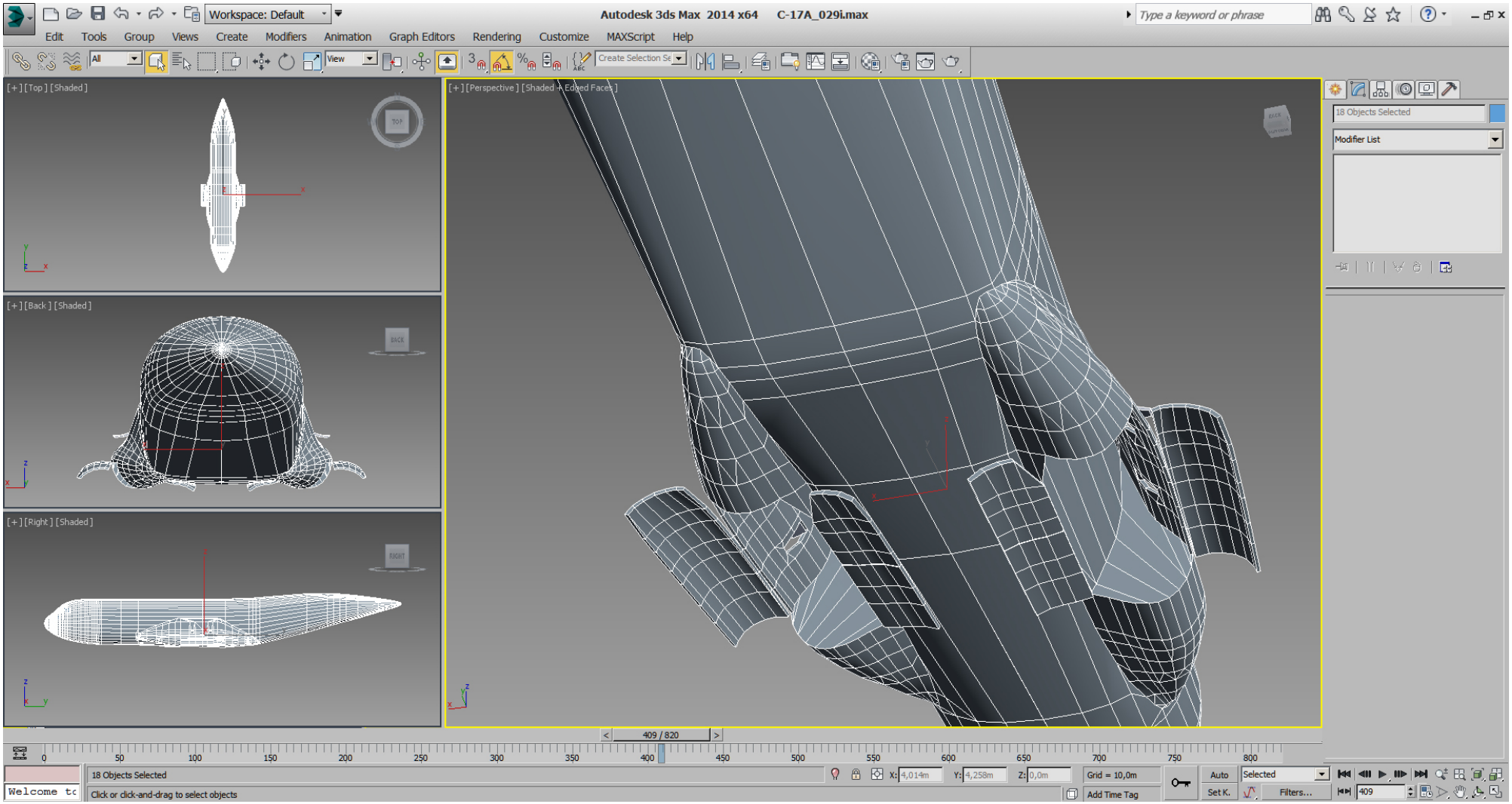

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_029i.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Back][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
0 / 820
None Selected
Click and drag to select and scale objects (uniformly)
Add Time Tag
Auto
Set K.
Selected
Filters...
Welcome to


Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_029i.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Back][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
409 / 820
None Selected
Click and drag to select and scale objects (uniformly)
Add Time Tag
Grid = 10,0m
Auto
Set K.
Selected
Filters...
Welcome to


Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_029i.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Back][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
409 / 820
None Selected
Click and drag to pan a non-camera view
Add Time Tag
Auto
Set K.
Selected
Filters...
Welcome to

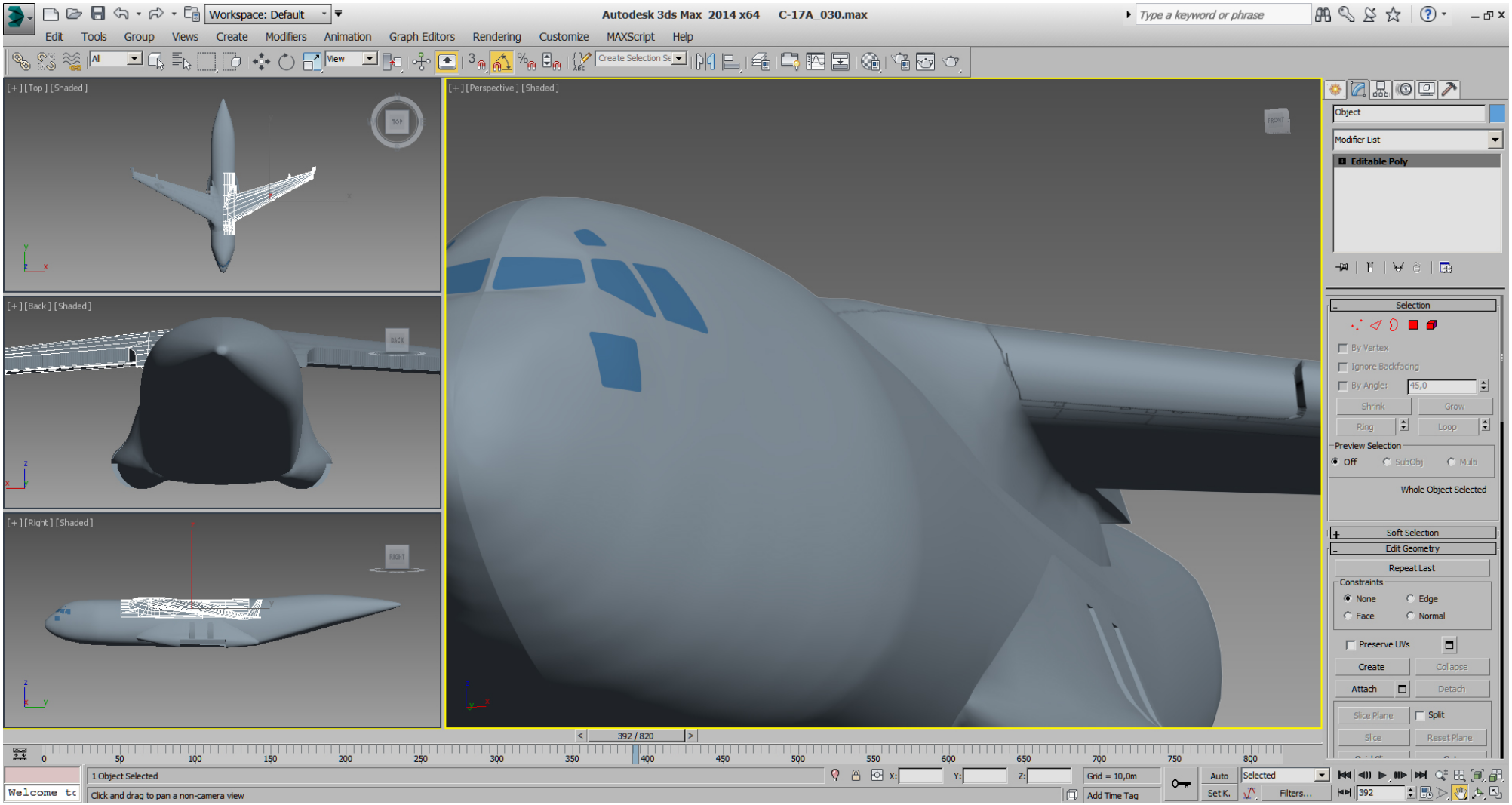

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_029i.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Back][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
409 / 820
None Selected
Click and drag to pan a non-camera view
Welcome to
Add Time Tag
Auto
Set K.
Selected
Filters...


Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_029i.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Back][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded + Edged Faces]
18 Objects Selected
Modifier List
409 / 820
0 50 100 150 200 250 300 350 400 450 500 550 600 650 700 750 800
18 Objects Selected
Click and drag to pan a non-camera view
Add Time Tag
Auto
Set K.
Selected
Filters...
Welcome to

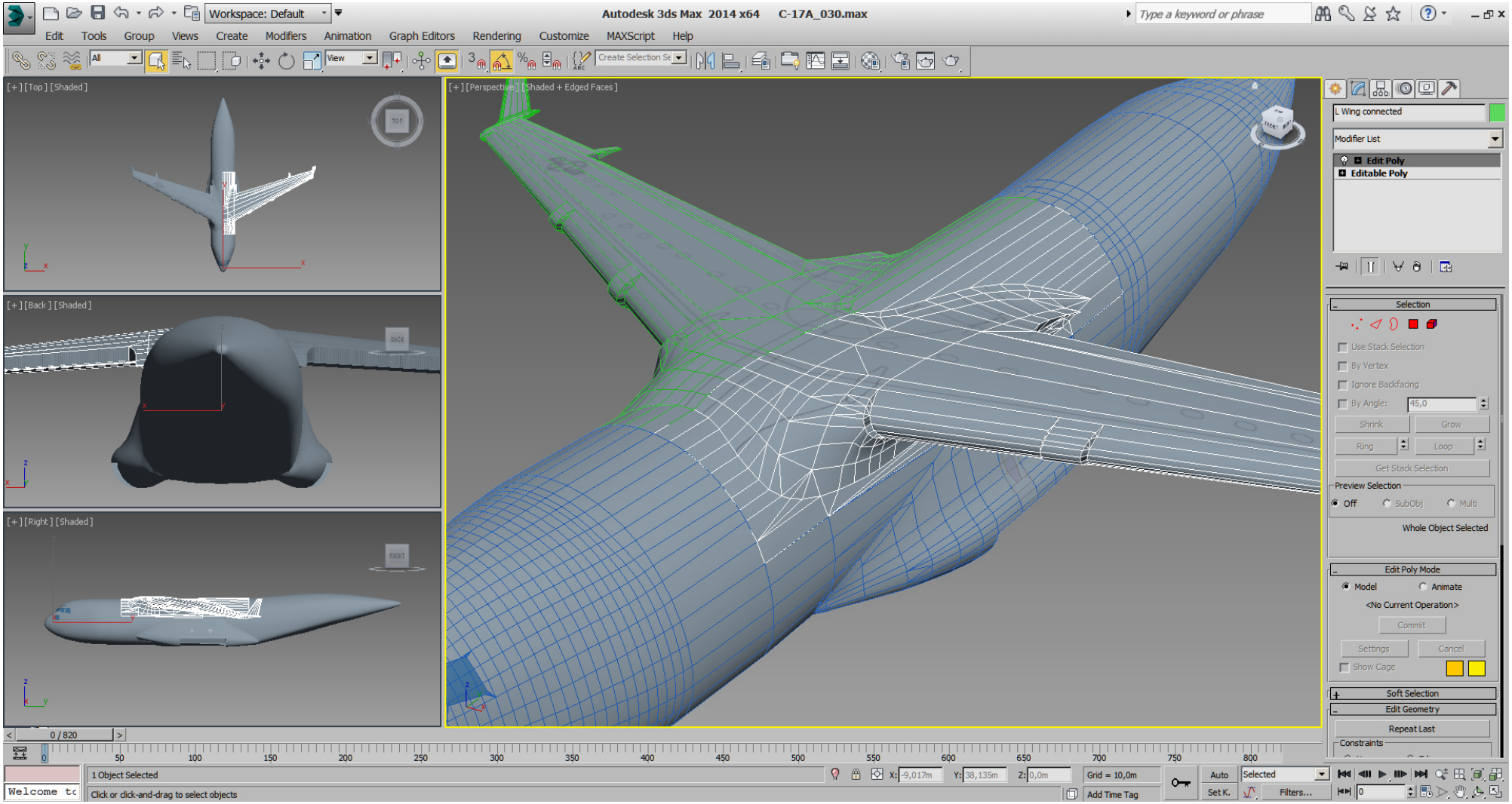


In the end there is not much difference to spot from far, compared to my last posts above,
but the sponsons are mesh connected to the fuselage now, and we already got rid of some more tris.

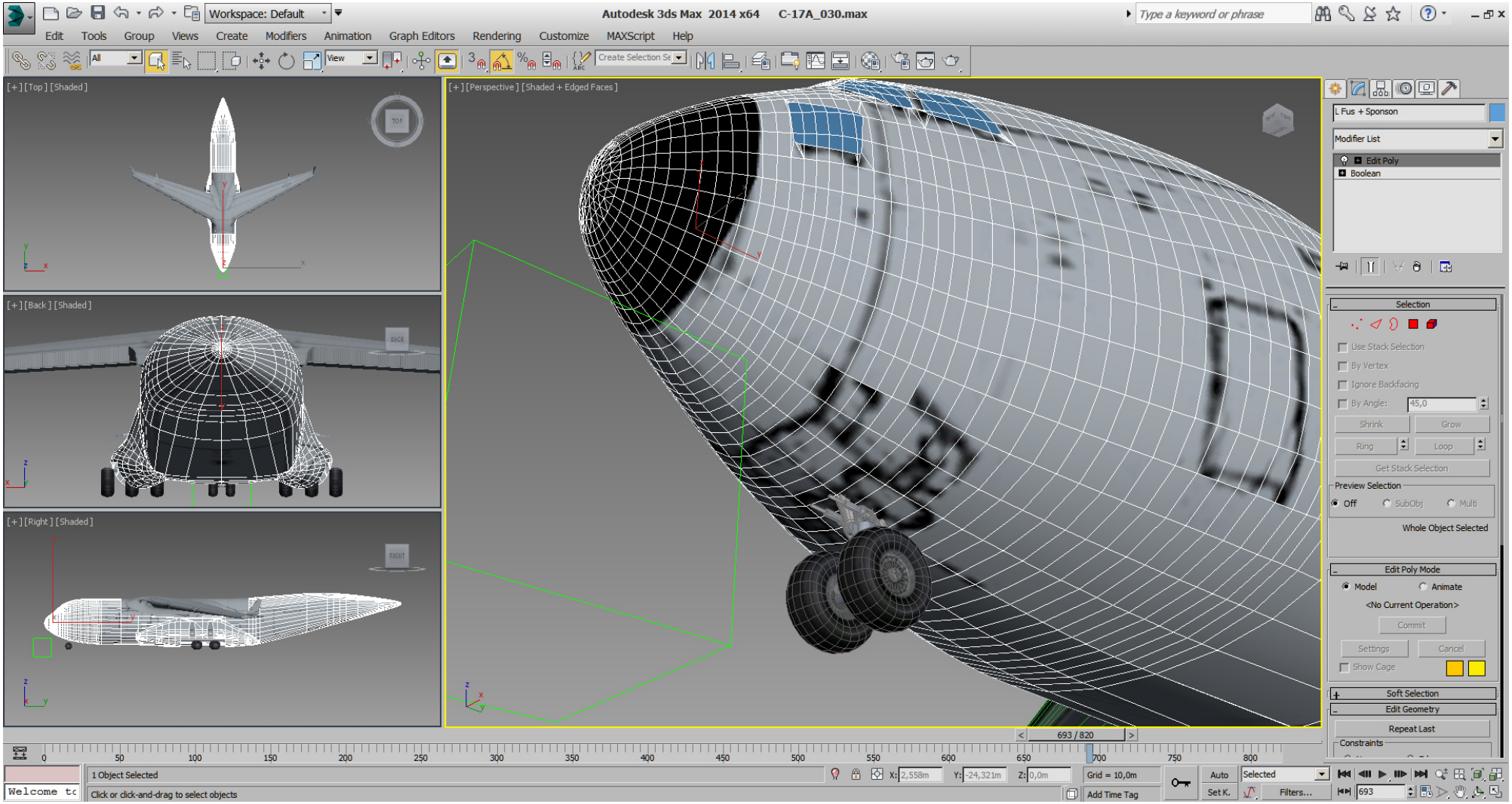
The wings got also mesh connected to the fuselage in similar way and got further tri optimized.



Here you see the wings with a part of the mesh connected fuselage detached again, because the fuselage itself isn't symmetrically due to the differently sponsons.
Now the wings are instanced copies again, ... for further work on the wings later.



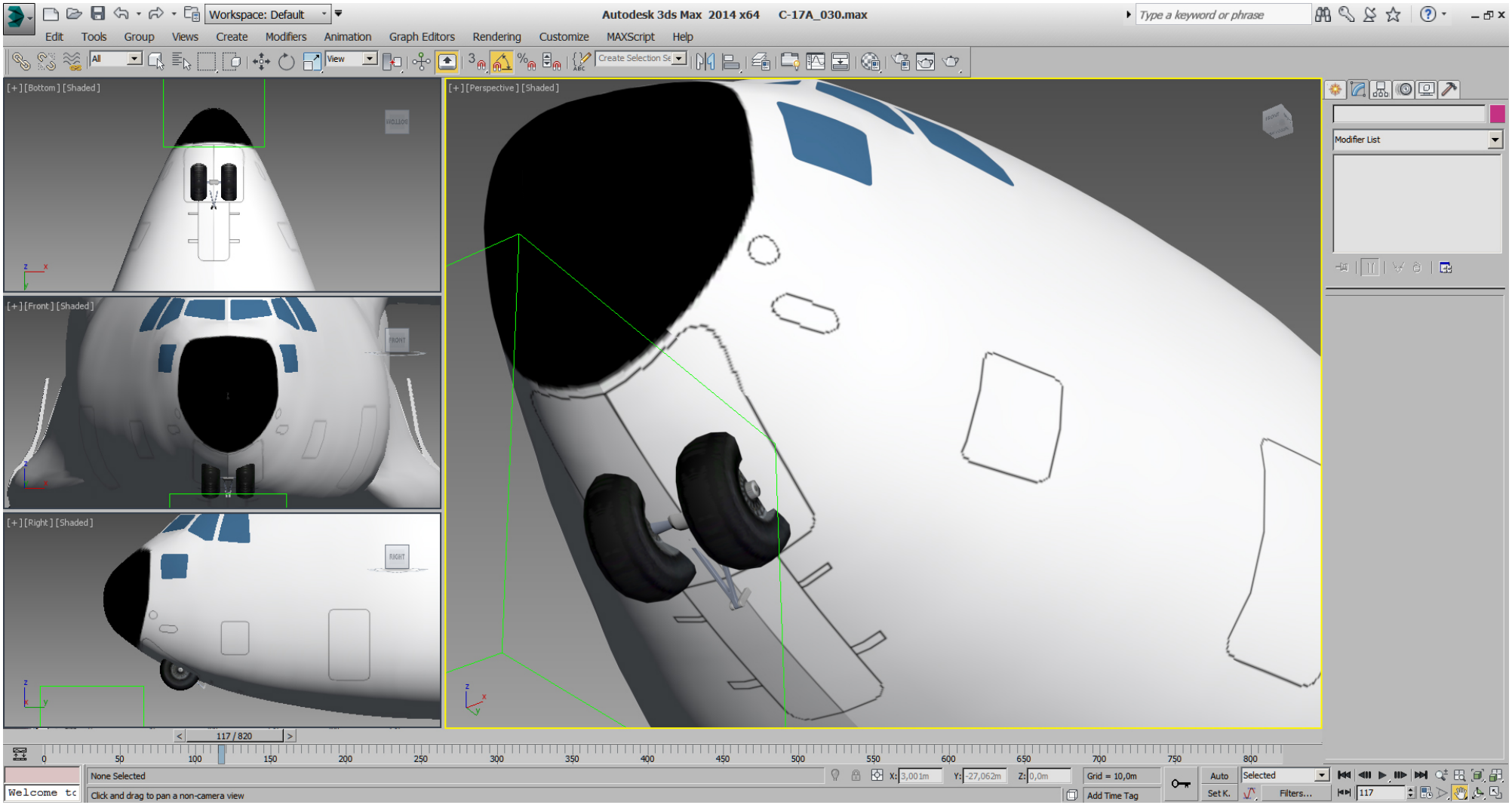
The front section needs front landing gear doors cutting, and some pre- optimizing.
Sadly the blueprint and other drawing references aren't much helpful here.



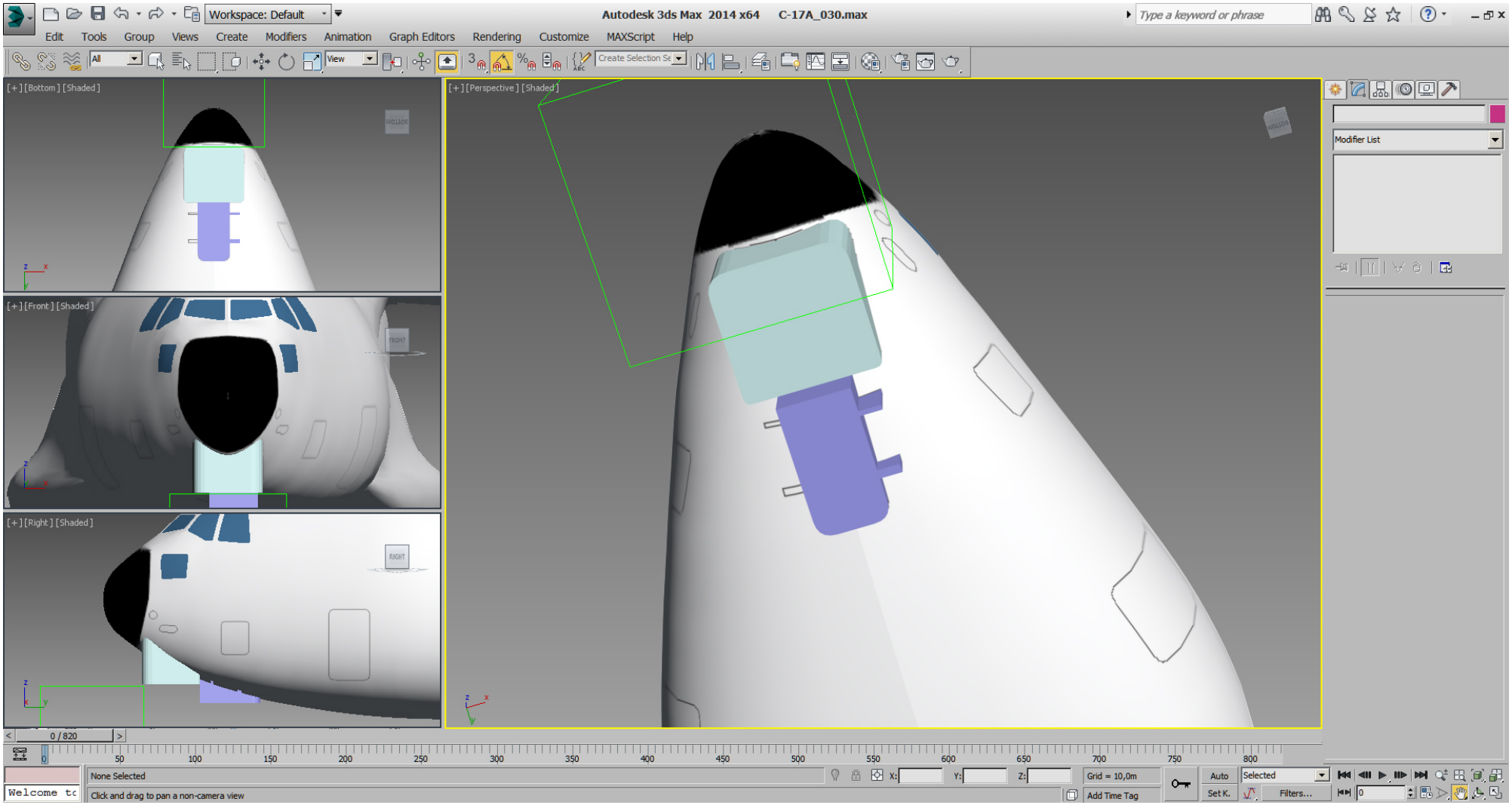
Please note in next picture the bad texture border of the black nose, where a cleaner line would be way more coherent, especially for those liveries with a differently nose color.

Note also the nose wheels touch (collide with) the fuselage at this position, but the front landing gear extension is not animated in "weight on wheels" state atm., so it's all fine.

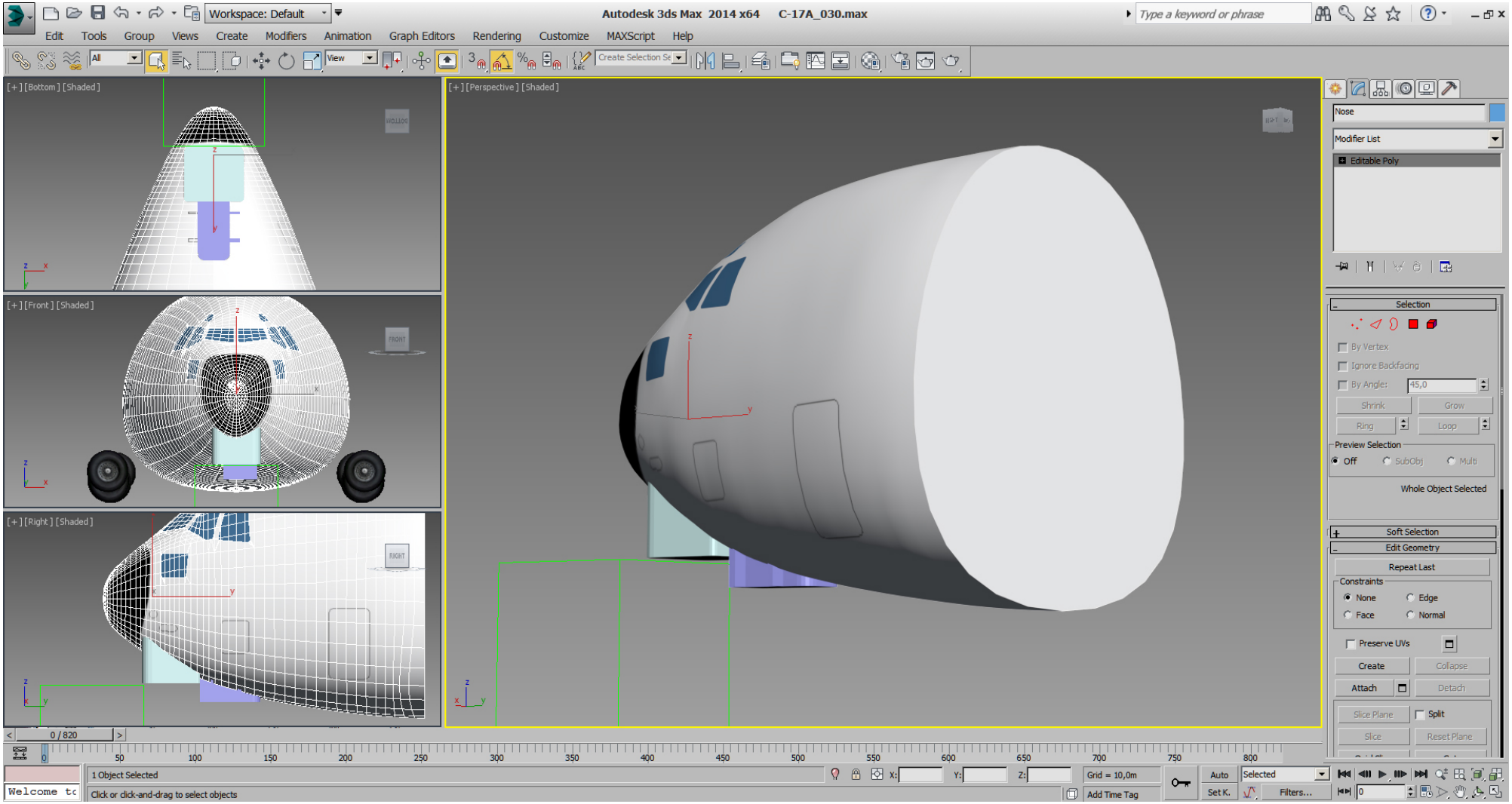
So after watching RL pictures, the markings on the texture for boolean cutting nose gear doors looks like this.



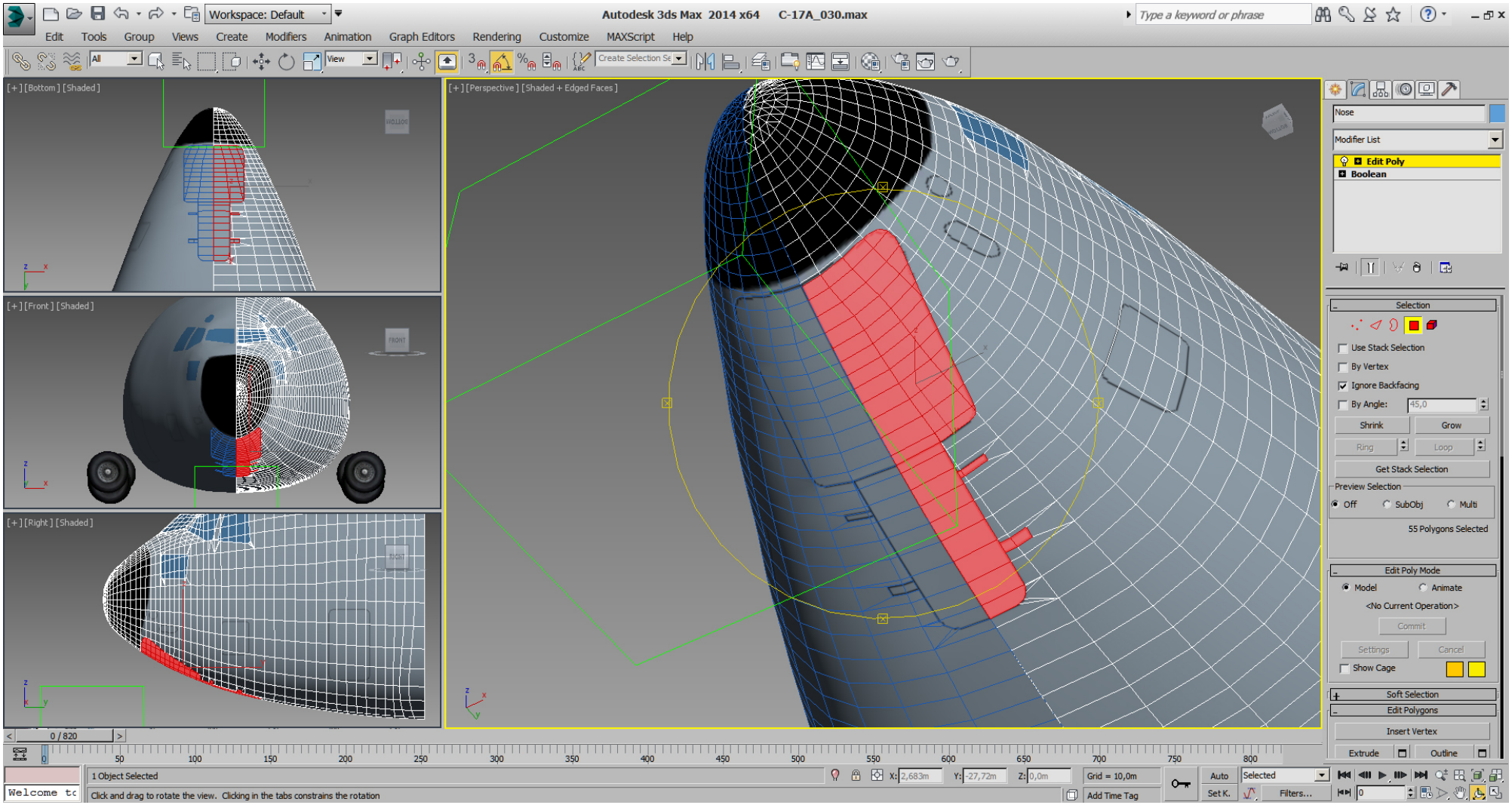
The cutting parts for boolean operations are created and placed.



To prepare the boolean cut, I've selected and detached the front section, because it's easier to work with, and I wanted to do that at least when it comes to model the cockpit anyway.
Additionally, the object has been temporary closed.

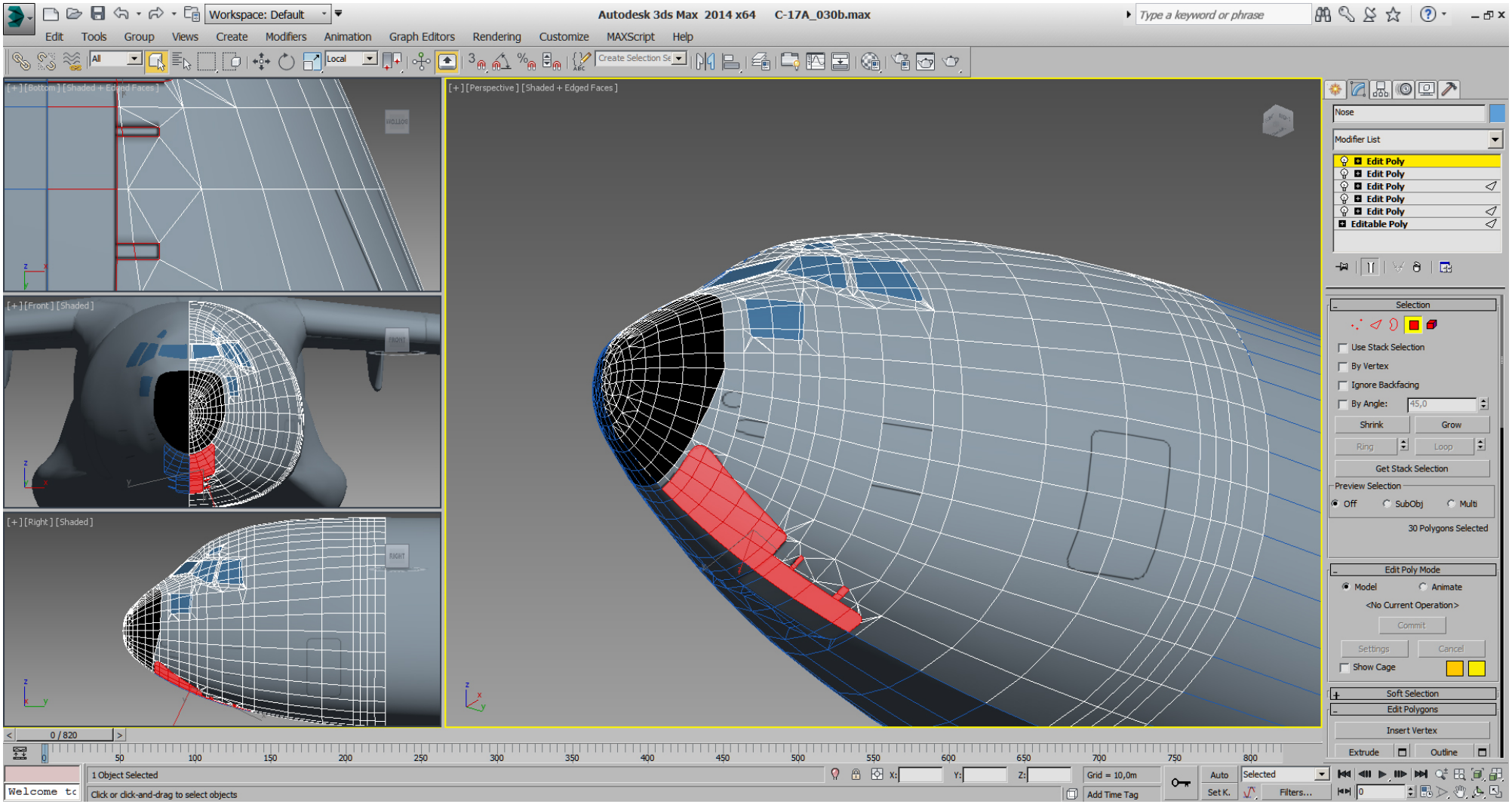


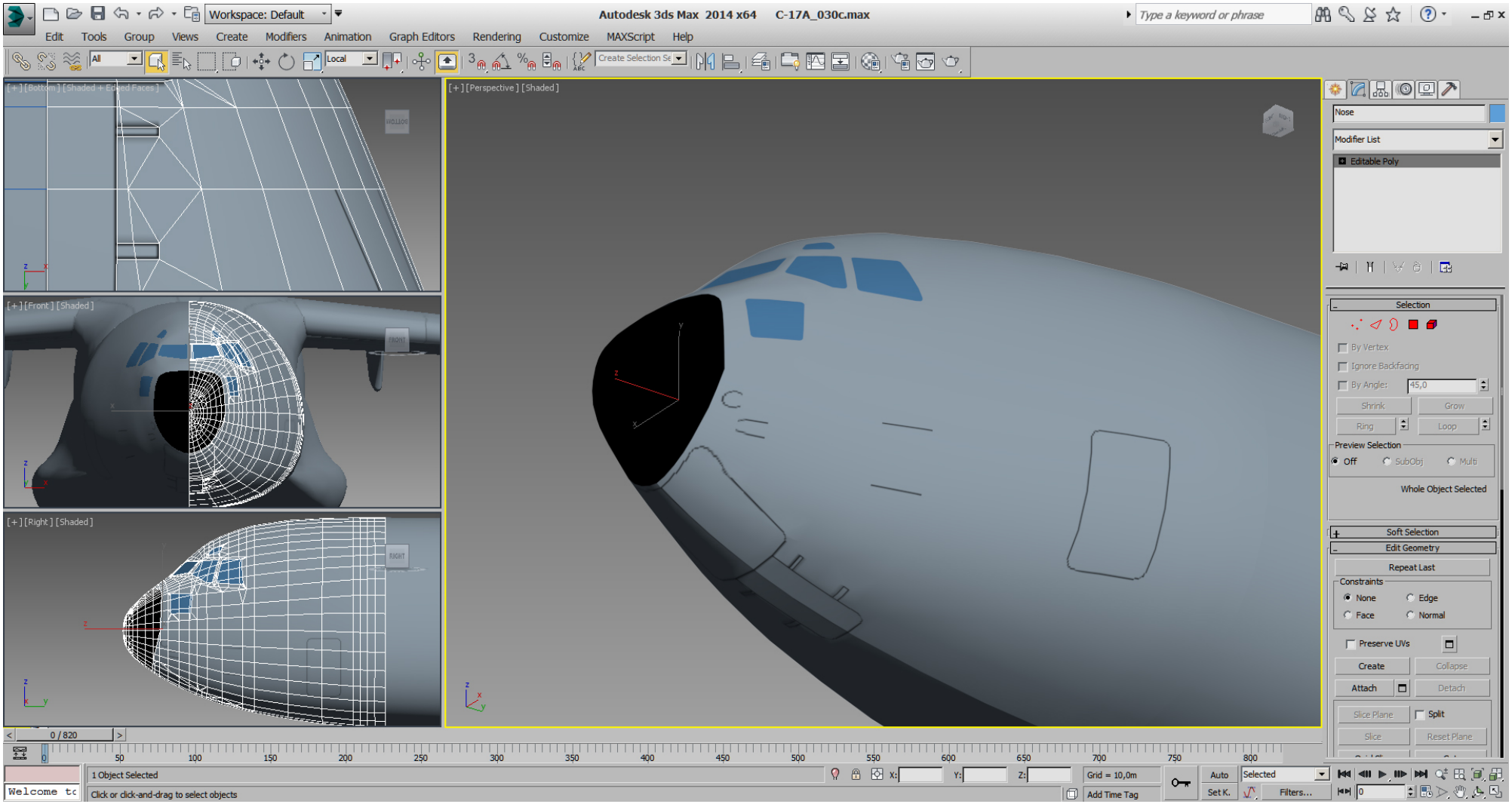
The doors got boolean cutted, the right side and that temporary back wall got deleted, then left side got mirrored instanced again.



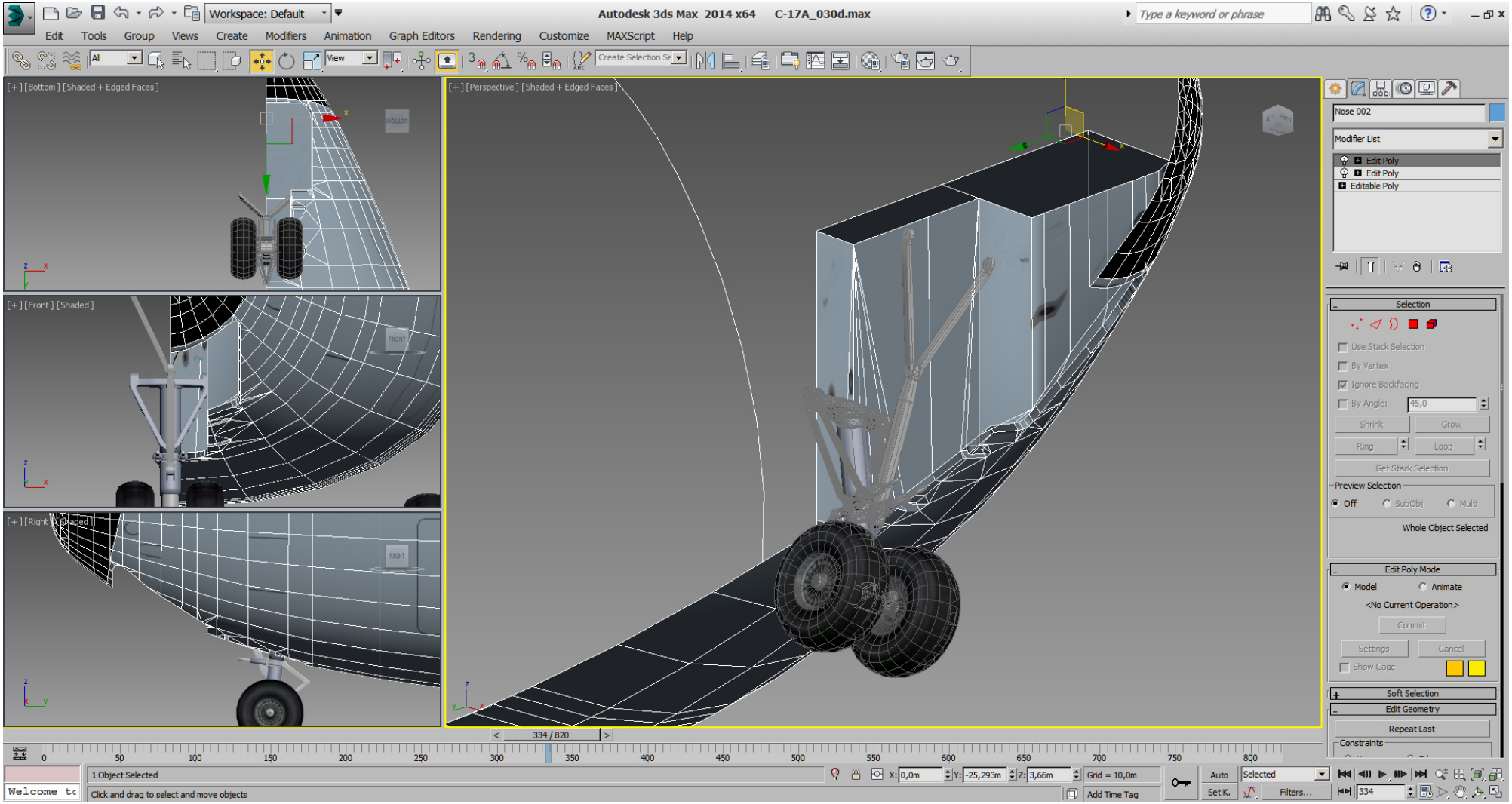
And with the gear doors cutted, we can do a pre- tri optimizing. The black nose shape has been also cutted to get a clean border, where we had that bad textured border before.

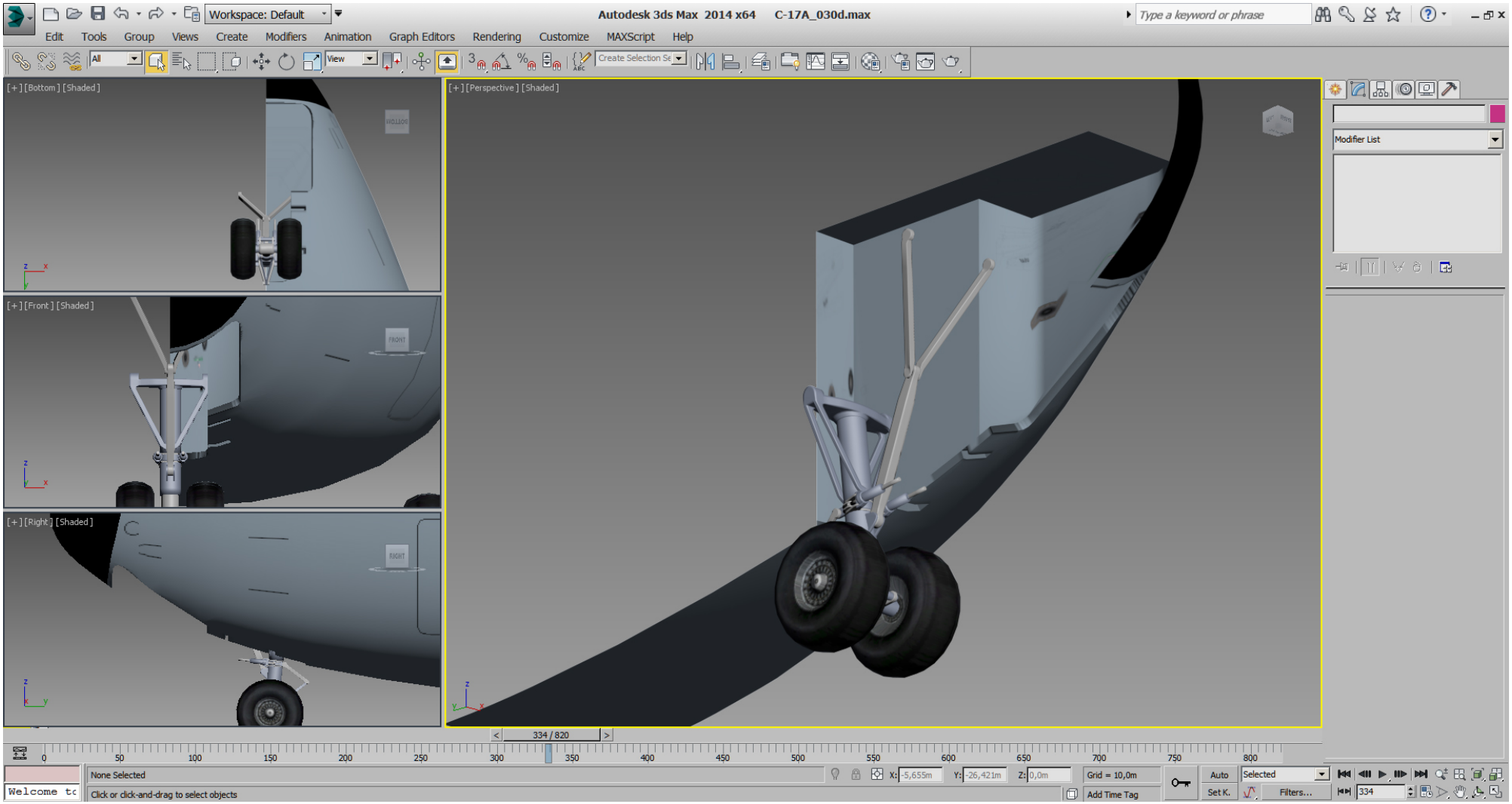
Note also that the temporary UVW mapping for the painted references got destroyed/ distorted, due to intensive tri optimizing, but with the gear doors already cutted, we don't need the painted references anymore and the model needs final re- mapping later anyway.


Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_030b.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Bottom][Shaded + Edged Faces]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded + Edged Faces]
Nose
Modifier List
Edit Poly
Edit Poly
Edit Poly
Edit Poly
Edit Poly
Editable Poly
Selection
Use Stack Selection
By Vertex
Ignore Backfacing
By Angle:
Shrink
Grow
Ring
Loop
Get Stack Selection
Preview Selection
Off
SubObj
Multi
30 Polygons Selected
Edit Poly Mode
Model
Animate
<No Current Operation>
Commit
Settings
Cancel
Show Cage
Soft Selection
Edit Polygons
Insert Vertex
Extrude
Outline
0 / 820
1 Object Selected
Click or click-and-drag to select objects
Grid = 10,0m
Add Time Tag
Auto
Set K.
Selected
Filters...
Welcome to

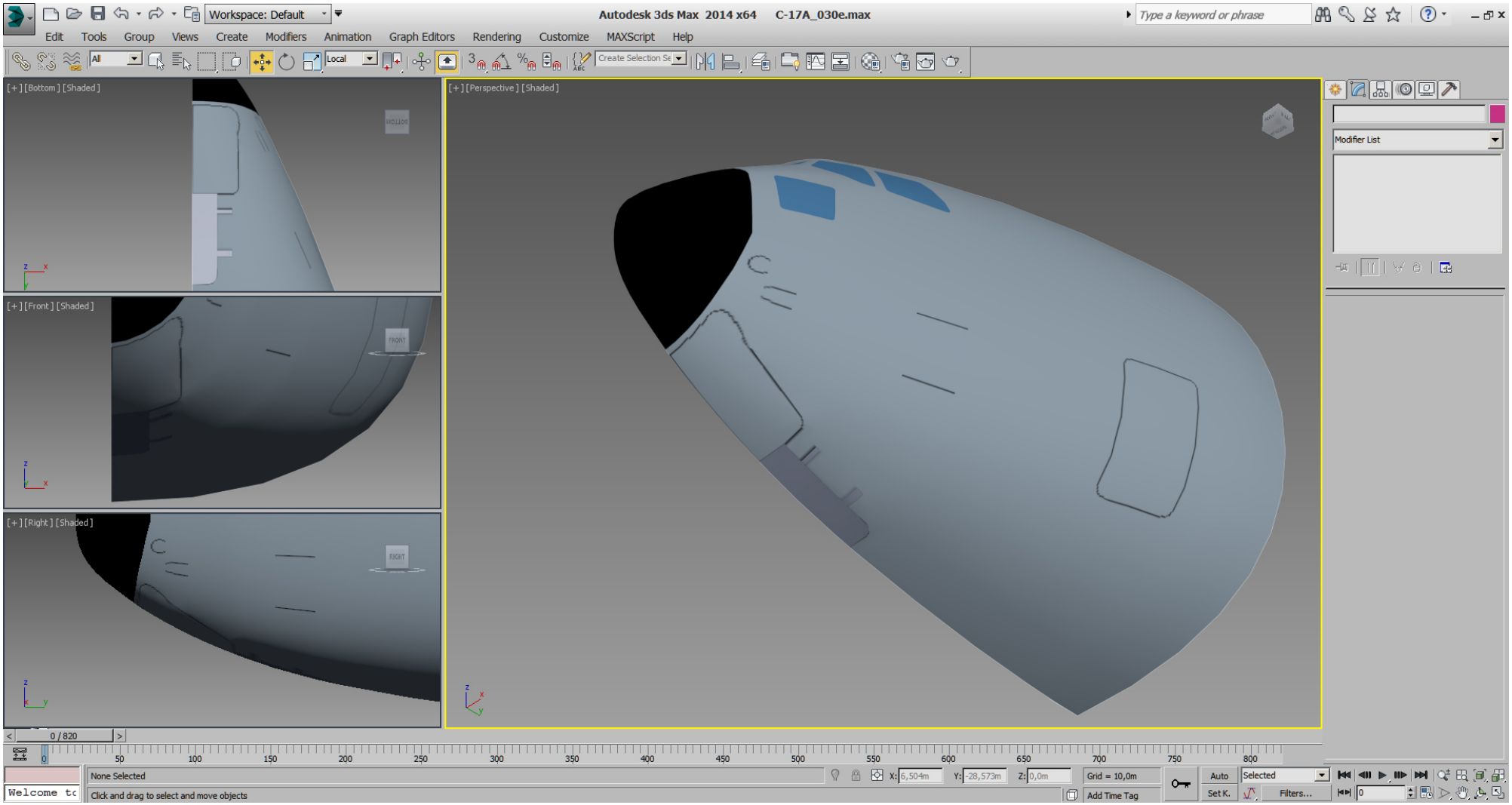

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_030c.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Bottom][Shaded + Edged Faces]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Nose
Modifier List
Editable Poly
Selection
By Vertex
Ignore Backfacing
By Angle:
Shrink
Grow
Ring
Loop
Preview Selection
Off SubObj Multi
Whole Object Selected
Soft Selection
Edit Geometry
Repeat Last
Constraints
None Edge
Face Normal
Preserve UVs
Create
Collapse
Attach
Detach
Slice Plane
Split
Slice
Reset Plane
0 / 820
1 Object Selected
Click or click-and-drag to select objects
Grid = 10,0m
Add Time Tag
Auto
Set K.
Selected
Filters...
Welcome to

With a copy of the left front fuselage section, the cutted doors has been extruded into the fuselage, and the build of the nose gear bay has been started.

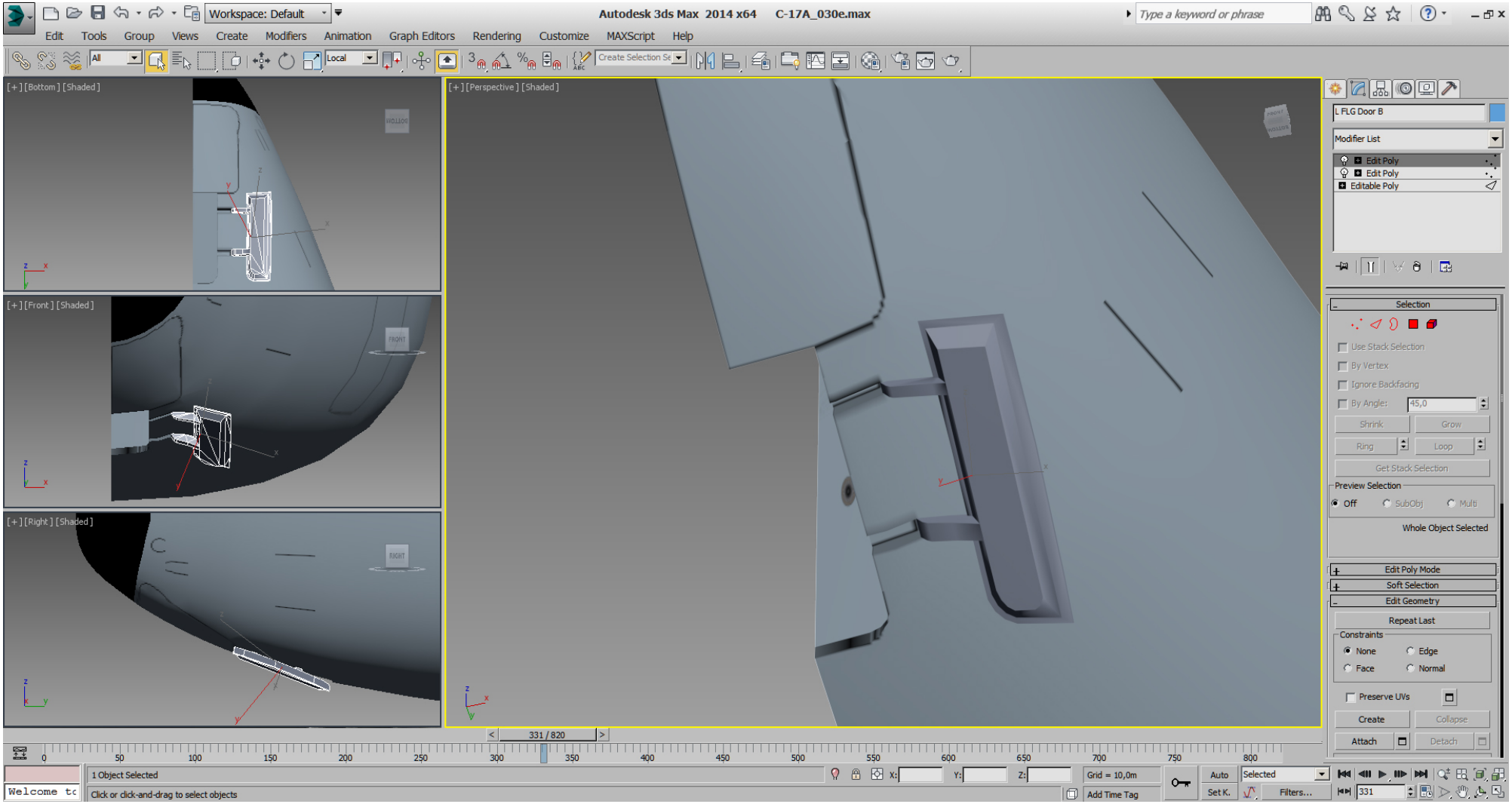



Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_030d.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Bottom][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
334 / 820
None Selected
Click or click-and-drag to select objects
Add Time Tag
Auto
Set K.
Selected
Filters...
Welcome to

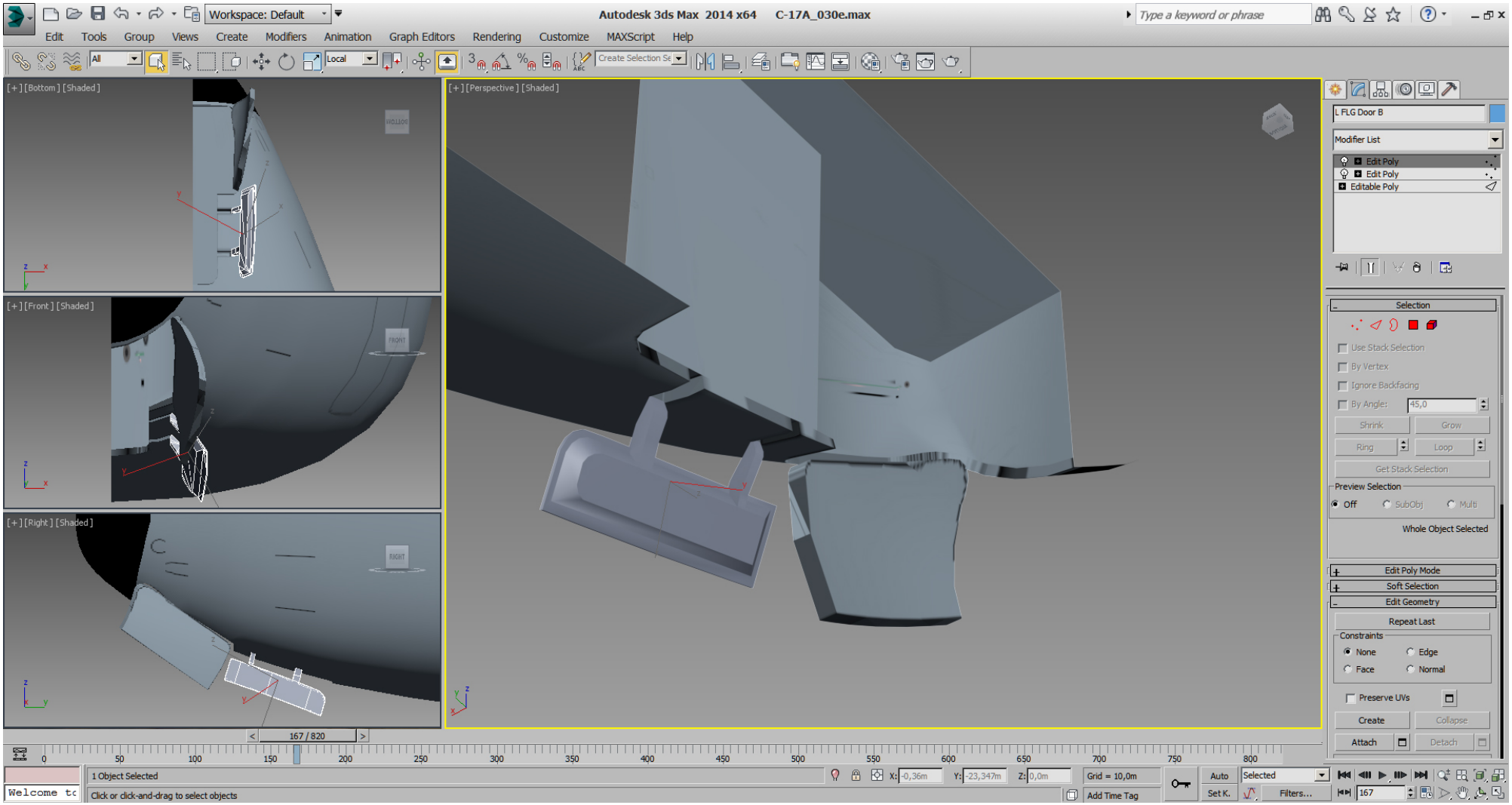
With the original of the above copy, and all tris deleted, except the gear door polys.



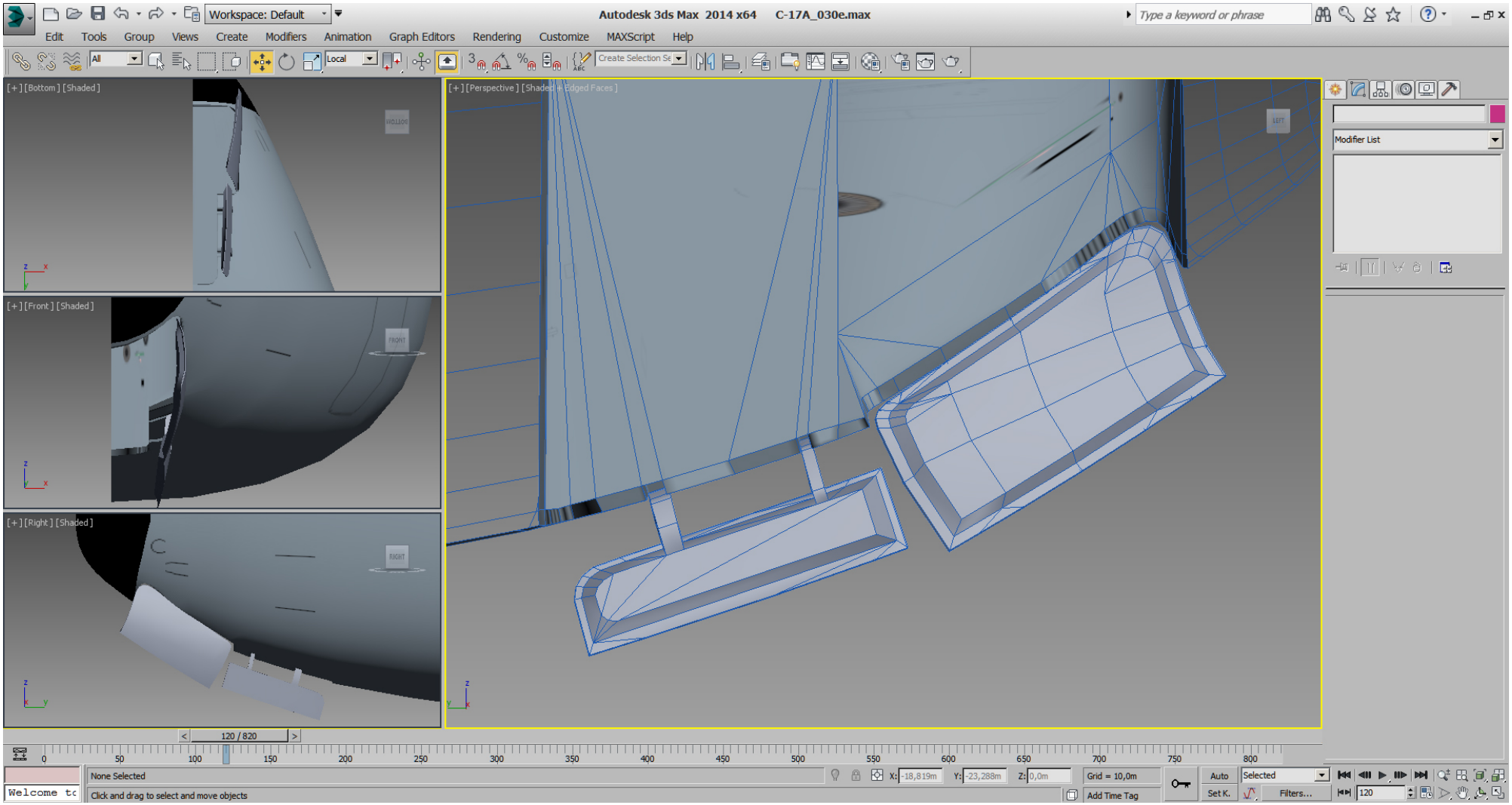
Here is the back door modeled, mainly using "extrude" and scaling selected tris in local axis, all done within the “Edit Poly” modifiers.
A DOF helper has been placed and got animated in 3dsMax, too.

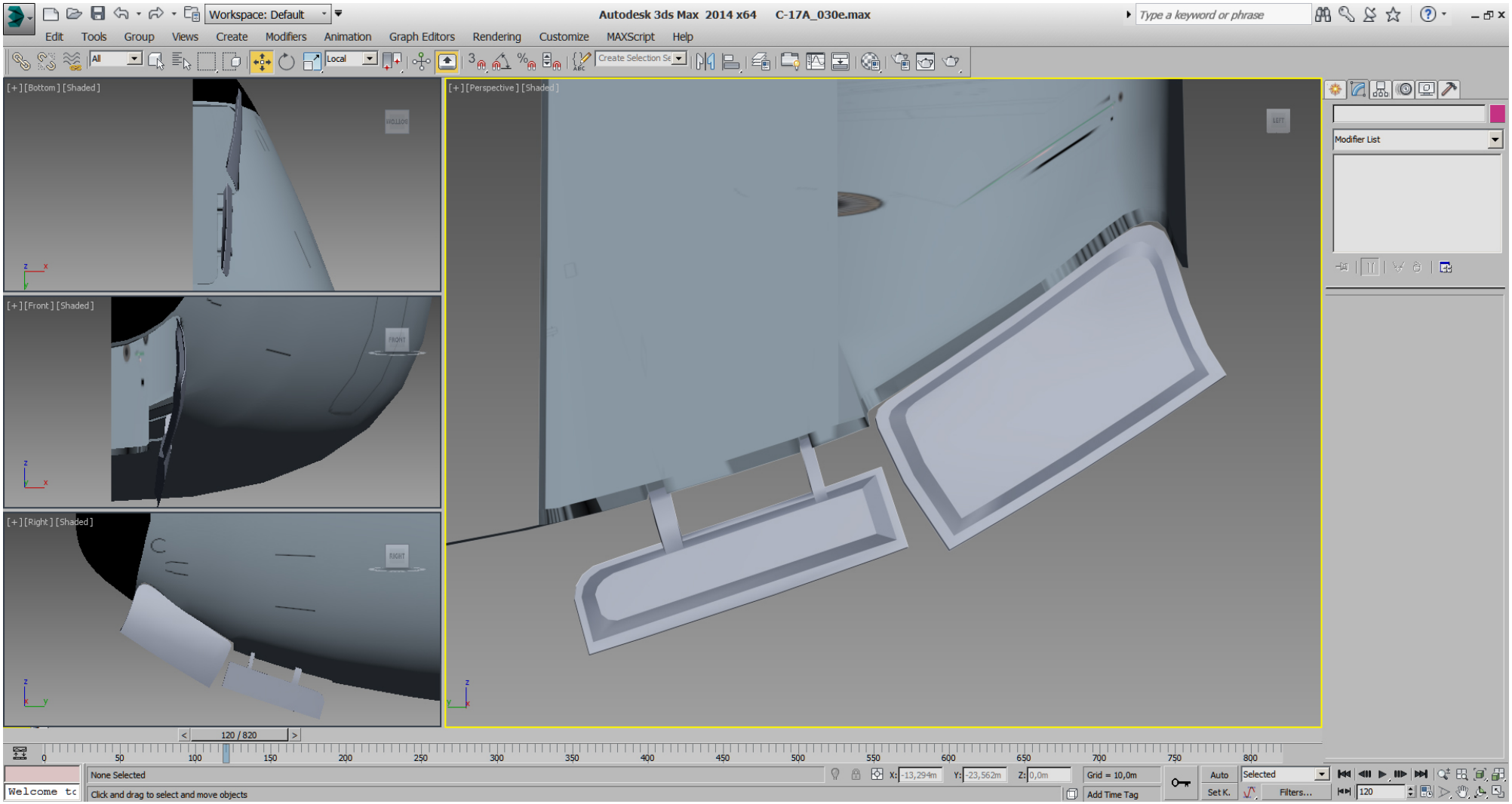


The front door in a raw state.



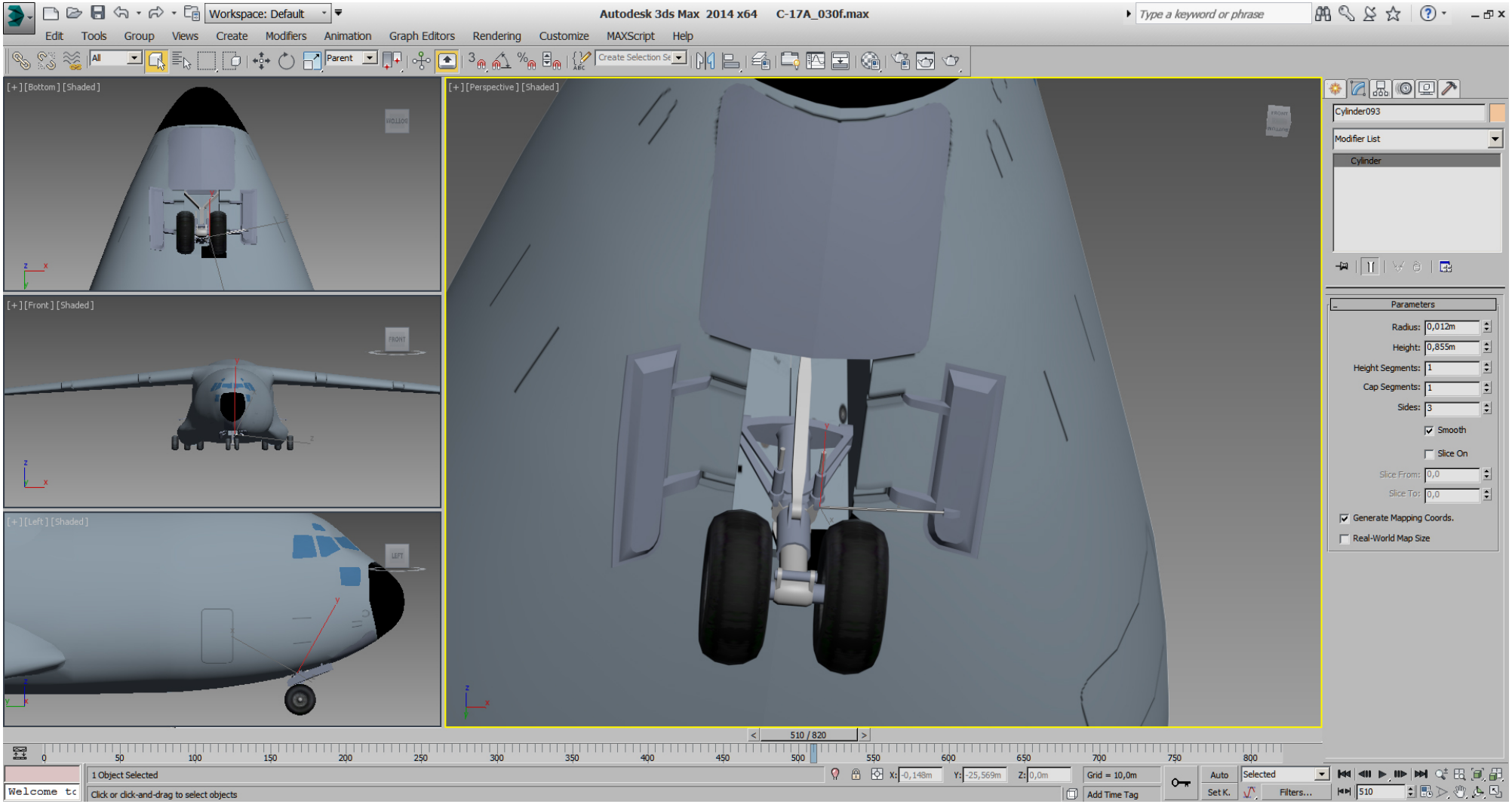
… modeled and animated in 3dsMax so far.




Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_030e.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Bottom][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
120 / 820
None Selected
Click and drag to select and move objects
Add Time Tag
Welcome to

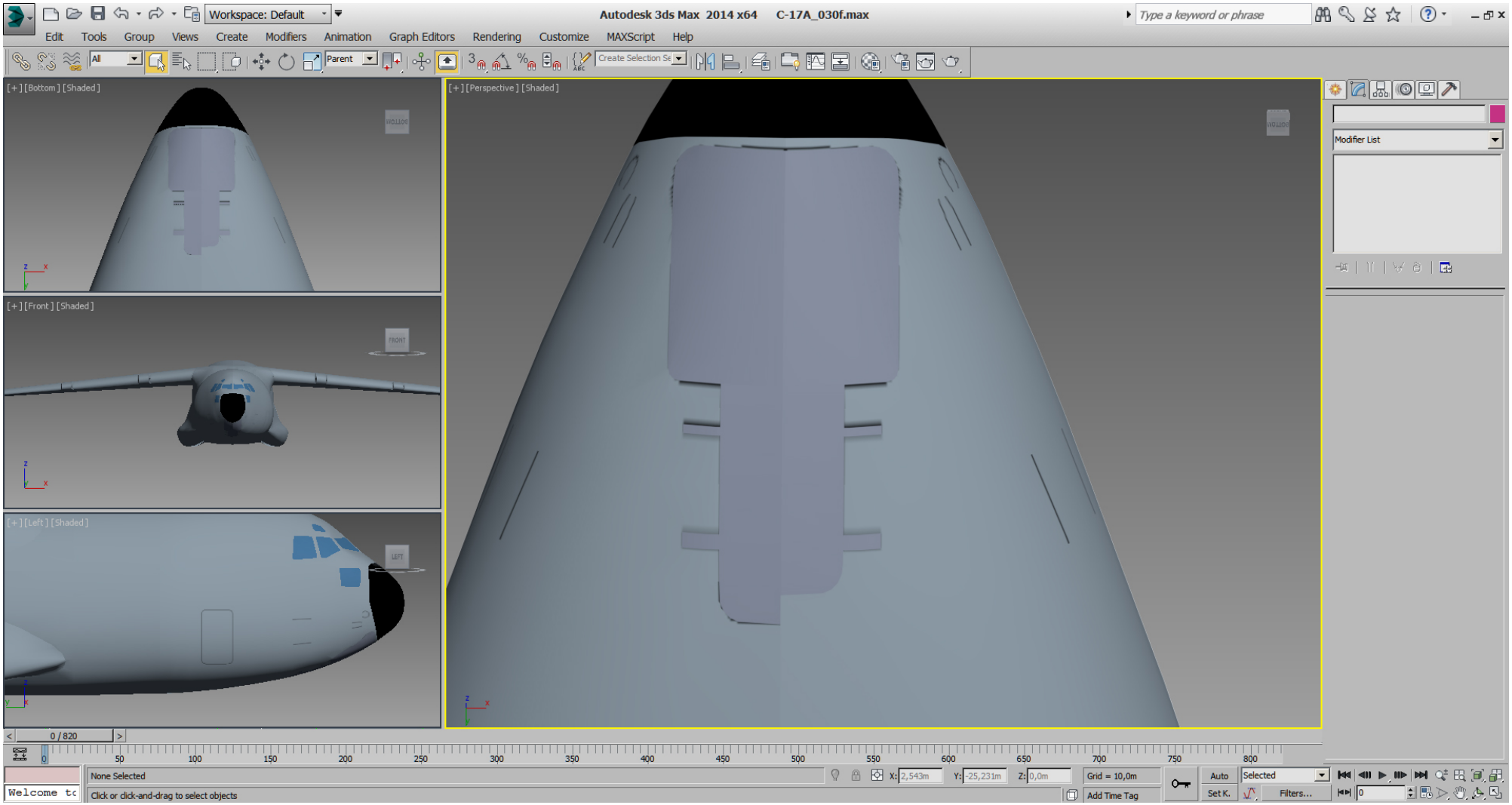
At this point, I've tried to animate the rod (just a 3 sided cylinder which moves the gear doors) roughly in 3dsMax to get them in sync with the FLG extend/retract animation.

Well, the rod for the front door do work fine, but the rod for the back door will need a scale DOF for it's length insim.



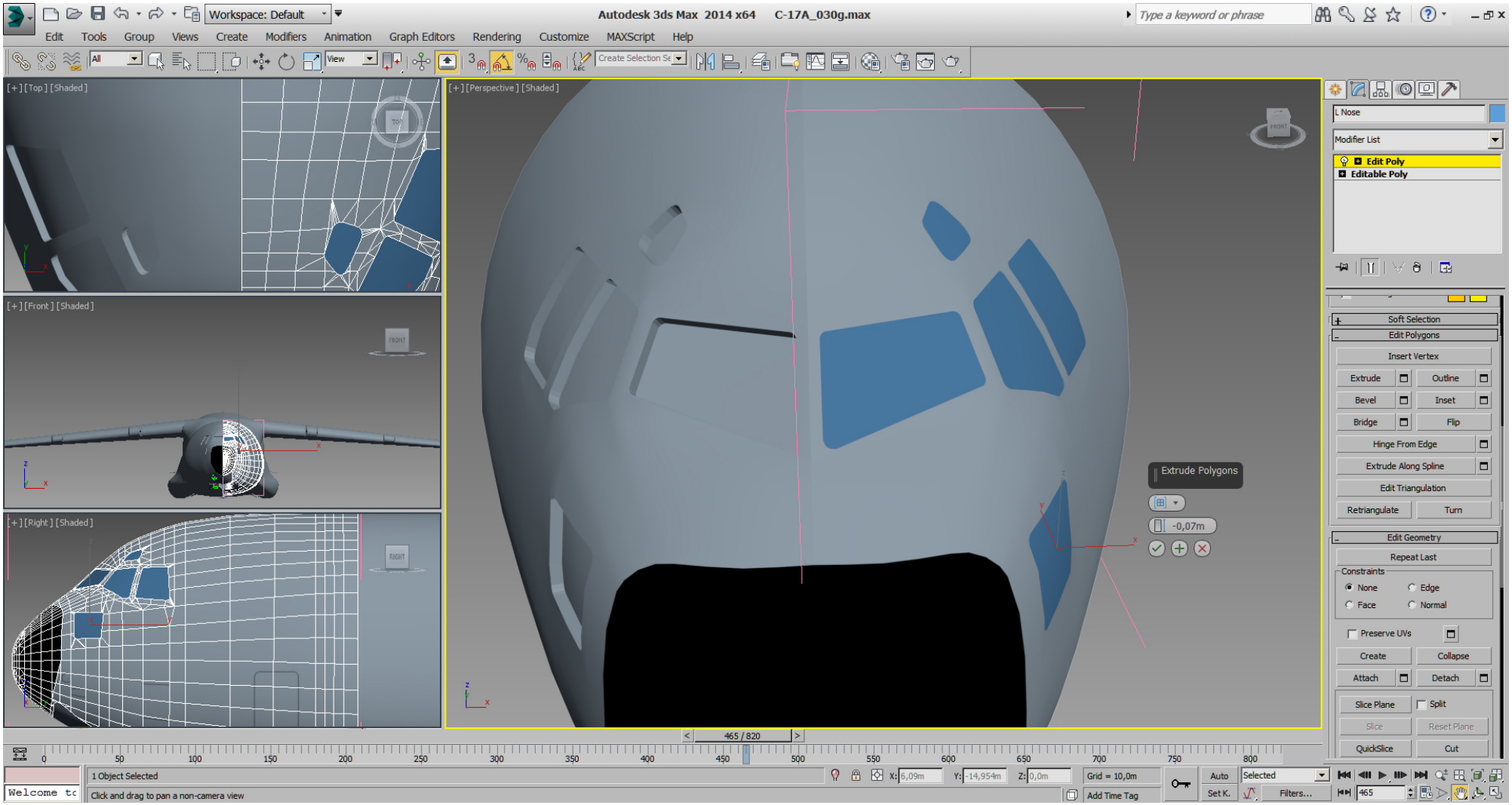
And haarg, ... there I've noticed that the back end of the back door is way to long compared to RL.
And while I was to stupid to see that BEFORE the boolean cut, I'm forced to repair that.

Here you see the difference after the modification, compare left to right gear door length.



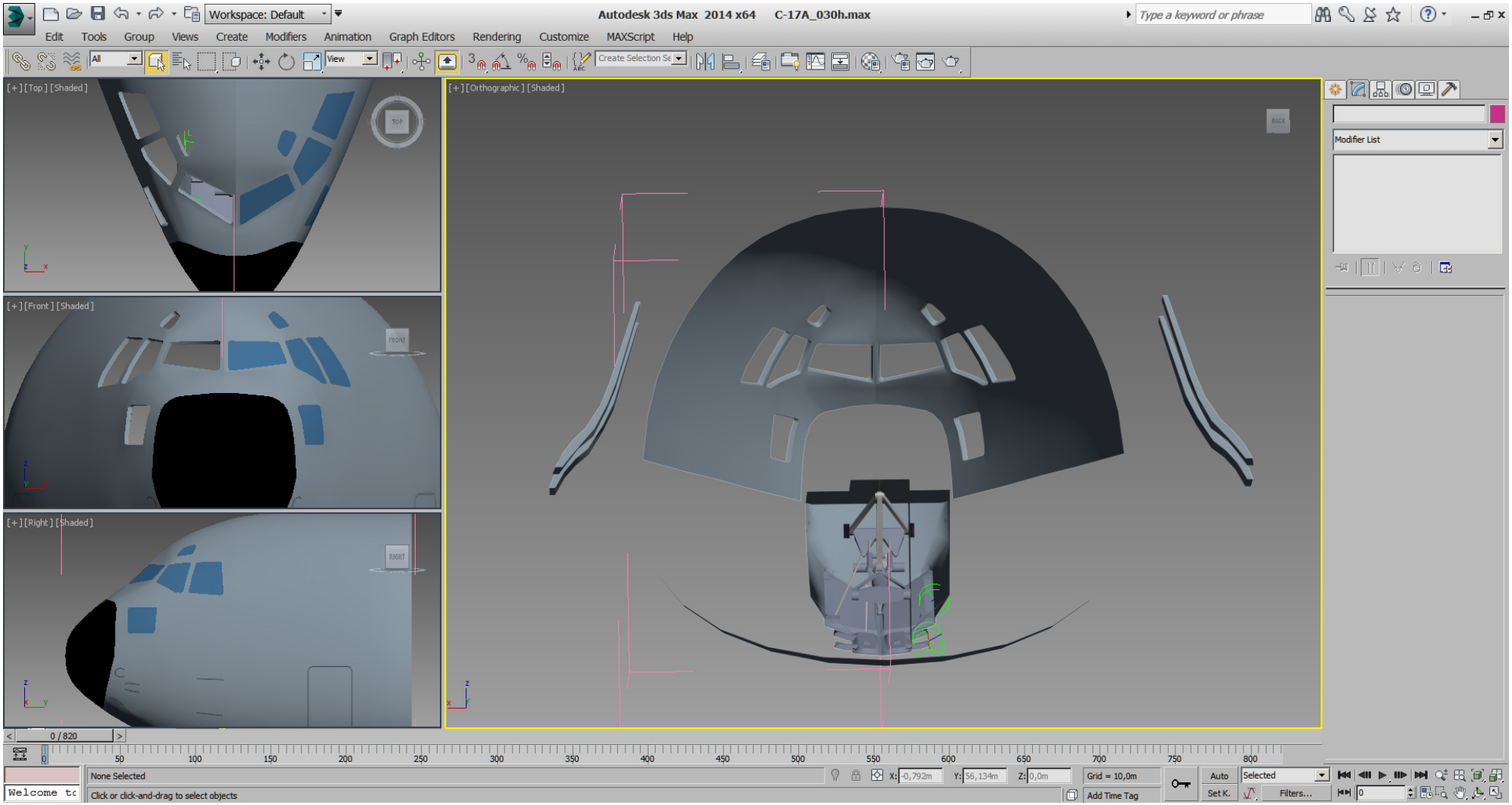
With a copy of the left nose section, I've selected all polys of the blue windows, and detached them to a new object, named "windows"
then have hidden the mirrored instanced copy.

With another copy of the left nose section, I've selected all polys of the blue windows, and changed their Material ID back to 1.
Then those selected polys got extruded into the fuselage to determinate the thickness of the wall.
In this picture we can't see the selected poyls behind the blue windows,
but we see the extruding effect on the mirrored opposite instance.



With another copy of the left nose section, I've selected all polys and extruded them all in, deleted the window polys and cleaned useless polys. With all polys selected and flipped, we got an inside surface.

In the next step, the inner surface got attached to our modified nose section and the vertices got connected by "weld" or "Target weld".

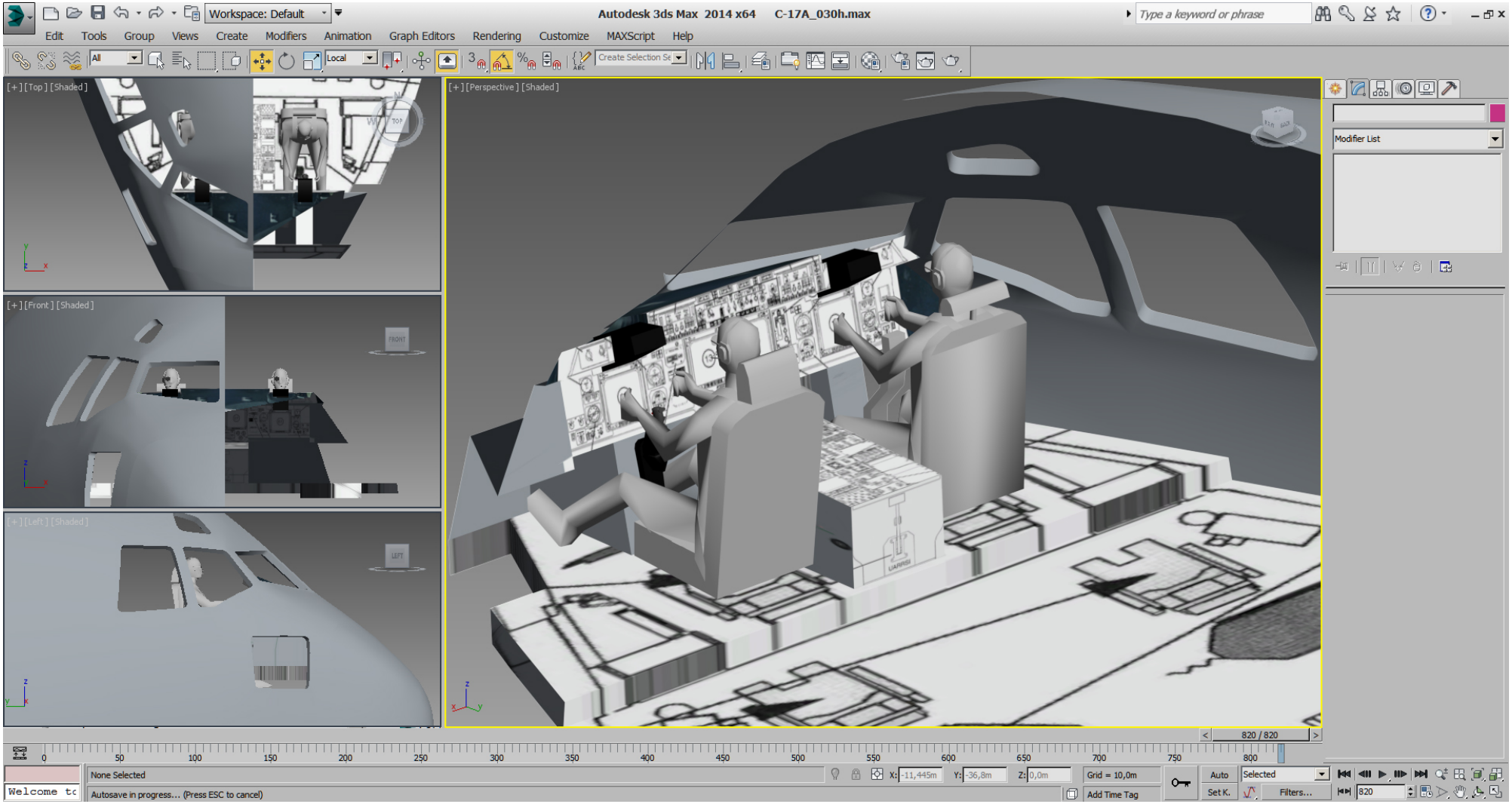


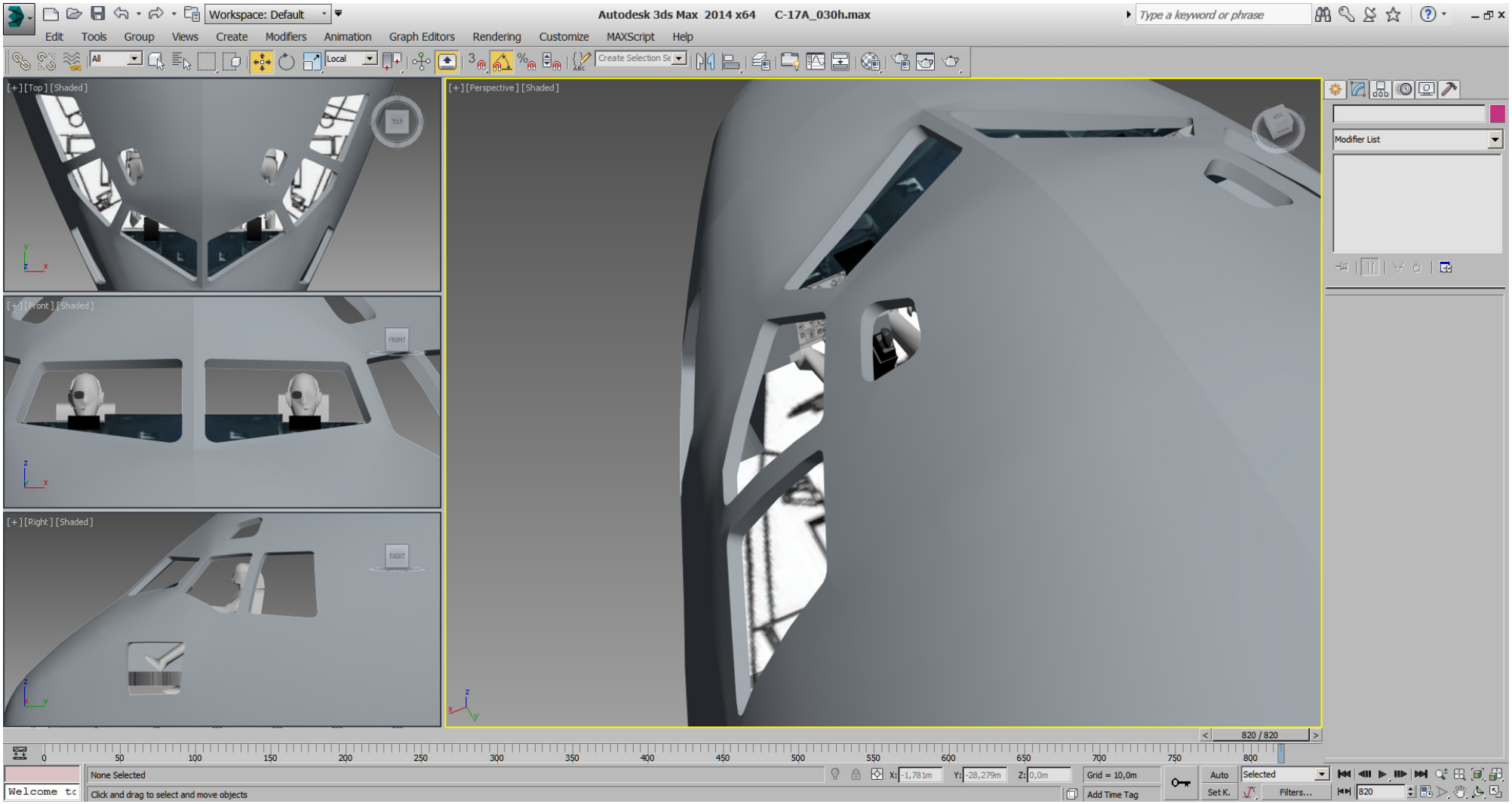
The next picture shows already the cockpit WIP, where the front panel was made basically from a box,
the sides cutted using boolean operation, and textured with a panel scheme for better orientation.

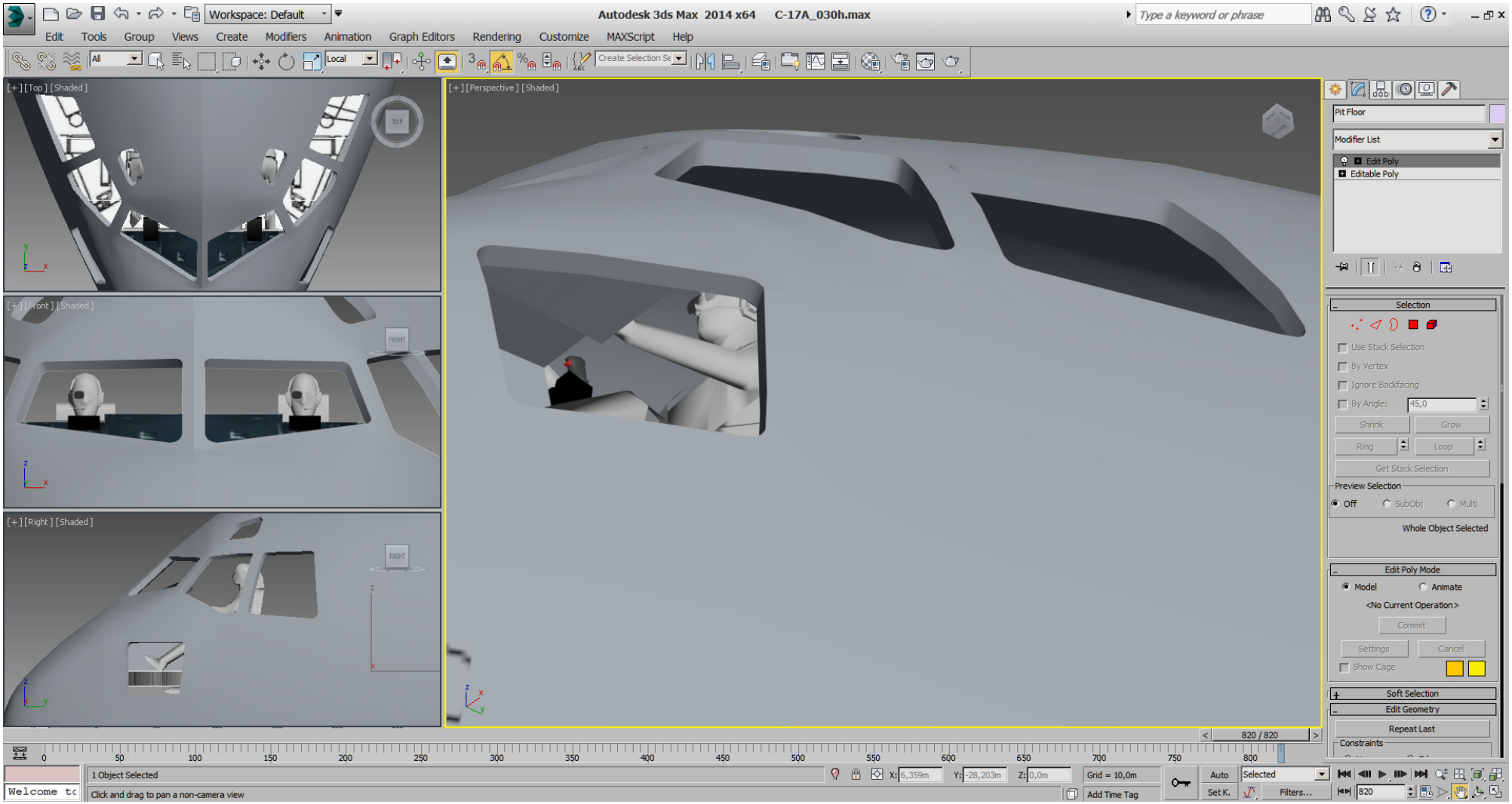
The HUDs are implied.
The pilots and seats are from my former models and placeholders atm..

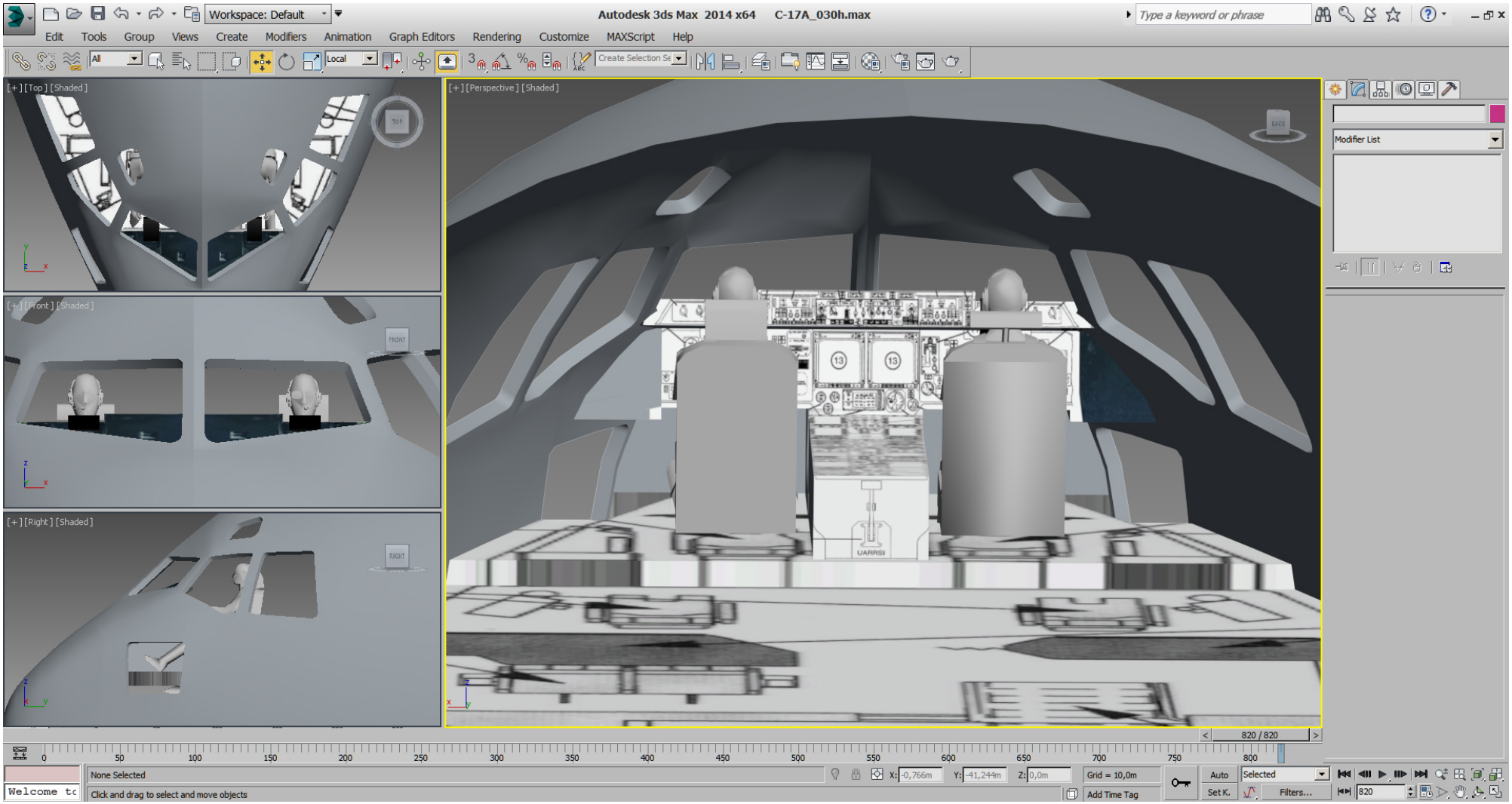
The other objects like headset, stick, etc. are basically made out of standard or extended primitives, then modified with the “Edit Poly” modifier as usual.

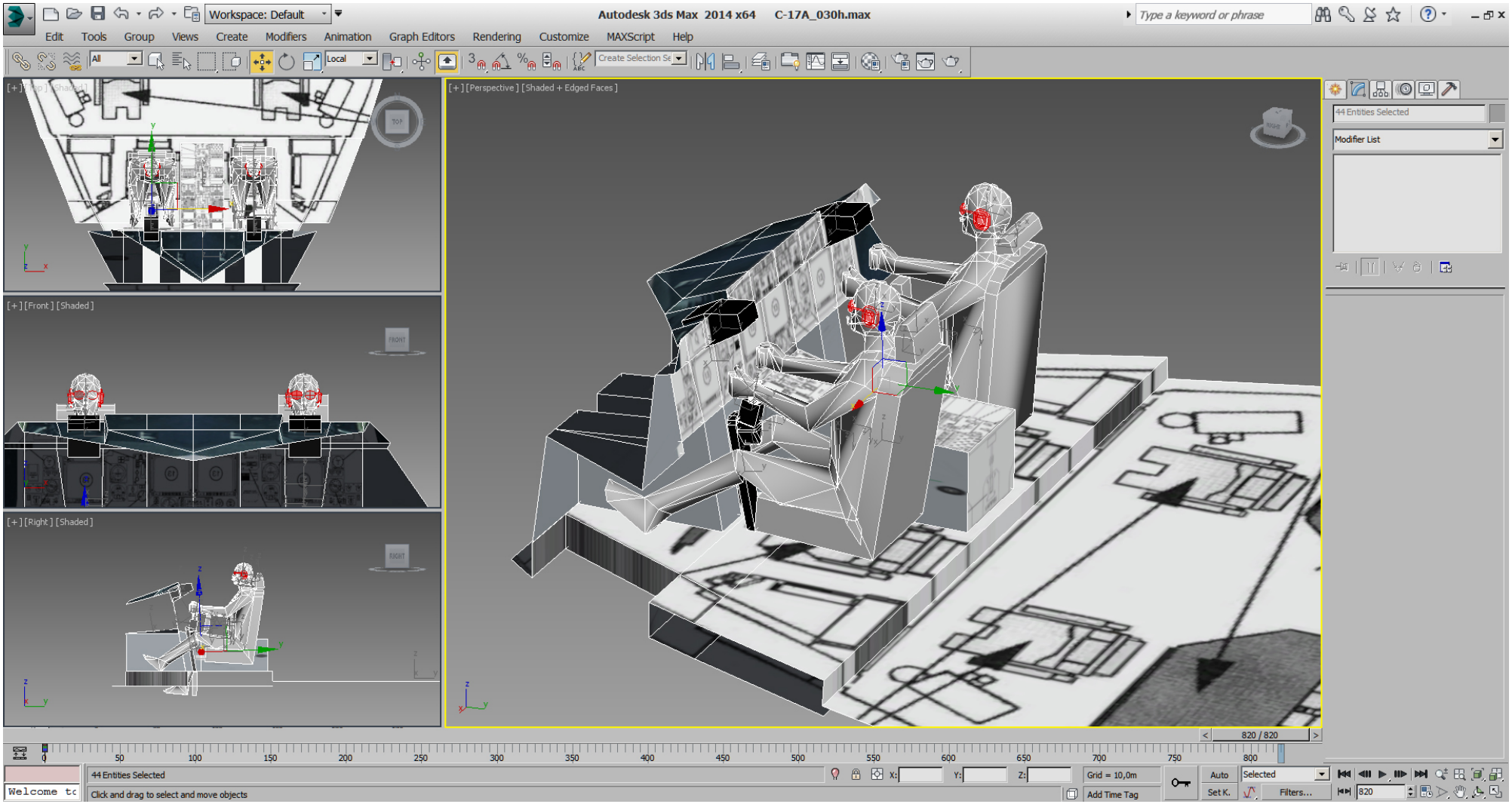
In those pictures only the pilot and seat has been modified as yet, co- pilot and seat is still in old model shape.




Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_030h.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
820 / 820
None Selected
Click and drag to select and move objects
Add Time Tag
Welcome to


Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_030h.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Pit Floor
Modifier List
Edit Poly
Editable Poly
Selection
Use Stack Selection
By Vertex
Ignore Backfacing
By Angle:
Shrink
Grow
Ring
Loop
Get Stack Selection
Preview Selection
Off
SubObj
Multi
Whole Object Selected
Edit Poly Mode
Model
Animate
<No Current Operation>
Commit
Settings
Cancel
Show Cage
Soft Selection
Edit Geometry
Repeat Last
Constraints
820 / 820
1 Object Selected
Click and drag to pan a non-camera view
Add Time Tag
Auto
Set K.
Filters...
Welcome to


Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_030h.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
820 / 820
None Selected
Click and drag to select and move objects
Add Time Tag
Welcome to



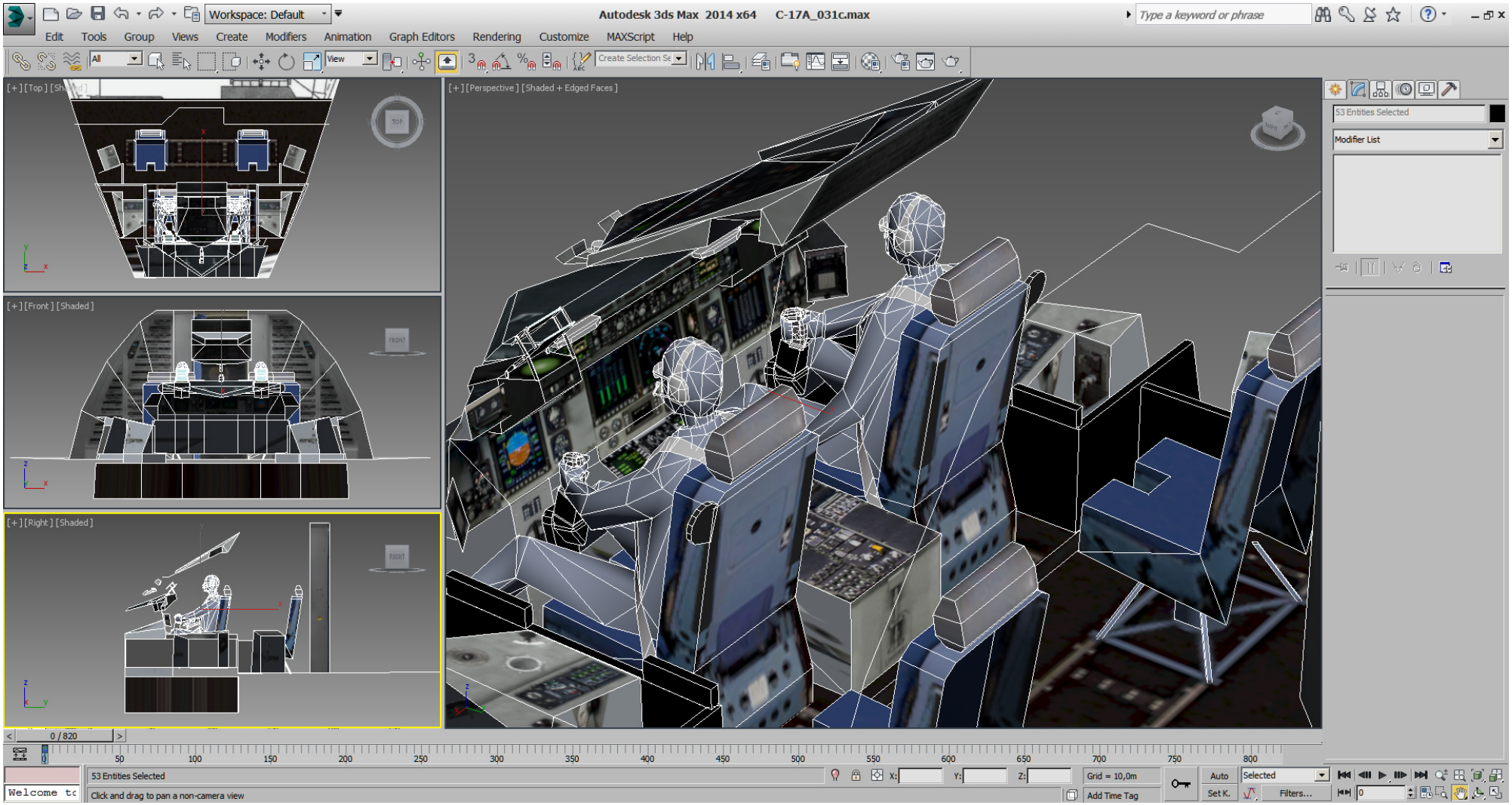
... cockpit WIP

So I've spend some time to view RL pictures and build a fake cockpit.

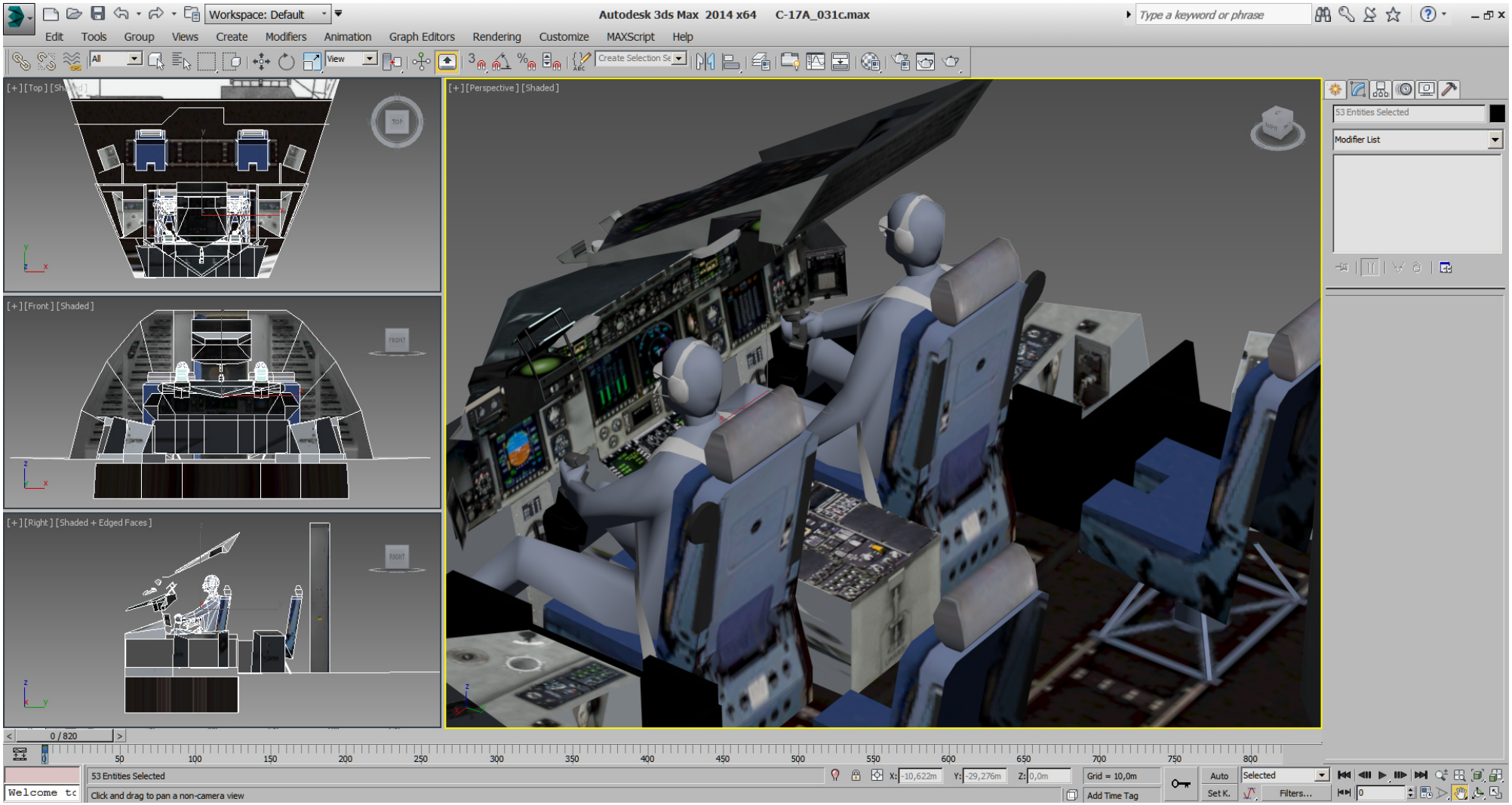
To get things in sync, there is already some texture work done and UVW mapped.
Texture, mapping, and the cockpit itself is not final, but we can see what to expect approximately.

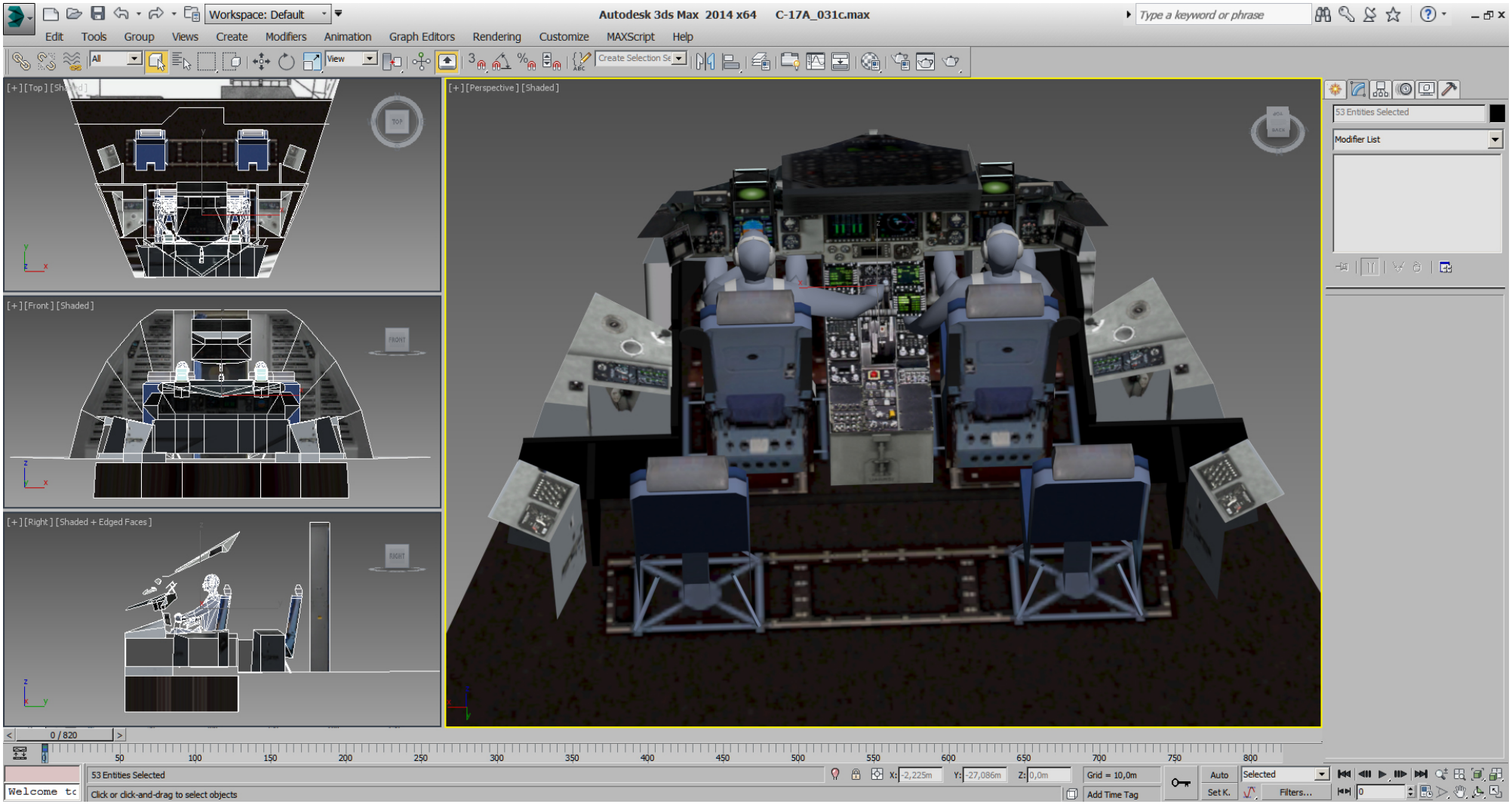
Beside the pilots, everything is made out of standard boxes or cylinders, then using the “Edit Poly” modifier as usual to refine.

All objects selected (could still save some tris):

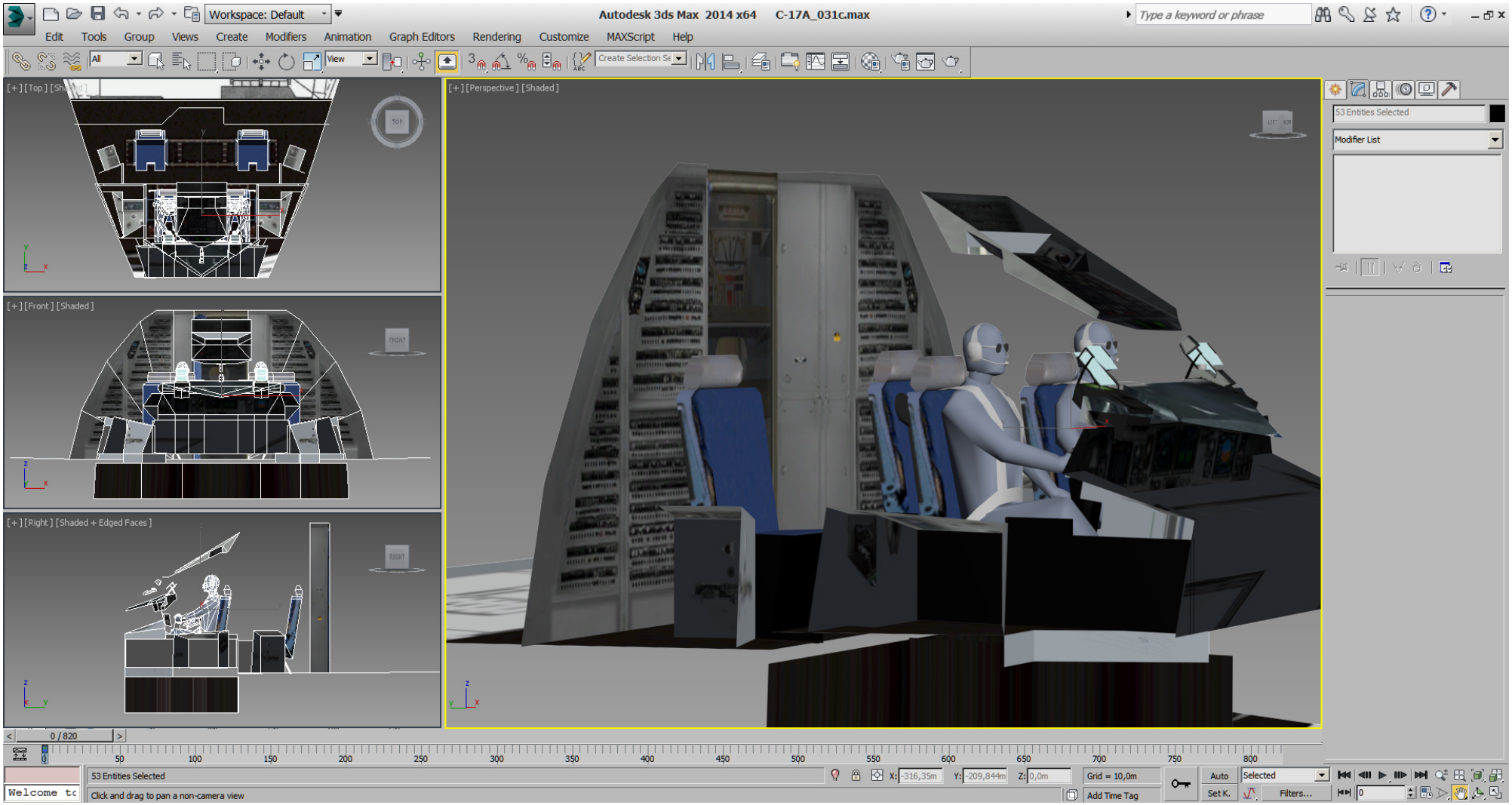


The cockpit is mostly “planar” UVW mapped or "unfold" mapped and textured. (texture WIP)

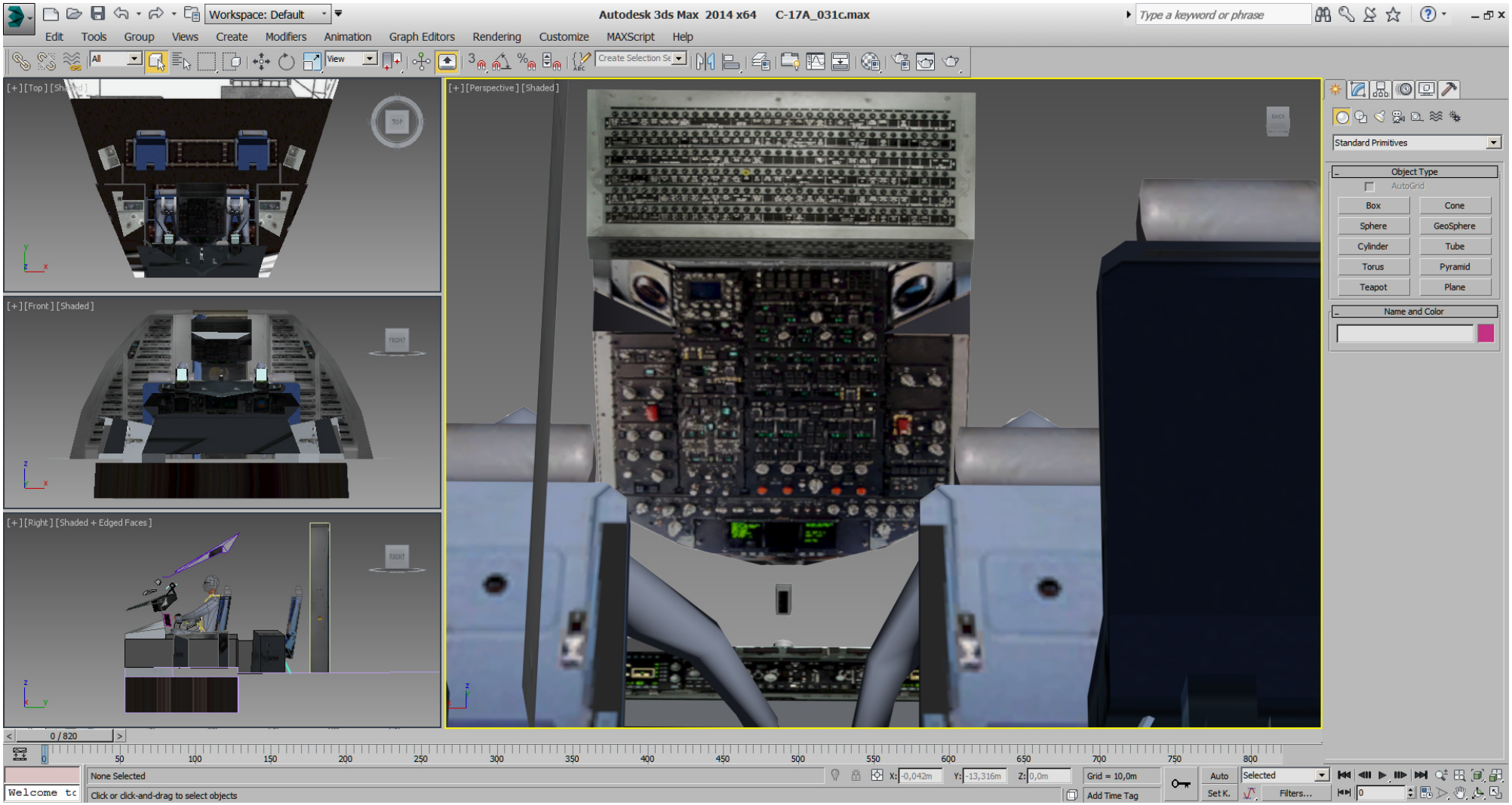



Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_031c.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Right][Shaded + Edged Faces]
[+][Perspective][Shaded]
53 Entities Selected
Modifier List
0 / 820
53 Entities Selected
Click or click-and-drag to select objects
Add Time Tag
Grid = 10,0m
Auto
Set K.
Filters...
Selected

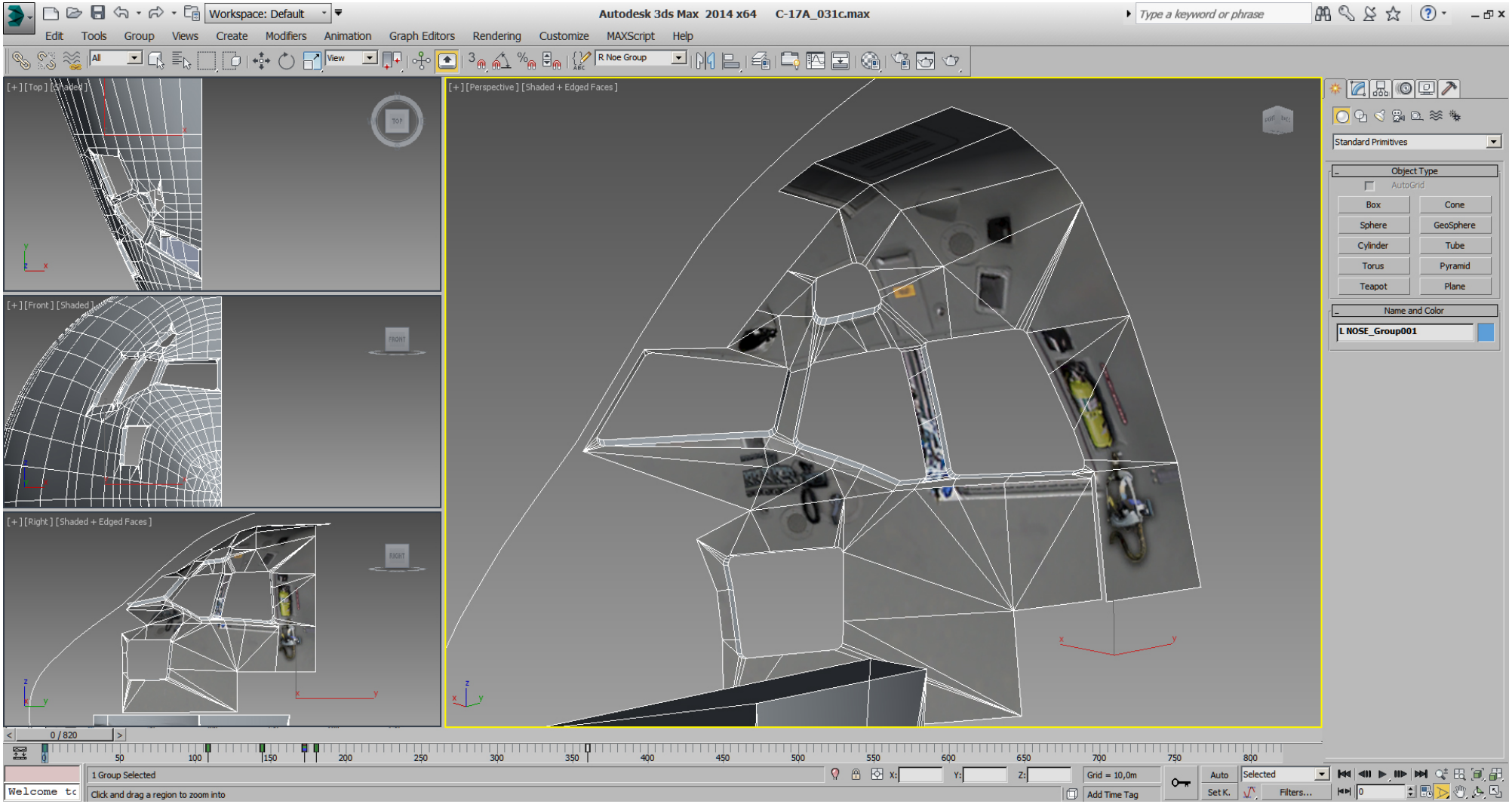
The back wall:



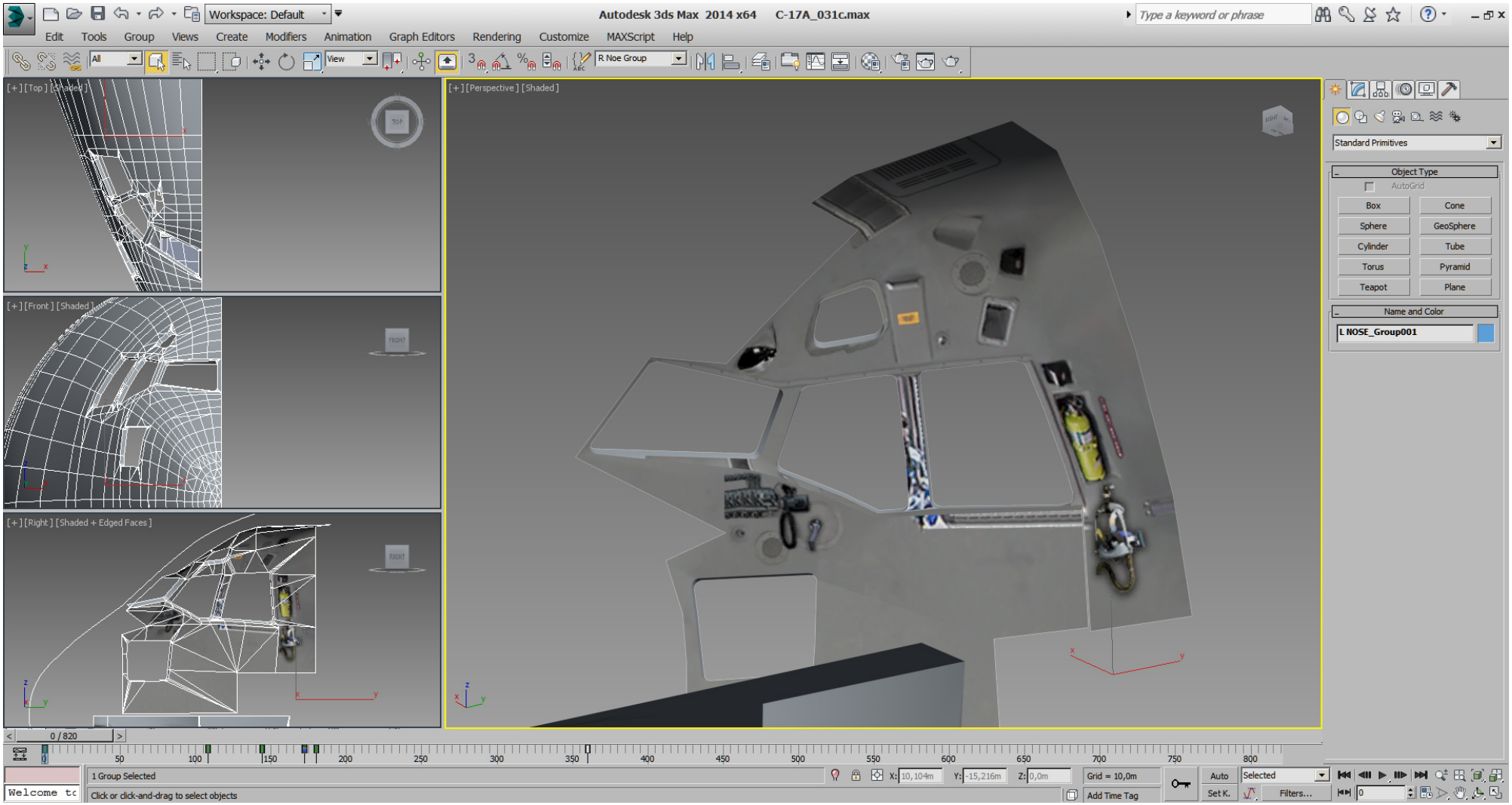
The overhead panel:



Some tri optimizing on the inside, but some more added and not optimized below the side windows, which will be needed for final work later.



See what we can fake on the texture without the need for building 3D geometry.

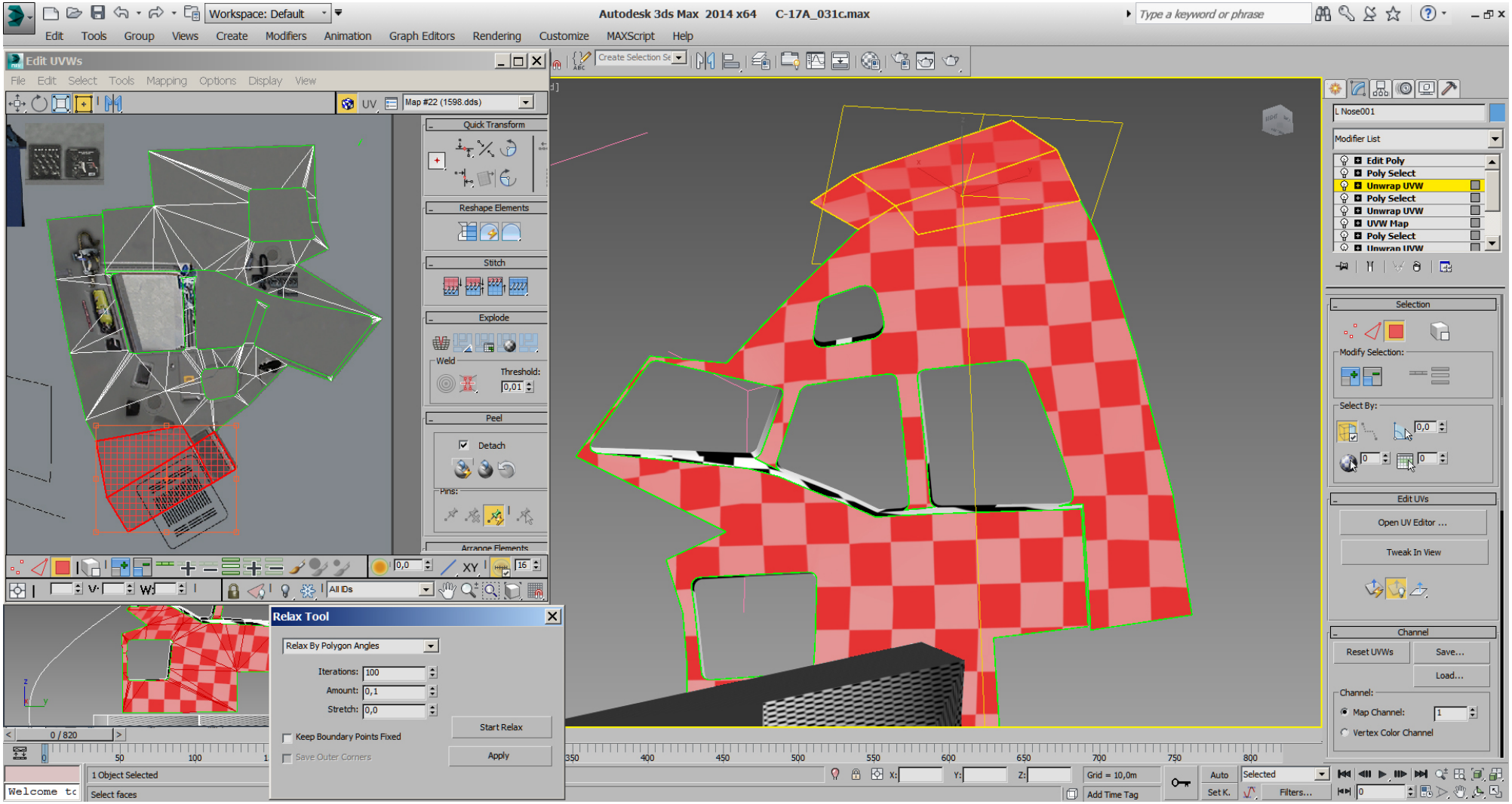


And for those who might ask how this is UVW mapped, ... I've started with putting a checker material on it, then all selected tris got a manually planar mapping.

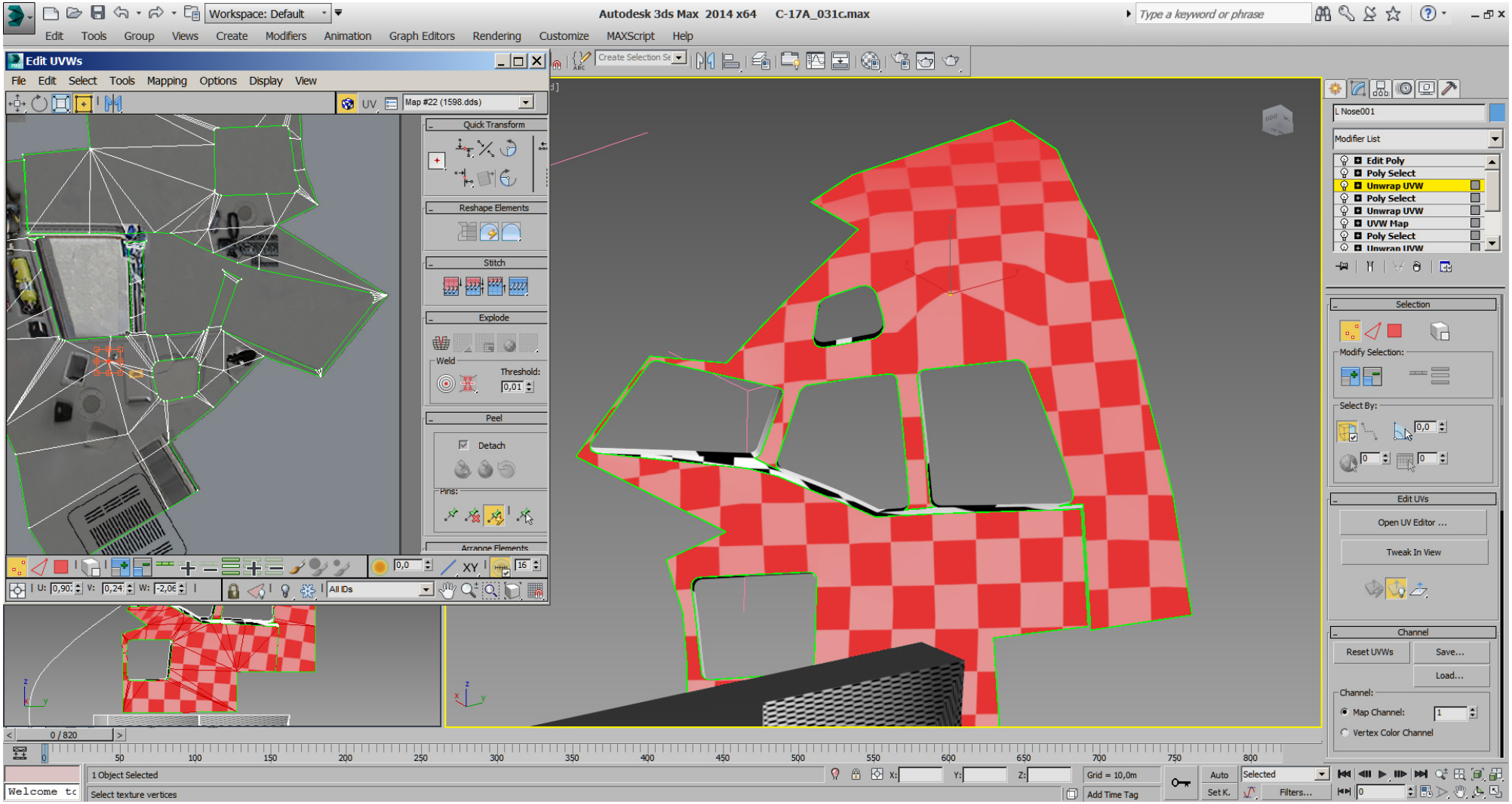
In the next step, I've used "Tools" -> "Relax ..." from the "Edit UVW's" window with the parameters shown.

HINT: don't await perfect results if you select all tris and let the relax function run.
Better start with one outer poly, relax it.

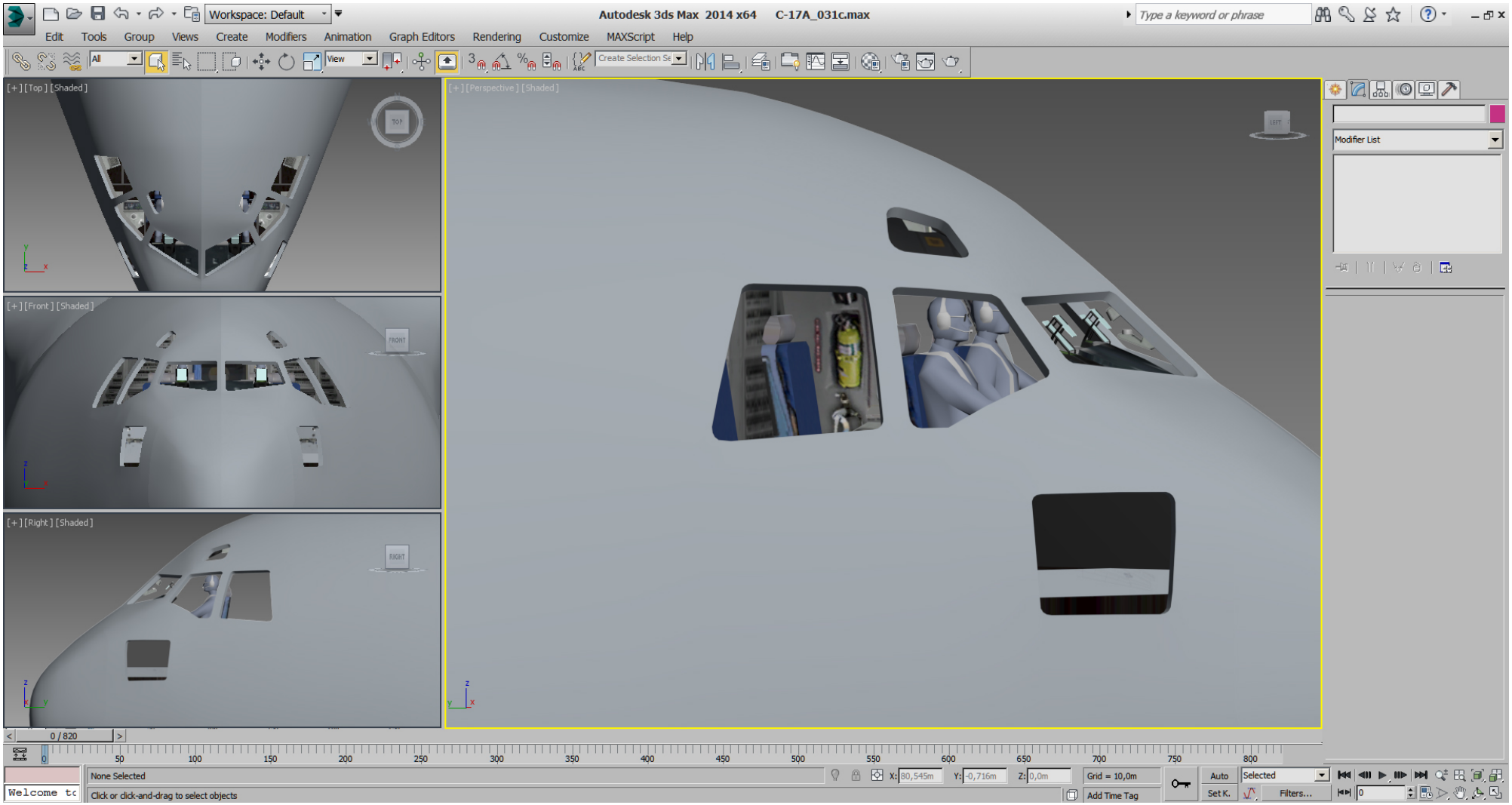
If needed, rotate, mirror or move it away from the bunch of other polys,
then add a nearby poly to the selection and relax both, ... and so on.

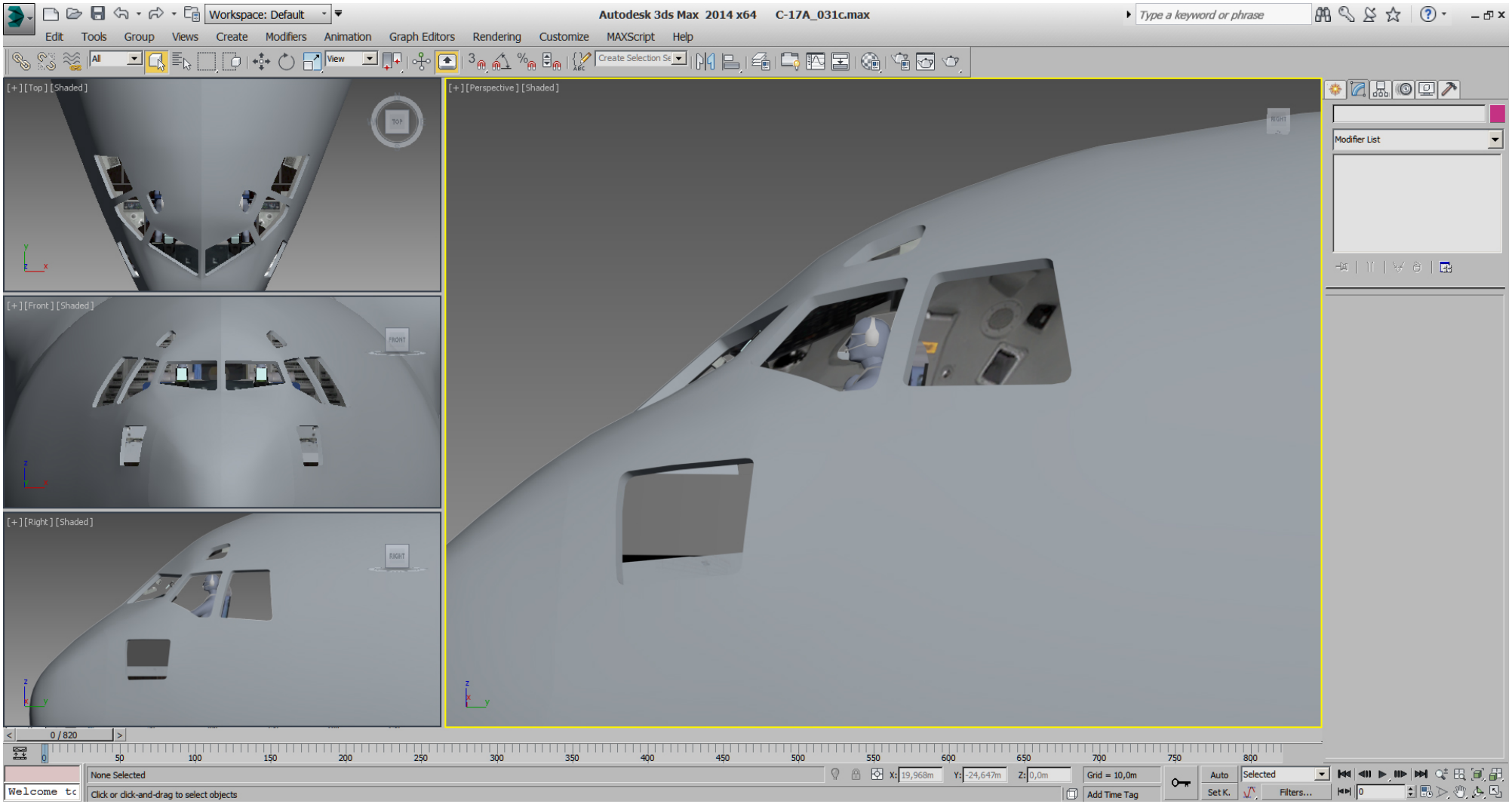


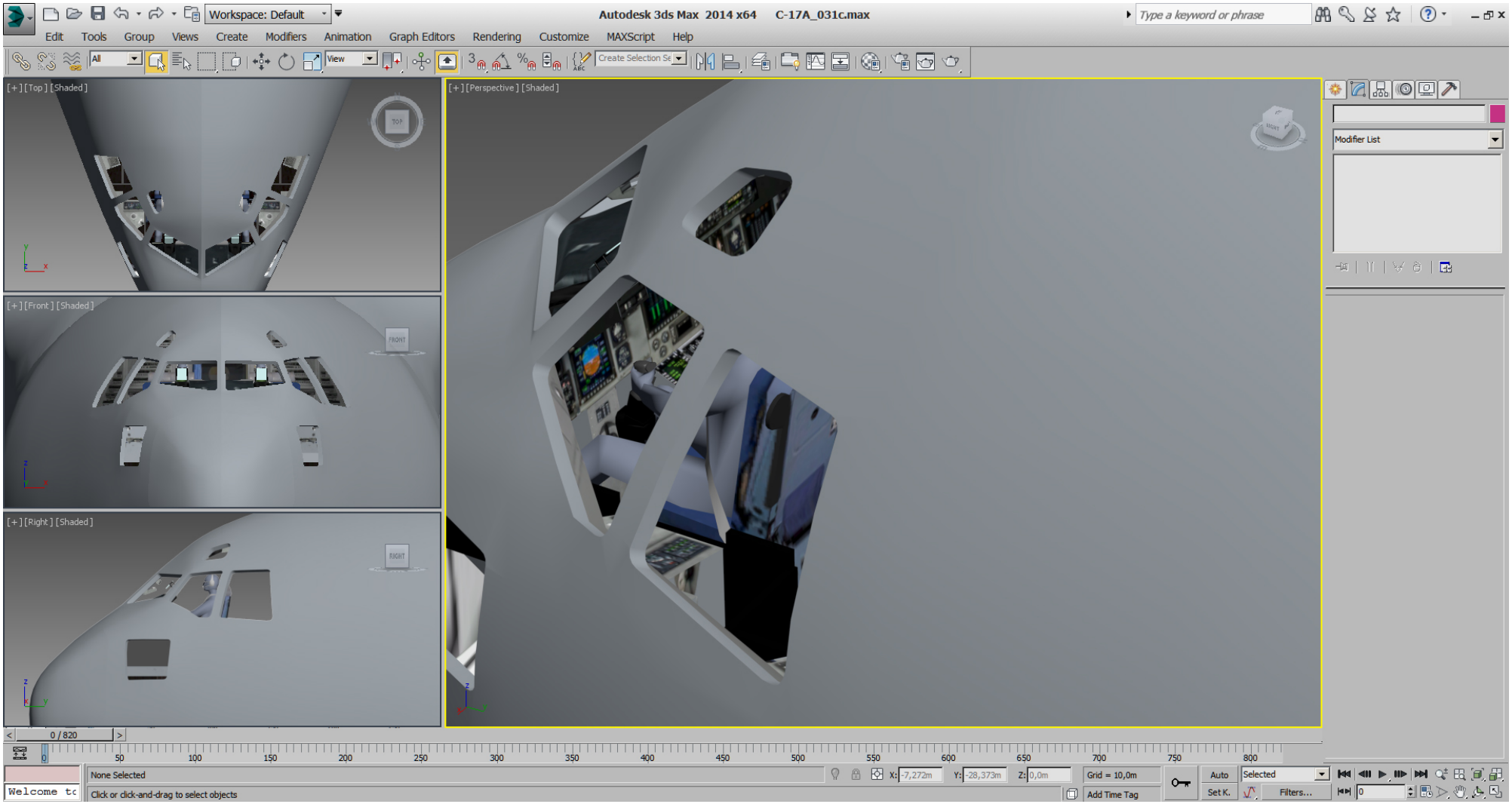
Fine tuning can be done manually in vertex sub mode. See here where I moved a UVW vertex out of position and get the bad result in viewport for showcase purpose.

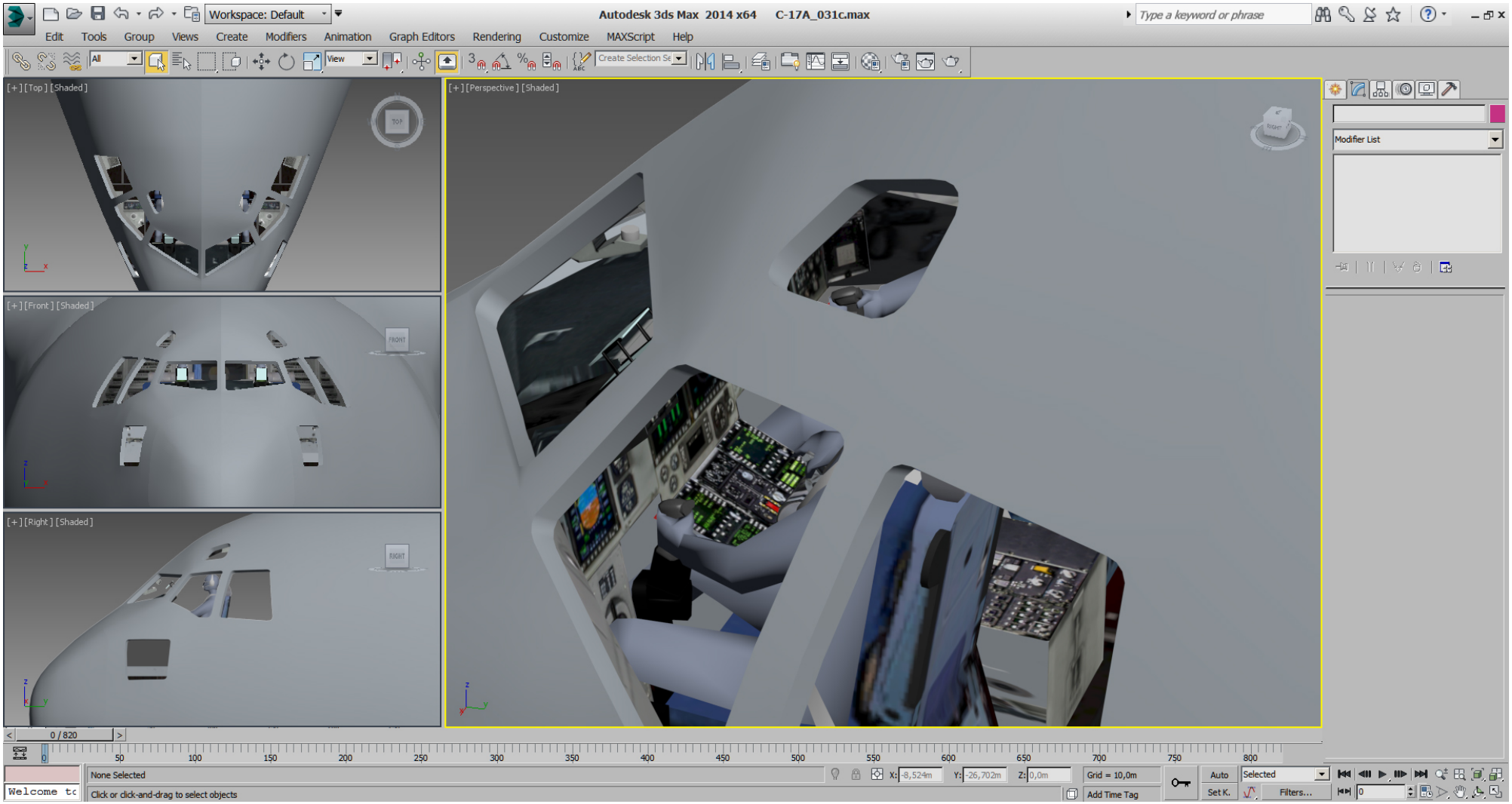


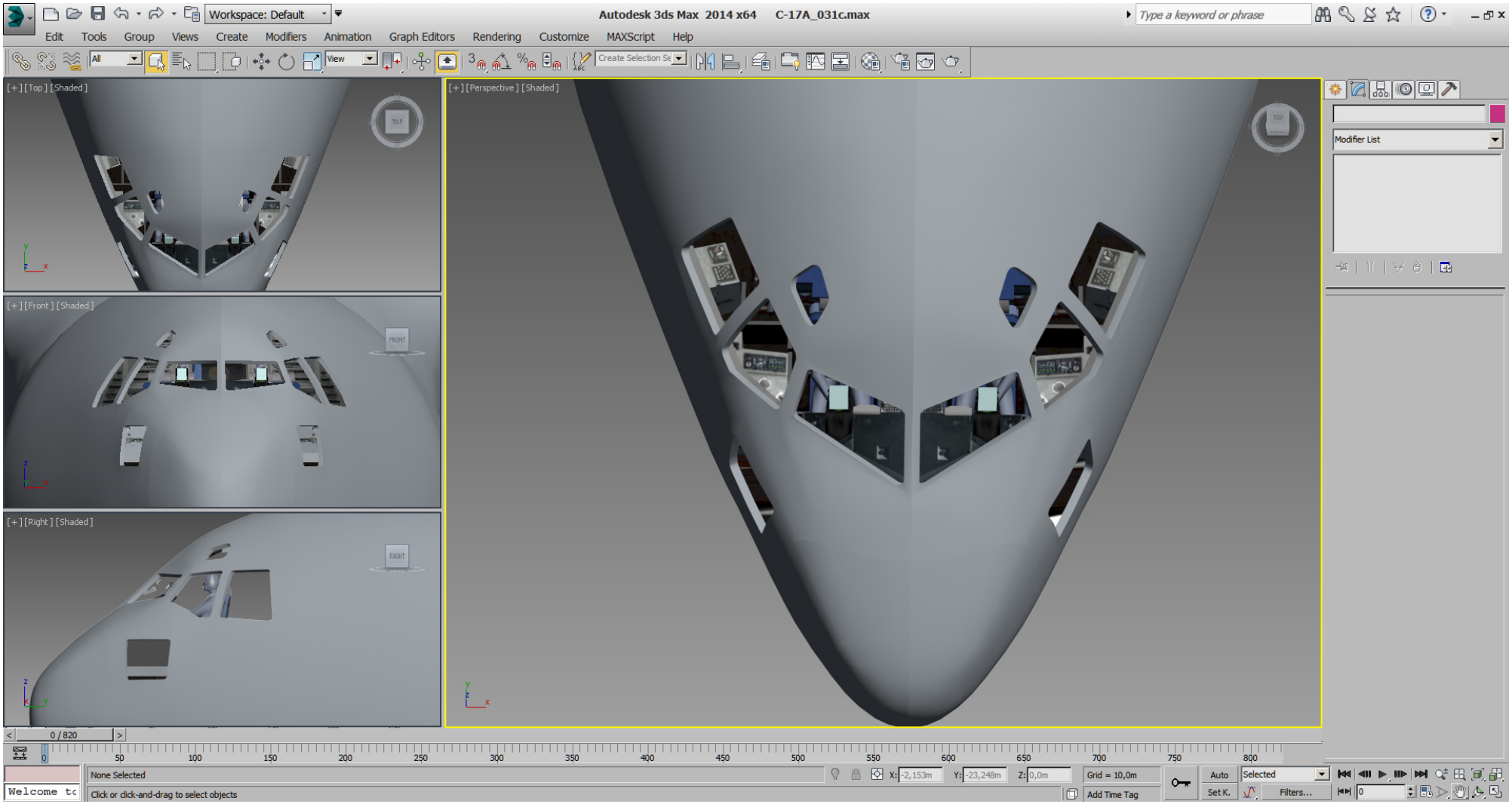
Looking into the cockpit from differently angles:




Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_031c.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
0 / 820
None Selected
Click or click-and-drag to select objects
Add Time Tag
Auto
Set K.
Selected
Filters...

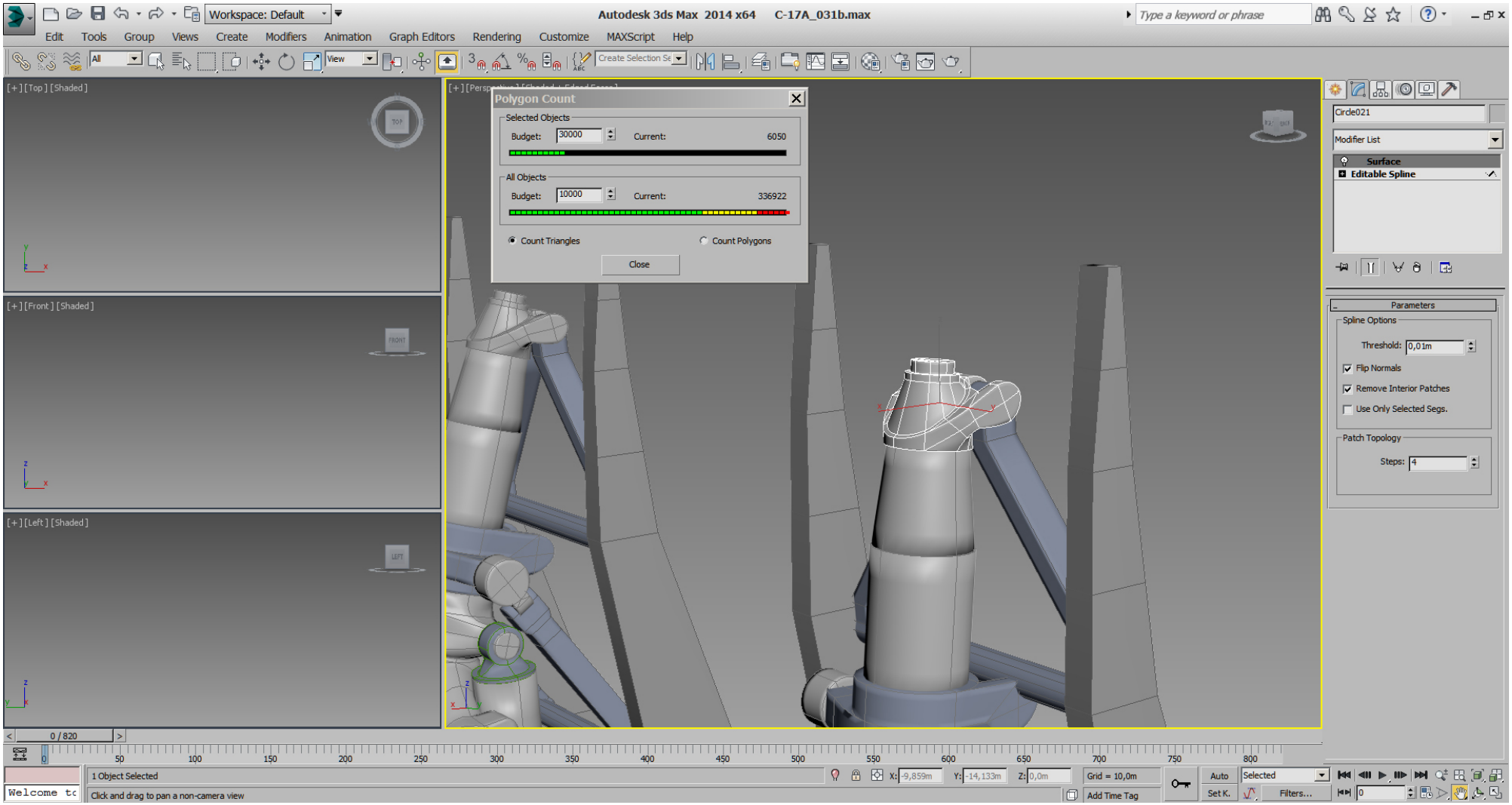

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_031c.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
0 / 820
None Selected
Click or click-and-drag to select objects
Add Time Tag
Auto
Set K.
Selected
Filters...
Welcome to


Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_031c.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
0 / 820
None Selected
Click or click-and-drag to select objects
Add Time Tag
Auto
Set K.
Filters...
Selected
Welcome to

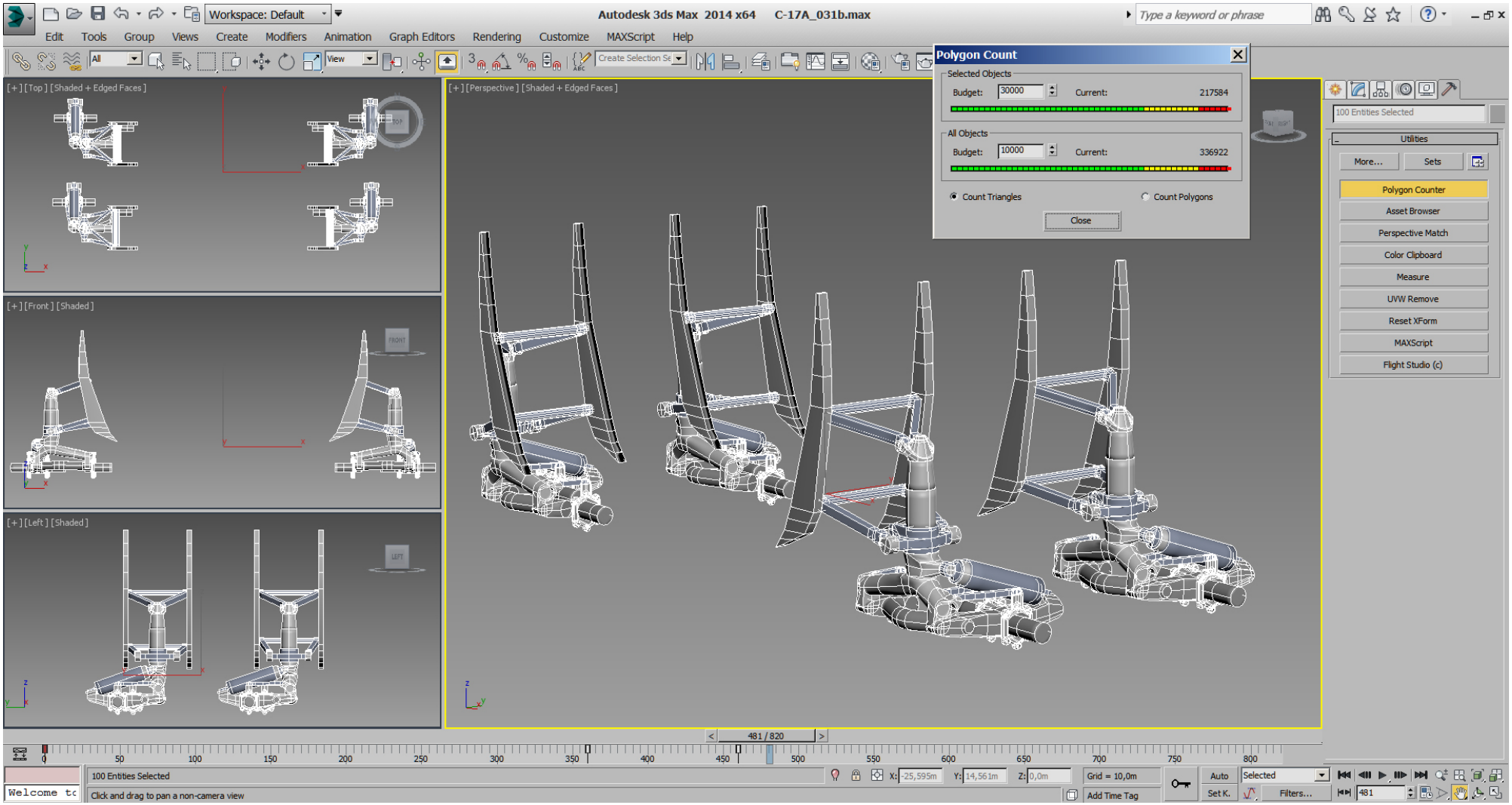


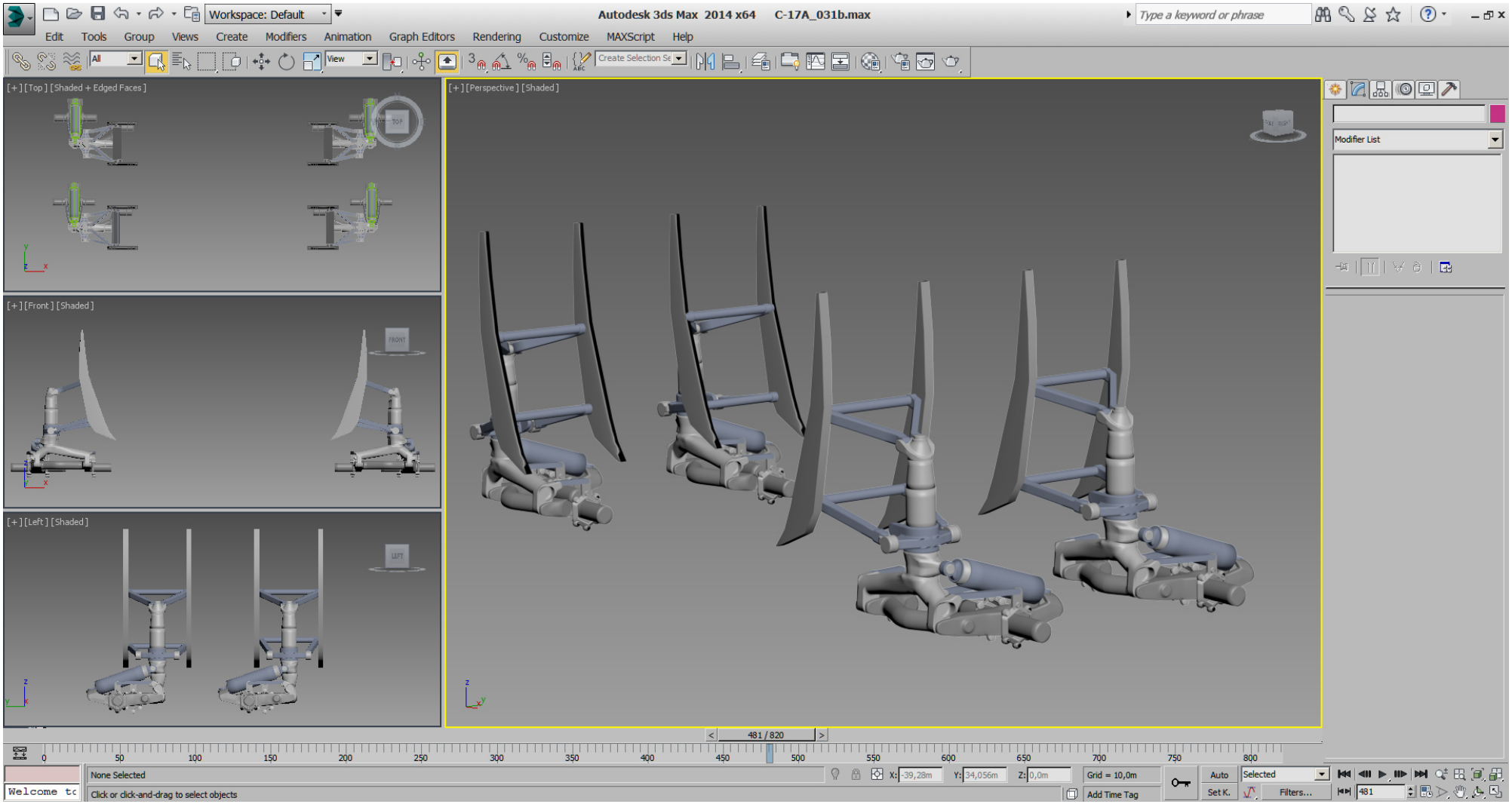
So we have a basic cockpit modelled which gets more love and finalizing later.

Let's have a look at the MLG which is still very high poly, because we have not pre- optimized the “Edit Spline” state as yet.

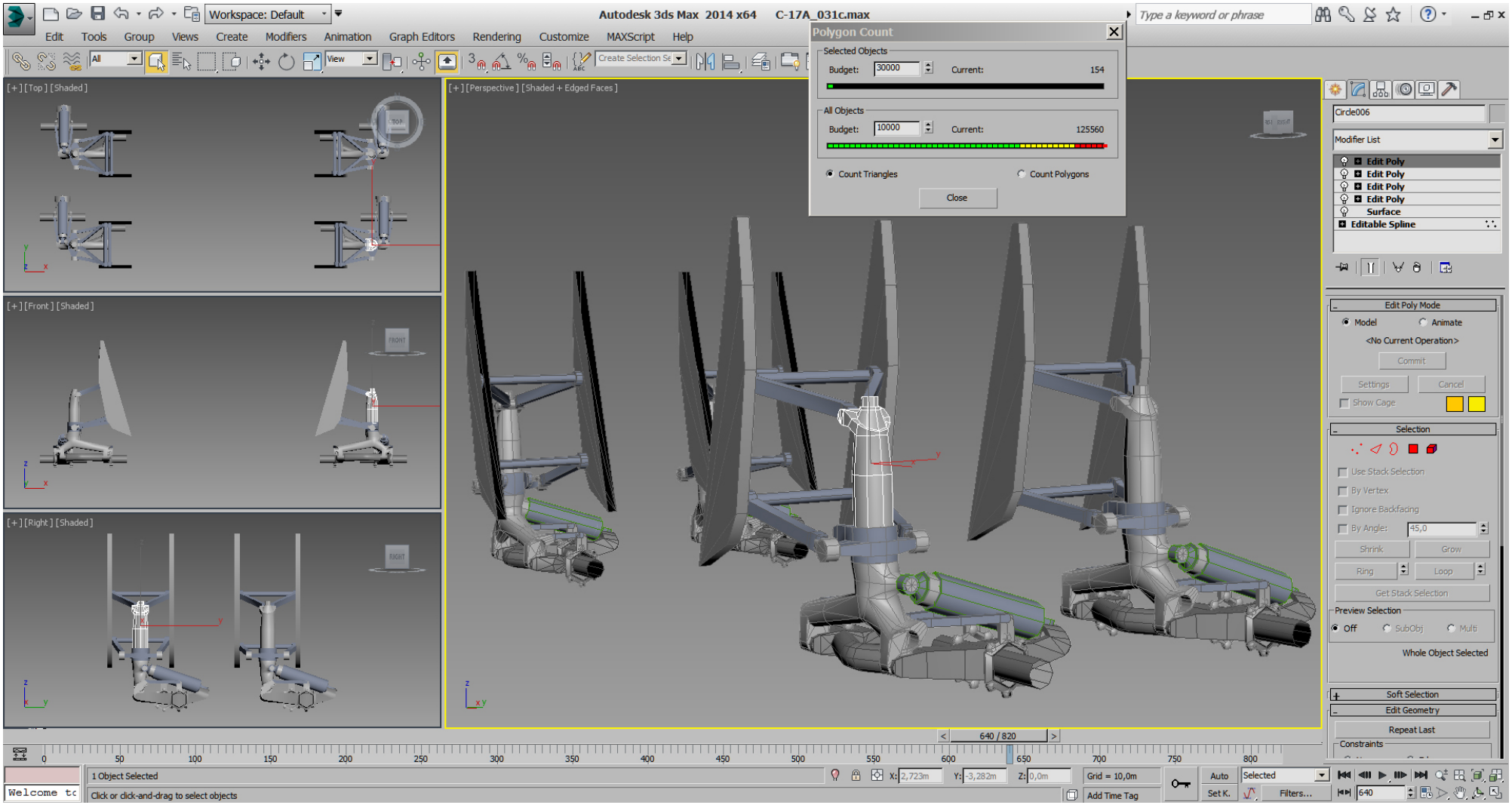


The whole 4 MLGs are more than 200000 tris atm.

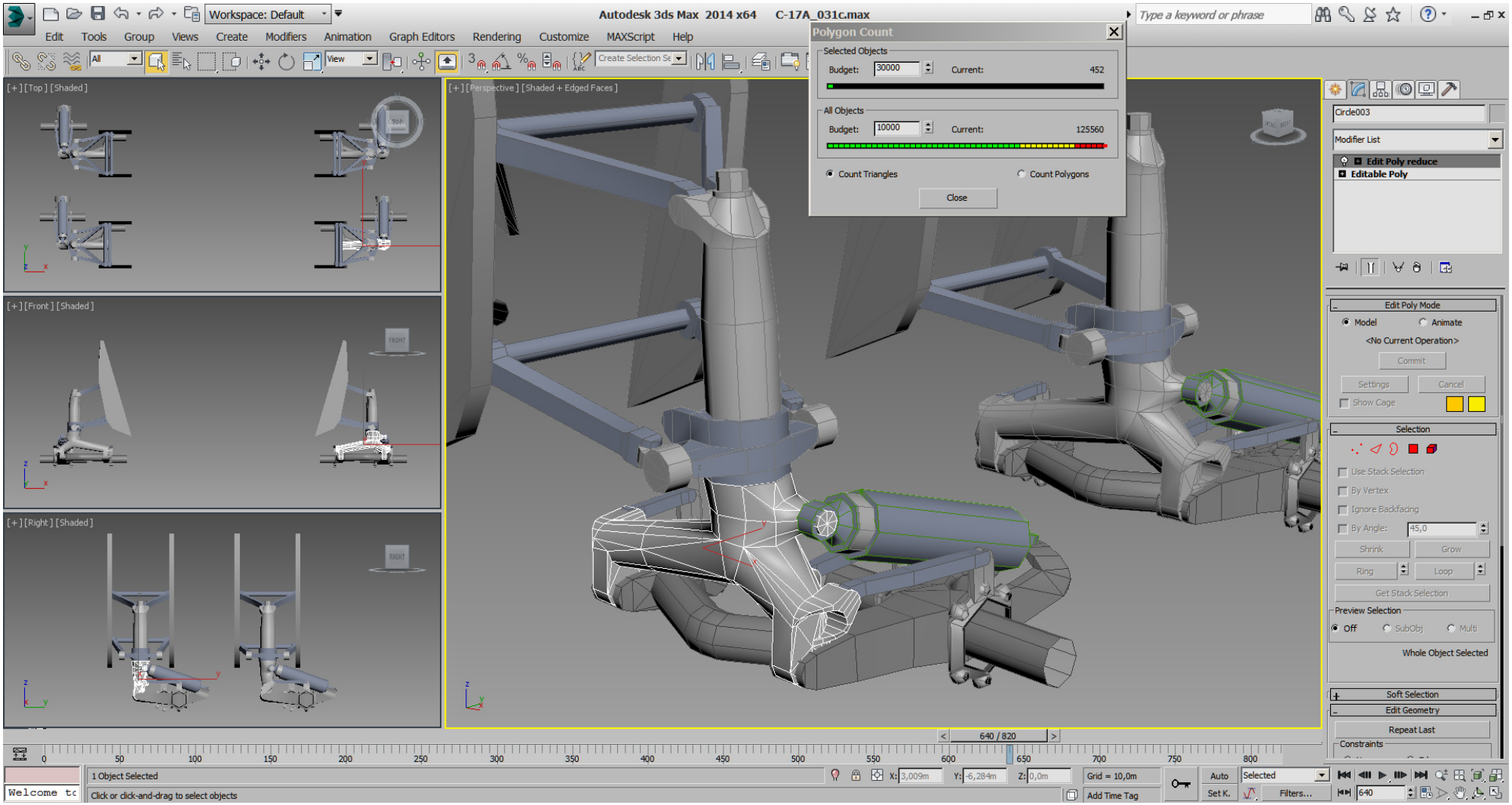



Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_031b.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded + Edged Faces]
[+][Front][Shaded]
[+][Left][Shaded]
[+][Perspective][Shaded]
Modifier List
481 / 820
None Selected
Click or click-and-drag to select objects
Add Time Tag
Auto
Set K.
Filters...
Selected
Welcome to

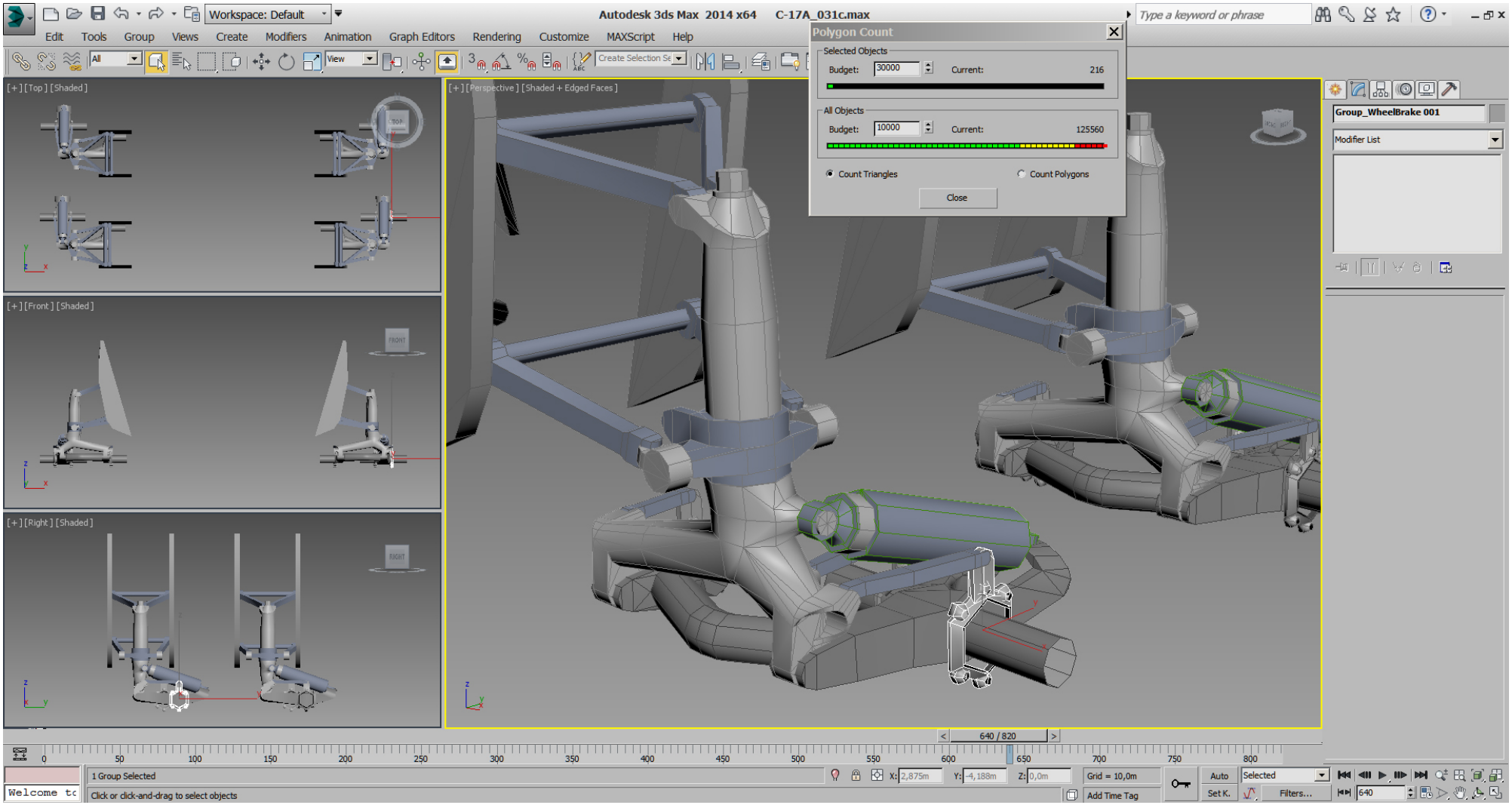
After some optimizing, using the “Edit Poly” modifier, the former two top parts are one part now.



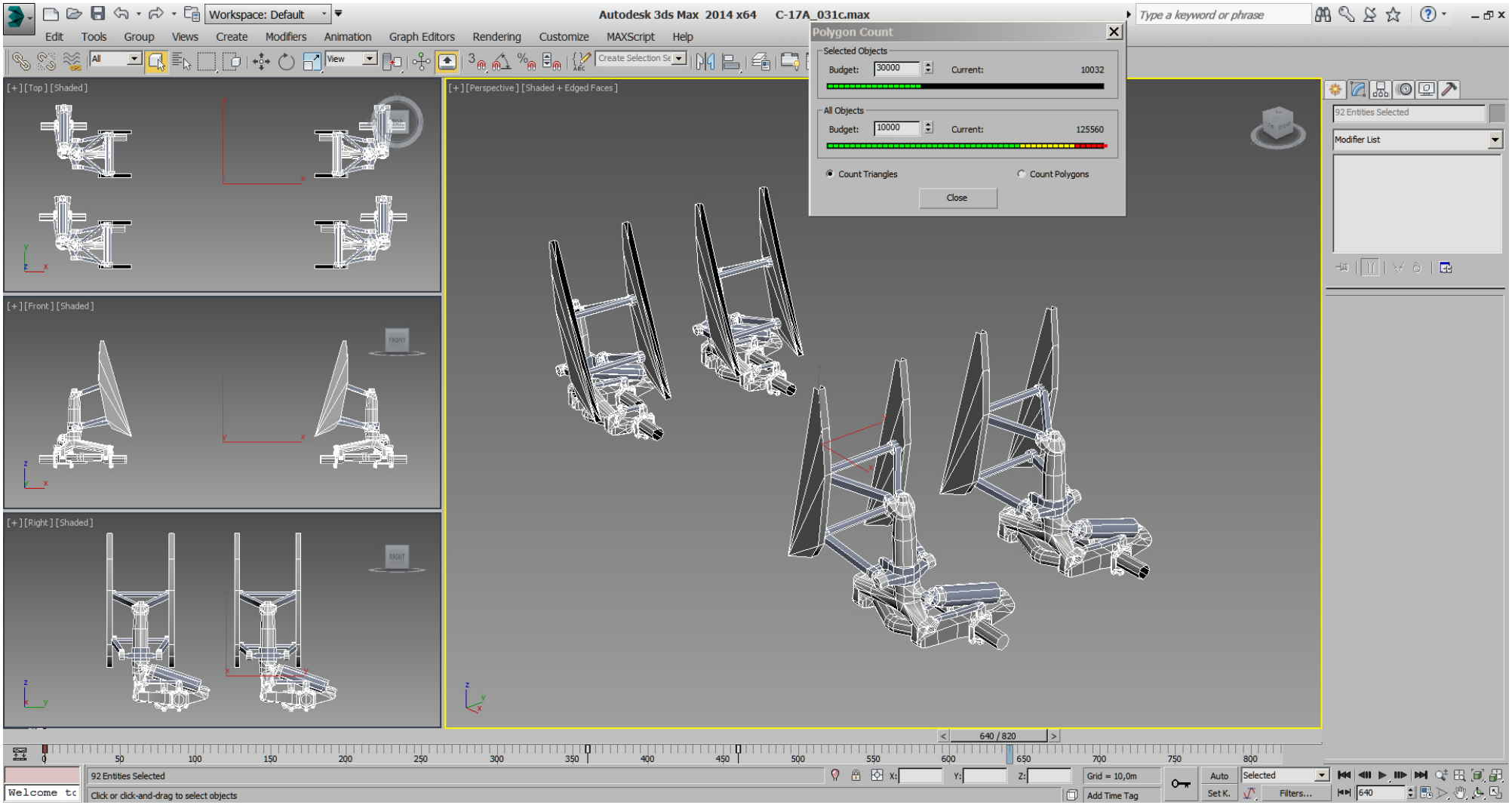
This part could get still optimized more, but we might keep the “ears” and the “nose” for the extension strut for LODa (advanced).

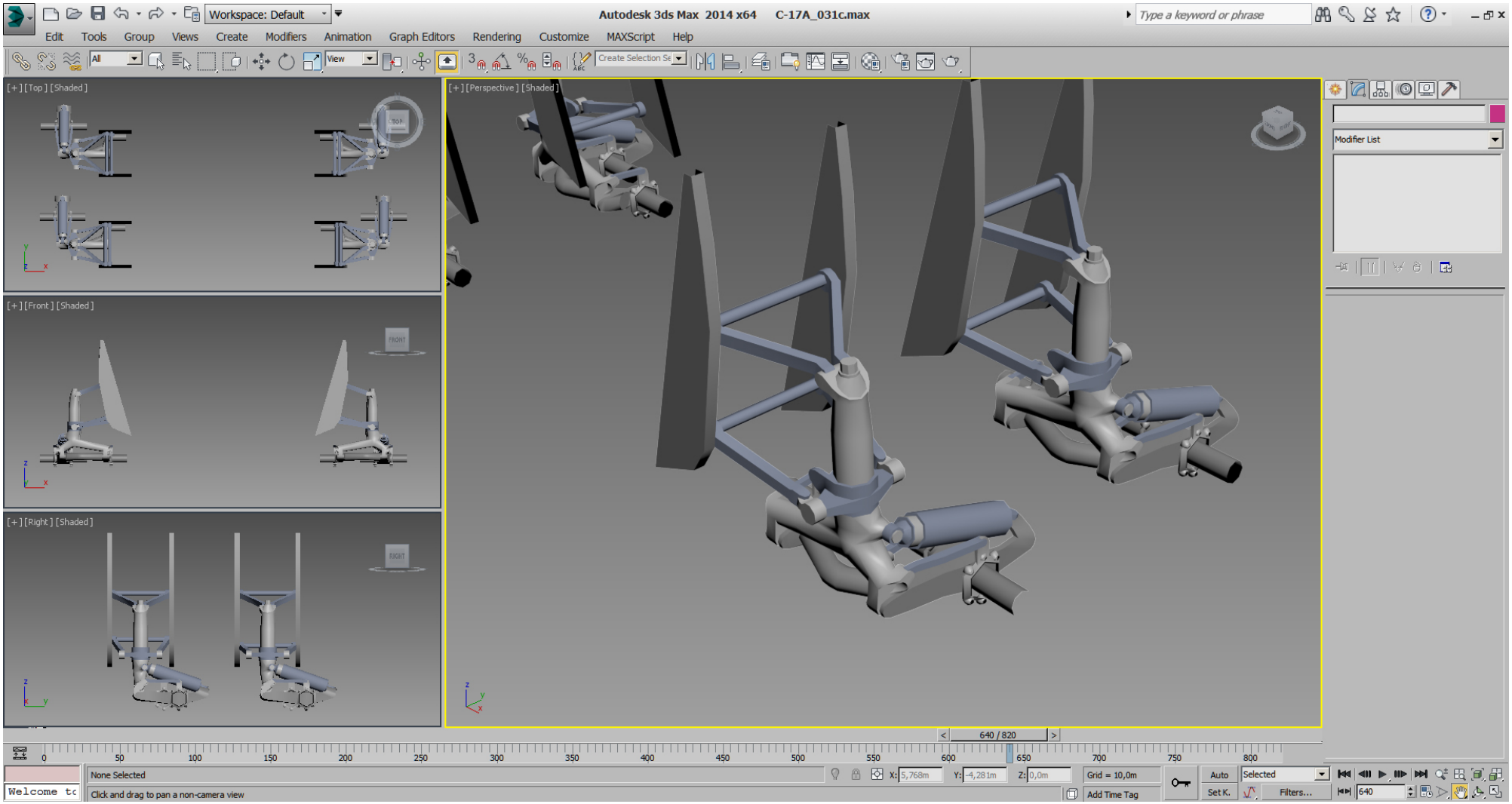


The wheel brakes are 216 tris.

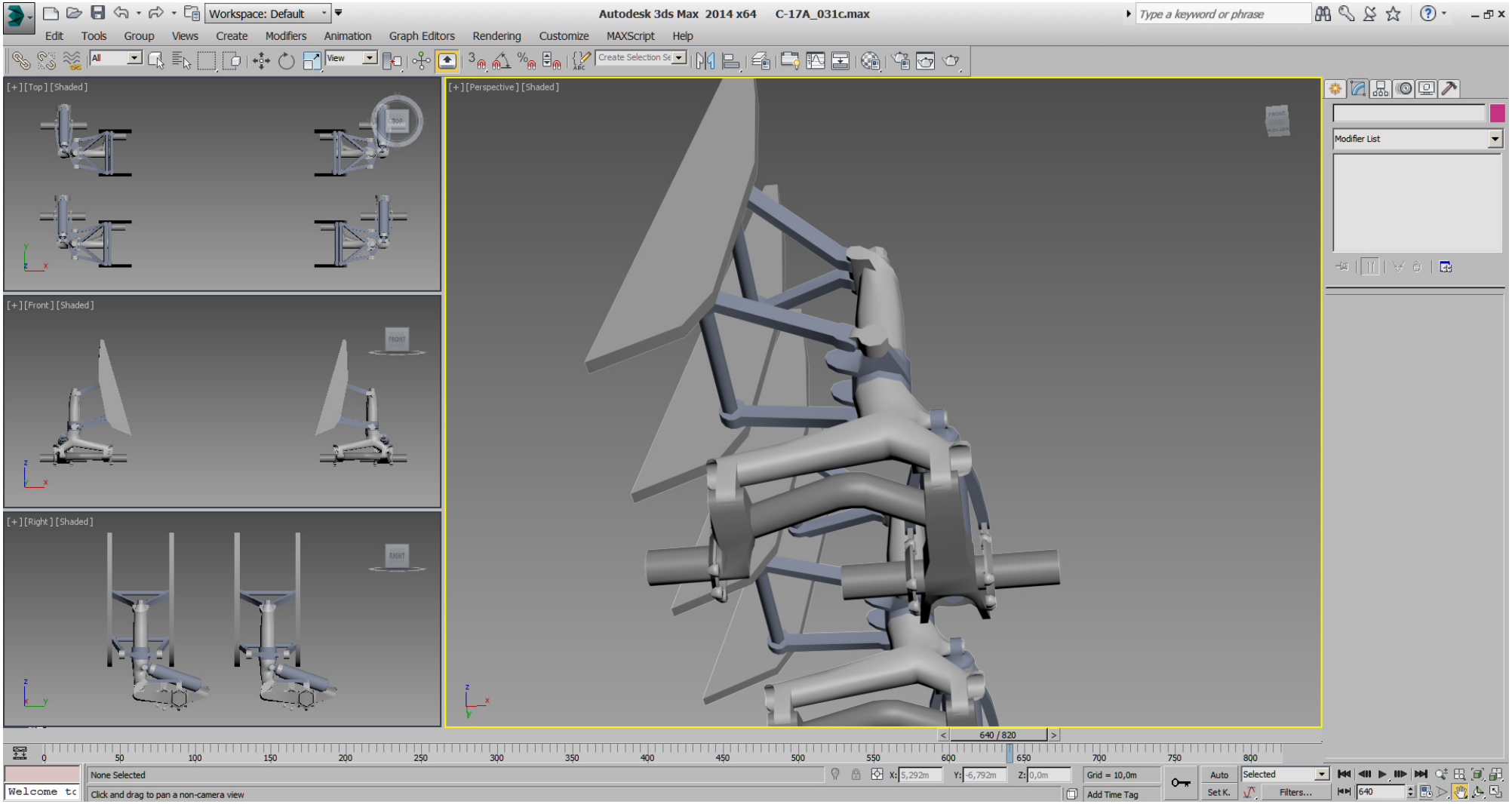


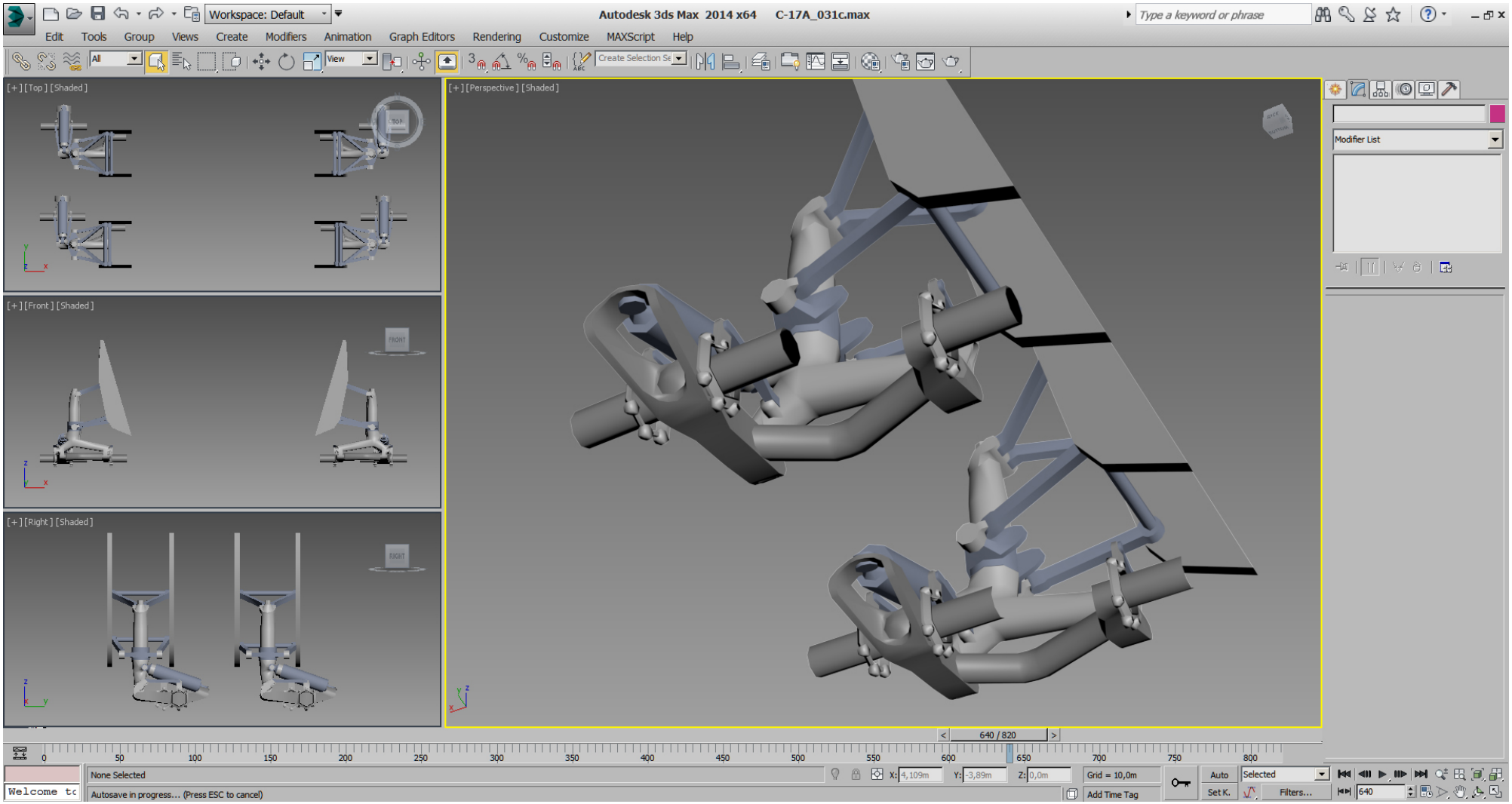
The other parts have been pre- optimized as well, so we are down to 10032 tris for the 4 MLGs.



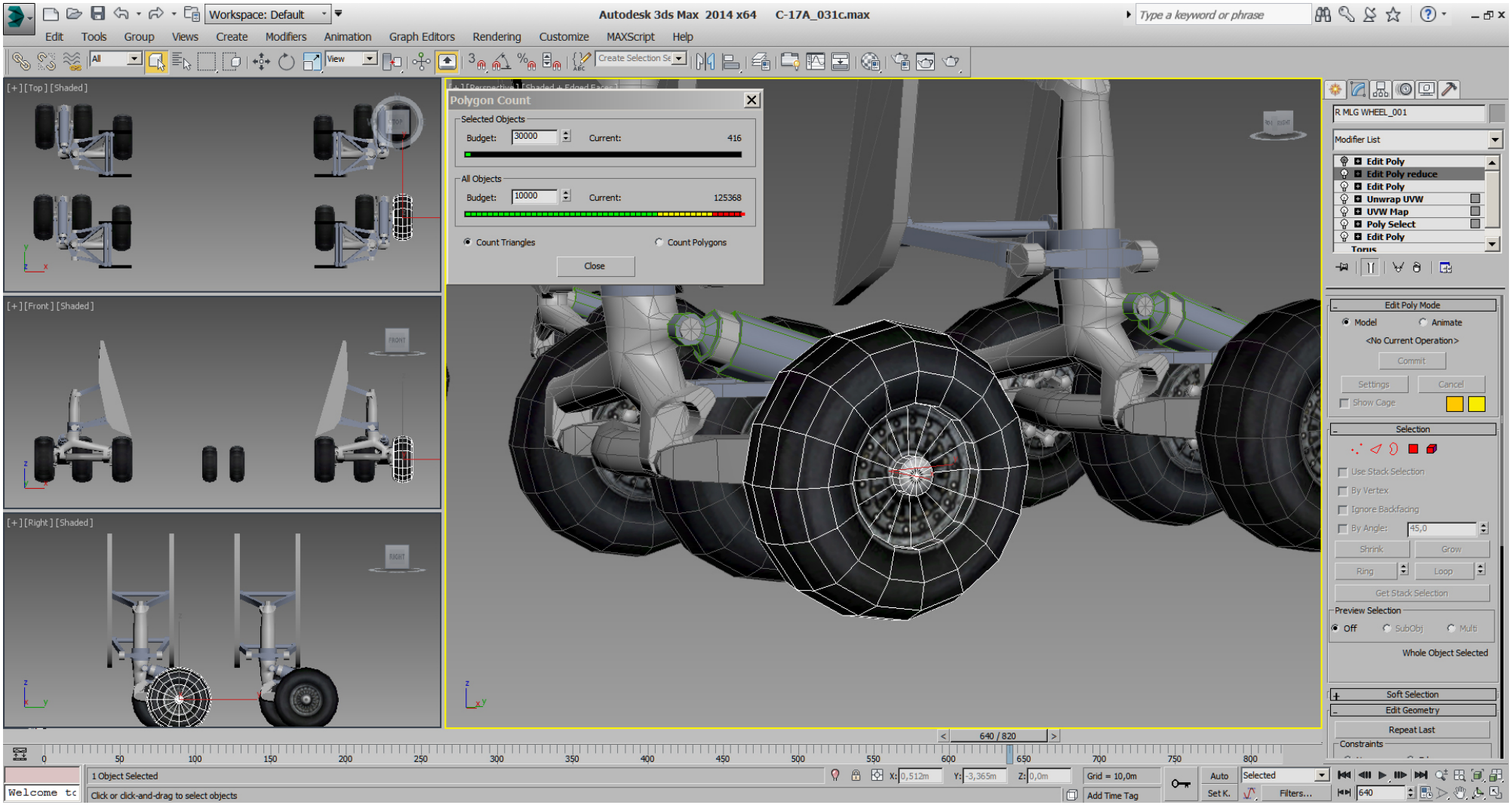

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_031c.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
640 / 820
None Selected
Click and drag to pan a non-camera view
Add Time Tag
Auto
Set K.
Selected
Filters...
Welcome to

Not sure as yet if we'll model and animate the strut which is connected to the noses of the grey MLG middle section later.
Maybe we'll simply skip it and those noses.

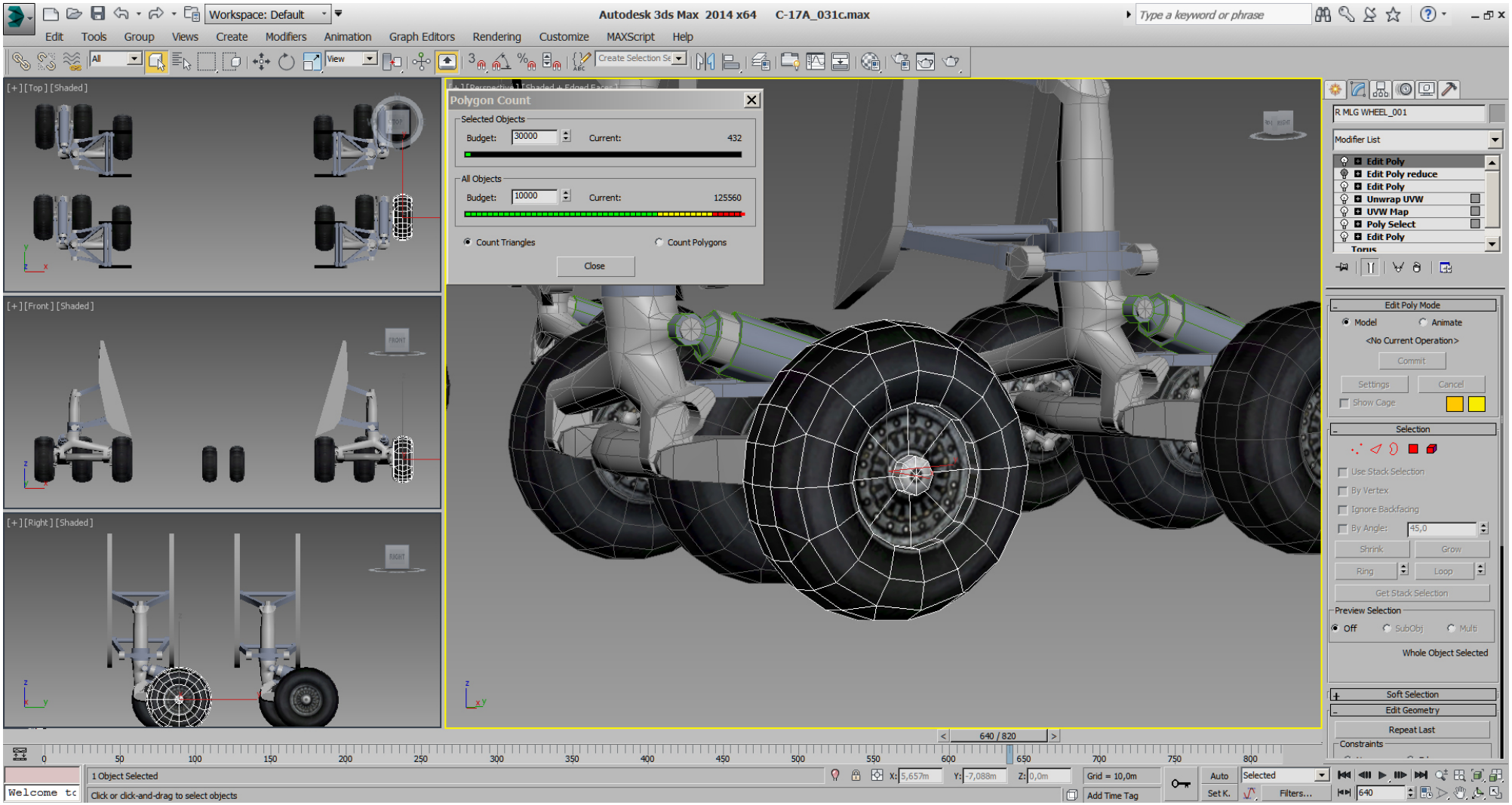



Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_031c.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded]
Modifier List
640 / 820
None Selected
Autosave in progress... (Press ESC to cancel)
Add Time Tag
Grid = 10,0m
Auto
Set K.
Filters...
Selected

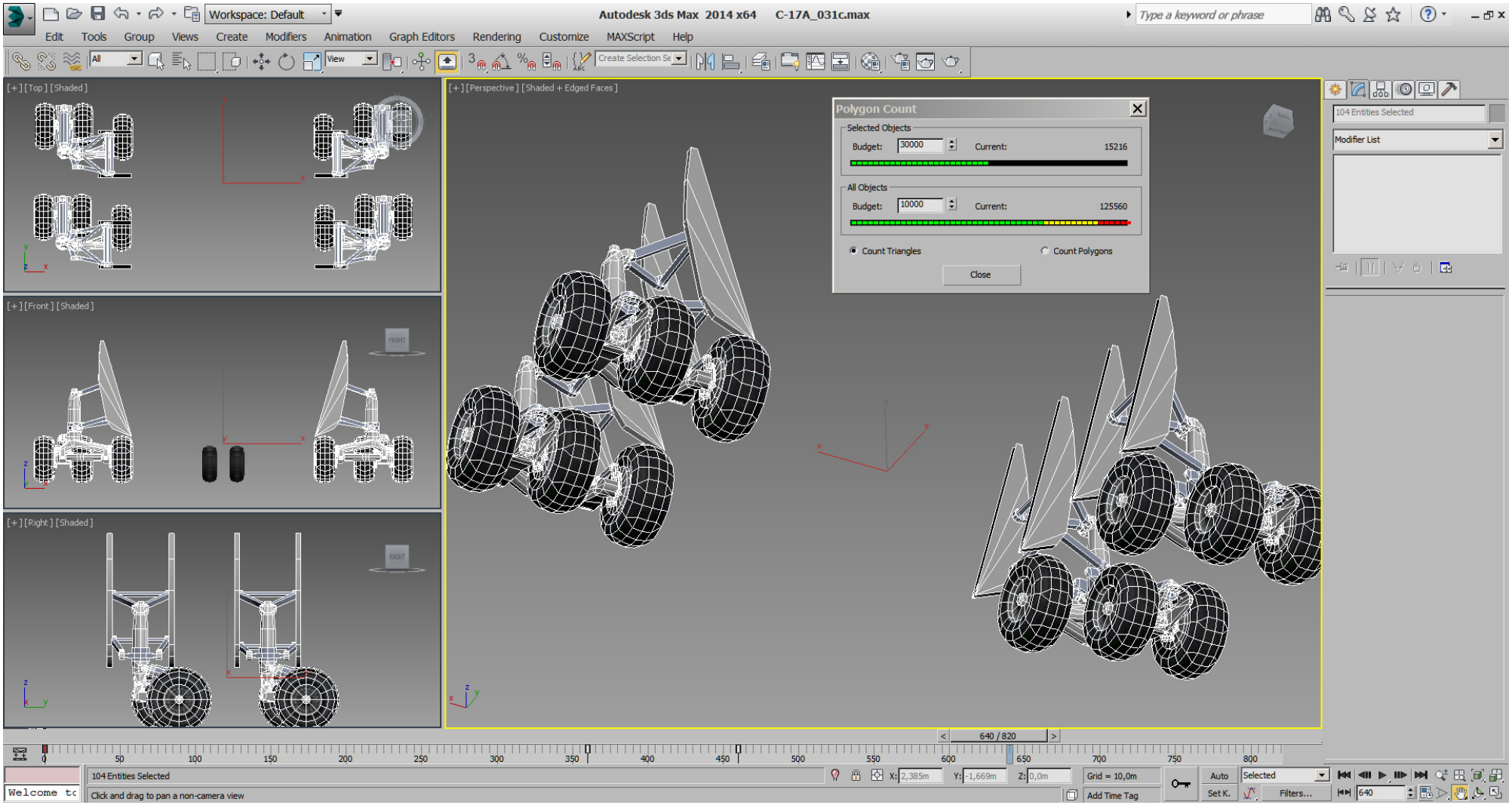
For the wheels I did an optimize down to 416 tris each, and all tris share the same “Smoothing Group”, but didn't like the result.



So the wheel got a differently optimizing. It's 432 tris now, and all tris share still the same smoothing group, but result is way better.

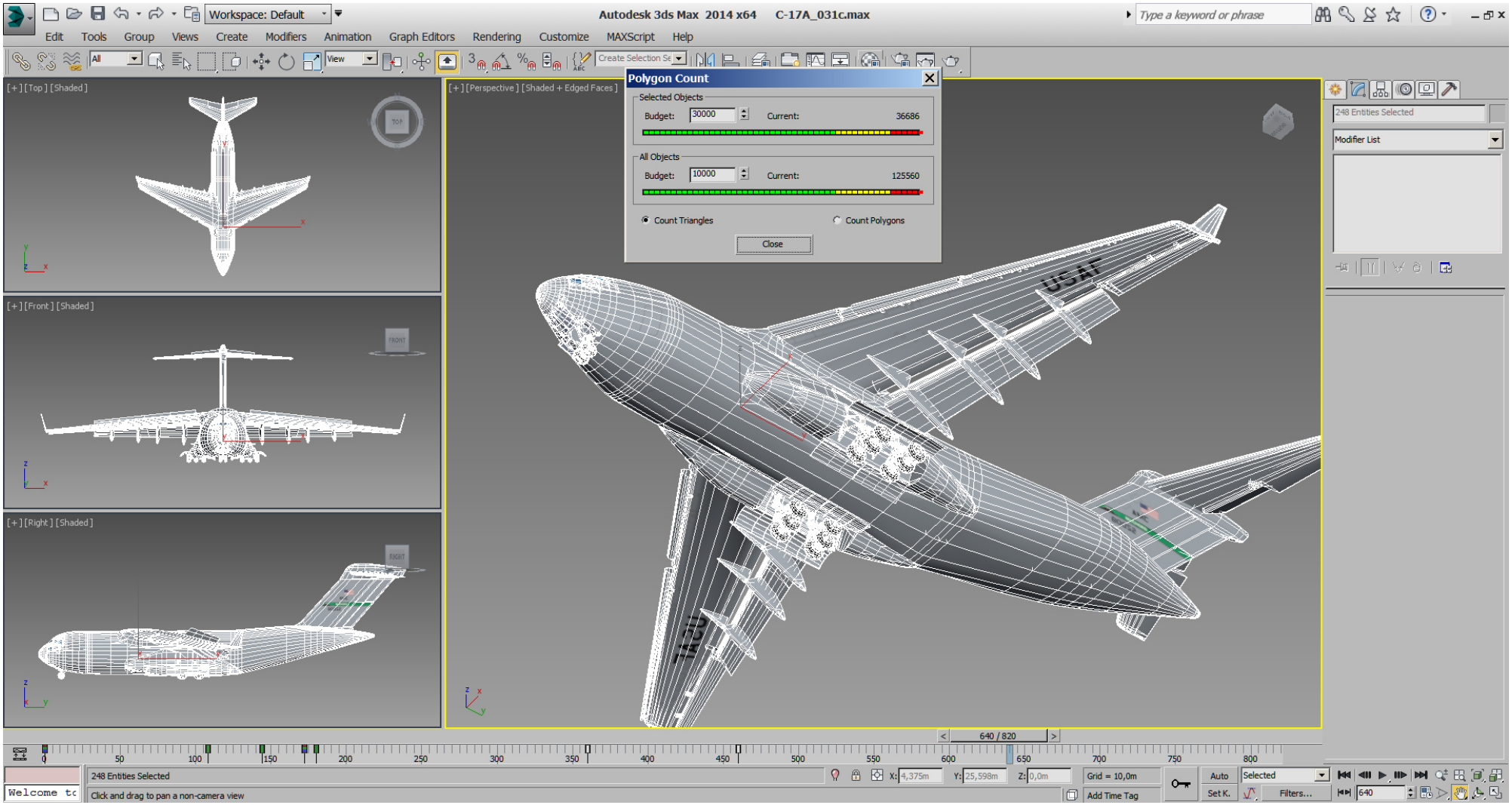


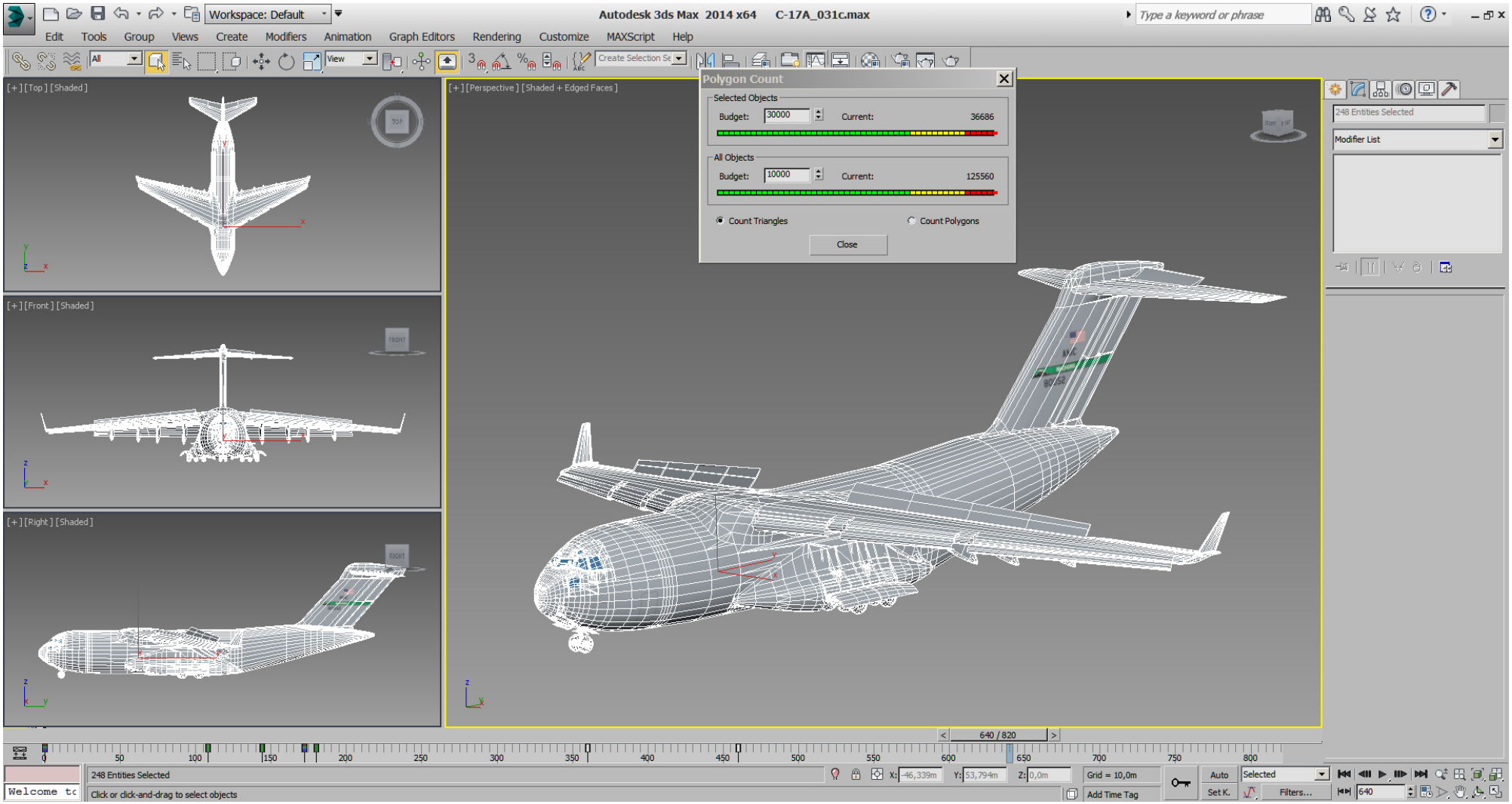
The 4 MLGs including its 12 wheels would be ~15000 tris atm., ... half of the 30k budget already.



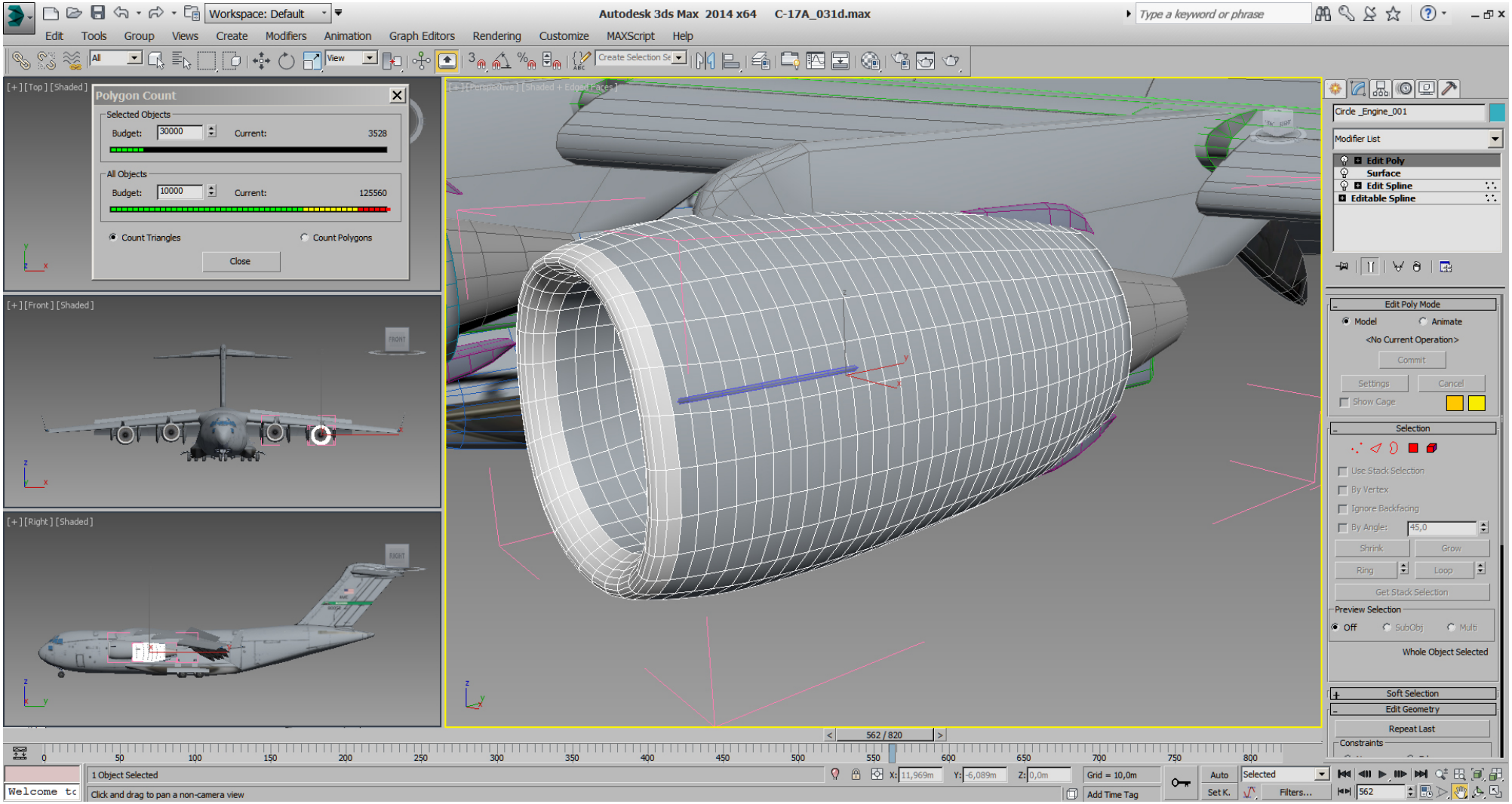
Now the only parts which are still high poly and in “Edit Spline” mode are the engines.
So we can approximately judge where we'll get with the tri count, without the engines.

With everything modeled and pre- optimized as seen (except the engines), the tri count is less than 37000 tris,
which I consider not that bad for the current state of the model.



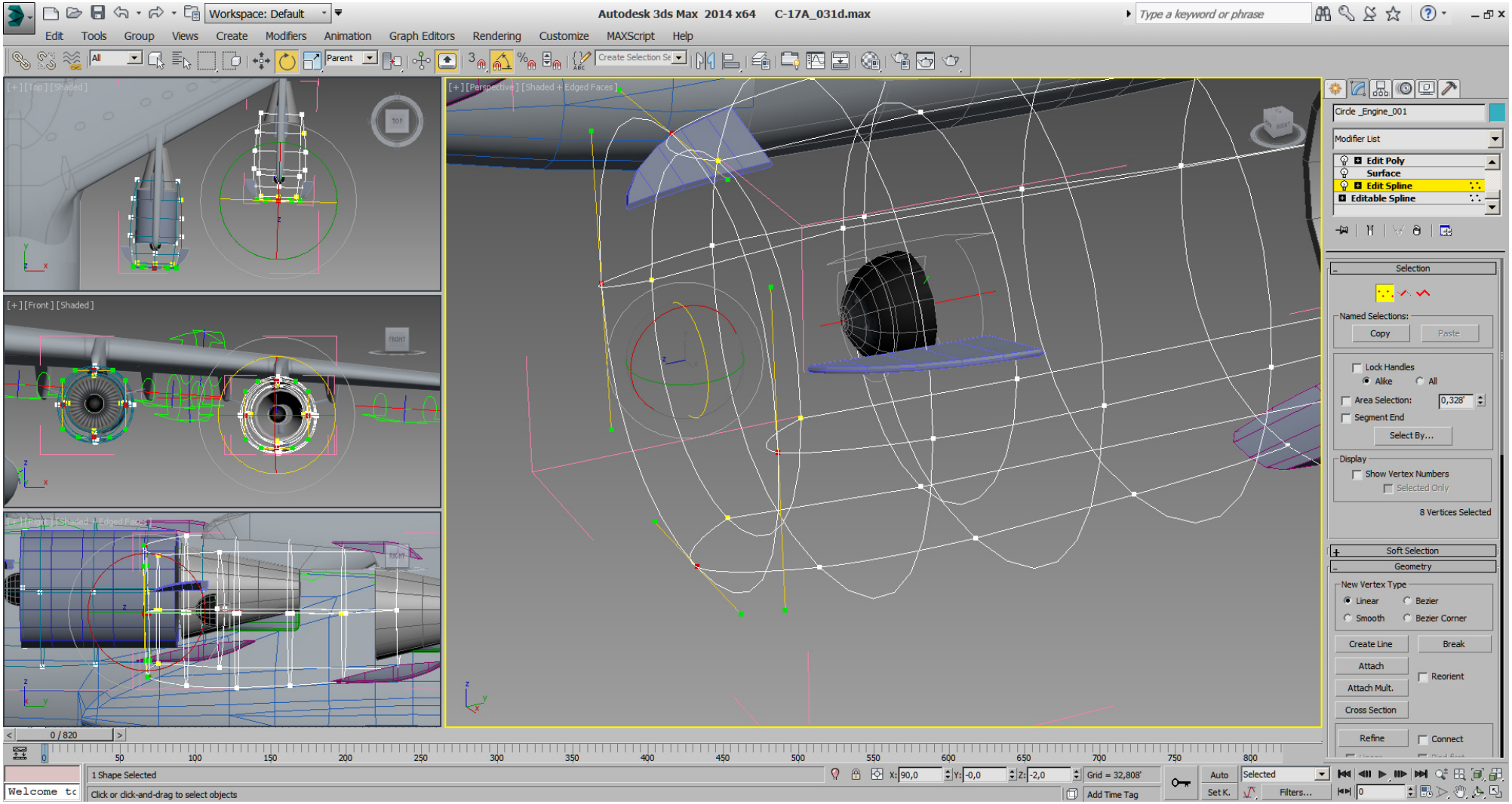

Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_031c.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Right][Shaded]
[+][Perspective][Shaded + Edged Faces]
Polygon Count
Selected Objects
Budget: 30000 Current: 36686
All Objects
Budget: 10000 Current: 125560
Count Triangles
Count Polygons
Close
248 Entities Selected
Modifier List
640 / 820
248 Entities Selected
Click or click-and-drag to select objects
Add Time Tag
Grid = 10,0m
Auto
Selected
Set K.
Filters...

So let's have a look at the engines again which are the last objects in very high poly, because we have not optimized the “Edit Spline” state as yet.

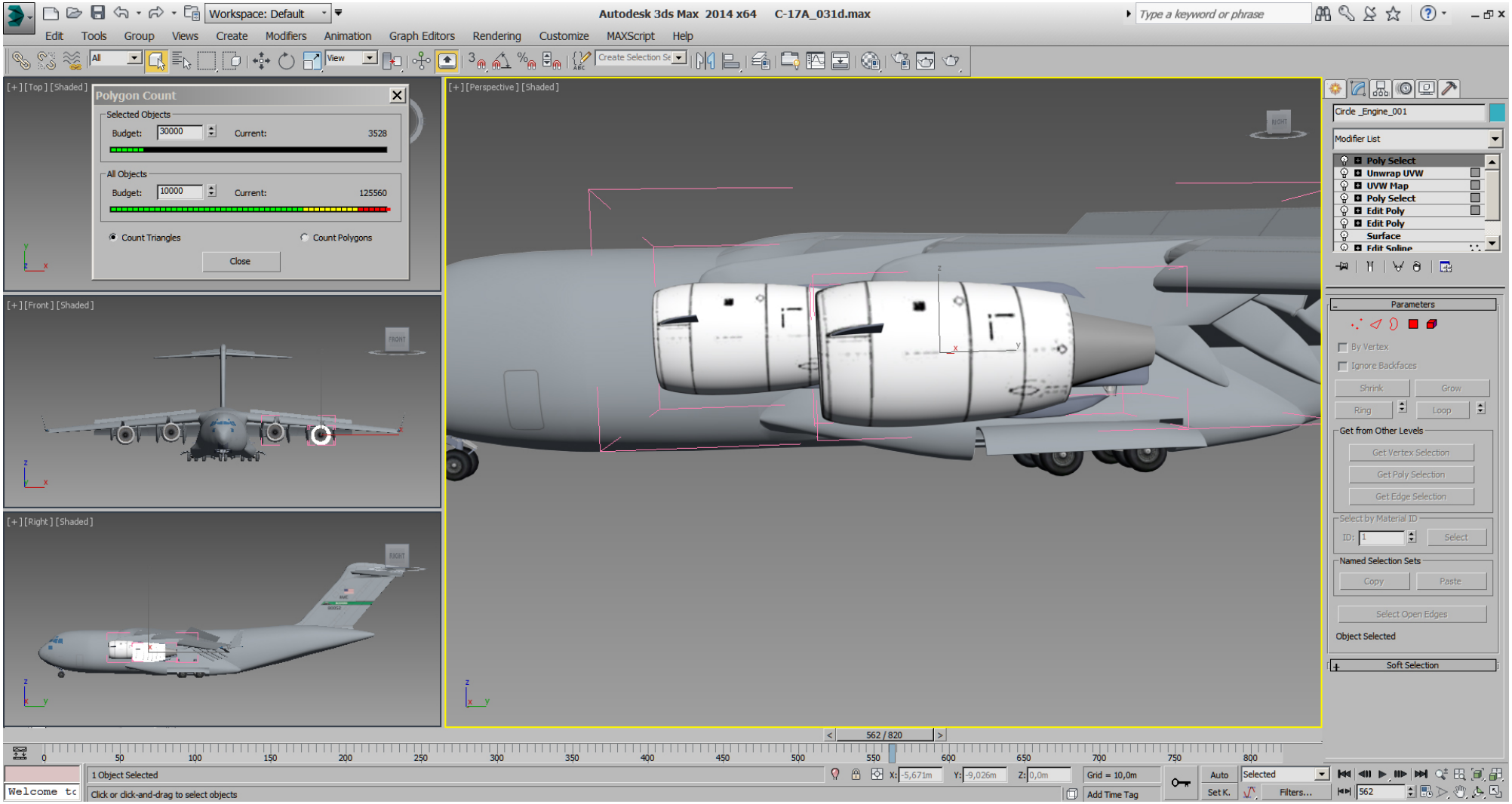


But as first we want to do some corrections regarding the front of the engines, where the intake is slightly rotated (facing downwards) on RL pictures. This is easier to do in “Edit Spline” mode, so with the 8 front spline vertex selected, and with “Reference Coordinate System” set to “Parent”, and “Use Selection Center”, we can rotate them slightly down.
(in next picture only 4 front spline vertex are selected, but we add the spline vertices of the next inner ring to the selection)

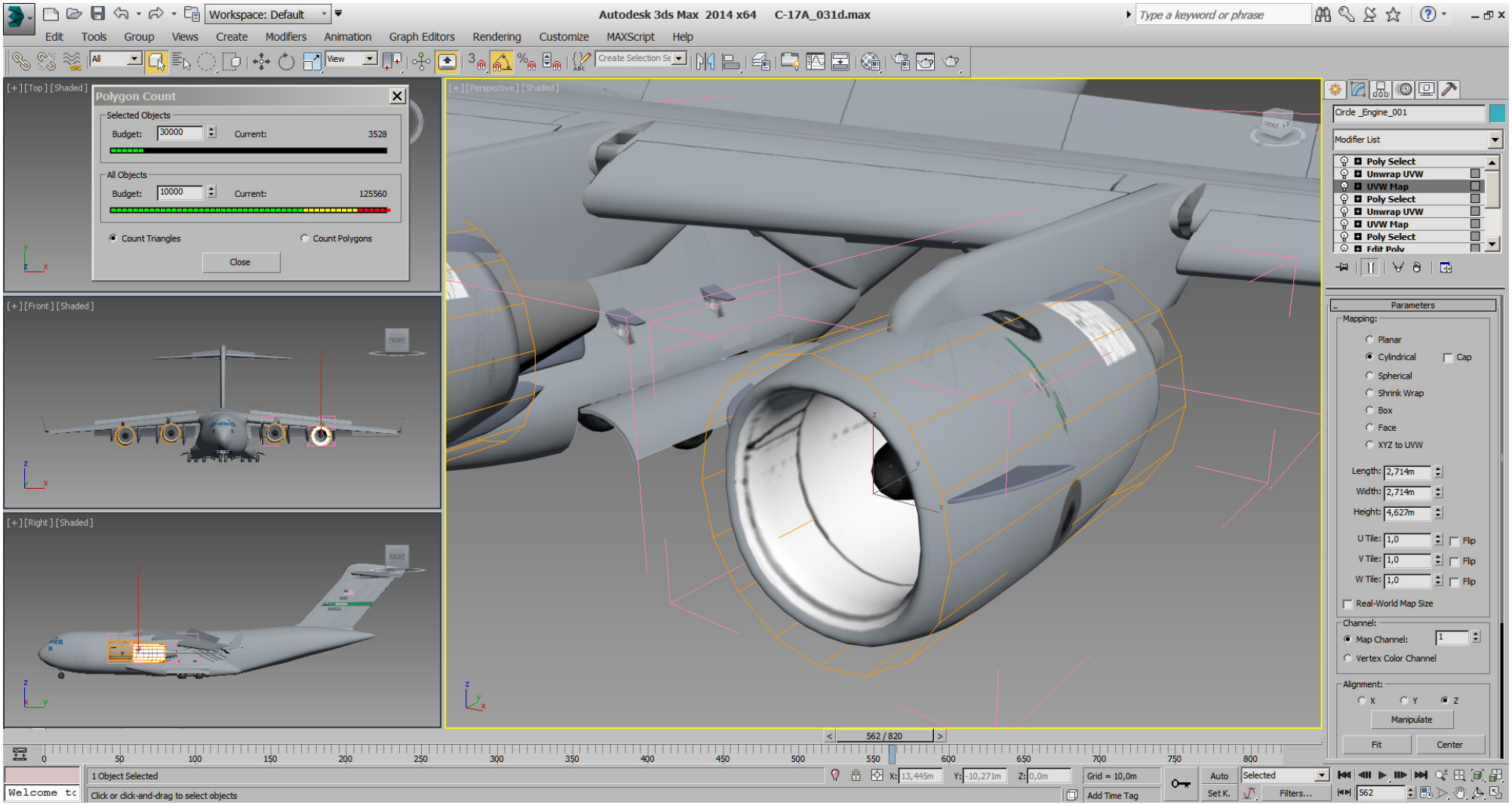
Note: Remember that we have rotated the engines already slightly in, so every transform like rotate, scale or move of sub- objects must be done with "Reference Coordinate System" -> "Parent" and NOT “View”.
Any transform of engine objects itself, should be done with "Reference Coordinate System" -> "Local" and NOT “View”.



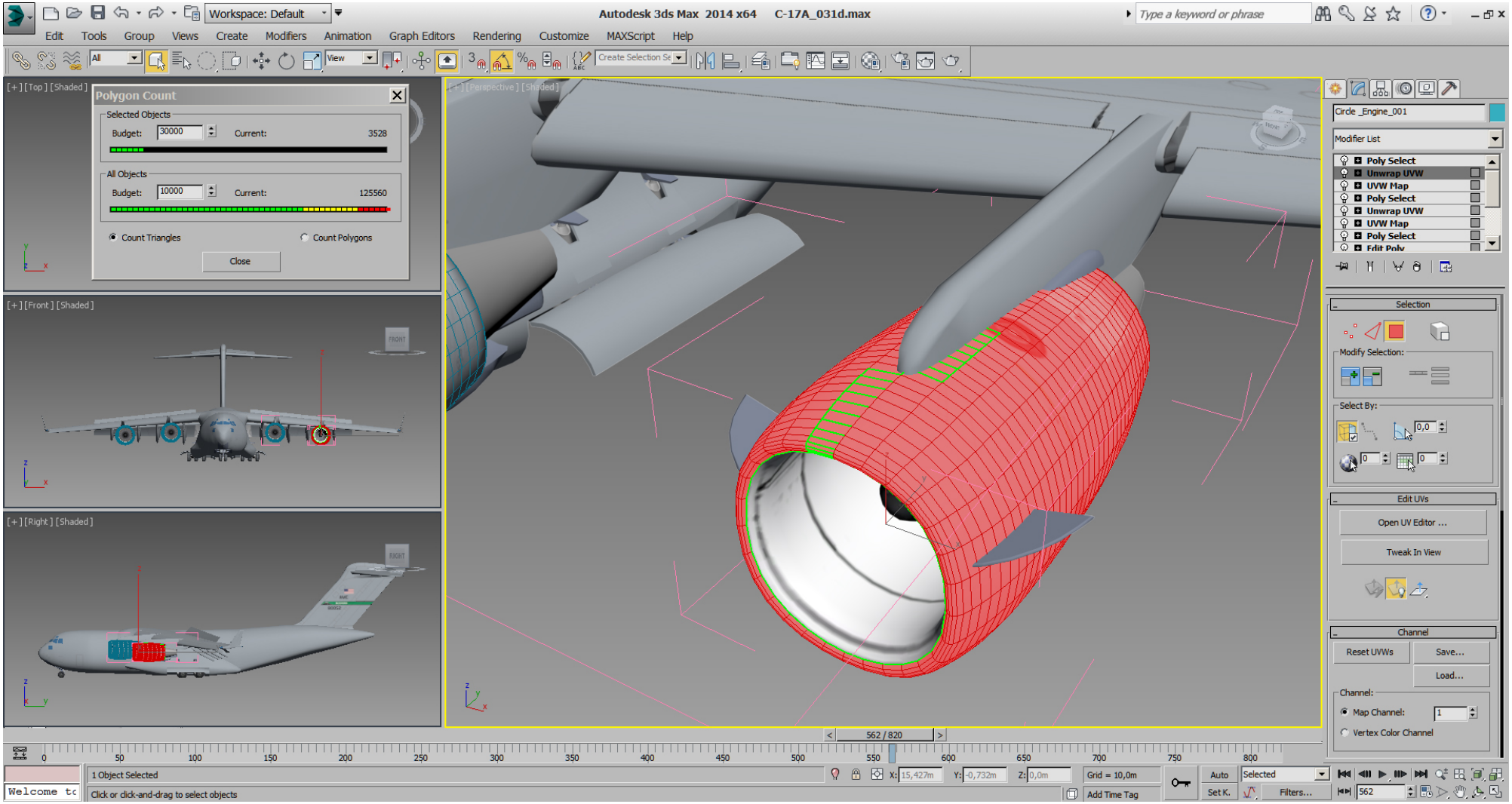
In the next step the Material-ID for the temporary white front frame got changed back to 1 which is our main textured PType9 material.
Then we do a simple planar left/right mapping of the engines blueprint to see if we are nearly in sync with RL pictures.



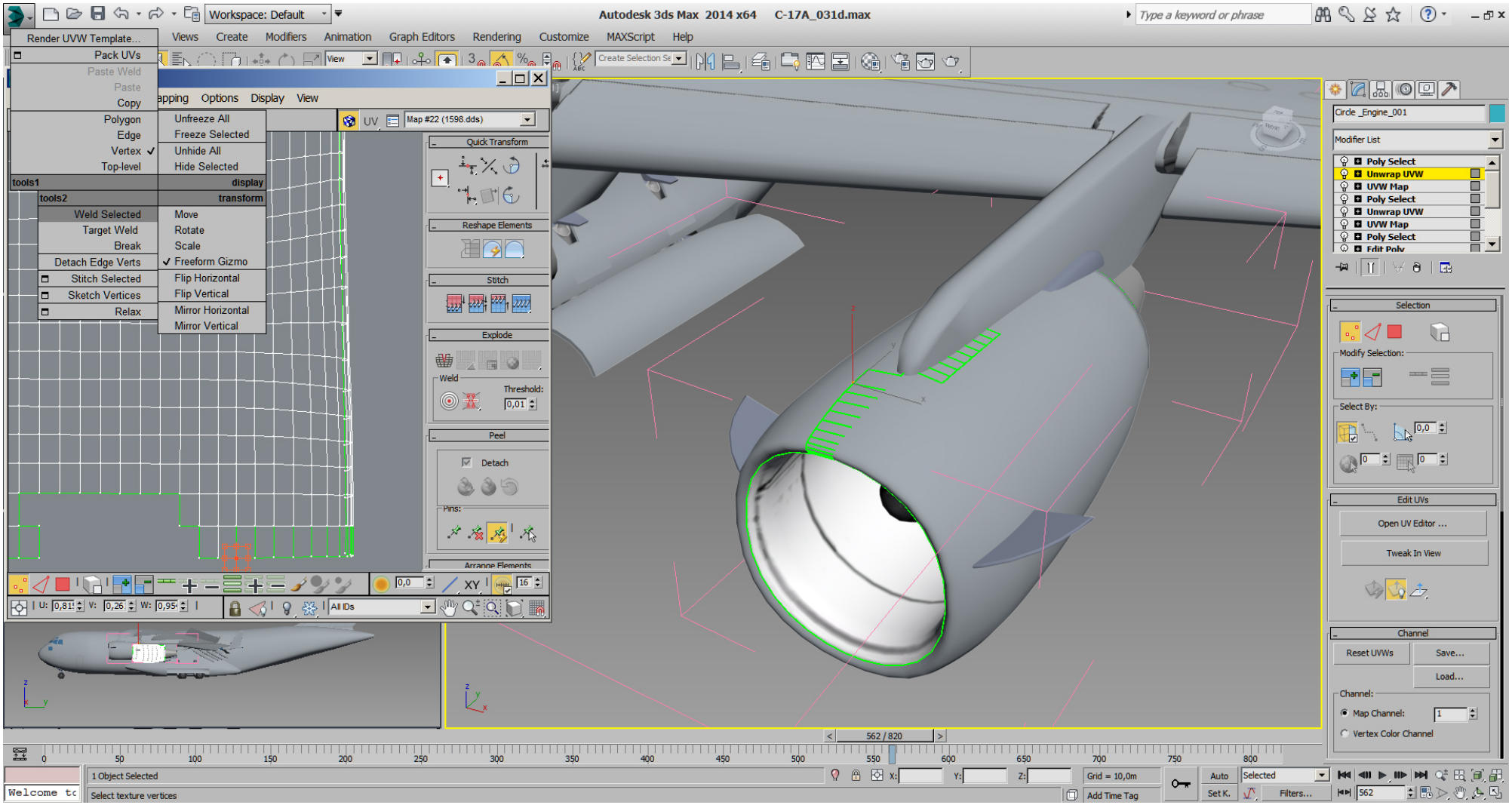
Being happy with the change of the intake geometry, we select the outer polys and do a cylindrical UVW mapping.



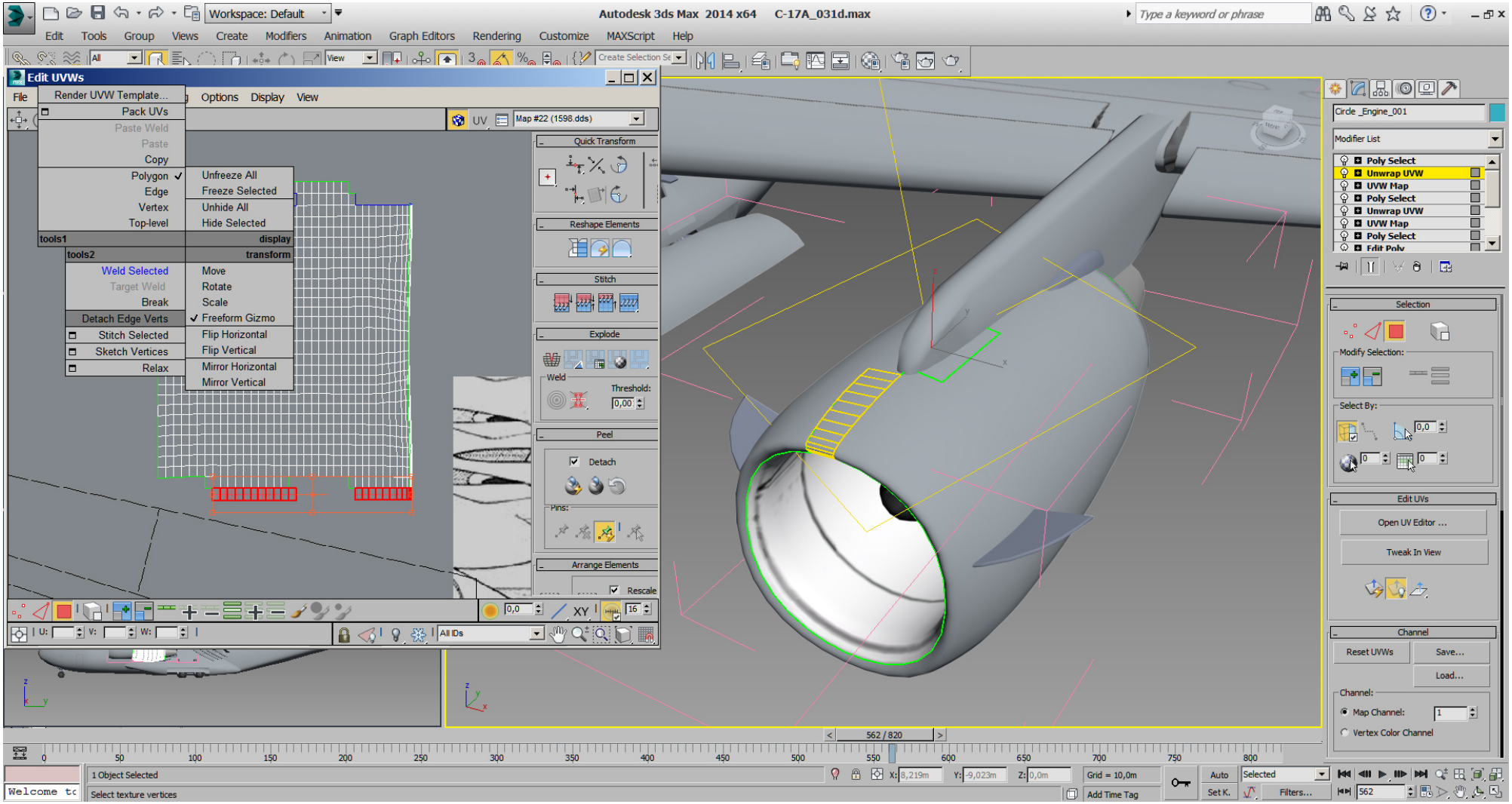
Whereat I'm not happy with the result of the mapping seams.
Hint: "Pelt mapping" could be an easier solution, but I'm not familiar with it as yet.



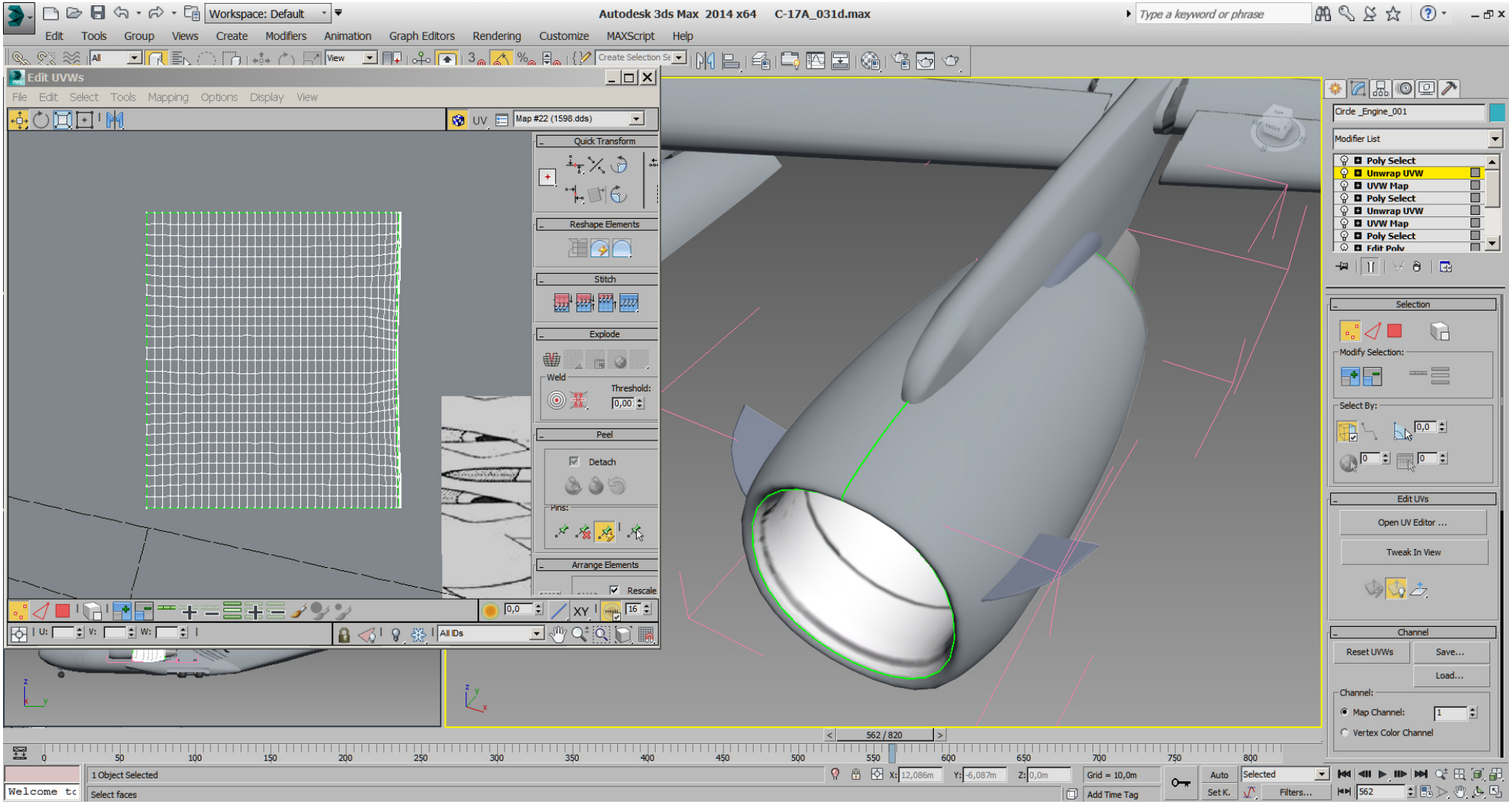
We can fix this by welding those UV vertices in the UV Editor.



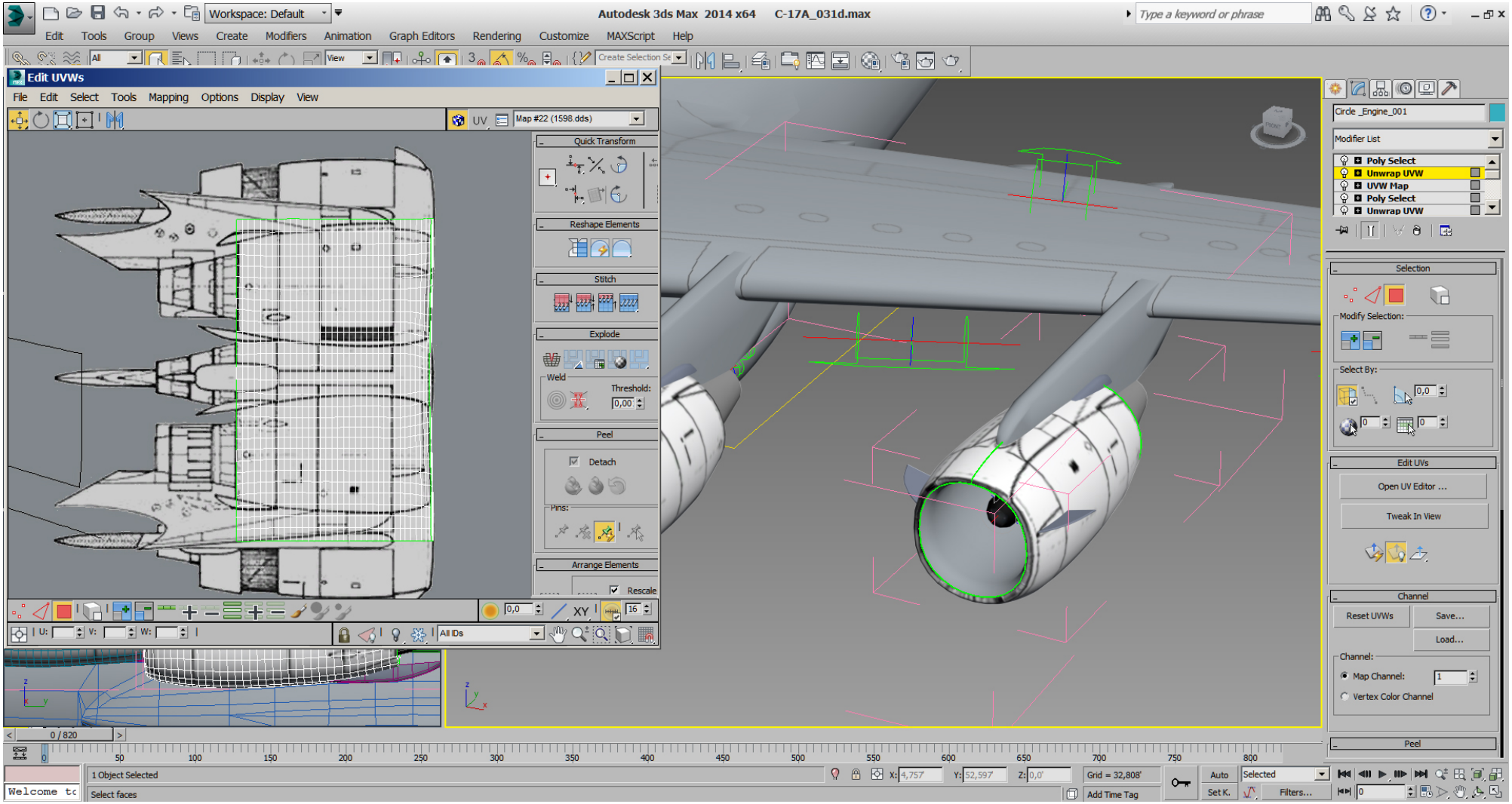
Then select those UV polys and “Detach Egde Verts” at the bottom, so they are a separated UV object,
then “Stitch Selected” on the top where the blue marked edges are. Eventually weld UV vertices there again,



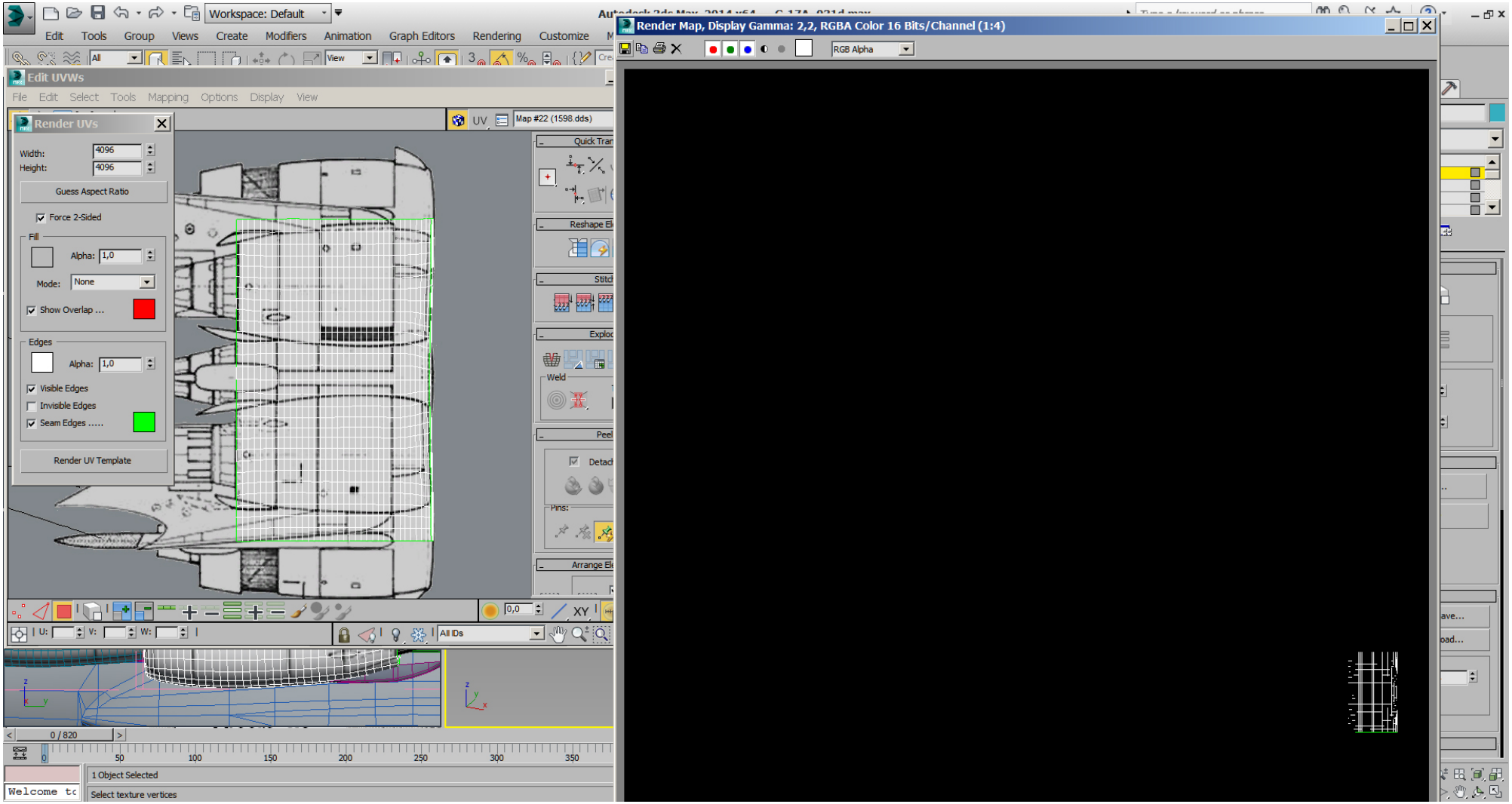
The UVW mapping result of our effort is almost a quad shape in UV Editor,
and the mapping seams are where we want them on the engine.



So we can prepare our texture with the engine blueprints for our now cylindrical UVW mapping and adjust mapping coordinates until it fits good enough to get references on the model.

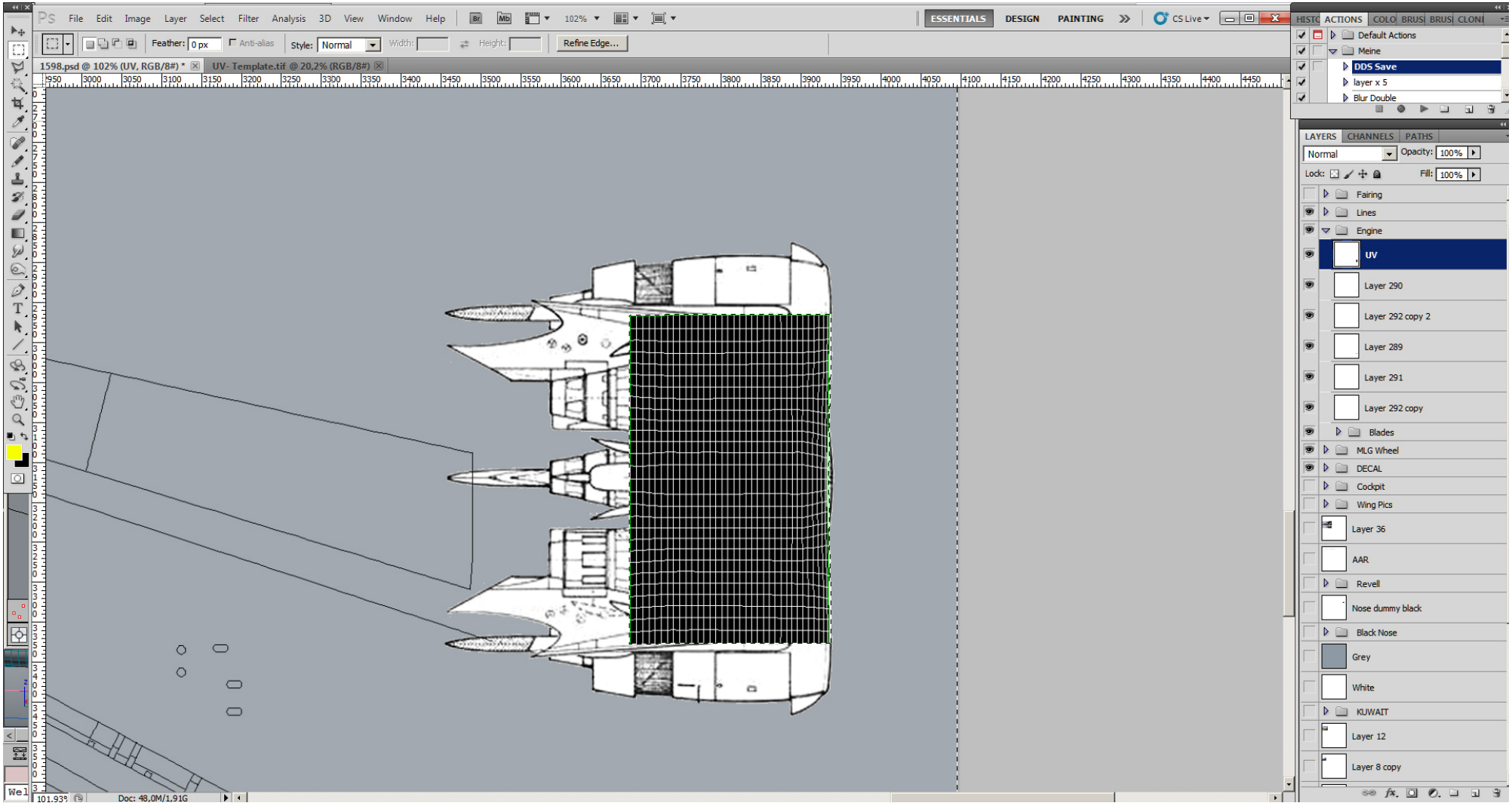


UV Editor -> Tools -> Render UVW Template...
saved to disk, in my case as UV- Template.tif is always useful to mark the used place on the texture.

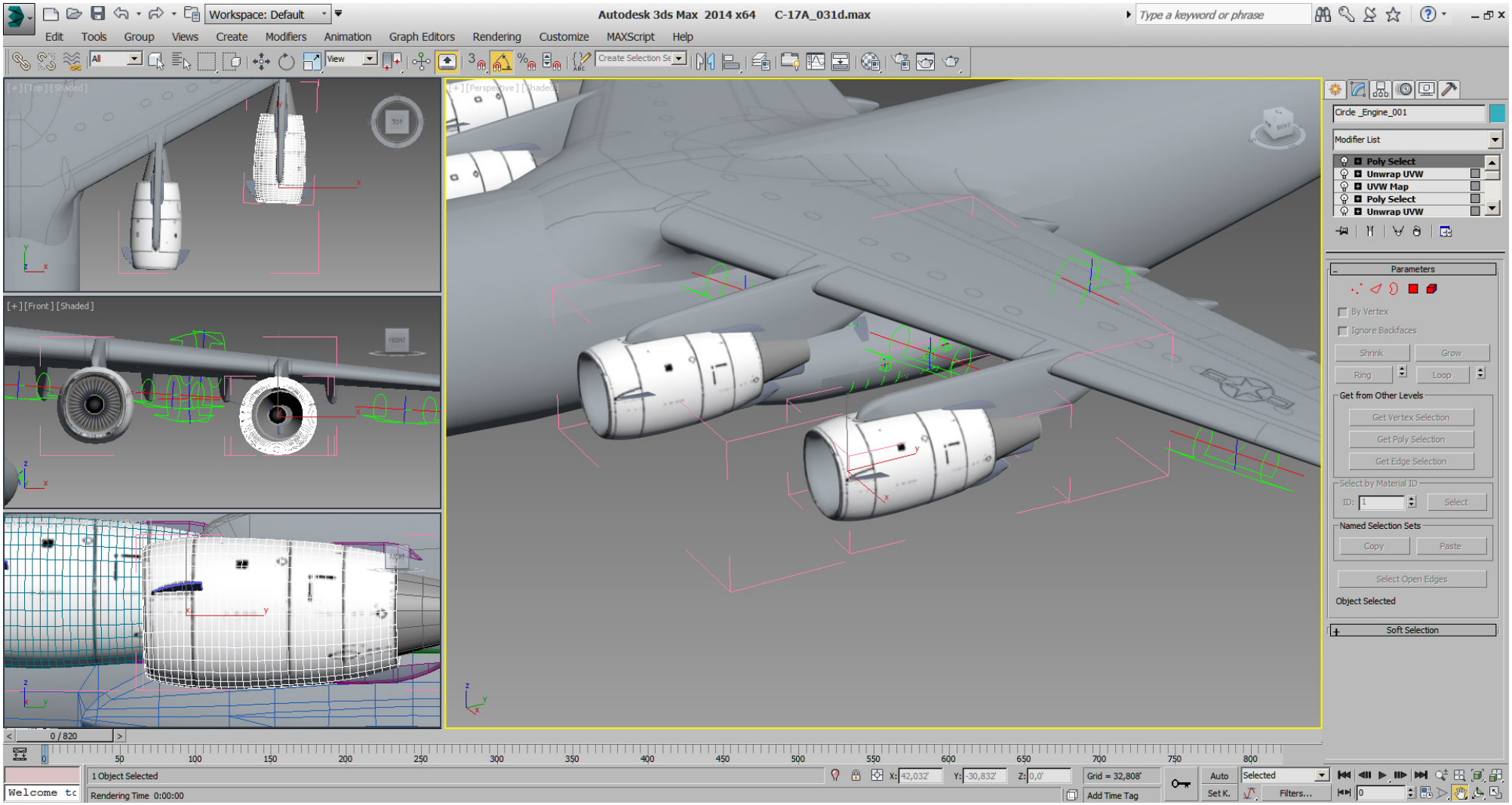


After a copy/paste of UV- Template.tif into our texture in Photoshop,
on top of the engine blueprint, and with the outer black area deleted.
This UV layer can be used for easier remapping for example.

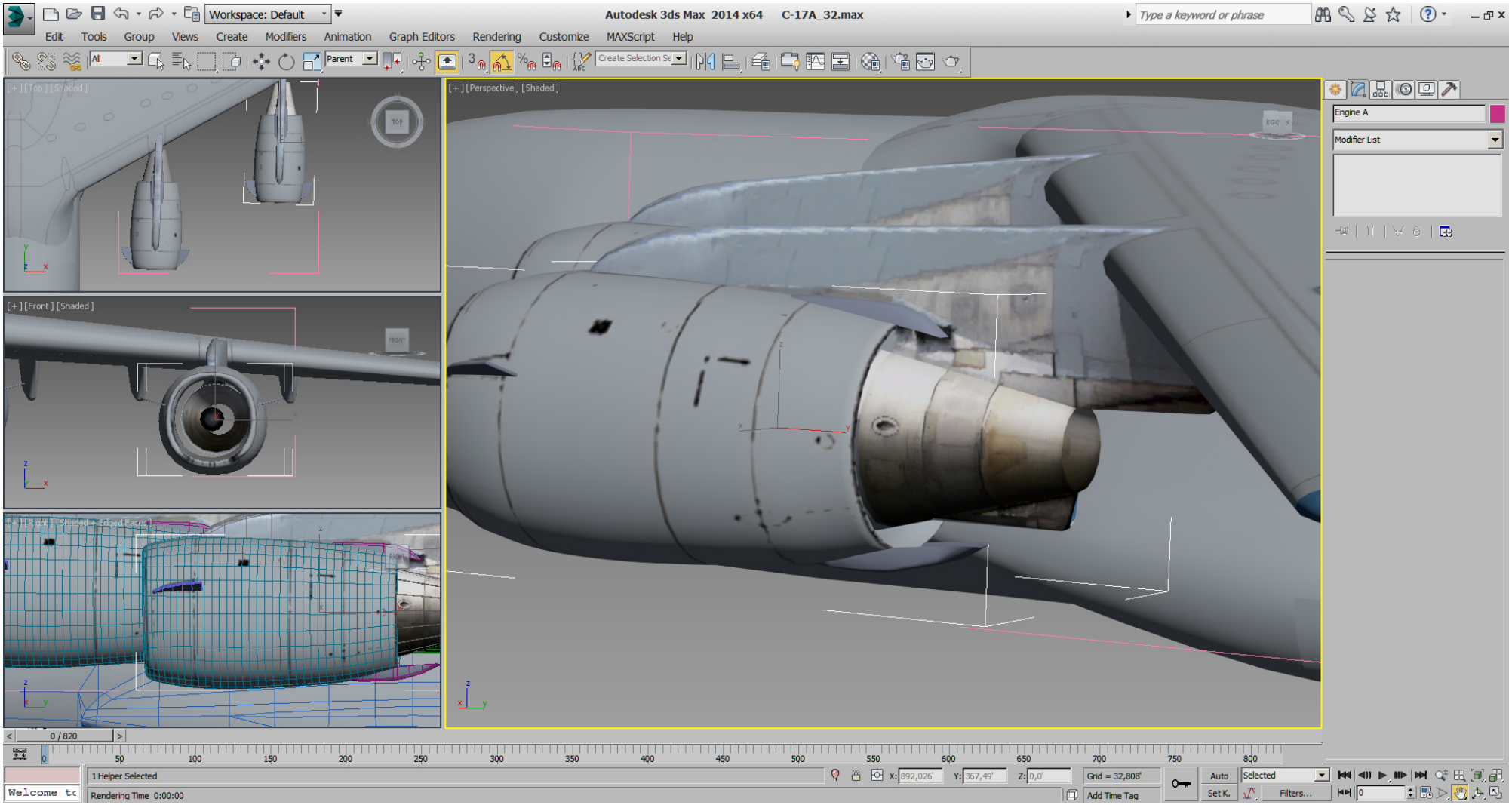
Remember, this is just a mapping to get references on the engine, but not the final mapping. The same workflow as with the wings, ...



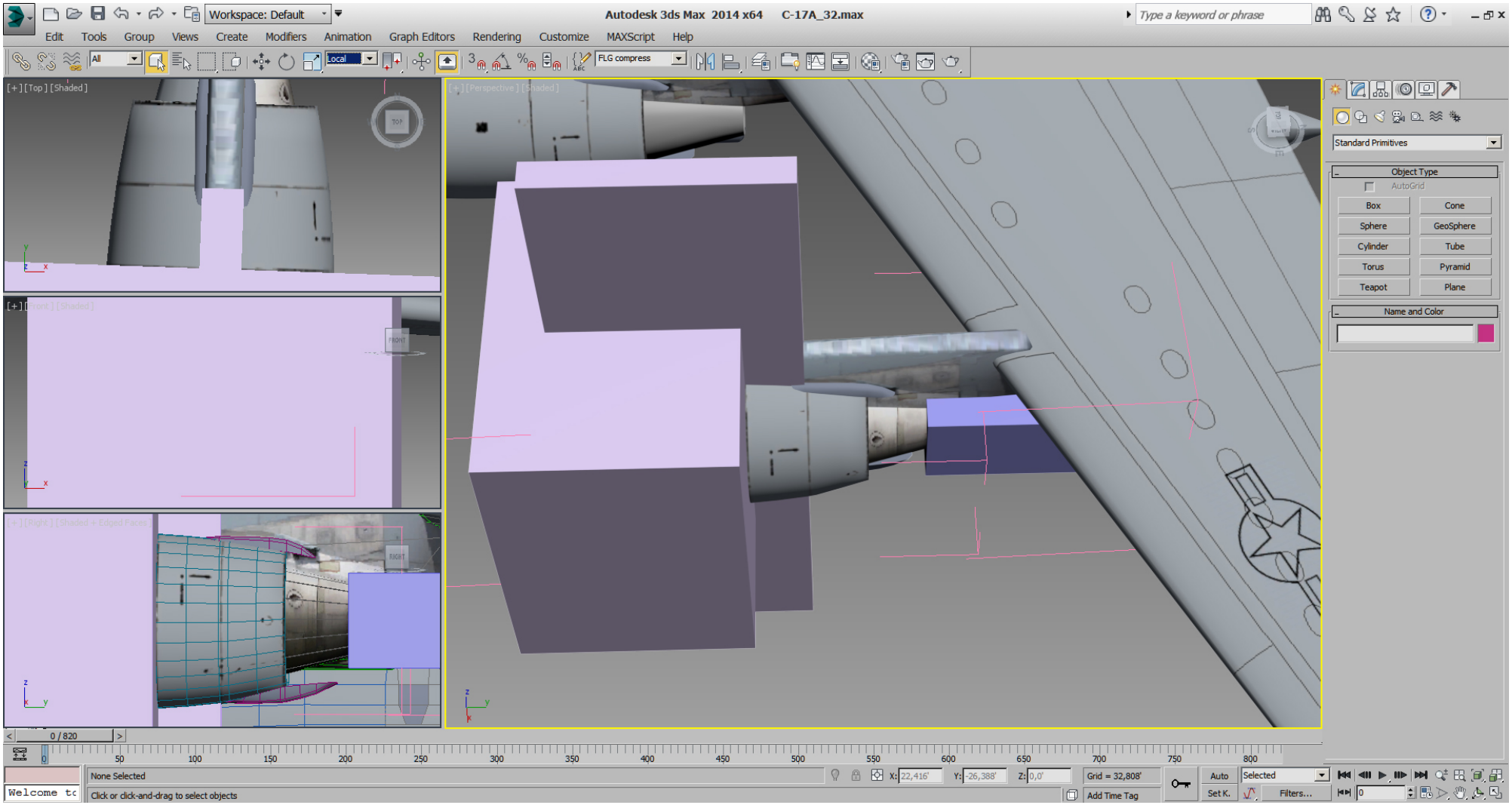
After a quick and rough polish of the reference blueprint in Photoshop.



And a quick manually planar mapping of picture references on the pylons and nozzle will help to decide the thrust reversers cut.



Then simple boxes for the boolean cutting of the thrust reverse system has been created and placed.

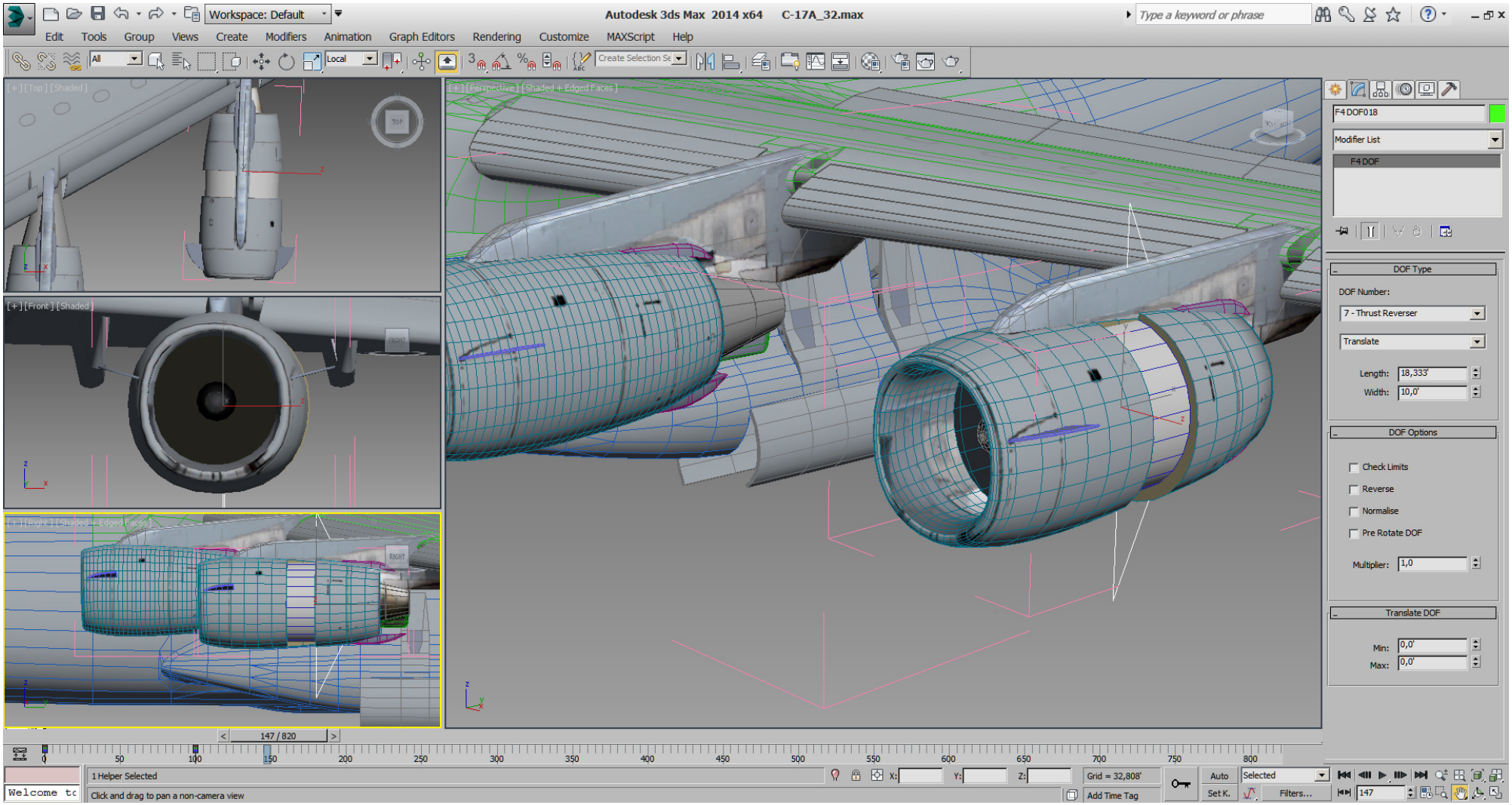


After the boolean cut, we did some further modeling to close the surface, using the “Edit Poly” modifier in “Edge” sub mode -> “Bridge” and/ or “Cap”.
For missing edges, we use “Cut” in “Edge” or “Vertex” sub mode to insert some where needed.
We got also rid of some tris, but not to much for the moment, (compare to engine #2)
because we want to keep the front area round and smooth.

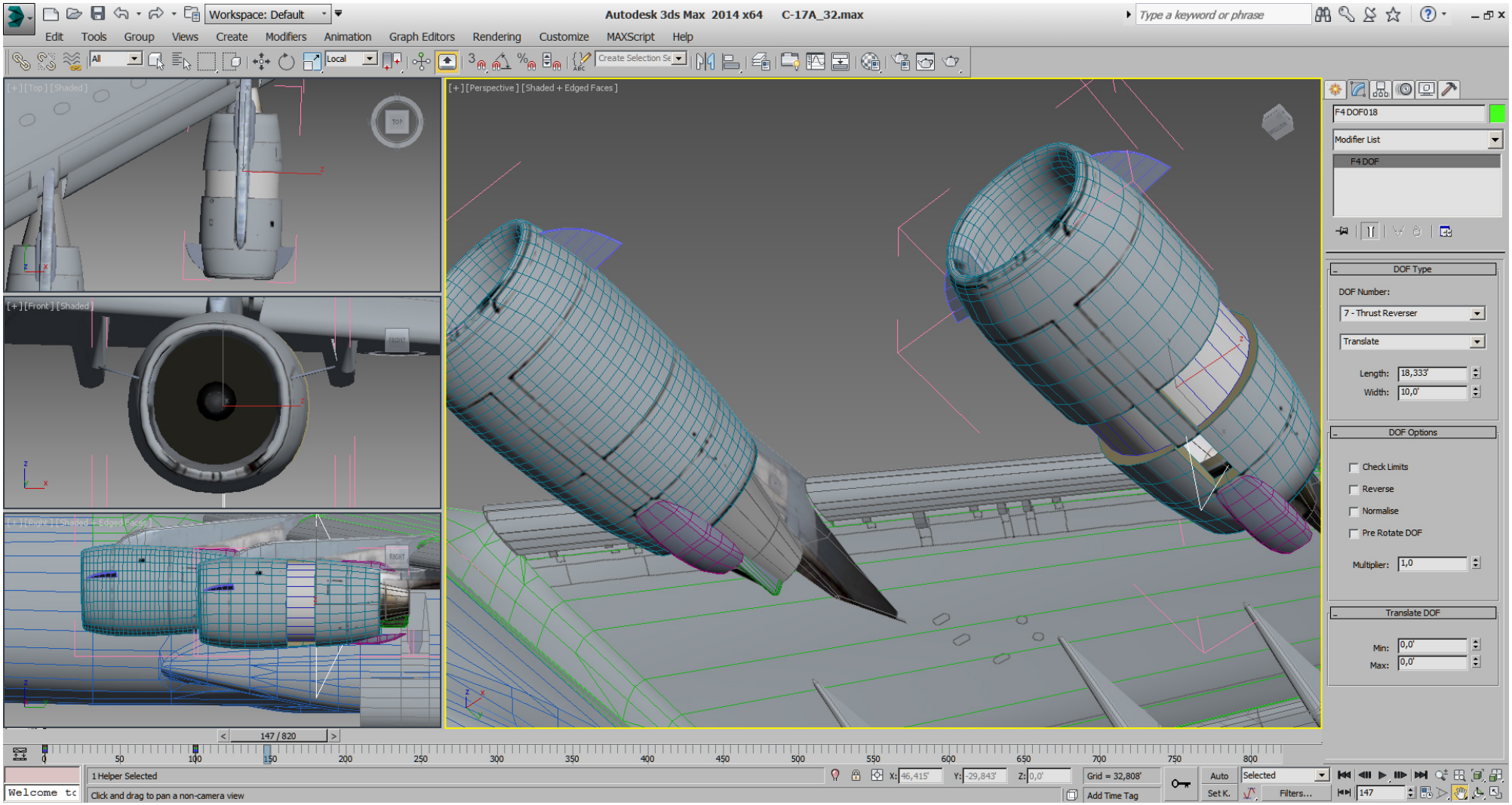
Next, we did a simple planar and/unfold UVW mapping for the surface we've closed and use/create a colored area on the texture.

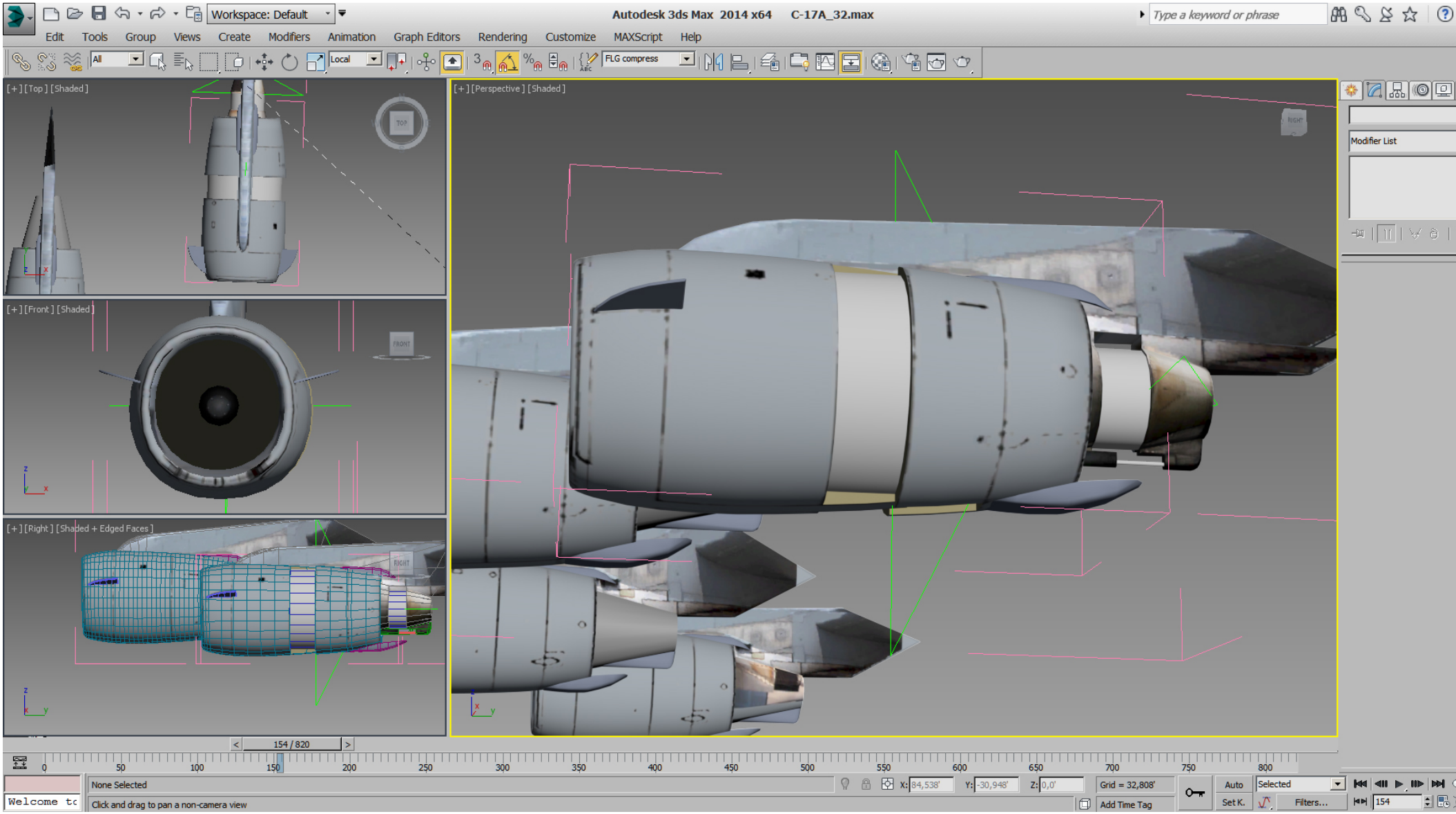
A DOF helper has been placed (TDOF #7 - Thrust Reverser) and the moving parts have been linked to it.
Then this DOF helper got a quick keyframe animation in 3dsMax.

Finally a cylinder, where useless top and bottom polys have been deleted (white), fills the gap.

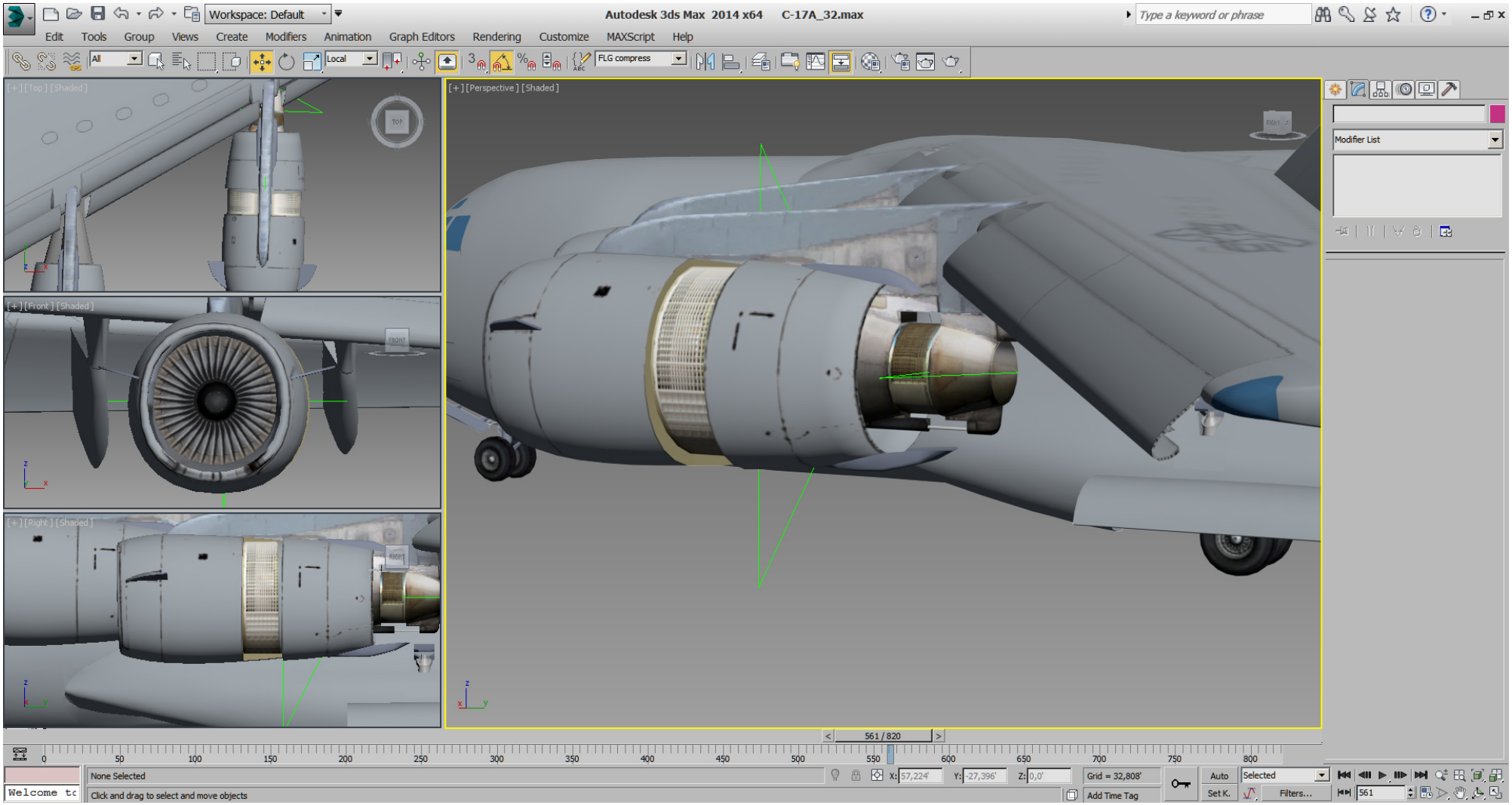


The smaller rear thrust reverser was made the same way.




Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_32.max
Type a keyword or phrase
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Shaded]
[+][Front][Shaded]
[+][Right][Shaded + Edged Faces]
[+][Perspective][Shaded]
Modifier List
154 / 820
None Selected
Click and drag to pan a non-camera view
Add Time Tag
Grid = 32,808'
Auto
Set K.
Selected
Filters...

And with a planar UVW mapped photo on the thrust reversers , we can already imagine.

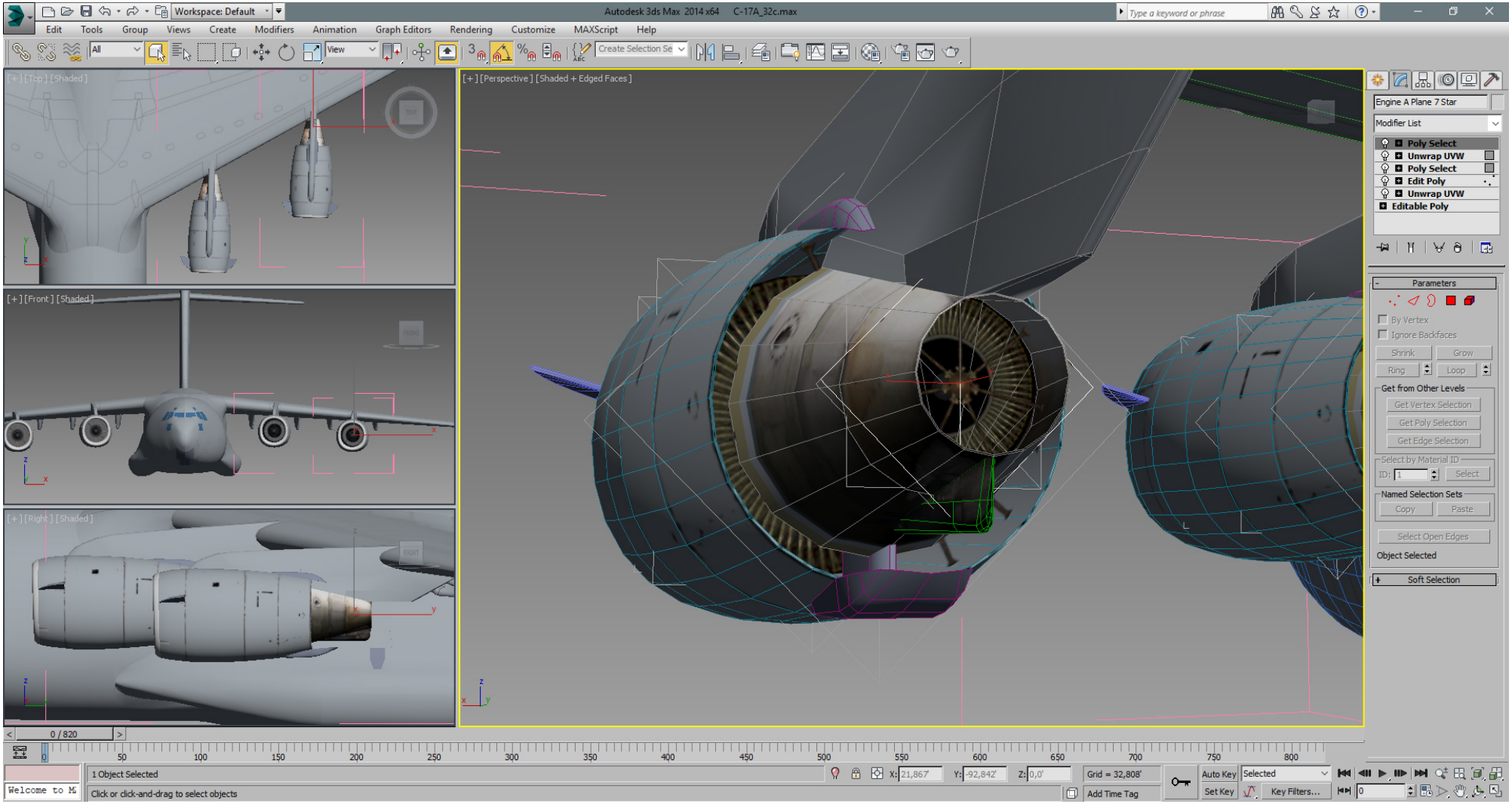


Looking at RL pictures, we see that to model and animate plates and struts for every single piece of the thrust reverser(s) in open/closed state would take many DOFs and tris.

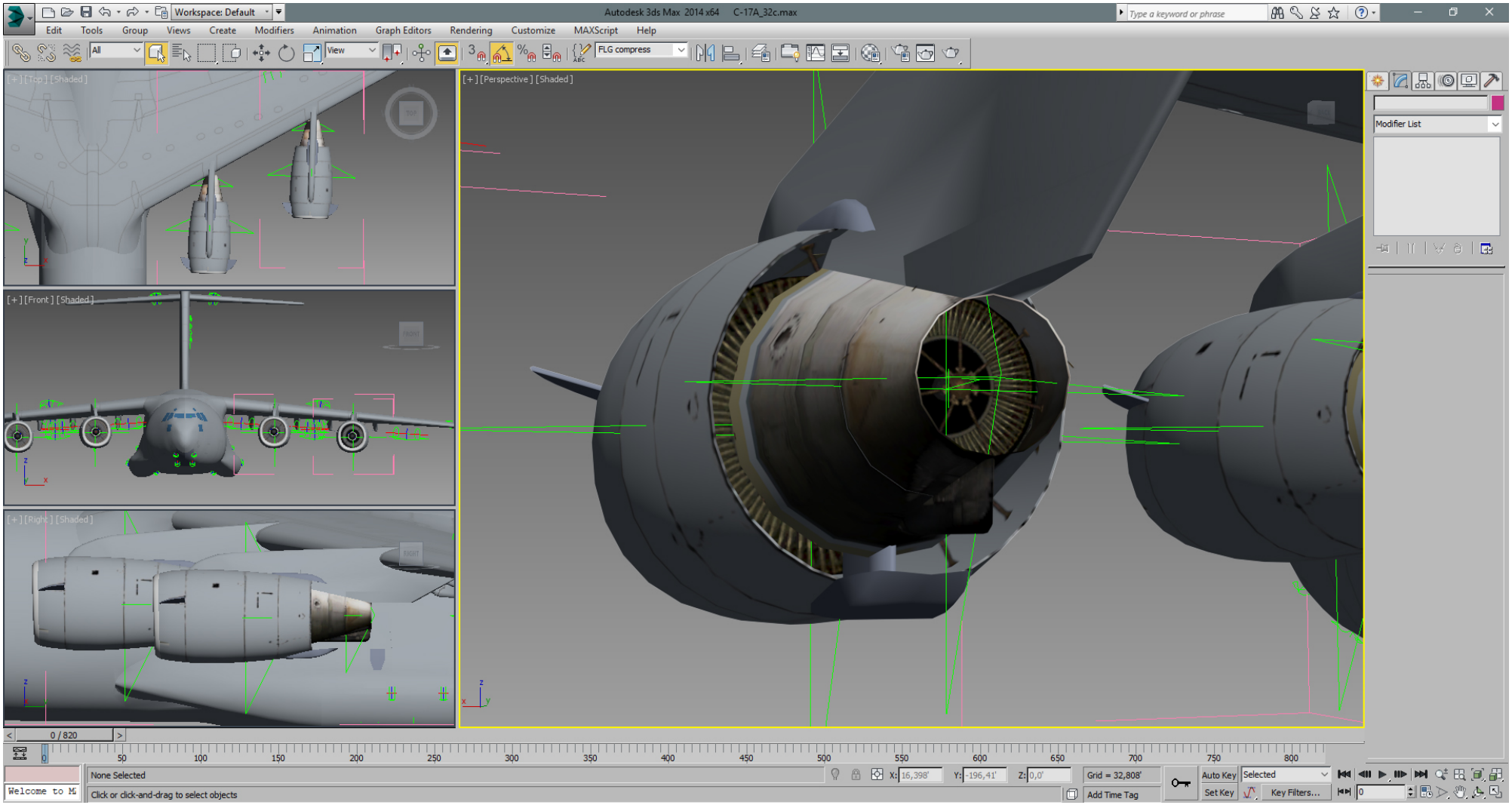
A simpler and cheaper solution would be a switch to show/ hide those plates, but a switch doesn't exist for thrust reverser(s), so we'll hide those plates in the engines geometry and show them using a "Translate"- DOF to move them into place when thrust reverser(s) are active.

Also for tri- saving reasons (only), we have created quadratic planes for the fans, the thrust reverser(s) plates and the struts, and use a pType21 material (with Alpha channel) on a 1024² DXT3 (Hi-Res) texture for them.

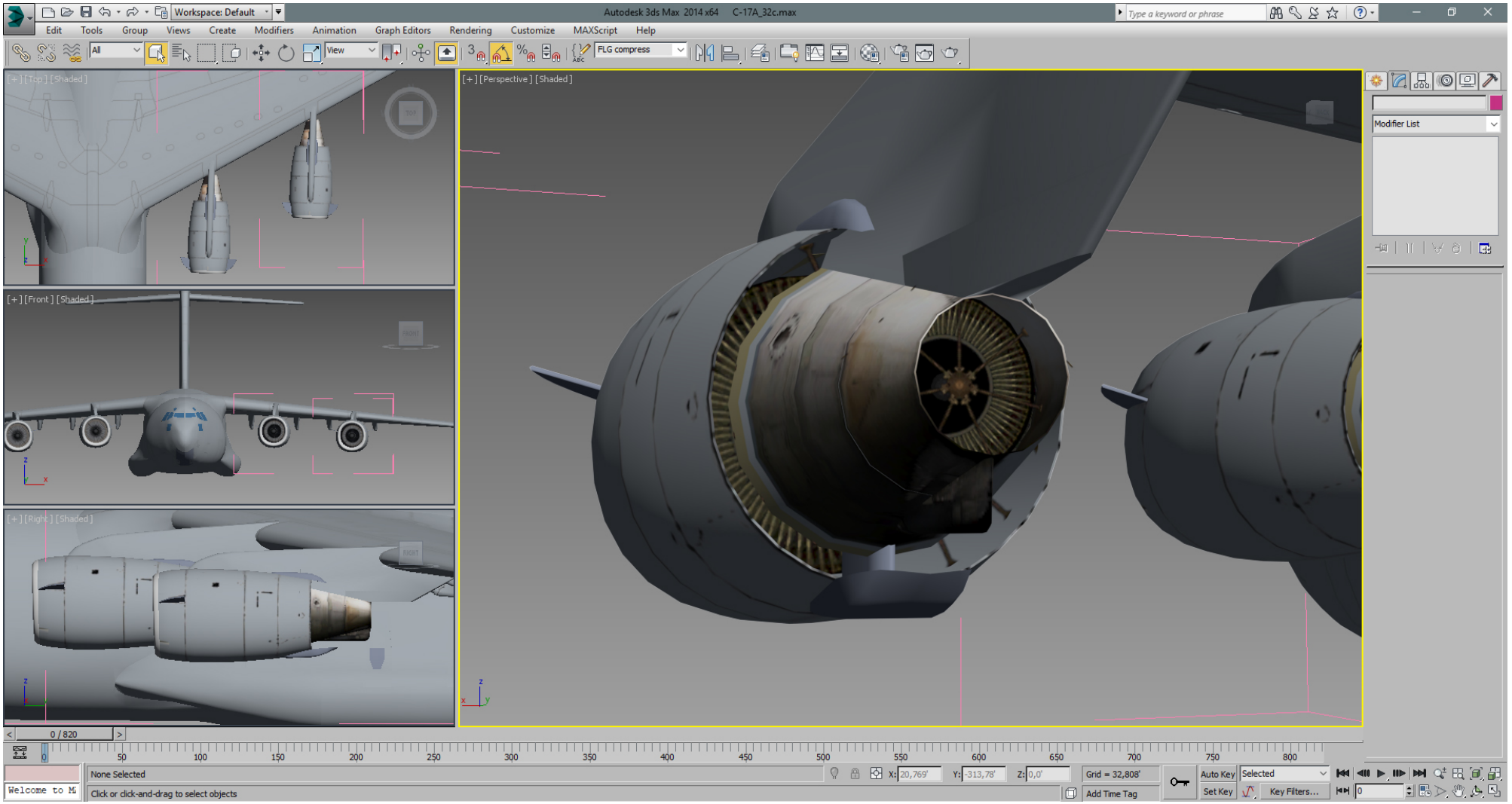
Note the quadratic planes, which got a diagonally cut each (for UVW mapping).



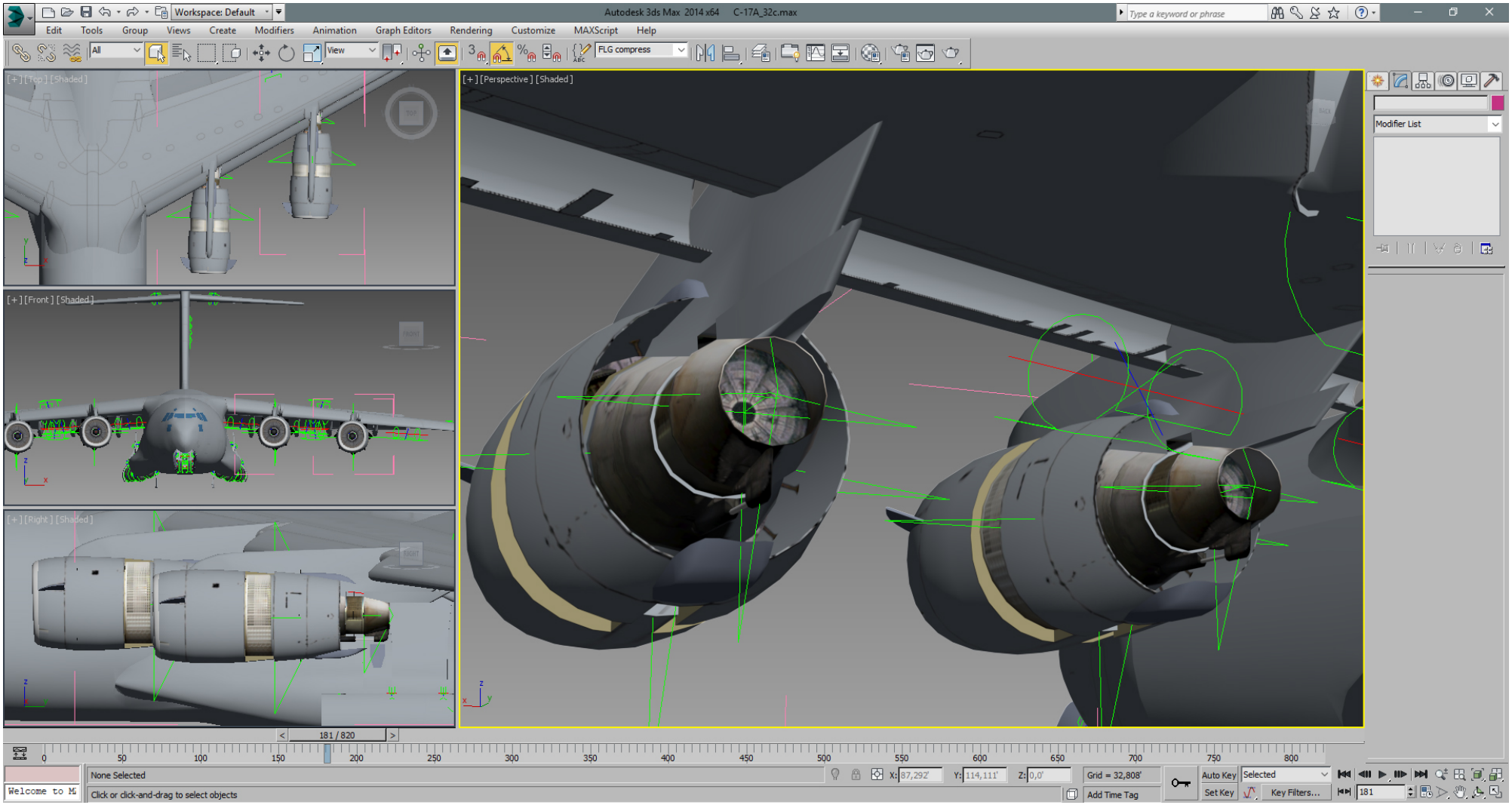
Placed and linked mentioned "Translate"- DOFs to the thrust reverser(s) geometry.



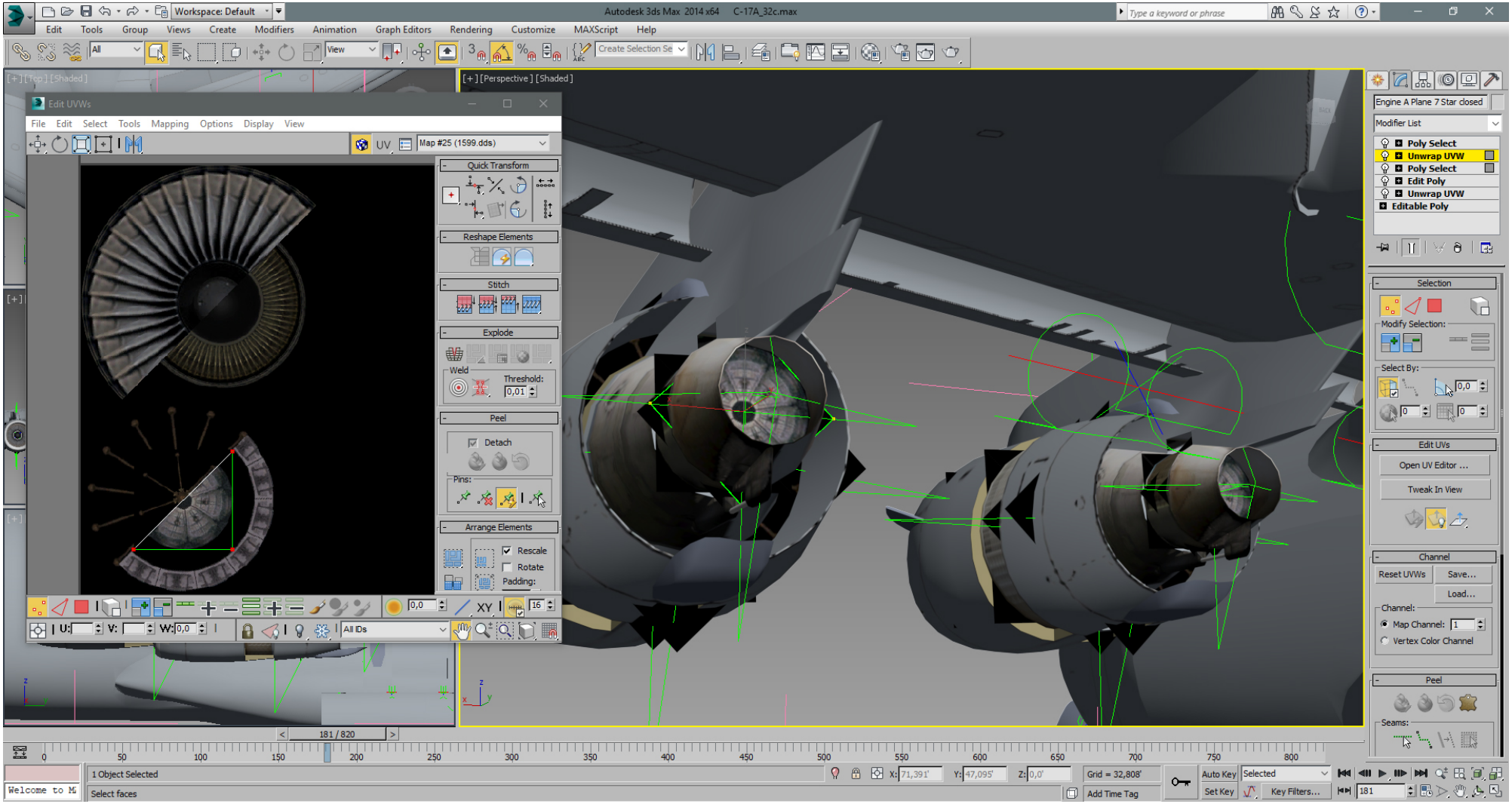
And a clean view (DOFs hidden), whereat 3dsMax has some problems to show transparency textures correctly.



With the thrust reverser(s) activated, we'll see the closed inner plates.

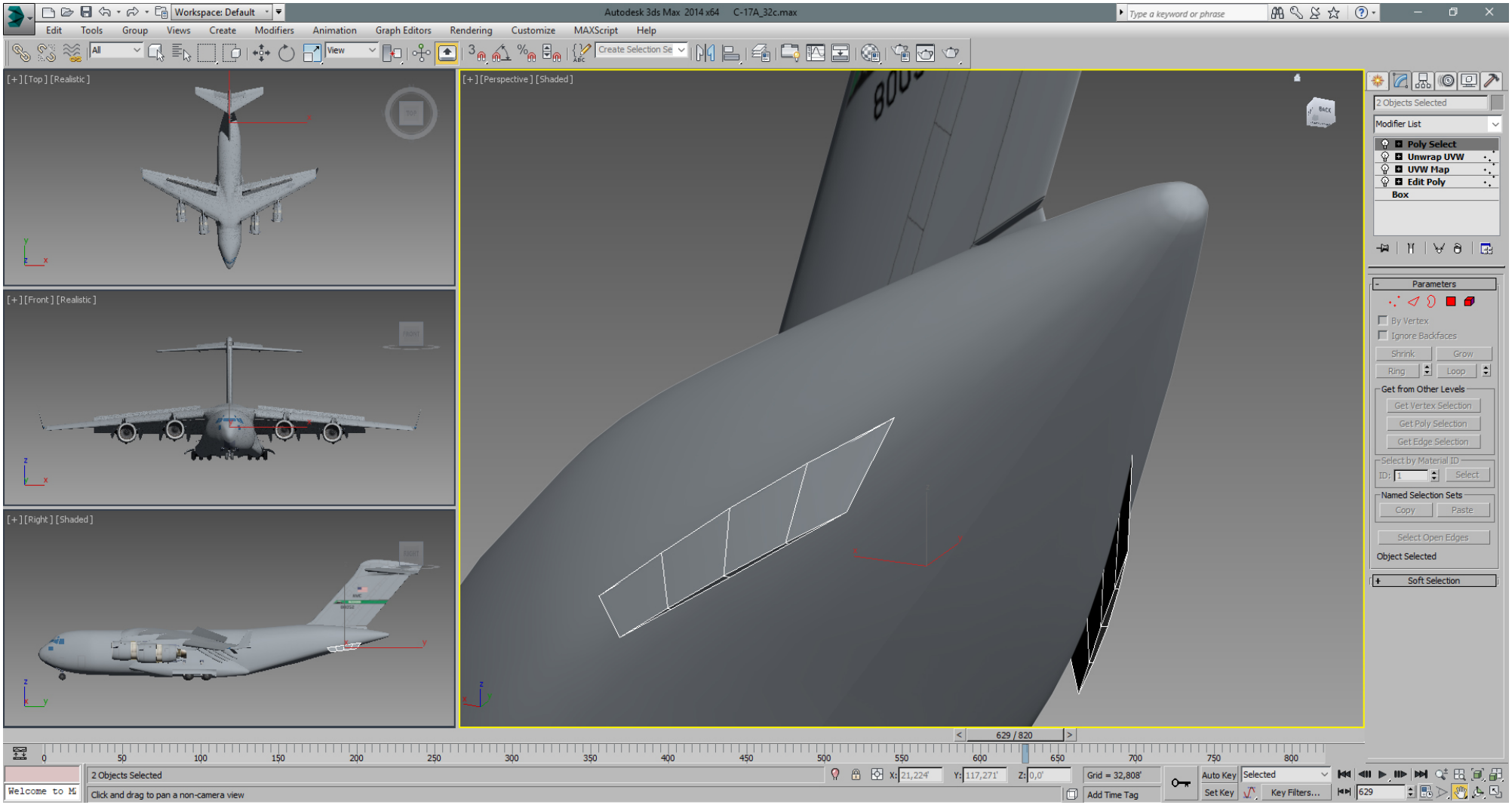


Note the UVW mapping in this pic. Basically it's a quadratic mapping,
then one corner UV vertex has been manually moved to the opposite corner.
Result is a mirrored mapping of just 2 tris, with minimum texture space wasted.

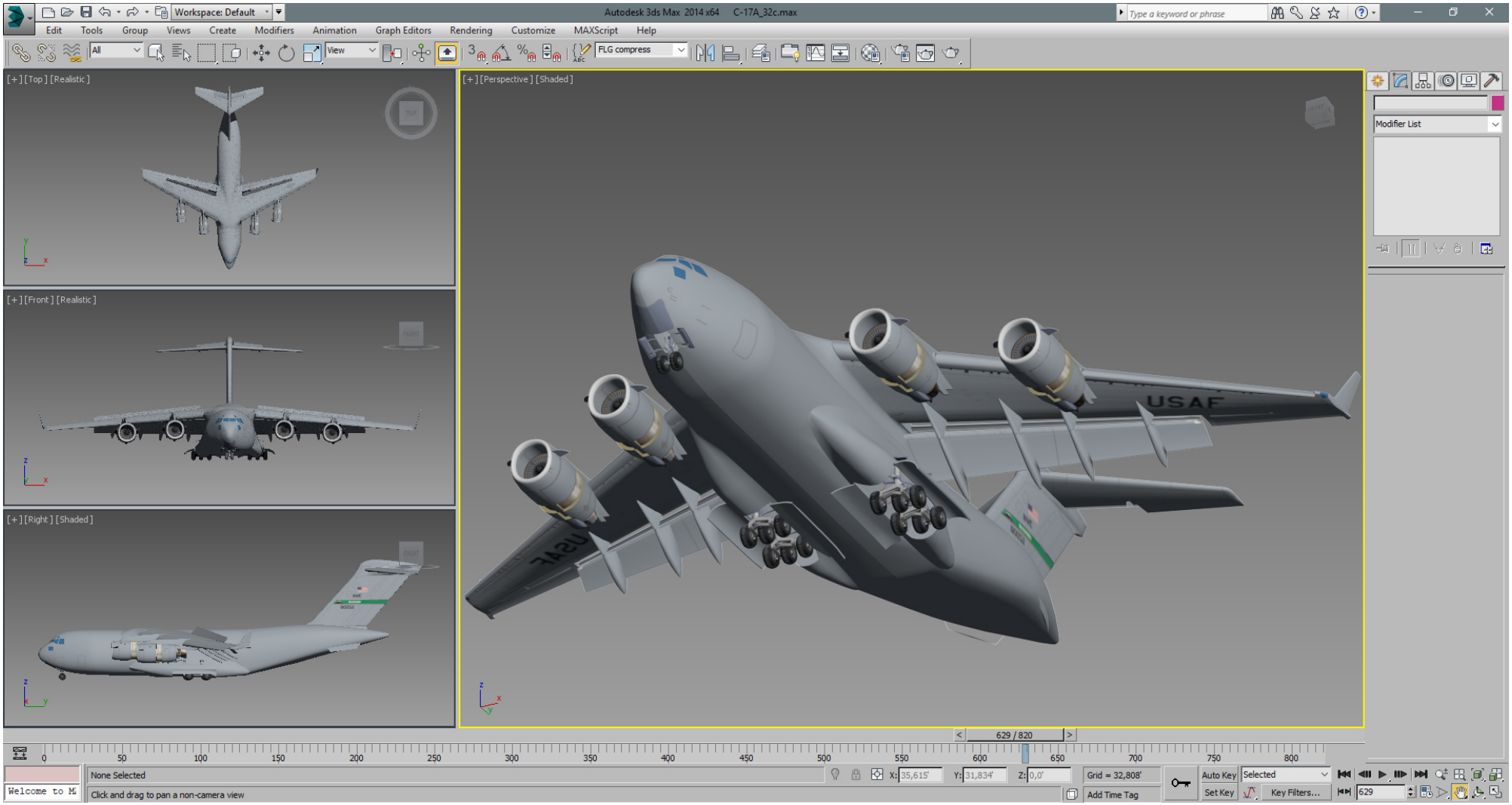


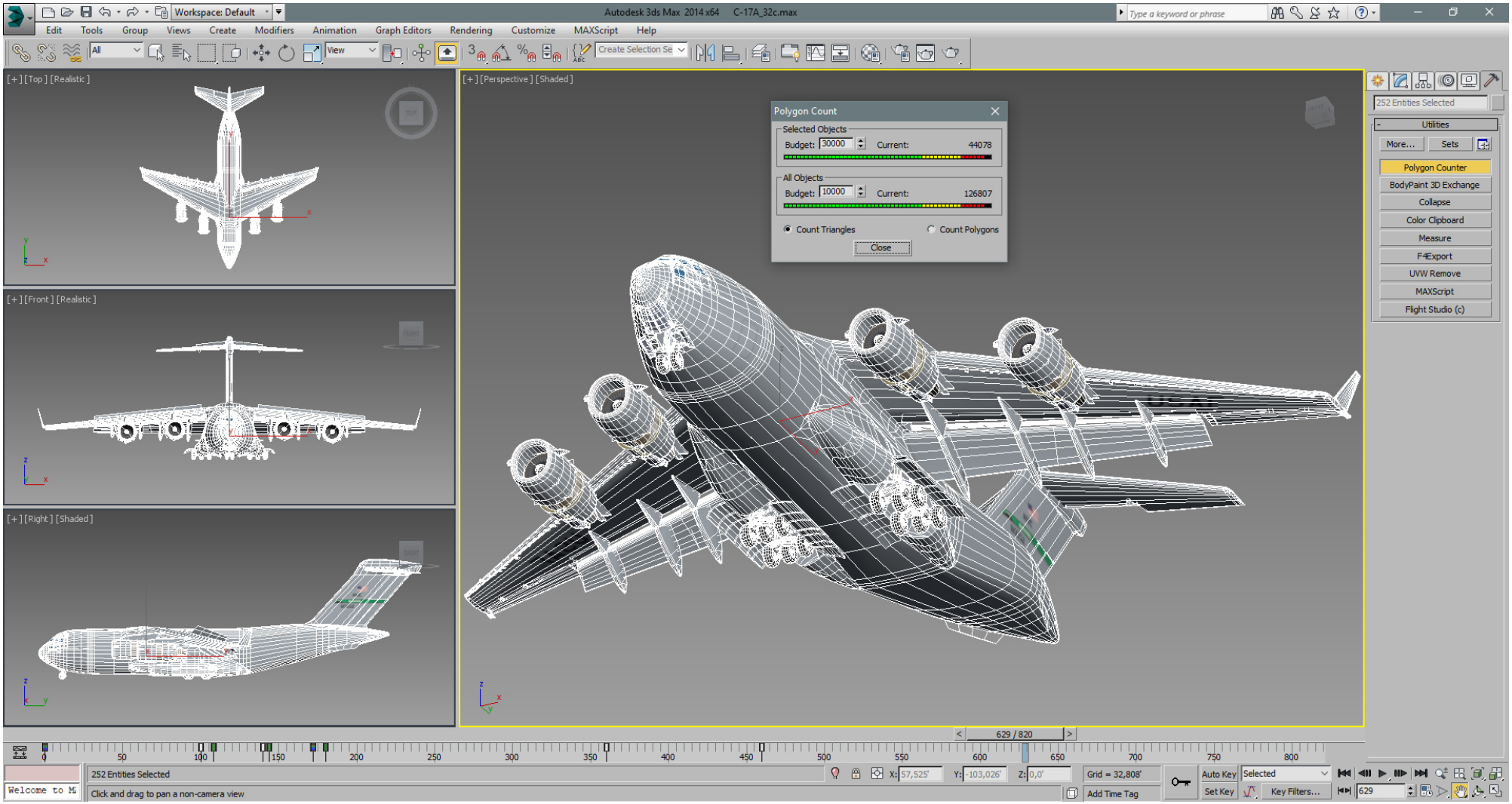
The engines are modeled and animated so far, but might need fine tune when we do the final texture later.

Here we've added back bottom fins to complete the main parts modeling so far.



The overall Tri count at the moment, ... we are "down" to ~44000 tris.




Workspace: Default
Autodesk 3ds Max 2014 x64 C-17A_32c.max
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
[+][Top][Realistic]
[+][Front][Realistic]
[+][Right][Shaded]
[+][Perspective][Shaded]
Polygon Count
Selected Objects
Budget: 30000 Current: 44078
All Objects
Budget: 10000 Current: 126807
Count Triangles
Count Polygons
Close
252 Entities Selected
Utilities
More...
Sets
Polygon Counter
BodyPaint 3D Exchange
Collapse
Color Clipboard
Measure
F4Export
UVW Remove
MAXScript
Flight Studio (c)
629 / 820
252 Entities Selected
Click and drag to pan a non-camera view
Add Time Tag
Auto Key
Selected
Set Key
Key Filters...