How to make parts for KSP

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I have recently figured out how to make mods for KSP, during the process of learning I stumbled upon many problems. I wanted to make this guide to help anyone who is having the same trouble or just wants to make parts.

MAJOR TIP: READ EVERYTHING VERY CAREFULLY!

To start you will need a few things:

1. Programs: Blender, Unity, and a text editor **(Notepad++**, Atom, Microsoft Visual Studio Code, etc.)
2. Knowledge on how to use Blender

That's all I can think of at the moment.

Blender:

Download Blender: https://www.blender.org/download/ (most recent version)

To start the process, first get blender and make a part (I recommend starting with making an engine). Once you have made the part, you need to texture it. Once you do that you will have to export the blender file as a **.fbx** file. Finally store the textures that you used and the .fbx file somewhere safe.

Quick Tip: Remember before exporting, delete the light source and camera while creating the part in blender. If you don't do this, it will mess everything up later on.

If you don't know how to use blender, here are some videos I found very helpful: (none of these videos are mine)

- Blender tutorial: Blender 2.8 Beginner 3D Modeling Tutorial
- How to make an engine for KSP in blender: Blender - Rocket Engine Tutorial
- General KSP parts in blender playlist: Blender
- Parenting Objects in blender (for animating and things): Blender 2.8 Everything About Parenting (In 60 Seconds!)

Unity:

This is where things get complicated. On its own, you will not be able to make the part with just unity. You need to download a plugin created by a KSP dev called KSP PartTools, you also have to modify the TextMesh Pro asset that comes with Unity.

Download Part Tools and alternative version of TextMesh pro, unzip them, and keep on reading: https://forum.kerbalspaceprogram.com/index.php?/topic/160487-parttools-updated/

Steps on how to configure Unity properly:

Step 1: Downloading Proper Version of Unity

You will first need an older version of Unity:

I recommend downloading Unity Hub (for organization)

- **Unity Hub: https://unity3d.com/get-unity/download (click Download Unity Hub, not Unity + download)**
- KSP 1.8.1: Unity 2019.3.15f1 (not tested yet, should work though)
- KSP 1.10+: Unity 2019.2.2f1 (recommended)

Go to Unity Archive (https://unity3d.com/get-unity/download/archive), click **2019.x** tab. Ctrl + F for either "Unity 2019.3.15" or "Unity 2019.2.2" depending on what version of KSP you are intending on making mods for. Now, click the download for Unity Hub (green button).

Now that you have those downloaded, start a new project for your respective version in Unity Hub.

Step 2: Configuring Unity

Check list for what you should have:

1. Your part (the .fbx file) as well as its textures
2. Either Unity 2019.3.15f1 or 2019.2.2f1
3. Downloaded PartTools and older version of TextMesh Pro, both unzipped

If you have all of these, you are ready to proceed.

Once you have created your project and started it up, it may look a little daunting. Its fine, you aren't going to typically use Unity for all that it offers.

To start with the configuration:

Follow the steps to install PartTools and TextMesh Pro properly:

- Uninstall the built in TextMesh Pro from Unity: Go to the "Window" tab at the top --> Package Manager --> Wait for it to load everything (may take a few seconds) --> Select TextMesh Pro and uninstall it.
- Install PartTools (unzip the folder first, DO NOT RUN THE .unitypackage file) - At the top of Unity click "Assets" --> Import package --> Custom Package --> click on the PartTools file and open it. A window should pop up with everything that you are importing, click "All" just to be safe, then "Import". At the bottom of Unity, there might be an error message, that's fine it will be resolved soon.
- Download "TextMesh Pro Release 1.0.56 - Unity 2017.3" from https://drive.google.com/file/d/1QL3NhpYim3xBE-fHAQKJ6B6JowZVxaGt/view and install it, by going to Assets and importing it the same way
- Disable "Validate References" for the KSPAssedCompiler.dll and KSPAssets.dll - At the bottom, in the Project tab, of Unity you will see multiple folders, go into the "Plugins" --> "KSPAssets" --> And click on KSPAssedCompiler.dll and KSPAssets.dll --> On the right of your screen in the Inspector find "Validate References" for each, a disable them (click the box so it is empty, no checkmark).

Good news and bad news:

Good News: you have successfully imported and configured Unity for KSP
Bad News: its broken

The problem is PartTools has a couple lines of code that are just slightly misconfigured. As a result, custom KSP shaders might be missing when you go to texture your part in Unity. But, there is a solution. Thanks to TheHDGDLabel on YouTube for help, all you have to do it replace three lines of code.

Basically, all you have to do is go into where ever you saved your Unity Project and follow these directions (keep the Unity Project open while doing this):

Open up "(project folder)/Assets/PartTools/Shaders/AutoLight.cginc" in a text editor (right click on the file and hit "Open with" and use whatever text editor you want, I recommend Notepad++) and change line 6-9:

from

```
#include "../CustomUnityShadowLibrary.cginc"
#include "HLSLSupport.cginc"

// #include "UnityShadowLibrary.cginc"

(^^ don't want that ^^)
```

to

```
// #include "../CustomUnityShadowLibrary.cginc"
#include "HLSLSupport.cginc"

#include "UnityShadowLibrary.cginc"

(^^ you want this ^^)
```

Make sure to save changes. Once you do all of this, Unity should pop up with a screen similar to the one you got when importing the packages. This window has all of the shaders that failed to compile during the original importation of PartTools, and it was all because of those three lines of code.

Click "Import" and let Unity do its thing.

Finally, once this is done you have a Unity Project that will support you parts forever. You do not need to make new projects every time you make a new part, all you have to do it throw the files that you want in and start modding.

Quick tip: make a Parts folder by right clicking where all of the other folders are to stay organized.

You are finally ready to make your part for KSP, but there is still a lot of work to be done.

Step 3: Making the Part

I really don't feel like typing out the entire process, so here is a really good video from Raiz Space (YouTube) on how to use Unity for KSP parts.

Importing Parts into Kerbal Space Program

Please note: He had some issues with the shading as well, but his problems are different. Since I already explained how to setup Unity, I recommend watching for the exclusive purpose of creating the part. I wouldn't follow his guide on how to setup Unity (not trying to be mean, but it is a little confusing and leads to problems). He starts to face issues at about **11:20 and ends at about 13:25, so if you want just skip that part.

He also goes over how to make the config file, so I recommend watching that too.

Step 4: Creating a Configuration File (config or .cfg) for the Part

This is the easiest part of this entire fiasco.

To start, create a **.txt** file where ever you want. Then rename it to your liking: from "New Text Document.txt" --> to "whatever you want.cfg". Windows will prompt you with a message asking if you want to change **.txt** to **.cfg**, say yes. Once you have done that, right click on it and hit "Open with" and choose Notepad++ or any other text editor you have been using. I strongly recommend Notepad++.

Once you have done that you should have an empty document.

To start, I recommend using a .cfg file that is already created.

Here is a template config file to help you get started, provided by yours truly:

(See bottom if this doesn't work)

Now that you have this, change everything that says "FILL IN HERE" with whatever you want. If you don't know what you are doing, watch the video above.

That is the end of what you have to do, now just make your own folder in KSPs Gamedata directory, put the config file, .mu file, and textures in there and you'll be good. Have fun modding!

Template Config, if file attachment doesn't work:

```
PART
{
	name = FILL IN HERE
	module = Part
	author = FILL IN HERE
	MODEL
	{
		model = FILL IN HERE
	}
	scale = 1
	rescaleFactor = 1.0
	node_stack_top = 0.0, FILL IN HERE, 0.0, 0.0, FILL IN HERE, 0.0, 2
	node_stack_bottom = 0.0, FILL IN HERE, 0.0, 0.0, FILL IN HERE, 0.0, 2

	TechRequired = basicRocketry
	entryCost = FILL IN HERE
	cost = FILL IN HERE
	category = FILL IN HERE
	subcategory = 0
	title = FILL IN HERE
	manufacturer = FILL IN HERE
	description = FILL IN HERE
	attachRules = 1,1,1,1,1
	mass = FILL IN HERE
	heatConductivity = 0.06 // half default
	skinInternalConductionMult = 4.0
	emissiveConstant = 0.8 // engine nozzles are good at radiating.
	dragModelType = default
	maximum_drag = 0.2
	minimum_drag = 0.2
	angularDrag = 2
	crashTolerance = 7
	maxTemp = FILL IN HERE
	bulkheadProfiles = size1
	tags = launch propuls rocket sustain

	EFFECTS
	{
		running_closed
		{
			AUDIO
			{
				channel = Ship
				clip = sound_rocket_hard
				volume = 0.0 0.0
				volume = 0.05 0.6
				volume = 1.0 1.5
				pitch = 0.0 1.2
				pitch = 1.0 2.0
				loop = true
			}
			PREFAB_PARTICLE
			{
				prefabName = fx_smokeTrail_light
				transformName = thrustTransform
				emission = 0.0 0.0
				emission = 0.05 0.0
				emission = 0.075 0.25
```

```
                emission = 1.0 1.25
                speed = 0.0 0.25
                speed = 1.0 1.0
                localOffset = 0, 0, 0
            }
            MODEL_MULTI_PARTICLE
            {
                //modelName = Squad/FX/ks25_Exhaust
                modelName = Squad/FX/hydroLOXFlame
                transformName = thrustTransform
                emission = 0.0 0.0
                emission = 0.1 0.5
                emission = 1.0 1.0
                speed = 0.0 0.8
                speed = 1.0 1.0
            }
        }
        engage
        {
            AUDIO
            {
                channel = Ship
                clip = sound_vent_soft
                volume = 1.0
                pitch = 2.0
                loop = false
            }
        }
        flameout
        {
            PREFAB_PARTICLE
            {
                prefabName = fx_exhaustSparks_flameout_2
                transformName = thrustTransform
                oneShot = true
            }
            AUDIO
            {
                channel = Ship
                clip = sound_explosion_low
                volume = 1.0
                pitch = 2.0
                loop = false
            }
        }
}

MODULE
{
        name = ModuleEnginesFX
        runningEffectName = running_closed
        thrustVectorTransformName = thrustTransform
        exhaustDamage = True
        ignitionThreshold = 0.1
        minThrust = FILL IN HERE
        maxThrust = FILL IN HERE
        heatProduction = 200
        fxOffset = 0, 0, 0
        EngineType = LiquidFuel
        exhaustDamageDistanceOffset = 0.79
        PROPELLANT
        {
            name = LiquidFuel
            ratio = 0.9
            DrawGauge = True
        }
        PROPELLANT
        {
            name = Oxidizer
            ratio = 1.1
        }
        atmosphereCurve
        {
            key = 0 FILL IN HERE
            key = 1 FILL IN HERE
            key = 6 0.001
        }
}
MODULE
{
        name = ModuleGimbal
        gimbalTransformName = gimbal
        gimbalRange = 5.0
}
MODULE
{
        name = FXModuleAnimateThrottle
        animationName = HeatEmissiveAnimation
        responseSpeed = 0.001
        dependOnEngineState = True
        dependOnThrottle = True
```

```
	}
	MODULE
	{
		name = ModuleSurfaceFX
		thrustProviderModuleIndex = 0
		fxMax = 0.5
		maxDistance = 30
		falloff = 1.7
		thrustTransformName = thrustTransform
	}



}
```