

Team Analysis Project Assignment

1 Production Ready Seat Handle Release

Based upon your teams CAD project to create an initial seat handle release design the client would like to order 100,000 completely assembled seats. Now that the initial design has been approved by the client you need to improve and optimize the design to a production ready version that has been validated. This is required before releasing to manufacturing to reduce risk of design issues. The first task is to establish a baseline of the existing design from your completed CAD team project. Using that data several design improvements will be made and validated providing an improved design. Once the final production ready design has been created assembly instructions need to be provided to manufacturing to ensure proper assembly. The following sections will provide additional information on this team project assignment.

1.1 Design Requirements

As a reminder to the objectives of the design the following design requirements have been established for this project. Based on the project approval the client as added a requirement to ensure the design is as light as possible. Please ensure your revised submitted design addresses all of these requirements.

1. There will be 100,000 of seats produced so the design must be designed for high volume production.
2. Design a handle release mechanism that mounts and pivots around the center of the hole marked as “A” in the below image and connect to hole “B” to pivot part “C” marked that releases the back seat to pivot.
3. The pin that would go into the hole of the frame marked as “A” in the following image needs to be **pressed fitted** to be held into place or **welded** to the frame. The pin should be fixed to the side of the seat frame.
4. The new design must be capable of being assembled by hand with modest hand tools only to lower manufacturing and assembly costs.
5. The new complete design cannot have more than nine (9) new parts to complete the project.
6. Design a new plastic switch pad that matches the theme of the handle and hand mounts onto the provided electrical switch. See the image below for additional information.
7. The final assembly must include the provided side plastic cover shield part with the new handle part on the outside. This is important due to the assembly sequence to ensure the handle can be on the outside of the plastic cover shield.

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8. There must be a spring added to the mechanism so there is tension force applied to the handle so it remains in the down position until force is applied to lift the handle upwards.
9. To ensure the handle has a home down position and a maximum up position design your mechanism to hit the seat frame as marked for hard stops limiting the movement of the handle.
10. The handle must be firmly fixed to the mechanism so the handle will not become loose or pull off.
11. To help improve the overall weight of the seat resulting in improved fuel efficiency your handle release design needs to be as light as possible while achieving all requirements.

Mounting Positions

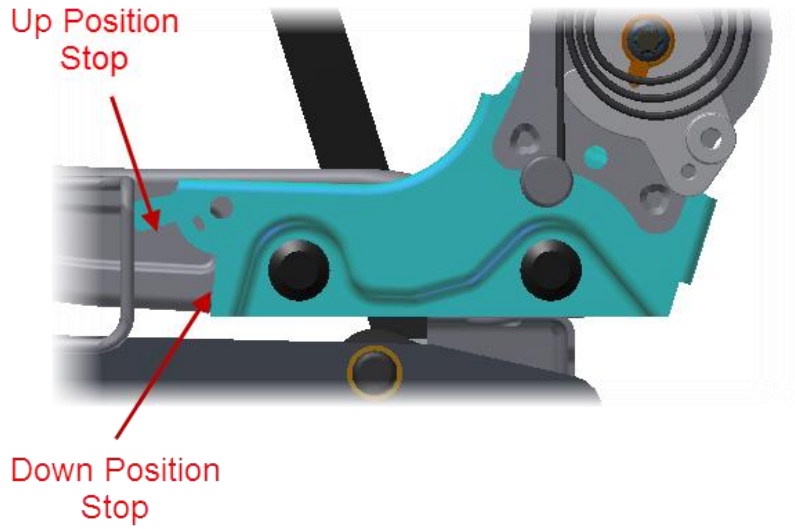


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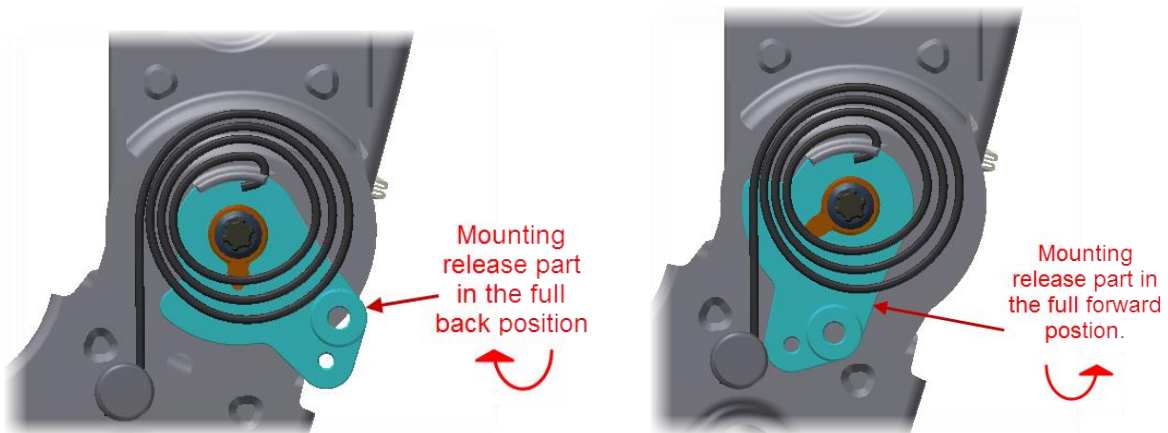
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Hard Stop Positions



Release Cam Pivot Positions



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1.2 Provided Items

The Autodesk Inventor design file you created and used during the CAD team project assignment should be used as your starting design. If required the following files are available from the CAD team project assignment.

Part Image	File Name	Description
	2012-5-1005.ipt	Side plastic cover shield for seat
	2012-5-1006.ipt	Power seat motor control switch
	2012-4-1011.ipt	(Optional Use) Spring
	Team Project 1 Seat Assembly Files.zip Seat Assembly.iam	Seat Assembly and parts

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1.3 Project Requirements

To complete the team project the following items need to be completed at a minimum. These items will be used for the team presentation material and project grading.

1. Nonlinear Analysis

Complete one of the following two options for a nonlinear analysis to validate your design.

- **Switch Pad Cover Connection**

The newly designed switch pad cover needs to be snapped onto the electrical switch. The part needs to be pushed on my hand and stay snapped to the electrical switch. No more than 15 lbs (67 N) of force should be required to snap the switch pad onto the switch. The switch pad must also require at least 20 lbs (89 N) to remove the switch pad from the switch after being pushed on. Complete a nonlinear analysis in Autodesk Simulation showing the performance of the final design providing validation to the force requirements.

Note: To improve performance you will need to reduce model detail on the electrical switch part to only contain the geometry where needed.

- **Snap or Clip Plastic Part Fit**

With the requirement for general hand assembly of most the components in your handle release design select one part that is designed with plastic that has a snap fit or clip fit. Complete a nonlinear Analysis in Autodesk Simulation to validate the parts performance and force required for assembly.

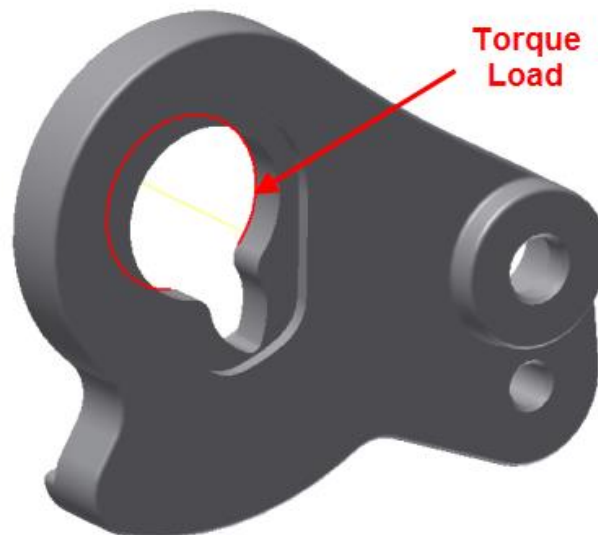
2. Component Improvement based on FEA Results

Select one of your components within the mechanism and complete a FEA analysis on the initial design to establish a baseline. The baseline results should provide the safety factor of the part, material, weight, and material volume used. From this baseline modify the component design in Autodesk Inventor to improve the design so that the component has a higher safety factor and is lighter than the initial design. Provide FEA results for the baseline and new improved design and also highlight the design changes that were made based from the FEA results.

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3. Dynamic Simulation

The handle release mechanism needs to successfully unlock the back cam to release the seat back. There are two springs attached between the seat back and main seat lower frame to apply pressure to the back. To simplify the dynamic simulation a torque load of 150 lbf-in (16950 N-mm) should be added to the release bracket part shown below that is about the center axis marked. This will assist in reducing components in the simulation. The goal of the simulation is to overcome this torque and rotate the release bracket with the handle mechanism. The handle should be able to be raised using normal hand pressure to make this required movement. Provide information on the forces and requirements of the mechanism that lead to an improvement in your design based on the results in your presentation.



4. Assembly Instructions

Once the final design has been completed use Autodesk Inventor Publisher to produce an assembly instructions video for the mechanism. The assembly instructions need to provide manufacturing all of the requirements to properly assemble the handle release mechanism and side shield plastic cover.

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1.4 Final Analysis Project Deliverables

Outlined below are the project assignment deliverables, grading elements, and assignment schedule.

Final Presentation Requirements

The following elements are required to be submitted to complete the project assignment.

- Submit a created presentation video with audio narration showcasing all four of the project requirements at minimum. The video should be no longer than five (5) minutes long.
 - Camtasia Relay **MUST** be used
 - Submission is only available while connected to the Carnegie Mellon Network
 - Camtasia Relay will publish the following formats:
 - Flash
 - Silverlight
 - MP4
- The following four project requirements need to be showcased within the presentation video:
 1. Nonlinear Analysis
 2. Component Improvement based on FEA Results
 3. Dynamic Simulation
 4. Assembly Instructions
- The intended audience of this video is a presentation for the automotive client to provide validation of the final proposed design before releasing to manufacturing.
- Submit analysis reports and screen captures of the various analysis studies completed.
- Submit a video file of final Autodesk Inventor Publisher assembly instructions.

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1.5 Project Assignment Schedule

- **Interim Report**
 - Submit project task list with team member task assignments
 - Please submit all materials into the team AFS directory
 - **Due: November 21 (Thu) 6pm, 2013**

- **Final Report**
 - Submit Autodesk Inventor model files and DWG files
 - Submit PowerPoint report file
 - Submit 5 min design presentation video (with audio explanation)
 - **Due: December 4 (Wed) noon, 2013**

- **Presentation**
 - **8:15am-10:20am December 5 (Thu), 2013**

1.6 Grading Elements

The following elements will be used to determine the final team grade for the assignment.

Elements

- Nonlinear Analysis Requirement
- Component Improvement from FEA Results Requirement
- Dynamic Simulation Requirement
- Assembly Instructions
- Presentation and Video Quality