

# ME 24-688 – Week 11

## Problem Set Assignment

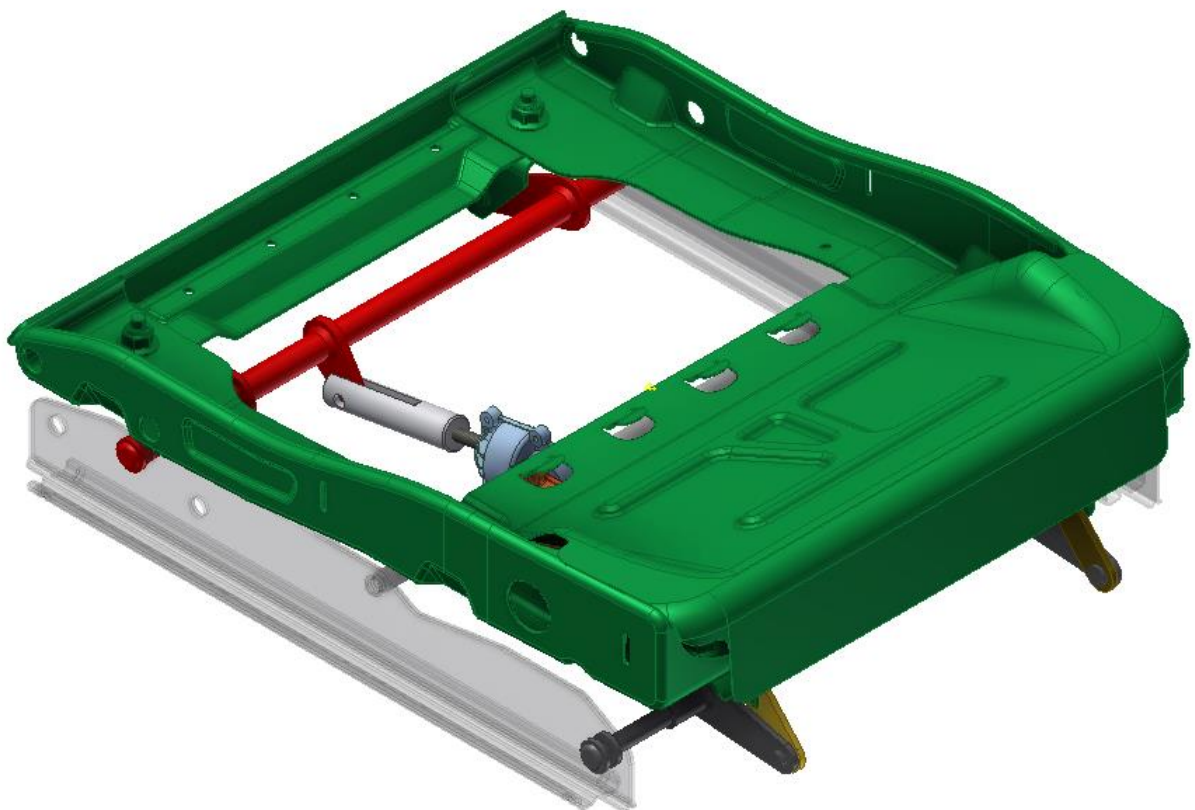
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### 1 Automotive Seat Lift Motor Selection Project

The automotive seat manufacturing company is in the process of completing the design of a new seat for a client. Several of the components have already been released to manufacturing and are being produced today. The current design is based off a previous design and uses the 1401 series motor for the two lift motors. These motors control the tilt and height of the power seat and have functioned well on past designs.

To lower the cost of the seat and to utilize the existing built up inventory the company would like an analysis completed to evaluate the impact and requirements of using a different motor. The design must first be analysis in the current condition to establish a baseline of the performance. To complete the analysis the original motor will be used and to comply with regulatory requirements the seat must be capable of lifting a load of 600 pounds.

The goal of the revised design is to utilize the new 1302 series motor without drastically impacting the upward travel distance and the time required to reach max height. A loss of up to 10 mm of travel and an increase of up to 2 seconds in cycle time have been identified as acceptable. The two lift bar components as noted in the following sections have not been completed and can be changed to improve the design with the new proposed motor. To complete the assignment utilize the dynamic simulation capabilities of Autodesk Inventor Professional and the additional information provided.



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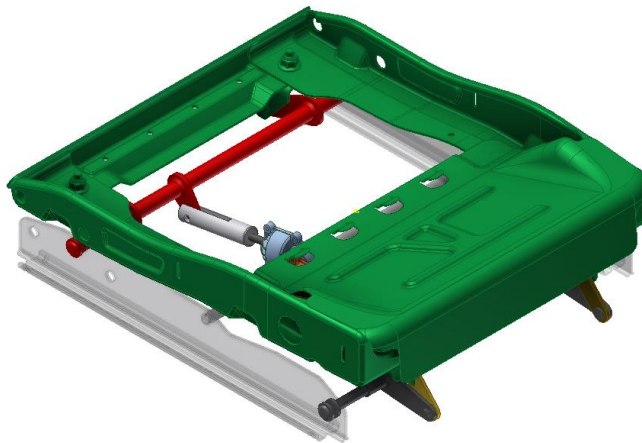
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### 1.1 Provided Items

The following items have been provided to complete the assignment.




#### Design Assembly Model

The Autodesk Inventor assembly model *2012-2-0000.iam* has been provided as the existing design. Within these files several dynamic simulation joints and an iLogic rule to switch out the motor have already been setup to save time. This design needs to be modified as required to support the new 1302 series motor.



#### Motor Options

Listed below are the available motors and their properties.

Image	Series	Diameter mm	Diameter in	Length mm	Length in	Torque Nmm	Torque Oz-in	Power kW	Power Hp	RPM	Cost
	1302	33	1.3	50.8	2	49.4	7	37.2467	0.05	7200	\$ 25.00
	1303	33	1.3	63.5	2.5	60	8.5	49.0088	0.0657	7800	\$ 40.00
	1401	43	1.7	38	1.5	89.6	3	79.7546	0.0253	8500	\$ 80.00

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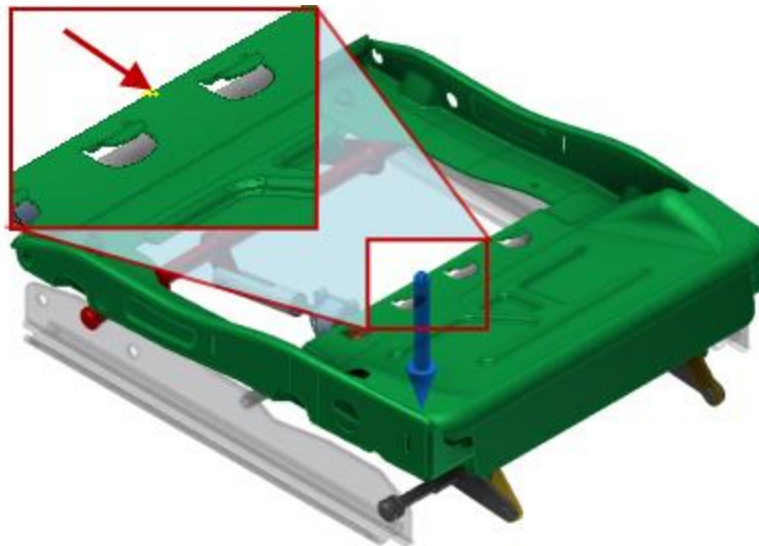
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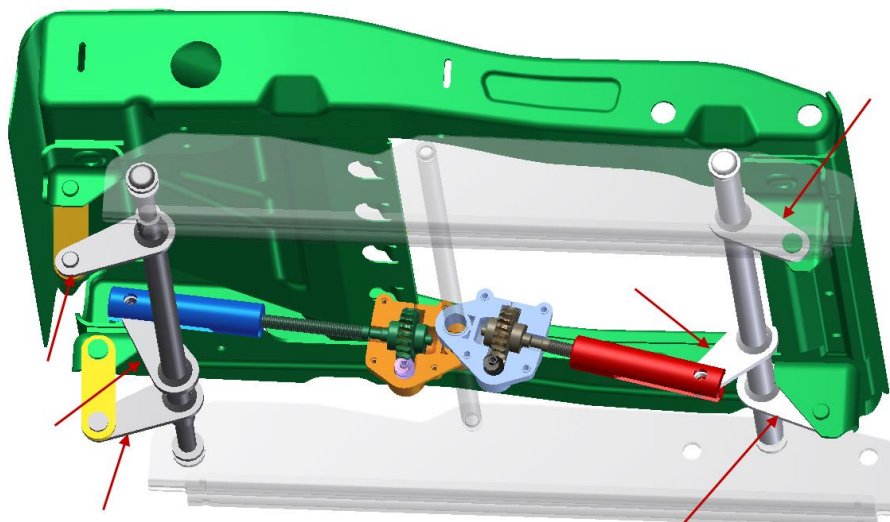
### 1.2 Requirements

Outlined below are the assignment requirements for the new design.

- There should be a force of 600 lbf applied in the negative Z-Axis direction on the workpoint marked below.



- The motor speed from the iLogic rule should be an imposed motion on the Standard Revolution joints for the Worm Front and Rear gear parts.
- The only geometry modification that can be made at this time is changing the length of the arms on the lift bars as shown below. The lift bars are the *2012-2-3000.iam* and *2012-2-4000.iam* components.

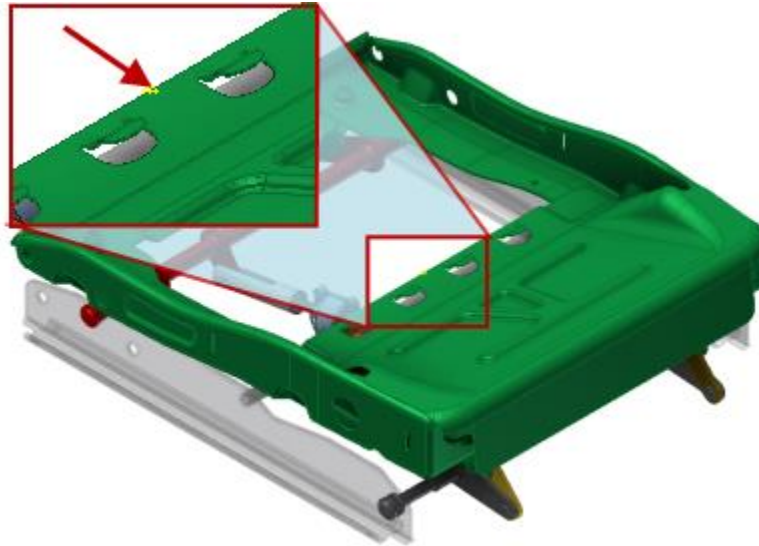


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- The new proposed design that utilizes the new motor must have as close as possible vertical up travel movement as the starting baseline design. The base line motor runs for 2.0 seconds. The workpoint as shown below placed on the top frame pan component should be used to trace the travel in the Z-Axis direction.



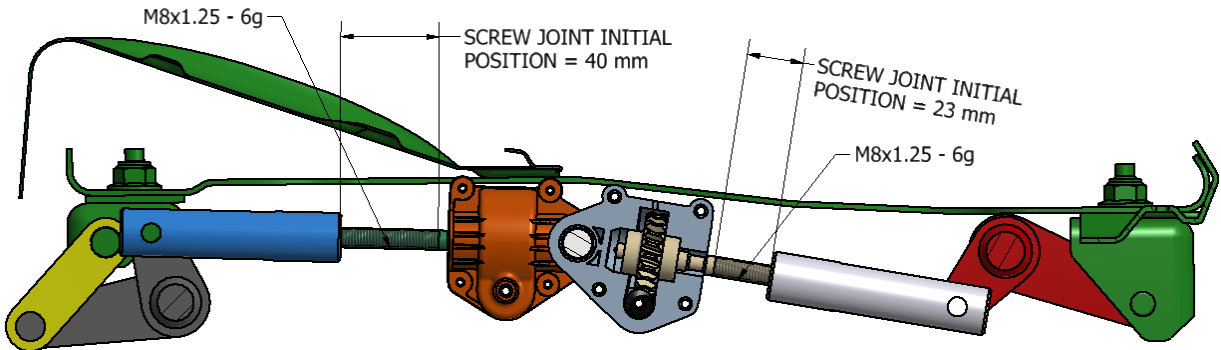
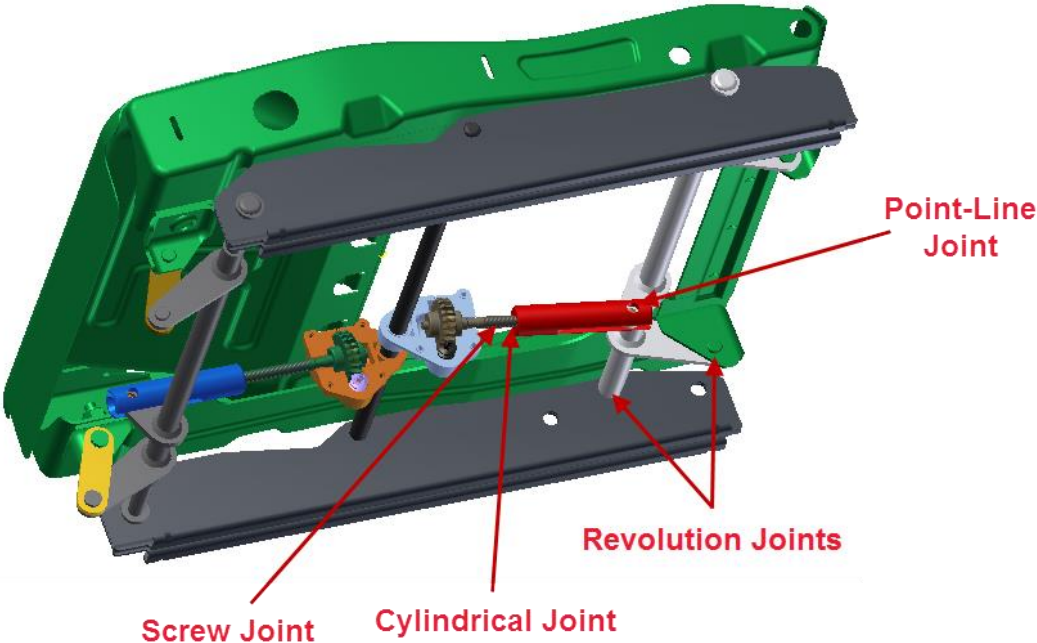
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### 1.3 Instructions

The images below outline several instructions for completing the joints within the provided assembly to simulate the baseline design and proposed new design. The front part of the seat as already been assembled using dynamic simulation joints as you can review within the provided models.



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### 1.4 Final Deliverable

The main tasks of this problem set assignment are: (1) to determine the current as-is condition using the 1401 series motor, and (2) to revised the design to support the 1302 series motor.

Under your AFS submission directory, create a folder called “ps9” (lower case) and submit the following four items:

- (1) Current design simulation result file (IAA). Name the file: ps9\_firstname\_lastname\_current.iaa
- (2) A txt file that describe the current design. Name the file: ps9\_firstname\_lastname\_current.txt
- (3) Revised design simulation result file (IAA). Name the file: ps9\_firstname\_lastname\_revised.iaa
- (4) A txt file that describe the revised design. Name the file: ps9\_firstname\_lastname\_revised.txt

Note: download the template txt files from the class web page.

### Current Design

- Current Simulation time.
  - 2.0 s
- Current Max Torque from both Worm Gears imposed driving force.
  - WORM FRONT Revolve - U\_Imposed = **XX.X N mm**
  - WORM REAR Revolve - U\_Imposed = **XX.X N mm**
- Current Vertical distance travel in the Z-Axis of the workpoint as noted in the requirements section for the baseline design in millimeters.
  - Vertical Distance Traveled = **XXX.X mm**
- Current initial position of the Screw Cylindrical Joints resulting in no interference.
  - SCREW\_FRONT initial = 40 mm
  - SCREW\_REAR initial = 23 mm
- The dimensions for the lift bar arms that mount the screen drive. The dimension value provided should be the distance between the two holes on the following parts in millimeters.
  - 2012-2-3003.ipt = 30 mm
  - 2012-2-3004.ipt = 60 mm
  - 2012-2-4002.ipt = 30 mm
  - 2012-2-4003.ipt = 60 mm



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### Revised Design

- Revised Simulation time.
  - **X.X s**
- Revised Max Torque from both Worm Gears imposed driving force.
  - WORM FRONT Revolve - U\_Imposed = **XX.X N mm**
  - WORM REAR Revolve - U\_Imposed = **XX.X N mm**
- Revised vertical distance travel in the Z-Axis of the workpoint as noted in the requirements section for the baseline design in millimeters.
  - Vertical Distance Traveled = **XXX.X mm**
- Revised initial position of the Screw Cylindrical Joints resulting in no interference.
  - SCREW FRONT Cylindrical dof 2 (t) Initial Position = **XX mm**
  - SCREW REAR Cylindrical dof 2 (t) Initial Position = **XX mm**
- Proposed dimensions for the lift bar arms that mount the screen drive. The dimension value provided should be the distance between the two holes on the following parts in millimeters.
  - 2012-2-3003.ipt = **XXX mm**
  - 2012-2-3004.ipt = **XXX mm**
  - 2012-2-4002.ipt = **XXX mm**
  - 2012-2-4003.ipt = **XXX mm**

### 1.5 Grading

The problem set grade will be determined based on the following items:

- 25% = Current design simulation result file (IAA). Name the file: ps9\_firstname\_lastname\_current.iaa
- 25% = A txt file that describe the current design. Name the file: ps9\_firstname\_lastname\_current.txt
- 25% = Revised design simulation result file (IAA). Name the file: ps9\_firstname\_lastname\_revised.iaa
- 25% = A txt file that describe the revised design. Name the file: ps9\_firstname\_lastname\_revised.txt