

# **Window Regulator System Analysis Using ADAMS View Parametric Modeling**

**Yong Kong**  
*EDS*

**Brett Harris**  
*MDI*

**May 15, 1996**

*1996 International ADAMS Users Conference, Ypsilanti, Michigan*



# Background

- **A significant portion of total passenger car warranties are door related**
- **The most common problems are unstable glass motion, high crank handle effort, unevenly distributed weather strip seal pressure which causes wind noise and water leakage**
- **Time consuming process to compromise the location of regulator system to meet both door packaging and glass stability requirements**



# Needs

- **There is a need to conduct "what if" study in the early phase of vehicle development process to optimize design and reduce subsequent change cost**
- **Help design engineers to understand how the various design parameters effect system stability in both qualitative and quantitative manner**



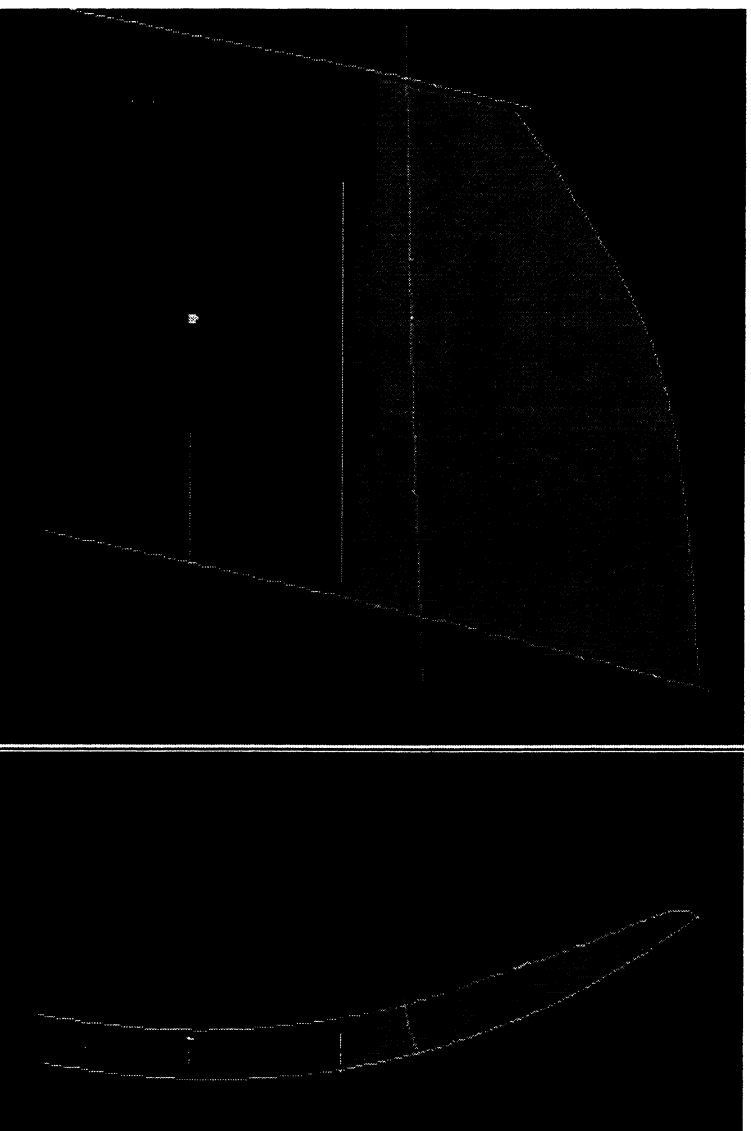
# Approaches

- **Take full advantage of ADAMS View macro parametric capabilities**
- **Parameters are:**
  - \* **Regulator location, orientation, geometry, and material properties**
  - \* **Seal properties**
  - \* **Motor motion and torque**



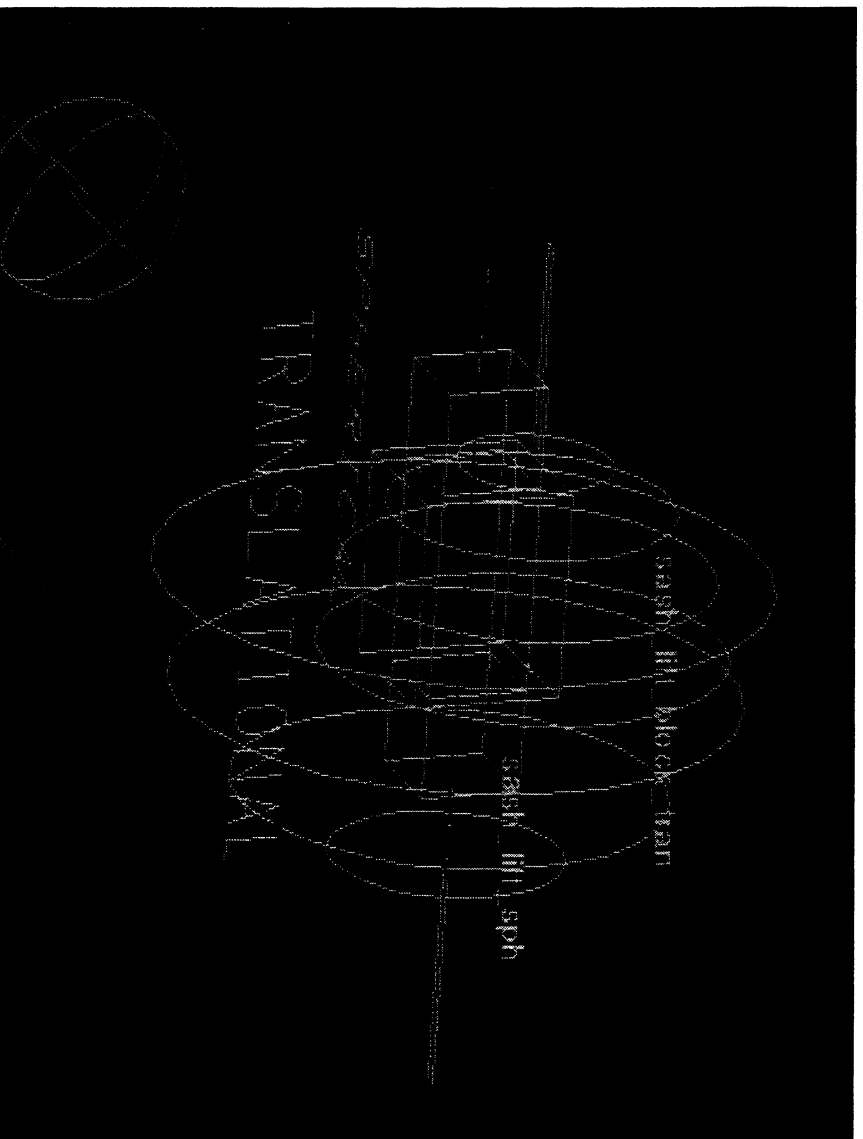
# Cross Arm Model

- **Cross arm model review: parts, constraints, and forces**
- **Primary design variables: location and orientation of regulator**



# Detail Setup

**Detail Setup of the parametric model: regulator plane,  
cross arm beam element force**



# DOE Study

- **Objective:** Finding average balance moment at lift point in global Y direction from full up to full down
- **Design variables:** lift point location and regulator plane angle
- **Range:**
  - +60 to -45 mm wrt glass C.G. location along x axis
  - +4 to -8 deg about vertical direction
- **Number of study for DOE:** 49 (7 by 7)

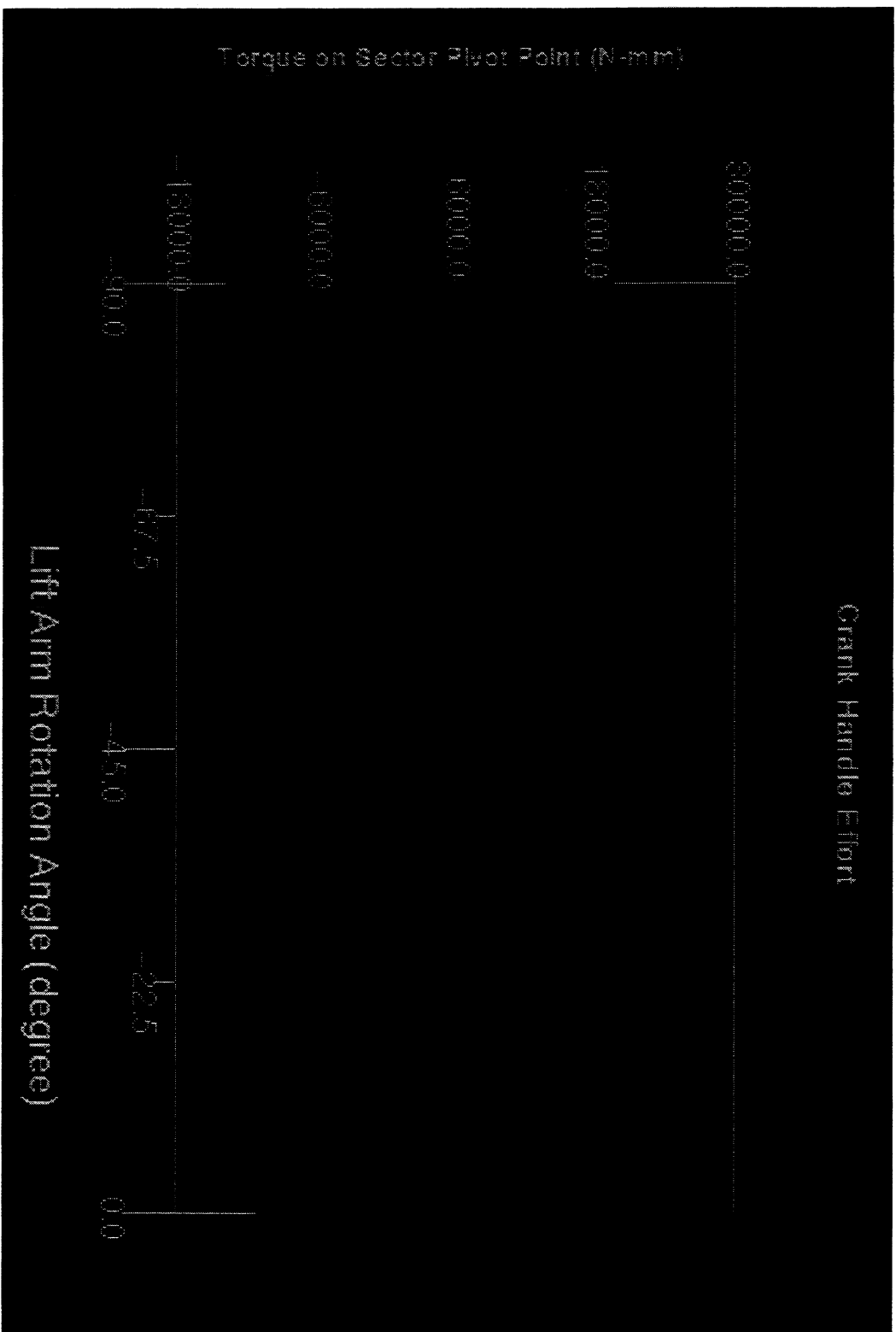


# Plot #1: Uneven Header Seal Force

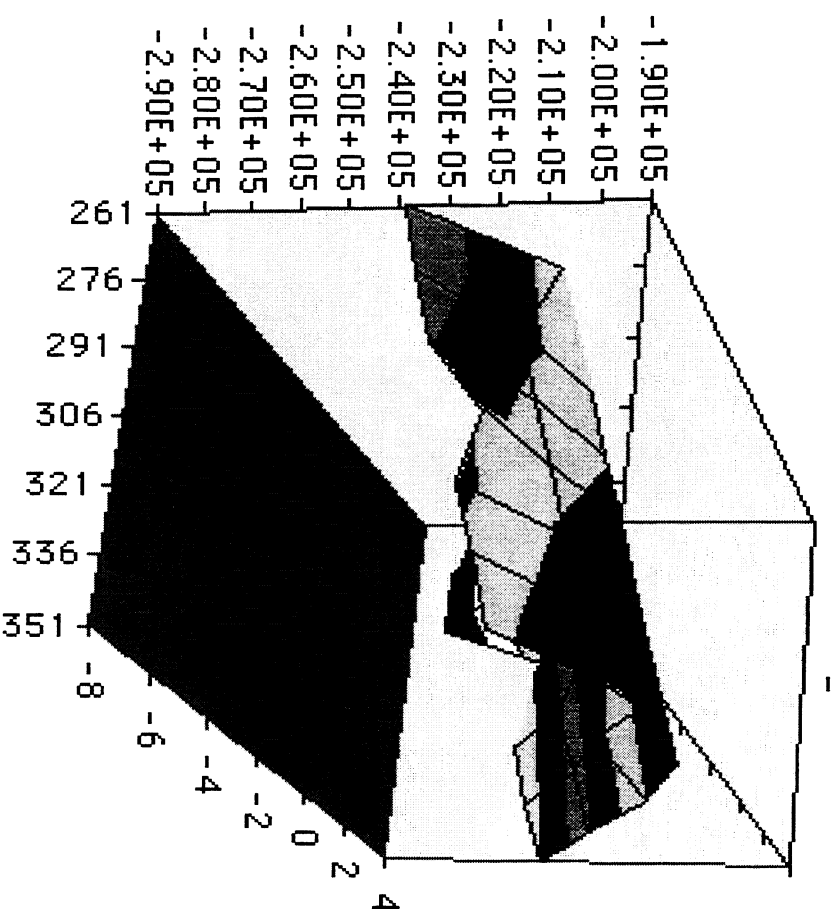




# Plot #2: Crank Handle Effort



# Plot #3: Results Presentation in 3D



■	$-2.00 \times 10^5$	--	$-1.90 \times 10^5$
■	$-2.10 \times 10^5$	--	$-2.00 \times 10^5$
□	$-2.20 \times 10^5$	--	$-2.10 \times 10^5$
■	$-2.30 \times 10^5$	--	$-2.20 \times 10^5$
▨	$-2.40 \times 10^5$	--	$-2.30 \times 10^5$
■	$-2.50 \times 10^5$	--	$-2.40 \times 10^5$
▨	$-2.60 \times 10^5$	--	$-2.50 \times 10^5$
□	$-2.70 \times 10^5$	--	$-2.60 \times 10^5$
■	$-2.80 \times 10^5$	--	$-2.70 \times 10^5$
▨	$-2.90 \times 10^5$	--	$-2.80 \times 10^5$

# Conclusions

- **View macro can be used to build parametric window system models for stability study. DOE can be conducted to quickly evaluate design parameters**
- **Using parametric modeling techniques accelerates the process of understanding the new designs**
- **It improves the quality and reduces cost of the window regulator system design process**

