

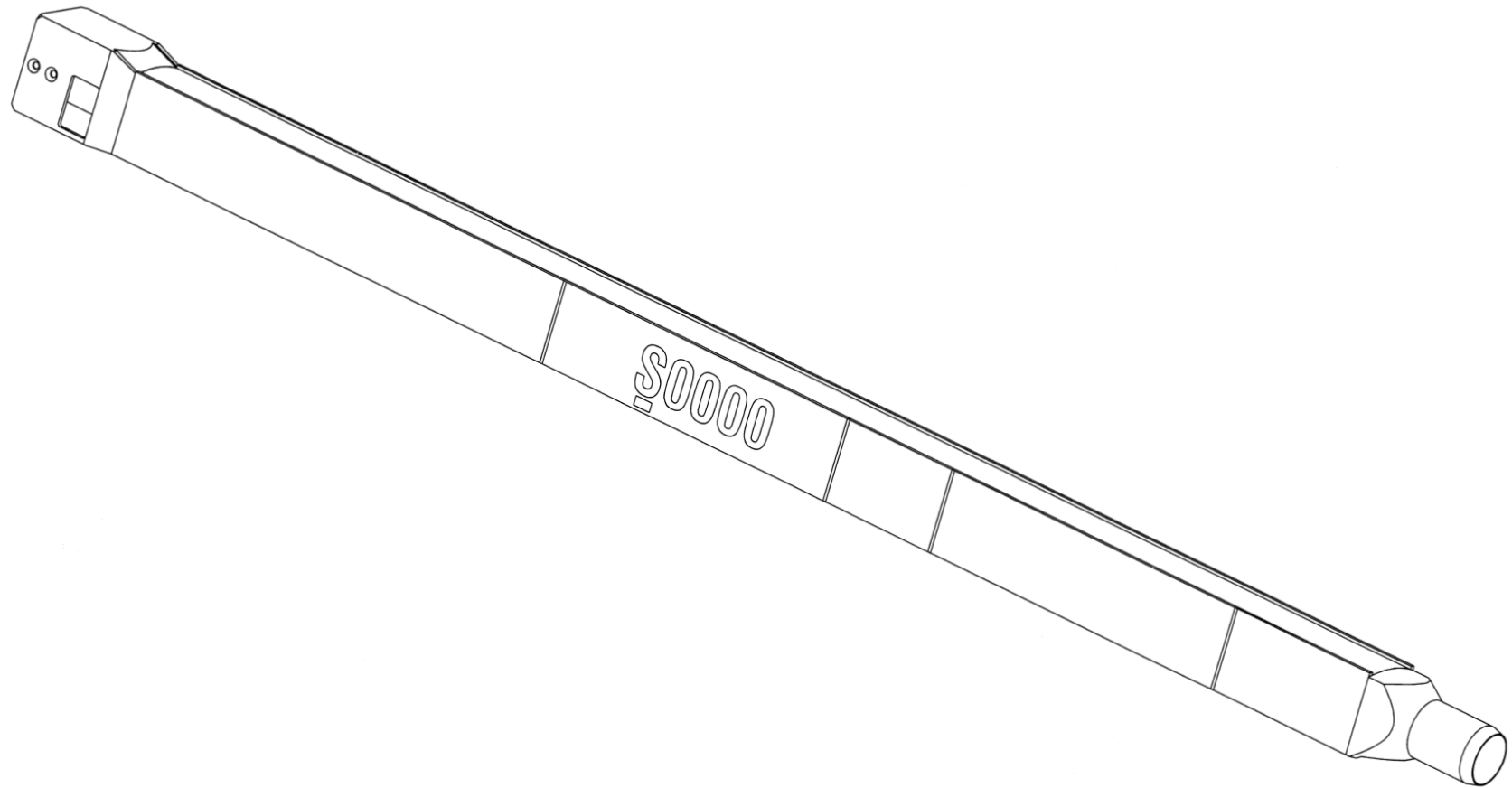


# Modifications to the NBSR Fuel Element Transfer Head

TRTR/IGORR 2010

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▶ NBSR FUEL ELEMENT

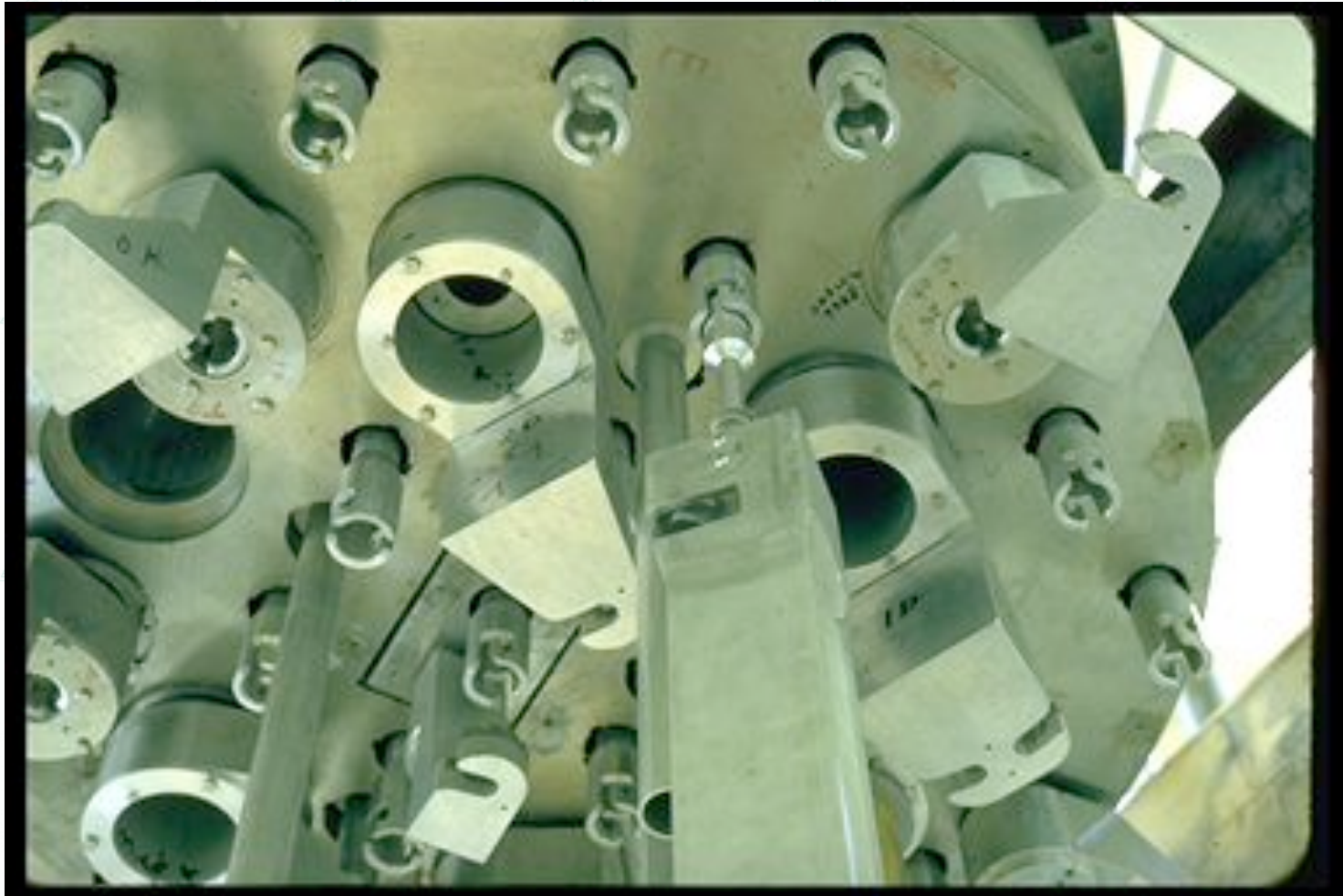




▶ ATTACHING TRANSFER HEAD TO FUEL ELEMENT



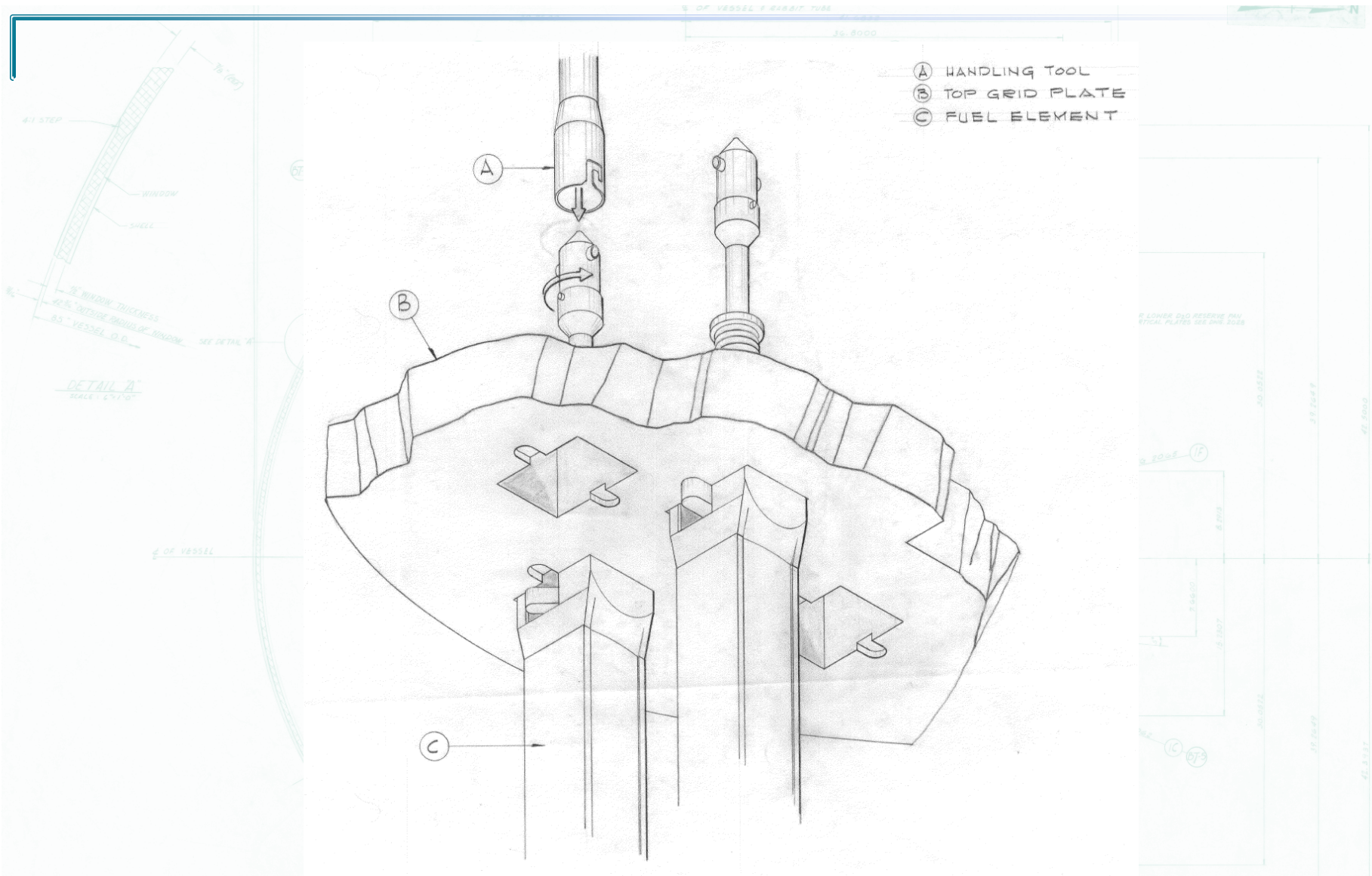
▶ ALIGNING TRANSFER HEAD



- ▶ Transfer head is manipulated by pickup tools and transfer arms



▶ INSERTING AND MOVING FUEL

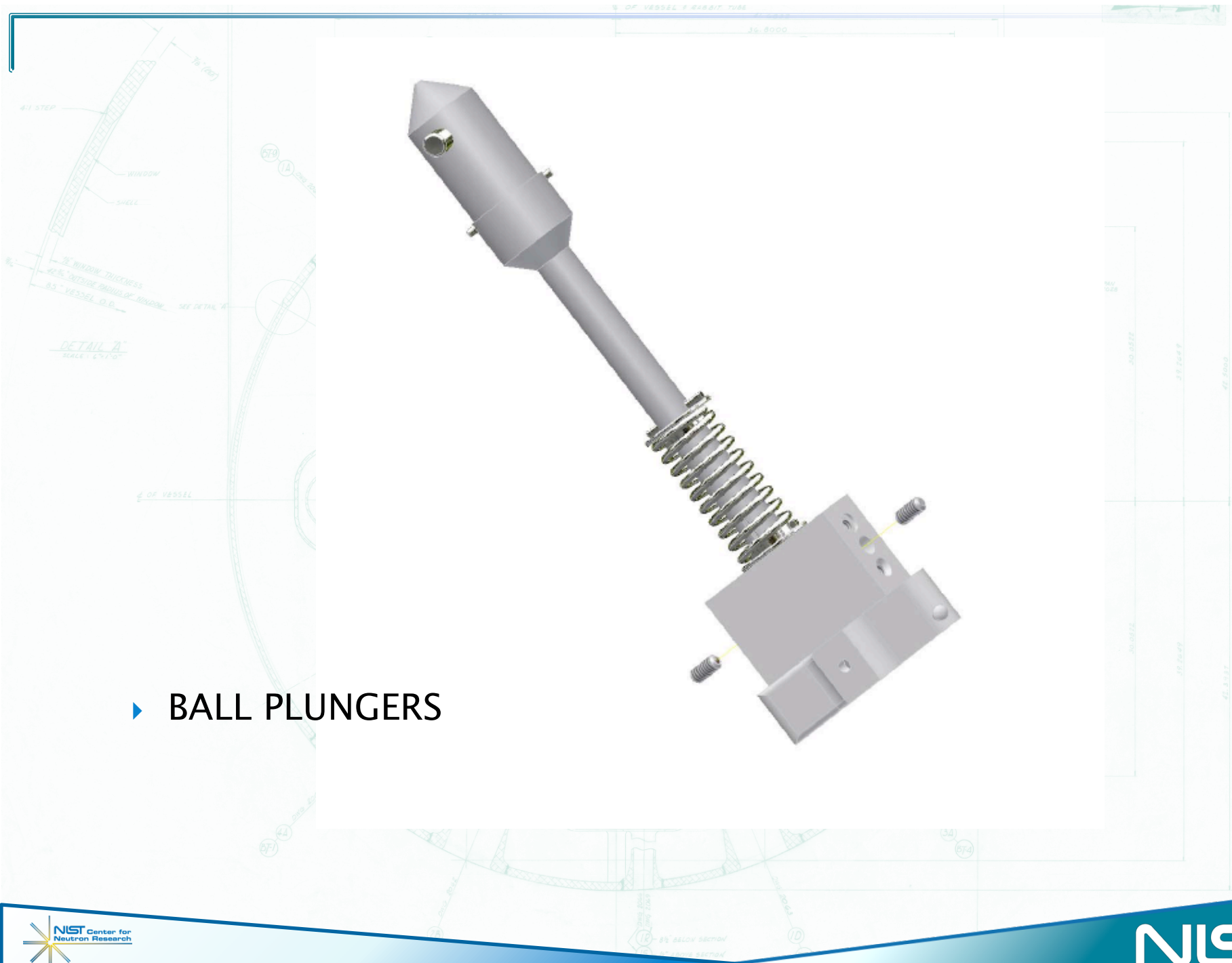


▶ LOCKING IN POSITION



# ORIGINAL DESIGN

- ▶ SIMPLE: SPRING AND LATCH BAR TO HOLD IN POSITION
- ▶ ATOMIC ENERGY COMMISSION QUESTIONED “Will the fuel elements stay locked in place?”
- ▶ INSTEAD OF JUSTIFYING THEIR SIMPLE DESIGN, REACTOR ENGINEERING COMPLICATED THE DESIGN BY ADDING BALL PLUNGERS FOR “LOCKING” FUEL ELEMENTS IN POSITION.



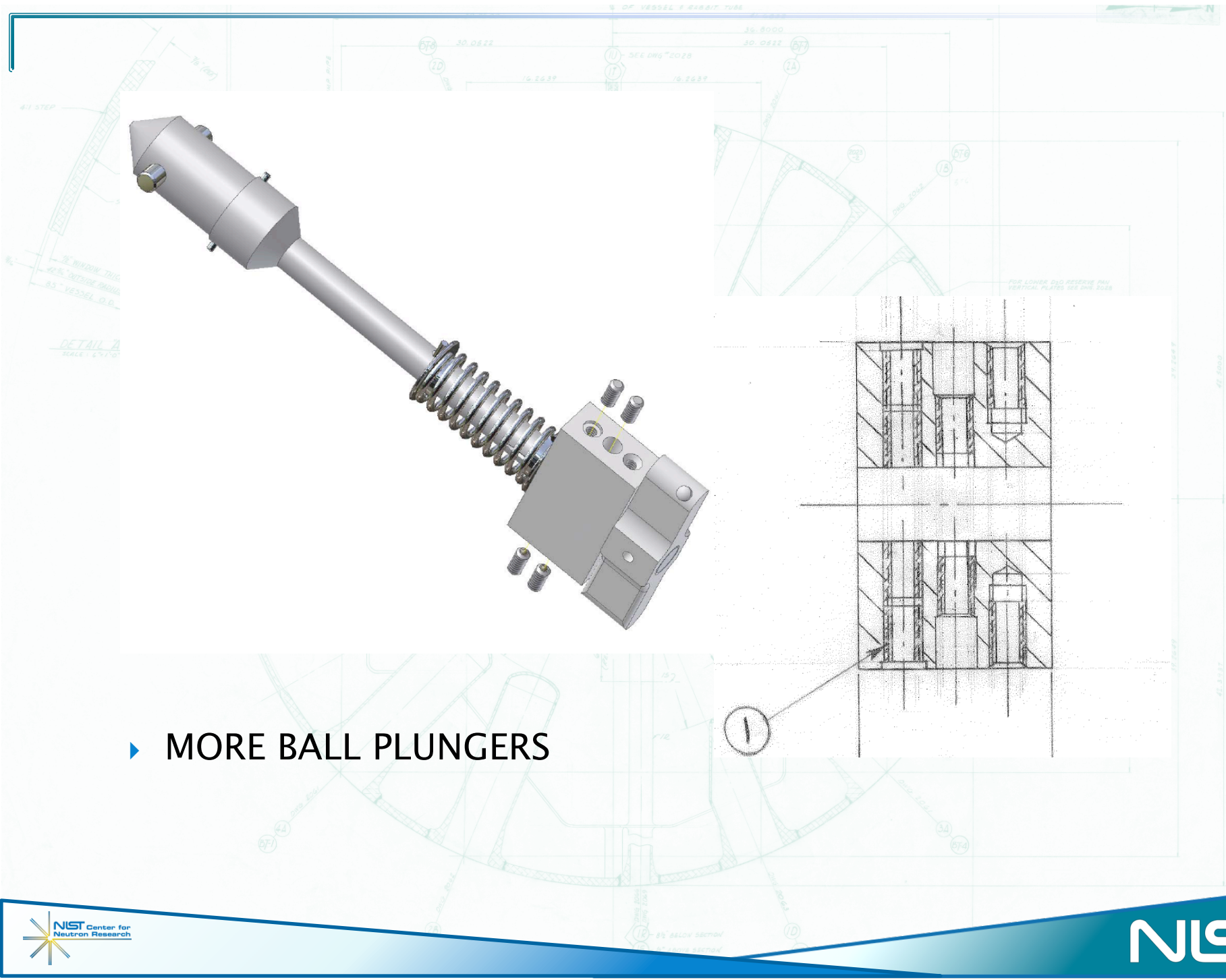
▶ BALL PLUNGERS

# BALL PLUNGERS REQUIRED:

- ▶ 2 GROOVES IN THE SHAFT
- ▶ MARTIN HARD COATING OF THE SHAFT
- ▶ THREADED HOLES IN THE BLOCK
- ▶ LOCKING HELI-COILS IN THE BLOCK
- ▶ INSTALLATION OF THE BALL PLUNGERS INTO THE LOCKING HELI-COILS

# PROBLEM:

- ▶ TRANSFER HEADS FOUND IN UNLATCHED POSITION

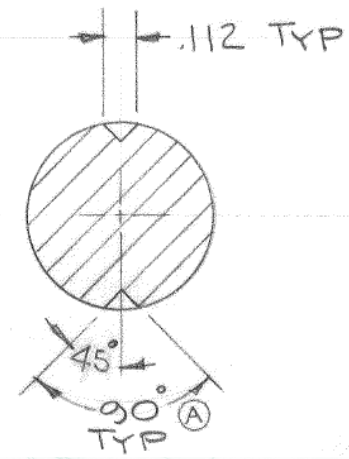


▶ MORE BALL PLUNGERS

# MORE PROBLEMS:

- ▶ TRANSFER HEADS FOUND IN UNLATCHED POSITION
- ▶ TRANSFER HEADS HARD TO TURN
- ▶ TRANSFER HEAD SPRING STAYING COMPRESSED

# RESPONSE TO PROBLEMS

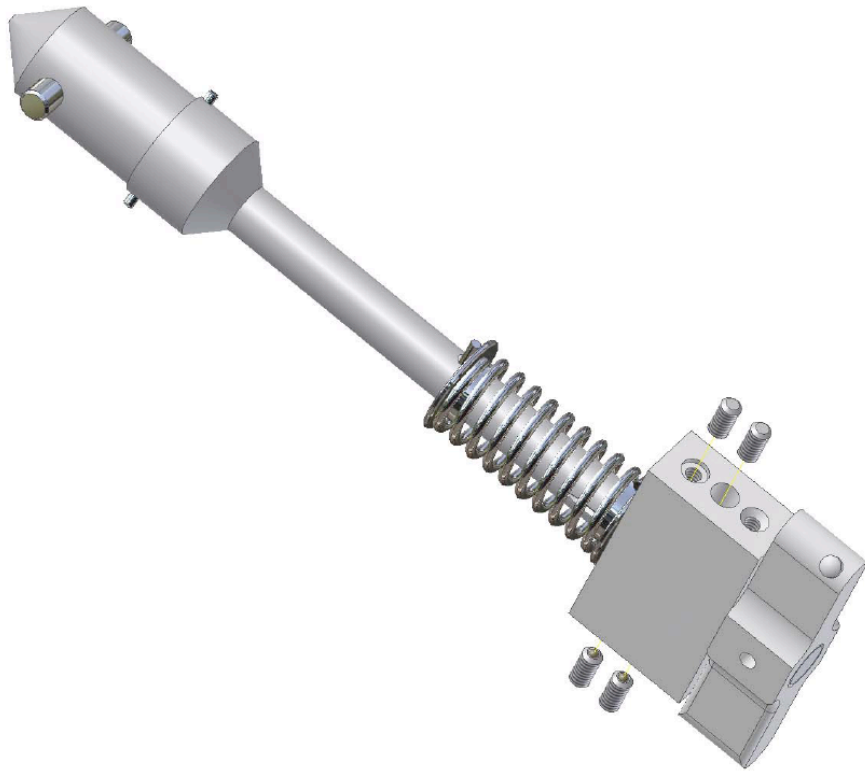


- ▶ Spring Centering Washer
- ▶ Correct Groove Dimensions

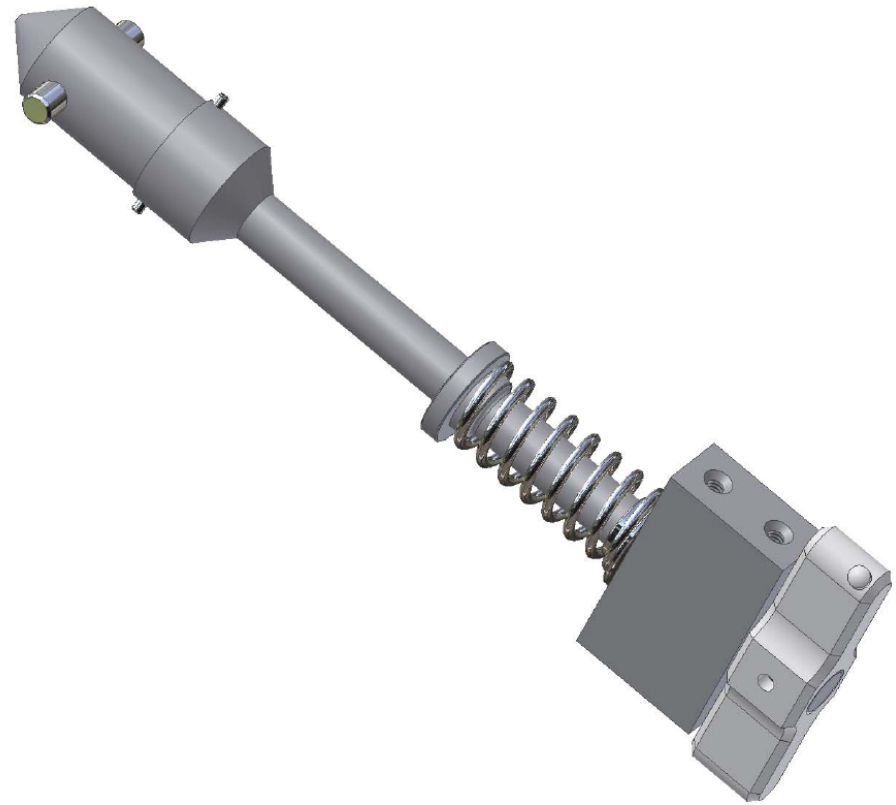
# TIME TO RE-EVALUATE THE PROBLEM:

- ▶ Do we need ball plungers and heli-coils?
- ▶ Field verified that the ball plungers were not needed.
- ▶ Re-designed the transfer head to be more easily fabricated, assembled, and reliable.



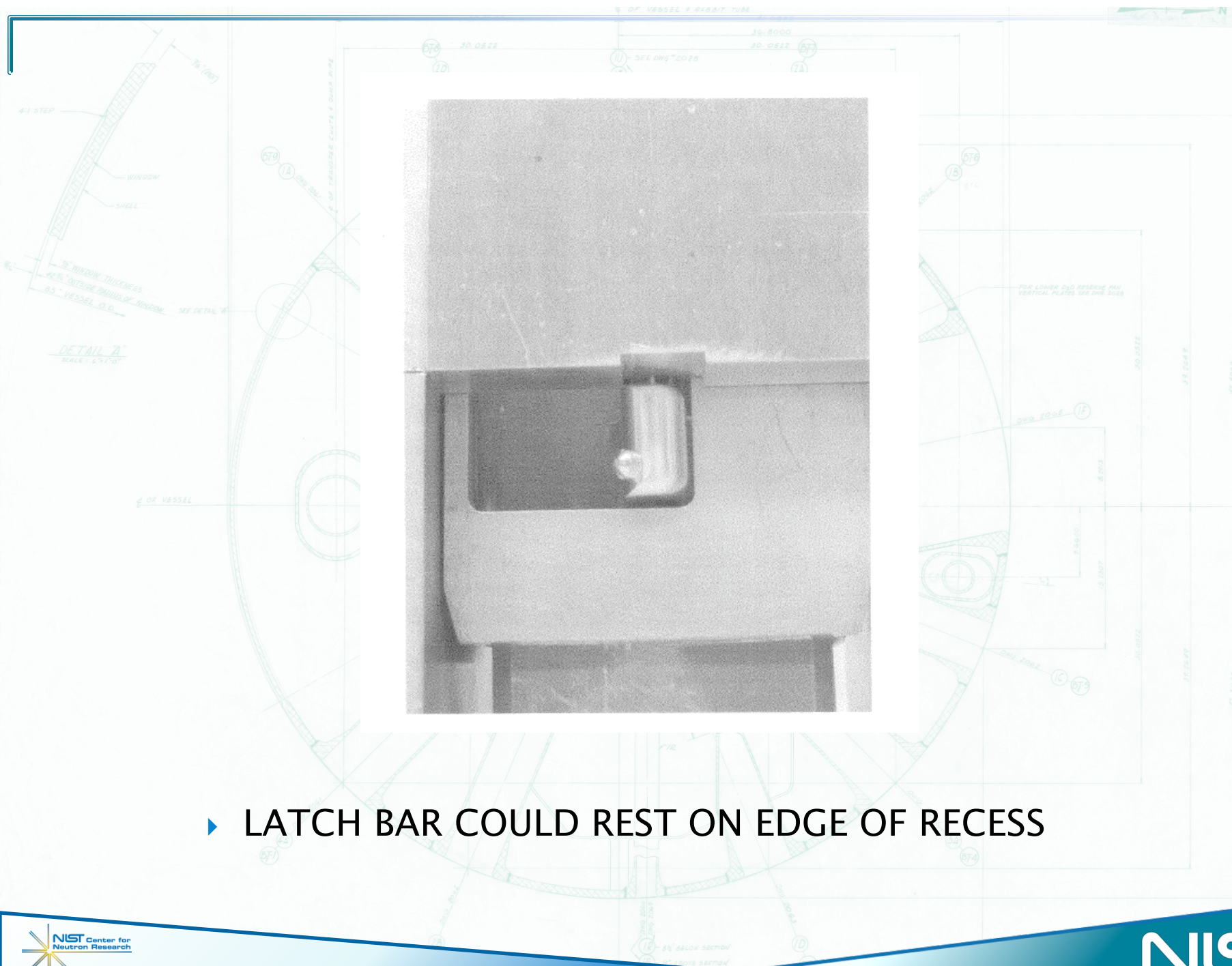


▶ OLD DESIGN

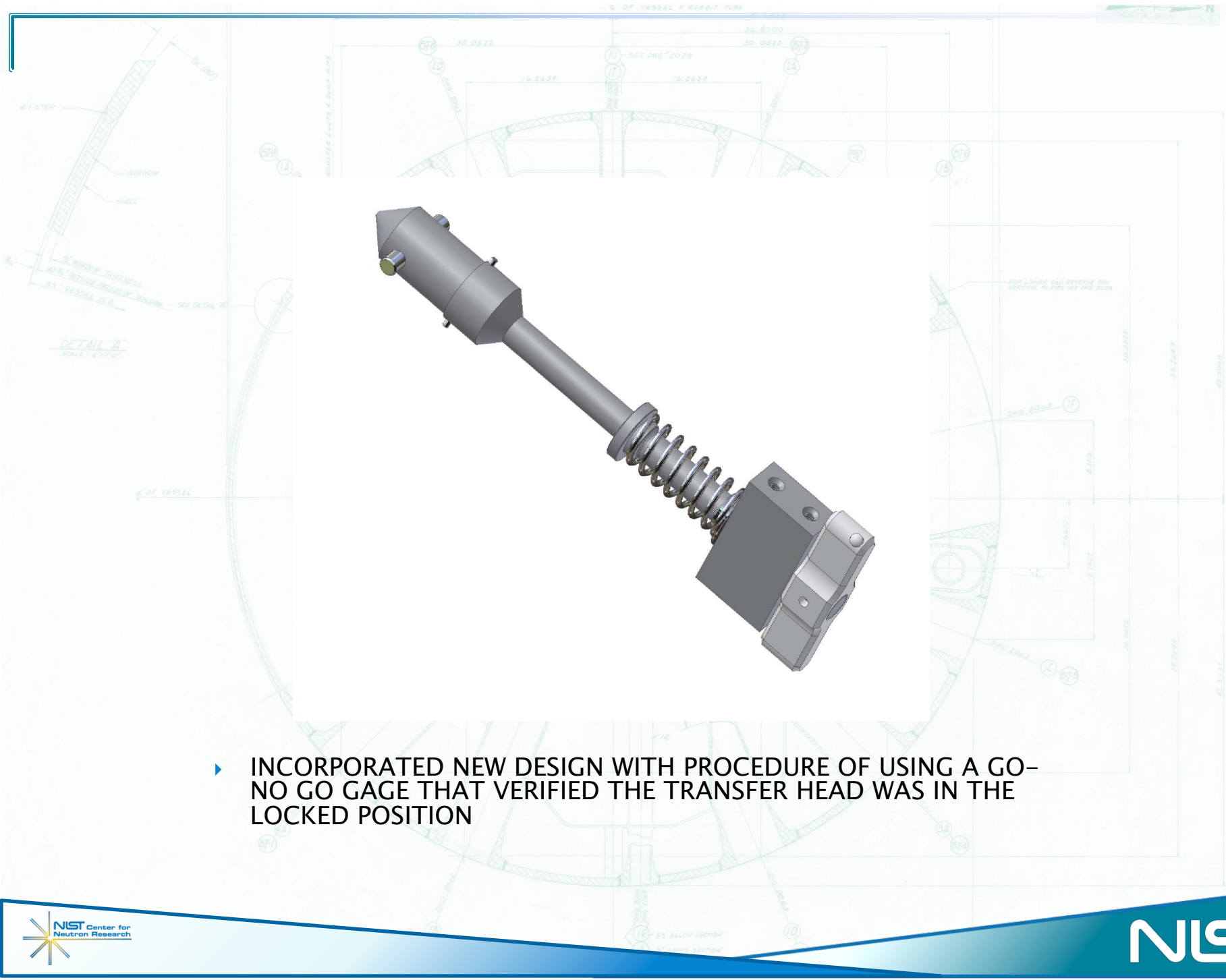


▶ NEW DESIGN

<b>BEFORE</b>	<b>AFTER</b>
Shaft: Aluminum 6061-T6 with grooves and hole for Shoulder Pin; hardcoated	Shaft: Titanium Alloy Grade 4 with machined step (incorporating C'Bore Washer)
Latch Bar: 5/32" fillet was in 4 places – 2 on top and 2 on bottom	Latch Bar: 3/32" chamfer all the way around top and bottom
Mounting Block: Aluminum 6061-T6 with ball plungers and helicoils installed	Mounting Block: Titanium Alloy Grade 4
Ball Plungers: (4 required)	Ball Plungers: (None required)
Helicoils: (6 required)	Helicoils: (None required)
Shoulder Pin: (1 required)	Shoulder Pin: (None required)
Tapered Pin: (1 required)	Tapered Pin: (1 required)
Lead Pin: (1 required)	Lead Pin: (1 required)
C'Bore Washer: (2 required)	C'Bore Washer: (1 required)
Spring: (1 required)	Spring: (1 required)



- ▶ LATCH BAR COULD REST ON EDGE OF RECESS



- ▶ INCORPORATED NEW DESIGN WITH PROCEDURE OF USING A GO-NO GO GAGE THAT VERIFIED THE TRANSFER HEAD WAS IN THE LOCKED POSITION

# NO MORE PROBLEMS ... The End.

