

NSRP 2025 Panel Project: DSSM Latch Adjustment Mechanism

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Steve Arturo

Newport News Shipbuilding, A Division of HII

Project Participants and NSRP ASE Representatives

Data Category: Category B



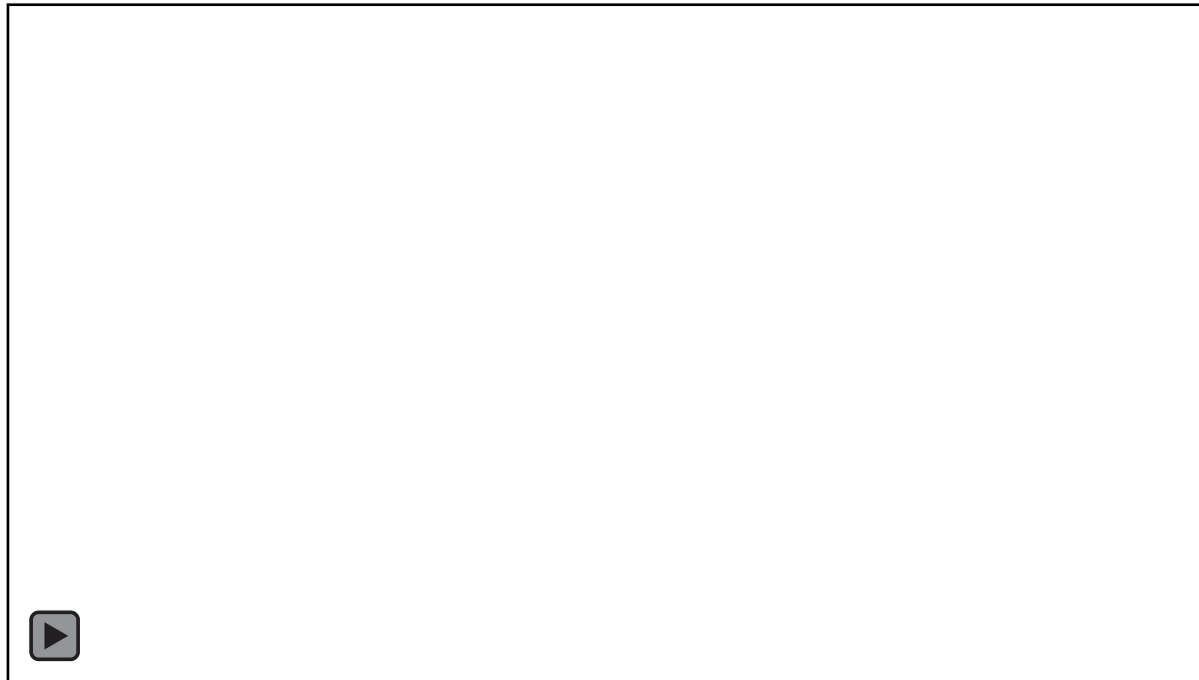
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NSRP 2025 Panel Project: DSSM Latch Adjustment Mechanism

- Participants:
 - Lead: HII-NNS, Steve Arturo (Michael Talley, D.Sc. until retirement in Jan 2026)
 - Element, U.S. Space & Defense, Calvin Milam
 - NAVSEA 05P1, Tom Brodrick
- This project seeks to:
 - Design, fabricate, and test a latch adjustment mechanism that will achieve optimum latch grip using existing DSSM spring trays
 - Provide inspection procedures to obtain objective quality evidence for latch maintenance and replacement actions

Problem Statement for Panel Project

- DSSM target frequency has dropped from 21.7Hz to 20Hz between 2015 to 2024
- Measurements and visual evidence during 2024 drops indicates latch play to be between 1/8 to 3/16 of an inch
- June 2025 video below shows play in latch system causing a gap between the impact pad and spring tray after latching



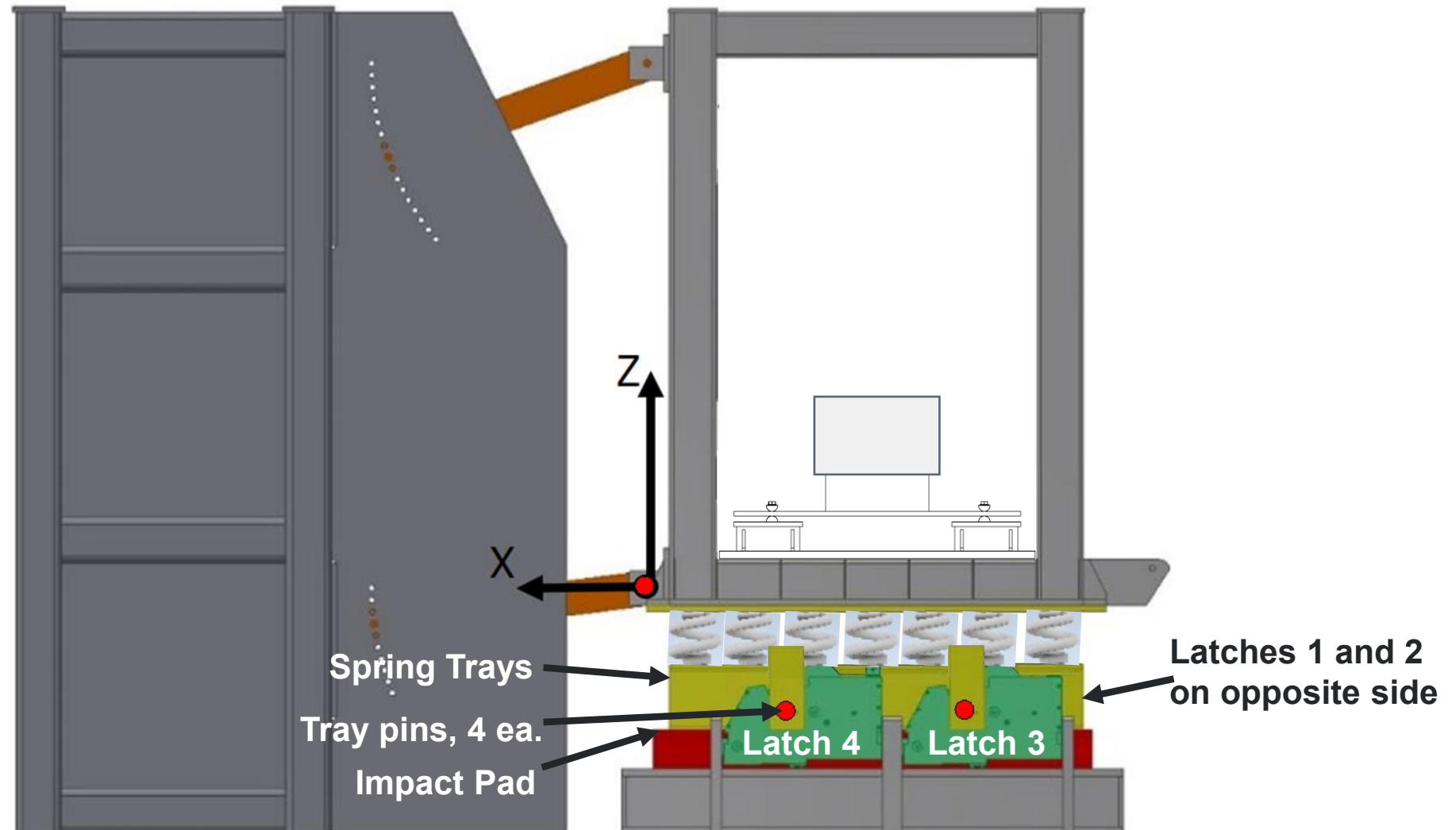
Gap reduces DSSM target frequency

Note: All videos and pictures in this presentation were obtained via HII-NNS purchase orders with Element, U.S. Space & Defense

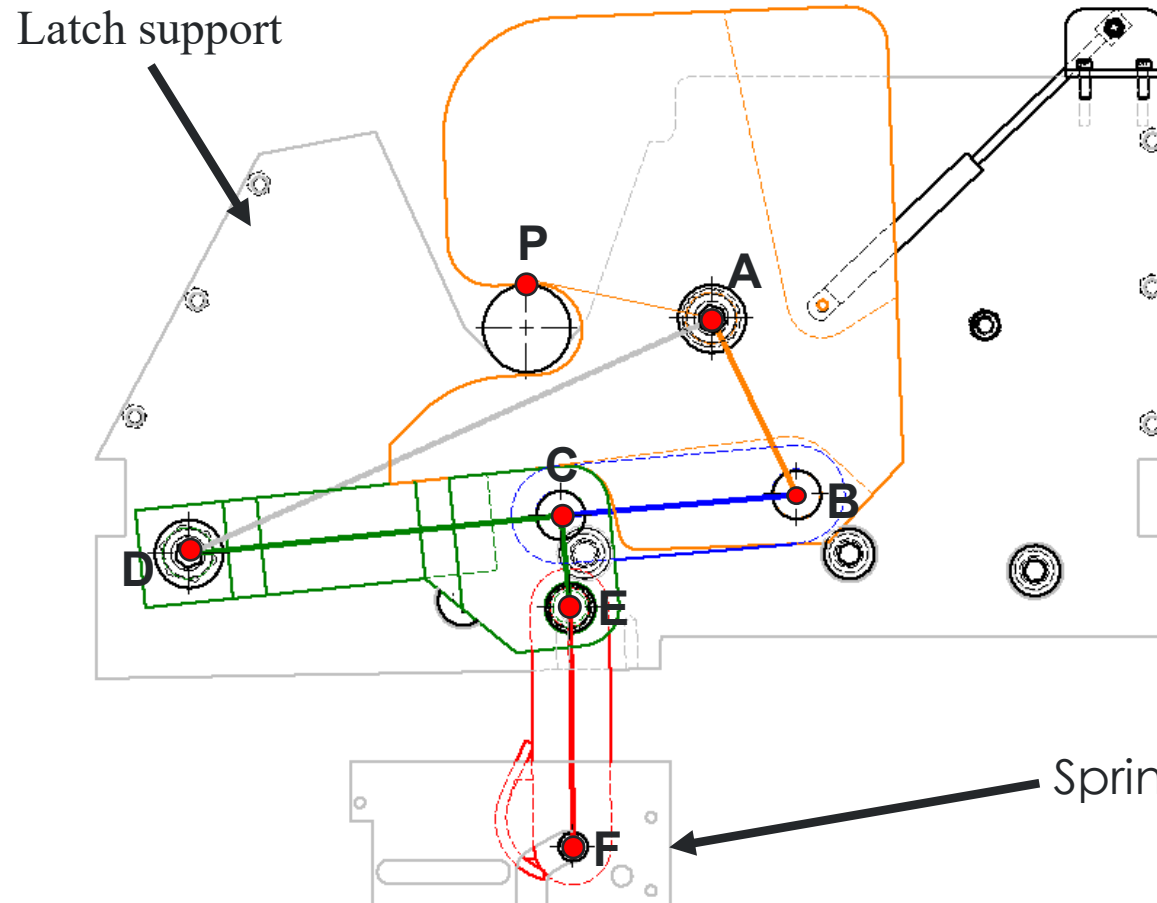
Summary of Methods and Procedures

- Inspect and document dimensions, degradation, and play associated with the DSSM latch mechanism parts (*Complete*)
- Design, produce sketches, and fabricate latch adjustment mechanisms for four DSSM latches (*Complete*)
- Perform DSSM drops with accelerometers on each drop and a means to monitor gaps between the spring tray bottom and impact pad (*Initial baseline drops complete*)
- Document results of drop testing and effect of latch adjustment mechanism (*Incomplete*)
- Collect information to support development of inspection procedures to obtain objective quality evidence for latch maintenance and replacement actions
- Develop and submit inspection procedures for NAVSEA 05P1 approval (*In progress*)

Location of Components Affecting Latching



4-Bar Link Latch Assembly



Nomenclature:

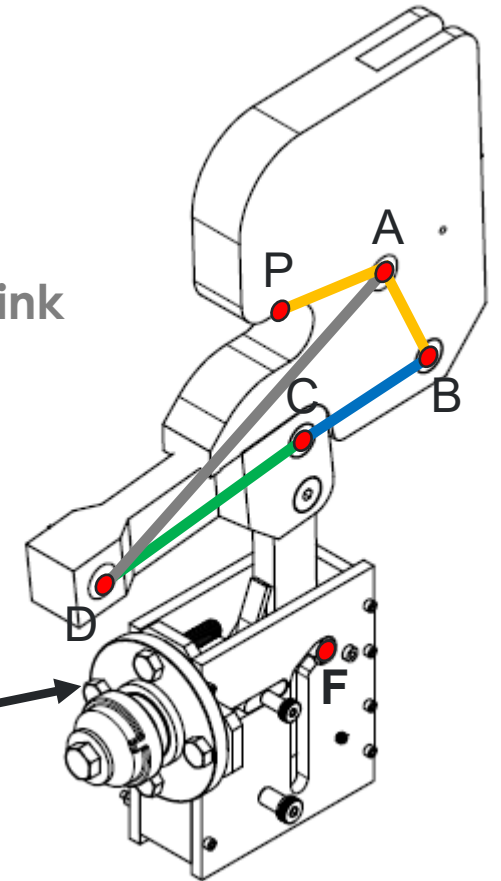
AB = Latch Fork Link

BC = Latch Link

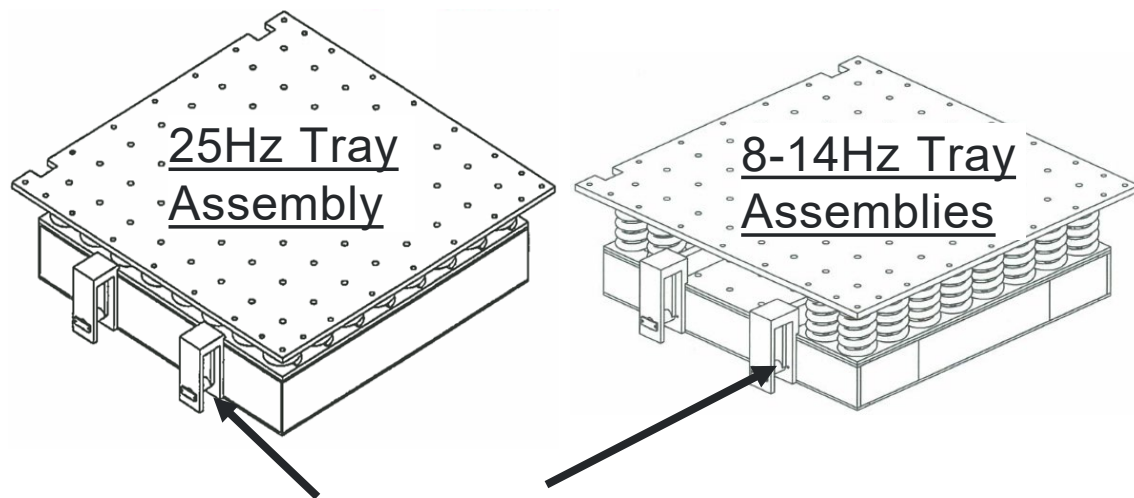
CD = Yoke Link

DA = Virtual Support Link

EF = Cam Link

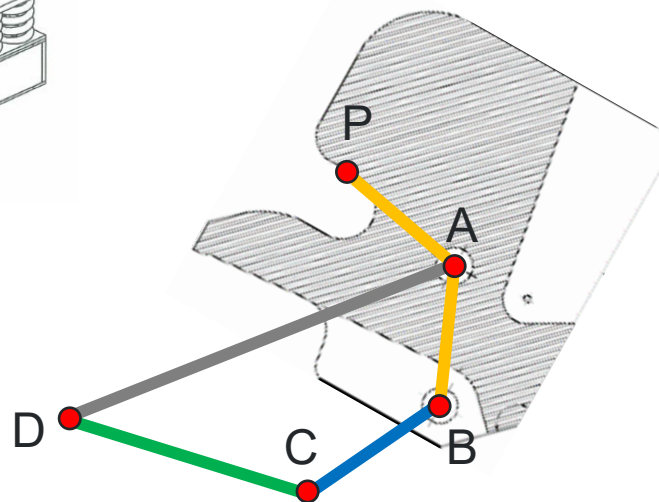


DSSM Latch Operation

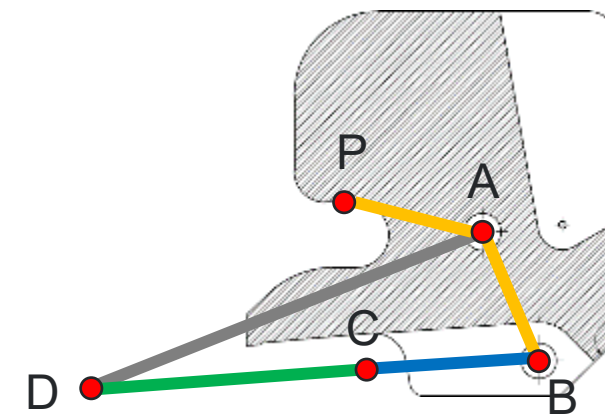


2.25 in. diameter pins that get captured by latches (4 on each tray)

DSSM Lifted



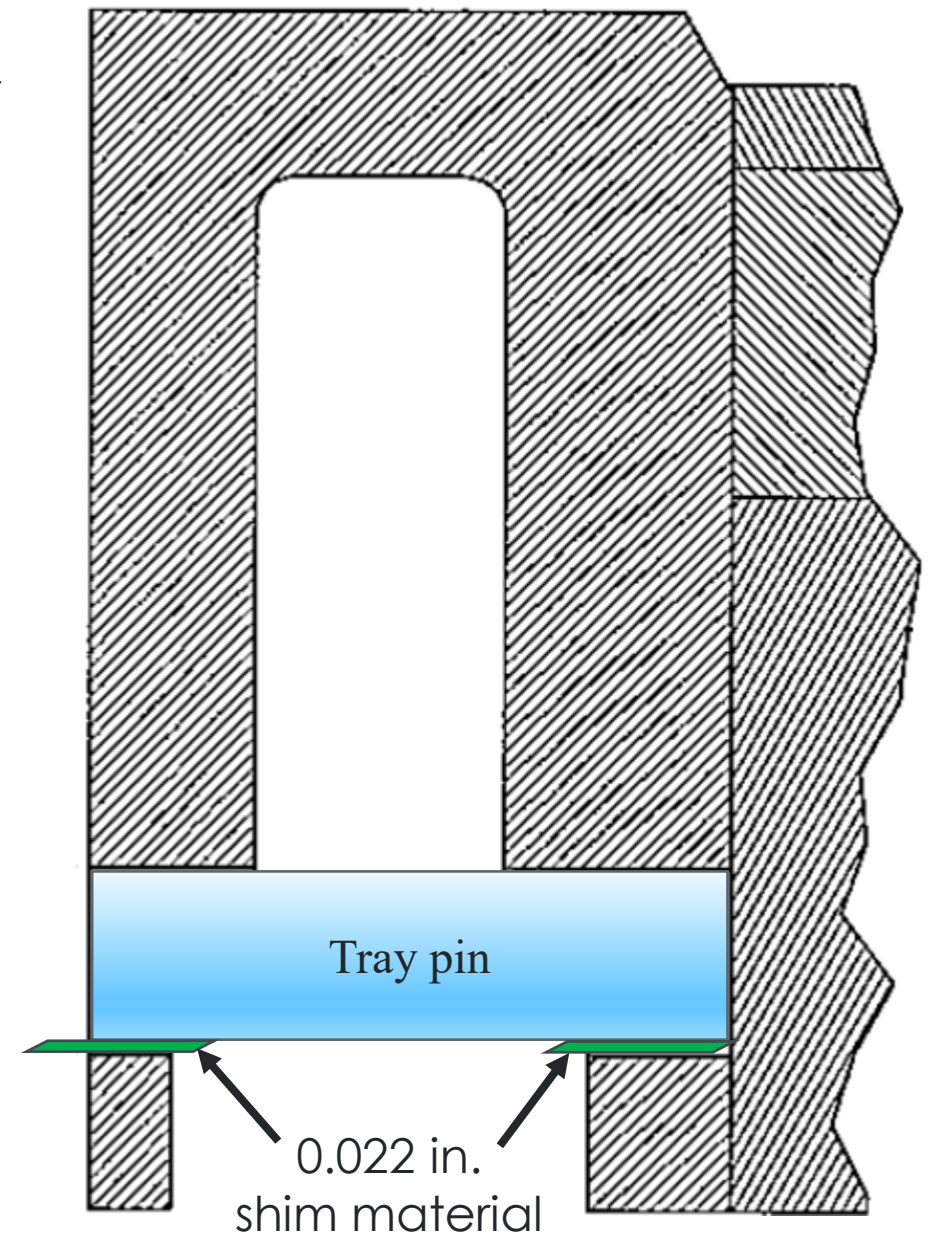
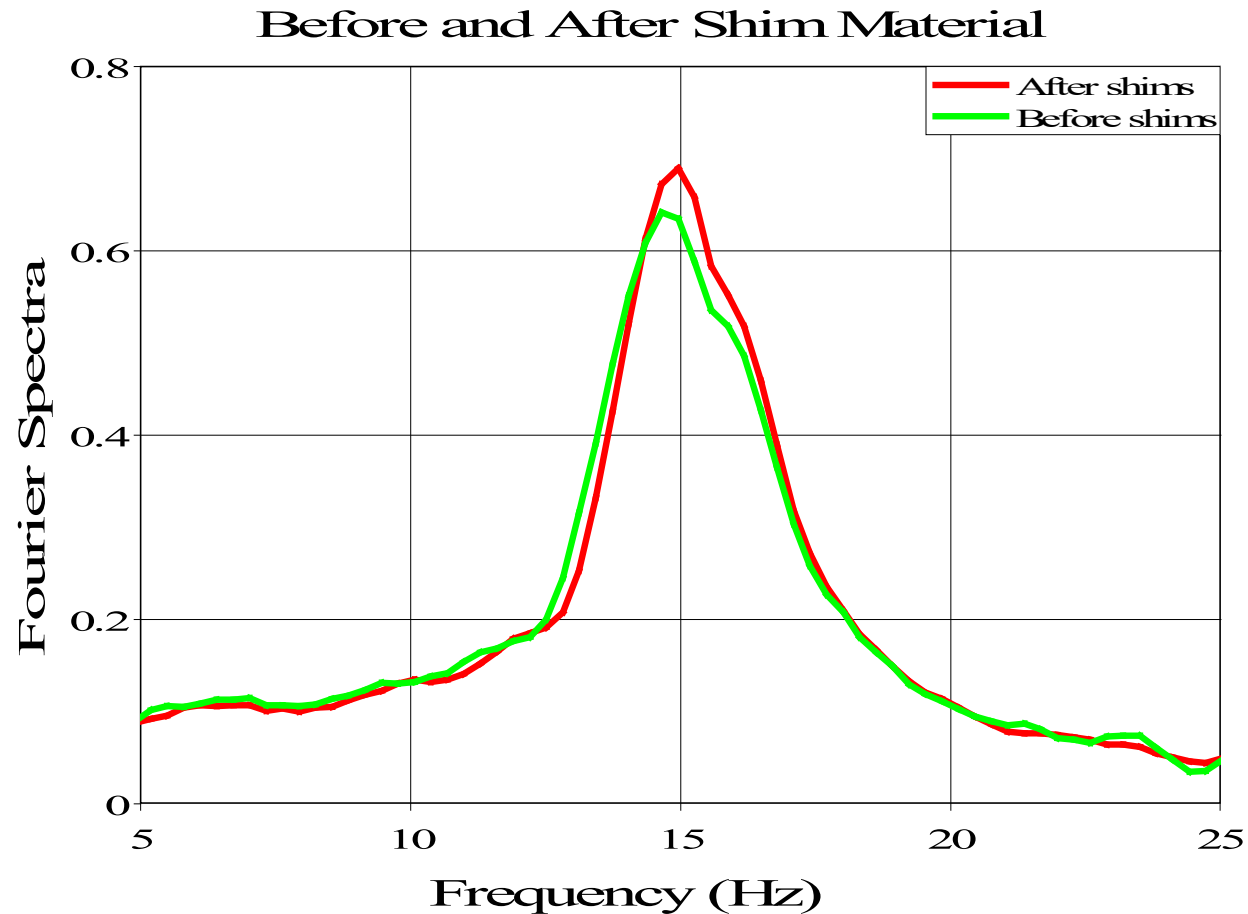
DSSM Latched



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Effect of Shimming with Banding Material Under Tray Pin on 14Hz Tray



DSSM Latch Dimension Updates

- The conclusions of the ad hoc testing and latch mechanism parts inspection thus far is that a single latch adjustment mechanism design would not be sufficient to reduce the latch play to acceptable levels.
- It was concluded that latch mechanism parts needed to be fabricated with tighter design tolerances.
- Fabrication of the new latch parts was completed and delivered to test lab on 5/7/26.



Planned DSSM Drops

- Perform drops to determine baseline responses for 25Hz spring tray and 14Hz spring tray before installing new adjustment mechanisms
- Perform drops with DSSM configured with 25Hz, 14Hz, and 8Hz spring trays with new adjustment mechanism installed
- Perform drops with new adjustment mechanism, 25Hz spring tray, and the tunable frequency deck installed to compare to 2024 test data
 - One drop with 36 inch span
 - One drop with 30 inch span

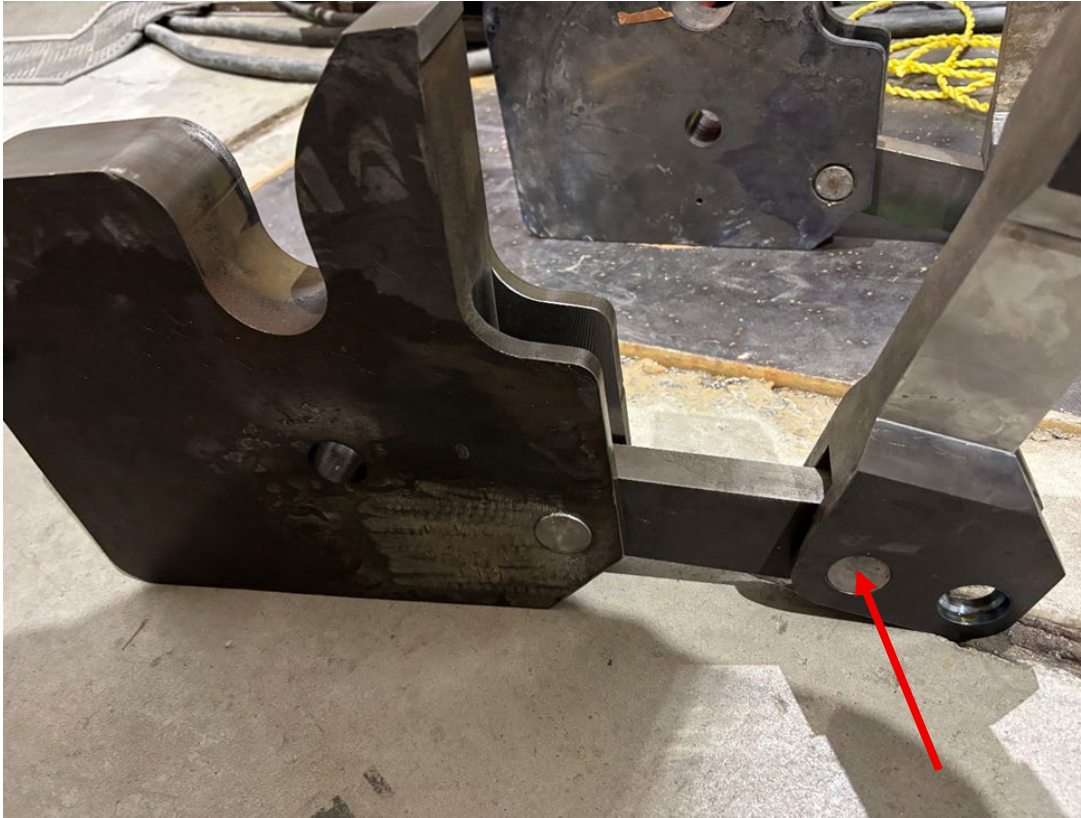
Drop #	Drop Ht., [in]	Spring Tray	# Springs	Arm Angles		Tuneable deck half round spacing, [in]	Weight Associated with the tuneable frequency deck, [lb]	Additional fixtures at top of DSSM cage, [lb]	Fixture weight supporting tuneable frequency deck, [lb]	Weights associated with washers, [lb]	Purpose
				γ (deg)	β (deg)						
1	13	25Hz	64	7.5	20	NA	0	293	1245	350	Determine baseline responses for 25Hz spring tray before installing new adjustment mechanisms and before any disassembly and reassembly of the four latches
2	13	14Hz	30	7.5	20	NA	0	293	1245	21	Determine baseline responses for 14Hz spring tray before installing new adjustment mechanisms and before any disassembly and reassembly of the four latches
3	13	25Hz	64	7.5	20	NA	0	293	1245	350	With new adjustment mechanism installed, conduct drop with DSSM configured with 25Hz spring tray
4	13	14Hz	30	7.5	20	NA	0	293	1245	21	With new adjustment mechanism installed, conduct drop with DSSM configured with 14Hz spring tray
5	11	8Hz	10	7.5	20	NA	0	293	1245	7	With new adjustment mechanism installed, conduct drop with DSSM configured with 8Hz spring tray
6	13	25Hz	64	7.5	20	36	779	293	1245	350	With new adjustment mechanism and the tunable frequency deck installed with the 25Hz spring tray frequency deck, conduct one drop with 36 inch span to compare to 2024 test data.
7	13	25Hz	64	7.5	20	30	779	293	1245	350	With new adjustment mechanism and the tunable frequency deck installed with the 25Hz spring tray frequency deck, conduct one drop with 30 inch span to compare to 2024 test data..

DSSM Latch Dimension Updates

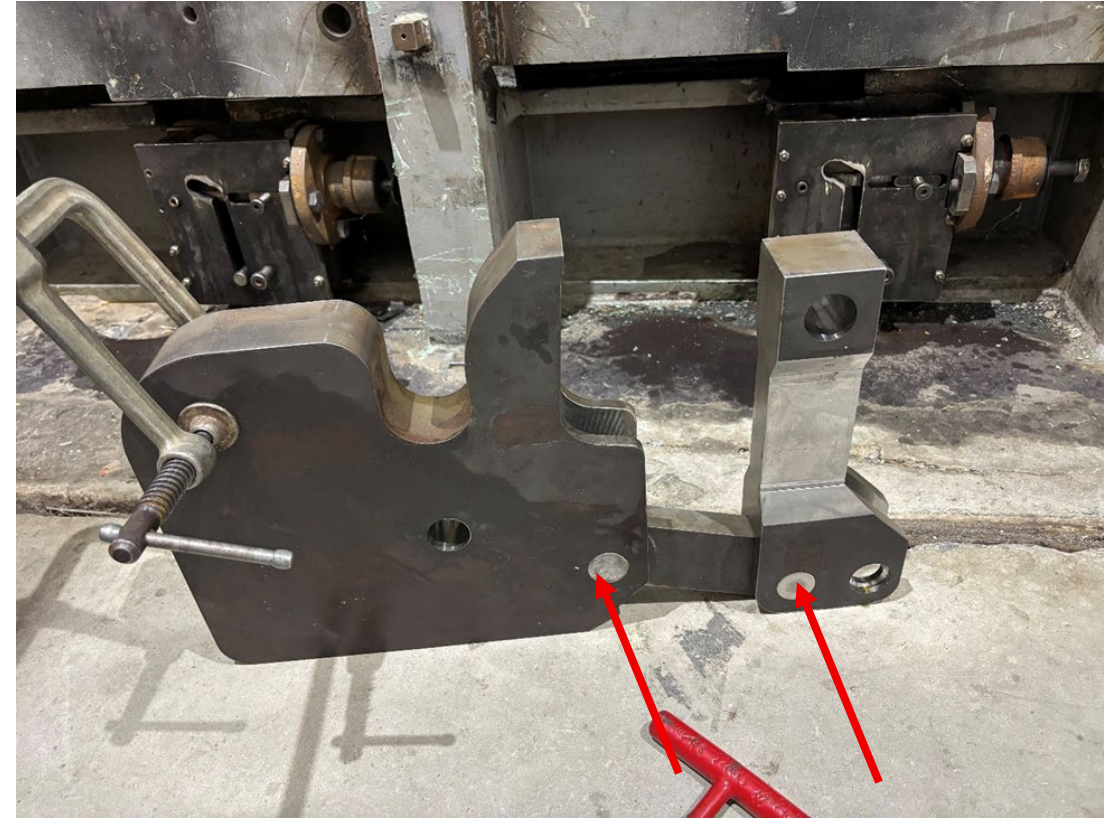
- DSSM Drop testing was scheduled 5/11/26 - 5/15/26.
- During a pre-drop testing the new mechanism seized up under a 5 inch height drop (full test drop height is 13 inch).



DSSM Latch Binding



Latch #1: Yoke Side Frozen



Latch #2: Both Pins Free



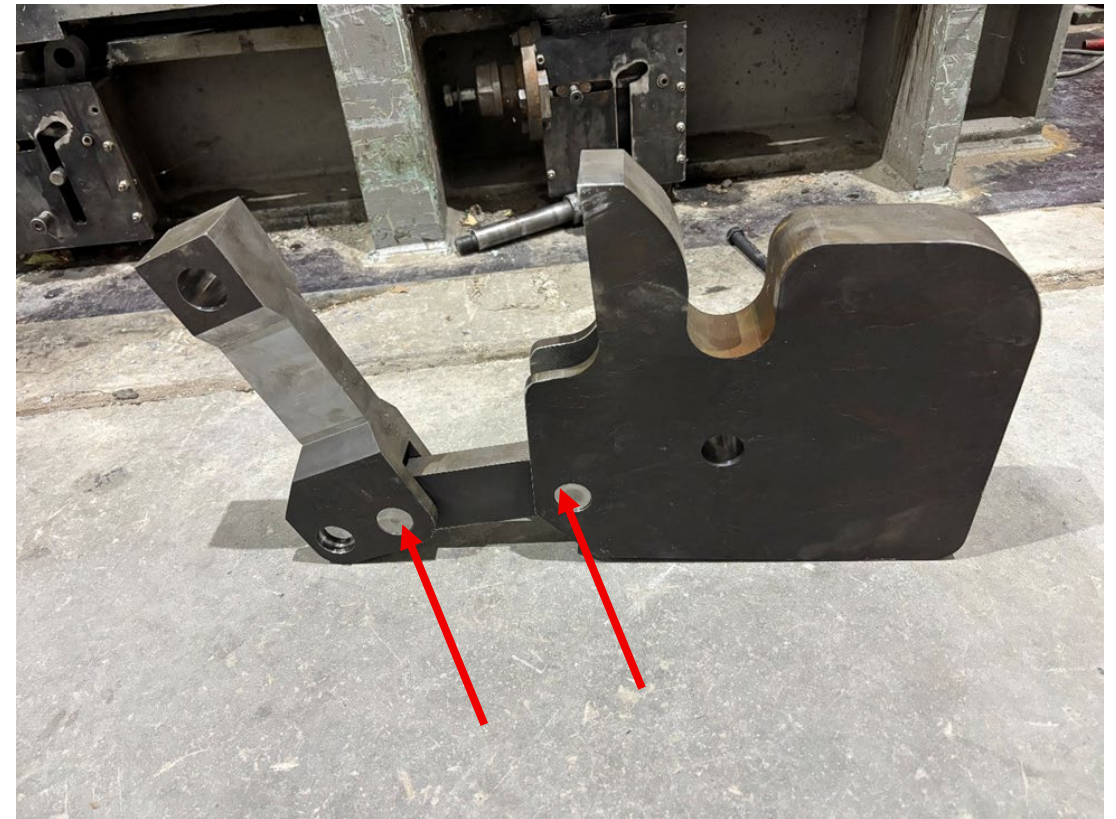
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DSSM Latch Binding



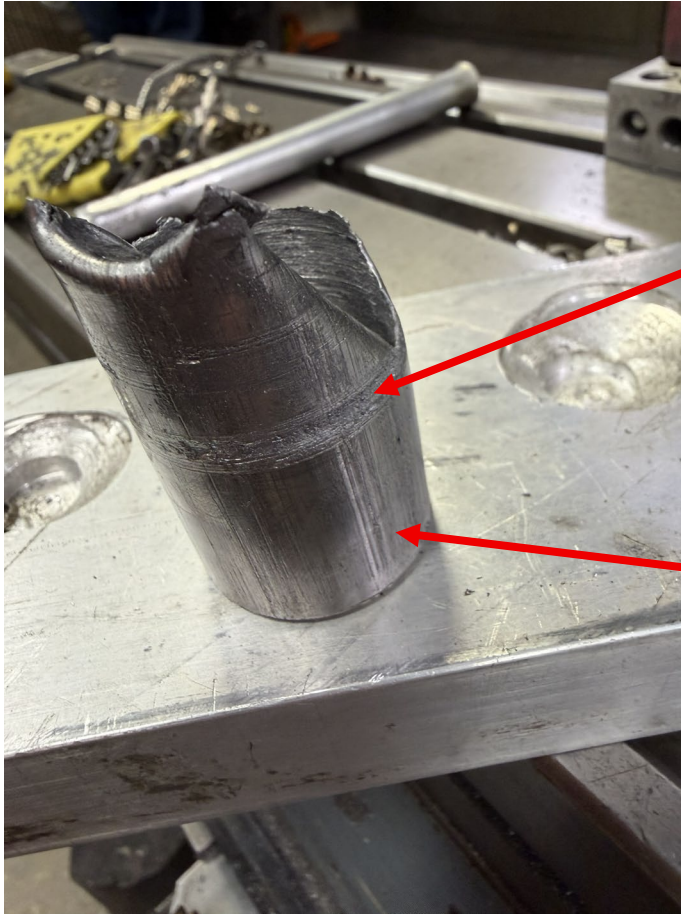
Latch #3: Fork Side Frozen



Latch #4: Both Pins Frozen

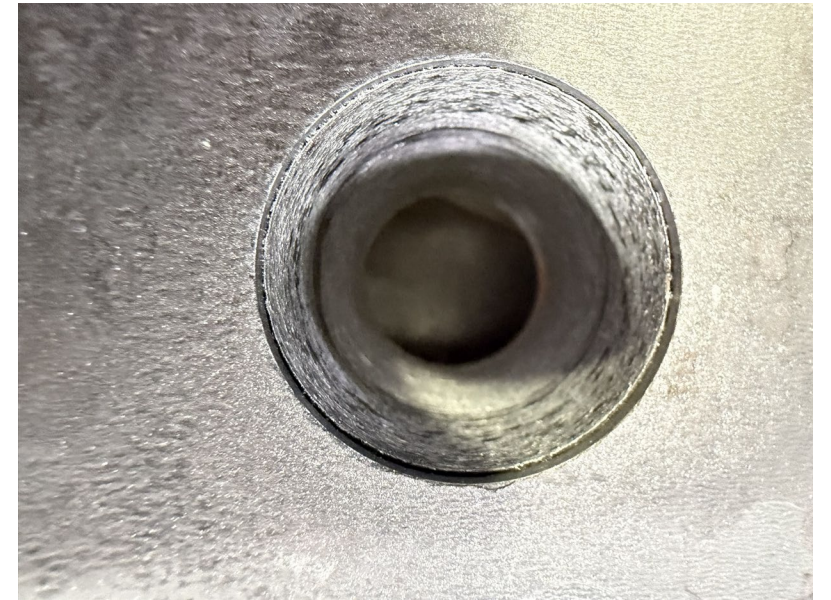


Pivot Pin Galling



Galling from trial drop

Scoring from interference press fit with Fork & Yoke



Next Steps

- Manufacture new pins with grease channels
 - NLGI #2 Molybdenum Disulfide Grease
- Manufacture new hardened steel bushings
- Reperform DSSM Testing



Sources Page

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Photos on slide 13		Yes
Photos on slide 14		Yes

