

CTD winch on R/V Paragon

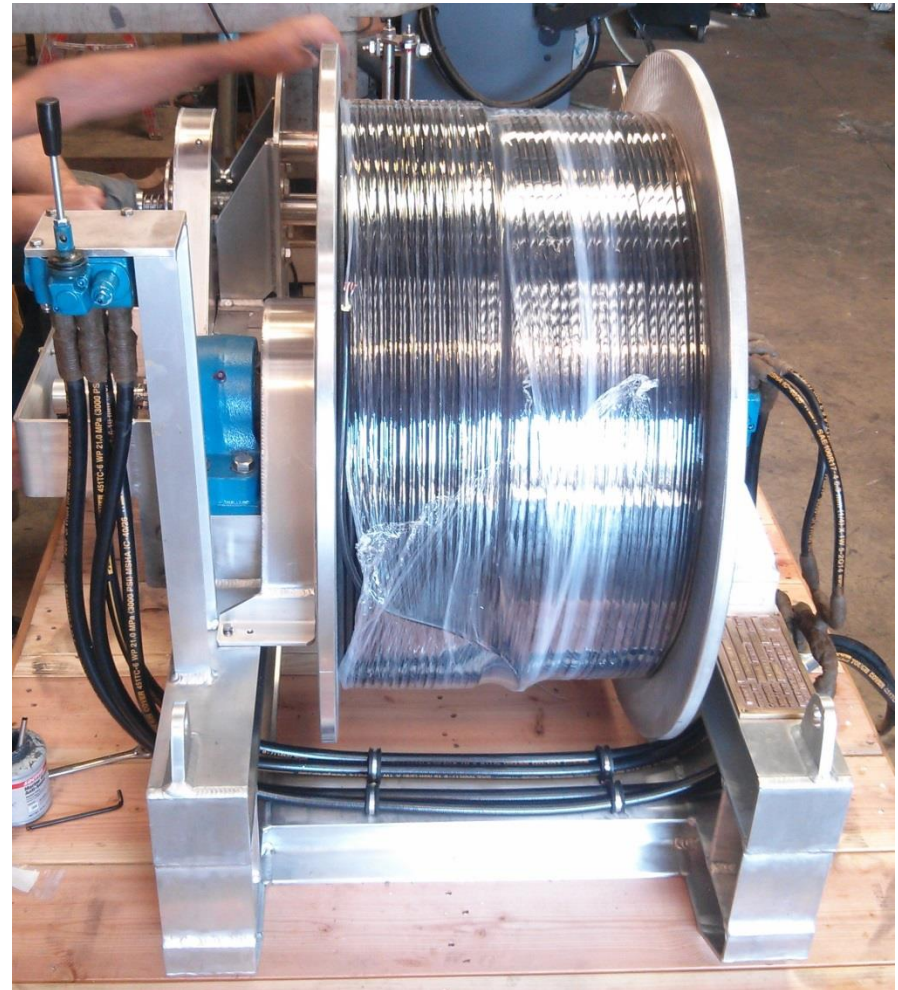
Design of attachments and boom

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12/03/2015

The winch

- 780 lb, including cable
- Aluminum frame
- Level winder
- 1000m long, 3/8" cable
- Cable weight: 223lb in air, 42lb in water.
- Break strength 2400 lb
- Max speed 70m/min
- Load cap.: 470 lb bare drum, 300 lb full drum



NOTES: UNLESS OTHERWISE SPECIFIED
1) BREAK AND DEBURR ALL SHARP EDGES .005-.010

REVISIONS					
ZONE	REV.	DESCRIPTION	ECO	DATE	APPROVED
N/A	-	INITIAL DRAWING RELEASE			

BARE
DRUM

FULL
DRUM

165°

Ø15

(20)

26

24

6°

46

24

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: $\pm 1/64$
ANGULAR: MACH: $\pm 1^\circ$
ANGULAR: BEND: $\pm 2^\circ$
.X ± 0.025
.XX ± 0.010
.XXX ± 0.005

INTERPRET TOLERANCING
PER: ASME Y14.5-1994

MATERIAL

FINISH

DO NOT SCALE DRAWING

NAME	DATE
DRAWN	
CHECKED	
ENG APPR.	
MFG APPR.	
G.A.	

COMMENTS:

PART NUMBER IS:

InterOcean InterOcean Systems, Inc.
3738 Ruffin Road,
San Diego, CA 92123

TITLE: MBARI LAYOUT

SIZE	DWG. NO.	REV
B		-
DO NOT SCALE WEIGHT:		SHEET 1 OF 1

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THIS DRAWING IS THE SOLE PROPERTY
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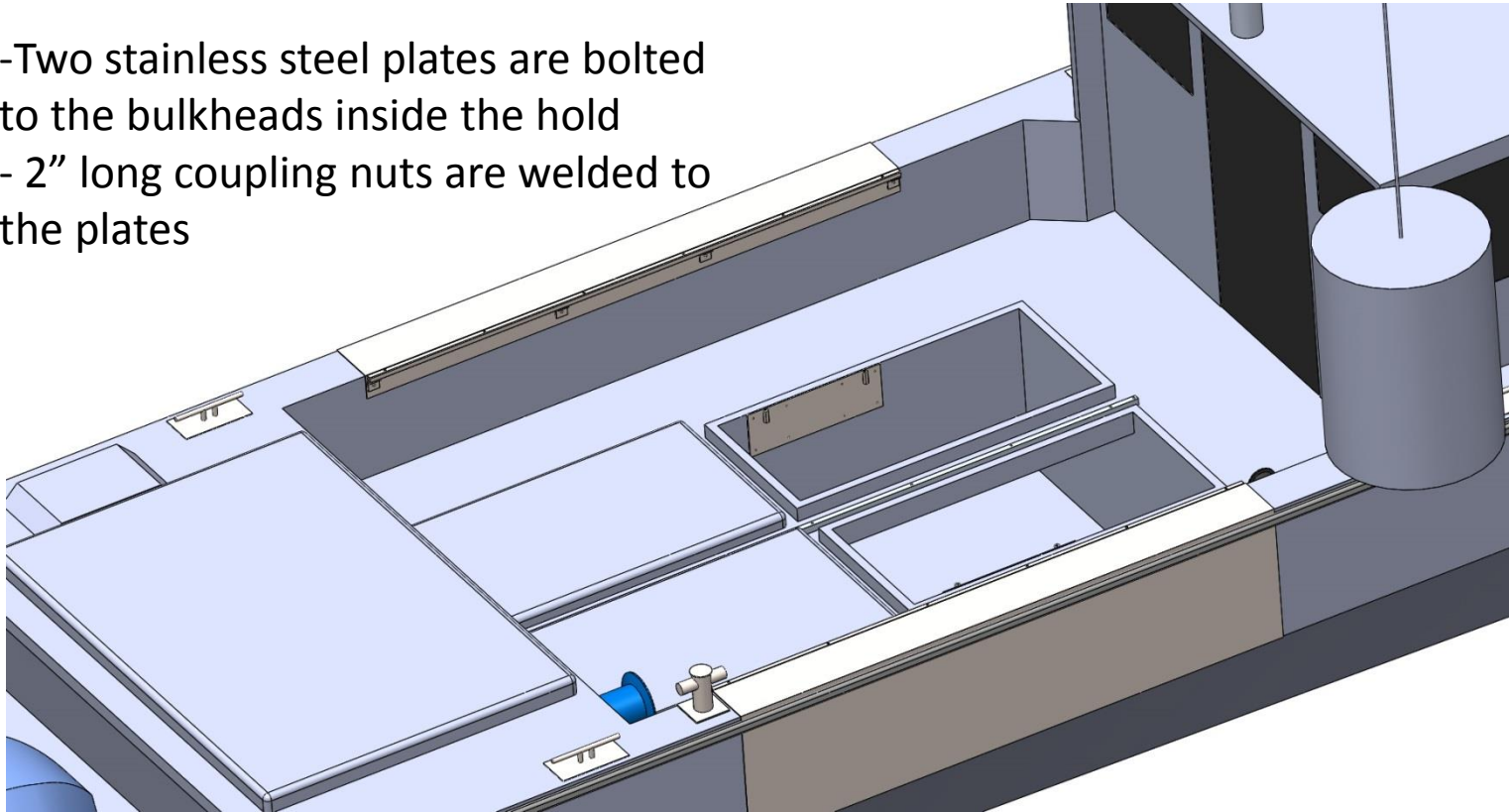
J:\V6164 MBARI\Layout.slddw 1/16/2015 11:02:13 AM

Requirements for winch attachment

- The winch must be securely attached to the deck to handle all sea states the Paragon operates in.
- The winch can be attached and detached easily by two operators, using 1000 lb rated MBARI dock davit, and basic tools.
- Hardware and required tools must be kept to a minimum
- Winch must be positioned so the aft hold covers are accessible and so operators can move around it easily

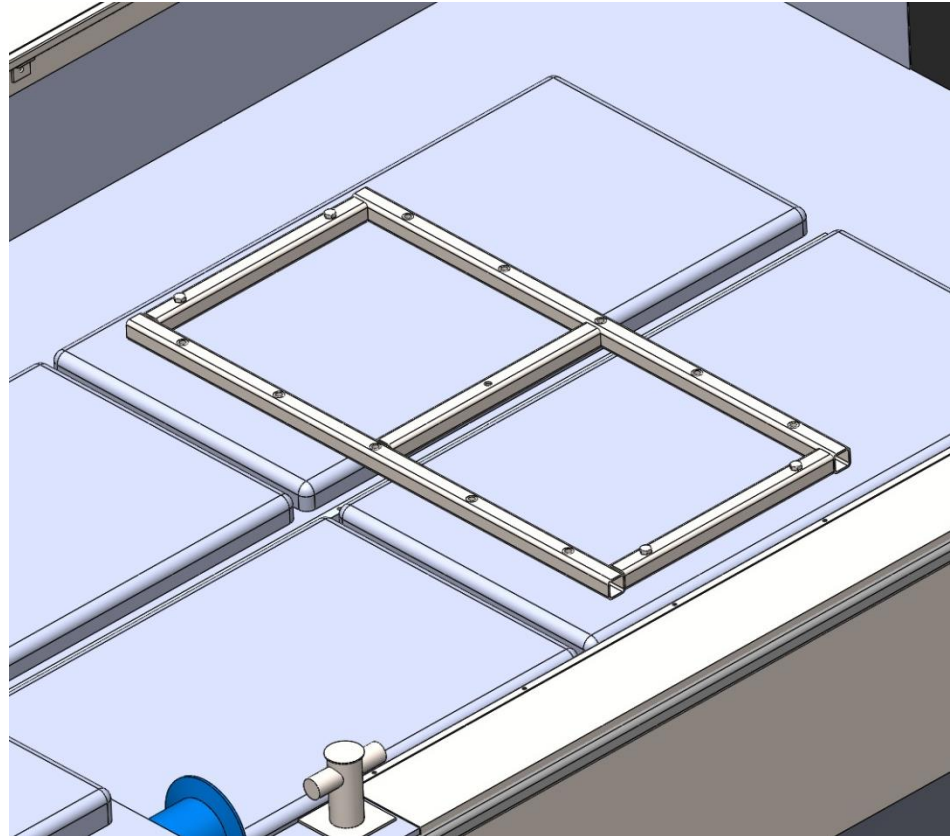
Suggested attachment design

- Two stainless steel plates are bolted to the bulkheads inside the hold
- 2" long coupling nuts are welded to the plates



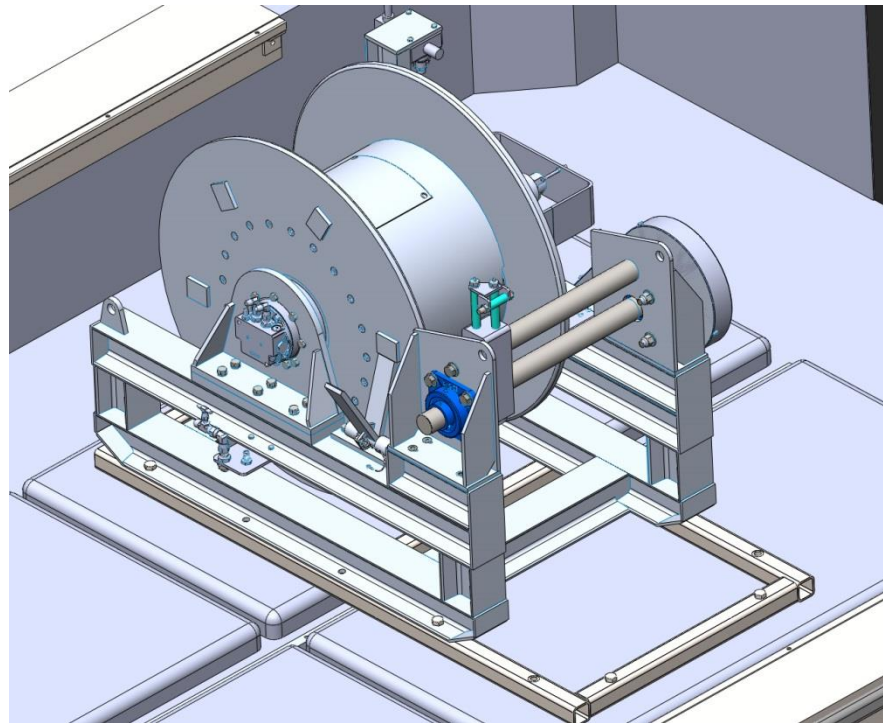
Suggested attachment design

- Stainless steel frame is bolted on top of the hold covers.
- 4 holes in hold covers allows frame to be bolted. Can be bolted to LARS bar also.
- Frame material: 2"x2"x3/16" SS
- 10 threaded holes welded to frame.
- Weight: 74lb



Suggested attachment design

- Winch is lowered with dock davit and bolted to frame using 4 5/8" bolts.
- Winch can be oriented to port or starboard, depending on operators need.

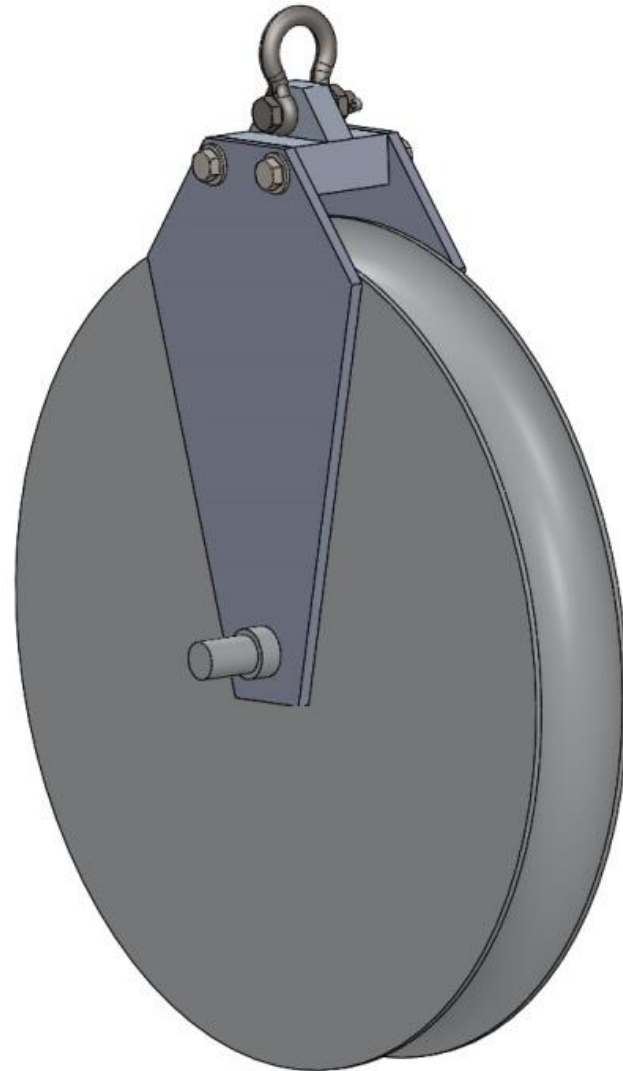


Requirements for CTD boom

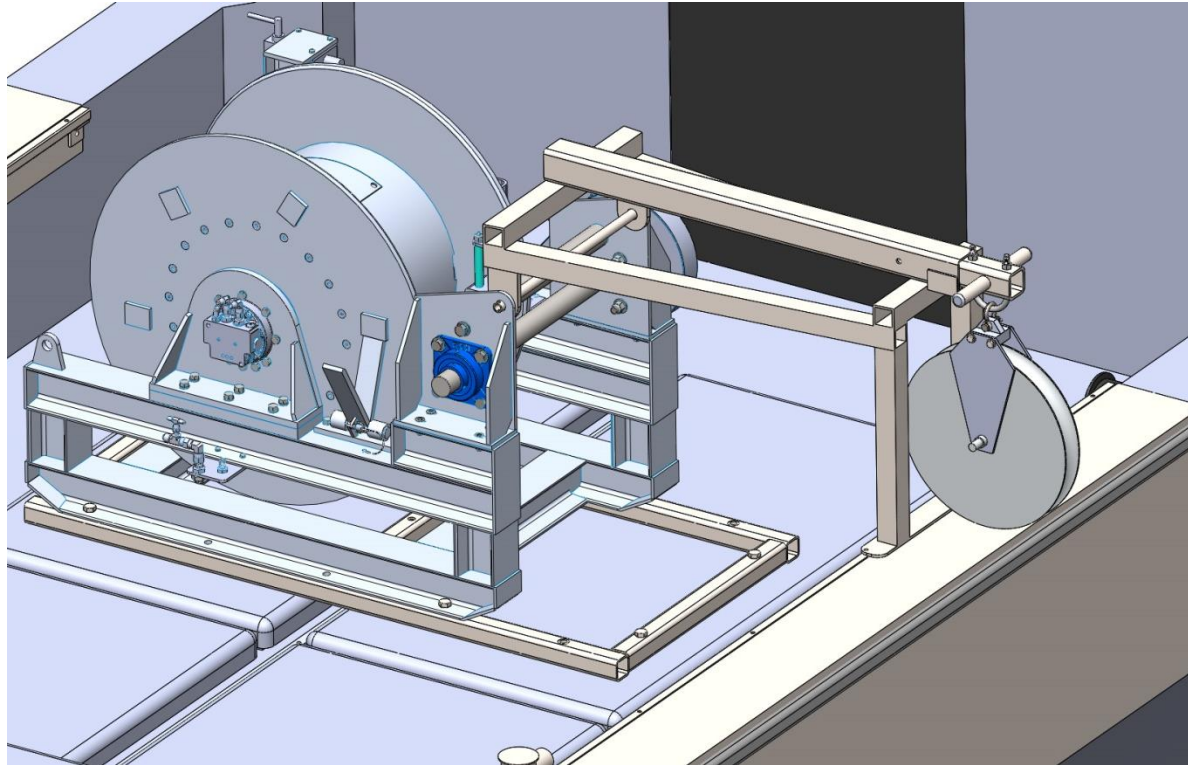
- Must enable safe deployment of CTD, or SBE 32 Carousel (300 lb when full of water, 28" diameter, 38" tall) by two operators
- 300 lb working load rating
- 5 to 1 safety factor for vertical pull and up to 45° from vertical pull.
- Must respect wire layout specified by manufacturer
- Must be retractable so it does not stick out past side of boat when not in use.
- Must hold wire block at an appropriate distance away from side of boat when in use (20" on axis).

Block for CTD wire

- Required minimum diameter: 15"
- MBARI owns a sheave that we can use
- Cheeks and attachment can be manufactured easily
- 3/8" shackle
- Opening large enough for wire termination

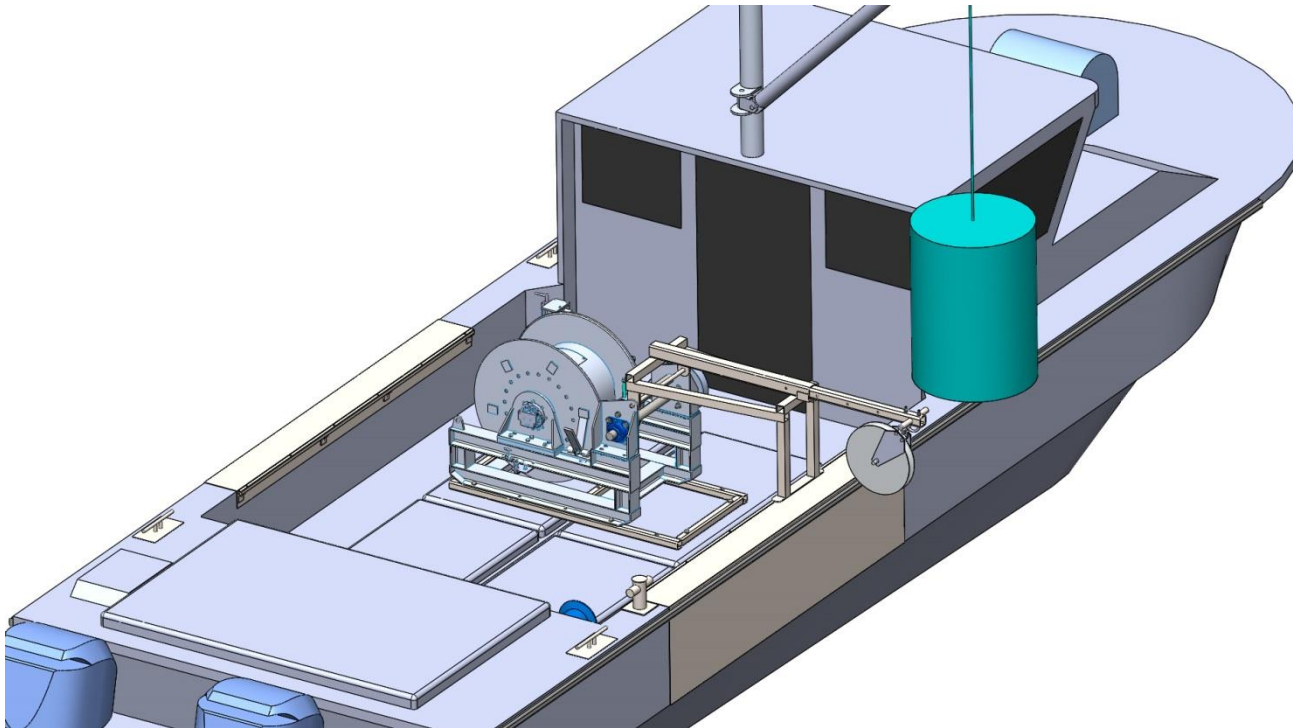


Suggested design for CTD boom



- Boom frame is attached to winch frame using pin
- Boom frame rests on gunwale and it bolted to it
- Shown in retracted position. Actuated by hand after removing pin. Extends 24"

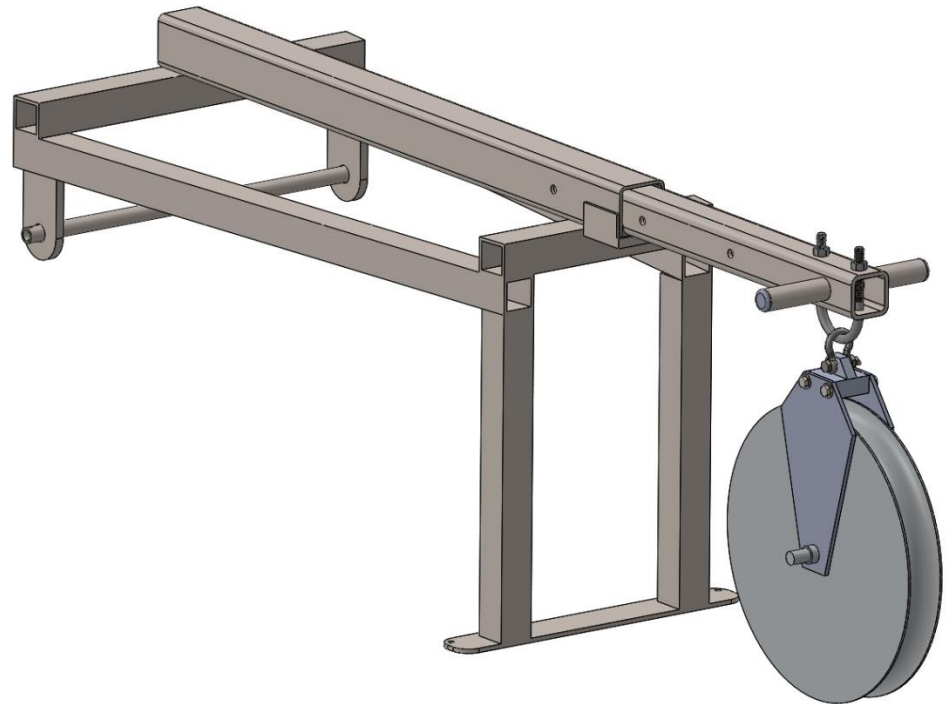
Suggested design for CTD boom



- The CTD and Carousel will be stored on the deck, behind the boat driver seat
- They will be deployed using the Paragon's boom (500 lb load rating).
- After being lowered in the water, the load will be transferred to the CTD boom and released with a quick release shackle

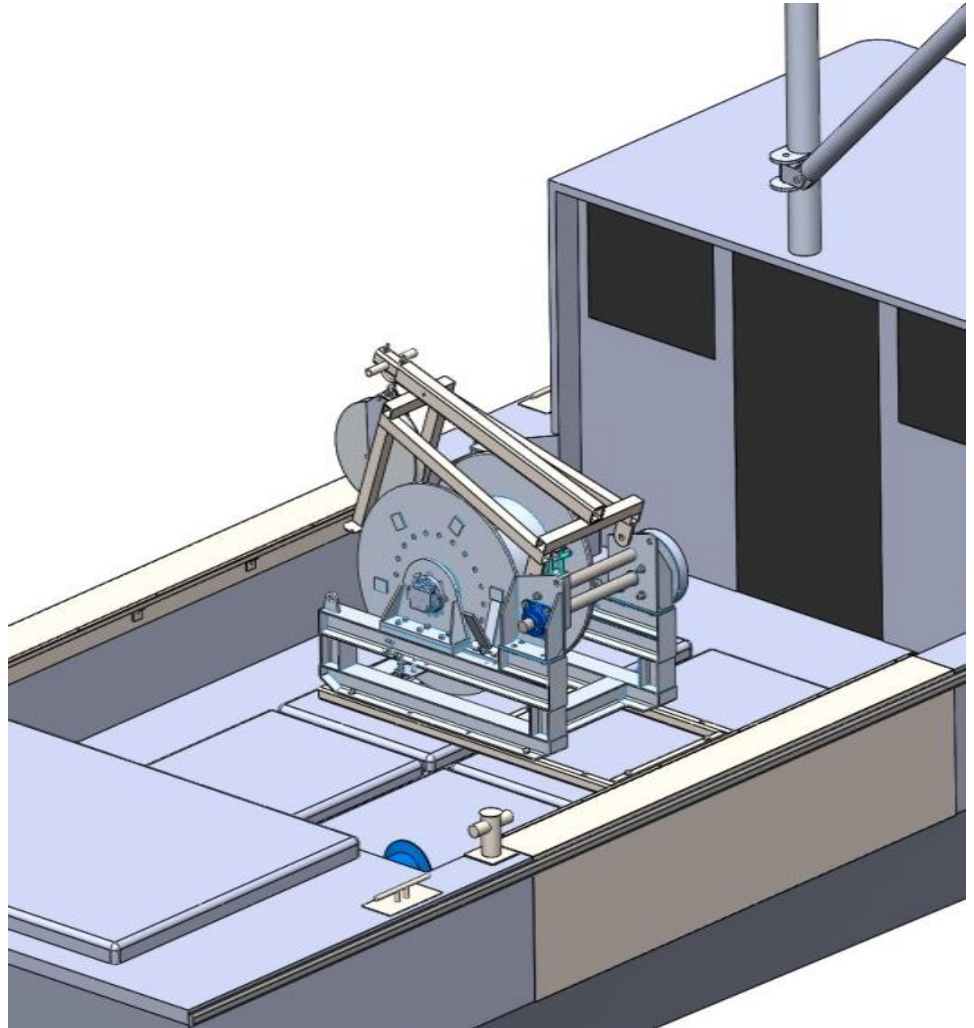
CTD boom features

- 316 Stainless steel tubing:
 - 2x2x3/16" for support frame
 - 2.5x2.5x1/4" inner boom
 - 3x3x3/16" for outer boom
- UHMW bearings for telescoping boom
- Handles for actuation
- Recommended wire layout respected
- 4 locations for pin on the boom (0" to 24")
- Tie down for block to prevent motion during transit (TBD)



CTD boom features

If space is needed on the deck, the boom can be rotated and stored on top of the winch.



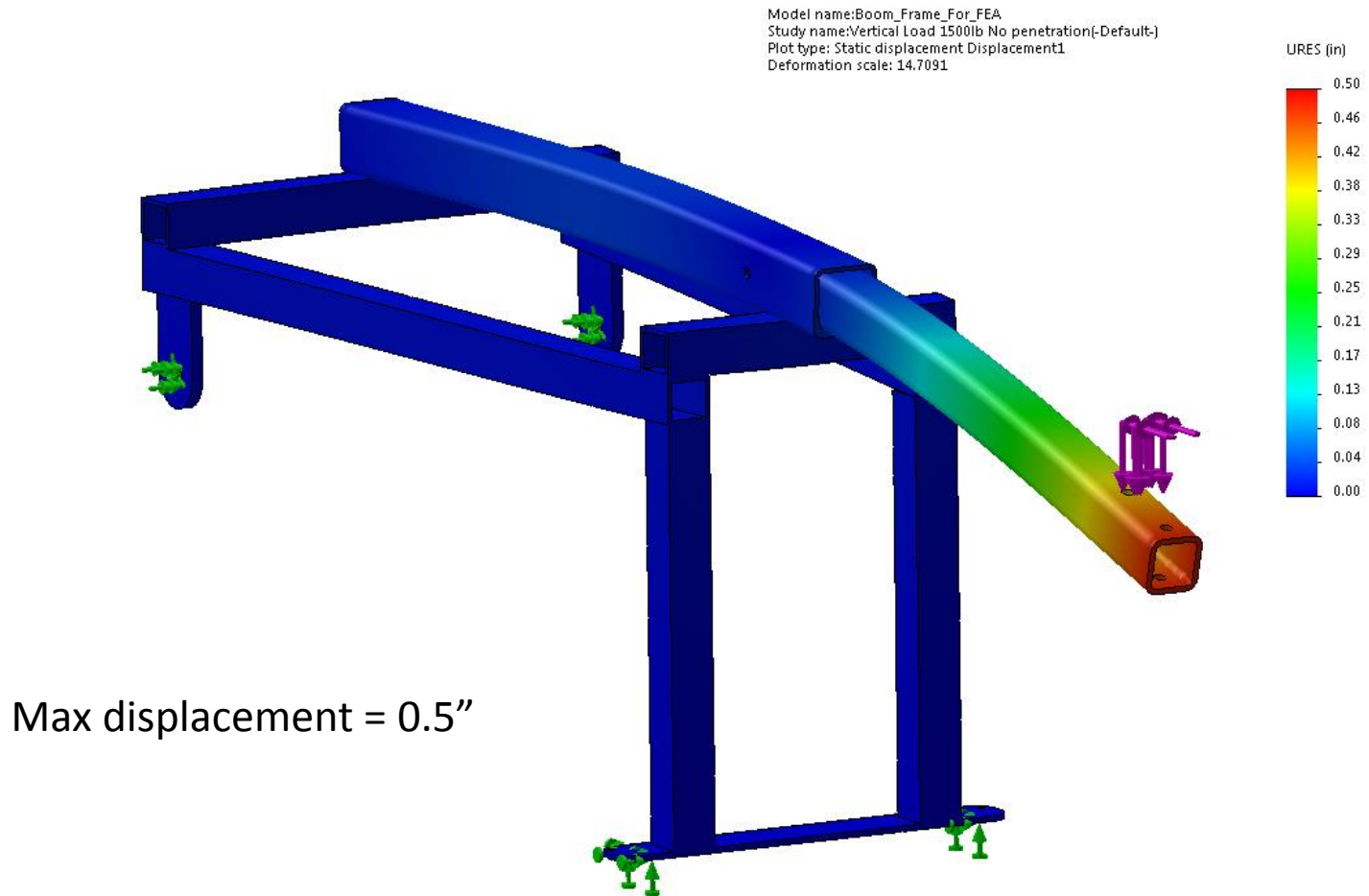
Structural analysis

- FEA and calculations were performed for 1500lb (FEA results and calculations provided).
- Vertical pull:
 - Maximum stress in inner tube = 29400 PSI
 - Maximum stress in outer tube 22600 PSI.
- 45° pull:
 - Maximum stress in inner tube = 36800 PSI (too high?)
 - Maximum stress in outer tube= 29600 PSI.

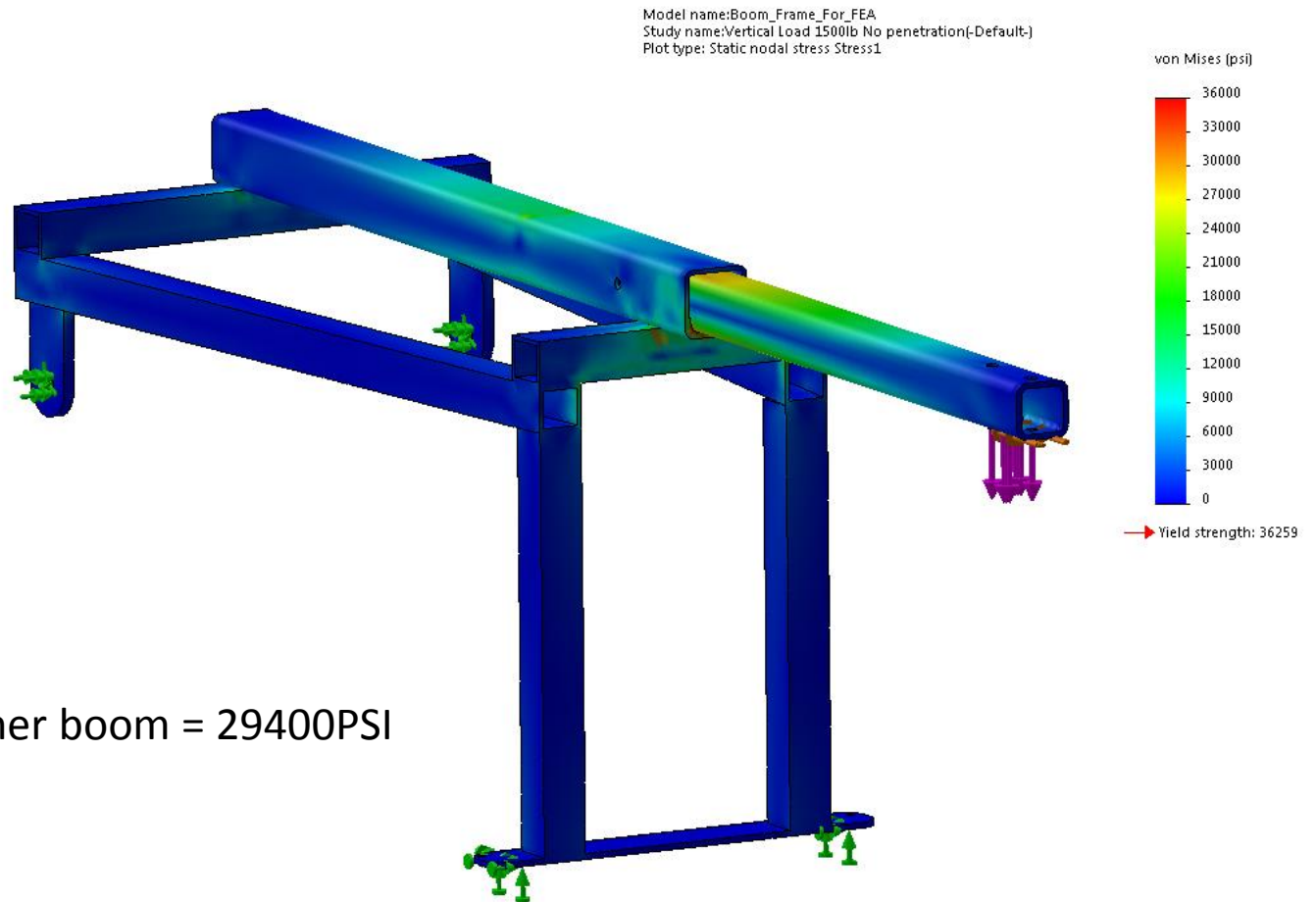
Wall thickness can be increase for inner tube. Max design load can be reduced for 45° pull. YS must be determined more accurately.

Stresses in the rest of the frame are below 20000 PSI. Bearings and attachment will be designed with same factor of safety.

FEA : displacement



FEA : Stress



Max stress in inner boom = 29400PSI