P14031 Test Plan Summary

Spec #	Metric/Specification	Units	Marginal	Target	Direction	Test Plan	Sonar Needed	Sailing Req'd	Actual	Concluded Condition
S1	Transfer time	sec	5	2	\downarrow	<u>TP1</u>	Х	Х	3 sec	0
S2	User reach distance to jib lines	in	25	15	\downarrow	<u>TP2</u>	Х		19"	0
S3	Does design only contain mechanical parts?	yes/no	Yes	Yes	Х	<u>TP3</u>			Yes	0
S4	Distance between existing bench and seat	mm	200	minimize	\downarrow	<u>TP4</u>	Х		6" (152.4 mm)	0
S5	Does design require boat modification?	yes/no	No	No	Х	<u>TP3</u>			No	0
S6	Is fixture permanently fastened to boat?	yes/no	No	No	Х	<u>TP3</u>			No	0
S7	Device Weight	lbs	100	50	\downarrow	<u>TP5</u>			51 lbs	0
S8	Device displacement from secured position	in	2	0	\downarrow	<u>TP6</u>	Х		0.75"	0
S9	Number of potential pinch points	count	5	0	\rightarrow	<u>TP7</u>	Х		0, but there is 1 trip hazard	0
S10	User's unobstructed field of view (compared to no device use)	%	75	100	\uparrow	<u>TP8</u>	Х	Х	100%	0
S12	Does the user have the option to secure their limbs?	yes/no	Yes	Yes	Х	<u>TP3</u>			Yes	0
S13	Time to get into seat	min	5	2	\downarrow	<u>TP9</u>	Х	Х	dependent on disability	Δ
S14	Time to get out of seat	min	5	2	\downarrow	<u>TP9</u>	Х	Х	dependent on disability	Δ
S15	Weight capacity		220	265	Ŷ	<u>TP10</u>			215 lbs (ANSYS simulation shows failure at ~300 lbs, but team could not test to device failure)	Δ
S16	Are all components chosen for corrosion resistant properties?	yes/no	Yes	Yes	Х	<u>TP3</u>			Yes	0
S17	Time to install device in Sonar	min	20	5	\downarrow	<u>TP11</u>	Х	Х	4.5 minutes	0
S18	Number of installation steps	count	10	5	\downarrow	<u>TP11</u>	Х		6 steps	0
S19	Max horizontal distance from boat centerline	in	21	24	\uparrow	<u>TP12</u>	Х		23"	0
S20	Degrees of rotation	degrees	+/- 30	+/-45	\uparrow	<u>TP13</u>	Х		+/- 90	0
S21	Vertical distance between seat and boom	in	33	38	\uparrow	<u>TP14</u>	Х		34.5"	0
S22	Number of parts requiring specialized equipment to manufacture.	count	5	0	\downarrow	<u>TP15</u>			1 part	0
S23	Number of custom parts used in design (custom parts cannot be purchased 'off-the-shelf' in a store or online)	count	5	0	\downarrow	<u>TP15</u>			1 part	0
S24	Time to remove device from Sonar	min	20	5	\rightarrow	<u>TP16</u>	Х	Х	2.5 minutes	0
S25	Number of steps to uninstall device	count	10	5	\downarrow	<u>TP16</u>	Х		6 steps	0
S26	% of users who find seat "comfortable"	%	60	75	\uparrow	<u>TP17</u>			Mfgr chooses seat that fits needs	Δ
S27	Depth of plywood groove after 13500 rotations (~5 years)	in	0.23	0.10	\downarrow	<u>TP18</u>			depth = 0.025 in	0

	KEY - TEST RESULTS										
х	Does not meet expectation										
Δ	Caution-Undetermined if specification is met										
0	Meets specification										

Test Plan # 1 (TP1) - Transfer time between port and starboard

Test Team:

Test Location:

Test Date:

TESTING SPECIFICA	TION					
Specification Number	Risk	Specification	Units	Marginal Value	Target Value	Comments/Status
S1	LOW	Transfer time	sec	5	2	Cannot test until device is fully built
EQUIPMENT/CON	DITIONS	REQURIED				
Specification Number	Equipme	nt or Instrumentation	required		Testing Condition	ons
S1	Completo Sonar Sa Stopwato		1		If these condition	sailing conditions - while on the water in order to obtain most accurate measurements. ons are not available then it is possible to complete the test while stationary (test will show ate; however, will provide unreliable results for transfer time conclusion)
. DATA COLLECTIO		GY uisition Strategy				
S1	Conducti					user between port and starboard. The transfer time is important because the user needs t tion.
Gather required instrumentation f testing		(position o	er system over bench position)	use	fore the tack, r will swing to ner side; time f motion	the Record the time, in Repeat the time
. RESULTS e device was tested at a		-	ults show app	roximately 3 second	transfer time	
. MITIGATION PLA	N (IF NEE	DED)				
A						
I. CONCLUSION						
e user will be able to tra	nsfer betwe	en port and starboard	d in an approp	oriate amount of time	e in order to main	ntain weight distribution

Test Plan # 2 (TP2) - Reach Distance to Jib Lines

Back to P14031 Test Plan Summary

Test Location: Rochester Yac	ht Club (devic	e installed in Sonar)	_	Concluded Condition							
Test Date: 4/23/14						0					
I. TESTING SPECIFICAT	ION										
Specification Number	Risk Level	Specification	Units	Marginal Value	Target Value	Comments/Status					
S2	MED	User reach distance to jib lines	15	Cannot complete test until device is fully built							
II. EQUIPMENT/COND	TIONS REC	QURIED									
Specification Number		or Instrumentation required	ons								
S2	Completed . Sonar Sailbo Tape Measu				None - Test can	be completed while Sonar is out of water					
III. DATA COLLECTION	STRATEGY										
Specification Number	Data Acquis	ition Strategy									
S2	-	he maximum distance from the seat to a user has to reach, in order to hold the				the jib system allows the user to reach the existing jib lines. We want the essive strain on their body.					
IV. TESTING FLOWCHA	RT										
Gather required instrumentation for testing	instrumentation (position over edge of the seat distance in inches local distance										
Port-side locked position Starboard locked position	Distance 19" 19"										
VI. RESULTS	ccess the jih li	ines is the same from both port and sta	rboard locks	d positions at 19"							
VII. MITIGATION PLAN											
		r then the team can consider two optic	ins:								
1) Moving the device more for		•									
		ing another subsystem into the jib tran	sfer system t	that feeds the existing	g jib lines within	the user's reach					
VIII. CONCLUSION	·										
No mitigation action needed.	The user is at	ble to reach the jib lines from both port	and starboa	rd locked positions							

Test Plan # 3 (TP3) - Yes/No Questions

Back to P14031 Test Plan Summary

Test Team: All

Test Locatio	on: Rochester	r Yacht Club (device installed in Sonar)				Concluded Condition				
Test Date: 4	4/23/14					0				
I. TESTIN	G SPECIFIC	ATION								
Spec #	Risk Level	Specification	Units	Marginal Value	Target Value	Comments/Status				
S3	LOW	Does design only contain mechanical parts?	yes/no	Yes	Yes					
S5	LOW	Does design require boat modification?	yes/no	No	No	Able to test concurrently with TP1, when the system is installed in the Sona				
S6	LOW	Is fixture permanently fastened to boat?	yes/no	No	No	Able to prove concurrently with TP16, when the system is uninstalled from the Sonar				
S12	MED	Does the user have the option to secure their limbs?	yes/no	Yes	Yes					
S16	LOW	Are all components chosen for corrosion resistant properties?	yes/no	Yes	Yes	Corrosion testing on components not needed because using SS, aluminum and plastic. These materials are known to be corrosion resistant				
II. EQUIPI		NDITIONS REQURIED								
Spec #		/Instrumentation/Material required			Testing Condit	tions				
S3	Completed	BOM			N/A					
S5	None				N/A					
S6	None				N/A					
S12	Completed 'Ace' Banda	Jib Transfer System Ige			Device needs t	to be stable to that the user can sit in the seat for testing				
S16	Completed	BOM			N/A					
III. DATA	COLLECTIO	DN STRATEGY								
Spec #	Data Acquis	sition Strategy								
\$3		sfer system will comply with ISAF/IFDS Regulations if th termines compliance with the ISAF/IFDS Regulations.	nere are no e	electronic component	ts. Complying w	ith these regulations allows for the device to be used in competitive sailing.				
S5		sfer system will comply with ISAF/IFDS Regulations if th allows for the device to be used in competitive sailing.				onar (drilling into the boat, cutting into the boat, etc.) Complying with these FDS Regulations.				
S6						t. By proving that the jib transfer system is removable from the Sonar, the tittive sailing. This test determines compliance with the ISAF/IFDS Regulation				
S12		e of this test is to confirm the device allows the user to ecification is met.	secure their	lower limbs, which t	hey may not ha	we full control of. If the user has the option to secure their legs to the base,				
S16	Corrosion t	esting								
IV. TESTI	NG PROCE	DURE								
S3	When the c	levice is complete, check the BOM for electronic compo	onents. If the	ere are none, the spe	cification has be	een met				
S5	When the c	levice is installed into the Sonar, verify the installation p	process does	not require any mo	difications to the	e Sonar. If there a no modifications, the specification has been met				
S6	At the com	pletion of TP16, the jib transfer system will be removed	I from the So	onar. The specificatio	n has been met	when the device is removed from the Sonar.				
					e (between the 2 PVC legs). Using an "Ace Bandage" see if the users legs are able to be secure					
S12		e PVC leg supports. Record the result								
\$16	When the o	omponents are purchased, ensure only the corrosion r	esitant mate	erial components are	bought. If these	e materials are used, the specification has been met				
V. RESUL	TS									
S3		ic components on BOM								
S5		Sonar on 4/23/14 - no modifcations to Sonar needed for	or proper de	vice fit & function						
S6		uninstalled from Sonar on 4/23/14 after testing - the			d to the boat					
S12		are able to fit between the PVC arm assembly - Piers Pa				er's needs				
\$16	All hardwar	e components chosen with corrosion resistant propert	ies		Č.					
VI. MITIG	ATION PL	AN (IF NEEDED)								
S3	If there are electoric components in the ROM at completion, a note needs to be added to the instructional information that the device does not comply with sailing racing regulations. The iih									
S5	If there are Senar modifications required during installation, a note needs to be added to the instructional information that the device does not comply with sailing requirations. The jib									
S6	If the device is permanently installed into the Sonar - and not able to be removed- a note needs to be added to the instructional information that the device does not comply with sailing racing									
S12	regulations N/A	. The jib transfer system will not be allowed for the use	n m a race.							
	IN/A									
S16	N/A									
VII. CONC	CLUSION									
		ded. All specifications for TP 3 are satisfied								

Test Plan # 4 (TP 4) - Distance between bench and device seat

Back to P14031 Test Plan Summary

Test Location: Rochester Yacht Club (device installed in Sonar)													
Test Date: 4/23/14						0							
I. TESTING SPECIFICAT	ION												
Specification Number	Risk Level	Specification	Units	Marginal Value	Target Value	Comments/Status							
S4	MED	Distance between existing bench and seat	mm	200	minimize								
II. EQUIPMENT/COND	I. EQUIPMENT/CONDITIONS REQURIED												
Specification Number													
Completed base of system built PVC chair needs to be assembled, but NOT glued together S4 Sonar Sailboat Tape Measure													
III. DATA COLLECTION	STRATEGY	1											
Specification Number	Data Acquisi	tion Strategy											
S4		, , , , ,			•	n Sonar bench seat and the jib transfer system seat is less than t determines compliance with the ISAF/IFDS Regulations.							
IV. TESTING FLOWCH	ART												
Gather requir instrumentation fo		Position the jib transfer system (position over bench in locked position)		the top and th	the distance b of the Sonar b e bottom of th transfer chair	pench Record the distance in mm							
		To verify the measure	ement d	lso complete the	following:								
Place the jib transf on a flat surf		Measure the height from the flat surface to the bottom of the device's seat		Record t	the measuren mm	nent, in Subtract the height of the bench (mm)							
V. RESULTS													
	VARESOLES Measurement from Sonar's existing bench seat to the top of the device's seat (where the user is seated) is ~6"												
VI MITIGATION PLAN													
VI. MITIGATION PLAN (IF NEEDED) If the height between the existing bench and the device seat is > 200mm then the team will not glue the PVC chair together. The team will re-evaluate the design to modify the height of the PVC chair. If this is not possible, the device will still function but will not comply with the ISAF/IFDS Racing Regulations. If the device does not comply with the racing regulations, a note needs to be added to the instructional information.													
VII. CONCLUSION													
The device complies with the		egulations of being <200mm (~7.87 inches). assistive device to be used in competitive sailing											

Test Plan # 5 (TP 5) - Weight of Jib Transfer System

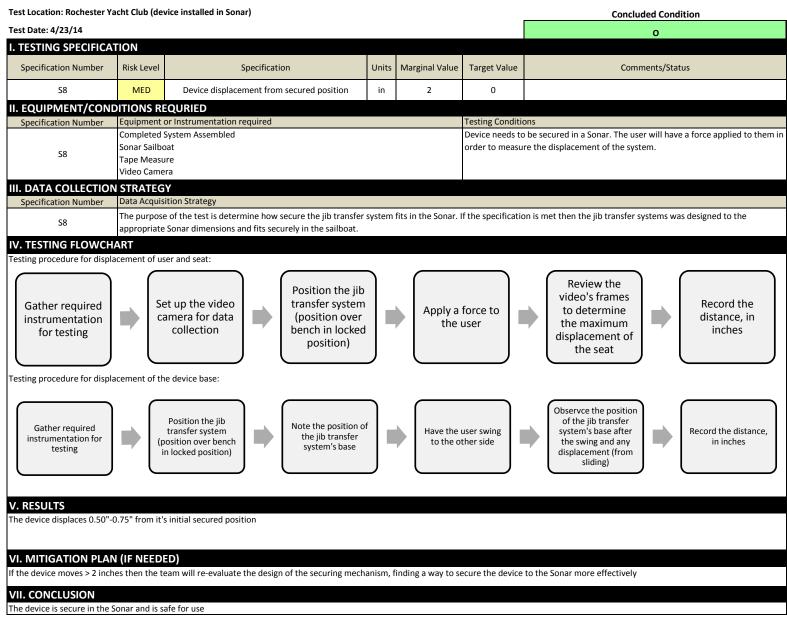
Back to P14031 Test Plan Summary

Test Team: M. Brunelle, K. Wurman

Test Location: College of En	gineering Ma	chine Shop		Concluded Condition							
Test Date: 4/28/14						ο					
I. TESTING SPECIFICAT	ΓΙΟΝ										
Specification Number	Risk Level	Specification	Units	Marginal Value	Target Value	Comments/Status					
S7	MED	Device Weight	50								
II. EQUIPMENT/COND	DITIONS RE	EQURIED									
Specification Number	ons										
S7		System Assembled bugh to place system on)			N/A						
III. DATA COLLECTION	STRATEG	Y									
Specification Number	Data Acquis	ition Strategy									
S7	S7 Weighing the device will ensure that the customer requirement of "lightweight" has been met. Since the volunteers at Piers Park are responsible for installing/un- installing the assitive devices, the weight is an important factor. If a device is too heavy then more volunteers are needed.										
IV. TESTING PROCEDU	JRE										
		the KGCOE Machine Shop. Place the device on the indiidual components will then be summed to ob		•	-	pound. If the device is too large to place on the scale, the base					
VI. RESULTS											
Whole device fits on scale fo	or measureme	ent - Total system weight is 51 lbs									
VII. MITIGATION PLAN	N (IF NEED	DED)									
N/A	,										
VIII. CONCLUSION											
The device weight of 51 lbs i	s significanly	less than the previous project iteration.									
With a total system weight o	of 51 lbs, two	volunteers are needed to safely install and uninst	tall the	device from the So	onar						

Test Plan # 6 (TP 6) - Secure Device Fit in Sonar

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Test Plan # 7 (TP 7) - Pinch Points

Back to P14031 Test Plan Summary

Test Location: Rochester Ya	cht Club (dev	vice installed in Sonar)	Concluded Condition									
Test Date: 4/23/14						ο						
I. TESTING SPECIFICAT	ΓΙΟΝ											
Specification Number	Risk Level	Specification	Units	Marginal Value	Target Value	Comments/Status						
S9	MED	Number of potential pinch points	count	5	0	Cannot test until device is complete						
II. EQUIPMENT/COND	DITIONS RE	QURIED										
Specification Number Equipment or Instrumentation required Testing Conditions												
S9	S9Completed Jib Transfer System Sonar SailboatDevice should be installed in the Sonar to accurately estimate pinch points in the real use environment											
III. DATA COLLECTION	STRATEG	Y										
Specification Number	Data Acquis	ition Strategy										
S9	S9 This ergonomic analysis will determine the relative safety of the device for the user - and others in the boat - based on the number of pinch points.											
IV. TESTING PROCEDU	JRE											
		n the Sonar, count the number of pinch p iis information in the instruction manual.		t pose a safety haz	ard to the user.	Develop countermeasures to reduce the severity or likeliood of						
V. RESULTS												
Analysis shows no pinch poi	nts because t	the spring and all moving components are	e covered	l by the bases								
The addition of handles to t	he bottom ba	ase did create one trip hazard (hazard for	the user	and the other peo	ple in the Sona	r)						
VI. MITIGATION PLAN												
N/A	I (IF NEEDI	-D)										
VII. CONCLUSION												
There is limited safety hazar	ds for the us	er while using the device										
The one trip hazard created	by the hand	es on the bottom base will be outlined as	s a warnir	ng in the user man	ual							

Test Plan # 8 (TP 8) - Unobstructed View

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Test Location: Rochester Yacht Club (device installed in Sonar)											
Test Date: 4/23/14						ο					
I. TESTING SPECIFICAT	ION										
Specification Number	Risk Level	Specification	Units	Marginal Value	Target Value	Comments/Status					
S10	LOW	User's unobstructed field of view (compared to no device use)	%	75	100	test after complete					
II. EQUIPMENT/COND	ITIONS RI	EQURIED									
Specification Number	Equipment	or Instrumentation required			Testing Condition	ions					
S10	Complete jil Sonar Sailbo	b transfer system pat			Ideally want to in a secure pos	test under sailing conditions, but it is possible to test with device ition					
III. DATA COLLECTION	STRATEG	Ϋ́									
Specification Number	Data Acquis	ition Strategy									
S10	,	g the user's estimated unobstructed field of view, ften the "eyes of the boat" and needs to be able				device inhibts the user's ability to see their surroundings. The jib of view					
IV. TESTING PROCEDU	IRE										
Gather required instrumentation and materials for testing		existing bench of the sy	stem (p ch in lo	he jib transfer position over cked position)	devi is i	ve the user sit in the ce seat and note what n their field of vision					
V. RESULTS	neeus to be		ie suita	ible, of it the metri							
100% field of view is unobstr	ucted (the u	ser can see the same field of view they would hav	ve with	out the device)							
VI. MITIGATION PLAN N/A	VI. MITIGATION PLAN (IF NEEDED) N/A										
	,	would have without the use of the device> 100 age because they are positioned ~6" higher than			w is unobstruct	ed					
, , , , ,											

Test Plan # 9 (TP9) - Getting into/out of the device

Test Team: All

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Test Location: Rochester Yacht Club (device installed in Sonar) **Concluded Condition** Test Date: 4/23/14 Λ I. TESTING SPECIFICATION Risk Level Spec # Specification Units Marginal Value Target Value Comments/Status LOW Time to get into seat S13 min 5 2 S14 LOW Time to get out of seat min 5 2 **II. EQUIPMENT/CONDITIONS REQURIED** Equipment/Instrumentation/Material required Testing Conditions Spec # Completed Jib Transfer System Test under real sailing conditions - while on the water in order to obtain most accurate Sonar Sailboat S13 measurements. Stopwatch Completed Jib Transfer System If these conditions are not available then it is possible to complete the test while stationary (test Sonar Sailboat S14 will not consider the reduce stability of the Sonar while it is in the water, or in a hoist) Stopwatch **III. DATA COLLECTION STRATEGY** Data Acquisition Strategy Spec # Conducting a time study will allow us to determine the time it takes to position a user into the seat. The entry time is important because the user wants to be able to easily begin using the S13 device. A lengthy process to set the user up in the seat may be discourgaing and take away the freedom associated with sailing Conducting a time study will allow us to determine the time it takes to position a release themselves from the seat. The exit time is important because the user wants to be able to easily S14 stop using the device. A lengthy process to get the user out of the seat may be discourgaing **IV. TESTING FLOWCHART** Record the time. in Gather required Position the jib transfer Have the user stand on seconds it takes for the Repeat the time user to board the Sonar S13 measurement 10 times instrumentation for system (position over the dock and board the and correctly position testing bench in locked position) Sonar total themselves in the device Record the time, in Position user into the Gather required seconds, it takes the Repeat the time jib transfer system instrumentation for user to get out of the measurement 10 S14 (position over bench testing seat and unboard the times total in locked position) Sonar to the dock V. RESULTS Cannot complete test VI. MITIGATION PLAN (IF NEEDED) N/A VII. CONCLUSION The time it takes for the user to get in and out of the seat is fully dependent on the user's disabilities The test team is able to get in and out of the seat in <<1 minute, which meets the specification No testing was complete with disabled users; however, the team is confident that the user will be able to position themselves in the seat in the 2-5min range

Test Plan # 10 (TP 10) - Weight Capacity

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Test Team:

Test Location:

Test Date:

TESTING SPECIFICATION specification with the link link link link link link link link						_								
515 LOW Weight capacity Ibs 220 265 cannot test until device is built FQUIPMENT/CONDITIONS RECURID Specification Number Exclument of instrumentation required Testing Conditions Specification Number Sonar Sailboat Jib Transfer System needs to be installed into the Sonar. If a Sonar is not available for testing, then the device needs to be secured in position so that it able to ungergo testing Specification Number Data Acquisition Strategy Specification Number Data Acquisition Strategy Specification and evice is able to accommodate a wide range of users. V. TESTING FLOWCHART Gather the instrumentation and materials needed Set the jib transfer Peterming the weight capacity of the system is a key piece of information that needs to be included in the instructional manual. If the specification is met, then the device is able to accommodate a wide range of users. V. TESTING FLOWCHART Set the jib transfer Peterming the weight capacity of the system is a key piece of information that needs to be included in the instructional manual. If the specification is met, then the instrumentation and manual. If the specification is met, then the instrumentation and materials needed Peterming the weight capacity of the system is the seat 's center, with a sonar Sailboat Image: measure the device total weight capacity of the system is the seat 's center, with a sonar Sailboat Image: measure the device total weight capacity of the system is the seat 's minutes'			Constituention	1 be the	Managinal Malua	Tennet)/else	Commente (Charless							
Lequipment/CONDITIONS REQUILED Specification Number Evaluation Required Testing Conditions Specification Number Specification Number Specification Number Specification Number Specification Number Specification Number Bit Acquisition Strategy Specification Number Data Acquisition Strategy Specification Number Specification Number Specification Number Data Acquisition Strategy Specification Number Specification Number Specification Number Data Acquisition Strategy Specification Number Specification Number Specification Number Data Acquisition Strategy Specification Number Specification Number Specification Number Data Acquisition Strategy Specification Number Place 50 more Bo System view System up in the Instrumentation and materials needed Specification Spe	•					-								
opecification Number Equipment or instrumentation required Testing Conditions 315 Weights- up to a combined 265 lbs available for testing, then the device needs to be secured in position so that it able to ungergo testing IDATA COLLECTION STRATESY Specification Number Tata Acquisition Strategy Testing and the device needs to be secured in position so that it able to ungergo testing Specification Number Stata Acquisition Strategy Testing Conditions Specification Number Testing Conditions Betermining the weight capacity of the system is a key piece of information that needs to be included in the instructional manual. If the specification is met, then the device is able to accommodate a wide range of users. V. TESTING FLOWCHART Set the jib transfer system up in the Sona's Saliboat Place 50 lbs onto the seat's center, wait z minutes measure the deflection			- · · ·	lbs	220	265	cannot test until device is built							
Sinar Sallbaat Jb Transfer System needs to be installed into the Sonar, If a Sonar is not available for testing, then the device needs to be secured in position so that it able to ungergo testing II. DATA COLLECTION STRATEGY Specification Number Data Acquisition Strategy Solar Sallboat Determining the weight capacity of the system is a key piece of information that needs to be included in the instructional manual. If the specification is met, then the device is able to accommodate a wide range of users. V. TESTING FLOWCHART Gather the is sonar Sallboat Image Sub sonto the seat's center, wait 2 minutes Images/Sub sonto the seat's center, weigt/Sub sonto the se						_								
11 Weights - up to a combined 265 lbs available for festing, then the device needs to be secured in position so that it able to ungergo testing 12 Top Measure bata Acquisition Strategy 23 Determining the weight capacity of the system is a key piece of information that needs to be included in the instructional manual. If the specification is met, then the measure is able to accommodate a wide range of users. VISTOR FOOWCHARE Image: State is able to accommodate a wide range of users. Provide the top is able to accommodate a wide range of users. Provide to the set is able to accommodate a wide range of users. Provide top is a provide to a wide range of users. Provide top is able to accommodate a wide range of users. Provide top is a ble to accommodate a wide range of users. Provide top is able to accommodate a wide range of users. Provide top is able to accommodate a wide range of users. Weight cont to for a colspan="2">Provide top is a ble to accommodate a wide range of users. Weight cont top is a ble to accommodate a wide range of users. Provide top is a ble to accommodate a wide range of users. Provide top is a ble to accommodate a wide range of users. Provide top is a ble to accommodate a wide range of users. <	Specification Number		•											
Tape Measure jable to ungergo testing Specification Numbe Data Acquisition Strategy Specification Numbe Data Acquisition Strategy Specification Numbe Data Acquisition Strategy Gather the Determining the weight capacity of the system is a key piece of information that needs to be included in the instructional manual. If the specification is met, then the device is able to accommodate a wide range of users. V.TESTING FLOWCHART														
I. DATA COLLECTION STRATEGY Specification Number Data Acquisition Strategy 515 Determining the weight capacity of the system is a key piece of information that needs to be included in the instructional manual. If the specification is met, then the device is able to accommodate a wide range of users. V. TESTING FLOWCHART Image: Set the jib transfer system up in the Sonar Sailboat Place 50 lbs onto the seat's center, wait 2 minutes Image: Place 50 more lbs onto the seat's center, wait 2 minutes Image: Place 50 more lbs onto the seat's center, wait 2 minutes Image: Place 50 more lbs onto the seat's center, wait 2 minutes Image: Place 50 more lbs onto the seat's center, wait 2 minutes Image: Place 50 more lbs onto the seat's center, wait 2 minutes Image: Place 50 more lbs onto the seat's center, wait 2 minutes Image: Place 50 more lbs onto the seat's center, wait 2 minutes Image: Place 50 more lbs onto the seat's center, wait 2 minutes Image: Place 50 more lbs onto the seat's center, wait 2 minutes Image: Place 50 more lbs onto the seat's center, wait 2 minutes Image: Place 50 more lbs onto the seat's center, wait 2 minutes Image: Place 50 more lbs onto the seat's center, wait 2 minutes Image: Place 50 more lbs onto the seat's center, wait 2 minutes Image: Place 50 more lbs onto the seat's center, wait 2 minutes Image: Place 50 more lbs onto the seat's center, wait 2 minutes Image: Place 50 more lbs onto the seat's center, wait 2 minutes Image: Place 50 more lbs onto the seat's center, wait 2 minutes Image: Place 50 more lbs onto the seat's center, wait 2 minut	\$15		•				- ·							
Specification Number Data Acquisition Strategy S15 Determining the weight capacity of the system is a key pice of information that needs to be included in the instructional manual. If the specification is met, then the device is able to accommodate a wide range of users. V TESTING FLOWCHART Image: State is able to accommodate a wide range of users. Materials needed Image: State is able to accommodate a wide range of users. Place 50 more lbs onto the seart's center, wait 2 minutes Image: State is able to accommodate a wide range of users. Record the total materials needed Image: State is able to accommodate a wide range of users. Image: State is able to accommodate a wide range of users. Note: State is able to accommodate a wide range of users. Image: State is able to accommodate a wide range of users. Image: State is able to accommodate a wide range of users. Materials needed Image: State is able to accommodate a wide range of users. Image: State is able to accommodate a wide range of users. Image: State is able to accommodate a wide range of users. Record the total materials needed Image: State is able to accommodate a wide range of users. Image: State is able to accommodate a wide range of users. Image: State is able to accommodate a wide range of users. Not State is able to accommodate a state is a not at least 215 lbs Image: State is able is accommodate and at least						able to ungerg								
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		nodate a ran	ige of users, given that it can hold at least 215 lbs	(most	likely more given /	ANSYS analysis)								
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Test Plan # 11 (TP11) - Installation of Jib Transfer System

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S18 LOW Number of installation steps count 10 5 the user to install in the sailboat Spec # Equipment/Instrumentation/Material required Testing Conditions S17 Completed Jib Transfer System Testing Should occur while the Sonar is docked on the water (or in a hoist) in order to represent real installation conditions. The volunteers used for testing will have limited knowledge of the device to represent the volunteers at Piers Park who may have no extension will allow the testing will have limited knowledge. S18 None None IDATA COLLECTION STRATEGY None S17 Conducting a time study, with multiple users, to obtain the average time it takes for two individuals to properly install the device in the Sonar will allow the team to evaluate the ease of installation. S18 Determining the number of steps in the installation manual will allow the team to evaluate the ease of installation. S18 Gather required instrumentation for testing Place all system components on the dock next to the Sonar the dock next to the Sonar the for each test to follow the instruction manual to properly install the device in the minutes Record the time, in in minutes			Yacht Club (device installed in Sonar)				Concluded Condition
Spec # Risk Level Specification Units Marginal Value Target Value Comments/Status 517 LOW Time to install device in Sonar min 20 5 The assumption is a device with a fewer number of steps will be easier in the user to install in the saliboat 518 LOW Number of installation steps count 10 5 The assumption is a device with a fewer number of steps will be easier in the user to install in the saliboat EQUIPMENT/CONDITIONS REQURIED Testing Gonditions Completed JB Transfer System Testing Gonditions Saliboat None Saliboat None Saliboat None Saliboat None Saliboat None Saliboat Saliboat Saliboat None Saliboat Saliboat Saliboat Saliboat <	-						0
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17 4.5 minutes 18 6 steps 11 MITIGATION PLAN (IF NEEDED) 517 N/A 518 N/A MIL CONCLUSION he device is easy to install, requiring < 5 minutes for 2 people to complete the installation process.	S18	Count the n	umber of steps in the completed installation r	nanual and rec	ord the number		
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ne device is easy to install, requiring < 5 minutes for 2 people to complete the installation process.	II. CONC	CLUSION					
			all, requiring < 5 minutes for 2 people to comp	lete the installa	ation process.		

Test Plan # 12 (TP 12) - Max User Distance from Centerline

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o ITESTING SPECIFICATION Specification mumber Risk Level to two instructions Specification mumber Risk Level to two instructions Specification mumber Risk Level to two instructions Specification Number Ris	Test Location: Rochester Ya	icht Club (de	vice installed in Sonar)							Concluded Co	onditio	'n			
Specification Number Risk Level Specification Units Marginal Value Target Value Comments/Status 519 LOW Max horizontal distance from boat centerline in 21 24 Specification Number Equipment or Instrumentation required Testing Conditions Complexited ib Transfer System The device needs to be properly installed in the Sonar, but the Sonar does not need to be on the water. S19 Sonar Sallooat The distance that the user is able to move to from the centerline is important because the user needs to be able to maintain the appropriate weight distribution. S20 The distance that the user is able to move to from the centerline is important because the user needs to be able to maintain the appropriate weight distribution. V. TESTING FLOWCHART Fare a piece of the Gonar, Status Fare a piece of the Gonar, Status Gather required Fare a piece of the centerline of the eak of the device point the eak of the device point the eak of the device point of the bench, at the back of the device of the sonar). Fere a piece of the sonar, Status V. RESULTS VI. RESULTS S24 VI. NITIGATION PLAN (IF NEEDED) NA VII. CONCLUSION VI. MITIGATION PLAN (IF NEEDED) VI. CONCLUSION	Test Date: 4/23/14									0					
S19 LOW Max horizontal distance from boat centerline In 21 24 Is COULPRENT/CONDITIONS REQUIRED Specification Number Exapprent of Instrumentation required Testing Conditions Specification Number Exapprent of Instrumentation required Testing Conditions Sign fraction Number Source and the Sonar's Subart The device needs to be properly installed in the Sonar, but the Sonar does not need to be on the water. Sign fraction Number Source Subart The device needs to be properly installed in the Sonar, but the Sonar does not need to be on the water. Sign fraction Number Data Acquisition Strategy The device needs to be apprentive weight distribution. JID Trimmers who do not need assistive devices are able to place themselves positive bench seats (seating themselves on the edge of the Sonar). If the specification is met, then the jim trimmer in the device will be able to provide sufficient weight distribution. V. TESTING FLOWCHART Flace a piece of in the specification the jim trimmer in the device will be able to provide sufficient weight distribution. Subtract 1/2 the device seat (be cased (be ca	I. TESTING SPECIFICAT	ΓΙΟΝ													
I. EQUIPMENT/CONDITIONS REQURIED Specification Number Equipment or instrumentation required Testing Conditions Specification Number Completed 101 Transfer System The device needs to be properly installed in the Sonar, but the Sonar does not need to be on the water. S19 Sonar Sallboat The device needs to be properly installed in the Sonar, but the Sonar does not need to be on the water. Specification Number Data Acquisition Strategy The distance that the user is able to move to from the centerline is important because the user needs to be able to maintain the appropriate weight distribution. Jib Trimeners who do not need assistive devices are able to place themselves past the bench seats (seating themselves on the edge of the Sonar). If the specification is met, then the jim trimmer in the device will be able to provide sufficient weight distribution. IV. TESTING FLOWCHART Place a piece of the sonar) weight distribution. Place a piece of masking tape in the sonar is able to provide sufficient weight distribution. Subtract 1/2 the device seat (to depth of the divice over the distance between the sonar) bench in locked position in boked position in boked position in boked position in boked Place a piece of masking tape in the sonar) bench in boked Subtract 1/2 the device seat (to device over the distance between the seat) If the device over the distance between the seat) Subtract 1/2 the device over the distance between the seat) If the device over the distance between the seat) If the device over the distance between the seat) Subtract 1/2 the device over the distance b	Specification Number	Risk Level	Sp	ecification		Units	Marginal Value	Target Value		Comments/	Status				
Specification Number Equipment of instrumentation required Testing conditions Sign 2 Some Sulbox The device needs to be properly installed in the Sonar, but the Sonar does not need to be on the water. Sign 3 Measuring Tape The device needs to be properly installed in the Sonar, but the Sonar does not need to be on the water. Specification Number Data Acquisition Strategy The device are also to place are are also to place are aread to place are arealso to place are are also to place are are al	S19	LOW	Max horizontal dis	tance from boat cent	terline	in	21	24							
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N/A VIII. CONCLUSION			in or sear (when position	neu over the beneny											
N/A VIII. CONCLUSION															
VIII. CONCLUSION	VII. MITIGATION PLAN	N (IF NEED)ED)												
	N/A														
	VIII. CONCLUSION														
		sufficient we	eight distribution while	using the device											

Test Plan # 13 (TP13) - Degrees of Rotation from Centerline

Back to P14031 Test Plan Summary

Test Location: Rochester Ya	cht Club (dev	ice installed in Sonar)					Concl	luded Condition
Test Date: 4/23/14								0
I. TESTING SPECIFICAT	ION							
Specification Number	Risk Level	Specification		Units	Marginal Value	Target Value	Cor	mments/Status
S20	LOW	Degrees of rotation	on	degrees	+/- 30	+/-45	cannot te	est until device is built
II. EQUIPMENT/COND	ITIONS RE	QURIED						
Specification Number	Equipment o	or Instrumentation required				Testing Condit	ions	
S20	Completed J Sonar Sailbo Tape Measu					be in the wate	,	nowever, the Sonar does not need to for testing, then the test can be ns of the Sonar
III. DATA COLLECTION	STRATEGY	1						
Specification Number	Data Acquisi	tion Strategy						
S20	Determining	the degrees of rotation will allow	w the team to con	nclude tha	t there is a large r	ange of movem	ent for the jib trimmer while	using the assistive device.
IV. TESTING FLOWCH	ART							
Gather required instrumentation for testing		Position the jib transfer system (position over bench in locked position)	rc	otation f	angle of	Rec	cord the angle, in degrees	Repeat the measurement with the seat secured on the other side of the Sonar
VI. RESULTS Device can swing +/- 90 degr	ees from the	centerline of the boat						
VII. MITIGATION PLAN	I (IF NEEDE	ED)						
VIII. CONCLUSION There is a large range of mot	ion for the jib	trimmer while using the assistiv	ve device					

Test Plan # 14 (TP14) - Boom and Head Collision

Back to P14031 Test Plan Summary

Test Team: All

Test Location: Rochester Y	acht Club (de	vice installed in Sonar)				Concluded Condition
Test Date: 4/23/14						0
I. TESTING SPECIFICA	TION					
Specification Number	Risk Level	Specification	Units	Marginal Value	Target Value	Comments/Status
S21	HIGH	Vertical distance between seat and boom	in	33	38	
II. EQUIPMENT/CONI	DITIONS RE	QURIED				
Specification Number	Equipment	or Instrumentation required			Testing Condit	ions
		lib Transfer System				to be installed in the Sonar and the boom needs to be positioned
S21	Sonar Sailbo				at its lowest p	oint (directly down the centerline of the sailboat)
	Measuring 1	Гаре				
III. DATA COLLECTION	STRATEG	Y				
Specification Number	Data Acquis	ition Strategy				
S21		g the vertical distance between the device seat and b n is met, then the user should not have to worry abo				ne user's head will come in contact with the boom. If the
IV. TESTING PROCED	URE					
Gather require instrumentation testing		transfer system at the the	minim	e boom to um height iterline of onar	fror dev	sure the distance n the top of the vice seat to the om of the boom
V. RESULTS						
Height between the seat to	p (where the	user sits) and the boom is 34.5"				
VI. MITIGATION PLAN	N (IF NEEDE	ED)				
If there is not enough dista	nce between t	the boom and the device seat, there is a high probab	ility tha	t the boom will hit	the user in the	head. This is a big safety concern. In order to reduce the
						ddition, the team will evaluate any minor design changes that
could reduce this hazard.						
VII. CONCLUSION						
	e to worry abo	but the hitting their head on the boom as they transf	er			

Most users should not have to worry about the hitting their head on the boom as they transfer The user should still be aware of what is going on around them to ensure they are not injured while swinging between port and starboard

Test Plan # 15 (TP15) - Custom Parts Manufacturing

Back to P14031 Test Plan Summary

Test Team: All

Test Locati	on: Rocheste	r Yacht Club (device installed in Sonar)				Concluded Condition
Test Date:	4/23/14					0
I. TESTIN	IG SPECIFIC	CATION				
Spec #	Risk Level	Specification	Units	Marginal Value	Target Value	Comments/Status
S23	LOW	Number of parts requiring specialized equipment to manufacture.	count	5	0	Testing will occur periodically throughout the build phase. As parts are built, notes will be taken on the
S24	LOW	Number of custom parts used in design (custom parts cannot be purchased 'off-the-shelf' in a store or online)	count	5	0	number of manufacturing processes and equipment used
II. EQUIP	MENT/CO	NDITIONS REQURIED				
Spec #	Equipment	/Instrumentation/Material required			Testing Condit	ions
S23	Completed	Jib Transfer System			None	
S24	None				None	
III. DATA	COLLECTI	ON STRATEGY				
Spec #	Data Acqui	sition Strategy				
S23		er of parts requiring specilized equipment to manufacture v ess likely to be satisfied.	vill relate to t	he ease of assembly	, repdroduction,	and cost. As the number increases these customer
S24	Count num	ber of parts that require more than 4 processes to manufa	cture.			
IV. TESTI	NG PROCE	DURE				
S23		numer of parts that require specialized equipment to manu ir posession).	ifacture (spec	cialized equipment is	considered to b	e tools/machinery that the average person would not
S24	Count the r	number of parts that require more than 4 processes to mar	nufacture.			
V. RESUL	TS					
S23	1 part					
S24	1 part					
VI. MITIO	GATION PL	AN (IF NEEDED)				
N/A						
VII. CON	CLUSION					
		custom part that will need to be taken to a local machine of	hon for man	ufacturing		

The device only has one custom part that will need to be taken to a local machine shop for manufacturing The specifications for TP15 are met

Test Plan # 16 (TP16) - Un-installation

Back to P14031 Test Plan Summary

	1/22/11					
st Date: 4						0
Spec #	G SPECIFIC Risk Level	Specification	Units	Marginal Value	Target Value	Comments/Status
S24	LOW	Time to remove device from Sonar	min	20	5	Testing should occur after TP11 is complete
524	2011			20	5	
S25	LOW	Number of steps to uninstall device	count	10	5	
		NDITIONS REQURIED			Testing Condit	ions
Spec #		Jib Transfer System			-	occur while the Sonar is docked on the water (or in a hoist) in order to
S24	Sonar Sailbo Volunteers				represent real	installation conditions. The volunteers used for testing will have limite of the device to represent the volunteers at Piers Park who may have n
S25	None				None	
. DATA	COLLECTIO	ON STRATEGY				
Spec #		ition Strategy				
S24		a time study, with multiple users, to obta	in the average tir	me it takes for two in	dividuals to prop	perly uninstall the device in the Sonar will allow the team to evaulate th
S25	-	g the number of steps in the installation m	nanual will allow	the team to evaluate	the ease of un-	installation
	NG FLOWO				the cuse of un	
S24	Gathe requir instrumer n for tes	ed (position over htatio	instru insi (c com	e how long it takes for volunteers to follow th iction manual to prope tall the device in the S completely removing t ponents from the Son- lacing them on the do	ne erly un- onar che ar and	Record the time, in in minutes
S25	Count the n	umber of steps in the completed installat	ion manual for th	ne process of removir	ng the device fro	om the Sonar, and record the number
RESUL	TS					
4	2.5 minutes					
5	6 steps					
S24	ATION PL	AN (IF NEEDED)				
S25	N/A					
	CLUSION					
		install, requiring < 5 minutes for 2 people	to complete the i	process.		
s not pos	-	, , , ,				

Test Plan # 17 (TP17) - Comfort

Test Team:

Back to P14031 Test Plan Summary

Test Location:						Concluded Condition
Test Date:						Δ
I. TESTING SPECIFICAT	TION					
Specification Number	Risk Level	Specification	Units	Marginal Value	Target Value	Comments/Status
S26	LOW	% of users who find seat "comfortable"	%	60	75	
II. EQUIPMENT/COND						
Specification Number		or Instrumentation required			Testing Condition	
S26	Completed J	Jib Transfer System				like the device installed in a Sonar. However, testing is possible as vice is properly secured to allow a user to place their weight on the
III. DATA COLLECTION Specification Number		Y sition Strategy				
S26	-	of "comfort" will evaluate whether the device can a le" then the specification has been met.	ccommo	odate multiple use	ers. If a wide aud	dience is surveyed, and a large percentage find the seat
IV. TESTING FLOWCH	ART					
		d rate their relative comfort on a scale of 1-10. Recor	rd the re	esults, and analyze	e the data.	
V. RAW DATA ACQUIS						
VI. RESULTS						
VII. MITIGATION PLAN	N (IF NEED	ED)				
	do not find th	ne device comfortable, the team will solicit their feer	dback or	n what would incr	ease their comfo	ort. These suggestions will be considered for potential (small scale)
design changes						
VIII. CONCLUSION						
The seat is installed to the so	eat plate, so t	the person building the device can pick a seat that be	est suits	, their needs		

st Plan #	# 18 (1	FP18)	- Ply	woo	d Base	e Lifetir	ne								В	ack to P14	1031 Test i	Plan Summa
Team: Matt B			edy															
Location: ME I Date: 2/11/14		ihop											ſ			Test Or		
STING SPE		ION															,	
ecification Nu	umber	Risk Leve	4			pecification			Units	s Marg	inal Value	Target		Testing v	vill be done b	Commen v applying		load to the p
S27		MED	Dept	th of plyv	rood groo	ve after 1350	0 rotations (~5 years)	in		0.23	0.:	10	est sam	ple with the l under brakin	athe runnin		
QUIPMENT	r/condi	TIONS													under brakin	g.		
cification Nu	umber	Equipmen Plywood 1	nt or Instru test samp		on requir	ed .						Testing	Condition d sample	ns must b	e secured in a	huck so it	will not mo	ve relative to
S27		Lathe wit	h with fou	ur-jaw ch	uck							chuck c	luring th	e test.				
ATA COLLI	ECTION	STRATE	GY															
cification Nu	111001	Data Acq	uisition St															
S27		Time and	lathe spe	ed will b	emeasure	d to estimate	e usage lifetin	me										
ESTING FL	OWCHA	RT			_			_	- 7				1					
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	Prepare la and chuc	the		Secu sam ch	re test ple in		Start lathe.		Ъ I'	Apply load t to provide a to the test reco	constant	pressure d bagio	1.1		Stop lathe a a 1/4 inch 'g	and time m proove' has	easurment (been cut in)	when to the
	and cruc	~	-	ch	uck.		in crite.	17		reco	ording time		1.7		· ·	plywwod sa	mple.	
													J					
W DATA	ACQUIS	ITION								TFST #	2							
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20	0.0	96 0	1.007		0.023	CCW	I			2	0 0	0.015	0.005	0.00	7 0.009 7 0.011	CCW CW		
25	0.0		0.008	0.068	0.035					2	5 0	.020	0.010	0.00	0.013	CCW CW		
15	0.0	M2 0	0.070	0.087	0.066	CCW	I			3	5 0	.021	0.012	0.00	0.014	CCW		
45	0.0	58 0	1.085	0.093	0.092	CCW					5 0	.022	0.017	0.00	0.017	CW CCW		
50	0.1	02 0	0.086	0.105	0.097	CCW				5	0 0 5 0	0.028	0.020	0.00	0.019	CW CCW		
60	0.1	02 0	0.089	0.108	0.100	CW				6	0 0	.027	0.012	0.01	5 0.025	CW CCW		
65 70	0.1	30 0	0.091	0.108	0.102	CW				7	0 0	032	0.035	0.02	0.029	CW		
75	0.1		0.105	0.115	0.111					7	0 0	.082	0.015	0.02	5 0.031 5 0.031	CCW CW		
						f") of 2219.6	di infania			-This t	est was r	un ata t	angenti		ity (of the "t	olt head) of 2115	n/min
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0.020	-	-		30		50 (min)	60	70	80	90								
0.020	10	2	D	30			60	70	80	90								
0.020	10	2	D	30			60	70	80	90								
	10 DN PLAN	2	D	30			60	70	80	90								