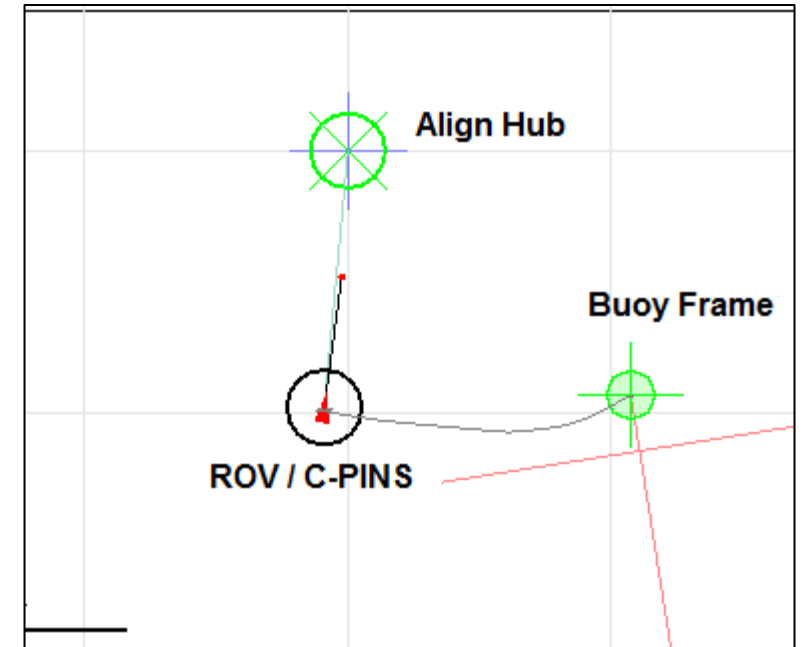


# C-PINS METROLOGY WORK

*BUOY SET SOLUTIONS*

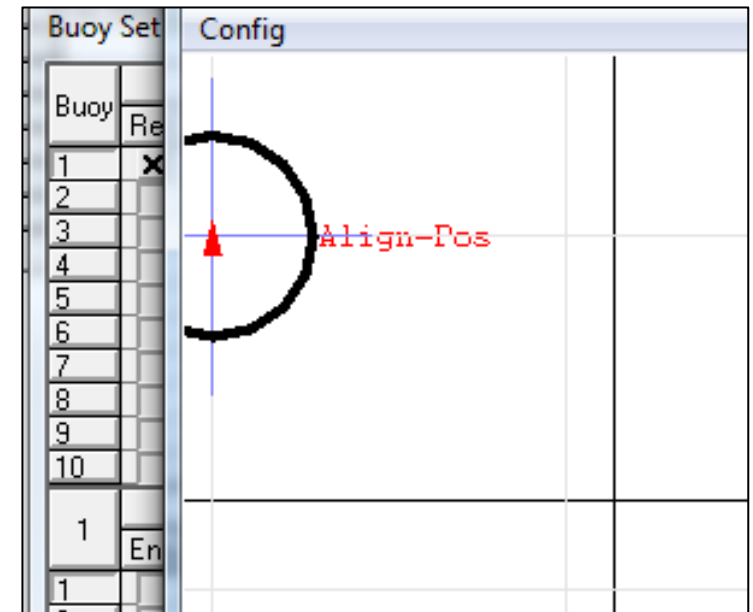


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# BUOY SET POSITIONING USING INS

- C-PINS aligns to known subsea location (nearby structure)  
(Will require ability to stab into something - receptacle)
- Needs a single point to align to (accuracy unimportant : ~30m)
- All buoys will be placed relative to the alignment position – or manifold/PLET/PLEM slot



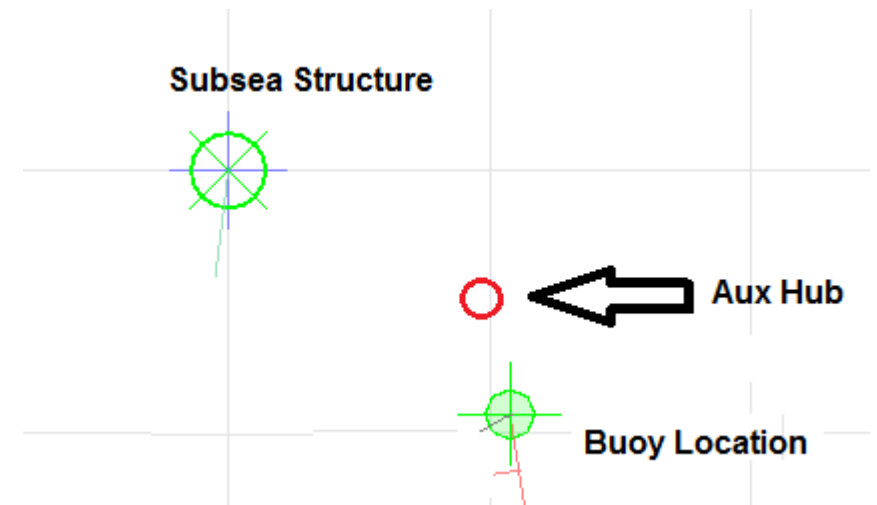
# BUOY SET POSITIONING USING INS

If the nearby structure with receptacle is over ~50 meters away Zupt will deploy an auxiliary hub closer to buoy locations

Auxiliary Hub (Aux Hub) is a receptacle on a parking frame

The Aux Hub will be tied into the known coordinates of the subsea structure nearby. The Aux Hub will be used to reference buoy placement and keep C-PINS drift minimal.

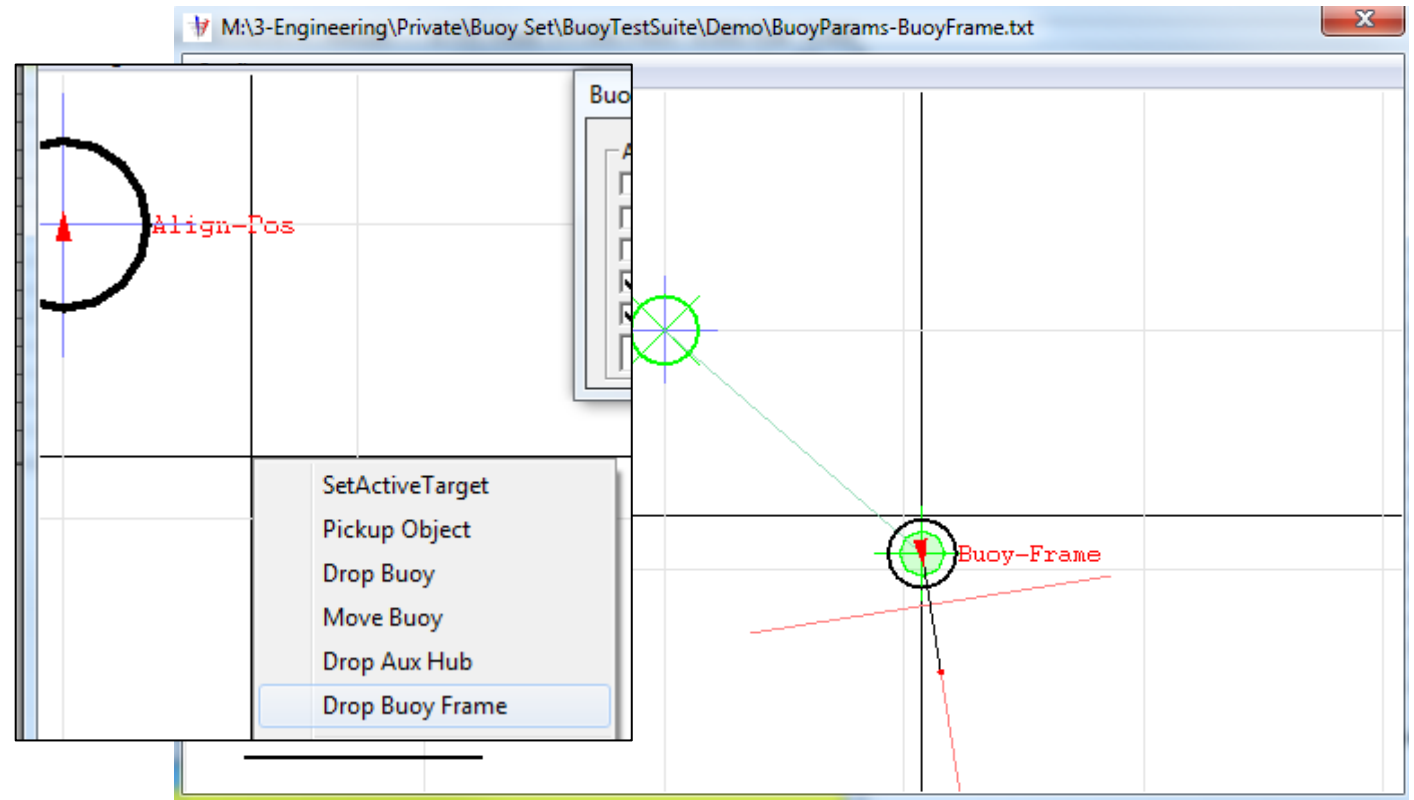
Two loops to Aux Hubs gives us <20cm relative (20 mins)



# BUOY SET POSITIONING USING INS

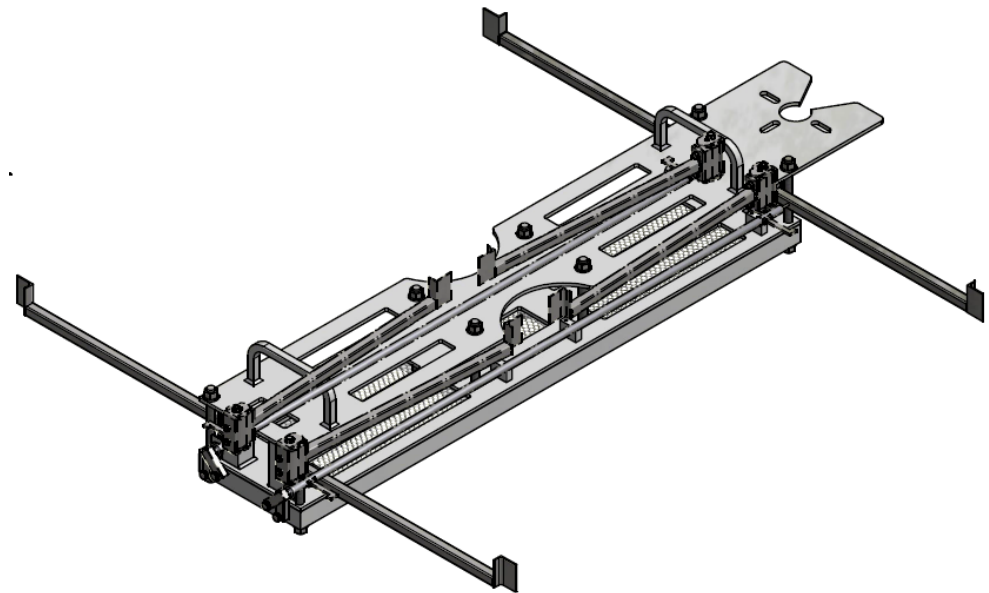
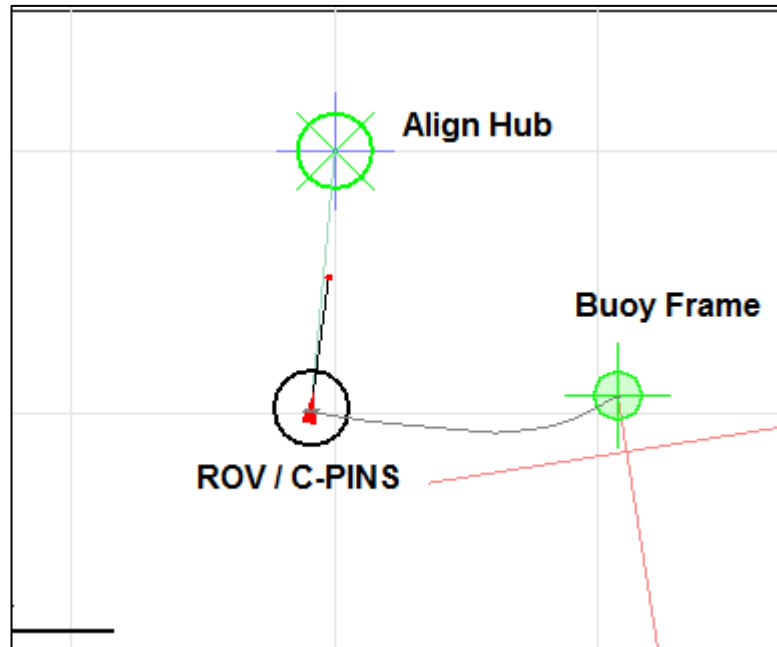
Aligned C-PINS can navigate to place a buoy frame

Alternatively buoys can be placed one by one



# BUOY SET POSITIONING USING INS

Real time visual map of buoy set targets / frames / ROV



# BUOY SET POSITIONING USING INS

## Data QC

*Buoy location accuracy in real time*

Buoy Set Processing							
Buoy	Buoy Results						Error to
	Ref.	Name	Northing	Easting	Range	Bearing	Target
1	✗	Align-Pos	3315064.429	257081.592	0.000	180.0	0.000
2		Buoy-Frame	3315063.498	257082.668	1.423	310.9	1.423
3		Buoy#1_1	???	???	???	???	???
4		Buoy#1_2	???	???	???	???	???
5		Buoy#1_3	???	???	???	???	???
6		Buoy#1_4	???	???	???	???	???
2	Individual Loops						Move
	Ena	Misclosure	Northing	Easting	Range	Bearing	Offset
1		0.000	0.000	0.000	0.000	0.0	0.000, 0.000
2		0.000	0.000	0.000	0.000	0.0	0.000, 0.000
3		0.000	0.000	0.000	0.000	0.0	0.000, 0.000
4		0.000	0.000	0.000	0.000	0.0	0.000, 0.000
5		0.000	0.000	0.000	0.000	0.0	0.000, 0.000
6		0.000	0.000	0.000	0.000	0.0	0.000, 0.000
7		0.000	0.000	0.000	0.000	0.0	0.000, 0.000
8		0.000	0.000	0.000	0.000	0.0	0.000, 0.000
9		0.000	0.000	0.000	0.000	0.0	0.000, 0.000
10		0.000	0.000	0.000	0.000	0.0	0.000, 0.000
1		Northing	Easting				
FIX		0.000	0.000				
SET		0.000	0.000				
TIE		0.000	0.000				

# TIMES FOR INERTIAL BUOY SET

<b>Align</b>	<b>45 mins</b>
<b>Aux Hub placement – if needed</b>	<b>&lt;30mins</b>
<b>Frame Placement (if buoy pattern needed)</b>	<b>40 mins</b>
<b>Buoy Placement to Frame</b>	<b>60 mins</b>
<b>Total time for well buoy set</b>	<b>&lt;4 hours</b>
<b>Buoy relative accuracy to known point &lt;20cm. Buoy to buoy relative accuracy - &lt;5cm.</b>	
<b>No array needed, no transponder frames, no array calibration and add on.</b>	



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