



Casing Cement Breaker (CCB)

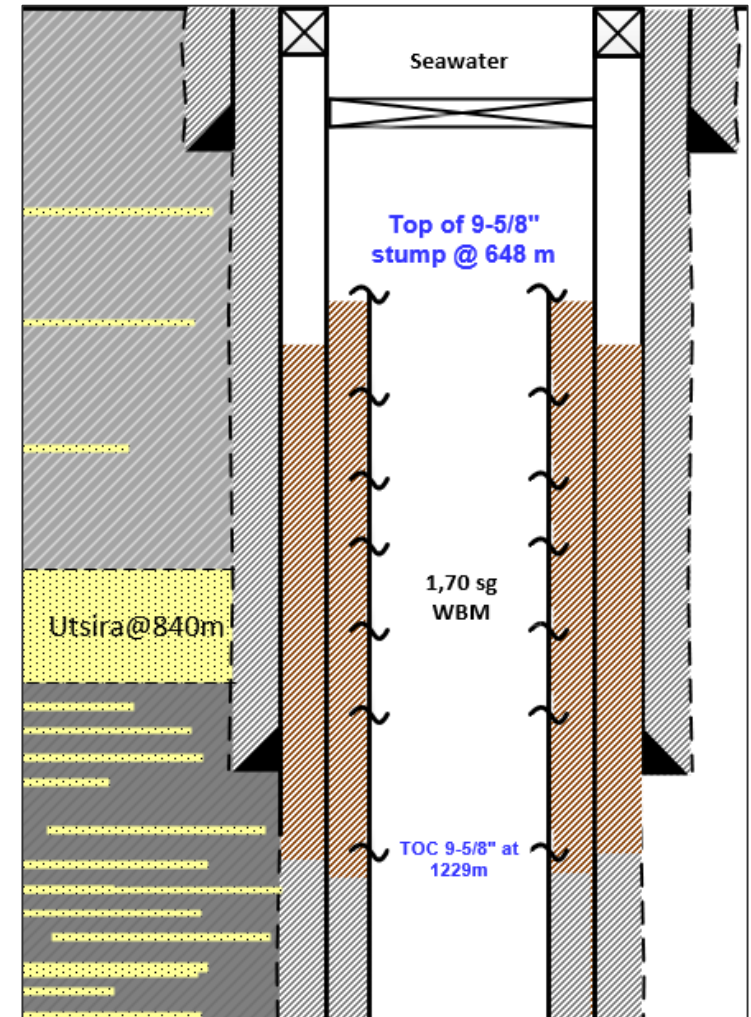
- Experiences using the prototype CCB, Equinor Huldra well 30/2-1
- CCB development

P&A Seminar, Sola 17.10.2019

- Steinar Strøm, Equinor
- David Stephenson, Deep Casing Tools

History

- ❑ The well was drilled and Temporary abandoned in 1982
- ❑ Scarabeo-5, 2016
 - Established reservoir barriers
 - Temporary abandoned the well; unable to pull 9 5/8" casing believed to be stuck in settled barite
- ❑ Deepsea Bergen, February/March 2019
 - Pulled 9 5/8" (grade MW125) + 13 3/8" casings to top Utsira
 - Established 'open hole to surface plug'
- ❑ Well head cut and recovered by Oceaneering/Island Vanguard (abrasive cutting), September 2019



Well status prior to second reentry

CCB efficiency vs. required pull force

Depth	Length	Force	Comment
[m]	[m]	[ton/m]	
708-720	12.0	10	Perforated
720-722	2.0	62	Perforated
722-725	3.0	66	Perforated
725-728.5	3.5	35	CCB, Perforated
728.5-732	3.5	90	CCB, Perforated, possible bad cut.
732-735.5	3.5	45	CCB, Not perforated
735.5-738	2.7	56	CCB, Not perforated



- 1st length (725 m - 728.5 m) → promising results, indicating a positive effect of work compared to the two previous lengths
- 2nd length (728.5 m - 732 m) → significantly higher torque, possibly an insufficient cut.
- 3rd and 4th lengths (732 m - 735.5 m, 735.5 m - 738 m) → observed pulling forces equal to pulling 9 5/8" casing stuck in cement.

Note: The CCB may have been worn out at his stage

Summary and recommended improvements

'Prototype' Casing Cement Breaker

Summary

- Prototype tool was made to prove the idea of breaking the cement bonding to the casing and by that improve casing pulling efficiency
 - 1.st length → apparently some effect
 - 2.nd length → uncertain whether the cut itself was good, possible unreliable results
 - 3.rd + 4.th lengths → washout, test terminated.
- The tool have to be more robust to adapt to tough operating conditions

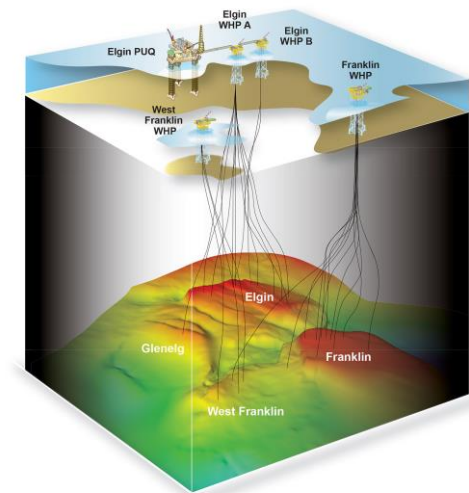
Improvements

Material and component selection



CCB - Industry Need & Operator Perspective (Martyn Fear – Total)

- P&A and Slot Recovery activity boosted by response to oil price
 - Less capially intensive projects (use existing infrastructure & rig contracts)
 - Shorter payback projects (reduces exposure to oil price volatility)
 - Delays cessation of production
 - Minimise “dead” money on P&A
- Moderate success rates from existing P&A and Slot Recovery techniques
 - Downhole jacks, for casing retrieval with cut & pull
 - Perf, wash & cement, for behind-pipe access
 - Often results in protracted milling operations
 - Higher success rates required



Casing Cement Breaker (CCB) What, How & Why

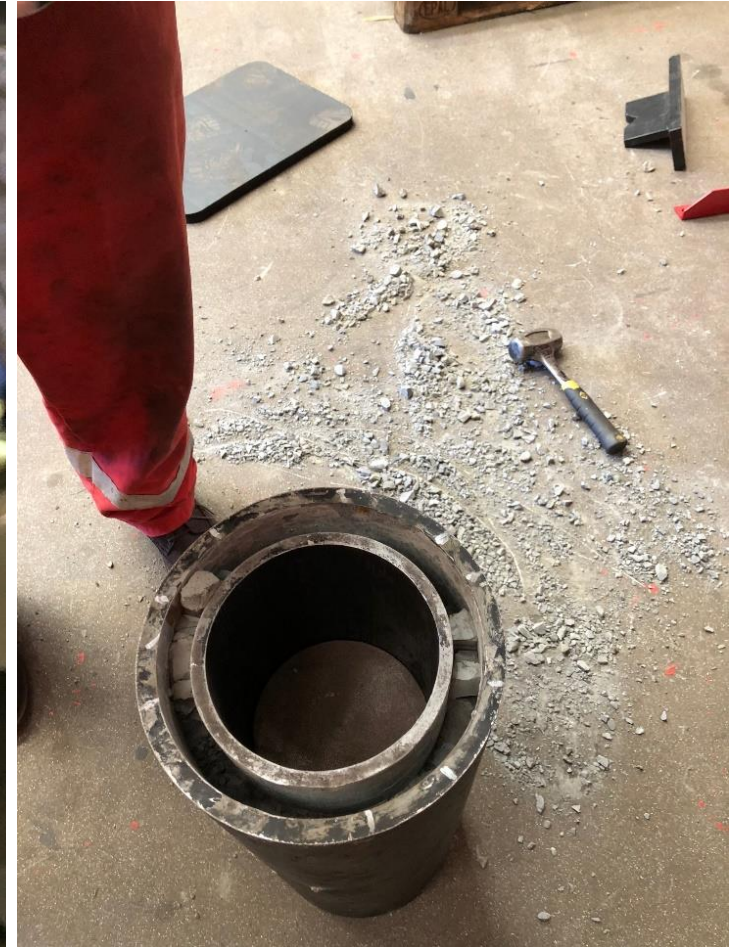
- What - More effective P&A and slot recovery techniques
 - Improve efficiency and success of cut & pull and perf, wash & cement operations
 - Avoid time consuming cut & pull and milling operations
- How – Break bond between cement/barite and casing and break down structure of cement/barite
- Why - Short Term – Evolution of existing technologies to improve performance
 - Break down cement bond and structure to enhance cut & pull and perf, wash & cement
 - Enhance and increase predictability of existing, known and trusted technologies
- Why - Longer Term – Integration with existing technologies to reduce rig/trip time
 - Integrate CCB with cut & pull and perf, wash & cement technologies
 - Enhance existing, known and trusted technologies
 - Save rig time and cost

CCB – First Test Scenario – 7" Cemented Inside 9 5/8" Casing

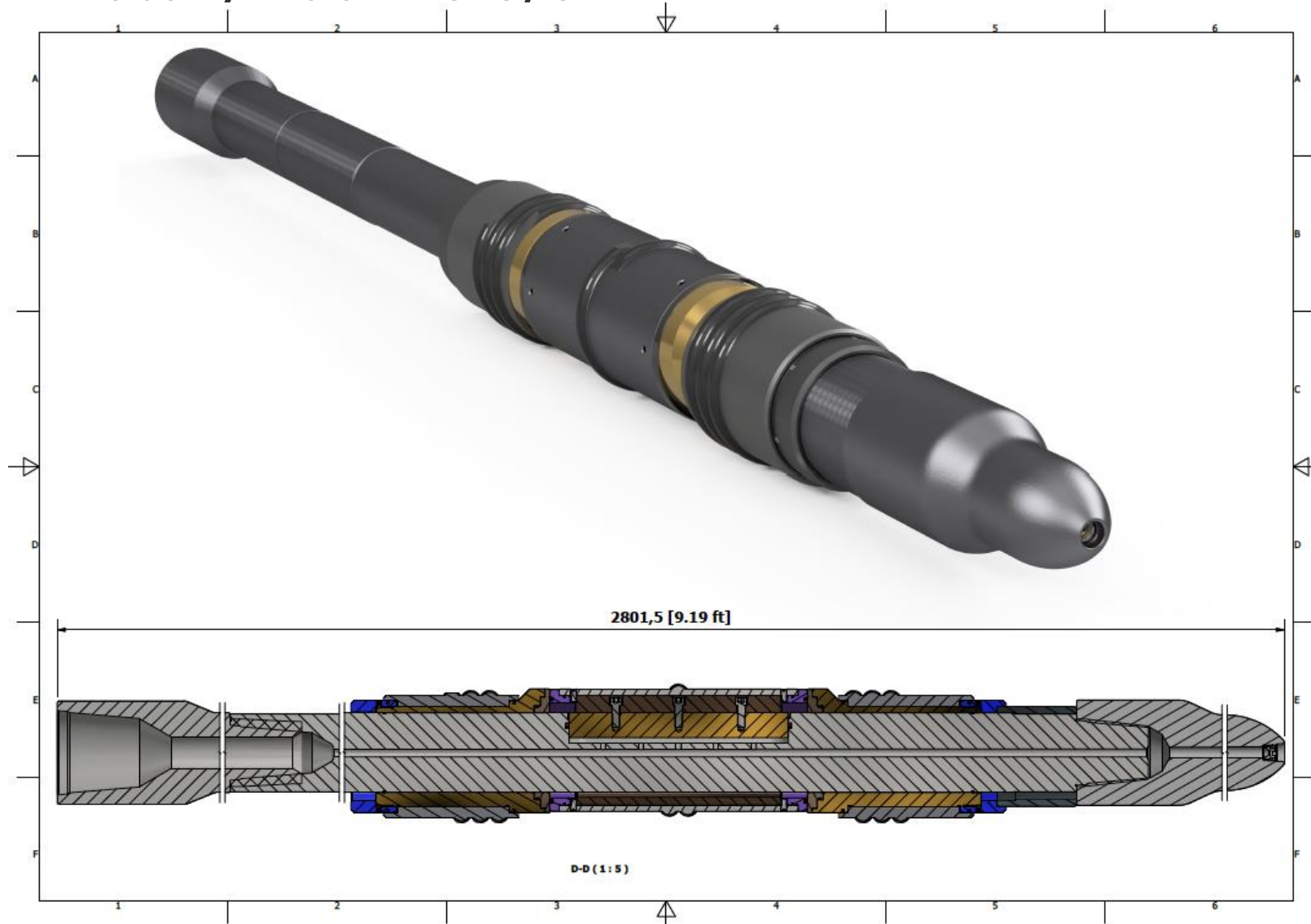
Before – 60MT to pull 60cm

After – 12MT to pull 60cm

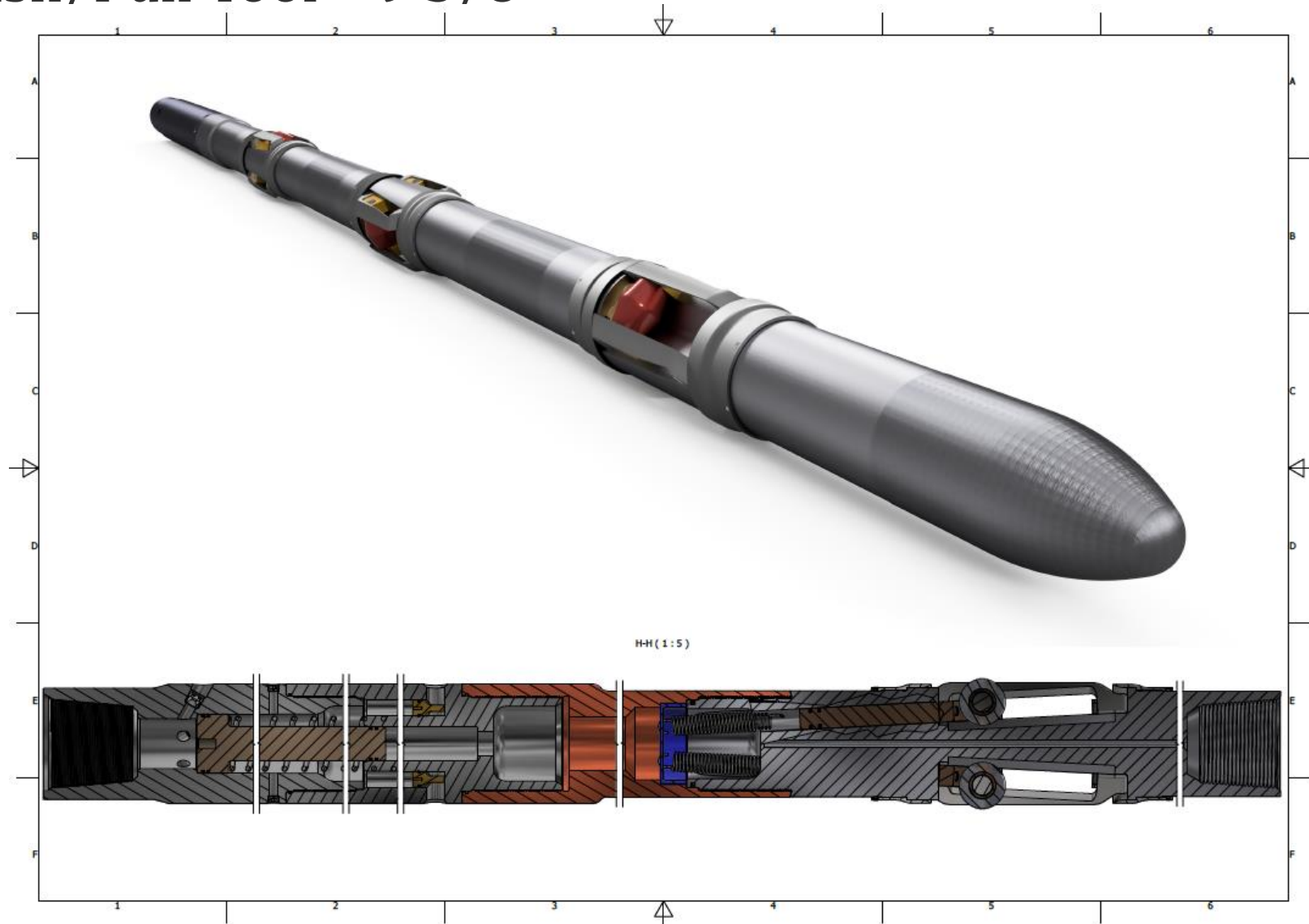
After After



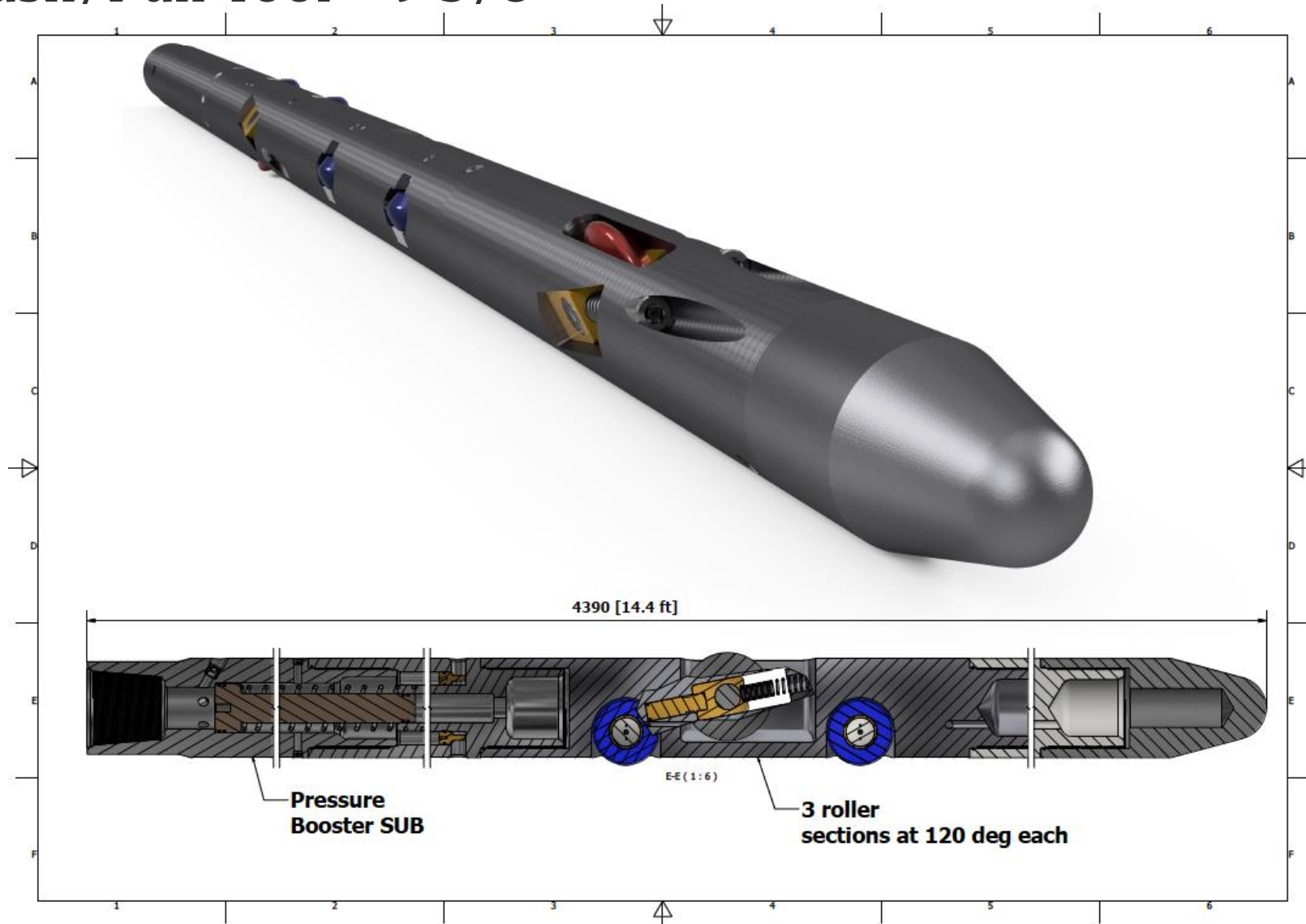
2nd Generation Rotary Tool – 9 5/8"



1st Design Push/Pull Tool – 9 5/8”



2nd Design Push/Pull Tool – 9 5/8”



What is Next – Way Forward

- OGTC, Total and Equinor Support & Funding
 - Learnings from first Equinor Huldra field trial
 - OGTC and Total funding received, progressing with Equinor
 - Test 2nd Gen Rotary Tool at Ullrigg mid November
 - Test 1st and 2nd Gen Push/Pull Tools at Ullrigg mid December
 - Test pre and post test samples for pressure, circulation and pull
- Market Introduction and acceptance of CCB
 - 1st and 2nd Total UK North Sea trial wells identified
 - Potential Equinor 2nd field trial well identified
 - Many other Operator enquiries, current focus is Total and Equinor
 - Additional sizes of tool, likely 13 3/8” next
- Integration with existing technologies
 - Integrate with and enhance current cut & pull technologies
 - Integrate with and enhance current perf, wash & cement technologies
 - Integrate with and enhance current jacking technologies

Thank you & questions...

