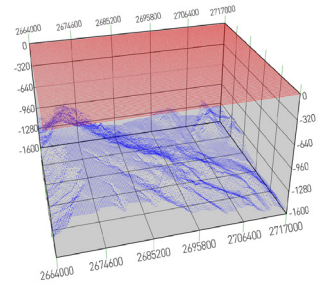


MESA[®] SimSurvey[™]

OPTIMIZED ACQUISITION PLANNING AND SURVEY DESIGN SOFTWARE

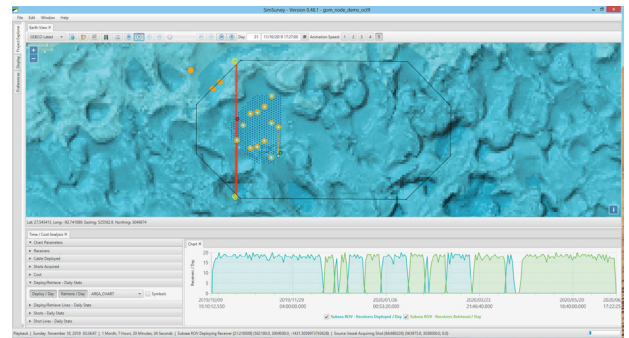
MESA SimSurvey is a new MESA module that provides a reliable time & motion and cost analysis functionality to the survey design and planning workflow.

MESA SimSurvey ensures the geophysical integrity, risk mitigation, HSE compliance and efficiencies of your operational planning and survey design. Users can transfer their survey designs from MESA directly into MESA SimSurvey to compare time and cost estimates for different design scenarios.

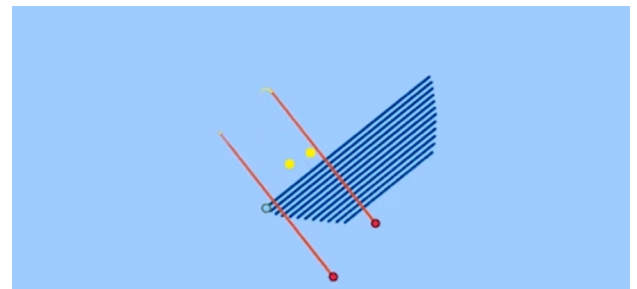


Operations planning and execution via MESA SimSurvey seismic simulation tool

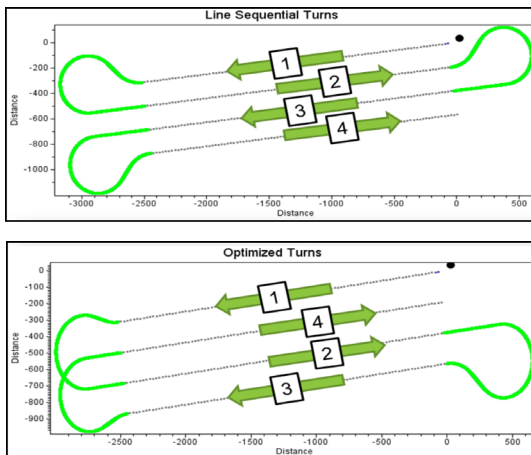
- Time and motion analysis for comparison of various ocean bottom operational scenarios providing time and cost estimates
- Animation of vessel/crew movements through project lifecycle - multi-line deployment, acquisition and retrieval
- Flexible parameterization; number of vessels, crew size, vessel speeds, turn radius analysis and unit costs
- Simulation of ocean bottom cable, node and ROV-deployed geometries
- MESA geometries are easily exported and imported to and from MESA SimSurvey
- MESA SimSurvey simulations can be used to initialize simultaneous operations management in Marlin
- Future enhancements will include towed streamer and land simulations



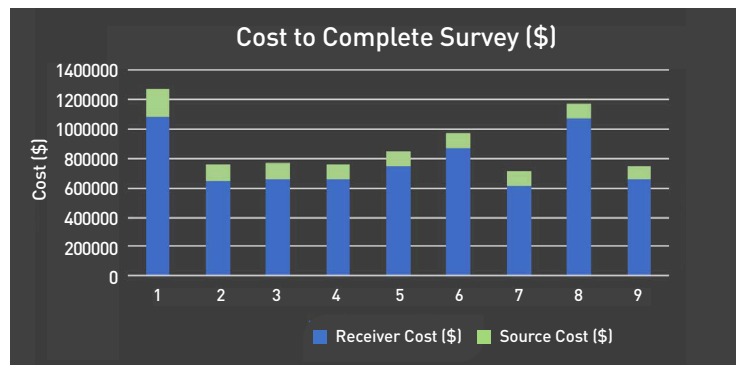
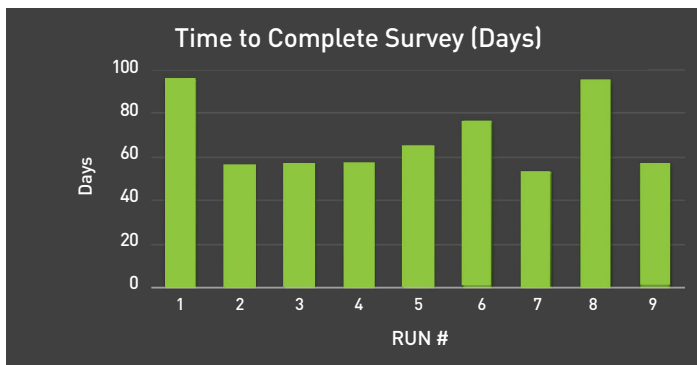
ROV Functionality



Two Vessel Simulation



Turn Radius Analysis



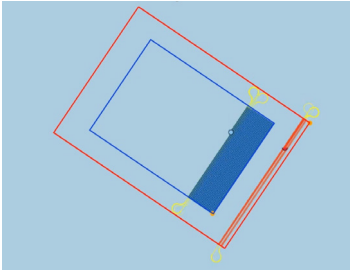
MESA SimSurvey DEMO | INPUT GEOMETRY FROM MESA

Three acquisition scenarios were simulated in MESA SimSurvey for the modeled geometry. Two different receiver vessel scenarios (5000 and 2500 nodes inventory) as well as the benefits of having a second source boat operating simultaneously were compared in the illustration below.

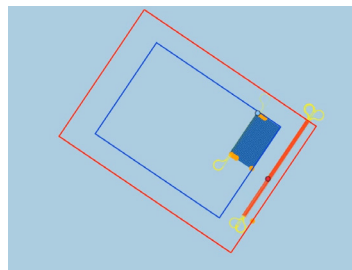
Source Information	
Total number of source lines	432
Source line separation	50 m
Shot interval	50 m
Shot strategy	Dual Source
Total length - all source lines	9683.44 Km
Total number of shots	137376
Source Point density	206.21 shots/Km ²

Receiver Information	
Total number of receiver lines	105
Receiver line separation	150 m
Receiver group interval	150 m
Total length - all receiver lines	1197 Km
Total number of receivers	8085
Receiver Point density	12.14 receivers/Km ²

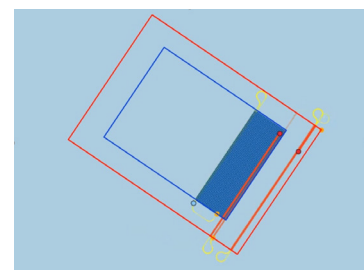
Scenario 1 - Patch management example: 5000 nodes inventory - single source boat



Scenario 2 - Patch management example: 2500 nodes inventory - single source boat



Scenario 3 - Patch management example: 5000 nodes inventory - two source boat



	Time (days)		
	Scenario 1	Scenario 2	Scenario 3
Mobilization	1	1	1
Line Change	4.82	9.25	4.88
Transit	11.02	19.23	11.32
Receiver	7.13	7.55	7.13
Receiver Retrieval	7.13	7.55	7.13
Waiting	30.95	91.28	13.43
Demobilization	1	1	1

	Time (days)		
	Scenario 1	Scenario 2	Scenario 3
	Boat 1	Boat 2	Boat 1/2
Mobilization	1	1	1
Source Acquisition	42.53	79.40	25.32/24.09
Line Change	12.08	29.56	6.73/6.39
Transit	5.43	11.81	3.41/3/24
Waiting	0.66	8.66	7.61/9.50
Demobilization	1	1	1/1

	Source and Receiver Costs (M\$)		
	Scenario 1	Scenario 2	Scenario 3
Source Vessel	2.54	134	3.01
Receiver Vessel	2.62	5.77	2.50

Time/Cost Relative Comparison

	Scenario 1	Scenario 2	Scenario 3
Time (days)	61	134	44
Cost (M\$)	5.16	10.96	5.51

Scenario 2 (2500 nodes inventory) is the less recommended option, costing almost twice the price of Scenario 1 and 3 (5000 nodes inventory), as well as exhibiting the lowest operational performance among the analyzed options (2 zippers required - higher source effort).

On the other hand, Scenario 1 looks as the most economical option, however, it is not the most efficient alternative (time wise).

A simultaneous shooting operation (Scenario 3) is perhaps the most balanced option, exhibiting the best operational performance with minimal cost impact.

ION has been delivering innovative solutions to the energy industry for over 50 years, and is the leading provider of real-time, multi-vessel positioning and control systems. For further information contact MESAsupport@iongeo.com

About ION

ION is a technology leader with a strong history of innovation. Leveraging innovative technologies, ION creates value through data capture, analysis and optimization to enhance companies' critical decision-making abilities and returns. Our offerings are focused on improving E&P decision-making, enhancing reservoir management and optimizing offshore operations.