







# Ship-based Robotics

# **An Enabling Technology for Manned and Autonomous Vessels**

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# Technical Market Research

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# **Contents:**

- 1. Review the Intervention Tasks to support offshore renewable energy and similar activity.
- 2. Review the available tools, processes and deployment methods needed to perform intervention tasks and identify which could be used in an automated manner from an ASSP.
- 3. Other services









# **Intervention Task:**

What is an intervention task?

"The ability to provide a service to assist in an activity to increase it's potential output".

Identify intervention tasks

Collate / tabulate intervention tasks

Identify industries / Activities that could benefit from the ASSP









# **INTERVENTION TASKS: Industry: Sub-Sector**

Oil & Gas: Platforms, FPSO, Drill Ship, Loading Buoy, Tanker, Supply Vsl, Decom

Renewables: Floating Wind, Offshore Wind, Tidal, Wave, Ocean Thermal

General Maritime: Survey/Science: ASV, AUV, Floating

Search & Rescue: Search, Rescue, Recovery

Subsea: Well Head, Inspection, Maintenance, Recovery, Survey

Maritime: Linkspan, Lifeboat Launch, Payload Transfer

Autonomous: Subsea, Surface

Salvage: Prep, Lift, Recover

Marine Civils: Nearshore, Offshore, Onshore

Survey: Deploy, ROV, Scan, Recovery

Aquaculture: Fish









#### Diagram 1

	Total tasks	1056	Marine-i142																			Marine-i14	2
ASSP 26/02/19																							
Industry		Oil & G	as			R	enewables				Survey/Scien	nce		Military		5	earch & Rescue	e			Subsea		
Activity	Platform	FPSO	Drill ship	Decom	Floating Wind	Offshore Wind	Tidal	Wave	Ocean Thermal Energy Conversion	ASV	AUV	Floating	Military (non stop ops)	Refuelling at sea	Ship to ship transfer	Search	Rescue	Recovery	Well head	Inspection	Maintenance	Recovery	Sur
Turrets mooring	3	3	3	3	3	3	3	3	3	3	3	3	0	1	1	0	0	0	0	0	0	0	
Access	3	3	3	3	3	3	2	3	1	3	3	3	3	3	3	3	3	3	3	3	3	2	
Spares	3	3	3	3	3	3	2	3	1	3	3	3	3	3	3	3	3	3	3	3	1	1	
Crew transfer	3	3	3	3	3	3	3	3	3	0	0	3	3	0	2	2	3	3	0	0	0	0	0
Blade tip inspection	0	0	0	0	3	3	3	0	0	3	3	3	0	0	o	0	0	0	0	1	0	0	- 1
AUV recovery	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	0	0	1	2	1 2
ASV recovery	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1 3
AUV/ASV transfer	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Refuelling	3	3	3	3	0	0	0	0	0	3	3	3	3	3	3	3	3	3	0	0	0	0	
Equipment maintenance	3	3	3	3	3	3	1	2	1	3	3	3	3	3	3	3	3	3	1	1	1	1	1
Payload transfer	3	3	3	3	3	3	2	3	2	3	3	3	3	3	3	3	3	3	2	1	2	2	
Casualty recovery	3	3	3	3	3	3	3	3	3	3	3	3	3	0	3	3	3	3	3	1	1	3	-
AUV LAR	3	3	3	3	0	1	2	3	3	3	3	1	2	3	3	3	3	3	3	3	3	3	3
ROV manipulators	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
Cable end retreival	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1 3
Satellite retreival	0	0	0	0	0	0	1	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	
Rocket recovery (SpaceX)	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	
Plane refueling	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Pilot transfer	3	3	3	3	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
Ship to ship transfer (interface)	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
Davit operation	3	3	3	3	3	3	0	3	0	3	3	3	1	2	0	1	1	1	0	0	0	1	
Launching	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1	1	3	- 1
Recovery	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1	1	3	- 2
Product transfer (fish, oil etc)	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	0	0	0	3	0
	60	60	60	60	54	55	49	55	48	58	57	59	51	49	51	51	52	52	36	30	29	39	3
		240					261				174			151			155				165		

ASSP 26/02/19																									
Industry	Subsea			Space	Aerospace		Maritime		Auto	onomous		Salvage		Aquaculture		Marine Civils			Rail			Sur	vey		-
Activity	Maintenance	Recovery	Survey	Space	Air - air	Linkspans / gangway	Lifeboat launch	Payload transfer	Subsea	Surface	Prepare	Lift / Hoist	Recover	Fish	Nearshore	Onshore	Offshore	Transfer	Shunt	08M	Deploy	ROV	Scan	Recovery	
Turrets mooring	0	0	0	0	2	2	0	3	3	3	0	0	0	0	0	0	0	0	0	0	0	1	0	0	52
Access	3	2	2	1	0	3	3	3	3	3	3	3	3	3	3	3	3	3	1	1	3	3	3	3	118
Spares	1	1	1	1	0	1	1	3	3	3	2	1	1	3	3	3	3	3	0	0	0	1	0	1	93
Crew transfer	0	0	0	3	0	3	3	0	0	0	3	3	1	1	1	1	1	1	1	1	1	1	1	2	71
Blade tip inspection	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2:
AUV recovery	1	2	2	1	1	1	3	3	3	3	1	2	2	1	1	1	2	1	1	1	1	3	3	3	97
ASV recovery	3	3	3	3	0	2	2	2	3	3	1	2	2	3	3	3	3	1	1	1	3	3	3	3	116
AUV/ASV transfer	3	3	3	0	0	0	1	1	3	3	1	3	3	3	3	3	3	0	0	0	2	3	3	3	10
Refuelling	0	0	0	0	3	0	3	0	3	3	1	1	1	3	0	0	2	0	0	1	0	0	0	1	6
Equipment maintenance	1	1	1	0	1	1	0	3	3	3	2	0	0	0	1	1	1	1	1	1	1	1	1	1	7.
Payload transfer	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	124
Casualty recovery	1	3	1	3	0	3	3	0	3	3	1	3	3	3	3	3	3	1	1	1	1	1	1	1	101
AUV LAR	3	3	3	3	3	3	3	3	3	3	1	1	1	2	1	1	2	0	0	0	3	3	3	3	100
ROV manipulators	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1	1	1	2	3	3	3	12
Cable end retreival	3	3	3	3	3	3	1	1	3	3	1	3	3	3	3	3	3	3	3	3	3	3	3	3	12
Satellite retreival	0	0	0	3	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
Rocket recovery (SpaceX)	0	0	0	3	0	0	0	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
Plane refueling	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Pilot transfer	0	0	0	0	0	3	3	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Ship to ship transfer (interface)	3	3	3	3	0	2	3	3	3	3	3	3	3	3	3	3	3	0	0	0	3	3	3	3	11
Davit operation	0	1	0	0	0	2	3	3	0	1	0	1	2	0	1	1	1	0	0	0	2	2	2	2	6
aunching	1	3	1	3	3	2	3	3	3	3	2	2	3	3	2	2	2	1	1	1	3	3	0	3	11
Recovery	1	3	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1	3	3	3	3	12
Product transfer (fish, oil etc)	0	3	0	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	3	3	11
	29	39	31	42	31	43	47	47	52	59	35	40	40	43	40	40	44	25	19	18	36	42	38	44	$\overline{}$
	165			42	31		137			111		115		43		124			62			1	50		1

#### Highest Activity

Highest

Activity	Score
Cable end retrieval	126
ROV manipulators	125
Recovery	125
Payload transfer	124
Ship to ship transfer (interface)	119
Access	118
ASV recovery	116
Product transfer (fish, oil etc)	116
Launching	111
AUV/ASV transfer	107
AUV LAR	102
Casualty recovery	101
AUV recovery	97
Spares	93
Equipment maintenance	77
Crew transfer	71
Refuelling	61
Davit operation	60
Turrets mooring	52
Pilot transfer	23
Blade tip inspection	22
Satellite retrieval	12
Rocket recovery (SpaceX)	10
Plane refuelling	3

Lowest









# **Intervention Task: Activity**

Cable end retrieval: 126	AUV/ASV transfer	: 107	Pilot transfer:	23
ROV manipulators: 125	<b>AUV LAR:</b>	102	Blade tip insp':	22

Recovery: 125	Casualty recovery: 101	Satellite rec'ry: 12
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<b>Payload transfer:</b>	<b>124</b>	Equipment maint': 77	Rocket SpaceX: 10
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Ship-ship transfer: 119	Spares:	93	Plane refuel:	3
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Access: 118	3 Crew transfer: 71
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<b>ASV</b> recovery:	116	Refuelling:	61
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<b>Product transfer:</b>	116	Davit operation:	60
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Launching:	111	<b>Turrets mooring:</b>	<b>52</b>
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# **IDENTIFY INDUSTRIES / ACTIVITIES THAT COULD BENEFIT FROM ASSP:**

## **INDUSTRY:**

Oil & Gas
Offshore Wind
General Maritime

### **INTERVENTION TASK:**

Launch & Recovery
Handling of Cables and Mooring Ropes
Crew Transfer
Transfer of Goods









# **Processes and Tooling: Platforms**

Floating - Over the side, Moonpool Deployment, ROVS, AUVs,

Offshore – Windfarm installation, walk to work, crew transfer

On land – crane demolition









# **Intervention: Tooling**

- ROV Manipulators: cable cutting, camera boom, cleaning brush, jetting systems, gasket change out, manipulator jaw
- Offshore: hyd release shackle, pipe cutter, jacket external lifting tool, buoyancy clamp, flanged pile upending tool, transition piece lifting tool, Amplemann system
- Pipe recovery tool, heave compensating tool Maxine
- Floating: crane, davit, A frame, lifeboat launch









# **Summary**

**Diverse application** 

**Concentrate on known industries** 

Autonomous industry further down the line

**Build one** 

Interested parties already keen to engage