MUST (Mobile Underwater System Tools) AUV, financed by the Knut and Alice Wallenberg Foundation:

- **Kongsberg Hugin**

Basic properties:

- **3000 m depth rating**
- **200 – 300 km range**
- **Navigation: Special solution with both Upward Looking and Downward Looking DVLs (RDI 300 kHz), combined with Honeywell HG 9900 IMU**
- **Collison avoidance: Imagenex forward looking sonar with Kongsberg algorithms for action (soft altitude changes)**
- **HiPap USBL for communiation & positioning in ship's range**

MUST AUV

Dimensions:

- Length: approx. 6,5m
- Diameter: 875 mm
- Weight: 1600 - 1800 kg

Depth Ratings:

- 3000 m

Power Supply:

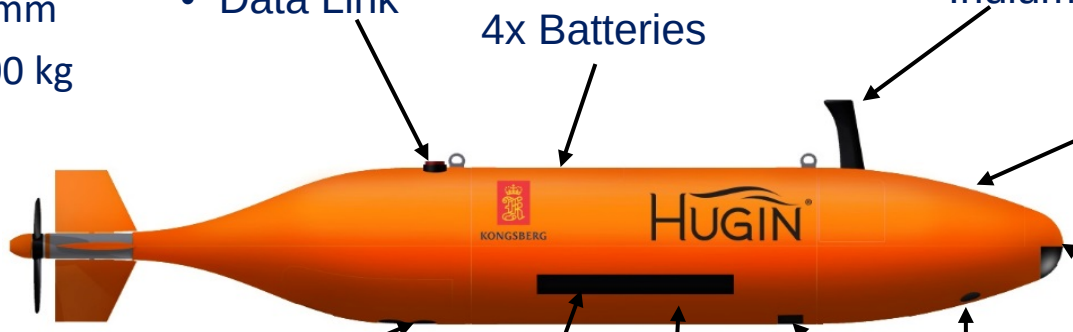
- 4x (max 6)Rechargeable and swappable Lithium Polymer batteries

Underwater Communications:

- HiPAP USBL
- Command Link
- Data Link

Surface Communications:

- GPS
- WiFi
- RF
- Iridium



4x Batteries

Magnetometer

Compass

Forward looking Sonar Obstacle Avoidance System

Sub Bottom Profiler

EM2040

Side Scan Sonar

2x Altimeter

Payload Sensors:

- CTD & O2 (Seabird, dual system)
- CO2
- Nitrate
- Eco-puck (3-channel optical sensor: Cholophyll, turbidity, ++)
- General payload area, 60 cm long: 6 RS232 connectors plus ethernet/LAN

Endurance:

- 4 Batteries
  - 26 hours at 4 knots
  - 41 hours at 3 knots

Navigation

IMU	Honeywell HG9900 NOTE: HG9900 IMU requires an export license from the United States State Department. If this license is not obtained in proper time, a Kongsberg Seatex MRU5+ IMU is offered instead.
Compass	Leica DMC
DVL	Teledyne RDI Workhorse Navigator 300 kHz or other make with similar performance.
Altimeters	Kongsberg Mesotech 200/675 kHz forward and down looking
Forward Looking Sonar/Anti-Collision System	Imagenex sonar and KM algorithms for improved contour following and obstacle avoidance
CTD	SAIV CTD
USBL	HiPAP Transponder
Depth Sensor	DigiQuartz 8CB4000
GPS Receiver	AUV: Novatel

Modes of Operation:	**Estimated Navigation Error**	
	Real-Time	**Post-Processed**
Autonomous: No updates, straight line	0.08% of DT (CEP50)	<= 0.08% of DT (CEP50)
Autonomous: GPS fix every 1-2 hrs	2-10 m	1-4 m
Autonomous: NavP UTP ranging (not included)	5 m	2 m
Supervised: HiPAP USBL updates	0.5-6 m (depending on depth and GPS accuracy)	0.5-4 m

Payload:

- **Multibeam (Kongsberg EM2040)**
- **Side scan sonar**
- **Sub bottom profiler**
- **CTD**
- **O2**
- **CO2**
- **Nitrat**
- **Eco-puck (3-channel optical sensor: Cholophyll, turbidity, ++)**

- **In addition, there is a general payload area where sensors and instruments can be placed (60 cm long, 87 cm diameter), 6 RS232 connectors plus ethernet / LAN connection**

- **Software environment for integration of new payload and development of algorithms**

Timeline:

Delivery April 2018

Tests (can adjust places so that it suits Swedish scientists): 2018

Science projects (peer reviewed and ranked in an open process) will start in 2019

HUGIN AUV Instrumentation

MAIN ACOUSTIC SENSORS:

- Multi Beam Echosounder (MBES)
- Side Scan Sonar (SSS)
- Sub Bottom Profiler (SBP)
- Downward looking DVL / ADCP

OTHER PAYLOAD SENSORS:

- Upward looking DVL / ADCP
- Contros HydroC CO_2
- Sea-Bird/Wet-Labs ECO Triplet (FLBBCD)
- Sea-Bird/Satlantic Deep SUNA (max 2000 meter)
- 2x Sea-Bird combination SBE-19plusV2 and SBE-43

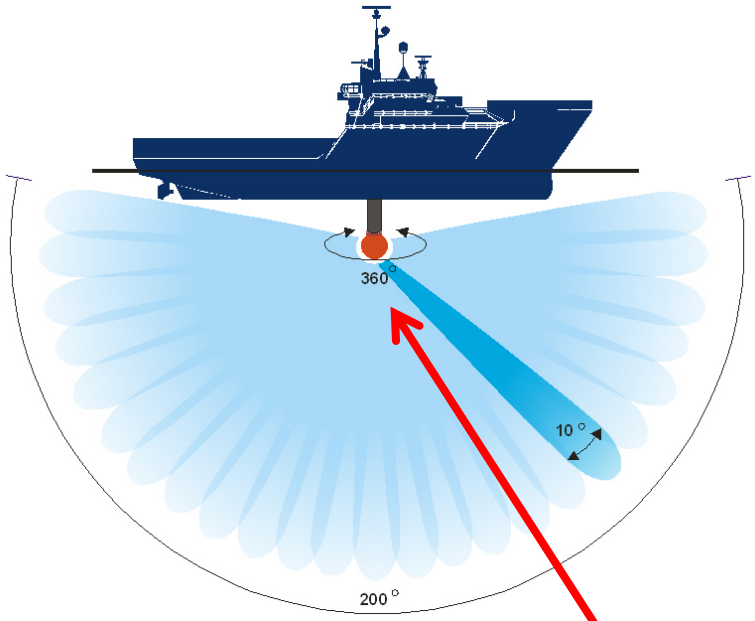
HUGIN Operator Station

HUGIN Operator Station (HOS)

APOS Survey station

Payload Operator Station (POS):

Positioning and communication – HIPAP



4-5 km

Under water Communications:

- Positioning
- Command link (down)
- Data link (up)