



The International Maritime Transport and Logistics Conference

“MARLOG 12”

**Sustainable & Innovative
Technologies**

Towards a Resilient Future

12 - 14 March, 2023 Alexandria - EGYPT



A STUDY FOR THE USAGE OF UNMANNED AERIAL VEHICLES (UAVS) IN SALVAGE OPERATIONS



Captain. Abdelrahman Abdelhadi.

Dr. Hassan Elghazouly.

Dr. Ahmed Ismail.

Eng. Eman Elkashat.

CONTENTS

ONE

Introduction of Maritime Transportation

TWO

FACTORS AFFECTING THE SALVAGE OPERATIONS

THREE

METHODS OF BATHYMETRY MEASURING

FOUR

USING OF DRONES IN SALVAGE OPERATIONS

FIVE

Final Conclusion

THE INTERNATIONAL SHIPPING INDUSTRY IS ACCOUNTABLE FOR TRANSPORTING 90% OF WORLD TRADE SO, MASSIVE INCREASE IN SHIP SIZES AND VOLUMES



Over 55,000 cargo ships are active in international trade.

Seaborne trade - expand at a compound annual growth rate of 3.8%

Generates an estimated annual income of over half a trillion US Dollars

Marine Emergencies Casualty Events



**ACCIDENTS
STILL
HAPPEN**

TOP LOSSES BY ACCIDENT CAUSE



Foundered



Wrecked/stranded



Fire/explosion



Machinery damage/failure



Collision

TOP VALUE OF LOSSES BY MARINE INSURANCE CLAIMS

MARINE INSURANCE
INDUSTRY CLAIMS IN
5 YRS.

\$10bn

The cost of claims

\$1.5bn

value of claims from ship
sinking/collision incidents¹

\$1bn+

value of claims from
machinery damage
incidents¹

\$1.6bn

Value of marine
insurance losses involving
some form of human error,
based on analysis of
almost 15,000
liability claims

TOP LOSSES BY VESSEL TYPE



Cargo



Fishery



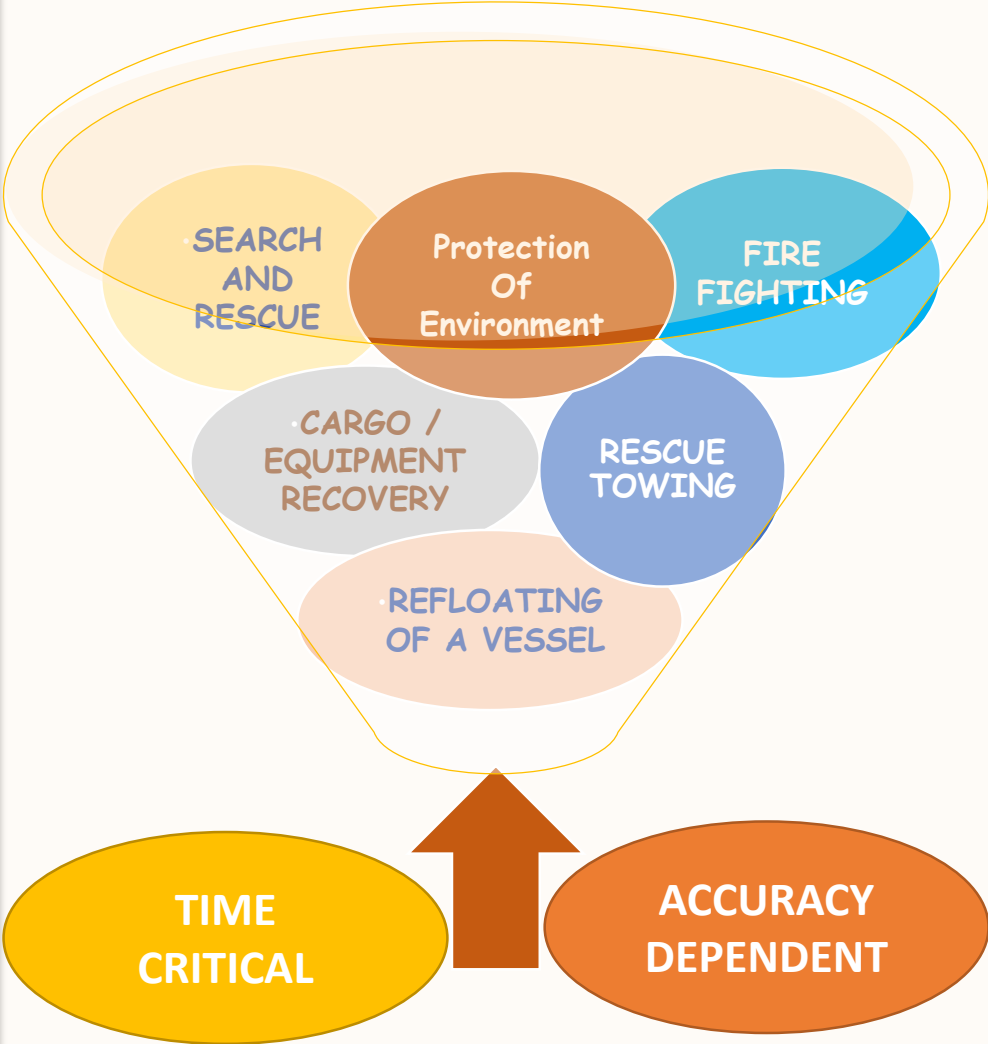
Bulk



Passenger



Chemical/Product





OFFSHORE SALVAGE

VERY CHALLENGING



HARBOUR SALVAGE



CARGO SALVAGE

VERY CHALLENGING



EQUIPMENT SALVAGE



SHIP WRECK SALVAGE



AFLOAT SALVAGE



CLEARANCE SALVAGE

TOPSIDE SURVEY

INTERIOR HULL SURVEY

DIVING AND EXTERIOR

HYDROGRAPHIC SURVEY

CURRENT STATUS OF BATHYMETRY DATA AVAILABILITY & ACCURACY

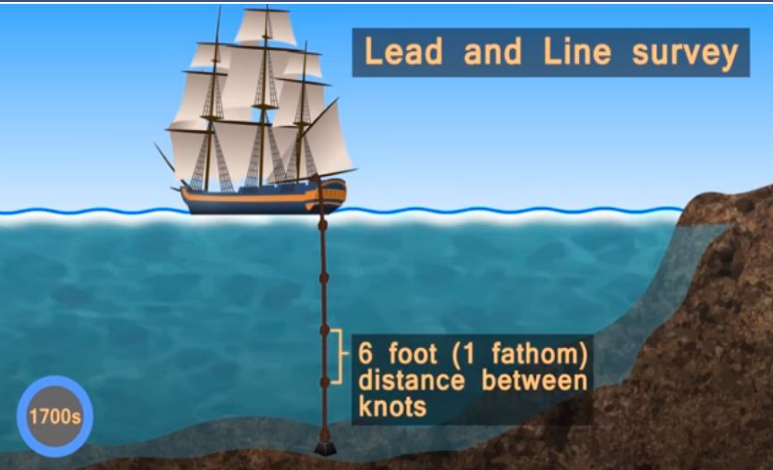


IHO ANALYSIS FOR SURVEYED COASTALWATER DEPTHS

IN SPITE OF THIS IMPORTANCE, STILL THERE IS INACCURATE AND OUTDATED BATHYMETRY DATA

COUNTRY	ADEQUATELY SURVEYED	REQUIRES RE-SURVEY	NO SURVEYS
UK	49%	22%	29%
AUSTRALIA	35%	20%	45%
JAPAN	46%	47%	7%
NIGERIA	20%	70%	10%
PHILIPPINES	25%	50%	25%
PANAMA	25%	75%	0%
ANTARTICA PENINSULAR	0%	40%	60%
THE REST OF ANTARTICA	0%	1%	99%

TRADITIONAL METHODS OF BATHYMETRY MEASURING

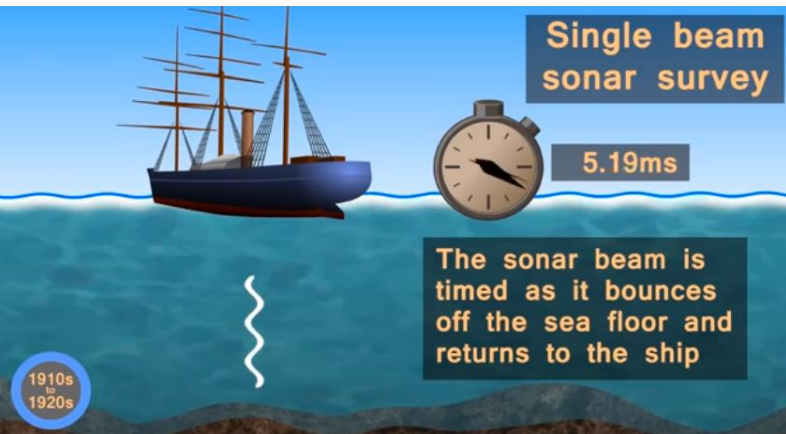


Lead and Line survey

6 foot (1 fathom) distance between knots

1700s

Able to examine up to 23 Foot, but slow, with high risks.



Single beam sonar survey

5.19ms

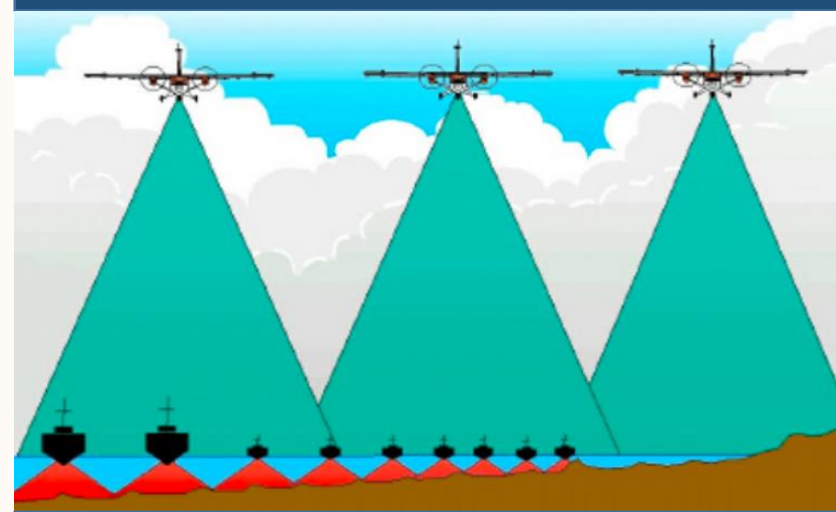
The sonar beam is timed as it bounces off the sea floor and returns to the ship

1910s to 1920s

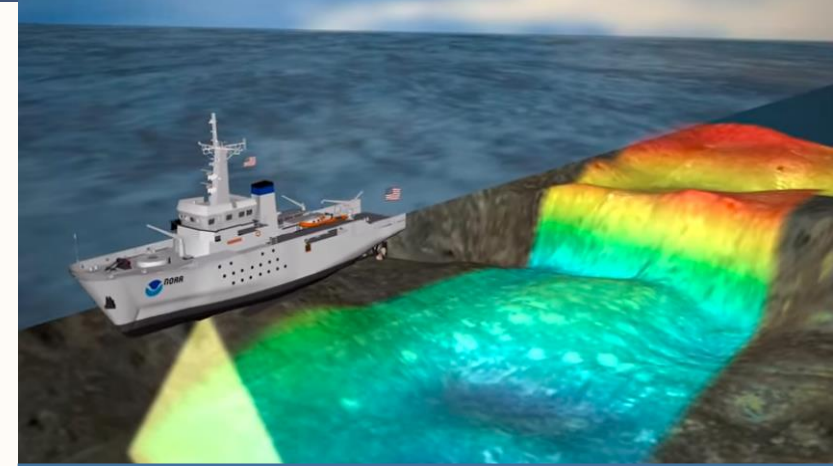
Measures the time lapse between sonar out and in of ship

Bathymetry measurements are not static.

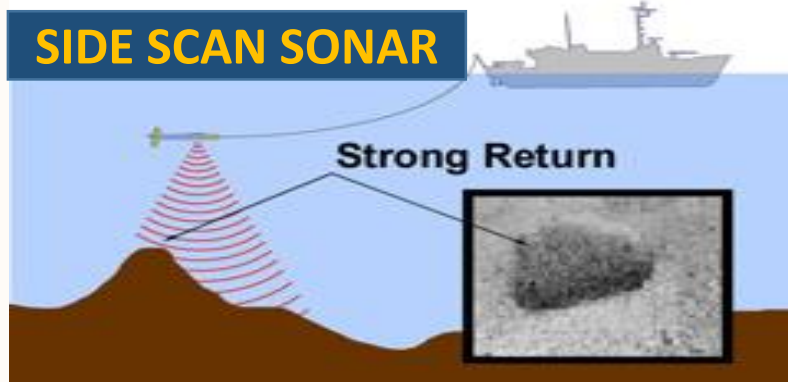
AIRBORNE LIDAR



proven to be an accurate, efficient, cost-effective, safe, and flexible method for rapidly charting waters.



Sound Energy sent out in a fan shape covering a wider range, surveying large swaths of seabed



SIDE SCAN SONAR

Strong Return

creates a picture of the sea floor, by measuring the strength of how "loud" the return echo is.

THE INTRODUCTION OF DRONE USAGE IN BATHYMETRY DATA AND OTHER APPLICATIONS FOR SALVORS AND SALVAGE OPERATIONS

WHAT IS A DRONE

An Unmanned Aircraft or Drone that can navigate autonomously, without human control or beyond the line of sight

FIXED WING DRONES



MULTIROTOR DRONES



obstacle
detection
capabilities

Collision
avoidance
technology

Carry various
equipment

ADVANTAGE OF DRONES IN SALVAGE OPERATIONS

REDUCING SALVAGE COSTS –
CREW & EQUIPMENT

ACCESS HAZARDOUS AREAS

TRANSFERRING TOWING LINES
BETWEEN TUGS AND SHIPS

SURVEYING AND TACKLING OIL
POLLUTION



FEATURES OF DRONES

An Unmanned Aircraft or Drone that can navigate autonomously, without human control or beyond the line of sight



Bad weather up to wind speed
40 Knot

made from different **light** composite materials in order to increase maneuverability while flying and reduce weight.

can be equipped with a variety of additional equipment, including cameras, Global Positioning Systems (GPS), navigation systems, LIDAR sensors, and so on.

comes in a broad range of shapes, sizes, and with various functions

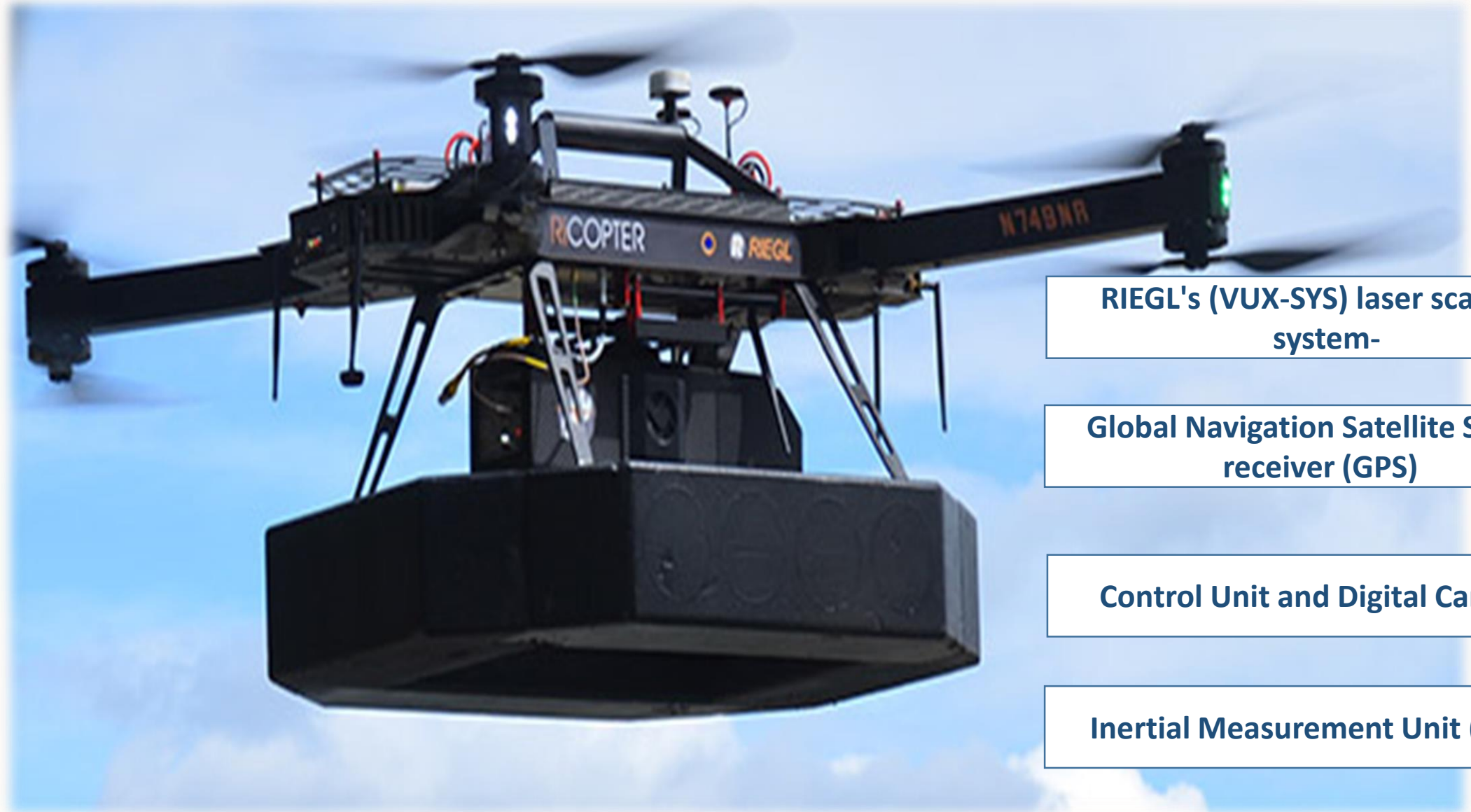
COMPACT & LIGHTWEIGHT BATHYMETRIC DEPTH FINDER FOR SURVEYING TASKS USING

RIEGL BathyCopter

The BathyCopter Drone-based Surveying System for Hydrographic Applications delivering points above, on, and below the water table.



RIEGL BATHYCOPTER MECHANISM



RIEGL's (VUX-SYS) laser scanning system-

Global Navigation Satellite System receiver (GPS)

Control Unit and Digital Cameras

Inertial Measurement Unit (IMU),

BathyCopter General Setup



EARLIER BATHYMETRIC METHODS

- Highly labor-intensive and dangerous
- Surveyors had to swim and dive in the water
- Boat-based sonar surveys limited by shallow water or the inability to access a certain area

NEW DRONE LIDAR PLATFORM

- Flown at lower operational altitude
- water surface could be detected reliably for water depths larger than 30 cm
- Conducted at a lower altitude and at a slower flight speed resulting in much higher density point clouds (> 500 ppm) and with much smaller laser spot sizes (< 3.5 cm).

OTHERS UTILITIES OF DRONES IN SALVAGE

1 – Drones to Access the structure of and coating inside ballast and cargo tanks

During these inspections, a surveyor has to be able to touch a surface to check the condition of the material



Deep within the ships core, Elios starts the inspection of huge ballast tanks

2 – Drones to aid salvors in easier and safe towing

Delft Dynamics

K
KOTUG



WE AIMED TO

SHARE REAL TIME INFORMATION ABOUT THE APPLICATIONS OF DRONES THAT ENHANCE THE SALVAGE OPERATIONS IN TERMS OF DATA, ACCURACY, RISKS AND COSTS

PRVIDED DATA INCLUDE:

Provide information to surveyors from difficult-to-reach areas on ships and offshore structures

Map shallow water and very narrow band of coastal areas that are inaccessible by survey boats

Fly safely over obstacles and exposed rocks, where the hydrographic vessels can't go

REDUCE PROJECT COSTS AND RISKS

THANK YOU FOR YOUR PATIENCE & TIME