Design of a controlled side launching system for tugboats

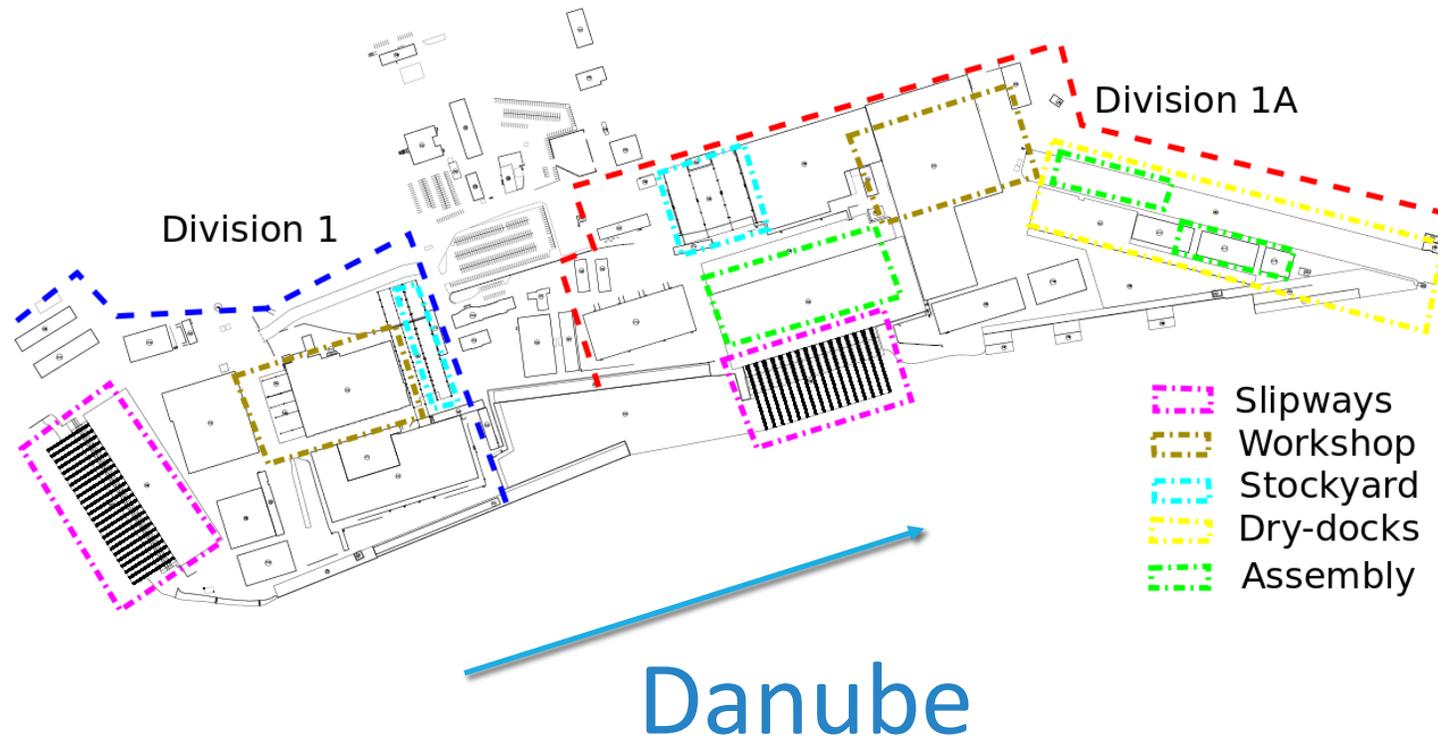PRESENTED BY: JUAN SEBASTIAN CARDONA

MECHANICAL ENGINEER. MSC IN COMPUTATIONAL MECHANICS. MSC IN NAVAL ARCHITECTURE

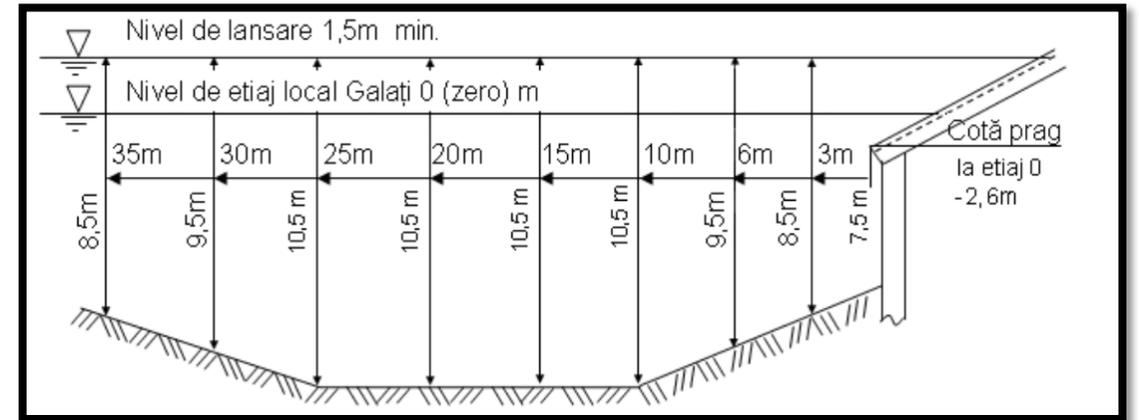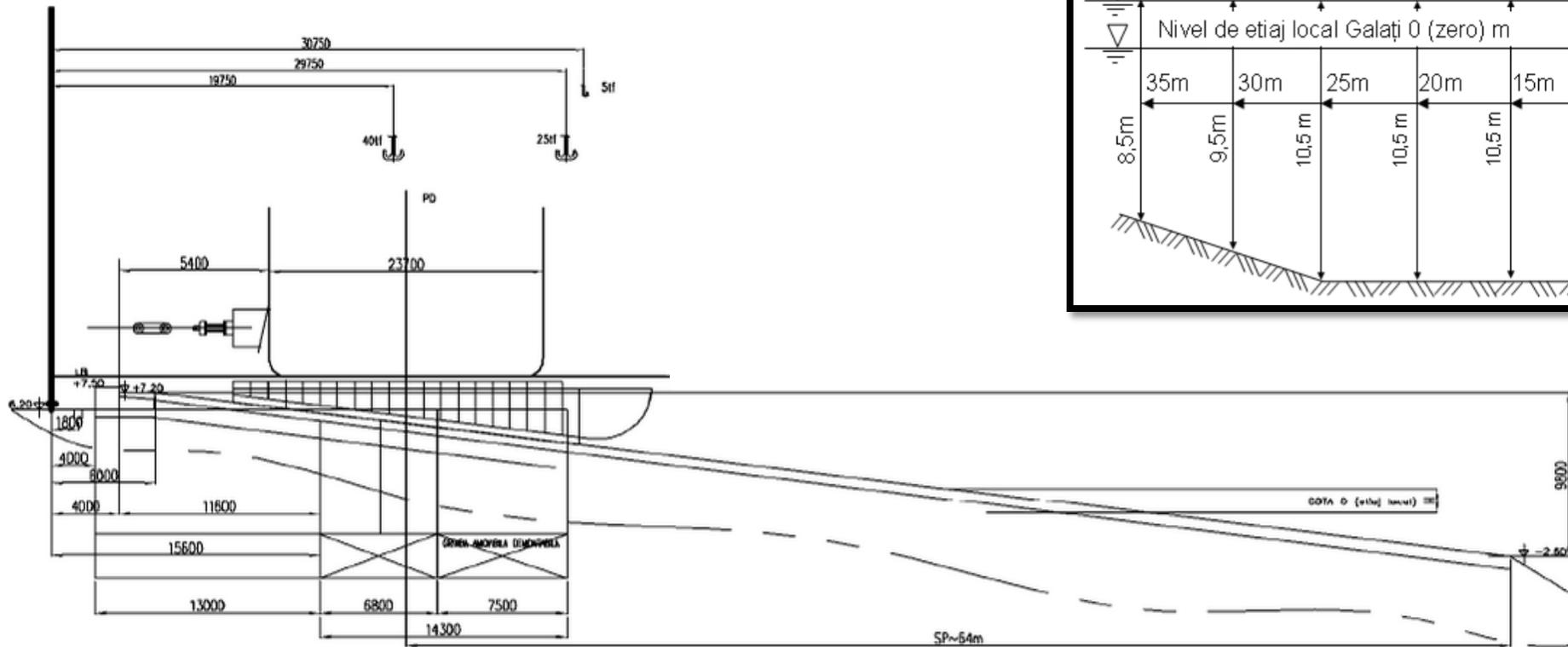ADVISOR: ASSOCIATE PROFESSOR RENARDO FLORIN TEODOR, "DUNAREA DE JOS" UNIVERSITY OF GALATI

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DAMEN SHIPYARDS GALATI

Division 1A

Division 1

Slipways
Workshop
Stockyard
Dry-docks
Assembly

Danube

GRAVITATIONAL SIDE LAUNCHING SYSTEM IN DAMEN SHIPYARDS GALATI

TUGBOAT CHARACTERISTICS


Characteristic
Length
Beam
Draught
Displacement

MOTIVATION

o Lifting capacity of the cranes restrict the launching by crane.

o Violent movement at the edge of the slipways.

o Risk of skidding and tilting the ship before reaching the water.

o Risk of impact between the wooden supports and hull.

o Risk of impact between cradle and vessel.

GRAVITATIONAL SIDE LAUNCHING SYSTEM IN DAMEN SHIPYARDS GALATI
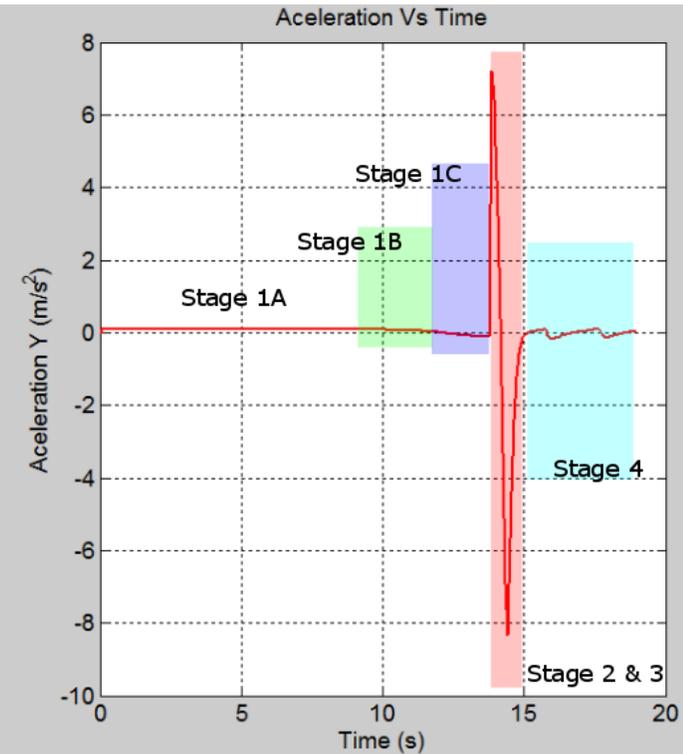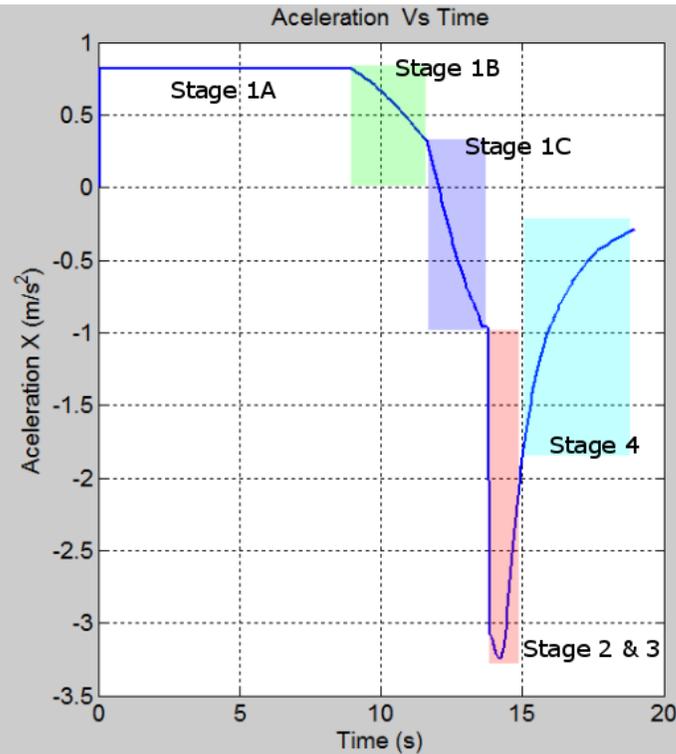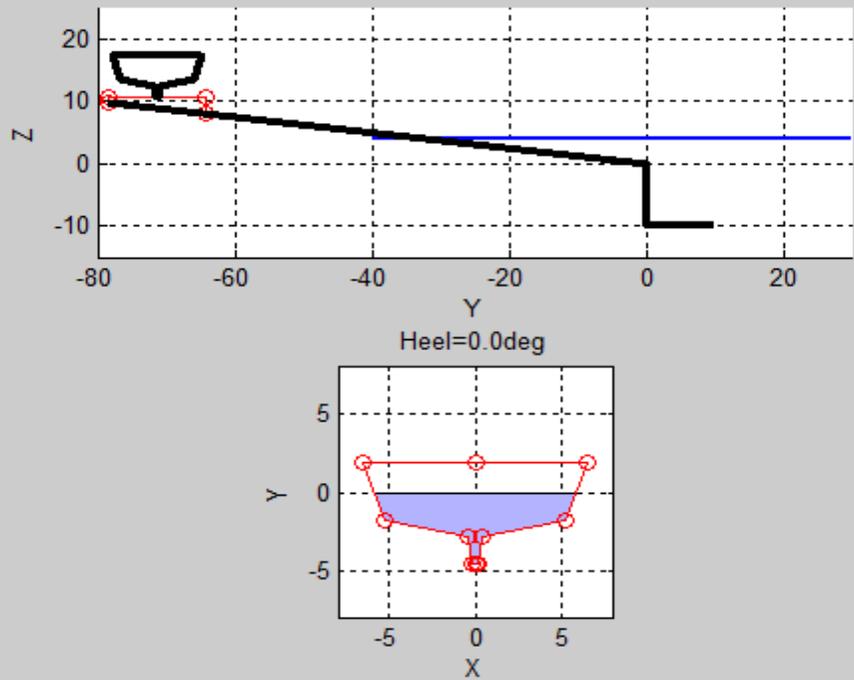
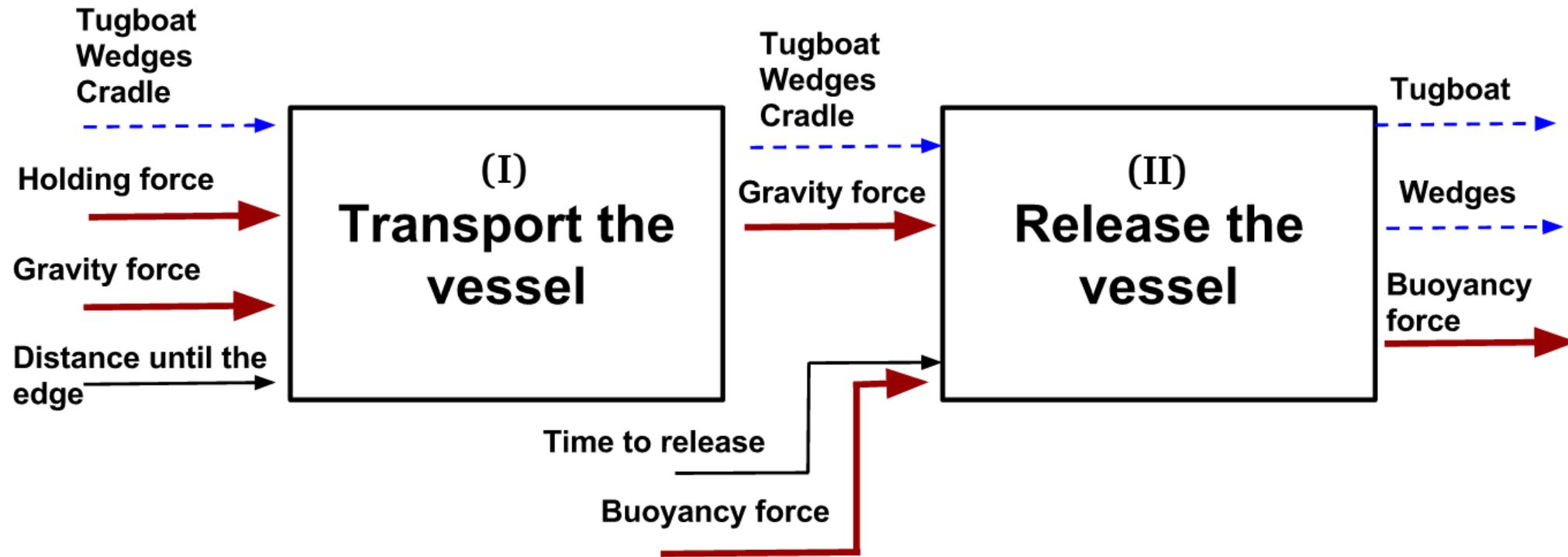$$\sum F = m_{total} * a = F_{grav} - F_{friction} - F_{dragCradle} - F_{dragVessel}$$

$$\Delta\alpha = f(V, \Delta t, K_\alpha, \lambda_\alpha)$$

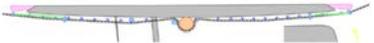$$\sum F = m_{total} * a = F_{buoyancy} + \lambda_y$$

REQUIREMENTS

o The system must be demountable or temporary system.

o Possibility of recover ships (Optional).

o The system must be modular.

o The demountable system must weigh less than the lift capacity of the two cranes.

o The system must consider the different sceneries of launching regarding the level of the river.

o Not speed launching requirements but launching must be slow and controlled.
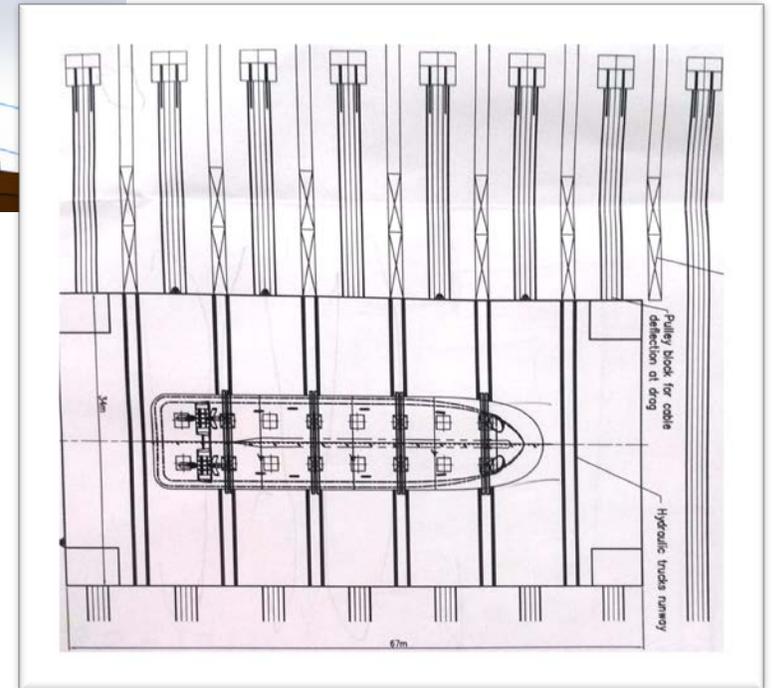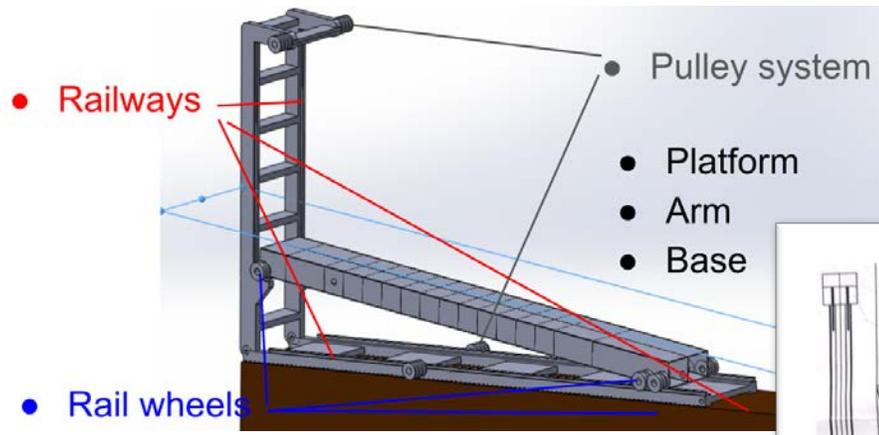
o Accessibility for Lorries coming with the ship.
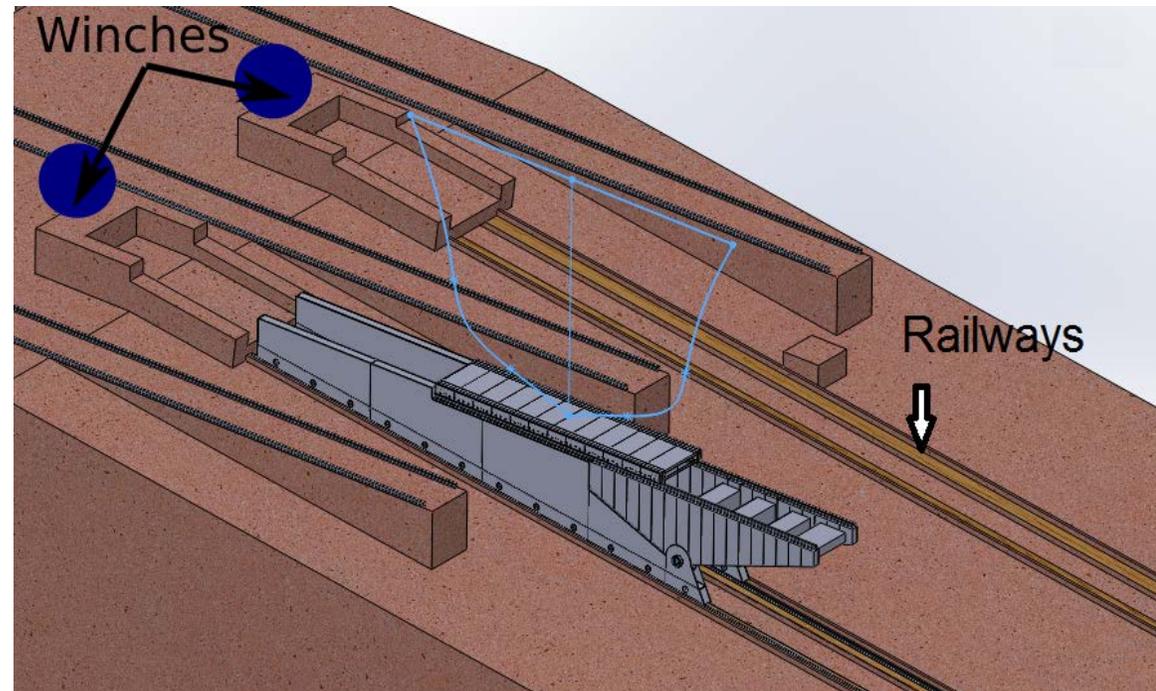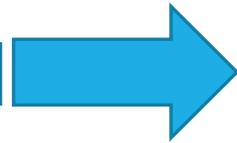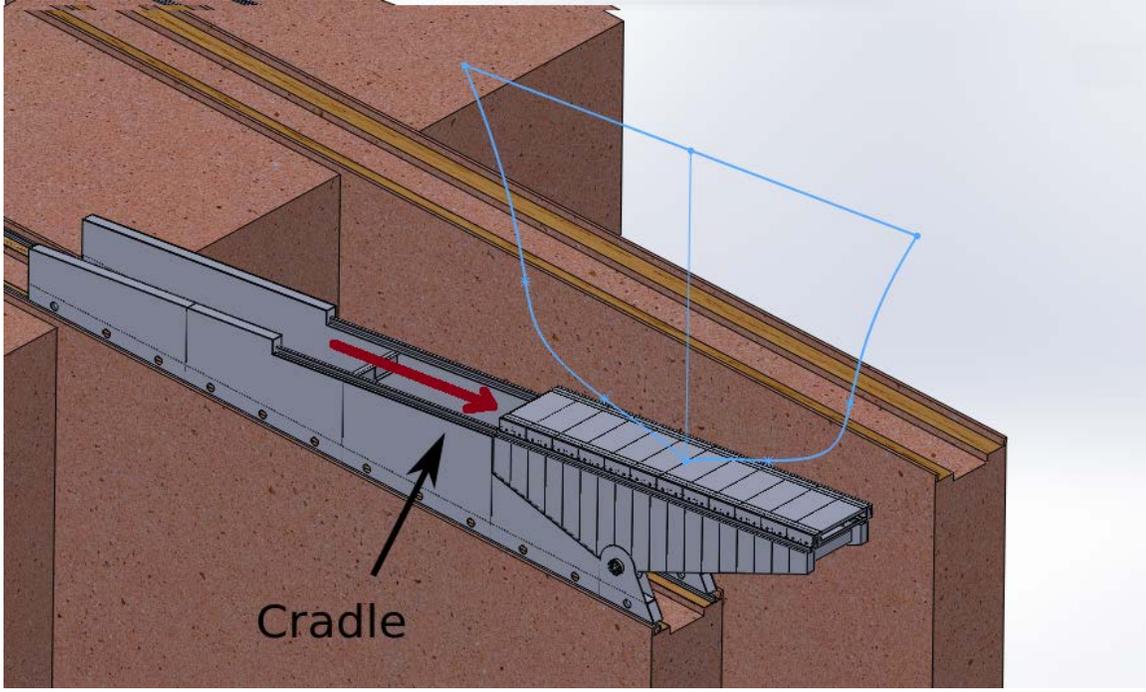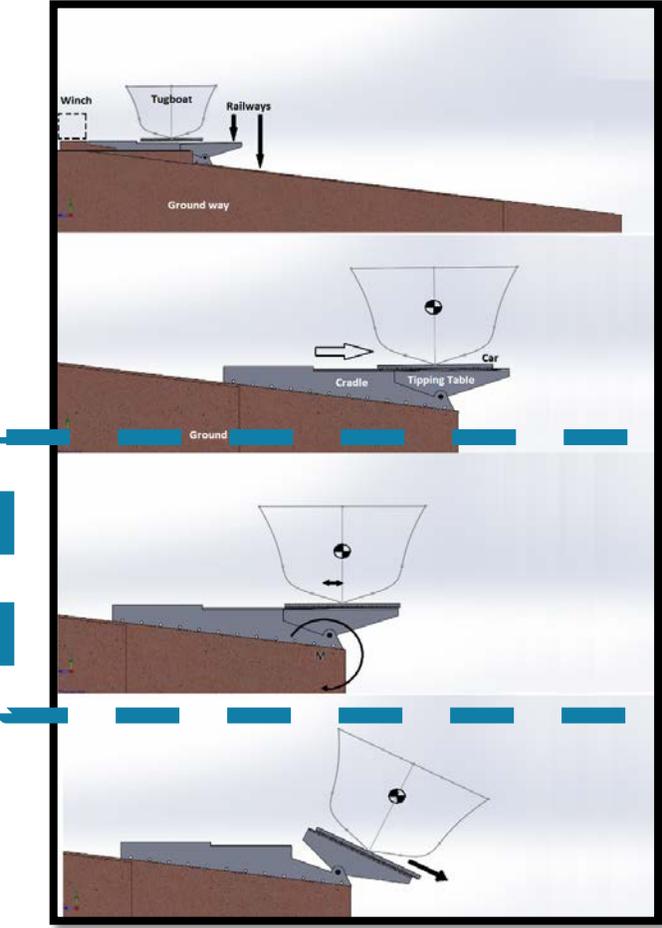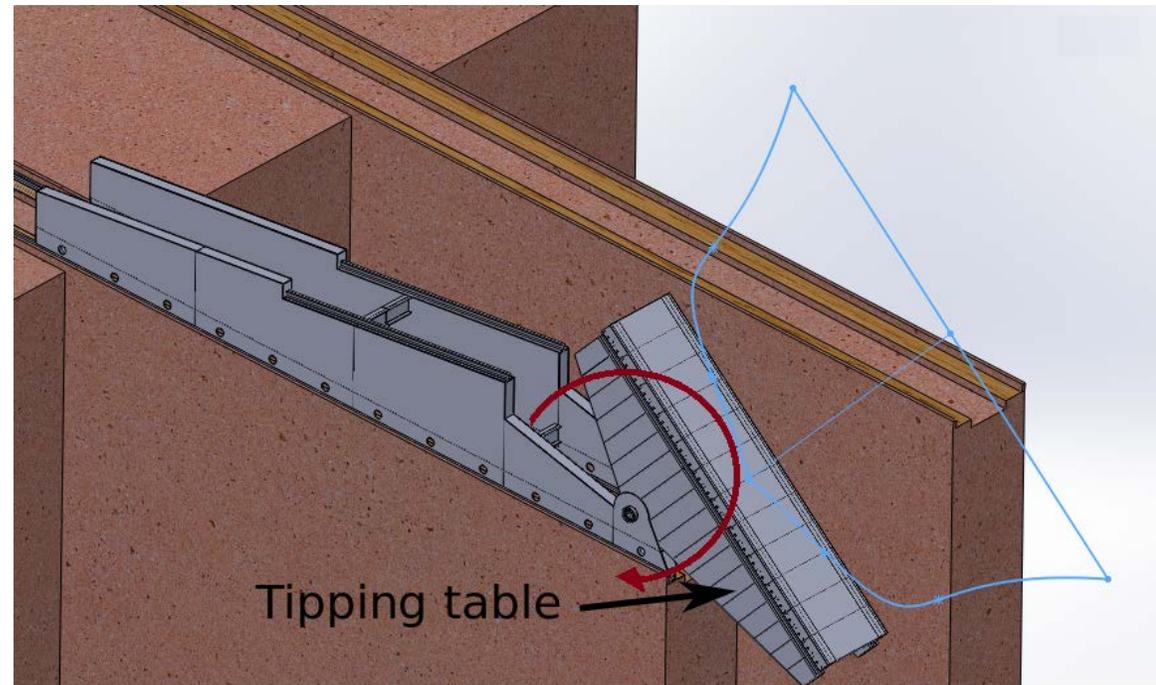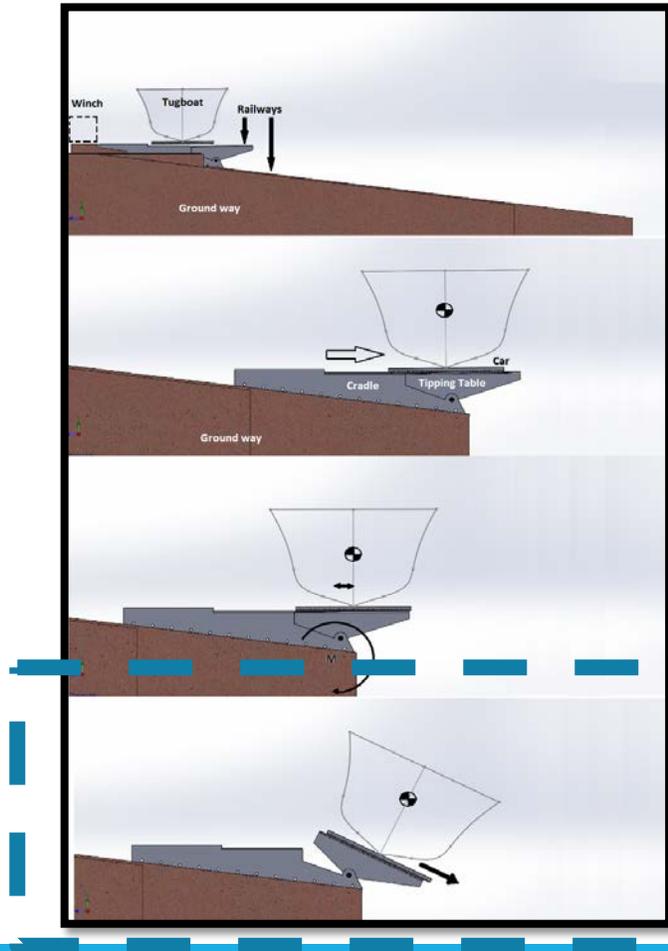
BLACKBOX DIAGRAM

DESIGN PROPOSAL

DESIGN PROPOSAL (Tipping table)

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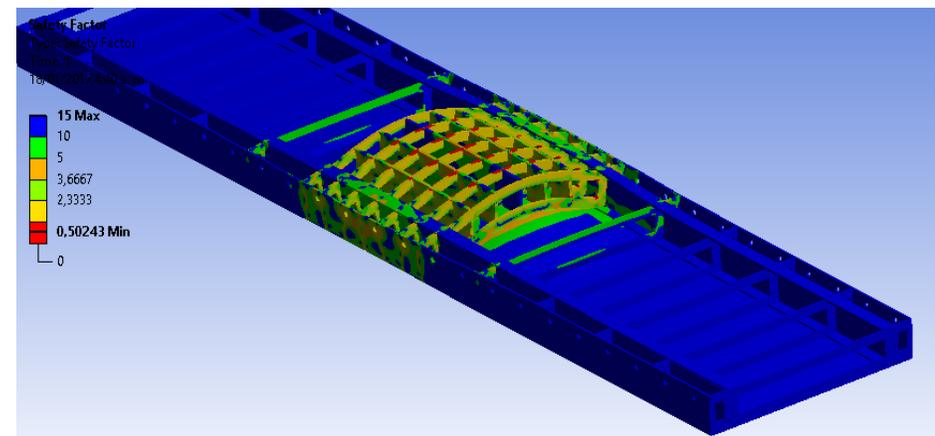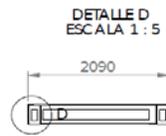# DESIGN PROPOSAL (Tipping table)

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Tipping table

DETAILED DESIGN OF TIPPING TABLE (Structural Analysis) Security factor calculation
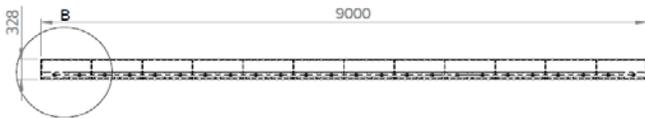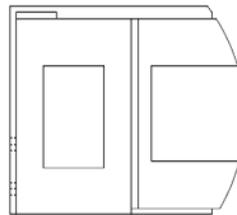
DETAILED DESIGN OF TIPPING TABLE (Kinematic analysis at 0 m)

DETAILED DESIGN OF TIPPING TABLE (Kinematic analysis at 3.95 m)
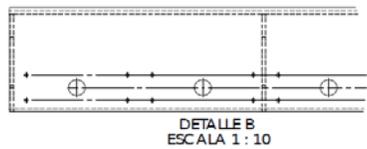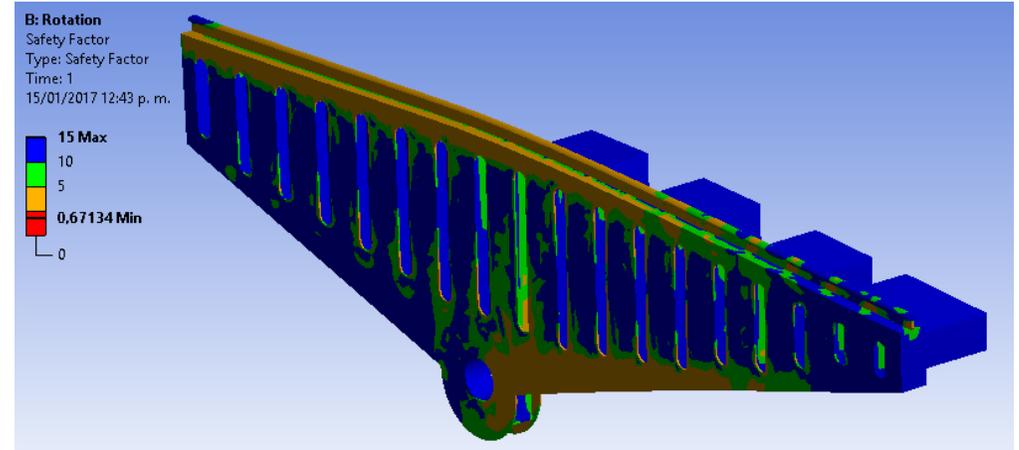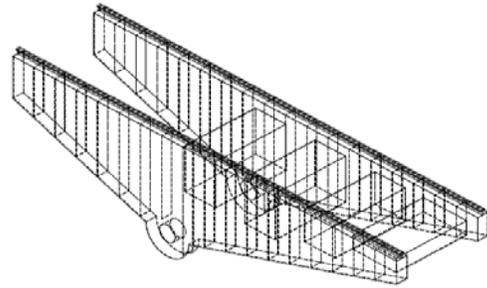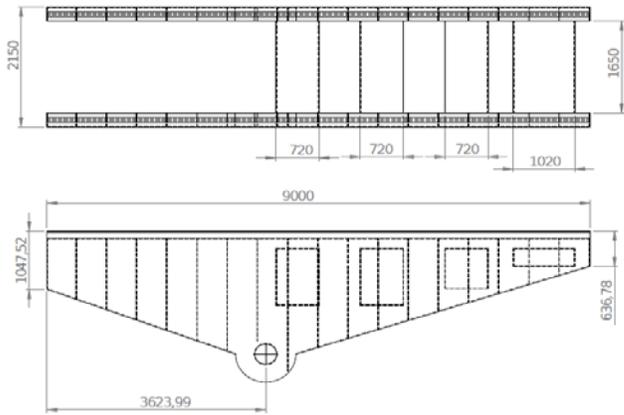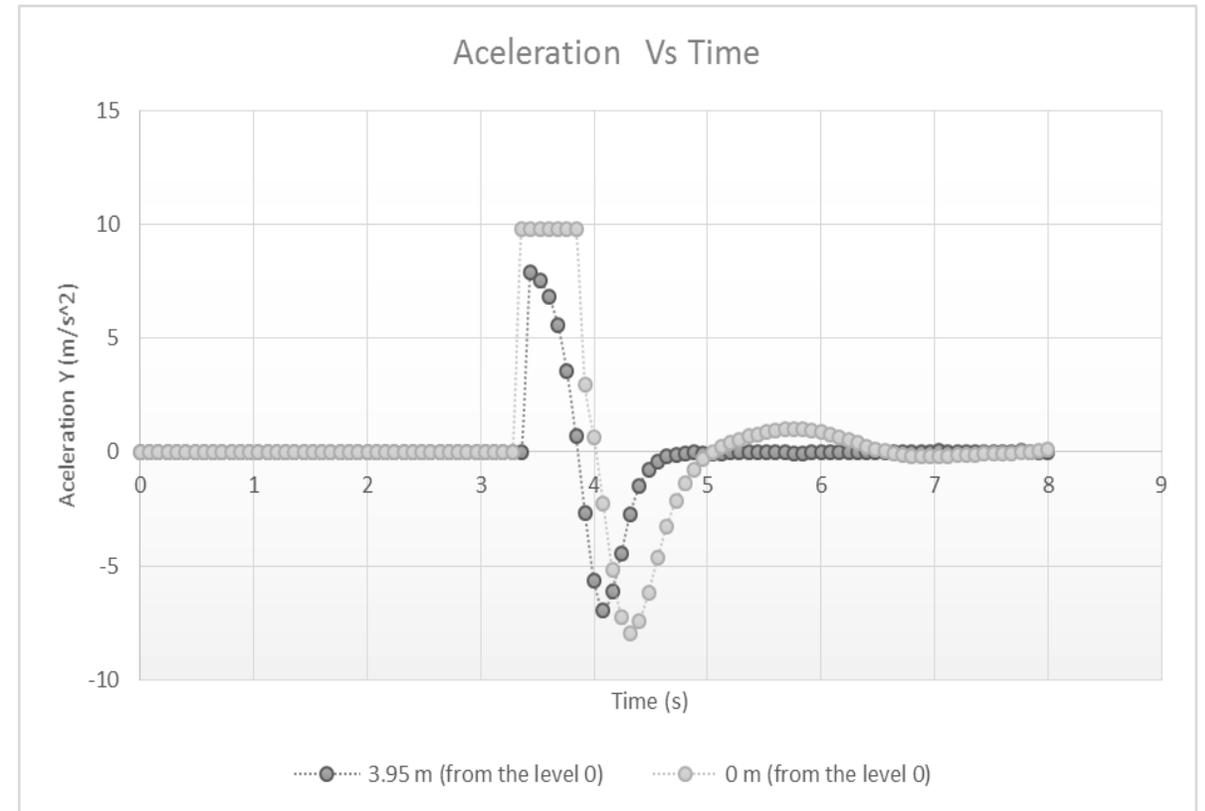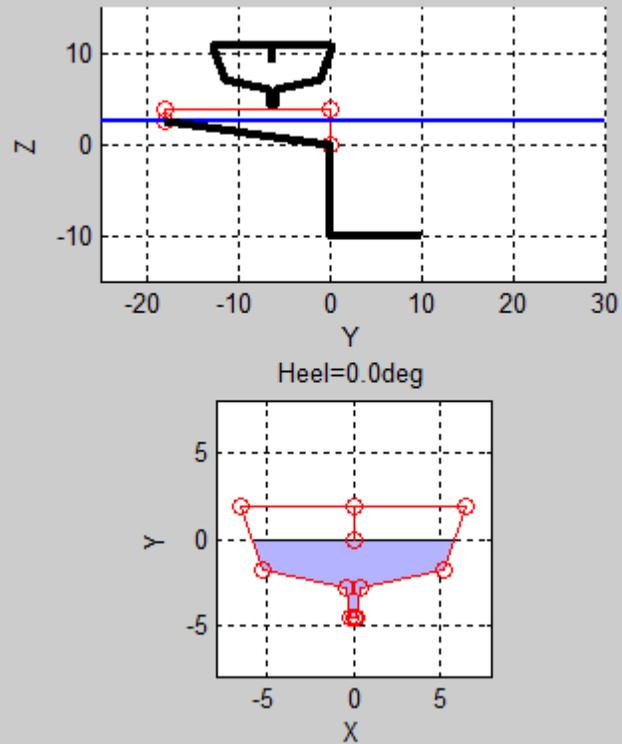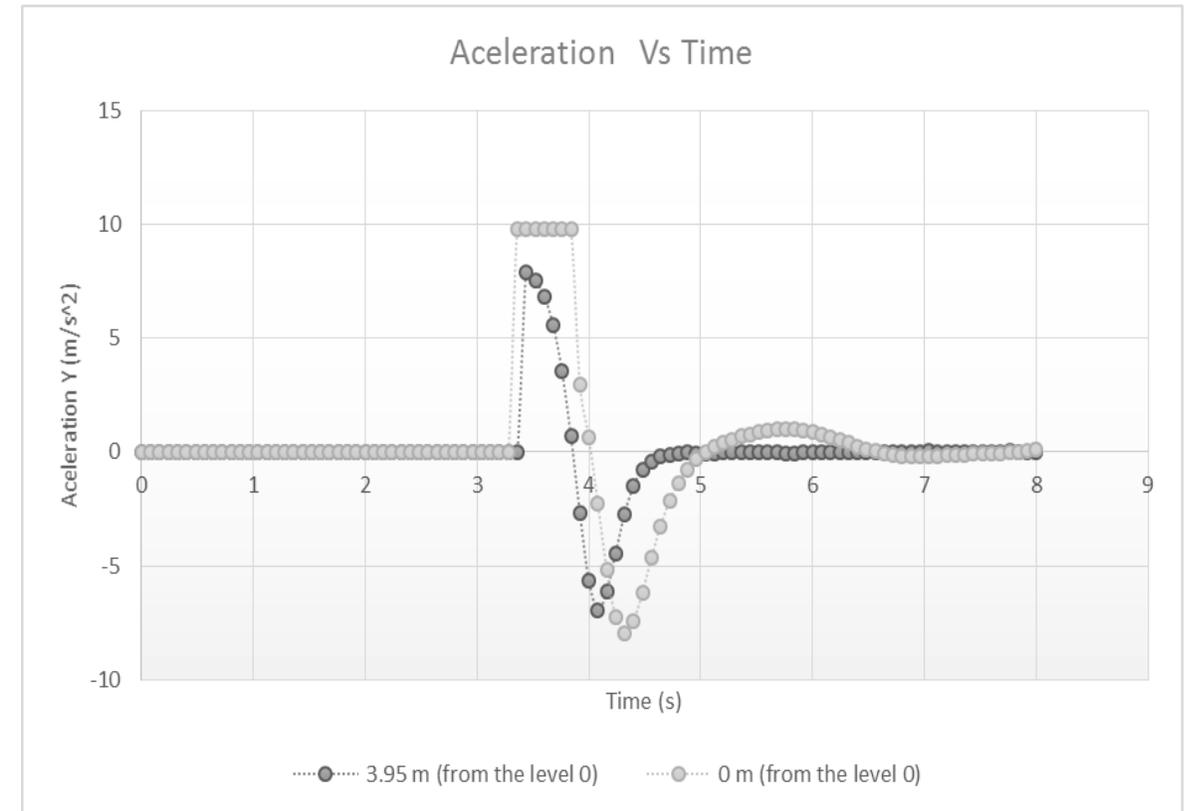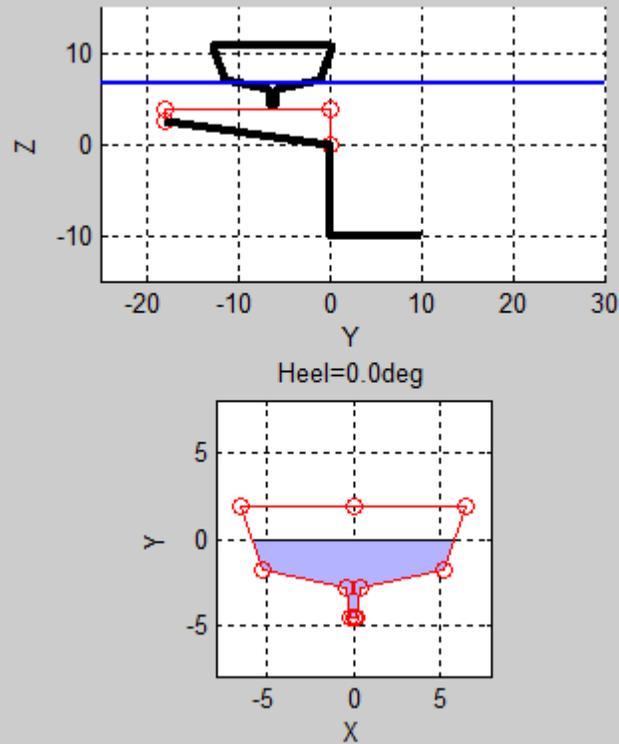
CONCLUSIONS

o The controlled side launching system fulfil all the specifications and requirements of the design.

o The design structure accomplishes with the minimum security factor of SF=1.2.

o The results found for the scenery of 3.95 m (from the level zero) shows a high risk of damage of the vessel.

o The controlled side launching system can be adjustable regarding the water level of the river.

o Extremely low water condition results give and safety launching without risk of damage.

o The computational model developed in the study, shows realistic behavior. However, must be validated rigorously before use it as tool.

ACKNOWLEDGEMENTS

GRACIAS

SPECIFICATIONS

o System is designed for launch ships with the maximum capacities of the Stan tugboat 4511.

o The total capacity of one slipway is 600 tons (biggest tugboat weight 900 tons).

o Ship maximum size 15 m beam (biggest tugboat 14 m beam).

o Ship maximum size 45 m length (biggest tugboat 45 m length).

o Reach draught enough to release the vessel (around 5.6 m).

o Launching speed about 0.1 m/min.