VIRTUAL PROTOTYPING IN AN ELEVATOR FOR MARINE APPLICATION

- NAVALIMPIANTI GROUP is specialized in engineering, design and construction of complete systems for access, hoisting and handling of cargo on all kind of ships.

- The Technical Departments of NAVALIMPIANTI GROUP are able to fully develop the design and to coordinate the project using the most advanced techniques in order to obtain solutions to satisfy Client's specific requirements.

NAVALIMPIANTI GROUP

NAVALIMPIANTI-GROUP

- The group includes four Companies: in ITALY, USA and CROATIA.
- NAVALIMPIANTI s.p.a established since 1971 is a private Company with:
  - Head Office and factory in Genoa.
  - Branch Office and factory in Monfalcone.
  - TECNIMPIANTI s.p.a with its technical offices and workshops in Sicily.
  - NAVALIMPIANTI USA Inc. operates as Marine Overseas Headquarter based with offices and workshops.
  - NAVALIMPIANTI Pula in Croatia is an auxiliary Design Center for the Group.

VIRTUAL PROTOTYPING IN AN ELEVATOR FOR MARINE APPLICATION

- Navalimpianti offers solutions in constructions for all Marine Applications about:

  - Specialized Equipment for Cruise Vessels & Ferries
  - Sliding roofs, Swimming pool covers.
  - Elevators and related hydraulic control systems.
  - Ramps (stern, bow, quarter, internal)
  - Tender Embarkation Platforms.
  - Service Cranes .

NAVALIMPIANTI GROUP

VIRTUAL PROTOTYPING IN AN ELEVATOR FOR MARINE APPLICATION

INTRODUCTION:

Navalimpianti wants to develop a hoisting system to transfer vehicles container and other, between the ship decks, applicable in cargo vessels and in navy ships.

- The goals of this project are:

  - To verify and validate a solution for all the project where loading platforms for carrying on-off vehicles are required.

  – To have a new significant model to use for future equipments.

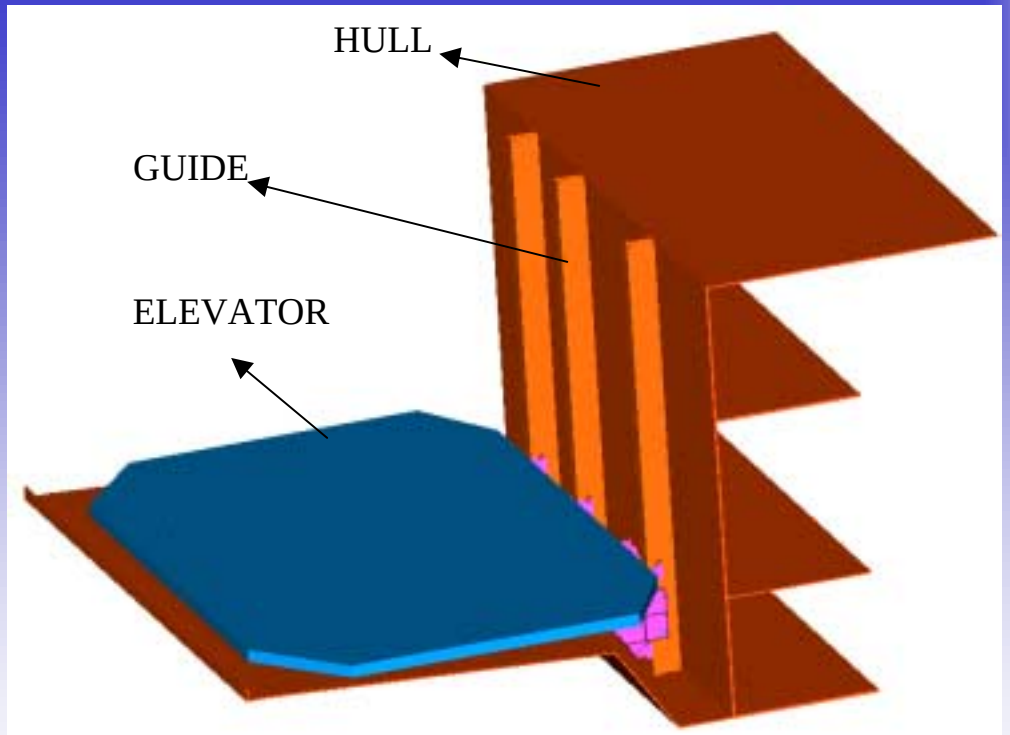
  – To used I-DEAS cad platform and ADAMS to improve the capabilities of the project.

NAVALIMPIANTI-GROUP

VIRTUAL PROTOTYPING IN AN ELEVATOR FOR MARINE APPLICATION

THE PLATFORM ARRANGEMENT:

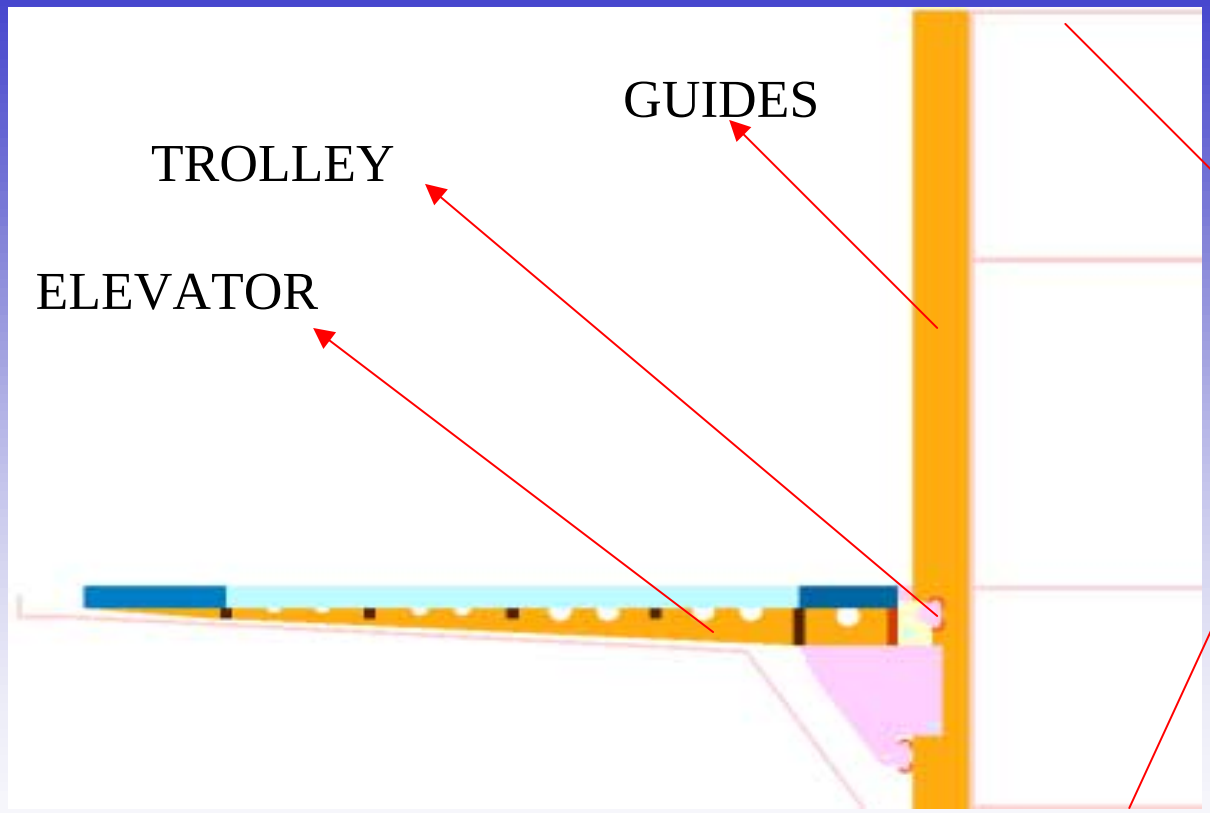
- 3-D model: the main dimensions of the elevator are about 21m X 14m a and a weight less then 55 tons.
- We have three vertical guides, a platform and a opportune trunk to contain the elevator in each working position.



NAVALIMPIANTI-GROUP

VIRTUAL PROTOTYPING IN AN ELEVATOR FOR MARINE APPLICATION

GENERAL ARRANGEMENT:



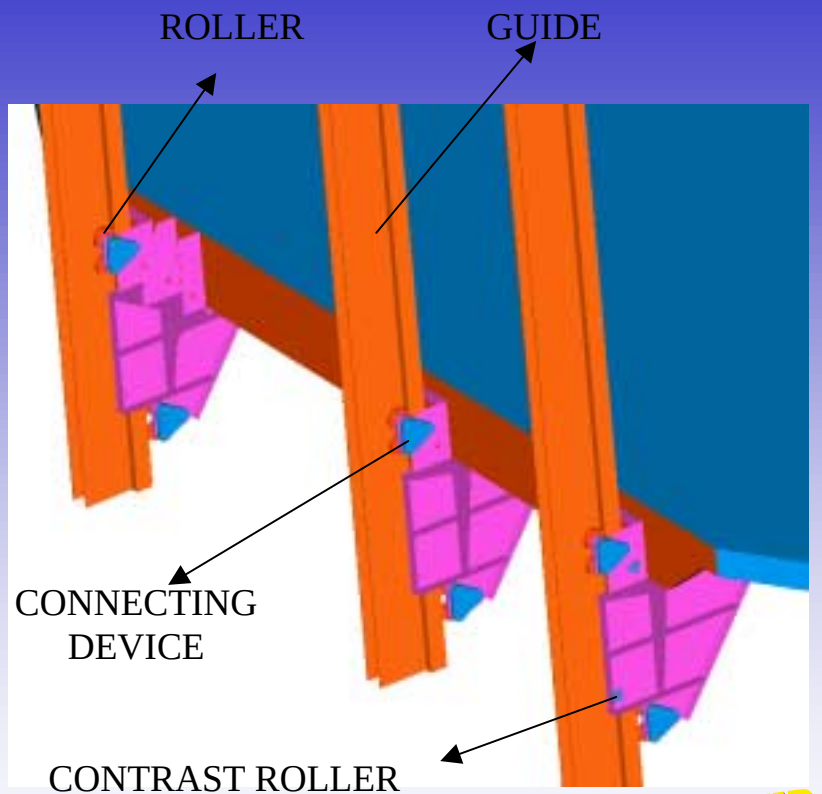
NAVALIMPIANTI-GROUP

VIRTUAL PROTOTYPING IN AN ELEVATOR FOR MARINE APPLICATION

CONNECTING DEVICES SKETCH

- Connecting devices sketch to interface the elevator with the hull, into a suitable trunk between ship decks.

- 24 rollers
- 12 connecting devices
- 4 contrast rollers



NAVALIMPIANTI-GROUP

VIRTUAL PROTOTYPING IN AN ELEVATOR FOR MARINE APPLICATION

DYNAMIC MODEL:

- **The main goals are**:

- To use bushing elements to concentrate the model flexibility on connecting points between rollers and support devices.

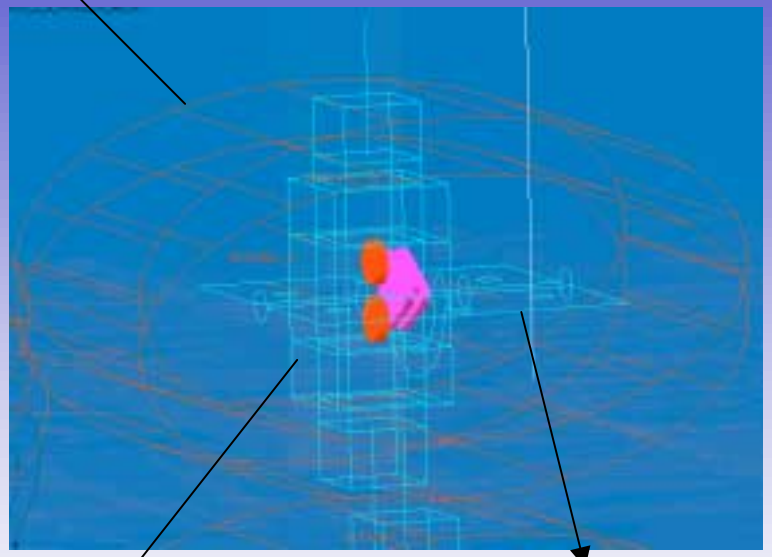
2) To validate the model in every work conditions, by using the necessary inputs, i.e. wave motions, different loads, boundary conditions and obtain the general behavior, like reaction forces, platform accelerations and so on.

- To simulate the wind up of the three wire ropes necessary to lift the platform.
- To obtain this we followed two different ways:
  - the first one by the rigid model by using bushing elements.
  - the second one by using a complete platform flexible body.

NAVALIMPIANTI-GROUP

TROLLEY MODEL :

- Create a simple model of the trolley with a bushing element for connecting rollers and supports and a cam/cam joints between guides and rollers.
- Modify the cam/cam contacts with translational joints.
- Improve the model stability.
- Discover the bushing stiffness.

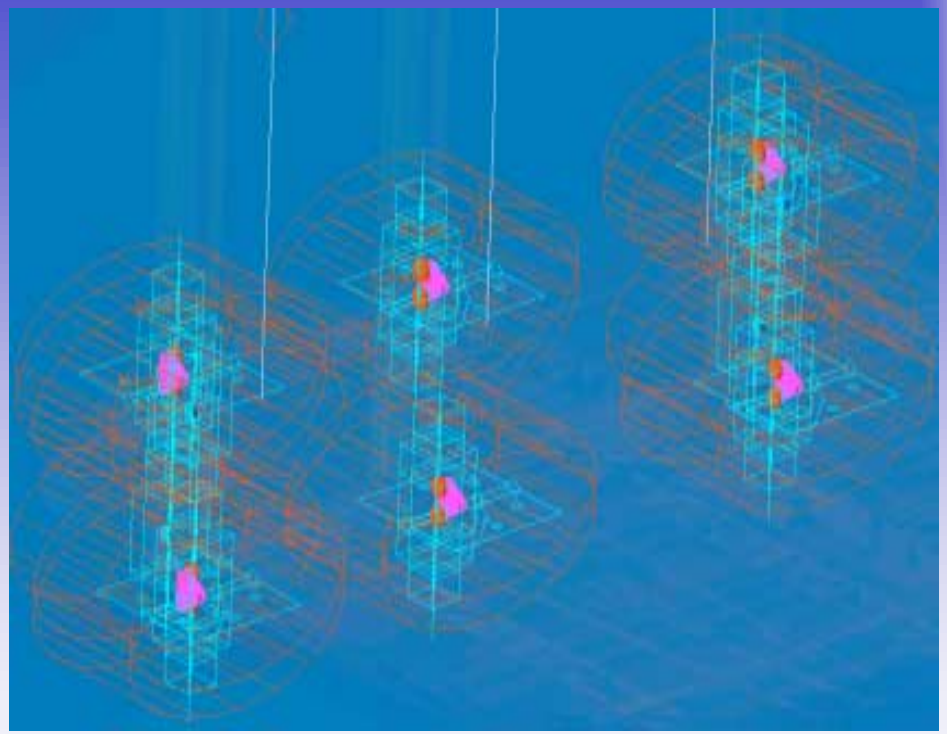


VIRTUAL PROTOTYPING IN AN ELEVATOR FOR MARINE APPLICATION

FIRST CASE WITH RIGID MODEL:

- Trolleys with bushing elements to concentrate the global flexibility, in the roller's center.

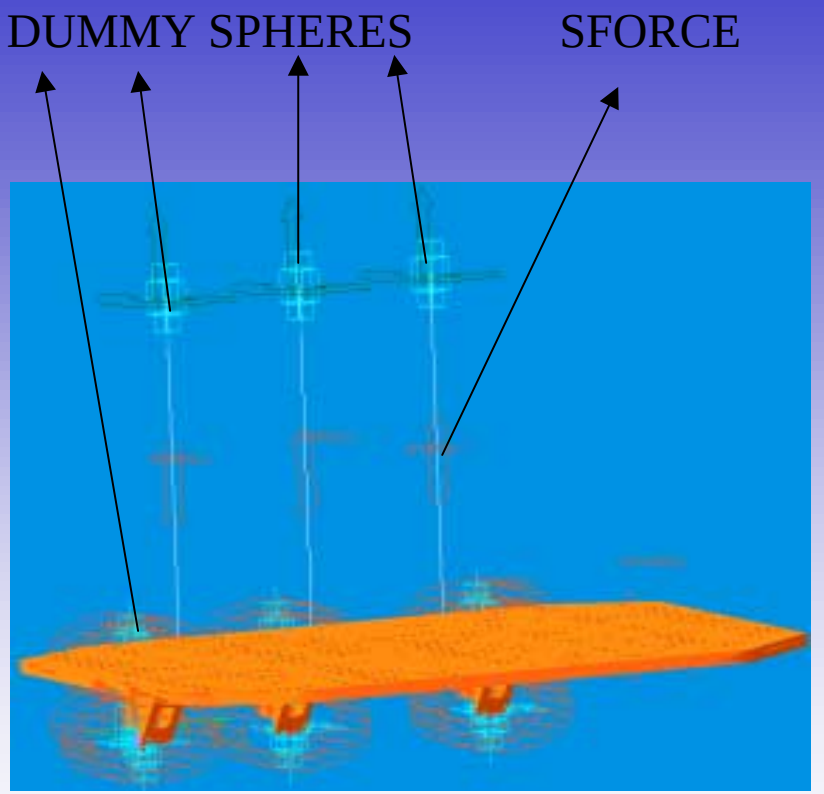
- For the symmetry of the arrangement it is not necessary to consider all rollers.



NAVALIMPIANTI-GROUP

WIRE ROPES MODEL TO LIFT THE PLATFORM:

- To use dummy spheres to create three Measures. (Coupled spheres)
- To create three SFORCE proportional to Measures about dummy parts to simulate the wire ropes behavior.
- To impose a lift speed about 200 mm/sec at the first three spheres.



NAVALIMPIANTI-GROUP

VIRTUAL PROTOTYPING IN AN ELEVATOR FOR MARINE APPLICATION

WAVE MOTION:

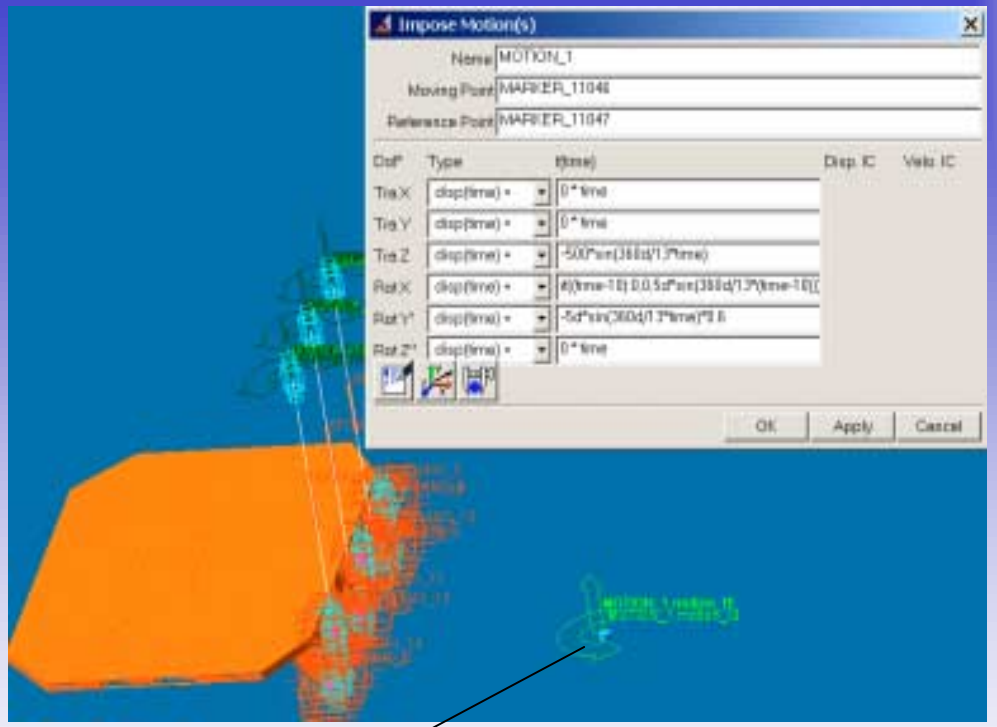
- In this model it is shown the main oscillatory motions to consider the most important kind of wave motions:

  1- Heaving motion.

  2- Rolling motion.

  3- Pitching motion.

- Applied by a general point motion to ship's C.G..



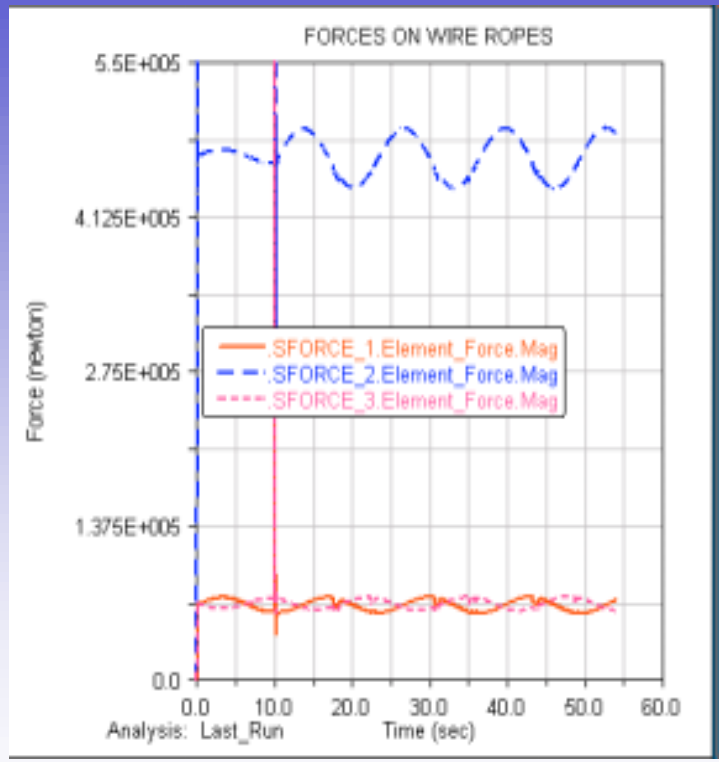
SHIP'S C.G. AND INPUT FOR WAVE MOTION

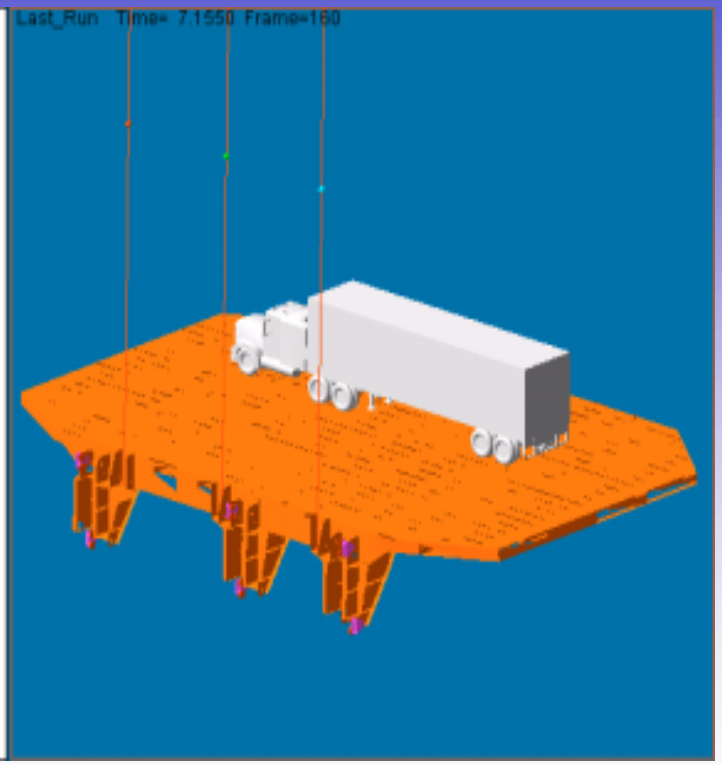
NAVALIMPIANTI-GROUP

VIRTUAL PROTOTYPING IN AN ELEVATOR FOR MARINE APPLICATION

RESULTS:

- Wire rope forces, are subdivide by three, it's possible to appreciate the oscillatory values.





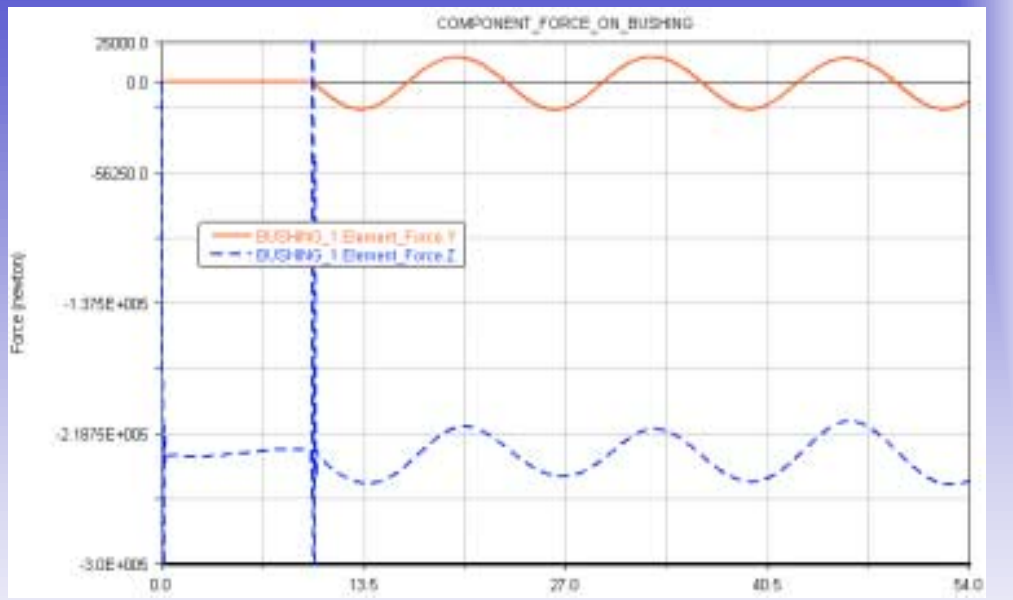
NAVALIMPIANTI-GROUP

VIRTUAL PROTOTYPING IN AN ELEVATOR FOR MARINE APPLICATION

BUSHING RESULTS:

- Components of one bushing element. They have a oscillatory trend proportional to input wave motions.

- Observe the unsteady behavior when act the Rolling motion with a phase angle.

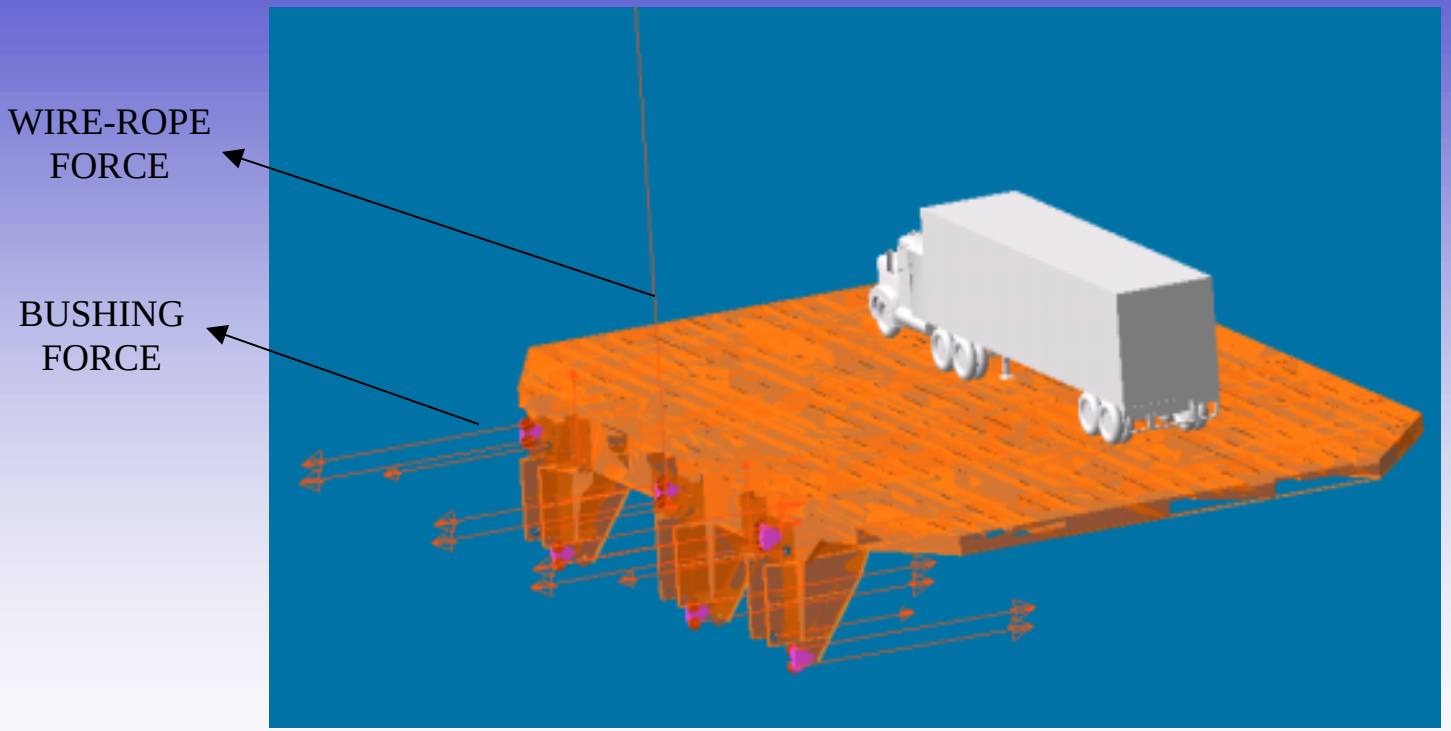


NAVALIMPIANTI-GROUP

VIRTUAL PROTOTYPING IN AN ELEVATOR FOR MARINE APPLICATION

FORCES:

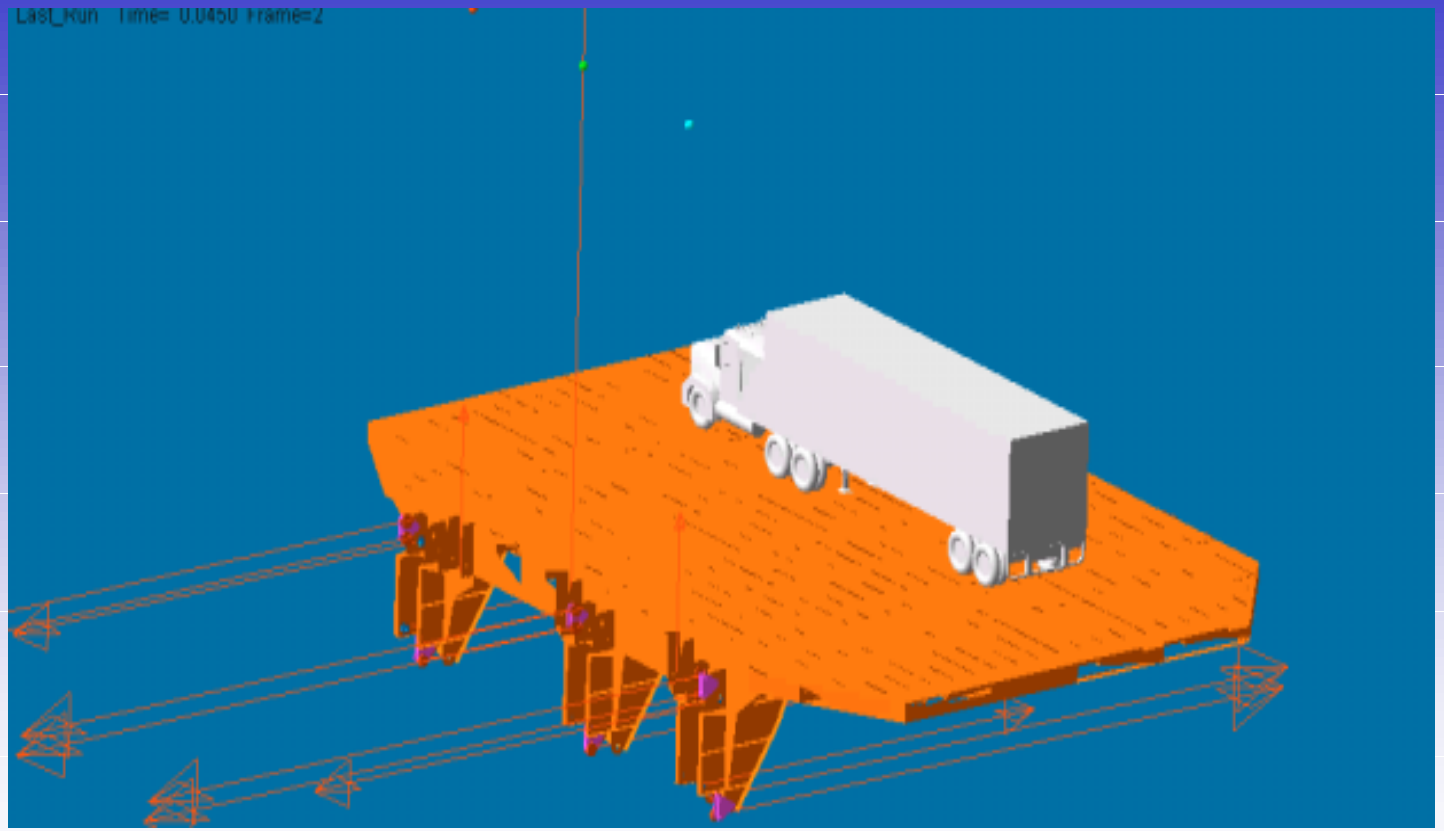
- Total forces on each bushing elements and each wire ropes at a generic frame of simulation.



NAVALIMPIANTI-GROUP

VIRTUAL PROTOTYPING IN AN ELEVATOR FOR MARINE APPLICATION

SIMULATION:

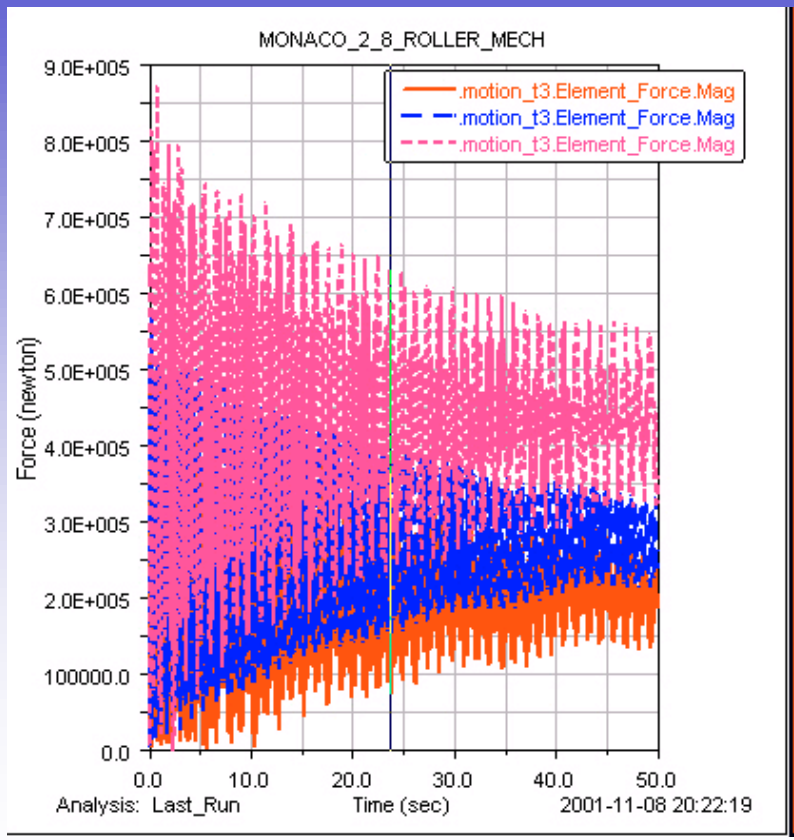


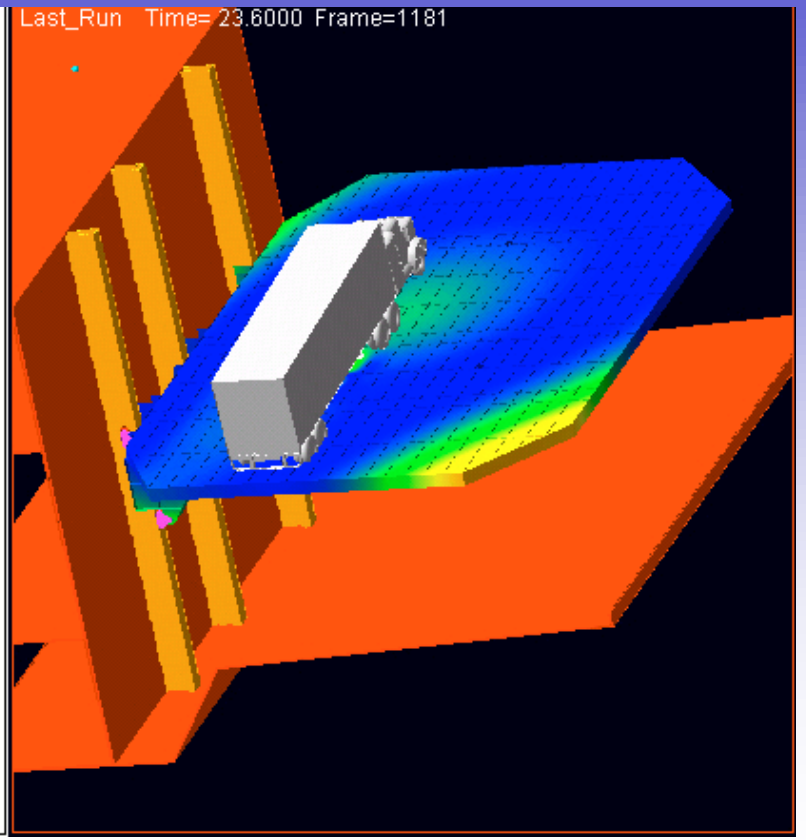
NAVALIMPIANTI-GROUP

VIRTUAL PROTOTYPING IN AN ELEVATOR FOR MARINE APPLICATION

FLEXIBLE BODY (partial results):

- The damper trend of the forces for the platform as a flexible body.





VIRTUAL PROTOTYPING IN AN ELEVATOR FOR MARINE APPLICATION

BENEFITS:

- Reduce the cost of the project.
- No experimental testing needed and less possible future modifications.
- Reduce time to market.

NAVALIMPIANTI-GROUP