

**PortMiami Vessel Berthing Analysis
Simulation**
September 9, 2014

Background

In December of 2011 the Port's 2035 Master Plan was approved. As part of the plan, a Simulation was done with the following 2 tasks:

1. Identify the maximum ship size that can safely maneuver the South Channel and operate out of Terminal J; and
2. The Port wanted to study the feasibility of adding land to the east side of the island along the North Ship channel. The task was to analyze how far into the channel the seawall could be moved before a berthed ship, being serviced by tugs, would interfere with a ship travelling in the channel.

The Port is now embarking on the implementation of various projects outlined in the 2035 Master Plan. These projects include:

The Deep Dredge: PortMiami's Deep Dredge project will deepen the Port's existing channel from its current 42-foot depth to minus 50-52' in preparation for the Panama Canal Expansion, scheduled for completion in 2015. Part of this project includes widening the South Ship Channel by 100' from 500' to 600'.

New Cruise Terminals and berths: The Master Plan indicates a need for additional cruise terminals to accommodate a growing industry. The Port will need to construct additional capacity to the east of existing cruise terminals B&C, while also increasing the capacity of existing terminals. Berths along the North Ship Channel will need to be able to accommodate 8 full-sized cruise ships that are in the range of 1,100 to 1,400 feet.

With the implementation of these projects, new questions arise in regards to the navigation and berthing of ships at PortMiami. This Berthing analysis aims to address these questions.

1. With the widening of the South Channel, what is the largest cruise vessel that can safely navigate the South Ship Channel to Cruise Terminal J?
2. When cargo vessels are being serviced by the gantry cranes, when and what circumstances require the boom to be raised?
3. What is the largest size vessel that will be able to turn at the enlarged Fisher Island Turning Basin once the dredging project is completed?
4. Can vessels back-in stern first to a cruise terminal along the North Channel and, if so, to which cruise terminal?
5. What is the optimal berthing scenario along the North Channel in terms of efficiency in time and sequencing?
6. What is the optimal dimension of the new cruise berth east of Bay 59?
7. If the bulkhead along the Main Ship Channel is extended west of Bay 0, can a cruise day ship or cruise vessel berth in front of CT-H and can boats still safely navigate the realigned ICW?

Proposed Scope of Services

The scope of services is divided into two separate studies; which are described herein:

Task 1 - South Channel

The simulation proposal should be structured to determine:

1. What the maximum ship size is that can safely maneuver through the South Channel and operate out of Terminal "J". This should include:
 - a. Through the use of tugs; and
 - b. Without the use of tugs.
2. If gantry cranes will need to raise the boom for cargo vessels that are being serviced when a cruise ship is traversing the channel.
 - a. If so, what the maximum size cargo ship is that can be serviced with the boom down; and
 - b. What the maximum size cruise vessel is that can traverse the channel while the gantry crane booms are down.

All scenarios should be evaluated with the expanded channel as per the approved Corps of Engineers plan. The simulations should also be done under the scenario where the Port's gantry cranes are servicing cargo vessels.

The proposal should be structured to work simulations in descending order from larger vessels to smaller vessels in order to establish the maximum ship size. Therefore we suggest that a staggered approach be used, starting simulations with 1,100-foot size ships with traditional propulsion. If this vessel is successful, then this will be reconfirmed with a similar ship with azipod propulsion. If after this simulation all parties are convinced that this class vessel is safe to enter the South Channel of PortMiami, the simulation process can then be adjusted to run whatever other size ships to confirm this decision.

If a larger vessel does not successfully enter the channel and cannot be safely operated, then ships progressively smaller in size, and generally of lesser than a 100 feet in length, should be tested until a ship is successfully operated.

Task 1.1 – Preparation

Consultant would prepare the simulator for PortMiami with the proposed layout. PortMiami will provide consultant with the CADD file.

Task 1.2 – Simulations

The simulations will be done with the new channel configuration and working gantry cranes.

The Port suggests running the simulation with the vessels outlined below. Should the consultant not have the proposed vessels already modeled, then the Port will work with

the consultant to create a similar line up with vessels the consultant currently has modeled.

Task 1.2.1 Run 1 – NCL Sky (conventional propulsion) 848' LOA

- If Sky passes, then proceed to Task 1.2.2

Task 1.2.2 Run 2 – RCI Majesty of the Seas (conventional propulsion) 880' LOA

- If Majesty of the Seas passes, then proceed to Task 1.2.3

Task 1.2.3 Run 3 – CCL Conquest (conventional propulsion) 952' LOA

- If Conquest passes, then proceed to Task 1.2.4

Task 1.2.4 Run 4 – Celebrity Millennium (azipod) 965' LOA

- If Millennium passes, then proceed to Task 1.2.5

Task 1.2.5 Run 5 – Disney Dream (Conventional Propulsion) 1,004' LOA

Simulations will be conducted with the appropriate Captains from the cruise lines, consultant or Biscayne Bay Pilots, but with sufficient oversight to assure an unbiased and unqualified opinion from the consultant.

Task 1.3 – Report

Consultant will prepare a report with its findings recommending the safe ship size/length for cruise ships entering the south channel, with and without tugs, and with the gantry crane booms down.

Task 2 – North Channel

The simulation proposal should be structured to determine:

1. What the maximum ship size is that can:
 - a. Safely turn at the Fisher Island Turning Basin after its expansion/widening.
 - b. Safely turn at the Main Turning Basin.
 - i. With an expanded 340' apron off of Bay 0, extending west, and a Daily Cruise Vessel at the Cruise Terminal H berth and a Cruise Vessel at Berth 1.
 1. The cruise vessel at berth 1 should be modeled first with an Oasis Class, should that not work then a smaller vessel.
2. Ship sizes (from maximum to minimum) that can safely maneuver backwards from the Fisher Island Turning Basin to the west and the furthest berth each ship can navigate to.
3. The optimal berthing of 8 ships in terms of time and location/direction.
4. The width of the new cruise berth east of bay 59 so that it's width does not interfere with the channel or passing vessels.
 - a. with a barge fueling
 - b. with a fuel hydrant

All scenarios should be evaluated with the expanded turning basin as per the approved Corps of Engineers plan.

The proposal should be structured to work simulations in descending order from larger vessels to smaller vessels in order to establish the maximum ship size. Therefore we suggest that a staggered approach be used, starting simulations with 1,200-foot size ships with traditional propulsion. If this vessel is successful, then this will be reconfirmed with a similar ship with azipod propulsion. If after this simulation all parties are convinced that this class vessel is safe to enter the South Channel of PortMiami, the simulation process can then be adjusted to run whatever other size ships to confirm this decision.

If a larger vessel does not successfully enter the channel and cannot be safely operated, then ships progressively smaller in size, and generally of lesser than a 100 feet in length, should be tested until a ship is successfully operated.

Task 2.1 – Preparation

Consultant would prepare the simulator for PortMiami with the proposed layout. PortMiami will provide consultant with the CADD file.

Task 2.2 – Simulations

The simulations will be done with the new channel configuration and working gantry cranes.

The Port suggests running the simulation with the vessels outlined below. Should the consultant not have the proposed vessels already modeled, then the Port will work with

the consultant to create a similar line up with vessels the consultant currently has modeled.

Task 2.2.1 Run 1a – MSC Divina (conventional propulsion) 1,094' LOA

- If Divina passes, then proceed to Task 2.2.2
- If Divina fails proceed to Task 2.2.3

Task 2.2.2 Run 1b – RCI Oasis (azipod) 1,188' LOA

- If both ships pass, determine if this is sufficient to establish maximum ship size.
- If Oasis fails proceed to Task 2.2.3

Task 2.2.3 Run 2a – NCL Epic (conventional propulsion) 1,081' LOA

- If Epic passes, then proceed to Task 2.2.4
- If Epic fails proceed to Task 2.2.5

Task 2.2.4 Run 2b – NCL Breakaway (azipod) 1,081' LOA

- If both ships pass, determine if this is sufficient to establish maximum ship size.
- If Breakaway fails proceed to Task 2.2.5

Task 2.2.5 Run 3a – Disney Dream (conventional propulsion) 1,004' LOA

- If Dream passes, proceed to Task 2.2.6
- If Dream fails, then stop simulation

Task 2.2.6 Run 3b – Celebrity Solstice (azipod) 1,041' LOA

Simulations will be conducted with the appropriate Captains from the cruise lines, consultant or Biscayne Bay Pilots, but with sufficient oversight to assure an unbiased and unqualified opinion from the consultant.

Task 2.3 – Report

Consultant will prepare a report with its findings recommending the safe ship size for cruise ships turning at the Fisher Island and Main Turning Basins and list the ship sizes that can safely back into cruise terminal berths as well as the safe ship size for a day cruise or cruise ship berthing at Cruise Terminal H and the maximum length the apron can extend to.