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Using the 2017 HYPACK® Mission Planner: The MavLINK Protocol

By Vitad Pradith

"With regard to robots, in the early days of robots people said, 'Oh, let's build a robot' and what's the first thought? You make a robot look like a human and do human things. That's so 1950s. We are so past that." ~ Neil deGrasse Tyson

The current proliferation of robotics systems into the surveying and mapping world can likely be attributed to a few things: advancing technologies, increased communication (connectivity), smaller and more optimized systems. The nexus of these technologies will undoubtedly advance the unmanned systems community and we are excited to be part of it. Quite frankly, my take on these advancements simply boils down to the fact that we are finally starting to ask the right questions, which in turn leads to better answers and solutions. To reference the quote above, making robots look like us is not particularly helpful to our industry, but making them do useful things is more relevant to us in this day and age.

One of the questions that we are trying to answer is better communications with your robotic vehicles. Good communication is usually apparent and one of the ways that we have started is building a transparent implementation of the MavLINK protocol within HYPACK®.

MavLINK, or the Micro Air Vehicle Link Protocol, is one of the common formats utilized in the unmanned systems world and allows for mission planning, sensor control, and real-time communications between the operator and the unmanned vehicle. Although the name implies an aerial application, it has expanded and adapted to a wide variety of unmanned marine and ground systems as well.

Our initial implementation of the MavLINK protocol will allow you to import/export any line plan and/or edits from HYPACK® into other MavLINK-compatible software such as the APM Mission Planner (currently hosted by the ArduPilot community). In the future, real-time communication between unmanned vehicles will also occur through HYPACK®. In more practical terms, HYPACK® will be compatible with any MavLINK-capable autopilot unit. This includes users of the ArduPilot, PixHawk, and PX4.

For more information on the MavLINK Protocol, please visit the following site:

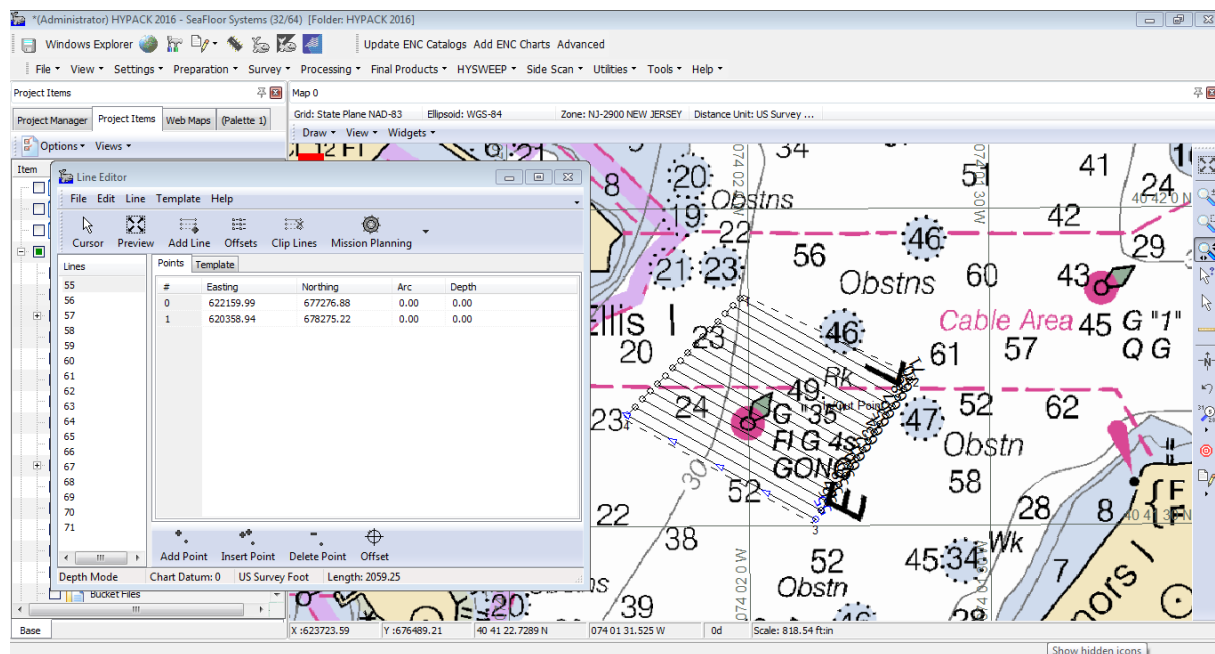
<http://qgroundcontrol.org/mavlink/start>

USING THE MAVLINK FORMAT FROM THE HYPACK® MISSION PLANNING MODULE

EXPORTING A *.WAYPOINTS FILE

1. **In the LINE EDITOR, create your line plan** as you normally would.

FIGURE 1. Making the HYPACK® Line Plan

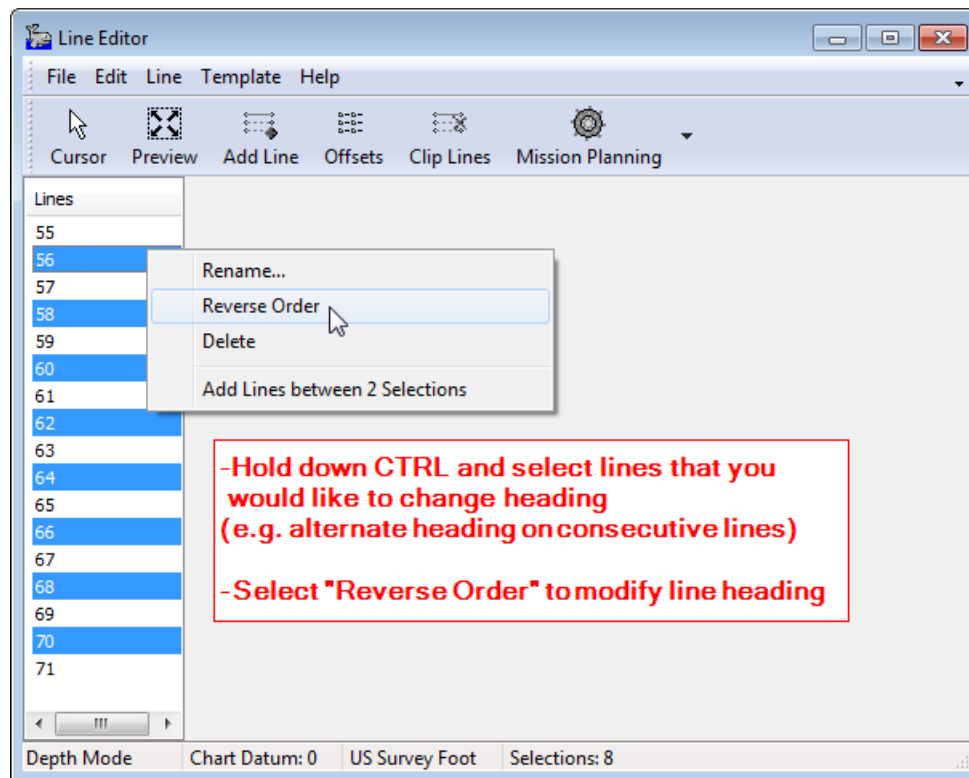


2. **Reverse the line heading, if necessary.** Please do so prior to exporting the mission planning file.

NOTE: The LINE EDITOR generates parallel lines with the start lines all at the same end. So, for example, to alternate the run direction in your mission, you would reverse the direction of alternate lines before you export the mission (Figure 2).

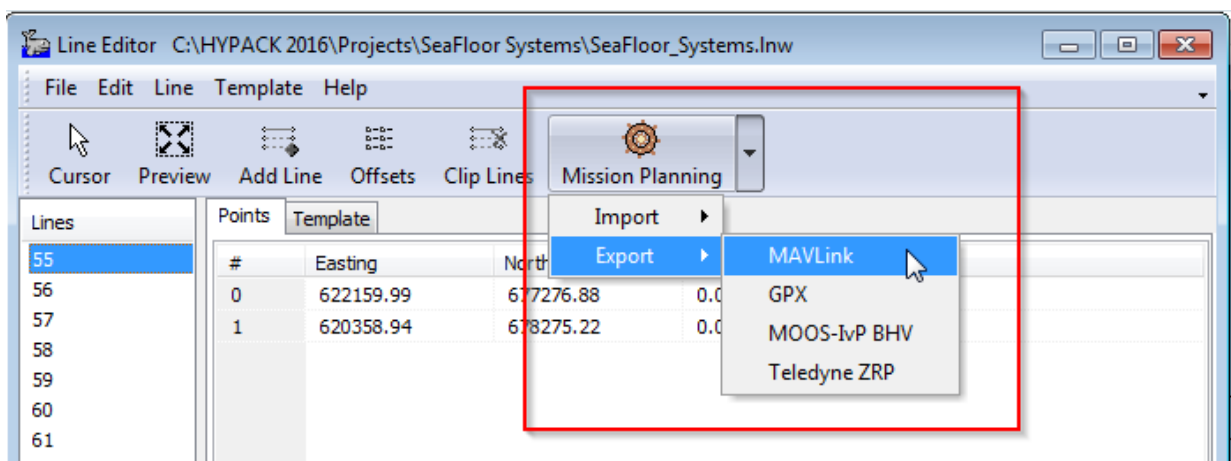
Select the lines to be reversed, then right-click on the selection and select Reverse Order.

FIGURE 2. *Reversing the Run Direction of Alternate Planned Survey Lines.:*



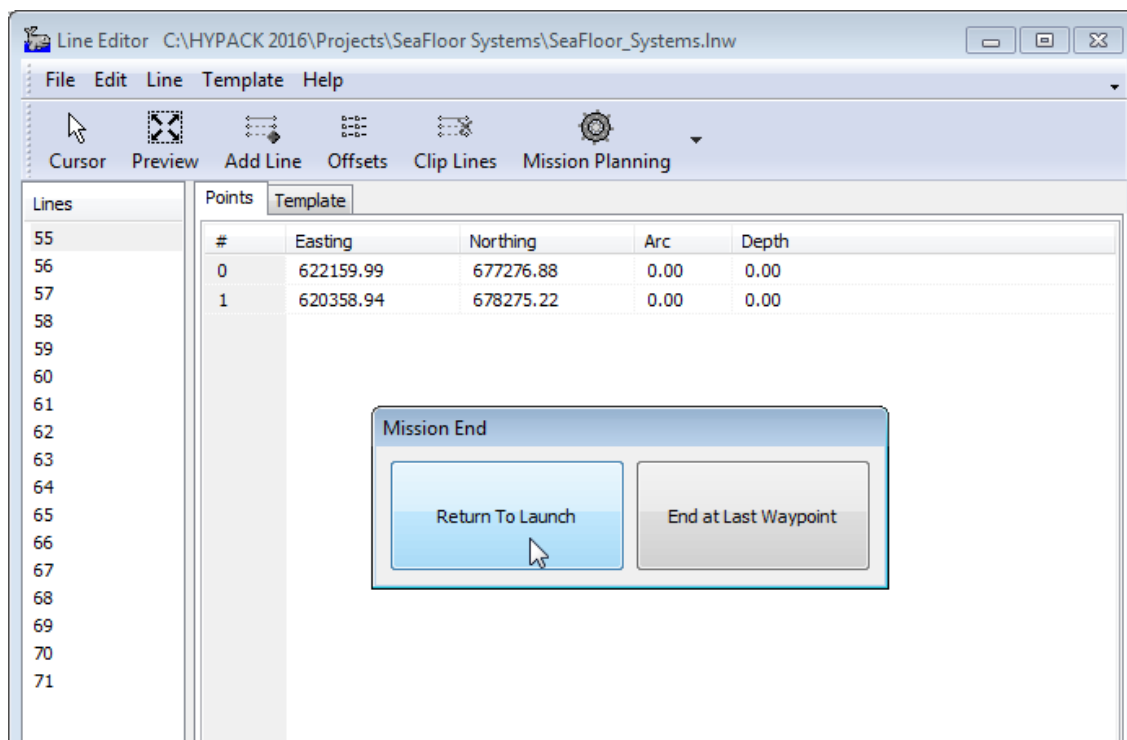
3. In the new, simplified Mission Planning menu in the LINE EDITOR, select EXPORT > MAVLink:

FIGURE 3. *Exporting the MAVLink File*



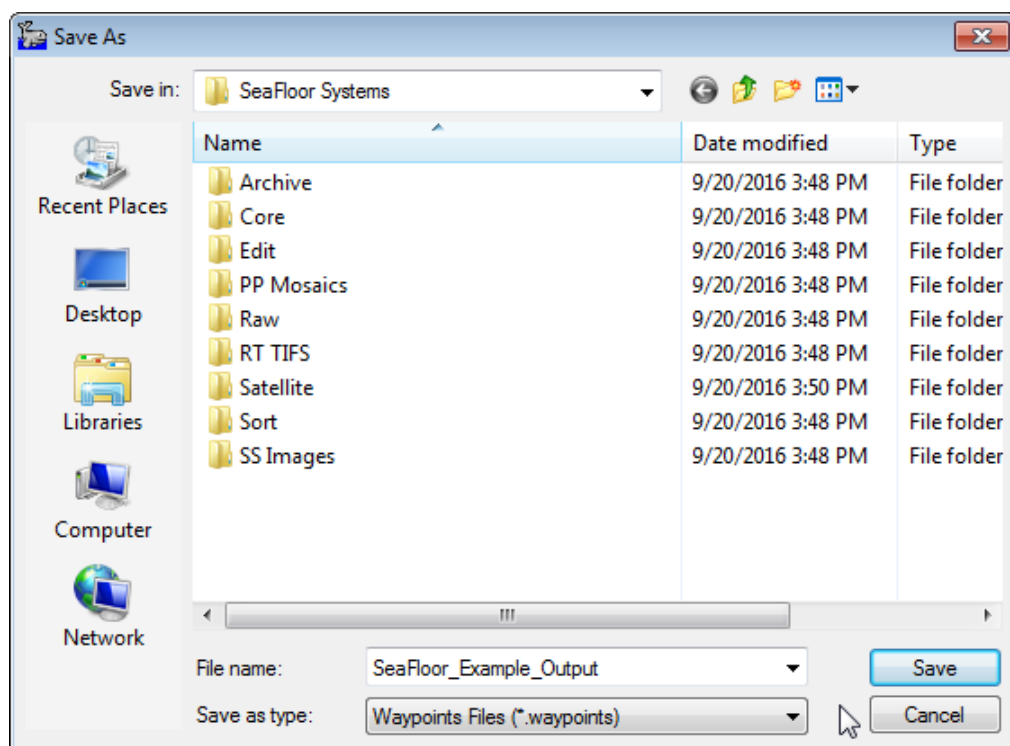
4. The program will prompt you to **set a mission end point**. (This can also be further modified in the LINE EDITOR and/or in the APM Mission Planner):

FIGURE 4. *Setting the Mission End Point*



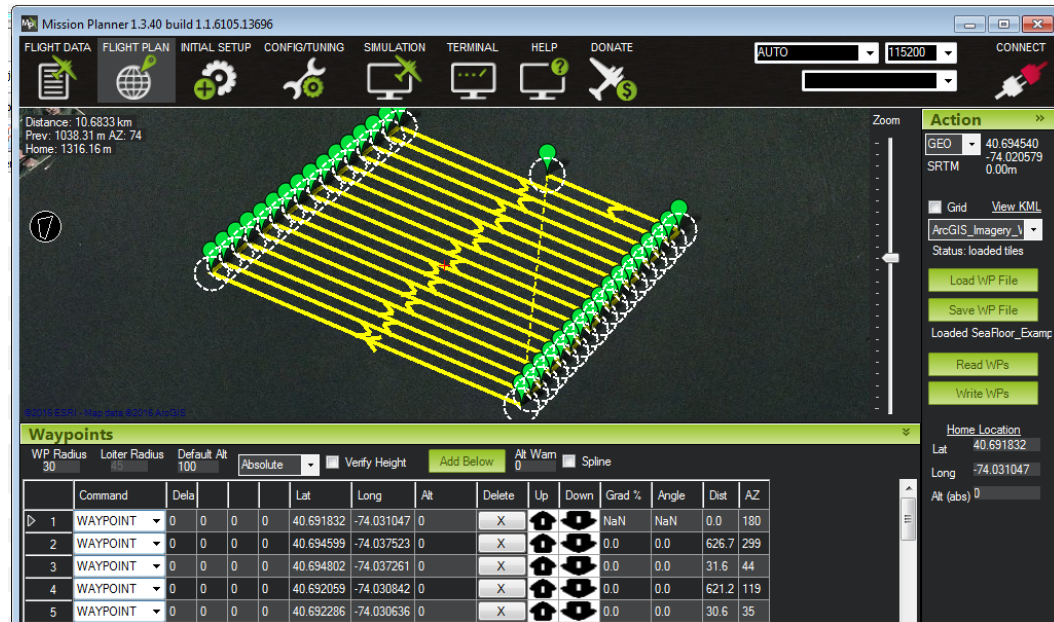
5. **Save the file as a *.waypoints file.**

FIGURE 5. *Saving the Line Plan in waypoints Format*



The file is now ready for import into the APM Mission Planner:

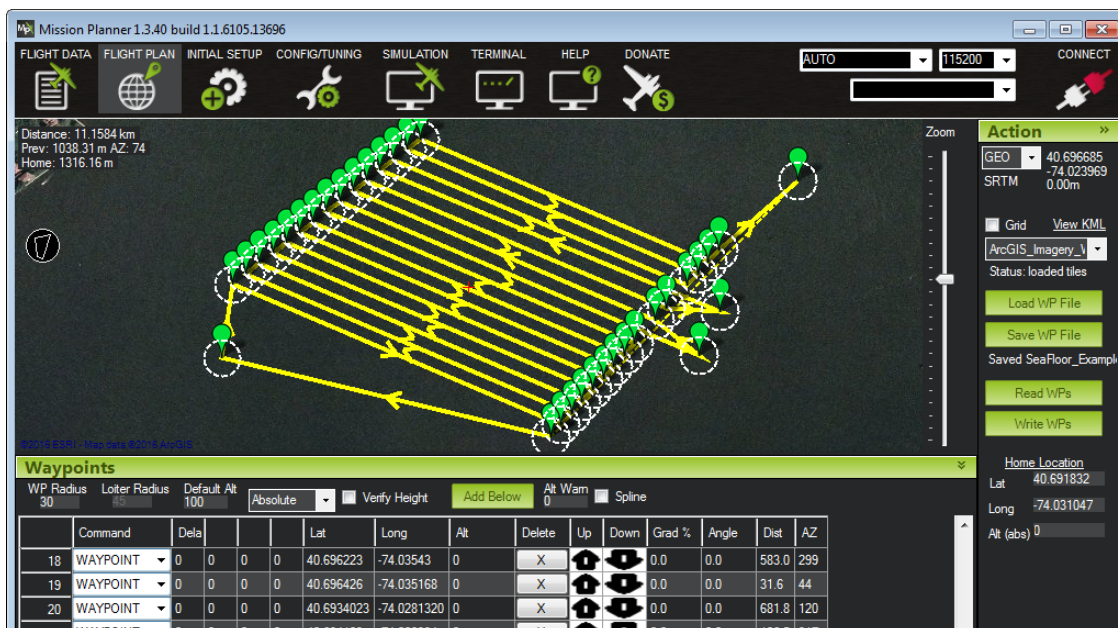
FIGURE 6. Your Waypoints File in the Mission Planner



IMPORTING THE *.WAYPOINTS FILE BACK INTO HYPACK® MISSION

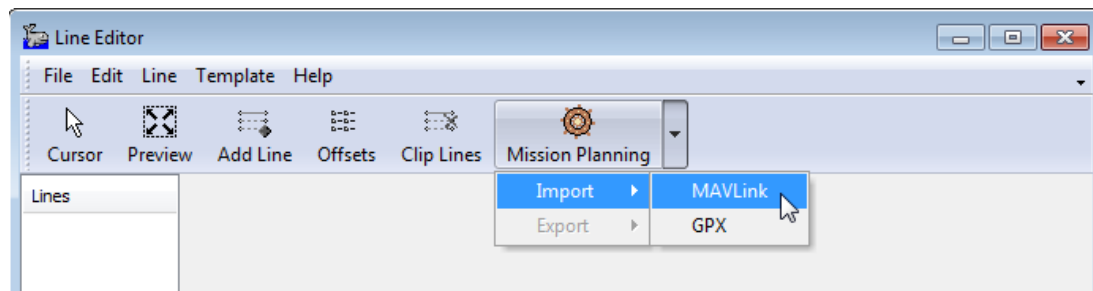
You can also import the *.waypoints file back into HYPACK®. For example:

FIGURE 7. The Original MavLINK File.



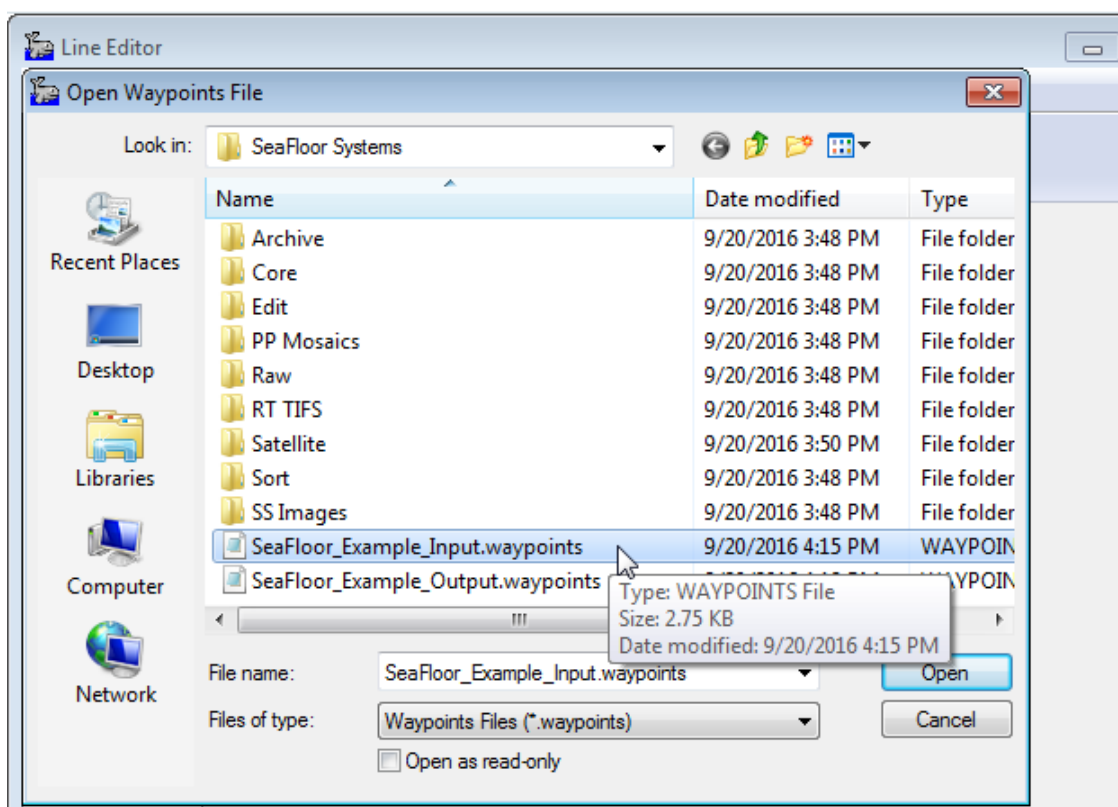
1. Open the HYPACK® LINE EDITOR and select MISSION PLANNING > IMPORT > MAVLink:

FIGURE 8. Importing a MAVLink File in the LINE EDITOR



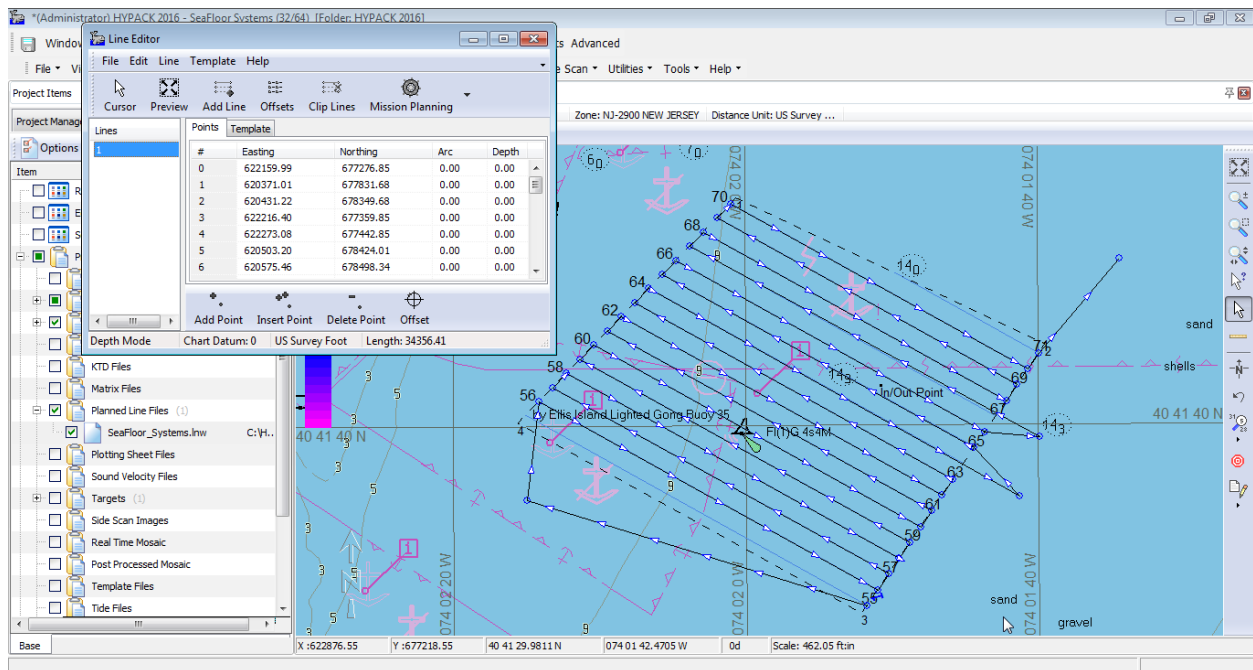
2. Select the file modified from the APM Mission Planning Software:

FIGURE 9. Loading the waypoints File



The modified line plan should now be visible (and editable) in HYPACK®:

FIGURE 10. *The Imported waypoint File in HYPACK®*



We acknowledge that we still have a ways to go. In a nod to the MavLINK community, we hope to bridge the gap between open source and commercial systems. In doing so, we can leverage these capabilities to the masses. Additionally, making these systems more user friendly and intuitive will no doubt encourage the use and expansion of these systems.

Lastly, for the conspiracy theorists out there: Will robots ever truly replace humans in this industry? I hope not, but what I do know is that in the process of answering this question, we also gain further insight and knowledge about ourselves. So perhaps a better question to ask is: "How do we as humans better communicate with our robots?" And yes Neil deGrasse Tyson, I am confident that we will so get past 2016 as well...