In the world of airport planning, sometimes engineers must feel like airport executives are asking for the moon. Now planners can offer them MARS instead.

When most of us hear the word Mars we think of the big red planet several million miles off in the night sky. If you are talking to an airport planner, the word MARS is an acronym for maximizing parking space on the tarmac. The Multiple Apron Ramp System allows airport planners to make their gates more flexible and efficient; servicing more planes and getting them back into the air in as little time possible. As more airlines build larger planes to keep up with passenger demand, airports have to build gates capable of accommodating them.

The daily routine is the same at every major airport in the world: a plane lands, taxis to its assigned gate, passengers and baggage get off, the plane is refueled and more passengers get on and they’re off into the friendly skies again. As a passenger, we’re just glad to get to our destination. But dozens of critical decisions have taken place prior to the plane landing and they affect everything to do with the safety of the aircraft. They are decisions that one person can’t make alone. Airport planners need intelligent software like AeroTURN Pro from Vancouver-based Transoft Solutions to juggle all the variables needed to taxi and dock a plane safely.

Imagine an airside planner at John F. Kennedy International Airport in New York has just seen an Airbus A380 push back from the gate, heading towards the taxiway and he has two smaller planes on final approach. He knows the large footprint the A380 leaves but can the two smaller planes fit into the space the larger plane occupied?

In our example, we’ll say the two inbound planes are ICAO Code C/FAA 3 aircraft like A321 Sharklets. If the gate is MARS-capable, the planner already has lead-in lines painted on the tarmac which shows each pilot the line they are supposed to follow. If the pilots hit their marks, the software gives the planners validation that the planes have the necessary clearance to support safe pushback operations and avoid any wingtip conflict.

A common scenario that many of us can relate to is waiting on the plane on the taxiway and hearing the pilot announce “We’ve just been told that our gate is tied up with another aircraft and they’ll get back to us in a few minutes with a new gate. Thanks for your patience.” In this case, planners from the airline are looking for another gate which can accommodate the plane you’re riding on from a servicing and passenger bridge perspective. AeroTURN is useful in putting this kind of information at the planners’ fingertips. Every minute the plane spends with engines running is costing hundreds of dollars in jet fuel, so getting a new gate ready to handle the plane is paramount.

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\textit{Frederick Fernandez, Port Authority for New York and New Jersey}
An important part of the decision-making process is visualization and not leaving any variable to chance. Jim Cota is a senior airport planner with Stantec and his airline clients are using MARS gates wherever they exist.

“My clients might ask me to look at an existing gate where two code-C narrow body aircraft might dock,” says Cota. “With AeroTURN Pro, I can bring the boarding bridges in and see where they go. I can see where a third lead-in line might go and it helps me account for wingtip clearances and other conflicts. For example, we need to know the footprint of the aircraft when it’s stationary and whether it can be pushed back safely. I would then use the software to set up a docking simulation to see if the bridge will go to both doors of the aircraft,” he continued.

JFK International Airport in New York City has every conceivable type of aircraft landing and taking off so the planners have to continually juggle gates and gate assignments. “AeroTURN really helps me with lead-in lines,” says Frederick Fernandez, an aviation planner with the Port Authority for New York and New Jersey. “We need to know exactly where to park aircraft by locating lead-in lines within the aircraft envelope. I love AeroTURN Pro for that,” he said. While Fernandez and his colleagues don’t call them MARS gates per se, precise lead-in lines mean passenger boarding bridges go to precise locations, continually freeing up apron space.

In addition, the JFK planners are constantly getting requests from the airlines and the FAA to adjust turning radii for bigger aircraft. As Fernandez explains, “This software is really important on taxiway relocation or rehabilitation projects. With taxiways at JFK and La Guardia, the FAA often changes their regulations. They might come to us and say ‘Group 5 aircraft are having a tough time making this turn. Please change the taxiway to make it easier for them.’ When we relocate the taxiway to come up with the extra footage, AeroTURN Pro is very handy then,” Fernandez continues.

With airports across the world expanding to accommodate more travelers and bigger aircraft, planners are factoring MARS gates into their tarmac layouts. Calgary International Airport is currently building a new runway, slated for completion in 2014 in order to accommodate the A380 aircraft. As the saying goes, ‘Build it and they will come.’ With the capacity to land larger aircraft, there will be a need for increased gate capacity when Calgary’s new terminal opens in mid-2015.

“When we complete our expansion, we are planning to have MARS gates as part of our system, but we’re not quite there yet,” says Jeffrey Tuazon, a CADD technologist at Calgary International Airport. “What we have at the airport currently is two lead-in lines to some gates, with one typically for a wide-body aircraft and the other for a narrow-body aircraft.”

The airport planners in Calgary are streamlining their operations to make their gates more efficient ahead of the new terminal. “One of our current projects is to minimize the number of stop bars,” says Tuazon. “Currently painted on the tarmac is the aircraft type, like an MD-11, A330 or 747. AeroTURN Pro helped me with minimizing those stop bars. I can grab multiple aircraft and set one stop bar for all the Code C planes. The software automatically tells you where you can place the aircraft. When we do go to the MARS gate system, this kind of visualization will be really important.”

Another major airport using MARS gates is Pearson International Airport in Toronto. There are currently nine MARS gates at Terminal 3 and 14 at Terminal 1. Knowing what type of plane will fit at a particular gate is central to what Lars Olsson does at Canada’s busiest airport.

“We use AeroTURN for gate allocations, determining new aircraft types or changes to existing gates to determine what aircraft would fit where,” says Olsson, an airside procedure specialist with the Greater Toronto Airport Authority.

Olsson was one of the key personnel on an airside project at Pearson International Airport to determine how the new Boeing 787 would dock safely at gates in Terminal 3. “For the past three months, I’ve been using AeroTURN every day. I use it to help me determine jet blast, turning radius and pushback procedures. Can the aircraft handle a specific turn going backwards from a gate? Is it possible to drive from one entry/exit on the apron on to a gate based on the actual turning radius of the airplane? I evaluated every gate at Terminal 3 for compatibility with the 787. For this type of intensive project, AeroTURN is a very good tool,” continues Olsson.

Many large hub airports are going to need the ability to plan additional lead-in lines in the coming years to maximize apron space. Olsson is starting to plan for additional MARS gates today. “We have gate B15 where we wanted to park the 787,” Olsson continued. “The gate has one bridge but two lead-in lines, B15 and B15A. AeroTURN was used to determine the bridging capabilities on B15A and any restrictions on adjacent gates. We needed to know if you parked the plane at Gate 15A, how it would affect the gate on the left? It would also be helpful to determine if a third lead-in line might be beneficial on a slightly different angle,” says Olsson.

Bigger aircraft like the A380 are game-changers for airport planners. The first question is how do they fit at existing gates at airports around the world? The second question is how to maximize the space they leave behind on the apron. MARS gates are one way airside planners are going to answer those questions and now they have a software tool that makes their jobs easier. For airports around the world, MARS is no longer just a faraway planet. It’s a way to maximize every inch of space on the apron and ultimately make airports more efficient.