MY WEIRD PROMPTS

Podcast Transcript

EPISODE #192

The Invisible Highways: Mastering North Atlantic Tracks

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EPISODE SYNOPSIS

Why does your flight path change every time you cross the Atlantic? In this episode, Herman and Corn dive into the Organized Track System (OTS), the invisible, shifting highways that guide thousands of planes across the ocean every day. We explore how the jet stream dictates fuel efficiency, why your in-flight Wi-Fi might vanish near Greenland, and the fascinating history of Gander and Shanwick. From the static of HF radio to the precision of modern satellite tracking, learn how air traffic controllers manage a massive "migration of metal" across the globe’s busiest oceanic corridor.

DANIEL'S PROMPT

Daniel

Why do North Atlantic Tracks (NATs) change every day instead of having fixed flight paths? What factors go into the decision-making process for designing these tracks, and why do we have this system in the first place?

TRANSCRIPT

Corn

Hey everyone, welcome back to My Weird Prompts! I am Corn, and I am sitting here in our living room in Jerusalem with my brother.

Herman

Herman Poppleberry, at your service. It is good to be back at the microphones. The Jerusalem winter is finally setting in, so it is the perfect time to huddle up and talk about some high-altitude physics.

Corn

It really is. We have a great one today. Our housemate Daniel sent us a voice note earlier, and it really took me back. He was talking about growing up in rural Ireland and hearing the Concorde make its sonic boom as it headed out over the Atlantic. That is such a vivid image, right? Just this lone, high-tech needle cutting through the sky at twice the speed of sound.

Herman

It is iconic. And it is the perfect jumping-off point for what he wanted us to dig into today, which is the North Atlantic Tracks, or the NATs. He noticed that when he flies, the routes seem to change, and specifically, he had this experience where his in-flight Wi-Fi worked on a southern track but failed on a more northerly one. He wanted to know why these tracks are not just fixed lines on a map, like a highway on the ground.

Corn

Right, because if you are driving from New York to Los Angeles, the road does not move fifty miles to the north because the wind is blowing. But in the sky, especially over the ocean, everything is fluid. So, Herman, I know you have been looking into the Organized Track System. Let us start with the basics. What are we actually looking at when we talk about the North Atlantic Tracks?

Herman

Think of them as a set of invisible, parallel highways that are rebuilt from scratch twice every single day. There are usually between five and seven tracks going in each direction. During the morning, the tracks are primarily eastbound, taking people from North America to Europe. Then, in the afternoon and evening, the whole system flips to accommodate the westbound flow. It is a massive, rhythmic migration of metal and people.

Corn

And these are not just suggestions, right? If you are a commercial airliner crossing the pond, you are almost certainly on one of these tracks.

Herman

Exactly. And the reason they move is almost entirely down to one thing: the jet stream. The jet stream is this high-altitude, fast-moving ribbon of air that flows from west to east. It can reach speeds of over two hundred miles per hour. If you are flying east, you want to sit right in the middle of that stream because it gives you a massive tailwind. You save time and, more importantly for the airlines, you save a staggering amount of fuel. We are talking about saving thousands of pounds of fuel per flight just by catching the right breeze.

Corn

But if you are going west, that same wind is your worst enemy. You would be flying into a two hundred mile per hour headwind.

Herman

Right. So, the controllers at Gander in Newfoundland and Shanwick in Ireland—those are the two main hubs that manage this—they look at the weather forecasts every twelve hours. They see where the jet stream is peaking and where the turbulence might be, and they plot the most efficient paths. For the eastbound tracks, they aim for the heart of the wind. For the westbound tracks, they try to find the path of least resistance, often looping far to the north or south to avoid the strongest headwinds. It is a constant game of cat and mouse with the atmosphere.

Corn

That explains why the tracks move, but I am curious about the why of the system itself. Why do we need these rigid tracks at all? On land, we have radar everywhere. Air traffic control can see exactly where every plane is and give them individual vectors. Why can we not do that over the Atlantic?

Herman

That is the big technical hurdle. Historically, once a plane moves about two hundred miles away from the coast, it disappears from land-based radar. The curve of the earth and the limits of the technology mean that for decades, the middle of the Atlantic was a black hole for real-time surveillance. If a plane had an issue, the controllers would not know for ten or fifteen minutes until the next scheduled radio check-in.

Corn

So, if you cannot see them, you have to keep them very far apart to make sure they do not hit each other.

Herman

Precisely. It is all about procedural separation. In a radar environment, like over the continental United States, you might only need five miles of horizontal separation between planes. But in the old oceanic environment, without radar, that separation had to be massive. We are talking sixty miles of lateral separation—side to side—and ten to fifteen minutes of longitudinal separation—meaning the distance between one plane and the one following it on the same track.

Corn

Wow. So the tracks are basically a way to organize that chaos. If everyone is on a pre-defined lane, it is much easier to manage those huge safety buffers.

Herman

Exactly. It turns the ocean into a structured grid. Each track is given a letter. For the westbound tracks, they usually start with Alpha at the northernmost point and go down the alphabet as you move south. For eastbound, they use a different set of identifiers. Every day, a Track Message is published that lists the coordinates for each track. Pilots and dispatchers get this message, and they pick the track that works best for their schedule and fuel load.

Corn

You mentioned Gander and Shanwick. Those names sound so specific. I know Gander is in Newfoundland, but where does the name Shanwick come from?

Herman

Oh, I love this bit of trivia. Shanwick is actually a portmanteau. It is a combination of Shannon, in Ireland, and Prestwick, in Scotland. Back in the day, the radio station was in Shannon and the air traffic control center was in Prestwick. They merged the names to create this singular oceanic authority. And Gander, of course, has its own incredible history. It was the crossroads of the world during the early days of flight because planes had to stop there to refuel before making the jump across the ocean.

Corn

I remember hearing about Gander during the events of September eleventh, two thousand one. When the American airspace closed, dozens of planes were diverted there. The town of ten thousand people suddenly had to host seven thousand stranded passengers. It really highlights how central that little spot in Newfoundland is to the entire global network.

Herman

It really does. And the handoff process between Gander and Shanwick is fascinating. It is not like a normal radio handoff. As Daniel mentioned in his prompt, back in the day, it was all about high-frequency or HF radio. Unlike the very-high-frequency or VHF radio used over land, HF can bounce off the ionosphere and travel over the horizon. But it sounds terrible. It is full of static, it fades in and out, and you have to deal with solar flares. Pilots had to call out their position reports every ten degrees of longitude. They would say, Position report, flight one two three, crossing thirty west at one four zero five, flight level three five zero, estimating forty west at one four five zero.

Corn

And then someone in a dark room in Ireland or Newfoundland would write that down on a paper strip and move it across a board. It is so analog for such a high-tech industry.

Herman

It really was. But that is why the tracks were so vital. If a pilot missed a report, the controllers knew exactly where that plane was supposed to be because it was locked onto a specific track at a specific altitude. It was a rigid system because it had to be. We were operating in a world of limited information.

Corn

Let us talk about Daniel's Wi-Fi issue for a second. He mentioned that on a northern track, his internet cut out, but on a southern one, it was fine. That seems like a weird side effect of these tracks moving around.

Herman

It is a great observation. Most in-flight Wi-Fi relies on geostationary satellites. These satellites orbit directly above the equator, about twenty-two thousand miles up. Because they are so far south relative to the North Atlantic, the angle from the plane to the satellite gets lower and lower the further north you fly. If you are on a very northerly track—say, crossing over the tip of Greenland—the curvature of the earth can actually block the line of sight to the satellite. The plane is essentially in the shadow of the planet.

Corn

So, as the tracks shift north to avoid a headwind or catch a tailwind, they can literally push the plane out of the coverage cone of the internet satellites.

Herman

Exactly. Now, in early twenty-six, we are seeing a shift. Newer constellations like Starlink and OneWeb use Low Earth Orbit satellites that cover the poles, so this issue is starting to disappear. But for many older commercial fleets still using geostationary tech, that northern track is still a digital dead zone. It is a perfect example of how these invisible highways have real-world consequences for the passengers sitting in twenty-four B.

Corn

That is fascinating. It is like the physical geography of the planet is interacting with the invisible geography of the tracks and the satellite orbits. Now, I want to dig into the decision-making process. You said they redesign these tracks every twelve hours. Who is in the room? Is it just a couple of guys with a map and a weather report?

Herman

It is actually a very collaborative process between Gander and Shanwick, along with input from the major airlines. They use sophisticated computer models that ingest data from weather balloons, satellites, and even other aircraft. They are looking for the Minimum Time Track. That is the golden path that uses the least amount of fuel. But they cannot just have one track. They need a whole set to account for capacity.

Corn

Right, because you might have fifty planes all wanting to leave New York for London within a two-hour window. You cannot fit them all on one track because of those separation requirements.

Herman

Exactly. So, they build a family of tracks. They might have Track Alpha, Bravo, Charlie, and Delta running parallel to each other, separated by about sixty miles. And then there is the vertical dimension. They use Flight Levels. For example, Flight Level three four zero is thirty-four thousand feet. They will stagger the planes. One might be at thirty-four thousand, the one behind it might be at thirty-six thousand. This creates a three-dimensional matrix of slots. When an airline files their flight plan, they are basically requesting a specific slot in that matrix—a specific track, at a specific altitude, at a specific time.

Corn

It sounds like a giant game of Tetris played with three-hundred-ton machines moving at five hundred miles per hour.

Herman

It really is. And the friction comes when everyone wants the same slot. The tracks that are right in the heart of the jet stream are the most popular because they are the cheapest to fly. If you are a smaller airline or you are late filing, you might get pushed to a less efficient track or a lower altitude where the air is denser and you burn more fuel. A difference of just one percent in fuel efficiency across the entire North Atlantic fleet translates to hundreds of millions of dollars a year. That is why the design of these tracks is so critical. They are trying to optimize the global economy in real-time.

Corn

I am curious about the misconception busting part of this. I think most people assume that planes just fly the Great Circle route—the shortest distance on a sphere. But what you are saying is that the shortest distance is rarely the fastest or the cheapest.

Herman

Exactly. If you look at a map of a flight from New York to London, the Great Circle route looks like a curve that goes up toward Iceland. But if the jet stream is sitting further south, the fastest path might actually be a longer physical distance that stays south. Pilots will happily fly an extra two hundred miles if it means they have a hundred-mile-per-hour tailwind. The wind is more important than the mileage. It is time-distance versus geographic distance.

Corn

Now, we have been talking about this system like it has been the same for forty years, but things are changing, right? We have better technology now than HF radio and paper strips. I have heard about something called ADS-B.

Herman

We are in the middle of a massive revolution. It is called ADS-B, which stands for Automatic Dependent Surveillance-Broadcast. Historically, ADS-B relied on ground stations, so it had the same black hole problem as radar. But recently, companies like Aireon have launched constellations of satellites that can pick up ADS-B signals from space. For the first time in history, air traffic controllers have a radar-like view of the entire Atlantic in real-time.

Corn

So now we can actually see the planes in the middle of the ocean? Does that mean the tracks are going away?

Herman

It is moving in that direction. Because we can see exactly where the planes are, we do not need those massive sixty-mile safety buffers anymore. They have already started reducing the separation. We now have something called Reduced Lateral Separation Minimums, where tracks can be as close as fifteen to nineteen nautical miles apart. And the ultimate goal is something called Free Route Airspace.

Corn

Free Route? That sounds like the opposite of the track system.

Herman

It is. Instead of everyone being forced onto these highways, planes would be allowed to fly their own optimized, user-preferred routes. In fact, as of early twenty-six, flights at or below Flight Level three three zero—thirty-three thousand feet—are already allowed to operate entirely free from the track structure. If you have the technology to show exactly where you are, and the controller can see you, you do not need to stay in a lane. You can just pick the exact point-to-point path that works best for your specific aircraft's performance and the current wind.

Corn

That seems way more efficient, but also way more complex to manage. It is a massive computational challenge for the controllers. But the benefits are enormous. We are talking about shorter flight times and a significant reduction in carbon emissions. The Organized Track System was a brilliant solution for an era of limited information. But in an era of total information, it starts to look like a bottleneck.

Herman

I love that transition. It is like moving from a train track to a wide-open field where everyone has a GPS. But even with Free Route Airspace, I imagine they still have to deal with the bottlenecks at the edges, right? You still have to funnel all those planes back into the busy corridors of Europe and North America.

Corn

Right. The gateways are still there. You have specific points off the coast of Ireland, like MALOT or BURAK, where the oceanic tracks end and the domestic airspace begins. Even if the middle of the ocean becomes a free-for-all, the entry and exit points will always be structured. It is like a funnel.

Herman

This actually reminds me of something we talked about back in episode two hundred eighty-eight, when we were discussing BGP and the internet's routing protocols. It is all about finding the most efficient path through a series of nodes, while accounting for congestion and cost. The sky is just another network.

Corn

That is a perfect analogy. And just like BGP can have route flapping or unexpected changes, the NATs can be disrupted by things like volcanic ash clouds. Remember the Icelandic volcano back in two thousand ten? That is a case where the tracks had to be completely abandoned. They had to build these massive no-fly zones and route everything around them. It showed just how fragile the system can be when the environment changes faster than the models can keep up.

Herman

So, to summarize the why for Daniel: the tracks exist because we could not see planes over the ocean, so we created a rigid grid to keep them safe. They move every day because the wind is the most important factor in how much money an airline makes. And the reason his Wi-Fi cuts out is that those tracks sometimes push the plane to the very edge of the world where satellites cannot reach.

Corn

Spot on. And for the nerds out there, it is worth looking up the Track Message for today. You can find them online. It looks like a string of gibberish—just coordinates and altitudes—but it is actually the blueprint for the entire Atlantic economy for the next twelve hours. Herman, when a pilot looks at that message, what are they actually seeing? It is not just fly east, right?

Herman

No, it is incredibly specific. A track message will define the entry point, which is a specific geographic coordinate or a named waypoint. Then it will list the coordinates at every ten degrees of longitude—thirty west, forty west, fifty west. It will also specify the valid time for the track and the available flight levels. Some tracks are only available at higher altitudes, while others are heavy tracks for the big jumbos that cannot climb as high when they are full of fuel.

Corn

And there is a code for the whole thing, right? The TMI?

Herman

Yes, the Track Message Identification. It is a three-digit number that corresponds to the day of the year. So, since today is the eighth of January, the TMI is zero zero eight. When a pilot calls up for their oceanic clearance, the controller will ask, Confirm TMI zero zero eight. It is a double-check to make sure the pilot is not using yesterday's map. If you are using yesterday's coordinates, you might be flying right into the path of another plane.

Corn

That is a terrifying thought. One thing I find interesting is the human element of this. We talk about these big centers like Gander and Shanwick, but these are real people sitting in front of screens in relatively isolated places. Gander, Newfoundland, is not exactly a major metropolis, but it is one of the most important hubs in global aviation. It is a legacy of the early days of flight. Back when planes did not have the range to cross the Atlantic in one go, they had to stop in Newfoundland or the Azores or Ireland to refuel.

Herman

It is a bit like a ghost of technology past that still dictates how we move today. I love those kinds of historical echoes. And it is not just Gander and Shanwick. You also have Santa Maria in the Azores managing the southern routes, and Reykjavik managing the polar routes. If you are flying from Los Angeles to London, you might actually go so far north that you leave the NAT system entirely and enter the Polar Tracks.

Corn

Oh, that is a whole other rabbit hole. Is that where Daniel's Wi-Fi would definitely fail?

Herman

Almost certainly. Once you get above about eighty degrees north, most geostationary satellites are below the horizon. You are basically in a digital desert unless the plane is equipped with the newer Low Earth Orbit satellite systems. It is funny to think that in twenty-six, we still have places on the planet where you can be off the grid just by flying a few hundred miles in the wrong direction.

Corn

It is a reminder of the sheer scale of the earth. We think of the Atlantic as a shuttle route because there are hundreds of flights a day, but it is still three thousand miles of empty water. Let us talk about the takeaways for our listeners. If you are a regular traveler, what should you look for the next time you are on a transatlantic flight?

Herman

First, look at the flight map on the back of the seat. If you see your plane making a big, gentle curve that seems to go way off the direct line, you are looking at a North Atlantic Track in action. You are probably either chasing a tailwind or dodging a headwind. Second, if you are an internet addict like me, check the flight path before you buy the Wi-Fi package. If you see the route going over Greenland or Northern Canada, maybe save your money and read a book instead. The curvature of the earth is a very effective firewall.

Corn

And third, just appreciate the sheer orchestration of it. At any given moment, there are hundreds of planes in the air over the Atlantic, all following this invisible, shifting grid. It is one of the greatest feats of international cooperation we have. You have controllers in different countries, pilots from every nation, and satellites in orbit all working together to make sure you get your tiny bag of pretzels on time.

Herman

I agree. It is the death of the one size fits all route. In the future, every single flight will be a unique, custom-designed path. That is better for the environment, better for the airlines, and ultimately faster for the passengers. Herman, before we wrap up, is there any weird fact about the NATs that we missed? Something that really gets the Poppleberry brain firing?

Corn

There is one thing called SLOP. I love the name. It stands for Strategic Lateral Offset Procedure.

Herman

Slop? That sounds like something you feed to pigs.

Corn

It does! But in aviation, it is a safety feature. Because GPS is now so incredibly accurate, planes can fly down the exact center of a track with centimeter precision. The problem is, if two planes are at the same altitude and one is following the other, and the first one has an engine failure or a sudden altitude drop, they are on the exact same rail. If they are too accurate, they are more likely to collide if something goes wrong.

Herman

Exactly. So, pilots are actually encouraged to fly one or two miles to the right of the center line. They call it Slopping. In fact, since twenty-one, they can even offset by tenths of a mile, like zero point five or one point three miles. It adds a little bit of fuzziness to the system to ensure that if there is a vertical separation issue, the planes are not physically lined up. It is a case where perfect accuracy is actually a risk.

Corn

That is brilliant. It is intentional imperfection for the sake of safety. I love that. Well, I think we have given Daniel a pretty deep dive into his childhood memories of the Concorde and his modern-day Wi-Fi struggles. It is a system that is both a relic of the past and a frontier for the future.

Herman

It really is. And I want to thank Daniel for the prompt. It is always fun to talk about the invisible architecture of the world.

Corn

Absolutely. And hey, to all of our listeners out there, if you are enjoying these deep dives, we would really appreciate it if you could leave us a review on your podcast app or on Spotify. It genuinely helps other curious people find the show.

Herman

Yeah, it makes a big difference. We love seeing the community grow. You can find us, as always, on Spotify and at our website, myweirdprompts dot com. We have the RSS feed there, and a contact form if you want to send us your own weird prompts.

Corn

We are looking forward to the next one. This has been a blast. This has been My Weird Prompts. I am Corn.

Herman

And I am Herman Poppleberry.

Corn

Thanks for listening, and we will catch you in the next one.

Herman

Safe travels, everyone!

Corn

So, Herman, speaking of slop, what are we having for dinner? Is it your turn to cook or mine?

Herman

I think it is Daniel's turn, actually. But given his luck with the northern tracks, I hope he does not try to optimize the recipe too much.

Corn

As long as there is no static in the soup, I am happy.

Herman

No promises. I will see you in the kitchen. Actually, wait, I just remembered one more thing about the Concorde. Did you know it had its own dedicated tracks? They were called Track Sierra Mike and Sierra November. They were much higher up, around sixty thousand feet, so they did not have to deal with any of the subsonic traffic.

Corn

Sixty thousand feet! You could see the curvature of the earth from up there.

Herman

You could. And because they were so high, they did not even have to worry about the jet stream in the same way. They were literally above the weather. Maybe that is the real lesson. If you do not like the tracks, just build a faster plane.

Corn

I will get right on that. Right after dinner.

Herman

Perfect. Let us go.

Corn

Goodbye everyone!

Herman

Bye!