Podcast Transcript

EPISODE #239

High-Altitude Spies: Why Planes and Balloons Beat Satellites

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EPISODE SYNOPSIS

In this episode of My Weird Prompts, Herman and Corn dive into the complex geography of the atmosphere to answer a listener's question: in an era of advanced satellite constellations, why do we still rely on "old-school" tech like high-altitude planes and surveillance balloons? From the legendary U-2 "Dragon Lady" to the controversial return of spy balloons, the duo breaks down the critical trade-offs between persistence, resolution, and sovereignty. They explore how different altitudes offer unique advantages for signals intelligence and why the future of reconnaissance involves a mix of stealthy drones and AI-steered balloons. Whether it’s the tactical precision of Israeli UAVs or the asymmetric cost-benefit of a simple stratospheric balloon, this discussion reveals that the race for intelligence is about much more than just having a camera in space—it's about mastering the layers of the sky. This deep dive into the "geography of the atmosphere" explains why the most sophisticated intelligence agencies in the world are still looking for a view from the clouds rather than just the stars.

DANIEL'S PROMPT

Daniel

We've previously discussed satellite intelligence and remote sensing, but I'd like to explore high-altitude reconnaissance planes, surveillance balloons, and drones. Why does a country with an extensive satellite fleet still choose to operate surveillance flights or deploy balloons and drones? What are the specific motivations and calculations behind choosing one airborne asset over another, and who are the primary players in this field?

TRANSCRIPT

Corn

Hey everyone, welcome back to My Weird Prompts. We are coming to you from a somewhat chilly morning here in Jerusalem. I am Corn, and I am sitting here with my brother, the man who probably knows more about high-altitude aerodynamics than anyone I have ever met.

Herman

Herman Poppleberry at your service, Corn. And yes, I have definitely spent my fair share of late nights reading up on sensor pods and lift-to-drag ratios. It is a hobby, or maybe a calling.

Corn

Well, it is a calling that fits perfectly with the prompt our housemate Daniel sent over this morning. He was listening to some of our previous discussions, like when we talked about satellite intelligence back in episode two hundred eight, and he had a really insightful question. He basically wanted to know why, in an age where we have constellations of satellites that can see a license plate from space, we are still using high-altitude planes, surveillance balloons, and drones.

Herman

It is such a great question because on the surface, it seems almost redundant. Why risk a pilot or a multi-million-dollar drone in someone else's airspace if you can just look down from the safety of orbit? But as we will get into today, the physics and the politics of surveillance are a lot more complicated than just having a camera in the sky.

Corn

Exactly. Daniel was curious about the specific motivations and the calculations that go into choosing one of these airborne assets over another. And honestly, it is a topic that feels particularly relevant given some of the headlines we have seen over the last few years. So, today we are diving into the world of reconnaissance planes, the return of the surveillance balloon, and the ever-evolving role of drones in intelligence gathering.

Herman

I love this topic. It is really about the geography of the atmosphere. We often think of space and air as the same thing when we look up, but for an intelligence officer, they are two completely different playgrounds with different rules, different costs, and very different capabilities.

Corn

Let us start with that fundamental question. If a country like the United States or China has an extensive fleet of spy satellites, why bother with anything else? What is the missing piece that satellites just cannot provide?

Herman

The biggest factor is what we call persistence. Most spy satellites are in low earth orbit, which means they are moving incredibly fast. They are circling the globe every ninety minutes or so. If you are a commander on the ground and you want to watch a specific building or a troop movement in real-time, that satellite is only going to be over your target for a few minutes at a time before it disappears over the horizon. You have to wait for the next pass, which might be hours or even days away depending on the orbit.

Corn

Right, and even with a large constellation, you are essentially getting snapshots. It is like trying to understand a movie by looking at five random frames.

Herman

Exactly. Now, you do have geostationary satellites that stay over one spot, but those are thirty-five thousand kilometers away. At that distance, you can get great weather data or signals intelligence, but getting high-resolution optical imagery is incredibly difficult. That is where airborne assets come in. A drone or a plane can loiter. They can stay over a target for twelve, twenty-four, or even forty-eight hours straight. They provide a live feed.

Corn

So, it is the difference between a high-speed fly-by and a fixed security camera. But there is also the resolution issue, right? Even the best satellite is still looking through hundreds of miles of atmosphere.

Herman

Precisely. The atmosphere is like a big, blurry lens. It has moisture, dust, and heat shimmer. The closer you get to the target, the less atmosphere you have to look through. A high-altitude reconnaissance plane like the U-Two is flying at seventy thousand feet. That is about twenty-one kilometers up. A satellite is at least two hundred kilometers up. That ten-fold difference in distance means you can get much finer detail with smaller, lighter cameras. Plus, you have the slant range advantage. A plane can look at a target from the side, which gives you a three-dimensional perspective that a top-down satellite often misses.

Corn

That makes sense. But then we have the classic U-Two. It is a design from the nineteen fifties. I think many people would be surprised to learn that it is still a primary asset for the United States in early twenty twenty-six. Why has it not been fully replaced by drones or satellites yet?

Herman

The U-Two is a fascinating beast. It is often called the Dragon Lady, and it is notoriously difficult to fly. But the reason it is still around is its versatility. It is basically a giant, high-altitude glider with a massive sensor bay. Because it is a manned aircraft, you can swap out the sensors for every mission. One day it might be carrying the S-Y-E-R-S two-C optical sensor, the next it is carrying a synthetic aperture radar that can see through clouds, and the day after that it is carrying a signals intelligence suite to intercept radio communications. The Air Force has been talking about retiring it for years, but they keep pushing the date back because nothing else can carry that specific mix of heavy, high-power sensors as reliably.

Corn

And I imagine the altitude is a key part of its defense, even though it is not a stealth plane in the modern sense.

Herman

Right. At seventy thousand feet, you are above most of the weather and above the effective ceiling of many older surface-to-air missiles. Of course, as we know from history, it is not invincible. But it occupies this sweet spot where it can see for hundreds of miles in every direction. From that height, a U-Two can look sideways into a country without actually crossing the border. This is what we call stand-off capability.

Corn

That is an important point about sovereignty. If you are in orbit, you are not technically violating anyone's airspace. But if you fly a plane over their territory, that is a big deal. However, if you can fly along the border and look in at an angle, you get the best of both worlds.

Herman

Exactly. And that brings us to the drones. If you look at something like the R-Q four Global Hawk, it does a lot of what the U-Two does, but without the pilot. It can stay up for over thirty hours. It is essentially a high-altitude, long-endurance platform. But even then, there are trade-offs. Drones are great for persistence, but they are often slower and more vulnerable to electronic jamming than a manned aircraft where a pilot can make real-time decisions. And we are now seeing the rise of the R-Q one hundred eighty, which is the stealthy, flying-wing successor that is designed to go into contested airspace where a Global Hawk or a U-Two would be shot down immediately.

Corn

I want to shift gears to something that surprised a lot of people a couple of years ago, and that is the surveillance balloon. I remember when that Chinese balloon was drifting across North America in early twenty twenty-three. It felt like such an old-school technology. Why would anyone use a balloon when they have drones and satellites?

Herman

It felt like a steampunk spy movie, did it not? But balloons have some incredible advantages that we often overlook. First, they are incredibly cheap compared to a satellite or a Global Hawk. Second, they can loiter even better than a drone. A balloon can sit in a particular layer of the stratosphere and just hover for weeks.

Corn

But you cannot really steer a balloon, can you? You are at the mercy of the wind.

Herman

That is the common misconception! Modern high-altitude balloons are actually quite steerable. They do not have engines, but they can change their altitude to find wind currents moving in different directions. By moving up or down a few thousand feet, they can essentially navigate. It is like a sailing ship in the sky. Companies like Raven Aerostar have perfected this. They use A-I to predict wind patterns and keep the balloon over a target area for a long time.

Corn

That is wild. So they use the different layers of the atmosphere like a series of conveyor belts moving in different directions.

Herman

Exactly. And because they move so slowly, they can collect much more data. If you are trying to intercept low-power radio signals or Wi-Fi signals, a satellite is moving too fast to catch much. A balloon just sits there and soaks it all up. Plus, they are made of plastic and fabric, which makes them very hard for traditional radars to track because they have a very small radar cross-section.

Corn

It is the ultimate low-and-slow approach. But there is a risk, as we saw. Once they are spotted, they are pretty easy to shoot down if you are willing to send up a fighter jet.

Herman

True, but for the cost of one F-Twenty-Two missile, you could probably launch a hundred balloons. It is an asymmetric calculation. If you send up enough of them, some are bound to get through and collect useful data.

Corn

So we have planes for versatility and speed, drones for long-term persistence, and balloons for low-cost, ultra-persistent signals intelligence. Who are the big players here? Obviously the United States and China, but I know Israel is a huge player in the drone space specifically.

Herman

Oh, absolutely. Being here in Jerusalem, we see the results of that expertise all the time. Israel is a world leader in Unmanned Aerial Vehicles, or U-A-Vs. They were really the ones who pioneered the use of drones for real-time battlefield surveillance back in the nineteen eighties. Companies like Israel Aerospace Industries and Elbit Systems produce drones like the Heron T-P, also known as the Eitan, and the Hermes nine hundred, which are used by dozens of countries.

Corn

And their focus seems to be more on tactical and medium-altitude intelligence, right? Not necessarily the seventy-thousand-foot stuff, but the kind of drones that can watch a specific border or a specific convoy.

Herman

Right. They specialize in what we call M-A-L-E drones, which stands for Medium-Altitude Long-Endurance. These are the workhorses of modern intelligence. They are not as high up as a U-Two, usually around thirty thousand feet, but they can carry incredibly sophisticated sensors. We are talking about cameras that can see in the dark, through smoke, and can even detect changes in the soil that might indicate a buried explosive.

Corn

It is interesting how the choice of asset depends so much on the specific goal. If you want to know if a country is building a new nuclear silo, a satellite is perfect. If you want to know what a specific group of people is saying in a specific house, you probably want a drone or a balloon.

Herman

And if you want to respond quickly to a sudden crisis where you do not have satellite coverage, you send in the planes. There is also the element of electronic warfare. Drones and planes can carry active jammers. They can not only listen but also interfere with the enemy's communications. A satellite is way too far away to be effective at that kind of tactical jamming.

Corn

I am curious about the signals intelligence side of this. We talked about this a bit in episode two hundred seven when we discussed Open Source Intelligence and how it is changing things. But when it comes to classified collection, how much of it is actually images versus just listening to electronic noise?

Herman

These days, the electronic noise is arguably more important. Every radar, every cell phone, every radio, and every encrypted data link gives off a signature. If you have a plane or a drone close enough, you can map out an entire country's air defense network just by listening to their radars. You can see how they talk to each other. This is what we call Sigint, or Signals Intelligence.

Corn

And that is why we see those spy planes flying in international airspace just off the coast of places like Crimea or the South China Sea. They are just waiting for someone to turn on a radar so they can record the frequency and the pulse pattern.

Herman

Exactly. They are tickling the defenses. They fly close enough to make the other side turn on their radars, and then they record everything. You cannot do that nearly as well from a satellite because the signals are often directional and get weaker as they travel through the ionosphere.

Corn

So, it is really a layered approach. It is not about one being better than the other; it is about how they all fit together. But I wonder, as A-I gets better and sensors get smaller, where is this going? Are we going to see swarms of tiny high-altitude drones instead of one big U-Two?

Herman

That is exactly where the research is headed. The concept of distributed sensing is the big buzzword right now. Instead of one billion-dollar satellite or one hundred-million-dollar plane, you launch a thousand small, cheap drones that communicate with each other. If you lose ten of them, it does not matter. The rest of the swarm just adjusts.

Corn

That sounds like a nightmare for privacy and for air defense. How do you stop a thousand small targets?

Herman

It is incredibly difficult. And it changes the calculation for smaller countries, too. You do not need the budget of a superpower to have a very effective drone surveillance program. We are seeing this play out in conflicts all over the world right now. Commercial drones are being modified for high-level reconnaissance.

Corn

It is amazing how much the barrier to entry has dropped. But at the same time, the high-end stuff, the exquisite intelligence as they call it, still requires those massive platforms. I was reading about the new sensors they are putting on the Global Hawk, and the level of detail is just mind-blowing. They can basically create a three-dimensional map of an entire city in real-time.

Herman

It is called Wide Area Motion Imagery, or Wami. It is essentially like having a Google Earth that is a live video. You can zoom in on any part of the city, but you can also rewind the tape for any specific vehicle. If a car bomb goes off, you can look at the footage, find that car, and then track it backward in time to see where it came from.

Corn

That is incredible and also terrifying. It really brings up the question of what happens when these technologies, which were developed for the battlefield, start being used for domestic surveillance or by private companies.

Herman

That is the second-order effect that we should really be thinking about. We are already seeing high-altitude balloons being used for providing internet to remote areas, but those same balloons are carrying cameras. The line between infrastructure and surveillance is getting very blurry.

Corn

You mentioned earlier that the U-Two is still flying. I have to ask, is there anything on the horizon that will finally replace it? I have heard rumors about a Son of Blackbird, the S-R seventy-two.

Herman

Ah, the legendary Skunk Works projects! Yes, Lockheed Martin has been working on the S-R seventy-two, which would be a hypersonic drone. We are talking about something that can fly at Mach six. At that speed, you do not even need stealth. You are moving so fast that by the time a missile is launched, you are already gone. Current reports suggest we might see flight demonstrators in the air later this year or in early twenty twenty-seven.

Corn

Mach six. That is over four thousand miles per hour. You could cross the entire United States in less than an hour.

Herman

Exactly. The goal there is prompt global surveillance. If something happens anywhere in the world, you can have a sensor over it in ninety minutes or less. It fills that gap between the persistence of a drone and the speed of a satellite. But the engineering challenges of hypersonic flight are immense. The heat alone is enough to melt most conventional materials.

Corn

It is like we are moving in two directions at once. On one hand, we have the low and slow balloons and gliders that stay up for weeks. On the other hand, we have these hypersonic monsters that are designed to get in and out before anyone even knows they were there.

Herman

And in the middle, you have the workhorse drones and the classic manned planes. It is all about the revisit rate. How quickly can you get a set of eyes back on a target? If you have a hypersonic drone, your revisit rate is incredibly high. If you have a balloon, your revisit rate is basically zero because you never left.

Corn

I think one of the things Daniel was asking about was the calculations behind these choices. If you are a mission commander, what is the first question you ask?

Herman

The first question is always: What is the threat environment? If the enemy has advanced S-four hundred surface-to-air missiles, you are not sending in a slow drone or a U-Two. You are using a stealthy asset like the R-Q one hundred eighty or a satellite. If you are operating in a place where the enemy only has shoulder-fired missiles, a medium-altitude drone is perfect because it is cheap and persistent.

Corn

And the second question is probably: What kind of data do I need?

Herman

Right. If you need to hear what is being said on a specific radio frequency, you need to be close. If you just need to see if the hangars at an airbase are open, a satellite is fine. There is also the cost factor. Fuel for a U-Two is expensive. Replacing a crashed Global Hawk is incredibly expensive. Launching a balloon is basically pocket change for a major military.

Corn

It is a fascinating ecosystem. It is not about one being better than the other; it is about how they all fit together. And it is a job that is constantly changing as the technology on the other side gets better at hiding.

Herman

That is the cat-and-mouse game. We develop a better camera, they develop better camouflage. We develop a drone that can stay up for two days, they develop an electronic jammer that cuts the data link. It never ends.

Corn

You know, we should probably talk a bit about the legal side of this. We mentioned airspace versus outer space. There is no international law that says you cannot take a picture of a country from a satellite. But the moment you enter their sovereign airspace, which generally goes up to about sixty thousand feet, you are technically committing an act of aggression if you do not have permission.

Herman

That is why the U-Two flies at seventy thousand feet. It is in this weird legal gray area. It is above most controlled airspace, but it is not in space. Many countries argue that their sovereignty extends as high as a plane can fly. But as we see with the balloons, if they are at eighty thousand or one hundred thousand feet, it is even harder to define where the border ends.

Corn

It is the Wild West of the upper atmosphere. And as more countries get the ability to reach those altitudes, those legal arguments are going to get a lot more heated.

Herman

Definitely. We are seeing more and more intercepts where one country's fighter jets fly dangerously close to another country's spy planes in international airspace. It is a very tense way to gather information.

Corn

It really is. It is a high-stakes game played out in the thin air of the stratosphere. I think we have covered a lot of ground here, from the Dragon Lady to the steerable balloons. It is clear that despite our amazing satellites, the air is still a vital place for intelligence.

Herman

It really is. And I think the big takeaway is that as much as we love the high-tech solutions, sometimes the best way to see what is happening is just to get as close as you can and stay there as long as you can. Whether that is a pilot in a pressurized suit or a bunch of helium in a plastic bag.

Corn

Well, Herman, as always, your deep dive into the technicalities has been eye-opening. I think Daniel is going to be pretty happy with this exploration. It definitely adds a lot of layers to our previous conversations about intelligence.

Herman

I hope so! It is such a dynamic field. Every time I think I have a handle on it, some new black project gets declassified or some new use for an old technology pops up.

Corn

That is the beauty of it, I guess. There is always something new to learn. And speaking of learning, if you are listening to this and you found it interesting, 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

It really does. We love seeing those reviews come in. And if you have your own weird prompts or questions about the world of tech and intelligence, you can always reach out to us.

Corn

You can find all our past episodes, including the ones we mentioned today, on our website at myweirdprompts.com. We have also got a contact form there if you want to get in touch. We are also available on Spotify, where you can follow us to get every new episode as soon as it drops.

Herman

This has been a lot of fun, Corn. I think I am going to go see if I can find any more info on those hypersonic drone prototypes.

Corn

Of course you are. Just do not stay up too late, we have another prompt to tackle tomorrow. Thanks for listening, everyone. This has been My Weird Prompts.

Herman

Until next time! Stay curious.

Corn

So, before we wrap up, Herman, I was thinking about that near space layer again. You know, that area between twenty and one hundred kilometers. It is too high for most planes and too low for satellites. Is that the next big frontier?

Herman

Oh, absolutely. That is where the high-altitude pseudo-satellites or H-A-P-S come in. These are solar-powered drones or balloons that are designed to stay up for months at a time. They basically act like satellites but at a fraction of the cost.

Corn

So, we are essentially building a new shell of infrastructure around the planet, just below orbit.

Herman

Exactly. It is a crowded sky, Corn. And it is only getting more crowded.

Corn

Well, on that note, let us head back inside. I think I hear Daniel calling about breakfast.

Herman

Hope it is shakshuka today.

Corn

We can only hope. Thanks again for listening, everyone. We will catch you in the next episode.

Herman

Goodbye!

Corn

Bye!

Corn

And one last thing, just to really drive home the point about specificity that we like to get into. When we talk about the U-Two's sensors, we are not just talking about good cameras. We are talking about things like the Iris-Two, which is a massive panoramic camera that uses actual film. Even in twenty twenty-six, sometimes physical film still provides a dynamic range that digital sensors struggle to match at those altitudes.

Herman

That is a great point. The wet film process is still legendary in the recon community. They actually have to fly the film back and have it developed in a specialized lab. It sounds ancient, but the resolution is still the gold standard for certain types of analysis.

Corn

It is that blend of old and new that makes this whole field so fascinating. Okay, now we are really done. See you next time!

Herman

See ya!