

Air Force Col. Thomas Rock
Senior Materiel Leader for Range and Network Division
Air Force Space and Missile Systems Center (AFSMC)
Interview with *Defense Daily*
Monday, September 26, 2016

Q: What is the impact of reusable vehicles on both different infrastructure needs as well as ability to relax some of the traditional 127-1 range rules.

A: Short answer is we have been supporting reusable vehicles for many years including the space shuttle and X-37. The range safety rules remain the same for expendables requiring two adequate and independent tracking sources and the capability to determine flight as necessary to protect the public. The use of fly back reusable vehicles by SpaceX creates a situation where two vehicles are in flight simultaneously, which means we have to call up additional range tracking assets. Relaxing is probably not the most appropriate approach since our top priority is the 127-1 public safety aspects of that, making sure we don't put a booster in someone's backyard or any of the other untoward things that could happen with two vehicles flying in the air at the same time.

What has been interesting and where we continue to work is with the 14th Air Force on actions to improve the process of how we allow two different vehicles to be flying at the same time and how do we provide positive controls as we do that.

Q: Could you elaborate on that? What does it take for the range to track or facilitate two vehicles operating in same immediate airspace?

A: With your question about how to operate two different vehicles and what does that mean, I'm not the right person to ask, that would go to 14th Air Force operations commands at both western and eastern range and the specific conops on that. The range and network division provides the equipment and the radars to do that.

Now with that being said, we work with the 14th Air Force to employ a series of conops to say -Do we have the right number of assets: radar, telemetry dishes, have we made each of the transition to automated flight safety system, which allows that job to be a whole lot easier on that. With a specific conops on what it take and how can you improve the process, I'm going to defer to the experts that are using my equipment.

Q: What is the USAF doing with its ranges to help improve the flight rate, reduce costs and improve reliability of actions at the range?

A: A big part of what we're doing on the range is through the launch and test range system integrated support contract (LISC) and how we engage with our contractor, how we engage with the commercial community, how we engage with the national security space community to ensure we're meeting all of the competing needs associated with that. And what I mean by that is a large part of the model that we're trying to bring to the range is, we just updated our turn time

officially to 60 days down from 90 on both the eastern and western range to turn safety documents is directly in support of desires from our range users: how do we become faster, how do we become cheaper, how do we become more elegant in providing tailored support for what they actually need versus a standard selection of options that we had gone from before.

What that allowed us to do is meet a very, very high rate of launches for FY 06. In fact, we exceeded our national security space mindset of 15 launches on the eastern range, we bumped that up to 20-21 depending on whether or not there's a few upcoming launches that are in a little bit of flux due to the space vehicle and launch vehicle associated with that. But you're starting to see us exceed the contract value, so we've actually done a lot working with the customers about -Alright, can you provide me a set of trajectories that you are expecting to fly so I can get ahead of what the users want so we can actually turn the range safety aspect of that faster. So that's an area where our range contractor, RGNNext in this case, is leaning toward trying to make sure we meet the launch manifest as presented to us by the range and user community.

The other area of what are we doing to enhance the architecture, a big part of that is the automated flight safety system which allows to reduce the amount of equipment that is required to launch a vehicle safely. Notice there is no difference in public safety and assurance that we provide with that. Rather it's a different mechanism. This is an onboard system that uses either an internal navigation system, in addition to two GPSes, there are many different ways this can be done. This is much more similar to how you do air to ground missiles out on a Utah test and training range where they carry their own flight termination system. We're starting to go to that model.

What that allows us to do from an equipment usage aspect is the range provides very, very good weather information but does not have the infrastructure requirements to pull up many radars and telemetry dishes to track the vehicle from a range safety perspective. The third aspect we did throughput, we talked a little bit about range architecture, and then our relationship with our customers. This is an area I'd like to highlight as a strength as opposed to a weakness. We've very much taken a strong look at how do we meet commercial space needs, how do we meet the national security space needs and how do we do it better? The revolution, as I call it, with the amount of folks coming to the range wanting to fly out of Cape Canaveral and Vandenberg AFB and the only way we're going to be able to meet that need is by providing the right architecture at the right time and the right support as we go forward on that.

Q: Do you ever see a point where reusable rockets are treated more like aircraft than traditional rockets?

A: So the short answer is we've always treated anything that flies on the range with the same light. We do a lot of aeronautical operations on the western range that has just the same importance in the way we think about it as the way we do rocket launches on the western range. The difference is the amount of propellant, the amount of explosives, that are incorporated in just the nature of a launch vehicle means you have to add a little bit more care and feeding to it as you normally would.

That's a long way to say "Yes, I can see us going to a much more routine, consistent but just as safe approach, much like aircraft do as they launch from Orlando or NYC or anything like that." But you're never going to be able to reduce the focus on safety that SMC and 14th Air Force and AFSPC have brought to the fight.

Q: Are you in discussions or working toward this routine approach at the moment?

A: The development of the conops on how to do that routine approach lies squarely with the 14th Air Force and operations folks on this one. From a SMC acquirer perspective, our safety equipment can be used, does not need to be used, if alternate uses are available, and we are certainly excited about the opportunities that a FAA style approach can bring because it allows us to launch more and support Gen. Hyten's vision about space enterprise vision a whole lot better. Because remember that we take advantage of all of the launch technologies, regardless if they're part of national security space or not.

Q: Is the fire at Vandenberg contained?

A: I refer you to 14th AF public affairs. My understanding of it is we are now able to proceed from active fire fighting to evaluating what the range can do and cannot do, but I cannot speculate on when it will be back open for business on that. Talk about a significant impact on the range, much like you would expect a hurricane to do. Obviously the Vandenberg AFB team is very well coordinated and able to do amazing things to fight the fire. But I always expected a natural disaster to be in the form of a hurricane as opposed to a wildfire.

Q: How was range affected by fire?

A: I don't know, and the reason I don't want to speculate on that is not because our teams aren't coordinating on that one, but there is a fairly lengthy process of making sure that all the range assets are used. I'll draw a parallel to that with a recent move we just did to support a building 7000 move. We moved all our range equipment from building 7000 up at Vandenberg to support the joint space operations center into our western range operations center. So we took all the equipment down, moved it across and set it up in the much more natural home of the operations center there. It took five to six months of down time to get that over, moved, tested and fully checked out. I don't expect it to take that long, but right now everything is just pure speculation at this point.

Q: Fire really didn't get too close to the range. Why did you guys cancel the world view 4 launch? Why didn't you just go ahead?

A: Not going to speculate on that.

Q: Do you ever see a point where you get off the radar completely for tracking rockets?

A: So the short answer on that is it is physically possible to do so, meaning we're demonstrating that concept with automated flight safety system. The challenge and people like to think about the reduction in the infrastructure support costs of having a radar. However, if you actually have

return to flight needs, such as you have an explosion off the pad or during flight, radar allows you to do a fantastic job of debris tracking and recreating the flight so that you know how to correct it and how to return to flight. There's an appropriate amount of radar imagery that is needed on the ranges from a simple return to flight aspect.

Q: Radars are old, do you ever anticipate replacing them or upgrading the tech on them?

A: Absolutely. A lot of that comes down to what is the need, what is the right business case associated with that. And we're actually very excited because we've seen a lot, as we do our market research on what makes sense to bring out to the ranges, we're seeing a lot about phased array radars and what that can provide to the radar community. I know that technology has been around a little bit and it's been cost prohibitive in our application. As we start to get more engagement with industry, there may very well be an opportunity to upgrade our current legacy radars with the phased array approach, or do something entirely different such as UAVs that hold it or many other technical solutions that are available.

Q: What kind of changes in technology that you see are going to change that we work on ranges?

A: So the changes in technology are not really what's going to drive it, once you make the leap to automated flight safety system and all the major companies that we've been working with have a plan to do so. Blue Origin, SpaceX are in the process of being certified now, ULA is planning to do that as part of their Vulcan program. That really is probably the biggest technology enhancement because it allows the vehicles themselves to make the decision whether or not they are straying off their path and need to be blow up as part of the self-destruct aspect of that.

The biggest ability for us to support the operator as they go through the conops and develop that will be: do you have the right piece of information at the right time, with enough detail for the mythgoes to make their decision on that one. Or if there is not a mythgo, do we have enough confidence in the signal and the processing that the range safety officers do prior to allowing a vehicle to launch?

Q: How long does the tracking certification process take?

A: Right now, we're working with SpaceX going through that process and typically it's about three flights, using both systems before the range is comfortable doing that. There have been exceptions where it has taken as much as five or six, and there have been fewer, based on the history and what the relationship has been with the range, meaning how long have they been on the range, have they been a part of it, or are they a new entrant on that. The specific dates in each of the cases are very unique and very subject to the quality of the package submitted to range safety.

Q: Has SpaceX performed those 2 or 3 flights for certification?

A: They're in process now, but have not yet completed those flights.

Q: How can we be more innovative at the range?

A: So the innovation on the range comes down to the relationship and understanding what the business model that the contractor wants to come on board with. And I say that from an idea of is your goal to simply have a date, make a date, or is your goal to have a full spectrum of support from the range, what is the business model that you want to have? Because there are ways and techniques that can make that process more difficult or very simple. Really comes down to how many different variations of launch trajectory do you want to have. That's probably the cleanest example. But there are many other choices: do you want all three telemetry dishes, what series of optics do you want, all of the host of technical specifics about how do you want us to provide support to you on the range. That's where you get to see the innovation and the speed so the more consistent you make a launch, the faster and much more reduced the processing times are to support a launch.

Q: Can you give me insight into how damaged the Cape range was from the SpaceX anomaly?

A: I would rather point you to 45th Space Wing, they have been much more engaged on that one, from a range perspective, since it didn't actually leave the pad, it didn't in fact mean very much at all.

(I'm) based at LA AFB - my head office is at LA, however my depot is at Colo Springs and then we have forward operating locations at both Vandenberg and Cape.

Want to brag a little bit about how well our contract for LISC was being executed by our contractor and adjusting to the new stimuli that we've had, and pretty much those were the three points that you brought up: how do you handle an increased launch manifest, and we're doing that; how do you handle an increased ops tempo, saying how fast can you go. We've done three launches within 14 days three times this last year. The third part of it was how fast can we go through the processing and what can our throughput be. What is the lower limit or upper limit, depending on how you want to look at it, on how fast we can process a trajectory and get through that. The USAF, in conjunction with its range support contractor, have done a fantastic job of accommodating and adjusting the system to best meet the commercial and national security space needs.

END