Spring 2019 Volume 20 Issue 1

Tracker News

Microwave Telemetry, Inc.

Enduring the Elements

Dear Customers and Friends,

As I write this, I realize that it is twenty years since our first newsletter and coincidentally twenty years since we began incorporating GPS into our PTTs. Looking back, much has happened in these twenty years, and there are even a few PTTs still operating from that time period. Our devices have stood the test of time and the often harsh conditions they have to endure.

In this edition, Teague Scott describes what is probably one of the harshest tests one of our PTTs has endured. (I won't spoil his story, read it next.) Thank you, Teague, for telling us. Such unforgiving conditions are nothing new for our transmitters. You might remember that many years ago we reported pop-up tags being consumed by sharks and surviving their intestinal journey before surfacing and transmitting their data normally. This has since been reported several times, so we are now quite familiar with the data "signature" of a consumed tag.

Sonja Krüger's study of Bearded Vultures again emphasizes the importance of long-lasting PTTs, ones that will virtually last for the lifetime of the individual. Thank you, Sonja, for your story.

To all of you, I would like to extend my thanks for trusting in us to provide you with the devices to support your research; we know it is important to you, and we strive to supply you with the highest quality transmitters that we can produce.

Have a successful field season.

Best wishes,
Paul and the Team at MTI

Photo by Teague Scott

Adult female White-headed Vulture tagged with a Solar Argos/GPS 70g PTT by Teague Scott and his colleagues.

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Evidence for White-headed Vulture Preyed Upon by African Rock Python

Teague Scott is a master's candidate in the Raptor Biology Program at Boise State University, in Boise, Idaho. Teague is studying the movement ecology of two critically endangered vulture species: the White-headed Vulture and the White-backed Vulture. He began working with raptors during his undergraduate studies at UC Santa Cruz and has been working with the Intermountain Bird Observatory since 2012.

Since 2016, we have been satellite tracking White-backed Vultures (*Gyps africanus*) and White-headed Vultures (*Trigonoceps occipitalis*) in Gorongosa National Park, Mozambique in an effort to better understand how these Critically Endangered species use the park and surrounding landscape (BirdLife International 2017). We have tagged 12 White-headed Vultures to date – an unprecedented number of individuals of this poorly understood and uncommon species (Murn et al. 2016, Alarcón and Lambertucci 2018). We have to thank Western EcoSystems Technology, Inc. (WEST) for their generous contribution of 17 Microwave Telemetry Argos/GPS PTT-100 units, without which this study would not have been possible.

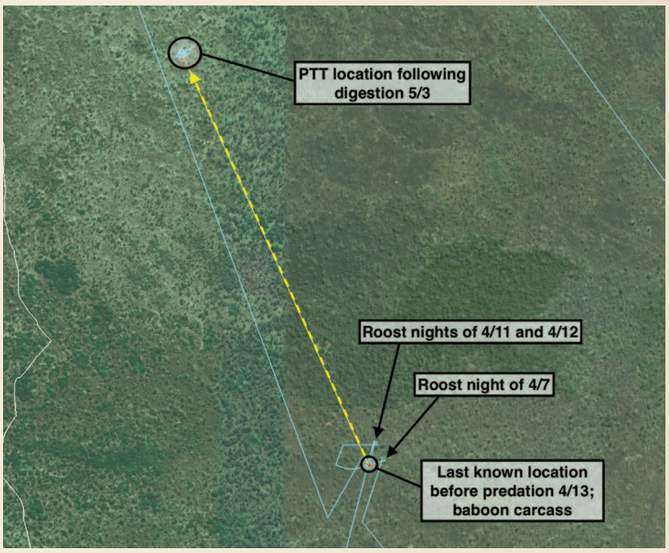
On June 6, 2017, we tagged an adult female White-headed Vulture with MTI PTT-100 unit number 105042. Within hours of release, "WH42" returned to its nest and began transmitting from within its breeding territory. WH42 maintained a small home range throughout the duration of its breeding season before branching out in January 2018. WH42 began foraging over a larger home range covering a substantial portion of the park after this date.

On April 13, 2018, WH42 stopped transmitting at -19.04967, 34.24167, a location that had been visited twice before on the 7th and 12th of April. We contacted law enforcement to investigate; they found a baboon carcass in the vicinity, but no sign of the bird. At this point we assumed that the PTT had either failed or was shed and dropped out of signal. We amended the tag deployment in Movebank to no longer include the unit in automatic updates. Any subsequent locations logged by the unit were classified as "undeployed locations" by the Movebank system.

White-headed Vulture "WH42" prior to release.

We downloaded all data from the Argos server in mid-June and found WH42's PTT was still live. Upon inspection, we discovered it had started transmitting again on May 3, 2018, from -19.033, 34.2335. This was almost two km from the April 13th location. Even more surprising was the fact that the unit had been consistently logging data at irregular intervals from within a radius of approximately 75 meters of this location. The irregularity of data, apparent error associated with the location, and low battery readings suggested that the tag was in poor condition, or in a position limiting solar panel exposure, or both.

We searched at the unit's last recorded location on July 20th. We found it within minutes of switching on the receiver, well camouflaged beneath a tall clump of grass. The unit was barely recognizable and contained in a pile of feces. Upon closer inspection we found not only the PTT, but also wing tags and a steel leg band. The bird's flight feather shafts were also clumped together in one long mass as if they had all passed through a digestive tract in parallel. Just off to the side of this impressive pile of feces was an apparent answer to the question "what ate the bird?" – a pile of shed snake skin. After consulting with fellow biologists in the park, it seemed the African Rock Python (*Python sebae natalensis*) was the most likely culprit.



Movement tracks prior to predation and following digestion. WH42 spent a number of days in the area before being predated. The snake covered 2 km before excreting the remains of the bird, PTT, and tags.

Another look at the movement data and the story fell into place. On April 13th, WH42 stopped in the vicinity of the baboon carcass for a third time in a few days. The bird was consumed during this stop, and so began its three-week, two km long journey within the python's digestive tract. While it was unfortunate to lose one of these Critically Endangered birds, it was amazing to find that White-headed Vultures can fall prey to a predator such as the African Rock Python.

There are published accounts of predation events at vulture nests, but relatively few at carcasses (Mundy et al. 1992, Thompson et al. 2017). While the African Rock Python is unlikely to be a frequent predator of African vultures, this incident highlights the fact that vultures can be susceptible to predation when visiting carcasses. A species such as the White-headed Vulture could be at greater risk of predation due to its solitary feeding behavior, and therefore decreased vigilance.

This event is a testament to the strength and durability of these Microwave Telemetry, Inc. PTTs. A python's digestive tract is a hostile environment. Gastric pH varies throughout the duration of the digestive process and has been found to drop as low as 1 in the Burmese python (Secor, 2003). Perhaps we've unveiled a secret in MTI's quality control process – the digestion test.

Microwave Telemetry, Inc. PTT, visual ID wing tags, and SAFRING steel leg band removed from the pile of feces.

A Decade of Data

Sonja Krüger has been studying the Bearded Vulture population in southern Africa since 2000. She obtained her PhD using data obtained from MTI's PTTs to determine the status of the population and investigate the reasons for its decline. Dr. Krüger works for Ezemvelo KwaZulu-Natal Wildlife as an Ecologist for the Maloti-Drakensberg Park, a transfrontier World Heritage Site between South Africa and Lesotho, for which the Bearded Vulture is an icon.

Photo by Shane Elliott

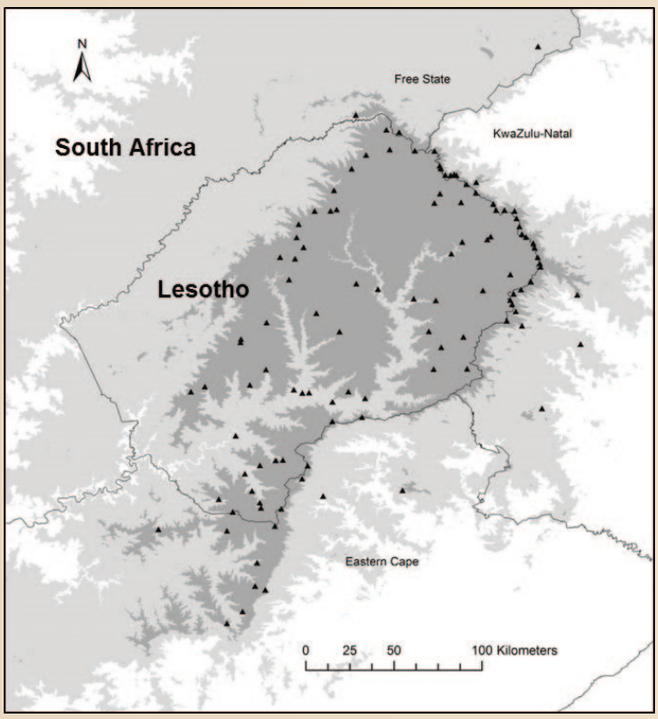
Adult Bearded Vulture fitted with a transmitter.

For the past decade, I have been using Microwave Telemetry Inc.'s (MTI) incredible technology to answer questions to inform the conservation of the critically endangered Bearded Vulture (*Gypaetus barbatus*) population which ranges over the Maloti-Drakensberg mountains of South Africa and Lesotho (see map). It has been an ongoing battle to fund the download costs, but the data obtained has been worth every cent. The support from MTI in the past decade and the transmitters they produce have been fantastic. They have always been extremely helpful and the conferences they organise and newsletters they produce have been very informative and beneficial to my project.

When I considered fitting satellite transmitters to Bearded Vultures in 2007, nobody was using this technology in South Africa and available wildlife transmitters were too large and heavy. Two colleagues working with Bearded Vultures in Europe provided me with two refurbished battery-powered Argos PTTs and two solar-powered GPS PTTs which they helped me fit in 2007 and 2008. In 2009, I purchased eight 70g solar-powered GPS PTT-100s, most of which were fitted to first year birds that winter. In 2012, a further six were purchased to fit to adult birds. Over the past 10 years, these 18 PTTs have been fitted to 27 individuals (including six Cape Vultures). Those that were recovered from birds that had died or dropped their transmitters were refitted to other individuals, one being used on three different individuals over the years (without even requiring refurbishment). Only one PTT was badly damaged and could not be re-used. No transmitter failures were experienced. Three of the PTTs stopped transmitting while they were moving and were not able to be recovered. Even the most recently recovered PTT looks almost brand new after 10 years in a harsh mountain environment where the birds fly at altitudes over 2000 m above sea level in temperatures ranging between -20°C and 35°C.

The original purpose of the study was to determine the causes of mortality in the species. The result, after finding 10 of the tracked birds dead, was that poisoning was the primary cause of death. Individuals were either deliberately poisoned for belief-based uses or accidentally poisoned when they ate poisoned bait used illegally for predator control. In addition to addressing the project's primary aim, the data has been used to address numerous other questions to guide conservation action.

The movement data were used to establish trends in territory occupancy, distribution, and density of the Bearded Vulture in southern Africa, information that led to the species being uplisted from endangered to critically endangered in an assessment of the species' status for the regional Red Data Book of Birds. The movement data were further used to determine the differential range use and anthropogenic risk exposure between age classes, provide insights into the post-fledging dispersal, and compare home ranges of Bearded Vultures from southern Africa, Nepal, and Spain. Since some of the tracked birds were adults when fitted with transmitters, or became adults a few years later, the tracking data were also used to assess the productivity of the population and confirm that anthropogenic activities influenced the abandonment of their breeding territories. Spatial analyses of the tracking data have also been used to assess the threat of proposed wind farm developments to inform wind turbine placement. In addition, a feasibility analysis was undertaken for the reintroduction of Bearded Vultures in South Africa, providing pertinent information for the newly established captive breeding programme by determining release sites.



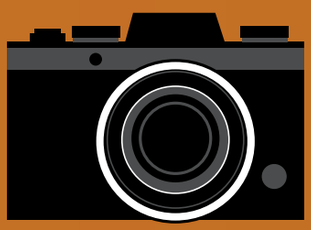
The range of the Bearded Vulture in southern Africa showing the location of occupied breeding territories, where darker shades indicate higher altitudes (dark grey = >2800 m a.s.l.)

Catching the birds to fit transmitters also provided an opportunity to take blood samples for genetic analyses which identified a reduced genetic diversity in Bearded Vultures and provided the evidence of genetic structure across African and European populations of the Bearded Vulture, placing the South African population in a global context. Blood samples as well as bone samples collected from tracked birds found dead revealed that they experienced long-term exposure to lead which may have contributed to their deaths.

One of the most rewarding parts of the project was following two individuals, fitted with transmitters in 2009 in their first year post-fledging, mature and establish their own breeding territories 6–7 years later. One bird was found dead in late 2018 and the other dropped its transmitter in early 2019, with both units still working well!

The species has been the catalyst for international collaboration. The project has enjoyed ongoing technical support from MTI and the assistance of numerous individuals in the research and monitoring activities that started with the goal of using satellite tracking technology. The data obtained over the past decade and data from the four transmitters currently still fitted to birds have provided, and will continue to provide, invaluable information allowing us to make more informed decisions to ensure the persistence of the species into the future.

Juvenile Bearded Vulture landing at a feeding site in the Drakensberg. Photo by Shane Elliott



REMEMBER TO PACK YOUR CAMERA

We love to see what our customers are tracking. Share photos of your species with us for a chance to win a prize!

All photo entries should

- depict animals tagged with MTI transmitters in the animals' natural environment
- include the photographer's name and affiliated organization, as well as the species photographed
- be in high resolution digital format (preferably a minimum of 2100 x 3000 pixels)

Groups and organizations, as well as individuals are eligible to enter. Multiple entries are permitted and encouraged. Photos previously used in our publications are ineligible.

Send all entries to

support@microwavetelemetry.com

by November 1, 2019

Please write "Photo Contest" in the subject line of your email.

Photographs will be judged anonymously, and all winners will be announced and featured in our winter newsletter.

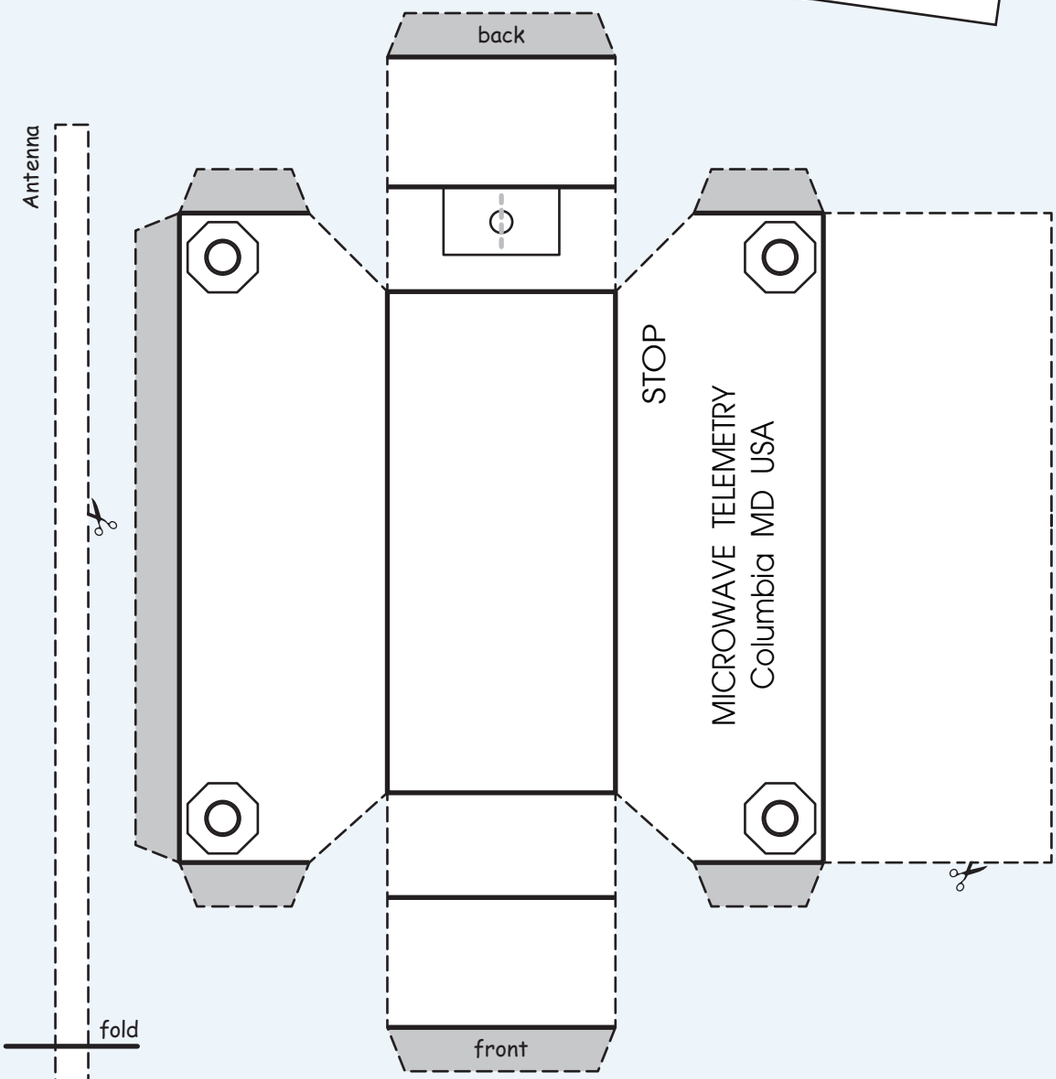
All contestants submitting entries grant permission for the future publication of their photos by Microwave Telemetry, Inc.; appropriate photo credit will be given.

Photo by Timothy Lawes Oregon State Univ and Oregon Cooperative Fish & Wildlife Research Unit

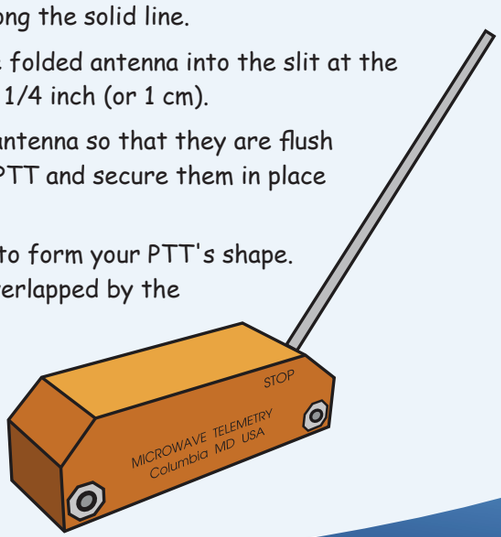
MAKE YOUR OWN PTT!

You will need:

- crayons or colored markers
- scissors
- clear tape



1. Color your PTT to match the species you want to study. (Keep in mind that the gray tabs will not be visible when your PTT is complete.)
2. Cut out your PTT and antenna. Only cut along the dotted black lines.
3. Use the point of your scissors to cut a slit along the dotted gray line located towards the back of your PTT.
4. Fold the antenna in half along the solid line.
5. Insert the open end of the folded antenna into the slit at the back of your PTT by about 1/4 inch (or 1 cm).
6. Flare out the ends of the antenna so that they are flush against the inside of your PTT and secure them in place with tape.
7. Fold along the solid lines to form your PTT's shape. The gray tabs should be overlapped by the outside of the box.
8. Secure the edges of your PTT with tape.



Have fun tracking!

TAKE YOUR CHILD TO WORK DAY

This April, we hosted some special young guests for Take Your Child to Work Day. On this day each year, millions of children across the USA join a parent or guardian at their place of work to glimpse future career possibilities and areas of interest. The day offers kids a chance to take their learning outside of the classroom and discover new skills that can be useful in the workplace and in everyday life.

We prepared a variety of activities for the children to welcome them to the world of animal tracking. To begin, we introduced them to our company's origins and how we have adapted our devices to suit many sizes and species of birds and fish.

They got to hear the story of a local species being tracked with our transmitters, and eagerly shared their own observations and interactions with species in the area. Later, our engineers and developers explained some of the exciting applications of STEM (Science, Technology, Engineering, and Mathematics) and how those four areas of study can intertwine with fun results.

Afterwards, we let our young researchers practice their team-building skills to complete a group project, then get creative and build their own PTTs out of paper. (See page 4 to build your own model PTT at home!) With their new knowledge of animal migration, we then asked them to write stories describing the migration of the birds they would track with their PTTs. The resulting imaginative tales showcased each child's bright personality and even introduced some exciting new species!

Both the kids and our staff had a blast spending the day together. We hope that we sent our participants home with happy memories and a greater appreciation of the many species with which we share our planet. By taking the time to foster their respect for our planet and all of its creatures, we can be confident that our children will carry on the challenge of conservation for years to come.

What is Your Wildest Story?

All kinds of unexpected things can happen to a transmitter. Simply read Teague Scott's article (page 2) if you don't believe us!

If you have a wild story to tell, we want to hear it!

Send us a short email describing your strange or funny tracking experience. We will feature one of these stories in our upcoming winter newsletter and the author will receive a prize!

Please send all entries to support@microwavetelemetry.com

Submissions due by November 1, 2019

Photo by Mike Grosso, Michigan Osprey

Christiane Howey Rising Scholar Award

CALL FOR ENTRIES

In addition to granting many educational awards for transmitters over the years, Christiane Howey quietly found ways to help young researchers and start-up programs. To honor Chris, and to carry on in her spirit of generosity, we are proud to offer this annual award in her name.

This award is intended to provide researchers who are starting out their careers with the means to get their projects off the ground. The recipient will receive five transmitters of his/her choice. Proposals should be a maximum of 5 pages and include an outline of the project indicating the scope and expected outcome. Please include a timeline and let us know what model of transmitter you are interested in using. Applicants are encouraged to include an educational component in their research, but this is not required. The recipient will be responsible for any Argos (or GSM) data distribution costs and any duties/taxes.

Proposals will be accepted through **October 15, 2019** and reviewed by an internal committee prior to the publication of our winter issue of *Tracker News*. The award recipient will be notified in late December to schedule a production slot. For more information, please email **support@microwavetelemetry.com** or visit our website.

Phone 410.715.5292
Email support@microwavetelemetry.com

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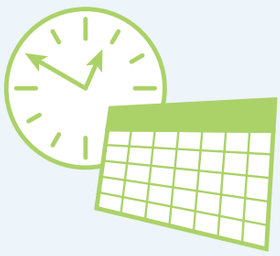
COMING SOON

We are streamlining our refurbishment process to benefit both our customers and our production team. Keep an eye out for changes in the next few months!

Calculating Satellite Pass Times

When you receive or recover your PTTs, it is important to test them. In order to test them, it can help to know when satellites will be passing near enough to "hear" the PTTs' transmissions. Fortunately, calculating satellite pass times is quick and easy!

1. Go to **www.argos-system.org** and click on **Data Access**.
2. Log in to your Argos account.
3. Click on **Satellite pass prediction** on your Argos Dashboard.
   (You can also click "System" in the upper left-hand corner and choose "Satellite pass prediction" in the drop down menu that appears.)



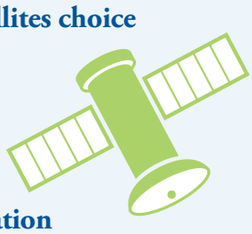
4. Enter the requested information:

Simulation period

Enter the time period for which you would like to know satellite pass prediction times. We suggest choosing either the **End date** or **Simulation duration** option.

> We recommend setting your account time zone to **UTC** (Coordinated Universal Time) rather than Local time. With UTC, you can be sure that any Daylight Savings changes are accounted for when you calculate for local time yourself. Your account time zone will be indicated in the top right hand corner next to your username and can be changed in your account settings.

Satellites choice



For most testing situations, you can choose **Select all**. For PTTs that will only be outside testing for a few hours (such as fish tags and PTTs with short ON time duty cycles), we recommend selecting satellites **MA (METOP-A)**, **MC (METOP-C)**, **NN (NOAA-18)**, **NP (NOAA-19)**, and **SR (SARAL)**. These satellites will help maximize the number of transmissions you receive during your test and are compatible with our newer transmitters.

Location

Choose the **Latitude/Longitude/Altitude** option and enter the coordinates where you will be testing your PTT. You can also set your latitude and longitude by clicking on the map.

Leave the **Minimum elevation site** at 5. This number determines the minimum number of degrees above the horizon a satellite will be "seen."

Set the **Minimum duration** to 10. A satellite pass lasting less than 10 minutes may not be long enough to reliably receive multiple messages from your PTT if you are only testing it for a short period of time.

5. Click **Simulate** in the lower right hand corner.

The site will generate a table that includes the beginning, middle, and end times for satellite passes at your desired location. You can even export this table as a CSV, Excel, HTML, or PDF file. It's that easy!

> **Remember to convert the times in your table from UTC to the local time of your testing location AND always have your PTT(s) outside and ready to test 10 minutes before the predicted start of a satellite pass.**

Bits & Pieces

Remember to review your Production Form thoroughly before submitting your order (and always feel free to contact us if you have any questions).

Please use low-adhesive tape to secure magnets to your transmitters. Do not use duct tape or masking tape.

Fun Fact:
We have shipped transmitters to over 60 countries around the world! The flags from these countries are proudly displayed in our office.

Microwave Telemetry, Inc.
www.microwavetelemetry.com