

Tracker News



Microwave Telemetry, Inc.

GPS: The Future is Here!

Dear Customers and Friends,

I would like to take this opportunity to thank you for your feedback and support in our continuing effort to advance satellite tracking technology. Over the last two years, many of you have deployed our Argos/GPS transmitters and received data back that were once thought impossible. The success of your projects has made our GPS transmitters our most popular PTTs.

However, we acknowledge that even our 45g GPS enhanced PTT would be too heavy for some species. In our endeavor to develop further this technology, we are delighted to bring you a 30g solar Argos/GPS PTT and our special 40g LC4™ GPS PTT. Further, we are also pleased to introduce our lightest solar PTT yet weighing a mere 12g, and our 22g implant, both of which we hope will allow you to track smaller species.

We would like to especially thank Maria Diekmann, Rena Borkhataria and Peter Frederick, and Mike Wallace for their excellent articles on tracking vultures in Florida and condors in California respectively. The success of their research gives meaning to the innumerable hours that we funnel into developmental work. Their enthusiasm urges us on!

We wish you peace, health and happiness this holiday season and throughout the coming year, and we look forward to continuing to work with you.

Sincerely,
Paul and the staff at MTI

P.S. We hope you like the new design and format of our newsletter!



Photo courtesy of Mike Wallace

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Above:

An artificially incubated and hatched condor chick is being fed by a puppet. The puppet, in the likeness of an adult condor, gives the chick a more natural image to imprint on and aids in our efforts to maintain isolation from human contact.

New Products

We are happy to introduce the latest additions to our extensive range of products. Three of the four new models are smaller, lighter versions of our proven PTTs. They retain the features of their bigger brothers, allowing you to track even smaller species. The fourth new PTT is the first in our LC4™ line of GPS enhanced battery powered PTTs.

12 gram Solar PTT

This latest model in our line of conventional solar powered PTTs is our lightest yet. It retains all of the features of our well proven and reliable 18, 35 and 50 gram models, many of which have operated continuously for over three years and some up to seven years. This latest version also includes an internal rechargeable battery, thus allowing a fully charged PTT to transmit during the night, not just when it is exposed to light. It is also available with our unique Ground Track (GT™) option, making it possible to precisely locate a detached PTT or a dead bird in the field with a simple receiver and small directional Yagi antenna.

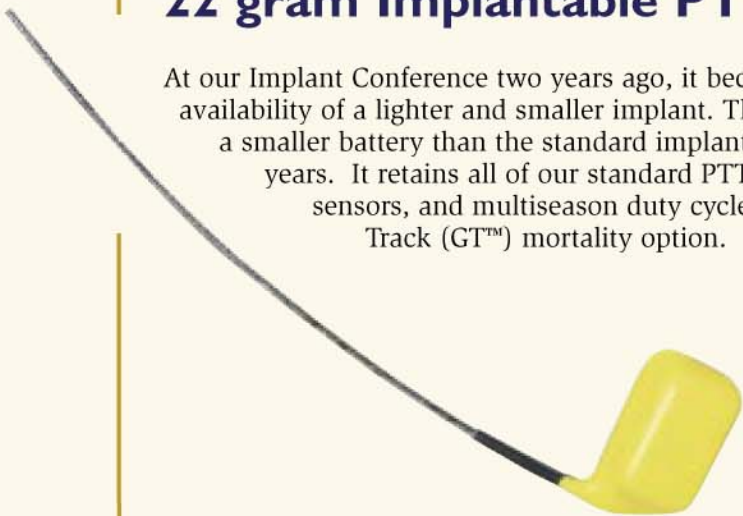
Weight- 12g
Sensors- Temperature,
Battery Voltage and Activity
Options- Ground Track (GT™)



22 gram Implantable PTT

At our Implant Conference two years ago, it became clear that researchers would benefit from the availability of a lighter and smaller implant. This 22 gram version of our implantable PTT uses a smaller battery than the standard implantable PTT that we have produced for the last ten years. It retains all of our standard PTT features, temperature, battery voltage and activity sensors, and multiseason duty cycle timer. It is also available with our unique Ground Track (GT™) mortality option.

Weight- 22g
Sensors- Temperature, Battery Voltage
and Activity
Options- Mortality Ground Track (GT™)



30 gram Solar Powered Argos/GPS PTT

The accuracy of location and amount of data collected by researchers using our 45 and 70g Argos/GPS PTTs have made them highly successful. This motivated us to push the envelope of this technology further. Advances in the power management of the GPS receiver, together with the latest battery technology, have made this tiny solar PTT possible. It can be programmed to record GPS locations at intervals during the day and relay them to the user via Argos every third day. Up to four seasons, repeated yearly, with different position collection and transmission intervals can be programmed into the PTT. This unit is also available with our Ground Track (GT™) option.

Our GPS data parsing software makes it simple to extract and sort GPS data from the raw Argos "DS" files.

Weight- 30g
GPS- 12 Channels
Sensors- Temperature,
Battery Voltage and Activity
Options- Ground Track (GT™)



Check Our Website for the Most Recent Updates!

LC4™ PTTs

This new line of innovative PTTs is our answer to several limiting factors that impact satellite tracking today, namely location accuracy, radio interference and limited power source.

In the last ten years, as satellite tracking became a proven technology, location accuracy has also become more of an issue. Users of conventional, Doppler located PTTs (non-GPS) are used to sporadic locations collected every few days due in part to the programmed duty cycle and the limitations of the available battery capacity. In the real world these locations are rarely of location class 3.

Directly impacting accuracy is radio interference at the satellite. In Europe, PTTs that work well elsewhere, now appear to be stifled by interference at the satellites. Often only a few of the transmitted messages are received at the satellites, making it difficult to get high grade locations. This problem remains unresolved and appears to be getting worse.

We had partially addressed the limited power issue by introducing solar powered Argos/GPS PTTs. In fact, up until now the only GPS enhanced PTTs we produced were solar powered. This has been the only feasible way of powering small PTTs for more than a few weeks while collecting hourly GPS locations and transmitting them to the user via Argos. However, solar power is not always suitable for species whose constant preening would cover the solar arrays or for species migrating far north where not enough sunlight is available.

Our new LC4™ PTTs operate on a new protocol using the latest lowest power GPS receivers and our Lix2 battery technology, potentially overcoming many of the real world limitations of conventional PTTs.

The LC4™ PTT takes a single GPS fix daily, for instance at noon. It stores the precise latitude and longitude, which is accurate to better than 30m, hence, location class 4, LC4™.

After 10 days it compresses these 10 daily locations into just two Argos messages, one containing the odd numbered days of the month, the other, the even numbered days. On the 10th day these two messages are repeatedly transmitted to Argos on a “Data Collection only” basis, within the

confines of a single GMT day as timed by the GPS clock. Using our proprietary Satellite in View timing (SiV™), transmissions are only made when a satellite is likely to be within range of the PTT, thus conserving power.

Even under the worst conditions the reception of just one of these messages will give you the precise LC4™ locations of your bird every other day! In reality, this will perform better than a conventional small PTT anywhere in the world, not just in Europe. An added bonus is that Argos “Data Collection only” service costs about half of “Data and Location” service.

Weight- 40g

GPS- 12 Channel

Sensors- Temperature, Battery Voltage and Activity

Lifetime- 12 months at 1 GPS fix per day, transmissions to Argos every 10 days

Options- Mortality Ground Track (GT™)

LC4



Delivery & Pricing

Please bear with us as we gear up for production of these new products, which should be available in February 2005. We are streamlining our operation to reduce lead-time.

We have worked very hard to hold the line on pricing despite increases in labor and material costs. Our new 12g solar PTT will be priced the same as other solar PTTs (\$3050). Similarly, our new 22g implantable PTT will be priced the same as our heavier implantable PTT (\$2950). The tiny 30g solar Argos/GPS PTT will also be priced the same as others in our solar GPS line (\$3950). However, our new 40g LC4™ Argos/GPS PTT will be comparable in price to the other models in our line of battery powered PTTs (\$2950). The GT™ Option is an additional \$200 per PTT.

For more information, please look us up on the web and for quantity discounts, please call us.

Tracking Namibia's Most Endangered Species: The Cape Griffon Vulture

The Rare & Endangered Species Trust (REST) works with the critically endangered Cape Griffon Vulture (*Gyps coprotheres*) of Namibia, Africa. These vultures nest on the cliffs of the Waterberg Plateau near Otjiwarongo, in north central Namibia, and have declined from an estimated population of 500 in 1939, to only eleven birds in 2004. In 2002, REST initiated a supplementary feeding scheme on the ranch, African Wilderness Trails, as the first step towards our goal to fit satellite telemetry equipment on the remaining Cape Griffons.

After extensive research it was decided to use the PTT-100 Argos/GPS transmitter produced by Microwave Telemetry, Inc. Our first purchase consisted of 3 units. Cost was an obvious consideration, so we also rehabilitated five H-module SB2 VHF radio transmitters using two AVM LA-12 receivers and two three-element yagi antennas. We fitted the radio transmitters onto White-Backed Vultures *Gyps africanus* (WBVs). After 9 months of data collection, we have ex-



A White-Backed Vulture coming in to land.

perienced problems tracking vultures with VHF radio telemetry due to the extreme distances flown by the birds. In addition, if one computes the cost of driving to triangulate radio signals plus the research time spent acquiring the data, there is no doubt about the efficiency and value for money with the satellite unit. The satellite unit provides us with approximately 8-10 plotted points on each of our birds per day. To decrease expenses, we receive our data every third day. Due to the complete success of the first 3 units, we have now purchased an additional two PTTs. Before the latest purchase, we considered trying to reduce Argos costs by only receiving our data every 7 days, but decided that the data is too valuable to have such delays.

A case in point is that of the second bird that we fitted with a PTT. He, or another bird, managed to break through his harness. We specifically designed it so that it would slide off from the front of the bird so as not to entangle him. Our first indication of a problem was that the data showed the PTT as not moving. We located the coordinates, compared them with the GIS mapping, contacted the landowner and went in by foot, as there was no road access. We managed to find and retrieve the undamaged PTT hanging from a tree branch within a 3-meter radius of the GPS coordinates.

In order to fit our vultures with PTTs, three capture operations have been performed, in

January, March and April 2004. We used a capture and release aviary designed by REST, and captive CGVs as decoy birds to lure the wild birds. During the three operations, a total of 291 vultures of various species were captured. The beauty of this capture technique is that the capture mechanism is only released once you



Mike Scott, Ann Scott, Tim Osborne and Maria Diekmann identifying a possible hybrid vulture.

determine which bird you would like captured. In January, Sky Banker, sponsored by the Commercial Bank of Namibia, was the first CGV in the world to receive a satellite transmitter. In March, both Emperor, sponsored by Steve Martin's Natural Encounters, and Tea Bag, sponsored by Ned and Diana Twining received their PTTs. In April, Sky Banker was recaptured to check his harness attachment and immediately released. Altogether 259 of the captured birds were ringed. All vultures handled were documented photographically, while a full set of mensural and other data was taken for 36 birds, and sex estimations done for 164 birds. No losses were sustained, and the first marked birds returned to the restaurant and into the capture aviary the very next day after the capture. We believe that the almost instantaneous return of birds into the capture aviary was due to the long preparations made to get the birds used to feeling safe at the feeding site.

The amount of information that we have discovered and confirmed in less than a year is amazing. One of my colleagues made the observation that we have collected more concrete data on this species in the last 9 months than the previous 30 years of observations. Traditionally, the CGV is a very hard species to study due to: its high nest cliff dwellings, our inability to easily determine the difference between the sexes, high altitude and long distance flights, and shy behaviour around people. Rather than



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Argos/GPS Transmitters Reveal New Information About Post-Fledging Movements of Juvenile Wood Storks

South Florida was once the stronghold of the North American nesting population of Wood Storks, but nesting there has declined by approximately 95% since the 1960's. This decline is generally thought to be due to habitat loss and dramatic changes in water management in the vast Everglades marshes. Because these birds detect prey (fish and invertebrates) by feeling around in the water with their bills rather than relying on eyesight, storks require high concentrations of fish in shallow waters to sustain themselves and their young. Due to their sensitivity to hydrological conditions and fish abundance, they are considered to be indicator species for the restoration of the Everglades. Although the Southeastern population of Wood Storks has been listed as endangered in the United States since 1984, population dynamics for the species remain poorly understood. Among the data that have been lacking for the species are age at first breeding, fledging success, juvenile

survival, and annual survival of adults. Factors affecting mortality rates for young and adult Wood Storks are also poorly understood.

Dr. Peter Frederick and Rebecca Hylton of the University of Florida used

Microwave Telemetry's solar 35g PTT-100 transmitters to monitor the fledging success, survival and movements of juvenile Wood Storks in 2002 and 2003. To supplement this work and increase the quality of our locational data, in the spring of 2004 we added the 45g Argos/GPS PTT to our program. We placed GPS transmitters on 17 juvenile Wood Storks and monitored their dispersal and subsequent movements and survival.

In all three years we observed the postfledging dispersal of Wood Storks out of south Florida into central and northern Florida, Georgia, South Carolina, and Alabama and occasionally



Photo courtesy of Melanie Colon

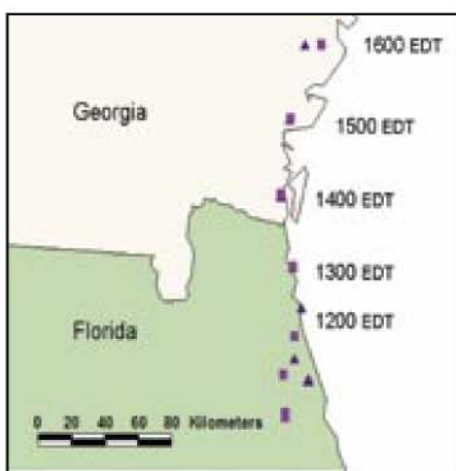
We performed health exams and placed transmitters on chicks that were between 4 and 5 weeks of age and returned them to their nests.



A young Wood Stork wearing a 45 g Argos/GPS PTT. Tagged birds acted normally and did not seem to be bothered by the transmitters. All but one tagged bird fledged successfully from the colony.

Mississippi. This northward dispersal has been followed in all cases by a return to the southern end of the Florida peninsula in winter, confirming a regular migratory pattern for the storks. The GPS PTTs have allowed us to detect new patterns and occurrences that we may have missed in previous years. This year we were excited to discover that young birds from the same colony may forage together after leaving the colony. The fine spatial and temporal resolution of the locations supplied by the GPS PTTs showed two young birds traveling together up the east coast. To the south, three birds spent a few days foraging within 2 km of one another and sometimes only a few hundred meters apart. This took place over 60 miles away from the colony. We were also able to detect different birds using the same locations within a few days of one another. The fine scale of the information is also now allowing us a much finer ability to identify preferred microhabitats. With three years of data now under our belt, we have a good idea of variation in first year survival, which we have incorporated into a preliminary demographic model.

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Paths of two juvenile Wood Storks on 9 July 2004. These storks had traveled together along the east coast of central Florida before splitting apart on 7 July. On 9 July they join each other once again at 1300 h, when they were located within 500 m of one another. At 1400 h they are approximately 1.1 km apart, but at 1500 h they are less than 200 m apart. By 1600 h they have parted ways, and are located approximately 8.5 km from one another. They spent the rest of the summer in separate locations in South Carolina.



This juvenile Wood Stork followed a similar path one week later at a much slower pace. This stork took 3 days to cover the same distance covered by the previous two storks in just a few hours.

Photo (above left) and maps courtesy of Rena Borkhataria

Tracking Condors: Steady Improvements Lead to Significant Help in Recovering the Species

I placed lightweight, radio transmitters on Turkey vultures for the first time in 1979 during my Masters work that focused on the development of reintroduction techniques for vultures with the hope for eventual application on condors. Encouraged with the results I later refined the wing or "patagial" tag on Andean condors to the point that it could be safely used on California condors. Combining the vinyl, numbered ID tag with the transmitter out on the wing made sense because the shape and behavior of condors makes the traditional backpack harness ill fitting and dangerous. The large dark scapular feathers on the back of the birds also interfered with energy efficiency of the solar paneled units while the wing mounted transmitters functioned better.

As an addition to standard field investigation, the patagial-mounted transmitters helped our early investigations into the reasons for the California



Young condors take only hours to a couple of days before adjusting to the wing ID tags. The lightweight transmitter (Argos/GPS PTT) is also well tolerated with the birds even preening the antenna like a feather on occasion.

Photo courtesy of Mike Wallace

condor's population decline. Among other mortality factors, several condors were discovered dead or dying from lead poisoning; without the use of radio tracking, this would have gone undetected. The realization of the extent and variety of mortality factors by the mid 1980's led to the controversial decision to capture the remaining flock of condors in 1987 and bring them to the relative safety of the Los Angeles and the San Diego Zoo's Wild Animal Park.

Our captive management techniques of inducing more eggs out of pairs by removing the first and sometimes the second egg and later raising them using puppets has made the critical difference in this otherwise slow breeder. Contrary to the critics' predictions, the success of the breeding program has been on schedule with the first breeding beginning in 1988 and releases back to the wild beginning in 1992. Today we have nearly 250 condors in the world and are steadily approaching our goal of 450.

Since the early 1980s the programs to restore California and Andean condors relied heavily on radio-telemetry technology as an important technique to manage the reintroduction efforts of both species but even with improvements with power and longevity, the method remained labor intensive. The steady increase in the number of condors from two in 1992 to over 100 in the wild today and their steadily increasing range, as they become more experienced flyers, has made it more

and more challenging to give adequate coverage to each bird.

In early 1997 Luis Jacome of the Buenos Aires Zoo and I approached Paul Howey about the possibility of placing a PTT on a condor's wing. The maximum weight of the radio transmitter/ID tag combination was no greater than 65 grams with lighter weights being preferred.

As a first test in 1997, Paul sent me a modified 35g PTT that I tested on the wing of a captive Andean condor at the Los Angeles Zoo. Seeing no apparent transmission issues, Microwave Telemetry produced the first 5 patagial, satellite transmitters that were tested on condors released to the wild in Argentina. Since then Luis Jacome and his staff working out of the Buenos Aires Zoo have released 38 Andean condors in Argentina, Bolivia, Chile and Venezuela with 29 of them wearing satellite transmitters.

On April 8, 2000 we placed the same design PTT on the first California condor. AC8, a founder that had ceased to reproduce in captivity, was given her freedom in the hopes that some of her latent wild behavior would rub off on the growing population of captive produced condors released in Southern California. Several more PTTs have been placed on California condors since then, particularly by the Ventana Wilderness Society directed by Kelly Sorensen. The data collected has begun to piece together the development of the condor's new range in California. Yet, the quantity and accuracy of locations (often within a kilometer or two) with the Argos based PTTs made it difficult to justify the expense on more than a few birds.

With the combination of GPS technology and the Argos satellite system came several improvements to the world of tracking and management of released condors. Solar powered, patagial GPS PTTs were developed by Microwave Telemetry that weigh less than 50 gm after the vinyl ID tag is attached. The first GPS PTT was

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Photo courtesy of

Two transmitters on each bird provides a backup when one eventually fails, giving us time to retrieve the bird for refitting. If an Argos/GPS PTT is available for a bird then a conventional transmitter is placed on the other wing.

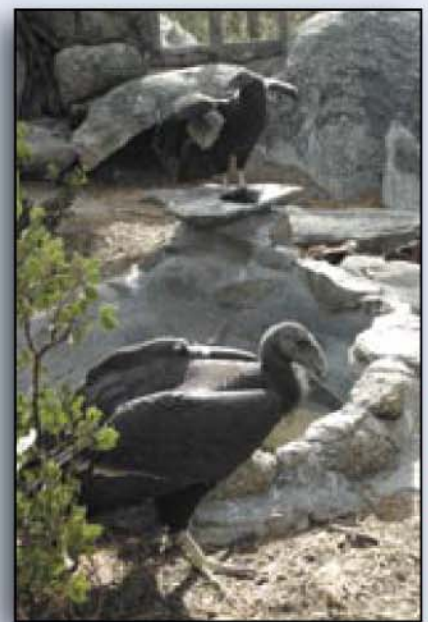


Photo courtesy of Mike Wallace

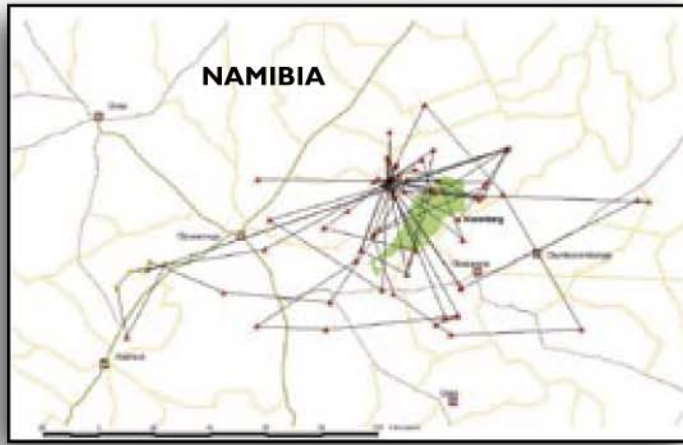
After transport from the zoo, young condors spend several weeks to months acclimating to the natural surroundings of the release site before going free. With some birds and food always in the pen it is relatively easy to re-trap the free flying condors to change a transmitter or for medical reasons.

Tracking The Cape Griffon Vulture

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try to collect all of this data in the field, with the PTT, researchers can collect confirmed data directly from the bird via satellite. These units cannot replace strong fieldwork, as this still needs to be done in order to watch individual behaviour and species interaction, but the PTT data collection compliments fieldwork and takes out the guesswork of individual researchers. For example, until we fitted PTTs to our CGVs we had no idea where they were roosting. We believed that most of them were in their traditional roosting areas on the cliffs, but after helicopter surveys, we could not determine exactly where they were on the cliffs. Once fitted with the PTTs, both of our adult CGVs returned to trees and have spent approximately 70% of their roosting time in two specific trees. This information was a complete shock to all of us and allowed us to pinpoint exact locations for intensive field observations during the breeding season. These observations led us to note the interbreeding of the CGV and the WBV, which will now have to be confirmed with samples and DNA testing. We have also gathered general information such as the longest single flight flown by one of our vultures, which was 420 km in seven hours. Another of our one-year-olds was kicked out of

the nest on the 25th April 2004 and proceeded to fly to the north into Angola, she then flew into the western desert coast – the Skeleton Coast. Afterwards, she flew hundreds of kilometers to the south before returning back to the general area where she was born. These were three destinations that we would not have believed our birds visited before receiving the data. The information collected has been so valuable that we are now trying to expand the number of birds to be fitted. We will track some relocated CGV being reintroduced into Namibia from



A sample of Sky Banker's daily movements during a 2 week period in February 2004. The bird radiated out to forage up to 100km away from its normal roost.

Map courtesy of John Mendelsohn

South Africa and see how they respond to their new home and we would like to find the funding to test at least two very interesting southern African colonies. One is located in Zimbabwe and seems to be composed of mainly younger immature birds. We need to know where they come from and where they go for breeding upon adulthood. We would also

like to fit PTTs on to a few birds from a large well-established vulture colony in South Africa and compare the data to our struggling colony. It will be fascinating to see how the strength of a colony could affect foraging, nesting, roosting and eating behaviour.

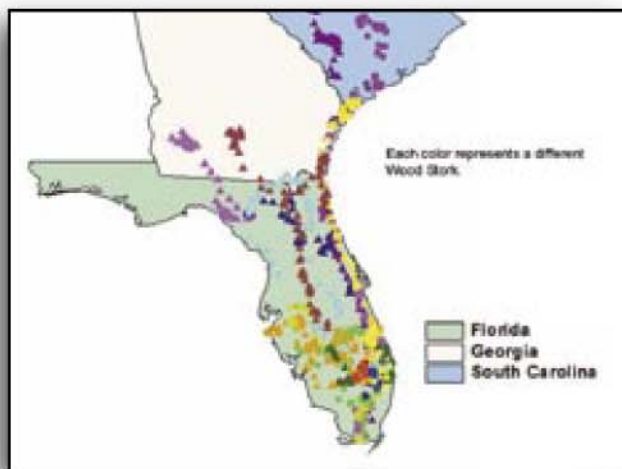
Maria Diekmann, REST

For more information, visit: www.restafrica.org

New Information on Juvenile Wood Storks

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In the future we hope to place GPS PTTs on an additional 50-60 juvenile birds. Our goal is to use information gained from satellite telemetry to understand how Wood Storks respond to their environment and to create models of population change that are linked to habitat use in south Florida and beyond. With these models, we can examine the likelihood of population increases or decreases under a variety of scenarios. For example, if Wood Storks are to serve as indicators of restoration success in the Everglades, it is important to know how planned restoration activities will affect the population dynamics of the stork. We can also use these models to identify regions, habitat types, and hydrological conditions that are critical for conservation of the Wood Stork. Ultimately, we hope to use information gained from satellite telemetry to help managers and biologists make wise decisions about the conservation of the Wood Stork, including whether or when to down-list the species from "endangered" to "threatened" or to remove it from the endangered species list entirely.



This map shows the dispersal of juvenile Wood Storks from their colony in south Florida during the month of July. While the majority of tagged storks

stayed in Florida, 3 storks took up residence in South Carolina and 2 storks took up residence in Georgia. The detailed tracks provided by the GPS PTTs will increase our understanding of habitat use by the Wood Stork and will allow us to model Wood Stork movements more realistically.

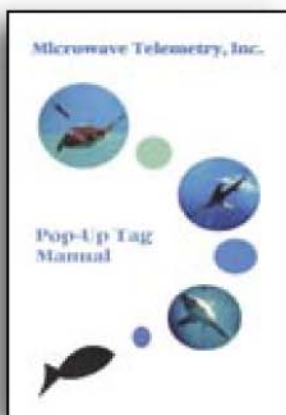
Rena R. Borkhataria and Peter Frederick
University of Florida, Gainesville, Florida

Updated Manuals Available to Customers

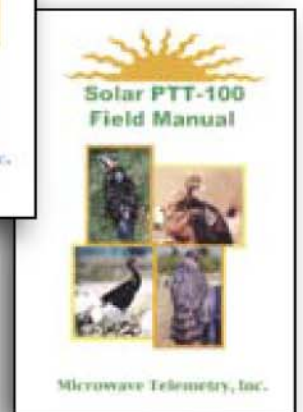
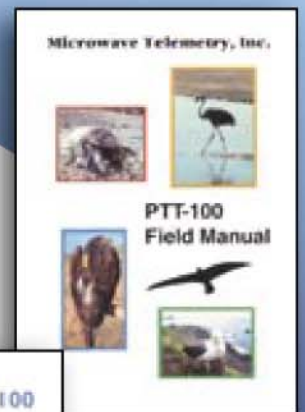
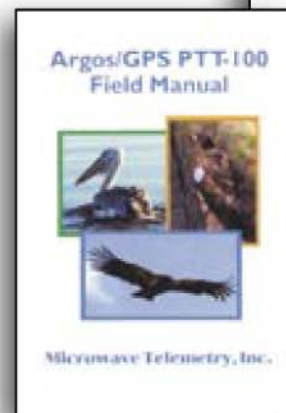
For the last few months, we have been including our new instruction manuals when shipping your PTTs. However, updated manuals are available to all customers. If you would like a copy, please e-mail us (microwt@aol.com) with your address so that we can either mail you a copy or e-mail you an Acrobat pdf version.

Please Remember...

- Read the manual carefully before deployment of your PTT
- Test your PTT before deployment. Failure to follow our test instructions will render your PTT's warranty null and void.
- Call us if you need help figuring out your test data



Call immediately if you stop receiving data from your PTT. Only the prior 10 calendar days of data can be accessed by logging into the Argos System. Older data would have to be requested from the archive at CLS Argos for a fee. Promptly getting in touch with us enables us to investigate and recommend the correct action to be taken.



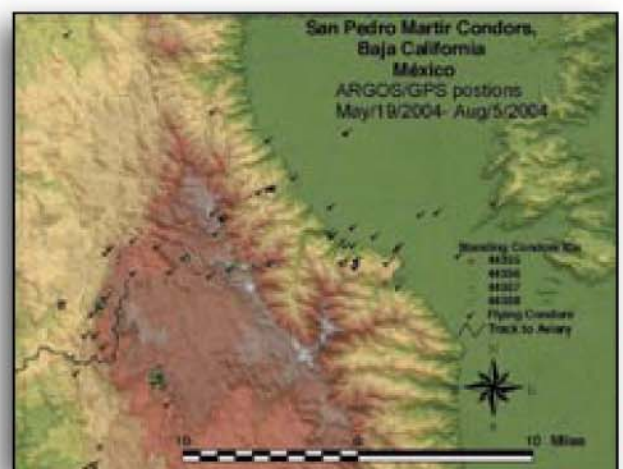
Tracking Condors

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tested on California condors released in the Grand Canyon by Chris Parish of the Peregrine Fund in 2003 and now several are in use throughout California and Baja.

Not only do we get meter accurate positions several times a day, but the newest parsing software provided by Microwave Telemetry makes transferring the coordinates sent by Argos relatively simple to import into Arcview projects and on to GIS based maps.

A transmitter speed of "0" tells us that the bird is perched while a speed of 20 – 30km/hr indicates that the bird may be in a thermal. Speeds of 50 – 80km/hr often indicate flights between thermals. A series of time/position points gives us a picture of their speed, altitude and direction of movements. Depending on the time of day, a cluster of points may indicate the use of an overnight roost or a feeding opportunity. Since there is a significant risk of lead poisoning when condors feed on "natural" carcasses that have been wounded or killed by hunting it is important for us to document the types of food they find on their own. When we observe birds returning to the central roosts after a few days' flight with full crops of food we now can plug into our hand held GPS the coordinates of a bird's previous days activity and push "GO TO" for a trail directly to the presumed feeding site.



Meter accurate location points on a GIS based map allow us to manage the release program at a new level.

Under exceptional flying conditions some exploratory flights of our released condors can be more than 300 miles over a day or two making it impossible to track their movements using conventional radio transmitters. Although still costly, the new GPS PTTs are making it possible to track their activities in ways that could not otherwise be possible using conventional methods, a much needed development in the program that will be significant in helping us reach our recovery goal for the species.

Mike Wallace, Ph.D.
California Condor Recovery Team Leader

For further information on condor recovery and links to other program participants visit www.sandiegozoo.org CRES/Condor program.

Photo courtesy of Alejandro Inohosa