FRENCH FRIGATE SHOALS
EXPEDITION #72
5-11 SEPT. 97
BALAZS

- 24195 TCD
- 24196 (REVERSED ANTENNA)
- 24197 (Reversed ANTENNA)
- 24198 Reseen w/o Trans. East 6/2000 ✓

1997

EXPEDITION #42 Released 5-11 SEPT. 97 (Friday – Thursday)

ST 14

EAST

3/3 SCL=94.0 CCL=101.5 12:10pm P.4-5 ♀ 24195 Sys # 370087A – 9/7/97 w/ TCD and COIL V82 Mototool

3/3 SCL-81.8 CCL-89.8 10:29AM P.25, 27 ♀ 24196 Sys # 370262BA – 9/8/97 (REVERSED) new tags 6T, 7-T, 9-T

3/3 SCL=95.0 CCL=89.0 cm 10:19AM ♀ 24197 Sys # 370126A 9/9/97 (REVERSED) V511 Mototool 746-T to 749-T

3/3 SCL=87.5cm CCL=94.0 10:05AM ♀ 24198 Sys # 370130A 9/10/97 V426 Mototool 573-T; 15-T, 16-T

NOAA 11 = H
12 = D
14 = J

-41:3
ght)

gin
gin & Paged
gin

656
w/ 2 people
2 seats & 150
co-pilot

Book of Seamanship"
Formula to determine distance an object can be seen from sea level = 1.44 x square root of height of the object in feet.
I.E. 1.144 X sq root of 14,000 (MAUNA KEA) = in nautical miles ~ 135 ft.

Coil Driver office testing - Turned "ON" (Magnet pulled out) 1

unit "2" (stamped in center)

Days
10 < 10-8-97 = no deflection
10-18-97 = deflection started
4-5 < 10-22-97 AM = deflection stopped
4 < 10-26-97 = deflection ON
5 < 10-31-97 = no deflection
11/11 = Replace magnet and then removed it. Loud Beep - hence Battery still good

Continues p.33

Telecon 4/1/2017
1993-? HPA Student
DIANA.KANE@outlook.com
* BRAXTON Science & Technology

TC Driver & Coil

Splice 8.5 cm From coil TO Breakaway link

32 cm from slice above TO TCD splice; TCD splice TO TCD nipple 13.5 cm

Office Test

Coil Driver: #1

	"ON" (magnet out)	no deflection of compass	11/12 820PM
10 <	deflection		11/22/97 430 pm
4 <	No deflection		11/26 AM
4-5 <	Deflection		11/30 PM
5 <	No Deflection		12/5; 12/16 NO AM

Coil Driver: #3

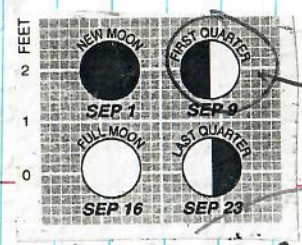
9 <	"ON" (magnet out)	11/11/97 820pm
4-5 <	Deflection	11/20 early am
5 <	No deflection	11/24 pm
4 <	Deflection	11/29 pm
	NO Deflection	12/3 Noon
		12/16 - Still off no deflection

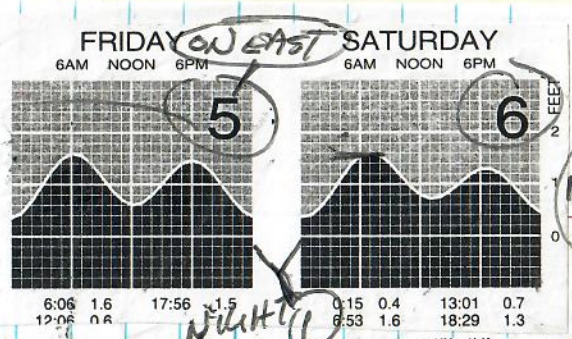
ALP ST 3

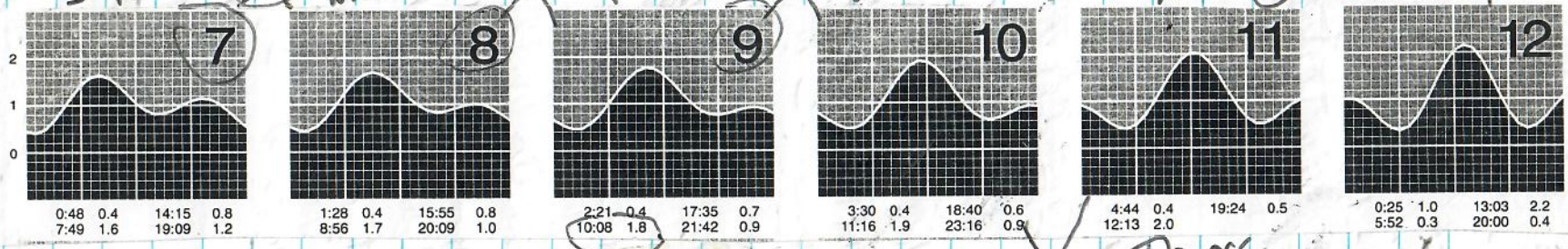
```
ID Code
8-bit Temperature
16-bit Last Dive Time
16-bit Average Dive Time Over "AVGINT" Hours
16-bit Dive Count for Last "AVGINT" Hours
2-bit Failsafe Flag
6-bit Dive Count Since Last Transmission
```

ALP
ST10 2 sensors
16 bits, 16 bits

SEPTEMBER 1997







EXPEDITION #42 FFS

9/5/97 Friday ~~Depart~~ arrive Piper Aztec Bob Justman GHB & Marc Rice 905 pm. video of eroded W-S and altered thing by M.R upon arrival. Light winds calm seas.

Anthony and Allison and BRYAN 2 boats took us to East at ~330PM. Set up camp by pole.

See P. 13 Dead N412 previously caught in weed netting by cement pile. Mummified - bird inside. Used this turtles head and compare to test-fit coil driver and head rod and breakaway link placement. collected humeri and skull

Friday Night 9/5 Walked East at 930pm and 230AM Saturday. Hatchling's attracted to flashlites - video by Marc of many hatchlings around my feet. Estimated 4 turtles up to nest. Some lightning. NIGHT 1

Saturday 9/6/97 Heavy rain showers 7AM off and on until noon. Searched for data loggers - located at least 4. Next time need to tie to existing island structures like pole stumps, iron cable stakes, etc. Assembled wooden box and put NIGHT 2

9/6/97 carpet inside. Needed carpet tacks.
~~[struck out]~~ Saturday Cratering all over island. Very little vegetation. Photos/video of dead adult entangled in weed netting.

ST-14 3 hours on/3 hours off

FIRST Transmitter deployment 11 930 pm

24195 "ON" Turned 1054 am 9/7/97 Sunday
SYS #370087A

V82" Moto tool Right 4th lateral from June 97 monitoring at East Area 3 chambering. Set up chairs to watch. Abandoned 3 times and moved a short distance to start over. Box container put over her at 1245 pm

~645 AM sunrise. Wind & N. passing rainshower start 755 pm. Clouds. Paravane over box

CCL - 101.5 (101 6/97) CCW - 94.5
SCL - 94.0 (94.5 6/97) A734 LHF (old)
199C RHF (new)
9289 LFL (old)
9312 RFL (old)

Straight Head width = 13.2

12.5 = posterior midline scale

With Tape = mid line posterior of prefrontals.

5/31/97 cataloged at East nesting

2.5 oz elastomer 9 drops
for ST-14 24195 3/3

835am 2 oz elastomer 7 drops
for TCD application

910AM Completion of first resin-glass wide strips front of ST14 and each side; and wide strip posterior curve of TCD.

930AM Second Resin — 2-14 across ST14 and two wide pieces up on curved sides of TCD. 2 oz + 35 drops

955am 1½" strip "X"ed across TCR coil 3 oz, 35 drops, faring coated with resin.

TO

1145am Numerous failed attempts to attach coil to head, 1, elastomer - didn't stick to coil potting material - popped off. Head with head butted against plywood. Neck pulls up and ripple positioned at back of coil hits neck - no time for resin to cure. Coil resined to pre-central - overhanging anterior - ORIENTATION (TAPE) TO EIGHT

☆

Sunday 9-7-97

Release 1210PM - Swam along shore to west then not seen. Substantial "wake" seen from TDC.

6

HST = GMT − 10 hours

EAST IS. FFS

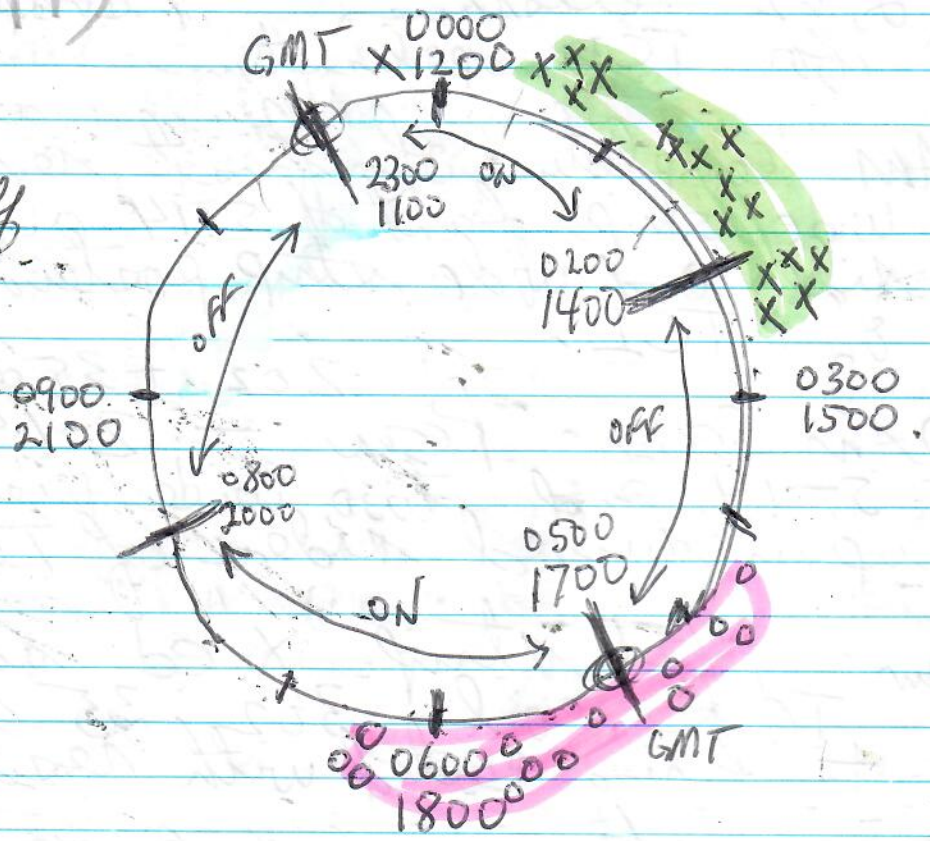
NOAA-14 = X

NOAA-12 = O

GMT

ST-14 S

3 hours on
3 hours off



GMT "ON" 0500 1700 = HST "ON" 7AM or 7PM

1100 2300 = 1AM or 1PM

Date: Thu, 22 Jan 1998 11:06:43 -0500 (EST)
From: michael ~~salmon~~ <salmon@fau.edu>
To: Ken Lohmann <klohmann@gibbs.oit.unc.edu>
Cc: George Balazs <gbalazs@honlab.nmfs.hawaii.edu>
Subject: Re: Visit with Larry Taylor

Kayla
1/22/98

Hi, Ken!

Happy new year to you, too! Thanks so much for your message. George is out of town for a few days but I'm forwarding a copy of this to him as well. I think you and I have been thinking along the same lines. Once George returns, we'll benefit from his views...

Anyway, here is what happened during the meeting with Larry.

(1) He was very gracious! He bought me lunch! He wants to continue! He agrees that the initial results (I told him about 24195 and 24196, from beginning to end!) were suggestive.

(2) Larry and I agreed that we should make the coil and the case for the power pack smaller. The latter can be done without changing the electronics, that is, both the battery and electronics occupy a relatively small portion of the current (oversized) pack.

7

French Frigate Shoals 24195 = 9/11/97 23.790N 166.226 W

Telonics Satellite Predictor
observer(s): BALAZS

BALAZS 23.8 NORTH / 166.1 WEST

date	object	beacon					
Mon 01Sep97	NOAA						
Mon 01Sep97	NOAA						
Mon 01Sep97	NOAA						
Mon 01Sep97	NOAA						
Mon 01Sep97	NOAA						
Mon 01Sep97	NOAA						
Mon 01Sep97	NOAA						
Mon 01Sep97	NOAA						
Mon 01Sep97	NOAA						
Mon 01Sep97	NOAA						
Mon 01Sep97	NOAA						
Mon 01Sep97	NOAA						
Mon 01Sep97	NOAA						
Mon 01Sep97	NOAA						
Mon 01Sep97	NOAA						
Mon 01Sep97	NOAA						
Mon 01Sep97	NOAA						
Mon 01Sep97	NOAA						
Mon 01Sep97	passes						
Tue 02Sep97	NOAA						
Tue 02Sep97	NOAA						
Tue 02Sep97	NOAA						
Tue 02Sep97	NOAA						
Tue 02Sep97	NOAA						
Tue 02Sep97	NOAA						
Tue 02Sep97	NOAA						
Tue 02Sep97	NOAA						
Tue 02Sep97	NOAA						
Tue 02Sep97	NOAA						
Tue 02Sep97	NOAA						
Tue 02Sep97	NOAA						
Tue 02Sep97	NOAA						
Tue 02Sep97	NOAA-11	1707.0000	18:53:11	19:00:58	19:08	64	
Tue 02Sep97	NOAA-12	1698.0000	19:40:05	19:42:25	19:44	1	
Tue 02Sep97	NOAA-11	1707.0000	20:35:07	20:40:57	20:46	11	
Tue 02Sep97	NOAA-14	1707.0000	23:52:34	23:59:06	00:05	16	

Date: Tue, 27 Jan 1998 11:54:52 -0500 (EST)
From: michael salmon <salmon@fau.edu>
To: "George H. Balazs" <gbalazs@honlab.nmfs.hawaii.edu>
Cc: klohmann@email.unc.edu
Subject: Re: shape for power pack

Reduce

1/27/98

George:

>Again I disagree with you. You had lunch with him, you could have asked
>him. Did you in fact give him the wooden model?

YES!

I'm presuming so, but don't want to think poorly of him if you didn't.

DON'T THINK POORLY OF HIM, ANYWAY! PEOPLE MAKE MISTAKES, ESP. OVERWORKED PEOPLE. LET'S GO ON!!

>Have him make the units the size of the wooden model or anything smaller
>he can fabricate in proportion to that rectanular shape. Take the
>dimensions right off of that if you prefer not to give him the block of
>wood. I don't care if it's beveled or not.

OKAY!

Closed-cell foam can again be put as faring.

lARRY SAID "URETHANE". IS THAT THE SAME AS CLOSED-CELL FOAM?

Mike

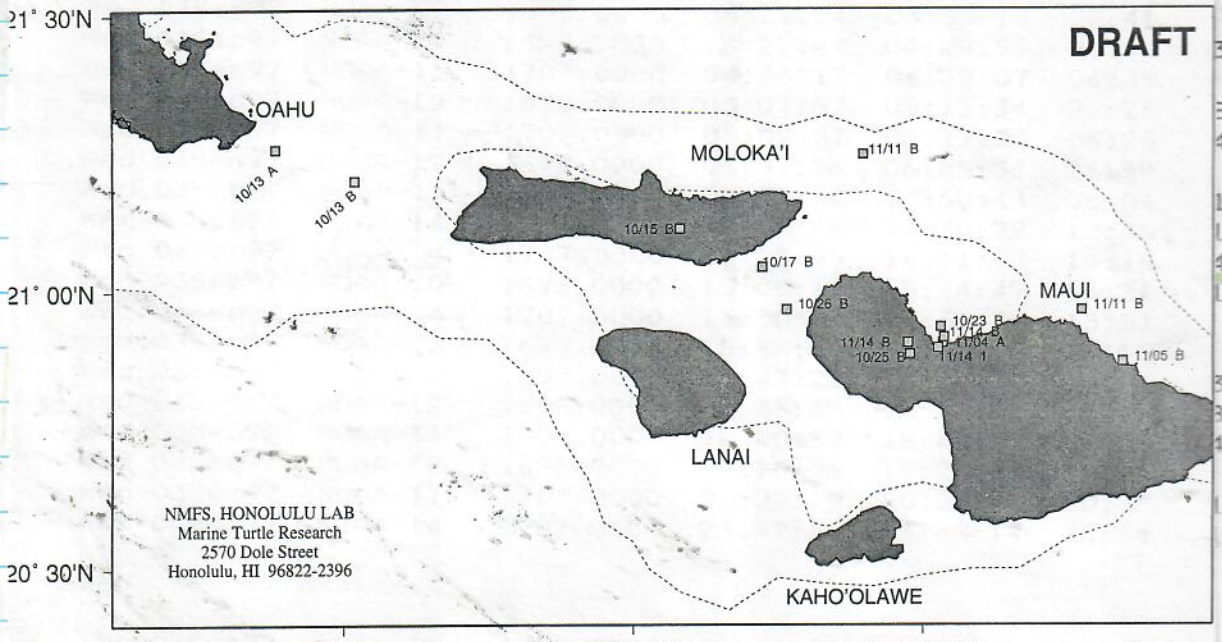
> **********
> **********

>On Tue, 27 Jan 1998, michael salmon wrote:
>
>> George:
>>
>> I can't answer your questions regarding why Larry built the case that he
>> did...Engineers have the tendency toward overkill when it comes to
>> specifications. In any event, I'm trying now to rectify this (and any
>> other) problem! We need to forget what was done in the past, avoid previous
>> mistakes, and go on from here.
>>
>> I'll now have him build a rectangular case that will be slightly smaller in
>> length and width than your wood model, but a bit higher (min of 1.6"). It
>> will be flat on the bottom, but the upper surface will have slightly rounded
>> edges (as per your wood model). Your wood model is also beveled, with a
>> smaller top than bottom surface. Would you like similar beveling on the
>> power case?
>>
>> How about sending a rough sketch, with your suggested dimensions?! There's
>> nothing like numbers and/or diagrams to avoid misinterpretation!! FAX to me
>> at 561/297-2749 (note change in FAX number). Please remember that the case
>> size can be no smaller than the dimensions (for the rectangle) that I sent
>> you last week. I take it you prefer that rectangle to the cylinder
>> alternative shape.
>>
>> Thanks for your help!

(3) With regard to the pack, Larry sketched out two shape options. One is cylindrical (1.5" diameter x 4.5" long) and the other, a flat rectangle (3.6" long by 1.6 high by 3" wide). Both can be covered by a urethane mold to make them hydrodynamically appropriate. What Larry needs from George is a piece of wood shaped exactly as he want, and large enough to enclose either one or the other pack shape.

NEXT page →

Post-nesting migration of green turtle 24198
from French Frigate Shoals to the Main Hawaiian Islands



Date: Tue, 27 Jan 1998 11:59:09 -0500 (EST)
From: michael salmon <salmon@fau.edu>
To: "George H. Balazs" <gbalazs@honlab.nmfs.hawaii.edu>
Cc: klohmann@email.unc.edu
Subject: Re: coil

Reduce

1/27

>I see know need to go to a head coil in year two until we repeat the
>carapace placement of the coil. What do you think?
> **********
>
George:
>
Our NG grant has a one-year time frame. Their normal policy is to have returned any monies not spent. We can, of course, request that they give us time to do these experiments at a more leisurely pace. If we do, we risk being turned down. Part of their decision will no doubt be based upon what we have accomplished thus far.

We need to discuss our options and strategy. Our report on the first year is due in May.

Thu 04Sep97	NOAA-10	1698.0000	18:05:54	18:09:27	18:12
Thu 04Sep97	NOAA-11	1707.0000	18:28:37	18:36:05	18:43
Thu 04Sep97	NOAA-12	1698.0000	18:53:11	18:59:12	19:05
Thu 04Sep97	NOAA-11	1707.0000	20:09:32	20:16:28	20:23

(4) I took the liberty of asking Larry to price out building 12 more units. Six of these would be "dummies" - empty cases for powerpacks covered with urethane, and weighted down to exactly match the real ones, attached by wire to fake coils. The remaining six would be actual units subdivided into two batches.

(a) One batch [of three] would be the three remaining units we now have, housed in smaller packs.

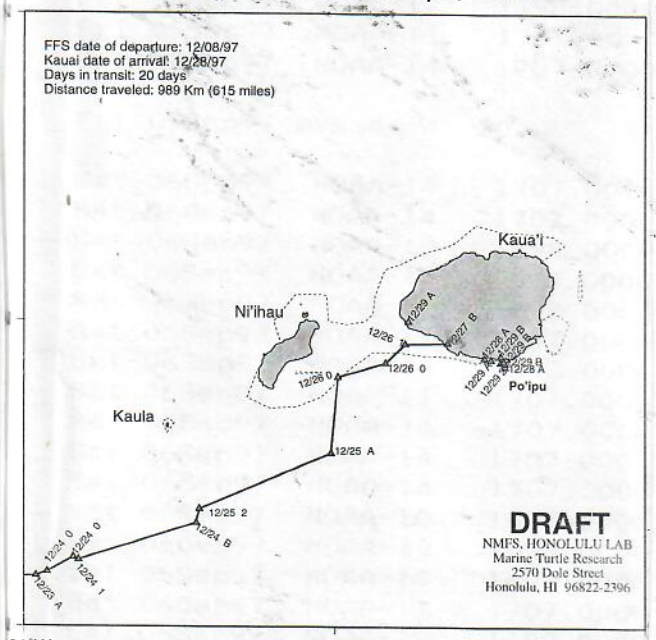
(b) The second batch [of three] would be housed in packs of the same shape, but slightly modified to power a smaller coil. (Three of the dummy units will be identical in configuration to these.)

Here is how we might deploy those units on 12 turtles this year.

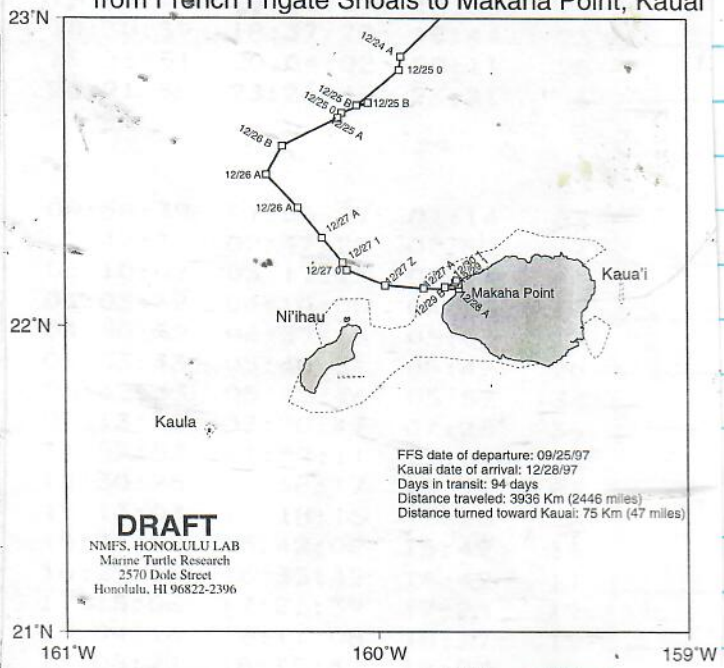
(5) We could use six turtles (three bearing dummies, three bearing real units identical to the one we previously used) for carapace mounting, as done with 24195. This group will allow us to determine if the effect we saw with 24195 was real or an accident. We can't loose either way! If, for example, it was a real effect we'll be rich and famous! If it wasn't, we have two sets of controls, one bearing the unit without any magnetic effect and the second bearing the unit with a magnetic effect that's out of range of the "receptor" (where ever that damn thing might be).

Fri	05Sep97	NOAA-14	1707.0000	01:09:37	01:17:25	01:25	76
Fri	05Sep97	NOAA-10	1698.0000	01:58:27	02:02:32	02:06	4
Fri	05Sep97	NOAA-14	1707.0000	02:54:44	02:58:33	03:02	4
Fri	05Sep97	NOAA-10	1698.0000	03:33:53	03:41:30	03:49	76
Fri	05Sep97	NOAA-12	1698.0000	04:24:42	04:31:51	04:39	33
Fri	05Sep97	NOAA-10	1698.0000	05:16:35	05:21:36	05:26	7
Fri	05Sep97	NOAA-11	1707.0000	05:45:44	05:52:50	05:59	27
Fri	05Sep97	NOAA-12	1698.0000	06:05:06	06:11:47	06:18	20
Fri	05Sep97	NOAA-11	1707.0000	07:26:06	07:33:15	07:40	26
Fri	05Sep97	NOAA-14	1707.0000	12:02:58	12:08:15	12:13	8
Fri	05Sep97	NOAA-14	1707.0000	13:41:24	13:49:14	13:57	76
Fri	05Sep97	NOAA-10	1698.0000	14:23:25	14:26:04	14:28	2
Fri	05Sep97	NOAA-14	1707.0000	15:24:42	15:29:03	15:33	5
Fri	05Sep97	NOAA-10	1698.0000	15:58:45	16:06:22	16:13	66
Fri	05Sep97	NOAA-12	1698.0000	16:50:32	16:57:43	17:04	29

Post-nesting migration of green turtle 24196 from French Frigate Shoals to Poipu, Kauai



Post-nesting migration of green turtle 24195 from French Frigate Shoals to Makaha Point, Kauai



Sat 0. (6) We could use six additional turtles (three bearing dummies, three bearing real units - but with a smaller coil successfully attached to the head) as another group, designed to determine the head's involvement in navigation.

Obviously, I need your feedback on these ideas. The final design will be one we all agree upon...

(7) Larry seems to think the cost for all of these won't be prohibitive, since we've already developed a successful circuit. I'm waiting for a detailed estimate. Will want your approval on this matter as well, since it will mean a substantial change in the budget (with all that implies).

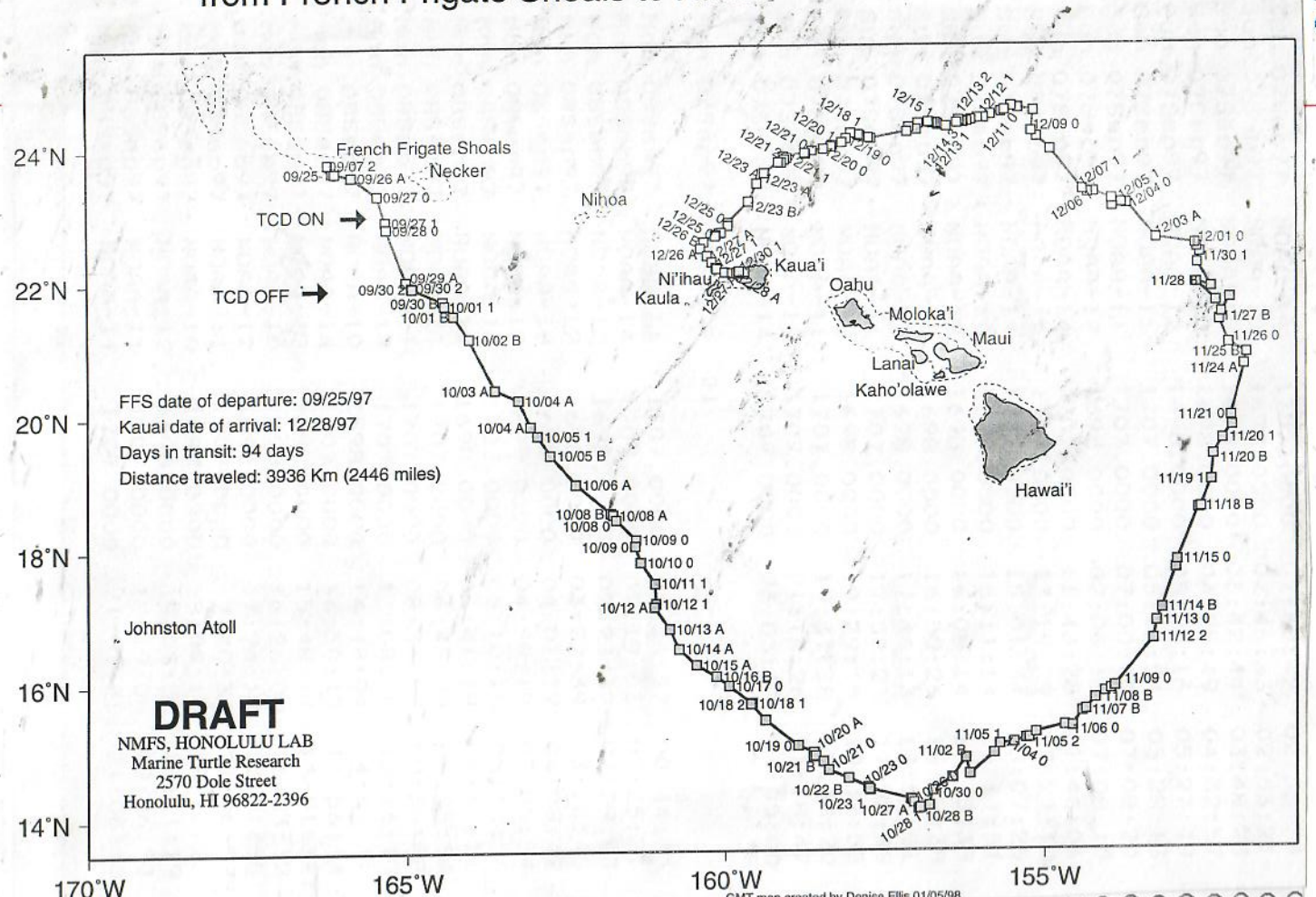
(8) Larry says we can easily eliminate that troublesome "nipple" just behind the coil, so George can actually glass the thing to the turtle's head! A smaller, more compact coil should also make the process easier.

I also talked to Larry about contracts and billing, in an effort to prevent any further delays such as those we experience before. He agrees we want to have a successful design approved by George within 6-8 weeks - no more surprises! - and delivery of all units to the Honolulu lab by the end of July.

Let me know what you think of all this.

Mike

Post-nesting migration of green turtle 24195 from French Frigate Shoals to Kauai



DRAFT

NMFS, HONOLULU LAB
Marine Turtle Research
2570 Dole Street
Honolulu, HI 96822-2396

GMT map created by Denise Ellis 01/05/98

10

Date: Tue, 27 Jan 1998 14:57:45 -0500 (EST)
From: michael salmon <salmon@fau.edu>
To: gbalazs@honlab.nmfs.hawaii.edu
Subject: Housing

1/27 Reduce

>To: Larry Taylor <Taylor@HBOI.edu>
>From: michael salmon <salmon@fau.edu>
>Subject: Case for power pack
>Cc: gbalazs@honlab.nmfs.hawaii.edu.klohmann@email.unc.edu
>
>Larry:
>
>I've reported on our meeting to George and Ken, and they were as pleased as
>me that you're willing to continue! I asked about recovering the power
>packs. Seems that's virtually impossible.
>
>Now with regard to the shape, George favors the rectangular shape you
>created in that diagram. There is, however, no need to bevel the edges or
>to cover it with urethane. He will shape it as he sees fit.
>
>The important thing is that the unit conforms to the dimensions you gave us:
>1.6" tall, 3.6" long, and 3" wide.
>
>Let me know if there are any other items we need to discuss before finishing
>up this part of the project! As soon as the three cases are done, I'll
>forward a check for the remaining $1000.
>
>Take care!
>
>Mike
>
>
>>George and Mike,
>>
>>I talked with Frank Caimi (my boss) and he wondered if something as
>>simple as double faced foam tape would make a quick-stick while you are
>>trying to get a glue to dry. We have some names of foam-tape and
>>adhesive suppliers if you need to talk to some experts.
>>
>>Let us know if we can help. Later, Taylor and Frank Caimi

Date: Tue, 27 Jan 1998 19:10:40 -0500 (GMT+5:00)
From: Ken Lohmann <klohmann@gibbs.oit.unc.edu>
To: "George H. Balazs" <gbalazs@honlab.nmfs.hawaii.edu>,
michael salmon <salmon@fau.edu>
Subject: Re: coil

1/27 Reduce

Hi guys --

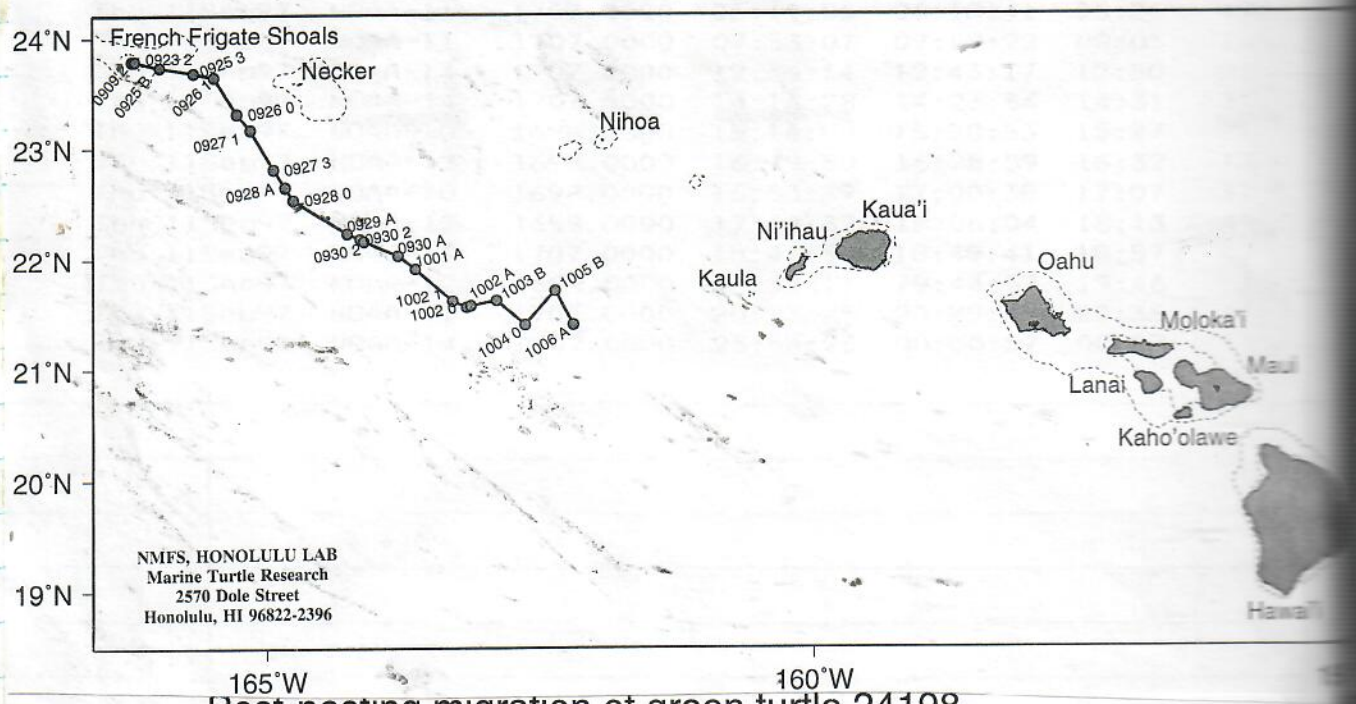
Wow -- I didn't get a chance to check my e-mail until late today and from all the messages I feel as if I've been gone for a week! It's good to see that things are moving along.

With respect to plans and whether to put coils on the heads or carapaces, I can see an argument for either approach. The advantage of putting the coil on the carapace is that it has been done once already (successfully, we think) and so we would hopefully be adding to our sample size. I suppose we could conceivably run into trouble if the receptors are indeed in the head and the next turtle is significantly larger or smaller, so that the distance between the carapace coil and receptors (and thus the field strength at the critical point) differs greatly between turtles due to variation in neck length, head size, etc. If this were the case, then placing the coil directly on the head might yield more consistent results. The difficulty with coils on the head, however, is just that if we DON'T see an effect in our next turtle, then we won't know if the new imposed field just fails to hit the receptors (while the field from the carapace coil did) or whether 24195 was a fluke.

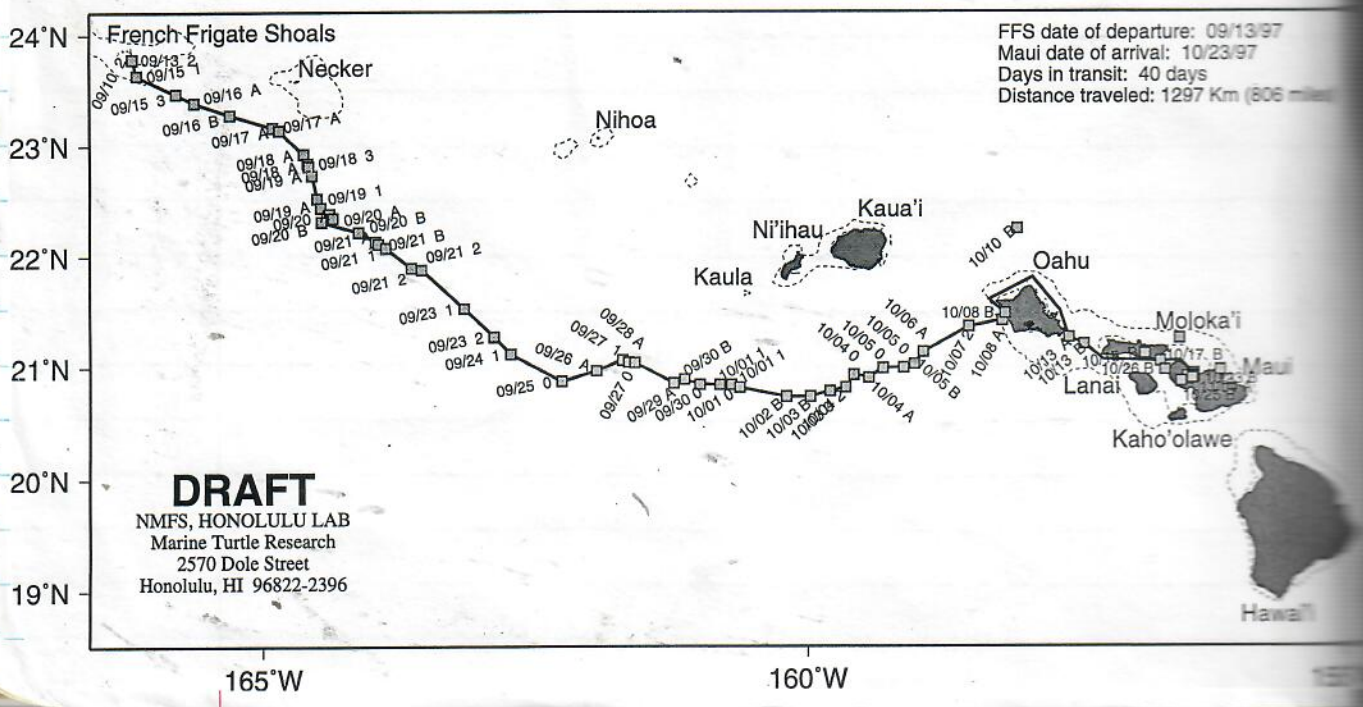
If I understood George correctly, then we will probably be able to put out (at most) one or two more turtles with coils this year. Given the need to go slow, I think I'd be inclined to go with the carapace coils, at least for the next round. Although there are potential pitfalls, this seems to me to give us the best shot of either confirming the results of 24195 or else providing evidence that 24195 may just have been a very unusual turtle. So that's my two cents worth -- although I could certainly be convinced to take a different approach if anyone feels strongly.

One extra thought stems from George's observation that the battery was not depleted at the end: it would be worth measuring the magnetic field produced by the battery alone, both when the battery is fully charged and when it is depleted. It is a strange idea, but perhaps the slight residual field from the BATTERY was enough to keep 24195 from figuring out where she was after the coil turned off. Mike and I both have magnetometers sensitive enough to measure this. We've been assuming that fields a ways back on the shell don't matter -- but perhaps such fields are stronger than we think, or perhaps they are sitting right on a critical area. Anyway -- just an idea.

Post-nesting migration of green turtle 24197 from French Frigate Shoals to the Main Hawaiian Islands



Post-nesting migration of green turtle 24198 from French Frigate Shoals to the Main Hawaiian Islands



~~First nighttime walkaround~~ NIGHT 1
walkaround

9/5/97 Friday — NIGHT ONE

1 - V82 - ~930PM nesting
1 - No tag nesting
1 - emerging (not examined) - water's edge

230 AM walk around
V479 SP just up.
V508 chamber (several false).

excavate
SAND POINT 1742 hours 9/7/97 (E1) (FFS #2) 16592 western-most. (BBA476). Depth at black line! (HOBO)

9/7/97
1806h (E4) (HOBO) South of (near westernmost TWIN BLOCKS
FFS #9 - 17473
~5cm deeper than deepest Black on line.

1816h 9/7/97 (E6) HOBO
17474 FFS #10
~"Area 9" (inland (South) from felled Pole on N. Shore
AT BLACK LINE.

9/7/97 Sunday 5-6pm Dug out the above 3 data loggers from East.
AREA Photos of Sandpoint - west to East view
AREA 1 - 4 pole, AREA 5 - 7,
Also, from on top of cement pile.

Dinner - Mexican Rice w/chicken + Cranberry juice.
9 PM Photoed hatchling at surface - hatch SITE.
Turtle up Sunset ~ 715pm area 16 - not tagged,
no motorboat. FLASH PHOTO.
930 PM V82 up chamber SP - Area 1
All gear in place.

CONT. PAGE 25

14

Date: Thu, 4 Sep 1997 14:03:01 -0400
From: KENNETH J LOHMANN <klohmann@gibbs.oit.unc.edu>
To: "George H. Balazs" <gbalazs@honlab.nmfs.hawaii.edu>
Cc: Hawaii Preparatory Academy <mrice@hpa.edu>,
Larry Taylor <Taylor@HBOI.edu>, "Salmon, Michael" <SALMON@ACC.FAU.EDU>,
WPIrwin@email.unc.edu
Subject: Coil Recommendation

George,

I haven't been able to reach Mike yet, but after some thought, my recommendation would be to place all the coils on the turtles in the same orientation. My feeling is that there are so many variables already that our best shot at getting something that can be interpreted would be to keep the coil alignment the same on all individuals.

The orientation of the coil that I would favor is to ALWAYS PUT THE SIDE OF THE COIL WITH THE TAPE ON IT ON THE TURTLE'S RIGHT SIDE. In theory this will simulate a displacement to the south if the receptors are in the center of the head as we are hoping. If Mike or anyone else disagrees, however, please e-mail or call me and we'll iron this out during the next few hours. I'm presently working from home (919-933-2093) but may go back into the lab within a couple of hours (919-962-1332).

I don't know what happened with the size but clearly at this point we'll have to make the best of what we have. Can the finished product be bent a little or is it rigid? I'm wondering if there might be a clever way to mold it to the turtles' heads even if it is slightly larger than the ideal size.

Regards, Ken

Date: Thu, 4 Sep 1997 11:38:02 -0400 (GMT+4:00)
From: Ken Lohmann <klohmann@gibbs.oit.unc.edu>
To: "Balazs, George H. " <gbalazs@honlab.nmfs.hawaii.edu>,
"Salmon, Michael" <SALMON@ACC.FAU.EDU>
Cc: WPIRWIN@EMAIL.UNC.EDU
Subject: Coil Arrangement

Hi George and Mike:

I gave Larry a call and now understand what the tape markings signify. The simplest way of thinking about it is as follows:

If the tape marking is on the TURTLE'S RIGHT side, then we simulate a displacement to the SOUTH.

If the tape marking is on the TURTLE'S LEFT side, then we simulate a displacement to the NORTH.

(All this assumes, of course, that the critical receptors are inside the perimeter of the coil. If this isn't true, then all bets are off.)

As to whether to arrange all of the coils one way or to alternate, an argument can be made for either approach. If we arrange them all to simulate south displacements, we will be hoping to steer the turtles toward the north, and a course change might be relatively easy to discern since the turtles spend much of their migration going approximately SE (but at least some veer almost NE toward the end of their migration). A simulated displacement to the north might be expected to result in orientation approximately towards the south, which might be hard to distinguish from a course toward the SE, but would be fine if the coil kicked on during an E/NE part of the migration. We can try both ways in the hopes of seeing SOMETHING (this would also cover the possibility that the receptors are in the head but just outside the coil) -- but the down side is that our sample size for each treatment will be exceedingly small.

I understand that Mike is out in a boat but will be back in a few hours. Mike -- let's talk by phone when you return and we'll settle on a procedure. Lab number is (919) 962-1332.

Ken

Date: Wed, 3 Sep 1997 08:32:06 -0400
From: Larry Taylor <Taylor@HBOI.edu>
To: "'George H. Balazs'" <gbalazs@honlab.nmfs.hawaii.edu>
Cc: 'Michael Salmon' <SALMON@ACC.FAU.EDU>
Subject: RE: ARRIVED! Reply to Telephone Questions.

George,
Received your call. Here are brief answers:

1) Pressure integrity -- no problem with magnets in or out. The 3 threaded holes that are at the same radius as the flat-head screws are what we call "jacking screw" holes. They are threaded in the lid and do not extend into the side of the cyllindrical housing. They are used to remove the lid. I encourage you to open the housing and inspect. Instructions will be faxed. (I will fax portions of the documentation as I roll them off the printer so that you will have the immediate needs met first). The other hole marked "D" is an extra hole for a magnet similar to the on/off magnet. I switched to the white magnet block that I sent to you for selecting delay. If you only want the 10 day delay, you don't mess with the "D" magnet at all - the default is 10 days.

2) Connections - yes, crimps are fine. I recommend non-insulated splices. They leave less volume for trapped air. Use the mastic as described previously. Note: the "sticky" side of the mastic must seal around the splice and wire and then "stick" to itself (the sticky part). The vinyl cover is just an outer jacket. If for some reason, your splices are large in diameter, then use two pieces of the mastic and apply them face to face, making sure that the sticky part completely covers the splice and cable.

3) Coil orientation: The coils are marked with a piece of orange tape. The tape is intended to temporarily mark the coils and I expect you to remove it at time of installation. Sketch is being faxed.

Call when you get in, we are very effective on the telephone.
Thanks,
Larry
> ----------
> From: George H. Balazs [SMTP:gbalazs@honlab.nmfs.hawaii.edu]
> Sent: Tuesday, September 02, 1997 9:51 PM
> To: Larry Taylor
> Cc: Mike Salmon; Hawaii Preparatory Academy
> Subject: ARRIVED!
>
>
> Now all I have to do is figure it all out! Help! Geo.
>

Date: Fri, 23 Jan 1998 10:05:01 -0500 (EST)
From: michael salmon <salmon@fau.edu>
To: "George H. Balazs" <gbalazs@honlab.nmfs.hawaii.edu>
Cc: Ken Lohmann <klohmann@email.unc.edu>
Subject: Re: Meeting with Larry

Reduce

George:

Thanks for your most recent. The only commitment thus far is to design a new and smaller case for the remaining three power packs. If you would assist by providing a "shape", that would be terrific! That will close out our first contract with Harbor Branch (at which point, I'll pay them the $1000 still owed.). Whether those three remaining power packs are deployed will, of course, depend ultimately upon your willingness to deploy them.

It would be good to know what kind of oceangraphic data analysis is being done. When time permits, please let us know...

16

Date: Sun, 14 Sep 1997 23:15:16 -1000 (HST)
From: "George H. Balazs" <gbalazs@honlab.nmfs.hawaii.edu>
To: Marc Webber <marc_webber@mail.fws.gov>
Cc: Chuck Monnett <chuck_monnett@mail.fws.gov>
Subject: French Frigate Shoals field work (fwd)

Marc and Chuck- In the message below that I sent you today I should have mentioned two other things.

First, I understand that Anthony is coming to Honolulu in early October so would like to propose that we take the opportunity to have a short turtle meeting. A post-season briefing so to speak.

The other item is that I wanted you to know that I salvaged the humeri and skull from the entangled dead turtle on East. It was truly a pityful circumstance. The turtle had entangled in a massive piece of webbing and proceeded to drag it with 3 blocks of concrete and and a piece of pipe about 20 meters from the weedpile. We repectfully buried the remains of the turtle and stored the webbing (for burning?) in the 55 gal drum present on the island. Other pieces of the same webbing along with other debris were already in the drum. George

****

---------- Forwarded message ----------
Date: Sun, 14 Sep 1997 09:39:12 -1000 (HST)
From: George H. Balazs <gbalazs@honlab.nmfs.hawaii.edu>
To: Marc Webber <marc_webber@mail.fws.gov>
Cc: Chuck Monnett <chuck_monnett@mail.fws.gov>,
Marc Rice- Hawaii Preparatory Academy <mrice@hpa.edu>
Subject: French Frigate Shoals field work

Dear Marc and Chuck: We have returned now from a very successful and safe trip. As planned, four nesting green turtles on East Island were deployed with standard satellite transmitter. As of this morning, all are still within the Shoals, but we expect their homeward migrations to occur shortly. Regarding the short-term magnetic field re-orientation devices, we deployed one of them but experienced much difficulty due to equipment design. Hence decided that it just wasn't worth it to use the other three. The units are being returned to Harbor Branch Oceanographic Institute for major reconsideration/redesign.

The assistance provided to us by Anthony, Allison and other FWS people at Tern was absolutely outstanding. I can't say enough in their praise. Thank you for allowing them to help us.

I'll be in contact with you by email in coming weeks to supply progress of the migrations of the four turtles. Best regards, George

****

Finally, I should say that I'm still not convinced that our wayward turtle was actually affected by the coil per se, or that it necessarily returned to its home pasture. That's not to say that I deny those possibilities, either! It's just that the track of that turtle seemed abnormal BEFORE the coil was activated, and failed to deviate either during or after coil activation. And the "big circle" that it took to the northeast, northwest, then southwest to Kau'ai seemed (once again) to be unaffected by the position of any land mass (tho it might have been a general response to the magnetic anomalies generated by the Hawaiian chain). Put another way, continuing on that turning arc would have led the turtle toward Kau'ai whether or not the animal actually used that location as a foraging ground. Once in visual (or other sensory) contact, a hungry turtle could, of course, find itself a new pasture.

Again, I'm simply suggesting that with a sample size of one, and one behaving in a unique way, we must be carefull about what we "conclude". The experiments I've proposed should allow us to distinguish between some of the alternatives. There is some risk involved for the turtles and that, I know, concerns us all. But perhaps between the three of us, we can come up with a way to minimize that risk. Let me know your thoughts!

Mike

Harbor Branch Oceanographic Institution, Inc.
5600 U.S. 1, North
Fort Pierce, Florida 34946

HARBOR BRANCH OCEANOGRAPHIC INSTITUTION

ELECTRICAL ENGINEERING

Received -

Packing List

DATE: August 30, 1997	
TO: George H. Balazs	
FROM: Larry Taylor	
Project: Turtle Coil Driver	**Department:** E2071.01
Shipping Method: Federal Express Priority Overnight #9027589152	
COMMENTS:	

Quantity	Description
4	Turtle Coil Housings. Sealed, Tested, Includes Tadiran TI-2300 Lithium D Cell
5	Hand wound Turtle Coils Potted in Polyurethane - Scothcast 2130
2	Hand Wound Turtle Coils - Bare
5	Custom Break-away Sections
2	Auxillary Programming Magnets
1	Cable Splice Accessory Pack containing 12 mastic strips, sandpaper, Vinyl Tape
1	Preliminary documentation packet

Turtle Coil and Turtle Coil Driver Preliminary Documentation 8/30/97
L.Taylor HBOI Inc.

System description:

General :
The Turtle Coil Driver (TCD) is basically an on/off sequence timer, a constant-current coil driver, a battery and controls. The battery, driver, and timer are sealed in a protective PVC pressure housing for submerged operation to a maximum depth of 100 meters. The coil current flows out of the housing through a custom miniature penetrator and a PVC jacketed cable. The cable is field-spliced to a hand-wound coil that has been sealed with a tough polyurethane potting compound. The timer control is activated via 2 external magnets that provide (1) on/off control and (2) a selection of start-up delay. The unit is powered by a replaceable single D-cell battery.

Sequence Timer:
The timer is a low-power PIC16F84 microcontroller manufactured by Microchip Tecnology, Inc. This device has internal flash program memory and internal EEPROM (non-volatile) data memory. Low power is achieved through low voltage (3V) operation and the use of a slow 32kHz clock that is provided by a miniature "watch" crystal for stability. The microcontroller utilizes a very low power sleep mode for maximum energy conservation. In sleep mode, the I/O pins keep the latest driven state (low or high) while the chip operation is halted. Resumption of program operation is controlled by the time-out of an on-chip Watchdog Timer. This timer utilizes a resistor/capacitor oscillator instead of a crystal. Therefore, the accuracy of this timer is only +/-10% over the operating range of the TCD battery supply. This wide range is adequate for the timing needs of the Turtle Coil Project.

Coil Driver:
The coil driver is a LP2951 Low Dropout Voltage regulator manufactured by National Semiconductor. Although the device was manufactured to be a voltage regulator, it includes the capability to be configured as a constanst current source. The TCD circuit is designed to provide a stable source of 15 milliamps of current for the coil. The LP2951 also incudes a shutdown pin that is driven by the microcontroller for on/off control. When the driver is in shutdown there is a residual leakage current through the coil of 140 micramps.

Battery System:
The TCD was originally designed to be powered by a single Alkaline 1.5V D-cell and a switching regulator that would step-up the supply to 3Vdc. During the last week of testing prior to the shipping deadline, a problem with the switching regulator was discovered. The switching regulator was shutting down before reaching the end-of-battery-life that is required for the TCD mission. The quickest solution was to disconnect the switching regulator and install a 3.6V Lithium D-cell. The new battery was installed and is operated without a regulator. The new cell has the energy capacity to meet the needs of the TCD.

Controls:
On/Off:
Operation and control of the TCD is provided through 2 external magnets. The first magnet is the on/off control and it is pre-installed in the housing when the unit is shipped from the factory. A piece of tape holds this magnet in place on the top of the housing. The hole for the magnet is labeled "PWR". When the tape is removed, the magnet can be pulled completely out of the hole. A reed switch inside the housing will then close and connect the battery to the circuit. The reed is a series switch and there is no current drain from the battery when the magnet is in place.

Delay control:
The second control is an auxillary magnet that can be used to select the delay time before the first activation of the coil current. There is a second normally closed reed switch inside the housing that controls an input bit of the micrcontroller. To select a short delay of 5 days, the auxillary magnet is held in place over the slot labeled "D" on the top of the housing. The magnet must be in place before the on/off magnet is pulled. As the microcontroller initializes, it reads the status of the delay bit. The presence of the auxillary magnet causes the microcontroller to store a delay selection of 5 days. To program the delay for 10 days, simply pull the on/off magnet without the auxillary "D" magnet in place. Also note that the microcontroller initializes in less then a second and then never reads the delay control bit

```
Date: Mon, 26 Jan 1998 18:06:53 -0500 (GMT+5:00)
From: Ken Lohmann <klohmann@gibbs.oit.unc.edu>
To: "George H. Balazs" <gbalazs@honlab.nmfs.hawaii.edu>,
    michael salmon <salmon@fau.edu>
Subject: Re: Meeting with Larry

Hi George and Mike:

     A few messages back, George asked for thoughts on the seeming
inability of the turtle to get back on course right away:

>Irrespective of that, there is also the other issue of the apparent
>INability of the turtle to get back on course (if in fact it was affected
>by the coil).  We must address this, first and foremost to ourselves.
>Ken, your thoughts please.

     This is a tough question and I certainly don't have a good answer.  I
think we all agree with the view Mike expressed: that we can't tell a great
deal from one turtle because: (1) it might have followed the course it took
without regard to the coil, and (2) we don't know for sure that it actually
arrived at its intended destination.  As a cautionary note, Paolo Luschi
recently e-mailed me that one turtle tagged at Ascension did in fact swim
toward the northeast for a few hundred km before retracing its path to the
island, then ventured toward the southeast, and then started toward the
northwest before the transmitter quit working.  (Paolo says they didn't
include that track with the others they sent us because the transmitter
quit so early in the migration.)  So I guess there is at least some
anecdotal evidence for the occasional deviant, seemingly random path among
these talented navigators.

     That said, however, the path of 24195 seems to be strikingly unlike
anything George has seen before, so if we really just happened to hit a
deviant turtle on this run, it seems a strange coincidence.  If this turns
out to be the case, though, we can certainly be forgiven for leaning
tentatively toward the wrong conclusion under the circumstances.
```

TO P.19

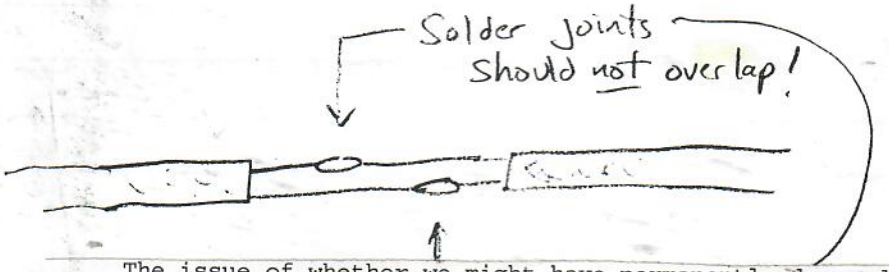
again. Therefore, once the controls are activated, the magnets are completely removed from the housing and will not affect the desired magnetic field generation of the coil.

Operation :

1. Determine the location of the TCD housing, the possible location of a breakaway section and cable lengths required.
2. Splice the cables as follows:
   - 2.1. Cut and remove 1.5" of the PVC cable jacket from the 2 ends you are about to join.
   - 2.2. Cutoff the silver shield wire (both ends)
   - 2.3. Pull back the black shielding material and cut it away as close to the pvc jacket as possible. (both ends).
   - 2.4. With sand paper, abrade or buff about 5/8" of the remaining pvc jacket. (both ends). Attempt to keep this area free of dirt and grease including oils from your hands.
   - 2.5. Take one of the ends and cutoff half of the exposed length of the red wire.
   - 2.6. Strip ¼" of the red insulation.
   - 2.7. Take the other end and repeat steps 2.5 and 2.6 using the black wire instead of the red. You are trying to make a non-overlapping set of connections.
   - 2.8. "tin" the 4 stripped wire ends and make a soldered connections of the matching colored wires.
   - 2.9. Grab the cables (back away from the splice) and twist the wires so that the pair of wires is twisted into a tight bundle .
   - 2.10. (optional) If time permits, gererously coat the splice with Scothkote (from 3M) and let dry for 5 to 10 minutes. Be sure to coat the abraded pvc cable jacket.
   - 2.11. Take a section of mastic from the HBOI kit, peel away the white liner (try not to get the sticky material dirty) and press the splice into the center of the exposed mastic.
   - 2.12. Fold the sticky mastic completely over the wire and squeeze it onto itself (sticky to sticky).
   - 2.13. Completely tape-over the splice with the Supper 33 vinyl tape. Stretch the tape as you wind it on in order to create a permanent pressure for the mastic.
   - 2.14. (optional) Completely coat the taped splice with Skotchkote and let dry.
3. Turn-on the TCD as described in the Controls description above. If the ambient area is quiet you will be able to hear the unit will beep 3 times when it is first turned on. The coil current will then be turned on for 5 seconds, turned off again, and the unit will go to "sleep" and begin the delay countdown. The coil can then be mounted.
4. Remove the orange tape that marks the coil polarity, choose a mounting orientation, and mount the coil.

Note that the on-off magnet can be re-installed and the start-up initialization can be completely restarted.

Much More Documentation on the way!



The issue of whether we might have permanently damaged the receptors, or impaired their functioning for a long time, seems impossible to answer with certainty. Prior to our test I would have said it was impossible or at least very unlikely. As far as I know, there are no theoretical reasons to suppose that such a weak, imposed field would disrupt receptors based on magnetite or photoreceptors (the two hypothetical mechanisms that have the most experimental support). John Phillips, who has done much work with the photoreceptor hypothesis, will be here next week to give a seminar and I'll ask him if he can think of anything that I've overlooked. Theory aside, however, I suppose that until the receptors are actually identified and their physiology fully understood, there is no way to be 100% sure of how an artificial field is affecting them. It is worth noting, however, that many turtles taken into captivity are unintentionally but routinely exposed to fields of this magnitude or stronger (from iron beams in buildings, metal supports in tanks, overhead lights, etc.).

TO p. 20

20

Date: Wed, 3 Sep 1997 14:56:16 -0400
From: Larry Taylor <Taylor@HBOI.edu>
To: "'George H. Balazs'" <gbalazs@honlab.nmfs.hawaii.edu>
Subject: Crimping Supplies

Crimping Supplies:

Radio Shack:
"Butt Connectors, 22-18 ga." - #64-3036 Package comes with 10 of size we need and 10 of a larger size that we don't need. Buy 2 t pkgs.

You need a crimp tool :
either buy the crimper only : #64-404
or
buy a whole kit: #64-409

If you don't have a wire stripper, buy a #64-1952

Sorry for the mix-up. Call me tonight if you need too. I'll wake talk to you if I need to. I can talk you through the process. Yo down to the wire with very little help. Besides, I can fall back a very quickly.

Larry

Solder

Date: Thu, 4 Sep 1997 17:05:35 -0400 (GMT+4:00)
From: Ken Lohmann <klohmann@gibbs.oit.unc.edu>
To: "Balazs, George H. " <gbalazs@honlab.nmfs.hawaii.edu>,
"Salmon, Michael" <SALMON@ACC.FAU.EDU>, Larry Taylor <Taylor@HBOI.edu>,
"Irwin, Bill" <wpirwin@email.unc.edu>
Subject: All Set!

Hello all:

I think we're now in agreement as to procedure. George will put all coils on with the tape marker on the right side of the turtles' heads. This will (hopefully) simulate displacements to the south when the coil comes on, if we've guessed right about where the receptors are.

It sounds like things are set. Good luck, George! We'll all be eager to hear how things go.

Best regards,

Ken

One issue can perhaps be resolved by Larry. I'm still wondering if the possibility exists of a malfunction in the circuit that could have kept the coil on at a very low level for a period of weeks, rather than for days as we intended. A tiny amount of current flowing through the coil for a long time could conceivably account for prolonged disorientation, as well as the path. I never heard back from Larry, however, as to whether this possibility can be ruled out. Mike -- did Larry mention anything about this to you? If not, I can e-mail him again to ask.

from page 19

Date: Thu, 4 Sep 1997 16:36:58 -0400 (EDT)
From: Bill Irwin <wpirwin@email.unc.edu>
To: "George H. Balazs" <gbalazs@honlab.nmfs.hawaii.edu>
Subject: Re: Size of coils

George:

The coil I designed matched your sketch and specs almost exactly (I erred on the small side to allow for additional potting if necessary). I sent the mold, the wire and your fax with sketch and specs to Larry Taylor since his team was doing the actual assembly. My only hunch is that his potting material added more width than what I used on the prototype, but 15% is quite a lot. I'd have to see one of the final products to know what might be different.

Happy hunting,

Bill

On Thu, 4 Sep 1997, George H. Balazs wrote:

> Bill- Water-under-the-brigde. But do you have any notion as to why the
> coil ended being built larger than what I specified?
>
> As I said in my other message, we will hope for the best (i.e.-
> encountering LARGE turtles). Aloha, George
>
> ```
> ****************************************
> *       George H. Balazs, Leader       *
> *   Marine Turtle Research Program     *
> *  National Marine Fisheries Service   *
> *        Honolulu Laboratory           *
> *         2570 Dole Street             *
> *   Honolulu, Hawaii 96822-2396 USA    *
> *        Tel:(808) 943-1240            *
> *        Fax:(808) 943-1290            *
> *Email: gbalazs@honlab.nmfs.hawaii.edu*
> *                                      *
> *          Deputy Chairman             *
> *       IUCN/SSC Marine Turtle         *
> *          Specialist Group            *
> ****************************************
> ```
>
>

William P. Irwin
Department of Biology
CB# 3280, Coker Hall
University of North Carolina
Chapel Hill, NC 27599-3280

wpirwin@email.unc.edu

I speak the truth
(but you should think for yourself)

Date: Mon, 26 Jan 1998 15:08:01 -0500 (EST)
From: michael salmon <salmon@fau.edu>
To: "George H. Balazs" <gbalazs@honlab.nmfs.hawaii.edu>
Cc: klohmann@email.unc.edu
Subject: Re: shape for power pack

George:

Thanks for your latest.

I have your wooden model. Larry can make a shape for the power pack that's a bit smaller in length and width (assuming a rectangle), but slightly more elevated (1.6" high, as opposed to your satellite model at 1.25 " high). It could be shaped to fit against your model, or to be placed elsewhere on the carapace. That's your call, and so are the shape specifics.

So please design another wood model and send it to me!

Thanks!

22

> ----------
> From: Larry Taylor
> Sent: Thursday, September 04, 1997 5:15 PM
> To: 'George H. Balazs'
> Subject: RE: Need Coil Conventions
>
>
>
> George, you are correct. The potting mold did increase the width ... error here at HBOI. If you get in the field and the size is slightly too large, trim the outside with a pen-knife. There is extra potting on the outside. If you must trim and get down to the wire(without knicking it) then brush on some of the 3M Skotchkote and give it a try. These problems always seem to crop-up when the schedules are tight and there is little time for checks and quality control.
>
> Good Luck !!
>
>
> In addition: the coils can be somewhat bent as needed and will keep their shape as you can see by viewing the un-potted units. With more time, the potting could have been done in multiple thin dips and kept its cross section to a minimum. Also, if we ever plan another outing, I believe that we could include a portable (if crude) magnetometer in your field kit to actually verify magnetic field before the coil is attached.
>
>
> ----------
> From: George H. Balazs [SMTP:gbalazs@honlab.nmfs.hawaii.edu]
> Sent: Thursday, September 04, 1997 12:56 PM
> To: Ken Lohmann
> Cc: Hawaii Preparatory Academy; Larry Taylor; Salmon, Michael; WPIrwin@email.unc.edu
> Subject: Re: Need Coil Conventions
>
> Colleagues- I need an answer in the next 12 hours. Please send by email
> or fax. Aloha, George
>
> PS I have just realized that the head coil are NOT the size I specified
> in my drawing and fax. They are about 15% larger. I have no idea how
>
> this could have happened since I was absolutely specific in what the maximum size had to be. Whether or not they will fit on the turtles we
> encounter remains to be seen. I'll tell you-all when we return a week
>

Should have been "dipped" like Samples sent!

Date: Wed, 28 Jan 1998 10:05:48 -0500 (EST)
From: michael salmon <salmon@fau.edu>
To: gbalazs@honlab.nmfs.hawaii.edu
Subject: Re: coil

>Date: Wed, 28 Jan 1998 09:44:44
>To: Ken Lohmann <klohmann@gibbs.oit.unc.edu>
>From: michael salmon <salmon@fau.edu>
>Subject: Re: coil
>
>Ken!
>
>Gee, don't you spend 6 h/d on your email???!!! It certainly is a productive way to spend time. I think you're right, and that we should go with another round of "carapace coil" mounting. But perhaps two more would be sufficient, saving one power pack for a "head" mount.
>
>Also like the idea of measuring the residual field left by the battery after it's gone thru a service cycle. We can do this once Larry finishes modifying the box and returns the power packs.
>
>And on a totally unrelated topic...Are you coming to the Turtle meetings?
>
>Mike

Date: Tue, 16 Sep 1997 13:39:07 -1000
From: Marc Rice <mrice@hpa.edu>
To: "George H. Balazs" <gbalazs@honlab.nmfs.hawaii.edu>
Subject: Re: Turtle Coil field results.

George,

I concur with everything you said regarding the turtle coil driver and the coil. I believe that the size of the driver could/should reduced vertically (lower profile) and, as you mentioned made to "hide in the lee" of the Sat tag. Furthermore, as you indicated during the trip, why was the case so heavy. A much thinner case good to 100' or so would have been more that adequate. If protection from banging is an issue, we can strengthen the case with fiberglass in the exposed areas.

Coil size: The coil needs to be smaller so that it fits easily within the confines of the skull (obviously, dipping instead of pouring the potting mixture would be good). I just thought that it might also be great if there was a "plug in" type connector coming directly off of the coil. That would mean that the coil is totally independent of the connecting wire while it is being attached and there would be no drag or pressure on the coil from the wire. Once the coil was attached securely, we could "plug" the wire into the coil and waterproof the plug just as we did with the splices. In this way, with a smaller coil and no wire connection, we might be able to connect the coil to the head (the retraction of the neck would not hit a "nipple" or wire extension and bouncing the head off the side of the box would not actually hit the coil because it would be smaller and independent). Also, I do believe that there may be some sort of super glue material that would allow us to "spot weld" the coil to the head so that we can then glass it on with relative security from movement.

I hope this may be of some use. I keep dreaming about our frustration and efforts with V82. Sooner or later, someone will come up with a solution to the problem.

Sorry to take so long to respond on this. By the way, thanks for the Neithammer paper- looks great and I will read it soonest possible.
Aloha,
Marc

Date: Tue, 6 Jan 1998 14:42:51 -1000 (HST)
From: "George H. Balazs" <gbalazs@honlab.nmfs.hawaii.edu>
To: Mike Salmon <salmon@acc.fau.edu>, Ken Lohmann <klohmann@email.unc.edu>
Cc: Marc- HPA Rice <mrice@hpa.edu>
Subject: Tracking completed.

Mike and Ken (cc Marc Rice):

Our turtle 24195 has now completed her migration, having successfully made a landfall at Kauai on 12/28/97. During the trip she covered 3900 km over a 94 day period. In contrast, satellite tracked turtle 24196 also migrated to Kauai, taking the "normal" FFS to main islands route consisting of only 1000 km in 20 days.

I'm faxing both of you copies of the migration maps for the two turtles. The points where the TCD went on and off for its last cycle are marked on the map for 24195. Compare this segment, where the turtle continued deep south, with the counterpart segment for 24196 where the turtle distinctly turned to the east.

The next step in trying to understand what happened, and why, will involve an analysis of finite oceanic conditions along the pathways taken by each turtle using data available to our lab from the TOPEX satellite. We have an authorized user here at our lab who will do this work for me. I don't know how long it will take, but will contact you again when the results are available. Best regards, George

arch Program

Date: Wed, 7 Jan 1998 12:09:01 -0500 (GMT+5:00)
From: Ken Lohmann <klohmann@gibbs.oit.unc.edu>
To: "George H. Balazs" <gbalazs@honlab.nmfs.hawaii.edu>,
"Salmon, Michael" <SALMON@ACC.FAU.EDU>
Subject: Re: Tracking completed.

Hi George and Mike:

Happy New Year! George -- thanks for the tracks. It is terrific news that our "coil-head" turtle made it back to land and that the transmitter held out to prove it. It would have been very disconcerting to have been left wondering if we had sent her on a one-way voyage, despite our good intentions.

Well, for a first try, you couldn't ask for a better "paired" experiment: two turtles, each apparently heading to the same place. On the surface of it, it certainly looks like the coil had some effect. We'll have to figure out what we think about it all and what our next move should be.

Date: Tue, 16 Sep 1997 13:39:07 -1000
From: Marc Rice <mrice@hpa.edu>
To: "George H. Balazs" <gbalazs@honlab.nmfs.hawaii.edu>
Subject: Re: Turtle Coil field results.

George,

I concur with everything you said regarding the turtle coil driver and the coil. I believe that the size of the driver could/should reduced vertically (lower profile) and, as you mentioned made to "hide in the lee" of the Sat tag. Furthermore, as you indicated during the trip, why was the case so heavy. A much thinner case good to 100' or so would have been more that adequate. If protection from banging is an issue, we can strengthen the case with fiberglass in the exposed areas.

Coil size: The coil needs to be smaller so that it fits easily within the confines of the skull (obviously, dipping instead of pouring the potting mixture would be good). I just thought that it might also be great if there was a "plug in" type connector coming directly off of the coil. That would mean that the coil is totally independent of the connecting wire while it is being attached and there would be no drag or pressure on the coil from the wire. Once the coil was attached securely, we could "plug" the wire into the coil and waterproof the plug just as we did with the splices. In this way, with a smaller coil and no wire connection, we might be able to connect the coil to the head (the retraction of the neck would not hit a "nipple" or wire extension and bouncing the head off the side of the box would not actually hit the coil because it would be smaller and independent). Also, I do believe that there may be some sort of super glue material that would allow us to "spot weld" the coil to the head so that we can then glass it on with relative security from movement.

I hope this may be of some use. I keep dreaming about our frustration and efforts with V82. Sooner or later, someone will come up with a solution to the problem.

Sorry to take so long to respond on this. By the way, thanks for the Neithammer paper- looks great and I will read it soonest possible.
Aloha,
Marc

Date: Tue, 6 Jan 1998 14:42:51 -1000 (HST)
From: "George H. Balazs" <gbalazs@honlab.nmfs.hawaii.edu>
To: Mike Salmon <salmon@acc.fau.edu>, Ken Lohmann <klohmann@email.unc.edu>
Cc: Marc- HPA Rice <mrice@hpa.edu>
Subject: Tracking completed.

Mike and Ken (cc Marc Rice):

Our turtle 24195 has now completed her migration, having successfully made a landfall at Kauai on 12/28/97. During the trip she covered 3900 km over a 94 day period. In contrast, satellite tracked turtle 24196 also migrated to Kauai, taking the "normal" FFS to main islands route consisting of only 1000 km in 20 days.

I'm faxing both of you copies of the migration maps for the two turtles. The points where the TCD went on and off for its last cycle are marked on the map for 24195. Compare this segment, where the turtle continued deep south, with the counterpart segment for 24196 where the turtle distinctly turned to the east.

The next step in trying to understand what happened, and why, will involve an analysis of finite oceanic conditions along the pathways taken by each turtle using data available to our lab from the TOPEX satellite. We have an authorized user here at our lab who will do this work for me. I don't know how long it will take, but will contact you again when the results are available. Best regards, George

Date: Wed, 7 Jan 1998 12:09:01 -0500 (GMT+5:00)
From: Ken Lohmann <klohmann@gibbs.oit.unc.edu>
To: "George H. Balazs" <gbalazs@honlab.nmfs.hawaii.edu>,
"Salmon, Michael" <SALMON@ACC.FAU.EDU>
Subject: Re: Tracking completed.

Hi George and Mike:

Happy New Year! George -- thanks for the tracks. It is terrific news that our "coil-head" turtle made it back to land and that the transmitter held out to prove it. It would have been very disconcerting to have been left wondering if we had sent her on a one-way voyage, despite our good intentions.

Well, for a first try, you couldn't ask for a better "paired" experiment: two turtles, each apparently heading to the same place. On the surface of it, it certainly looks like the coil had some effect. We'll have to figure out what we think about it all and what our next move should be.

24

Date: Sat, 20 Sep 1997 13:51:40 +0500
From: michael salmon <salmon@acc.fau.edu>
To: "George H. Balazs" <gbalazs@honlab.nmfs.hawaii.edu>
Subject: Re: Larry's message to us of 28 Aug 97

Return

George:

Thanks for your latest. I think to a large extent, our failures stem from the difficulties of distance and perspective. Don't know to what extent you've ever had these problems before, but some years ago Larry constructed something for me while I was working on the Harbor Branch premises, and we STILL had problems communicating effectively. Engineers appear to be dominated by "fear of failure" (which means that something breaks) so they tend toward making things too heavy or too large. They don't think about, and perhaps have no experience with, live animals and how they react to these things.

Ken, you may recall, has some of these qualities (tho he is much better than Larry!). That "thing" he put on the loggerhead in So. Carolina is a shining example..."perfect" in terms of the field it produced, but entirely unrealistic attached to a living creature. I actually think even the present coils, which were too large, should as a first approximation have been much reduced in size. The turtle's brain could have been surrounded by something much smaller, centered immediately over the midline. I've asked Ken what he thinks of this idea. If his response is positive, that will also mean we can reduce the size of the battery package.

Anyway, there's not much we can do about the past except try to improve things for the next go-around. And I hope you're still willing to give this another try. I've paid Larry (Harbor Branch) $3000 of the total bill ($4000), and won't come up with the remainder until they meet the specs. you originally requested for size, weight, etc. of the powerpack. And of course, there is no excuse for sending you oversized coils.

So how about returning everything you have left to Larry for another try. Incidentally, when is the next "window" of opportunity to do this again? Next year?

Are you willing to give it another go, assuming National Geographic will allow us?

Mike

Date: Mon, 15 Dec 1997 11:14:37 -0500
From: michael salmon <salmon@acc.fau.edu>
To: "George H. Balazs" <gbalazs@honlab.nmfs.hawaii.edu>
Cc: Ken Lohmann <klohmann@gibbs.oit.unc.edu>
Subject: NG project

George:

What's the latest on 24195?

We need to do some thinking about the project. Thus far, we've spent $3000 of the total allocated, and (not for lack of trying!) haven't got much to show for it. I'd like to get the remaining units returned and modified according to your original specifications so that we get exactly what we want. That will also include a significant reduction in the size of the coils.

But all that assumes you are willing to try again. Are you, in spite of 24195? And if the answer is yes, can we possibly make more than one trip to FFS to increase our chances of success? Can Ken and/or I join you there?

Mike

CONTINUED FROM page 13

NIGHT 3

MARC saw a basking female NO "V" Mototool at SEP Mid-afternoon, AREA 7

9-7-97 Sunday Night

9:30pm Turtle newly up SEP for nesting. Newly TAgged

CCL=98.5cm

9/8/97 Monday successfully nested by MACHINERY

LFL 2-T
RFL 4-T
RH 5-T
LH 3/4 AMPUTATED - HEALED

(3-T Lost - NEW TORN Slit)

9/8/97 Second transmitter deployment

827 AM Turtle up Area 17-SP Monday Turtle in box.

ID 24196 3/3 ST 14 Sys. 378628A

"ON" 7 AM and confirmed with receiver.

CCL = 89.0 x 84.0
SCL = 81.8
Notch = 81.5

finished 855am Eastomer 2-3 oz 6 drops ST 14 w/ Antenna posterior.

finished 912AM 1st Application of cloth-Resin 4-wide around edge folded over top a short distance & a rolled piece of cloth immediately anterior of antenna across width of transmitter.

947AM we FINISHED Resin & cloth #2 2-1¼" across, 1-1.5" length 2 covering "anterior" surface + one over "808943-19" My Card 24196"

GO TO p. 27

Need MARC'S unit → Super VHS-C "Compact" "JVC" = SONY HI-8

9-8-97 Found DATA Logger tied to stake
Monday night next to nesting site of
24196 - at surface and
plastic torn, Does not Blink. (Hobo)
NOT WORKING 1996 Hobo
E-~~X~~ (3) #17469 "HTI
BBA 473 E7 correct -05 +37°C
BUT FROM 1996

Needs
CHAIRS
"Mocha Express" Made in Italy
(Marc pressurized coffee pot)
- Extra clips for paravane + line BLACK
- BABY WIPES; freeze dried camping food; powdered milk/granola
- Lipton's ONION SOUP; SUN Flower Seeds
- peanut butter/Guava jam/Saloon crackers
- Coleman propane stove

This entry is a repeat of the one on page 13

9/8/97 Monday Late afternoon excavation of more (TWO) data loggers
- E6 FFS#10, 17474, BBA 475
- E7 (Stowaway - Red plastic) 71049
- E8 FFS#7 17471 (Hobo)

ALL Three above were buried to depth of black MARK (deepest) on cord.

[So far = E1, E3, E4, E6, E7, E8] MISSING E2, E5

Night 3

9/7 Sunday - V 82 10pm to Midnight seen up in area 1 - resting, but not successful. Photos. NO IMPACTS TO TCD or Transmitter

FROM p. 25 ST-14 24196 3/3 Second transmitter deployment (reversed) 3/3
System 3782628A

9/8/97 10:14 hrs DNA Biopsy from left hind flipper - placed in salt pack (with hemostat and sissors)

CCC

New Tag RH - 6-T 89.0 cm (8T-LOST)
" RFL - 7-T 81.8 cm SCL
LFL - 9-T

My business card under 2nd coat of clothing.

9/8 Monday 10:29 AM Release N. Shore - Photos. BLACK Antifouling painted as whole unit.

After Rice/Balazs 5-11 Sept TRIP
- 2 STOWAWAYS ON TERN
4 HOBOS, 1 STOWAWAY ON EAST
(TWO ACCOUNTED FOR THAT WE REBURNED).

28
24196
From page 113

24196 Date : 29.01.98 07:22:44 LC : A IQ : 00
Lat1 : 21.083N Lon1 : 156.613W
162 34459 246 8276
00 00

24196 Date : 29.01.98 18:19:39 LC : B IQ : 00
Lat1 : 21.104N Lon1 : 156.740W
165 653 715 30
00 01

24196 Date : 27.01.98 18:41:28 LC : 3 IQ : 60
Lat1 : 21.095N Lon1 : 156.748W
166 51 455 47
00 00

24196 Date : 27.01.98 17:34:18 LC : B IQ : 00
Lat1 : 21.105N Lon1 : 156.736W
166 468 455 47
00 00

24196 Date : 30.01.98 18:05:29 LC : B IQ : 00
Lat1 : 21.088N Lon1 : 156.113W
167 167 149 140

24196 Date : 30.01.98 19:44:20 LC : B IQ : 00
Lat1 : 21.093N Lon1 : 156.102W
168 21 149 140

24196 Date : 30.01.98 23:17:13 LC : B IQ : 00
Lat1 : 21.061N Lon1 : 156.065W
170 119 149 140

24196 Date : 31.01.98 11:49:56 LC : B IQ : 00
Lat1 : 21.135N Lon1 : 155.974W
166 69 165 129

24196 Date : 31.01.98 17:54:06 LC : B IQ : 00
Lat1 : 21.148N Lon1 : 155.920W

24196 Date : 01.02.98 04:59:44 LC : 1 IQ : 50
Lat1 : 21.184N Lon1 : 155.790W
166 12 118 180

24196 Date : 01.02.98 05:07:44 LC : B IQ : 00
Lat1 : 21.159N Lon1 : 155.855W
166 15 118 180
00 01

24196 Date : 02.02.98 00:37:04 LC : B IQ : 00
Lat1 : 21.154N Lon1 : 155.699W
169 120 182 112

24196 Date : 01.02.98 17:39:30 LC : B IQ : 00
Lat1 : 21.205N Lon1 : 155.736W
166 77 182 112

Mototool V511 = 4th lateral Right ST-14
3/3 " "

9/9/97 (see page 31) 24197 ON " 7 AM HST
TUES AM Sys. 370126 A

3rd Transmitter Deployment

ATTAched Reversed. Visitors from Tern
Allison ①Veit, ②LEE, ③Bryan, ④Vanessa, ⑤Mellis~~a~~ JESSICA STEP 1. SAND
815 Am. START - STEP 2 ELASTOMERE 7 drops. STEP 3 TRIM SAND
STEP 4. 1st RESIN & cloth 4 wide on each side. Step 5 - 2nd resin 1-cigar 1 15" - 2 - 14" across, 1 lenght
+ another front piece. + Angling back, cross piece over cigar
My card under second resin, solidifying resin + gobbed over cigar.
"Cloth cylinder" rolled tight and taped w/masking tape.
∴ TWO Resin Steps ONLY

Duct TAPE used to cover saltwater switch screw heads.

9/9/97 Tuesday Released - AREA 5 1019 AM

No photos at release by me.
Black anti fouling paint covering entire transmitter.
Close-up photos while in box.

Biopsy Taken from hind flipper tagging area using scissors and hemostat. into salt.

FROM June 97 ~~data sheets~~:
SCL = 8?.D
CCL = 9?.D

6/29/97 cataloged nesting at East
New tags

746-T	LHF
747-T	RHF
748-T	LFL
749-T	RFL

24196 Date : 04.02.98 00:13:20 LC : A IQ : 00
Lat1 : 20.249N Lon1 : 155.258W Lat2 : 22.989N Lon2 : 142.760W
169 31 192 108
00 00

24196 Date : 04.02.98 12:50:31 LC : B IQ : 00
Lat1 : 19.933N Lon1 : 155.092W Lat2 : 17.924N Lon2 : 146.072W
Nb mes : 002 Nb mes>-120dB : 000 Best level : -126 dB
Pass duration : 061s NOPC : 2
Calcul freq : 401 649741.4 Hz Altitude : 0 m
166 3005 38148 3290
03 44

24196 Date : 06.02.98 07:29:02 LC : Z IQ : 00
Lat1 : ??????? Lon1 : ????????
161 912 313 67
00 00

24196 Date : 08.02.98 13:48:54 LC : B IQ : 00
Lat1 : 19.807N Lon1 : 154.907W
165 06 286 72
00 01

24196 Date : 09.02.98 17:43:06 LC : 1 IQ : 60
Lat1 : 19.735N Lon1 : 155.010W
165 1021 199 107
00 00

compare!

24196 Date : 09.02.98 19:20:16 LC : B IQ : 00
Lat1 : 19.744N Lon1 : 155.007W
165 468 199 107
00 00

24196 Date : 10.02.98 11:42:55 LC : B IQ : 00
Lat1 : 19.732N Lon1 : 154.989W
164 592 2187 112
00 00

24196 Date : 13.02.98 18:31:21 LC : A IQ : 00
Lat1 : 19.683N Lon1 : 154.981W
165 66 379 56
00 00

24196 Date : 14.02.98 00:01:36 LC : A IQ : 08
Lat1 : 19.630N Lon1 : 154.920W
167 46 379 56
00 00

24196 Date : 14.02.98 05:46:53 LC : B IQ : 00
Lat1 : 19.576N Lon1 : 154.922W
165 63 120 6944
01 57

need ant. to placement

24196 Date : 15.02.98 17:18:18 LC : 3 IQ : 50
Lat1 : 19.696N Lon1 : 154.981W
163 05 315 68
00 00

24196 Date : 16.02.98 19:36:45 LC : 1 IQ : 60
Lat1 : 19.733N Lon1 : 155.019W
166 1270 266 80

GO TO P. 38

NIGHT 4 WALK RECORD

9/8/97 MONday 939PM 9/9 1205AM A1 690-T SCL-88.5 SPLIT LH
MOTOTOOL -V501 on Sandpoint

MOTOTOOL -V511 930PM +1154PM Boxed 11PM Area 5 EGGS laid.

MOTOTOOL 1030PM +1154PM CRAWLING SCL=88 AREA 6 MOTOTOOL V426

MOTOTOOL 1104 PM V511 FLASH photos + Boxed for sat. Trans.

NO MOTOTOOL 1114 PM EGGS A8
Turtle covering by machinery
Covering eggs - Photos w/hatching.
CCL - 110.5 cm
SCL - 102 cm RH 1/4 missing healed
newly tagged RFL 10-T
LFL 11-T
LH 12-T
RH 13-T

MOTOTOOL V449 Area 8 1142PM near the
above turtle - ADDED TAG
595-T LH RFL 14-T
SCL = 87.0 cm

9/9/97 TUESDAY NO MOTOTOOL 10532 RFL
10531 LFL
EGGS LAID 1205 AM A3 SCL = 88.5
CCL = 97.0

MOTOTOOL 1205 AM A1
V475 covering eggs
SCL - 95 cm
CCL - 102 cm LH 600-T

9/9/97
TUESDAY

V412 dead turtle =

SCL = 94 cm.
CCL = 100

Humerus - both bagged - + 2 tags hinds
Jawbone + skull -

4 chunks of concrete + pipe wrapped in Netting (camo flage netting)
Threw dried front flippers into sea,
buried remains at site,
dragged netting to 55 gal barrel (more of same already inside).
If this had entangled and killed a Centrus monk seal?!

9/9/97
TUES Reburied Hobo E8 1906 h
near machine wrapped on rusted post

E7 Stowaway Z960
1916 hours

9/9/97 Tues. first walkaround of night — NIGHT 5 — V426 A 2130 hours into Box

2202h V507 SP
LH freshly bitten

(722T) RH (723-T) LH

30" high
50" long
33" wide

CCR = 98

RAIN!

Turtle container
- width could be 4" less
- Length could be 15" less
36.5"
60"

H = 30"
W = 36.5
L = 60"

wed. 9/10/97 Antenna 24198 on 7Am
825Am start ANTENNA
Sys 370130 A
SCL- 87.5
SAND Carapace
SCL- 94

Recaptured 6/00 nesting on EAST — NO TRANSMITTER - PATCHES OF GLASS

(MOTO) V426
573-T LH

2-3oz resin 35 drops catalyst — no 2 LATERAL left 13 DBs — 2nd MARG Right 5 DBs

902AM FINISH first resin coat, — wide on each of 4 sides, and 15" strip down center.

926 Am start second resin. 2 oz 35 drops

932 Am 3 strips 14" crossways, one w/ includes hole for antenna

 STI4 313 24198 (Continued)

9/10/97 Gob of curing resin
Wednesday placed next to antenna
along antenna's end,
painted top and
front between
952AM screws
PAN Biopsy taken from LH-

Added -
15-T RFL
16-T RH

1005 AM release - off South
Shore.

Tags left at Tern:
17-T thru 25-T
+ 2-C thru 100-C

need to enter in Tagging log

Depart East ~ 1PM
"SS Midway" arrived w/ USCG
~90' employees, Navy. Unloaded all gear, cleaned and
repacked.
Lumber unloaded to build
addition to boathouse.
Leona here to cook for 4-5 days

Need Japanese film video FFS – Brenda
Tim

website =
Planet 1 Phone
ComSAT 6560 Rock Spring Drive
Bethesda, Maryland 20817
800-316-7049
301-428-2500
FAX 301 601-5953

1626-1660 MHz ~22,000 mile orbit

Customer Care 800-316-7049
outside US (301) 428-2500

9/10/97 walked Tern runway after
Wednesday dinner. Did goat walk
Tern beach – Allison Veit hunt
them back during offloading of
gear. 9/8 Tern walk – no
nesters recorded.

Thursday
9/11/97 – up for breakfast ~8:15am
~930am walked South Beach Tern
to excavate data recorders –
left T1 (retrieved and
T4 (not found).
Obtained T2 & T3 for
Honolulu – both onset Stowaways
(red plastic).

9/11/97
Thursday

930 Am T1 stowaway
shallow burial - dug up and reburied
at 50cm T1 stake
Logger

TO BLACK MARK LINE ON
T2 940 Am excavation
return TO Honolulu
Logger

" T3 945 Am followed
" to Honolulu
"

Discussions w/ vet (UF) Melissa Shaw (Jamar working w/Mitch)
- know Elliott, Larry etc.

Depart Tern ~1230pm. ARRIVE Lagoon 4PM. photos of W. Beach Lagoons →
770 lbs (includes gear)
Vanessa 170 (Body + gear)
Rice 4 Balazs 380
gear = 320 lbs / 770 lbs Total

T4 only known to Allison

Marc & I
1030 Am walked N. Sea Wall of Tern -
no juvenile greens seen. Need
High tide - later in day? Photos of
deteriorating seawall. Lots of debris
showing  Bronze (Amplifier Tubes?)
(Batteries, transformers). Easy to
see how juveniles (and hatchlings!)
now wash through ("over") seawall.
3 hatchlings found in pool - 1 dead - 2 released after photos.
USCG cup found, w/ broken handle.

Volunteer USFWS
9/11/97 Thursday

Volunteer USFWS Tern

Plane Back from Tern 9/11/97. Will work on Laysan for FWS in Oct, '97

sent

Interested in Tern monitoring 6/98

Vanessa E. Pepi
11501 Brookview Rd
Woodbury, MN 55129 ← at Parents
(612) 436-5961
will be on Oahu mid Oct - early Nov
on Laysan Isl till March '98

copy from

Univ. Minnesota

9/11/97 Thursday → Alden (Koko head taxi) to Aloha Air (for Mare Rice) then to Hawaii Kai.

$ 8 + TV $ 4 = 12

need
MAEC
- pelagic tracks
- Tern Is. nesting paper
- Argos data for 9/97 East
- Temp. data from loggers.

38

FFS#42 Expedition 5-11 Sept. 97 EAST ISCAND

DNA Samples Sent TO PETER DUTTON (skin biopsies in salt)

sat. tag #	Date	SCL	CCL	
24196	9/8/97	81.8cm	89.0cm	Nesting female
24197	9/9/97	89.0cm	95.0cm	» »
24198	9/10/97	87.5cm	94.0cm	» »

Dups in DMSO via Honolulu

NMFS, HONOLULU LAB
Marine Turtle Research
2570 Dole Street
Honolulu, HI 96822-2396

From 1.30

```
24196 Date : 18.02.98 19:13:58 LC : A IQ : 00
 Lat1 : 19.721N Lon1 : 155.217W
 164 359 502 42
 00 00
24196 Date : 22.02.98 00:16:10 LC : 1 IQ : 50
 Lat1 : 19.733N Lon1 : 155.029W
 166 154 201 106
 00 00
24196 Date : 23.02.98 07:18:41 LC : Z IQ : 00
 Lat1 : ??????? Lon1 : ????????
 165 802 687 32798
 02 00
24196 Date : 20.02.98 18:45:27 LC : B IQ : 00
 Lat1 : 19.773N Lon1 : 155.034W
 160 53 499 43
 00 00
24196 Date : 23.02.98 12:36:59 LC : B IQ : 00
 Lat1 : 19.743N Lon1 : 155.033W
 164 212 687 30
 00 00
24196 Date : 23.02.98 19:48:33 LC : 0 IQ : 50
 Lat1 : 19.727N Lon1 : 155.028W
 164 901 438 49
 00 00
24196 Date : 24.02.98 01:32:54 LC
 Lat1 : 19.731N Lon1 : 155.048W
 165 1068 438 49
 00 00
24196 Date : 24.02.98 19:33:46 LC : B IQ : 00
 Lat1 : 19.736N Lon1 : 155.034W
 164 590 474 45
 00 00
```

FFS #42

EAST I3.

DATE/NIGHT	Night	Turtles Ashore	No. w/ MotoTool	No MotoTool
9/5-9/6/97	1			
9/6-9/7/97	2			
9/7-9/8/97	3			
9/8-9/9/97	4			
9/9-9/10/97	5			

24196 Date : 25.02.98 17:46:49 LC : B IQ : 00
Lat1 : 19.760N Lon1 : 155.056W
165 1413 1173 18
00 00
24196 Date : 28.02.98 00:54:09 LC : A IQ : 00
Lat1 : 19.739N Lon1 : 154.976W
166 56 311 69
00 00
24196 Date : 28.02.98 18:41:05 LC : Z IQ : 00
Lat1 : ??????? Lon1 : ????????
164 182 382 56
00 01
24196 Date : 03.03.98 18:13:20 LC : A IQ : 00
Lat1 : 19.752N Lon1 : 155.069W
164 336 537 40
00 00
24196 Date : 03.03.98 19:49:07 LC : B IQ : 00
Lat1 : 19.731N Lon1 : 155.035W
165 420 537 40
00 00
24196 Date : 04.03.98 00:11:15 LC : B IQ : 00
Lat1 : 19.678N Lon1 : 155.077W
00 00
167 464 537 40

24196 Date : 04.03.98 05:16:45 LC : B IQ : 00
Lat1 : 19.753N Lon1 : 155.025W
36 00
90 230 689 00
24196 Date : 05.03.98 17:47:41 LC : A IQ : 00
Lat1 : 19.731N Lon1 : 155.018W
164 863 397 54
00 00

24196 Date : 04.03.98 05:22:17 LC : B IQ : 00
Lat1 : 19.755N Lon1 : 155.016W
166 172 230 4186
00 00

40 sp. Fedexed to Peter Dutton 9/30/97

NMFS, HONOLULU LAB
Marine Turtle Research
2570 Dole Street
Honolulu, HI 96822-2396

50 Skin biopsies collected from adult female green turltes at French Frigate Shoals during the 1997 nesting season

Mototool ID	Flipper Tag ID	Location of Biopsy
V41	U140	RHF
V43	A581	LHF
V44	U773	RHF
V46	A928	LHF
V49	U303	RHF
V53	F705	RHF
V54	142C	RHF
V58	Y628	LHF
V59	U220	RHF
V60	U645	LHF
V67	159C	LHF
V69	F750	LHF
V92	F729	LHF
V95	722C	LHF
V99	734C	LHF
V100	F84	LHF
V104	F739	RHF
V108	A432	LHF
V113	U164	LHF
V122	784C	LHF
V125	792C	LHF
V131	U977	LHF
V142	828C	LHF
V152	846C	LHF
V186	907C	LFL
V207	948C	LHF

24196 Date : 05.03.98 19:28:28 LC : 0 IQ : 60
Lat1 : 19.741N Lon1 : 154.967W
182 18725 37449 9362
01 13
24196 Date : 06.03.98 17:00:23 LC : A IQ : 00
Lat1 : 19.736N Lon1 : 155.031W
163 23 261 82
00 00

NMFS, HONOLULU LAB
Marine Turtle Research
2570 Dole Street
Honolulu, HI 96822-2396

50 Skin biopsies collected from adult female green turltes at French Frigate Shoals during the 1997 nesting season

Mototool ID	Flipper Tag ID	Location of Biopsy
V212	957C	LHF
V257	245T	LHF
V278	282T	LHF
V284	301T	LHF
V327	391T	RHF
V349	U452	LHF
V400	511T	LHF
V410	555T	RHF
V423	571T	LHF
V431	576T	LHF
V434	578T	LHF
V438	583T	LHF
V446	590T	RHF
V447	591T	LHF
V451	598T	LHF
V454	659C	LHF
V456	661C	LHF
V457	662C	LHF
V458	663C	LHF
T55	F952	LFL
T136	610C	LHF

Transmitter-tagged nesting green turtles biopsied during September 1997

Satellite Tag	SCL	Date Collected
24196	81.8	9/08/97
24197	89.0	9/09/97
24198	87.5	9/10/97

24196 Date : 06.03.98 19:15:03 LC : B IQ : 00
Lat1 : 19.745N Lon1 : 155.009W
165 1173 18693 2391
03 42

TOP 73

42

Date: Mon, 15 Sep 1997 10:09:25 -0400
From: Larry Taylor <Taylor@HBOI.edu>
To: "'George H. Balazs'" <gbalazs@honlab.nmfs.hawaii.edu>
Cc: 'Michael Salmon' <SALMON@ACC.FAU.EDU>, Frank Caimi <Caimi@HBOI.edu>
Subject: Turtle Coil field results.

George,

We share your disappointment and do concur with your decisions that you made in the field. I was concerned with the 'splicing' operation because we know that something that is elementary when tried in the lab can be elevated to nearly impossible when tried under field conditions.

Here are some ideas for evaluation:
1) Review the dimensions of the unpotted coil that I sent you. My judgement is that the coil met the specifications but that the potting did not. The schedule forced us to mold the coil in one step rather than in multiple steps which would have yielded minimum profile. Also, we have ideas for a flexible silicone mold which would yield more desirable results.
2) Advise further as to the problem with the molded "tail" section (strain relief). It seems from your observations that this feature must go.
3) Since the design of the of the driver/timer electronics is complete, repackaging in a smaller housing is now feasable. A sketch will be in the documentation package to be shipped on Friday, 9/15/97.

Date: Thu, 25 Sep 1997 13:01:27 +0500
From: michael salmon <salmon@acc.fau.edu>
To: "George H. Balazs" <gbalazs@honlab.nmfs.hawaii.edu>
Subject: National Geographic Project

Redirect

Hi, George:

When time permits, would you please send me that preserved (adult) green turtle head, and one skull? I never got to see the former and rather soon after they arrived, sent the skulls to Ken. I'd like another look.

Larry and I will be getting together after he receives the left over power packs and coils from you. I intend, this time around, to insist that he meet your specifications on the power packs. Certainly, he will have to if Harbor Branch is to receive final payment. I also want to rethink the coil design. I think we can get away with something much smaller, less intrusive, and more easily attached to the head. Will be working with Bill and Ken on this and, once ideas are more firm, will send you a prototype to examine and comment upon...

Meantime, please remember that we have a budget and that thus far, you have asked for nothing from it. Do you have some expenses which need to be covered? If so, all I need is a request and some receipts.

Mike

Date: Tue, 30 Sep 1997 10:21:30 -0400 (EDT)
From: michael salmon <salmon@ACC.FAU.EDU>
To: "George H. Balazs" <gbalazs@honlab.nmfs.hawaii.edu>
Subject: Re: Turtle Project

Redirect

George!

Just got those photos! Wow, does that place look barren! Anyway, I can now see (for the first time) why you wanted a smaller, smoother and more streamlined package. You'll get it next time around, guaranteed. Suppose the power pack was identical in size/shape to your transmitter pack so the two could be placed one behind the other (i.e., touching on one side). Would that work?

As I indicated earlier, Ken and I are exchanging emails regarding modified coil designs (much smaller, and totally enclosed in plastic shaped to the head surface), as well as electromagnets. By the latter, I mean some material that will respond to a DC voltage from our power pack by permanently distorting the magnetic field. Presumably, this alternative (to a coil) could be smaller still, yet effective.

When we come to some "meeting of the minds", I'll send you an email summarizing things. You and I also have some items to discuss, esp. regarding scheduling of our next "go-around" at French Frigate Shoals...but that can also wait.

Thanks again for the photos. Hope all goes well.

24195 Date : 07.09.97 13:28:18 LC : 2 IQ : 50
Lat1 : 23.788N Lon1 : 166.206W
161 00 00 00
00 00

24195 Date : 07.09.97 17:54:41 LC : 1 IQ : 58
Lat1 : 23.784N Lon1 : 166.197W
160 00 00 00
00 00

24195 Date : 08.09.97 13:17:34 LC : 3 IQ : 58
Lat1 : 23.789N Lon1 : 166.210W
162 05 99 125
00 00

24195 Date : 11.09.97 00:10:14 LC : 1 IQ : 50
Lat1 : 23.790N Lon1 : 166.226W
167 73 202 103
00 00

24195 Date : 14.09.97 13:47:06 LC : Z IQ : 00
Lat1 : ??????? Lon1 : ????????
163 675 196 107
00 01

24195 Date : 14.09.97 12:09:49 LC : Z IQ : 00
Lat1 : ??????? Lon1 : ????????
163 597 196 107
00 00

24195 Date : 14.09.97 18:39:06 LC : Z IQ : 00
Lat1 : ??????? Lon1 : ????????
164 118 196 107
00 00

24195 Date : 13.09.97 01:26:29 LC : B IQ : 00
Lat1 : 23.533N Lon1 : 166.482W
164 05 154 135
00 01

24195 Date : 14.09.97 01:20:50 LC : Z IQ : 00
Lat1 : ??????? Lon1 : ????????
165 791 205 101
00 00

24195 Date : 15.09.97 18:14:29 LC : B IQ : 00
Lat1 : 23.947N Lon1 : 166.340W
163 957 213 98
00 00

24195 Date : 16.09.97 01:00:13 LC : B IQ : 00
Lat1 : 23.819N Lon1 : 166.236W
165 808 298 70
00 00

24195 Date : 16.09.97 13:24:00 LC : Z IQ : 00
Lat1 : ??????? Lon1 : ????????
164 723 509 41
00 00

TURTLE Coil DEPLOYED "ON" (10-DAYS SINCE START OF

24195 Date : 17.09.97 13:23:19 LC : B IQ : 00
Lat1 : 23.490N Lon1 : 166.190W
163 985 362 58
00 00

ON FOR 5 days

24195 Date : 19.09.97 02:00:52 LC : 0 IQ : 50
Lat1 : 23.795N Lon1 : 166.157W
174 34 235 89
00 00

24195 Date : 19.09.97 06:06:08 LC : 1 IQ : 50
Lat1 : 23.794N Lon1 : 166.219W
164 35 235 89
00 00

24195 Date : 19.09.97 00:29:27 LC : B IQ : 00
Lat1 : 23.693N Lon1 : 166.348W
165 380 235 89
00 00

24195 Date : 19.09.97 12:56:21 LC : 1 IQ : 58
Lat1 : 23.789N Lon1 : 166.225W
163 72 76 73
00 00

24195 Date : 19.09.97 18:32:27 LC : 1 IQ : 68
Lat1 : 23.742N Lon1 : 166.174W
171 88 24652 14409
00 04

24195 Date : 20.09.97 01:55:21 LC : B IQ : 00
Lat1 : 23.815N Lon1 : 166.186W
168 166 119 164
00 00

24195 Date : 20.09.97 18:13:34 LC : Z IQ : 00
Lat1 : ??????? Lon1 : ????????
163 1017 184 93
02 00

24195 Date : 21.09.97 19:25:12 LC : B IQ : 00
Lat1 : 23.808N Lon1 : 166.295W
164 248 358 59
00 00

24195 Date : 21.09.97 17:51:53 LC : B IQ : 00
Lat1 : 23.808N Lon1 : 165.231W
163 143 358 59
00 01

24195 Date : 21.09.97 23:54:12 LC : B IQ : 00
Lat1 : 23.800N Lon1 : 166.252W
167 302 119 46
00 08

24195 Date : 22.09.97 01:33:01 LC : B IQ : 00
Lat1 : 23.804N Lon1 : 166.165W
164 128 119 174
00 00

24195 Date : 22.09.97 12:21:53 LC : B IQ : 00
Lat1 : 23.765N Lon1 : 166.169W
163 238 128 165
00 00

24195 Date : 22.09.97 14:01:57 LC : B IQ : 00
Lat1 : 23.813N Lon1 : 166.256W
163 238 128 165
00 01

24195 Date : 22.09.97 19:04:44 LC : B IQ : 00
Lat1 : 23.793N Lon1 : 166.197W
164 185 128 165
00 00

24195 Date : 25.09.97 05:32:52 LC : 0 IQ : 56
Lat1 : 23.669N Lon1 : 166.112W
164 204 166 127
00 00

24195 Date : 25.09.97 13:31:37 LC : 1 IQ : 58
Lat1 : 23.653N Lon1 : 166.100W
163 69 34900 60964
00 63

24195 Date : 26.09.97 00:44:48 LC : A IQ : 08
Lat1 : 23.594N Lon1 : 165.843W
164 05 96 222
00 01

24195 Date : 27.09.97 00:37:44 LC : 0 IQ : 50
Lat1 : 23.312N Lon1 : 165.438W
164 66 147 142
00 00

24195 Date : 28.09.97 00:23:36 LC : 0 IQ : 58
Lat1 : 22.816N Lon1 : 165.298W
165 12 144 145
00 00

24195 Date : 27.09.97 18:53:27 LC : 1 IQ : 50
Lat1 : 22.926N Lon1 : 165.313W
163 93 3830 331
00 38

24195 Date : 29.09.97 18:10:35 LC : A IQ : 00
Lat1 : 22.023N Lon1 : 164.987W
163 66 131 158
00 00

24195 Date : 30.09.97 01:43:40 LC : 2 IQ : 68
Lat1 : 21.918N Lon1 : 164.896W
164 06 134 156
00 01

24195 Date : 30.09.97 00:03:31 LC : 2 IQ : 56
Lat1 : 21.935N Lon1 : 164.905W
165 60 134 156
00 00

24195 Date : 30.09.97 23:52:00 LC : B IQ : 00
Lat1 : 21.720N Lon1 : 164.411W
165 91 126 166
00 00

24195 Date : 01.10.97 01:35:48 LC : 1 IQ : 60
Lat1 : 21.656N Lon1 : 164.381W
165 34 126 166
00 00

24195 Date : 01.10.97 14:01:37 LC : B IQ : 00
Lat1 : 21.505N Lon1 : 164.240W
163 09 128 163
00 01

24195 Date : 01.10.97 19:05:26 LC : B IQ : 00
Lat1 : 21.273N Lon1 : 164.117W
164 81 128 163
00 00

24195 Date : 02.10.97 01:23:21 LC : B IQ : 00
Lat1 : 21.154N Lon1 : 163.990W
165 93 119 173
00 00

th 5day on 10/2/97 ~1800h

24195 Date : 03.10.97 05:54:52 LC : A IQ : 00
Lat1 : 20.395N Lon1 : 163.583W
163 08 103 204
00 01

Then permanently off

24195 Date : 04.10.97 01:00:22 LC : A IQ : 00
Lat1 : 20.240N Lon1 : 163.211W
165 100 113 185
00 00

24195 Date : 04.10.97 13:31:51 LC : 1 IQ : 50
Lat1 : 20.429N Lon1 : 165.175W
163 4124 378 1194
00 02

24195 Date : 04.10.97 18:00:27 LC : A IQ : 00
Lat1 : 19.839N Lon1 : 163.020W
163 110 120 170
00 00

24195 Date : 05.10.97 00:49:02 LC : 1 IQ : 58
Lat1 : 19.693N Lon1 : 162.915W
165 05 113 186
00 00

24195 Date : 05.10.97 17:37:21 LC : B IQ : 00
Lat1 : 19.401N Lon1 : 162.722W
164 77 77 36866
00 30

24195 Date : 06.10.97 18:56:55 LC : A IQ : 00
Lat1 : 18.959N Lon1 : 162.329W
128 1519 62779 13723
01 43

24195 Date : 08.10.97 00:18:03 LC : B IQ : 00
Lat1 : 18.529N Lon1 : 161.793W
166 53740 2095 43870
01 27

24195 Date : 08.10.97 01:56:11 LC : A IQ : 00
Lat1 : 18.507N Lon1 : 161.758W
161 142 132 158
00 00

24195 Date : 08.10.97 05:43:09 LC : 0 IQ : 58
Lat1 : 18.427N Lon1 : 161.709W

24195 Date : 09.10.97 01:42:46 LC : B IQ : 00
Lat1 : 18.147N Lon1 : 161.537W
164 44 131 160
00 00

24195 Date : 09.10.97 05:19:16 LC : 0 IQ : 60
Lat1 : 18.134N Lon1 : 161.398W
164 08 131 160
00 00

24195 Date : 09.10.97 12:35:33 LC : 0 IQ : 50
Lat1 : 18.033N Lon1 : 161.402W
164 12 131 159
00 01

24195 Date : 09.10.97 23:53:52 LC : A IQ : 00
Lat1 : 17.822N Lon1 : 161.328W
166 120 128 164
00 00

24195 Date : 10.10.97 01:34:08 LC : 0 IQ : 58
Lat1 : 17.791N Lon1 : 161.323W
164 71 128 164
00 00

24195 Date : 10.10.97 17:28:39 LC : B IQ : 00
Lat1 : 17.689N Lon1 : 161.252W
163 146 132 157
00 00

24195 Date : 11.10.97 06:20:18 LC : B IQ : 00
Lat1 : 17.560N Lon1 : 161.119W
163 13 123 167
00 00

24195 Date : 11.10.97 12:17:28 LC : 1 IQ : 50
Lat1 : 17.472N Lon1 : 161.099W
163 05 120 169
00 02

24195 Date : 11.10.97 13:56:41 LC : 1 IQ : 58
Lat1 : 17.442N Lon1 : 161.118W
163 42 120 169
00 00

24195 Date : 11.10.97 17:08:22 LC : B IQ : 00
Lat1 : 17.349N Lon1 : 161.074W
00 126 120 169
00 35

24195 Date : 11.10.97 18:47:55 LC : B IQ : 00
Lat1 : 17.333N Lon1 : 161.068W
164 126 120 169
00 00

24195 Date : 11.10.97 23:31:03 LC : B IQ : 00
Lat1 : 17.296N Lon1 : 161.077W
166 82 122 173
00 00

24195 Date : 12.10.97 05:58:25 LC : 1 IQ : 58
Lat1 : 17.167N Lon1 : 161.083W
163 60 122 173
00 00

24195 Date : 12.10.97 01:12:49 LC : B IQ : 00
Lat1 : 17.322N Lon1 : 161.050W
165 102 122 173
00 00

24195 Date : 12.10.97 12:05:07 LC : A IQ : 00
Lat1 : 17.121N Lon1 : 161.113W
163 62 120 175
00 00

24195 Date : 13.10.97 05:31:14 LC : A IQ : 00
Lat1 : 16.367N Lon1 : 161.772W
163 07 135 154
00 00

24195 Date : 13.10.97 18:03:55 LC : A IQ : 00
Lat1 : 16.789N Lon1 : 160.864W
163 96 134 153
00 00

24195 Date : 14.10.97 17:42:08 LC : A IQ : 00
Lat1 : 16.493N Lon1 : 160.719W
163 106 32907 144
02 00

24195 Date : 15.10.97 00:39:17 LC : A IQ : 08
Lat1 : 16.439N Lon1 : 160.606W
164 84 135 155
00 00

24195 Date : 15.10.97 17:20:27 LC : A IQ : 00
Lat1 : 16.250N Lon1 : 160.445W
163 94 142 148
00 01

24195 Date : 16.10.97 00:32:22 LC : B IQ : 00
Lat1 : 16.276N Lon1 : 160.278W
164 13 118 169
00 01

24195 Date : 16.10.97 13:02:14 LC : B IQ : 00
Lat1 : 16.078N Lon1 : 160.129W
163 40 132 159
00 00

24195 Date : 17.10.97 00:20:13 LC : 0 IQ : 50
Lat1 : 15.939N Lon1 : 159.930W
164 36 127 163
00 00

24195 Date : 18.10.97 00:04:06 LC : 1 IQ : 56
Lat1 : 15.681N Lon1 : 159.572W
166 05 130 159
00 00

24195 Date : 18.10.97 01:46:27 LC : 2 IQ : 56
Lat1 : 15.669N Lon1 : 159.588W
167 07 130 5272
01 25

24195 Date : 18.10.97 17:54:39 LC : A IQ : 00
Lat1 : 15.435N Lon1 : 159.364W
163 55 111 151
00 00

19595 Date : 19.10.97 01:37:19 LC : B IQ : 00
Lat1 : 10.609N Lon1 : 135.072W
34284 34284

24195 Date : 19.10.97 23:40:54 LC : 0 IQ : 58
Lat1 : 15.053N Lon1 : 158.859W
164 55 128 165
00 01

24195 Date : 20.10.97 01:20:47 LC : B IQ : 00
Lat1 : 15.004N Lon1 : 158.815W
164 27 128 165

24195 Date : 19.10.97 12:29:17 LC : A IQ : 00
Lat1 : 15.163N Lon1 : 159.052W
162 240 148 141
00 00

24195 Date : 19.10.97 05:09:10 LC : Z IQ : 10
Lat1 : 15.402N Lon1 : 159.250W
162 10 124 171
00 01

24195 Date : 20.10.97 12:16:04 LC : A IQ : 00
Lat1 : 14.954N Lon1 : 158.615W
162 11 161 130
00 01

24195 Date : 20.10.97 14:01:38 LC : A IQ : 00
Lat1 : 14.887N Lon1 : 158.622W
162 20 161 130
00 02

24195 Date : 20.10.97 17:12:16 LC : A IQ : 00
Lat1 : 14.903N Lon1 : 158.590W
162 96 4135 49564
01 19

Lat1 : 14.816N Lon1 : 158.470W Lat2 : 11.899N

24195 Date : 21.10.97 01:15:54 LC : B IQ : 00

163 161 131 161
00 00

24195 Date : 21.10.97 05:59:23 LC : 0 IQ : 50
Lat1 : 14.687N Lon1 : 158.385W
162 16 131 161
00 01

24195 Date : 21.10.97 23:23:21 LC : B IQ : 00
Lat1 : 14.639N Lon1 : 157.967W
164 95 121 167
00 00

2 24195 Date : 22.10.97 01:01:32 LC : B IQ : 00
Lat1 : 14.566N Lon1 : 158.076W
163 158 121 167
2 00 00

2 24195 Date : 22.10.97 13:39:39 LC : B IQ : 00
Lat1 : 14.614N Lon1 : 158.079W
162 1413 154 136
2 00 00

24195 Date : 23.10.97 05:12:31 LC : 0 IQ : 50
Lat1 : 14.434N Lon1 : 157.770W
2 162 07 142 148
00 01

1 24195 Date : 23.10.97 11:44:24 LC : B IQ : 00
Lat1 : 14.523N Lon1 : 157.921W
162 08 165 126
00 01

24195 Date : 23.10.97 17:46:18 LC : 1 IQ : 56
Lat1 : 14.386N Lon1 : 157.737W
163 18 165 126
00 00

24195 Date : 23.10.97 11:44:24 LC : B IQ : 00
Lat1 : 14.523N Lon1 : 157.921W
162 08 165 126
00 01

24195 Date : 24.10.97 00:41:03 LC : B IQ : 00
Lat1 : 14.409N Lon1 : 157.752W
164 125 132 153
00 00

24195 Date : 25.10.97 13:02:27 LC : Z IQ : 00
Lat1 : ??????? Lon1 : ????????
162 16 157 133
00 00

24195 Date : 26.10.97 00:15:33 LC : Z IQ : 00
Lat1 : ??????? Lon1 : ????????
164 98 158 134
00 00

24195 Date : 26.10.97 18:20:42 LC : B IQ : 00
Lat1 : 14.233N Lon1 : 157.076W
163 61 176 118
00 00

24195 Date : 27.10.97 00:05:21 LC : A IQ : 08
Lat1 : 14.196N Lon1 : 157.041W
164 82 143 144
00 00

24195 Date : 26.10.97 12:55:02 LC : 0 IQ : 58
Lat1 : 14.248N Lon1 : 157.098W
162 05 176 118
00 00

24195 Date : 28.10.97 01:35:50 LC : B IQ : 00
Lat1 : 14.106N Lon1 : 156.970W Lat2 : 8.433N Lon2 : 177.961E
Nb mes : 002 Nb mes>-120dB : 000 Best level : -127 dB
Pass duration : 231s NOPC : 2
Calcul freq : 401 649639.8 Hz Altitude : 0 m
163 212 34957 5346
00 57

24195 Date : 28.10.97 17:34:38 LC : A IQ : 00
Lat1 : 14.124N Lon1 : 156.925W
162 110 173 120
00 00

24195 Date : 28.10.97 23:43:14 LC : 1 IQ : 58
Lat1 : 14.119N Lon1 : 156.943W
165 16429 1402 9517
00 05

24195 Date : 30.10.97 01:10:43 LC : 0 IQ : 50
Lat1 : 14.150N Lon1 : 156.797W
163 26 161 131
00 00

24195 Date : 31.10.97 01:01:33 LC : B IQ : 00
Lat1 : 14.377N Lon1 : 156.746W
163 122 161 131
00 00

24195 Date : 01.11.97 17:47:38 LC : B IQ : 00
Lat1 : 14.567N Lon1 : 156.440W
162 4217 4322 4192
01 10

24195 Date : 02.11.97 00:46:41 LC : B IQ : 00
Lat1 : 14.511N Lon1 : 157.228W
162 05 161 131
00 02

24195 Date : 02.11.97 17:27:23 LC : B IQ : 00
Lat1 : Lon1 : 156.163W
162 194 192 104
00 01

24195 Date : 04.11.97 01:57:18 LC : B IQ : 00
Lat1 : 14.926N Lon1 : 155.781W

24195 Date : 04.11.97 05:53:40 LC : 0 IQ : 60
Lat1 : 15.060N Lon1 : 155.690W
47 37938 47279 38
01 40

24195 Date : 05.11.97 00:09:26 LC : 1 IQ : 50
Lat1 : 15.085N Lon1 : 155.473W

24195 Date : 05.11.97 12:42:46 LC : 2 IQ : 50
Lat1 : 15.143N Lon1 : 155.277W
164 769 33509 34853
00 03

24195 Date : 05.11.97 18:01:52 LC : A IQ : 08
Lat1 : 15.149N Lon1 : 155.231W
160 26 198 105
00 00

19595 Date : 05.11.97 00:11:03 LC : 0 IQ : 50
Lat1 : 11.873N Lon1 : 139.781W
9653 9653

24195 Date : 06.11.97 00:01:56 LC : B IQ : 00
Lat1 : 15.230N Lon1 : 155.121W
162 285 186 114
00 50

24195 Date : 06.11.97 23:49:34 LC : 0 IQ : 50
Lat1 : 15.332N Lon1 : 154.667W
24195 Date : 07.11.97 01:24:05 LC : A IQ : 00
Lat1 : 15.315N Lon1 : 154.550W
162 05 171 113
00 00

24195 Date : 07.11.97 23:37:02 LC : B IQ : 00
Lat1 : 15.535N Lon1 : 154.397W
162 83 220 95
00 00

24195 Date : 07.11.97 12:17:16 LC : B IQ : 00
Lat1 : 15.430N Lon1 : 154.550W
160 16 1211 114
00 00

24195 Date : 08.11.97 01:16:47 LC : B IQ : 00
Lat1 : 15.558N Lon1 : 154.338W
162 80 220 95
00 00

19595 Date : 08.11.97 01:14:05 LC : 0 IQ : 42
Lat1 : 12.678N Lon1 : 139.919W
40275 40275

Xerox and revive

24195 Date : 08.11.97 12:06:30 LC : 1
Lat1 : 15.725N Lon1 : 154.192W
161 11 179 117
00 01

24195 Date : 08.11.97 23:24:27 LC : A IQ : 00
Lat1 : 15.823N Lon1 : 154.037W
164 89 151 128
00 00

24195 Date : 09.11.97 01:07:03 LC : A IQ : 07
Lat1 : 15.860N Lon1 : 153.944W
162 19 151 128
00 02

24195 Date : 09.11.97 13:40:47 LC : 0 IQ : 50
Lat1 : 15.903N Lon1 : 153.881W
160 50 159 132
00 00

24195 Date : 12.11.97 17:08:52 LC : 2 IQ : 50
Lat1 : 16.594N Lon1 : 153.274W
161 05 236 88
00 00

24195 Date : 11.11.97 11:42:07 LC : Z IQ : 00
Lat1 : ??????? Lon1 : ???????? Lat2 : ??????? Lon2 : ????????
Nb mes : 001 Nb mes>-120dB : 000 Best level : -134 dB
Pass duration : ? s NOPC : ?
Calcul freq : 401 650000.0 Hz Altitude : 0 m
161 09 223 93
00 01

TO page 74

24196
Reversed -
Antenna [illegible]

24196 Date : 08.09.97 17:30:55 LC : 3 IQ : 60
Lat1 : 23.787N Lon1 : 166.209W
172 00 00 00
00 00

24196 Date : 10.09.97 18:27:26 LC : A IQ : 00
Lat1 : 23.786N Lon1 : 166.211W
176 34 214 99
00 00

24196 Date : 14.09.97 23:28:12 LC : A IQ : 00
Lat1 : 23.780N Lon1 : 166.187W
178 16680 6972 36503
01 59

24196 Date : 15.09.97 01:08:10 LC : 0 IQ : 58
Lat1 : 23.785N Lon1 : 166.203W
178 31 572 37
00 00

24196 Date : 12.09.97 23:49:05 LC : A IQ : 00
Lat1 : 32.079N Lon1 : 127.335W
176 1216 336 63
00 00

24196 Date : 14.09.97 01:24:26 LC : B IQ : 00
Lat1 : 23.796N Lon1 : 166.197W
177 520 750 28
00 00

24196 Date : 16.09.97 13:35:04 LC : B IQ : 00
Lat1 : 23.858N Lon1 : 166.201W
176 1154 284 73
00 00

24196 Date : 17.09.97 13:17:46 LC : B IQ : 00
Lat1 : 23.786N Lon1 : 166.206W
176 1410 1382 15
00 01

24196 Date : 18.09.97 17:07:43 LC : B IQ : 00

24196 Date : 18.09.97 18:53:42 LC : A IQ : 00
Lat1 : 23.792N Lon1 : 166.218W
176 1044 690 30
00 00

24196 Date : 19.09.97 00:28:58 LC : B IQ : 00
Lat1 : 23.900N Lon1 : 166.153W
177 402 690 30
00 00

24196 Date : 20.09.97 00:10:36 LC : 0 IQ : 60
Lat1 : 23.784N Lon1 : 166.229W
176 1562 318 67
00 00

24196 Date : 21.08.97 04:56:24 LC : 1 IQ : 60
Lat1 : 21.293N Lon1 : 157.828W
165 00 00 00
00 00

24196 Date : 20.09.97 18:09:18 LC : 0 IQ : 50
Lat1 : 23.788N Lon1 : 166.215W
175 24 216 99
00 00

24196 Date : 21.09.97 07:00:53 LC : Z IQ : 00
Lat1 : ??????? Lon1 : ????????
176 1041 203 246
00 00

24196 Date : 22.09.97 05:01:54 LC : 0 IQ : 58
Lat1 : 23.786N Lon1 : 166.203W
176 29 296 68
00 00

24196 Date : 21.09.97 23:50:31 LC : A IQ : 00
Lat1 : 23.813N Lon1 : 166.201W
178 39 198 108
00 00

24196 Date : 23.09.97 01:24:17 LC : B IQ : 00
Lat1 : 23.780N Lon1 : 165.933W
177 653 138 150
00 00

24196 Date : 23.09.97 17:00:58 LC : A IQ : 00
Lat1 : 23.764N Lon1 : 166.167W
175 514 127 165
00 00

24196 Date : 23.09.97 23:30:41 LC : A IQ : 00
Lat1 : 23.783N Lon1 : 166.237W
176 638 127 164
00 01

24196 Date : 24.09.97 13:42:01 LC : 1 IQ : 58
Lat1 : 23.786N Lon1 : 166.205W
169 08 375 54
00 00

24196 Date : 24.09.97 18:17:33 LC : 0 IQ : 50
Lat1 : 23.732N Lon1 : 166.121W
176 417 89 154
00 00

24196 Date : 27.09.97 00:39:09 LC : A IQ : 00
Lat1 : 23.769N Lon1 : 166.158W
177 628 558 38
00 00

24196 Date : 27.09.97 17:15:45 LC : 1 IQ : 50
Lat1 : 23.770N Lon1 : 166.178W
176 73 663 32
00 00

24196 Date : 30.09.97 23:58:10 LC : B IQ : 00
Lat1 : 23.694N Lon1 : 166.201W
178 732 329 65
00 00

24196 Date : 30.09.97 01:43:28 LC : 1 IQ : 68
Lat1 : 23.764N Lon1 : 166.163W
176 1612 344 62
00 00

24196 Date : 29.09.97 18:12:54 LC : 3 IQ : 60
Lat1 : 23.758N Lon1 : 166.160W
175 35 344 62
00 00

24196 Date : 01.10.97 01:33:02 LC : 1 IQ : 60
Lat1 : 23.767N Lon1 : 166.165W
178 194 329 65
00 00

24196 Date : 01.10.97 19:09:19 LC : A IQ : 00
Lat1 : 23.756N Lon1 : 166.165W
175 1026 302 71
00 00

24196 Date : 02.10.97 18:42:25 LC : B IQ : 00
Lat1 : 23.773N Lon1 : 166.171W
175 1490 361 59
00 00

24196 Date : 04.10.97 00:59:03 LC : 2 IQ : 60
Lat1 : 23.751N Lon1 : 166.180W
178 34 474 45
00 00

24196 Date : 04.10.97 18:00:49 LC : 2 IQ : 60
Lat1 : 23.761N Lon1 : 166.167W
175 1797 339 63
00 00

24196 Date : 05.10.97 00:51:29 LC : B IQ : 00
Lat1 : 23.737N Lon1 : 166.145W
178 202 339 63
00 00

24196 Date : 06.10.97 17:23:50 LC : B IQ : 00
Lat1 : 23.732N Lon1 : 166.138W
00 1453 577 37
00 09

24196 Date : 07.10.97 00:30:38 LC : B IQ : 00
Lat1 : 23.720N Lon1 : 166.171W
176 475 577 37
00 00

24196 Date : 05.10.97 19:18:38 LC : 0 IQ : 50
Lat1 : 23.760N Lon1 : 166.172W
175 41 411 52
00 00

24196 Date : 05.10.97 17:39:56 LC : 0 IQ : 50
Lat1 : 23.756N Lon1 : 166.160W
174 09 411 52
00 00

24196 Date : 06.10.97 00:38:01 LC : B IQ : 00
Lat1 : 23.708N Lon1 : 166.174W
175 549 411 52
00 00

24196 Date : 09.10.97 01:43:14 LC : B IQ : 00
Lat1 : 23.761N Lon1 : 166.158W
176 83 851 25
00 00

24196 Date : 09.10.97 17:50:54 LC : 2 IQ : 50
Lat1 : 23.763N Lon1 : 166.164W
175 16 522 16425
02 49

24196 Date : 10.10.97 19:05:42 LC : 0 IQ : 50
Lat1 : 23.757N Lon1 : 166.115W
176 394 310 69
00 00

24196 Date : 13.10.97 01:00:18 LC : A IQ : 00
Lat1 : 23.766N Lon1 : 166.106W
177 532 427 50
00 00

24196 Date : 13.10.97 05:41:30 LC : B IQ : 00
Lat1 : 23.759N Lon1 : 166.175W
00 1612 320 62
00 05

24196 Date : 14.10.97 13:19:11 LC : 0 IQ : 50
Lat1 : 23.749N Lon1 : 166.157W
175 38 379 55
00 00

24196 Date : 15.10.97 00:46:11 LC : B IQ : 00
Lat1 : 23.412N Lon1 : 166.245W
177 1647 323 66
00 00

24196 Date : 15.10.97 17:23:37 LC : 0 IQ : 60
Lat1 : 23.694N Lon1 : 166.126W
175 712 286 74
00 00

24196 Date : 16.10.97 00:32:49 LC : B IQ : 00
Lat1 : 23.683N Lon1 : 166.183W
178 383 286 74
00 00

24196 Date : 16.10.97 18:36:40 LC : B IQ : 00
Lat1 : 23.724N Lon1 : 166.155W
175 132 362 59
00 00

24196 Date : 16.10.97 16:59:33 LC : B IQ : 00
Lat1 : 23.717N Lon1 : 166.159W
00 201 362 59
00 16

24196 Date : 17.10.97 18:14:58 LC : A IQ : 00
Lat1 : 23.782N Lon1 : 166.171W
174 72 435 49
00 00

24196 Date : 18.10.97 00:12:47 LC : B IQ : 00
Lat1 : 23.595N Lon1 : 166.241W
175 1605 435 49
00 00

24196 Date : 18.10.97 18:00:12 LC : B IQ : 00
Lat1 : 23.701N Lon1 : 166.279W
174 1393 851 25
00 00

24196 Date : 18.10.97 19:31:06 LC : B IQ : 00
Lat1 : 23.789N Lon1 : 166.190W
174 184 851 25
00 00

24196 Date : 18.10.97 23:55:55 LC : 1 IQ : 50
Lat1 : 23.764N Lon1 : 166.162W
177 42 851 25
00 00

24196 Date : 19.10.97 19:11:24 LC : B IQ : 00
Lat1 : 23.763N Lon1 : 166.182W
174 101 536 40
00 00

24196 Date : 20.10.97 17:08:11 LC : 3 IQ : 60
Lat1 : 23.769N Lon1 : 166.173W
173 62 763 28
00 00

24196 Date : 22.10.97 01:06:29 LC : A IQ : 00
Lat1 : 23.809N Lon1 : 166.031W
00 2164 502 41
00 07

24196 Date : 24.10.97 17:24:11 LC : 1 IQ : 60
Lat1 : 23.767N Lon1 : 166.174W
174 1375 1067 20
00 00

24196 Date : 25.10.97 18:37:17 LC : 0 IQ : 50
Lat1 : 23.762N Lon1 : 166.157W
174 1738 1070 20
00 00

24196 Date : 25.10.97 00:35:34 LC : B IQ : 00
Lat1 : 23.737N Lon1 : 166.181W
174 1660 1067 20
00 00

24196 Date : 25.10.97 17:06:03 LC : 0 IQ : 60
Lat1 : 23.836N Lon1 : 166.245W
173 989 1070 20
00 00

24196 Date : 28.10.97 17:32:42 LC : A IQ : 00
Lat1 : 23.766N Lon1 : 166.170W
173 1548 891 24
00 00

24196 Date : 29.10.97 18:50:16 LC : B IQ : 00
Lat1 : 23.751N Lon1 : 166.140W
173 793 973 22
00 00

24196 Date : 29.10.97 17:10:54 LC : A IQ : 00
Lat1 : 23.774N Lon1 : 166.187W
173 28 973 22
00 01

24196 Date : 30.10.97 01:16:33 LC : B IQ : 00
Lat1 : 23.768N Lon1 : 166.154W
175 34727 973 22
00 00

24196 Date : 31.10.97 05:42:53 LC : B IQ : 00
Lat1 : 23.761N Lon1 : 166.168W
00 2054 769 27
00 03

24196 Date : 02.11.97 00:48:44 LC : Z IQ : 10
Lat1 : 27.449N Lon1 : 153.061W Lat2 : 23.451N Lon2 : 166.527W
171 2241 737 29
00 00

24196 Date : 03.11.97 00:31:26 LC : B IQ : 00
Lat1 : 23.748N Lon1 : 166.186W
171 772 1195 18
00 00

24196 Date : 04.11.97 18:16:38 LC : 0 IQ : 60
Lat1 : 23.765N Lon1 : 166.170W
168 63 63 65535
03 63

24196 Date : 04.11.97 00:23:01 LC : A IQ : 00
Lat1 : 23.765N Lon1 : 166.171W
170 19 564 38
00 00

24196 Date : 27.10.97 00:13:58 LC : 0 IQ : 67
Lat1 : 23.678N Lon1 : 166.357W
174 33 858 25
00 00

24196 Date : 27.10.97 01:49:29 LC : A IQ : 00
Lat1 : 23.761N Lon1 : 166.166W
176 56 858 25
00 00

24196 Date : 05.11.97 18:01:15 LC : A IQ : 00
Lat1 : 23.744N Lon1 : 166.170W
168 62 139 149
00 00

24196 Date : 07.11.97 01:23:05 LC : B IQ : 00
Lat1 : 23.572N Lon1 : 166.260W
170 2173 1348 16
00 00

24196 Date : 07.11.97 18:54:03 LC : A IQ : 00
Lat1 : 23.775N Lon1 : 166.163W
170 57 1133 19
00 00

24196 Date : 09.11.97 18:13:43 LC : B IQ : 00
Lat1 : 23.777N Lon1 : 166.190W
170 340 897 24
00 00

24196 Date : 10.11.97 17:46:02 LC : 1 IQ : 60
Lat1 : 23.770N Lon1 : 166.170W
170 61 1195 18
00 00

24196 Date : 11.11.97 00:45:13 LC : 0 IQ : 58
Lat1 : 23.680N Lon1 : 166.134W
174 218 1195 18
00 00

24196 Date : 11.11.97 19:08:50 LC : B IQ : 00
Lat1 : 23.704N Lon1 : 166.142W
171 564 398 54
00 01

24196 Date : 12.11.97 00:31:06 LC : A IQ : 00
Lat1 : 23.707N Lon1 : 166.071W
172 06 398 54
00 01

24196 Date : 13.11.97 18:28:29 LC : B IQ : 00
Lat1 : 23.666N Lon1 : 166.158W
170 05 261 94
00 12

24196 Date : 14.11.97 00:16:50 LC : A IQ : 00
Lat1 : 23.650N Lon1 : 166.228W
171 05 261 82
00 01

24196 Date : 15.11.97 00:03:20 LC : B IQ : 00
Lat1 : 23.696N Lon1 : 166.156W
172 381 405 53
00 00

24196 Date : 15.11.97 17:39:33 LC : 0 IQ : 60
Lat1 : 23.697N Lon1 : 166.130W
170 09 466 46
00 00

24196 Date : 13.11.97 00:23:44 LC : B IQ : 00
Lat1 : 23.646N Lon1 : 166.106W
172 173 340 63
00 00

24196 Date : 12.11.97 17:05:05 LC : 1 IQ : 50
Lat1 : 23.687N Lon1 : 166.118W
171 242 340 63
00 00