1969

Garrison, L.E.

5A

Gulf of Mexico

Cruise # 1 (Leg B)

USNS KANE - Cruise # 939009

2/4 - 2/25/69

Scientific Party

New Oceanos

Bob Heden - ch. sci. (9310) Speaks "FEDDEN" in native tongue

Hank Ensminger (9310)

Herb Eppert (9310)

Ken Olsen (proj. ch. for KANE engineering)

Carl Nellies (PST)

Keith Kaufman (PST)

Bill Curtis - oceanog.

Ernie Walters (ET)

Gary Gilbert - oceanog.

Tom Hammond (ch. ET)

Jim Daniels (ET)

Vic Yorke (math)

John Sterret (math)

Dave Fraley (comp - ET)

Dave Rigor } Navigators
Bob Colter }

USGS Dave Trafecanty (ET)

me

Hal Krivoy

Pat Patrick

Teledyne

Ray Estrellas

4 Feb. 1969

Departed Corpus Christi on USNS Kane about 1100. Streamed sparker and magnetometer gear about 1500 and began Line 1 on a course of 086°. Except for blowing several 100 amp fuses in the sparker, which were replaced with 200 amp, everything ran fairly well. Record for rest of day was very good. Using 160 Kj, 4 sec. fire, 4 sec sweep, we were getting apparent information as deep as 3 seconds in water only 30 fathoms deep. Lots of multiples, but the structure comes through well.

The gravimeter did not operate at all, and it is most doubtful that it will - and if it does, the data will not be trustworthy.

5 Feb 1969

Still running line 1. Slowed to 4kts at 1515 to pull in cables and check tips – all systems operating except gravimeter. About 10 min. after we re-streamed the cables, however, while the sparker was on and gaps were being adjusted, the ½ HP motor driving the pump which cooled the transformer on Bank #4 caught fire. It turned out that the motor was burned beyond use, and the pump was frozen. About the same time, the magnetometer quit giving readouts, and the typewriter on the Cal comp stripped a gear (no spares) while the Cal-comp logic system broke down. For a couple ½ hours, we were measuring only surface temp and sal. About 1700

we started up on banks 1, 2, & 3 and have been running on 120 KJ ever since. The mag, The gravimeter, and The Cal comp are still down. Can't raise Teledyne on the single side band.

6 Feb.

Turned south on The cross line about 0330 and onto Line 2 around 0830. Called The Coast Guard and had them phone Teledyne and ask them to listen on our frequency. Talked to Joe Hill, who said he'd come back at 1330 to advise. All systems down yesterday are still down at noon today.

After lunch things gradually began to pick up, and by midnight, the mag. was reading again, although its recorder was still out, The Cal Comp typewriter was OK and we were making

good seismic records. Switched over to 6 sec. rep. rate and sweep for some reason not clear to me, but the records look OK and we kept it. We had also made contact with Teledyne again, who said spares would be sent thru Brownsville. We plan to have them sent out by pilot boat.

7 Feb.

At 1030 when I got up, message from The Navy said we should go into Port Isabel to pick up the spares. We will try to avoid this by making arrangements through Teledyne at 1300.

Raised Carl Berglund at 1300 and asked him to call Henry and ask him to arrange for the pilot boat

to come out from Port Isabel and bring us the spares. By about 1530 we learned through this awkward network that the harbormaster at P. Isabel had made arrangements for us to come in and dock, and wasn't interested in changing them. Jesse said we would not go in there, we'd just send in the small boat. So it was arranged that a Teledyne man will meet us there at 0800 tomorrow and will send in the motor boat.

Records have been good today, mag. read visually and recorded every 15 min., no gravity (I think we're given up completely on that.)

Feb 8

Finished Line 2 about 0030, ran into fog shortly after and the horn blew all nite making sleep difficult. Made our 0800 rendezvous with Teledyne man on north jetty at Brazos de Santiago - spares were aboard by 0900. Back to T.P. #4 by 1030 and streaming gear - in fog.

Started Line 3 about 1130 on all 4 banks, 6 sec. rep., 6 sec sweep [adds to about 14,400 shots per day]. Weather cleared in afternoon, wind came up to 15+ kts from NE and we started rolling in the trough. Tough sleeping!

Feb 9.

Still on Line 3, all systems OK at noon. Still rolling in the trough. Records along strike on lower Cont. Slope look good. Up to 3.5 sec penetration in sed. filled valleys.

Feb 10.

Bad day for the sparker. During the early morning watch, the volt meter on Bnk 2 blew up in Hanks face (shielded by the plate glass window). This was caused by a dirty resistor across the meter, which allowed the full charge of 15K volts to be put through it instead of the reduced load. Then on my watch during the afternoon the fuse wire to a capacitor in Bnk 4 blew up with a loud bang, and an hour or so later the same thing happened on Bank 1. By this time all watch standers

were getting pretty gun shy. Then about 1900 Banks 2 and 4 began being very erratic and by 1000 were impossible to control. We had planned to try to run until TP #6 at 1000 on 11 Feb Then shut down for a maintenance period. But things were so bad we shut down about 1100 and pulled all cables. Tips were all in good condition, but nevertheless we put on some double length (about 15-18 ft) ladders which we made up earlier.

Everything back overboard and firing by about 0130 and to bed.

11 Feb.

Made TP 6 about 1000, waited until after lunch to shut down for maintenance along the cross leg. After shut down, about 1600, went

a new mode of 12 second rep rate, print 1st 6 sec, gate 2nd. In deeper water, this will get us a better placed record so that we should have plenty of room for deep reflectors.

We took a few polaroid shots of parts of Line 3, which look real good. Unfortunately, film is limited.

A couple of days ago, I planned that when we began this line (Line 4) I would keep it on a 6 sec. sweep to keep the scale the same as our other records, but since we could expect over 4 sec. of water at the foot of the Ills. Escarpment, we would use center fire, a 12 sec rep rate, and only print the second sweep. This would have the following advantages
1) It would put bottom near the top of the page, with more than 4½ seconds

of record space available below. 2) It would keep the same scale and same vertical exag. we've had all along, 3) it would gate out the shot and any second Third multiple, while the first mult. would be right at bottom of page. The disadvantage would be that the gated out sweep would make the overall record appearance less contrasty. I discussed this with Ensminger, who agreed, but failed (I guess) to mention it to Fedden, who is party chief. At any rate, we started running record by this plan before the turn, and did so on Line 4 until about an hour before the shelf breaks. Then Fedden called the hut and said lets go back to marking every sweep. I went down to the Recording Lab and we argued this back and forth for a long time. He finally

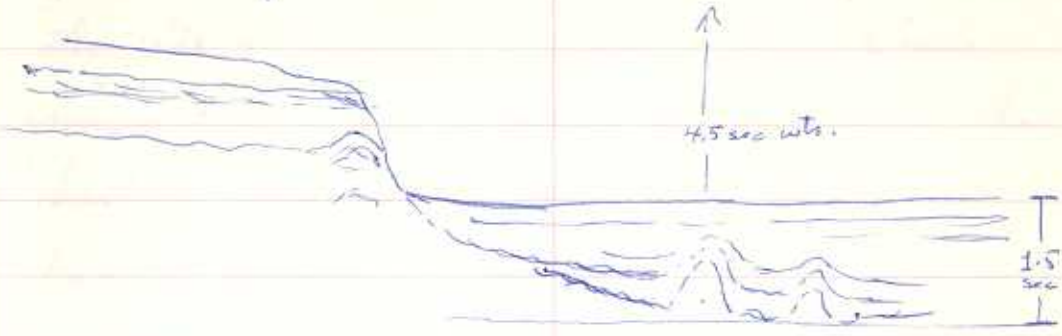
gave ground but was not at all convinced, because about 30 min later, Ensminger called me out of the movie and said Tedden had talked to him. Again we went near it, but by this time it seemed to me I couldn't push it any further without actually butting heads, and with more than two weeks to go on this cruise, I'm not willing to do that now.

As a result, I switched back to marking each sweep as pleasantly as possible, but I'm afraid that we will lose the Cret. ~~[illegible]~~ "scarp-face" reflector in the shot at the top of the page. We also see a 2nd multiple which would have been gated out. I'm sure that this was done with all good intentions and according to his past experience, but I now doubt his judgement and don't think

the necessary background and experience are there for this job. I feel that it is wrong to judge record data by their pictorial quality, which I think is the case here. Tedder seems to be operating under a good bit of pressure, and this could color his decisions. Its not a good situation, and not a good start for a very important project.

About midnite, I went out to the hut to see the records of the foot of Fla. Escarp. Bank #3 was not firing and while Bob and I were fooling with it, a fuse wire in Bank 1 blew up. We shut down and got Ray. About 15 min. later while he was working with adjustments and we were back on line, a capacitor blew out in Bank 1 (top capy.). Got back in action after rewiring the whole bank and cutting generator output back to about 13,500 volts or so.

Showed note here that we seem to see diapiric forms at the foot of the escarpment.



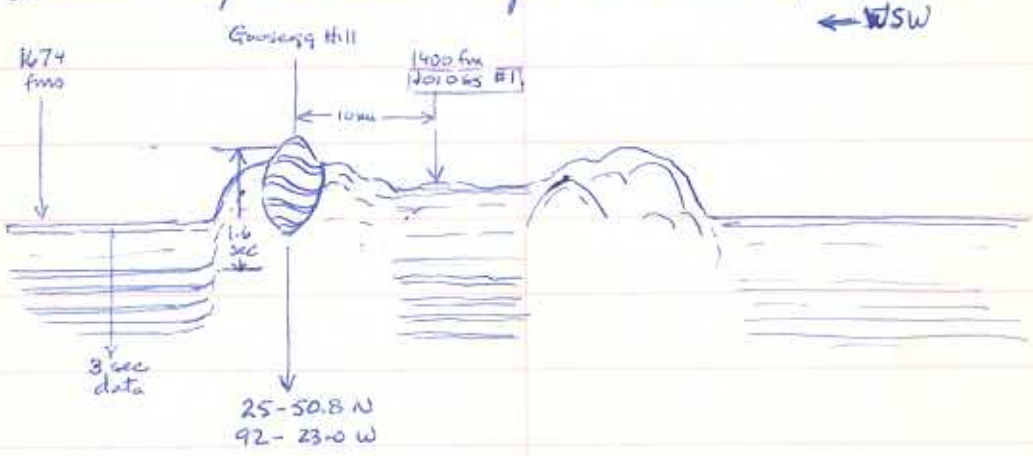
This worth a further look if it can be arranged later in the program.

12 Feb

Chugged monotonously over the Miss. cone all day. Flat bottom rising gradually to a crest in mid afternoon, Then dropping off last night. Deepest around 1700 fms, shoalest around 1000. In places we could see about 3.8 seconds of bottom penetration. Down for about 15 min while finding and replacing fuse in generator volt. regulator. Also electrodes.

Feb 13, 1969

Crossed over the outermost nose of the Sigsbee Escarpment at approximately the site of JOIDES #1 hole (within ½ mile navigation error). Up to that scarp, the bottom had been very flat and we had a definite reflector at 4.1 seconds. The scarp crossing showed some very interesting relationships at 2045 Z, this date



The goosegg is a piece of the lower bedded sequence trapped on top of and between two diapiric structures and moved upward more than 3500' above its original position. Also, this material underlies the Joides hole and

can probably be sampled with a corer or even a dredge. It may also represent the clearest evidence to date for the diapiric origin of the Sigsbee escarpment, and, if Goosegg Hill is sampled, may yield a date for intrusion. Also of interest is the fact that the Jaides Hole was drilled in a very poorly chosen location to solve the question of what the intrusive material really is.

Encountered some moderately rough seas which made sleeping difficult again.

Feb 14, 1969

Still rough at noon, by which time we had begun to run up the continental slope just south of the Rio Grande. Same diapiric nature as that to north, with intrusive bodies marching right up to the shelf, and much of the shelf faulting seemingly related to deep seated diapirs.

Finally shut down ops. at end of line 4 about 1500 and changed sparker tips after 72+ hours on same (elongated) set. Ran ships 13 KJ system in down interval, but it was pretty lean stuff - about .5 sec.

For the record - Hank ran off about 1 hr of 12 sec. rep rate with gating in deep water the other night. Everyone assured me that it was not good because the ~~multiples~~ deep reflectors were lost. I saw it today when we took the record off, and they were - I even admitted to Fedden he was right. But then it dawned on me that the deep reflectors were absent because they were on the second 6 sec. sweep which was gated out - We will try it again in deep water, on a cross line.

[15 Feb]

Turned east on line 5 about 0900 (0300Z) Still some swell running but clear. Hear Corpus had bad storm.

Feb 15 –

Ran Trio 5 out with no particular problems. On cross leg to Trio 6, I switched to Mode 4 (center fire), 12 sec rep. rate, 6 sec sweep, printing only 2nd sweep. This gated out shot, and put the bottom (4.5 sec. gate) near top of page. Gated record looked ok, but some very fine scale characters missing from upper units, as compared to printing every sweep. Then we began printing every sweep (shooting 6 sec) but stayed in Mode 4 and tried to use "presuppression" control to knock down the shot asymptotics. Didn't do much, We left it in this mode, however to keep from splitting the deep record. Made T.P. #13 and turned into Trio 6. When bottom raised up near top of paper, I switched back to Mode 1, top fire, print every sweep. Records are very

good, but looks poor to have the shot running through.

The slope of Mexico was characterized by wide, open folds, and one large intrusion at water depth of about 3.2 sec. I went to bed after that and didn't see the close in records, but Hank said he saw both of disturbance under the obelisk. None of this, however, looks like Bill Bryant ridges.

Feb 16

Had made cross leg near Mexican coast and were on line 7 when I came on at noon. Record good, with only slight folding on upper slope down to nearly 3 sec. water depth. Have been making 10.8 to 11 pts for last 24 hrs, but records look good. I hope the gear

holds up, because as of yesterday noon, we were running 30 hours behind schedule to finish the course on time. Hidden has some plans for cutting a few corners, if necessary, to make it. Some of these probably need cutting anyway. They are in very shallow water, on the Yucatan shelf.

The weather has turned off warm and sunny, and the fantail looks like a prison courtyard at exercise time with all the pale people getting their sunshine.

By 1445 (2045 Z) the shape record is showing some sharp, deep folds although the surface is only slightly rippled. Could these be the

→W Mex Ridges, buried to the north? By 2230Z these have developed beautiful, tight, symmetrical folds with wa-

lengths about 5 miles. About 2.5 secs penetration shows apparently folded strata all the way. They don't look diapiric at this point. By 2200 Z it was obvious that some were intrusive while others were large, symmetrical folds resulting from the intrusions (maybe?) At any rate, one diapir at 0200 Z, 17 Feb. appeared to intrude the syncline? a large fold

Bottom had flattened by 0600 Z when I left watch (1200 Local) and sub-bottom was parallel with about 2 sec pen't or more.

At about 2050 Z 16 Feb note the small graben which breaks the surface of the bottom, and sits atop a large fold. This is a good clue to the recency of the vertical movements.

References from Hawkes N.B

Ewing, M., Worzel, Ericson & Heezen, 1955. Geophysical and geological investigations in the Gulf of Mexico, Part I. Geophysics, v 20, no 1, pp. 1-18.

Ewing, M. & Antoine, 1966. New seismic data concerning sediments and diapiric structures in Sigsbee Deep and upper continental slope, Gulf of Mexico. Bull. AAPG 50 (3), 479-504.

Ewing J., Worzel & Ewing, 1962. Sediments and oceanic structural history of the Gulf of Mexico. J Geoph. Res. 67 (6), 2509-2527

ask Harold if he has this ->

This has details of velocity structure in Basin - very important

Keugh, D.I. 1967. Magnetic anomalies and crustal structure in eastern Gulf of Mex. Bull. AAPG 51 (2), 200-211.

Heirtzler, Burkle & Peter 1966. Magnetic anomalies in the Gulf of Mexico. Jour. Geophys. Res. 71 (2), 519-526.

Miller & M. Ewing 1956. Aeromagnetic measurements in the Gulf of Mexico and in the vicinity of Cayo Peale. Geophysics XXI (2), 406-432.

Jordan and Stewart 1959. Continental slope off southwest Florida. Bull AAPG 43 (5), 974-991.

Murray, 1966. Salt structures of Gulf of Mexico Basin - a review. AAPG 50 (3), 439-478.

Ewing M & Ewing J. 1966? Geology of Gulf of Mexico. MT Society

Dehlinger & Jones 1965. Free-air gravity anomaly map of the Gulf of Mexico and its tectonic implications, 1963 edition. Geophysics XXX (1) 102-110.

Rawlin, Harding & Amstutz 1965. A reconnaissance study of the Sigsbee Knolls of the Gulf of Mexico. Jour Geophys Res. 70 (6) 1339-1347

See also GCAGS Trans 1967

Halbouty - Salt Domes ✓

Diapirs & Diapirism, AAPG Memoir ✓

Murray Coastal Plain book ✓

[(look for Geol. map of Mexico)

Kings Tectonic maps of Mex. - notes or whatever]

- Uchupi's bathy maps ✓

- copy of page size track maps for crew
- copy of fold scale track maps.

Feb 17 -

Crossed the flat Sigsbee Abyssal Plain during morning watch - depth exactly 1999 fms for more than 50 miles in one stretch. Then around 1530 local we came up on the Sigsbee Knolls. The first one, according to our navig. was Challenger Knoll, but it had a twin next to it. Peak ~~depth~~ or highest point of twin was about 1880 fms. A deep reflector (or multiple?) leading into the knoll area fit exactly the position of Eocene top of the salt. From 1500 until 2100 the bottom was flat, but the sub-bottom deeper than .5 sec. was rippled by domes. Our turning point off Line 7 at about 1030 local.

Trouble - generator volt. reg. blew fuse about 1700 L ~~on~~ first dome east of Sigsbee K. Had about a 10 min. blank there. First shut down in more than 38 hours.

Feb 18 -

When I got up about 1000, the tips on the sparker had broken down and we were stopping to haul in. Two leads were firing on cable only. Changed all 4, replaced with 20 footers changed all electrodes, and fixed tape recorder which had broken down.

Made a couple of short tracks down the Campeche escarpment, as a short cut from line 7 to line 8. Near end of second one, running up, the streamer crapped out and we had to change streamers.

Finally strung out on line 8 from Campeche Bnk to Tampico. Had to change #2 electrode. Running OK at midnite local. After Campeche Bank saw one knoll so far

Feb 19

When I came on at 1200 local, the flat, southward extension of abyssal plain was just giving way to a slightly rising, faintly undulatory surface. I switched from M4 (center fire) to M1 (top fire). Things ran more or less smoothly until about 1430 L when Ray & Pat decided to switch leads on the sparker tips - This evens up the uneven burning of the two electrodes in the water. When they opened the door to the pulser room, it was full of smoke - the pump for the #3 power supply was down. In order not to lose too much record - we were coming up to the ridges off Tampico, (Line 8) we shut down #3, and ran on 1, 2, & 4.

Within 30 minutes however, #4 was very erratic, apparently the tip was fouled up. Ray switched the dead #3 cable to the #4 power and we've been limping

along on that ever since (now 2100). It fires only intermittently, so our records are not the best.

At that, the ridges have been very disappointing on this run. Only 3 or 4 strong folds with <100 fm relief until 1900L, since which we have begun climbing up the slope, which is smooth so far. At 2130, we are supposed to turn south, ending Line 8, and will shortly thereafter shut down for repairs & maintenance. Have had lots of bad luck with Line 8 and its approaches. I think the fact that we were making too much speed (135 rpm) for a day or two has contributed to our break downs. We are back down to 130 rpm since about mid afternoon, but the damage, if any, had been done.

Made TP #19 about 2130 Loc. & shut down for maint. Found open lead in motor for pump - no problems. Installed temperature

sensors on power supplys, changed electrodes 3 & 4. All tips OK except #2 which had parted on one side - patched it up and got going again about 2330 L. Printing good record on cross leg along Tampico coast in around 200 gms.

20 Oct -

Stayed up for a movie after watch during which there was more trouble in the hut. A fuse wire blew, then shortly after, a lead in one of the power supply vessels began shorting out - essentially firing in the pot. This was the one which had run low on air due to pump failure. They didn't get it fixed last nite and we are firing on three banks today on Line 9.

During the morning hours before my watch we passed over the ridge zone

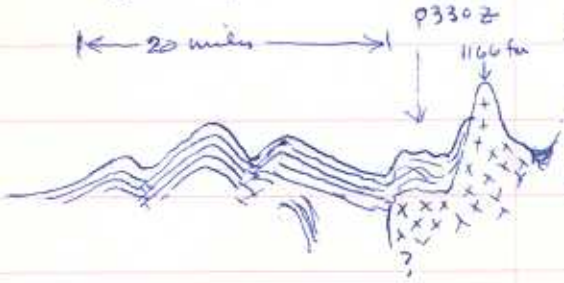
with ridges comparable to those on Line 7. Apparently Line 8 was somewhat anomalous in that the ridges were deeper, or less well developed than to the north and the south.

In the PM local we ran out onto a gradually deepening plain and at around 1700 fathoms or so I changed to center fire. Then, since we got so little penetration, I counted up our on-line capacitors and was a little set-back to find that we had only 21 out of 36 working. Of course I really knew that when the ground wires came loose Ray had been wiring them off, waiting for a chance to put bolts into the Buss bar to hold them, but with all of Bank #3 out (and it has been all day), the power loss was beginning to show. We were using only about 88 KJ. So I got Ray to look up the 3 down capacitors in Bank #4, which brought us up to 3 X 34 = 102 KJ and that's

what were used all day.

(21 Feb.)

About 0100 Z we came onto a series of strongly folded and faulted blocks of sed., probably related to the Gulf of Campeche intrusive zone. They seem



to be lying on the western flank of the intrusion, but penetration here has been less than 3 sec on the average, so I can't really see the intrusive material below anything earlier than about 0330 Z. It is a very interesting section, however, and is rather well shown in the records.

The intrusive came in strong at 0345 Z as above.

21 Feb -

We finished the run across the Gulf of Campeche (Line 9) this morning at 0700 local. We then turned south, slowed to 4 kts, hauled the sparker cables, and began a maintenance period.

Ray and Pat repaired the insulator bushing in transformer #3 by rewiring and epoxy. Also the electrodes were all changed, streamer #1 checked and put back in service (in use, that is) and we got back up to 9 capacitors in 4 banks — at 14 kv that is 172 kj.

This work lasted until 1530 local when we started firing again for about 1 hr on the southerly course. We then turned Point #22 and began Line 10. Campeche Canyon was well shown. The hills look more like folded beds than salt intrusions. Salt must be quite deep.

22 Feb -

Arrived back on the west side of Gulf of Campeache shortly after noon, ending Line 10. Turned south on the cross line and around 1430 we shut down to switch leads and change electrods. Turned back to OSE to begin Line 11 at 1725 and after descending the short slope have run at about 1400 fms across a ridge system buried beneath about 1 sec of sedi. Except for burial these folds look the same - symetry, spacing etc, but they haven't yet (at 0000 local) broken the surface.

I got up for breakfast this morning and loafed until 0930 when Hank and I began writing summaries of the geology of each profile.

23 Feb.

Got up about 0930 and finished the notes on seismic lines run to date. We finished Line 11 around 1800 local and turned south along the Campeche shelf. There was a brief shutdown this morning to fix a fuel line on the generator and about 2130 tonite we shut down to switch leads and change electrodes. Otherwise no difficulties with sparker. The tape recorder was down for about 3 hrs in the last part of Line 11 - no tape record of that.

Began Line 12 (270°) 1000 local. Everything seemed OK at midnite except #2 Bank had blown a fuse just as I went off watch.

24 Feb-

Got up for breakfast and found we were on 3 banks. Number 3 (I think) arcer cable had shorted out - in the cable somewhere. I laundered and went back to bed until 1130. By this time they had shut down to trace out the short. They never found anything, but changed tips on three banks anyway and the trouble cleared itself up.

Finished Line 12 at 1800 and turned on to Line 13 - next to last line.

Bob ran off copies of the seismic notes today.

Feb 25 -

When I got up around noon I was surprised to learn that we had already turned onto the last line (14). I had figured that to be on my watch. Furthermore, the time for ending the survey was to be 1800 today, rather than tomorrow. All this came about because the last 60 of line 13 were cut off, which meant line 14 was also that much shorter. Consequently we will have about 40 hours with nothing to do since we can't enter Vera Cruz before 1000 on the 27th. After all the corner cutting and worrying about being late, we finally ended up wasting 40 hours.

Anyway, the survey (first leg) is done. I think it could have been done better if we hadn't panicked

about schedules 2 weeks ago, but at any rate I feel that our records are high quality and we covered over 90% of what we set out to do.

Sparker Record

date	Σ hrs
Jan 22	21.0
23	12.7
24	12.0
25	21.3
26	24.0
27	21.9
28	18.0
29	03.0
Feb 4	01.5
5	19.3
6	21.0
7	23.5
8	16.5
9	24.0
10	19.0
11	18.6
12	23.0
13	23.0
14	20.7
15	23.5
16	23.5
17	23.5
18	21.0
19	23.5
20	23.5
21	17.0
22	23.5
23	23.5
24	20.4
25	23.5

	Σ hrs	hrs/day
Bayone - CC	134	16.7
CC - VC	456.5	21.7
totals	590.5	21.0*

* This av. doesn't include Jan 29 + Feb 4

total track from ships log about 4700 miles

$$\frac{\text{mi}}{\text{hr}} \times \frac{\text{hr}}{\text{min}} \times \frac{\text{min}}{\text{sec}} \times \frac{\text{ft}}{\text{mi}} = \frac{\text{ft}}{\text{sec}}$$

6080
9
54720

$$\frac{9}{1} \times \frac{1}{60} \times \frac{1}{60} \times \frac{6080}{1}$$

1 × 60 × 60

$$\frac{9}{1} \times \frac{1}{60} \times \frac{1}{60} \times \frac{6080}{1} = \frac{54720}{3600} = 15.2 \frac{\text{ft}}{\text{sec}}$$

15.2
3600) 54720
36
187
180
7.0

15.2
6
91.2

91 ft between shots

1.6