



U.S. NAVAL ACADEMY SAILING PROGRAM



Offshore



Intercollegiate



CSNTS



P-100

Navigation 2

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Course Overview...

- The Chart
 - Primary emphasis on chart preparation
- The Fix
 - Visual & Electronic
 - Accuracy and errors
- The DR
 - The most important thing on the chart
- Navigation Party
 - Organization, procedures & philosophy
- Making landfall
 - The Navigation Brief
- Navigation Practical



The Chart Prep Checklist...

Navy Sailing Chart Preparation Checklist

Chart Number _____

1. Note the chart's sounding datum (X the appropriate box).

Fathoms _____ Feet _____ Meters _____

2. Box the Sounding Datum. Highlight this in Orange and verify that it's visible after the chart is folded for use. If not - annotate it where it can best be seen.

3. Enter the vessel's draft (i.e., 7.5 feet) _____

- Use the same units as the chart's sounding datum

4. Round up _____

5. Define Your Risk Factor: _____

- Knowledgeable Crew/Racing Risk Factor = 1
- Novice Crew/Training Risk Factor = 2 or 3

6. Calculate minimum sounding line as follows:

- Multiply the number from Block 4 by the Risk Factor defined in Block 5

_____ X _____ = _____

(i.e., For a CSNTS Cruise: 8 feet times 2 = 16 ft)

6. Review the chart for actual sounding datum. Choose one based on Block 6 above (if required, round up): _____

7. Highlight this sounding line with a dark blue marker. Pay particular attention to the rate of change of depth, and mark the chart accordingly.

8. Visual Nav Aids: Carefully review the chart, and identify visual navaids:

- Circle, highlight in yellow, and label **ABC** (Where ABC is an easily spoken, unmistakable noun name)

9. Nav hazards: Carefully review the chart, and identify unlighted buoys and other nav hazards.

- Circle, highlight in pink, and label **UNLIT ABC/NAVHAZARD ABC**.

10. Radar Nav Aids: Carefully review the chart, and identify radar nav aids.

- Triangle, highlight in orange, and label **ABC**
- Pay particular attention for RACON buoys. These should have a circle and a triangle, and be labeled **RACON ABC**

11. Track: Draw and label the track.

- The track can be drawn down the center of the deep draft channel to alert the watchsection to the expected location of merchant traffic.

12. Shoal Water: Using the blue line defined in 7 above, slash the shoal water areas in blue, and double slash those areas where soundings won't provide meaningful backup.

13. Fold and label: Fold and label the chart as follows:

- Fold the chart in fourths
- Label the corner with the fold with the chart's noun name in large letters. Immediately above/below list the next chart along the north/southbound track

14. Verify Currency: Immediately prior to use, verify the chart is up to date by querying the NIMA Notice To Mariners Database at:

http://pollux.nss.nima.mil/untm/untm_j_options.html?class_flag=N

Latest Chart Edition _____ On-hand Chart Edition _____

Latest Notice To Mariners _____

CHART UPDATED THROUGH NOTICE TO MARINERS _____ / _____
Number Date

Submitted: _____ Reviewed: _____
Midshipman Navigator AOIC/Navigator

Approved: _____
Officer In Charge



Principles & Practice of Basic Navigation

- Fix taking
- Fix evaluation
- “Minimum Cyclic Routine”
 - Plot, Label, DR.. Plot, Label, DR.. Plot, Label, DR...
- Situational Awareness & “Gut Feel”
- Watch Captain involvement
- Midshipman Navigator involvement
- Officer in Charge involvement



The Handouts...

Tenth Edition

Fundamentals of

Naval Science

NS 100

An inset photograph showing five tugboats with purple and white hulls moving through a harbor. The boats are leaving wakes in the water. In the background, a city skyline is visible across the water.

United States Naval Academy
Annapolis, Maryland



The Six Rules Of Deduced Reckoning

1. Every hour on the hour
2. At the time of every course change
3. At the time of every speed change
4. At the time of obtaining a single line of position
5. At the time of obtaining a fix or running fix
6. A new course line shall be drawn from each fix or running fix as soon as it is determined

YOU MUST KNOW THESE!!!

You Must Know How To Apply These!!!



The Fix...

The Fix is:

WHERE YOU WERE

And...

It's hardly ever really where you were



The Fix...

The Fix is:

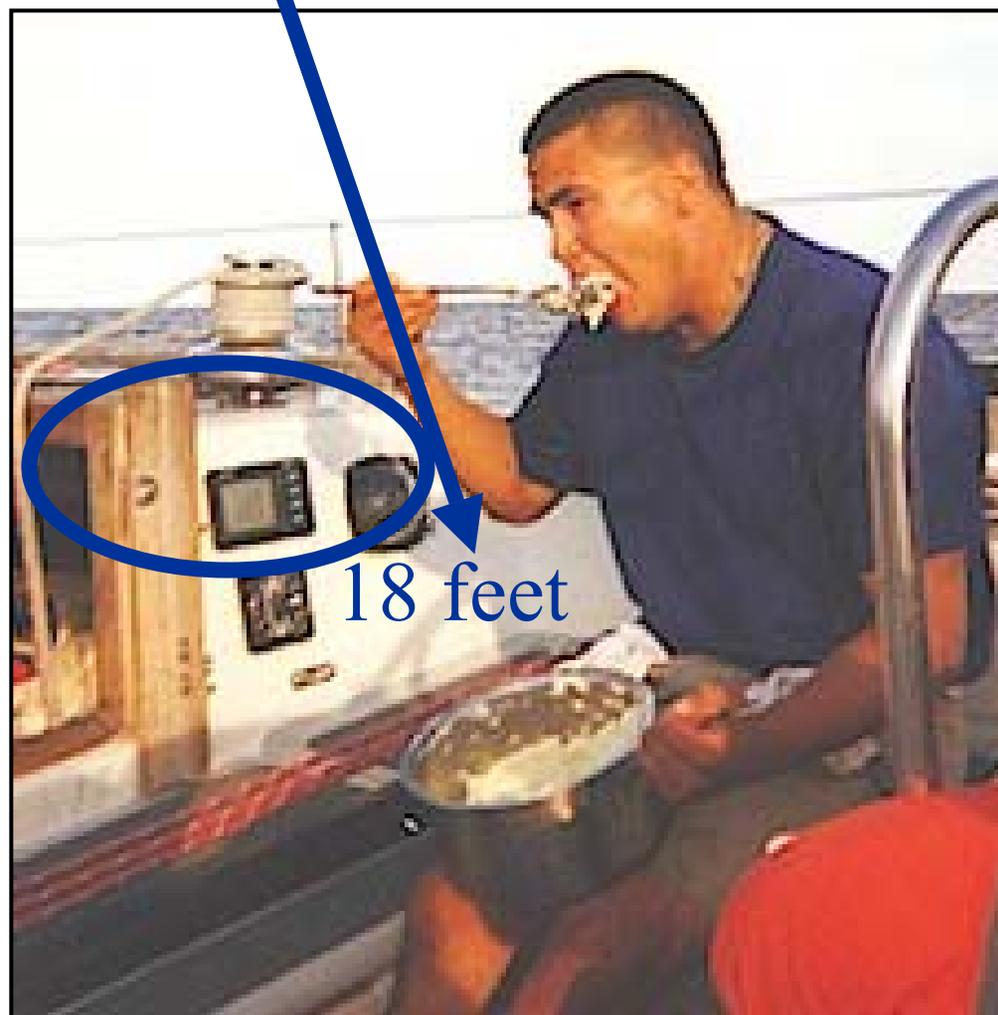
THREE DIMENSIONAL

“Sounding – Checks with chart”



The Fatho....

Write the “No Go Sounding” In Grease Pencil Here





The Fix...

Fix Interval

Whatever you do, establish and maintain
a consistent fix interval

Need to be able to step back and see the
trend, and respond if the trend changes



The Fix...

- What interval is required?
 - Hourly?
 - Half hourly?
 - Fifteen minutes?
 - Ten Minutes?
 - Five Minutes?
- It depends
 - However, it should be obvious when looking at the chart when it changes – and why
- The OIC determines Fix Interval!



The Fix...

- Open ocean – outbound
 - 1 hour maximum
- Open ocean – inbound
 - Frequently enough so you can see you approach develop
- The Bay
 - Where are you???
- Remember – these are fully crewed yachts
 - Whose mission is to train on navigation



The Fix...

Treat Every Fix With

Suspicion



Electronic Fixes

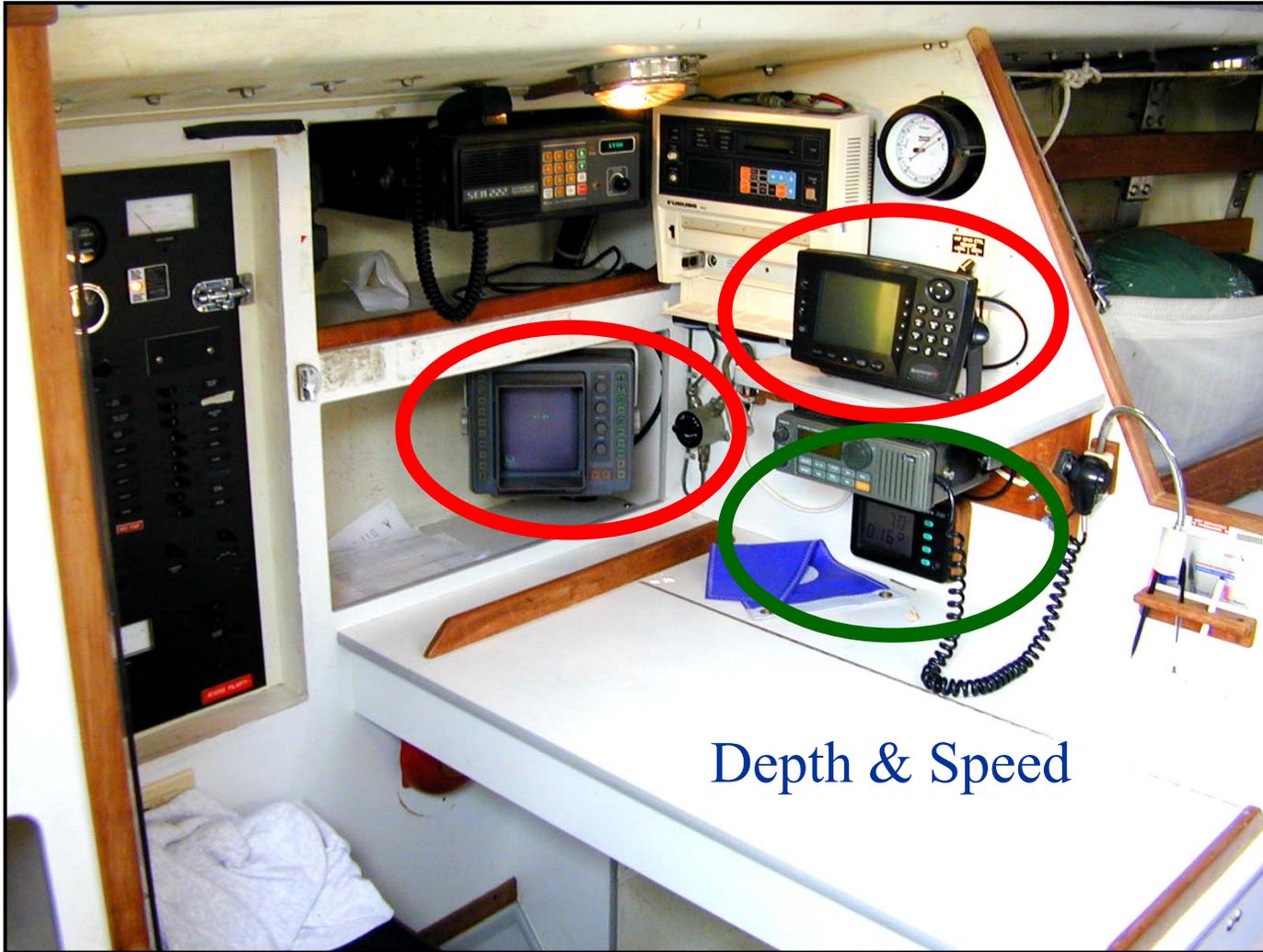
Global Positioning System

Loran C

Radar



How Do You Take A Fix?





Latitude & Longitude...

- Two scales
 - Degrees, Minutes & Tenths
 - Degrees, Minutes & Seconds

Note: Many errors occur on the chart shift!!!

- Use latitude for distance measurement



Which of these do you use???

The Tools of the Trade



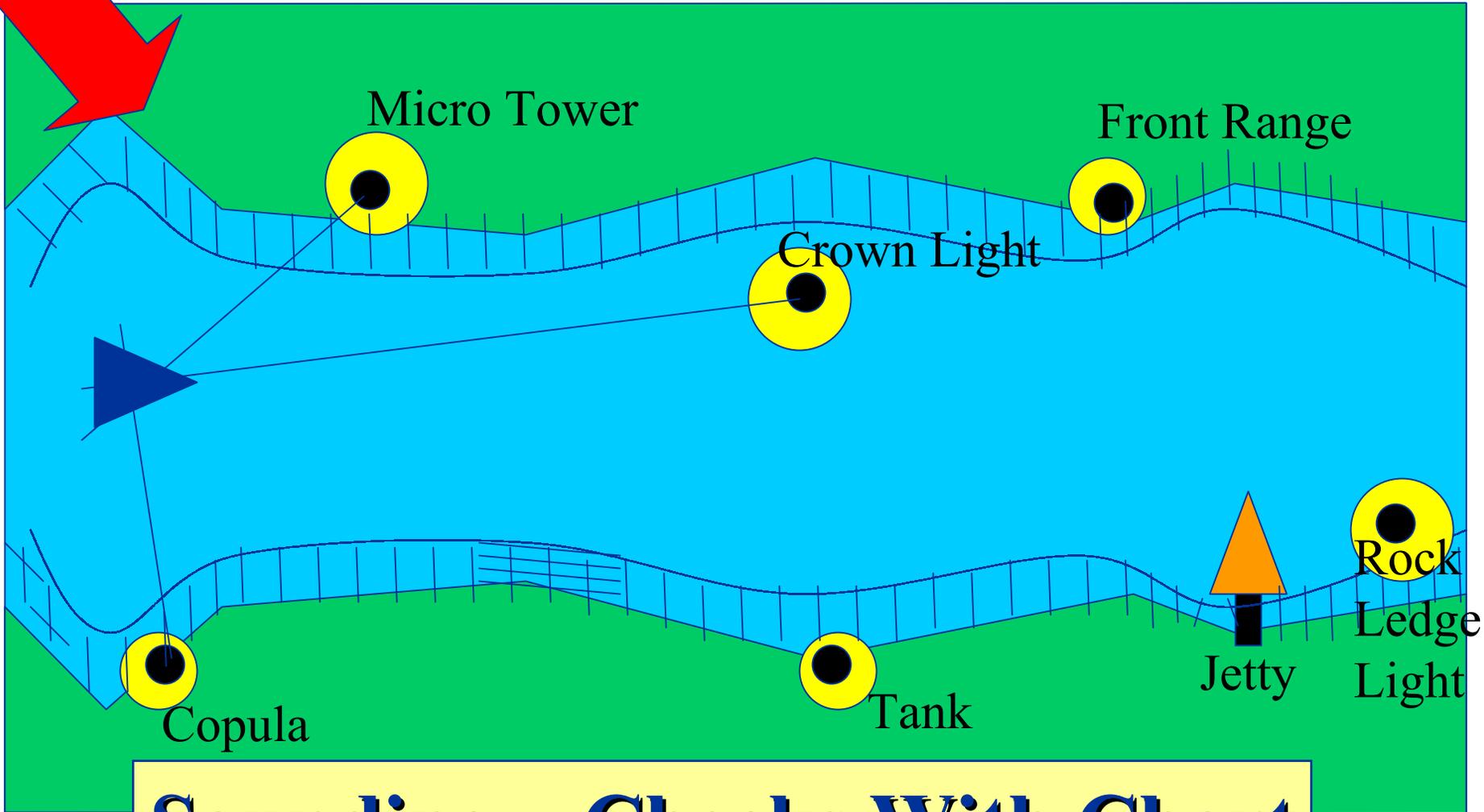
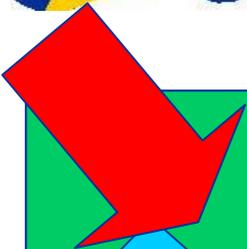
Dividers & Compass

These Are INSTRUMENTS...

Practice Session....



Visual Fixes...



Sounding – Checks With Chart



“Taking A Round Of Bearings”

- The Mids are taught to shoot the most rapidly changing bearing first
 - Typically the beam bearing
 - May not be...
 - Why - Shooting at a given time
- In the sail training craft context, shoot the most rapidly changing bearing last
 - Mark the time
 - Why – Most up to date information



The Hand Bearing Compass...



Key elements:

- Almost Midshipman Proof
- Susceptible to deviation errors
- They come with a Lanyard – Use it!!!





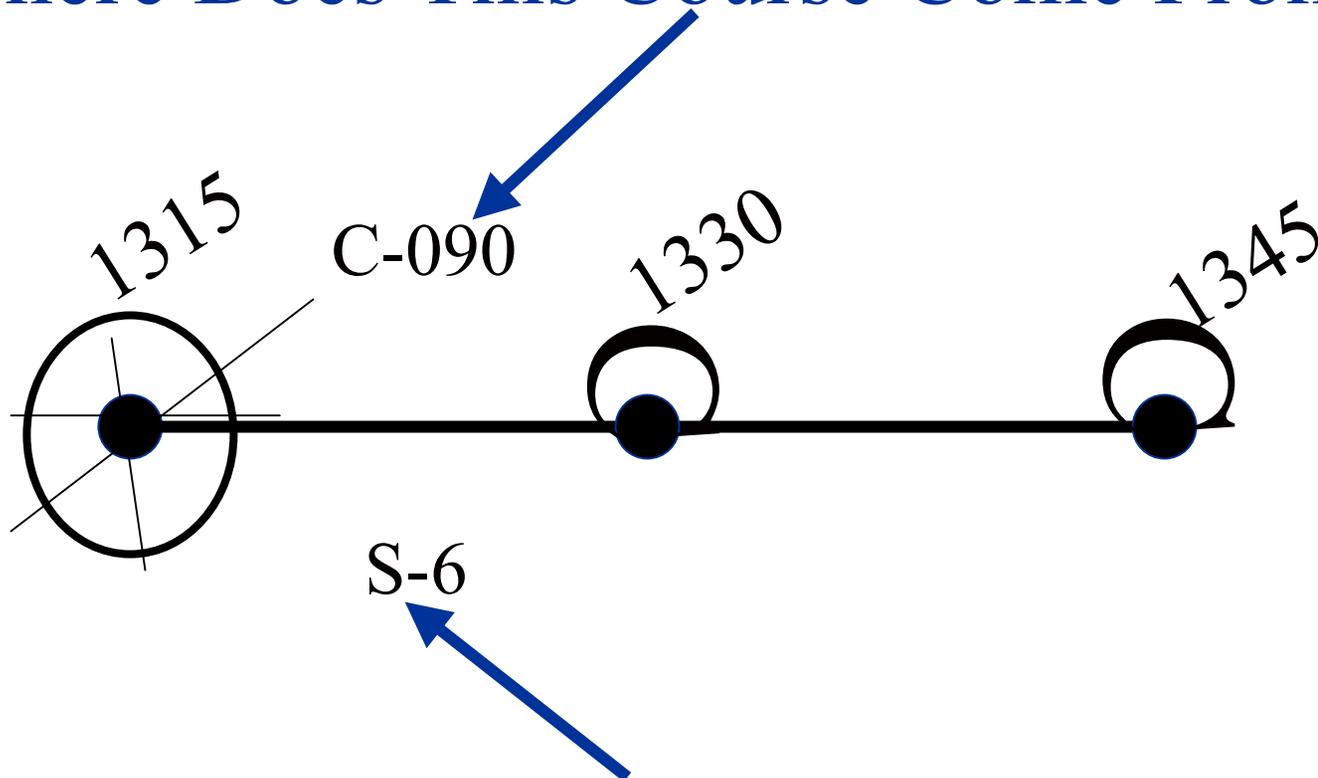
Note - These Are Not... Hand Bearing Compasses!!!





Plot, Label, DR... Plot, Label,
DR... Plot, Label, DR...

Where Does This Course Come From???



Where Does This Speed Come From???

Sounding – Checks With Chart



The Fix & The DR...

The DR Is Based on Onboard Instrumentation



Do Not Use Loran C or GPS
Course Over Ground/Speed Over Ground

“Weighted Averages...”



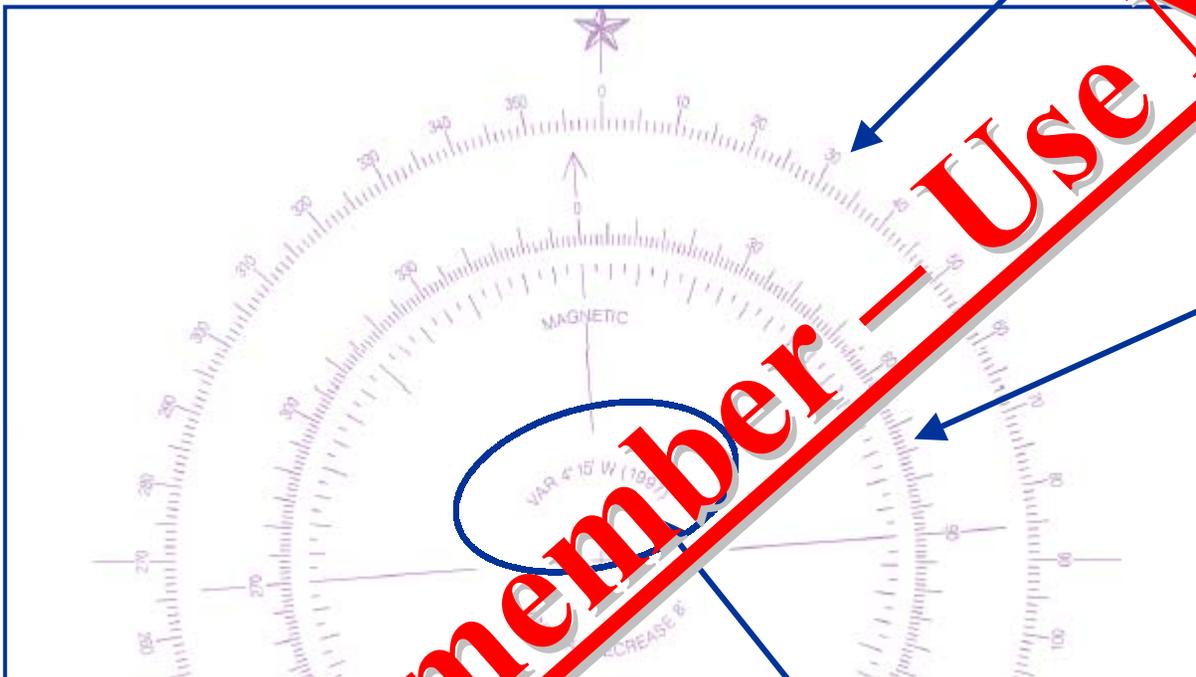
The Compass Rose...

Degrees True

- Don't use this one...

Degrees Magnetic

- Use this one!!!



Remember - Use Magnetic

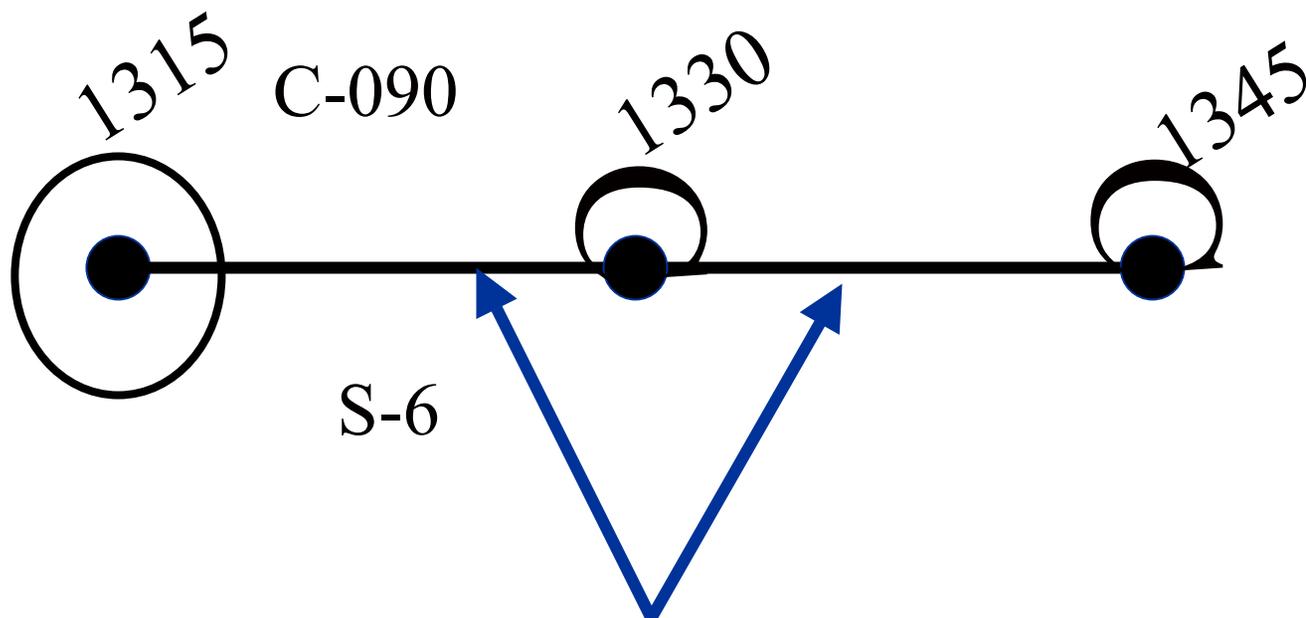
Variation...

- What do you need to know?





The Fix & The DR...



How Long Are These Segments???

Sounding – Checks With Chart



How Far Can You Go... Before You Plot A Fix Again?

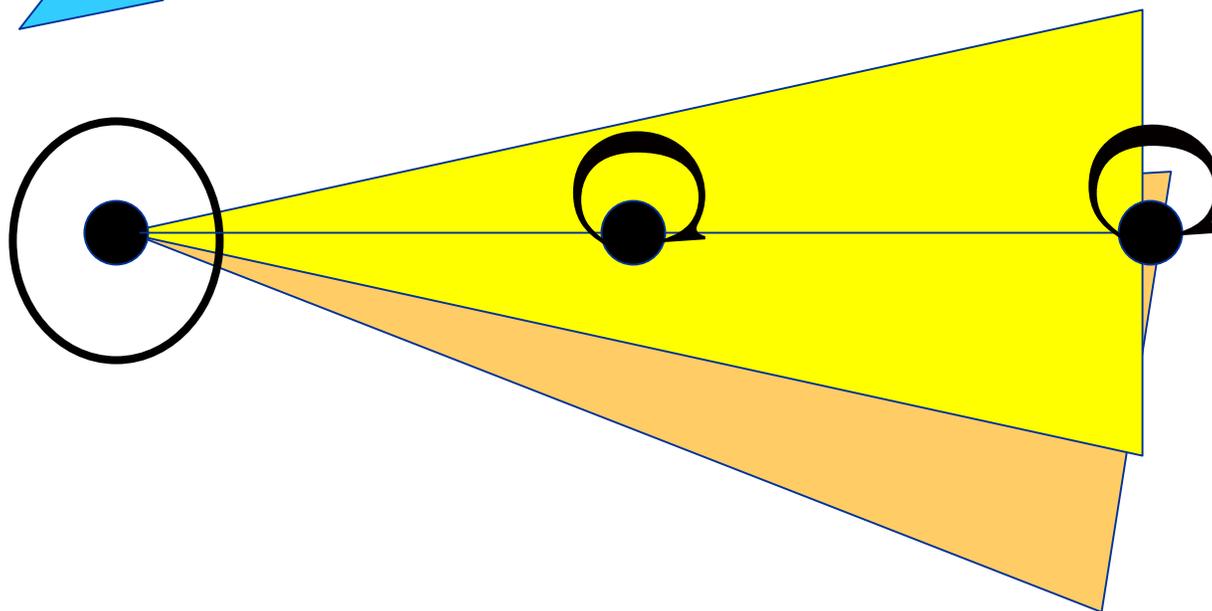


The Nautical Slide Rule

$$\underline{\text{Speed X Time = Distance}}$$



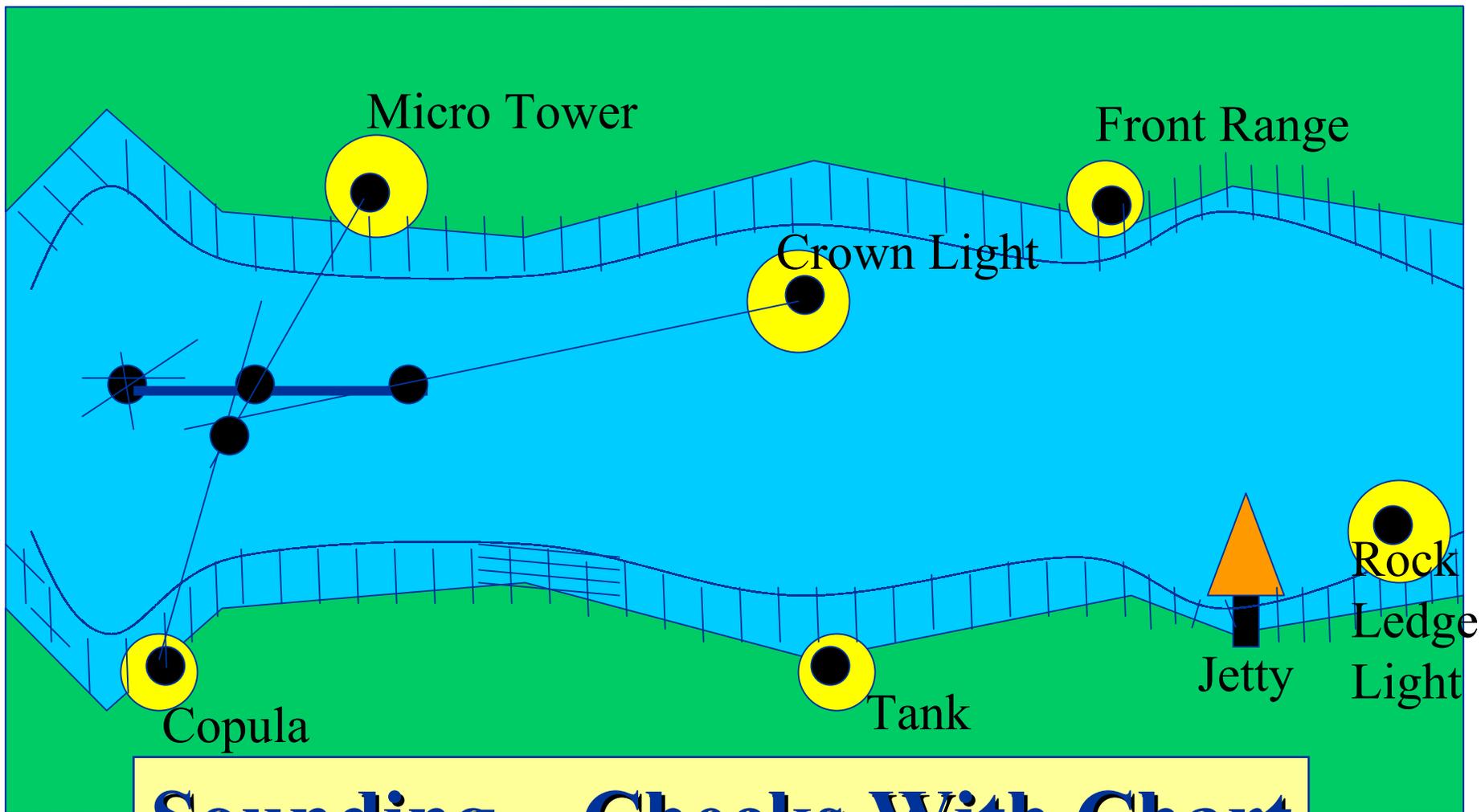
The Fix & The DR... Uncertainty!!!





The Fix & The Dr...

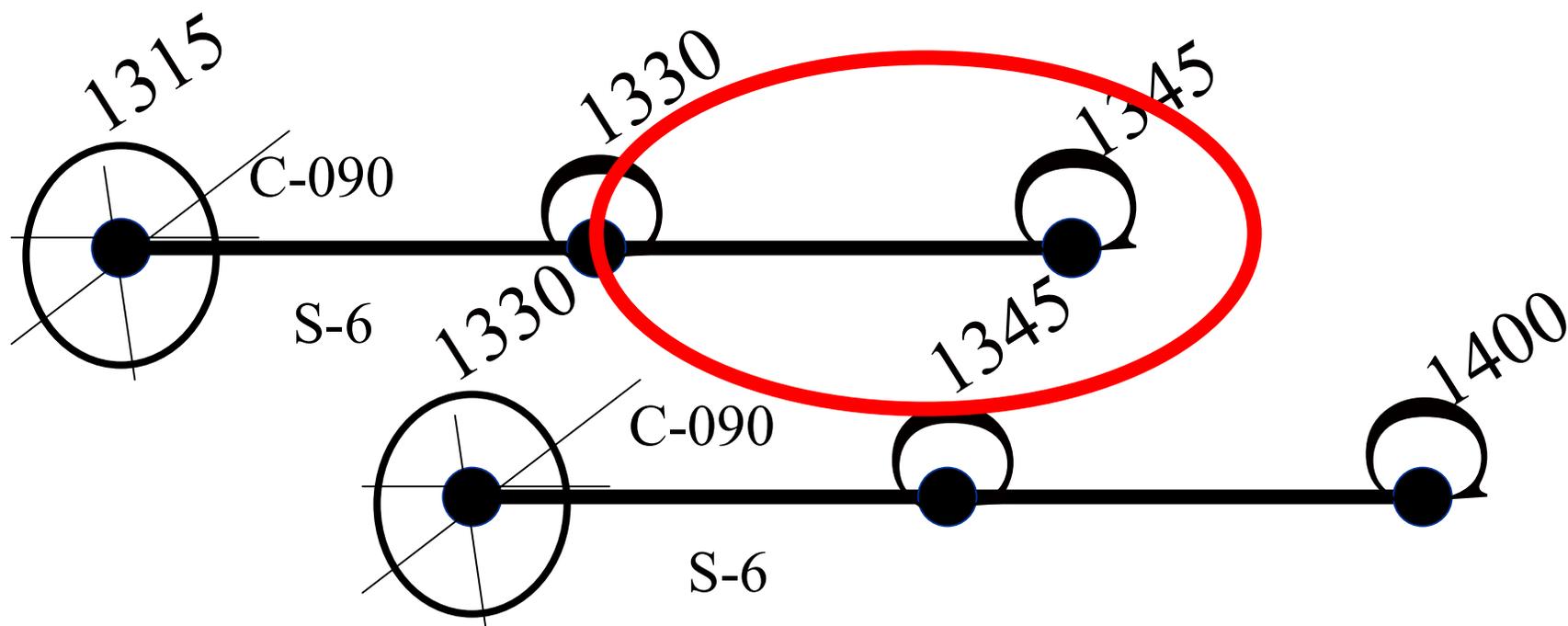
The Process



Sounding – Checks With Chart



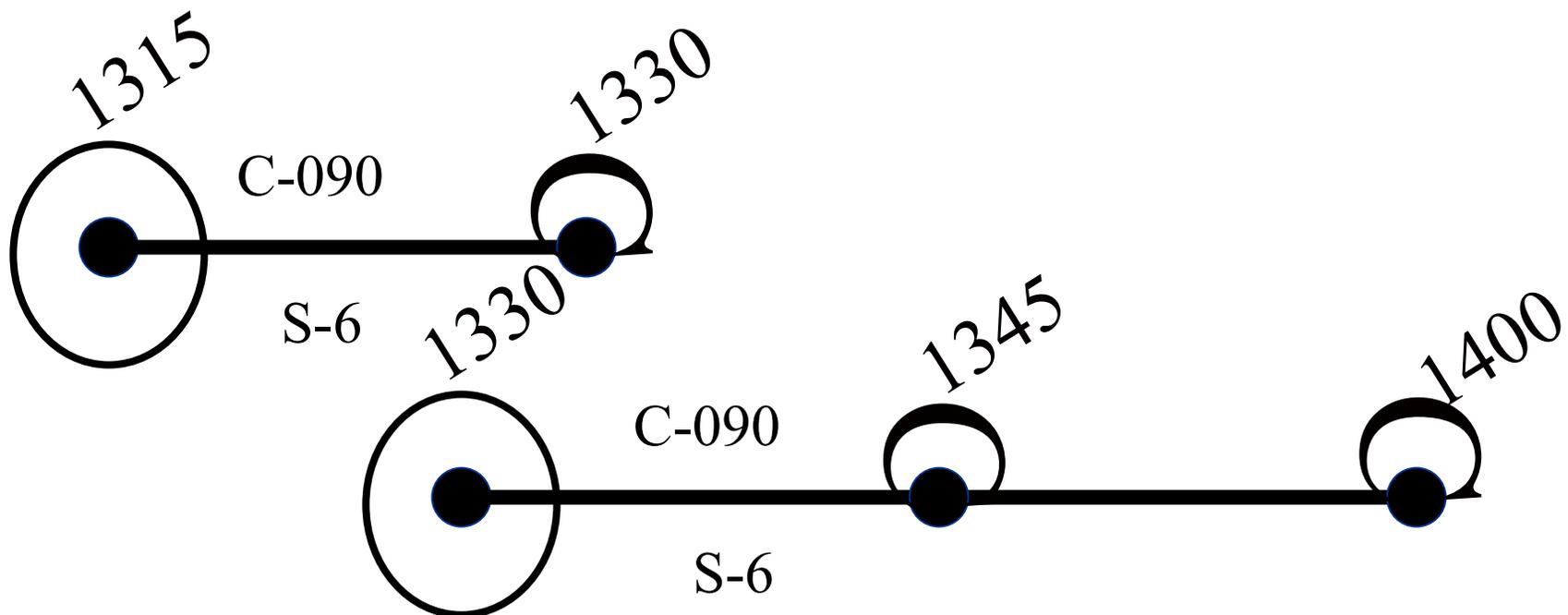
The Fix & The DR...



Sounding – Checks With Chart

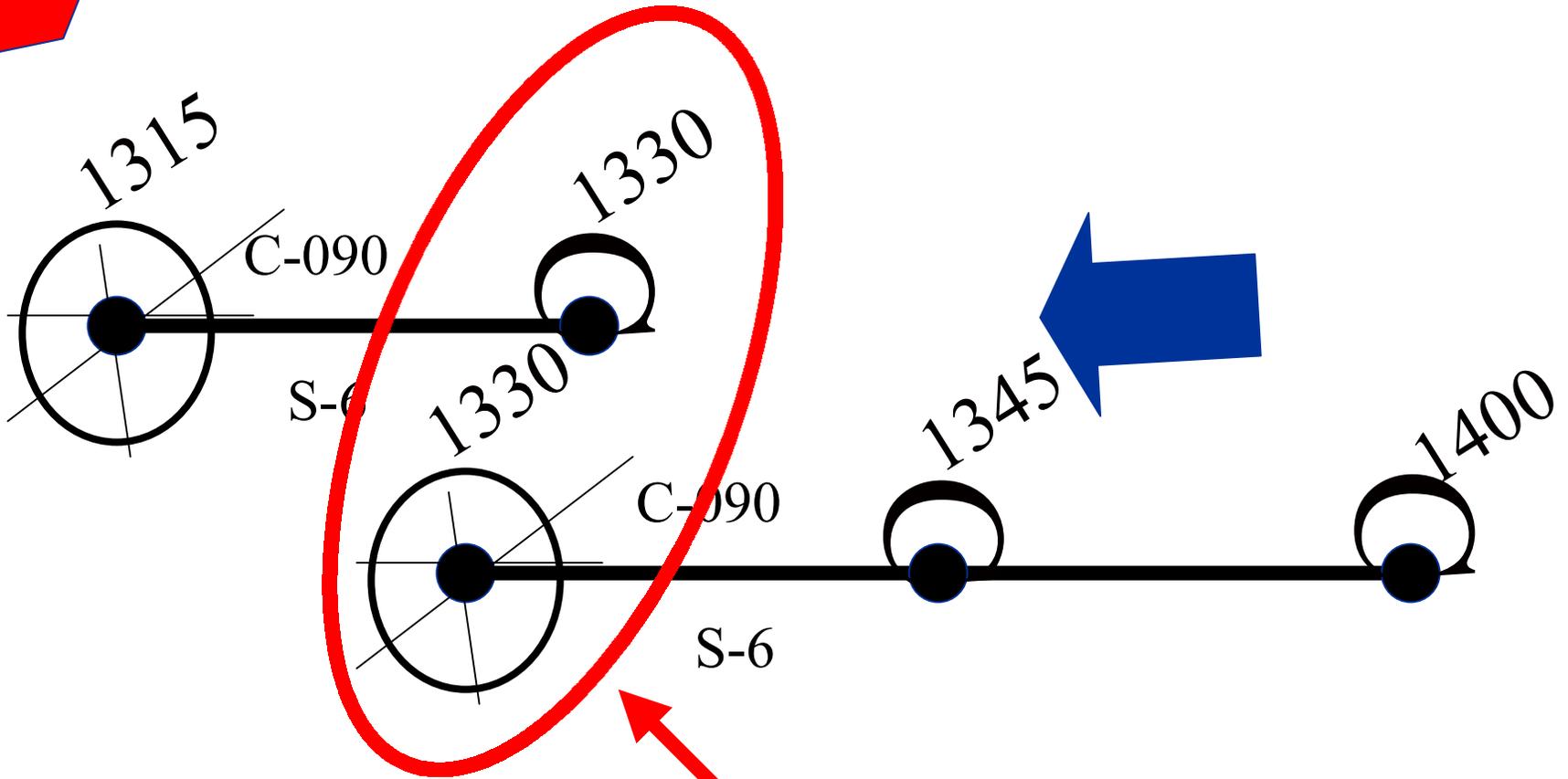
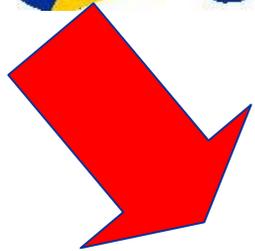


The Fix & The DR...





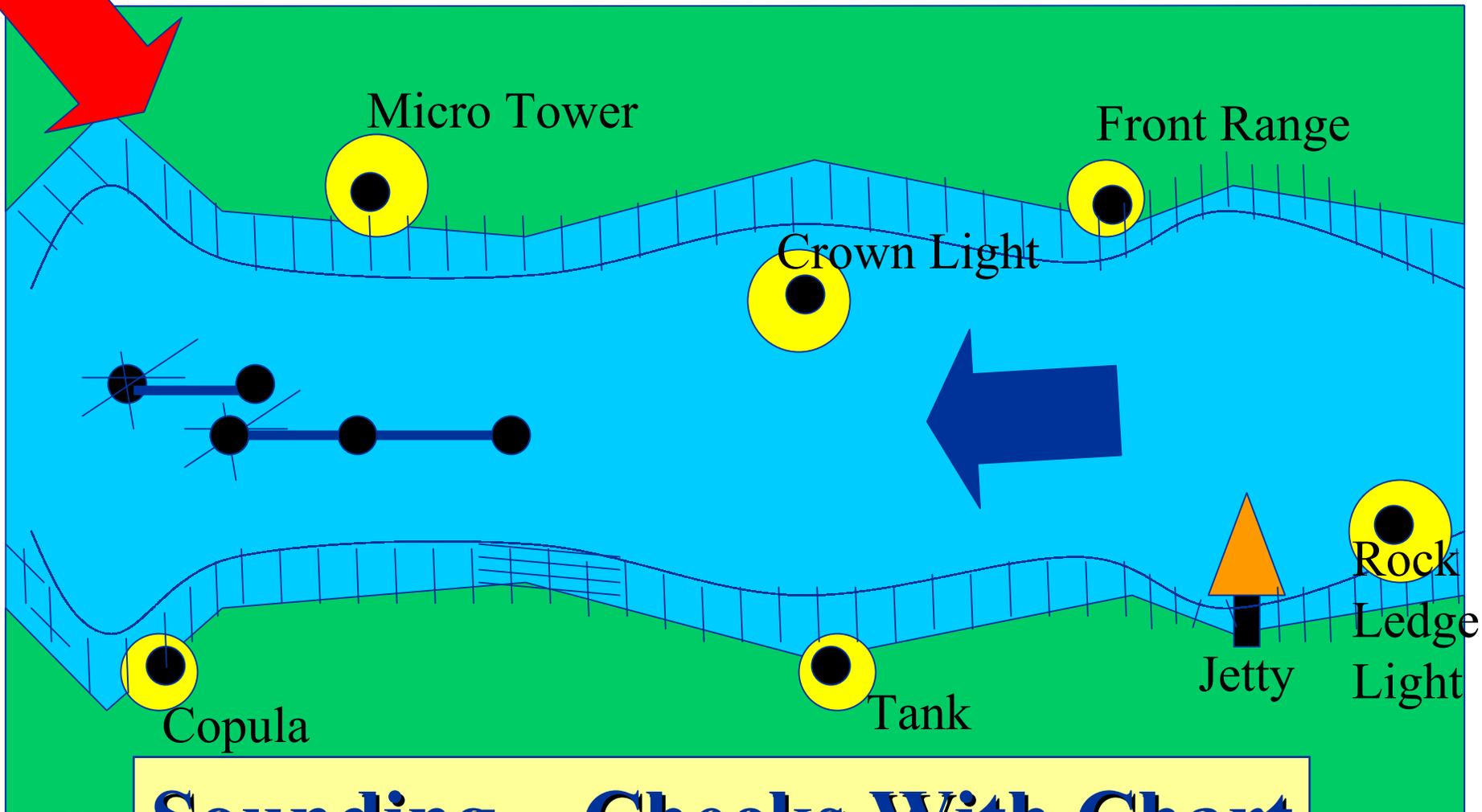
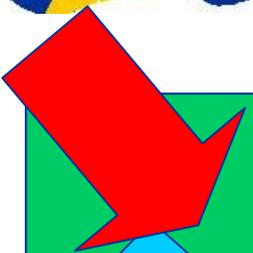
The Fix & The DR...



Does This Make Sense???



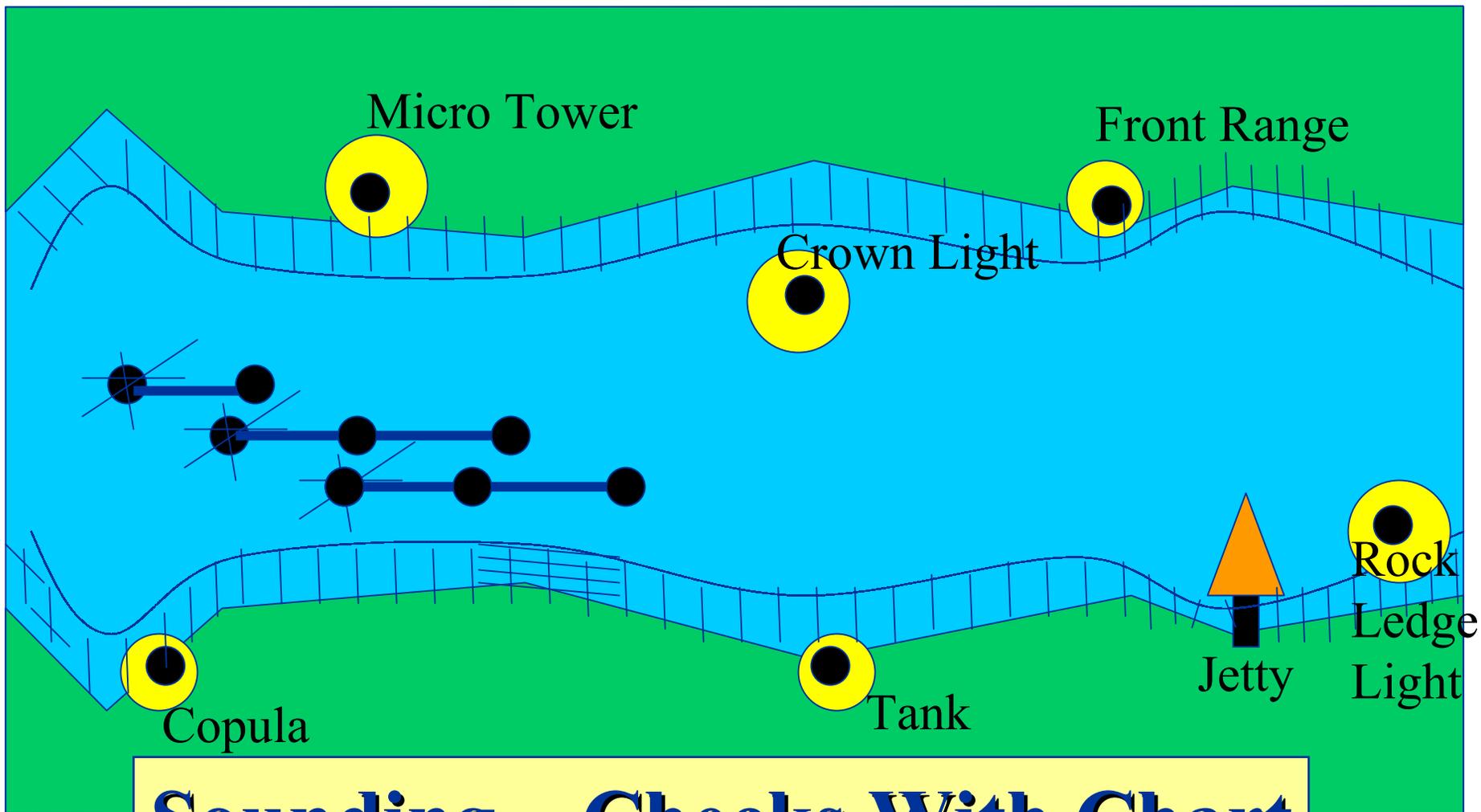
The Fix & The Dr... The Process



Sounding – Checks With Chart



The Fix & The Dr... The Process

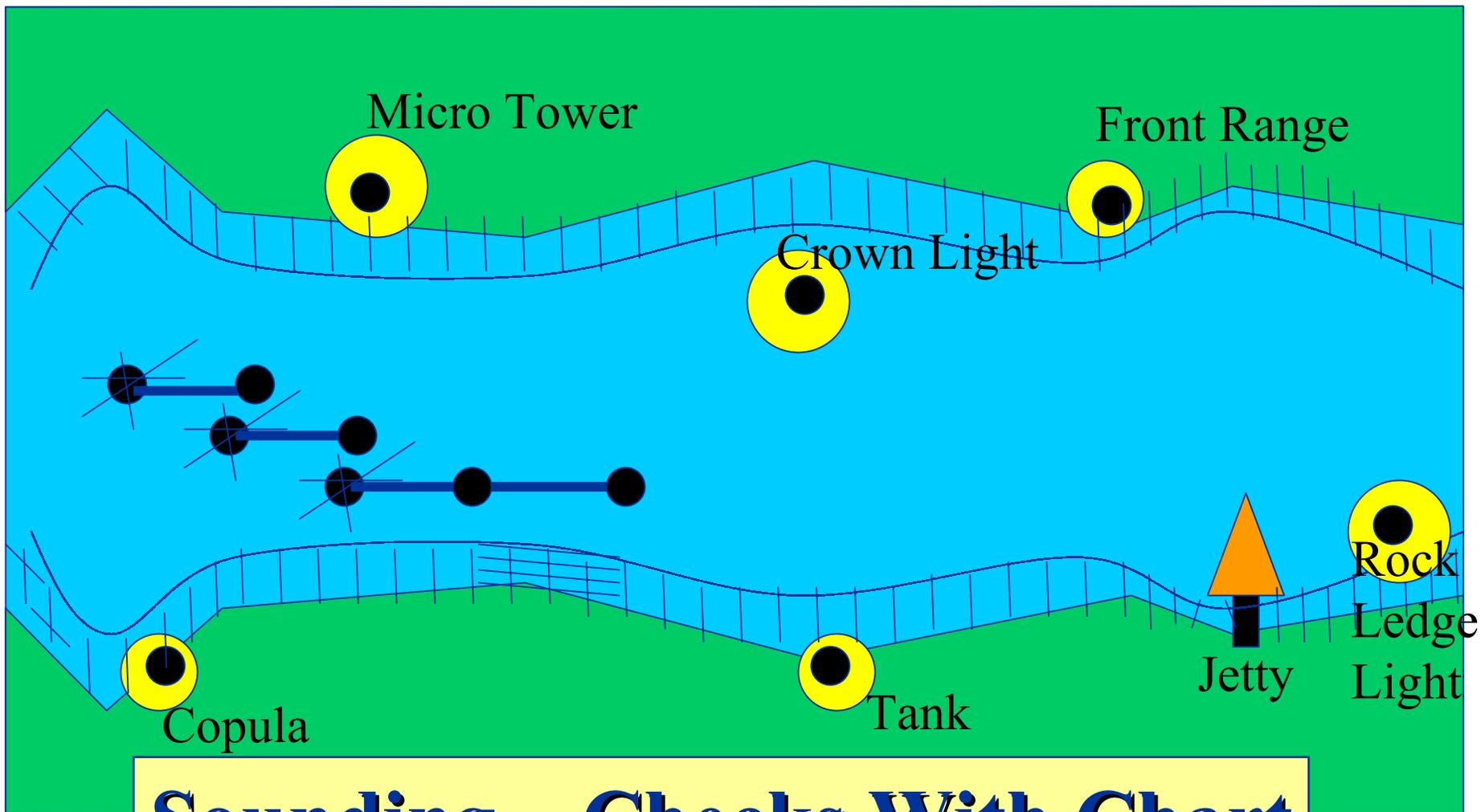


Sounding – Checks With Chart



The Fix & The Dr...

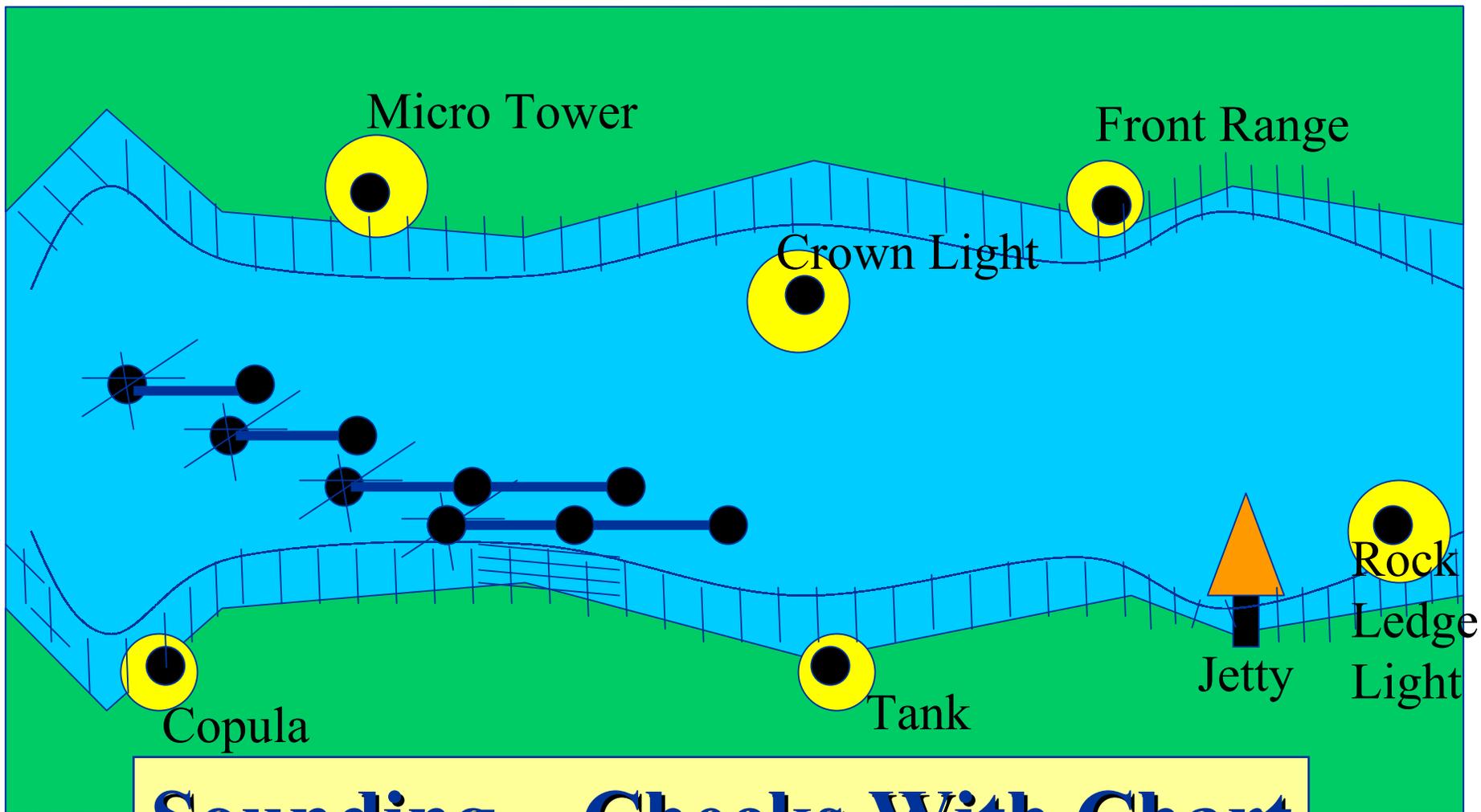
The Process



Sounding – Checks With Chart



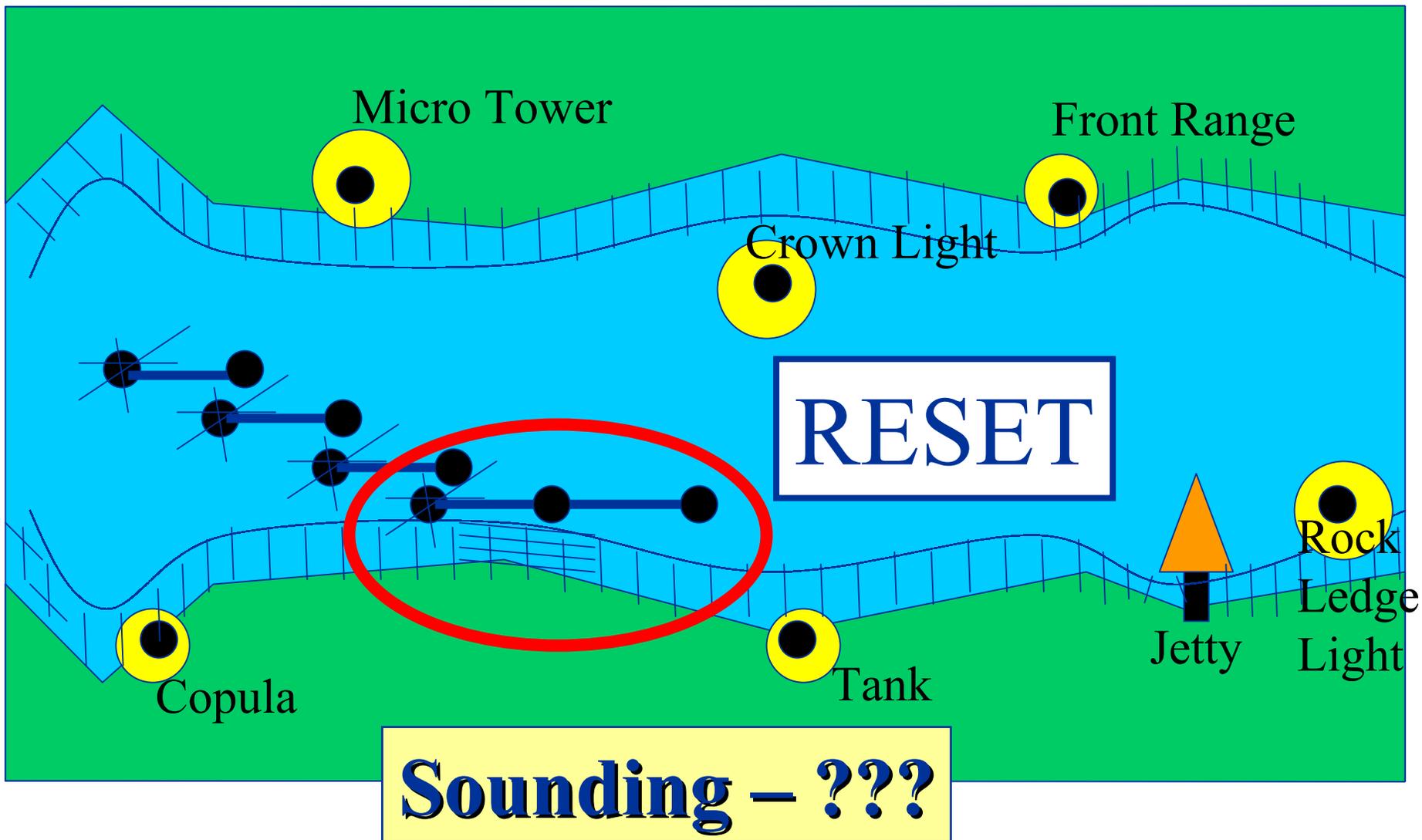
The Fix & The Dr... The Process



Sounding – Checks With Chart

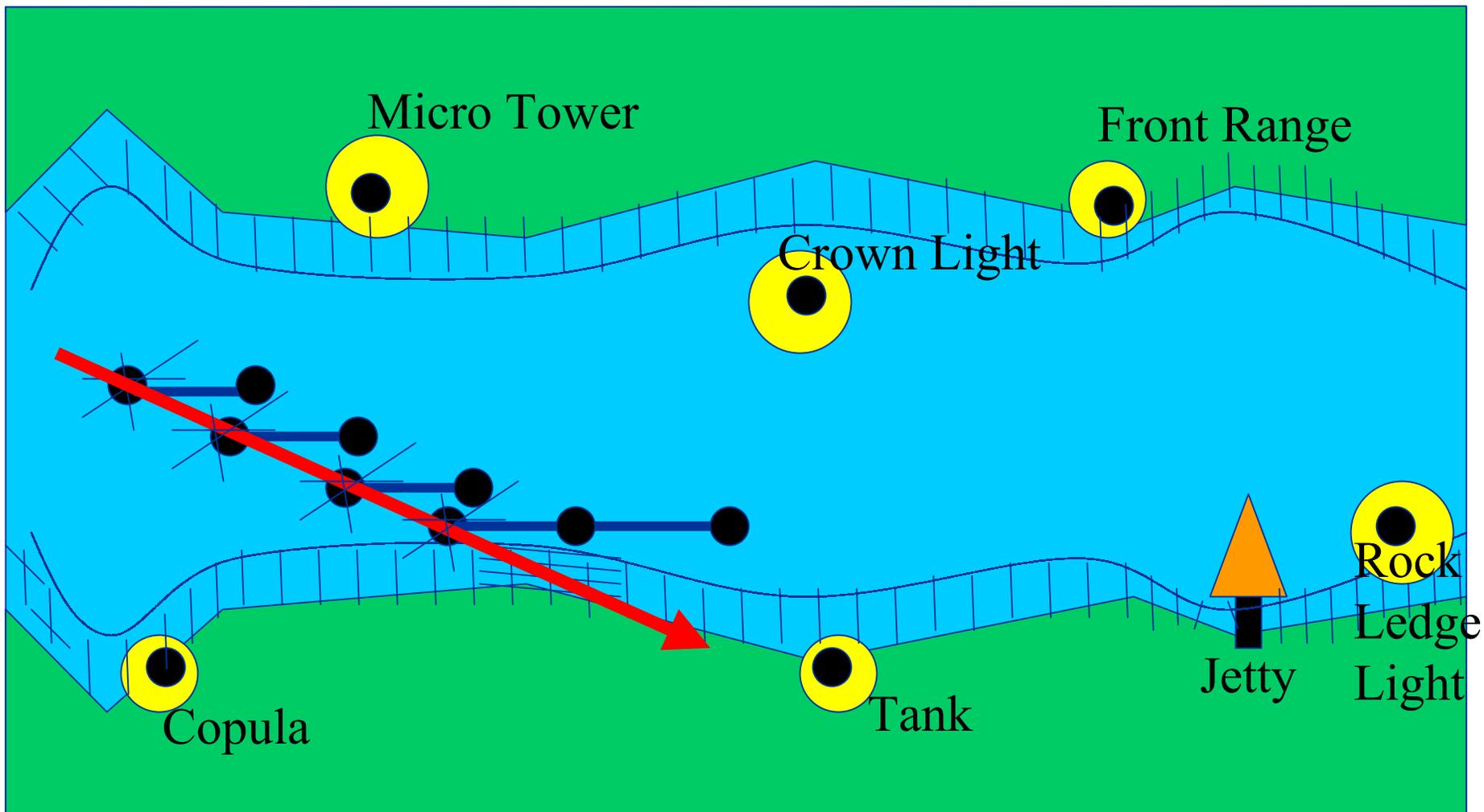


The Fix & The Dr... The Process



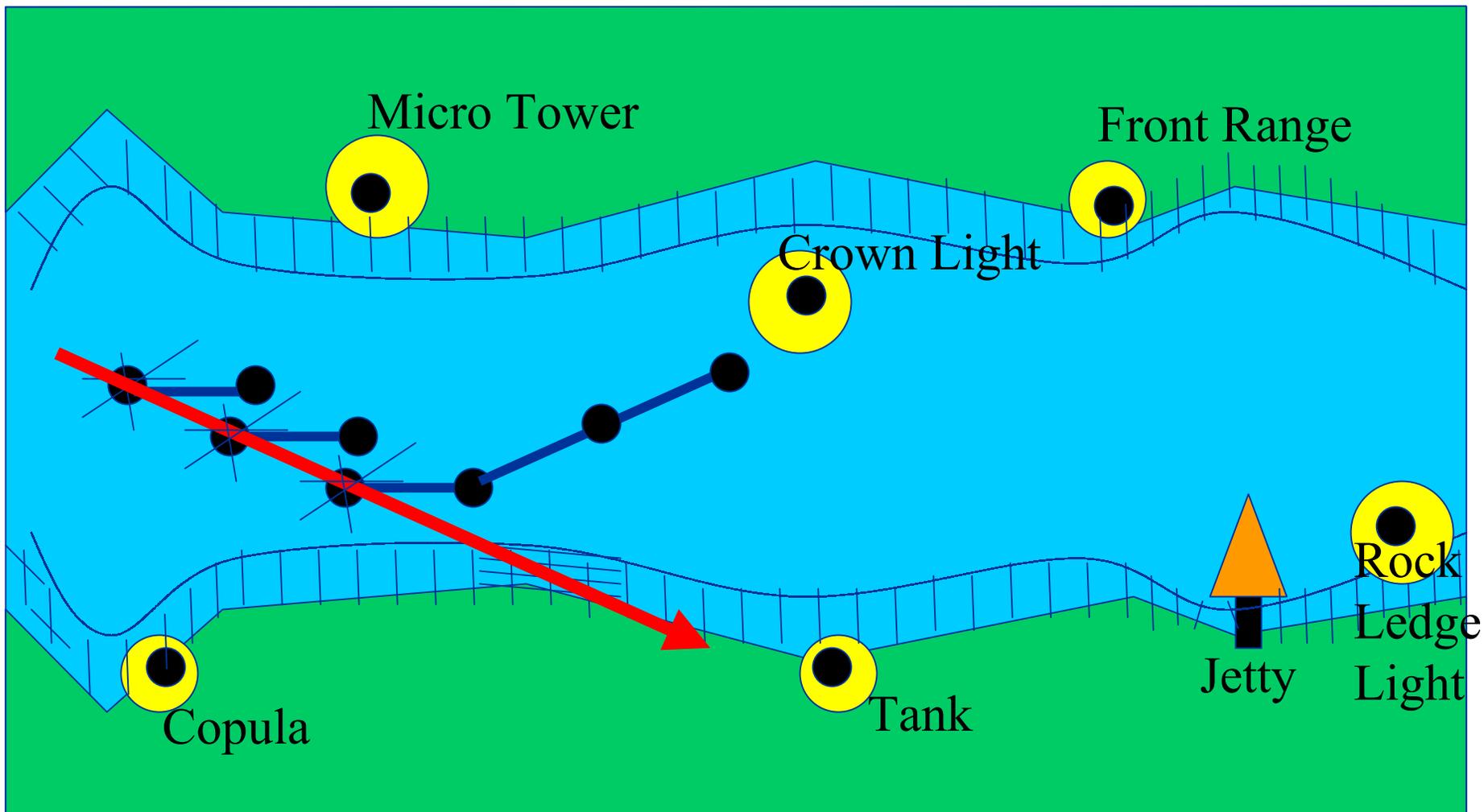


The Fix & The Dr... The Process





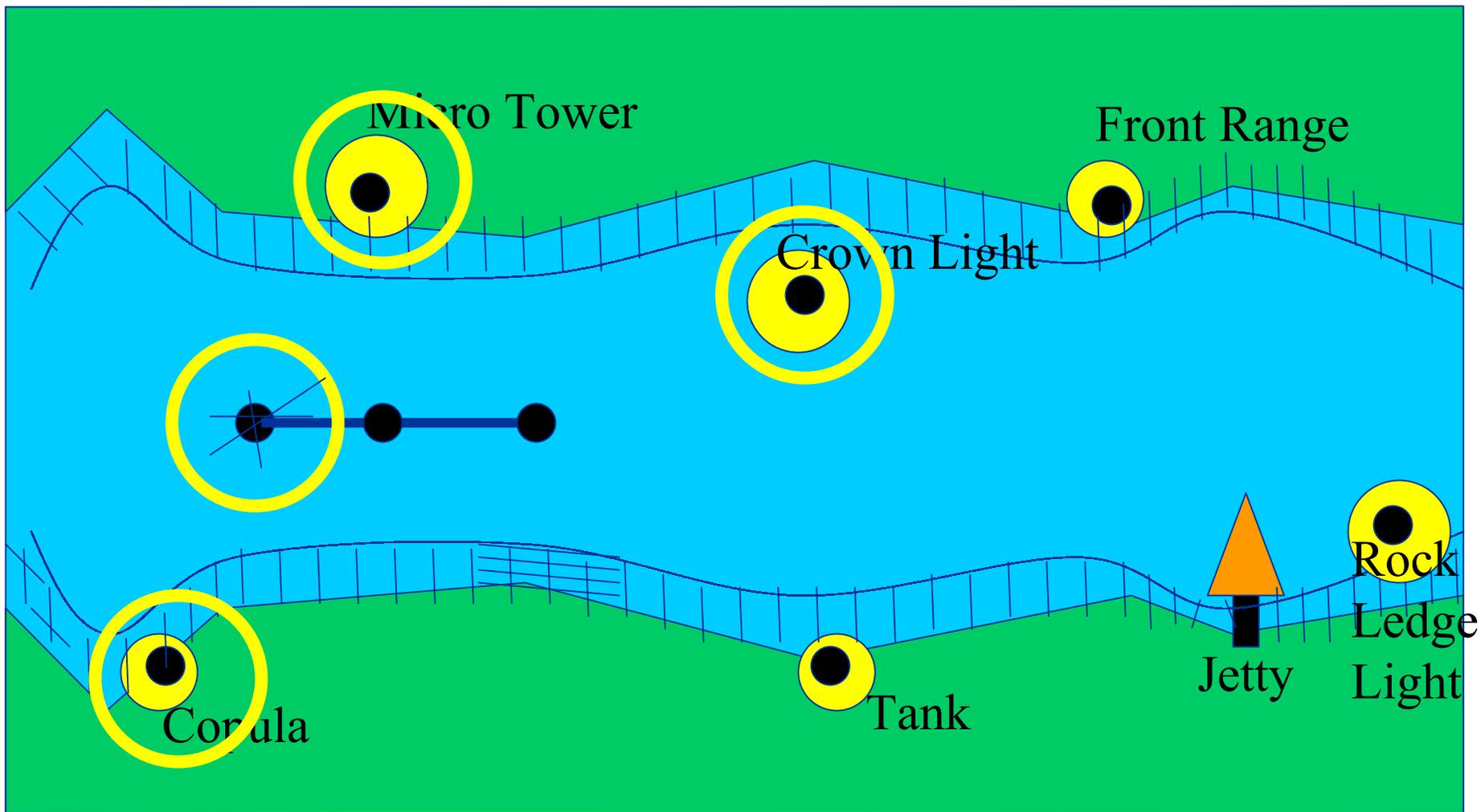
The Fix & The Dr... The Process





We Move...

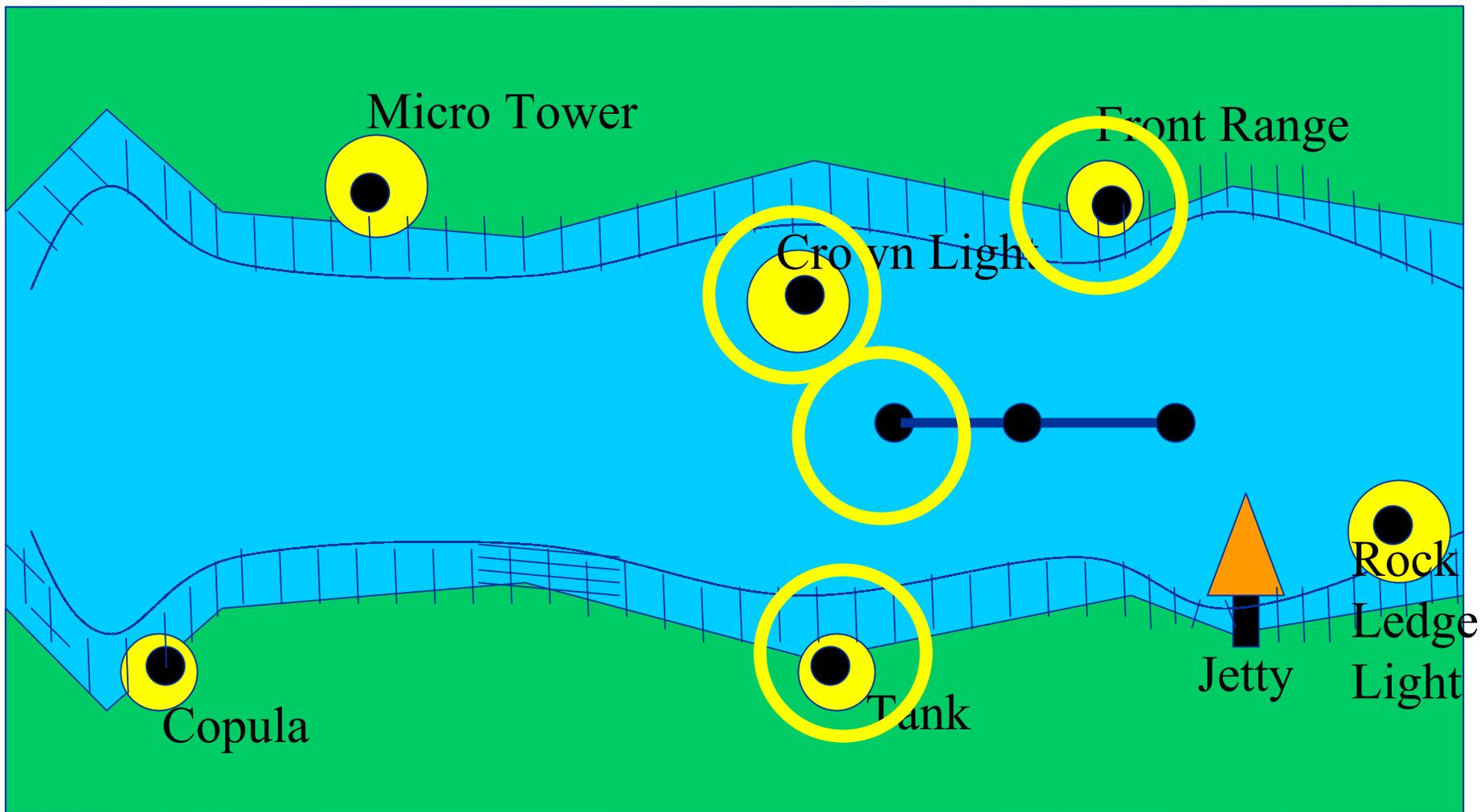
Gaining and Dropping Nav Aids





Skip Ahead...

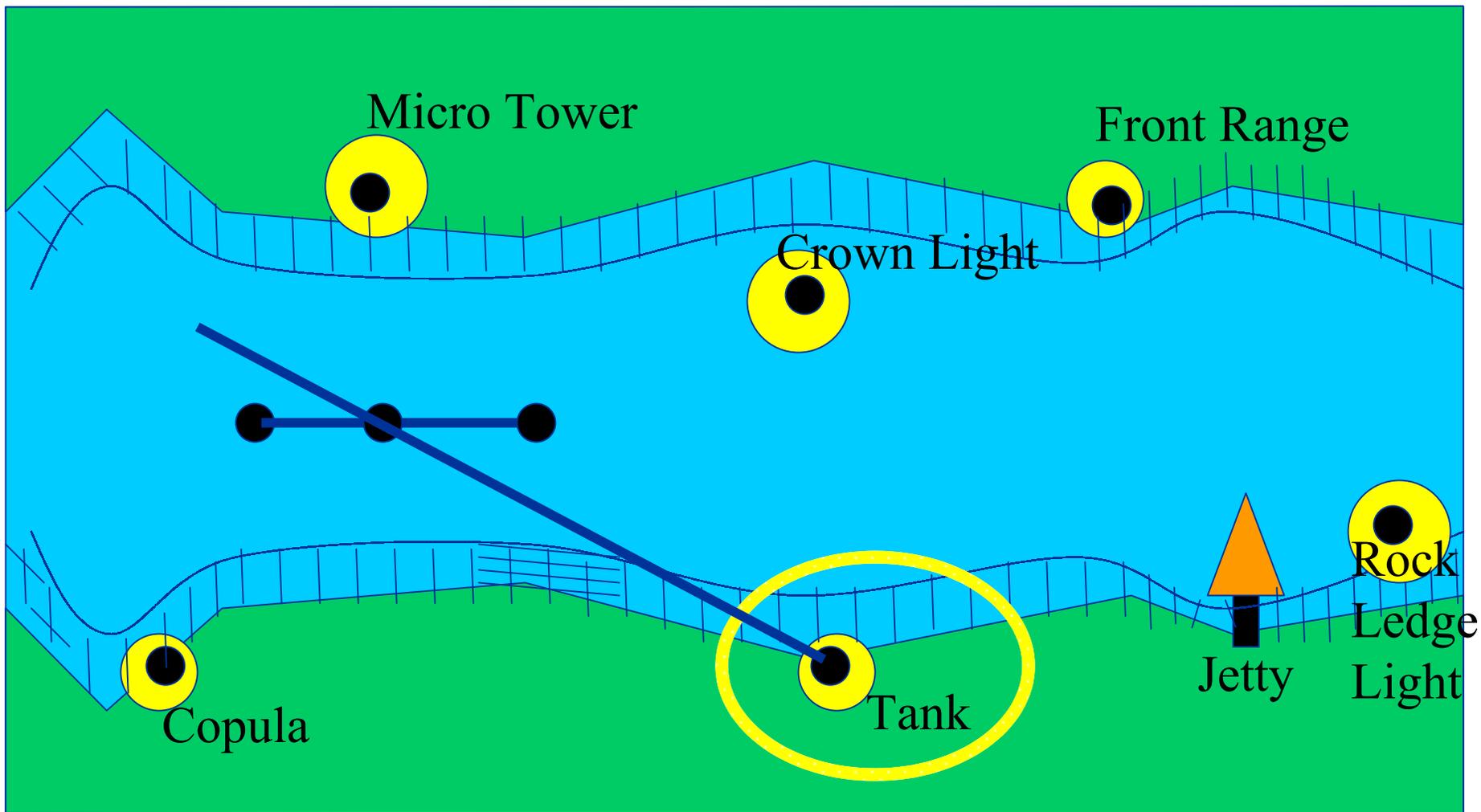
Gaining and Dropping Nav Aids





Gaining & Dropping Nav Aids...

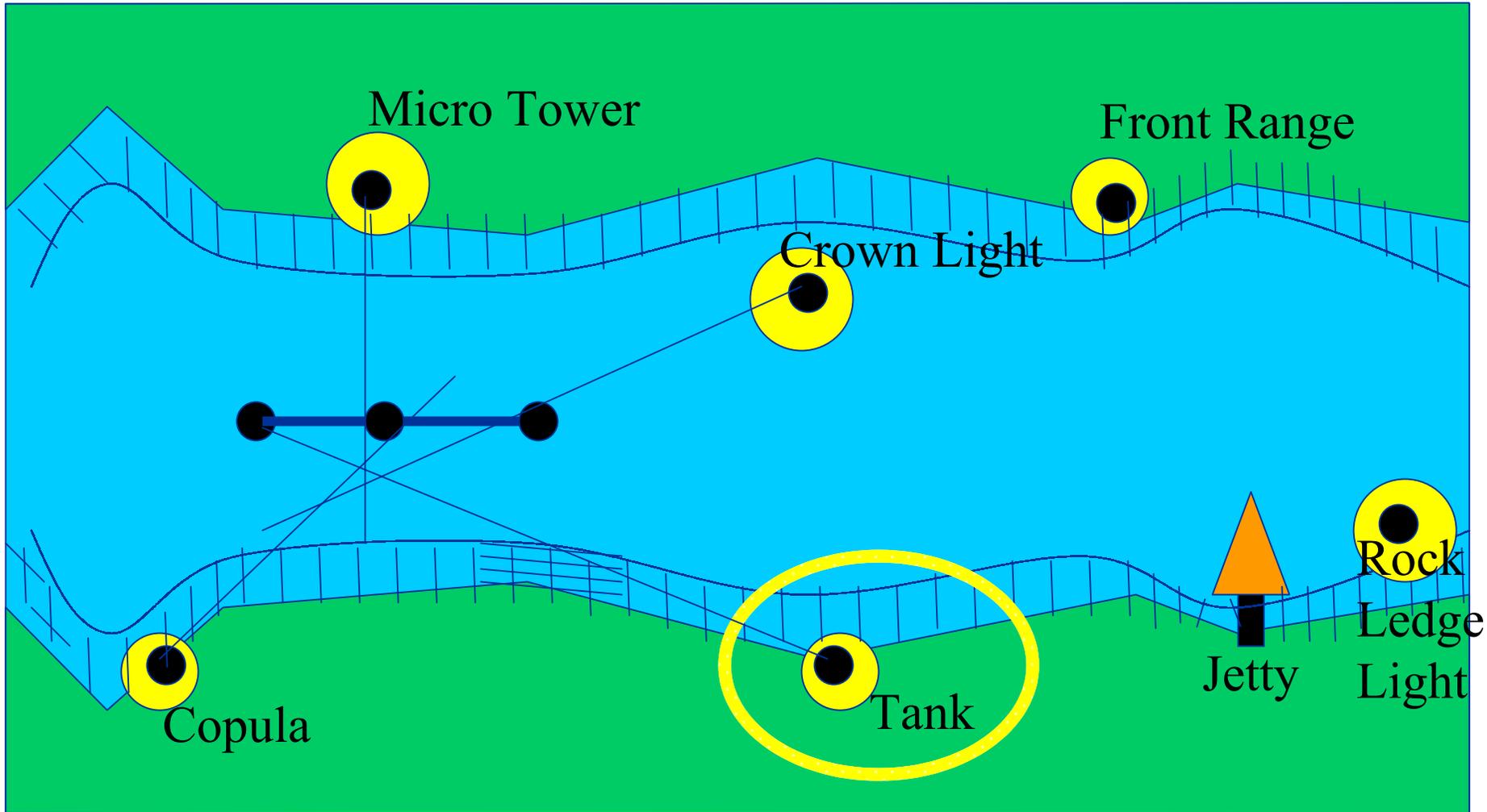
Step 1: Sight & Identify





Gaining & Dropping Nav Aids...

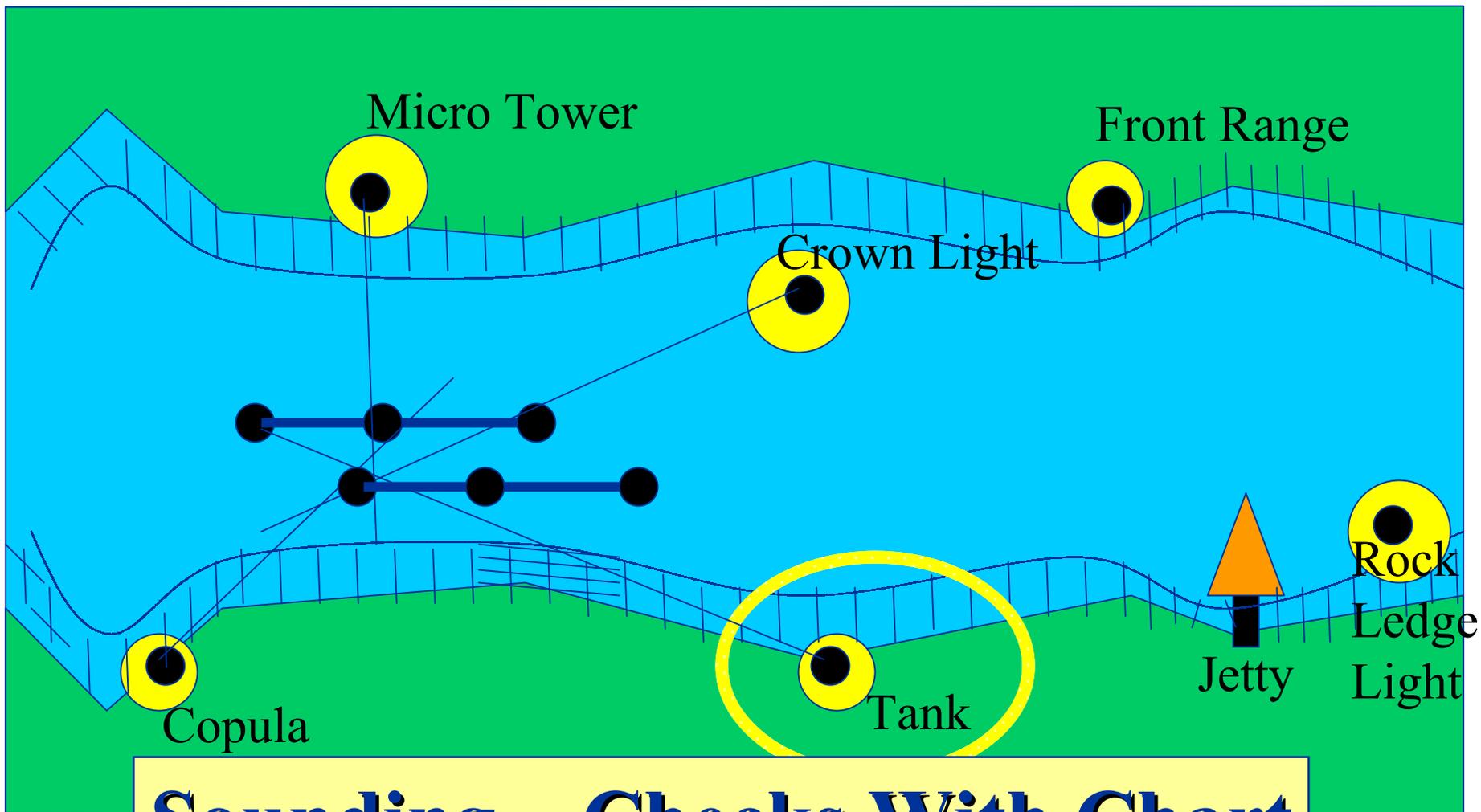
Step 2: Confirm With Fix





Gaining & Dropping Nav Aids...

Step 2: Confirm With Fix

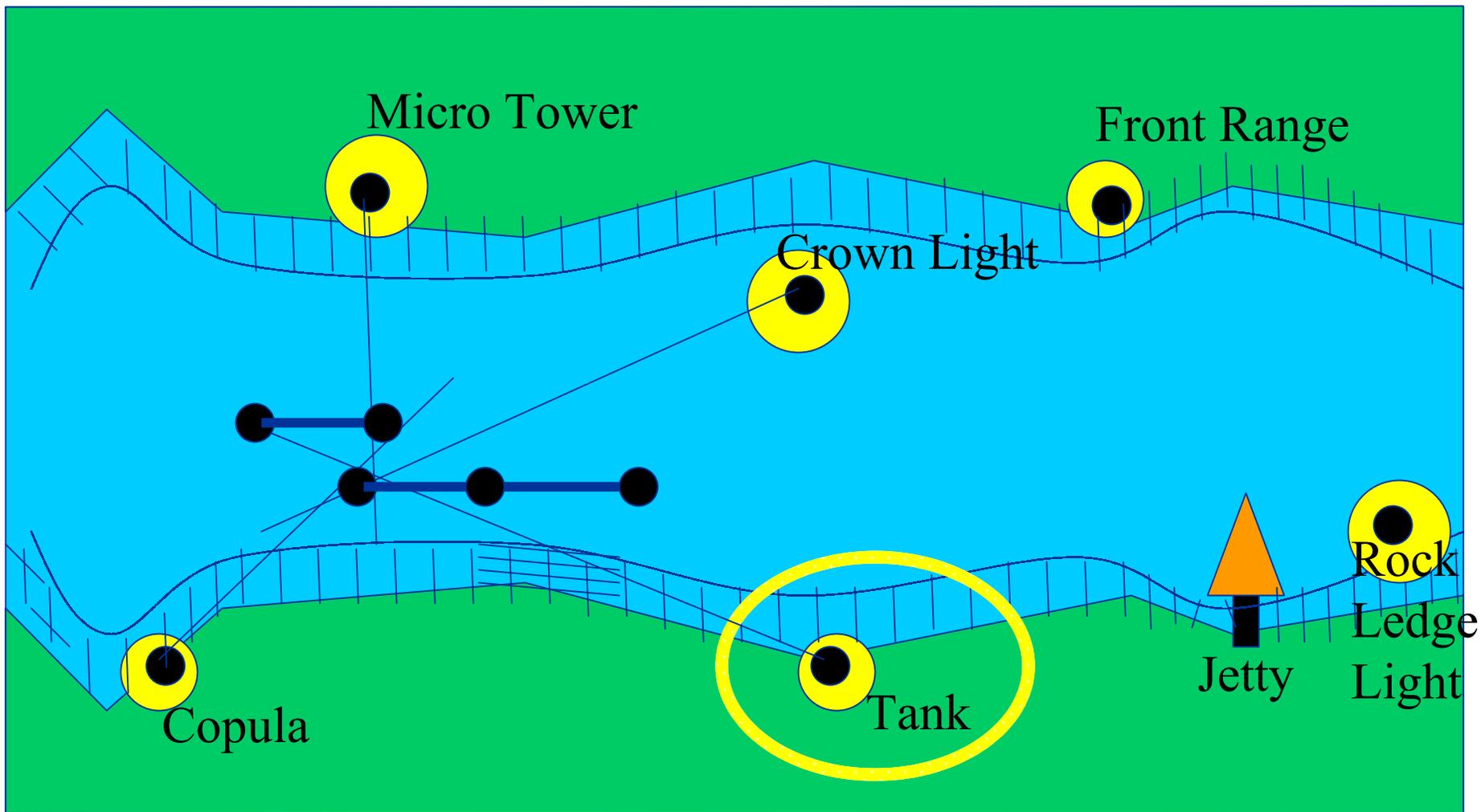


Sounding - Checks With Chart



Gaining & Dropping Nav Aids...

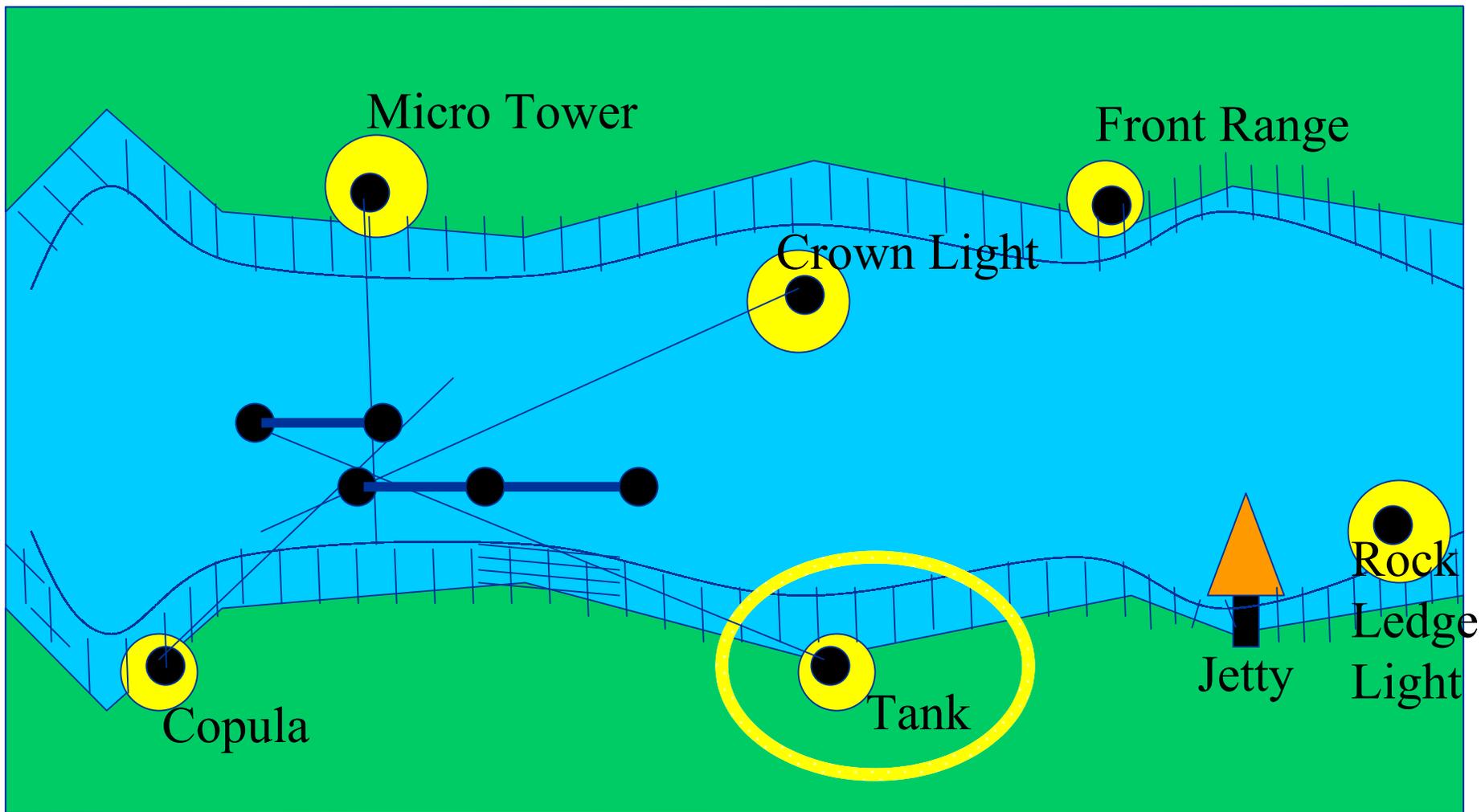
Step 2: Confirm With Fix





Gaining & Dropping Nav Aids...

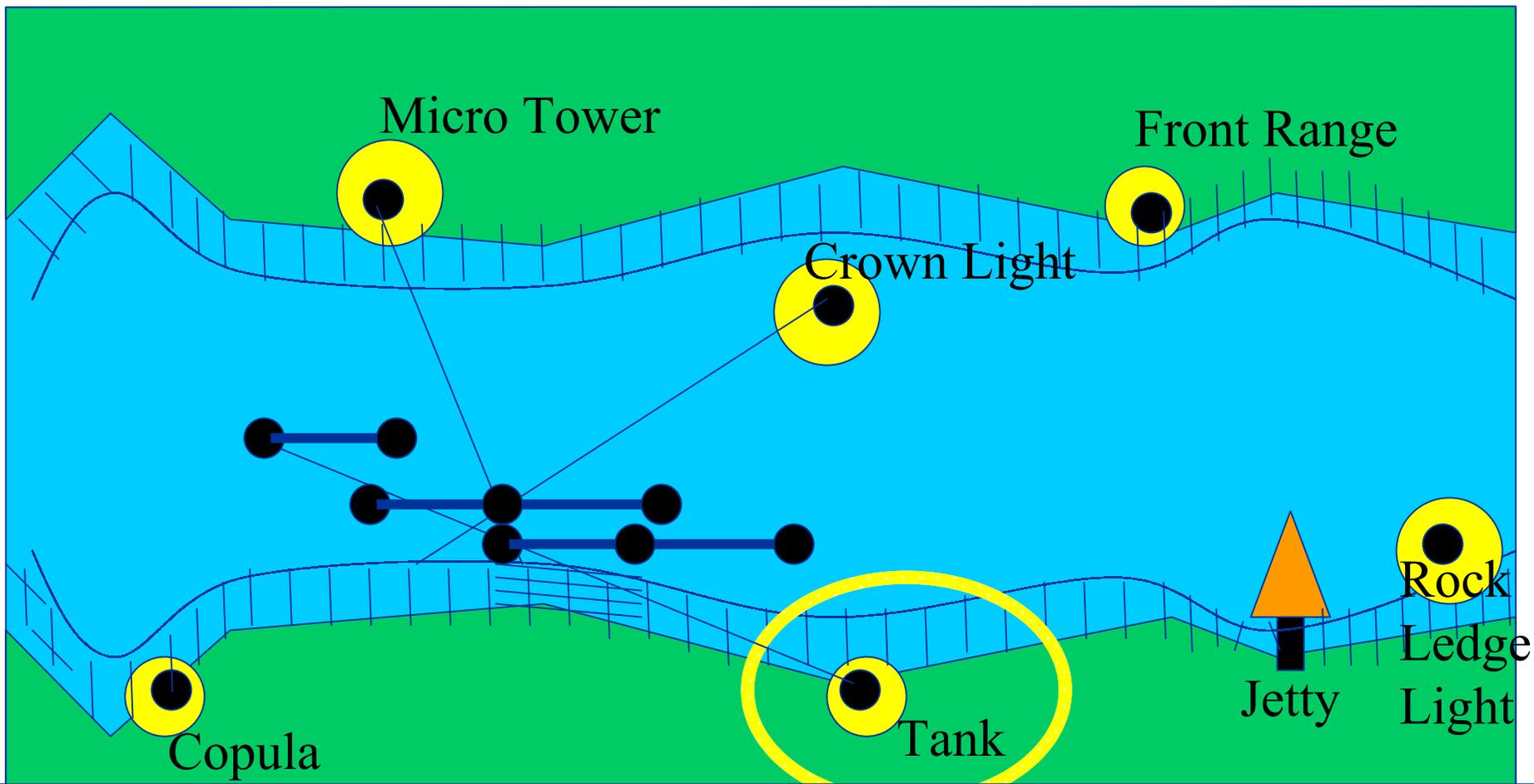
Step 3: Gain & Drop





Gaining & Dropping Nav Aids...

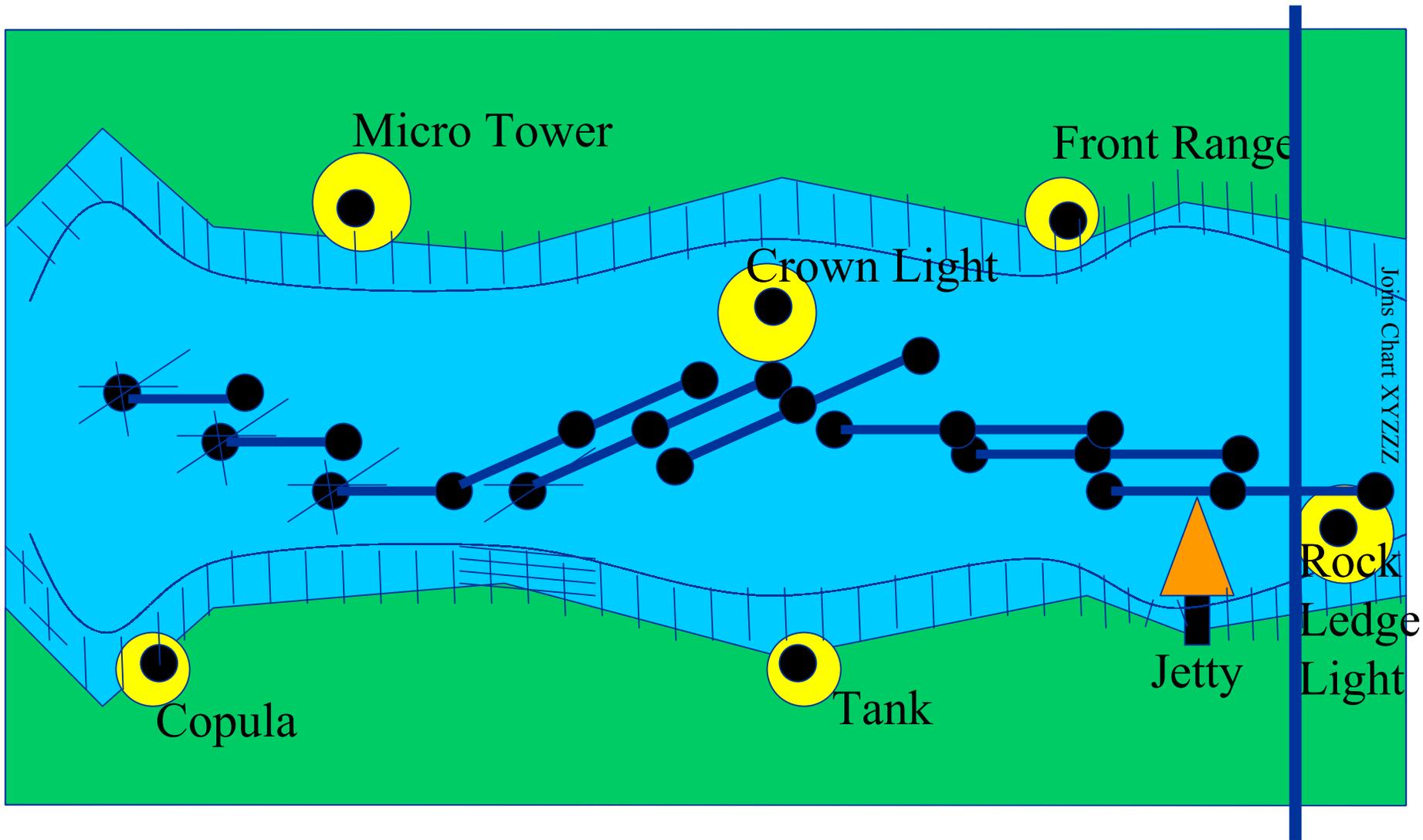
Step 3: Gain & Drop



Sounding – Does Not Check With Chart



The Chart Shift





How Do You Do The Shift???

What should you look for personally to make sure this is done correctly?

- The chart is **ready** for use
 - The Chart Prep Checklist
- Remember this???



The Chart Prep Checklist...

Navy Sailing Chart Preparation Checklist

Chart Number _____

1. Note the chart's sounding datum (X the appropriate box).

Fathoms _____ Feet _____ Meters _____

2. Box the Sounding Datum. Highlight this in Orange and verify that it's visible after the chart is folded for use. If not - annotate it where it can best be seen.

3. Enter the vessel's draft (i.e., 7.5 feet) _____

Did you, in fact, sign off on this chart???

If not – reverse course and do it right!!!

_____ X _____ = _____

(i.e., For a CSNTS Cruise: 8 feet times 2 = 16 ft)

6. Review the chart for actual sounding datum. Choose one based on Block 6 above (if required, round up): _____

7. Highlight this sounding line with a dark blue marker. Pay particular attention to the rate of change of depth, and mark the chart accordingly.

8. Visual Nav Aids: Carefully review the chart, and identify visual nav aids:

- Circle, highlight in yellow, and label ABC (Where ABC is an easily spoken, unmistakable noun name)

9. Nav hazards: Carefully review the chart, and identify unlighted buoys and other nav hazards.

- Circle, highlight in pink, and label UNLIT ABC/NAVHAZARD ABC.

10. Radar Nav Aids: Carefully review the chart, and identify radar nav aids.

- Triangle, highlight in orange, and label ABC
- Pay particular attention for RACON buoys. These should have a circle and a triangle, and be labeled RACON ABC

11. Track: Draw and label the track

Enter the deep draft to the expected location

lined in 7 above, slash slash those areas where

chart as follows:

the chart's noun name e/below list the next

chart along the north/southbound track

14. Verify Currency: Immediately prior to use, verify the chart is up to date by querying the NIMA Notice To Mariners Database at:

http://pollux.nss.nima.mil/untm/untm_j_options.html?class_flag=N

Latest Chart Edition _____ On-hand Chart Edition _____

Latest Notice To Mariners _____

CHART UPDATED THROUGH NOTICE TO MARINERS _____ / _____

Number Date

Submitted: _____ Reviewed: _____

Midshipman Navigator AOIC/Navigator

Approved: _____
Officer In Charge



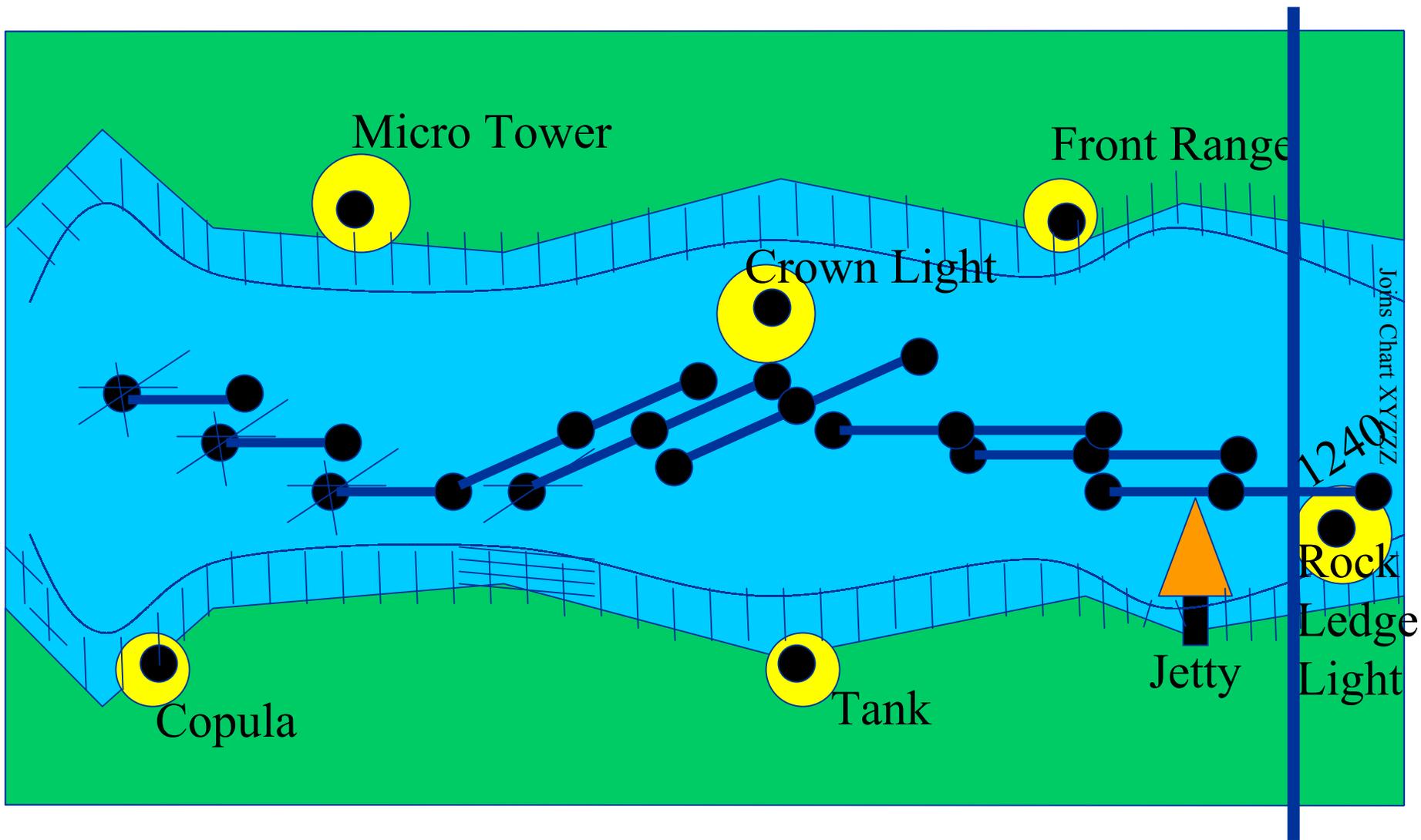
How Do You Do The Shift???

What should the plotter do?

- Determine the Latitude and Longitude of the **DR** that will be advanced onto the new chart
- Write it in the log
- “Shifted to chart 12224. Advanced DR position $34^{\circ}17.8'N$ $074^{\circ}16.4'W$
- Check you didn't make a transcription error
- Plot this DR position on the new chart
- See the homework problem

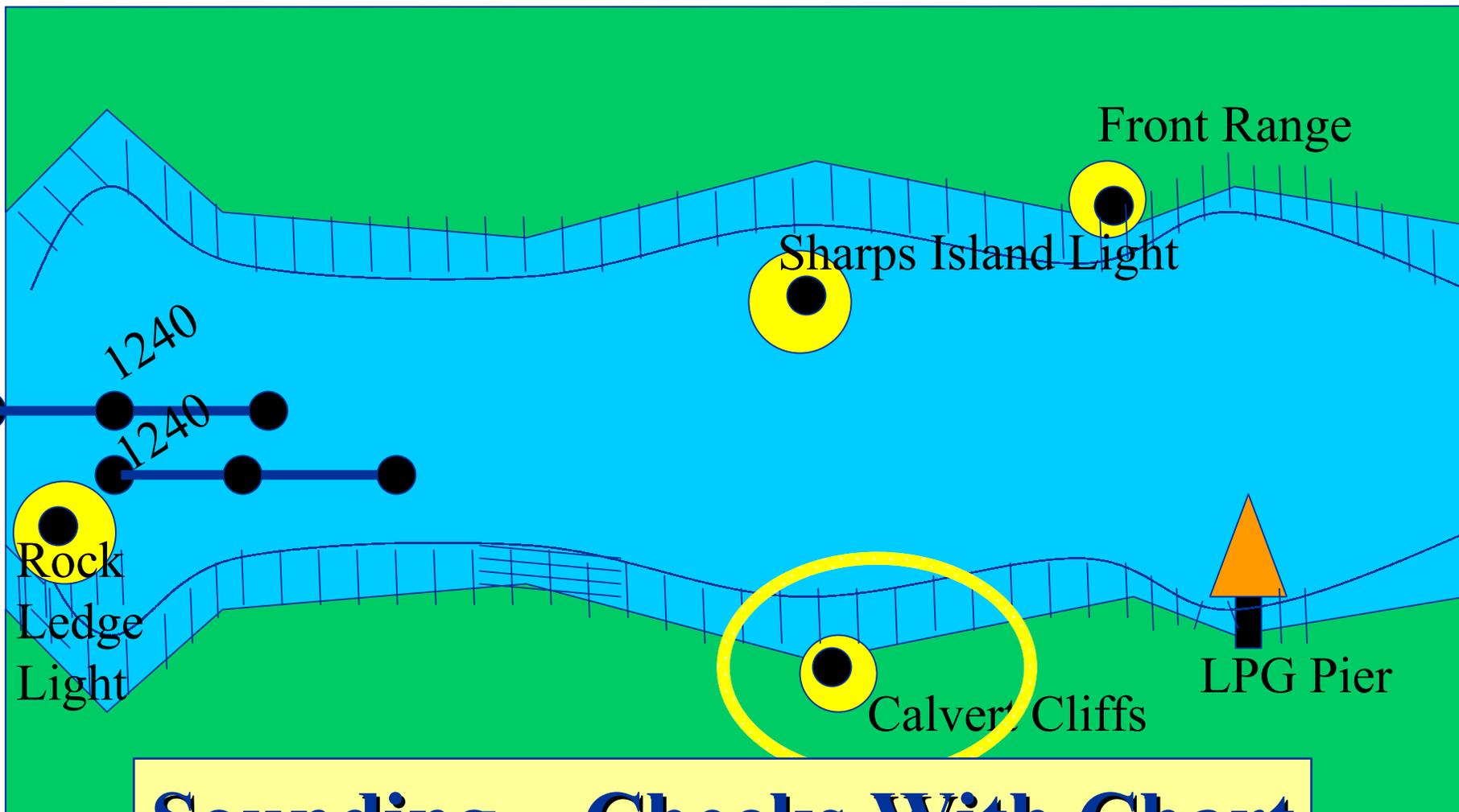


The Chart Shift





The Chart Shift



Sounding – Checks With Chart



How Do You Do The Shift???

What should the plotter do?

- Fix the vessel's position at OR BEFORE the time of the advanced DR
- Compare and contrast those two posits
- Sounding???
- Does this make sense?
- DR
 - Minimum cyclic routine: Plot Label DR
 - Six rules of DR
 - Don't plot a fix on the new chart without something to compare it to



How Do You Do The Shift???

What should the plotter do?

- Invite Watch Captain and OIC/AOIC to check the shift.
- “Officer in charge. Shifted to Chart 12224. Fixed the ship’s position at time 1240 by Loran C, checks with DR. Request you lay below to check the chart.”
- Check it – and not in a perfunctory manner



How Do You Do The Shift???

Check it – and not in a perfunctory manner

- What do I mean by that?
 - Check the log entry – It's your logbook!!!
 - Compare what's written to the displayed data
 - Break out the dividers and plot it - yourself
 - Or, shoot a round – yourself
 - Then initial the log book





Caution!!!

When you make the chart shift **UPDATE YOUR INSTRUMENTATION** to match the chart exactly:

- Open Ocean Charts are often in Degrees, Minutes and Tenths
- Piloting Charts are often in Degrees, Minutes and Seconds
- Sounding datum – fathoms, feet or meters???
- Tell everyone the new “No go sounding”
- Make sure they acknowledge



The Fatho...

Write the NEW “No Go Sounding” In Grease Pencil Here







The Bottom Line...

The DR is:

The Single Most Important Thing On the Chart



Homework

- Read and Study the Handout
- Do the Nav Homework Problem
 - Located on the CSNTS Website



Next Class...

- The Chart
 - Primary emphasis on chart preparation
- The Fix
 - Visual & Electronic
 - Accuracy and errors
- The DR
 - The most important thing on the chart
- Navigation Party
 - Organization, procedures & philosophy
- Making landfall
 - The Navigation Brief



Backup Slides





What Should You Remember About Reduced Visibility

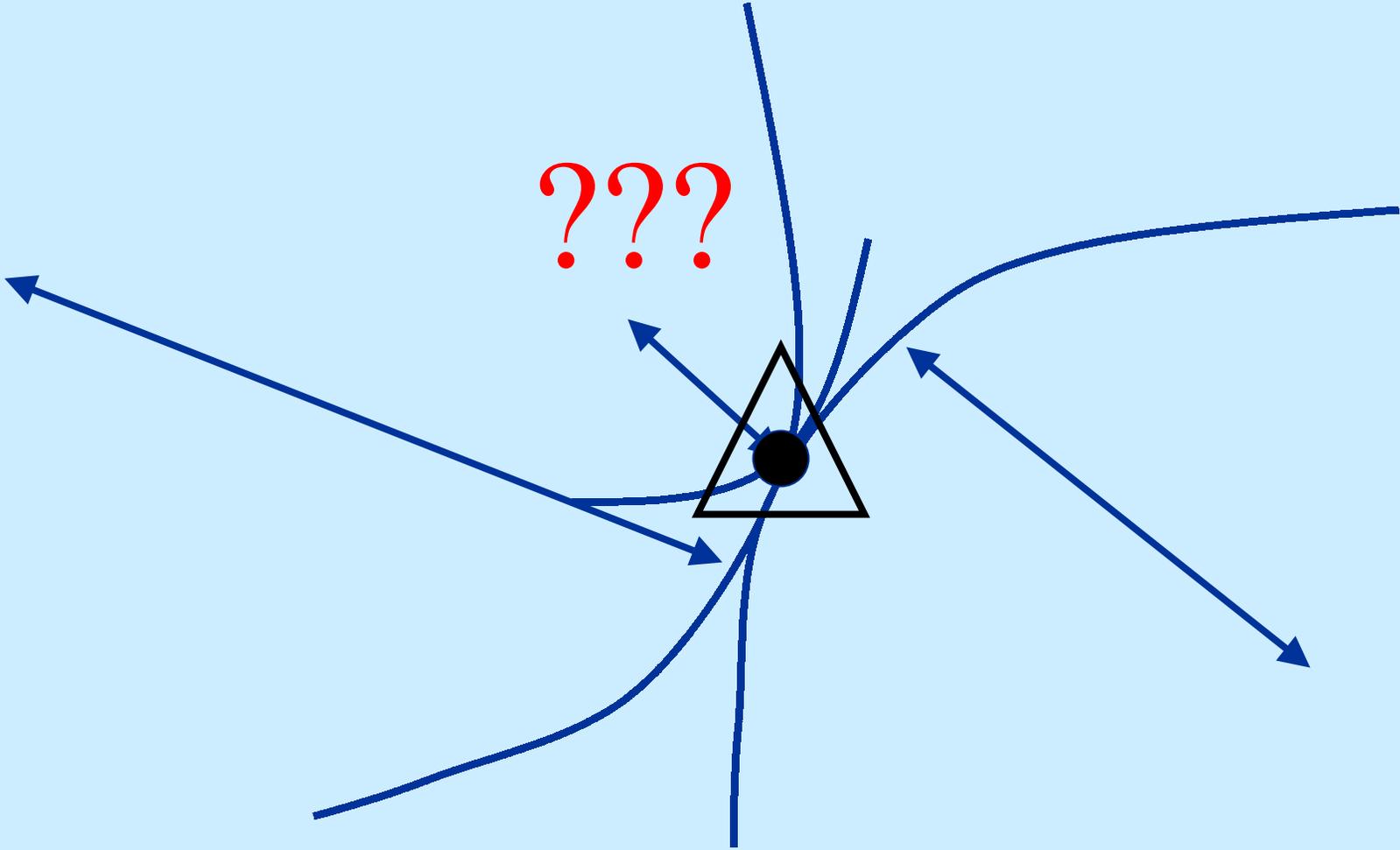
- Rotate and radiate first in clear weather
- Tune the radar and verify you can get radar returns from the coast and other vessels
- Have all hands memorize the pot settings!!!



What Do I Mean By Pot Settings???



???





The Bottom Line...

The DR is:

The Single Most Important Thing On the Chart