

# ***Navigation Systems***

## **NS-PN09 - PATON Patrol Operations Guide**

# *Reporting Data to any Federal Agency*

- In order for your reports to be useful to the Coast Guard or NOAA, you have to always provide:

**Evidence** that all your electronic measuring equipment has been *pre-calibrated and operating accurately.*

**Evidence** that your electronic measuring equipment is *operating accurately when used to acquire data.*

**Evidence** that you are *reporting the correct aid.*

# *GPS Accuracy Issues*

- **WAAS** is enabled.
- Heading is set to **TRUE**.
- LAT/LONG expression is set to:  
    “**DD-MM-SS.SS N / DDD-MM-SS.SS W**”
- Horizontal Chart DATUM is set to **WGS84** or **NAD83**
- **Accuracy pre-check** is performed and recorded against a charted fixed position or another GPS set.
- GPS is operating in **3D** (*reading 4 or more satellites*) while on scene when the actual fix is being taken.
- The EPE – Estimated POSN Error is 20 feet or less.

# *Documentation Support*

- **One Page Verification Report.**
  - Available from the on-line PATON System.
  - **Provides specifications, Google location and photo of aid.**
- **Copy of the Corrected Light List.**
  - Available for download from the NS Web Site.
  - [[www.uscgaan.com](http://www.uscgaan.com)]
- **NOAA Chart of the area.**
  - Available for download from the NS Web Site.
  - [[www.uscgaan.com](http://www.uscgaan.com)]

# Example of the One Page Verification Report

The next three slides portray the three features of this document that will help you find to identify the PATON.

- 1. Copy of the PATON's specification.**
- 2. Google Map for the PATON's position.**
  - a. Google Map for the PATON.
  - b. Satellite photo of the PATON's POSN.
- 3. Photo of the PATON.**
  - a. If no Photo, take one and e-mail it to the DSO-NS.

ONE PAGE PATON VERIFICATION REPORT

**Edit Record** ?

[Discrepancy report](#)

PATON NAME: **UMass Lighted Research Buoy A-1**  
 LLNR: **0.00**  
 AID NUMBER: **100117387276**  
 CLASS: **2**  
 ANNUAL VERIFICATION: **No**  
 OPFAC ASSIGNMENT: **41949**

**Location, Depth and PATON Type**.....

LATITUDE: **42° 20' 15.480" N**  
 LONGITUDE: **70° 58' 55.560" W**  
 GENERAL LOCALITY: **President Roads, Boston Harbor**  
 PATON TYPE: **Floating ,Lighted**  
 PATON PURPOSE: **Research**  
 PATON CATEGORY: **Lighted Buoy**  
 AID COLOR: **YELLOW**  
 DEPTH AT DATUM: **26.0**

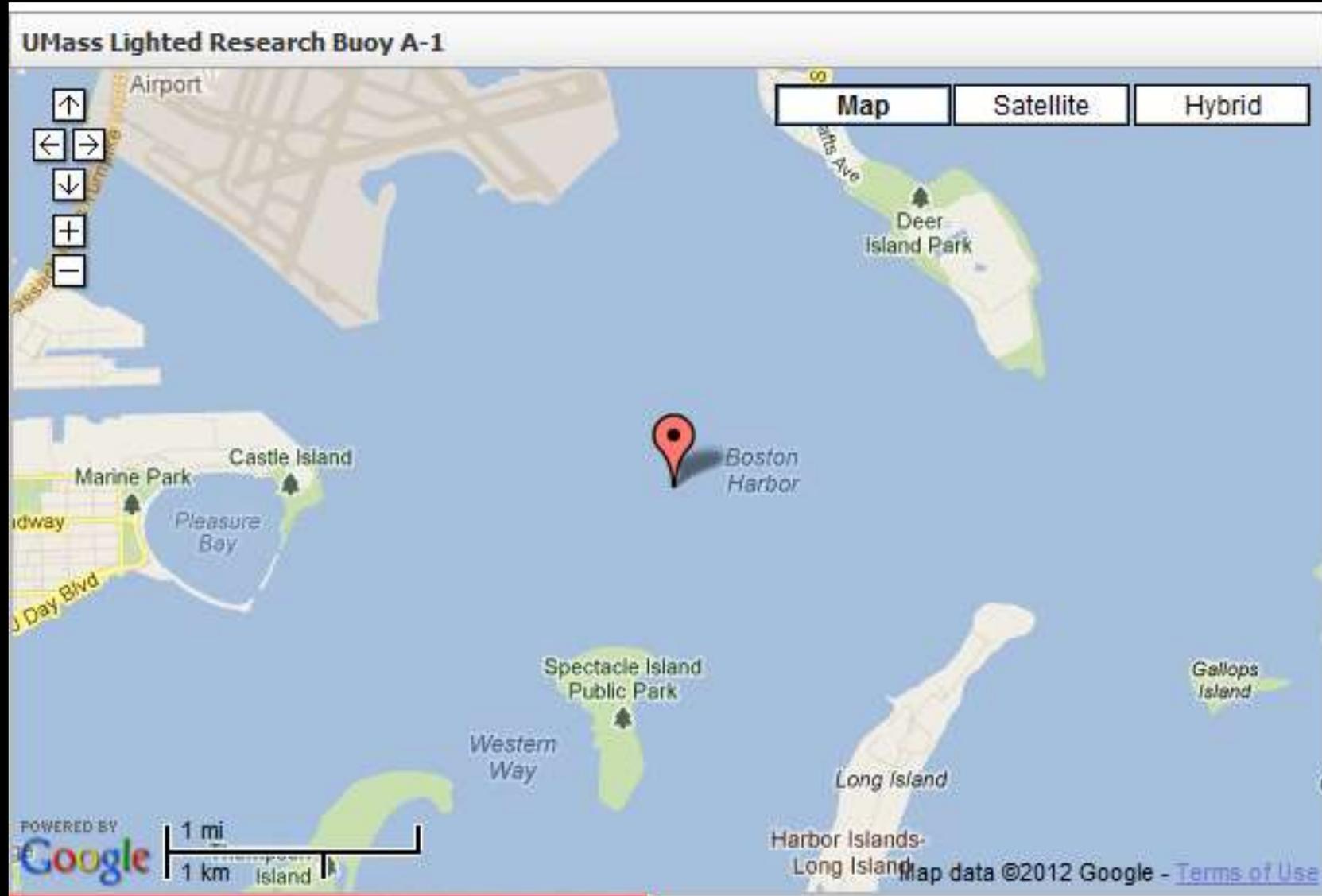
**Floating PATON**.....

BUOY MATERIAL: **PLASTIC**

**Lighted PATON**.....

LIGHT CHARACTERISTIC: **FL**  
 LIGHT PERIOD: **4**  
 LIGHT COLOR: **WHITE**  
 HEIGHT OF LIGHT: **3'**  
 SOUND SIGNAL TYPE:  
 ACTION REQUESTED: **Seasonal**  
 AID DURATION: **Set: 05/01 - Pull: 11/01**  
 DATE LAST VERIFIED: **7/12/2011**  
 DISTRICT/DIVISION/FLOTILLA: **013/05/00**  
 PATROL AREA: **BOS-2**  
 PERMITTED COMMENTS: **Located at the turn of the main channel off Spectacle Island. Marked UMB.**

Each report shows a Google map to assist with locating the PATON, if needed.



**Each report should also show a photo of the PATON.**

**Unfortunately, many photos are still missing and we could use your help to take them.**

**You don't have to be AV qualified to take photos of PATONs and Bridges.**



# Seasonal PATONs

- Means that this aid will be pulled from the water in the fall and re-set in the spring.
- Some Aquaculture Aids are set in the fall and pulled in the spring.
- Always pay close attention to the position accuracy of all **seasonal lateral aids**.
  - Off Station Criterion is only 50 feet.
  - They are pulled and reset each year in New England.
- Seasonal Lateral PATONs are the source of most of the Private Aid Local Notices to Mariners reports.

# *Duration of a PATON*

Check the **Set** and **Pull** dates on all “Seasonal” designated PATONs.

If you are verifying the aid before its **SET** date or after its **PULL** date, this aid should be missing per the PATON’s permit.

**Plan to verify when the aid is available.**

If the Duration is wrong or the Set and Pull dates are in error, report this information in the AV Observation field on the **CG 7054 PATON Report** or just e-mail the DSO-NS.

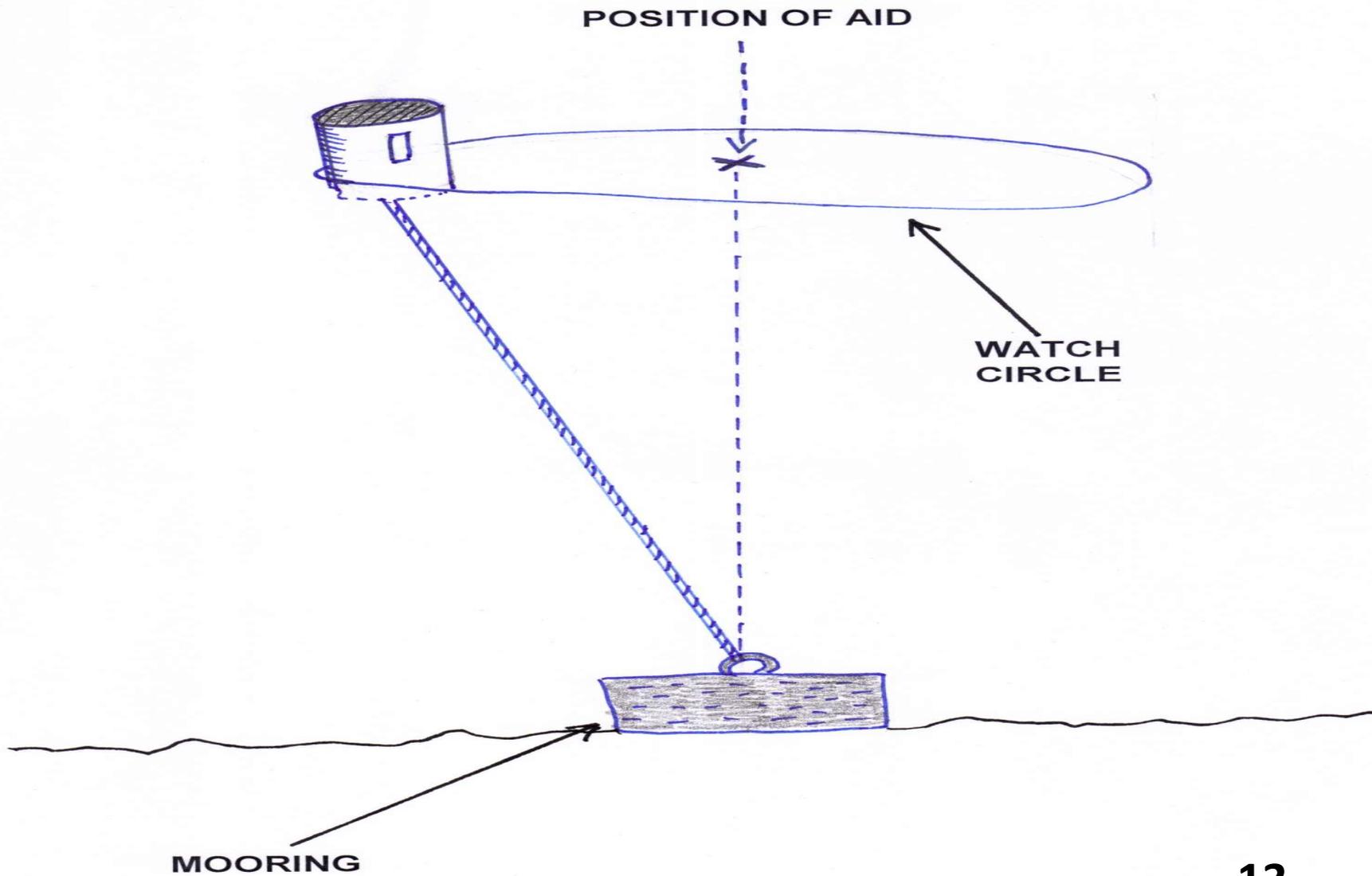
# *Locating the PATON*

1. **Check whether the aid is “Seasonal.”** Be sure you are verifying the aid within its duration (deployment) dates.
2. **If the aid is charted,** you can navigate by NOAA chart to the aid’s position.
3. **Use the GOOGLE screen** on the “[One Page Verification Report](#)” to view the location of the aid.
4. **Enter the aid as a Waypoint on your GPS,** and use the “[GOTO](#)” command to get to the aid’s permitted position.
5. **View the immediate area** around the aid’s permitted POSN. If it is not in view, **report the aid as missing.**

# *OFF STATION CRITERIA*

- **Fixed PATONs** – should be within **25 feet** from the aid's structure.
- **Floating Lateral Aids** – should be within **50 feet** from the buoy's mooring.
- **Floating Non-Lateral Aids** – should be within **500 feet** from the buoy's mooring.
- **Lighted Non-Lateral Aids** – should be within **50 feet** from the buoys mooring.

# FLOATING LATERAL AIDS



# ***Causes of Buoy Movement within its Watch Circle***

- **CURRENT**

- Current is weakest at periods of high and low water. Often referenced as *Slack Water*.

- **WIND**

- Try not to verify *lateral* floating aids on very windy days,
- It is hard to maneuver and can generate position errors.

- **CURRENT TRUMPS WIND**

# ***Pre-Underway Set up Checks for Measuring Equipment***

- **Check that the GPS(s) are set up correctly.**
  - WAAS is enabled.
  - The correct Lat/Long expression is set on the GPS.  
[00-00-00.00 N / 000-00-00.00 W]
- **Check that the Horizontal Datum in the GPS(s) matches the Horizontal Datum on the NOAA Chart.**
  - Use NAD 83 or WGS 84 charts only.
- **GPS(s) are set to nautical miles.**  
(New sets come pre-set to Statute Miles.)
- **Correction for the echo sounder's Transducer is available. Report in your Accuracy Statement.**

# *Pre-underway Checks*

## Check the Lat/Long on your GPS(s) for accuracy:

- Against a known location. (i.e. Your boat slip.)
  - Against another GPS. (Match antenna locations)
  - Against a charted fixed position. (A fixed aid or charted position)
  - **Record** how you performed this check in your “*Accuracy Statement.*”
- **Check the accuracy of your echo sounder:**
    - Using a lead line.
    - Using a hand-held echo sounder.
    - Performing a calculation.
    - **Record** how you performed this check in your “*Accuracy Statement.*” Also record the **Substation** referenced.

*The location of the GPS' antenna on a vessel determines the POSN location for the Lat/Long reading on your GPS.*

*A hand-held GPS is a more versatile positioning tool. With WAAS enabled, they are accurate to under 12 feet on the surface of the earth when operating in 3D (viewing four or more satellites). Reference the EPE readings!*

# *Example of GPS Antenna placement.*



# *Formula for Depth at Datum*

**Record the depth** from your echo sounder.

**Add** the correction for the position of the transducer on the OPFAC.

**Subtract** the estimated HOT (Height of Tide).

(Available as a read out from your [GPS' Almanac Screen](#) or your [Open CPN NOAA Chart](#).)

**Example:** Depth reading of **24** feet, plus **0.8** feet for the transducer location, minus a **5.4** foot **H.O.T.** equals a **Depth at Datum** of **19.4 feet**.

**Report the 19.4 feet as the Depth at Datum on your CG-7054 PATON report on the Harbormaster System.**

# *On-Scene Quality Checks*

- **Verify and record** that the GPS set was operating in **3D**. (For the Accuracy Report)
- **Record the *EPE*** reading from the GPS.
  - EPE reading should be **20 feet or under**.
- ***Sanity check*** that the echo sounder is operating correctly.

# *Taking On-scene Readings*

- For Lateral Aids, take the fix and depth readings alongside the aid, if possible.
  - **Never put your OPFAC in jeopardy to get a fix.**
- If you can't get close aboard a lateral aid, you need to explain why.
  - They are supposed to be marking a navigable channel.
- Non-lateral aids can be given a wider berth.
  - OFF STA criterion is 500 feet.
  - This aid is not used for navigation.

# *Calling out Lat/Long and Depth*

**Step 1** - As you near the aid, heading into the current and/or wind, pre-record the degrees and minutes of Latitude and Longitude showing on your GPS.

**Step 2** - When the vessel is alongside the aid, call out the seconds to the recorder.

**Step 3** - The helmsperson calls out the depth of water to the recorder.

**Step 4** – Estimate and record the distance that the GPS antenna is from the PATON.

**Step 5** - Record the date and time.

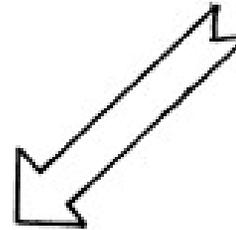
**Step 6** - Look up and record the H.O.T. (Height Of Tide).

**Step 7** – Recheck the Substation.

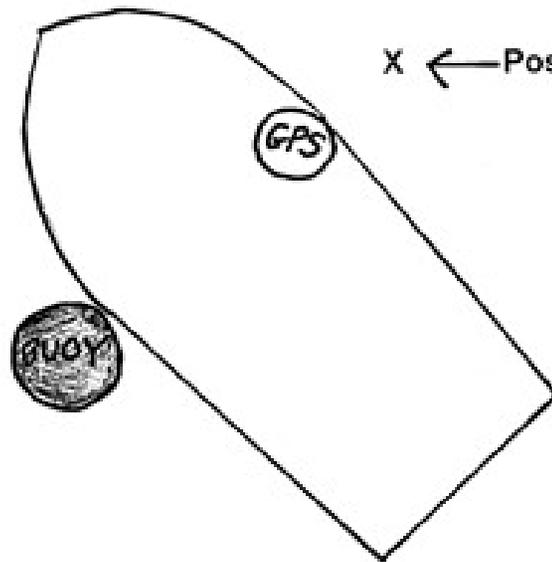
# PATONS ARE GENERALLY LOCATED IN SHALLOW WATER

Watch  
Circle

WIND or  
CURRENT



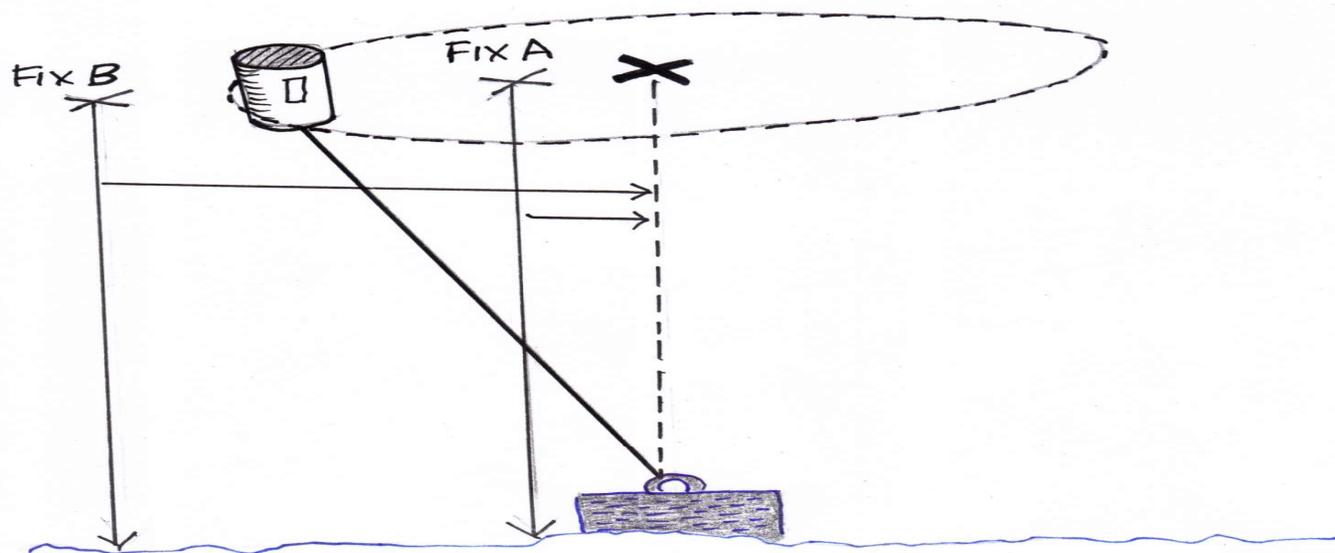
X ← Position of aid



OVERHEAD VIEW

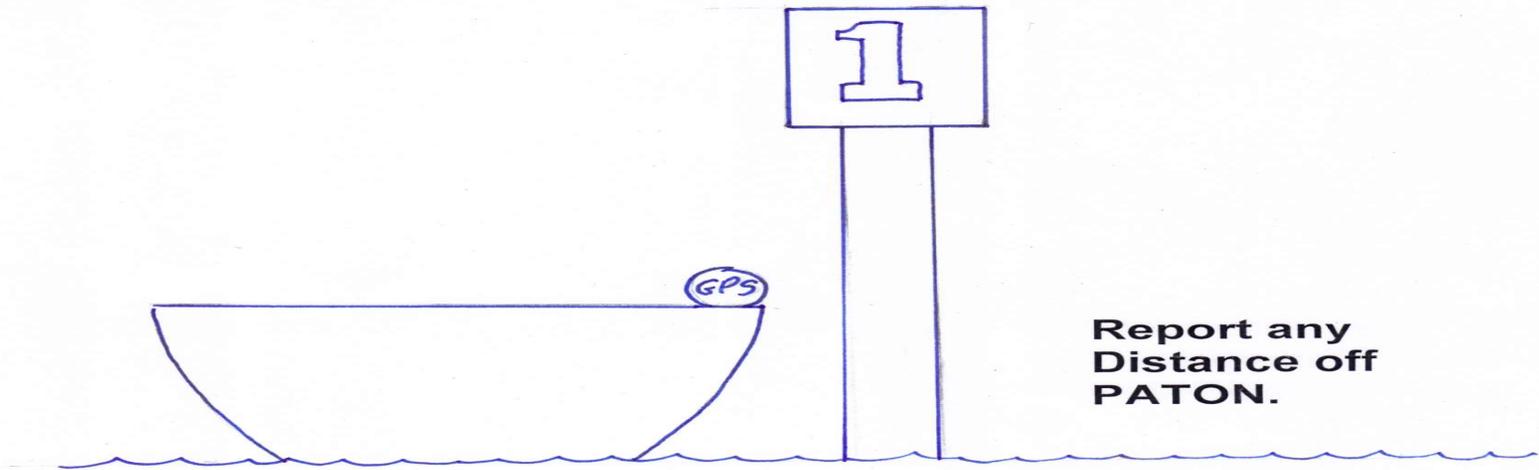
**MANEUVER YOUR VESSEL INTO THE CURRENT  
OR WIND ON THE UP CURRENT SIDE OF THE  
BUOY.**

**TAKE THE FIX FROM THE SIDE OF THE VESSEL  
AWAY FROM THE BUOY.**



46

## FIXED AID



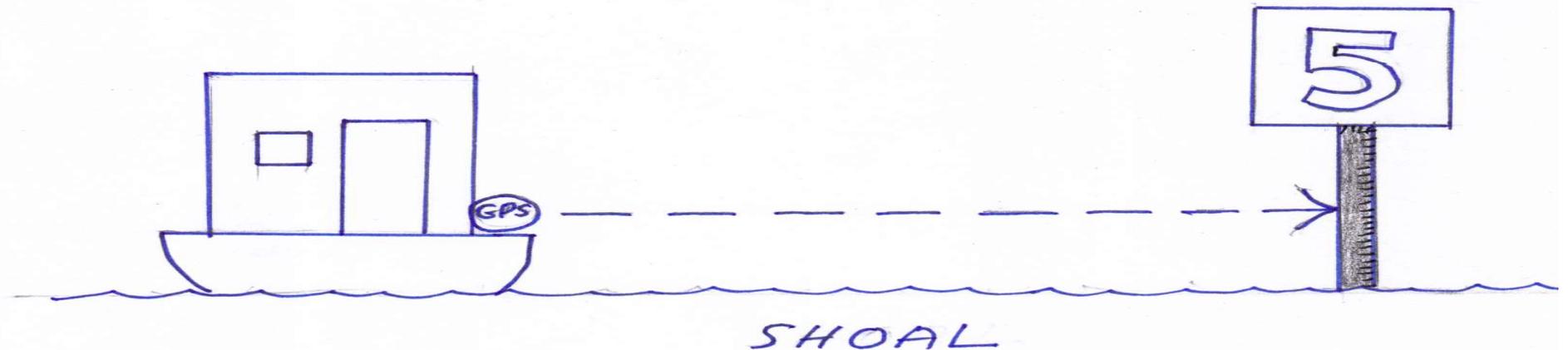
5.

# *Caveats*

- Work only at periods of *high water*.
- Be wary of *riprap* or *shoaling* near a fixed aid.
- Always stay aware of the position of the *antenna on your GPS*. This is where your POSN reading is originating from.
- Also stay aware of the location of the *transducer* for your echo sounder when taking depths. This is where your depth reading is originating from.

## CAN'T GET TO THE AID . . .

- ❖ Take the FIX from a safe distance.
- ❖ Estimate and report the distance to the aid.
  - Your estimate may put the aid within its watch circle.



Report when a lateral or danger aid is not marking the best water. Explain in detail on your report. Provide a recommendation.

# *Review of the Permit Specifications*

- Check that the *Official Image photo* still matches your observation.
- *If no photo* or the photo is in error, take a photo showing the special characteristics on the aid – numbers or letters, retro, color and lights.
- *Add a Discrepancy Photo* and/or an *Official Usage Photo* to your report.
  - This is our secret for getting the permitted records corrected.
- **Photos are great supporting evidence.**

# *Latest Reference Data*

- The ***One Page Verification Report*** contains the PATON specification data for the date and time when you downloaded it.
- The ***CG-7054 PATON Report*** contains the very latest specification data for a PATON on the day when you downloaded it.
  - Note that specifications can change between the download dates for these two reports.

# ***The PATON's Position on the Waterway***

- Is the lateral PATON deployed in the *correct numerical sequence in the navigation channel*?
  - ***Red Right Returning from the sea.***
- Is the regulatory PATON positioned outside of the navigational channel?
- Is the PATON *marking the best water*?
  - **Not located on a shoal.**
  - **Not directing the mariner into an unseen danger.**
  - **Make correction recommendations or just explain the situation on your report.**
  - **Do not report without an explanation.**

# *Depth Check*

- ***What is the “Depth at Datum?”***

**Take** the reading from the Echo Sounder.

**Add** the correction for the location of the transducer on the vessel.

**Subtract** the estimated HOT-Height of Tide when the depth was taken.

- ***Subtract the Range of Tide from the Depth at DATUM.***

When the answer is **negative**, there will be shoaling in the area of the PATON at low water.

# ***When "Depth at Datum" minus "Range of Tide" is negative***

- Highlight ***negative*** depth readings in the channel near lateral aids on your report.

***Mariners are being directed into danger by the aid.***

- ***Negative*** depth readings for regulatory aids are normally not a major problem.

– Report them so the owner can be alerted.

– Maybe that's all the water that's available.

***Remember that these are not navigation aids!***

# *Other Depth Issues*

- Do the charted depths in the navigable channel reflect your observations in this area?

**BAD** – Observed depths at datum are less than charted depths.

**OK** – Observed depths at datum are greater than charted depths.

- Are there any statements on the chart that warn of the shoaling problems in the navigable channel?
- When reporting depths, always record the date and time when the reading is taken and the Substation. Also needed are the correction for the transducer and the estimated HOT-Height of Tide.

# Recalculating the POSN Error using the PATON Plan Spreadsheet.

- The ***EPE – Estimated POSN Error*** is a GPS estimated error that a GPS is currently being calculated by the GPS.
- The ***average error*** for a properly set up and used GPS should be between 6 to 12 feet.
- AVs are not allowed use EPEs over 20 feet for a PATON Position.
- **EPE is a required entry on every CG-5074 PATON Report.**

- CG-7054 PATON Reports submitted without a proper EPE have questionable accuracy.
- The Auxiliary CG-7054 PATON Report screener uses the reported EPE as a reflection of the AV's overall report's professionalism.
- EPE should not be a burden for an AV since it is a simple readout readily available from the GPS screen.

Follow these guidelines and you will always generate and send . . .

- **Highly professional,**
- **Highly accurate** and
- **Highly credible**

. . . **“CG-7054 PATON REPORTS”** to the Coast Guard and PATON Owners.