SAR Electronic Devices

7 November 2020
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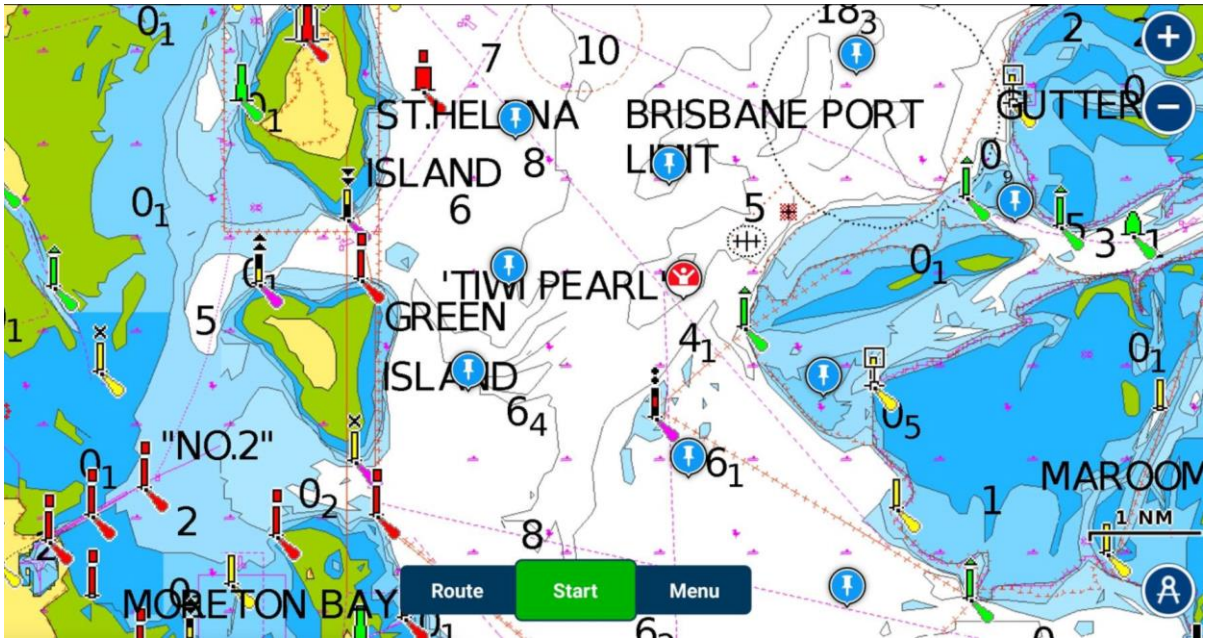
Introduction

Over recent years, several electronic devices have become available to assist with marine search and rescue (SAR). This document details evidence captured from multiple sea and air units from a variety of distances and differing backdrops.



Environment

Datum: 27 25.10` S, 153 17.70` E (near Hope Beacon, Moreton Bay, Queensland)

Date: Saturday 7 November 2020

Tides at Brisbane Bar:

- High 2.12m at 1347
- Low 0.8m at 2035

Weather conditions were clear with light clouds and winds ESE 10-15 knots. Visibility was good.

Participants

The following units took part in the event, see Appendix A for positioning details:

- Water Police Brisbane, Casey Blain
- AMSA, Challenger RSCU660
- PBSA, AW139 RSCU500
- VMR Bribie Island, Bribie 1
- VMR Brisbane, Sandgate 1
- VMR Raby Bay, RBII
- VMR North Stradbroke Island, Deranji
- VMR Victoria Point, VP1 and Papillon
- Coast Guard Redcliffe, CG32
- Coast Guard Brisbane, CG20
- Coast Guard Redland Bay, CG71

In addition, some reports were also collected from land locations:

- Cleveland Point
- Wellington Point
- Manly Marina
- Manly hill

Devices and Schedule

Time	Activity
1930	EPIRB – training only – 121.4MHz
1935	Red Pyro Flare (Comet Pinpoint 15k candela)
1940	Parachute Flare (Comet Parachute Rocket – 30k candela)
1945	AIS Beacon (Tx ID: 972123112, Serial No: 203112)
1950	LED Flare (Ocean Signal RescueME ~75 candela)
1955	Laser Flare (Greatland RLL013-01)
2000	Exercise completed – vessels depart for home bases

Data Collection

Participating vessels were issued with a simple template and asked to provide subjective comments on their observations.

For consistency, all photographs and videos were requested be taken with a modern smartphone (iPhone or Android) with no zoom applied. The combination of vessel movement and darkness resulted in generally poor quality of photos and videos.

In addition, an online survey was issued to all participants as a follow up to the event. Results of this are captured at Annex C.

Summary

EPIRB/PLB Homing Signal

- Range 3-5nm – detected by a vessel at 3nm, not detected by aircraft at 5nm
- Less than 50% of rescue vessels have Direction Finding (DF) capability

Red Pyro Flares

- Range 5nm+
- Short-lived (~60s)
- Get attention
- Visible on FLIR when close enough
- Hot to handle, high risk

Parachute Flares

- Range 5nm+
- Short-lived (~40s)
- Get attention
- Visible on FLIR when close enough
- High risk

AIS Beacon

- Range 5nm+
- Appearance dependent on equipment
- Accurate position
- Low risk

LED Flare

- Visible Range >3nm, Effective Range <1nm
- Long-lived (1.5 hours on max setting – not tested)
- Unlikely to attract attention unless close
- Not visible on FLIR etc
- Low risk
- Easy to use
- Colour blends too easily with beacons and running lights

Laser Flare

- Visible Range 5nm+, Effective Range ??
- Long-lived (40 hours – not tested)
- Attracting attention inconclusive – most who reported seeing it then doubted themselves
- Not visible on FLIR etc
- Low risk
- Trying to use as per guidance on a vessel in rough weather may not be easy

Conclusions

EPIRB/PLB Homing Signal

Effective for final homing.

With increasing PWC, kayak/canoes and potential PLBs, DF capability on rescue vessels may become more important.

Red Pyro Flares

Effective for getting attention and for final homing.

The high burn temperature is a significant risk, particularly with a less experienced user who could potentially drop the burning flare inside the vessel.

There is also very real possibility of distressed mariners setting flares off prematurely while nothing is in range and then having nothing available when they are actually needed.

Parachute Flares

Effective for getting attention.

Medium risk of injury to operator, particularly if inexperienced and on unstable vessel.

Short burn time and again a risk of being fired prematurely.

AIS Beacon

Observations varied dependent on the display and AIS equipped but in most cases an instant alert was displayed on the plotter followed shortly after by a precise marker on the plotter. While intended to be used as man-overboard devices to attract the attention of the vessel they have fallen

from, in areas such as Moreton Bay these could potentially be considered as a suitable alternative for PWC and kayakers given they would almost always be within 5nm of a vessel which is AIS equipped. However, it must be remembered that these will not notify authorities as EPIRB and PLB do.

LED Flares

Safe, easy to use and can be repeatedly over an extended period of time. However, as tested, the colour and brightness are too easily mistaken for running lights or navigation beacons to be attention grabbing so rescuers would need to be pretty close for them to be effective.

Laser Flares

Safe and can be used repeatedly over an extended period of time. However, as tested they were not effective in getting the attention of rescuers, and those who did see something immediately doubted themselves. Further evaluation is required with more pointed targeting of rescue units following the usage guidelines. From a user perspective, trying to correctly orientate and scan the device as per guidelines may be difficult in adverse conditions and in a distressed state.

Appendix A – Observer locations

ID	Description	Position	BRG/nm	Height	Background
R660	AMSA Challenger jet	n/a	W/>5	1200m	From above so background less impact
R500	RSCU500 AW139 helo	n/a	1-5	100-200m	From above so background less impact
Datum	Casey Blain Water Police vessel	27 25.10 S 153 17.70 E	0/0	n/a	N/A
BRIB	Bribie 1 rescue vessel	27 23.153 S 153 19.378 E	037/2.5	n/a	Mainland just south of Wellington Point, limited lighting
SG1	Sandgate 1 rescue vessel	27 23.711S 153 16.073E	314/2	n/a	North coast of Peel Island, no habitation and no lighting
NSI	Deranji rescue vessel	27 24.431 S 153 20.918 E	076/3	n/a	Our position well to the east of the target vessel meant that we were looking directly at the city nightscape with many lights, particularly red ones, in our line of sight.
RBII	Raby Bay II rescue vessel	27 26.637 S 153 17.750 E	178/1.5	n/a	North Moreton Bay, little to no lighting
VP1	Victoria Point 1 rescue vessel	27 25.892 S 153 15.611 E	248/2	n/a	Southern Moreton Island, some lighting from Rous Channel
PAP	Papillon rescue vessel	27 25.940 S 153 19.063 E	124/1.5	n/a	Towards entrance to Port of Brisbane, some lighting
CG71	Coast Guard 71 rescue vessel	27 27.758 S 153 19.287 E	151/3	n/a	Mud Island, little to no lighting
CG20	Coast Guard 20 rescue vessel	27 24.989 S 153 16.006 E	275/1.5	n/a	Northern North Stradbroke Island, some lighting from Rous Channel
CG32	Coast Guard 32 rescue vessel	27 24.105 S 153 17.561 E	352/1	n/a	Just east of Cleveland Point, some lighting
CP	Cleveland Point - VMR	27 30.560 S 153 17.347 E	183/5.5	n/a	Out to the bay, little to no lighting
WPM	Wellington Point MSQ	27 27.920 S 153 14.417 E	226/4		Out to the bay, little to no lighting
WPV	Wellington Point - VMR	27 27.950 S 153 14.462 E	225/4		Out to the bay, little to no lighting
MANCG	Coast Guard Brisbane base	27 27.135 S 153 11.396 E	250/6		Out to the bay, through Manly leads
MANH	Manly Hill	27 27.594 S 153 10.894 E	245/6.5		Out to the bay, through Manly leads

Appendix B – Observations

A similar exercise was observed off Bridport Beach by Keith Williams, General Manager of Volunteer Marine Rescue Queensland, in January 2018 as a guest of Surf Life Saving Tasmania. See summary here.

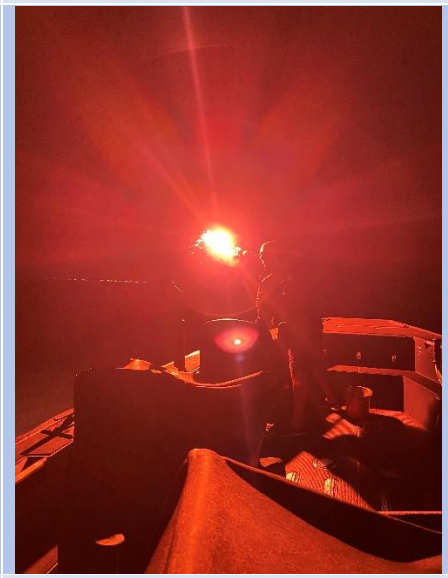
EPIRB

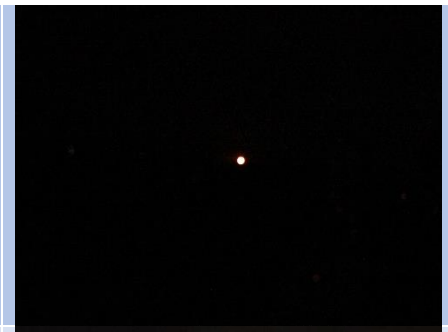
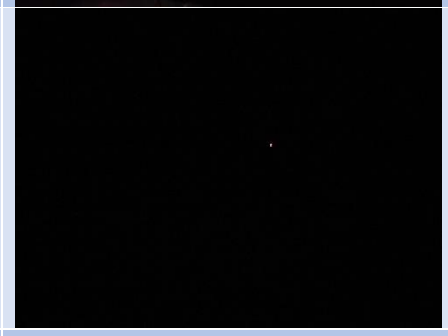
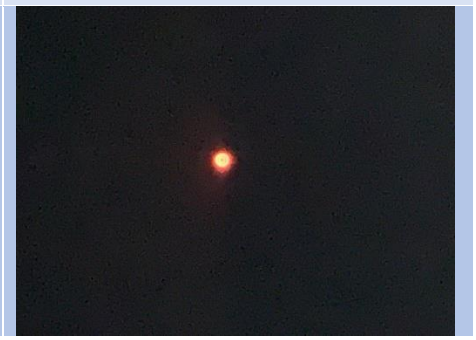
Training device activated with homing signal only on 121.4Mhz – see videos

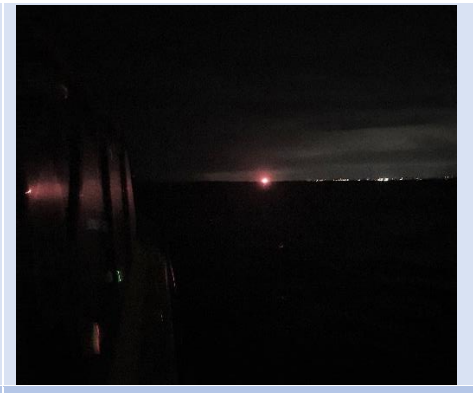
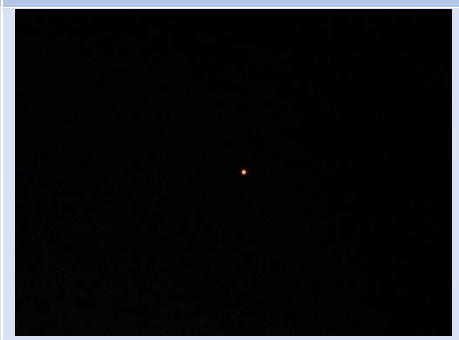
Observer	Comments
R660	Nil
R500	Nil
Datum	Nil
BRIB	No DF
SG1	Nil
NSI	No DF
RBII	No DF
VP1	No DF
PAP	No DF
CG71	Detected early at 323 degrees. Good signal
CG20	DF in use
CG32	Nothing heard or seen
CP	No DF
WPM	No DF
WPV	No DF
MANCG	No DF
MANH	No DF

Red Pyro Flare

2 flares ignited, one immediately after the other – see videos

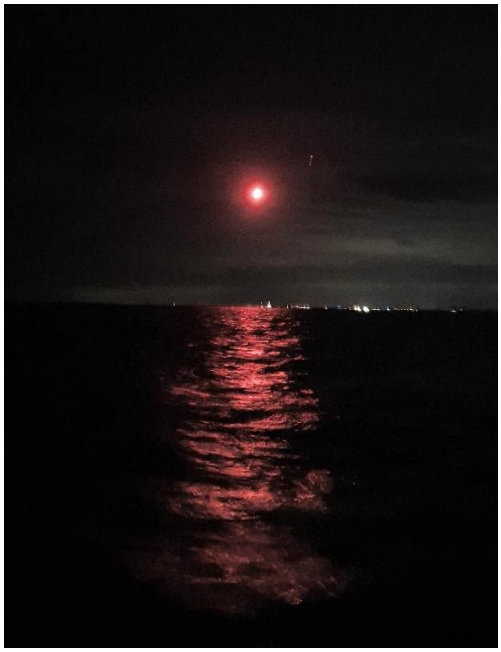
Observer	Comments	Photo
R660	NVD Observations Easily sighted with both NVD and naked eye. Distinguishable and provided ambient light which increased detail under NVD at the scene. Grabbed observer's attention immediately after activation. Good homing device. EO/IR Observations Easily sighted in IR. Media captured.	
R500	Concur with R660	
Datum		
BRIB	1st Flare - we rated the brightness as 8/10 so we had a scale to use. In general was easy to see as something unusual and worthy of attention. 2nd Flare - Didn't seem as bright, 6/10. See easy to see against the background. Did not show on FLIR	

SG1	Bright and visible during burn time	
NSI	Easily visible even against background of city lights, particularly were able to differentiate between the flare and the red lights on gateway bridge. Short life span means timing of deployment needs to be well planned.	
RBII	Flare 1 – high intensity red light observed for 1min 4sec at sea level. Flare 2 – as above, observed for 56sec	
VP1	2 flares approx. 2 minutes apart. Very visible - emitting a bright red light. Each flare lasted about 1 minute.	
PAP	Very obvious	
CG71	Easily visible, bearing 319 degrees. Equivalent brightness to port lights. Much brighter than anything else in our line to vessel	
CG20	Clearly visible on horizon	

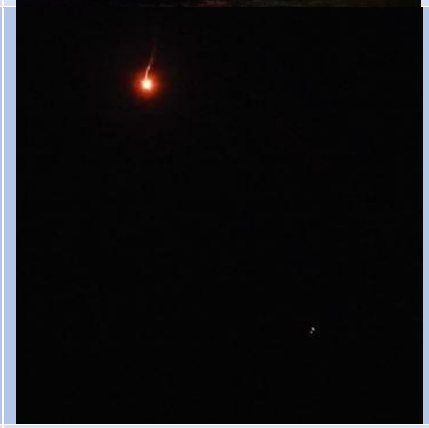
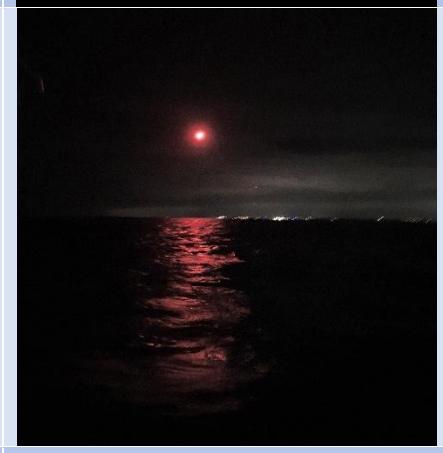
CG32	Easy to see but not necessarily recognisable as a flare	
CP	Very faint red glow on the horizon, hard to see with the naked eye. Possibly would not have noticed it if we did not know it was being activated	
WPM	Photo taken showing nav light of the staging vessel. Seconds later another photo taken showing the 1st Red H/Held flare. Clearly seen from shore but intensity quickly reduced after approximately 60 seconds. Photo taken of the 2nd Red H/Held flare. Again quickly reduced after 60 seconds. There were a few people standing with me by this stage and they could see the flares but advised only because they were looking for it. There was a boatie amongst them who was amazed at how short a time they lasted – advised him that the intensity drops dramatically after a minute and is the specs for them	
WPV	Clearly visible and distinguishable from nav lights and beacons, relatively long-lasting	
MANCG	Sighted as a faint glow on horizon	
MANH	Clearly visible	

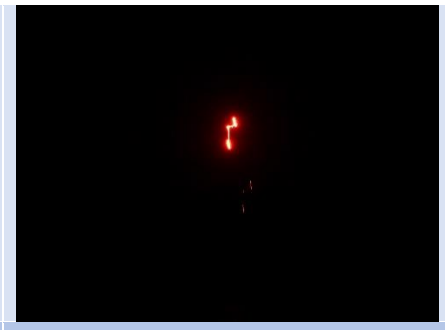
Parachute Flare

1 flare ignited – see videos



Observer	Comments	Photo
R660	NVD Observations Superior to the pyro flare. Provided significant ambient light which increased detail under NVD at the scene. Grabbed observer's attention immediately after activation. EO/IR Observations Easily sighted in IR and EO Low Light mode. Media captured	
R500	Concur with R660	
Datum		
BRIB	Was easy to see, 9/10 for brightness. Was easily visible, we had some cloud in the background. Having not seen one before, the crew comment was that they were surprised how short the duration of the flare was. Did not show on FLIR	
SG1	Bright and visible during burn time and easier to see above any background lights (although not many)	

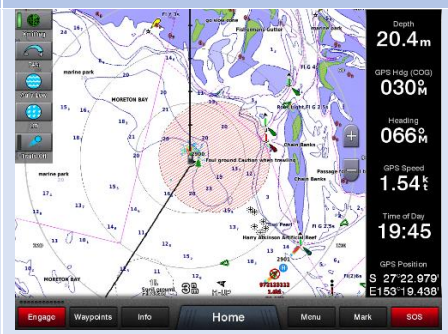
NSI	As above but obviously would be seen from a greater distance. Easily identifiable and not readily confused with city lights.	
RBII	High intensity red light observed for 46sec. Flare burnt out before descending	
VP1	Very visible. Bright red. Lasted around 40 seconds.	
PAP	Very obvious	
CG71	Easily visible bearing 316 degrees. Slightly less bright than red flare. Easy to identify bearing to DV	
CG20	Clearly visible 3 fingers high	
CG32	Easily seen and identifiable. Saw the launch. Red pattern across water	
CP	Very clear for the full flight	

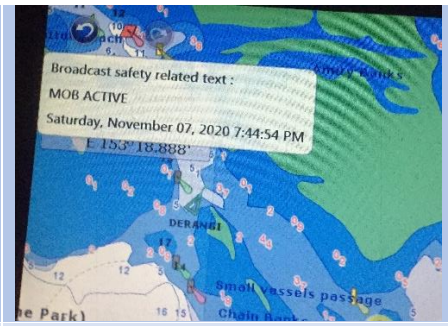
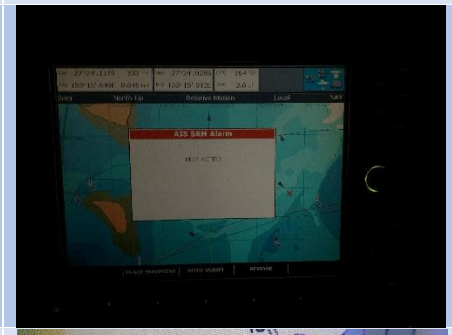
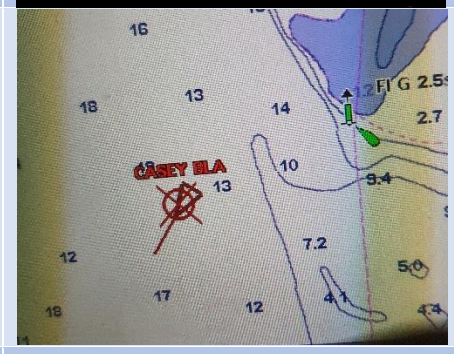
WPM	3 Photos were taken of the Parachute Flares which were a lot more noticeable from shore and lasted about the same time as the hand held flares	
WPV	If anything, more visible than the red flare and lasted it's 40 sec, noticeable movement with the wind, away from the vessel	
MANCG	Visibility extremely good	
MANH	Clearly visible	

AIS Beacon

AIS Man Overboard beacon activated – see videos.

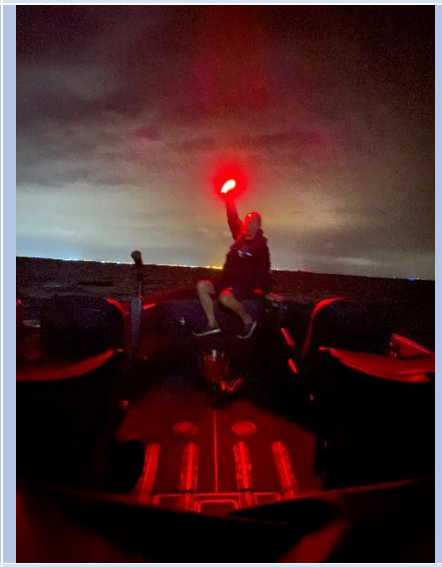
Also worth noting that Brisbane VTS acquired this on their Maritime Control System at 1944.

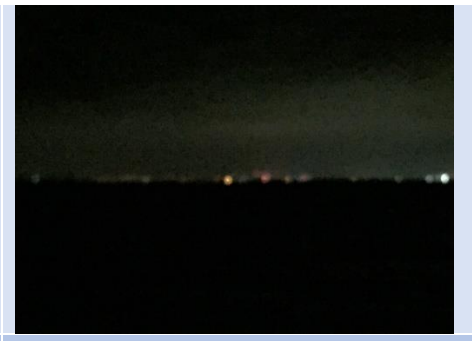
Observer	Comments	Photo
R660	Approx. 2 minutes after activation declared on radios.	
R500	Concur with R660	
Datum		
BRIB	This showed immediately on our AIS Transceiver and then almost immediately as an alarm on our Garmin screens. The actual alarm on the Garmin went away and was replaced by the plotted position of the beacon shown in red (see screen shots of AIS and Garmins). Additionally, it continued to show on the Garmins as red dot with a cross as we were about to depart on our track back home, 15mins later (see screen shot)	
SG1	Briefly registered on GPS as identified but no location provided. Unable to place waypoint (checking out to see if this is our end as new equipment)	
NSI	Detected. Plotter report attached. Quality not the best as it is a photo and not a screen shot.	
RBII	Nothing observed on GPS plotter	
VP1	Initially, nothing visible on AIS screen. Warning on AIS screen that there was a man overboard somewhere. Position took several minutes to show on AIS screen. Position still showing several minutes after beacon was turned off.	

PAP	See photo - good	
CG71	GPS displayed emergency message but deleted it. Location ~2mins later, large red letters. Very clear for navigation. MOB message lost when turned off. MMSI also quoted	
CG20	Appeared as MOB Activated. AIS target info appeared under Casey Blain	
CG32	Very obvious on chart plotter with alarm	
CP	N/A	
WPM	N/A	
WPV	N/A	
MANCG	N/A	
MANH	N/A	

LED Flare

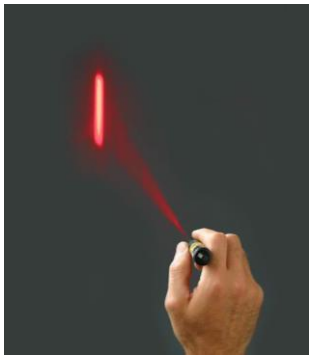
Cycled through various brightness modes every 30 seconds, note the SOS flashing sequence was not used – see videos

Observer	Comments	Photo
R660	**NVD Observations** **Not seen through NVD** (RSCU500 reported same). Barely visible with naked eye. EO/IR Observations Barely visible with EO Low Light mode. Not detected in IR. **Unlikely to be seen during a night search.**	
R500	Concur with R660	
Datum		
BRIB	We could see the flare but only just. We were debating if what we were seeing was the red flashers of the Casey Blain but decided these were brighter and would have been switched off. It would easily (and probably) be disregarded as a car brake light or a port light of a vessel in a swell. We could only barely make out it was flashing and we knew where to look. In a swell it could be seen as the port light of another search vessel. It didn't look like an emergency/attention seeking device.	
SG1	Barely brighter than nav lights. Discernible by flashing patterns. Definitely pyro was brighter and more visible.	

NSI	Against city backdrop would be difficult to detect unless position of deploying unit known. In open ocean would be of value, but not as a substitute for a pyro flare. Would be difficult to see from a rescue vessel's low level, particularly in a swell. Attractive as a reusable backup for pyro flare.	
RBII	Red light observed, not as intense as either of previous Red Pyro/Parachute flares. Similar intensity as a red beacon flash	
VP1	Weak view. Not very visible from our position. Became more "visible" as settings changed on flare. Looks more like a normal vessel running light than a flare. The only visible distinction between the flare and a vessel light was that the flare was flashing.	
PAP	Very faintly seen	
CG71	Not distinguishable as flare. Looks like red nav light. Appeared less than nav light at lower settings. Police blue flashers were easier to see	
CG20	Is visible but not as bright as Red Pyro flare. Possible to mistake it for port lateral marker	
CG32	Not really noticeable. Could be distant red beacon	
CP	Nil	
WPM	Nil	
WPV	Was visible and noticeable because we were focused on the location, would easily be mistaken for vessel or lateral beacon lights if perhaps a quicker flash than most laterals. Was very similar to helicopter running lights.	
MANCG	Nothing sighted	
MANH	The LED flare was visible, however looked no better or brighter then Nav lights on vessels involved in the exercise, and no detectable pattern or flashing at that range	

Laser Flare

Scanned roughly in 90 degree arcs to try to cover all observing units. The movement was probably too fast and did not follow the recommended guidelines off targeting through V fingers and scanning across the fingers - see videos.



Observer	Comments	Photo
R660	**NVD Observations** Briefly seen through NVD. This trial inconclusive as laser did not intentionally sweep the aircraft due to laser safety considerations. Would likely be detected if used as per manufacturers guidance. This class of laser (3R) requires further discussion on utility in a SAR context, in particular for signalling aircraft. EO/IR Observations Momentary detection on EO Low Light mode. Not seen IR. Media captured.	
R500	Concur with R660	
Datum		
BRIB	Could not see anything at all. At one stage one of the crew said he thought he may have seen it but really he was doubting himself as soon as he said it. Considering we were looking directly towards it and expecting it, I would say it was a failure.	
SG1	Flare was intermittently seen but was definitely not as visible as the pyro	
NSI	Quite disappointing. Expected something special but we had a great deal of trouble finding the flare and saw only fleeting glimpses (and are still not quite sure we did see the flare anyway). Again, in open ocean may be of value, but LED flare probably better than the laser flare even then.	
RBII	Nothing observed	
VP1	Nothing visible from our position for entire time flare was activated.	
PAP	Nil sighting	

CG71	Not distinguishable. Might have seen vague flashes, but would not recognise as emergency flare (or light at all)	
CG20	Not all that visible – just small flash of red every now and then. Less visible than LED flare	
CG32	Saw 1 very brief flash. Would not have seen if not looking for. Not attention grabbing at all.	
CP	Indistinguishable, Faint green flash. Would not indicate an emergency flare	
WPM	Photo taken of the area of the staging vessel. I did not see anything that would alert me to the area from shore following the rockets	
WPV	Easily missed if we had not been expecting it and watching exact location. Was a crisper light than nav beacons and boat lights but extremely brief.	
MANCG	Nothing sighted	
MANH	Not visible at all, even with the use of binoculars	

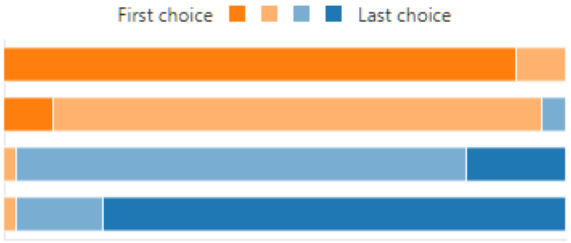
Appendix C – Survey

As a follow up to the event, a short online survey was issued to all attendees. The response rate was almost 65%.

1. Order these with the most likely to attract attention at the top and least likely at the bottom

More Details

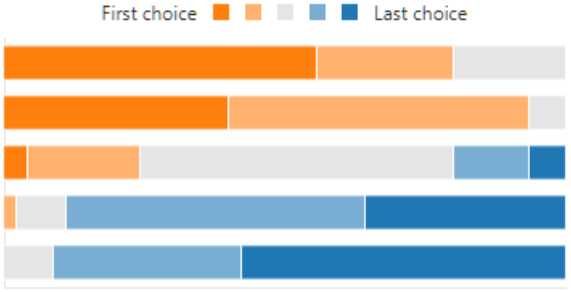
Rank	Options
1	Parachute Flare
2	Red Pyro Flare
3	LED Flare
4	Laser Flare



2. As a potential rescuer, rank the following as the most concerning risks regarding Red Pyro flares

More Details

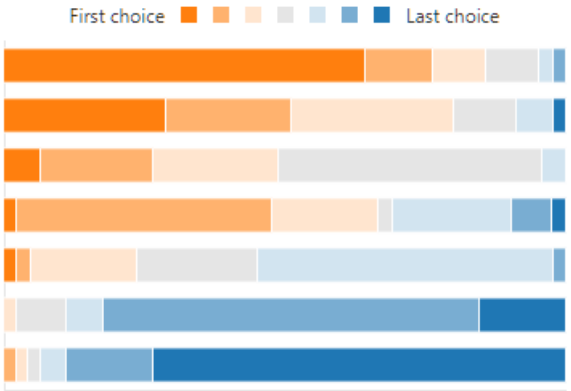
Rank	Options
1	Used too early - before rescue...
2	Dropping the burning flare ins...
3	Explosion if vessel on fire
4	Being used out of date
5	Incorrect disposal



3. Order these with what you believe would be most useful to help you find a vessel in distress at the top and the least at the bottom

More Details

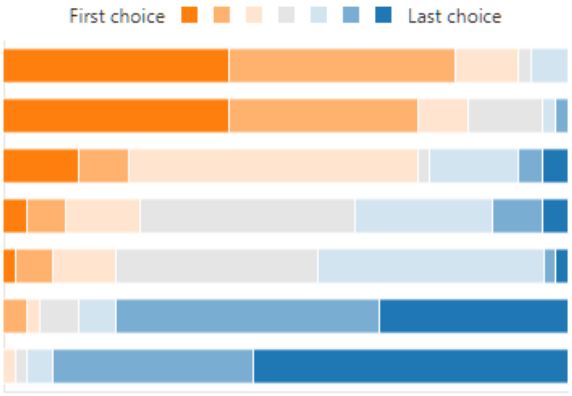
Rank	Options
1	EPIRB
2	AIS Beacon
3	Parachute Flare
4	Personal Locator Beacon
5	Red Pyro Flare
6	LED Flare
7	Laser Flare



4. Order these with what you believe would be most useful to help you find PWCs, canoes or kayaks in distress at the top and the least at the bottom

More Details

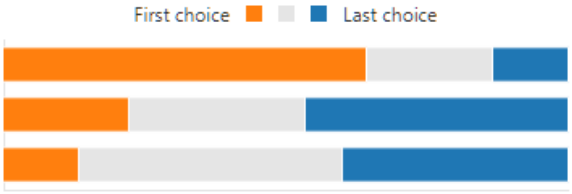
Rank	Options
1	Personal Locator Beacon
2	EPIRB
3	AIS Beacon
4	Parachute Flare
5	Red Pyro Flare
6	LED Flare
7	Laser Flare



5. The LED Flare was generally considered hard to make out and too easily confused with port running lights or lateral markers - below are some options which MIGHT make them more effective, please put them in order with whatever you think would be most effective at the top

More Details

Rank	Options
1	Brighter - accepting battery w...
2	Different colour
3	Different flashing sequence



A free text field also offered the opportunity to contribute additional comments:

If you have additional thoughts or suggestions on the effectiveness of SAR devices then please add your comments below
A brighter LED flare, different colour (say blue realising it is a dedicated police colour but it has less attenuation as the blue wavelength is quite narrow so less interference/dispersal), and flash pattern, would be more useful around PWC etc. The duration even with height consumption for brighter will be longer than the approx 45" that you get from a pyro. Obviously all pyro flares are a risk and difficult to manage on PWC esp kayaks.
Being a crew member on a vessel, I did not manage to see the Laser Flare. I believe it may have been more visible to aircraft, however the lack of being able to view it on the water has affected my answers above.
Could not make out the Laser at all. The LED was very hard to see as well but might be better in complete darkness in the open ocean as to many other lights around in the bay.
GPS EPIRBs and GPS PLBs would seem to be the best options, yet we didn't seem to make much of a distinction between the GPS enabled EPIRBs and their non-GPS counterparts. Use of mobile phone apps would also seem to be of benefit for enclosed waters. The most likely rescue vessel in a MOB scenario is the vessel the crew fell from so it would be good to consider SAR devices for those scenarios as well.

Helicopter was around 2Nm away from the boat throughout the trail. LED and laser were not visible under NVG at all, and were ineffective at that range. Traditional pyro and para flares were by far the best visual aide.
I rated AIS beacon as low for PWC etc as these craft would not have AIS. Also I did not rate EPIRB and PLBs as high as otherwise because we do not have DF equipment. If we had DF these would have rated higher.
I was only land observing so the Laser/LED flares were not seen at all. Responses above in relation to these should not be used as comparison between these two as neither were observed.
In our areas of operation where the search areas aren't huge, the AIS beacon would be great. This would be an ideal in small craft like Kayaks and Jetskis which also usually have no lights if the search goes into the night. Most of the areas where these craft go are not Open water so an epirb isn't a requirement and a small device like the AIS beacon would be suited
In Q4 i rated pyro flares low not because of poor effectiveness but because I believe users would resist carrying such devices on the craft.
Laser / LED flares are a waste of time
Laser flare was not observed from 1.5nm so difficult to rate.
Not on the SAR devices itself but I believe the police boat should have moved to different locations before each device was used to force people to actually look after they found the first beacon.
Note the difference in answer order regarding boat vs pwc (Q3&4) , difference in my opinion is due to probability of knowing that there is a vessel in distress vs a over due report for a pwc
Perhaps the LED could flash SOS and even better if it was 'purple' or an odd colour.
PLB, LED and Laser units would be most helpful on a PWC or other Paddle Craft. Simply logging on and wearing a PFD are two of the most important things to do!
Please note I rated question 4 on practicality rather than effectiveness, otherwise I would have kept as per vessel CG 71 - We were stationed 3NM from target to the SSE. We had good contrast with the port off to the left. It was difficult to even see the laser flare, different crew saw different things but I believe you would have to be looking directly at it to see. The LED flare looked like a nav light and was hard to distinguish, I believe more of a capacitance style flash may be more visible?? On our system the AIS beacon was very obvious but as discussed alarmed but then appeared to cancel so if you weren't paying attention you would miss. The good news is that it stayed up as a waypoint in the system, I believe we have a video of the AIS. The DF unit worked exceptionally well at 3NM we would have had a very good direction fix probably +_ 5 deg but it felt better maybe down to just a few degrees. The pyro was very visible and would get attention. The parachute was the dark horse of the group, I have always though that being in the air would be a detriment, but from a direction fix and visibility it by far exceeded my expectations, and I would not hesitate to ask for one to be used in the future.
Question 4 asked us to rate what you believe would be most useful to help you find PWCs, canoes or kayaks in distress. Had it asked what I thought was better for the person in the PWC, canoe or kayak, I would have rated the LED flare above the parachute flare and the pyro flare - simply from the safety of the person in the PWC, canoe or kayak,
Referring to question five, as long as the device runs longer than 40 sec then it would be an advantage The main issue for canoes and kayaks is they don't officially carry anything to signal with. The rowing craft in the BNE river have whit strobe lights on them.

Rotating flash light similar to a lighthouse light
The EPIRB and PLB would be most effective due to the cost/benefit relationship and size. Watercraft users are more familiar with these and I believe would be more inclined to use them.
The logic or reasoning for selections were not asked. Type of vessel in distress will obviously dictate the type of distress beacon used. Search area would also affect beacon effectiveness due to background lighting. The LED and Laser are not as effective where other background lighting is present.
The two electronic flares were close to useless to signal for help as they were too close to running lights and beacons.
These answers are based on the exercise being undertaken in the backdrop of the Brisbane and suburbs skyline. My answers would change if the target was in open ocean.
This is resubmission of previous response due my error in not being aware that the AIS beacon was a personal item able to be carried in your pocket on kayaks, PWCs etc. Our unit does not have DF equipment so EPIRB and PLB ranked lower than if we had DF equip. Flash sequence suggestion for the Laser Flare would be SOS.
When searching for People/vessels in distress the single most effective item for allowing us to find them by air is a beacon either PLB or EPIRB. Then once they can hear the helicopter they should light their flares. The flares can very easily be seen by NVG at night. A simple Pyro flare will suffice for this.
Laser flare near impossible to see. Technology needs to improve before moving away from a tried and effective pyro flares.

Appendix D – Glossary of Terms

Abbreviation	Definition
SAR	Search and Rescue
Datum	Point of interest – in this scenario the Casey Blain, the vessel on which the devices were activated
ESE	East South East – wind direction
AMSA	Australian Maritime Safety Authority
PBSA	Public Safety Business Agency
VMR	Volunteer Marine Rescue
EPIRB	Emergency Position Indicating Radio Beacon
PLB	Personal Locator Beacon
Pyro	Pyrotechnic
AIS	Automatic Identification System
LED	Light Emitting Diode
nm	Nautical Miles
DF	Direction Finder
FLIR	Forward Looking Infra-Red
PWC	Personal Watercraft (jet ski)
Helo	Helicopter
BRG	Bearing
NVD	Night Vision Device
VTS	Vessel Traffic Service
MMSI	Maritime Mobile Service Identity
MOB	Man Overboard
SOS	Save Our Souls – international distress signal