Report: Raynet-UK supports three M27 weekend closures for Romsey road bridge demolition and installation of new bridge deck.

Task: To supply traffic data to Raynet control situated at "Southampton Tactical" in City Depot, Southampton, which was where the multi-agency cell was set up.

Result: The task was completed with the satisfaction of all multi-agency representatives.

Lessons from the whole exercise: Will be actioned in the coming weeks

Before I explain what happened, I must say a huge thank you to operators from all groups in Hampshire and individual operators from Dorset, Wiltshire, Sussex and Gloucestershire. It was a regional effort with some operators doing both days which was amazing, as we are all volunteers - only those who volunteer can be deployed.

Information notes are at the start of this report and technical notes are at the end.
{For those who have been passed this report outside of Raynet-UK, APRS stands for "Automatic Packet Reporting System" and uses GPS and our licenced radios.}

Raynet members John Benton G8UXW and Julian Shaw G0ERI were invited and have attended M27 stakeholder meetings at the Osborne site office during this whole process.

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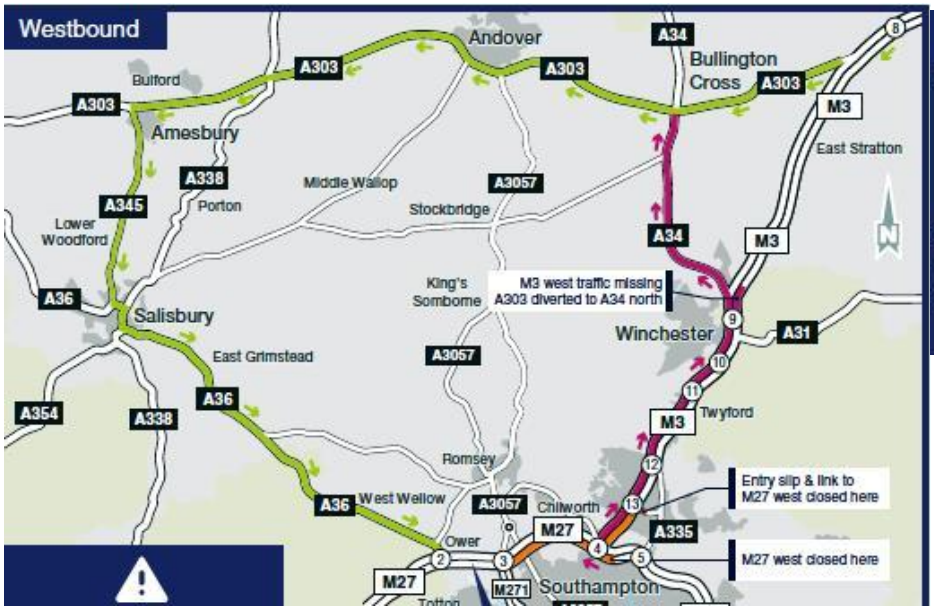
Below is the text of an email that I received from the Senior EPRRO at Southampton City Council which was where the multi-agency cell was located for a 3 closures.

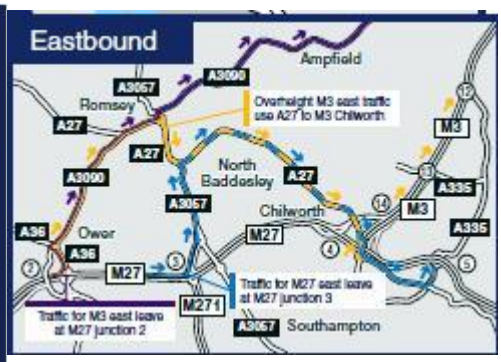
"I just wanted to extend my personal gratitude for all the work that was undertaken by not just South West Hampshire RAYNET-UK but also from members drawn from many RAYNET-UK groups to provide such a committed, comprehensive and competent role. The timely and accurate information from the various check points, together with the use of live data feed cameras directly into our CCTV control proved to be invaluable and provided ourselves in SCC and the multi-agency partners with the ability to respond to challenges before they really developed and for acute events, our response was in seconds rather than in many minutes.

I have requested that RAYNET-UK is formally recognised by the Hampshire and Isle of Wight Local Resilience Forum for your collective work for all three M27 closures and furthermore I will also formally request on record, that future projects such as a large scale network closures, must include consideration for using RAYNET-UK."

Routes:

The routes for the first and last closures are the routes Westbound and Eastbound below. The June Closure used only the Eastbound routes in both directions – Of more later.





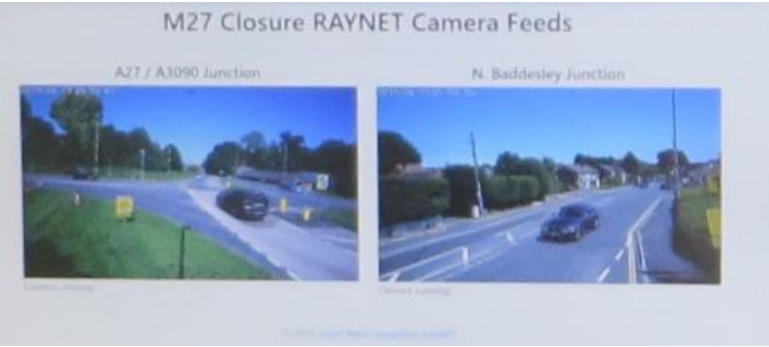
Closure 1 in September 2018 saw the East Bridge demolished and was completed early due to the fact that the spoil could be taken away as it was happening. This was a Hampshire callout which did not give much time for organisation, but never the less Raynet did this with the assistance from other groups. Raynet provided fixed reporting points and operators driving the short and long diversion routes with APRS tracking which was displayed on a big screen from a live feed via radio. Thanks should be paid to Paul Duell G0TLG who worked out how to overlay the M27 routes on Google mapping at the website "aprs.fi" for internet access. { The picture below comes from the live feed } We used this for our live APRS via radio as it had the routes overlaid and would look the same as "aprs.fi".

Most of this worked, but some areas had technical issues on the day, but these were mostly overcome or we worked out something else so the data always flowed.
Both the voice net via a quickly installed 70cms in band repeater, {Thanks to NW Hants} and APRS came from a high point where MB7UW is located west of Winchester .
{ MB7UW on pic above}. There were also relay points at other locations, for which thanks to N Wilts & SE Hants. Reports were passed via the Raynet voice network. We found that with multiple voice relays it was vital that the squelch was adjusted so that interference did not happen on the main net as we could not move freq.

For closure 1 and 2 we had a Raynet operator based at the Osborne site office within their team, which assisted in both sides learning the complexities/stresses of the work that we both do.

For closures 2 and 3 the organisation was passed to me, Julian G0ERI at SW Hants.

Closure 2 in June 2019 had the time to be planned to the last detail, it was.
This time the closure was to install the "new bridge deck".
{Again it was completed ahead of schedule.}
Unfortunately it was found that the road space booking had not been confirmed by Area 2 and it was the weekend of a big closure of roads in Wiltshire for D-Day. This then necessitated lots of stressful re-planning by all organisations including Raynet.
{Or other words I cannot repeat.! }. The Eastbound routes were used in both directions.
Raynet plans came together very close to the closure due to operator availability. Raynet fixed reporting points and the short diversion routes were driven and monitored via APRS.
A new 70cms permanent in-band repeater was installed thanks to donations to SW Hants.

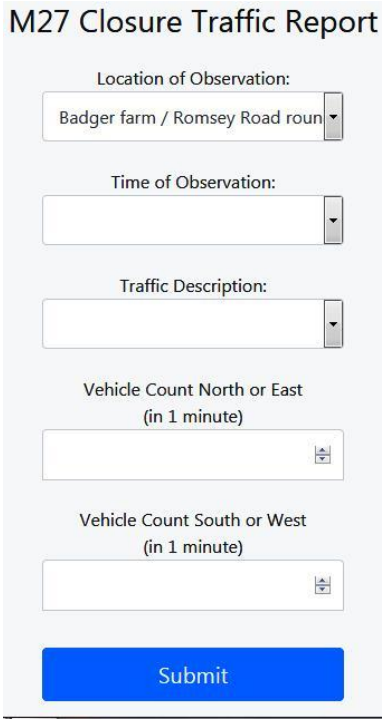


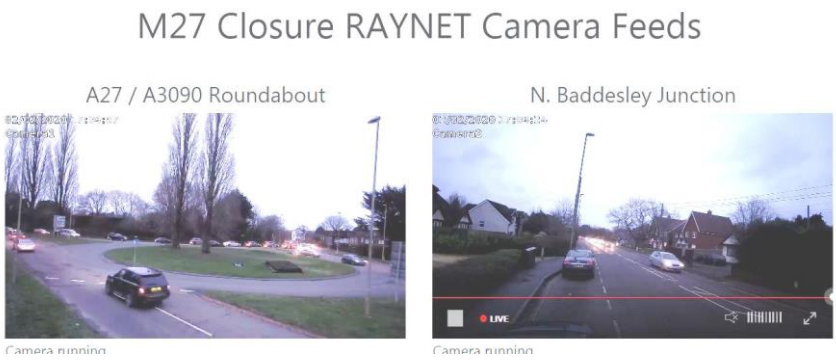
Also it was noted from the first closure that a live camera feed from North Baddesley would be helpful, this happened with the help from a "public Wi-Fi" feed. Also SW Hants deployed their Satellite dish for Internet and a camera to the west of Romsey to show capability.

The feeds were used enthusiastically by Southampton CCTV and those at the multi-agency cell at Southampton City.
In a new trial at this closure reports of traffic were passed via voice by some, also via Internet devices filling in a shared spreadsheet "Ethercalc" by some. This could then be viewed by the multi-agency partners. This worked well, but could be improved as the "info sheet" was difficult for some on mobile devices. {More in Technical section.} Raynet Control in picture to the right.

Closure 3 in January 2020 again had the time to be planned to the last detail, it was. This closure was known to be a longer closure due to the complexities of moving the debris. {The East Bridge had to be totally demolished before transfer of debris could take place under the new bridge to the West.} Then again there was an issue; unfortunately the date had to be changed due to "supplier chain issues". Raynet heard 5 weeks before the closure on Christmas Eve. Due to change in date, again Raynet plans came together very close to the closure because of operator changes.

This closure used fixed reporting points but there were more than previously. This time driving of routes did not happen. The routes from the first closure were used and more fixed reporting points were put in place. Again 2 live camera feeds were used with the Satellite dish being deployed. In a further refinement the reporting process was refined so that the reports were filed using a drop down menu system via a secure server. The reports were viewable via a "read only" web page that refreshed every 5 seconds. {Thanks must be paid to Phil Crump M0DNY.} More info in Technical section.





During all 3 closures, Osborne ensured that permission was granted by TVBC and HCC for Raynet members to safely park, be it a grass verge or on a roundabout.
Expenses were paid by Osborne for all 3 closures, for travel, cold weather and sustenance payments. Thank You from operators to Osborne. A donation was also made from Osborne at each closure, which enabled purchase of extra equipment

Due to the commitment of many, the profile of Raynet-UK has been raised, I thank you all.

Julian Shaw G0ERI SW Hants

Task Completed = Yes, technical and lessons from the whole exercise on next page/s:

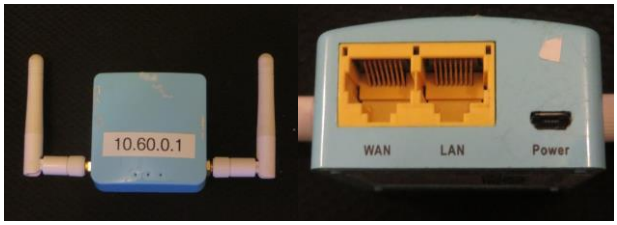
Technical comments here…

Both APRS and voice nets were on an Aerial co-located at MB7UW, the dual band aerial is at 640ft or 195m ASL, the base of the aerial tower is at about 150m according to OS map

APRS: As was seen above, for the first closure G0TLG created KML file overlays for aprs.fi which were re-called from a "web" file store after the website link. This also displayed other users which we really did not want, for the second closure we listed the callsigns to display for the user services. – You can see examples on the M27 Page on our website. However at control, we were using a "live RF feed" from MB7UW, so had to put up with the other APRS beacons. We were running both "UI-View" to record the whole event and "AGW Tracker" as that allows zooming in and out, via a sound card interface on the same computer. This was then displayed on a large screen TV via HDMI. { But switched to other information as required }
AGW Packet Engine was used for the first closure, which is easy to setup and then we tried "Direwolf" for the second closure, which is not as easy as you have to specify the various ports. All of this was on computers running "Windows".
Some programs are older and not necessarily technically supported now, but it worked. There are a lot of new programs out there now as operating systems are being updated and we are investigating for future events.
Any suggestions are welcome as we may not have investigated that particular software.

Voice Radio: As mentioned for our main freq we used a 70cm in band TTU, with a feeder 2m to 70cms TTU. At control we had a local 70cms to 2m TTU so anyone on the local site could hear and call control as well as recording the whole net on a computer using the Cleveland Raynet program "CRASH". Control used 2m to the TTU.
The only 70cm TTU freq in the band plan, is Listen on 438.400 and Tx on 430.800, we had no CTCSS tones due to the high mast and the fact we may unknowingly interfere with other groups. This happened on the second closure and I was able to phone the controller of that group in Gloucestershire and it was resolved, this was a very long hop on 70cm.!
Over the events we have had issues with local TTU and not setting their squelch properly. On the last event, also we are sure that operators were over deviating their audio as they wanted to get reports in, which caused difficulty. There is no issue with wide or narrow FM as a member tested on the day. But another member had much better audio on narrow FM, so it could be a radio issue. We are going to run tests again from various locations.

Live Cameras: A small ethernet network was set up at each location, with WiFi routers running 'OpenWRT' open-source firmware used to connect to a public wifi network or an ethernet WAN connection for internet access. One of the routers used was a GL-MT300A pictured here, in combination with a network switch to allow enough Cat5 connections for the Raspberry Pi and Camera. At another location a WR1043ND with internal network switch was used. These low voltage devices can be run directly off 12V batteries, or through a 'Car USB Charger' to provide 5V for the GL-MT300A.



Off-the-shelf 'Foscam' Outdoor IP Security Cameras at each location were powered with 12V and connected to the network switch. These cameras were configured to provide a 1280x720 30fps H.264 video stream at a constant bitrate of 500kb/s over RTSP protocol. A Raspberry Pi was then also connected to the network switch, running 'ffmpeg' to pull the RTSP video stream from the camera, convert it to an RTMP video stream, and push the RTMP stream up to the SWHR webserver. An RTMP Live Streaming Server (nginx-rtmp) was then used to generate a HTML5 Live Video Stream that was viewed on the webpage. https://swhr.org.uk/m27/ There was approximately 20 seconds delay on the webpage video stream, this is unavoidable when using the HTML5 streaming protocol between the server and the webpage.

The software used on the Raspberry Pi is available open-source at https://github.com/philcrump/swhr-rtmp-camera

For one station the Wi-Fi Router was set up as a client on a nearby public Wi-Fi connection, allowing the Raspberry Pi to use this to reach the internet and SWHR server. For the other station South West Hants RAYNET group's portable Ka-band Satellite Internet system was set up on the day to provide the link to the server.

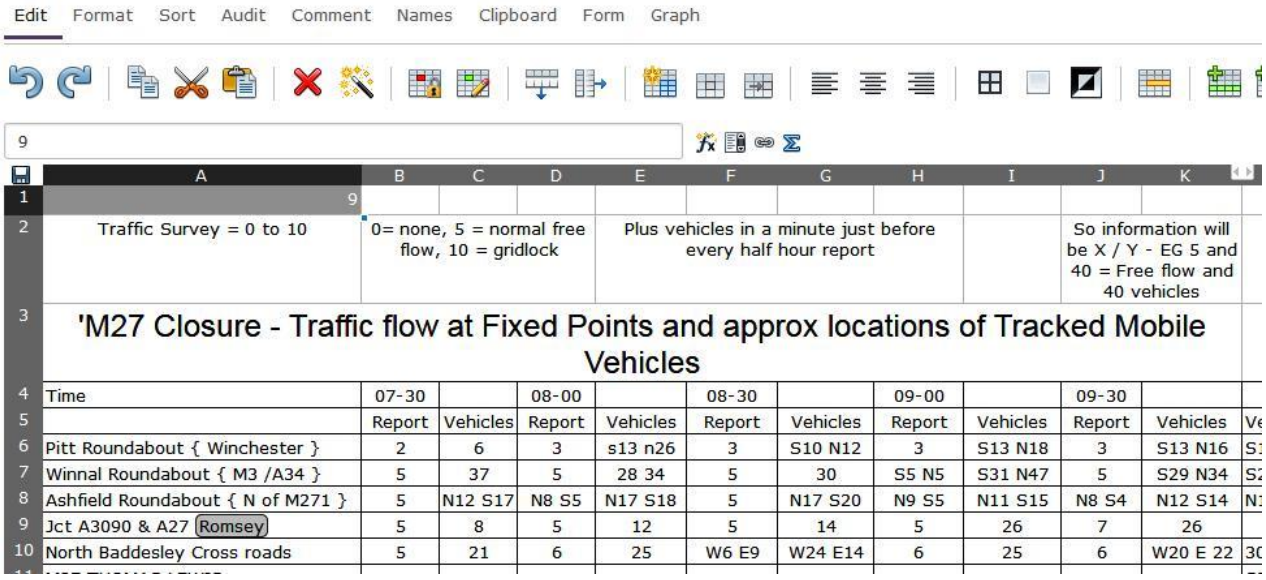
Camera 1:

- Public Wi-Fi
  - Router =10.60.0.1
    - Switch = LAN
      - Camera 1 = =10.60.0.40
      - Raspberry Pi = 10.60.0.25

Camera 2:

- Satellite LAN
  - Router =10.60.0.1
    - Switch = LAN
      - Camera 2 = 10.60.0.50
      - Raspberry Pi = 10.60.0.35

Report Data: Our task was to provide data about the traffic flow around the diversion routes. Due to the short lead time to the first closure this was written on a paper form, then scanned and emailed to Osborne.
On the second closure we had learned about Ethercalc { https://ethercalc.net/ } and one of our technical wizards { Phil M0DNY } had installed it on our website. {Which he also hosts on his server}. This then meant that we could take reports and enter this into a spreadsheet that could be viewed by anyone with an Internet connection = *With the right login and password..!* Those with mobile devices had to scroll across, which was not as easy. – Screen Shot Below:



Edit Format Sort Audit Comment Names Clipboard Form Graph

	A	B	C	D	E	F	G	H	I	J	K
1	9										
2	Traffic Survey = 0 to 10	0= none, 5 = normal free flow, 10 = gridlock			Plus vehicles in a minute just before every half hour report					So information will be X / Y - EG 5 and 40 = Free flow and 40 vehicles	
3	'M27 Closure - Traffic flow at Fixed Points and approx locations of Tracked Mobile Vehicles										
4	Time	07-30		08-00		08-30		09-00		09-30	
5		Report	Vehicles	Report	Vehicles	Report	Vehicles	Report	Vehicles	Report	Vehicles
6	Pitt Roundabout { Winchester }	2	6	3	s13 n26	3	S10 N12	3	S13 N18	3	S13 N16
7	Winnal Roundabout { M3 /A34 }	5	37	5	28 34	5	30	S5 N5	S31 N47	5	S29 N34
8	Ashfield Roundabout { N of M271 }	5	N12 S17	N8 S5	N17 S18	5	N17 S20	N9 S5	N11 S15	N8 S4	N12 S14
9	Jct A3090 & A27 Romsey	5	8	5	12	5	14	5	26	7	26
10	North Baddesley Cross roads	5	21	6	25	W6 E9	W24 E14	6	25	6	W20 E 22

For the last and third closure Phil M0DNY developed an online database report form and a read only reports view page, both of which had different user ID & passwords. This worked well both at control and the outstations who used it. I thank Phil for an amazing job. Part screen shot below for 3 locations:

M27 Closure Traffic Report

Location of Observation:

Badger farm / Romsey Road roun

Time of Observation:

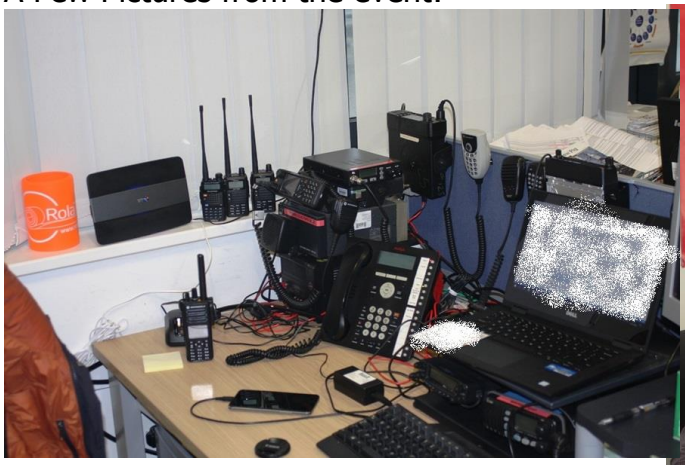
Submit

South-West Hants RAYNET - M27 Closure Observations

Last updated: 2 seconds ago

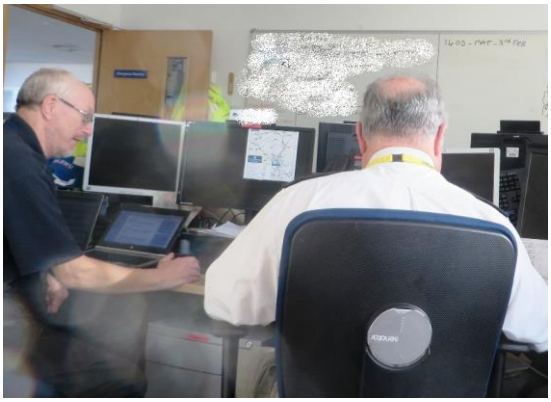
	08:00	08:30	09:00	09:30	10:00	10:30	11:00
Potters Heron Hotel - Hook Road / B3090 south of Hursley	Traffic: 2/10 N or E: 15/1m S or W: 0/1m	Traffic: 2/10 N or E: 20/1m S or W: 0/1m	Traffic: 2/10 N or E: 10/1m S or W: 0/1m	Traffic: 2/10 N or E: 8/1m S or W: 0/1m	Traffic: 2/10 N or E: 17/1m S or W: 0/1m	Traffic: 2/10 N or E: 11/1m S or W: 0/1m	Traffic: 3/10 N or E: 20/1m S or W: 0/1m
Badger farm / Romsey Road roundabout	Traffic: 2/10 N or E: 5/1m S or W: 0/1m	Traffic: 3/10 N or E: 10/1m S or W: 0/1m	Traffic: 2/10 N or E: 9/1m S or W: 0/1m	Traffic: 2/10 N or E: 14/1m S or W: 0/1m	Traffic: 2/10 N or E: 14/1m S or W: 0/1m	Traffic: 3/10 N or E: 20/1m S or W: 0/1m	Traffic: 3/10 N or E: 19/1m S or W: 0/1m
Winnall Roundabout	Traffic: 2/10 N or E: 15/1m S or W: 0/1m	Traffic: 2/10 N or E: 30/1m S or W: 0/1m	Traffic: 2/10 N or E: 18/1m S or W: 0/1m	Traffic: 2/10 N or E: 27/1m S or W: 0/1m	Traffic: 2/10 N or E: 18/1m S or W: 0/1m	Traffic: 2/10 N or E: 29/1m S or W: 0/1m	Traffic: 4/10 N or E: 31/1m S or W: 0/1m

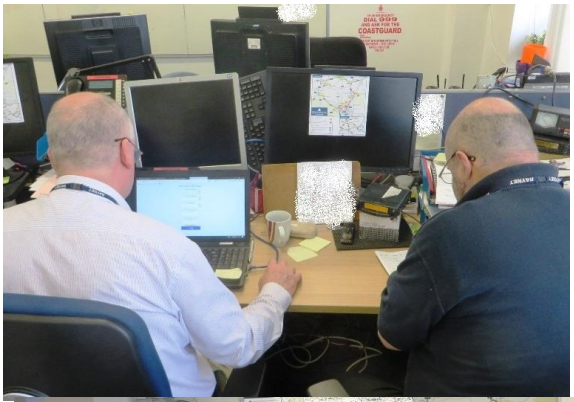
A Few Pictures from the event:



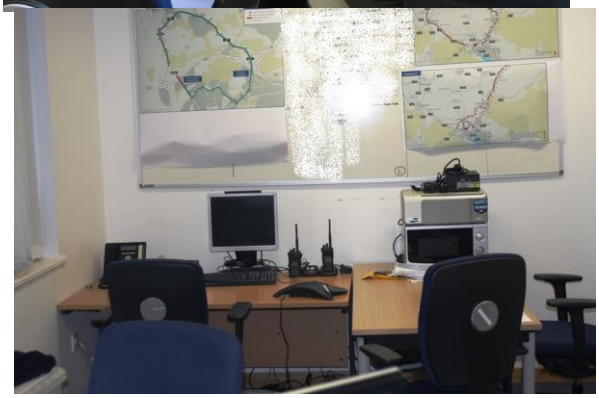
The Main Tactical control with Airwave, Marine, CB { Dock Gate 20 for container port }, Amateur band = Analogue & Digital and Tim Pettis Senior EPRRO at this desk.

Raynet picture feed at Southampton CCTV





Pictures at Control



CCTV Camera at North Baddesley

Camera at Romsey West Roundabout with the Sat Dish deployed

Lessons from the whole exercise

1. Voice nets over multiple relays have to be monitored carefully by those providing them so spurious signals or low squelch do not cause issues.
2. Tests need to me made during a coming county wide test into the 70cm repeater to see if we can resolve the audio issues.
3. If you have the operator availability, it is a very good idea to have one with the user. But they must be technically capable of dealing with the situation.
4. Ask your users what information they need and make it available by any method, be it taking a photo / screen shot and emailing.
   Or if you can make Information available via an internet feed that goes down very well.
5. If possible have "multiple" fall-backs in case one system doesn't work as well as you expect. – However if our main 70cm voice net had gone down, it would have been more difficult, but not impossible to relay information.
   { Most Raynet members bring everything anyway, so can be flexible.. }
6. EtherCalc is a great tool, but not so good for some users with some devices. It does "default" to cell A1 if it loses connection, {Like if you are using it via a "phone" connection.} which is an annoyance. SW Hants Raynet has used it with at least 5 users, some thought that was enough, but this is something we are going to investigate further. EtherCalc cannot "freeze frame" like some spreadsheets, so it can be a problem working out whee you are. However EtherCalc does have 2 very good points. One – everyone should know how to use a spreadsheet, and two – it is a very flexible spreadsheet on the Internet, and can be changed "on the day", this is not true of a database. Whilst there are other "sharing" sheets, currently we think this is the best for us. However, you really need to think about what you are going to use it for.
7. Investigate the possibilities of cameras if you are in a similar situation. They may be a pain to set up and get going, but they will go down well with your Users.

Julian G0ERI – SW Hants – To avoid spam – contact via https://swhr.org.uk/contact-us/

Conclusion

Prior to this, Raynet in Hampshire was regarded as a 'used once in a 100 years' organisation. With the capability shown in these incidents, particularly the cameras, our credibility has gone up very significantly. When it comes to Communications, we are now regarded as a technical resource for all members of the Hampshire and Isle of Wight LRF. This gives Raynet-UK a great platform to build on for the future.