Work VK90AR
Last chance!

www.wia.org.au
Since 1910

maker ▲ electronics ▲ wireless ▲ projects ▲ on-air ▲ news

AMATEUR Radio

Amateurs support Air Show

3-band rig continues

Contest Calendar 2024

FEATURE: Antennas — Feedlines — Propagation

ISSN 0002-6859

Volume 91 ◀ Number 6 ▶ 2023 Price: $14.50 incl GST

Local amateurs provided front-line comms for first spectacular event in Australia

Amateurs play critical role supporting Pacific Airshow Gold Coast

Roger Harrison VK2ZRH

This brace of MV-22B Osprey vertical take-off and landing (VTOL) tilt-rotor aircraft were standout participants in the event. Stationed at the Gold Coast Airport in Coolangatta for the event, they came in from the US Marine Corps' Medium Tilt Rotor Squadron 363, based in Hawai'i. Photographer, Ron Hayman VK4RH, provides some idea of scale.

A series of chance encounters involving the Airshow event CEO from California, a local Uber driver, Greg Ackman VK4BBX of Mobile 1 fame, and Gold Coast Amateur Radio Society President Mark Hanrahan VK4DMH, led to the involvement of local hams in planning, building and operating key communications support for the Pacific Airshow last August. This article came about thanks to the efforts of Mark Hanrahan VK4DMH and Andrew Chapman VK4QF.

Following that serendipitous connection, the Gold Coast Amateur Radio Society (GCARS) received an official request from Code Four to provide radio communications for the Pacific Airshow planned for August at Surfers Paradise on the Gold Coast.

A little research by Mark VK4DMH threw up details of the USA's Pacific Airshow, revealing the involvement of the local RACES (Radio Amateur Civil Emergency Service), an affiliate of the ARRL (a similar organisation to WICEN in Australia). Mark was keen to hear how the US amateurs handled the same aeronautical event that has been running in California since 2016.

Multiple airfields are involved in putting on an Airshow. Amateur radio involvement requires small teams at each airport to communicate operational information to the show's Command Centre at the precinct housing the crowds. That's not all, but we'll get to that.

In early April, Mark spoke with Jon Welfringer WB6OZD of Huntington Beach RACES, who outlined what was expected of amateur radio support for the Pacific Airshow in Australia.

One of the key points of RACES support provided in the USA is that each amateur operator involved monitors the relevant air traffic control frequency (in the VHF airband) for the airfield where they're assigned. Jon WB6OZD advised

ABOUT THE PACIFIC AIRSHOW

Gold Coast Freedom Flyers. [Greg VK4BBX]

Queensland's Gold Coast was the chosen location for the first Pacific Airshow to be staged in Australia, an outgrowth out of the established Pacific Airshow of Huntington Beach, California. Developed, promoted and run by Code Four, an event production company of Huntington Beach, the Pacific Airshow has run annually in the US since 2016.

Held for the first time on the Gold Coast, over 18 to 20 August, 49 aircraft participated, both civilian and military machines, some first flown in the 1940s. They showcased a range of aerial manoeuvres and over-water flypasts "... that pushed the boundaries of speed and altitude." From sea level to heights of 15,000 feet, stunts ranged from tailstands to thrilling near-supersonic flypasts, not to mention the skydiver displays.

The promoters promised "non-stop, live choreographed aerial performances by some of the best civilian and military aviators from around the world" and delivered in spades. The event demonstrated the extraordinary skills of the many pilots who participated, leaving audiences awestruck.

More than 200,000 spectators watched the Airshow, from the crowds at the event precinct on Surfers Paradise beach, to nearby beaches and high-rise balconies, in locations spanning from The Spit in the north to Burleigh in the south.

Commanding the beachside PA system from the show's beachside Command Centre, an "Air Boss" controlled the show and provided running commentary that included *on-air interviews* with the performing pilots!

The Pacific Airshow was a collaborative effort involving 116 dedicated volunteers across the Surfers Paradise event precinct and key airports, which included Brisbane, Coolangatta, the Southport Flying Club, and RAAF Base Amberley.

Aircraft numbers based at each airport			
Southport Flying Club	26	RAAF Base Amberley	9
Gold Coast Airport	11	Brisbane International	3

https://pacificairshowaus.com

Mark that this would be good to do here, too.

In June, Mark had an online video meeting with event organiser Steve Wray of Code Four California, Pacific Airshow Ground Operations. The initial plan by Code Four was to involve five airfields – Amberley RAAF, Brisbane International, Archerfield (Brisbane), Southport Flying Club (Gold Coast), and Gold Coast Airport at Coolangatta.

As it panned out, only four airports became involved, where Airshow planes were parked to wait their turn to take off, fly to the event precinct, do theirs stunts and return. On-ground communications at each airport was required to inform the Command Centre at the event precinct about aircraft movements so that the Air Boss could maintain critical timing of events. Amazingly, the local Airshow operations spread across four times the area of the US events!

From those first contact onwards, Mark exchanged emails with Code Four's Steve Wray and Ken Ashmore, followed by many Microsoft Teams meetings.

As it happened

The Gold Coast Amateur Radio Society (GCARS) was involved in establishing and coordinating radio communications for the Pacific Airshow in roles providing schedule-timing and aircraft movement

The infamous Yakovlev Yak-110 – two Yak-55s bolted side by side with a jet added between them – delighted the crowds with hair-raising stunts. [Fargo AirSho]

updates from the various airfields back to the Airshow command in Surfers Paradise.

Ten amateurs were engaged for three days at the four different airfields and event precinct locations, scattered across some 100 km. Many also had aircraft radio certifications so that they could communicate with the pilots on the 118-137 MHz airband as necessary.

In initial planning, Mark VK4DMH thought it best to include amateurs from Ipswich & District Radio Club to cover the Amberley RAAF airfield to the west, along with WICEN Brisbane to cover Archerfield and Brisbane International airports, while amateurs from the Gold Coast club would cover the Southport Flying Club airfield, Gold Coast Airport at Coolangatta, and the Control Centre at the Surfers Paradise event precinct.

The final plan only involved Gold Coast Airport, Southport Flying Club, Brisbane International, and Amberley. Archerfield wasn't required. The RAAF would not allow radio amateurs to operate from

The Gold Coast Airport site was fortuitously located air side, adjacent to the Airshow participants' aircraft parking area. [Ron VK4RH]

their Amberley base, so their C-17 Globemaster, C-130 Hercules, the Roulettes aerobatic display team, and F/A-18 Hornet, all flew in and out of Amberley without our involvement, and were expected to be in the Airshow zone as and when required.

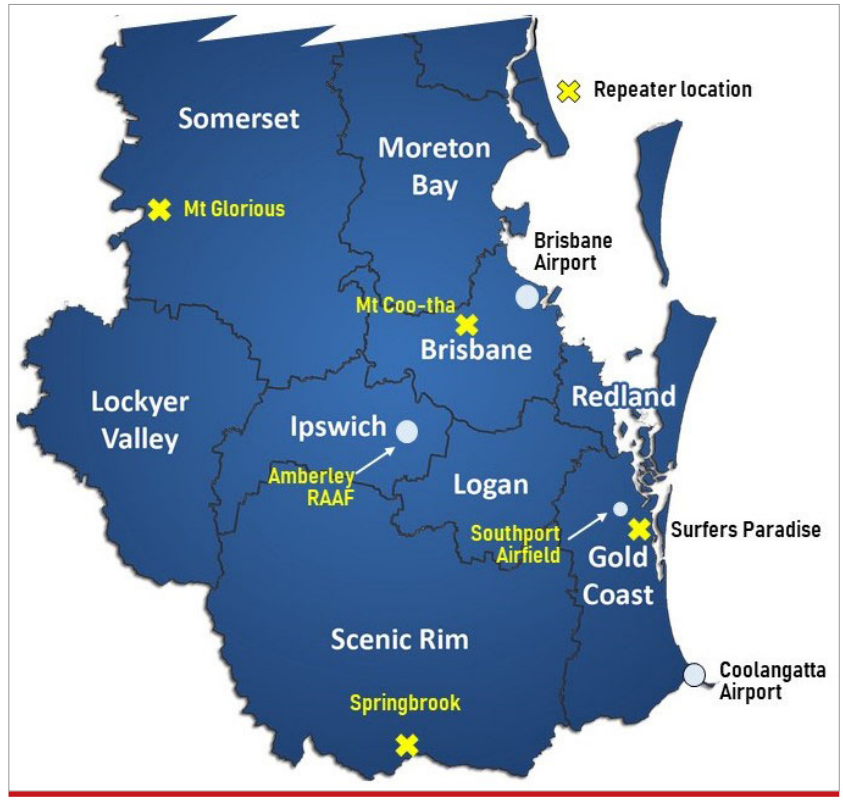
Code Four required small teams of amateurs to provide real-time aircraft movement reports to the Surfers Paradise Control Centre, detailing times for participating aircraft starting engines, taxiing to the runway, taking off, and safe return to the airfield. They also required reporting of any incidents at the airfields, or of aircraft experiencing mechanical issues and having to withdraw.

To knit this all together and provide on-demand intercommunication was going to require a quite sophisticated radio network. Mark brought into the discussions Andrew Chapman VK4QF, who conceived and established the south-east Queensland wide area repeater network (SEQ WAN – vk4nu.au/index.php/seq-wan). He was able to come up with a 70cm network plan that would provide reliable radio coverage to all Pacific Airshow venues.

Early in the planning, the matter of airband communications between aircraft and the Control Centre being blocked by the many high-rise buildings surrounding the Surfers Paradise event precinct was discussed between Ken Ashmore of Code Four Pacific Airshow Air Operations, and Mark VK4DMH.

The Airshow Control Centre was to be atop a three-story high scaffold on the Surfers Paradise beachfront, hosting the Air Bosses for the show, a show commentator, two amateur radio operators, two Air Services Australia representatives, a representative from the Civil Aviation Safety Authority (CASA), and a Queensland Police officer.

Mark VK4DMH suggested a cross-band aviation-to-commercial VHF-UHF repeater, to be placed on a nearby high-rise building that could be accessed by a handheld two-way radio at the Control Centre. As participating aircraft flying in a holding pattern to the north while waiting to fly-in were within a zone not monitored by an air traffic controller, Mark thought it best to have this cross-band repeater operate on the airband common traffic advisory (CTAF) frequency of 119.0 MHz.



Local government areas in southeast Queensland, showing locations of the four Airnet repeaters of the bespoke network created for the Pacific Airshow, along with the four airports involved. The Mount Glorious site is at 685 metres ASL, the Mount Coot-tha site at 268 metres ASL, the Springbrook site at 990 metres ASL, while Surfers Paradise was at 115 metres ASL.

The bespoke "Airnet"

A complete new 70cm repeater network was commissioned specially for the Pacific Airshow event. Over a period of weeks leading up to the event, the Airnet was designed, built, and tested by Andrew VK4QF, with assistance from Mark VK4DMH, Aidan VK4APM, and Jamie VK4XD.

Four repeater sites were instituted at Mount Glorious to the northwest, Mount Coot-tha in Brisbane, Springbrook in the Gold Coast Hinterland to the southwest, and a site atop a Surfers Paradise high-rise building in Cavill Avenue at Surfers Paradise, behind the beach.

All the sites were interlinked via 70cm transceivers. The Airnet, along with the cross-band aviation-to-commercial (airband/UHF) repeater, gave the show's Air Bosses an expanded area of aircraft radio coverage.

Showtime operations

Each airfield presented unique issues for our amateur radio operators, as we needed to see and report on each aircraft, ranging across pushing-out from the hanger, to engine start-up, then taxiing and finally, take-off. Even though two airports had Air Traffic Control towers, we weren't allowed access, so our radio operators had to make the best from airside ground positions.

Local skydivers entertained the crowds, leading with the event organisers' flag. [Code Four].

The Southport Flying Club airfield hosted 26 of the show's aircraft, including the incredible purpose-built Yak-110. This airfield is within a CTAF zone, which is pilot self-controlled with no Air Services Traffic Controllers.

The upper balcony of the Southport Flying Club gave the radio amateur team a good place to operate from, with a full view of the runway, and about a 60 per cent view of the taxiways. Handheld UHF CB radios enabled communications with ground support crew on the ground.

As Southport was within the 119.0 MHz CTAF zone, it became necessary to communicate on airband direct to the aircraft as they were warming up their engines, then taxiing to the runway. Incoming aircraft could be warned of any hazards, like a flock of birds on the field or if a kangaroo had strayed in from the neighbouring nature reserve.

At Coolangatta, the Gold Coast Airport hosted 11 aircraft, including the small privately-owned fighter jets, the US Marines' MV-22B Ospreys, and three WW2-vintage fighter planes. There was a Special Event Zone set up airside for the aircraft, allowing our amateur radio team to freely move about the parked aircraft and to talk with the pilots and crew.

As there were a few blind spots at Gold Coast Airport, the radio amateur team had to improvise to transmit aircraft status reports.

The Brisbane International Airport team of amateurs had a large area of airfield to deal with. They were situated over 5½ km from where the three military jet aircraft were parked, these being the US Air Force's C-17 Globemaster and KC-135 tanker, and a Canadian CC-150 tanker. Once again, the radio team improvised, making use of *Flightradar24* and binoculars so they could verify via radio the ground movements for these heavy-lift aircraft.

The Surfers Paradise Command Centre crew were well prepared to deal with the continuous loud aircraft noise from the airshow. They had noise cancelling pilot headsets connected into their handheld transceivers. With only two city blocks to the 70cm repeater, they had excellent radio coverage.

Seated alongside the team of two amateur radio operators in the Surfers Paradise Command Centre were two Air Services Australia representatives and a CASA representative. The three Air Bosses were able to get the latest aircraft updates from the amateur radio crew, and all three groups constantly liaised on aircraft movements, including those aircraft in the area that weren't in the airshow.

Technicalities

Andrew VK4QF provided all these juicy details of the hardware deployed for the Airnet 70cm repeater network.

Amateurs involved in Pacific Airshow communications operations

Who	Where	When
Mark VK4DMH	Southport Flying Club	3 days
Aidan VK4APM	Surfers Paradise Control Centre	3 days
Ron VK4RH	Gold Coast Airport	3 days
Simon VK4TSC	Brisbane International Airport	3 days
Jamie VK4XD	Surfers Paradise Control Centre Southport Flying Club	1 day 1 day
Geoff VK2DLA	Gold Coast Airport Surfers Paradise Control Centre	1 day 1 day
Ed VK4JEN	Southport Flying Club Surfers Paradise Control Centre	1 day 1 day
Chris VK4CBX	Southport Flying Club	1 day
Dylan VK4NFS	Gold Coast Airport	2 days
Syd VK4TVR	Brisbane International Airport	2 days

A 0800 morning briefing at Southport Flying Club, with Ground Support, Safety crew, and club members; Mark VK4DMH is seated on the far side of the table, in the centre. [Mark VK4DMH].

The original concept called for saturated portable coverage for radio amateur teams at the major airfields involved with the airshow.

Because the VHF airband – at 118-137 MHz – is close to the 144-148 MHz amateur band, it was decided to use the 70cm amateur band (430-450 MHz) for the Airnet repeater network as it would have minimum impact on aviation band receivers. This is not to mention the lack of frequencies available on the 2m band. Something as large and important as this event required a dedicated network.

RF coverage plots were made of the general area to be covered. The following sites and repeater input frequencies were decided-on as giving the best 'bang for the buck.'

- 439.700 MHz VK4RES Mount Glorious (Greater Brisbane – Ipswich).
- 439.725 MHz VK4RMC Mount Coot-tha (Brisbane City – Brisbane Airport).
- 439.750 MHz VK4RGX Springbrook (Greater Gold Coast coverage – Gold Coast and Southport Airports) .
- 439.675 MHz Surfers Paradise high-rise (Surfers Paradise – Control Centre coverage).

VK4RES Mount Glorious had a local 70cm repeater on 439.700 MHz, along with a 'talk-thru link' on a 430/440 MHz pair, with VK4RMC, VK4RGX and Surfers being 'child sites' or end links.

The talk-thru link antenna was an RFI OA-40-67P offset array at the 50 metre mark on the tower; the 70cm repeater antenna was another RFI product, a BA40-67 binary array, at the 60 metre mark on the tower.

Equipment used at VK4RES was a Spectra Engineering MX800 UHF repeater, another Spectra Engineering MX800 UHF repeater as the talk-thru link, plus an Omnitronics 619EI Audiobridge and Telewave TPRD-4544 duplexers for both the

Looking after 26 aircraft at Southport Flying Club – Ed VK4JEN on the mic, Mark VK4DMH on the camera phone; looking after 26 aircraft. [Mark VK4DMH]

PACIFIC AIRSHOW GOLD COAST 2023
Performer Schedule
Saturday 19 August
V1 - FINAL

Air Boss: 127.9
Unicom: 119.0
Discrete: 125.05

Start	End	Duration	Performer	Airfield	Airspace	Description	Helo	I/E
10:16	10:22	0:06	Opening Ceremonies	–	–		–	–
10:22	10:30	0:08	All Anthems Flag Jump	OOL	3 / 4k	Gold Coast Skydive Circle the Jumpers - Boerboon		
10:31	10:37	0:06	Yak110 Jeff Boerboon (USA)	SPT	3 / 4k	Teaser		B/N
10:38	10:41	0:03	RAAF C-130	AMB	5 / 8k	Flypasts 1 Pass/ 270, Flares		S/N
10:42	10:45	0:03	RAAF C-17	AMB	5 / 8k	2/Flypasts		N/N
10:46	10:56	0:10	Matt Hall & Emma McDonald	SPT	3 / 4k	2-ship Display MXS & Extra 300		NS/N
10:57	11:01	0:04	Media Helo Flypast		3 / 4k			
11:02	11:15	0:13	Freedom Formation	SPT	3 / 4k	Yak 55 plus RV x 12		N/N

View of a daily runsheet. This was essential for each amateur radio team as it set down the time windows when each aircraft was to be in the air and performing. [Roger VK2ZRH]

repeater and talk-thru link.

Antennas at the VK4RMC Mount Coot-tha 439.725 MHz repeater used half of an RFI BA4040-67 dual binary array at the 70 metre mark on the tower, with an RFI YB9 9-element Yagi pointed back to the Mount Glorious talk-thru link

The transmission hardware at VK4RMC included a Spectra Engineering MX800 on 439.725 MHz, an Omnitronics 619EI Audiobridge, and a Tait TM9455 link; the repeater duplexer used was a Telewave TPRD-4556.

Greg VK4BBX visiting the Surfers Paradise Control Centre crew; Jamie VK4XD on the left, Aiden VK4APM on the right. Note the special noise control headsets. The police officer's task was to spot illegal drone flights; yes, the drones were forcefully brought down!. [Greg VK4BBX]

Springbrook's VK4RGX 439.750 MHz repeater used an RFI BA80-67 binary array at the 30 metre mark on the tower, again with an RFI YB9 9-element Yagi pointed back to the Mount Glorious talk-thru link.

Similarly to VK4RMC on Mount Coot-tha, the transmission hardware at VK4RGX was another Spectra Engineering MX800 on 439.750 MHz, an Omnitronics 619EI Audiobridge, and a Tait TM9455 link. The repeater duplexer employed a Telewave TPRD-4544.

The Surfers Paradise 439.675 MHz repeater used an RFI SMD4-67 side-mount dipole around three meters off the deck on a 115 metre-tall high rise overlooking the official area where local amateur radio operators sat with the Air Boss and other Airshow officials. An RFI YB9 9-element Yagi pointed back to the Mount Glorious talk-thru link

At Surfers, the transmission equipment, yet again, used a Spectra Engineering MX800 on 439.675 MHz, an Omnitronics 619EI Audiobridge, and a Tait TM9455 link. Likewise, the repeater duplexer used was a Telewave TPRD-4544.

After testing Airband communications at Surfers Paradise, it became apparent that the Air Boss would have major issues communicating with aircraft on the Gold Coast CTAF frequency (119.000 MHz). A UHF crossband repeater was established at the same site as the Surfers amateur 70cm repeater to allow portable coverage across the official area.

The equipment for this crossband system was based on an Icom IC-A110 VHF Airband transceiver, modified to allow operation into an Omnitronics DSRI Audiobridge along with a Spectra MX800 UHF repeater on a commercial 456/466 MHz duplex frequency pair; a Telewave TPRD-4544 duplexer and a Power Box 12 VDC power supply completed the equipment manifest.

Antennas for the crossband system included an RFI SMD4-67 side-mount dipole for the UHF crossband and an RFI GP3 airband groundplane for the airband transceiver.

The advantage of the Omnitronics DSRI Audiobridge is that its operating mode can be changed by using Selcall. For this, a Tait TP9460 portable transceiver was used by the amateur radio team so that, in the event of an issue, a Selcall sequence

could be sent on the commercial UHF frequency to "break" away the airband crossband link.

The Air Boss radio was a Motorola APX6000 portable, for operation via the UHF/CTAF crossband repeater.

The future

Code Four has announced that the Pacific Airshow Gold Coast will return in 2024. Lessons learned by the amateur radio support team will be applied for future events, said Mark VK4DMH.

Acknowledgements

Andrew VK4QF said that the Airnet system would not have been possible without the help of the following people, and thanked them for their dedicated assistance:

- Mark Hanrahan VK4DMH, President GCARS
- Aidan Mountford VK4APM, GCARS member
- Peter Mill VK3PM, WIA Repeater Coordinator
- Marcus Bamford VK6ZMB, accredited frequency assigner.

Andrew especially thanks his employer, who allowed him to take leave quickly to build and commission the system, in particular Joel Muller, State Manager, Queensland Police, Radio & Electronics Section, and Adam Brown, OIC Toowoomba, Queensland Police, Radio & Electronics Section.

During Saturday of the event, Greg Ackman VK4BBX graciously gave the Editor in Chief a comprehensive tour of key sites and airfields with "access all areas" hospitality; thanks also for lunch.

Northern Territory MV-22B Osprey crash

A week after the event finished, one of the Osprey MV-22B aircraft that participated, known by the call sign *Dumptruck*, crashed while on operations in the Northern Territory, with the loss of the three aircrew. However, the cargo of 24 Marines were saved, with three hospitalised.

The Pacific Airshow organisers and participants expressed devastation at the loss of Major Tobin "Smeagol" Lewis, 37, Captain Eleanor LeBeau, 29, and Corporal Spencer Collart, 21. As is said on such occasions, "blue skies and tailwinds."

The Control Centre at Surfers Paradise was atop this three-story high scaffold on the beachfront. From here, the Air Boss ran the show. [Roger VK2ZRH]

Another pilot from the Pacific Airshow, Stephen Gale, lost his life in a crash in Victoria in November. Stephen flew his private fighter jet in the Gold Coast event. *Blue skies and tailwinds.*