

## CUTTING EDGE TECHNOLOGY REPRODUCES MISSING PARTS

A \$700 3D printer owned by Tram Section member Joseph Dickson has revolutionised the production of special castings for Tram 21.

Joseph, an engineer, is a member of the Tram Trailer 21 restoration team, and has been producing masters for brass castings at home using CAD files produced by team member Tony Messenger on a Creality Ender 5 3D printer owned jointly by Joseph and his brother.

The masters have been produced in PLA material, which will be used in the lost wax casting method to produce the required castings.

Among the items produced so far have been hand rail bases and knobs, and



*3D printed masters for handrails knobs and bases for trailer 21.*



*A Creality Ender 5 desktop 3D printer from which the masters for missing parts for trailer 21 are being produced*

*Photo from the manufacturer's on-line publicity*

latches for the lifting side doors.

According to Joseph each item takes about 6 hours to produce. He said the usual practice was to set the machine running when he went to bed and seeing what was sitting in the machine when he woke up in the morning.

Project leader Leyton Chan, said the work being produced is of the highest quality and could usually be used for casting masters with no extra work.

This won't be the first time that 3D printing has been used for restoration work, with the method being used to reproduce items on the instrument panel of the Solent flying boat. The work was contracted to a specialist company, with it working from photographs supplied by the restoration team.

## THE TECHNOLOGY IN A NUTSHELL

### 3D PRINTING

3D printing is a cutting edge technology which is revolutionising the way objects are made.

It works by building a three-dimensional object, successively adding material, layer by layer.

It was invented in 1981 by Hideo Kodama of the Nagoya Municipal Industrial Research Institute, and the first commercial 3D printer was produced in 1987, called the SLA-1.

In the ensuing years the format has been developed to a point where items can be produced in various metals on machines which can be used at home, purchased over the counter in stores such as Warehouse Stationery.

### LOST WAX CASTING

Lost wax casting is a technique which has been around for at least 6000 years.

Also known as investment casting, it involves a wax model being used to create a mold into which molten metal will be poured.

Once the mold is made the wax model is melted and the wax drained away, hence the name lost wax.

In the case of the 3D masters being produced for trailer 21, the PLA will be melted and drained away.

*- by Evan James*



*ABOVE: Joseph Dickson inspects a 3D printed latch for trailer 21 against an original.*

*BELOW: The brass original, the only one available, and the 3D printed master for its replacement. Eight will be required for trailer 21.*

*Evan James photos*



# MILITARY SECTION WELCOMES SUMMER

The MOTAT Military Section are looking forward to some sunny days during the summer months so they can progress some of the outstanding maintenance which has been hampered by the inclement winter weather.

In particular the popular ride-giving APC has been out of action with worn track pins, and the longer, fine days of summer should enable this vehicle to resume service after Christmas.

Section spokesperson John Tutchen noted that "Since we don't have proper workshop facilities we are reliant on the weather to enable us to work on the tracks outdoors. 'Track-bashing' is no fun at the best of time, let alone in the rain. And we've had a lot of rain this winter."



APC - Track repairs, work-in-progress.

Photo credit: John Tutchen Collection.

Additional maintenance is occurring on both Landrovers. The SWB SIIA has an oil leak and the LWB 109V8 now has need of a new brake master cylinder.

A worn fan-belt tensioner pivot was recently found to be the cause of a troublesome noise and Society Life Member Greg Pittams machined a new pivot post to account for the wear in the tensioner bush. On the morning of the October 3rd Sunday "Experience" rides, JT reassembled the dual belt-drive just in time to resume normal service. The Landrover rides are very popular with the public who can relate to these iconic vehicles, and with good visibility are able to appreciate the 4WD capability as they are driven around the M2 off-road course.

## SUPPORTING MUSEUM EXPERIENCE PUBLIC PROGRAMMES AND ADH TOURS HOST TEAMS

Military Section are regularly called upon to support the Museum Experience Public Programmes Team, most recently during the Night Lights event, with their 90cm Searchlight from WWII. Chief Searchlight Operator and Society Life Member Ross Goldsworthy led a small team to overhaul the searchlight lamp mechanism and the light performed faultlessly during the three nights. Powered by its own stand-alone generator, this rare artefact was overhauled in time to enable the searchlight team to sweep the Auckland sky with a beam reported to be visible at times as far away as Muriwai.

This year the Military Section have supported ADH Tours Host David Kaanu, adding a Military Technology talk to his youth group visits to the ADH. Groups include Air Cadets, Schools, (various Auckland and, most recently, Rotorua) as well as the Waimauku Scouts & Guides administered by ADH Host, Vanessa Belton. David, Vanessa and several other ADH Hosts are members of the MOTAT Society with three more joining in the past week since the successful Society AGM.

JT noted that "Kids ask the most interesting questions, often from an unusual perspective. We like to explain how military technology also has civilian benefits, such as tracked transport and four-wheel-drive. Naturally, we are happy to help David with his programme. His gift of chocolate biscuits is always gratefully received"

## AND IT RAINED!

Speaking of rain – The perpetual flooding of Shed F was deemed to be cured by the installation of a larger sump-pump in the drain outside, however recent works by ME Team behind Shed Alley had damaged the outlet pipe. The latest storm in mid-October caused a repeat of the flooding to 'F' and, for the first time, Shed 'E' due to raised ground levels. Military Section members are still assessing water-damage to artefacts and drying-out the sheds, yet again. Another reason to look forward to sunny summer days.

- by John Tutchen

# RAIL RESTORATION

The priority for the Rail Team for most of this year has been the restoration of L533, a 5 tonne (approx.), standard, open wooden wagon of 1899 vintage. In its heyday it was used in the South Island to cart coal, timber, grain etc.

Work has included some decking, Westinghouse brake check, paint, a new canvas cover and replacing all the under floor wooden framing with purple heart hardwood timber which, we believe, is the first time this work has been carried out in the 120 years of the wagon's life.

The L533 wagon is unique in that in the early 1900's when there were insufficient carriages available for major events such as Race Days or picnics, a frame was erected over the wagon to support a canvas roof, and board seats were added for up to 20 passengers. MOTAT has faithfully restored the L533 to that

era and the Rail Team are expecting it to be attached to a train and running during the Rail Live Day on Sunday Nov 17.

## A1819 - DELAYED RESTORATION

A1819 is a second class, 50 foot, steel paneled carriage of 1935 vintage with centre toilet, used on express trains. A start was made to restore it many years ago but halted until last year when the Rail Team recommenced the restoration. Unfortunately, due to the urgent work required on the L533, restoration work was once again delayed but will resume once L533 is complete.

## MOTAT 2 JIGGER SHED

Work was recently completed on the MOTAT 2 jigger shed. The two bay trolley shed was salvaged from Mercer in 1976 and was rebuilt some time ago but was removed and placed



ABOVE: The newly renovated Jigger Shed at MOTAT 2

temporarily on a wagon, during the track upgrade at Waititiko to make way for a new track alignment.

- by Richard Croker

BELOW: L533 with passengers at Waititiko Station, July 2012. The wagon is being hauled by "Bertha" (currently undergoing extensive boiler repairs).



## MOTAT SOCIETY VISIT

Saturday 7 December

Departing by coach from MOTAT 2 at 8:30 am for the Classics Museum in Hamilton. Leaving Hamilton at approximately 3:00 pm.

**FREE** Travel for all.

**FREE** Museum Entry for MOTAT Society members, \$10 for partners/non-members (50% off normal admission)

Email [admin@motatsociety.org.nz](mailto:admin@motatsociety.org.nz) to book a seat. Last day for booking 30/11/2019.

# AVIATION AIRINGS

After the huge achievement of the external restoration of the Solent, now in the ADH after up to fifty years outside, you could well be forgiven for thinking that the Aviation Team are sat back resting on their laurels. But not a bit of it! Even before that Herculean task was completed several of the engineers in Aviation were badgering those in authority like blue bottomed budgerigars mixing their metaphors, for new projects...and they got 'em! Lots of them! A few current projects will follow here and there are one or two more waiting in the wings....was that an aviation pun? Whoops sorry.

Gun turrets, guns, the Dakota C47 aileron, the 747 flight simulator deck, riveting repairs and the routine maintenance of the ADH exhibits... there is no time for the grass to grow under our twinkle toes, it's all go in the Belfast hangar.

## CANNON REPLICAS

We can start with Les Graham who is working on the very realistic plastic and aluminium replicas of 50cal cannons, the smile on his face is not intended to be that of a successful bank robber, but more displays the exhilaration of a task nearing completion to await refit.



## FRASER NASH GUN TURRET

The guns need their turret for mounting and Engineer John Dykes is seen here as he observes his progress on the complex Fraser Nash gun turret that is being repaired and rebuilt before being refitted to the Sunderland. It will replace the blank that has been there for too many years giving the Sunderland its originality and credibility, missing for so long.



## DAKOTA (C47/DC3)

For a long time the Dakota (C47/DC3) sat out in the elements, weathering Auckland's wettest winters and searing summers, almost as long as the Sunderland and Solent. And it deteriorated just like they did. Initially it was assumed that the old aeroplane would be safe with a few tarps and the engine covers protecting its vulnerable accesses and important little places, but we hadn't figured on THE BIRDS! The feathered fiends (not friends,

these are fiends) got into every nook and cranny stuffing straw, small decaying bits of plastic and whatever else they could find, finally sticking it all together with the most unspeakable mixture of only they know what. What we knew was that it was hard to get it all out! We eventually resorted to a water blaster. The pile of soggy nest materials that we extracted would have made enough straw bricks to re-build Stonehenge! We moved the Dakota into the Belfast hangar, removed the wings from the two Lockheeds and got them all tucked up out of the elements, allowing us to concentrate on the conservation of the Dakota. The control surfaces are now being resurfaced under the guidance of Norm McKelvie using techniques and skills that were once in danger of being lost.



## BOEING 747/200 FLIGHT SIMULATOR

In the Boeing 747/200 flight simulator, Peter Kelly is delving deep into the electrics to restore light to the instrument panels. This will provide a "visitor experience" with a much more realistic view of what a fully instrumented pre glass cockpit (computer screen flight information) was like with all the individual instruments glowing and a genuine cockpit voice providing "aircraft to tower" approach talk. This has been a huge task and one which the Aviation Team have long



planned and discussed. It has taken us on a journey through the magical mystery tour of the Rediffusion Simulator circuit diagrams that only a master of this art could navigate. That master is Peter Kelly, assisted by electrical expert Bob Deacon, in restoring life to the long dormant simulator.

The Aviation Team led by Steve Subritzky hope that with all of this action occurring in the Belfast hangar we can help lift the visitors ADH experience to a higher level of realism, making it a more stimulating event and, most importantly, restoring the originality and authenticity of the exhibits for all to enjoy and from which to learn their fascinating stories. *- by Henry Swan*

## MOTAT TRUST BOARD APPOINTMENTS

Regional Facilities Auckland (RFA) and the MOTAT Society announce the following MOTAT Board appointments for the 2019 year.

The reappointment of Sue Wood for a further two years, with new members David Downs, Gavin Fernandez, Dr Bryan Young and Samantha Sharif being appointed for a two-year term.

RFA and the MOTAT Society would like to thank Dr Lesley McTurk and Bruce Howat for their commitment and contribution to the Museum Trust Board, as well as the Rt Hon Judith Tizard and William (Bill) Rayner for their respective contributions to the board over the last six years.

## - AUSSIE RAIL TOUR - SOCIETY MEMBERS HEAD TO VICTORIA

A group of five members from Rail have just returned from Victoria, Australia after a full schedule of visits to Steam/Rail orientated museums and collections, culminating in a visit to the 114th Lake Goldsmith Steam Rally, asserted to be the greatest gathering of vintage machinery in the Southern Hemisphere.

Charles Richards, Martyn Radford, Ian Wiley, Alex Smith and Andrew Holembly headed over for the eight day trip with a focus on gathering knowledge and making contacts. Strictly no beaches or random sightseeing, the five took working clothes and intended to shovel coal at every stop along the way

Venues on the itinerary included:

- Puffing Billy Railway
- Lake Goldsmith Steam Rally
- National Steam Center
- Sovereign Hill Open Air Museum
- Scienceworks Museum
- Murray River Steam Boats in Echuca
- Bendigo Tramway Museum (plus Goldmine experience)
- Bellarine Railway
- Australian Railway Historical Society Victoria
- Steam Rail Victoria
- Mornington Peninsula Railway

The MOTAT Society is proud to have been able to assist the travellers with a grant towards trip costs and look forward to an interesting report of their adventures in the near future.

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# THE MOTAT SOCIETY LUSH AWARD 2019 - RICHARD CROKER

Our presentation of the Annual Lush Award this year goes to a member of the Society who has given half a century of service to the museum and over 50 years to New Zealand's major transport organisation (through its various guises).

He is a published author, having co-written three books. He is a member of the MOTAT Rail Section and a long-term servant of the MOTAT Society, most recently serving as a Committee member for several years.

Richard left school at the end of his 6th form year in 1957 and joined the District Engineers Office of the New Zealand Railways as a Cadet. On returning from a Cadet Training Course in Wellington during April 1958 Richard was placed in the Railway's New Works Office where the projects included the duplication of the railway lines between Mercer and Ohinewai. This project, and others, gave him much experience in engineering surveying, setting out bridges and many kilometres of track and general railway engineering. After two years of secondment to the Resident Engineers Office in Hamilton he returned in 1964 to the District Engineers Office in Auckland to assist with all aspects of railway civil engineering in the Auckland District.

## MOTAT

At the end of 1967 with a solid 10 years under his belt, a Rail Section member from MOTAT sought help to design a track layout in the gully behind the pump house, which was then, full of rock outcrops and large pine trees.

Richard was seconded unceremoniously, thinking a survey and plan preparation should not take longer than a day at most. But the setting out was next, rails and sleepers were required, and soon Richard was hooked. What started as an anticipated two or three day project with MOTAT has ended as 52 years as a volunteer thus far.

In 1974 Richard was seconded to the Project Design Office for Auckland's Rapid Transit project (ART or '*Robbie's Rapid Rail*') to fine tune the track layout for the underground railway. He worked alongside staff from NZR head office, Ministry of Works, DSIR and Contractors. The project came to an abrupt end late 1975 but Richard was asked to stay on after other staff had returned to their respective offices, to prepare an inventory of the remaining documents in the ART office.

It was during this time that he came across some paintings by world renowned industrial designer Gifford Jackson and was given permission to retain them so that they might one day be displayed at MOTAT, in what was going to be *THE* Railway Museum. That lofty idea of a National Railway Museum never eventuated and some 43 years later in preparation for moving house, Richard discovered the drawings in a cupboard at home. Since MOTAT still didn't have a Railway Display Building, Richard decided to make them available to the Walsh Memorial Library where they were enthusiastically received and put on display at the end of last year. Richard has also made available to the Library old railway posters, drawings and manuals.

By 1979 the MOTAT 1 site, with the influx of rolling stock and locomotives, proved to be too small and over the years the collection, other than the Waitakere station building and the Mt Albert signal box, has been relocated to MOTAT 2. Again Richard's expertise was put to the test designing a track layout and an operating Main Line to fit the shape of the MOTAT 2 site, now known as the Museum's "Western Springs Railway". This Railway was opened by the Minister of Railways, the Honourable George Gair in December 1982.



Richard Croker standing alongside A1819.

## RETIREMENT

In 2009 Richard, now a Project Engineer/ Project Manager in KiwiRail's Auckland Project Office, retired from the NZR, with a grand 3 score and ten years being enough, in the Project Directors view, to finally enjoy a well earned retirement.

At MOTAT, Richard works on track and carriage restoration, and NZ Rail heritage projects. His most memorable moments from the past 52 years at MOTAT involve the K900 locomotive (132 tonne in working order), its move from Pacific Steel to MOTAT in the first instance (in particular the use of the Auckland Harbour Board's 100 tonne floating steam crane "Hikinui", which was used to lift the locomotive onto NZ's then largest road transporter, not to mention the celebration afterwards!) and its subsequent move to M2 more recently.

For his dedication to the Museum at MOTAT, his involvement in the preservation of NZ Rail heritage and his 'foresight' to gather and retain items of National Rail Significance for the benefit of future generations we are delighted to present the MOTAT Society Lush Award to Richard Croker. Congratulations Richard.

- by John Tutchen



## MOTAT LIVE DAY : RAIL

Sunday 17th November, 10 to 4, MOTAT 2

Come and see MOTAT's operational rail collection come to life with a great range of family activities.

The MOTAT Society will be on site selling a couple of fantastic Rail oriented books co-authored by our very own 2019 Lush Award winner, Richard Croker.

Roll up to the MOTAT gazebo with your eftpos card or cash in hand for:

- *K900 and NZR's K, KA & Kb class 4-8-4 locomotives \$20.00; or*
- *MOTAT Locomotives \$20.00.*

Or buy them both for the special price of \$35.00.

Also available, plus P&P, by emailing the Administrator on [admin@motatsociety.org.nz](mailto:admin@motatsociety.org.nz).



## MOTAT SOCIETY AGM

A very successful AGM was held on 22nd October with attendance of approximately 40 members. Thanks go to our guest speakers Mike Spraggon, MOTAT Board, Michael Frawley, MOTAT and Randy Rainsford for their interesting and informative presentations.

Welcome to the new 2019/2020 MOTAT Society Committee:

- Henry Swan
- John Tutchen
- Alan Curtis
- Evan James
- Peter Burch
- Ross Goldsworthy
- Bruce Wild
- Leyton Chan
- Bill Rayner
- James Duncan

For those unable to attend the AGM you can find the Chairman's Report online at [www.motatsociety.org.nz](http://www.motatsociety.org.nz)