The Times

August 2014

A journal of transport timetable history and analysis

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Inside: **Who moved my cheese?**
How Busy?- the saga of 3MB2
Busy night on the North Coast- the saga of 3BM2
Busy busy busy– them and us

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The Times

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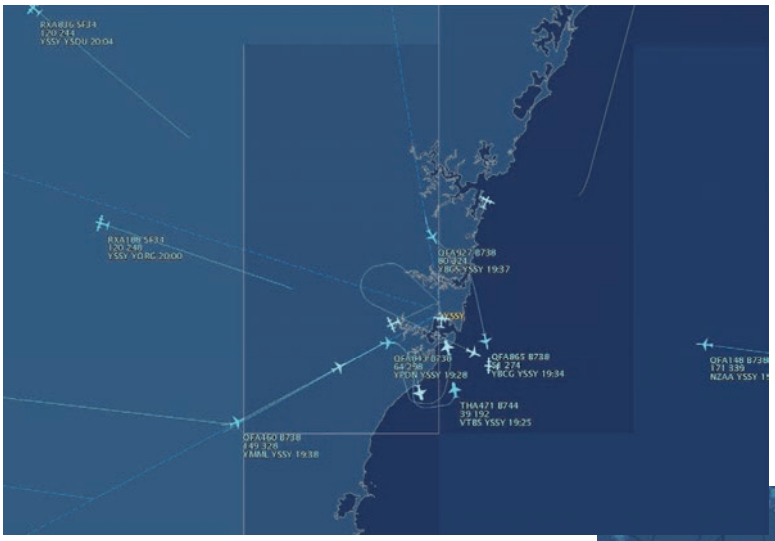
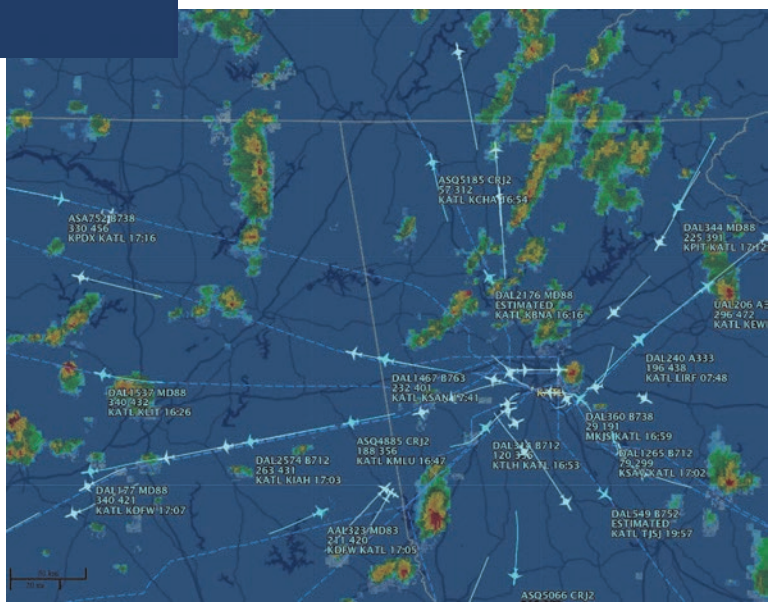




Who moved my cheese?

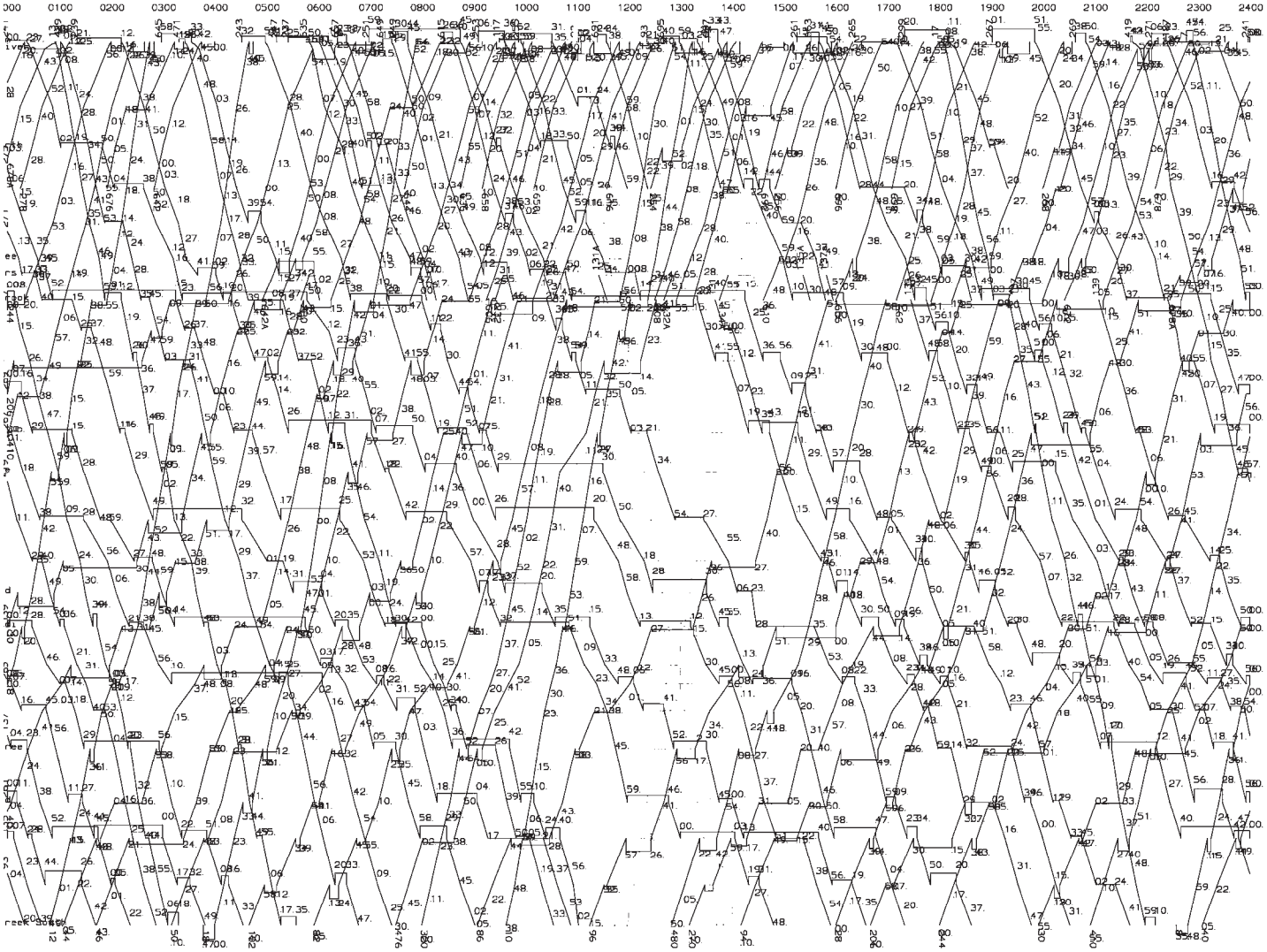
TORQUEMADA

YOUR MISSION—should you choose to accept it—is to schedule a middle of the day Down and Up Express Train onto this line.

Your Mission Possible Team has been selected because we know that your team can do better than a hypercomputer, which would take all of eternity to solve this problem.

Train timetablers and train controllers are born– not made. What is in your DNA?

Your solution (in red pen on a photocopy) —should you choose to present it—will appear in the next issue.



North-South Freight– How fast? The saga of 3MB2

JIM WELLS

The issue of transit times for Melbourne – Brisbane freight trains continues to be of much interest. The ARTC justified much of its recent expenditure on passing lanes, concrete sleepers etc. on the need to reduce transit times by several hours. There's a lot of interest in an inland route to shorten the distance, avoid curfews and have a much improved alignment.

Australia is no stranger to fast freight trains. The June 1964 issue of *Trains* magazine surveyed train speeds; the only countries apart from the US mentioned for freight trains were Australia and France – two examples each. The faster of the Australian ones was: No 465 Through Goods Alumatta (Wangaratta) – Chiltern, Speed 56.5 mph = 90.9 kmh.

Intermodal trains are generally allowed to run up to 110 or 115 kmh. This is intriguing as the 'flat' wagons still use classic three piece bogies. A number of improvements have been made over the years: roller bearings for the wheel sets, "ride control" spring damping and constant contact side bearings. The point of the latter is to resist bogie hunting (oscillation around the pivot). That's fine on tangent track but not so good on the very curvy alignment of the North South route where necessary bogie rotation would be resisted resulting in increased wear and noise.

The trains are operated with no change of locomotives between Melbourne and Sydney and Sydney and Brisbane. Normally there is no change of locomotives in Sydney. This means, particularly for the latter sector, gross overpowering for much of the distance as the ruling grade of 1 in 40 occurs only in a few places.

Proceeding through Hornsby the trains are certainly not at drag speed but it may be that on the final 1 in 40 approaching that station they are still running out momentum from the Normanhurst dip.

Other factors influence speed – the trains can be up to 1.5 km long which means their recovery from speed restrictions is very slow. This also means that braking has to be conservative as air pressure propagation through the train pipe takes some time. Train management on undulating track is a demanding skill.

This article looks at one train only – Pacific National's 3MB2 which takes 35.5 hours for the journey. The Melbourne – Sydney times are shown on pages 4-5, Sydney – Brisbane on pages 6-7.

Many pages of Working Time table for two operators have been drawn together for this presentation. Departure from South Dynon (below right) is at 12:20— to follow VLine's 8615 passenger train to Albury.

This is quite early for Day 1 loading ex Melbourne. Maybe this train conveys non urgent traffic or traffic that must be in Brisbane very early on Thursday. Some of the containers may have originated in Tasmania.

The run to Albury which is reached at 16:19 (about 300 km) takes just under four hours which is similar to the old Southern

TRAIN NO			3MB2
LENGTH (Metres)			1500
DAYS			TUE
SCHEDULE			MELBOURNE
STATUS			M
OPERATOR			PNT
COMMODITY			INTERMODAL
Appleton Dock		arr	
		dep	
Swanson Dock		arr	
		dep	
Southern Cross Station		arr	
		dep	
Moonee Ponds Junction		arr	
		dep	
Melbourne Operations Ter		arr	
		dep	
Canal Siding		arr	
		dep	
South Dynon Yard		arr	
		dep	12:20
Appleton Dock Junction		arr	
		dep	12:22
North Dynon		arr	
		dep	12:25
Sims Street		arr	
		dep	12:27
West Footscray Junction		arr	
		dep	12:35
Tottenham		arr	12:39
		dep	
FORMS OR DESTINATION			ACR

TRAIN NO			3MB2
LENGTH (Metres)			1500
DAYS			TUE
SCHEDULE			SFR
STATUS			M
OPERATOR			PNT
COMMODITY			INTERMODAL
Tottenham		arr	
		dep	12:39
Tottenham Junction		arr	
		dep	12:40
Albion Junction		arr	
		dep	
Sunshine		arr	
		dep	12:41
McIntyre Loop		arr	
		dep	12:44
Tullamarine Loop		arr	
		dep	12:49
Jacana Loop		arr	
		dep	
Broadmeadows		arr	
		dep	12:54
Somerton Loop		arr	
		dep	12:59
Donnybrook		arr	
		dep	13:09
Wallan		arr	
		dep	13:19
Kilmore East		arr	
		dep	13:29
Tallarook		arr	
		dep	13:47
Seymour Platform		arr	
		dep	13:55
Seymour Loop		arr	
		dep	13:57
Mangalore		arr	
		dep	13:59
Avenel		arr	
		dep	14:07
Longwood		arr	
		dep	14:23
Euroa		arr	
		dep	14:36
Violet Town		arr	
		dep	14:44
Benalla Platform		arr	
		dep	14:58
Benalla		arr	
		dep	15:00
Glenrowan		arr	
		dep	15:15
Alumatta		arr	
		dep	15:25
Wangaratta		arr	
		dep	15:33
Chiltern		arr	
		dep	15:53
Wodonga		arr	
		dep	16:14
Albury		arr	16:19
		dep	
FORMS OR DESTINATION			ACR

Aurora's non stop passenger time. There are no scheduled crossings on the single line section to Seymour; north of there to Wodonga there is now "twin" track. Slow points would be the Albion curve, and the cross over to West track at Seymour.

First stop is at Ettamogah at 16:28, where forty minutes is allowed to attach north bound loading. This is the Col Rees operated inter modal hub for Albury / Wodonga. See http://www.ettamogah-hub.com.au. It is understood that loading for Ettamogah from Melbourne is handled by the Griffith train.

Then it's on to Junee (about 150km) in 1hr 48 min which isn't dawdling. This sector is regarded as a bit of a race way. It is as far as Uranquinty but the 'slopes' of NSW start to come into play from here on. It's single track but no crosses are timetabled.

Seventeen minutes are scheduled for the crew change at Junee which is a bit longer than typical.

The new crew now work 6 hr. 37 min non stop on double track to Macarthur South Junction where the South Sydney Freight Line begins for a cross on the Glenfield Loop at 01:50. Distance is about 450 km so the average speed on this roller coaster curvy route is a lowly 67 kmh.

The dwell on the loop is 14 minutes – the opposing train being 3BM2. Given that the adjacent passenger lines have almost no traffic at this time one wonders why one or other of these trains could not use those lines – probably access arrangements and accounting controls prevent this. What happens in emergencies?

The next timing point of interest is SOY (Sydney Outer Yard or Chullora) at 02:27.

Shunting and crew changes occur at Chullora and possibly locomotive changes. The next timing point of interest is Flemington Goods South at 04:21 so it will be underway before the Sydney peak hour curfew starts.

The train is now on Rail Corp double track metals for perhaps the most demanding sector of the route as far as Islington Junction in the Newcastle area. Leaving at the time it does it will avoid suburban traffic in the southern end but the most important thing to overcome is the grades – the steepest being 1 in 40. The worst bit is probably the 5km from the dip after Epping to Pennant Hills. Ten minutes is allowed for the 6.1 km from Epping to Thornleigh – an average speed of 37 kmh.

The descent of Cowan Bank from Cowan takes eleven minutes which compares to the ten minutes allowed for stopping passenger trains. Gosford to Broadmeadow takes 86 minutes – fast passenger trains take around 66 minutes.

TRAIN NO		3MB2
LENGTH (Metres)		1500
DAYS		TUE
SCHEDULE		A2
STATUS		M
OPERATOR		PNT
COMMODITY		INTERMODAL
Albury	arr	
	dep	16:19
Ettamogah	arr	16:28
	dep	17:08
Table Top	arr	
	dep	17:15
Gerogery	arr	
	dep	17:21
Culcairn	arr	
	dep	17:35
Culcairn North	arr	
	dep	17:38
Henty	arr	
	dep	17:45
Yerong Creek	arr	
	dep	17:54
The Rock	arr	
	dep	18:04
Uranquinty	arr	
	dep	18:12
Wagga Wagga	arr	
	dep	18:23
Bomen Xover	arr	
	dep	18:31
Harefield	arr	
	dep	18:43
Junee	arr	18:56
	dep	19:13
Cootamundra	arr	
	dep	20:07
Jindalee	arr	
	dep	20:11
Wallendbeen	arr	
	dep	20:30
Demondrille	arr	
	dep	20:44
Harden	arr	
	dep	20:50
Yass Jct	arr	
	dep	21:56
Fish River	dep	22:41
Joppa Junction	dep	23:17
Goulburn	arr	
	dep	23:22
FORMS OR DESTINATION		ACR

TRAIN NO		3MB2
LENGTH (Metres)		1500
DAYS		TUE
SCHEDULE		A2
STATUS		M
OPERATOR		PNT
COMMODITY		INTERMODAL
Joppa Junction	arr	
	dep	23:17
Goulburn	arr	
	dep	23:22
Medway Quarry	dep	
MAIN SCHEDULE		A2
Medway Junction	arr	
	dep	23:49
Wingello	arr	
	dep	00:00
Bundanoon	arr	
	dep	00:12
Exeter	arr	
	dep	00:19
Moss Vale	arr	
	dep	00:28
Moss Vale Junction	arr	
	dep	00:29
Mittagong	arr	
	dep	00:38
Bargo	arr	
	dep	01:01
Tahmoor Colliery Jct	arr	
	dep	01:07
Tahmoor	arr	
	dep	01:08
Picton	arr	
	dep	01:16
Maldon	arr	
	dep	01:19
Glenlee Junction	arr	
	dep	01:34
Macarthur South Junction	arr	
	dep	01:36
Macarthur	arr	
	dep	
Glenfield Loop	arr	**01:50**
	dep	**02:04**
Leightonfield (ARTC)	arr	
	dep	02:17
SOY	arr	02:27
	dep	
FORMS OR DESTINATION		ACR

SECTION 2	3MB2
Consist	
Mondays to Fridays	Fght
LENGTH (M)	1500
COMMODITY	General
OPERATOR	PNIN
SCHEDULE	A1
PATH TYPE	T
	WO
Flemington Gds South	04 21
Flemington Gds Jctns arr	
dep	04 24
Homebush	
Flemington Markets arr	
dep	04 30
Homebush	04 34
Forms or Destination	Acacia Ridge

The train may have missed the Sydney suburban traffic but it gets caught with Newcastle traffic. At Gosford it follows a passenger train leaving 16 minutes before it and is followed fourteen minutes later by another, both stopping all stations so running times are similar.

Once around the "corner" at Islington Junction Hunter diesels come into play. If it arrives early it will wait time for the 7:25 ex Newcastle; late and it might be held to let the 7:44 proceed.

At Telarah it reaches the long, long windy single track to Acacia Ridge. The main interest now is where and with what sort of trains crossings occur. It's a pity that modern working timetables don't mark on the side the train numbers met or overtaken.

The first cross is not far out. 3MB2 rolls past 3BM4 at Paterson (8:26) but then goes into the loop at Kilbride (8:36-8:51) for the closely following 3BM7.

There's a cross with a coal train at Stroud Road (9:31); it's then into the loop at Craven North loop (9:55-10:06) for 3BW4 steel train. Busy times on the North Coast! Refer to Geoff Lambert's article in this issue for more on this.

A further loop passage occurs at Bulliac (10:37-10:48) for a passenger train – XPT NT36 ex Grafton.

A crew change occurs at Taree (11:36-11:41). The new crew has a somewhat boring time with crossings as they deal with only two – Telegraph Point (13:04-13:15 – XPT NT32 ex Roma St, Brisbane) and Braunstone (16:15- 17:39). The latter is not for a cross but for an overtake, XPT – NT33 to Casino at 16:58.

It's a pity that this happens because having let the XPT past, it has to be dealt with at or on its return from Casino.

One wonders why 3MB2 has a further 41 minutes in the hole after the XPT passes. Part of the explanation maybe that the down XPT dwells at Grafton City, the next station for 10 minutes – crew change and refuelling.

Crew hours would not be an issue as the crew would be well within normal time

SECTION 3	3MB2
Consist	
Mondays to Fridays	Fght
LENGTH (M)	1500
COMMODITY	General
OPERATOR	PNIN
SCHEDULE	A1
PATH TYPE	T
	WO
Flemington Gds South	04 21
Flemington Gds Jctns arr	
dep	04 24
Flemington Markets arr	
dep	04 30
Homebush	04 34
Nth Strathfield Jctn	04 37
	XNM
Concord West	04 40
Rhodes arr	
dep	04 42
West Ryde	04 46
	S
Eastwood arr	
dep	04 50
Epping	04 54
Thornleigh	05 04
Hornsby	05 08
Hornsby C.S. Jctn	05 09
Hornsby 2 Down T/B	
Asquith	...
Berowra	05 20
Cowan	05 24
Hawkesbury River	05 35
Woy Woy	05 50
Gosford arr	
dep	05 58
Gosford Down Refuge arr	
dep	
Gosford North	05 59
Wyong	06 17
Wyee	06 29
Vales Point Colliery	
Vales Point Jctn	06 33
Morisset	06 38
Eraring Colliery	
Eraring Colliery Jct	06 49
Awaba	06 54
Fassifern	06 59
Newstan Colliery	
Newstan Colliery Jct	06 59
Newstan Colliery	
Teralba Colliery	
Teralba Colliery Jct	07 06
Sulphide Jctn Yard arr	
dep	07 09
Sulphide Junction	07 11
Adamstown	07 22
	R
Broadmeadow Yard arr	
dep	07 24
Broadmeadow	07 28
Woodville Junction	07 34
Islington Junction arr	
dep	07 38
	Acacia Ridge
Forms or Destination	

TRAIN NO		3MB2
LENGTH (Metres)		1500
DAYS		WED
SCHEDULE		IB1
STATUS		M
OPERATOR		PNT
COMMODITY		INTERMODAL
Islington Junction	arr	
	dep	07:38
Scholey Street	dep	
Port Waratah Yard Depart	arr	
	dep	
Morandoo	arr	
	dep	
Bullock Island Brambles	arr	
	dep	
Waratah	arr	
	dep	07:41
Warabrook	dep	07:44
Kooragang Coal Unloader	arr	
	dep	
Hexham	arr	
	dep	07:50
Thornton	arr	
	dep	07:58
Maitland	arr	
	dep	08:06
Telarah	arr	
	dep	08:09
Mindaribba	arr	
	dep	08:17
Paterson	arr	
	dep	08:26
Kilbride	arr	08:36
	dep	08:51
Wallarobba Loop	arr	
	dep	09:02
Dungog South	arr	
	dep	09:10
Dungog North	arr	
	dep	09:12
Monkerai	arr	
	dep	09:19
Stroud Road	arr	
	dep	09:31
Craven	arr	
	dep	09:52
Stratford Coal Loader	arr	
	dep	
Craven North Loop	arr	09:55
	dep	10:06
Berrico	arr	
	dep	10:14
Gloucester	arr	
	dep	10:21
Bulliac	arr	10:37
	dep	10:48
Bundook	arr	
	dep	10:59
Mount George	arr	
	dep	11:06
Killawarra	arr	
	dep	11:20
Wingham	arr	
	dep	11:26
Taree	arr	11:36
	dep	11:41
Melinga	arr	
	dep	11:56
John's River	arr	
	dep	12:17
Kendall	arr	
	dep	12:30
Kerewong	arr	
	dep	12:42
Wauchope	arr	
	dep	12:49
Telegraph Point	arr	13:04
	dep	13:15
FORMS OR DESTINATION		ACR

hours when the crew change occurs at Grafton. (No stop is shown for this?)

As it turns out 3MB2 runs through the XPT during its layover at Casino – 19:15.

Crossings become more common now with poor old 3MB2 going into the loops at Loadstone (20:06-20:30 – 4BS6), Glenapp (20:58-21:12 – 4BM4), and Tamrookum (21:36-21:53 – 4BM7). These are consecutive loops and the dwells are shortish. 3MB2 crosses 4BW4 steel at Bromelton. Any late running by any of the trains concerned could result in 3MB2 being substantially delayed.

Complicating this situation is that the Up trains have to cross the down train that precedes 3MB2. This train is 3WB3 Steel which leaves Casino an hour ahead of 3MB2; it having spent 55 minutes in Grafton yard. There is nothing following 3MB2 to complicate this situation further.

Speeds on the North Coast are quite constrained by curvature. 3MB2 gets a three hour non stop run to Braunstone – distance 210.8 km so an average of 70 kmh.

3MB2 arrives at Acacia Ridge at 22:50. One wonders how quickly unloading takes place – containers would be moved onto trucks or onto 1,067 mm wagons for onward transit within Queensland. Three hours is the norm here but 3MB2 may take longer given the small hours. There shouldn't be any difficulty delivering containers to warehouses etc. at the commencement of business on the Thursday but it's understood a lot of warehouses operate 24/7 and that delivery slot times must be respected.

The following trains arrive at 01:47 (3MB7 – InterRail in the Timetable, should be Aurizon) and 03:44 (3MB4 – Pacific National).

3MB2's overall time for the journey from Melbourne is 35.5 hours, well above ARTC's target of 32 hours for scenario S1. This probably doesn't matter too much as it's probably not a prime service.

The timetable pivots on the peak hour curfew in Sydney; 3MB2 avoids it by preceding it. There's no chance of getting to Acacia Ridge before 17:00 so the extended stop at Braunstone probably doesn't matter very much.

Leaving later from South Dynon might help with marketing but pathing problems with later down trains would be a problem. Timetables are always a matter of compromise and Pacific National's management of the South Dynon terminal may be facilitated by 3MB2's departure at 12:20. Nothing arrives at South Dynon between 9:40 and 19:35 so making space for an arrival is not a concern.

My thanks to Geoff Lambert for his assistance.

Photo: markthetrainspotter


Photo: Greensleeves.94

TRAIN NO		3MB2
LENGTH (Metres)		1500
DAYS		WED
SCHEDULE		IB1
STATUS		M
OPERATOR		PNT
COMMODITY		INTERMODAL
Telegraph Point	arr	13:04
	dep	13:15
Kundabung	arr	
	dep	13:26
Kempsey	arr	
	dep	13:42
Tamban	arr	
	dep	13:54
Eungai	arr	
	dep	14:08
Macksville	arr	
	dep	14:22
Nambucca Heads	arr	
	dep	14:34
Urunga	arr	
	dep	14:47
Raleigh	arr	
	dep	14:51
Bonville	arr	
	dep	15:00
Sawtell	arr	
	dep	15:03
Boambee Beach	arr	
	dep	15:08
Coffs Harbour	arr	
	dep	15:09
Landrigans	arr	
	dep	15:21
Coramba	arr	
	dep	15:30
Nana Glen	arr	
	dep	15:42
Glenreagh	arr	
	dep	15:51
Kungala	arr	
	dep	16:01
Braunstone	arr	16:15
	dep	17:39
Grafton City	arr	
	dep	17:51
Grafton Yard	arr	
	dep	17:54
Kyarran	arr	
	dep	18:06
Lawrence Road	arr	
	dep	18:28
Rappville	arr	
	dep	18:56
Casino	arr	
	dep	19:15
Nammoona	arr	
	dep	19:20
Kyogle	arr	
	dep	19:38
Kyogle Loop	arr	
	dep	19:41
Loadstone	arr	20:06
	dep	20:30
Glenapp	arr	20:58
	dep	21:12
Tamrookum	arr	21:36
	dep	21:53
Bromelton	arr	
	dep	22:07
Greenbank	arr	
	dep	22:28
Acacia Ridge	arr	22:50
	dep	------
Roma St	dep	
FORMS OR DESTINATION		TERM

A quiet night on the North Coast: The saga of 3BM2

GEOFF LAMBERT

Where's the train? Don't hold your breath waiting. The train, when it finally showed up, was PN's 7WB3 steel train- but running to the schedule of Aurizon's 7MB7 intermodal. Such are the vagaries of Easter traffic on the NSW North Coast.

REPTON, BLACK THURSDAY. A thrumming noise grows louder and louder. Is it a train, a plane or a truck? You can be nearly certain it is not a train. Southbound trains burst into Repton through a tunnel and announce their presence only as they cross the Bellinger River bridge. Approaching northbound trains cannot be heard for the ceaseless roar from the Pacific Highway. Even the busy air service (14 flights per day) plays aural tricks down in the valley.

It wasn't ever thus.

The North Coast line was constructed in fits and starts. Until 1932, when the Clarence River bridge opened at Grafton, the line was not continuous throughout. The isolated lines around Grafton once had their own separate Working Time Table. The line was not really conceived as being an interstate route until after the connection to Sydney was forged. Even after connection, provincialism remained. For instance, a Murwillumbah-Kyogle picnic train service was an annual event (*The Times*, April 1991). A school train operated between Macksville and Coffs Harbour from 1944 to 1957-see *Byways of Steam* # 1. Our host at Repton travelled to school on this train.

Back in 1972, Peter Barry wrote an article for the *Australian Railway Enthusiast* on the trains which threaded the line on Black Thursday 1971- "*A night on the North Coast*". It was a ***busy*** night at Repton on that night- eighteen trains in the 12 hours between 9 PM and 9 AM. Eleven of these were passenger trains Several of these were relief services. Peter's train graph for this night appears below. On a normal Thursday in 1971, there would have been 19 freights on Peter's graph, including "Fruit Expresses", Meat Expresses" and "Flexi Expresses. I have drawn all of them on Peter's chart. Surely some of them, especially the Conditional Goods and pick-ups must have been cancelled. Notice the 9 trains crowded onto the line at about 8AM. Thirty-nine percent of NSW-QLD freight traffic went by rail in 1971- now it is less than 5%.

My own experience of the North Coast holiday trains dates back to the 1980s during our annual Labor Day SCUBA diving pilgrimages. In 1985 I recorded 19 trains during daylight hours on both the Saturday and the Monday of the long weekend. There were only 5 passenger trains on each day. Among them were what we would now regard as nostalgic exotica- the *North Coast Overnight Express*, the *Gold Coast Motorail Express* and the *North Coast Mail*. One of the latter was an "extra". All were locomotive-hauled trains. The freights were generally short. One consisted of but 1 truck and a van.

At Easter 2014, there was no Train Advice from ARTC nor a Special Train Notice from NSWTrains to indicate freight train cancellations on Black Thursday. Most cancellations (9) were on the Saturday or Sunday. In the April 2014 Master Train Plan, only 4 of the 9 night trains were passenger trains. The freights, of course, were much heavier and longer than anything dreamed of in the past. This is not the only reason that there are fewer freights today. Intrastate trains such as the plethora of trains that ran to and from Grafton have disappeared. Only the weekly cement train remains and it calls at only two stations- Grafton and Wauchope. A chart for Thursday might, covering the same times and track covered by Peter, appears under his chart (left).

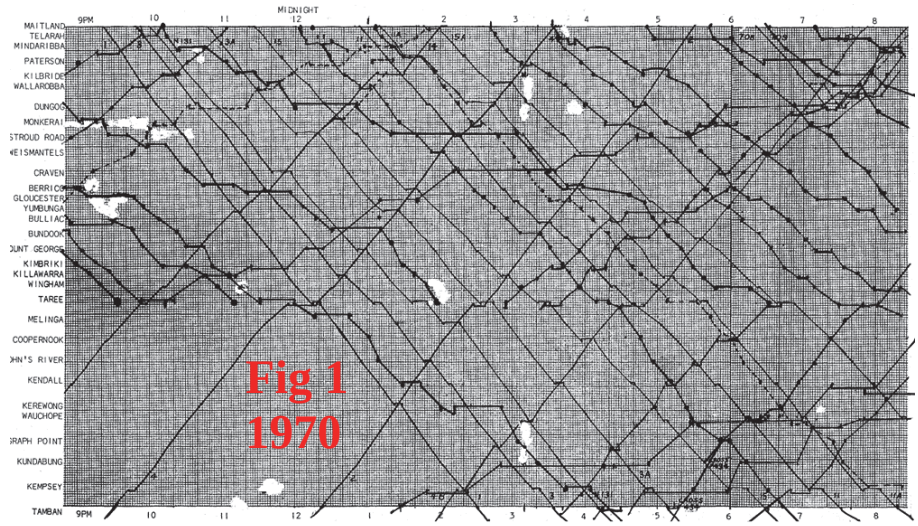


Fig 1
1970

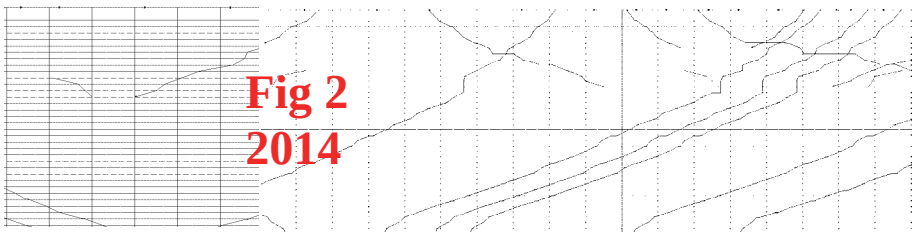


Fig 2
2014

Train service through Repton

	DOWN									UP							
	SUN	MON	TUE	WED	THU	FRI	SAT	WEEK		SUN	MON	TUE	WED	THU	FRI	SAT	WEEK
Train #	1	2	3	4	5	6	7		Train#	1	2	3	4	5	6	7	
MB2		X	X	X		X		4	BM2	X		X				X	3
MB4		X	X	X	X	X	X	6	BM4		X	X	X	X	X	X	6
MB7		X	X	X	X	X	X	6	BM7		X	X	X	X	X	X	6
AB6			X			X		2	BA6			X			X		2
WB3	X	X	X	X			X	5	BW4		X	X	X	X	X		5
								0	BS6				X	X			2
4621							X	1	6422N	X							1
	1	4	5	4	2	4	4	24		2	3	5	4	4	4	3	25

Repton is roughly half-way between Sydney and Brisbane. Brisbane is a terminus for all of the freights except the Saturday Down and Sunday Up Newcastle-Grafton cement train. Sydney is the terminus for only 2 freight trains per week. There is a twice-weekly Adelaide service each way and a 5 times per week steel train to and from Port Kembla. All passenger trains have Sydney as one terminus– Grafton Casino and Brisbane share the other end of their routes. Pacific National generally runs two Intermodal trains per day each way (train number suffixes 2&4) and Aurizon generally runs one pair (suffix 7). Most of these trains are prone to loiter around Sydney for 4 hours or so to handle Sydney traffic or to avoid the Sydney "curfew". The Intermodal trains seem to carry "just in time" traffic, which dictates evening departures and morning arrivals.

The table above shows all of the freight trains that pass Repton each week. Note that there is an imbalance. There is 1 more Up train than there are Down trains. This is associated with the Brisbane - Sydney freight service, where there is no balancing Sydney-Brisbane service. The 49 trains per week in this table is a considerable reduction from the 61 trains per week reported to be running on the line in 2007 [BITRE Information Paper #62]. This is conceivably associated with the running of fewer but bigger trains, plus a halving of the 10 Brisbane-Adelaide trains.

All trains come and go from the North Coast line at Telarah. Coal and passenger trains which do not reach Repton may terminate at—or return from—Dungog or Stratford Junction. This southern end of the line is quite busy, as described in the previous article by Jim Wells. On the busiest weekday (Thursday) 33 trains pass through Martin's Creek between Maitland and Dungog. The table below gives a summary of the number of trains each week in each section of track and the number of crossings that occur between these trains on that section. Timetabled crossings of long freight trains can only occur at long loops, but XPTs can be tucked away in a large number of shorter loops.

A train from Melbourne takes an average of 25½ hours to get to Repton. They depart Melbourne at any time between midday and midnight, but cluster around 6PM. Trains from Brisbane take about 5 hours to get to Repton and generally depart Brisbane somewhat after the evening peak- i.e. after 7 PM to midnight. Repton therefore sees a fleet of Down trains in the 6 hours before midnight and a fleet of Up trains in the 6 hours after it. This means that the North Coast line north of Grafton carries 4 to 5 trains each way in the wee small hours, implying about 20 crosses. This is about the only time of day that saves a 'Coast B" train controller from boredom.

During the autumn daylight hours only one freight is to be seen at Repton on Mondays. On Fridays there are none at all. The area is no longer the train-watchers paradise it was in the 1970s and 1980s. Indeed, because a lot of trains run late and a significant proportion run early, the area is a very frustrating spot for train watchers.

Road traffic past Repton is extraordinarily heavy. Even at dawn on Good Friday morning there were two cars per minute. The rate of passage of B-doubles, on a recent Thursday was 2 per minute or 120 per hour. This is equivalent to 2 intermodal trains per hour. At this hour there are no intermodal trains at all. BITRE projections from 2007 give a result of 900 Brisbane-Sydney B-doubles per day. This is equivalent to about 100 intermodal trains per week. B-doubles on the Pacific Highway are probably at least 50% Brisbane-Sydney trucks. There is essentially no Sydney-Brisbane intermodal rail services, Rail holds only a 5% share and there are only 2 trains per week- and then only southbound.

"Sections" of the North Coast Line and the traffic on them.

Section limit	Section limit	Monitoring-point	# long loops	Total	Pass	Freight	Coal	Crosses	Crosses per loop
Telarah	Dungog South	Martins Creek	4	209	102	49	58	104	26
Dungog South	Duralie	Monkerai	2	146	42	49	55	97	49
Duralie	Stratford Junction	Craven	1	200	42	50	108	24	24
Stratford Junction	Grafton	Repton		93	42	49	0		
Stratford Junction	Grafton	Entire Section	15	95	42	51	0	122	8
Grafton	Casino	Banyabba	4	76	28	45	0	40	10
Casino	Brisbane	Kyogle	7	65	14	50	0	43	6
Sums/Max			33	212	102	56	108	430	13

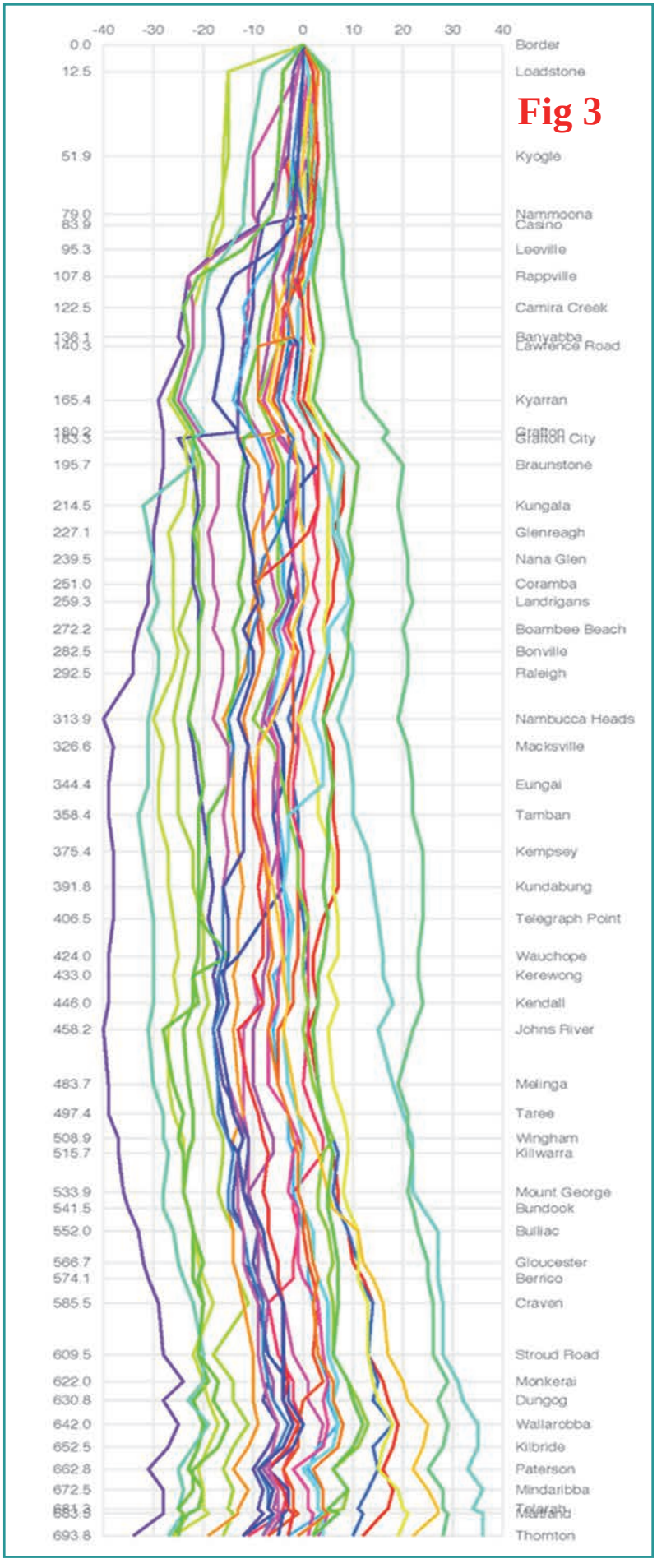
Some Brisbane-Sydney intermodal moves *via* the Brisbane-Melbourne trains, but there are no figures for this.

The trucks take the inland route and come nowhere near Repton. It would seem there are about 600 per day running Melbourne Brisbane according to recent statistics on the Newel Highway. This would equate to 56 intermodal trains per week. If so, rail has about 38% of the Melbourne-Brisbane traffic.

The lateness of trains on the North Coast has two origins- late departures (generally the fault of the operators) and extended running times- for which the blame may lie with either the operators or ARTC. ARTC has a complex set of criteria to measure performance: departure lateness, transit delays and arrival lateness. The tolerances used to separate "unhealthy" performance from "healthy" performance can be 15 or 60 minutes, depending on the attribute being measured. Scarcely any KPI figures exist for the North Coast line as a stand-alone entity. This is because there are only two Brisbane-Sydney trains per week. KPIs are normally calculated for the entire Brisbane-Melbourne corridor. Tolerances are independent of the length or time of journey. This is quite illogical.

Because reliability and on time running are KPIs, ARTC has become quite concerned about its ability to construct "robust" timetables. These are timetables for which reliability will be high or, more particularly, those which will resist the tendency for trains to run late. Although ARTC has purchased several timetabling software packages, it seems to be wary of computing methods and its timetables are still drawn up manually on paper graphs by a person with a pencil. ARTC commissioned the Centre for Applied and Industrial Mathematics (CAIM), at the University of South Australia to analyse its performance and to devise an analytical tool to predict robustness. ARTC gave CAIM sets of train running data from 2009, one subset of which was two weeks of freight train running on the North Coast line. CAIM analysed both departure and transit delays. I am grateful to Professor Peter Pudney of CAIM for providing extra data for the following analyses.

Out of Sydney half of the departures were early (as much as 2 hours) or were on-time. CAIM took "on time" to mean exactly that, but ARTC uses the concept of "tolerance" (in this case no more than 1 hour late) to determine "on-time" performance The late-starters were sometimes VERY late- 20% of them were more than 3 hours late departing Sydney. These trains probably departed late due to lateness accumulated on the trip up from Melbourne plus their consequent entanglement with the Sydney curfew. Southbound out of Brisbane 40% of trains left on time or early



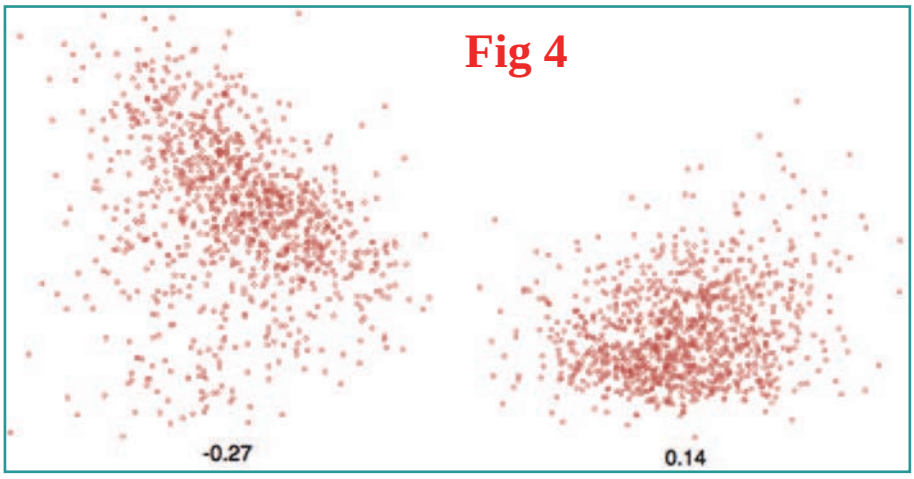


Fig 4

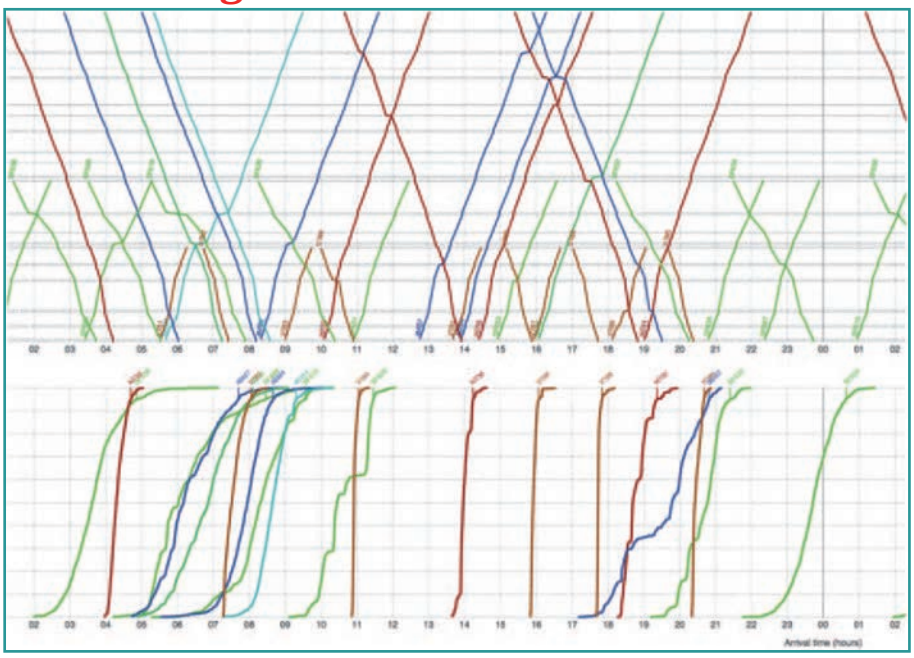
and 70% departed "within tolerance". The latter figure agrees with ARTC's own KPI data for most of 2009. One-third of the trains which departed late departed at least 3 hours behind time. This was NOT good. Because so many trains were so very late, the mean (arithmetic average) departure lateness seems to have been about 1 hour in each direction. A statistician would say that the distribution of starting times was negatively skewed in which the most common delay (median) was less than the average (mean) delay.

Whether or not a train starts on time, it may lose or gain further time during the journey. These gains or losses may be due to variations from timetabled speed (perhaps due to load variations or motive power variations); to breakdowns or other mishaps or; to altered crossing arrangements. The latter might be related to the train's intrinsic variability or that of other trains. CAIM examined the section times of a suite of trains through every section and calculated the deviation from what the timetabled running time for that section. It then kept a running total as the train proceeded along the track. This process makes the data independent of any starting time anomalies and of any "knock-on" crossing delays. The result of these manipulations is therefore effectively a measure of the deviations of average line speed from timetabled line speed (usually 80 kph).

According to the CAIM's analysis, about 70% of trains on the line lost time during the journey, the average amount of time lost was of the order of 20 minutes in the 9 to 10 hour, 800 km journey. This doesn't seem too bad- it amounts to a slow down of about 2.5 kph. Eleven percent of trains arrived later than the 30-minute arrival tolerance. On the other hand, 30% of trains ran ahead of schedule with the result that the average lateness of exit from the North Coast line was only 10 minutes. This seems even better. Trains exited the line anywhere from 68 minutes late to 37 minutes early, a range of 105 minutes. This distribution of transit time variation was not skewed (the median was equal to the mean), although it was not what a statistician would call "normal" in the mathematical sense. At Raleigh (it is near Repton), the deviations were from about 30 minutes late to 20 minutes early, a range of about 50 minutes. A typical chart is shown in Fig 3. However, we do not know whether ARTC forwarded truly representative sets of running times to CAIM.

Notice that the deviation from schedule in the chart– whether loss or gain – tends to grow as the trains run further and further over the track. There seems to be no particular pattern in these charts and few abrupt deviations from the steady pattern. This suggests that crossing delays contribute little to the performance deficits or gains. There is a hint in the charts

Fig 5



that gains against the timetable tend to occur in the first half of the trip and are lost later in the trip. These are the uphill and downhill sections respectively- that makes sense.

After making these analyses, CAIM proceeded to build a mathematical model ("TPAT"- Train Plan Assessment Tool) for testing the robustness of current and hypothetical rail timetables. This was a complicated process involving a "*Monte Carlo*" simulation based on the known distributions of starting lateness and transit deviations. These data were coupled to a simulation of how ARTC train controllers prioritise train crosses at loops. Each train was simulated 1,000 times, a process that took about 15 minutes on the CAIM computing system. The result for each train was a chart of exit times and how they were distributed for each of the 1,000 simulations. In these simulations, CAIM assumed the "standard deviation" of the departure time was 2 minutes. This means that 95% of the time, the train would depart within an 8 minute window encompassing the scheduled time. It also meant that, in about 10 of the simulations the would depart either 6 minutes early or 6 minutes late. This s more generous than reality CAIM also assumed that the average speed of trains in its simulation was 80 kph, give or take a standard deviation of 2 kph. This means that some 1% of the trains will travel at less than 74 kph or more than 86 kph. Over a 1000 km journey this in turn means that 1% of trains will lose or gain about 55 minutes. The departure delays and the transit variations get randomly mixed during a simulation, so that the exit times for 1% of trains on the could be about 61 minutes ahead or behind time. Over the top of these variations are those imposed as a result of simulated train control decisions. These will further "spread out" the variations- often very considerably.

TPAT also produces a "scatter-plot" of exit time deviations versus starting time deviations – sample of two such scatter plots is shown in our Fig 4. The value of such a chart is that it gives ARTC some idea of how to improve the robustness of each train path by jiggling the departure time. If the scatterplot slopes upward (the black number under each scatter indicates the slope) then exit time increases as the train departs later (right-hand scatter plot). The left-hand scatter plot shows the reverse phenomenon. Here, delaying the train's departure will give it a better run. Jiggling the departure times to produce more robust timetables ought to produce "better" KPI figures. But, of course, to improve one train's performance this way could well lead to poorer performance of trains coming the other way. It is like chess- the variations are all but endless and to ask a computer to compute all of them is an "NP-hard" problem- i.e. all but impossible to carry out. It is no wonder that ARTC throws up its hands and resorts to pencil and paper.

TPAT is not the only tool of its type, but it is one custom-tailored for ARTC. It is hard to say whether ARTC is using this tool-certainly there seems to have been little or no jiggling of timetables in recent years. There has, however, been quite wild fluctuations up and down in ARTC's KPIs. These seem to be the result of track and train troubles, rather than of tinkering with the timetables.

Our Fig. 5 shows the results for the simulations of all Up trains passing over the southern portion of the North Coast line in 2009, roughly between Taree and Telarah (184 km).

The upper half of this chart shows the train plan as it was in 2009 (upside down compared to normal railway convention). The lower half shows the results of 1000 simulations of each of the trains shown immediately above as a series of S-shaped curves. "Steep" curves represent trains with robust performance, "shallow" curves are trains prone to go wonky. The most robust trains are the passenger services. This is due to the high priority which train controllers give to these services. The train with the worst potential performance is the train fourth from the right on the bottom half of the chart. This is 3BM2 (pictures: pages 11&12) This leaves Brisbane at 0350 and is not scheduled to exit the single line until

1930. In its more than 15½ hour journey, it spends nearly 4 hours stuck in 5 passing loops and meeting 10 opposing trains. The simulation demonstrated that it can show up at Telarah anywhere between 1705 and 2115. On average, it could be expected to exit 25 minutes late. When it gets back onto single track again – at Junee – it again spends time locked away in loops. Over the Albury-Melbourne section it is the slowest of all trains. This train still runs to this timetable on Tuesdays- truly something to wonder about. Whatever the reason for this (time insensitive loading?), one can probably say that ARTC has not used TPAT to fix it. I never spotted this train at Repton.

For two years I monitored all trains on the ARTC network in NSW on an hourly basis through a now-vanished train-tracking system. It is possible to monitor the performance of 3BM2 over this time, but it is not an easy task.

The case of Aurizon intermodal train 5BM7 (seen below) in early April 2013 is an interesting case. It came to the attention of the Australian Transportation Safety Board (ATSB) because of a near miss at Culcairn Loop when it almost collided with a north-bound train. In its report on the incident, ATSB noted that the train had already been delayed by 24 hours before the incident. Most of this delay occurred on the North Coast line. According to my database, the train first logged on to the Train Control Board at about 1500 on Thursday afternoon, about 40 minutes before its scheduled departure. It did not depart Acacia Ridge (right) until almost 1700— 80 minutes late. It trundled south rather slowly and passed Repton just after midnight. At this point it was about 90 minutes late. There is a gap in my information until the train reached Paterson at 0700. Here it was 130 minutes late. Then it stopped in Mindraribba loop. It stayed here for 26 hours and departed Mindraribba after 9 AM on Saturday. At this point it was now about 27 hours late. By 1500 on Saturday afternoon, it had got as far as North Menangle, where it again was stopped for more than three hours. Around Junee, it proceeded quite slowly, then came to an abrupt stop at Culcairn- the location of the near-miss. This, remarkably enough, did not delay it for more than a few minutes. However, it was then held at the Tallarook Passing Lane for a further two hours. Wearily, it arrived at Dynon at just before 0800 on Sunday- having spent 63 hours on the trip! It wasn't the only one. Passenger and freight trains all over NSW seemed to stall interminably during Friday 5th May 2013. Was there a strike?

Over the Easter to Anzac Day period in 2014, there were simply not enough freight trains seen or heard to put the CAIM data to a definitive test. For what it is worth, the average lateness through Repton was 15 minutes This average was skewed by one train that was 2 hours late. The overall performance is a tad worse than the 2009 performance simulations would suggest. In the week after Anzac Day, things seemed to return more towards normal. The deviations from the timetable at Repton ranged from 5 minutes early to about 15 minutes late. The Down steel train mostly seemed to be on time, It only comes from Port Kembla, although it seemed to be cancelled more often than I expected.

The XPTs were generally on time- the Up Grafton XPT always was- but at Repton, it had not travelled very far. Passenger loadings on these trains seemed to be parlous. We already know that passengers from Brisbane are very reluctant to get up hours before sunrise to catch a 6 AM train. The Up Grafton is even worse in this regard. I could only see 2 or 3 passengers on some of the Up Grafton services. Repton residents seem to know the train and plane timetables by heart- but they stick to their cars and trucks.

Busy busy busy—Them & Us—a comparison between Sydney and the world leaders

GEOFF LAMBERT

IN "BIG AS B&O BUT NOT AS BUSY", in *Trains* magazine of August 1957, Peter Sloss described Sydney's Central Station as "*one of the world's busiest railroad terminals*". In the August 1961 issue, Editor David Morgan remarked upon Central thus: "*Central would impress a Londoner; it astounds an American.*"

For a long time Australia was the most "air-conscious" country on the planet. Qantas was flying around Queensland well before there was a single commercial flight in America. The first commercial flight out of Sydney was in 1924. In the USA, the first commercial flights did not take off until after Lindbergh flew the Atlantic in 1927.

Can we say that these "truths" hold true in 2014? No.

Airports

In 2013, the busiest airport in the world, both in terms of passengers carried and flights operated was Atlanta's Hartsfield–Jackson Airport (KATL, front cover, top). The first commercial flight into Atlanta was in May 1928. In 2014, it may be overtaken by Beijing, These cities (especially Beijing) are probably not the first guess of many people. Sydney's Kingsford Smith (YSSY) doesn't stack up very well against this: it is the 31st busiest in terms of passengers per day (just behind Istanbul) and 40th in terms of flight numbers. Middle of the day photos from September 2013 show 150 planes on the ground at KATL, but only 38 at YSSY (insets on our page 15). In June 2014 planes in the air in the evening rush hour at KATL and at YSSY totalled 50 and 16 respectively (our page 2). Note that Hartsfield planes carry more passengers than those of Sydney– they are larger and more heavily loaded. Below Hartsfield, but above YSSY in the traffic stakes are such diverse places as Charlotte, Las Vegas and Guangzhou. Nineteen of the top 30 airports are in the USA

Railway Stations

In most cases the amount of traffic at a "railway station" will include the traffic associated with its subway or metro. Stand-out among all the railway stations of the world is Tokyo Shinjuku (front cover, bottom), which puts nearly 4 million passengers a day through the turnstiles. Where is Sydney's Central? It is hard to say because there is no comprehensive list with numbers attached on the web. Sydney Central falls off the bottom of any list. We can say that it is not in the top 100 and that the station that ***is*** #100 (Sendai in Miyagi, Japan) carries twice as many as Sydney Central. There are 4 stations in the U.K. which carry more traffic– Waterloo processes twice as many as Central. Eighty-two of the top 100 stations are in Japan, you will be unsurprised to learn. Incidentally, in Morgan's 1961 article, he stated that 1400 trains per day used Central– so traffic has grown over 53 years.

Australia is a tiny country and Sydney is a tiny city in terms of population. Tokyo has 13 million people. Sydney has 4.5 million. It is astonishing to think that one in every 6 of Tokyo's citizens come and go through Shinjuku every day. At Central it is 1 in every 60 citizens. In the case of air-travel, making comparisons is a little more odious, because a lot of airline traffic can be transit. Since the first flight in 1928, Atlanta has always been a hub for Delta airlines and is by far the largest airline hub on the planet. Atlanta has a population of less than 10% of Sydney– but its airport moves fifteen times as many people per day!

However, what we can say is that the Sydney—Melbourne air route is the 3rd busiest in terms of flights, the 4th busiest in terms of seat capacity and the 5th busiest in terms of passenger traffic. The busiest is—wait for it—Rio De Janeiro to Sao Paulo. That's not so bad, is it? It reflects of course, Australia's centralisation into a handful of cities.

Air

	No of gates	Flights	Passengers	Rank	Pass per plane
Hartsfield	189	2,547	258,542	1	102
Kingsford-Smith	55	793	17,564	40	22
Ratio	3.4	3	15		

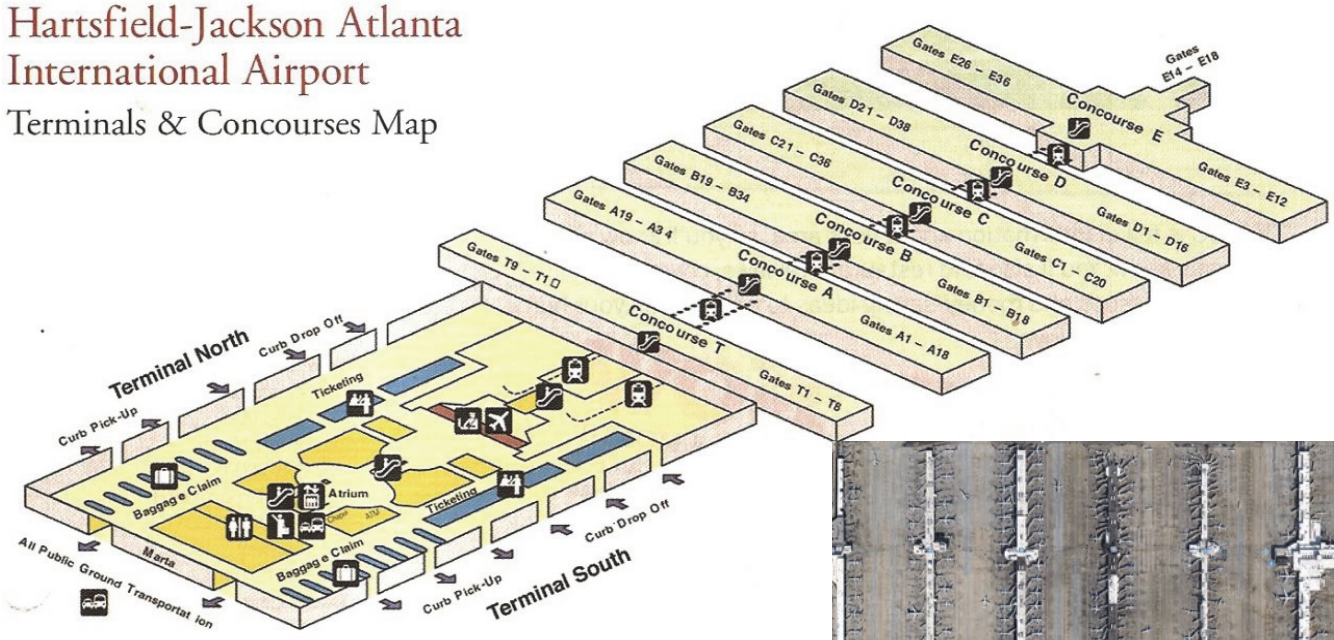
Rail

Daily figures

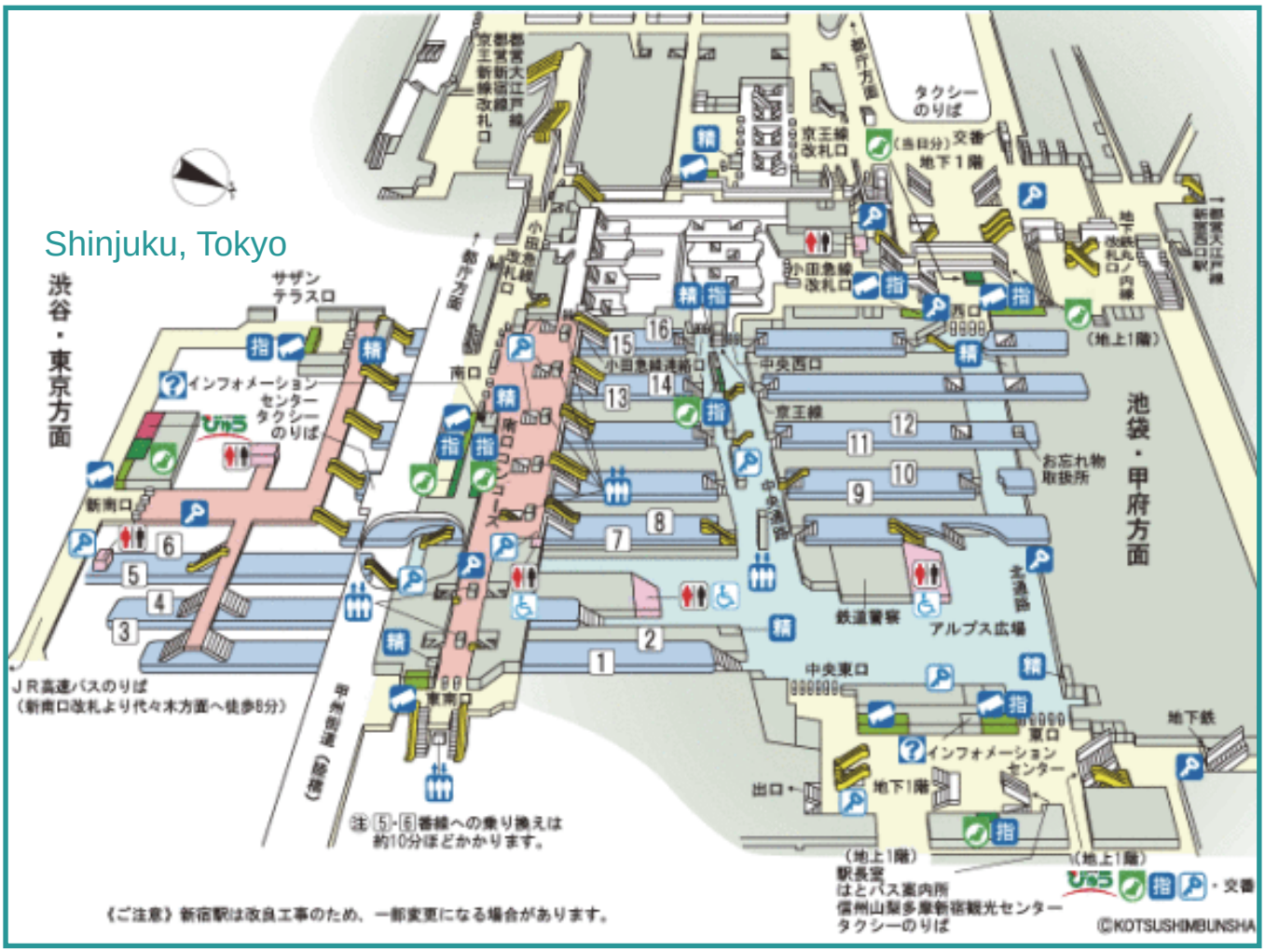
	No of platforms	Trains	Passengers	Rank	Pass per train
Shinjuku	36	25,000	3,640,000	1	146
Sydney	26	2,400	140,600	~150	59
Ratio	1.4	10	26		

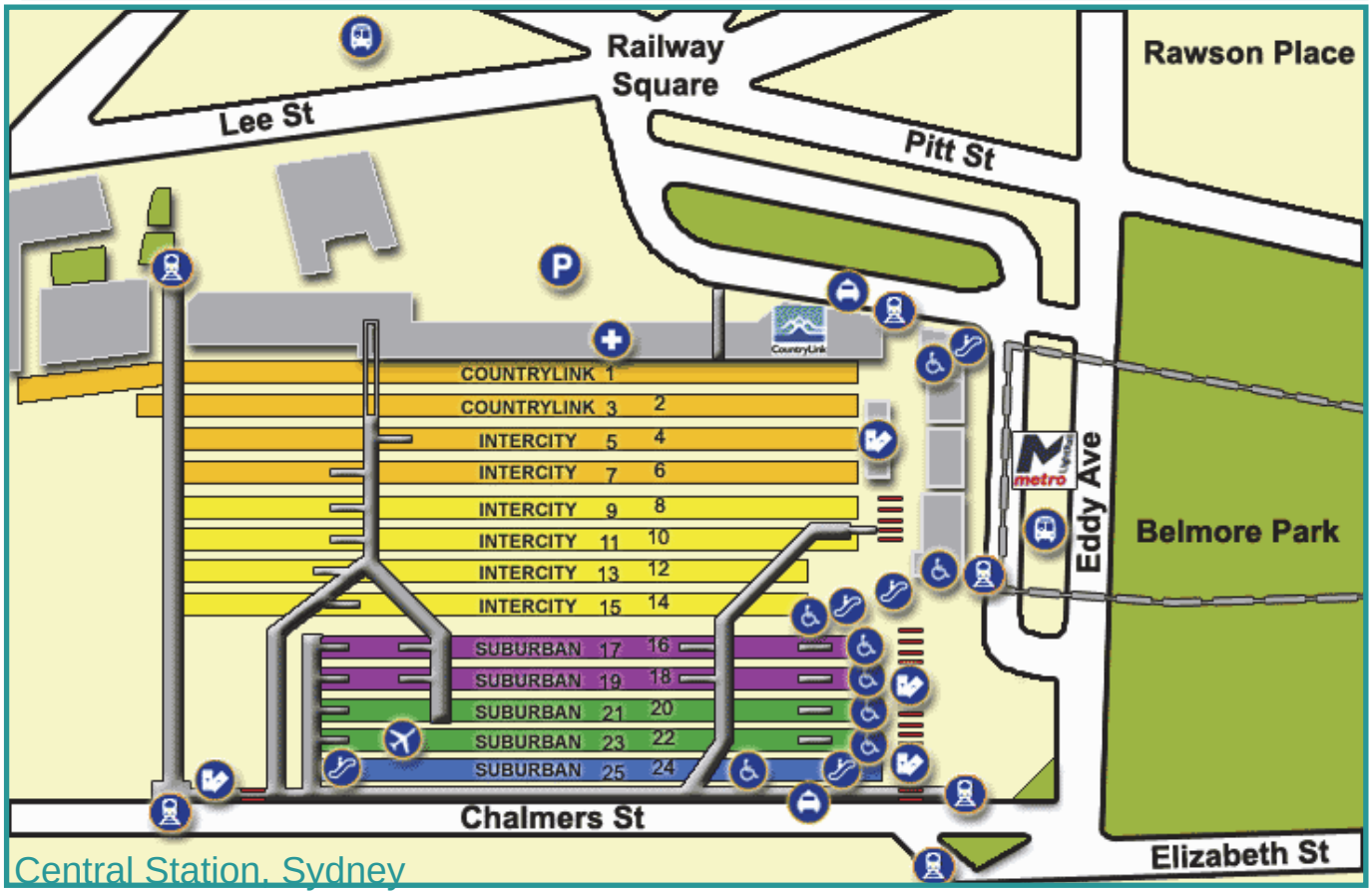
Hartsfield-Jackson Atlanta International Airport

Terminals & Concourses Map



Sydney Kingsford Smith Airport


Shinjuku, Tokyo
渋谷・東京方面
池袋・甲府方面
サザンテラス口
南口
新南口
中央西口
東口
中央東口
京王線
小田急線
インフォメーションセンター
タクシーのりば
お忘れ物取扱所
鉄道警察
アルプス広場
地下鉄
出口
地下1階
(地上1階)
JR高速バスのりば
(新南口改札より代々木方面へ徒歩8分)
注 5・6番線への乗り換えは約10分ほどかかります。
《ご注意》新宿駅は改良工事のため、一部変更になる場合があります。
駅長室
はとバス案内所
信州山梨多摩新宿観光センター
タクシーのりば
©KOTSUSHIMBUNSHA


Railway Square
Lee St
Pitt St
Rawson Place
Belmore Park
Eddy Ave
Chalmers St
Elizabeth St
COUNTRYLINK 1
COUNTRYLINK 3 2
INTERCITY 5 4
INTERCITY 7 6
INTERCITY 9 8
INTERCITY 11 10
INTERCITY 13 12
INTERCITY 15 14
SUBURBAN 17 16
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SUBURBAN 21 20
SUBURBAN 23 22
SUBURBAN 25 24
Central Station, Sydney