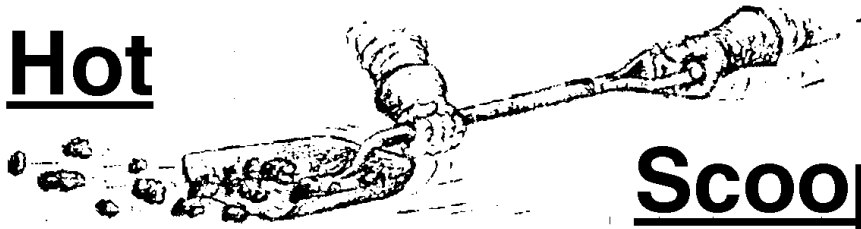


# Hot



# Scoop

A publication dedicated to the volunteers of the San Diego Railroad Museum

**April 1994**  
**VOL VI NO IV**

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The HOT SCOOP is published by the San Diego Railroad Museum.  
Please send address or subscription changes to:

San Diego Railroad Museum  
c/o Santa Fe Depot  
1050 Kettner Blvd.  
San Diego, Ca.  
92101

## DIRECTOR OF CAMPO OPERATIONS

*Denby Jones*

### **Conductors and Superintendents, CPR Classes:**

The Museum has established the requirement that all Conductors and Superintendents be qualified in CPR. Qualifications must be completed by 1 May, 1994. Contact Lew Wolfgang for details.

### **Focus**

When I was a boy, more years ago than I care to accurately remember, we used to go to the Tower Theater in my hometown of Fresno and pay 15 cents to watch the Saturday Matinee. They must have used that time period as a training time for projectionists because invariably there would be a multitude of voices yelling "FOCUS!!! FOCUS!!!" Well, with all we have coming up, I am again yelling FOCUS, because that is the only way that we are going to be able to accomplish the tasks that are ahead of us. I would like to set up a team principle, where one team under a team leader would take ownership of a project and complete all facets of it. Whether it be mechanical, restoration, clean up or whatever. It would be up to the various superintendents to lend their expertise where it is needed but it would be up to the team leader and his team to work the task. A classic example of the team concept is the Steam Team. Don Getz has offered to head up the Building Site team. This team will be responsible for the laying of tracks 7 and 8, moving the museum main line over and prepping the site for the new display building. This is a monumental task and we need focused people. Contact Don or myself. We need teams for passenger car repair, 1509 truck re-assembly and installation, Facilities work, grounds clean up, equipment maintenance to keep it running to support all these tasks, and keep up with our regular required maintenance and operations schedule. We, the Museum Staff and I are asking for a maximum effort, but we do not want the same problems we had during Rail Fair, where people got burned out and left. I feel that by using the team concept we can avoid that type of pitfall and still accomplish the tasks that have to be done.

The catch is, we need to commit today and start yesterday. So please, get together with the people that you like to work with, form a team, and pick a task. I will be the overall coordinator for the activity at Campo, so give me a call at 279-2419 or one of the Superintendents, Mike Reneau Operations, Jim Wilson Mechanical, Steve Wade Facilities, Ted Kornweible Restoration, Rich Borstadt Interpretation, Richard Dick Steam Team and Lew Wolfgang Safety. As the old saying goes, "We have a long way to go and a short time to get there", so lets get started.

See you at Campo,

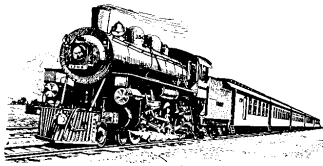
Denby

#### Notice

Richard Dick reports that a critical part of Locomotive 2353 (throttle lever) is missing. If anyone knows of its whereabouts, please notify Richard, the entire Steam Team will appreciate it.

From time to time we all bring parts down the hill for any of a number of reasons. If anyone has in their possession anything belonging to the Museum, please let Denby know so that we can start a proper inventory.

[lew]



### OPERATIONS DEPARTMENT

Maryanne Thompson

The ridership total for February was 1639 including school days, Tecate, and Legacy Ranch trips. We have started off well this year and I hope that it will continue to improve. Once again, thanks to all of the train crews that help to keep the trains rolling.

As you have heard by now, we have a lot to accomplish before November and the 75th Anniversary celebration. Help is needed in every department to complete our goals. If you have any spare time (I know, you're already maxed out just like I am), please contact one of the Superintendents and let them know how you could lend a hand. The big push of course is the completion of #2353. We also need to get the Lackawanna cars looking their best. Add to these two tasks the Display Building and the track work that needs to be accomplished to finish this, and you can see that we have enough work to keep us busy until the year 2000! But, we CAN do this if everyone participates. Any help would be greatly appreciated.

For those of you who recently completed the speeder class, you now need to arrange your hands-on training. If you have not yet completed the rules test, you must do this before your

training begins. Please contact Mike Reneau at 466-5402 to arrange either of these. If anyone is still interested in additional speeder classes, please contact me at 443-4418.

The next Operations meeting will be on Wednesday, April 20th at 7:00 p.m. at the Santa Fe Depot. All are welcome. Hope to see you there!

### INTERPRETATION DEPARTMENT

Rich Borstadt

#### Special Tour of Kennecott No. 100

The Museum's newest gem of passenger rolling stock will be open for a Sunday tour on April 17. It is about to begin stabilization and restoration on the La Mesa Lumber spur. The tour group will gather at the La Mesa Depot for a briefing at 2:00 p.m. and proceed to the lumber yard property to view this turn-of-the-century business car once used by the Jackling interests. Join us.

Trainman/Guide Course offering this month is the Museum Organization and Mission Class on Wednesday, April 13. This is an ideal session for a newcomer to begin active involvement with the Museum. Urge any new recruits to attend. Call Rich Borstadt (544-5875) or Mike Retz (466-8808) for more information and to sign up for the course, or just join us at the Depot.

Plans are being made for interpretation of the 1994 centennial of the La Mesa Depot and the Diamond Jubilee of the SD&A. If you would like to help with these plans and their execution, contact Superintendent Borstadt (above number).

#### Sunday 3

|                                    |                      |
|------------------------------------|----------------------|
| Easter Sunday (Normal Operation)   | Campo Depot          |
| Transportation Corridor Structure  | Stone Store Archives |
| Field Survey (Photo Documentation) | 10:00 a.m.           |

#### Monday 4

|               |                  |
|---------------|------------------|
| Staff Meeting | Office 6:30 p.m. |
|---------------|------------------|

#### Wednesday 6

|                               |                                   |
|-------------------------------|-----------------------------------|
| Mountain Empire High School   | Career Day 8:00 a.m. - noon       |
| Campo Wild West Days Planning | Community Center Campo, 7:00 p.m. |

#### Saturday 9

|                          |                                     |
|--------------------------|-------------------------------------|
| Puerto Peñasco Excursion | Mexicali Border 8:00 a.m. Departure |
|--------------------------|-------------------------------------|

#### Sunday 10

|                                    |                      |
|------------------------------------|----------------------|
| Border Californias Museum Assn.    | Stone Store Archives |
| Strategy Meeting                   | 10:00 a.m.           |
| Mountain Empire Historical Society | Stone Store Archives |
| Board Meeting                      | Noon                 |

#### Monday 11

|                              |                  |
|------------------------------|------------------|
| Special Staff Meeting        | Office 6:30 p.m. |
| 75th Anniversary Celebration |                  |

#### Wednesday 13

|                                 |                  |
|---------------------------------|------------------|
| Trainman/Guide Course           | Office 7:00 p.m. |
| Museum Organization and Mission |                  |

#### Friday 15

|                                        |          |
|----------------------------------------|----------|
| Copper Canyon Excursion, Mexicali      |          |
| Saturday 16 Horse/Express Exhibit Hall | Work Day |
| 10:00 a.m.-4:30 p.m.                   |          |

#### Sunday 17

|                         |               |          |
|-------------------------|---------------|----------|
| Kennecott No. 100 Tour, | La Mesa Depot | Jackling |
| Business Car            | 2:00 p.m.     |          |

#### Monday 18

|               |                  |
|---------------|------------------|
| Staff Meeting | Office 6:30 p.m. |
|---------------|------------------|

#### Tuesday 19

|                      |                  |
|----------------------|------------------|
| School Day Excursion | Campo, 9:00 a.m. |
|----------------------|------------------|

#### Wednesday 20

|                               |                  |                  |
|-------------------------------|------------------|------------------|
| Operations Department         | Office 6:30 p.m. | Business Meeting |
| Campo Wild West Days Planning | Community Center |                  |
|                               | Campo, 7:00 p.m. |                  |

#### Friday 22

|                                         |                   |
|-----------------------------------------|-------------------|
| The Iron Horse, John Ford Silent Film   | Symphony Hall     |
| Re-premiere w/original orchestral score | 7:00 p.m.         |
| Pre-show San Diego Symphony and Organ   | 8:00 p.m. Curtain |

#### Monday 25

|                         |                  |      |
|-------------------------|------------------|------|
| Special Staff Meeting   | Office 6:30 p.m. | 75th |
| Anniversary Celebration |                  |      |

#### Tuesday 26

|                                   |                      |
|-----------------------------------|----------------------|
| Special Board of Trustees Meeting | San Diego T&S Bank   |
| 75th Anniversary Celebration      | Board Room 6:30 p.m. |

#### Wednesday 27

|                           |                  |                  |
|---------------------------|------------------|------------------|
| Interpretation Department | Office 7:00 p.m. | Business Meeting |
|---------------------------|------------------|------------------|

### SAFETY CORNER

Lew Wolfgang

#### Adult Heartsaver Courses

Here are some more dates for the CPR class at Grossmont Hospital:

April 4, 6:00 p.m. to 10:00 p.m.

April 22, 9:00 a.m. to 1:00 p.m.

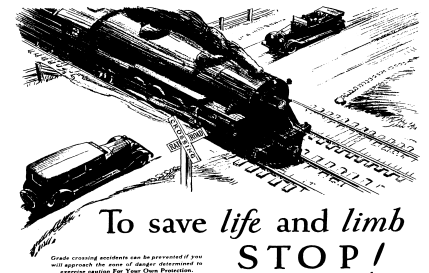
April 30, 8:00 a.m. to 12:00 p.m.

May 13, 9:00 a.m. to 1:00 p.m.

May 21, 8:00 a.m. to 12:00 p.m.

May 23, 6:00 p.m. to 10:00 p.m.

Phone 668-4226 to make arrangements.



#### Complacency

We operate at Campo within a fairly limited set of conditions. For example, run the train up the hill, run it down. Run it up again, down again, put it away. Same thing next time, and time again. These conditions can lead to a feeling of complacency. We tend to do our jobs by rote, without thinking about what is happening. Nothing grows better in a field of complacency than accidents.

For example: recently on a Sunday afternoon the Perry was used on the demonstration train for a charter. At the end of the day our normal sequence of tasks was disturbed by the requirement to place the Perry on the house-track. The locomotive was run-around first, then the Perry spotted on the house-track, followed by spotting the rest of the consist on the passing track. Because the consist was pointing in the right direction everything was secured and tied down at that point. Complacency then took over and everyone forgot that the train still had air and was effectively bottled. Normally, the consist is blown down by the locomotive separating, but this time it didn't have to separate, and everyone just walked away from it.

Of course, a skate was placed and hand brakes set, but the bottling removed one link in the chain of redundant safety devices that we must

have at all times in a mountain division. Does anyone recall a rule concerning this subject? A six-pack of root-beer to the first Operations Department member to tell me the rule. (I wonder if anyone ever reads these things)

The moral is that we can **not** tolerate complacency. We have to be awake at all times, aware of what we are doing and know what we must do next. And don't be afraid to check each other, two heads are better than none!

### Spongy Tracks

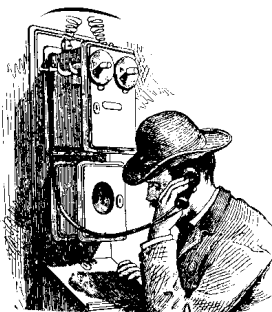
With the recent rains we have noticed a *slightly* increased propensity for locomotives to pop off of the tracks in the Campo yard. Guaranteed, this will happen when you can least afford it. So please take it easy in the yard. Go extra slow, especially in the turns, and continuously watch for that first wheel dropping off. It's easier to re-rail one axle than a whole three axle truck! (hint.. yes, the tracks in the yard need work)

If you have safety on your mind, You may call at any time!

Daze 553-3106 Nites 662-9019

◆ ◆ ◆ ◆ ◆

Gaylen Dyreng was laid to rest on March 10, 1994 at the Glen Abbey Cemetery in Bonita. The services were attended by well over 150 family and Museum members who shared in a moving and well-done experience. Several Museum member attended in uniform and served as honorary pallbearers. Grave side ceremonies included U.S. Navy pallbearers and a twenty-one gun salute over the flag-draped coffin. After the echo of the guns subsided, off in the distance could be heard the wail of a locomotive whistle sounding the grade crossing signal. Farewell, Gaylen, I am sure that we will all meet again at the top of the grade.



## PHONE NUMBERS

### SDRM ADMINISTRATION CAMPO

|                                           |          |
|-------------------------------------------|----------|
| Museum Phone.....                         | 697-7762 |
| Business Office, Bobbie Ringersma .....   | 595-3030 |
| Business Office Fax .....                 | 595-3034 |
| Director of Operations, Denby Jones ..... | 279-2419 |
| Executive Director, Kay Carter .....      | 265-7682 |
| HotScoop Editor, Lew Wolfgang.....        | 553-3106 |
| La Mesa Depot.....                        | 465-8444 |
| Campo Depot.....                          | 478-9937 |
| Campo Car Shop .....                      | 478-9917 |

### MEMORANDUM:

DATE: March 16, 1994  
TO: All SDRM BOARD and STAFF  
FROM: Kay B. Carter  
SUBJECT: A Night at the SYMPHONY

**Friday, April 22nd - Famous silent film "THE IRON HORSE"**, directed by John Houston, accompanied by the San Diego Symphony and Organist  
Film celebrates the completion of the transcontinental railroad.

We have been invited to participate as a group in this evening. Ticket prices will be pro-rated according to the number of guests in our group.

### Ticket Sales:

Regularly - \$14 \$17 \$21

15-50 people 20% off - \$11.20 @ ticket (14)  
51-99 30%  
100+ 40%  
500 50%

### Evenings Schedule:

5:00 No-host cocktail reception at Dakota's Restaurant, corner 5th and E Sts.  
Needs two costumed SDRM folks at door

7:00 P.M. Pre-show at Symphony "Iron Mule" silent spoof  
Entertainment and door prizes

8:00 - Actual Show

Must let them know how many folks will be attending ASAP.

**Chop Kerr from the SDRM to coordinate our portion 291-4787. Please call and reserve your seats with him. Cut off date April 15<sup>th</sup>.**

We will also provide contest prizes - 10 pkgs of passes or excursion tickets  
We have been invited to make a short presentation on 75th Anniversary at pre-show.

|                                              |          |
|----------------------------------------------|----------|
| Campo Caretaker, Thomas Lee Braginton .....  | 478-9344 |
| Campo Gift Shop, George and Nancy Boggs..... | 789-4210 |

### DEPARTMENT HEADS

|                                     |          |
|-------------------------------------|----------|
| Facilities, Steve Wade .....        | 469-8029 |
| Interpretation, Rich Borstadt ..... | 294-9321 |
| Research, Bruce Semelsberger.....   | 264-7282 |
| Chief Trainman, Mike Retz.....      | 466-8808 |
| Mechanical, Jim Wilson .....        | 697-9544 |
| Library, Roy Pickering .....        | 462-3392 |
| Operations, Mike Reneau .....       | 466-5402 |
| Restoration, Ted Kornweibel.....    | 461-0098 |
| Safety, Lew Wolfgang.....           | 662-9019 |
| Steam, Richard Dick .....           | 276-2222 |

### NETWORK NEWS

In which articles from the Internet's Usnet rec.railroad are presented for your edification and further enlightenment. A small font is used to save duplication and mailing costs.

◆ ◆ ◆ ◆ ◆

Subject: Re: Does water slosh move locomotives?

In article <1994Mar18.111538.23017@bradford.ac.uk>  
J.P.Hole@bradford.ac.uk (JP HOLE) writes:

>Tony Lupton (lupton@ugli.citr.uq.oz.au) wrote: Wasn't  
>here an accident on the Southern Railway in the 1920's  
>involving 4-6-4T locomotives that was basically caused  
>by surging in the tanks?. The class of locomotives in  
>question were converted to 4-6-0 tender engines as a  
>result of this accident.

Correct. The class involved were the river class.  
However, it is unclear whether the accidents were  
caused by water movement, or by poorly maintained

permanent way, or possibly both.

The accident occurred at Sevenoaks on August 24, 1927. The 4-6-4 tank locomotive "River Cray" derailed at speed. Unfortunately, the derailed engine burst a set of trailing catch points (derailing the train) which piled up against an overbridge. Thirteen people died and 21 were seriously injured.

The accident was primarily caused by poor track foundation. The summary of the accident report in the Railway Gazette of February 3, 1928 stated:

[The] examination [...] of the down track in the vicinity of the scene of this accident, and the actual survey made of the gauge and level of the rails, lead him to conclude that there was an insufficiency of hard and clean ballast foundation, a lack of proper drainage, and irregularities in the level and gauge of the rails, sufficient to set up serious rolling and lateral motion on tank engines travelling at high speed. [...]

He finds, therefore, that the condition of the road, in respect of foundation and maintenance, was the initial cause of the rolling motion set up on engine No 800, which caused this derailment. [...]

The comments on the locomotive were:

Heavy tank engines of the "River" class are more susceptible to weakness in foundation, and to irregularities, of track, than tender engines of the "King Arthur" type. This susceptibility is largely due to the fact that they are more lightly sprung, and the springs, being more resilient, react more readily to inequalities in the track. Their side tanks (capacity 500 gallons each), wide apart, and higher above rail level, have the effect of making rolling movements across the track slower and easier, but the movement, for the same reason, being more difficult to damp out, is likely if not checked to attain greater amplitude. A longer wheelbase, and the attachment of a heavy tender, may assist in checking the liability of an engine to roll. Speed is also a factor determining the liability, first, for this rolling movement to set up, as the result of uneven support of the sleepers, low rail joints or other track irregularities, and secondly, for the amplitude

of the movement to increase and become dangerous.

The result of the experimental trials at high speeds of two of these tank engines on sections of the main line of the London & North Eastern and Southern (Western Section) Railways justifies, in his opinion, the conclusion that on roads where the ballast foundation and drainage are good, the gauge is correct, and the level of the rails - including the cant upon curves - is within reasonable limits properly maintained throughout, as was the case on the London and North Eastern Railway, no rolling movement, at any speed likely to be attained by these engines, will develop and increase in amplitude sufficiently to cause derailment. On the other hand, when these conditions do not obtain, movements of this nature may, if unchecked, rapidly become dangerous on tank engines travelling at speeds of 60, or even less, m.p.h. On a curve, particularly, some other lateral movement of the engine frame, synchronising with the rolling, may result in derailment.

The comments on the tests is interesting. While both tank locomotives and the King Arthur class locomotive ran perfectly smoothly on the LNER line, it was a different matter on the ex LSWR line, where Gresley (CME, LNER) commented that the rolling of \*both\* tender and tank engines at 70 m.p.h. was unsafe.

The River class tanks were perfectly suitable for express service on well maintained track. But, as the designer must have been aware, the tracks of the ex LBSCR were not well maintained.

One final point, it doesn't seem to be well remembered but an exactly similar accident had happened four days previously when a Margate train, hauled by a River class tank derailed at Bearsted. Fortunately, this time, the train stayed in line and no one was injured.

andrew waugh

◆◆◆◆◆

Subject: Re: What's so great about ALCO's?

In article <2msvtp\$7li@ornews.intel.com>, jaley@frx602.intel.com (jaley) writes:

>I was wondering why there is so much fascination with >ALCO diesel locomotives. I've read a lot of hoopla >here about "the so-&-so RR still run ALCOs until 1979", >and so forth. There is even a big deal about CP or CN (I >forget) bringing their ALCOs out of mothballs. Finally, >one of the railfan magazines has a series on "ALCO >hunting" in North America. What's the big deal? I >don't hear the same kinds of emphasis placed on >Baldwins or Fairbanks-Morse. Are ALCOs somehow >more "romantic"? I hope that this thread doesn't >degrade into the common "the crews liked the ALCOs >better than EMDs because ..." I want to know why >ALCOs are popular with RAILFANS, not ENGINEERS >and FIREMEN (except of course when the latter are >also the former (foamer?)). Thanks for helping me to >understand.

Partial answer:

They're RARE - relatively.

There are far fewer ALCOs still running than GE or GM(EMD). That accounts for part of the interest. Another part probably comes from the fact that ALCO is descended directly from the American Locomotive Company, a builder of steam locomotives ever since Noah got out of the Ark. GE and GM never (or at least almost never) built any steam locomotives; they're not "traditional" railroad equipment builders.

Baldwins and Fairbanks-Morse units are almost completely, if not absolutely completely extinct in the U.S. and Canada. If there were any still around, you can bet your farm that there'd be plenty of interest in them.

Also, ALCO in at least some of its locomotive designs paid some attention to the aesthetics of the business. In most people's opinion (not everyone's obviously), ALCOs just "look better" than GE or GM.

Because very few have been made recently, any that are left tend to be older, and to many people, "old" equates to "interesting".

ALCOs typically (I've seen some technical reasons for this posted here, but they're way over my head) smoke a lot. Thus they "sorta look like" steam engines, especially when starting. The ALCO PA passenger locomotive and its FA freight cousin or the FPA freight units with steam generators (CN) are thought by many people to be the most aesthetically attractive Diesels ever built. The PA in particular is often called an "honorary steam engine" because of its good looks and its habit of smoking.

These are some of the reasons people like Alcos. Not everyone would care about all of these points; some people probably don't care about any of them, but others do. And that's what makes the hobby interesting - "Different strokes for different folks". (Different bores too, but

that's another point.)

Len Bachelder

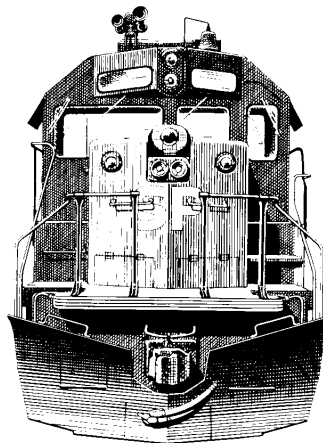
m00209@mbvms.mitre.org

◆◆◆◆◆

Subject: The News From Here 3/19

1 - Freight follies Department: Track was restored last night after the derailment of CSXT R103. As a result of the grade crossing accident/derailment Amtrak trains 52, 88, 53, 87 and the West Palm Beach special detoured via Raleigh. Delays ranged from 4 to 13 hours on those trains. Also CSXT R413 became disabled yesterday at Weldon NC. Amtrak trains 79, 90, 89, 88 and 52 were delayed from 7 minutes to over two hours as result. Recently, a Wisconsin and Calumet freight train was crossing the Wisconsin River when the bridge collapsed sending four cars in the river.

2 - Continuous Carnage Department: VIA / Amtrak 365 struck a truck north of Port Huron MI damaging VIA unit 6446. Passengers were bussed to Chicago, delaying them six hours, partially because of heavy snowfall. Also Amtrak 3 struck and killed a trespasser east of Albuquerque NM, delaying the train over two hours. 3 - Statistics Department: In February, railroad car load traffic was 5.2 per cent higher over the same period in 1993. For the year, traffic is up 1.1 per cent. Intermodal traffic increased 13.7 per cent, and it is running 8.9 per cent over last year, for the year. Coal traffic increased 8.4 per cent. The



Burlington Northern now has 200 coal train sets operating, and increase from the 170 it was running last year at this time. The Santa Fe is operating over 7000 trailers/containers a month now over the BN from Arvada to Birmingham AL. BN grain traffic is down 21 per cent from last year, because of poor export corn demand. Primarily because of the weather Conrail had a decrease of 5.1 per cent in coal movement, while CSXT had an 8.5 per cent increase, and NS had a 13.6 per cent, primarily for domestic consumption. The Santa Fe experienced an amazing 10.4 increase in traffic for the month of February.

◆◆◆◆◆

Subject: Re: Train wreck in "The Fugitive"

In article <2n47e9\$ck9@toads.pgh.pa.us> field@cs.pitt.edu writes:

>Hi, I rented and watched "The Fugitive" last night and >found the train wreck scene very intense and realistic. >Does anyone know how they made it??

I know what you mean; I didn't take a complete breath from the moment the bus went out of control (I had heard what came next) until sometime after the train's wheels stopped spinning. But then, the whole movie is like that.

The crash was filmed on the Great Smoky Mountains Railway in North Carolina. The lead unit is ex-CSX U18B 1901, the "slug" is a flatcar with some boxes piled on it, the third unit is ex-N&W GP30 536. Both of the locomotives were nothing but empty shells purchased by the movie company for scrap value. The wreck was the real thing, only a one-time deal, with the train pushed along by GSMR GP7 777. All units (including 777, which never appeared in the film itself) were painted in the rather attractive "Illinois Southern" red-gray-yellow paint scheme. Modifications to 1901 included a camera mounted in its cab, a studio floodlight mounted in its old nose Mars light casing (which was used as the "headlight" in the scene), and a liberal application of a napalm-type

gel smothered over its nose and sides to produce the pyrotechnics. In order to "improve its nighttime appearance" the 536's headlight was moved to the center of the high nose, and a Mars light was installed over the number boards (Didn't help though, 'cause only one of sealed-beam lights was on during the crash, anyway.)

The scenes where Harrison Ford jumps off of the bus, and when he's chased along the ground by the derailling 536 (IMHO the best shot of the wreck; made me want to jump out of my seat and run, too) required a new, very convincing, type of cinematic superimposition (saw it on ET last week).

For the people involved in the Locomotive Direction thread, I noticed on the pre-wreck roster shots of the locomotives in Issue 98 of Extra 2200 South that 536 has the "F" painted on the short-hood end (though they were built set up long-hood forward) and 1901 has the "F" of the long-hood end! (they were all short-hood forward, of course) Better get new consultants...

All in all, though, it was a very impressive scene and is worth the rental price itself. Not only that, but the entire movie is worth seeing, even without the train wreck. Either way, check it out!!!

◆◆◆◆◆

Subject: Pollution Train vs. Auto

IS THE AUTOMOBILE BETTER FOR THE ENVIRONMENT THAN THE TRAIN?

A special computational report constructed by the BRASS KEY, Portland Oregon. Calculations and preparation by Glenn Laubaugh.

BRASS KEY, Volume 1, Number 6, March 28, 1994

#### PROLOGUE

In recent months, there has been much talk and much rubbish posted to the internet newsgroup rec.railroad about air pollution caused by trains versus air pollution caused by automobiles. Most of this seems to have originated from someone in California who seems to think that rec.railroad is the place to post his opinions that the automobile is more fuel efficient and less polluting than any other form of transportation. He also quotes some obscure source that claims to have proven that automobiles do consume less fuel and generate less pollution than commuter trains. Since I am currently laid off, and am getting quite bored, I have decided that for lack of better things to do with myself, I would run through a few calculations just to see what kind of assumptions need to be made in order to "prove" the automobile is all this source claims it is.

No references are given by computations. This is done because it would appear to me as if this person is trying to get someone to do research for them. A list of references is given at the end of the report.

#### CONTENTS

SUMMARY INTRODUCTION GENERAL ASSUMPTIONS AND A NOTE ON UNITS AUTOMOBILE ASSUMPTIONS ASSUMPTIONS AND FORMULAS FOR THE TRAIN (THE TRAIN FROM HELL) COMPUTATIONS RESULTS CONCLUSION AND DISCUSSION REFERENCES

#### SUMMARY

It is never a good idea to start with a conclusion and then gather data to try to prove that conclusion. It has a nasty habit of ruining the objectivity of the data collection.

However, that is what is done in this case. It is assumed that the automobile is better for the environment than the train. Every possible legal and illegal means of mathematically proving this is then made.

In order to produce numbers that can be compared easily, the results are in the form of grams of particulate matter per passenger per mile.

The results are that a train carrying only 30 passengers per passenger car emits about half as much pollution as an automobile carrying 4 passengers.

A more realistic comparison is then made between a reasonable train and an automobile carrying 2 people. In this case, it takes only 7 passengers in each passenger car to make the train produce less pollution per passenger than the automobile.

The results are as follows:

An automobile with four passengers produces 0.05 grams of particulate pollution per mile per passenger.

The absolute worst commuter train that can be developed with any stretch of the imagination carrying only 30 passengers per car produces 0.028 grams of particulate per mile per passenger.

A more realistic automobile assumes 2 passengers per auto on average. This comes to 0.1 grams of particulate

per mile per passenger.

A more realistic train computation reveals that the train need only carry 7 passengers per car to be better than the automobile with 2 passengers and 13 passengers per car to be better than the automobile with four passengers.

#### INTRODUCTION

**OBJECTIVE:** To determine what assumptions were made in proving that the automobile is more fuel efficient than any railed form of transportation.

This is certainly not designed to be a detailed examination into the pollution and energy consumption issue. Quite simply, no one has gathered the needed data since experiments performed in the 1920's.

#### GENERAL ASSUMPTIONS AND A NOTE ON UNITS

This particular writer prefers using the metric system. However, the formulas that deal with rolling friction of various railroad equipment were developed before the metric system was officially recognized in the United States of America. Therefore, all calculations have been done in the most convenient units available.

The other initial assumption that was made was that it is necessary to show the automobile in as positive a light as possible. Therefore, all formula usage and calculations should be done in such a way as to make the automobile look as environmentally sensible as possible without any blatant mathematical errors or unreasonably low train ridership assumptions.

Because particulate emissions are a major source of urban air problems, these computations were performed with this emission in mind.

#### AUTOMOBILE ASSUMPTIONS

In order to make the automobile competitive with the train, it is assumed the average automobile journey consists of four passengers. It should be noted that this is a little high, but there is a chance that it might happen in cities that are very crowded.

In the second set of calculations, where some simulation of reality is attempted, it is assumed that the average automobile contains two passengers.

The pollution standards for the automobile is set using the "Federal Test Procedure" (FTP), and specifies the number of grams per mile of various items the automobile is allowed to release during the test. In order to calculate the amount of pollution per passenger per mile, the amount is simply divided by the total number of passengers in the car.

The automobile is assumed to be moving at about 50 miles an hour.

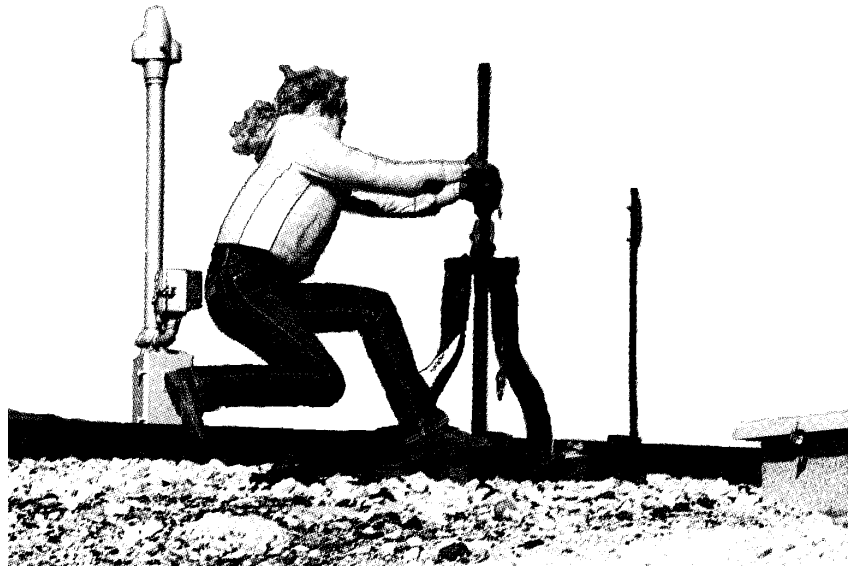
#### ASSUMPTIONS AND FORMULAS FOR THE TRAIN (THE TRAIN FROM HELL)

The general assumption is that the train is to American Association of Railroads standards. This means that it is a standard railroad train used for intercity and long distance commuter service. Because of the heavy weight for this type of train, it is less energy efficient than heavy rail transit (subways and elevateds) and light rail transit (modern streetcar). It is necessary to ignore these types of railed systems because the Federal Railroad Administration, The Association of American Railroads, and the Interstate Commerce Commission do not consider them to be railroads. Therefore, one simply can't include them in any kind of computation that seeks to compare railroads to the automobile. Also, it is not possible to compare rail transit to the automobile because no one has ever bothered to calculate how much energy is needed to move such equipment.

It is also assumed that this is a diesel hauled train. The fact is that electric trains have an unfair advantage over the automobile because the source of energy (the heaviest part of the system) is stationary in an electric railroad system. Therefore, this assumption adds some 100+ tons to the train formulas, and therefore maintains a fair comparison to the automobile.

The train is assumed to consist of one General Motors constructed F40PH (common passenger locomotive) and five passenger cars. The F40PH weighs 116 tons. Each passenger car is assumed to be 70 tons each because that is the maximum allowed by the Association of American Railroads for cars that have 33 inch wheels. This restriction is for fully loaded freight cars, and therefore this high weight will allow the automobile a great advantage.

It is also assumed that the passenger train resistance follows the Davis formula. This formula was developed in the 1920's to determine what force is necessary to move a train. This is long before low friction bearings or most other energy efficiency measures were made on railroad equipment. Also, in the 1920's the average



weight of rail tended to be lighter than today. This increases the energy needed to move the train because the light rail tends to sag, and produce the effect that the train is constantly running up a hill.

It is also known that the Davis formula gives high results for speeds above 40 miles an hour. Therefore, in order to give the automobile a better advantage, it is assumed that the train is moving at 50 miles an hour.

Furthermore, because the Davis formula was developed specifically for freight trains, it takes into consideration such items as open boxcar doors, open top hopper cars, and box cars placed behind flat cars. These types of conditions cause the drag force to increase substantially because each represents a new frontal area for the air to hit. This does not happen on passenger trains.

Streamlining didn't appear until the 1930's, and besides the Davis formula deals with unstreamlined freight trains, so there is no need to worry about any unfair advantages given to railroad equipment designed to reduce wind drag.

The larger the surface area of the equipment, the larger the force needed to move the train. Therefore, in order to give the automobile the edge, it is assumed that the equipment is the maximum size permitted by trackside structures. One source recommends using 12 feet wide by 17 feet high in clearance cases where equipment must enter buildings. This is some 40 square feet larger than the equipment profile recommended by the Association of American Railroads plate B specifications. Therefore, the automobile definitely has an edge in this case.

All that said, it is time to introduce the Davis formula:

$$R = 1.3W + 29n + 0.045WV + 0.0005AV^2$$

where R is the train resistance in pounds per car, W is the weight per car in tons, V is the speed in miles per hour, n is the total number of axles, A is the cross sectional area in square feet, and  $V^2$  represents the square of the speed.

Acceleration, climbing hills, and curvature increase train resistance. However, they also increase the computational difficulty. Therefore, it is determined that the automobile has enough advantages with the computations as they are now.

In order to give even more advantage to the automobile, it is assumed that the cars and locomotive have two frontal areas. In other words, there is a large enough gap between the locomotive and the cars to make the train act like two separate objects.

It is difficult to create an estimate of the power demanded by the various other equipment. The eventual computation determined that there is about 1,000 horsepower required to move the train. This was then doubled to 2,000 horsepower to leave no doubt in anyone's mind that there is more than enough energy being consumed by the various miscellaneous power demands.

One of the more difficult areas to deal with is in translating the force required to move the train at a given speed into an engine horsepower. One general rule that has been around for years is that multiplying the diesel engine horsepower by 308 and dividing by the speed in miles per hour yields the force the locomotive is

providing. This formula was modified to yield horsepower from the tractive effort.

For the first calculation it is assumed that the train carries an average of 30 riders per car.

For determining the pollution generated by the engine, it is assumed that the engine is allowed to pollute at the federally allowed maximum for heavy diesel equipment as specified by the EPA Transient Engine analysis test.

#### COMPUTATIONS

Computations for the Automobile:

The regulations permit autos built past 1987 to emit 0.20 grams of particulates per mile.

0.20 grams/mile divide by 4 passengers = 0.05 grams per mile per person

divide by 2 passengers = 0.1 grams per mile per person

Computations for the Train from Hell:

12 ft. wide x 17 ft. high = 204 sq. ft.

number of axles = 4 axles per car x 5 cars = 20 total

$$R = 1.3W + 29n + 0.045WV + 0.0005AV^2$$

where R is the train resistance in pounds per car, W is the weight per car in tons, V is the speed in miles per hour, n is the total number of axles, A is the cross sectional area in square feet, and  $V^2$  represents the square of the speed.  $R = 1.3W + 29n + 0.045WV + 0.0005AV^2$

where R is the train resistance in pounds per car, W is the weight per car in tons, V is the speed in miles per hour, n is the total number of axles, A is the cross sectional area in square feet, and  $V^2$  represents the square of the speed.

Force to move locomotive:

$$R = 1.3 \cdot 116 + 29 \cdot 4 + 0.045 \cdot 116 \cdot 50 + 0.0005 \cdot 204 \cdot 50^2$$

$$R = 782.8 \text{ lbs.}$$

Force to move passenger Cars:

$$R = 1.3 \cdot 70 + 29 \cdot 20 + 0.045 \cdot 70 \cdot 50 + 0.0005 \cdot 204 \cdot 50^2$$

$$R = 1,083.5 \text{ lbs per car}$$

Total to move Train:

$$R = 5 \text{ cars} \cdot 1,083.5 \text{ lbs.} + 782.8 \text{ lbs. locomotive}$$

$$R = 6,200.3 \text{ lbs.}$$

Tractive Effort \* mph / 308 = horsepower required

$$6,200 \cdot 50 / 308 = 1,006.5 \text{ horsepower}$$

Round this figure up to 2,000 horsepower to make it easier to work with, and to compensate for miscellaneous power consumption.

$$5 \cdot 30 \text{ passengers} = 150 \text{ total passengers}$$

$$2,000 \text{ hp} / 150 \text{ people} = 13.3 \text{ hp per passenger}$$

Operate for 1 hour at 50 miles per hour:

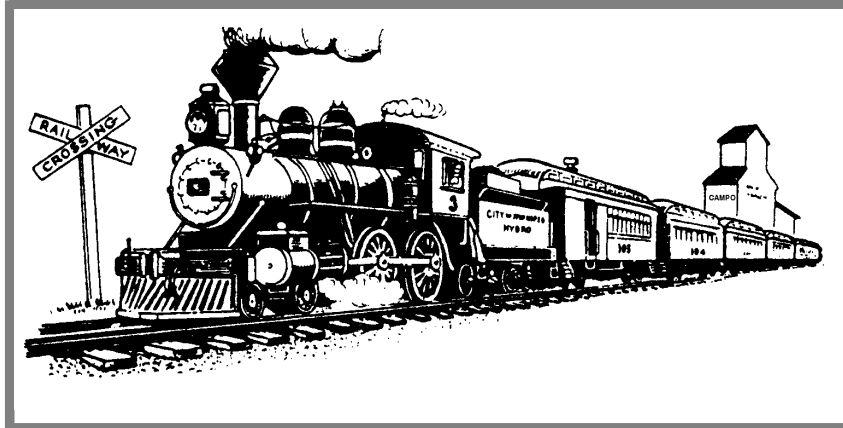
$$13.3 \text{ hp per passenger} \cdot 1/50 \text{ mile per one hour} = 0.266667 \text{ hp}^{\circ}\text{hour/pass.}$$

Federally allowed standards for particulate:

0.1 grams per brake horsepower per hour

$$0.1 \text{ grams/hp}^{\circ}\text{hour} \cdot 2000 \text{ hp} / 150 \text{ passenger} \cdot 1/50 \text{ hour per mile}$$

$$= 0.0267 \text{ grams pf particulate per mile per passenger.}$$



More realistic train computations:

Most locomotives designed to provide maximum of 700 horsepower for passenger car auxil. electricity. Thermal efficiency of diesel engine is about 33%, and at the rail overall eff. is about 26%. Therefore, multiplying by 26/33 will provide energy for locomotive aux.

AAR plate B specifications:

Approximate complex shape as box 10 ft. 8 in wide by 15' 1 inch tall.

$(8/12 + 10) * (15 + 1/12) = 161 \text{ sq. ft.}$

Locomotive: 116 tons, 8 axles, use Davis formula:

$R = 1.3 * 116 + 29 * 8 + 0.045 * 116 * 50 + 0.0005 * 161 * 50^2 = 845.05 \text{ lbs per locomotive}$

(Note this is higher than previous locomotive calculation!)

For the passenger cars:

Using the Trotten Modification for Streamlined Passenger cars:

$R = 921.8 \text{ lbs per car}$

Total Resistance:

$R = 845.05 + 5 * 921.8$

$R = 5,454 \text{ lbs}$

$5,454 \text{ lbs} * 50 \text{ mph} / 308 = 885.4 \text{ horsepower}$   
 $+700 \text{ for car power} = 1,585.4 \text{ horsepower}$

$1,585.4 / .77 \text{ locomotive aux.} = 2,058.9 \text{ horsepower}$

Because of the basic defects of the Davis formula, there is little change.

For narrow gauge mine equipment, (Page 10-23 in Mark's) it was demonstrated that older bearing types have a rolling resistance of 24 lbs per ton. Newer bearings resist as little as 14 lbs per ton.

$5,454 \text{ lbs. of train resistance} * 14/24 = 3,181.5 \text{ lbs.}$

$3,181.5 \text{ lbs} * 50 \text{ mph} / 308 = 516.5 \text{ horsepower}$   
 $+700 \text{ horsepower for car power}$

$= 1,216.5 \text{ horsepower total}$

$1,216.5 \text{ horsepower} / .77 \text{ engine aux.} = 1,579.8 \text{ horsepower}$

$1,579.8 \text{ hp} * 0.1 \text{ g/bhp} * \text{h particulate limit} = 157.98 \text{ g/h}$

$157.98 \text{ g/h} * 1/50 \text{ hour per mile} = 3.16 \text{ grams per mile}$

Assuming the average automobile has 4 passengers:

$3.16 \text{ g/mile} / 0.05 \text{ g/mile} / \text{passenger} = 63.2 \text{ passengers on train}$

$63.2 \text{ passengers} / 5 \text{ cars} = 12.64$

or approx 13 passengers per car.

A more realistic automobile calculation assumes 2 passengers per car

$3.16 \text{ g/mile} / 0.1 \text{ g/mile/pass.} = 31.6 \text{ total train passengers}$

$31.6 / 5 = 6.32 \text{ pass/ car}$

or 7 passengers total

#### RESULTS

The results are as follows:

An automobile with four passengers produces 0.05 grams of particulate pollution per mile per passenger.

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per mile per passenger.

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#### CONCLUSION AND DISCUSSION:

The only thing one can really conclude from this information is that the experiment was an absolute failure. There does not appear to be any way of reproducing the results that the automobile pollutes less than the train, even using the heaviest and most primitive equipment available to the computations.

It must also be noted that no absolute comparison can be made between automobile and train for the following reasons:

1. The available formulas date from the mid 1920's to the early 1930's. Because there have been improvements in energy consumption (most notably in the bearings) since that time, the formulas are out of date.
2. The test procedure for automobiles and heavy industrial diesel engines are two entirely different tests, and one can't compare the two engines except when they are put through the same tests.

It is still not clear what conditions were present in order to produce the results that found the automobile more environmentally friendly than the train. One possible way of doing this would be to collect train ridership data only from the last stop on the line. This would sway the pollution per passenger to favor the automobile. It might be that only automobiles with carpools were used in the data collection process, but even then it was shown that a automobile with 4 passengers was not favorable over a train.

It would be very interesting if someone were to collect data for light weight rail transit equipment and other energy efficient variants of the railroad train. One can only assume that the 7 passengers per car required for a heavy diesel commuter train would be reduced even further.

In short, any city that needs to move large amounts of people with a minimum of headache and pollution will need to use its railroad system efficiently. One can only point to the panic that occurs in Chicago every time Chicago and Northwestern workers threaten to go on strike to demonstrate how much modern, large cities (with the exception only of Los Angeles) rely on their railroad systems.

The automobile is great for personal transportation, but mass produced transportation occurs best with a pair of steel rails.

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