



सत्यमेव जयते

GOVERNMENT OF INDIA
MINISTRY OF TOURISM AND CIVIL AVIATION
(COMMISSION OF RAILWAY SAFETY)

RAILWAY ACCIDENT INVESTIGATION

REPORT

ON

**Derailment of 121 Up Tamil Nadu Express
near Ralapet Station of
South Central Railway
on 31-8-81**

SUMMARY

1. Date 31-8-1981.
2. Time 17-53 hours.
3. Railway South Central.
4. Gauge 1676 mm.
5. Location Within the limits of Ralapet station on Kazipet-Balharshah section.
6. Nature of accident Derailment.
7. Train involved No. 121 Up Tamil Nadu Express.
8. Consisting of 21 coaches hauled by WDM-2 Diesel locomotives No. 17562 (leading) and No. 17621 (trailing).
9. Estimated speed at derailment 128 Km/h.
10. System of operation Absolute Block System.
11. Number of tracks Single line.
12. Gradient Level
13. Alignment $1\frac{1}{2}^{\circ}$ right handed curve (1167 m radius) followed, by straight.
14. Weather Good.
15. Visibility Clear.
16. Casualties. Killed-16
Injured-86 (Grievous-27, Minor-59).
17. Damage to Railway assets Rs. 133.35 lakhs.
18. Cause Train having been driven in excess of the authorised speed.
Contributory Failure of Railway Management to curb the tendency of overspeeding by Drivers.
19. Responsibility Driver of the Express train.
20. Important recommendations, in brief (1) Machinery for monitoring speeds of Express trains to be made effective and overspeeding tendencies of Drivers to be curbed.
(2) Railway Officials who have developed an obsession for 'speed at any cost' to be corrected.
(3) Violations of conditions of statutory sanctions issued by the Commission of Railway Safety under the Indian Railways Act to be stopped.
(4) Track and Rolling Stock used for operation of High Speed trains to be maintained to rigid specifications prescribed by R.D.S.O.

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(COMMISSION OF RAILWAY SAFETY)

From

The Commissioner of Railway Safety,
Southern Circle,
Bangalore.

To

The Secretary to the Govt. of India,
Ministry of Tourism and Civil Aviation,
Sardar Patel Bhavan,
New Delhi.

Through: The Chief Commissioner of Railway Safety, Lucknow.

Sir,

In accordance with Rule 4 of the Statutory Investigation into Railway Accidents Rules, 1973 (published by the Ministry of Tourism and Civil Aviation under their Notification No. RS. 13-T(8)/71 dated 19th April, 1973), I have the honour to report the results of my inquiry into the derailment of some coaches of No. 121 Up 'Tamil Nadu Express' train near Ralapet station on Kazipet-Balharshah Broad Gauge section of South Central Railway, on 31-8-1981.

1.2 Inspection and Inquiry

1.2.1 I reached the site of accident at about 18-00 hours on 2-9-1981 and made a quick survey of the site for about 45 minutes before day-light faded. The next morning, I spent about four hours at the site in company with the Chief Engineer, the Chief Mechanical Engineer, the Chief Signal and Telecommunication Engineer, the Chief Rolling Stock Engineer and the Chief Traffic Safety Superintendent, all of South Central Railway, Secunderabad, the Chief Rolling Stock Engineer of Souther Railway, Madras and the Divisional Railway Manager, Secunderabad, going into the details of damage suffered by the rolling stock, the track and the signalling installation and keeping note of the clues still available. The joint recordings made by the Railway officials soon after the accident and the particulars of the rolling stock and track which had been damaged were also gone into. On the 4th of September, I had again spent two hours at the site inspecting the damaged rolling stock, track and signalling installation after a few coaches had been re-railed.

1.2.2 On the 5th of September I visited the Singareni Collieries Company's Hospital at Bellampalli where some of the persons injured in the accident were receiving treatment as inpatients and spoke to them. Statement of three of them were also recorded.

1.2.3 On the 6th of September I again visited the site and spent about four hours checking up some details in the context of evidence recorded till the previous evening.

1.2.4 Shri M. C. Sinha, Dy. Commissioner of Railway Safety, Mechanical, attached to the Chief Commissioner of Railway Safety, joined me on the 4th and carried out a detailed inspection of the rolling stock involved and furnished his report of observations.

1.2.5 A Press Notification was issued and it appeared in all English and language dailies of the area on 2-9-1981 and again on 21-9-81 inviting members of the public having knowledge of the accident or related matters to tender evidence at the inquiry, which I commenced at Sirpur Kaghaznagar station on 3-9-1981 and continued at my subsequent sittings at Secunderabad and Madras or to communicate with me by post.

1.2.6 The Civil and Police authorities of Adilabad District of Andhra Pradesh in whose jurisdiction the accident had occurred were duly notified.

1.2.7 The Senior Administrative Officers of South Central and Southern Railways present at the Inquiry, which I held at Sirpur Kaghaznagar from the 3rd to the 6th of September, at Secunderabad from the 7th to 10th, at Madras on 22nd, at Secunderabad on 28th and 29th September and 1st October and at Madras on 3rd October, were:

- (1) Shri S. Abuzar, Chief Mechanical Engineer, South Central Railway on 3-9-81.
- (2) Shri J. Rajagopalachari, Chief Traffic Safety Superintendent . . . on all days except 5/9 to 7/9, 10/9 & 3/10.
- (3) Shri R. Balasubramanian, Chief Engineer on 3/9 and 4/9.
- (4) Shri K. S. John, Chief Signal and Telecommunication Engineer . . on 3/9, 4/9, 7/9 to 10/9, 28/9 & 29/9.
- (5) Shri Vinod Pal, Chief Traffic Planning Superintendent on 4/9 to 7/9 & 10/9
- (6) Shri S. H. R. Krishna Rao, Chief Track Engineer on 5/9 to 9/9, 28/9 and 29/9.
- (7) Shri S. Rangarajan, Chief Rolling Stock Engineer, Southern Railway on 3/9, 4/9, 9/9 and 3/10.
- (8) Shri M.K.L. Narasimhayya, Chief Rolling Stock Engineer, South Central Railway on 7/9 to 9/9.
- (9) Shri A. Viswanathan, Chief Signal and Tele-Com. Engineer (Constuction) on 4/9 to 9/9.
- (10) Shri V. Viswanathan, Divisional Railway Manager, Secunderabad on all days except on 22/9 and 3/10.
- (11) Shri P. Narayana Reddy, Addl. Chief Engineer, Secunderabad . . on 4/9 to 9/9.

1.2.8 The following Police Officers were also present at some of the sittings of the Inquiry:

- (1) Shri S. Subbarayudu, Addl. Superintendent of Police, Crime Branch/CID, Hyderabad.
- (2) Shri K. Satyanarayana Rao, Dy. Superintendent of Police, Hyderabad.
- (3) Shri P. Narayana Reddy, Dy. Superintendent of Police, Secunderabad.
- (4) Shri P. Mohan Rao, Inspector, Railway Police, Secunderabad.
- (5) Shri C. V. Sudhakar Rao, CI/CB CID, Hyderabad.
- (6) Shri K. Harnath, Inspector of Police, Crime Branch, CID, Hyderabad.

1.2.9 Evidence of 76 witnesses in all, including 48 Railway Officials of South Central Railway, 13 of Southern Railway, 3 of Research Designs and Standards Organisation, one of Northern Railway and 11 members of public was recorded. Of these 19 were on the train when the accident occurred and three were eye witnesses to it. Evidence of two, who were passengers on the train, was recorded at Delhi by the Dy. Commissioner of Railway Safety, Lucknow and of three Railway Officials by the Divisional Safety Officer, Secunderabad at my request. Postal communications received from a few members of the public are also placed on record.

NOTE: In this Report—

- (i) The expressions 'Tamil Nadu Express' or 'The Express train' wherever used refer to No. 121 Up 'Tamil Nadu Express' train which left Madras Central on the morning of 31-8-1981 for New Delhi and met with the accident at Ralapet the same evening.
- (ii) The expressions 'left'/'right', 'front'/'rear' and 'leading'/'trailing' wherever used are in reference to the direction in which the train was moving prior to the derailment.

- (iii) Reference to coaches wherever made, as A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T and U, is as per metal plates fixed on each of the coaches on the train and as per reservation lists prepared at Madras Central. Reference to their individual numbers and positions from the locomotives is to be had from the marshalling order given in para 3.1.1.
- (iv) The expression 'alignment' wherever used refers to the track alignment of the Main line at Ralapet station on which the train was signalled to pass.

1.3 **The Accident.**—At about 17:53 hours on 31-8-1981 while No. 121 Up Tamil Nadu Express which had earlier left Warangal station after a scheduled halt, was on run within the limits of Ralapet station on Kazipet-Balharshah section of South Central Railway on signals to run through the station on Main line. 17 of its 21 coaches, third to nineteenth behind the two train locomotives, got derailed between telegraph posts 209/10 and 209/6 between the Up Home Signal and the Main line Starter Signal of Ralapet station.

1.4 **Casualties.**—About 1100 passengers out of a total capacity of 1150 were stated to be occupying the train at the time of the accident. 16 were reported to have lost their lives as a result of the accident, 27 sustained grievous injuries and 59 persons sustained minor injuries besides several others who sustained trivial injuries. In the course of my inquiry it came to light that some more persons, whose names are not included in the list furnished by the Railway Administration were also injured but their exact number is not known.

2. RELIEF MEASURES

2.1 **Intimation.**—The Accident having taken place close to Ralapet station, the Station Master who was an eye witness to the occurrence tried to inform the Divisional Control at once but as the telephone was not in working condition, he passed on a brief message by "Block Telephone" to Sirpur Kaghaznagar at 17:57 hours, followed by a detailed report later. The station staff of Sirpur Kaghaznagar had in turn advised the Divisional Headquarters at Secunderabad, the local Police and Medical authorities as well as the Management of the Sirpur Paper Mills, Sir-Silk Factory and the Rotary Club for rushing relief to the accident victims.

2.2 **Medical Attention and Relief.**—A few Doctors travelling on the train including a Medical Superintendent of Southern Railway commenced rendering first-aid to the injured within minutes of the occurrence. They were soon joined by the Doctors of the Employees State Insurance Hospital, Sirpur Kaghaznagar and the Doctors of local Paper Mills, Singareni Collieries Co. Ltd., and others from about 18:45 hours onwards. The first Railway Doctor from Bellampalli reached the site at 20:20 hours, Doctors from Kazipet by about 21:50 hrs., and those from Secunderabad by about 01:00 hours the next morning. Road Ambulances, Cars, Vans and Lorries were liberally made available by the managements of the above Organisations and others and the injured were shifted to the E.S.I. Hospital, Kaghaznagar, commencing from 19:30 hours. All the injured persons requiring to be shifted to hospital were moved to the E.S.I. Hospital by about 23:15 hours, except one person who could not be extricated from a coach. Later, he was also shifted but died soon after admission. By the time the Railway Medical Relief Van arrived from Kazipet none was left to be shifted to the hospital. Railway Doctors had then proceeded to the E.S.I. Hospital and co-ordinated with the Doctors of the Hospital in rendering medical aid. Subsequently, some of the injured were shifted to the Singareni Collieries Hospital, Bellampalli, on the morning of 1st September.

2.3 **Restoration.**—Accident Relief Trains from Kazipet and Balharshah directions were moved to the site and took positions in the early morning hours of 1st September. After removing the coaches which were infringing the track and by diverting the track itself at one location temporarily, the main running line was made available for traffic at 23:40 hours on 1st September, after about 30 hours of suspension. Subsequently, the loop line was made available on 7-9-1981.

3. THE TRAIN

3.1 Composition of the Train

3.1.1 The composition of the Express train in marshalling order was as under:—

Locomotives No. WDM-2 17562 (leading)
No. WDM-2 17621 (trailing)

Coaches

Sl. No.	Coach No. and Type	Coach identification	Body type	Year built	Date of P.O.H.	Date of Return
1.	WIRAM 4787	A	ICF AC/AT	1975	14-7-81	7/82
2.	WGSCNY 6933	B	Do.	1978	2-2-81	2/82
3.	Do. 6938	C	Do.	1978	11-11-80	11/81
4.	Do. 6793	D	Do.	1978	11-11-80	11/81
5.	Do. 6565	E	Do.	1974	29-6-81	7/82
6.	WSZAC 5643	F	Do.	1965	28-5-81	6/82
7.	Do. 1096	G	Do.	1966	26-3-81	4/82
8.	WGSCNY 5133	H	Do.	1974	20-11-80	11/81
9.	Do. 6790	I	Do.	1978	23-12-80	1/82
10.	Do. 6937	J	Do.	1978	28-1-81	2/82
11.	Do. 6549	K	Do.	1974	23-10-80	11/81
12.	WCL 6411	L	Do.	1966	5-5-81	5-82
13.	WGSCNY 7125	M	Do.	1978	12-1-81	1/82
14.	Do. 6932	N	Do.	1978	4-3-81	3/82
15.	WSCNY 5350	O	Do.	1968	3-10-80	10/80
16.	WACCW 5343	P	Do.	1974	18-9-80	9/81
17.	WGACCW6193	Q	Do.	1978	2-7-81	7/82
18.	WGEAC 3695	R	Do.	1980	6-8-81	8/82
19.	WFC 6369	S	Do.	1976	19-9-80	9/81
20.	WFC 6015	T	Do.	1966	21-8-80	9/81
21.	WIRRM 4788	U	Do.	1975	26-12-80	12/81

3.1.2 The total length of the train including the two locomotives was 495.6 metres and its weight was 1136.7 tonnes.

3.2 The train was fully vacuum braked and was certified to be having all of its 42 vacuum cylinders functioning when the train left Madras Central, that morning. The brake power certificate issued to the Driver of the Electric locomotive, which hauled the train from Madras Central to Vijayawada, had certified vacuum levels of 55 cms. in the locomotive and 50 cms. in the rear brake van of the train. The WAM-4 AC Electric locomotive which hauled the train upto Vijayawada was replaced by two WDM-2 locomotives but the train was worked forward under the same brake power certificate issued at Madras Central. The brake power available on the train was 936.6 tonnes while leaving Madras Central.

3.3 Damage to Rolling Stock

3.3.1 The two train locomotives, two front coaches (coaches A & B) and the two rear coaches (Coaches T & U) were on rails and 17 intermediate coaches (Coaches C to S) were found derailed, of which eight coaches (G to N) had capsized.

Particulars of damage sustained by individual coaches are detailed below:

3.3.2 Coach 'B'—SR WGSCNY 6933—remained on rails but had its trailing end draw gear yoke trimmers bent towards right and stiffeners given up. Base plate right lug was sheared off.

3.3.3 Coach 'C'—SR WGSCNY 6938—was found derailed of all wheels and grounded with its left wheels hugging the right hand rail of the Main line and its body and all

right wheels lying outside, infringing the loop line. The coach had its leading draw hook broken in middle portion, right trailing buffer bolts sheared off, buffer dropped, and under-gear fittings damaged.

3.3.4 Coach 'D'—SR WGSCNY 6793—was found derailed and grounded with its left wheels hugging the right rail of the Main line and its body and right wheels outside infringing the loop line but almost parallel to the track alignment. It had its undergear damaged. The trailing bogie got separated and was completely damaged.

3.3.5 Coach 'E'—SR WGSCNY 6565—was found derailed and grounded across the loop line making a slight angle with the track alignment, its front end being closer to the Main line than its rear end. Both the bogies got separated and strewn away. All wheels were thrown out, both end bodies crushed and middle portion damaged. Its leading draw hook was broken, right trailing buffer bolts were sheared and dropped and all undergear fittings were damaged.

3.3.6 Coach 'F'—SR WSCZAC 5643—was found derailed and grounded on the right side of the main and loop lines making a slight angle with the track alignment, its front end being closer to loop line than its rear end. The front bogie wheels of both the bogies were thrown away. Its trailing bogie without wheels was lying under the body and leading draw hook was broken, right leading and left trailing buffers damaged and all undergear fittings damaged.

3.3.7 Coach 'G'—SR WSCZAC 1096—was found lying on its left side, across the main and loop lines and almost at right angles to them. Its bogies and wheels were thrown away and left side body and undergear fittings completely damaged.

3.3.8 Coach 'H'—SR WGSCNY 6493—was found capsized on the left side of the main line and about 18 metres away from and almost parallel to it with its front end close to the rear end of Coach 'G'. Bogie frames without wheels were under the body. Its body got damage badly, the leading draw bar shank broken and all under-gear fittings damaged.

3.3.9 Coach 'I'—WGSCNY 6790—was found derailed and capsized lying on the left side of the track alignment and about 15 metres away from it making a slight angle, with its front end being farther from the alignment than the rear end. Its body and under-gear were completely damaged. Both the ends were, however, intact.

3.3.10 Coach 'J'—WGSCNY 6937—was found derailed and capsized, lying across the main and loop lines, its front end being close to the rear of Coach 'I' on the left side of the alignment, its body making an angle of about 45° to the track alignment and its rear end to the right of it. It had its body and under-gear completely damaged but ends were intact.

3.3.11 Coach 'K'—SR WGSCNY 6549—was found capsized and ridden over by Coach 'M' and one end was crushed by Coach 'L'. This was the worst affected coach and many of the casualties were from this coach.

3.3.12 Coach 'L'—SR WCL 6411—was found lying capsized at a distance of about 20 metres on to the left of the main line, making a slight angle with it. This was the next worst affected coach after 'K' and had within it several casualties.

3.3.13 Coach 'M'—WGSCNY 7125—was found lying derailed and capsized, away from the main line and to the left of it, making an angle of about 30°, its rear end being close to track and front end farther away. The coach was badly damaged.

3.3.14 Coach 'N'—WGSCNY 6932—was found derailed and partly capsized on to the left of the main line but close to it with its front end being just behind the rear of Coach 'M'. The damage suffered by the coach was not much.

3.3.15 Coach 'O'—WSCNY 5350—was found derailed but upright with its bogies and wheels in position but completely outside the main line on to the left side. The damage it had suffered was light.

3.3.16 Coach 'P'—WACCW 5343—was similar in alignment to Coach 'O' and was just behind it with all wheels having left the main line on to the left side. The damage to the coach was minimal.

3.3.17 Coach 'Q'—WGACCW 6193—was derailed of all wheels but its left wheels only had left the track and right wheels were in the middle of the track. The coach was just behind Coach 'P' in alignment.

3.3.18 Coach 'R'—WGEAC 3605—had all its left wheels derailed outside the left rail and right wheels inside the track. It was just behind Coach 'Q' on the curved alignment of the track.

3.3.19 Coach 'S'—WFC 6369—had its front bogie only derailed but rear bogie wheels floating. The derailed left wheels were outside the left rail and right wheels inside the track. It was just behind Coach 'R'.

The total cost of damage to rolling stock, excluding electrical equipment, is estimated by the Railway Administration to be about Rs. 75 Lakhs.

3.4 Damage to the Permanent Way

Permanent Way in a length of about 250 metres on the main line and about 75 metres on the loop line was completely damaged besides one 1 in 12 turn-out on steel sleepers.

The approximate cost of damage is estimated to be Rs. 2.5 Lakhs.

3.5 Damage to Signalling and Telecommunications equipment.—The Down main line and loop Starter Signals were completely damaged and uprooted. The equipment at the points of the 1 in 12 turn-out and the derailing switch were also damaged and uprooted. Detectors of the points, main line track circuiting feeding arrangements, battery boxes and cable were damaged. Signal and Point transmission pertaining to Up Home and Down Advanced Starter and Starter Signals was also damaged.

The approximate cost of damage is assessed as Rs. 0.85 lakhs.

3.6 Damage to the Electrical equipment.—Four A.C. Coaches and 11 non-A.C. Coaches suffered damage, some of them extensively.

The approximate cost of damage is assessed as Rs. 55 lakhs.

3.7 There was no damage to other Railway assets.

3.8 The cost of damage to Railway assets as furnished by the Railway Administration aggregates to Rs. 133.35 lakhs.

IV. LOCAL FEATURES

4.1 The accident occurred within the limits of Ralapet station in between the Up Home and main line Starter signals. Ralapet is situated in Adilabad District of Andhra Pradesh, about 32 kilometres from Bellampalli, an important colliery centre of M/s. Singareni Collieries Co. Ltd., and seven Kilometres from Sirpur Kaghaznagar with its Paper Mills, Silk Factory and other industries.

4.2 After leaving Asifabad Road, the alignment runs on a straight line for about 2.5 kms., which is practically South to North and then swings to the left in a 1750 m. radius curve for about a kilometre in length. After running on straight for another 2.5 kms., it swings further to the right in a 1167 metre radius curve between Km. 210/6 and 209/9 to enter Ralapet yard on the straight alignment at Km. 209/9, where its direction is North-Northeast. After running on the straight alignment for a portion of the yard, it takes a reverse curve of 1400 metre radius in Km. 208 before crossing the major girder bridge No. 208 (consisting of 5 × 18 m. and 1 × 90 m. girder spans) across the rivulet 'Bibra'. After crossing the bridge it takes a further rightward swing towards Sirpur Kaghaznagar where its direction is Southwest to North-East. The country side in the entire reach consists of forests and bushes and is sparsely populated.

4.3 The alignment in the approach of Ralapet is alternatively on banks and in cuttings. The soil is soft moorum of which the bank is formed. The entry to the station yard is through a $1\frac{1}{2}^\circ$ right handed curve (1167 m. radius), transitioned at either end to a nominal length of 70 metres. In between the transition curve and the facing points of the 1 in 12 turn-out of the yard, there is a straight of about 20 metres as per the lay-out design. The points and crossing is itself on a straight as per the lay-out design. The Permanent Way consists of 52 kg. rails welded into 5 rail lengths of 60-65 m. each, laid on CST-9 sleepers to M+7 density laid in 1966 over stone ballast. The points and crossing of the turn-out is also of 52 kg. section on a steel sleeper layout laid in 1975.

4.4 Ralapet is a 'B' Class station, interlocked to Standard III and is equipped with Multiple Aspect Upper Quadrant Double Wire Signalling comprising Distant, Home, Starter and Advanced Starter signals in each direction. A loop line takes off the main line on a right hand turn-out. The station building is the Signal Cabin itself, located in the middle of the yard on the loop line side. The station is not open for commercial purposes.

4.5 Trains are operated between Asifabad Road and Ralapet stations under what is called the Absolute Block System of Train Working and the Block Instruments in use are Tokenless type of Podanur make.

4.6 The maximum permissible speed of trains in the section is 100 Km./h. except for a few pairs of Superfast trains, which are permitted a maximum speed of 110 Km./h. There was no permanent or temporary speed restriction of any kind between Asifabad Road and Ralapet on the day of the accident. A 30 Km./h. temporary speed restriction was in force at the approach of the curve in Km. 210/6-7 for all Up and Down trains till 29-8-81, when it was removed and sectional speed restored.

4.7 Tamil Nadu Express is permitted a maximum speed of 110 Km./h. and a booked speed of 100 Km./h. The Time Table for the train which is based on trials conducted in 1976 for a 13 coaches train hauled by a single WDM-2 locomotive provided for an overall time of 345 minutes between Vijayawada and Balharshah and normal and minimum running times of 300 minutes and 272.5 minutes respectively, the balance 45 minutes being provided for traffic halts, Engineering restrictions, etc. On introduction of the Double-headed Express with a trailing load of 21 coaches in 1979, no trials were known to have been conducted but the timings of the earlier single-headed train were adopted. As on 31-8-81 (as per the revised Time Table which came into force on and from 16-4-1981) the normal and minimum running inter-sectional timings were the same as for the earlier single-headed train but the train had an overall running time of 361 minutes, a total normal running time of 296 minutes and minimum running time of 271 minutes.

4.8 The kilometrage of various locations and stations mentioned in this Report, reckoned from Wardha on the Central Railway, is as under:—

Madras Central	1015.26
Vijayawada	586.50
Warangal	376.90
Kazipet	366.80
Bellampalli	240.89
Asifabad Road	216.57
Site of Accident	209/10-6
Ralapet	209.13
Sirpur-Kaghaznagar	202.18
Balharshah	132.40

There are 14 Telegraph posts per kilometre at the site of the accident.

V. SUMMARY OF EVIDENCE

5.1.1 Sri E. O. Lever, Driver of the ill-fated train said that his train ran through Asifabad Road station on main line through signals at 17.54 hours and, while approaching Ralapet, was running at 90 Km./h. While passing the cabin he noticed that the vacuum

had dropped and on looking back found that only 2 coaches were behind the engines and the rest of the train had been left behind. He stopped the incomplete train a little beyond the Down Home Signal after crossing the major bridge. After his co-driver, who went back to the station side to see what had happened, returned with the Station Master, the train was backed upto the station. The accident occurred at 17.58 hours, weather was clear, day light was still available and visibility was good.

5.1.2 Answering questions, the witness gave the following information:--

- (i) The mechanical speedometer was recording 10 km. in excess of the electrical speedometer. He considered that the Electrical speedometer was more accurate. He did not, however, check the speed with reference to the Telegraph posts.
- (ii) The vacuum created by the engine was 53 cm on the down trip from Balharshah to Vijayawada on 30-8-81 and 50 cm on the up trip from Vijayawada to Ralapet on 31-8-1981.
- (iii) The first indication he had of the accident was the dropping of vacuum. He had no indication of anything unusual happening to the train. He did not (even) feel the breaking of draw hook between the second and third coaches.
- (iv) He was not aware of the notification published in South Central Railway Gazette in 1977 about loss of time on speed restrictions.
- (v) He did not observe the Speed restriction of 30 km./h between Raghavapuram and Ramagundam as it pertained to Road over bridge and not to track.

5.2 **Sri G. Venugopal**, Co-Driver of the train, said that after leaving Asifabad Road, the train ran at a speed of 95 to 100 km./h. Somewhere between the Up Home Signal and the Down Advanced starter signal of Ralapet he had experienced a recoiling feeling on the locomotive and jerk resulting in the parting. While on run between Asifabad Road and Ralapet he experienced severe oscillations in the locomotive at km. 213/8. Although a danger hand signal was displayed at the cabin as the train passed, the front portion was continued to run at the same speed with a view to avoid collision with rear coaches which parted.

5.3.1 **Sri I. J. LOPES**, Guard of the train, said that as the train was approaching Ralapet at its normal speed of about 100 km./h., he suddenly felt a jerk which hit him on his back and he fell down on the floor. He took a few minutes to recover before he went out of the van. He went to the cabin to inform the authorities about the accident but as the Control phone was not working, the Station Master spoke to Sirpur Kaghaznagar on block phone at 18.20 hours. Thereafter he rendered first aid to some injured passengers. He had no emergency lighting provided in the brake van but the generator van in the rear of the train gave some lights to light upto 5/6 bogies from the rear.

5.3.2 Answering a question, the witness said that the loss of 2 minutes for 15 km./h. restriction between Repalliwada and Asifabad Road and 1 minute for 30 km./h. restriction between Raghavapuram and Ramgundam which he recorded in his journal were the actual losses suffered by the train.

5.4.1 **Sri Zahir Ahmed**, Assistant Guard, said that after leaving Asifabad Road, the train ran at its normal speed. As his coach (first behind the engine) was negotiating the Up Home and Down Starter Signals of Ralapet he experienced a side jerk which had thrown him out on to the left side. As he looked out in the rear from the right side window he found that the train had parted.

5.4.2 Answering a question, the witness said that earlier on the run he did not experience any jerk similar to the one he felt at Ralapet.

5.5 **Sri M. Ramachandra Rao**, Train Superintendent, Southern Railway said that at the time of the accident he occupied 'O' coach and the train was running at the maximum speed of 110 km./h. At 18.05 hours he experienced a sudden jerk and oscillation of the coach and the train came to a stop.

Other points which the witness touched in this deposition include the following:—

- (i) When he went to the cabin at about 18.30 hours he noted the levers 7, 15, 16, 22, 34, 37 & 38 as being in lowered position.
- (ii) There was no arrangement in the train to light up the area. The Electrical Chargeman who was on the train tried to give some lights outside as well as inside the compartments but his efforts did not succeed as far as outside lighting was concerned.
- (iii) He had not kept any record of injured passengers shifted to hospitals.
- (iv) There was no help available for shifting the luggage and other belongings of the passengers and they helped themselves.
- (v) Of the 32 catering personnel in the pantry car, 18 were injured and three lost their lives. Refreshments to stranded passengers were served by Sirpur Paper Mills authorities.

5.6.1. Sri S. N. Contractor, Joint Director, RDSO, Lucknow who occupied a berth in Coach 'R' said that for 5-10 minutes before the train derailed he felt that the riding was rough compared to the running he experienced earlier on the journey. He found it difficult to read and so he stopped reading. At about 17.56 hours he experienced a sudden jerk. The jerk was longitudinal as a result of which he was thrown on to the opposite berth. Within 3 or 4 seconds he experienced a grating sound and the train came to a stop with a jerk. On going out of the coach and looking around he found that the train had derailed and some of the coaches had capsized.

5.6.2 The following were among other things the witness stated in his deposition:—

- (i) He went up the cabin and took stock of the position of levers at 18.12 hours. He found that levers 7, 15, 16, 22, 34, 37 and 38 were in pulled condition. None of the clutches was in tripped condition. His observation of the indicators was that 36 loop Home was 'ON'; 37 Main Home 45° was 'ON'; 38 Main Home 90° was 'ON'; Home light was 'ON'; Loop Home light was 'ON'; Main Home light was 'ON'; Down Distant was 'ON'; 15 Track (Advanced starter replacement) was 'ON'; Distant release was normal and sealed.
- (ii) The Tokenless Block Instrument (Podanur Type) for Ralapet-Asifabad Road Section had its 'Train on line' light red, Station Master's key normal, Cancellation No. 000406 and the block phone dead. The Tokenless Block Instrument for Ralapet-Sirpur Kaghaznagar section also had 'Train on line' light red. The block phone was working and cancellation number was 000403. The Control phone was dead.
- (iii) From the above indications he concluded that there was nothing abnormal as far as Signalling and Block equipment in the cabin were concerned.
- (iv) He did not consider it possible or correct at that moment to undertake recording of his observations in the register.
- (v) The expression 'rough riding' which he used in his deposition was a relative term and the track was rough compared to the earlier stretches of track negotiated by the train. He felt that the train was running at a speed little higher than the maximum speed it was supposed to go. He was, however, unable to say what the speed could have been at the time of derailment.

5.7.1 Sri S. Palanivelu, Electrical Chargeman, Southern Railway who was incharge of the power cars on the train and was on the last coach at the time of the accident said that he noticed at 17.58 hours that the power had tripped and when he learned out he saw dust and smoke.

5.7.2 Answering questions, he said that—

- (i) the train was running at normal speed and he did not experience any unusual jerk.
- (ii) there was no provision in the train for outside lighting; and
- (iii) that no emergency lighting kit was carried by him.

5.8.1 Sri T. N. Narendra Varma, an Officer of the Indian Overseas Bank, Delhi, who was travelling in 'B' coach of the train said that at about 6.00 p.m. while on his way to the Pantry Car for some refreshments, he experienced a heavy jerk while passing through the AC coach. He was pushed to the right side but steadied himself. While entering the Pantry Car, within a minute of the first jerk he experienced the colliding effect.

5.8.2 Answering questions the witness said that—

- (i) the train was running higher than the normal speed at the time of the accident.
- (ii) running after leaving Vijayawada was more unsteady than the earlier run.

5.9 Sri A. U. Bhaskara Rao, an employee of the Defence Services, who was travelling in 'K' coach, said that the running of the train from Vijayawada where he boarded was smooth like any other journey by the same train. Suddenly he experienced a heavy jerk and in quick succession the coach derailed and capsized and another coach rolled over it.

5.10 Sri A. Chakravarthy, an Executive of a Shoe Factory in Agra, who was travelling in coach 'G' (A/C chair car) said that the run upto the time of the accident was smooth and he did not feel anything unusual. He felt that at the time of the accident the train was running at its usual speed as it had run all the way from Madras. He lost consciousness soon after the occurrence and was not in a position to recollect how it all happened.

5.11 Sri C. Muralikrishna Murthy, Train Examiner, Southern Railway, said that the train had a normal run and he did not feel anything unusual prior to the accident. At the time of the occurrence he was in coach 'O' and felt a sudden left side jerk and the coach appeared to be having a pendulum type movement till it came to an abrupt stop. At the time he felt the jerk, the train was running at its maximum speed of 110 km./h. After that it moved for about 3-4 seconds and might have covered two to three bogie lengths before coming to a stop.

5.12.1 Sri T. V. Srinivasan, a retired Chief Operating Superintendent of Indian Railways, who was travelling in 'S' coach of the train said that he felt that the train was running at a good speed when he suddenly felt a severe lateral jerk (possibly left-ward) followed by another short jerk with which it came to a stop.

5.12.2 In his detailed account of what he saw and did after he came out of the coach, the witness stated, among other things, the following:—

- (i) The rescue operations carried out by the Police personnel travelling by the train were hampered for some time for want of cutting tools.
- (ii) Excellent work was done by the trucks requisitioned by Sirpur Paper Mills authorities in transporting the injured to the hospital.
- (iii) Remarkably good work was done by the members of the Rotary Club, Sirpur Paper Mills and Sir-Silk Ltd., in arranging food and accommodation to stranded passengers.
- (iv) The arrangements made for the running of the duplicate train to Delhi could have been more satisfactory (than what they were). There were no arrangements at the large number of unscheduled halts of the train to provide even a cup of milk for the children while the train did not stop at stations where such facilities were available.
- (v) His feeling as an Ex-Railway man was that the Railways had the resources and ability to organise the arrangements (for the passengers travelling by the duplicate train to Delhi) much better than they had actually done.

5.13.1 Sri M. P. Radha Krishnan, Editor of a weekly at Delhi, who was travelling in Coach 'G' (A/C chair car) of the train said that he had suddenly felt something like an explosion and the coach began to shift towards the right and after a few seconds came to a stop on its side. The speed of the train at that time was a little faster than what is normally experienced on Super fast trains and may be between 100 and 120 km./h.

5.13.2 The following were among other points made by the witness:—

- (i) No attention was given to him for a long time after he was admitted to the hospital.
- (ii) The term 'explosion' used by him was actually a crash which gave him the feeling of an explosion but he did not consider it to be due to sabotage.
- (iii) Arrangements made by the Railway authorities to meet the situation were not satisfactory and chaos and confusion prevailed.
- (iv) The Indian Railways which have introduced Super-fast trains should ensure sustained technological advance to prevent recurrence of situations like the one which occurred on 31st August (81).

5.14.1 Dr. K. M. Cherian, Medical Superintendent, Southern Railway who was travelling in Coach 'T' of the train said that (prior to the accident) the journey was normal and smooth and the train was running at the usual speed of a Super fast train and he had not felt anything unusual. There was a sudden big jolt similar to what is felt when a parting takes place and the train came to a stop in 10 seconds.

5.14.2 Dr. Cherian gave a detailed account of what all he saw and did. Among the points he made were:—

- (i) By 7.30 p.m. the first batch of injured persons were transported to the hospital in a truck escorted by the Additional General Manager of South Central Railway, and the second batch was escorted by him personally to the hospital.
- (ii) He felt that the injured persons were taken care of to the best of the facilities available at that place and that in the circumstances in which the accident had taken place whatever was possible had been done.

5.15.1 Sri Purushottam Rao, a passenger travelling in Coach 'H', said that after leaving Vijayawada, the train picked up speed and after leaving Kazipet, he felt that it was really over-speeding. He could not even steadily press the cock to get water (in the toilet where he went a little before the crash). He was still in the toilet when he felt a loud explosive crash and his coach was hitting the front coach and had recoiled more than once.

5.15.2 Other points made by the witness include:—

- (i) He travelled by Tamil Nadu Express a number of times. In the early stages the upkeep of the train used to be very good, but on this trip the arrangements were not 'that satisfactory'.
- (ii) He entered the toilet approximately 3 minutes before the occurrence but when he tried to put a few mug-fulls of water to have a bath he found it very difficult and felt that the train was running at a high speed.

5.16 Sri P. Munuswamy, a bearer of the Pantry Car attached to the train, said that after the train left Vijayawada when he was serving Thalys, he felt it a little difficult to balance them. The train was, however, running at its normal speed. Some 5—10 minutes before the occurrence he felt slight swaying which made it difficult for him to hold the tray of eatables he was then carrying. He felt a violent sideway lurch like "waves of the sea" and held on to the rods to balance himself. He was in 'J' or 'K' coach at that moment and within the last two seconds before it came to a stop, a rail pierced into his coach.

5.17.1 Sri K. Anbumani, a bearer of the Pantry Car, said that after the train left Warangal, the speed increased and particularly after passing Godavari bridge (at Km. 264-265 which it passed around 17.20 hours) started shaking sideways. He felt that it was running at a still higher speed. He experienced the shaking in coaches 'K' & 'L' where he was serving coffee. Suddenly he experienced braking effect and the coach started moving forward and backward and then came to a stop.

5.17.2 Answering a question, the witness said that he generally experiences shaking of the coaches between Jhansi & Delhi and again from Bhopal to Amla, but the shaking he had experienced in this trip was a little more than those earlier ones.

5.18.1 **Sri Shamsher Singh**, Additional General Manager, South Central Railway who was travelling in Coach 'R' said that some time prior to the accident he dozed off and was suddenly woken up due to the train coming to a stop with a big jerk. From Warangal onwards (where he boarded the train) he did not experience any rough riding nor did he have any impression that the train was running at an excessive speed.

5.18.2 The witness gave a detailed account of what all he saw and did after the occurrence and the following were among other things, touched upon by him:—

- (i) Soon after the occurrence he went out, made a quick assessment of the situation, and rushed to the cabin from where he spoke to the next station requesting for immediate medical assistance.
- (ii) He accompanied 15-16 persons with serious injuries to the hospital, an hour and a half after the occurrence which he estimated as having taken place at 18.00 hours.
- (iii) He went over the site from one end to the other to see if there was any obvious evidence which would prove useful for subsequent investigations but did not come across any such evidence which he could conclusively interpret as the cause of the accident.

5.19.1 **Sri K. Gopalakrishna**, Staff reporter of some journals at Vijayawada, who was travelling in 'F' coach of the train, said that at about 5.50 P.M. he experienced a big sound similar to that of a thunder bolt and the coach left the rails and started moving to his right. There were half a dozen similar experiences in a short time (which appeared to him to be 5 minutes) and the coach came to a stop away from the track. He frequently travels by high speed trains and he felt that the speed of the train prior to the occurrence was about 100 km/h., normal for a high speed train. While the Pantry Car (Coach 'K') where he went a little earlier was very unsteady, jolting like a cradle, his coach (Coach 'F') ran steadily right from Vijayawada and he did not experience anything abnormal till the accident had occurred.

5.19.2 The witness added that his journey from Sirpur Kaghaznagar onwards to New Delhi was not at all comfortable. No arrangements were made for food or refreshments after leaving Sirpur Kaghaznagar. The train stopped 40 to 50 times enroute, the coaches were also rickety and two of them had to be changed in between being considered unsafe.

5.20.1 **Miss Sushila Subrahmanian**, Assistant Librarian, Jawaharlal Nehru University, Delhi, who was travelling in a Coach 3rd from the rear (Coach 'S') said that when she visited the toilet sometime after passing Vijayawada, she found the oscillation of the coach so much that she was afraid that she would fall down. This state indicated to her "that the train was running at a high speed". The journey was not smooth but "jerky and jolting". About 10—15 minutes prior to the accident there were a few jerks and then suddenly she felt that there was "a several upheaval like a storm accompanied by rattling, then a few seconds later another such upheaval and rattling effect and then the coach stopped after derailing".

5.20.2 Describing her experiences by the duplicate train after leaving Sirpur Kaghaznagar on 1-9-81, the witness said that "there was no water in the toilet and no catering arrangement whatsoever till Nagpur". The coaches were very old and in a broken condition. On 2-9-81 there was no catering till she reached Delhi at 14.00 hours.

5.20.3 The witness added that she was "pleasantly surprised to note that there was no visible indication of any attempt to rob the passengers. On the other hand the villagers appeared helpful".

5.21.1 **Sri K. S. Saibaba**, a Post Graduate student of Jawaharlal Nehru University, who travelled in 'E' compartment (Coach 'E') of the train from Vijayawada, in his deposition before the Deputy Commissioner of Railway Safety (Traffic), Lucknow, at Delhi on 21-9-81, said that he experienced severe jerks and saw things falling down when he went to the Pantry Car. He reported about the speed to the Station Master, Warangal but the latter took no notice of it. Subsequently he experienced that jerking noise was getting too much and felt that any moment his coach might be thrown out. At about 5.45 P.M. he noticed from the window that Coaches 'A' & 'B' with the engine were getting away. In the view of the witness the speed of the train was too high as compared to normal running.

5.21.2 In his communication dated 24-9-81, addressed to me by post, the witness gave among other things the following further information:

- (i) He noticed jerking, shaking and peculiar noise in bogie 'E' (Coach 'E') in which he was travelling. He was very much suspicious and had a premonition that there was a certain malfunctioning of the bogie.
- (ii) After the train left Warangal, he changed to Coach 'N' where many of his friends were travelling. Around 6.00 PM when the accident occurred there was a big explosion—like thunder.
- (iii) In his view, had his complaint been taken serious notice of at Warangal, the accident would not have taken place.

(Note:—The Station Master and the Assistant Station Master on duty at Warangal denied having been approached by the witness during the time the Express Train halted at the station. The Travelling Ticket Examiner manning Coach 'E' said that no such passenger (as the witness) travelled in Coach 'E' and there was no conversation of the nature reported between him and any passenger.)

5.22.1 Sri M. A. H. Hafeez, Station Master, Ralapet said that 'Line Clear' was taken at 17.45 hours by station Master, Asifabad Road, for the Block section Asifabad Road-Ralapet for the Express train and the witness had in turn taken 'Line Clear' for the Block section Ralapet-Sirpur Kaghaznagar at 17.46 hours. Thereafter, through signals were taken off for the train to run through the station on the Main line. The train left Asifabad Road at 17.50 hours and he was expecting it to run through his station at 17.54 hours. He was standing in the balcony of his cabin looking in the direction of the train and as it approached the Down starter he suddenly heard a 'thud-thud sound' followed by dust and smoke rising up. As the Engines approached the cabin he found that only two coaches were behind them. Red signal was immediately displayed but the train did not stop. The time recorded by him was 17.56 hours. The Station Master, Sirpur Kaghaznagar, came on phone immediately he heard the 'train on line' buzzer and witness told him at 17.57 hours about the accident but asked him to wait for details till he (witness) was able to ascertain. The Section Controller could not be contacted as the telephone was not working. At 18.05 hours Joint Director, RDSO Sri Contractor entered his cabin and noted the position of levers.

5.22.2 The witness gave the following further details:—

- (i) As he looked out for the approaching train visibility was normal, the sky was clear and it was still day light. He was able to see all signals and other objects normally.
- (ii) The Signalling and Interlocking system worked normally throughout the day during his duty hours (8 to 18 hrs.) and earlier trains had passed smoothly and there was no failure.
- (iii) During his 2½ years stay at the station he came across signal failures now and then but there were more electrical failures than mechanical failures. There was no unsafe failure.

5.23 Sri Md. Mahaboob Jan, Pointsman, Ralapet, said that as the train entered the block section "Asifabad Road-Ralapet" he took his position on the off-side of Ralapet station to exchange alright signals with the train crew. While he was looking in the direction of the approaching train, and as it was passing the Down starter he heard a loud noise followed by derailment and capsizing of coaches. Two engines and two coaches, however, proceeded on the Main line beyond the station inspite of witness displaying his red hand signal. It stopped after covering some distance. Answering a question the witness said that the train passed him at the normal speed at which Tamil Nadu Express normally passes. He did not notice anything unusual with the coaches.

5.24 Sri Rajiah Malliah, Gangman of Gang No. 1, said that at the time of accident he was on Ralapet platform opposite the cabin waiting for a passenger train which was to follow the Express train. As the train approached the yard and passed over the point there was an explosive sound and dust was raising. Simultaneously, there was a sound at the cabin also indicating the snapping of signal wires. The train approached the station at the normal speed of Tamil Nadu Express.

5.25 **Sri S. A. Azeem**, Station Master, Asifabad Road, said that the Express train ran through his station at 17.50 hrs. at its normal maximum speed of 110 km/h., and he exchanged alright signals with the train crew who acknowledged the same. The run of the train was normal and he did not notice anything unusual.

5.26 **Sri M. Hanumantha Rao**, Assistant Station Master, Rechni Road, said that as the Express train ran through the station at 17.45 hours at its usual speed he exchanged signals with the train crew who acknowledged the same. He did not find anything unusual with the train.

5.27 **Sri P. A. Venkatesan**, Driver, who worked the train between Madras and Vijayawada, said that the run from Madras to Vijayawada was smooth and he did not experience any thing unusual. He was able to create 56 cm of vacuum on the locomotive gauge and his Guard told him that he had 53 cm in the brake van gauge, although the Brake Power certificate mentioned only 55 cm and 50 cm. The train had normal brake power and he had no difficulty in controlling or stopping the train wherever necessary.

5.28 According to **Sri M. Dasaratha Ramaiah**, Guard, who worked the train from Madras to Vijayawada, the prescribed vacuum level on rear brake van of Tamil Nadu Express was only 50 cms although the level of 53 cm was maintained. The run upto Vijayawada was smooth and nothing unusual came to his notice.

5.29.1 **Shri B. L. Dada**, Vice President, Sir-Silk, Sirpur Kaghaznagar, said that he received information about the accident at about 6.30 PM and had immediately organised relief by rushing Doctors and others to the site. He himself went there within about 15 minutes. It took about 2½ hours to remove all the injured (except one trapped person) from site and by 11.15 PM they were all in the hospital. About 15 trucks were used to shift the stranded passengers from site to SKZR and all of them were accommodated for the night in various public and private places. By about 2.00 A.M. all were fed and early in the morning they were all shifted to Railway Station from where they took trains to their respective destinations.

5.29.2 An important observation which the witness made was that some of the more enlightened passengers told him during discussion that they had felt unusual bad riding on the run beyond Vijayawada and the speed at which the train was running was excessive.

5.30.1 **Dr. V. Sarveswar Rao**, Assistant Divisional Medical Officer, Bellampalli, who was the first South Central Railway Doctor to visit the site of accident, said that he reached the site at 20.20 hours. By that time several Doctors were already there attending to those who received minor injuries, but there was none to be shifted to the hospital. He was at site till 3.00 AM and later visited the Employees State Insurance hospital at Sirpur Kaghaznagar and the Singareni Collieries hospital at Bellampalli. He co-ordinated with the Doctors of Singareni Collieries hospital, Bellampalli, while his Divisional Medical Officer co-ordinated with those at Sirpur Kaghaznagar.

5.30.2 11 persons died on the spot and 5 died after being admitted to hospitals. 20 persons were grievously injured and 38 received simple injuries and 26 trivial injuries.

5.31 **Sri Posham Elliah**, Gangmate, said that he walked over his entire gang length on 28-8-81. performing the duties of Keyman and satisfied himself that the track was in a fit condition. In his view the points run satisfactorily but whenever Signal and Telecommunication department makes a programme for attention to their gear his gang also works. The frequent attention given to the points as seen from the chart was on this account and also for the attention given in connection with the test runs of oscillograph car and Amsler track recording car.

5.32 **Sri Md. Yusuf Ali**, Permanent Way Inspector, Sirpur Kaghaznagar, said that he inspected the track by trolley and later from the foot plate of an Express train on 29-8-81 and no bad spots were observed by him in Km. 209-210.

The following were among the other issues which the witness clarified in his deposition:—

- (i) Of the irregularities in versines in transitions at both ends of the curve recorded by his Assistant Engineer during his check on 6-8-81, the transition at Kazipet-end only was attended to on 20th and 21st August, '81.

- (ii) Running on the curve was good in his opinion although the versines were showing irregularities during the check on 6-9-81.
- (iii) During his foot plate inspection on 29-8-81, running on Points No. 31 (trailing for a Down train and facing for an Up train) was satisfactory and he did not feel anything bad.

5.33 Sri V. Veeramallu, Assistant Engineer, Bellampalli, gave the following particulars, among other things:—

- (i) He reached the site of accident at 19.25 hours. He could not identify the point of mount or drop during his inspection on arrival.
- (ii) From + 11.00 to + 65.20, the track was found to have shifted laterally towards left, the maximum shift of 20 cms, being at + 65.20.
- (iii) He inspected the section by push trolley on 6-8-81, from the foot plate of an Express train on 8-8-81, and from the brake van of a train on 18-8-81. He did not notice anything warranting attention during the latter two inspections.
- (iv) He checked Points No. 31 at Ralapet on 15-7-81 and nothing warranting attention came to his notice.

5.34 Sri R. N. Raghavan, Divisional Engineer-II, stated the following among other things:

- (i) He observed the condition of track on 21-8-81 and on 30-8-81 when he accompanied the Amsler Track Recording Car. Earlier on 12-8-81 he inspected the track from the foot plate of a high speed train.
- (ii) He had a general feeling that between Bellampalli and Balharshah trains run at excessive speed upto 120 km/h. He had no occasion to scrutinise speed charts of any high speed trains during his tenure of 13 months in his present post. During his foot plate inspections, however, he had seen drivers going at an excessive speed.
- (iii) He noticed a wheel set with a portion of its flange chipped off when he visited the site on the night of 31-8-81. From his observations (which he described in detail) he was of the view that the wheel with the chipped off portion negotiated the left running rail corresponding to the location of the left check rail of the crossing as could be seen from the dent marks on the rail table.

5.35 Sri P. Narayana Reddy, Additional Chief Engineer, gave the following particulars among other things:—

- (i) His 'Guess' was that the wheel with a portion of its flange chipped off was perhaps the cause of the accident (Details of dents similar to item (iii) of sub-para 5.34 above were also given by the witness).
- (ii) Rails in Kms. 209 to 211 were tested by ultrasonic rail flaw detector on 10-1-80. There were no major flaws but 59 minor flaws, 40 on the left rail and 19 on the right rail, were noticed.
- (iii) Due to shortage of ultrasonic flaw detectors and trained staff to operate them, it had not been possible to test the rails subsequently and he was aware that the failure meant violation of the statutory condition of sanction (for running the high speed trains).

5.36 Sri S.H.R. Krishna Rao, Chief Track, Engineer, gave the following particulars among other things:

- (i) Track maintenance as observed by him was satisfactory. The track could not have caused or contributed to the derailment.
- (ii) In his view there was some inherent metallurgical weakness in the wheel which was noticed with a portion of its flange chipped off. There was a possibility of this having caused the accident.
- (iii) He had some doubts about the draw hooks and buffer bolts of some coaches.

- (iv) With the current position of flaw detectors it had not been possible to comply with the periodicity of flaw detection as provided for in the safety certificate signed prior to authorisation of the high speed trains.

5.37.1 The view expressed by **Sri R. Balasubrahmanian**, Chief Engineer, in his deposition was that possibly the wheel with a chipped off flange being on the left side had caused the accident.

5.37.2 Answering a question about the track condition as revealed by the chart of the Amsler Track Recording Car which ran in the Section on 30-8-81, the witness said that the condition was within the limits prescribed for comfortable travel on high speed track.

5.38 **Sri D.A. Anand**, Deputy Director, RDSO, who was in charge of the Oscillograph Car run of 27th July 1981, produced the original records of the test run and stated the following among other things:—

- (1) As interpreted by him and his staff, there were 3 peaks in the transverse mode—two between 0.20 g and 0.25 g and one between 0.25 g and 0.30 g and one peak of 0.26 g in the vertical mode at the facing points of Ralapel.
- (2) The test train ran at 105 km/h. in km. 210-209 and 110 km/h. in km. 211-210 and the worst peaks were 0.28 g and 0.35 g in the transverse mode and 0.26 g and 0.18 g in the vertical mode in Kms. 209-210 and 210-211 respectively.
- (3) The spring deflections as recorded on the chart for Km. 209-210 would indicate an off-loading of about 23.4% at the worst point.
- (4) Oscillations recorded at a particular speed could be used for interpreting the possible oscillation at a speed higher or lower in linear proportion on the same track and same vehicle.

5.39 **Sri V. D. Ram**, Assistant Research Engineer, RDSO, produced the original charts of Amsler Track Recording Car of 30-8-81 and April '81 and gave the following clarifications:—

- (1) The maximum alignment fault was 16 mm on the left rail at Km. 210/6—7 of the curve. The record on the right rail was discarded being faulty. The kilometreage was classified as 'C' for alignment. The maximum twist recorded on the curve was 22 mm. The classification for the kilometreage was 'B'.
- (2) In regard to the Points & Crossings, the record showed the following defects:
 - Gauge 12 mm slack
 - Twist 18 mm in the clockwise direction & 12 mm in the anticlockwise direction.
 - Unevenness : 10 mm high on the left rail & 11 mm on the right rail.
 - Alignment : 10 mm at one location & 11 mm at another location.

From the record it was seen that the curve ends partly on the Points & Crossings.

5.40 **Sri M. Dharmagnani**, Train Examiner, Vijayawada, who was on platform duty when the Express train halted there, said that he and his colleagues examined the train while it halted at the station and were satisfied with its condition. There were no deficiencies nor warm boxes.

5.41.1 **Sri H. Ramachandra**, Chief Train Examiner, Madras, Southern Railway said that primary maintenance was given to the Express train rake on the evening of 30-8-81. After maintenance and replacement of parts (which he detailed) the rake was sent to Madras Central platform in good working condition. No coach was due POH. Only one coach (No. 6933) was due IOH having been last turned out from Shops on 2-2-81. About 75 litres of dash pot oil was issued on that trip for topping up in all dash pots on the rake (An empty dash pot requires 1.7 litres of oil and there were 336 dash pots on the rake).

5.41.2 Answering a question, the witness said that from his record he would identify the wheel set, a portion of the flange of which was found chipped off, as belonging to the

leading bogie of coach No. 5643 when the train left Madras. He had no records to say whether the wheel was leading or trailing on the bogie or whether the wheel with chipped off portion was on the right side or left side.

5.42 **Sri P. V. Ramaswamy**, Assistant Mechanical Engineer, Southern Railway, gave the following particulars:—

- (1) One of the wheels of a derailed coach found to be having a portion of its flange chipped off had the following defects:—
 - (1) Length of Breakage 280 mm
 - (2) Width of Breakage 80—105 mm
 - (3) Depth of breakage at the deepest portion 9 mm
 - (4) Bend in the axle 3 mm with the broken portion of the wheel 'UP'
 - (5) Wheel gauge near the broken portion 25 mm tight wheel gauge at the opposite location 25 mm slack.

In his view there was no possibility of such a breakage occurring in service.

- (2) The wheel with chipped off portion belonged to, as seen from records, the 2nd pair of wheels on the leading bogie of coach No. WSCZAC 5643 (Coach 'F').

5.43 **Sri M. Vijayaram**, Senior Divisional Mechanical Engineer, Madras, gave some maintenance particulars of the rake of the Express train, including the dashpots which arrived with inadequate oil level when the incoming train reached Madras on 30-8-81. He clarified that the flange thicknesses were regularly measured during maintenance but no records were maintained unless a particular wheel had to be changed on that account. In his opinion higher values of 'B' dimensions of bolster clearance in a bogie had no adverse effects on the running.

5.44 **Sri S. Gopalan**, Addl. Divisional Railway Manager, South Central Railway (who is a Mechanical Engineer and who was among the first to visit the site) expressed the following opinion among others in his deposition:—

- (1) The accident which occurred due to some coach/coaches ('G' Coach in his view) taking two routes was not due to any Mechanical failure.
- (2) Breakage of track check block in the region of the crossing and the lower half taking a vertical position might have formed an obstruction to the movement of the following coaches and caused the derailment.
- (3) From the track defects which he observed during the Amsler Track Recording Car run on 30-8-81 and the irregularities in the curve (as recorded on 6-9-81) he would surmise that track defects were responsible for the accident.
- (4) The speed of the train as interpreted by him from the speed chart was 114-115 km./h.

5.45 **Sri R. Gopal**, Addl. Chief Mechanical Engineer, Carriage Works, Perambur, Madras, under whose guidance two coaches of the train had been lifted and examined on 22-9-81, gave particulars of readings as per proforma and clarified the following:—

- (1) If a portion of the Spherical surface of the side bearers of the bogie is not submerged in oil and comes in contact with the side bearer, over a period of time there would be a certain amount of malfunctioning of the bronze surface but it would not affect the normal running of the coach.
- (2) The axle box spring height being below the prescribed range would indicate a weak spring which would further result in lower buffer height and the springs getting home while on run.
- (3) Wheels are not checked for old flaws as such but when a wheel is machined on a lathe for correcting its profile, if an old flaw exists, the chances of its being located at the time of machining are high.

5.46 Sri S. Rangarajam, Chief Rolling Stock Engineer, Southern Railway Madras, gave particulars of his observations during his visit to the accident site on 1st September and expressed his views on various issues. In particular, he opined that in view of there being no hit marks (except grazing marks) on either side of the wheel disc and there being no collection of ballast and also in view of the bend in the axle, the wheel might not have been hit by a vertical force; but a lateral force from outside might have caused the chipping off the flange, after the derailment. From his close observations of the damaged coaching stock he was of the view that defects on them were not responsible for the accident. In his view, even with a major metallurgical flaw, the breakage, if it were to take place in service, could have only broken the flange at the radius portion and chipping off a portion of the disc would not have occurred. With a thin flange, it could have bent and not broken, if it were to happen in service. If, for argument, the chipped off portion occurred on the run it would have caused severe battering marks which were absent.

5.47.1 Sri M.K.L. Narasimhaiah, Chief Rolling Stock Engineer, South Central Railway discussed at length in his deposition, the possibility of the broken wheel flange causing or contributing to the derailment and opined that in all probability it was a result of the accident. In his view a prior rail breakage, on the wing rail might have enabled it to get out of position and act as a ramp to enable the subsequent trailing wheel to mount. However, the broken wing rail surface indicated a fresh breakage.

5.47.2 The witness gave the following further particulars:—

- (1) His visual examination of the coaches including wheel profiles and general under gear did not reveal any defect that would have contributed to the mishap.
- (2) The breakage of the wheel flange was seen to be fresh and did not reveal any flay on a visual examination. Severe hit marks seen on the wheel would indicate that the breakage was caused by a hit.

5.48 Sri B. M. Kotiah, Signal Inspector, gave the following particulars, among other things, in his deposition:—

- (1) The interlocking and signalling installation at Ralpet was known to be working satisfactorily during his tenure of about a year in his present post. The failures which were not many were not of any unusual nature.
- (2) He inspected the installation and tested the points on 12-8-81 and nothing abnormal was noticed. Route testing was done on that occasion and everything was normal.
- (3) There was no problem with Civil Engineering maintenance of the top points at Kazipet end of Ralpet station.

5.49 Sri V.V. Deo, Senior Divl. Signal & Telecommunication Engineer, Secunderabad gave the following particulars among other things, in his deposition.

- (1) Prior to the accident the signalling & Interlocking gears at the station were working normally.
- (2) There was no difficulty in maintenance of the point mechanisms due to Civil Engineering or other deficiencies. From March 1981 there were no failures of the point mechanism.

5.50 Sri K. S. John, Chief Signal & Telecommunication Engineer, South Central Railway, gave a detailed account of his observations of the Signalling and Interlocking gears. The main points brought out in his deposition were:

- (1) The closed tongue rail was slightly bent but otherwise intact. There were no marks of its being forced open. Had it been forced open the lock stretcher attached to it will have heavy damage which was not observed. Again the tongue rail would have been bent within the first 12 inches (30 cm) which was also not observed.
- (2) The lock bar was more or less intact proving that it could not have been forced under the train for unlocking the point.

- (3) He inspected the station on 12-8-81 and found the point equipment in good condition. The point was working hard due to the track not having been packed properly. This could not have, however, contributed to the accident in any way.
- (4) In his view the wheel with broken flange on coach 'F' which might have taken the wrong road at the nose of the crossing might have initiated the accident.
- (5) There was no possibility of a sharp flange forcing open the tongue rail as the condemning limit for the flange was 22 mm and the permitted interlocking tolerance was 5 mm.

The following Railway officials who were particularly questioned in regard to over speeding of trains by Drivers and speed monitoring by the Railway Administration gave the following information.

5.51 Sri B. N. Swamy, Senior Divl. Mechanical Engineer, Secunderabad.

- (1) During his tenure of 2½ months he did not peruse any of the speed charts of high speed trains which ran on his Division.
- (2) The Locomotives which haul the (high speed) trains are from Tughlakabad, Shed on Northern Railway. The Division had not received any charts from that Railway and the witness was not in a position to produce any chart (as on 8-9-81).
- (3) He had not received a single report from Northern Railway about over speeding during the previous one year (except in one case where a dispute about over speeding was under correspondence with Northern Railway).
- (4) From the charts (since obtained between 8-9-81 & 29-9-81 from Northern Railway at the instance of the Commissioner of Railway Safety) pertaining to three months there were cases of over speeding indicated on the charts which were being analysed.
- (5) In some instances of over speeding observed on one day charts pertaining to trains worked by South Central Railway Locomotives he had counselled the Drivers and his impression was that the parties had understood the seriousness and changed themselves.
- (6) The Driver involved in the derailment of Tamil Nadu Express of 19-6-80 was found to have over speed upto 115 km on four occasions, upto 117 Kms. twice and upto 120 Kms. once as revealed from a scrutiny of 12 charts of trains worked by him between 8-8-81 & 29-8-81.

5.52 Sri R. Venkat Rao, Senior Divl. Mechanical Engineer, Guntakal—Answering a question as to what action was being taken on his Division to get over the tendency of overspeeding by Drivers (of which several instances one of them containing 65 instances against one Driver, 60 instances against another Driver between October 80 and September 81 were on record in the over speeding register), the witness said that the drivers concerned were called by him to office and warned every month. Some written advice was also given.

5.53 Sri L. N. Rao, Senior Divl. Electrical Engineer, Vijayawada Division.

- (i) Answering a question about 15 instances of over speeding (by Drivers working trains hauled by Electrical Loco between Vijayawada & Madras) which came on record between 12-5-81 and 2-9-81 as per registers maintained by his Division, the witness said that errant Drivers were warned and counselled.
- (ii) Answering a question as to why four cases of over speeding observed on the charts of Coromandal Express produced by him for the period 1-8-81 to 31-8-81 was not reflected in the over speeding register maintained, the witness said that arrangements had since been tightened so as to avoid such omissions in future.

5.54 Sri M. N. Mudaliar, Assistant Mechanical Engineer, Vijayawada.

- (i) All Express trains worked by Diesel Locomotives on Vijayawada Division belong to Kazipet shed (South Central Railway). No register for monitoring speeds of such trains was maintained by the Division nor was he in a position to produce any charts for inspection.

- (ii) The charts were not being scrutinised by the Diesel shed, Kazipet also. This included charts pertaining to Coromandal Express which is a high speed train.
- (iii) Answering a question as to whether he was aware of the clause requiring monthly scrutiny of charts of high speed trains by an Officer of the Mechanical Department, the witness said that he was recently promoted to the post and was not aware of the instructions.

5.55 Sri R. D. Ayaganollu, Divl. Mechanical Engineer, Hyderabad Division.

- (1) Answering a question as to what action was being taken on his Division to get over the tendency of overspeeding by Drivers (of which several instances—One of them containing 67 entries against a single driver between 1-1-81 & 30-8-81—were on record in the overspeeding register) the witness said that he spoke to the Driver on a few occasions when he met him in the shed and asked him to be careful.
- (2) Insertion of speed charts on trains worked by Drivers of Purna loco shed suffered for some months upto June, 1981 due to short supply of blank charts. The position had since improved.

5.56 Sri S.S. Nair, Diesel Driver Instructor—Hubli Division.

- (1) Answering a question as to the action taken to prevent recurrence of frequent instances of overspeeding which in one case had 40 entries against one single driver between 7-12-80 and 31-8-81 as seen from the register produced by him, the witness said that the Driver was called to office and counselled and warned. If overspeeding continues he will be chargesheeted and punished.
- (2) Answering a question as to why against several entries of overspeeding remarks about defective meters were being recorded and whether such defective meters were tested subsequently to establish the remark, the witness said that as Diesel Locomotives were maintained by Guntakal shed (not under Hubli Division) the cases were only being reported to the shed but there was no feed back from the shed.

5.57 Sri Deepak Anand, Senior Divisional Mechanical Engineer, Northern Railway, in charge of Diesel Loco Shed of Tuglakabad, stated as follows:—

- (i) Speed charts of locomotives are removed on their arrival in the shed and scrutinised. Whenever overspeeding is detected a letter is issued to the concerned Senior Divisional Mechanical Engineer and the Loco Foreman.
- (ii) Asked to state if he would recollect any instances of overspeeding reported to the Divisions, the witness said that the matter is dealt by the Loco Inspector concerned and does not go to him. From the file available with him during his deposition he observed three such letters issued in respect of Tamil Nadu Express of 25th, 27th, 28th of August 81 on Secunderabad Division. He did not have any particulars relating to earlier periods and promised to furnish particulars during the subsequent sitting of the inquiry on 1-10-81. On 1-10-81 he reported that it had not been possible to locate any files relating to the earlier period.
- (iii) Answering a question whether the analysis of speed charts in his shed covered temporary and permanent speed restrictions, the witness said that his shed would not be having a record of the permanent and temporary speed restrictions in the entire section, especially of foreign Railways which are covered by Northern Railway locomotives. Further in his view if the restriction was lasting for only a few minutes the resolution in the chart would not be adequate to ensure that the Driver had followed the speed restriction throughout the kilometreage.

5.58 Sri F. A. Sequira, Divisional Safety Officer, Secunderabad.

- (1) He had no occasion to see the chart of any Super Express during his 7 months tenure on the Division.
- (2) He had occasion to check any control chart with a view to monitor the speeds of fast trains and there was no procedure also for such scrutiny.

5.59 Sri V. Viswanathan, Divisional Railway Manager, Secunderabad.

- (i) Answering a question as to what follow up steps were taken to avoid recurrence of overspeeding of the type which came to light from the Proceedings of the Inquiry conducted into the derailment of Tamil Nadu Express which occurred a year earlier on his Division, the witness said that apart from punishing the Driver, no other follow-up action was taken.
- (ii) Asked to comment on the performance of certain trains in Repalliwada—Asifabad Road block section where a temporary speed restriction of 15 km./h was in force for six days in the last week of August '81 (extracted at my instance), the witness expressed the view that a loss of 2 minutes by an Express Train to observe a 15 km/h. restriction was in order.
- (iii) Asked to confirm whether the notification of loss of time for various restrictions gazetted by South Central Railway in March 1977 and the figures given by RDSO in their Mechanical Engineering Report No. M. 46 stood superseded by his above views, the witness avoided a direct answer but said that time tables on South Central Railway were framed on the basis of 3 minutes for acceleration and decelerations of a stopping train and for the non-stopping trains the Guard was expected to book the actual time taken for observing the restriction.
- (iv) Asked if he was aware of the fact that the assurances given in the Safety certificate signed by South Central Railway Administration prior to the introduction of high speed trains in January 1979 were not being honoured on his Division, the witness replied in the negative.

5.60 Sri S. Abuzar, Chief Mechanical Engineer, South Central Railway.

- (i) Asked to confirm if he was satisfied that the assurances given by South Central Railway Administration about scrutiny of speed charts to ensure observance of all temporary and permanent speed restrictions under items 5 & 17 of the Safety certificate signed in respect of High speed trains were being honoured on the Railway, the witness said that the issue pertains to Chief Operating Superintendent who controls the operation of trains on the Railway and there is an Officer in Senior Administrative level to assist the Chief Operating Superintendent in that respect.
- (ii) Asked to confirm if the directives (about speed monitoring of trains) of the Railway Board to Railways in terms of their communication of 10/11-9-80 to Chief Commissioner of Railway Safety was getting implemented on South Central Railway satisfactorily, the witness said that machinery exists to check the speed recorded charts and evaluate them.

5.61 Sri J. Rajagopalachari, Chief Traffic Safety Superintendent, South Central Railway.

- (i) Asked to say if he was satisfied that overspeeding of trains was not a problem on South Central Railway, the witness admitted that he was not satisfied with the existing machinery to detect cases of overspeeding with reference to speed charts. He listed out the limitations of speed charts now in use on trains and detailed the steps being taken by the Railway Administration to solve the problem. One was to acquire sophisticated speed sensing devices to be used at random for ambush checks and the other, a proposal to acquire Hasler type speedometers for use on Express trains in replacement of the existing ones.
- (ii) Asked to confirm if the assurances (about speed monitoring of high speed trains) given in the safety certificate signed by his predecessor (prior to introduction of high speed trains in January 1979) were being honoured by the Railway the witness said that he was satisfied that the necessary machinery existed on the Railway for adhering to the assurances given under items 5 and 17 of the Safety Certificate. As to the implementation of the same, it was the responsibility of the Mechanical Engineers on the Divisions reporting to the Divisional Railway Manager/Chief Motive Power Engineer/Chief Operating Superintendent (in that order).

5.62 Sri S. B. Mohindra, Chief Motive Power Engineer.

- (i) Answering a question about the machinery at Railway Headquarters to watch the compliance by the Divisions of the instructions to monitor speeds of high

speed trains in compliance of the assurances given in the Safety certificate signed by the Railway Administration, the witness said that it was watched at the Divisional level and checked only by Headquarters Officers during their routine inspections.

- (ii) Answering a question as to whether the failure of the Divisions in the matter of watching the compliance of the assurances given in the Safety Certificate would not amount to the failure of the Railway Headquarters, the witness agreed that it was so.
- (iii) Answering a question about the compliance of the Railway Board's instructions (to the Railway as a sequel to the report of inquiry into the derailment of 204 Down Mahalaxmi Express on 3-12-79) to monitor speeds of Express trains, the witness denied the suggestion that effective follow up action was not taken. In his view the number of errant drivers was exceedingly small and they were being taken up when cases of overspeeding came to notice.
- (iv) Confronted with the case of a Driver in Guntakal Division who had over 60 instances of overspeeding in less than a year prior to September 1981 and when asked as to whether the action against errant Drivers cannot be termed as ineffective where instances of that nature were on record in the registers of all the sheds, the witness said that he held no brief for such errant Drivers and that the Railway Administration was well aware of such cases and had recently procured sophisticated instruments for carrying surprise inspections at vulnerable spots where overspeeding can take place.

5.63 Sri D. Francis, who travelled on the train from Madras, bound for New Delhi in his communication dated 25th September 1981 stated that the train was on "normal speed" upto Vijayawada and thereafter it ran at "tremendous speed". He experienced a 'Tremendous jerk' and 'heavy thwart' when the train came to a sudden stop at 5.50 p.m. at Ralapet.

VI. OBSERVATIONS AND TESTS

6.1 Observations

6.1.1 I travelled on the foot-plate of No. 123 Andhra Pradesh Express of 2-9-1981 from Kazipet to the site of accident, a distance of about 150 kms. observing the track conditions as well as the operating conditions under which Tamil Nadu Express had travelled 48 hours earlier to its destiny, maximum permissible speed and actual timings being the same for both the trains.

6.1.2 On arrival at site around 18-00 hours I made a quick survey of the situation for about 45 minutes till darkness set in.

6.1.3 On 3-9-81 I spent about four hours at the site observing in detail various aspects of the accident. On 4-9-81 I spent nearly 90 minutes and again on 6-9-81 about four hours seeking clarifications to some of the observations I had made earlier in the light of evidence recorded till then.

6.1.4 Some of the significant observations made during my site inspection are briefly indicated below. I shall at a later stage of the report, under the heading 'Discussion of evidence' deal with each of these observations in detail and record my conclusions thereon.

NOTE: In what follows under this chapter and in the next chapter the chainages of various objects, clues, etc., observed during my site inspection were with reference to the rear buffer end of the last coach of the train when it came to a stop after the accident. This point is referred to as Zero and locations of all objects towards Balharshah end are shown as positive and those towards Kazipet end as negative, all figures being in metres and decimals of metres. The site plan accompanying this report as Annexure IV shows all the objects observed and their respective locations.

- (1) The point of mount or drop of the first derailed vehicle was reported to be not traceable by Railway Officials who reached the site soon after the accident. Considering the manner in which the track had been damaged and ploughed through I was satisfied with their observations.

- (2) Between + 11.00 and + 65.20 the track was reported to have been found in shifted condition, the shift being zero at + 11.00 and 20 cm at + 65.20. Although the shift had been rectified at the time of restoration there was evidence of the shift at the site and I accept the Chief Engineer's observations of the shift soon after he reached the site before restoration operations commenced.
- (3) Track had progressively been found damaged from + 65.20 towards Balharshah end and the damage was total at around + 100.00. The theoretical transition of the curve was between + 20.40 and + 90.40. The point of take off of the turnout commences at + 111.50 and the entire lay out was found completely smashed and components thrown out, with the crossing having been thrown towards the right by about 11 metres longitudinally and 8 metres laterally, the right side check rail and running rail having been deposited a little beyond the crossing on to its right, the right side tongue rail and stock rail having been thrown on to the left by about 40 metres longitudinally and 9 metres laterally, the left hand switch having pierced through the body of 'M' coach and a wing rail piece having been deposited 50 metres longitudinally and 40 metres laterally on the left side of the alignment.
- (4) Beyond the turn-out and upto about + 230.00 where coach 'G' was found lying across the two tracks the track was found completely ploughed through.
- (5) Beyond + 230.00 and upto about + 330.00, the last mark of derailed wheels to be noticed on the wooden sleepers, the damage was very light. The wheels which had derailed and travelled on sleepers moved progressively from left rail towards the right rail and the left wheels of coaches 'C' and 'D' were still inside the track in their lateral drift but close to the right rail of the Main line.
- (6) The disposition of various coaches as they came to rest would indicate some clues as to which of the coach or coaches might have derailed first and the effect of their derailment on others at either end.
- (7) One of the wheels (later identified as belonging to the front bogie of Coach 'F') had a portion of its flange chipped off and the wheel was lying at + 217.98, about 8.21 metres to the right of the alignment. The sheared off portion could not be located at the site of accident.
- (8) The front draw hooks of coaches 'C', 'E' and 'F' had also been found sheared off with the sheared off portions lying within the area of the accident.
- (9) The damaged lock bar of the facing point and its dispositions was also noted. While the right rail to which the lock bar had been fitted was in position the corresponding left rail was found deposited on the left side of the alignment about 20 metres longitudinally and 10 metres laterally.
- (10) The speed charts fixed in the Tachographs of both the locomotives of the train were made available to me, along with the Tachographs. One of them contained record of the run from Vijayawada upto the site of accident on 31-8-81 while the other did not. Earlier recordings of the movements of the two locomotives from 29-8-81 were available in both.

6.2 Tests

6.2.1 The Tachographs were tested with the Master Gauge of Diesel Loco Shed, Kazipet, South Central Railway, on 4-9-81 and with the Master Gauge of Lallaguda Workshops on 8-9-81 by the respective Mechanical Engineers of those sheds and their reports have been made available to me. The functioning of the Tachographs was tested by running the same locomotives which worked the Express train fitted with the Tachographs to haul the special train which transported me from Sirpur Kaghaznagar to Secunderabad on the night of 6/7-9-81.

6.2.2 The instruments were tested by M/s. International Instruments Ltd., Bangalore at my request and their test report is placed on record. I was present during the calibration of the instruments and some of the tests conducted by the Firm.

6.2.3 The speed chart was also analysed by the Firm and their report is made available to me. The report contains clarifications to some of the points referred to them.

6.2.4 The Director, Indian Institute of Science, Bangalore, was requested to interpret certain aspects of the Chart using scientific aids and the report received from the Institute is placed on record.

6.2.5 The portion of the wheel from which a portion of the flange was found sheared off was subjected to metallurgical and other tests at the National Aeronautical Laboratory, Bangalore, at my request and their test report is placed on record.

6.2.6 **Deputy Commissioner of Railway Safety's Observations.**—At my request, the Chief Commissioner of Railway Safety, Lucknow, deputed the Dy. Commissioner of Railway Safety (Mechanical) to visit the site on 4-9-81 and make detailed observations/tests on the rolling stock. His report is placed on record.

6.2.7 **Report from Southern Railway Workshops, Perambur.**—At my request coaches 'B' and 'C' were worked to Southern Railway Workshops, Perambur, Madras, and subjected to a detailed inspection after lifting. The report of the Additional Chief Mechanical Engineer, Perambur Workshops, is placed on record. I visited the shops during the detailed inspection of the coaches and made a general inspection of their condition.

VII. DISCUSSION

7.1 **Time of Accident.**—According to the train Guard, the train ran through Bellampalli at 17.38 hours, Rechni Road at 17.45 hours, Repalliwada at 17.48 hours, Asifabad Road at 17.54 hours and met with the accident at 17.58 hours. According to the Section Controller who gets his timings from the stations, the train ran through Bellampalli at 17.35 hours, Rechni Road at 17.40 hours, Repalliwada at 17.45 hours and Asifabad Road at 17.50 hours. While there was a difference of three minutes between the two sets of timings at Bellampalli and Repalliwada the difference was five minutes for Rechni Road and four minutes for Asifabad Road. As the timings recorded by the four consecutive stations were uniformly consistent and as I have reason to believe that the Guard was motivated in recording some-what different timings, I accept the station timing of 17.50 hours for the train to have run through Asifabad Road. Adding three minutes for the run from Asifabad Road to the accident spot, I determine 17.53 hours as the time of accident.

7.2 Speed of the Train at the time of accident

7.2.1 **Assessment of the train crew.**—The Driver stated that the train was running at about 90 Km./h. This was corroborated by the Diesel Assistant. The Guard estimated it as 100 Km./h.

7.2.2 **Assessment of eye witnesses.**—The pointsman of Ralapet who was standing on the off-side of the station to exchange 'All right' signals with the train and a Gangman of Ralapet who was on the Platform at the time of the accident stated that the train was approaching the station at the normal speed of Tamil Nadu Express.

7.2.3 Assessment of persons (other than train crew) who were on the train

- (1) Shri Zahir Ahmed, Assistant Guard: 'normal speed'.
- (2) Shri Ramachandra Rao, Train Superintendent: 'maximum speed of 110 Km./h.'
- (3) Shri S. N. Contractor, Jt. Director, R.D.S.O: 'a little higher than the maximum speed it was suppose to go'.
- (4) Shri S. Palanivelu, Electric Chageman: 'normal speed'.
- (5) Shri T. N. Verma, Passenger: 'higher than its normal speed'.
- (6) Shri A. V. Bhaskara Rao, Passenger: 'Smooth like any other journey by the same train'.
- (7) Shri A. Chakravarti, Passenger: 'usual speed'
- (8) Shri C. Muralikrishnamurthy, Train Examiner: 'maximum speed of 110 km./h.'
- (9) Shri T.V. Srinivasan, Retired Chief Operating Superintendent of Indian Railways: 'good speed'.

- (10) Shri M. P. Radhakrishnan, Passenger: 'Faster than a superfast train and may be between 100 and 120 Km/h'.
- (11) Shri K. M. Cherian, Medical Superintendent, Southern Railway: 'Usual speed of a Superfast train'.
- (12) Shri Purushottama Rao, Passenger: 'really overspeeding'.
- (13) Shri P. Munuswamy, Catering Bearer: 'normal speed'.
- (14) Shri K. Anbumani, Catering Bearer: 'high speed'.
- (15) Shri Shamsher Singh, Addl. General Manager, South Central Railway: 'dozed off at the time of the accident—normal speed earlier'.
- (16) Shri K. Gopalakrishna, Passenger: 'About 100 Km./h, normal for a high speed train'.
- (17) Miss Sushila Subramanian, Passenger: 'at a high speed'.
- (18) Shri K. S. Saibaba, Passenger: 'too high compared to normal running'.
- (19) Shri D. Francis, Passenger: 'Tremendous speed'.

7.2.4 Information from the Guard's journal

7.2.4.1 The Guard recorded that the train took three minutes to clear the Block section between Rechni Road and Repalliwada. This is one minute less than the minimum running time of four minutes provided in the Working Time Table. Even if this is considered to be not representing the actual time taken precisely, the time booked by him for the two block sections Rechni Road Repalliwada and Repalliwada—Asifabad Road was nine minutes against eight minutes minimum running time provided in the Working Time Table. From the booked time of nine minutes, two minutes were accounted by him for observance of a temporary speed restriction of 15 Km./h. which was in force in Repalliwada—Asifabad Road section on that day. This would mean that the train ran at a speed higher than the maximum permissible speed of 110 Km./h. in those two block sections, besides not observing the speed restriction properly. This conclusion is corroborated by the recording on the speed chart.

7.2.4.2 For the earlier two block sections Mandamari—Bellampalli and Bellampalli—Rechni Road, the Guard booked 15 minutes against 11.5 minutes of minimum running time provided. The train ran through the loop line of Bellampalli for which the Guard's account of three minutes was included in the total of 15 mts.

7.2.4.3 As per a Notification issued by South Central Railway on 13-3-1977 under the authority of the Chief Operating Superintendent, the time loss estimated for a Diesel hauled Express train, passing through a standard loop line at 15 Km./h. is six minutes and for observing a short restriction of 15 Km./h., four minutes. From the timings booked by the Guard, the train lost only three minutes for the loop and two minutes for the restriction of 15 Km./h.

7.2.4.4 The time loss given by South Central Railway Notification falls short of the figures recommended by RDSO in their Mechanical Engineering Report No. 46 for the above two types of restrictions required to be observed by the train. The latter was against based on declaration from 95 Km./h. and back to 95 Km./h. after passing the restriction spot against 110 Km./h. for a high speed train which should take more time for attaining the maximum speed after deceleration and accordingly more loss of time on account of the observance of restrictions. The fact that even what has been authorised by the Railway Administration was not observed by the train would indicate the manner in which authorised speeds were violated and the contempt with which speed restrictions were treated by the Driver.

7.2.5 Information from the Speed Chart

7.2.5.1 Tachographs were fitted on both the train locomotives and from the record available on the charts from New Delhi to Vijayawada on 29-8-81 and 30-8-81 both were found to be working. The locomotives were used for some local trips during their waiting period between 30-8-81 and 31-8-81 and even on those trips both the tachographs were found to be working. However, for the run between Vijayawada and Ralapet (site of accident) on 31-8-81, the chart on the tachograph fitted to the leading WDM-2 locomotive No. 17562 was not found to have recorded the speed.

7.2.5.2 The tachograph fitted to the trailing WDM-2 locomotive No. 17621 was found to have recorded the speed on the chart fitted but the commencing point at Vijayawada, was around 11.40 hrs. against 13.35 hrs. recorded by the Guard for departure of the train from Vijayawada. Similarly, at the time of accident, the chart recorded an abrupt deceleration to zero at around 16.00 hrs. while the accident is determined to have taken place at 17.58 hrs. (and the stopping time of the locomotive which ran for over 2.2 Kms. after the derailment as 17.55 hours). The actual running time of the chart between Vijayawada and Ralpet was four hours and 20 minutes in both cases, and accordingly I consider that there was wrong setting of the chart at Vijayawada. There should have normally been no cause for opening the tachograph at Vijayawada as the charts were designed to record for 7 days non-stop but the circumstances under which this disturbance had occurred could not be ascertained.

7.2.5.3 The chart is found to have recorded the decelerations and accelerations due to speed restrictions enroute, the scheduled halt at Warangal between 13.51 and 13.58 hrs (15.51 and 15.53 hrs. as per the Guard's journal) and an unscheduled halt at Peddapalli between 14.56 hrs. and 15.05 hrs. (17.00 hrs. and 17.03 hrs. as per Guard's journal). The chart has also recorded a deceleration upto around 40 Km./h. at about 15.38 hrs. passed through Pellampalli loop (17.35 hrs to 17.38 hrs. as per Guard's journal) and another deceleration of around 65-70 Km./h. at about 15.50 hrs. (observed 15 Km./h. restriction between Repalliwada and Asifabad Road stations through which it ran at 17.48 hrs. and 17.54 hrs. respectively as per Guard's journal) before dropping down to zero at around 16.00 hrs. (17.55 hrs. as determined) when the locomotive came to a stop after negotiating 2.2 Kms. beyond the point of derailment. From these timings I concluded that except for the time lag appearing on the chart, the tachograph recorded the various aspects of running normally with a lag of 115 minutes, the slight variation at some locations being on account of the Guard's erroneous or motivated bookings at some restriction spots or halts for his own reasons.

7.2.5.4 It is observed from the speed graph on the chart that it ran close to 120 Km./h. for a major part of the run between Vijayawada and Ralpet. From Bellampalli onwards it decelerated to some extent to observe speed restrictions but was again close to 120 Km./h. some minutes before approaching the site of accident. Significant observations made on the tachograph chart are detailed below:

(i) At the simulated speeds of 40, 60, 80, 100 and 120 Km./h. on the test bench of M/s. International Instruments Limited, Bangalore, the speed indicator of the tachograph fixed on locomotive No. 17621 indicated 38.5, 59, 79, 100 and 116.5 Kms. respectively. The Engineers of the Firm attributed the cause for variation of the indicated speed of 116.5 Km./h. against the specified speed of 120 Km./h. 'to the stopper not being properly adjusted at the time of servicing'.

(ii) The firm have read the speed recorded on the chart at the time of derailment as 119.5 Km./h. Their observation in this regards was as under:

"The speed recording mechanism is functioning normally. The recorded speed, however, may vary if the calibration setting at the time of servicing/calibration is not properly adjusted."

In other words what had been recorded as 119.5 Km./h. need not mean that the speed attained was only 119.5 but depending on the adjustment it could be more than 119.5.

(iii) As observed on the time-distance graph, the total distance covered by the locomotive from the time it commenced its journey at Vijayawada was 37 full 'V' formations plus nearly 4 kms. at the commencement and nearly 4 kms. at the end of its journey indicated by the respective partial 'V' formations. This determines the total distance covered as 378 Kms. As per the Working Time Table the kilometrage of Vijayawada is 586.50 and the locomotive came to a stop after the accident at Km. 207/4 (207.25). Considering the two factors viz. (i) the locomotive started from the end of the platform of Vijayawada while the Kilometrage of Vijayawada is reckoned as at the centre of the station building and (ii) the train by-passed Kazipet station via the by-pass line while the Kilometrage given in the Working Time Table is through Kazipet station, the computed distance of 378 Kms. as recorded by the chart tallies with the actual distance covered by the train.

In view of this I conclude that the chart had precisely recorded this parameter.

- (iv) M/s. International Instruments Ltd., have calculated the speed of the train at the crucial point from the Time-distance record and arrived at the figure of 136 Km./h. at a location 0.7 km. from the derailment point. During my visit to the Firm's premises I observed that they had used their 'profile projector' for the purpose, which is a 'winkel Messer' (angle measuring) instrument of West German make capable of magnifying an object upto 100 times and having a least count of 0.01 mm for measuring distances and 30 seconds for measuring angles. They had placed the original chart on the instrument for making measurements.
- (v) The report from the Indian Institute of Science indicates that they had also used a method similar to that used by M/s. International Instruments but by photographing the original chart using a 35 mm camera with close-up lens and projecting it on to a flat surface enlarging the record 100 times. The AVERAGE Speed as obtained by them for the two kilometres length (between 3.5 km. and 5.5 km. from the point of stoppage of the locomotive which is the same as 1.3 Kms. and 3.3 Kms. from the point of derailment) as 128.5 Km./h. They have also stated that uncertainty in measurement could be $\pm 6\%$ by this method which determines the speed in the range between 120.8 and 136.2 with 128.5 as the average position. To my inquiry as to how the 'uncertainty in measurement' was arrived at, the Scientist-in-charge explained that they had taken a number of measurements which ranged between the two extremes with the average being 128.5.
- (vi) The Indian Institute of Science had also calculated the speed, using the profile projector (Winkel Messer) of M/s. International Instruments Ltd., and the original tachograph as a cross check on the method described earlier. According to their observations by this method the average speed over 2 kms. (between 0.7 km. and 2.7 km. behind the point of derailment) was 134.4 Km./h. with an uncertainty of $\pm 5\%$. They have also made a mention in their report of a third method which they have rejected as unreliable.

7.2.5.5. Of the estimates of the speed made by the two Agencies, I accept the figure of the Indian Institute of Science as being more reliable having been undertaken by reputed Scientists, and consider that the speed of the train shortly before it derailed was of the order of $134.4 \pm 5\%$ as determined by them from a direct measurement from the original chart. Giving the benefit of doubt about the uncertainty factor of $\pm 5\%$ to the Driver I accept the figure of $134.4 - 6.7 = 127.7$ or 128 Km./h. as the speed at which the train was running at the crucial moment as per the speed chart of the tachograph fixed on the train locomotive. This is close to the average speed of 128.5 Km./h. arrived at by them by an alternative method of computation.

7.2.5.6 One aspect which requires clarification at this stage is whether any error on account of the actual wheel diameter of the locomotive on which the mechanism was mounted for tachograph record has to be provided for while computing the speed from the time-distance graph. Since the simulated speed on the test bench is for a wheel dia. equivalent to 1090 mm and as the actual dia. of the wheel on the locomotive in question was 1045 mm., the speed arrived at by using the Time-speed graph would be subject to correction on this account. For speed calculated on Time-distance graph, no such correction is to be applied as the time and distance are directly measured on the chart and the number of revolutions made by the wheel per minute has no relation to this record. This view is also corroborated by the precise recording on the chart giving 37.8 V formations for the total distance of 378 Kilometres covered by the train locomotive which is precisely 10 kilometres per V formation as per design of the chart (see sub-para (iii) of para 7.2.5.4 for explanation).

7.2.5.7 On a careful consideration of the factual, material and circumstantial factors brought out in paras 7.2.1 to 7.2.5.6, I reject the evidence of the train crew in respect of speed and conclude that the speed of the train at the moment of derailment was of the order of 128 Km./h. as computed from the chart by the Scientists of the Indian Institute of Science, Bangalore. This is supported by corroborating evidence from the Guard's journal (para 7.2.4), the statements of several of those who were on the train at the time of accident (para 7.2.3) and the propensity for overspeeding on the part of Shri E. O. Lever as established by his own record during the weeks preceding the accident (para 7.7.10).

7.3 Track condition

7.3.1 I have carefully inspected the track for over three kilometres—two kilometres behind the site of accident and one kilometre beyond the accident zone. The approach alignment is on a curve of 1167 m. radius ($1\frac{1}{2}^\circ$ curve) with prescribed transitions of 70 mm and a super-elevation of 70 mm. The curve as designed is suitable for the authorised speed of Tamil Nadu Express. The track which consists of 52 kg. rails on CST-9 sleepers to M plus 7 density was provided with adequate stone ballast. A detailed check of the curve (except the Balharshah end transition which was not in alignment consequent to the restoration of the track after the accident with temporary reverse curves) indicated, poor alignment. At the worst situation between three consecutive stations of 5 m. each; the versines on 10 m. chords varied from 12 mm to 0 and back to 10 mm. (10.5 mm versine on a 10 m. chord would indicate a curvature of $1\frac{1}{2}^\circ$). At another place it recorded versines of 15 mm, 4 mm, 12 mm, 5 mm and 10 mm, respectively at five consecutive stations. The transition at Kazipet-end was equally poor, the versines at stations 1 to 14 (a total of 70 m.) being 5, 5, 10, 3, 10, 5, 3, 10, 15, 7, 5, 8, 10 and 7 mm. From this condition of the curve which was recorded on 6-9-81 and the frequency of attention given to the transition at Kazipet-end I conclude that the curve in general and its approaches in particular go out of alignment very frequently resulting in rough running.

7.3.2 About the condition of the Balharshah end transition which is more relevant to the accident, nothing is known as it had been destroyed in the course of the accident. Results of three consecutive inspections on 12-12-80, 20-5-81 and 6-8-81, records of which are available, would give the following picture:

Station No.	Prescribed versine in mm. on 20 m chords	Actual versines on		
		12-12-80	20-5-81	6-8-81
0	—	—	—	—
1	—	—	1	1
2	—	—	4	2
3	—	—	2	3
4	—	4	5	5
5	6	8	6	10
6	12	14	13	16
7	18	20	22	22
8	21	29	45	35
9	30	34	35	35
10	36	40	38	38
11	42	42	43	43

7.3.3 Other records.—A test run was undertaken by RDSO's Amsler Track Recording Car on 30-8-81, a day before the accident. The alignment of the left rail recorded a defect of 16 mm at the Kazipet-end transition and two defects of around 10 mm at the Balharshah-end transition. The right rail alignment was stated to have not been recorded as there was some defect in the gadget. It may be added that the alignment record on the instrument is on 7.2 m. chords as against 10 m. chords adopted in the special check conducted at my instance on 6-9-81 and of 20 m. chords adopted during the three routine inspections.

The twist recorded on the curve was also high, being of the order of 22 mm. at Kazipet-end and 18 mm at Balharshah-end. Unevenness and gauge variations were also high.

7.3.4 The oscillograph Car was on run by RDSO in the section on 27-7-81, five weeks prior to the accident. The chart recorded a lateral peak of 0.35 g. at Kazipet end of the curve, three peaks of 0.24 g., 0.26 g., and 0.32 g. on the circular portion and a 0.28 g. peak at Balharshah end.

7.3.5 Facing points No. 31 of Ralapet.—The layout comprised 52 kg. R 1 in 12 standard right and turn-out laid over steel through sleepers in 1975. The crossing was reconditioned by welding metal over the work out portions in 1978 and 1980. Prior to the accident it was inspected by the permanent Way Inspector on 14-7-81 and by the Assistant Engineer independently on 15-7-81 as per records. The only significant points as recorded during these inspections were that (i) the cross level at the heel of the switch was 8 mm low on the left rail on Main Line (ii) the cross-level at the toe was 5 mm low on right rail and (iii) the cross-cross level at the nose of crossing was low on the left rail on the Main Line by 4 mm. The Oscillograph Car run on 27-7-81 recorded two lateral peaks of 0.28 g and 0.24 g and one vertical peak of 0.26 g. The Amsler Track Recording Car run on 30-8-81 recorded alignment defects upto 10 mm, twist upto 18 mm, gauge variation upto +10 mm and unevenness upto 11 mm.

Maintenance records indicated attention to the points and crossings after the Oscillograph Car run of 27-7-81 but not after the Track Recording Car run on 30-8-81.

7.3.6 From what has been discussed in paras 7.3.1 to 7.3.5, I conclude that the track in the approach of the facing points and on the turn out itself was not upto the mark expected of a Group 'A' route permitting High Speed trains. Trains negotiating the curve and the facing points from Kazipet end at speeds upto 110 Km./h. could be expected to give bad lurches making it uncomfortable for the passengers. I do not, however, consider that the condition was such as would have caused unsafe conditions at the maximum authorised speed of 110 Km./h. when it is viewed in isolation.

7.4 condition of the Signalling and Interlocking Installation

7.4.1 The entire field interlocking mechanism around the facing points had been destroyed in the accident and it has not been possible to know the condition of the mechanism except the following which may help in assessing its condition:

- (i) The lock bar ahead of the toe of the switch was in locked position for main line.
- (ii) The right tongue rail of the point assembly which was found thrown out on to the left of the alignment, though bearing some marks of wheel riding, bending etc. shows that there had been no forced or violent opening of the switch by a moving wheel.

7.4.2 A junior Administrative Grade Signal and Telecommunication Engineer of RDSO, Lucknow, who was on the train and who had within about 20 minutes of the occurrence gone up the Cabin and noted the particulars of the levers operated, deposed that the levers had been correctly pulled for sending the train on the Main line with all signals correctly cleared. The Station Master had stated that the installation had earlier been working satisfactorily and he did not anticipate any faulty working. The particulars given in the depositions of the Signal Inspector and the Senior Devisional Signal and Telecommunication Engineer as also the inspection of the relevant failure register for the past failures at the installation would give no indications of any fault in the signalling equipment. The Chief Signal and Telecommunication Engineer who inspected the station three weeks earlier found everything normal. The fact that the two locomotives and two coaches went correctly on the Main line would dispel any doubts about any of the following vehicles taking the wrong path at the points due to interlocking defects. I accordingly consider that there was no fault in the signalling and interlocking installation at the time the train passed through the facing points.

7.5 Rolling Stock condition

7.5.1 Some of the coaches, the condition of which would be crucial for determining the cause of the accident were so badly damaged that it became impossible to know from what remained of them at site their condition prior to the accident. As with track and signalling equipment, so with the rolling stock condition, I have to rely mostly on circumstantial evidence as discussed below:

- (i) None of the coaches forming the rake of Tamil Nadu Express was overdue periodical over-haul. In respect of the intermediate over-haul, only one coach become due on 2-8-81. but Southern Railway Administration stated that as overhaul of coaches is done on monthly reckoning, the IOH of the coach could only be called 'over due' after 31st

August 1981. Whatever may be the relevance of this argument, I feel that a few weeks beyond the due date would not have caused undue deterioration in the condition of the particular coach and as such am inclined to ignore it.

- (ii) The monthly schedule of inspection of roller bearings was also upto date in respect of all coaches and there was also no evidence at site about the failure of any roller bearing on the coaches.
- (iii) I have gone through the maintenance registers of the coaches and from what I saw in the registers (about various maintenance aspects brought out therein) I am of the view that maintenance of coaches had generally been satisfactory.
- (iv) In the matter of dash pot maintenance on coaches, my experience has been that Railways tend to neglect them even on Express trains. On the rake of Andhra Pradesh Express which I inspected on the line at Secunderabad in August 1981 and the Kerala Karnataka Express which I had inspected on more than one occasion, the condition of dash pots was not generally satisfactory, attributed by maintenance men to causes beyond their control. I observed also from the entries in the register of the rake of Tamil Nadu Express that the condition of the dash pots was not too good requiring about 77 litres of oil to make up the deficiencies, which cropped up in a round trip from Madras to Delhi and back. Dash pots in some coaches, viz. 'F', 'G', 'I' and 'K' were particularly not good and their condition must have been reflected in the quality of their running. I am of the view that the condition of the dash pots might have been one of the causes for several of the passengers (who deposed before me) to have complained of rough running, particularly after the train left Vijayawada when the speed was continuously high in long stretches of track. If track imperfections (the evidence for which is considerable as seen from the chart of the Amsler Track Recording Car which tested the section on 30-8-81) are to act in conjunction with high speed and imperfections in rolling stock, the combined effect could have been what the passengers had actually given expression to in their depositions, about the rough running they had experienced on the run after Vijayawada.

7.5.2 Another aspect of maintenance which has not been very satisfactory on the coaches of Express train rakes is in respect of running clearances between the top of bogie frame above bolster spring (Dimension 'B') and clearances between axle box casting and bottom of bogie frame (Dimension 'A'). During the detailed inspection of the coaches involved in the derailment of Kerala Karnataka Express on South Central Railway in May 1981, it came to light that this was another aspect which was not receiving adequate attention in Southern Railway Carriage Repair Workshops. A similar situation was also noticed by me in respect of two coaches of Tamil Nadu Express rake which were subjected to detailed inspection after lifting in Perambur Workshops on 22-9-81. Although the Senior Divisional Mechanical Engineer whom I questioned about this maintained that excessive clearances will not have adverse effects on running, I am unable to agree with that view and consider that excessive bolster clearances recording as much as 53 mm against the standard of 40 mm (in coach No. 6933 which had not derailed) must be generating considerable oscillations of the coach and when acting in conjunction with high speed and track imperfections must be causing severe rough running given expression to by the passengers. While I have no data for coaches other than 'B' and 'C', I consider from what I have noticed in these two coaches and also in the coaches of Kerala-Karnataka Express which were examined in detail in May 1981, that one need not be surprised if some of the coaches whose condition was crucial for the course of the accident had also similar deficiencies.

7.5.3. Besides, defects noticed in the underrailed coach No. 6933 included axle box spring seat height (266 mm) which was 11.6 mm less than the minimum prescribed and in the derailed coach No. 6938 side bearer oil level which was as low as 19 mm against 43 mm required to submerge the rubbing metal surfaces. The workshop Engineer felt that the low level was probably due to its having spilled in the course of the derailment but, looking at the light dents which it imprinted on the wooden sleepers, I do not consider that there was enough provocation for the oil from the side bearer well to spill out and do consider that the quality of Workshop attention to coaches, even high speed train coaches, had not been quite upto the mark in Southern Railway Workshops. While each defect or deficiency mentioned above may not be sufficiently important to be taken notice of, the cumulative effect of such defects could be unsatisfactory running, and when it acts in conjunction with track imperfections also, could have the effect of accentuating a given adverse situation.

7.5.4 A wheel set (later identified as belonging to the front bogie of coach 'F' No. 5643) was observed with a portion of the wheel flange chipped off and the particulars of the sheared off portion are detailed in para 5.42 and diagrammatically shown in Annexure-IV). The material was sent to the Director, National Aeronautical Laboratory, Bangalore, with a request to have it tested and evaluate the failure. In particular he was requested to express his opinion on:

- (i) whether the wheel had the specified chemical and metallurgical strength
- (ii) whether there was an indication of any old flaw in the region of breakage
- (iii) (a) whether the shearing off could have taken place in service or (b) under the impact of an outside force, and
- (iv) extent of force necessary to shear it off and its nature.

7.5.5 The opinion expressed by the Director, National Aeronautical Laboratory, was that the metal used for the wheel had the specified chemical composition and mechanical strength, that there was no material flaw at the origin of the fracture nor any pre-existing crack prior to rapid fracture and that the fracture surface was typical of an impact failure. The force required to create the fracture was estimated by laboratory tests to be atleast 300 kg. m.

7.5.6 I accept the conclusions of the Director, National Aeronautical Laboratory and consider that the breakage of a portion of the wheel flange was due to violent impact as a result of the accident.

7.5.7 Some of the Draw hooks and Draw bar couplings were observed to have broken. A careful visual inspection and laboratory tests on some of them indicated that they had broken due to violent forces acting on them and had no flaws which could have caused their failure in service.

7.6 Which vehicle derailed first and where?

7.6.1 There was no evidence at site to determine the point of mount or drop. There might have been such an indication to start with, but in view of the subsequent smash up and the consequent ploughing up of the track, whatever evidence might have been left by the first derailed wheel had been destroyed. In the absence of this information I propose to analyse the disposition of the derailed coaches and the damage suffered by the track in various locations and thus come to a view as to the probable point of mount or drop or jump and the first vehicle which might have left the rail.

7.6.2 Observations made on the track for a length of about 100 m. (+231.50 to +330.00) from the point where the foremost vehicle (coach 'C') was found in derailed condition indicated that the derailed wheels left dent marks on the wooden sleepers commencing at 27 cm. from the left gauge face at + 231.50 to right gauge face at about + 330.00. This disposition as well as the lateral dent marks of other derailed wheels on the wooden sleepers clearly showed that coach 'C' shifted from its alignment towards the right gradually in a length of about 120 m. commencing from about + 210.00. Coach 'D' followed coach 'C' practically till the end. Coach 'E' had either not traversed on the alignment at all in this length (+210.00 onwards towards Balharshah end) or its front wheels might have been on the alignment for a short distance. There was no evidence of any wheel having mounted the rails indicating that by the time it moved upto +230.00 its left and right side wheels were off the track. While the front end of this coach as it came to rest was 3.07 m. laterally away from the centre of the mainline towards the right its rear end was nearly 5 m. away. From these dispositions of coaches C, D and E. I have come to the conclusion that their derailment was only consequential to the accident. While the two train locomotives were pulling them forward they were being pulled backward as well as laterally to the right by the derailed coaches in the rear. This rightward drift was only due to these two different pulls and none of these was the first to derail. This is further corroborated by the fact that the dents left by the derailed wheels on wooden sleepers were rather light indicating that their full weight was not taken by the sleepers. The track structure in this region (+231 to +330) was undisturbed. The shearing of hooks between coaches B and C, between D and E and between E and F was only due to the violent tension caused by cross pulls as was evident from the sheared surfaces.

7.6.3 At Kazipet end, the disposition of the derailed wheels of coaches S, R, Q, P, O, N and M indicated that the derailed right wheels had fallen inside the track and the left wheels outside the track on to the left of the rail. The front bogie of coach S which was the last to have derailed on the train formation was at + 62.00 while the theoretical transition of the curve was between + 20.40 and + 90.40. Thus two left wheels of the front bogie of coach S and all left wheels of coach R went outside the curve. The track in this region having been damaged there is no direct site evidence of mount or drop but from the disposition of coaches Q, P, O, N and M, I consider that they had also derailed on the outside of the left rail and drifted farther and farther away to the left in the direction of the tangent at the point of their derailment. From this observation, I have come to the conclusion that none among these was the first to derail. Their derailment was also consequential to the accident.

7.6.4 Coaches L and K had also drifted to the left of the alignment but there appeared to have been a break in the coupling arrangements at some point of time after the accident started and that break separated coach J from coach K. After the break, while the rear portion of coach J moved to the right of the alignment its front portion which had been following coach I remained close to it on the left side of the alignment. In view of the gap created by the rear of coach J changing its direction, coach K appeared to have drifted in a different direction. Coaches L and M might also have drifted likewise resulting in coach K getting ridden over by the other two and the consequent heavy casualties in it. From this observation I conclude that the derailment of coaches L and K was also consequential to the accident.

7.6.5 The points and crossing layout was ripped open and thrown out as a result of the violent impact one of the coaches made on it, the crossing together with the lead rail having fallen on to the right side at a distance of 11m. longitudinally forward and 8 m. laterally rightward from its original position. The right hand check rail opposite the nose of the crossing on the loop line was found deposited close to the crossing but, while the crossing was in the right direction (the nose being at Kazipet end), the check rail and the corresponding right running rail of the loop line was in a position turned to 180° longitudinally. Besides, the leading end which trailed in the final position of its forward movement took a semicircular shape. From this observation I consider that one of the coaches in its forward motion in derailed condition might have hit the lead rail at an angle towards the right of the alignment. The detached rail end in the rear might have got entangled to its undergear and moved forward. It had taken a semicircular shape after it got entangled to the coach in the course of the movement of the latter while the rest of the running rail and the check rail remained stationary for a moment and in that process the rail got reversed in direction. As the coach moved forward it left the rail which it had uprooted with its rear bent to a semicircular shape taking with it the lead portion when got detached from the coach. Such a devastation could only have been done by one or the other of the two coaches J and G as seen from their final disposition. Of the two, coach G was less likely to have done it. Had it uprooted the points and crossing assembly, its final position at rest would not have been what it actually was. I have accordingly come to the conclusion that the rear of J coach got entangled to the rear end of the right rail of the layout in the lead portion, uprooted and threw it out onto the right. In that process it got separated from the following coach K. While the front end of the coach J followed coach I, its rear end drifted to the right, crossing the loop line also in the final position. This phenomenon explains its entanglement with the track assembly on the lead portion of the turn out. Its drift to the right of the alignment caused coach K to move forward leaving coach J to its right.

7.6.6 Coaches H and I derailed on to the outside of the left rail and moved tangential to the alignment on to the left. Coach G appears to have remained coupled to the rear of coach F and front of coach H almost till the end before its couplings broke and it got deposited across the two tracks and almost at right angles to the alignment. I consider that while coach H and the following ones were moving after derailment towards the left of the main line, the powerful locomotives in the front were pulling the coaches C, D, E, F and G towards the alignment. As a consequence of the cross pulls in different directions coaches C, D, E and F drifted to the right side gradually, the rear coupling of coach F still having been connected to the front coupling of coach G, while coach H which was moving away towards the left of the alignment was pulling the rear end of coach G towards left. When these two pulls reached extreme limits the coupling between coaches G and H broke and coach G got deposited across the two tracks with its rear end not far from the front end of coach H.

7.6.7 I accordingly consider that while the rear group of coaches H to S left the alignment outside the left running rail and the front coaches A to F were following the locomotives in front, coach G remained as a link between the two groups, its front end remaining close to the rear of F coach and its rear end remaining close to the front end of H coach. This observation and the reasoning which preceded leads me to the conclusion that it was the front bogie of coach G which had jumped off the rails first towards the right. While its front end was drifting towards the right by the impact of the lateral force which caused it to jump off the rail, the front coaches A to F remained coupled to it and four of them gradually derailed as the crosspuil forced them to do so. The derailed coaches drifted gradually towards the right till the hook between coaches B & C broke and the locomotive moved forward with coaches A and B. The hooks between coaches D and E and between E and F must have broken even earlier and deposited the coaches at the locations where they were found in their final position. The rear derailed coaches led by coach H must have pushed the rear end of coach G till it took a position at right angles to the alignment and the hook between coaches G and H sheared off.

7.6.8 I have considered the possibility of coach F derailing first and find that there are three improbabilities which render it unlikely to have been the culprit vehicle.

- (i) The final disposition of the coach when it came to rest was that its front end was nearer to the alignment than the rear end. Had the front bogie of this coach been the first to jump out its front end should have been farther away from the alignment than its rear end which it was not.
- (ii) Had the rear bogie of the coach been the first to jump out it is possible that the front end would have been nearer the alignment than the rear but its rear end would have been restrained from its rightward drift by the rear following vehicles and it would not have moved so far away from the alignment.
- (iii) In the event of one of the bogies of coach F having jumped out it would be difficult to explain the final position coach G took across the two tracks.

7.6.9 First point of derailment

In the absence of site indication of mount or drop of the derailment, the first point of derailment has also to be estimated using other clues available at site:

- (i) I consider that the derailment could not have been on the transition curve anywhere between + 66 and + 90.40. Had it been so, the derailed wheel would have jumped off to the left i.e. on the outside of the curve.
- (ii) The right running rail in the approach of the top point was in position and was also in tact with the lock bar. Had the wheel jumped off to the right in this region (i.e. between the transition curve and toe of the top point) the rail surface would have received some distinguishing mark and possibly the following bogie wheels would have uprooted it.
- (iii) The right hand switch rail and one 11 m. long lead rail fish bolted to it was found on the left of the alignment almost at right angles to it and longitudinally about 40 m. forward from its original position. The tip of the tongue rail was in a relatively undamaged condition although there were some marks of violence on the rail proper. This leads me to the conclusion that the region of the switches of the turn out was not the location where the wheel had first jumped off to the right. The dragging off the right hand switch rail must have been done by a following coach after the forward end of the lead rail got sheared off (its joint with the lead rail at the crossing end) and the switch portion must have been pushed out. Its final disposition at right angles to its original position corroborates this possibility.
- (iv) The nose of the crossing remained undamaged. There were no violent marks on the nose (except minor dents) or on the rails forming the V of the crossing except that when the whole layout was thrown out bodily it had sustained some relatively minor damage. As indicated in para 7.6.5 this must have been the punishment given by the rear portion of coach J while getting dragged towards the left by the coach ahead. Had the crossing been the region where the first wheel jumped off its path there would have been marks of violence on the crossing by the following wheels even if the culprit wheel passed off smoothly.

7.6.10 The above observations leave the lead portion of the turnout and I consider that it must have been just after the derailing wheel passed the heel of the switch that it had jumped off. The result might have been that the left and right wheels of that particular wheel set (and possibly the following wheel set/sets of the coach) had started moving, after derailment, close to the turnout rails but with the left wheel being outside its left rail and the right wheel inside its right rail. Having been guided in that path for some short while the bogie might have ripped open the turnout rails in the lead portion and moved forward. This explains the quick rightward drift of coach G within a short distance. While the right lead rail and the crossing which had been uprooted by the impact of coach G had not moved much along with that coach, coach J which took a rightward drift (as discussed in para 7.6.5) threw it out. It would be otherwise difficult to imagine how a lead rail with crossing aggregating to a length of 34 m. could have been thrown out by over-11 m. longitudinally and 8 m. laterally.

7.6.11 Keeping in view the track conditions on the turn out as discussed in para 7.3, I presume that at the high speed of 128 Km./h., the vehicle received a violent lurch just as its front wheel left the heel of the switch and had been thrown out of its path triggering off the smash. There is no evidence before me to show that the particular coach had any deficiency or defect and even if there was some deficiency, it was destroyed in the smash up and is not available. With the general condition of rolling stock discussed in para 7.5. I do believe that there must have been some minor deficiency triggering off the derailment.

7.7 Possible causes of the derailment

7.7.1 In an accident of this nature which had taken place during the day light hours on a relatively dry day close to a curve and the facing points of a station yard involving an important Express train scheduled to run through the station at the authorised speed of 110 km./h. I consider that it will be sufficient if I examine the following possibilities.

- (1) Sabotage.
- (2) Sudden obstruction in the path of the train.
- (3) Condition of the signalling installation.
- (4) Rolling stock condition.
- (5) Track condition, and
- (6) Excessive speed.

7.7.2 Sabotage

There was no indication from site evidence that the accident could have been the result of the action of a saboteur. I have, however, received two anonymous letters in Telugu (the local language) indicating that it was the act of an extremist gang. While I have passed on these communications to the Police authorities for disposal, I consider that it could not have been the act of a saboteur for the following reasons;

- (i) The accident occurred during day light hours in a station yard within the visibility range of Railway officials in the cabin. Such a setting would hardly have been the choice of a saboteur.
- (ii) If a saboteur wanted to wreck the train, a major bridge, 2 Kms. further north would have been an ideal choice during dark hours.
- (iii) The fact that the two train locomotives and two coaches had successfully negotiated the track would disprove even a remote theory of sabotage.

I accordingly consider that the derailment was not the act of a saboteur.

7.7.3 **Obstruction in the path of the train.**—The fact that four vehicles passed safely would disprove the possibility of an obstruction existing at the point of derailment when the train approached it. There is, however, a theoretical possibility of a part of the front vehicles of the train falling down and forming an obstruction in the path of the following vehicles. A thorough examination of the four underailed vehicles and the front two derailed vehicles indicated no such incidence and I accordingly rule out this possibility as well.

7.7.4 **Interlocking and Signalling installation.**—The fact that a few derailed vehicles drifted towards right would make it necessary to examine whether the facing point yielded

during the movement of the train and whether, the points gaped after the first four vehicles passed and allowed the following vehicles take the wrong route. In the light of my conclusions in para 7.4 regarding the signalling installation I rule out the possibility of an interlocking defect being the cause.

7.7.5 Rolling stock.—The possible effects of the defects and deficiencies noticed in the rolling stock have been discussed in para 7.5 and with the evidence at my disposal I consider that the defects and deficiencies were not such as would have precipitated an accident by themselves. I do, however, consider that they had the potential of aggravating a given situation and triggering off the derailment had other conditions been favourable.

7.7.6. The wheel set of the front bogie of coach F with a portion of the wheel flange chipped off attracted the attention of many of the technical officials who visited the site soon after the accident. In fact the Civil Engineering Officers right from the Chief Engineer down to the Assistant Engineer built up uniformly the theory of the broken wheel flange having approached the points and crossing in that condition and caused the smash up while negotiating the points and crossing assembly. I have given careful consideration to such a possibility but am unable to find evidence which could have made it possible. The Chemical and Metallurgical tests discussed earlier have shown that the fracture was not due to any old flaw but due to an impact load. Apart from this finding, which I accept, I consider that it is highly unlikely, if not impossible, that the wheel of a Railway coach could have travelled any length of track with a fracture of that nature and if by any chance it had travelled on a statistical possibility of one in a million it would have certainly shown up on the fractured surface the battering it would have received while coming in contact with the rail surface for every revolution it made in that condition.

7.7.7 In view of the above I have no hesitation in rejecting the theory put forward by the Civil Engineers of South Central Railway about the cause of the accident. I conclude that the broken wheel flange, as seen after the accident, did not exist prior to the accident and that it was only the result of the accident due to its having hit an object or having been hit by an object while moving at high speed just after the derailment.

7.7.8 Permanent Way.—I have examined this aspect also in great detail and recorded my observations in para 7.3.

I consider that with the evidence at my disposal and from the track condition which obtained on 31-8-1981 the track could not have by itself caused a derailment of this nature at the maximum authorised speed. It had, however, the potentiality of triggering off a derailment had other conditions been favourable for such an eventuality.

7.7.9 Apart from the condition of track discussed earlier, a rail fracture caused during the movement of the front vehicles of this train or an earlier train had the potential of causing a derailment. I have gone into this possibility in detail, the incidence of fractures in that section, and the indications of ultrasonic flaw detector which tested the rails some months earlier. There had been no rail fracture in that region (or even from Km. 188 to 210) during the preceding 12 months nor did the flaw detector reveal any major flaws in that region during its earlier run. With no evidence in that direction I consider that the possibility of the derailment having been caused due to a rail fracture did not exist.

7.7.10 Speed

7.7.10.1 This aspect has been discussed in detail in para 7.2 and I hold that the speed of the train while approaching the point of derailment was about 128 km./h.

7.7.10.2 I scrutinised a number of charts of trains worked by Shri E.O. Lever, Driver, in the weeks and months preceding the accident.

7.7.10.3 The speed chart of the train worked by the same driver from Balharshah to Vijayawada on 30-8-81 indicates a speed of not less than 120 km./h. for a good part of its run. The charts fitted in the tachographs of both the locomotives recorded properly on that journey clearly indicating overspeeding.

7.7.10.4 A look at the available speed charts of trains worked by the Driver during the weeks preceding the accident indicates that he had a high propensity for overspeeding. Twenty two charts of trains worked by him out of thirty four made available to me recorded excessive speeds, while seven were within the authorised speed and five were blank. The actual speeds attained while working the trains which recorded a speed of 120 km./h. on some

of the charts could as well be higher and have to be analysed by methods similar to those adopted for the chart of 31-8-81.

7.7.10.5 A close look at the speeds recorded at locations where there were temporary or permanent speed restrictions would indicate that the Driver had developed a sort of contempt for speed restrictions. The speed restriction of 15 Km./h. between Repalliwada and Asifabad Road was negotiated at a speed of about 65-70 Km./h. as recorded on the chart of 31-8-81 and the loop line at Bellampalli at about 40 Km./h. Similar violations could be pointed out at several other places on the same chart as well as on other available charts.

7.7.10.6 To a question as to why he did not observe the speed restriction of 30 Km./h. at Km. 272/2-1 between Raghavapuram and Ramgundam which he negotiated prior to the accident Shri Lever replied that as the restriction was imposed in connection with the construction of a road over bridge across the track, he considered it to be not relevant to his train but only to the road over bridge. A more dangerous attitude of a Driver to a speed restriction notified to him in the form of a Caution Order will be difficult to come across.

7.7.10.7 I accordingly conclude that Shri E.O. Lever had a high propensity for overspeeding and that he drove No. 121 Up Tamil Nadu Express of 31-8-81 to its disastrous end, having attained a speed of about 128 Km./h. shortly before reaching the derailment spot.

7.8 Overspeeding—a chronic feature

7.8.1 My inquiries have revealed that overspeeding was not confined to a particular driver or to a particular train. It was found to be widely prevalent cutting across the barriers of Divisions and Depots, Ordinary Express trains as well as High Speed trains.

7.8.2 A scrutiny of the speed charts of Tamil Nadu group of High Speed trains hauled by Tughlakabad-(Northern Rly.) based locomotives and worked by South Central Railway Drivers between Vijayawada and Balharshah for some weeks preceding the accident, revealed that there was frequent overspeeding by different drivers. The list includes several instances by Driver E. O. Lever who figured in the accident of Tamil Nadu Express of 31-8-1981, and by Driver Anthony Swamy who figured in an earlier accident of Tamil Nadu Express of 19-6-1980 on Kazipet-Balharsha section of South Central Railway and which was attributed to overspeeding besides some other cause.

7.8.3 On other Express trains of Secunderabad Division worked by Lallaguda and Kazipet—based Drivers there were several cases of overspeeding upto 120 Km./h. as recorded on the charts. The list includes High Speed Express trains as well as ordinary Express trains whose maximum authorised speed is only 100 Km./h.

7.8.4 On Vijayawada Division of the Railway not a single chart of any Diesel Locomotive-hauled Express train between Vijayawada and Waltair could be produced by the Officer who appeared before me. This included the Coromandel Express which is a high speed train.

In respect of trains worked by Electric traction in Vijayawada-Gudur section speed charts have been maintained with effect from May 1981 although Express trains hauled by A. C. Electric Locomotives started operating from January 1981 onwards and the High Speed trains from April 1981. From particulars furnished, it was seen that overspeeding upto 120 Km/h. was a frequent feature even in respect of trains which have an authorised maximum speed of 100 Km/h. Considering the relatively weak track conditions in the section, such overspeeding could only be termed as disastrous. Except for a remark that Drivers were being warned, no effective steps appeared to have been taken to curb the tendency.

During the first week of May 1981, when, during a routine inspection, some instances of overspeeding came to my notice, the matter was reported to the Railway Administration through an Inspection Note. The advice tendered in that report went unheeded and instances of overspeeding continued unabated. Even the findings of a Departmental Inquiry Committee consisting of four Heads of Departments which went into the cause of the derailment of Ganga-Kaveri Express, another High Speed train, near Tenali on Gudur-Vijayawada section in April 1981 and which determined excessive speed as one of the causes remained unnoticed.

7.8.5 On Guntakal Division the records produced by the Senior Divisional Mechanical Engineer, who deposed before me, revealed widespread overspeeding by some Express train

Drivers upto 120 Km/h. against 100 Km/h. authorised on that route. Against one of the Drivers who works fast Express trains there were as many as 65 entries of overspeeding between 5-10-1980 and 12-9-1981, 54 of them indicating speeds of 110 Km/h. or more as per records produced before me during my inquiry. Instances of at least twenty other Drivers indulging in similar frequent overspeeding (with scores ranging from 10 to 59 in a period of one year) have also come to notice.

7.8.6 I was disappointed to notice large scale instances of overspeeding even on Hubli Division where a disaster, determined to have been caused by overspeeding, occurred to one of the prestigious trains of the Railway in December 1979. There were as many as 40 instances of overspeeding against one of the Drivers between 7-12-1980 and 31-8-1981, some of them upto 90 Km/h. against the maximum authorised speed of 75 Km/h. as per register produced before me.

7.8.7 On Hyderabad Division analysis of speed charts and maintenance of Driver-wise overspeeding statements were found to have received attention in respect of trains worked by Drivers under Lallaguda Shed but there again no worthwhile action to curb the tendency was taken. There were frequent overspeeding entries against some Drivers: one of them was involved in overspeeding on 67 occasions between January 1981 and August 1981 with no follow up action to dissuade him from overspeeding.

7.9 Monitoring of train speeds—a half hearted exercise

7.9.1 Monitoring of speeds of the Tamil Nadu group of High Speed trains hauled by WDM-2 Diesel Locomotives between Vijayawada and Balharshah on Secunderabad Division was conspicuous by its absence. The locomotives of these trains belonging to Northern Railway are fitted with 7-day Yenkey Speed Charts, inserted and removed by the officials of the Diesel Loco Shed, Tughlakabad, Northern Railway. Depositions of the concerned officials including the Senior Divisional Mechanical Engineer of the South Central Railway and the Senior Divisional Mechanical Engineer of Tughlakabad Shed, Northern Railway, have revealed that neither the charts nor any extracts of the analysis of the charts had been sent by the Northern Railway officials for at least a year prior to the accident. South Central Railway officials had also, during this long period, not sought any information in the matter from Northern Railway and acted as per the belief "No news is good news". Unfortunately, their expectations failed as could be seen from a number of charts pertaining to the months of June, July and August 1981 obtained from Delhi at my request and made available to me.

7.9.2 In respect of speed charts of trains worked by South Central Railway's locomotives, it was seen that speed charts were generally being collected by the depots and brought on to the Overspeeding Register; except in some depots like Vijayawada where not a single chart was collected from the Diesel locomotives for at least a year prior to 31-8-1981. The analysis of the charts was, however, cursory and confined to the maximum authorised speed of the section or train and not to lower authorised speeds in certain stretches or to temporary restrictions. The only exception was in Hubli Division where speeds in some stretches with a lower authorised speed were also being noted in the register.

7.9.3 Where particular Drivers were found to have been exceeding the maximum authorised speed the incidents were being brought on to the Driver-wise Overspeeding Registers; beyond that, very little appeared to have been done to dissuade the Drivers from the overspeeding tendency. Except innocuous remarks like "Drivers counselled, Driver warned; Reported to DME etc.", no effective follow up steps appeared to have been taken in most of the cases. In Hubli Division a peculiar feature noticed was that against most of the overspeeding entries, remarks were made to the effect that the instrument was defective. To a question as to whether such remarks were substantiated by testing the respective instruments, the reply was in the negative.

7.9.4 The fact that in almost all the Divisions long lists of Drivers exceeding the maximum authorised speed appeared day after day and week after week without any let up in the frequency of such incidents, leads one to the inevitable conclusion that speed monitoring as practised on the Railway was half-hearted and ineffective.

7.10 Reluctance of Divisional Officers to curb the overspeeding tendency

7.10.1 Most of the Overspeeding Registers were being scrutinised by the Divisional and Assistant Mechanical Engineers of the respective Divisions but the fact that they were also not able to curb the tendency is clear from the continuing incidence of such overspeeding cases (as seen from the respective registers) right upto the time of my inquiry.

7.10.2 The Divisional Safety Officer and the Divisional Engineer of Secunderabad Division, when questioned as to whether they were keeping a watch in the matter and whether they were scrutinising the Overspeeding Registers replied in the negative. The position could not have been different in other Divisions, judging from the results.

7.11 Indifference of Administrative Officers to overspeeding

7.11.1 The replies I received from the Divisional Railway Manager to my questions on speed monitoring leave me in serious doubt. He maintained that a loss of two minutes was all that was required for a fast Express train to observe a speed restriction of 15 Km/h. He was not convinced even when his attention was drawn to South Central Railway's Notification of 13-3-1977 which prescribes a loss of four minutes or RDSO's Report (No. M. 46) which prescribes a loss of 4.5 minutes for such a restriction.

7.11.2 The Chief Motive Power Engineer was equally casual when, in the face of scores and scores of overspeeding cases recorded against dozens and dozens of Drivers all over the Railway as per registers produced by his own Divisional Officers, he preferred to describe the incidence of overspeeding cases as "exceedingly small". Even the Chief Mechanical Engineer was not inspiring confidence when he said that he had nothing to do with the conditions relating to speeds in the Safety Certificate signed by the Administration prior to the introduction of High Speed trains. In such an atmosphere it is difficult to imagine that lower cadres of Railwaymen can think or act differently.

7.12 Commitments not honoured

7.12.1 The following assurances were a part of the Safety Certificate signed by six Heads of Departments of South Central Railway in January 1979 before the Double-headed Tamil Nadu Express with 21 coaches was introduced and sanction for operation of the train (as also the other two High Speed trains—Andhra Pradesh Express and Kerala-Karnataka Express) was issued by this Circle:

"5. All temporary and permanent speed restrictions in force and those that will be imposed from time to time shall be observed.

17. All speed charts shall be scrutinised by the nominated Mechanical Supervisors to ensure observance of all temporary and permanent speed restrictions. An Officer of the Mechanical Department not below the rank of an Assistant Officer shall test check a few charts once a month and sign in token thereof".

7.12.2 Commenting on the observations made in para 9.3 of my Report on the Derailment of No. 204 Down "Mahalakshmi Express" on Miraj-Hubli section of South Central Railway on 3-12-1979, the Ministry of Railways stated in their communication No. 79/Safety (A&R)/1/30 dated 3-2-1981 to the Chief Commissioner of Railway Safety as under :

"General Managers of all Zonal Railways have been addressed vide this Ministry's D.O. No. 77-M (M&P)/467/7 dated 10/11-9-1980 on the matter of setting up a proper system of monitoring speed recorder charts and tracking down errant drivers prone to overspeeding. They have been asked to confirm that proper machinery exists and that prompt action is being taken to bring errant Drivers to book.

S.C. Railway has been advised to take necessary action against the staff held responsible in this case."

7.12.3 It appears from what has been brought out in para 7.8 to 7.12.2 above that the statutory conditions of sanction of the High Speed trains as well as the instructions issued by the Ministry of Railways to monitor speed charts with a view to check overspeeding tendencies on all Express trains have been grossly violated or ignored by all the Divisions of the Railway, leading me to come to the irresistible conclusion that there has been a Management failure in this respect on South Central Railway.

7.13 Speed at any cost—A way of life with some Railway Officials.

7.13.1 My assessment of the situation (which is also shared by several others including some of the railway officials who deposed before me in this Inquiry but who were not prepared to go on record for obvious reasons) is that a small but influential section of Railway officials appear to be believing in the philosophy "speed at any cost" though the Railway Ministry have declared from time to time that this was not the philosophy of Indian Railways and that "speed with safety" was what they believed in Some-

how the wrong philosophy appears to have become a way of life with certain Railway officials and it appears to be so much deep-rooted that it needs sustained and determined efforts to erase it out of their minds and substitute it by the philosophy "speed with safety".

7.13.2 As I draft these paras a few recent instances which serve to illustrate the point in a striking manner come to my mind.

7.13.3 On 27-8-1981 I travelled by No. 11 Dadar Express train from Guntakal to Madras on a routine inspection. A little after the train left Guntakal as I looked at the vacuum gauge in the Inspection Carriage I noticed that it was showing insufficient vacuum. When I sent for the Guard at the next halting station (Gooty) to know whether my gauge was defective or the train was really having insufficient vacuum, he confirmed that the gauge in his Break Van had shown 31 cms. but he had started the train as otherwise its punctuality would have been affected. On my request the train was detained for a check up and rectification which took an extra 9 minutes. The Guard involved was a very senior Guard working important Express trains.

7.13.4 It was again on this trip that I noticed the train running at a speed very much higher than the authorised speed of 60 Km/h. on the Balepalli-Mamanduru Ghat section. When the speed chart was called for and checked it was found to have recorded 90 Km/h. in the relevant section. The Driver involved was a Special Grade Driver working important trains and the situation was that the train was somewhat behind schedule and would have reached the end of the Railway (Renigunta) late and its punctuality would have been lost had he not hurried up to save its punctual running by violating the speed limit.

7.13.5 On 20-7-1981 a Goods train running in Gundur-Vijayawada section was noticed to be having hot axle condition on a wagon at Nidubroju station and the station staff had requested the Controller to have it stopped and checked at Tsundur, the next station. This was not permitted and the train proceeded but got derailed before reaching Tenali, the next station. The person who took the decision was a Senior Section Controller with 23 years of service and the situation was that there was no spare Down line at Tsundur for passing through the station an important Mail train which was following the Goods train. In the event of its being detained there for check up of the hot axle the punctuality of that Mail train would have been lost.

7.13.6 On 19-8-1981 the Cabin Assistant Station Master of Jolarpettai Junction was to receive an Up Express train but he was not able to normalise the block instruments (on which line clear had been taken for an earlier Goods train). His anxiety not to delay the Express train was so intense that he lost his sense of proportion, made several mistakes including the wrong use of an emergency release for normalising the block instruments and admitted the Express train, only to cause a collision within minutes of taking that decision.

7.13.7 Four Senior Administrative Officers of Southern Railway who recently inquired into a Goods train accident determined that a particular defect was noticed by the train crew in the formation of a through Goods train and wanted it to be rectified before the train was allowed to proceed further. The train Examining Staff refused to attend to it on the plea that they had strict instructions not to detain through Goods trains. The train was allowed to continue its journey without the defect being rectified but derailed after covering some distance causing damage of Rs 8.59 lakhs to Railway assets and displacement of about 36 hours to through traffic.

7.13.8 Instances can be multiplied but the above examples would suffice to illustrate how Drivers, Guards, Train Examiners, Asst. Station Masters and Section Controllers are surcharged in their obsession to some-how maintain the punctuality of passenger-carrying trains and to push through Goods trains to their destinations at the earliest without due consideration for safety. It is not relevant for this discussion to go into the reasons for their obsession but what is important is that they are so conditioned as to believe that what all they do is in the interests of train operation. It is difficult to imagine that these lower level officials could have been so conditioned without the knowledge of their superior officers or that the higher officers, having been aware of this tendency, are unable to check the erring officials if they seriously wanted to stop such irregularities. In either case it is a serious matter which is very much against the interests of safe train operation and deserves immediate attention of the top management.

7.13.9 It appears that there are enough circulars and instructions for guidance of the officials at lower levels but what appears to be badly needed is genuine willingness on the part of the Railway Management to implement the instructions. By and large, Railway men are a disciplined and devoted lot and can be trusted to fall in line with the policy of the Management within the shortest possible time, provided they get the correct lead and provided further they are also made to realise that the Management is serious about it. What appears immediately necessary, therefore, is the correct lead from higher officials by personal involvement in the matter and steps to make them understand that the Management means business.

7.14 Violation of conditions of statutory sanctions

7.14.1 In the recommendation which I made to the Government under cover of my office letter No. 81/SC. 63/1815 dated 11-9-81, the following infractions were detailed:

- “(i) A very vital condition relating to the Brake power of the train stipulated in the Sanction that the vacuum level on the locomotive should not be less than 56 cms. and in the rear Brake van 53 cms. is frequently violated. It appears that some of the locomotive are not able to create the necessary vacuum.
- (ii) Several cases of defects of roller bearings used for the coaches have come to notice during monthly examinations in recent months and one case of seizure of roller bearing on Tamil Nadu Express while on run at full speed has taken place recently. That the defect was observed in time and a disaster had been averted was only fortuitous. The situation warrants an urgent review of the type of roller bearings used and the methods of their periodical examination.
- (iii) Both the Southern and the South Central Railways, owing and operating the coaches of the three High Speed trains, face the chronic problem of shortage of coaches which has been further aggravated by the strengthening of two of the trains to 21 coaches recently without addition to the existing fleet. This has resulted in maintenance schedules being in arrears and coaches from ordinary Express trains (not specifically cleared for 110 Km./h.) being substituted for High Speed rakes.
- (iv) There have been cases of occasional strengthening of the trains beyond the sanctioned capacity of 21 coaches with the attendant problems of haulage, Emergency Braking Distances, etc.
- (v) Some of the other maintenance/operational infractions/deficiencies which have come to my notice include—
 - (a) the condition which stipulates that when a High speed train is required to be stopped out of course at a station, it should first be brought to a stop at the first stop signal is observed more in its breach.
 - (b) The condition which requires the Mechanical Engineers to keep a watch on the speeds by a proper procedure of checking the speed charts including monthly scrutiny by Officers is also observed in its breach, while over-speeding continues.
 - (c) Periodical testing of rails by flaw detectors and the track by Amsler Track Recording Cars/Oscillograph Cars is not done as per stipulations. Rails with major flaws are allowed to remain in the track for long periods.
 - (d) Stipulated examination of rakes by Assistant Mechanical Engineers is not properly done.
 - (e) Leaking and empty dash pots are a common feature of the coaches and shortages of critical items of stores do not appear to be sparing even these High Speed trains.
 - (f) Speedometers and speed charts even on the High Speed trains have ceased to be reliable.
 - (g) The locomotive which worked the Andhra Pradesh Express of 2-9-1981 (by which I travelled upto the site of accident) did not even have a wiper in working order. There was a down pour on the run and visibility reduced considerably, creating unsafe conditions.

- (h) Vigilance Control Devices do not work even on High Speed trains (Railway Board have not clarified in their letter No. 73-M(L) 466/112 Pt. III dated 3-7-1981 whether their orders refer to High Speed trains also. The condition stipulating the Vigilance Control Device in proper working order stands, however, in the statutory sanction issued by the Commission for the High Speed train)."

These infractions violate the following clauses of the Safety Certificate signed by the Railway Administration based on which the introduction of the High Speed train with 21 coaches was authorised in January 1979.

- "24. The trains shall consist of a maximum 21 all-coil I.C.F., B.E.M.L. or IRS nominated coaches (distinctly marked for easy identification). These coaches shall be equipped and maintained to that standard prescribed by the RDSO vide Technical Pamphlet No. 7103 and approved by Railway Board vide Wireless Message No. CRB/T/ME/1 dated 27-8-1971.
25. The coaching stock shall be maintained in accordance with RDSO's Technical Pamphlet No. 7103 and the facilities required for maintaining the coaches to the above mentioned pamphlet have been provided.
27. The coaches forming the nominated rake of the train shall be distinctly marked for easy identification.
36. (i) The vacuum gradient for these trains shall be 560 mm. in the locomotive and 530 mm. in the Brake Van.
40. If the train is to be stopped out of course in Multiple Aspect Signalling Territory, it shall be brought to a stop at the Home Signal as the distance available between the Home and Starter signals at all stations is generally less than the emergency braking distances.
47. Ultrasonic testing of track on stretches where the rails are more than 10 years old shall be carried out once a year and such testing shall be intensified at vulnerable locations where there is heavy corrosion, such as points and crossings and vicinities of water columns in yards.
56. The braking distance of the train comprising 21 ICF all-coiled coaches fitted with D.A. valves hauled by two WDM-2 locomotives will be within the braking distance stipulated for trains with 14 bogies I.C.F. all-coiled coaches fitted with D.A. Valves and hauled by single WDM-2 locomotive booked at a speed of 100 Km./h. and a maximum speed of 110 Km./h."

7.14.2 I now add the following which have since come to notice.

1. Speed:

- (a) Violation of the two conditions (clauses 5 and 17 of the Safety Certificate) relating to observance of maximum authorised speeds by Drivers and monitoring of their performance by Supervisory officials have been detailed in para 7.12.1.
- (b) Clause 36 (ii) of the Safety Certificate requires the Drivers "not to exceed the booked speed of 100 Km./h. when the specified vacuum gradient cannot be maintained". Some of the Drivers were not even aware of this clause.

2. An additional condition (reproduced below) was stipulated in July 1979 in the light of experience gained with High Speed trains and the observations made by RDSO which went into certain problems that had cropped up during the period (communicated under Railway Board's No. 77-M(C)/137/17 dated 16-5-1979).

- "6. Instructions contained in paras 6.4.1 to 6.4.3 of the Minutes of the meeting held on 31-3-1979 at RDSO and communicated under Railway Board's No. 77-M(C)/137/17 dated 16-5-79 shall be suitably displayed in the locomotives and Drivers be asked to sign in token of having understood these before being allowed to drive."

No such display is noticed in any of the locomotives hauling the High Speed trains.

7.15 Yenkey Speed Chart—Is it suitable for use on fast trains?

7.15.1 The speed chart which is now used in the tachographs fitted to the Mail and Express trains including the High Speed Express trains has several shortcomings some of which are detailed below :

- (1) Some times the recorder does not work even when the indicator works.
- (2) Due to its size it requires a lot of effort to identify short stretches of restrictions from the chart.
- (3) The time-speed chart does not record beyond 120 Km./h. even when the speed exceeds that limit. Similar is the case with the indicator needle.
- (4) The indicator as well as the recorder are sluggish at the commencement and also while decelerating.
- (5) Allowances are to be made for wheel diameter of the locomotive when the speed is to be assessed from the Time-speed graph.
- (6) When the chart is a 24 hour chart it has perforce to be inserted in and removed from the instrument by persons other than the Shed staff and as Drivers are allowed to exercise this function it is not made available when it does not suit the Driver.
- (7) The seven day chart over-comes this drawback but on some charts the stylus does not seem to be able to go from one chart to the next due to some reasons or the other.

7.15.2 It appears desirable that a more reliable type of speed recorder is fitted on to the Mail and Express trains to render speed monitoring and controlling a really worthwhile exercise. In this context the recent decision of the Ministry of Railways to go in for Hasel type recorders on all new locomotives to be manufactured is welcome. In respect of the existing locomotives the Ministry's decision appears to be that charts of the present design will not be discarded as long as these remain serviceable. It appears desirable that at least in the locomotives working fast Express trains the change over is effected right now without waiting for the existing charts to run their course.

7.15.3 Pending change over to the new type of speed charts, it appears desirable that the existing machinery in Loco Sheds and Depots for analysis and evaluation of the speed charts is strengthened with a view to make it really purposeful. It is not very difficult to observe from the speed chart that the train was decelerated at about 15.50 hrs. to about 65-70 Km./h. and at about 15.35 hrs. to about 40 Km./h. When this is cross checked with the Guard's journal it will not be difficult to conclude that these decelerations were for observance of a speed restriction of 15 Km./h. in Repalliwada-Asifabad Road section and for passing through the loop line at Bellampalli. It is thus clear that, given adequate machinery to analyse the charts and willingness on the part of the Management to accept the interpretation, even the present type of Yenkey charts can serve the cause of safety.

7.16 Miscellaneous issues

7.16.1 Being the first of its kind involving a High Speed train, the accident has naturally received country wide publicity and reaction and many News Papers commented on several issues. In consider that this report will not be complete if I do not deal with at least the important among them.

7.16.2 Casualty figures as notified by the Railway Administration was the first issue which has been commented by almost all News Papers and contested by some. Having reached the site 48 hours after the occurrence I had no opportunity to observe this myself as relief work had been completed earlier. However, I kept this foremost in my mind during my investigations and from what I was told by some of the witnesses as well as my discussions with persons from outside agencies in the area including the Sirpur Paper Mills, Sir Silk Factory, Rotary Club and Doctors who rendered medical aid. I am satisfied that the figure notified by the Railway Administration represented the actuals and they had not tried to keep back any information. Misgivings of the Public on this score are generally based on the devastation caused to the coaches. It may,

however, be said that the extent of damage to coaches would not normally represent the casualties, particularly in view of the fact that all coaches used on fast Express trains are of Anti-Telescopic type design capable of absorbing the momentum at either end without allowing the body to buckle or get crushed unless there is great provocation for it as had happened to coach K in this particular accident. It appears desirable that Railways try to educate the general public in this respect, not necessarily when an accident occurs since such an occasion would be taken as an attempt to defend the Railways and will be dismissed as a cloak for keeping back actual casualties.

7.16.3 Uncomfortable run on the journey between Vijayawada and Ralapel.— Several witnesses including a few Railwaymen gave expression to rough running between Vijayawada and Ralapel on 31-8-81. The News Papers had also published such reports and drawn adverse inferences about track and rolling stock condition. I have gone through the results of the Amsler Track Recording Car run of 30-8-1981 and found that track condition was such that running in several stretches must have been really unsteady. A perusal of the records of dash-pot oil recouplements indicated that there were some coaches on the train whose dash-pots were not in an efficient state of maintenance and there were cases of leakage of dash-pots even on earlier runs. A coach with inadequate hydraulic shock absorption could be really uncomfortable for passengers and the effect could get further compounded on a "not well maintained" track. Besides the condition of dash-pots, excessive clearances between the top of bogie frame above bolster spring and clearances between axle box casing and bottom of bogie frame could also accentuate the tendency of the coach to oscillate heavily particularly when it gets combined with poor stretches of track or high speed and worse still when all the three factors combine. I do believe that most of the complaints about 'frightful jolting' and 'rough running' were due to the above factors and consider that tight schedules of track and rolling stock maintenance are prescribed for high speed trains just to take care of those factors. Therefore, the desirability of maintaining coaches and track to the prescribed tight schedules cannot be overemphasised. There has been a tendency, as observed by me from the statements of the concerned Civil and Mechanical Engineers during this inquiry as well as my earlier inquiry into the derailment of K.K. Express in May 1981, to explain away the condition of track or rolling stock as not 'unsafe'. It may not be unsafe by itself but it could be very uncomfortable and when both the factors combine conditions could be really frightening as deposed by some witnesses. In an adverse situation, the deficiencies in rolling stock and track maintenance could also cause unsafe conditions and trigger off derailments. It is, therefore, essential that tight maintenance schedules fixed for the high speed trains are rigidly adhered to by maintenance men.

7.16.4 Traumatic experience of the passengers who travelled on the duplicate Tamil Nadu Express of 1-9-1981 between Sirpur Kaghaznagar and New Delhi.

7.16.4.1 The bitter complaints voiced by some of the witnesses before me as also by others through the Press about the unsatisfactory run of the Duplicate train which was arranged on 1-9-1981 from Sirpur Kaghaznagar were in sharp contrast with their universal appreciation of the help rendered by the managements of the Rotary Club, Sir Silk Factory, Sirpur Paper Mills and others of Sirpur Kaghaznagar in their hour of suffering on the night of 31-8-1981. The complaints were in respect of the following:

- (1) The duplicate train consisted of rickety coaches some of which were not even fit to run on Express trains.
- (2) The train made a large number of unscheduled halts at way side stations and did not at all run like an Express train. The train took about 29 hours to cover the journey from Sirpur Kaghaznagar to Delhi which was very much more than even an ordinary Express train.
- (3) While it stopped at many small stations with no refreshment facilities it ran through important stations where food and catables could be procured. The result was that most of the passengers had to go without food or even adequate water for washing and the plight of children for whom even milk could not be procured was miserable.

7.16.4.2 Having witnessed a train disaster in which they were themselves involved and having continued their journey in their state of shock (and perhaps with injuries too in some cases) the passengers were justified in expecting a better treatment from the Railway authorities on their journey from Sirpur Kaghaznagar to Delhi. Some of them

gave expression to the feeling that if the Railways were not capable of looking after the passengers, they could atleast have sent messages to the Rotary Club managements enroute to look after their comforts as had been done by the one at Sirpur Kaghaznagar. The meaning conveyed by this expression is obvious if Railways can read it properly. I am not inclined to dismiss the complaints as exaggerations when several passengers including retired Chief Operating Superintendent of Indian Railways gave expression to the misery they experienced on that run.

7.16.4.3 I had occasion to hear similar complaints from passengers of K.K. Express train involved in a derailment in May 1981 (para 9.1.14 of the relevant Report). The hardship caused to those passengers was negligible compared to what must have been gone through by the thousand and odd passengers of Tamil Nadu Express of 31-8-1981. Railways cannot afford to remain indifferent to the needs of their customers if they value their good will. A humanistic approach—and not routine and mechanical controlling of the movement of trains regardless of the needs of passengers—is what is required of Railway officials responsible for train operation even in normal situations and more so on an extraordinary occasion like this. I understand that Railway Divisional Control Offices are manned by Commercial Controllers also and it will be interesting to know what they were doing when a thousand and odd passengers of a prestigious train were put to such inconvenience. The Railway Administrations concerned may profitably go into the circumstances in which the battered passengers of Tamil Nadu Express of 31-8-81 received such a harsh treatment on their journey after what all they were made to suffer in the course of the accident itself. Such a review will certainly be useful to avoid similar situations in future.

VIII. CONCLUSIONS

8.1 Having carefully considered the factual, material and circumstantial evidence at my disposal, I have arrived at the conclusion that the derailment of No. 121 Up Tamil Nadu Express train between Km. 209/10-6 within Ralapet station limits on Kazipet-Balharshah section of South Central Railway at about 17.53 hours on 31-8-1981 was brought about primarily on account of the train having been driven at an estimated speed of about 128 Km./h.—much in excess of the authorised speed of 110 Km./h.—triggered off by track which was not upto the mark and rolling stock which had minor deficiencies and both of which were not in a fit condition to withstand the effects of the excessive speed.

Failure of the Railway Management to curb the over-speeding tendencies of locomotive Drivers in an extensive area covering the length and breadth of the Railway system over a considerable period, thereby giving them a wrong impression that the Management was behind them in their erroneous pursuit, was a strong contributory factor to the occurrence.

8.2 Responsibility

8.2.1 I hold Shri E. O. Lever, Driver of the Express train primarily responsible for the accident.

8.2.2 Shri Lever violated G.R. 89 (a) and (b) which read as under:

“89. Limits of speed generally—(a) Every train shall be run on each section of the Railway within the limits of speeds sanctioned for that section by approved special instructions. The sectional speed sanctioned shall be shown in the Working Time Table, a copy of which shall be supplied on issue to the Commissioner of Railway Safety.

(b) The Driver shall regulate and control the running of his train as accurately as possible, according to the Working Time Table, so as to avoid either excessive speed or loss of time; he shall not make up between any two stations more time than is allowed in this behalf by special instructions, and shall observe all temporary speed restrictions.”

I do not hold any individual Railway official responsible for contribution to the occurrence. The Railway Administration may decide the action to be taken against the erring officials.

8.2.3 Shri Lever who is 53 years of age started his Railway career in 1946 as a Fireman and had been working as a locomotive Driver for about 25 years prior to the

accident. He was trained in Diesel Locomotive driving in 1976 and had since been driving important Express trains in the category of 'Driver A' (Special) grade. He had six punishments related to train working in his long career of 35 years of which the last two—one in October 1973 and the other in November 1977—were for passing Home Signals at ON.

8.3 Relief arrangements

8.3.1 I am generally satisfied with the relief arrangements. Thanks to the availability of a few competent Doctors on the train and also due to the spontaneous response of the authorities of the E.S.I. Hospital, Sirpur Kaghaznagar, as also the zealous efforts of the authorities of Sirpur Paper Mills, Sir Silk Factory and the Rotary Club of Sirpur Kaghaznagar, medical aid reached the injured as quickly as could be expected in the circumstances. The injured who deposed before me were generally appreciative of the help rendered by these authorities. A few complaints have also been voiced of delayed attention but considering the gigantic dimensions of the task unexpectedly fallen on them it could be said without hesitation that they had responded wonderfully and had not only cared for the injured but had also looked after the needs of the thousand and odd passengers till they left the place by a duplicate train the next morning. The sympathy and care shown by one and all of the small town was praiseworthy, having brought out the best in Man in the moment of adversity of hundreds of passengers of the ill fated train.

8.3.2 There was no major part played by the Railway authorities both in respect of medical aid to the injured and refreshments to the others. This was understandable considering their limitations at the out of the way place.

8.3.3. I cannot, however, help observing that the extraordinary delay in starting the Medical Relief Van from Secunderabad was really deplorable. Having been ordered at 18.30 hrs. the Van left the station at 19.45 hrs. full 75 minutes after being ordered. Ordering of the train was itself delayed having been done at 18.30 hrs., full thirty minutes after the news of the accident was received in the Railway Divisional Control Office. What is further surprising is that there should have been no time schedule prescribed for turn out of Medical Relief Vans at Secunderabad. Railway Officials who were questioned on this issue stated that the delay was due to Doctors having been required to travel from Lallaguda to Secunderabad station, a distance of nearly 3 kms, but were not able to say what the optimum time was for transporting them. Further questioning revealed that no Mock Drill, whatsoever, of the Relief Van had been conducted for quite some time. That such a situation should exist at the Headquarters station of the Railway is really sur-
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8.3.4. It may, however, be stated that the delayed turn out of the Medical Van from Secunderabad made no difference to relief operations as the local public and State Government Doctors came to the rescue of the injured and others. It appears all the same necessary that the situation should be corrected and the relief vans which are maintained at considerable expense are really made useful in times of need.

IX. REMARKS AND RECOMMENDATIONS

9.1 From what has been brought out in paras 7.8 to 7.12 it is evident that there was a widespread tendency of overspeeding of trains by Drivers on all Divisions of the South Central Railway system for quite some time and the Railway Management had not taken effective steps to curb the tendency even when frequent instances of overspeeding came on record. That such a situation should have prevailed on almost all sections of the Railway over a period of time indicates that the Railway Management had not seriously viewed the situation. Its continued indifference to the problem even in the face of frequent instances of overspeeding recorded against certain Drivers had perhaps created an impression in the minds of the offenders as well as lower supervisory officials that it had the blessings of the Management. Ministry of Railways may urgently consider steps necessary to correct the situation in the overall interests of safety of travelling public. That this was the fourth instance for an important train to come to grief on the same Railway within two years due to overspeeding (the first was on 3-12-79 involving the Mahalakshmi Express, the second was on 19-6-80 involving the Tamil Nadu Express and the third was on 16-4-81 involving the Ganga Kaveri Express) makes it all the more urgent.

9.2 Apropos para 7.13, Ministry of Railways may consider steps which might be necessary to dissuade misguided Railway Officials from adopting a narrow approach for achieving speeds of trains without giving due consideration to the needs of safety and help inculcate in all categories of Railway-men equal concern for speed and safety.

9.3 From what has been brought out in para 7.14 it is evident that there was a large scale violation of the statutory conditions of sanction issued for the operation of High Speed trains on the Grand Trunk route. It is recommended for the consideration of the Ministry of Railways that the matter be urgently reviewed and steps taken to retrieve the situation in the shortest possible time. Pending this, the speeds of the High Speed trains on the Grand Trunk route may be reduced to 100 Km./h. Railway Board may also consider advising the Railway Administrations concerned suitably on the desirability of honouring the commitments, once made, for the operation of the trains. In the event of a revision being considered necessary based on the experience gained subsequently they should proceed about in a constitutional manner to have the conditions revised after convincing the RDSO and the Commission of Railway Safety.

9.4 Apropos para 7.15 Ministry of Railways may consider the desirability of reviewing their present policy about the use of speed recorders on fast trains and suitably direct the Railways to go in for reliable speed recorders and adequate machinery for analysing and interpreting the charts so as to be capable of being used as an effective Management tool not only for ensuring safety but also for promoting efficiency in train operations.

9.5 Apropos para 7.16.4 Ministry of Railways may consider suitably directing the Railway Administrations about the desirability of looking after the needs of the passengers involved in an accident of this nature till they reach their destination by alternate arrangements made for their travel as a result of the accident. That the officials on the Railways are not quite alive to this requirement has been brought out in sharp focus both by the experience of passengers involved in this accident as also in the earlier one involving K.K. Express of 19-5-1981 and warrants urgent remedial measures.

9.6 Apropos para 7.16.3 Ministry of Railways may suitably direct the Railway Administrations to aim at maintaining the track and rolling stock to the rigid specifications, recommended by RDSO after extensive trials, with a view to make long distance travel on fast trains comfortable for passengers. Many of the Civil Engineers responsible for track maintenance and Mechanical Engineers responsible for maintenance of rolling stock appear to be under the impression that as long as it is 'not unsafe', even mediocre maintenance is passable. This erroneous impression has to be removed from their minds with a view to make Rail Travel by High Speed trains really a pleasure and not an unavoidable misery as given expression to by some of the passengers.

Yours faithfully,

B. P. SASTRY,

Commissioner of Railway Safety.

Bangalore-560 009.

Dated 23rd Novr. 1981.

RAILWAY BOARD'S COMMENTS ON VARIOUS PARAS OF THE REPORT

Cause and Responsibility

CCRS's remarks regarding cause and responsibility supporting the conclusions of the CRS are fully appreciated. Nevertheless the basic issue which has remained unresolved and which led to the difference of opinion between the CRS and the Railway is whether the actual speed of the train could be determined, with reasonable assurance of its being correct, from the speed recorder chart of the type used in this case. This chart has a very narrow time base and the trace tends to become smudged at the high speed end. Various methods have been employed to interpret the chart including optical projection. It is stated that methods 1, 2 and 3 employed by the Indian Institute of Sciences, Bangalore, are in ascending order of accuracy, the degree of uncertainty being respectively plus/minus 10% plus/minus 6% and plus/minus 5%.

It is one of the principles of mathematics that as a technique of measurement is refined or algorithm developed, each step leads to more accurate results and there is a convergence of the solution—the measured value or the computed quantity. In this case the speed of the train measured over a 2 Km base was determined successively as 112 Kmph. by Method 1, 128.5 Kmph by Method 2 and 134.4 Kmph by Method 3. These results could be considered to be leading towards a convergence but the speed of the same train as measured as 109.6 Kmph by Method 1, 116.8 Kmph by Method 2 and 112.5 by Method 3. Here between the reading obtained by Method 2 and Method 3 there is a divergence. While the speed on 2 Km. base has been assessed as higher by using Method 3 then what is assessed by using Method 2, in the case of the speed over a 4 Km base it has been assessed at 116.8 Kmph by Method 2 and 112 Kmph by Method 3 which is less. Both results are computed from the same trace. Since there is a divergence between the results obtained. It is not possible to place firm reliance on these methods of measurement.

Again, a difficulty is experienced when an attempt is made to correlate the average speeds over the 2 Km base and the 4 Km base. It may be presumed that the speed maintained by the Driver for the 2 Km stretch from 5.5 to 3.5 Kms from the point where the locomotives finally came to rest was maintained till derailment. This is also the presumption made by CRS. Hence for a train travelling at 134.4 Kmph for the last three Kms. of the stretch from 5.5 to 2.5 Kms from point of derailment to average 112.5 Kms over the entire 4 Kms from 6.5 to 2.5 Kms, it would have to travel the first Km at 75 Kmph. In fact, if we allow proper time to accelerate to 134.4 kmph, the speed in the first km would be much less than 75 kmph at the start of the stretch. Such a slow speed would definitely have been noticed and remarked upon by the witnesses which has not been the case.

It is, therefore, only reasonable to assume that the mean value of the readings over the 4 km stretch is a more realistic indication of speed than the 2 km version picked out by CRS. This mean value is about 113 kmph.

It may also be relevant to mention here that the WDM-2 loco is stable upto 120 kmph. Thereafter, its riding quality declines markedly. With the track also not in optimum condition, the rough riding itself would have worked the engine crew of the speed being excessive. The track condition may also explain why a few of the witnesses examined described the speed as excessive.

We cannot, therefore, escape the conclusion that the speed was, at most, marginally above the maximum as recorded and allowing for the 1% adjustment due to wheel diameter and 5% for accuracy of reading, it might even have been only 106 kmph. In any case, the entire range of possible speeds is within the allowed range of error.

The other significant points brought up by the Railway are :

- (1) Times entered in guard's journal do not indicate overspeeding.
- (2) A majority of witnesses, some of them experienced Railway men, used to train travel, have testified that speed was not excessive.

- (3) No point of mount could be detected. With secondary suspension total unloading of the wheel just cannot take place.

The Railway has also stated that possibilities of rail gap, tilt, fracture etc. were not examined by CRS. These are mere conjectures. The basic fact is that the cause of derailment in this case could not be exactly determined because of inherent inaccuracy of the speed recording system. The need for rectifying this is accepted. As a policy, HASLER speed recorders which use a strip chart that allows a wider time base are now being fitted to all diesel and electric passenger train locomotives. Even these, however, are not considered totally free from error and trails with electronic systems with pulse counters on the gear box, digital data processing and off-line analysis to provide exact speeds, subject to proper calibration, are now being considered.

REMARKS AND RECOMMENDATIONS

Para 9.1 : Curbing the tendency of over speeding of trains by Drivers.

CRS has stated that there has been a general failure of S.C. Railway's management in controlling the tendency of Drivers to overspeed and in the quest for punctuality and making up time, some officers have even connived at overspeeding. Such a situation would be contrary to the prevailing culture on the Railways generally which puts safety above all other managerial values. A study of accidents due to 'human failure' will show that a majority of such accidents are due to negligence, usually not deliberate, of existing orders on the subject. The official response is always to tighten up the rules further, intensify inspections and counselling and enforce disciplinary action. Any attempt to shield an individual or a group of the staff is viewed adversely by higher management.

Regarding minor defects in the coach the low oil level in the dashpots is a factual observation and no further remarks are necessary.

Para 9.2 : Dissuading of Railway official from adopting narrow approach for achieving Speeds without giving due consideration to the needs of safety.

Speed is not achieved at the cost of safety. Booked speed is worked out, taking into consideration all factors affecting safety. Sufficient 'cushion' time is also provided. Speed restrictions, both temporary and permanent are also monitored by Inspectors and Officers, and surprise checks conducted to ensure strict observance of various speed restrictions. However, CRS's observance has been brought to the notice of the Railways for necessary action in Board's letter No. 85/Safety I/12/16 dated 12-8-1985.

Para 9.3 : Reduction of speed of high speed trains on G. T. route.

The question of maximum permissible speed on G.T. route was examined. The maximum permissible speed on Vijayawada Gudur section for WAM-4 locos was reduced to 100 kmph. The results of track recording and acceleration elsewhere or with other permitted rolling stock on track consideration did not warrant general reduction in maximum permissible speed on G.T. route. However, Railways impose local speed restrictions wherever warranted.

As regards violation of statutory conditions of sanctions issued, instructions were issued to S.C. Railway vide Board's letter No. 81/W6/PRA/24 dated 17-11-81 to ensure that ultrasonic testing is carried out as per schedule. Orders have been placed for self propelled ultrasonic test card and also for more hand operated ultrasonic testers.

The Railways have since reduced the speed of some trains to a maximum of 100 or 105 kms per hour. The SC Rly.'s remark that "no overspeeding on this Division exists at present" has been interpreted as an admission that overspeeding existed in the past. It does not appear that the Railway intended such a meaning if this remark is seen in the context of the details of the measures taken to control overspeeding both before and after the accident.

Restoration of the maximum speed of passenger trains to the earlier levels will only be done after consulting RDSO and CCRS.

Para 9.4 : Use of speed recorders.

Development work has been undertaken for capacity within the country for the manufacture of better and more reliable speed recorders. At present Hasler speed recorders are being used exclusively for fitment on diesel and electric locomotives required to haul passenger trains. Efforts are also being made for the development of more accurate electronic speed recorders based on pulse counters, digital data processing and multi-function data logging and off-line analysis on micro computers installed in the Running Sheds. It is expected that highly accurate results will be obtained by the last method.

Para 9.5 : Looking after the passengers involved in accidents till they reach their destination.

Instructions already exist which require the Railways to take all possible care while making alternative arrangements for journey of passengers of a train involved in the train accident with a view to ensuring that the passengers do not feel further distressed. Duplicate/relief train should have adequate halt at appropriate timings at stations where suitable catering arrangements are available. These arrangements are also strengthened to ensure availability of meals and other eatables to the passengers. In this connection, recently a check list of all important items to be attended to promptly in the event of a serious accident has been issued to all zonal railway for guidance.

Para 9.6 : Maintenance of track and rolling stock.

The instructions issued for proper maintenance of coaches required to run at speeds in excess of 100 kms per hour are quite comprehensive and detailed in RDSO's pamphlet C-7103. The implementation of these instructions is not optional and there is no tendency on the part of the Mechanical Engineers Incharge of maintenance of rolling stock to work on the principle that a "not unsafe" coach can be allowed to run except under exceptional circumstances when it is kept under observation. For instance, a "warm box" discovered while the train is on the run, may sometimes be allowed to run at the discretion of the Train Examining Staff with or without accompanying staff to nurse the warm box. Similarly a coach with a broken spring may be allowed to run at a restricted speed till destination. Except for these cases which develop on the run there is no relaxation of the rules for maintenance of coaches.

As regards, maintenance of track, it has always been the aim to maintain the track to as good as standard as possible. Instructions have been reiterated to the Railways in this regard vide this Ministry's letter No. 85/SW6/TK/10 dated 1-8-1985, a copy of which is enclosed.

Relief measures : Detailed instructions including a time schedule for turning out ARME van at each base station have been issued. Individual Railways are reminded from time to time regarding the need for holding mock drills at regular intervals. The SC Railway has advised that the time schedule for turning out the ARME van from Secunderabad is 15 minutes for direct despatch from the siding and 20 minutes for indirect despatch. The actual delay in this case is a matter of factual observation.

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