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

RAILWAY ACCIDENT INVESTIGATION REPORT

ON

**Derailment of No. 125 'Kerala--Karnataka Express' train between Surareddipalem
and Ongole stations on Gudur--Vijayawada Broad Gauge Electrified
Double line/section of Vijayawada Division of South Central
Railway on 19th May 1981**

SUMMARY

1. Date 19-5-1981.
2. Time 14-46 hrs.
3. Railway South Central
4. Gauge Broad - 1676 mm.
5. Location At Km. 288/26-289/6 between Surareddipalem and Ongole stations.
6. Nature of Accident Derailment
7. Train involved No. 125 'Kerala-Karnataka Express'
8. Consisting of 22 coaches, hauled by WAM-4 Electric locomotive No. 21230.
9. Estimated speed at derailment 70 Km./h.
10. System of Operation Absolute Block System
11. Number of tracks Double line
12. Gradient level
13. Alignment Straight
14. Weather Clear
15. Visibility Good
16. Casualties Killed--Nil
Injured--3 (minor)
17. Cost of Damage Rs. 1,51,250
18. Cause Inadequacies in maintenance of Permanent Way accentuated by inadequacies in maintenance of Rolling Stock.
19. Responsibility Officials charged with the maintenance of Permanent Way.
20. Important Recommendations in Brief:
 1. Railway Board may direct the Railway Administrations to take such steps as may be necessary to ensure that there is no dilution in the attention given to the High speed trains which must be strictly in terms of the conditions accompanying the sanctions issued and the technical specifications recommended by the RDSO.
 2. Urgent steps may be taken to improve the condition of track in Gudur-Vijayawada section of South Central Railway such that it will be able to carry the heavy passenger and Goods traffic safely and smoothly at current authorised speeds before considering any augmentation. If, for some unavoidable reasons, it is not possible to invest adequate amounts and make available the required materials to bring about the necessary improvements urgently, it appears desirable to regulate speeds and loads at realistic levels till such time it becomes possible to effect the required improvements.
 3. Railway Board may consider ordering a review of the design aspects of the WAM-4 locomotive with a view to bring down its oscillation characteristics to levels comparable with the WDM-2 locomotives.

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From

The Commissioner of Railway Safety,
Southern Circle,
Bangalore.

To

The Secretary to the Government 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 No. 125 'Kerala-Karnataka Express' train between Surareddipalem and Ongole stations on Gudur-Vijayawada Broad Gauge Electrified Double Line section of South Central Railway at about 14-46 hours on 19-5-1981.

1.2 Inspection and Inquiry

1.2.1 I inspected the site of accident and fourteen coaches of the train stabled at Ongole on 21st May in company with the Chief Engineer, the Chief Track Engineer, the Chief Traffic Planning Superintendent and the Chief Rolling Stock Engineer of South Central Railway, all from Secunderabad and the Divisional Railway Manager, Vijayawada. On the 22nd I again inspected the site along with the Chief Engineer, Chief Track Engineer and others and had a detailed look at the track in the approach of the point of derailment and also inspected in detail the affected coaches along with the Chief Rolling Stock Engineer of South Central Railway and the Additional Chief Mechanical Engineer (Carriage Repair Shops), Perambur, Madras and others. After this inspection I decided to have the coaches booked to Perambur Shops for a more detailed inspection after lifting the bogies. This inspection was conducted on the 26th in company with the Chief Mechanical Engineer, Chief Workshops Engineer and Chief Rolling Stock Engineer all from Southern Railway, Madras, the Chief Engineer, the Chief Track Engineer, Chief Traffic Safety Superintendent and Chief Rolling Stock Engineer, all from South Central Railway, Secunderabad and others. Shri M.C. Sinha, Dy. Commissioner of Railway Safety (Mechanical), attached to the Technical Wing of the Office of the Chief Commissioner of Railway Safety, Lucknow, inspected the undergear of the coaches in detail on the 26th and 27th.

1.2.2 A Press Notification was issued on 21st May inviting members of the public having knowledge of the accident or related matters to tender evidence at the Inquiry which I commenced at Ongole on 22nd May or to communicate with me by post.

1.2.3 The Civil and the Police Authorities of the Prakasam District of Andhra Pradesh in whose jurisdiction the accident had occurred were duly notified.

1.2.4 The Senior Administrative Officers of South Central Railway and Southern Railway present at the inquiry, which I held at Ongole on 22nd and 23rd May and at Madras on 27th May 1981, were:

- (i) Shri Vinod Pal, Chief Traffic Planning Superintendent, South on 22nd and 23rd May.
Central Rly.

- | | |
|---|-----------------------|
| (ii) Shri D. Jagannadham, Divisional Railway Manager, South Central Railway, Vijayawada. | On 22nd and 23rd May. |
| (iii) Shri R. Balasubramanyam, Chief Engineer, South Central Railway. | on all days. |
| (iv) Shri S.H.R. Krishna Rao, Chief Track Engineer, South Central Railway. | Do. |
| (v) Shri Mir Liaquet Ali, Addl. Chief Track Engineer, South Central Railway. | on 22nd and 23rd May. |
| (vi) Shri J. Rajagopalachari, Chief Traffic Safety Superintendent, South Central Railway. | on 27th May. |
| (vii) Shri T. Rangachari, Chief Rolling Stock Engineer, South Central Railway. | on all days. |
| (viii) Shri T.K. Balakrishna, Addl. Chief Mechanical Engineer, Southern Railway | on 23rd and 27th May. |
| (ix) Shri S. Rangarajan, Chief Rolling Stock Engineer, Southern Railway. | on 27th May. |

None from the State Government (Civil Police and Magistracy) or Railway Police was present at the inquiry.

Evidence of two witnesses was also recorded in my office at Bangalore on the 29th May and 8th June.

1.2.5 Evidence of 25 witnesses in all, all Railway Officials, was recorded and relevant exhibits filed.

NOTE: In this report

- (i) The expression "the Express train" wherever used refers to No. 125 'Kerala-Karnataka Express' which left Jolarpettai on the morning of 19-5-1981 and derailed between Surareddipalem and Ongole stations later that afternoon.
- (ii) The expressions "left"/"right" and "leading"/"trailing", wherever used have reference to the direction in which the train was moving prior to derailment.

1.3 The Accident

At about 14-46 hours on the bright sunny afternoon of 19-5-1981 while No. 125 'Kerala-Karnataka Express' train which had earlier left Gudur station after a scheduled halt was on run between Surareddipalem and Ongole stations of South Central Railway, 13 of its coaches—6th to 18th from the engine—got derailed between Km. 288/26 and Km. 289/6 between the Down Distant and Home Signals of Ongole station. The estimated speed of the train at the time of the accident was about 70 Km./h.

1.4 Casualties

About 1260 passengers were stated to be occupying the train but mercifully casualties were very light—one passenger and two Railway officials having sustained minor injuries and three others trivial injuries.

II. RELIEF MEASURES

2.1 Intimation

The Accident having taken place close to a Traction power Sub-Station connected by a telephone to the Railway Divisional Headquarters at Vijayawada information was conveyed within about 15 minutes of the occurrence by the Divisional Signal and Telecommunication Engineer of the Division, who was himself travelling on the train locomotive, to the Divisional Operating Superintendent, Vijayawada, and the latter had informed all concerned. Simultaneously the Station Master, Ongole was also informed and he advised the local Civil and Police Officials as well as Railway and Private Doctors.

2.2 Medical Attention and Relief

The Railway Assistant Medical Officer, Ongole, reached the site of accident at about 15-40 hours and rendered First aid to the injured. Later, three of them, about whose injuries there was a doubt, were taken to the Government Hospital, Ongole, at about 17-30 hours for X-Ray examination. One of them was, after examination, discharged and permitted to continue his journey by the same train while the other two persons (Railway Officials) were shifted to the Divisional Railway Hospital, Vijayawada, where they are stated to be progressing satisfactorily.

2.3 Restoration

Accident Relief Trains from Bitragunta and Vijayawada reached the site at 20-00 hours and 20-45 hours respectively the same evening and those from Waltair and Arakkonam Jn. the next morning. After derailling the affected coaches, and attending to the disturbed track, traffic on the Down line was restored at 20-30 hours on the 20th May. During the intervening period of 30 hours single line working was introduced on the Up line and important trains were operated. As a result of the accident, five passenger trains and one pair of Express trains were cancelled on the 19th and six pairs of Express trains and the Down 'Madras New Delhi Express' were

III. THE TRAIN

3.1 Composition of the Train

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

Locomotive No. WAM 4 21230.

Coaches: (All coaches were ICF (all coil) Anti telescopic type).

Sl.No.	Coach No.	Year built	Date of P.O.H.	Date of return
1.	SR WGSCNLR 7159	1972	27-1-81	2/82
2.	SR WGACCW 6199	1977	31-7-80	7/81
3.	SR WGACCW 6305	1979	29-4-81	5/82
4.	SR WGACCW 4072	1981	28-2-81	2/82
5.	SR WFC 6392	1976	5-5-81	5/82
6.	SR WGSCNY 7130	1978	18-12-80	12/81
7.	SR WGSCNY 7120	1978	11-3-81	3/82
8.	SR WGSCNY 7136	1978	19-3-81	4/82
9.	SR WGSCNY 7234	1979	20-9-80	11/81
10.	SR WGSCNY 7177	1978	3-4-81	4/82
11.	SR WGSCNY 7257	1979	25-9-80	9/81
12.	SR WCL 6207	1976	17-2-81	2/82
13.	NE WGSCNY 4544	1981	9-2-81	2/82
14.	SR WGSCNY 7179	1978	28-3-81	4/82
15.	SR WGSCNY 7132	1978	1-4-81	4/82
16.	SR WGSCNY 7148	1978	1-4-81	4/82
17.	SR WGSCNY 7134	1978	6-4-81	4/82
18.	WR WGSCNY 7446	1980	18-7-80	7/81
19.	SR WFC 6390	1976	11-5-81	5/82
20.	SR WGACCW 6192	1979	2-9-80	10/81
21.	SR WGACCW 6295	1979	30-12-80	1/82
22.	SR WGSCNLR 7154	1978	25-11-80	12/81

The total length of the train including the locomotive was 517.17 metres and its weight was 1212.8 tonnes.

The train was fully vacuum braked and was certified to be having all the 44 vacuum cylinders functioning when the train left Jolarpettai where the train had been examined and a Brake Power Certificate issued to the Driver. The vacuum levels maintained in the engine and the rear Brake Van were, however, certified for 48 cms. and 40 cms. respectively while the prescribed figures were 56 cms. and 53 cms. A check of the brake power of the fourteen coaches stabled at Ongole after the accident revealed that 25 out of 28 cylinders were effective.

3.2 Damage to Rolling Stock

3.2.1 The train locomotive, five of the coaches which were immediately behind it and four coaches from the rear (19th to 22nd from the engine) were on rails and thirteen intermediate coaches, 6th to 18th from the engine (except the leading bogies of the 6th and 7th) were found derailed. There was, however, some doubt as to the trailing bogie of the 5th coach and the leading bogie of the 6th coach which had grazing marks on the outside (indicating the possibility of their wheels having derailed and grazed against the rail gauge face) but in their final position they were found to be on rails.

Particulars of damage to individual coaches are detailed below:

3.2.2 SRWFC 6392, 5th from the engine, was not in derailed condition but was found to be having bright grinding marks on the outer face of the tyres of both the right side wheels of its rear bogie. Its rear buffers were found to have been interlocked with the buffers of the next coach.

3.2.3 SRWGSCNY 7130, 6th from engine, had its leading bogie on rails and all wheels of trailing bogie derailed. Bright grazing marks on the outer face of the wheel tread on left leading wheel of the leading bogie were noticed.

3.2.4 SRWGSCNY 7120, 7th from the engine, had all wheels of the leading bogie on track but all wheels of its trailing bogie had derailed. The right side buffers between the 6th and 7th coaches were found interlocked.

3.2.5 SRWGSCNY 7136, 8th from the engine, had all wheels of both the bogies derailed and leading inner stirrup link was missing. Axle box lip on right hand side rear wheel was also found missing. The buffers between the 7th and 8th coaches were found interlocked on the left side.

3.2.6 SRWGSCNY 7234, 9th from the engine, had all wheels of the leading bogie derailed and axle box safety straps bent on left hand side. All wheels of the rear bogie dropped inside the track. The buffers between the 8th and 9th coaches were found interlocked on the left side.

3.2.7 SRWGSCNY 7177, 10th from the engine, had all wheels of both the bogies dropped inside the track. Trailing axle box safety loop of the right trailing wheel of the leading bogie was broken at welding and dropped.

The buffers between the 9th and 10th coaches were found interlocked, buffers of the 9th being on the right and buffers of the 10th being on the left.

3.2.8 SRWGSCNY 7257, 11th from the engine, had all wheels of both the bogies dropped inside the track. Two trailing axle box safety loops were bent. The right side buffers of the 10th and 11th coaches were found interlocked.

3.2.9 SRWCL 6207, 12th from the engine, had all wheels of both the bogies dropped inside the track. The leading axle box safety loop of the rear bogie was found broken and that on trailing axle box was bent. Left side rear cylinder was in released condition. The right side buffers of the 11th and 12th were found interlocked.

3.2.10 NEWGSCNY 4544, 13th from the engine, had all wheels of both the bogies derailed and dropped inside the track. The right side trailing inner stirrup link of the leading bogie was missing from its position but was found inside the track. The right side buffers of the 12th and 13th coaches were found interlocked.

3.2.11 SRWGSCNY 7179, 14th from the engine, had all wheels of both the bogies dropped inside the track. The buffers between 13th and 14th coaches were found interlocked both on the left and on the right.

3.2.12 SRWGSCNY 7132, 15th from the engine, had all wheels of both the bogies dropped inside. One stirrup link in broken condition was found on the left hand side of the rear bogie.

3.2.13 SRWGSCNY 7148, 16th from the engine had all wheels of both the bogies dropped inside the track.

3.2.14 SRWGSCNY 7134, 17th from the engine, had all wheels of both the bogies dropped inside the track. Bolster assembly was swinging to right side.

3.2.15 WRWGSCNY 7446, 18th from the engine, had all wheels of the leading bogie and left leading wheel of the rear bogie dropped inside the track. The other three wheels of the bogie were on rails.

3.2.16 The estimated cost of damage to the Rolling Stock is assessed as Rs. 1,250/-

3.3 Damage to the Permanent Way

About 270 lineal metres of Permanent Way was damaged and most of the sleepers had to be replaced. One short welded panel of 52 Kgs. 64 m. rail had been replaced and in the rest of the length the same rails had been used after removing the bends.

The estimated cost of damage to Permanent Way is assessed as Rs. 1.5 lakhs.

There was no damage to any other Railway asset.

3.4 The total estimated cost of damage to Railway assets aggregate to Rs. 1,51,250/-.

IV. LOCAL FEATURES

4.1 The accident site is about 1.5 Kms. from Ongole station in between the Down Distant and Home Signals, between Surareddipalem and Ongole stations. The accident occurred in the Civil District of Prakasam in Andhra Pradesh in the outskirts of the District Town of Ongole.

4.2 The track runs from South-West to North-East in the direction of motion of the Express train and is about ten kilometres from the Bay of Bengal. The alignment which is straight from Surareddipalem swings to the left by a 1° left handed curve in Km. 285-286 and is thereafter straight upto the point of derailment. The countryside around is plain with paddy cultivation, and cashew nut groves and the ground level gently rises towards Ongole. The site of accident itself is on a level stretch on a low bank of 1.20 metres in height composed of black cotton soil known for its adverse effects on track maintenance.

4.3 The Permanent Way at the site of accident consists of 52 Kg. rails welded into panels of 5-rail lengths of about 64 metres each laid on CST-9 sleepers to M x 7 density over stone ballast. In the immediate approach of the point of derailment there is a short stretch of wooden sleepers track for a length of about 25 metres sandwiched in between the CST-9 sleeper track. The wooden sleeper track though having adequate ballast cushion was found to be laterally weak with inadequate shoulder ballast.

4.4 Trains are worked between Surareddipalem and Ongole under what is called the Absolute Block System of Train Working. There are two running lines designated as Up and Down, Down signifying the direction from Surareddipalem to Ongole. The section from Madras Central to Vijayawada is electrified and almost the entire traffic, including the Express train involved in the accident run on Electric traction, hauled by WAM-4 locomotives with lateral links removed.

4.5 The maximum permissible speed of trains in the section is 100 Km./h. except for a few pairs of Superfast trains for which a maximum speed of 110 Km./h. is permitted. Two kilometres short of the accident spot, at Km. 286/8 10 a temporary speed restriction of 10 Km./h. was in force on the day of the accident while the track in the approach of the site of accident was under a permanent speed restriction of 100 Km./h. and the reach covered by the derailment spot was itself covered by a permanent speed restriction of 90 Km./h.

4.6 The kilometrage of various location and stations mentioned in this report is as under:

Madras Central	. . . . .	00-00
Gudur	. . . . .	136-04
Surareddipalem	. . . . .	280-25
Site of Accident	. . . . .	288/26-28
Ongole	. . . . .	290-40
Vijayawada	. . . . .	428-76

V. SUMMARY OF EVIDENCE

5.1.1 Shri P.A. Venkatesan, Driver of the Express train stated that after observing a caution of 10 Km./h. at Km. 286/8-10 between Surareddipalem and Ongole stations, he picked up speed upto 60 Km./h. and at that time he suddenly experienced an unusual jerk. Immediately, he experienced a second jerk which was of a retarding nature and he applied vacuum brake and brought the train to a stop with the locomotive at OHE mast No. 289/10, at 14-45 hours. When he learnt that the rear coaches had derailed, he made arrangements to protect the train in front. After meeting the Guard and noting the particulars of the derailing, he went along with the Divisional Signal and Telecommunication Engineer to the nearby Traction Sub-Station to inform the Control. Thereafter as directed, he uncoupled the first four unaffected coaches and took them to Ongole. His train had finally left Ongole at 21-00 hours with 16 coaches.

5.1.2 Answering questions, the witness gave the following information.

- (i) The normal composition of the train was 21 coaches but on that day there were 22 coaches. Sometimes the High speed trains were formed with 22 coaches. He gave an example of having worked No. 122 Tamil Nadu Express on 10th May 1981 with 22 coaches.
- (ii) He did not experience any unusual lateral oscillation with the WAM-4 locomotive during the run between Gudur and Surareddipalem. He did not experience any lateral oscillation at the time he experienced the jerk before coming to a stop.
- (iii) The track alignment appeared normal to him as he approached the point of derailment. He did not notice anything unusual.
- (iv) Weather was hot and wind was blowing.

5.2.1 Shri K.R. Sadasivan, Co-Driver of the Express train generally corroborated the statement of the Driver.

5.2.2 Answering questions, he said that the run between Gudur and Surareddipalem was normal and nothing unusual was noticed. He did not also see anything unusual in the alignment as the train approached the site of accident. He stated that the Driver did not get a fresh Brake Power Certificate when the Diesel Traction changed into Electric Traction at Gudur. The locomotive maintained a vacuum of 60 cms.

5.3.1 Shri A.V. Viswanathan, Divisional Signal and Tele-communication Engineer/South, Vijayawada, who was travelling in the Cab of the train locomotive at the time of the derailment, said that as the train was passing the Down Distant Signal of Ongole at a speed of 60-70 Km./h., he was looking forward to pick up the Home Signal and somewhere between the Distant and the Home Signal, he experienced a slight jerk. His impression on looking back was that one of the coaches might have caught fire. After the train came to a stop, he went to the rear side of the train and noticed that 13 coaches had derailed. No injuries were reported by the passengers. He proceeded to the nearby Electric Traction Sub-Station and informed the Traction Power Controller first and then the Divisional Operating Superintendent at about 15-05 hours.

5.3.2 Answering questions, the witness gave the following details :—

- (i) He experienced a slight jerk which had a retarding effect on the train. It did not have the effect of throwing him away from his seat nor did he imagine that there was a derailment. He did not experience any lateral oscillation.
- (ii) As he looked forward to pick up the Home Signal, he did not notice anything unusual on the track.
- (iii) Between Gudur and Ongole he did not feel anything unusual in the riding of the locomotive.

5.4.1 Shri K.N.K. Murthy, Guard of the Express train, said that the train ran through Surareddipalem at 14-35.5 hours. and after observing a caution of 10 Km./h. at Km. 286/8-10, the train picked up a speed of about 60-70 Km./h. At 14-46 hours it came to an abrupt stop with his Brakevan at Km. 288/24. He proceeded towards the locomotive and noticed that 13 coaches of the train were derailed. From enquiries with the passengers he learnt that none was injured except one passenger and two bearers of the Pantry Car. These were attended to by a Doctor who was on the train. He conveyed particulars of the accident to the Control at 15-10 hours from the Traction Sub-station.

5.4.2 Answering questions, the witness gave the following particulars :

- (i) When he took over the train at Renigunta, the vacuum read 53 cms. in the Brakevan.
- (ii) The scheduled lunch arrangement for the passengers was at Vijayawada but as the train reached Vijayawada at 23-15 hours, food packets were served at Ongole and Dinner was arranged at Vijayawada.
- (iii) The train had 22 coaches. He knew that as per the Working Time Table the maximum load of the train was 21 coaches but it had originated from Southern Railway with 22 coaches.
- (iv) He experienced two jerks both of which were severe. With the first jerk the vacuum dropped to 30 cms. His body moved forward but he managed to steady himself without falling. With the second jerk the vacuum came to zero.
- (v) He was not in possession of the Competency Certificate to work in the Automatic Signaling Territory.

5.5 **Shri K.V. Sivasankaran, Driver**, who worked No. 139 Express as Co-Driver ex : Madras Beach to Vijayawada on 19-5-81 said that after his train had observed cautious driving at Km. 286/8-10 it had picked up a speed of 75-80 Km./h. while approaching Ongole and ran through the station at 14-32 hr. While approaching the Distant and Home Signals he was alert and everything appeared normal. He did not experience rough riding nor any lurch while passing through the site of accident.

5.6 **Shri V. ParamadayaI, Guard**, who worked No. 139 Express, said that his train ran through Surareddipalem at 14-24 hours and Ongole at 14-33 hours. While approaching Ongole he did not experience any bad riding nor any lurch nor felt anything unusual.

5.7.1 **Shri C.J. Joseph, Manager of the Pantry Car** of the Express train said that as the train was approaching Ongole station at about 14-45 hours, he experienced a jerk and the train came to a stop. Two of the bearers of the Pantry Car were found injured and the gas oven was dislocated.

5.7.2 Answering questions, the witness said that when the train left Jolarpettai late, he realised that it would be very much delayed for lunch at Vijayawada. He did not give any message as on an earlier occasion he learnt from Gudur that it would not be possible for the Catering Unit there to supply meals for such a large number of passengers. Renigunta Unit would also not be in a position to serve meals at short notice.

5.8 **Shri M. Kanniah, Station Master, Ongole**, said that he learnt of the accident at 15-15 hours and rushed to the station at 15-20 hours. After informing the local Doctors, Civil and Police Officials, he, along with the Assistant Divisional Medical Officer and his staff, left for site at 15-37 hours. At 16-10 hours the front four coaches were taken forward to Ongole. Utilising 8 coaches of an empty rake, the stranded passengers of the derailed coaches of the train were taken to Ongole at 17-45 hours. About 450 food packets were served by the Railway Departmental Catering Unit and 100 meals were arranged by the District Collector from outside. The train left Ongole at 21-00 hrs.

5.9.1 **Shri K.N.S. Sarma, Section Controller, Vijayawada**, said that information about the accident was received from the Traction Power Controller at 15-02 hours. Immediately Medical Relief Van was ordered at 15-05 hours which left Vijayawada at 15-40 hours and reached Ongole at 18-40 hours.

5.9.2 Answering questions, the witness said that the permitted time for the out-turn of the Medical Relief Van after ordering was 20 minutes. The Relief train was ordered at 15-05 hours and left at 16-50 hours. The scheduled time for turning out the relief train was 30 minutes. When trains ran unduly late upsetting meals arrangements, it was the function of the Commercial Controller to make arrangements for food and refreshments to the passengers.

5.10 **Dr. K. Subba Rao, Railway Assistant Divisional Medical Officer, Ongole**, said that he received information about the accident at 15-15 hours, rushed to the Station at 15-25 hours and reached the site at 15-40 hours. In all, six persons sustained injuries - three minor and three trivial. First aid was rendered to them at site and the three persons, about whose injuries there was a doubt, were taken to the Government Hospital, Ongole, at about 17-30 hrs. After necessary examination, one person was discharged and allowed to continue his journey and the other two persons were shifted to the Divisional Railway Hospital, Vijayawada.

5.11 **Shri V. Vijayakumar, Train Examiner, Trivandrum Central,** gave the following information, answering specific questions put to him :

- (i) A total of 50 (High speed) coaches were maintained at Trivandrum Central and maintenance schedules for all the coaches were current.
- (ii) On the 19th May as per orders of the Divisional Operating Superintendent, Trivandrum Central, an extra coach was attached for Delhi (by K.K. Express).
- (iii) A spare coach from the nominated strength of High speed coaches was found for this purpose.

5.12.1 **Shri D. Vinodchandra, Train Examiner, Southern Railway, Bangalore City,** said that the train which left Bangalore City, on the evening of 18-5-1981 consisted of 10 coaches and all were found fit to run by the High speed train.

5.12.2 Answering a question as to the utilisation of Coach No. NE 4544 on the High speed train, the witness answered that for want of certified High speed coaches, this coach was offered by Traffic for use on the High speed train. The Chief Train Examiner had declared it fit after examination. In regard to Special examination conducted for declaring the particular coach fit for use on the High speed train, the witness said that no particular records were maintained.

5.12.3 Answering another question about the condition of the dash pots on Coaches No. NE 4544 and No. WR 7446, the witness said that he was not the regular Train Examiner and was not in a position to explain as to why this was so.

5.13.1 **Shri M. Kasinathan, Train Examiner, Southern Railway, Jolarpettai,** who examined the combined K.K. Express at Jolarpettai and certified the train, said that he issued Brake Power Certificate after checking up the cylinders. He read the vacuum recorded on the Brakevan and then proceeded to the locomotive and read the vacuum level there before issuing the certificate.

5.13.2 Answering a question as to whether he had personally seen the vacuum levels of 48 and 40 cms. vacuum in the locomotive and Brakevan respectively at the time of issuing the certificate, he said that he noticed the vacuum in the Guard's Brakevan but as he was in a hurry and was required to attend to another train to be despatched to Bangalore City, he recorded the figure 48 cms. against the vacuum on engine and asked one of the staff to proceed to the engine and after reading the vacuum gauge to hand over the certificate to the Driver.

5.14 **Shri P.N. Muteiker, Divisional Mechanical Engineer, Bangalore,** answering specific questions, gave the following details :

The availability of spare coaches at Bangalore City for the High speed train was only one A.C. Sleeper which was also under repairs. In the absence of nominated coaches the Operating Department makes suitable arrangement to procure coaches from Madras and offers to the staff to examine their suitability or otherwise for running on High speed trains. After examination, the Chief Train Examiner certifies them fit if found suitable to run on K.K. Express and permits them to be attached. On such occasions, the approval of the Division is not sought. Whenever any dash pot gets empty frequently it should as a rule be taken out, examined for cracks, etc., and replaced where necessary. Due to acute shortage of coaches, however, the Train Examiner concerned might have permitted Coach No. WR 7446 on three consecutive occasions with the dash pots unattended.

5.15 **Shri C.R.V. Raghavan, Divisional Mechanical Engineer, Carriage and Wagons, Southern Railway, Trivandrum,** said that out of 34 coaches nominated for K.K. Express, three were available as spare. Due to this difficulty, the programming of coaches for IOH and POH was getting delayed. In respect of K.K. Express which left Trivandrum Central on 21-5-1981, two coaches which were over due IOH were permitted but a message was issued to all concerned to reduce the speed to 100 Km./h.

5.16 **Shri N. Vijayaraman, Sr. Divisional Mechanical Engineer, Southern Railway, Madras,** answering a question about the Brake Power Certificate issued at Jolarpettai, said that as per prescribed Brake Power Rules, the engine should create 55 cms. of vacuum and the Brakevan 50 cms. So far no difficulty had been experienced in creating the required vacuum and the hauling of 21 coaches by a single WDM-2 locomotive from Jolarpettai to Gudur. As regards the Brake Power Certificate issued by the Train Examiner for No. 125 Express on 19-5-1981, it was an erroneous record maintained by the Train Examiner.

5.17 **Shri S. Krishna Murthy, Sr. Transportation Officer, Coaching, Southern Railway, Madras,** answering a specific question as to how a load of 22 coaches was permitted on K.K. Express of 19th May 1981, said that as per telephonic instructions from the Dy. Director, Coaching, Railway Board,

on 15-5-1981 to put on an extra AC Coach by K.K. Express leaving Trivandrum on 18-5-1981, he had permitted it after bringing the matter to the notice of the Additional Chief Operating Superintendent/Coaching. He had not checked up before augmentation of the load whether necessary sanction existed for hauling 22 coaches by K.K. Express. There were, however, instances of Railway Board permitting haulage of 22 bogies on these trains earlier. A few instances of High speed trains having run with 22 coaches as mentioned by the witness, were No. 121 Express on 20-4-1981; No. 122 Express on 28-4-1981 and No. 121 Express on 19-7-1980.

5.18 **Shri T. Pius Joseph, Chief Passenger Traffic Superintendent, Southern Railway, Madras,** answering specific questions put to him in regard to the composition of K.K. Express, said that he was informed of the load being strengthened to 22 coaches by his Sr. Transportation Officer/Coaching. The witness was aware of the limitation of the trailing load of 21 coaches for the High speed trains operating on the Railway, but he was advised by the Chief Engineer that it was quite safe to run the train with a load of 22 coaches. When the order to strengthen the train by one more coach came from the Board, he did not think it necessary to check up whether a sanction had formally been issued to run the train with 22 coaches. His understanding was that it was not infringing any safety regulations. The witness was aware of the occasional partings which were taking place on High speed trains running with a trailing load of 21 coaches and also about the recommendation of the RDSO to replace the existing couplings of coaches by enhanced capacity couplings. His impression was that coaches run on double-headed trains had couplings of enhanced capacity.

5.19 **Shri S.V. Chainulu, Permanent Way Inspector/Grade I, South Central Railway, Ongole,** stated the following, answering specific questions put to him.

- (i) The track was 18-20 years old and the tie-bar holes were elongated. There was wear on rail seats of CST-9 plates also. In spite of efforts put in it had not been possible to correct the variations in gauge and cross levels.
- (ii) Due to soft formation slacks developed rather fast during summer and gauge and cross level variations noticed were on that account.
- (iii) In view of the instances of heavy creep, periodical pulling back of rails was resorted to. The rails being 18-20 years old and due to elongated bolt holes, gaps of the extent of 32 mm. seen in the track were developing. Despite the use of creep resisting devices it has not been possible to arrest movement of rails due to heavy directional traffic and old track.
- (iv) Bridge No. 582-A (Km. 288/26-28) was constructed in 1979 and cess was made up at that time. It has settled during the last rainy season and due to this and due to heavy tresspassing the cess got disturbed.
- (v) Standard ballast shoulder was provided on either side of the new culvert but it might have worked down due to new approach banks.

5.20 **Shri S. Sankaran, Permanent Way Inspector Grade III, South Central Railway, Ongole,** gave the following information, answering specific questions :

- (i) Joint Nos. 8 and 10 (at Km. 288/26-28) were formed by cutting the original 64 m. welded panels when the new culvert was constructed some time in the year 1980.
- (ii) A rail closure of 18 cm. was inserted on the right side rail at joint No. 9 (Km 288/26-28) after the pulling back was done on 21-4-1981. But insufficient total gap (between the level crossing and the top point of Ongole) as noticed during the survey of 23-12-1980 was adjusted by pulling back the rails between 23rd and 27th February 1981.
- (iii) There was no creep through the level crossing at Km. 288/12-14.
- (iv) During the pulling back operations on 21st April, the normal gap was provided at Joint No. 8 (where it was found to be 32 mm. on 22-5-1981).

5.21.1 **Shri S.V. Subba Rao, Sr. Divisional Engineer, I, South Central Railway, Vijayawada,** answering specific questions put to him, stated as follows :

- (i) The witness was quite satisfied with the quality of the track as represented by the parameters 'B' for gauge, 'C' for alignment and 'C-15' for twist in Km. 288-289.
- (ii) No special difficulty was experienced in maintaining the 5-rail panels in the reach. Creep existed in the section due to aged sleepers but jamming of joints was not prevalent in this section. No such jammed joints were noticed when he push trolled on 18-4-1981.

- (iii) Provided the total gaps available between two fixed points are within the prescribed limits as laid down in the S.W.P. Manual, he would consider the phenomenon of having very wide gaps at one end and jamming at the other end safe.
- (iv) In the absence of any other specific instructions for 5-rail panels and also in view of the Short Welded Rail Panels Manual making a mention of 5-rail panels, the gap provided in the Manual were being adopted for 5-rail panels also.
- (v) The witness did not know how old the orders for cutting 5-rail panels into 2 1/2 rail panels were, but he was positive that they were current from October 1976.
- (vi) When wooden sleeper track was sandwiched in between stretches of CST-9 sleeper track, wooden sleepers were provided with AC bearing plates and sectional ballast of full width. In the approach of the point of derailment, AC bearing plates were provided in adequate numbers but shoulder width was only upto 8".
- (vii) The wooden sleeper track immediately ahead of the accident spot would be considerably vulnerable in the absence of rail gaps.
- (viii) 5-rail welded panels were still in track in the section between Km. 215/13 to Km. 225/33 and from Km. 271.70 to Km. 300.00. The age of the 52 kg. rails was 1965-66 and that of sleepers 1962-69.

5.21.2 Answering a specific question as to whether he was in a position to say that the 5-rail panels with incidence of creep and jamming of joints, did not present any problems in maintenance, the witness admitted that maintenance problems existed and added that rails were being pulled back and joint gaps were being adjusted as and when required.

5.22.1 **Shri M.A. Rahman, Divisional Mechanical Engineer C & W, South Central Railway, Vijayawada,** gave details of deficiencies found on the coaches as seen from a visual examination and opined that in all aspects the deficiencies were found to be within permissible limits and no defect that would contribute to the derailment was found.

5.22.2 Answering questions, the witness gave the following further clarifications :

- (i) The grazing marks found on the outside of the wheels of the 5th and 6th coaches would indicate that these were travelling in a floating condition for some distance after derailing and under favourable circumstances got derailed. In the opinion of the witness they were the first to drop from the rails. The provocation for this might be buckling of the track during the hottest part of the day.
- (ii) The effect of the dash pot not having oil would be rough riding.
- (iii) Out of 28 cylinders in the 14 coaches examined at site, three were found to be inoperative.

5.23.1 **Shri T.R. Balakrishnan, Addl. Chief Mechanical Engineer, Carriage Repair Workshops, Perambur,** gave the following information in reply to specific questions put to him.

- (i) Absence of oil or inadequate oil in the dash pots might result in certain amount of discomfort to the passengers but would in no way contribute to off-loading of the wheel. Riding would be rough but would not affect safety.
- (ii) Oil or no oil in the dash pots, the safety of the riding will depend on the degree of imperfection of the track. In the opinion of the witness the imperfections found in the Coach No. 6392 were due to partial derailment and the stress caused by interlocking of the buffers with those of the trailing coach.
- (iii) Regarding excess clearance between axle box and the bogie frame (dimension 'A'), there was possibility of the springs going home whereas with inadequate clearance, the axle box movement in the vertical direction is restricted and axle box will hit the bogie frame before the springs become solid. Such reduced clearances would not in any way restrict the downward movement of the spring which is always pre-loaded and there is no possibility of its getting off-loaded or floating over a low joint.
- (iv) In respect of clearances between the top of the bogie bolster and the bottom of the bogie frame (Dimension 'B'), reduced gaps would result in bolster getting jammed with the bogie and temporarily off-loading but the excess clearance would not in any way affect the riding of the bogie nor off-load it.
- (v) In respect of Coach No. 6392 which did not derail the abnormal excess clearance 'B' could be due to mis-alignment of some of the components.

- (vi) The lower wear limits prescribed for the bronze piece permitted on High speed trains is to restrict the load shifting between the two side bearers. In the opinion of the witness, the excess wear on the bronze piece on the front bogie of Coach No. 6392 had not contributed anything towards the derailment as the coach can safely run upto 100 Km./ha. with that wear.
- (vii) There was no difference between the new coaches turned out from the Integral Coach Factory and earlier coaches made fit for a speed of 100 Km./ha. for High speed services the wear limits prescribed are lower than those for other coaches. Therefore, a newly turned-out coach from the Integral Coach Factory will be fit for High speed services for a period of six months or till it has earned 1.5 lakh kilometres. Beyond this period, the wear prescribed for various components would be in excess of those prescribed for High speed service. Thus, only new coaches of the Integral Coach Factory upto six months will be safely selected by the Train Examiner for running on High speed trains. Beyond that the coach should be thoroughly checked for which facilities are not available on sick lines.

VI. OBSERVATIONS AND TESTS

6.1 Track

6.1.1. On 21-5-1981 I carefully inspected the track where the derailment occurred and in its approaches for about a kilometre on either side. Again on the 22nd, I inspected the site and had some track measurements recorded in my presence. My observations based on these inspections and the joint record of measurements taken soon after the accident are detailed below.

6.1.2 The track in Kms. 288-290 consists of 52 kg. rails welded into 5-rail panels of about 64 metres in length (except for a few) laid on CST-9 sleepers with wooden sleepers at joints (to a density of M+7) except at the unmanned level crossing at Km. 288/12-14 and in the approaches of the newly constructed RCC slab culvert at Km. 288/26-28 where wooden sleepers were provided. The rails and CST-9 sleepers have been in track for about 18 years having been laid during 1963-64. Side and table wear on rails was clearly noticeable and so was the wear at the rail seat of CST-9 plates which is stated to be 3mm. on the average as per information furnished by the Railway Administration. The wooden sleepers at the location of the newly constructed culvert (for a length of about 25 metres with a total of 42 sleepers in all) were stated to be selected second hand sleepers when laid in 1979 and their present condition can be described as 'fair'.

6.1.3 Stone ballast cushion was adequate being not less than 30 cms. below the bottom of the sleeper but the shoulder width was varying, the minimum being 20 cm. on the wooden sleeper portion on either side of the new culvert. In the rest of the section it can be described as satisfactory. A special feature of the ballast of the wooden sleeper track which deserves a mention is that the formation in the approaches of the culvert being new, there was practically no cress and accordingly the ballast was not boxed. It was seen to be lying disturbed on the slopes and down the bank but this condition was stated to have come about due mainly to heavy trespassing at that location and partly due to relief operations which followed the accident. It was clear from what I saw during my inspection that even prior to the accident the ballast shoulder as prescribed did not exist due to unsatisfactory cress conditions and even after collecting the ballast from the foot of the bank (during my inspection) the shoulder could be built up to only about 20 cms. This falls short of the shoulder width prescribed in para 3.3 of Railway Boards letter No. 71/W6/TK/19 dated 15-1-1972 by as much as 15 cms.

6.1.4 The classification of the track as recorded by the Track Recording Car run of 18-4-1981 was 'B' under gauge, 'C' under alignment, 'C-15' under twist and 'A' under unevenness.

6.1.5 The gauge varied from normal to 12 mm. slack in the approach of the point of drop and the cross levels varied from 8 mm out on one rail to 4 mm out on the other rail, the maximum variation between two consecutive three metre lengths being 6 mm as per joint track measurements recorded immediately after the accident. The approach track which remained undisturbed (except for about 25 metres from the point of drop) till I inspected two days later indicated across level variation from 10 mm on one rail to 8 mm on the other rail, the maximum variation between two consecutive sleepers being 6 mm and general variation being 2 mm. when measurements were taken in my presence. Alignment varied upto 5 mm on right rail and 4 mm on left rail when versines were recorded on 7.5 m. chords.

6.1.6 There was unmistakable evidence of creep in Km. 288-289, the maximum noticed at the time of my inspection being 23 cms. at the rail joint, 27 metres away from the point of drop. At that location, the left rail joint was supported on sleeper No. 44 and the right joint on sleeper No. 45. The rail gaps measured at that location at the time of my inspection (at about 35°C around 10 a.m.

on 22-5-1981) were 32 mms. on right side and 15.5 mms. on left side. In the rail panel of 48 metres seven sleepers were out of square, the maximum shift noticed at sleeper No. 54 being 15 cms. in the direction of traffic. At the rail joint near sleeper No. 21 about 14 metres from the point of drop there was a closure rail 18 cms. in length on the right hand side (in the direction of traffic).

6.1.7 The gap survey recorded at consecutive joints between Km. 288/12-14 and Km. 289/30-32 at two different temperatures after the accident and on 21-4-1981 i.e., a month before the accident occurred gave the following readings :

Joint No.	Kilometrage	At 30°C on 20-5-81		At 48.25 C on 20-5-81		At 50.5°C on 21-4-81	
		L	R	L	R	L	R
1.	288/12-14 (level crossing)	18	6	6	3	14	12
2.	14-16	20	10	3	2	12	14
3.	16-18	12	12	1.5	0.25	12	10
4.	18-20	6	5	2.5	0.25	6	8
5.	20-22	14	10	0	0	8	0
6.	22-24	14	10	0.5	0.0	6	0
7.	24-26	15	11	11	1	6	0
8.	26-28	11	30	15	26	12	0
9.	26-28	disturbed due to accident, hence				10	1
10.	26-28	not comparable.				2	0
11.	28-30					0	2
12.	30-32					0	3
13.	32-289,2					0	2
14.	289/2-4					0	4
15.	6-8	4	8	0	0.5	0	4
16.	8-10	4	9	0	1	0	3
17.	10-12	0	8	0	0.5	0	4
18.	12-14	2	10	1	1	1	2
19.	14-16	1	15	0	0.5	2	4
20.	16-18	0	12	0	1	0	3
21.	20-22	2	18	0	5	2	2
22.	22-24	9	17	0	3	3	3
23.	24-26	10	15	2	4	3	3
24.	26-28	9	9	3	2	4	2
25.	26-28	5	12	4	9	3	4
26.	28-30	12	15	8	12	2	3
27.	28-30	13	16	15	15	4	2
28.	28-30	15	6	8	1	4	4
29.	30-32	14	3	15	0	3	3
30.	30-32 (top point of Ongole yard)	15	9	10	1	3	4

6.1.8 The first indication of the derailment (in the direction of traffic) was at a location 15.80 metres from OHE mast 288/28 between masts 16 and 28 where hit marks were noticed on the protruding mite weld deposit on the inside web of left rail. Prior to that there were faint wheel tread marks (for a length of 1½-2 metres) on the foot of the rail on the inside leading to the above hit marks. The wheel tread marks were not continuous indicating the movement of a floating wheel in that region but the hit marks on the weld deposit and damages thereafter were unmistakable.

6.1.9 At the point of drop, the track was found to have been displaced by 23 cms. towards the right of its original alignment, the displacement having extended to about 25 metres at Gudur end where the lateral shifts was nil. Beyond the point of drop (at Ongole end) the position of the left rail was as under :

Sl. No.	Distance from point of drop in metres	Distance from OHE mast to the gauge face of left rail	Maximum lateral shift (+ indicates right) (- indicates left)
1.	-25.4	1.67 m.	0
2.	0	1.90 m.	+23 cm.
3.	+15.23	2.30 m.	+63 cm.
4.	+69.20	1.73 m.	+06 cm.
5.	+123.25	1.36 m.	-31 cm.
6.	+181.76	1.37 m.	-30 cm.
7.	+233.0	1.68 m.	+01 cm.
8.	+303	1.70 m.	+03 cm.

6.2 Rolling Stock

6.2.1. Of the 22 coaches comprising the Express train, eight coaches—four which were next to the engine and four from the rear—which were on rails had been worked away soon after the occurrence and I have had no opportunity of inspecting them. I did not even have the benefit of a report of inspection by Railway Officials before they had been worked away. Similar was the case in respect of the train locomotive which had been worked away soon after the accident without an inspection. Later, on my request, the locomotive was inspected at the Electric Loco Shed, Vijayawada, on 22-5-19 in the presence of two Railway Officers and a report of their observations was made available to me.

6.2.2 On the evening of 21st May and again on the evening of the 22nd I made a general inspection of the 14 coaches which were lying in Ongole yard in conjunction with the joint record of measurements made available to me. A significant observation made during the inspection was the existence of grazing marks on the outside of the right side wheels of the trailing bogie of Coach No. 6392, fifth from the engine and on the outside of the left side wheels of the leading bogie of Coach No. 7130, sixth from the engine. These bogies, not having been found in derailed condition when the train came to a stop and there being no indication even of their having touched the ballast, it raises a doubt as to whether the wheels concerned had derailed but travelled in a floating condition till they again had an occasion to get derailed before coming to a stop.

6.2.3 On 26-5-1981, three coaches bearing Nos. SR 6392, SR 7130 and SR 7120—5th, 6th and 7th from the engine—were lifted on the lifting lines of Carriage Repair Workshops, Perambur, Madras, and a general inspection of the condition of undergear was conducted. The Deputy Commissioner of Railway Safety (Mechanical), who assisted me during the inspection, arranged for detailed measurements being taken in his presence on the 26th and 27th of May.

Significant observations made during the inspection were.

6.2.4 Coach No. 6392 5th from the engine

6.2.4.1 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') were not satisfactory.

6.2.4.2 Level of dash pot oil in lower spring seats at various locations was found to be low both in the leading as well as trailing trolleys.

6.2.4.3 13 out of 16 lower spring seats had internal dia. above the permissible limit.

6.2.4.4 12 out of the 16 lower spring seats when examined for internal bore finish were found to be scored. Clearances between the guide bush and lower spring seat bore diameter were above condemning size.

6.2.4.5 The bronze wearing piece in the side bearer arrangement of the left leading trolley was found to be below condemning size of 43.5 mm. by 1 mm for a High speed coach.

6.2.4.6 Out of four vertical shock absorbers, three were defective.

6.2.5 Coach No. SR 7130 - 6th from the engine

6.2.5.1 A and B clearances were in excess over specified figures.

6.2.5.2 The quantity of dash pot oil in lower spring sets was less in all the 16 dash pots.

6.2.6 Coach No. SR 7120—7th from the engine

6.2.6.1 A & B clearances were in excess over specified figures, the excess in clearance A being conspicuous on the wheels of the trailing trolley (left rear 103 mm and right rear 93.5 mm against 52 mm specified).

6.2.6.2 The quantity of dash pot oil in lower springs was less in all the 16 locations.

VII. DISCUSSION

7.1 Time of Accident

The Guard of the train timed the accident as 14.46 hrs. which I accept.

7.2 Speed of the Train

The speed recorded by the chart fixed on the locomotive indicates 70 Km./h., which is corroborated by oral evidence and I accept it.

7.3 Possible causes of Derailment

7.3.1 While a train derailment in mid section can take place due to a variety of causes, I consider that, in the circumstances in which the Express train had derailed, it is sufficient if I deal with the following four possibilities :

- (i) Excessive speed;
- (ii) Obstruction in the path of the train;
- (iii) Defective track, and
- (iv) Defective Rolling Stock.

7.3.2 I have no hesitation in dismissing the first possibility inasmuch as the authorised speed of track in the approach to the point of derailment was 100 Km./h. and at the point of derailment 90 Km./h. and as there is clear evidence that the speed of the train at the moment of derailment was not more than 70 Km./h.. I would likewise dismiss the second possibility in view of the evidence of the engine crew and that of a Divisional Signal and Telecommunication Engineer of the Railway who was travelling in the cab of the locomotive to the effect that they did not notice anything unusual while approaching the point of derailment. There are strong reasons to believe that all three of them were alert at that moment and were looking for the aspects of the Down reception and departure signals of Ongole as the train was scheduled to run through that station and any obstruction in its path would not have escaped their notice. The possibility of a part of the front vehicles of the train having fallen down from its position and formed an obstruction in the path of the wheels of the following vehicles has also been looked into but in view of the fact that no such part had been located and that the front vehicles had safely resumed their journey, this possibility is also ruled out.

7.3.3 This leaves the other two possibilities, namely defective track and defective rolling stock, which I discuss in detail in the following paragraphs.

7.4 Track Condition

7.4.1 The approach track up to Km. 288/26 having slack gauge upto 12 mm., cross level variations upto 8 mm. and alignment variations (on the straight) upto 5 mm. (and classified as 'B' under gauge, 'C' under alignment and 'C 15' under twist during the run of the track recording car on 18-4-1981) can by no means be termed as a good track for Group 'A' route with heavy Passenger and Goods traffic, particularly when the age of the track (18-20 years) is taken into account with unmistakable indications of wear at the rail seats of the CST 9 plates and side wear on rails. Even for the speeds of 100/90 Km./h. which are permitted it can only be considered as mediocre.

7.4.2 Short patches of wooden sleeper track in between stretches of metal sleeper track are recognised as being an undesirable practice. In recognition of this, Railway Board in their letter No. 71/W6/TK/19 dated 15-1-1972 directed the Railway Administrations to take certain special precautions when provision of such vulnerable short patches of wooden sleeper track becomes unavoidable. The precautions required to be taken at such vulnerable patches include, among other things, provision of shoulder ballast as per figure 5.3.1 of the L.W.R. Manual.

7.4.3 The short patch of wooden sleeper track, just 25 metres in length in Km. 288/26-28 in between stretches of CST 9 sleeper track, was provided in 1979-80 over a newly constructed irrigation culvert. Special care ought to have been taken for its maintenance till the newly formed approach banks got consolidated, but its condition as I saw on 21-5-1981, two days after the accident was as under :

- (i) There was practically no cess on the newly made approach banks. Possibly standard section of bank was provided when the culvert work was completed but no attention appeared to have been given to make up cess and replace the washed away earth after the 1980 monsoon.
- (ii) Ballast was scanty and a good portion of whatever was available was lying scattered on the slopes and down the bank. This was stated to have been partly the result of heavy trespassing at that location and partly the result of disturbance caused during restoration operations after the accident. I, however, consider that the condition of the cess had also much to do with it. Even after the scattered ballast was allowed to be put back on the shoulder in my presence it worked out to hardly 20 cm. against 35 cm. with heaping up required to be provided as per figure 5.3.1 of the L.W.R. Manual.

7.4.4 5 rail welded panels used to be the practice on Indian Railways during the Sixties but due to inherent maintenance problems caused by such long panels, particularly in hot zones of the country, the standard practice thereafter has been to weld rails into 3 rail panels only. Railway Administrations were also instructed to cut the existing 5 rail panels into 2½ rail panels wherever maintenance problems existed. Permanent Way Engineers responsible for the maintenance of track in Surareddipalem-Ongole section are not unaware of the maintenance problems in the 18 years old track but they have not so far persuaded themselves to cut these panels into two all these years. Although the Sr. Divisional Engineer in his deposition tried to defend this failure by saying that there had been no maintenance problems to warrant the elimination of these panels, I have no doubt in my mind that maintenance problems in the stretch covered by the present accident are acute and that the statement of the Sr. Divisional Engineer does not stand scrutiny. Answers given by him and his Inspector to questions put to them on the issue bring this out.

7.4.5 S.W.P. Manual prescribes gap surveys between two fixed points in track (where rails are not likely to creep) and local adjustments of gaps if the total gap of all joints in the surveyed portion is adequate and average gap is within the prescribed range. A perusal of the gap surveys conducted previously for the track covered by the accident spot and its approaches would indicate that the level crossing at Km. 288/12-14 and the top point of Ongole yard at Km. 289/32 have been adopted for the purpose. The gap surveys undertaken after the accident at two different rail temperatures have also followed this pattern.

7.4.6 An analysis of the gaps tabulated in para 6.1.7 within the two fixed points referred to above would indicate the following :

7.4.6.1 Right rail

- (i) Even prior to the pulling back of creep and readjustment of gaps on the 23rd of April 1981, there was a strong tendency for the rail to move in the direction of traffic resulting in jamming up of joints as could be seen from the figures of gaps from joint No. 5 on CST-9 sleeper track, through joints Nos. 8 to 10 on wooden sleeper track to the CST 9 sleeper track beyond towards the top points of Ongole.
- (ii) The fact that a closure rail of 18 cm. was inserted at joint No. 9 on 23-4-1981 would indicate that creep at that point must have been at least 18 cms. while the subsequent joints towards the top points of Ongole were either jammed or had little gaps.
- (iii) The readjustment of gaps on 23-4-1981 after inserting the closure rail resulted in an average gap of 3.5 mm. for the entire stretch (total gap for 30 joints being 106 mm.).
- (iv) The particulars of gaps at joints recorded at 48.25°C on 20-5-1981 (a day after the accident) at about the same temperature as on 21-4-1981 would also confirm the continuance of the earlier tendency of closing of gaps as could be seen from the gaps recorded at joints Nos. 3 to 7 and again from 15 to 20.

- (v) There was a concentration of gaps at joints Nos. 25, 26 and 27, the extent of which was 9, 12, and 15 mm. respectively. The fact that large gaps were available at 48.25°C and 30°C on the same day would indicate a sort of restraining influence at those rails due to measures taken to prevent their movement towards the top points which would otherwise cause interlocking failures.
- (vi) The accident having taken place at the estimated rail temperature of about 60°C (the maximum temperature recorded in shade on 19-5-1981 at Ongole as per weather reports was 46°C), it is evident that joints Nos. 3 to 7 and 15 to 20 were in a jammed condition at that moment.
- (vii) There is no information nor direct evidence about the condition of gaps at joints Nos. 8 to 14 just before the accident took place and it has only to be presumed from earlier trends. The gaps of 26 mm., 4.25 mm, 17 mm. at joints Nos. 8, 9, and 10 and gaps of 12 mm., 7 mm., 3.5 mm. at joints 12, 13 and 14, recorded on 20-5-1981 at 48.25°C need not necessarily lead one to conclude that such gaps existed at 60°C also just before the accident took place. On the other hand, the symptomatic indication of jammed or near jammed condition of these joints on 21-4-1981 at a temperature of 50.5°C and the continuing tendency of the rails to creep even after that date as is evident from the gaps at other joints for which information is available would lead me to presume that these were again in a jammed condition on 19-5-1981, since a month had elapsed after the pulling back of rails and readjustment of gaps was undertaken. With the worn out condition of the rail seats of the CST-9 sleepers and the incidence of creep in the region as revealed from a look at the creep register, this presumption gets strengthened.
- (viii) The gaps that were seen at joints Nos. 8, 9 and 10 on 20-5-1981 a day after the accident were evidently the result of the tendency of the rails with jammed joints to spring back and create gaps due to the release of thermal force as a result of the accident and subsequent variation in temperatures. This was inevitable in view of the fact that the track from Joint No. 8 to Joint No. 10 short of the point of drop had shifted by 23 cms. laterally to the right and the track beyond the point of drop upto joint No. 14 was found ripped open and the rails in that released condition were free to expand and contract.
- (ix) I accordingly consider that just before the K.K. Express passed over them at the rail temperature of about 60°C during the hottest part of that mid-summer afternoon, all the right side joints from No. 3 to 20 were in a jammed condition.

7.4.6.2 Left rail

- (i) The left side joint gaps which aggregate to 86 mm. from joint No. 1 to joint No. 8 out of a total of 122 mm. of gap for 30 joints during the survey conducted on 21-4-1981 would indicate a tendency to create jamming of joints towards the top points with large gaps near about the level crossing.
- (ii) Thereafter this tendency appears to have undergone a slight change with large gaps forming towards the top points also on the CST-9 sleeper track.
- (iii) The result was that while there were large gaps at either end (namely, the top points and the level crossing respectively) there was jamming up in the middle portion as could be seen from the readings at 48.25°C on 20-5-1981, a day after the accident.
- (iv) The only gaps seen on 20-5-1981 at 48.25°C temperature were at joints 7 to 10 which were read as 11 mm., 15 mm., 13 mm. and 11 mm. respectively. The point of drop was near joint No. 10 and the track between joints 8 and 10 short of that point was found to have shifted by 23 cms. towards the right. Due to this disturbance and due to the damaged condition of the track between joints 10 to 14, it appears that joints Nos. 7, 8 and 9 had developed gaps due to the release of thermal force at the time of accident and subsequent variations in temperature.
- (v) I accordingly consider that the joints of the left rails also had been in a jammed condition except at the ends (near the top points and the level crossing) as the Express train approached the point of drop.

7.5 Rolling Stock Condition

7.5.1 Post-accident inspection of the rolling stock did not reveal any condition serious enough to cause an accident in any of the derailed vehicles. While coaches 8 to 17 had all their wheels in derailed condition, coaches 6, 7 and 18 were found in partially derailed condition only. From the position of Coach No. 18 when it came to rest near the point of drop, it was clear that its wheels which

where still on rails had not derailed because they had not yet reached the zone of disturbed track. In regard to coaches Nos. 6 and 7, which had their trailing bogie wheels only derailed but not the leading bogie wheels, I have to seek a different explanation.

7.5.2 The right side wheels of the rear bogie of the 5th coach and the left side wheels of the leading bogie of the 6th coach had bright grazing marks on the outside which could only have been the result of their coming in contact with a metal object or objects. From the manner in which the grazing marks were imprinted on the left side of one wheel and the right side of the other wheel it could only be presumed that the wheels had rubbed against the rails only, but only momentarily for a short period.

7.5.3 Another observation in regard to coaches Nos. 5, 6 and 7 was that their buffers were in interlocked condition as seen after the accident. From an examination of the coaches including the buffers, there is no evidence that it could have happened without any external provocation while the train was in motion. Presumably in the process of the derailed coaches ploughing through the ballast bed, the push-pull effect of the front coaches along with the locomotive as also of the coaches 19 to 22 in the rear of the derailed coaches in motion on rails might have caused the interlocking of buffers of several coaches including those of coaches 5, 6 and 7. This disturbing condition might have caused the grazing marks on the wheels of the bogies of 5th and 6th coaches as they jumped about but I have no evidence to precisely explain the phenomenon.

7.5.4 I consider that the phenomenon of the rear bogies of the 6th and 7th coaches being found in derailed condition while the intervening leading bogie of the 7th coach remained on rails might also have been due to the interlocking of buffers which must have happened suddenly with a jerk just before the train came to a stop.

7.5.5 The 5th, 6th and 7th coaches were worked to Perambur Carriage Shops at my instance and were thoroughly inspected after lifting the bogies. The inspection did reveal some deficiencies as brought out in paras 6.2.4 and 6.2.5, but these again were not such as could have caused the accident. At the worst these deficiencies were only capable of accentuating an existing situation.

7.5.6 Which was the Vehicle to have derailed first ?

There is no clear evidence to come to a conclusion on this point. Since all wheels of coaches Nos. 8 to 17 which passed the point of drop had derailed, it could be assumed that none of them was the first to have derailed. The derailment of the rear bogie wheels of the 6th coach might have occurred as a result of the push-pull effect in the last seconds of motion of the train after derailment as discussed in para 7.5.3. The rear bogie wheels of the 7th coach might have been the ones to have derailed first and widened the yielding track causing derailment of all other wheels which had followed.

7.6 WAM-4 Locomotive

7.6.1 An inspection of the WAM-4 locomotive which hauled the Express train revealed nothing unusual to be connected directly to the derailment.

7.6.2 WAM-4 locomotive by its inherent design characteristics is known to be prone to high frequency oscillations at speed and its capacity to inflict punishment to track is very much higher than that of its Diesel Electric counterpart viz., WDM-2. I consider that it had played a significant part in rendering the short vulnerable stretch of track with wooden sleepers with inadequate lateral strength near about the point of drop in Km. 288/26-28, more and more vulnerable by repeated vertical and horizontal kicks, as each such locomotive passed that stretch, till "the last straw on the camels back" was contributed by the coaches of the K.K. Express with deficiencies brought out in paras 6.2.4, and 6.2.5.

7.6.3 The part played by the locomotive is confined to hastening the process of reducing the lateral strength of track at that vulnerable location to unsafe limits but as that process was not due to any inherent defect in the particular locomotive which hauled the train but is a design characteristic which is known to track Engineers, I do not consider that it can be accused of causing or contributing to the accident.

7.7 Course of the Accident

7.7.1 With the background of track and rolling stock conditions as brought out in paras 7.4, 7.5 and 7.6, I consider that the factors leading to the accident had been as under :

- (i) The short stretch of wooden sleeper track in Km. 288/26-28 became vulnerable in the circumstances detailed in paras 7.4.2 and 7.4.3.

- (ii) Due to proneness of track in between the level crossing at Km. 288/12 and the top points of Ongole at Km. 289/30-32 to creep in the direction of traffic, the readjustment of joint gaps done on the 22nd and 23rd of April 1981 got upset and jamming of joints developed again as brought out in para 7.4.6 except at the ends. Thermal stresses developed as the day temperature rose after the 7th of May, (as per weather reports the maximum and minimum temperatures recorded in shade at Ongole on 7-5-1981 were 35°C and 27°C which steadily rose to 46°C and 31°C on the 19th of May) and were the highest on the afternoon of the 19th. Even in that situation, the metal sleeper track was perhaps not such as could have been called unsafe, but the short stretch of wooden sleeper track in its midst rendered it very vulnerable.
- (iii) Most of the trains operating in Gudur-Vijayawada section are hauled by WAM-4 locomotives known for their high vertical and lateral oscillations and each such locomotive contributed its share to reduce the lateral strength of the short stretch of wooden sleeper track in between metal sleeper track. When this process of reduction which had reached unsafe limits, combined with the thermal stresses which had developed on that afternoon (the train negotiated that track at 14.46 hours), the process of lateral shifts of the wooden sleeper track to the right started with the locomotive and the coaches which had followed it, administering lateral and vertical oscillations (the locomotive due to inherent design features and the coaches Nos. 5 and 6 with the deficiencies detailed in paras 6.2.4 and 6.2.5) and when the shift had reached its dangerous limit, it resulted in the derailment of the vehicles which had followed.
- (iv) As the alignment of the track got disturbed even before the first vehicle derailed, the process of destruction of the track was quick. In the case of a derailment of a vehicle for other reasons, the derailed vehicle is normally dragged for some length, damaging the track gradually and the following vehicles derail at that stage. In this case, as the track alignment shifted in the circumstances described above, its further widening was instantaneous due to the tendency of the built up thermal stresses seeking release instantaneously and that would perhaps explain the derailment of 14 coaches one after the other and the wholesale destruction of track structure within the distance covered by those 14 coaches themselves leaving the track and coaches on either side unaffected.

VIII. CONCLUSIONS

8.1 Cause of the Accident

Having carefully considered the factual, material and circumstantial evidence at my disposal, I have come to the conclusion that the derailment of No. 125 'Kerala-Karnataka Express' train between OHE masts at Km. 288/26 and 289/6 between Surareddipalem and Ongole stations on Gudur-Vijayawada Electrified Double Line section of South Central Railway on 19-5-1981 was primarily due to inadequacies in the maintenance of Permanent Way, accentuated by inadequacies in the maintenance of Rolling Stock.

8.2 Responsibility

8.2.1 Officials of South Central Railway responsible for maintenance of Permanent Way should take the primary responsibility for the accident. The Railway Administration may apportion individual responsibility of different Officials depending on their respective failures.

8.2.2 Staff and Supervisory Officials of the Carriage Repair Shops, Perambur, Madras, should own up responsibility for the deficiencies noticed in Coach No. SR 6392 (which was turned out after periodical overhaul only two weeks earlier) and in coach No. SR 7130. This becomes all the more serious as these coaches happen to be part of a High speed rake. I do not, however, hold any one in the workshop responsible for causing the accident.

8.3 Relief Arrangements

I am satisfied with the relief arrangements. The Railway Assistant Divisional Medical Officer reached the site of accident within an hour of the occurrence and attended to the few cases of minor injuries. I am, however, not happy with the delayed turn-out of the Medical Relief Van which was ordered from Vijayawada, particularly in view of the fact that the accident occurred during day light hours, when every one was supposed to be alert and ready to move out at short notice.

IX. REMARKS AND RECOMMENDATIONS

9.1 In the course of my inquiry certain disturbing features in the matter of operation of the High speed trains came to light. The awe and respect which these "once prestigious" trains used to command and the attention which they used to receive at all levels in the early stages of their introduction appear to be slowly disappearing and they look like getting gradually reduced to the status of ordinary Express trains. I base my observations on the following aspects of operation, some of which have serious safety implications and recommend that Railway Board may direct the Railway Administrations to take such steps as may be necessary to ensure that there is no dilution in the attention given to the High speed trains which must be strictly in terms of the conditions accompanying the sanctions issued and the technical specifications recommended by the Research Designs and Standards Organisation.

9.1.1 In terms of RDSO's Technical Pamphlet No. 7103, the vacuum levels to be maintained on High speed trains are 560 mm in the engine and 530 mm in the rear Brakevan working out to an average of 545 mm. of vacuum on the train. The Safety Certificates furnished by the southern South Central and Central Railway Administrations assure this level of vacuum (except that the Southern Railway Administration had subsequently reported that it had not been possible for them to maintain vacuum levels in excess of 550 mm in the engine and 500 mm in the rear Brakevan), and the sanction issued by the Commission of Railway Safety for the operation of the train between Trivandrum Central and New Delhi was on this specific condition. Surprisingly, however, the Brake power Certificate issued for the train at Jolarpettai station on the morning of 19-5-1981 was only for a vacuum level of 48 cms. in the engine and 40 cms. in the rear Brakevan working out to an average of only 440 mm. against 545 mm. specified and 525 mm which the Southern Railway Administration undertook to provide. I was also told that the haulage of the train right from Jolarpettai to New Delhi, a distance of about 2350 kilometres, would be based on this Certificate and no further train examination and issue of Brake Power Certificate was scheduled at any station en-route, even when there was a change of Traction and consequently of locomotives. That an important High speed train like the K. K. Express should have been certified in such a perfunctory manner with inadequate brake power by a Train Examiner and accepted without protest by the Driver and the Guard appears to be the limit of indifference with which these important trains came to be treated by staff responsible for their operation. That this was not a stray case of an individual Train Examiner making a mistake due to ignorance would be evident from the fact that similar was the Brake Power Certificate (50 cm. of vacuum on engine and 48 cm. on Brakevan) given to the same Express train on 15-5-1981 by a different Train Examiner and accepted by a different Driver and a different Guard.

9.1.2 Another irregularity which came to notice in respect of the Brake Power of the train was that whereas the Train Examiner certified that all the 44 vacuum cylinders on the train were effective, it was found during the check after the accident at Ongole that only 25 out of 28 cylinders of the 14 coaches tested were effective, working out to less than 90% against the minimum of 95% prescribed for the train on the entire run. Eight coaches which were unaffected by the accident were worked away without their brake power having been checked and even if it be assumed that all the 16 cylinders of those coaches were operative, the percentage of brake power works out to 93% only. This would still be less than the minimum of 95% specified for the High Speed train raising a doubt as to whether there was infraction in regard to this condition also.

9.1.3 The sanction issued for the High speed train to be operated at 110 Km./h. was only for a maximum of 21 coaches in the sections where the train is hauled by Diesel power. It came to notice that despite this provision, the train was carrying 22 coaches (all scheduled to go up to New Delhi) at the time of accident, despite the fact that the train was operated on Diesel traction upto Gudur and was again to be operated on Diesel traction between Vijayawada and New Delhi. The extra coach was stated to have been attached at Trivandrum Central for through run to Delhi on telephonic instructions from the Deputy Director/Coaching, Railway Board, to the Sr. Transportation Officer/Coaching, Southern Railway.

9.1.4 Evidently, these Officers were either ignorant of the sanction issued for the maximum load of the train or were inclined to ignore the sanction. Besides violation of the statutory requirements for operation of the train, the following safety aspects were also ignored ;

- (a) Extra load on the train would mean increased emergency braking distance and to increase the load without ensuring that such extra load is permissible under the conditions of working is likely to lead to dangerous situations.
- (b) Increased load would mean extra strain on the locomotive and its inability to maintain speeds on rising gradients. With mounting pressure on the Drivers to maintain punctuality, it is likely that they might exceed the speeds on falling gradients leading to dangerous situations.

- (c) Experience has shown that even with the formation of 21 coaches, the existing design of the couplings is not strong enough for the longitudinal forces operating and RDSO have recommended couplings of enhanced capacity. To add extra load to the train without even fully complying with RDSO's recommendation is likely to lead to partings with serious consequences to the safety of passengers.
- (d) Several of the platforms where the train is scheduled to halt have no capacity for the additional length and that would mean inconvenience to the passengers.

9.1.5 It appears highly undesirable and positively unsafe to empower Officers who are not aware of implications of their decisions to order increase of loads on High speed trains.

9.1.6 The impression which the Operating Officers on the Railway appear to be carrying (as was evident from the replies I got from them to my queries on the issue during my inquiry) is that a telephonic directive from a Deputy Director of the Railway Board to attach an additional coach on the train is as good as sanction of the Railway Board for running the train with 22 coaches. This impression is not confined to Operating Officers alone but is generally the attitude of the Officers of other Departments also. The general attitude of Railway Officers even in matters involving statutory sanction under the Indian Railways Act is that Railway Board's letter is as good as sanction for executing any work or complying with any directives and sanction from the Commissioner of Railway Safety is only a formality.

9.1.7 It appears desirable that Railway Board suitably direct the Railway Administrations to remove this wrong impression from the minds of Officers. They may also consider the desirability of issuing sanctions in exercise of their functions as the safety controlling Authority under the Indian Railways Act in a specific format so that other Administrative directives not in that specific format will not be mistaken to be sanctions under the Act.

9.1.8 The Express train involved in the accident had in its composition two coaches (one of North-Eastern Railway and the other of Western Railway) which were not a part of the original rake nor were they stencilled 'fit for 110 Km./h.' as certified in the Safety Certificate issued by the Railway and as stipulated in the sanction for the operation of the train. This situation appears to have come about due to shortage of coaches resulting from double-heading of the train and increasing the load to 21 coaches. The Divisional Mechanical Engineers, Bangalore and Trivandrum Central, who deposed before me stated that they did not have sufficient spare coaches to meet any contingency. While Bangalore Division resorted to using other available coaches like the North Eastern and Western Railway coaches referred to above, Trivandrum Division resorted to retaining in service coaches due P.O.H. and I.O.H. The Divisional Mechanical Engineer, Trivandrum, stated that he had issued a message to restrict the speed of the train which left Trivandrum with such overdue coaches on 21-5-1981 to 100 Km./h., but how far that had been complied with is not known.

9.1.9 This does not appear to be the only instance wherein a train had been strengthened without ensuring adequacy of spare coaches to meet contingencies in operation. There are examples galore wherein Express trains are strengthened or new trains are introduced without ensuring adequacy of coaches, particularly of S.L.Rs. and without ensuring that maintenance facilities are available at Primary Maintenance Stations. Railway Board may consider the desirability of curbing this tendency on the part of the Railway Administrations. They may also consider directing the Directorates processing introduction of new trains or strengthening of Existing trains to ensure that this aspect is fully taken into consideration before the introduction or strengthening is ordered.

9.1.10 It appears highly undesirable and positively unsafe, to empower the Train Examining Staff to add to the formation of the High Speed train rakes, coaches other than those nominated and duly stencilled 'fit to run at 110 Km./h.' as is being done on Southern Railway in view of the fact that maintenance schedules and some of the maintenance tolerances (which a depot Train Examiner is not in a position to be aware of during a routine examination) are different for High speed coaches and ordinary coaches and a mix up is likely to cause unsafe conditions at higher speeds. It appears desirable that certain guide lines are framed by the Railway Administrations for observation when utilisation of a coach other than a nominated one becomes necessary. Exercise of discretion in such an eventuality should not be left to Train Examining Staff but should be with an Officer only.

9.1.11 Adding an odd extra coach to a High speed train would mean upsetting the communication arrangements between the Driver and the Guard. It may be significant to state here that the train in question had no communication system which is again a violation of the statutory provision. It is all the more necessary, therefore, that the decision is taken at least at the Divisional level associating the concerned Signal and Telecommunication Engineer also.

9.1.12 Coach No. SR 6392 which had been turned out from the Carriage E Repair Shops hardly two weeks prior to the accident was found to be having its bronze piece in the side bearer

assembly beyond the condemning size for a High speed coach. This and the other deficiencies found in the coach during the inspection after the accident would indicate the indifference with which even High Speed coaches are treated during P.O.H. in Shops.

9.1.13 It appears desirable that High speed coaches when turned out from Repair Shops are subjected to an inspection and certification by an Officer and not left to Supervisory Officials who tend to treat them in a routine manner."

9.1.14 It was clear even before the train left Jolarpettai at about 07-20 hours on the 19th of May that it was running over 3½ hours late and would not be expected to reach Vijayawada before 16-00 hours. The scheduled arrangement for picking up of lunch for the thousand and odd passengers on the train was Vijayawada and one would have expected the Railways, particularly when they had adequate notice of the delay, to make alternative arrangements for the lunch of the passengers. It appeared, however, that no such arrangements were made and the passengers had to undergo untold hardships by going without lunch which was compounded by the unfortunate accident which delayed the train by another six hours. Such an indifferent treatment to passengers of High speed trains (with limited stops of short duration) is a sure way of losing the good will which the public may be having in the operation of these High speed trains, and it appears desirable that some contingency plan is devised to meet situations like the above when the High speed trains are badly delayed upsetting the scheduled food arrangements.

9.2 The condition of the track in the approach of the accident site has been detailed in paras 6.1.2 to 6.1.6. The condition of track at many other locations in Gudur-Vijayawada section is not very different from this and in some, it may even be worse as revealed by the Oscillograph Car runs which the RDSO undertook in July 1981. It was only in April 1981 that another High speed train became a victim of imperfect track conditions. During the same month, a Goods train hauled by a WAM-4 locomotive derailed at a speed of 62 Km./h. (at a location where the speed permitted was 75 Km./h.) due to track imperfections amounting to as much as 55 mm. of cross level difference. The results of the Oscillograph Car runs conducted by the RDSO on Vijayawada-Gudur section with WDM-2 and WAM-4 locomotives in July 1981 have brought out in sharp focus that the track structure and the quality of maintenance in several stretches are not such as would be considered fit for a High speed route. Perhaps there are strong reasons for this condition to have been brought about - old track materials, yielding formation, poor up-keep and so on - and it appears that it won't be able to carry on for long unless immediate steps are taken to improve each of these components. Introduction of powerful WAM-4 Electric locomotives capable of sustained high speeds while hauling the maximum load, the pressure of traffic to go in for longer and heavier train loads and, last but not the least, the practice of over-loading of wagons beyond their design capacity, are aggravating the situation. Even as I write this report, I received a proposal for trials of Goods trains with 3900 tonnes trailing loads at 100 Km./h. I consider it suicidal to go in for such speeds and loads when the health of the track is not good even for current speeds and loads and would accordingly recommend that urgent steps may be taken to improve the condition of track such that it will be able to carry the heavy passenger and Goods traffic safely and smoothly at current authorised speeds before considering any augmentation. If, for some unavoidable reasons, it is not possible to invest adequate amounts and make available the required materials to bring about the necessary improvements urgently, it appears desirable to regulate speeds and loads at realistic levels till such time it becomes possible to effect the required improvements.

9.3 The results of the Oscillograph Car runs undertaken by RDSO in Vijayawada-Madras section separately with WDM-2 and WAM-4 locomotives in July 1981 would indicate that the oscillations recorded by WAM-4 locomotives are very much more than those recorded by WDM-2 locomotives on the same track. Although it is claimed that the bogies of WAM-4 locomotives are identical in design with those of WDM-2 locomotives, there appear to be some other factors which render these otherwise powerful locomotives more sensitive and prone to higher oscillations under identical conditions of track. Railway Board may consider ordering a review of the design aspects of the WAM-4 locomotive with a view to bring down its oscillation characteristics to levels comparable with the WDM-2 locomotives.

9.4 The locomotive and the front four coaches of the Express train were worked away soon after the accident and I have had no opportunity to inspect them. Even a record of inspection of the rolling stock was not kept for the benefit of the Inquiring Officer before ordering their movement away from the site. South Central Railway Administration may take such steps as would avoid such situations in future.

Yours faithfully,

(Sd.)

(B. P. SASTRY)

Commissioner of Railway Safety

Railway Board's Comments on various paras of the report:— Para 9.1.1 : Southern Railway had already apprised CRS that it was difficult to attain prescribed amount of vacuum in the engine and Brake van and got an amendment for maintaining 550 mm vacuum in the locomotive and 500 mm in the B. van approved by CRS vide letter No 3366 dated 23-1-79.

However, instructions have been issued to RDSO to conduct trials to see if it is feasible to attain 560 mm vacuum in the locomotive and 530 mm vacuum in the brakevan on a 21/22 coach train to be hauled by a single WDM 2 or WAM 4 locomotive. Instructions have also been issued to all Railways that at all engine changing points a fresh vacuum brake certificate shall be issued by the TXR certifying the level of vacuum on the engine and the brakevan.

Para 9.1.2 Commissioner of Railway Safety has not indicated the type of defects observed by him on the vacuum cylinders tested at Ongole on 21st and 22nd May, 1928. In absence of this information it is difficult to ascertain if these cylinders were defective at the originating station or had developed the faults subsequent to the accident. However, the instructions to ensure the stipulated brake power on all passenger trains at the originating station are being reiterated.

Paras 9.1.3 to 9.1.7 On occasions, the overloading of Tamil Nadu group of trains by one coach was resorted to in the past for clearance of extra rush of traffic, etc. under pressure duly taking permission from the Mechanical Directorate and the then Director (Safety & Coaching). Similar was the case with other high speed trains also.

GM/Southern Railway has stated that originally the trials were conducted for 22 bogies and the result has shown that the braking distance was within the distance from the sighting board to the first stop signal. The hauling capacity of the loco is also adequate. Safety certificate issued for the Tamilnadu Express on Madras-Vijayawada section was for 22 bogies. On these remarks of the railway, the CCRS has objected to exceeding the sanction. Instructions, have, therefore, been issued in October, 81 that with immediate effect high speed trains and the trains for which specific sanction of trailing load has been given by CRS, should not be overloaded under any circumstances.

Paras 9.1.8 to 9.1.10 : Instructions are being issued to Railways that whenever due to any unforeseen circumstances, coaches other than those nominated for high speed trains are attached to such trains, the maximum speed of the trains should be reduced suitably through a control order to be communicated to the crew of the train in writing.

Para 9.1.11: It has been advised by the Railway that the coaches intended for KK Express have been wired and that instructions are being issued that only the earmarked coaches are put on the KK Express. This will ensure maintenance of communication system between the Guard and the Driver.

Paras 9.1.12 and 9.1.13: As for the defect in the item noticed in the coach No. SR 6392 which had been turned out from the shops two weeks prior to the accident, viz. bronze wearing piece being beyond engineering size, the staff concerned has been punished under disciplinary rules.

With a view to ensuring that high speed coaches are given proper attention in shops during POH, the Southern Railway has introduced an inspection proforma which shall be certified by AWM in addition to the inspectorial staff. Instructions on the subject are being issued to the other Railway also.

Para 9.1.14: Instructions already exist that Railways should anticipate in advance the difficulties in picking up meals from scheduled static units in case of trains running abnormally late and make alternative arrangements for supply of food in time. In so far as the subject accident is concerned, the Pantry Car Manager has been placed under suspension and necessary disciplinary action is being taken against him.

Para 9.2: As already advised in this Ministry's O.M. No. 81/Safety (A & R)/11/1 dated 27-2-82, considerable efforts have been made for improving the track on the Vijayawada-Gudur section by way of track renewals, putting in additional Ballast and labour inputs, provision of oversized keys and fair-anchors, M.S. saddled plates and M.S. rubber liners, etc. All the missing fittings have been replaced in this section. Special drive was also launched for maintenance of points and crossings. These efforts have yielded fruitful results and there has been considerable improvement in the track parameters as soon from the track recording results of August, 1981 and thereafter. Speed restrictions have also been imposed on the section having bad formation.

Para 9.3: Detailed oscillation tests on standard WAM-4 locomotive were conducted in 1973 on the Raipur-Bilaspur section of the S.E. Railway and results of these oscillation trials are reported in RDSO Mech. Engg. Report No. M-336. These trials were conducted on track which

conformed to standards laid down RDSO Report C & M 1, Vol. I. The trials indicated that the riding characteristics of standard WAM-4 locomotive with maximum permissible root wear of 6 mm at wheel profiles were well within extant stability criteria upto a maximum test speed of 120 Km/h. In the transverse mode which was critical, maximum values of stability and comfort criteria parameters were as follows :—

Maximum transverse force H_y 7.2 t

Derailment coefficient H_y/Q 0.76

Maximum transverse acceleration 0.24 g

T-90 transverse acceleration 0.16 g

Based on these observations and results of proving runs done on the route, speed certificate No. SD. WAM. 4.11 dated 17-12-75 was issued for service operation of WAM 4 loco on Howrah-Durg route at a maximum permissible speed of 110 Kmp/h.

Subsequently, with a view to increasing speed potential of the locomotive for operation at 120 Kmph, removal of lateral traction motor links was proposed. In 1977-78, comparative trials were carried out with a standard WAM4 loco and modified WAM4 loco with lateral traction motor links removed upto speed of 120 Km/h. The trials were carried out with locos with worn wheel profiles and on normal main line track on S.E. Railway. Although in respect of vertical and transverse accelerations the proposed modification did not show much difference in the performance of the two locomotives, in respect of transverse forces H_y and stability as indicated by derailment coefficient, there was a distinct improvement with lateral traction motor links removed. The objective of increasing speed potential to 120 Kmph. could not be achieved but considering the performance of the WAM4 loco with lateral traction motor links removed, it was decided to remove the lateral traction motor links in all future builds of the WAM4 locomotive and also to remove the same in existing locomotives in a phased manner by suitable alterations. All locomotives in use on S.C. Railway are without lateral links.

A comparison of the performance of standard WDM2 and modified WAM4 locos without lateral links on the basis of the runs done in July, 1981 on the Vijayawada-Madras section has also been made. Riding characteristics on ten selected stretches of track where track geometry conformed to tolerances given in report No. C&M1, Vol. I, have been considered. Both the locos were with newly turned wheels. The comparative performance indicated that the transverse accelerations were well within the permissible limits of the assessment criteria and that WAM 4 does not exhibit poor performance. Even acceleration peaks in the range of 0.2g are few.

It is, therefore, considered that serious concern about the riding quality of WAM 4 locomotive is not warranted. On track maintained to the tolerances prescribed in RDSO Report No. C & M 1, Vol. I, riding qualities of the WAM4 loco with lateral traction motor links removed at maximum speed of 110 Km/h. is well within acceptable limits. The subjective feeling that the WAM4 loco does not ride as well as compared to WDM2 loco is in a large measure due to the fact that the cab in the WDM4 loco is located at 2 metres away from the pivot which causes magnification of the acceleration in the cab.

The riding quality of WAM4 locomotive with traction motor links removed, is satisfactory on track maintained to Rajdhani standards. There has been no adverse report regarding riding of these locomotives on Delhi-Howrah Rajdhani route.

While by itself neither the track nor the WAM4 locomotive may be unfit for 110 Kmph., both together do not appear to give the same level of confidence in regard to the riding quality on Vijayawada-Gudur section of South Central Railway as on Northern and Eastern Railways. The maximum permissible speed of WAM4 locomotive on Vijayawada-Gudur section of S.C. Railway has therefore been reduced to 100 Kmph from 1-5-82.

Para 9.4: Instructions with regard to preservation of clues already exist and have been reiterated from time to time.

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