



सत्यमेव जयते

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

## **RAILWAY ACCIDENT INVESTIGATION REPORT**

**ON**

**HEAD-ON COLLISION OF No. 21 DOWN HYDERABAD-HAZRAT  
NIZAMUDDIN EXPRESS WITH AGRA-ITARSI GOODS TRAIN  
NEAR THE MARSHALLING CABIN AT AGRA CANTT. STATION  
ON THE CENTRAL RAILWAY'S JHANSI DIVISION  
AT ABOUT 04-12 HOURS ON 27-1-1982**

## SUMMARY

1. Date . . . . . 27th January, 1982.
2. Time . . . . . 04-12 hours.
3. Railway . . . . . Central.
4. Gauge . . . . . 1676 mm (Broad Gauge)
5. Location . . . . . Near the Marshalling Cabin at Agra Cantt. Station.
6. Nature of Accident . . . . . Head-on collision.
7. Trains involved . . . . . (i) 21 Dn : Hyderabad-Hazrat Nizamuddin Dakshin Express.  
(ii) AE Spl. : Goods Train.
8. Consisting of . . . . . (i) 21 Dn : 14 coaches hauled by a WDM2 Diesel Electric Locomotive.  
(ii) AE Spl. : 68 wagons hauled by a WDM2 Diesel Electric Locomotive.
9. Estimated speed at the moment of impact . . . . . (i) 21 Dn. : Upwards of 70 Km/h.  
(ii) AE Spl. : Stationary.
10. System of operation . . . . . Absolute Block System.
11. No. of tracks . . . . . Double Track Main Line (with entry/exit to the Goods yard located by the side of the Dn Main Line).
12. Gradient . . . . . Level.
13. Alignment . . . . . Straight.
14. Weather . . . . . Foggy.
15. Visibility . . . . . Restricted, but not to the extent that necessitated Fog-Signalling.
16. Casualties . . . . . Killed — 64  
Injured — 26 (13 grievous and 13 simple).
17. Cost of damage . . . . . Rs. 75.60 lacs.
18. Cause . . . . . Due to 21 Dn's Driver passing several Approach Signals, all at Danger.
19. Responsibility . . . . . (a) Primary : Shri Budhoo Lal, 21 Dn's Driver (deceased).  
(b) Secondary : Shri Radhey Lal, 21 Dn's Diesel Asstt. (deceased).  
(c) Contributory : Shri Jag Lal Dhusia, 21 Dn's Guard.
20. Summary of Important Recommendations :—  
(i) Re-introduction of the Vigilance Control Device on Diesol-Electric locomotives ;  
(ii) Enforcement of cautious driving of trains during foggy weather ;  
(iii) Rules for Train working in foggy weather to be reviewed ;  
(iv) Certain safer operating practices suggested for observance during foggy weather ;  
(v) The formulation of Disaster-Prevention strategies for Cabin-level implementation advocated;  
(vi) Certain measures indicated for curbing over-speeding ;  
(vii) Safety Marshalling Instructions to be reviewed, having regard to basic requirements of passenger safety and also the existing constraints ; and  
(viii) Improved examination of goods trains at Originating stations.

(i)

No. C-10(INQ)/53  
GOVERNMENT OF INDIA  
MINISTRY OF CIVIL AVIATION  
(Commission of Railway safety)

FROM :

The Commissioner of Railway Safety,  
Central Circle,  
Churchgate Station Building Annexe,  
2nd Floor, Maharshi Karve Road,  
Bombay-400 020.

TO :

The Secretary to the Government of India,  
Ministry of Civil Aviation,  
Sardar Patel Bhavan,  
Parliament Street,  
New Delhi-110 001.

Through :

The Chief Commissioner of Railway Safety,  
Lucknow-226 001.

SIR,

I have the honour to submit, in accordance with Rule 4 of the "Statutory Investigation into Railway Accidents Rules, 1973", issued by the then Ministry of Tourism and Civil Aviation under their Notification No. RS. 13-T(8)/71, dated 19-4-1973, the Report of my Statutory Inquiry into the Head on Collision of No. 21 Dn. Hyderabad-Hazrat Nizamuddin Express also popularly known as the 'Dakshin' Express with the stationary Agra-Itarsi Special Goods Train near the Marshalling Cabin at Agra Cantt. Railway Station of Central Railway's Jhansi Division at about 04.12 hrs. on 27-1-1982.

**2. Inspection and Inquiry—**

(a) Although I endeavoured to reach the accident site by the earliest possible means by flying to Delhi, the flight itself had been very badly held up on account of Delhi Airport getting closed, firstly due to fog and thereafter due to other reasons. In the event, I arrived Agra Cantt. at 00.40 hrs. on 28-1-1982, by which time the double-line non-electrified BG track to the South of Agra Cantt. was already restored for traffic, the necessary permission having already been obtained from me in respect of clearing the tracks after recording all the requisite measurements relating to the disposition of as well as the damage to the rolling stock, track, etc.

(b) Accompanied by the Railway's General Manager, the Chief Transportation Safety Superintendent, the Chief Mechanical Engineer, the Chief Operating Superintendent and the Divisional Railway Manager of Jhansi, I inspected the accident site as well as the wreckage and the Cabins concerned. A visibility test was carried out during the early morning hours of the 29-1-1982 at the same time as the accident but approximately 48 hrs. after it, in the company of the Sr. Divisional Mechanical Engineer (Power) and the Sr. Divisional S&T Engineer of Jhansi Division.

(c) Whereas the Inquiry was commenced straightaway on 28th itself with the recording of evidence of railway officials on duty at various positions at Agra Cantt., a Press Notification was got issued, inviting members of the public having any knowledge relating to this accident to give evidence at the Inquiry on the next day i.e., 29-1-1982, or to otherwise communicate with me by post. The District Magistrate as well as the Superintendents of both the Government Railway Police and the Railway Protection Force, all headquartered at Agra, were also suitably notified, but no Civil or Police Officials called at any stage of the Inquiry at which the following Railway Officers were present :—

Shri S. P. Agarwala — Divisional Railway Safety Superintendent, Bombay.

Shri S. P. Agarwala .. Divisional Railway Manager, Jhansi.

(d) Shri Vishwa Prakash, Dy. Commissioner of Railway Safety (S&T) from the Commission's Technical Wing at Lucknow inspected Agra Cantt. 'A' Cabin on 29-1-1982 and reported on its functioning, which was also subsequently inspected at greater length by me in the company of Shri T. Janardhana Rao, Dy. Commissioner of Railway Safety (S&T), Bombay. Because certain key witnesses, who had reported sick, could not be produced, the Inquiry could be recommenced at Agra only on 12-2-1982 for 2 days and then continued at Jhansi on 14-2-82. In the meantime, evidence relating to the orientation of the rear SLR of 51 Dn Link Express, which had left Southern Railway's Madras Central Station on

25-1-82 and which was later on to become the first vehicle in rear of the engine on the ill-fated 21 Dn 'Dakshin' Express was recorded at Madras on 1-2-82 and 2-2-82.

(e) Arising from these inspections, sketches were got prepared of the Accident site and its environs, besides other diagrams, a reference to which would help in gaining an appreciation of how the train-consist varied from Madras and Hyderabad. These are appended as Annexures I(a) to (e).

(f) Evidence was recorded of 59 witnesses in all, while written communications were received on behalf of the Post Master General of Uttar Pradesh Circle, besides the ABSKS (Akhil Bharatiya Shoshit Karamchari Sangh), the AIRMS (All India Railway Mail Service) Employees' Union and a private person. No public witness nor any passenger from the ill-fated 21 Dn 'Dakshin' Express came forward to appear at this Inquiry.

(g) Having visited the hospital attached to the Sarojini Naidu Memorial Medical College at Agra on the 28th in the company of the Railway's General Manager and again on the 29th, in the company of Jhansi Division's Medical Superintendent, I was fully satisfied with the medical attention and care that was being bestowed on the patients admitted there. The Military Hospital, where three passengers including two Army personnel were admitted, was not visited.

(h) In this Report, unless otherwise apparent from the context, the terms "right"/"left", "leading"/"trailing", "front"/"rear", etc. are invariably in reference to the direction of motion of 21 Dn 'Dakshin' Express.

### 3. The Accident—

(a) 21 Dn Hyderabad-Hazrat Nizamuddin Express (hereinafter termed simply as 21 Dn) left Jhansi approximately an hour late and it lost further time "en route" for a variety of reasons and ran through Bhandai, the Station immediately in rear of Agra Cantt., at 04.05 hrs. without any mishap.

(b) In the meantime, Agra-Itarsi Special Up Goods Train, which was formed in the Goods Yard at Agra Cantt. itself (hereinafter simply termed as AE Spl.) was planned to be despatched from that Goods Yard, with the "Line Clear" duly obtained for this move at 03.42 hrs. by Agra Cantt. 'A' Cabin. Although a Starting Permit was received by AE Spl.'s Driver at 03.50 hrs., pursuant to the setting of the proper route for it and the necessary departure Signals having been duly taken Off, this Goods train was nevertheless unable to move until 04.05 hrs. and, even when it did, its engine had barely travelled some 230 m. by 04.12 hrs., when 21 Dn which had in the meanwhile run past successively the Outer, the Main Home and the bracketted Routing Home Signals, all of which were at Danger

entered the track leading to the Goods Yard to crash head on into a by now stationary AE Spl.

(c) The severity of the collision was such that the tricomposite Second-Luggage-Cum-Brake-Van (hereinafter referred to simply as the ill-fated SLR), which happened to have been marshalled immediately in rear of the TE (train engine) on 21 Dn was simply pierced through by the Diesel locomotive's trailing long-hood, the rear end of which had also bucked up by 1.1 m. in this process. The next two coaches had veered to the right, capsizing anti-clockwise; the second (a First Class Coach) landed on its side straddling both the lines of the double-track non-electrified Main Line, whilst the third (a Second Class 3-Tier Sleeper Coach) tilted precariously but blocking only the Dn. Main Line. Further in rear on 21 Dn., seven more coaches had derailed, whereas the rearmost four coaches remained intact on track.

(d) As regards AE Sol., which was pushed back by hardly 15m as a result of the impact, its Diesel loco (which was also in a short-hood leading orientation) was so firmly rammed face-to-face with the colliding loco of 21 Dn. that it gave rise to an illusion, 'prima facie', that both the locomotives were actually one engine. The two wagons immediately behind the TE jack-knifed upwards together and rotated by about 120° so that they formed a 'V' shape with their undergear inside the 'V' and the badly damaged roofs outside. While the third wagon got badly crushed under the roof of the second wagon, the next two (i.e. the 4th and 5th) had also derailed, with all the 63 wagons further in their rear remaining intact on track.

(e) The total distance travelled by 21 Dn. after passing the Dn. Outer at Danger was 896 m. and, as per the speed chart (extracted after the accident from its YENKAY Speed Recorder No. JHS.09 fitted on its loco) showed that the terminal speed at the moment of impact was upwards of 70 km/h.

(f) Even though it was almost nearing a full moon on the night of the 26th, the night-time visibility at the time of the collision was undoubtedly impaired by foggy weather, the occurrence of which had been recorded by the Jhansi-based Jhansi-Agra Control Board as having commenced right from 02.00 hrs. of 27-1-82 all over this Section. However, in view of conflicting evidence on this score, the extent of the resultant reduction in visibility could not be conclusively established.

### 4. Passenger Occupation and Casualties—

(a) I regret to report that no less than 63 persons died on the spot, with an additional single death occurring after admission into a hospital; this latter was the Driver of the 21 Dn. Of these 64, 60 were adults, of whom 44 were male; of the four children, three were male.

(b) In addition, 26 others were hurt in this accident, half of them grievously and half receiving simple injuries.

(c) Of the 64 dead, two were 21 Dn's loco crew and all the rest had been taken off the ill-fated SLR coach, the front end of which was punctured through by the engine's long-hood. [See the 'Bird's Eye View', vide Annexure I(c)].

(d) The front SLR, which had actually started from Madras as part of the train-consist of 51 Dn. Link Express, was regrettably oriented with its passenger portion leading, of which the front 20 seats were earmarked for the RMS (Railway Mail Service) ex: Madras as, due to shortage of "Postal Vans" on the Southern Railway, reservation had necessarily to be made for RMS use in non-postal compartments. This particular feature in respect of 51 Dn. Link Express was authorised vide Appendix 'M' at page 103 of Southern Railway's Booklet No. 24, which contains appendices to its Working Time-Table No. 57.

(e) According to the Postal Department, as many as 221 postal bags were being carried ex: Jhansi under the overall charge of its Jhansi-

based RMS Superintendent, who was accompanied by four other RMS officials. Quite apart from the fact that the RMS Superintendent is under instructions *not* to allow non-RMS persons any access into the portion earmarked for the exclusive use of the RMS, the space occupied by 221 bags would itself have left scarcely any room for trespass.

(f) Besides the Assistant Guard and four other Railway Officials travelling in the Brake Van, some 65 passengers were found crowded in the confined rear non-RMS portion, which had a nominal seating capacity of only 20. The circumstance that around that time 57 Dn. Dadar-Amritsar Express (which should have preceded 21 Dn. by about half an hour at least) was actually running some 2½ hours behind 21 Dn. had probably contributed to this unusual over-crowding in this 'unreserved' 2nd Class portion of the ill-fated SLR, the extent of which might be judged from the odd feature that no less than two dead bodies and three persons alive were extricated from its rear toilet, besides another body that found its way into the luggage portion in the rear, past the torn rear-panel of this lavatory.

## II. RELIEF MEASURES

### 5. Intimation—

(a) The collision having taken place within the yard, the Controllers of Agra Board and Jhansi Board were immediately advised of the mishap and relief measures were thus activated at once. Coincidentally, the Divisional Railway Manager, Jhansi Division (with his senior Railway Officials) as well as the Railway's General Manager (with his Chief Operating Superintendent and Chief Mechanical Engineer) all happened to be at Agra Cantt. at that juncture, in connection with a scheduled inspection by the Chairman and the Member (Mechanical) of the Railway Board. Thus, the ready and convenient on-the-spot presence of so many senior Railway Officials led to a speedy and effective execution of rescue as well as restoration operations.

(b) The Agra-based Breakdown Train with its Accident Relief Medical Equipment Van was in position at 05.30 hrs., whereas the Jhansi-based Breakdown Train could reach Agra Cantt. only by 12.30 hrs. and be in position at 14.06 hrs.

(c) The Railway's Agra-based Assistant Divisional Medical Officer rushed to the spot within minutes and, as the news flashed about the magnitude of this tragedy, the Army lent its help, particularly in extricating the bodies from the ill-fated SLR.

### 6. Medical Attention—

(a) Almost all the passengers in the two capsized coaches, positioned the 2nd and 3rd behind the engine on 21 Dn., had fortunately received either simple or trivial injuries, which

were all effectively treated on the spot and discharged. Those particular cases about which there was some doubt, were conveyed to the hospital attached to the Sarojini Naidu Memorial Medical College, the Military Hospital and the District Hospital, for a proper check-up and later discharged.

(b) The last body could be extricated only in the after-noon and, as several bodies got mangled together as the engine's long-hood punched through the front of the ill-fated SLR, a most meticulous search had necessarily to be conducted by the Army personnel up to 18.00 hrs. of 27-1-82 before finally certifying that there were no more bodies left in that coach.

(c) As regards dead bodies, all due care was taken to properly shroud them with fresh white linen and, later, in the premises of the Railway's Health Unit, the bodies were surrounded on all sides by blocks of ice, in order to contain their de-composition and preserve them as long as possible for the purposes of facilitating their identification.

(d) Due to several multiple internal injuries contracted by him during this accident, despite the best efforts of the doctors in attendance and notwithstanding all the commendable volunteer effort in donating over a score pints of blood for him, 21 Dn.'s Driver eventually succumbed in the hospital, after struggling in vain for his life until 31-1-82.

### 7. Clearance and Restoration—

(a) A Special Train with a scratch rake of 14 coaches was started from New Delhi

at 08.50 hrs. on 27-1-82 for clearing the Stranded passengers of 21 Dn. Besides making regular announcements over loud-speakers about this arrangement, a personal check was also made to ensure that no one was left behind. Licensed porters and three buses were provided free of cost, to transport the Stranded passengers and their luggage from the accident site to the Station for boarding this Special Train.

(b) The Police Clearance for restoring the double-track Main Line, which was fouled by two coaches, was received at 12.35 hrs. on 27-1-82 and, once these two coaches were removed well clear of them, the tracks underneath were quickly attended to. Thus, both the Main Lines were given safe for traffic at 19.55 hrs. on 27-1-82.

(c) However, because of extensive damage caused to turn-outs and S&T transmission gear by this accident, only non-interlocked working and piloting had to be resorted to in the first

### III. COMPOSITION OF

#### 8. Composition of 21 Dn. at the time of the Accident—

(a) It was hauled by Jhansi-based WDM-2 Diesel Electric Locomotive No. 17626 of the following characteristics, in its short-hood-leading orientation :—

Year Built	1976
Place of Manufacture	Diesel Locomotive Works, Varanasi.
Over all length	17.12 m.
Over all weight	112.8 T.
Last yearly scheduled maintenance done	14-9-81
Kilometres earned after the last schedule.	53,673 kms.
Last attended for fortnightly trip schedule maintenance	26-1-82.

(b) The Vigilance Control Device had not been provided, in view of the latest directive from the Railway Board in this regard. According to the Driver's Repair Book, its ACD (Acceleration Control Device) was uncoupled\* and the wipers as well as the sanding gear were not working. However, both the speedometers including the speed recorder, the newly installed flashing head-lights and all the braking systems were all stated to be functioning well, although its 28 VB cut-out-cock responsible for synchronisation between the Loco's air brake and the train's vacuum brakes had not yet been recommissioned.

instance. The work of re-connecting and re-testing Points, Signals and interlocking was then taken up progressively; in the event, the Up Main Line was fully restored by 19.00 hrs. on 28-1-82 and Dn. Main Line by 19.30 hrs. on 30-1-82, with the remaining re-connections relating to the yard portion completed by 19.00 hrs. on 1-2-82.

(d) As a result, besides the understandable adverse effect on goods movement, the following disruption to Mail and Express trains could not be avoided:—

- (i) Cancellation of four trains;
- (ii) Diversion of six trains via the Western Railway route;
- (iii) Termination of three trains short of destination and their working back so as to maintain the rake links; and
- (iv) Termination en route on 27-1-82 of two trains ex : New Delhi, which were brought back to New Delhi.

### TRAINS AND DAMAGE

(c) The trailing load comprised 14 coaches, of which the first 3 were part of 51 Dn. Link Express ex : Madras and the last 2 were slip coaches from Jhansi to New Delhi. As might be inferred from the particulars given in Annexure II (a), none of the coaches was overdue its POH (the earliest Return Date being 3/82) at the time of the accident. According to the vacuum continuity certificate issued at Jhansi, this train had 100% effective brake-power with vacuum levels reading 40 cm and 50 cm respectively in the rear brakevan and on the engine.

#### 9. An appreciation of the composition of 21 Dn.—

(a) Annexure I(a) shows an incomplete rail-map of India with the path of 21 Dn. and associated trains shown thereon, so as to focus attention on the movement of the ill-fated SLR as it left Madras Central by 51 Dn. Link Express on 25-1-82, which was a Monday. On the basis of documented data published at page 32 of Southern Railway's Booklet\* No. 24, at pages 21 to 23 of South Central Railway's Booklet\* No. 19 and at page 18 of Central Railway's Booklet\* of the Operating Department (in force from 1-1-81) the changes in the train-formations had been worked out and indicated on this map for easy grasp.

(b) Although the coaches of 21 Dn. have been shown as destination-bound nominally to (NDLS) New Delhi, the train itself terminates at Hazrat Nizamuddin (a suburb, located 7.25 Km to the south of New Delhi). The ill-fated SLR has been underlined and its orientation

\*Board's letter No. 73M(L) 466/122-Pt. III dated 19-8-81.

\*The ACD, which is meant to control the fuel supply to Locomotives equipped with single streamlined manifold, occasionally requires to be uncoupled when its base diaphragm bursts in service.

arrow-marked, so that its progress may be easily appreciated as below :

- (i) It was the last vehicle on 51 Dn. ex : Madras Central up to Gudur;
- (ii) Thereafter it was in the middle of the train formation up to Vijayawada;
- (iii) It was the last vehicle on 51 Dn. again ex : Vijayawada up to Kazipet; and
- (iv) It became the first vehicle (i.e. immediately in rear of the engine) on 21 Dn. from Kazipet onwards, but with its orientation reversed because 21 Dn. and 51 Dn. enter Kazipet from opposite directions.

(c) The ill-fated SLR happened to have been oriented at Madras Central with the passenger-portion trailing, which meant that the passenger-portion was leading ex : Kazipet onwards.

(d) Incidentally, on 21 Dn. of the day *previous* to the accident, this particular SLR would not have been the *first* coach behind the engine between Kazipet and Itarsi, when the Hyderabad-Varanasi slip coach [which leaves Hyderabad on Sundays vide Annexure IV(a)] would have been positioned in between; ex : Itarsi onwards, however, the situation would have been the same as at sub-para (b) (iv) supra.

#### 10. Composition of AE Spl.—

(a) This goods train was hauled by Itarsi-based WDM-2 diesel electric loco No. 17321 (also manufactured by the Varanasi Locomotive Works), with the following salient features, in its short-hood leading orientation :—

Date of commissioning : 8-4-72  
 Last POH done on : 5-9-78@  
 Kilometres earned since then : 4.8 lacs (approx.)

(b) According to the Driver's Repair Book, this loco was not equipped with the Vigilance Control Device and the conjunction valve (for synchronisation between the loco's air-brakes and the trailing load's vacuum-brakes) had been isolated. Whilst the flashing lights were stated to be in working order, the undernoted deficiencies were recorded :

- (i) Front head-light bulb fused;
- (ii) Both sides wipers absent;
- (iii) Water temperature gauge defective;
- (iv) Right Control Stand : Gauge light not working; and
- (v) Left Control Stand : all indication bulbs deficient.

(c) As regards the trailing load of 2,200 t, which was formed at Agra Cantt. itself, all relevant particulars are given in Annexure II(b), wherefrom it might be noticed that the load of 68 wagons included 5 (marshalled the 19th, 43rd, 44th, 55th and 56th behind the TE) BRH bogie-wagons. Although the (un-machine-numbered) Vacuum Brake Certificate did not indicate the level of vacuum in the TE, it was actually 50 cm, whilst 38 cm of vacuum obtained in the brake-van when the train was given ready for despatch by Train Examiner (TXR) staff with an effective brake power of 85%.

#### 11. Damage—

(a) The havoc wreaked on the locomotives and rolling stock of the 2 trains involved in the collision was commensurate with 21 Dn's terminal speed in excess of 70 Km/h. The severity of the impact may be gauged from the following brief description of damage suffered by the 2 trains concerned :

##### 21 Dn.

- (i) The entire engine-block shifted apparently "forward" (the chassis having actually been driven back) by about a meter, with an extensive damage caused to all systems;
- (ii) The trailing long-hood of the engine (with its overall width of 1.82m and height of 4.1m above the rail level) punched/pierced through the leading portion of the SLR (with its overall width of 3.25m and height of only 3.926m above rail level) while ripping through the roof as its rear end bucked up by about 1.1m. In this process, both the trolleys of the SLR got wrenched off and twisted out of shape, while the rest of the coach suffered extensive damage;
- (iii) The next 2 coaches (which had veered off and capsized) had their shells distorted badly and head-stocks twisted, while none of the trolleys survived, nor the brake-rigging;
- (iv) The 4th coach telescoped into the tilted rear of the 3rd; while its derailed trolleys contracted little damage, its superstructure suffered distortion under the continuing momentum of the trailing load;
- (v) The 5th coach (both the trolleys of which had derailed) and the next 3 coaches (all of which derailed by one trolley only) in rear were all affected to progressively diminishing extent, excepting that the buffers had understandably given way under the shock load; and
- (vi) The 9th and 10th coaches remained unaffected by the collision, although each had derailed by *both* its trolleys.

@ This loco was thus overdue its triennial scheduled maintenance or POH by nearly 5 months.

**AE Spl.**

- (vii) The engine block shifted "forward" by about 0.3 m, while the electrical systems as well as the radiator and expessor compartments were a total write-off, besides the expected destruction of the cattle guard and buffers at both ends;
- (viii) The shock-wave of the impact caused the first 2 wagons (both loaded with food grains) to almost "turn turtle" by pivoting through approximately 120° about the coupling in between them, and in this process these 2 covered wagons became a total-write-off with almost nothing worth salvaging out of either their brake/draw/buffing/springing gear or their bodies and trolleys;
- (ix) The third covered wagon (also loaded with food grains) got crushed underneath the weight of the 2nd wagon, besides suffering deformation of its sole-bar and head-stocks and extensive damage to axle-boxes and all mechanical gear; and
- (x) The 4th and 5th covered wagons (loaded with "smalls") had also derailed and were the last to sustain heavy damage in their superstructure as well as the running and other gear.

(b) The damage caused to the infrastructure was a direct consequence of the derailment of the rolling stock and the lateral displacement of the derailed stock, besides the understandable dragging/pushing of 21 Dn's 2 coaches which had been far flung to the right. This damage, graphically shown in Annexure I(b), is summarised hereunder :

**Track**

- (i) All the five 1 in 8½ turn-outs (which happened to be positioned under the derailed coaching stock) got destroyed 'in toto', while additionally the Bombay-end turn-out of cross-over No. 35 got damaged by the capsizing coaches;
- (ii) Whilst the short lengths of "plain track" in between these turn-outs had also got destroyed, over 30 m. of track beyond the point of collision (reckoned as the meeting point of the 2 locos as they finally came to rest) was uprooted underneath the damaged rolling stock of AE Spl; and

- (iii) Whereas it was unavoidable that, due to the inherent transverse stiffness of turn-outs, some short lengths of track continuous with the "other legs" (which were *not* negotiated by 21 Dn.) could not escape the effects of the collision, both the tracks of the Main Line also contracted extensive damage through the passage of the 2 capsizing coaches.

**Signalling & Interlocking**

- (i) The complete fittings (including the lock bars concerned) of the 6 aforementioned turn-outs got destroyed;
- (ii) Due mostly to the trajectory taken by the 2 capsizing coaches, 300 m of rod-ding transmission (for the operation of 'points') and an equal length of wire transmission (for the operation of Signals) got damaged; and
- (iii) A one-arm signal Post No. 16-A got knocked down by the lateral displacement of one of the coaches that had derailed in the rear.

(c) From the evidence, it appears that AE Spl. had yielded hardly 15 m, under the bludgeoning impact of 21 Dn. This circumstance prevented the dissipation of a substantial proportion of the kinetic energy, but for which the consequences would certainly have been much loss catastrophic (i.e., had AE Spl. rolled back under impact).

(d) The overall direct costs of damage, as estimated by the Railway, were as below :—

	Rs. in lacs.
— 21 Dn.'s Loco . . . . .	42.50
— AE Spl.'s Loco . . . . .	19.49
— Coaching stock of 21 Dn. . . . .	08.83
— Goods stock of AE Spl. . . . .	00.58*
— Track . . . . .	03.60
— Signalling . . . . .	00.60
TOTAL	75.60

\*This includes Rs. 31,000 worth of damage to electrical train lighting system.

**IV. LOCAL FEATURES****12. The Section and the Site—**

(a) Agra Cantt. is an important Junction Station on the non-electrified Broad Gauge double line section of Central Railway's Jhansi Division, where the tracks generally run North-

South. The line to Western Railway's Idgah-Agra takes off to the North of this station in a North-Easterly direction. The location of the Goods Yard to the West of the main lines necessitates the crossing of the Dn. Main Line by any *Up* goods train departing from it.



(b) The kilometrages, reckoned from Bombay VT, are given below in the direction of 21 Dn's travel :—

Jhansi . . . . .	1128
Datia . . . . .	1153
Sonagir . . . . .	1164
Kotra . . . . .	1174
Dabra . . . . .	1185
Anant Paith . . . . .	1193
Antri . . . . .	1203
Gwalior . . . . .	1225
Banmor . . . . .	1245
Morena . . . . .	1264
Hetampur . . . . .	1278
Bhandai . . . . .	1333
Accident Site . . . . .	1342.5 (Approx.)
Agra Cantt. . . . .	1344

(c) Trains are worked on the Absolute Block System. Agra Cantt, a 'B' Class Station, was provided with only Standard I Interlocking, @ whereby a permanent speed limit of 50 Km/h had long been imposed between Km. 1341/7 and 1344/7 on both the Up and Dn. roads; page 101 of Appendix VII of the "current" Working Time Table of Jhansi Division also indicates this.\*

(d) SGE 3-wire 3-position double line Lock-and-Block Instruments are provided in 'A' Cabin at Agra Cantt. for working trains to and from Bhandai. Besides the 'C' Cabin—which similarly attends to all Block Working beyond Agra Cantt. to the North (i.e. the Double Line to New Delhi and the Single Line to the Western Railway)—there is a 'B' Cabin located just to the South of the island platform, a Marshalling (or Hump) Cabin almost due West of (and, slightly to the North of) 'A' Cabin. There is also a 'D' Cabin here, to control the Northern exit/entry for the Goods Yard and its environs. Annexure I(b) shows only the 'A', 'B' and Marshalling Cabins.

(e) This Station is provided with orthodox TALQ (Two Aspect Lower Quadrant) Semaphore Signals, without a Warner. Post-type reversers are provided as necessary and adequate inter-cabin control (ICC) exists via slotting and electrical releases. All Signals are lit at night by standard kerosene oil lamps, excepting for the 2 Outers, which had been fitted, in compliance with the Railway Board's directive No. 78/W/III/SG/G/4, dated 30-3-79 with battery-operated electric bulbs. A Sighting Board has been provided in rear of the Down Outer at a distance of 1,443 m.

(f) The 'A' Cabin can accommodate a 90-lever frame, but is equipped with a 80-lever frame of 1924 'A'-2 type, with 1914 type locking, which was last overhauled on 5-12-1980 and the functioning of which was last tested and found OK on 22-1-1982. The Marshalling Cabin (hereinafter called simply as the 'M' Cabin), which can accommodate a 30-lever frame is equipped with a 24-lever frame, which was last overhauled on 22-5-1981 and the functioning of which was last checked and found OK on 23-1-1982.

(g) The track is on a dead straight right from Bhandai almost upto the 'B' Cabin-controlled Dn. Routing Approach Signals at Agra Cantt (i.e., a continuous stretch of about 10 Km.). As may be seen from Annexure I(b), the entry from the marshalling lines into the Up Main Line is via a 1 in 8½ turnout (viz. No. 49 in the case of Marshalling Lines 1 to 4 and No. 50 for Lines 5 to 12) joining the shunting neck, then a 1 in 8½ cross-over (No. 53) between this shunting neck and the Down Main Line, and thereafter a 1 in 12 cross-over (No. 54) between the 2 Main Lines. The last Track Recording Car run classified the Down Main Line in this region as falling under 'A' category.

(h) The gradients from Bhandai in the Dn. direction are as tabulated below, whence it may be seen that the falling and rising grades compensate and almost cancel each other (which entirely rules out any chance for a Dn. train to attain a run-away speed) :

Kilometres		Grade Length(m)	Gradient %
From	To		
1332.99	1333.05	60	L
1333.05	1333.30	250	0.1 F
1335.30	1334.05	750	0.25 F
1334.05	1335.05	1000	L
1335.05	1335.65	600	0.2 R
1335.65	1336.65	1000	L
1336.65	1337.05	400	0.5 R
1337.05	1337.10	50	L
1337.10	1337.65	550	0.5 F
1337.65	1340.65	3000	L
1340.65	1342.13	1480	0.8 R
1342.13	1344.00	1870	L

\*Western Railway's SR 90-(3) requires, when the speed over the facing points at a given Station is less than the speed permitted at other Stations on the same section, the fixing of a permanent Speed Indicator on the post of the first Approach Signal at that Station. Although no such provision exists on the Central Railway, the Speed Limit Board was found affixed on only the Up Outer, but not the Dn. Outer. Subsequent to the subject accident, however, a similar Speed Limit Board has been fixed on the Dn. Outer as well.

@Although the facing point equipment does conform to Standard III, the down-rating is due to the non-isolation of Main Lines.

(i) With regard to the path taken by AE Spl, whereas the marshalling yard was itself generally (i.e. ignoring local deviations of the type normally associated with goods yards in India) on a level stretch, the gradients (as applicable for *this* direction and reckoned from the Fouling Mark between marshalling line Nos. 1 and 2) were got surveyed as below, whence it would be apparent that the existing gradients 'per se' could hardly have contributed to starting trouble or wheel-skidding on its loco :—

Rise of 1 in 185 over a length of 114.1 m, followed by  
Fall of 1 in 426 over a length of 65.0 m, followed by  
Rise of 1 in 511 over a length of 52.55 m upto the position\* in which the front end of its loco had come to rest after the collision.

\*A distance of 896 m from the Dn. Outer.

### 13. Further features relevant to the Infrastructure—

(a) On 27-1-82, 21 Dn. was planned to be received on the "Back Platform Line", in the context of which, its passage would be governed by the following Signals, vide Annexure I(b) :

Signal No.	Description	Location*	Remarks
79-A 78-A	Dn. Outer Main Home	** 490.60	Released by 78-A; Released by, inter alia, 77-A;
77-A	Routing Home	652.90	Released by 25-A and cross-over Nos. 53 & 35 locked Normal;
25-A	Inner Home	1046.10	Released by cross over No. 22-A locked Normal and Slot already given by 'B' Cabin <sup>@</sup> ; also requires Signal No. 16-A to be at 'ON';
52-B	Routing Home	1179.40	Already lowered by 'B' Cabin, after receiving the appropriate Slot from 'C' Cabin and, inter alia, setting and locking Points No. 31-B in Reverse.

\*All distances are unless otherwise clarified to the contrary or readily apparent from the context, reckoned in metres with reference to the Dn. Outer Signal No. 79-A.

\*\*18m ahead of Dn. Outer (located 835.7m in 'A' Cabin's rear) is 'Traffic Gate' No. 494-0.

<sup>@</sup>'B' Cabin is located 1380 m ahead of the Dn. Outer.

(b) With reference to AE Spl. departing from Marshalling Line No. 1, its passage would

be governed by the following Signals, vide Annexure I(b) :

Signal No.	Description	Location	Remarks
29-A	Intermediate Starter <sup>@</sup>	932.80	Released by, inter alia, 16-A, and lever Nos. 49, 43 & 47 which must be pulled in that order for the Slot which was already given by 'M' Cabin <sup>£</sup> .

<sup>@</sup>Movement of its Signal arm is controlled by the usual 3-lever (counterweight) mechanism.

<sup>£</sup>'M' Cabin is located 912.10 m ahead of the Dn. Outer.

Signal No.	Description	Location	Remarks
16-A	Goods Starter	746.80	Released by, inter alia, 20-A and the locking of cross-over Nos. 54 & 53 in Reverse;
20-A	Main Starter	561.90	Locks cross-over No. 54 both ways;
21-A	Advanced Starter	298.30	Electrical lever lock released by the 'Line Clear' position of the 'Up commutator handle' of the Block Instrument.

Note : All the aforesaid Signals (excepting 21-A, of course) are equipped with post-type reversers.

(c) Only the 2 farthest Signals 79-A and 21-A are worked by double-wire mechanism operated, however, by the older catch-handle type levers, with appropriate inputs to obtain the requisite increase in the "stroke" length.

(d) The Dn. Outer (79-A) has a 4W/12V bulb, of the type commonly used for 'indication' purposes in Cabins; it is actuated by a switch fitted at the Bombay-end of the leverframe's "lead-board" in 'A' Cabin. As the functioning of this bulb is to be inferred from its 'back light', no separate 'indication' had been arranged in the Cabin to verify this matter. The 'basement' of 'A' Cabin has 7 batteries (each of 2V and 120 Amps-hrs. capacity) in series to feed this bulb. These batteries were commissioned on 21-2-1978 and are charged by a Battery Charger (which also energises a 6-unit battery meant to feed the 'Departure Bell' and the Hepper's Key Transmitter as well as another 7-unit battery exclusively meant for the Block External Circuit).

(e) The Joint Observation of lever positions noted in 'A' and 'M' Cabines as soon as possible after the accident showed as follows :

**'A' Cabin\*—**

Levers pulled : 2, 5, 20, 21, 23, 24, 43, 47, 49 & 53. As regards the levers under-lined above, whilst 23 and 24 are for lock-bars @ for cross-over No. 22-A, 2 and 5 are slots for 'B' Cabin. Whereas Signal No. 21 had assumed its 'OFF' aspect, Signal No. 20 was found to be ON, however, despite the position of the lever concerned. Another anomaly was that Signal No. 29 continued to be in its 'OFF' aspect, even though its 'A' Cabin lever had been replaced.

**'M' Cabin—**

Levers pulled : 13, 15, 16 & 23, all of which are consistent with the departure arrangements for AE Spl.

(f) As pertinent to the departure of AE Spl, the following levers should have been pulled in 'A' Cabin :

49, 43, 47, 54, 59, 20, 53, 57, 16, 29, 21.

—————→  
 -----→  
 -----→

The arrow-headed under-lining indicates the sequencing within a sub-group of levers; thus, it would not matter at what stage 21 is pulled nor, indeed, at what point of time the sequence 49, 43, 47 is accomplished relative to the other levers.

(g) Similarly, as pertinent to 21 Dn's reception, the following levers should have been pulled in 'A' Cabin :

23, 25, 38, 58, 77, 78, 79, with levers 54, 53,

—————→  
 -----→  
 -----→

36, 35, 22 and 16 in the normal position (or unpulled condition).

(h) Whereas no "unsafe-failures" ever occurred, as could be gathered from the Signal Failure Registers maintained in 'A' and 'M' Cabins, there had indeed been complaints (coincidentally, all of them booked by a single Driver, at the mini "Booking Office" at Agra) about the visibility especially of the Dn. Outer, as brought out below :

Dato	Complaint	Action taken
16-10-81	Extinguished	No records with S&T.
20-10-81	Burning Dim	None, as subsequent footplate inspection by S & T officials did not apparently substantiate this version.
23-11-81	Burning Dim	
21-1-82	Visibility very bad	

\*The commutator handle of the Block Instrument was found *locked* in the 'TOL' position.

@As this cross-over is scarcely used, it is usual to lock it Normal from both directions.

\*\*Distances reckoned from Dn. Outer, as before, in metres.

@@Corresponding to the normal position of stoppage of 21 Dn's TE on the Back Platform Line, its front end would have been 1890.90 m from the Dn. Outer.

(i) Subsequent to the subject accident, the light was found to be dim by me and the cause was traced to off-centre positioning of the bulb relative to the focus of the lens; this situation was got remedied straightaway and, with proper focussing, the visibility did improve considerably.

(j) Indeed, for the sake of providing better visibility, this Outer Signal had been *shifted* to the *right* side of the "double-line" at the time of constructing the new Dn. Main Line under the Commission of Railway Safety's sanction No. 177 of 16-4-73, as could be readily deduced from Alteration 'N' to I.P. No. SI-2235.

(k) The facing points actually encountered by 21 Dn. and which should have been negotiated by it in the context of its reception on the 'Back Platform Line' @@ are described below :

(i) For 21 Dn's reception proper :—

Points No.	Location**	Setting	Remarks
31 B	1194.40	Reverse	Already set

(ii) As actually traversed by 29 Dn's TE :—

Points No.	Location**	Setting	Remarks
54 A	666.80	Reverse	Consistent with the setting of the route or the despatch of AE Spl. from Marshalling Line No.1.
49 A	792.30	Reverse <sup>o</sup>	
43 A	832.70	Reverse	
48 A	879.80	Normal	

(1) The Joint Observations of the track showed as follows, with particular reference to the setting of 'points', all of which were in accord with the position of the 'A' Cabin levers concerned :

- (i) Cross-over No. 54 found 'Normal' (and, hence, there was no question of the trailing points getting trailed through by 21 Dn.), but not locked in either direction;
- (ii) "Facing points" of Cross-over No. 53 found 'Reverse', but not locked. trailing points damaged and not locked; and
- (iii) Points No. 50, 49, 43 & 48 as well as the 'Facing points' of cross-over No. 35 were all damaged and *none* of them was locked.

(m) The Joint Measurements recorded of the track over 45 m immediately in rear of 21 Dn's last vehicle showed nothing even remotely adverse on the Dn. Main Line.

#### 14. Features pertaining to the Weather—

(a) On Jhansi Division, the region to the North of Gwalior has been designated as "cold area" for the purposes of issuing overcoats to staff in Winter. Correlation exists between coldness of the climate and proneness to fog and it is not unusual for thick blankets of fog to descend upon the tracts of the "Agra-Delhi belt", through which the railway track passes.

(b) In order to caution Drivers, under such foggy weather conditions, of the approaching Station Limits, Central Railway's SR. 71-1(c) & (d) require the placement of detonators at a distance of 275 metres *beyond* the outermost Signal, provided that the VIO (Visibility Test Object, located 180 m from the Cabin) cannot be sighted due to reduced visibility. Annexure V(b) details the provisions that exist on Northern, Eastern and Western Railways to cover a similar situation.

(c) Yet, a perusal of the "Detonators Registers", maintained in the Cabins of all the 33 stations in this region — which fall within the Central Railway's jurisdiction, to the North and inclusive of Gwalior — showed that simply *no* detonators were used anywhere at all\* right from 1-1-1980 upto the time of this accident. And, according to field data collated subsequent to the subject accident (i.e. from 27-1-82 onwards) whilst detonators were all of a sudden being "burst" at 19 Stations, the situation with regard to non-use of detonators continued to remain as before at the remainder 14 stations. More curiously, whilst recourse to using detonators was frequently resorted to by Agra Cantt's 'A' Cabin during the post-accident period, none were used by Agra Cantt's 'C' Cabin, located just 2 km. away from the 'A' Cabin.

(d) As most Stations on this "board" had reported about this matter to the Section Controller (SCOR, hereafter), the Jhansi-Agra (Cantt.) Section's "Control Chart" for the period 00.00 hrs. to 08.00 hrs. of 27-1-82 recorded "HEAVY FOG ALL OVER SECTION" (in bold capital letters and in red ink) diagonally down this Chart between the columns indicating the timings 02.20 hrs. and 03.40 hrs. and below the row corresponding to Dabra Station. The SCOR's expectation was that Goods trains would lose 7 minutes and Mail/Express trains about 2 to 3 minutes in each Block Section as a consequence of the foggy weather.

(e) Similarly, the Control Chart for Agra (Cantt.)—New Delhi section recorded in the time-zone beyond 6 AM "HEAVY FOG IN SECTION. ALL RINGS FAILED DUE TO LOW INSULATION".

(f) Whereas all evidence uniformly pointed to foggy weather prevailing at the time of the accident, there was considerable difference of opinion

as to the extent to which visibility was actually impaired as a result. A slight drizzle had occurred on the night of the 26-1-82 (at about 9 PM in the vicinity of 'A' Cabin and from 00.00 hrs. to 03.30 hrs. of 27-1-82 at Bhandai), in consequence of which the weather could have comparatively cleared up by 04.00 hrs.

(g) The weather records logged during the early hours of 27-1-82 by the Air Force Station at Agra Airfield (located about 5 Km. from Agra Cantt. Station) showed as follows, whence may be deduced the progressive fall in temperature, rise in saturation of moisture and the deterioration in visibility:—

Time (hrs.)	Visibility (Km)£	Weather @	T(°C)	Dew# point	Wind* speed
00-00	6	Fine	14.4	14.0	2
01-00	6	Cloudy 3/8	"	"	6
02-00	6	Cloudy 5/8	14.2	13.8	3
03-00	6	Cloudy 3/8	13.6	13.2	Calm
03-15	5	"	"	"	"
03-30	2	"	"	"	"
03-45	1½	"	"	"	"
04-00	1	"	13.0	12.6	"
05-00	0.8	"	12.6	12.6	"
06-00	0.6	Sky obscured	12.2	12.2	"

Notes : £Horizontal or ground visibility.

@Represents vertical visibility and how many "octas" of the sky is covered by cloud formations.

#Dew point is less than or equal to prevailing temperature and, when equal, the situation represents 100% humidity.

\*In Knots (1 Knot is roughly 1.8 Km/h).

#### 15. Features relevant to 21 Dn.—

(a) Ex : Jhansi, this train was driven by (the late) Shri Budhoo Lal, a Jhansi-based 'A' Spl. Grade Driver. Perusal of records confidentially maintained by the Foreman of the Jhansi Loco Shed in respect of Drivers habituated to consuming liquor showed that Budhoo Lal was *not* one of the 8 listed in this category. Records also indicate that Budhoo Lal was successfully administered the 'breathalyzer' test (using a battery-powered torch-shaped appliance) by the on-duty Shedman of Jhansi Loco Shed at 20.35 hrs. on 26-1-82 in the presence of the Assistant Loco Foreman, who had countersigned this entry, *inter alia*, on the relevant register. Indeed, the Safety Counsellor (Loco), who located him badly hurt and trapped inside the Loco-cab, did not sense any smell of alcohol on him. The Diesel Assistant had already died on the spot.

\*Only two isolated exceptions occurred in this period that covered over 24 months : one single day in January, 80 at Kos i Kalan and another single day at Mathura in December, 81.

(b) The bio-data of Budhoo Lal, who had studied upto VIIth Standard, revealed as under :

— Date of birth	7-2-1928
— Date of appointment	7-2-1948 as Augwalla
— Promotion to Fireman 'B'	28-7-1951
— Promotion to Shuntar 'B'	16-6-1961
— Promotion to Driver 'C'	25-11-1963
— Promotion to Driver 'B'	26-3-1974*
— Promotion to Driver 'A'	14-9-1978@
— Passed Refresher Course	2-2-1980
— Promoted as Driver 'A' Spl.	11-11-1980@

\*Against "40-point roster", but after selection.

@Against "40-point roster".

(c) Annexure III(a) reproduces the jottings made by Budhoo Lal himself on that fateful journey. From this evidence, the Guard's Journal and the Control Chart@, the following reconstruction could be made of 21 Dn's progress, with Budhoo Lal at the controls :

- Departed Jhansi (1' 10" late) — 23.40 hrs. of 26-1-82;
- Through Datia *via loop* at 00.00 hrs. of 27-1-82 as a Goods train was on the Main Line;
- Stopped at Sonagir for T. 32 B (Authority to pass defective Signal) left at 00.17 hrs. *via loop*;
- Stopped at Kotra (both the lines blocked by Dn. Goods trains) for piloting via the Up Main Line; left at 00.37 hrs.;
- Stopped at Dabra, to detrain\* Loco Fitters (to repair the loco of TKD 841, which was held up here from 19.10 hrs. of 26-1-82); left at 00.56 hrs.;
- Stopped at Antpeth, again to detrain\* Loco Fitters (to repair the loco of TKD 170, which was held up here from 20.30 hrs. of 26-1-82); left at 01.11 hrs.;
- Stopped at Antri for 'Line Clear' as 359 Dn. Passenger lost 41" in the section (due to engine trouble) and left at 01.37 hrs. (indeed, BL65 840 was also held up here for engine trouble!);
- Stopped at Banmor to detrain\* C & W Fitters; suffered ACP (alarm chain pulling) after start and finally left at 02.50 hrs.;
- Scheduled stoppage at Morena; left at 03.10 hrs. (i.e. 2' 50" late);
- Stopped at Hetampur, once again to detrain\* C & W Fitters; left at 03.27 hrs.;
- Through Bhandai at 04.07 hrs.;
- Next notation already made by the Driver indicated the scheduled arrival/departure at Agra Cantt.

(d) Annexure III(b) shows the speed-profile attained by Budhoo Lal (with a fresh chart inserted for this journey) on the basis of Yenka Y speed-chart Nos. 1 and 2 (out of the 7-day pile recovered from the cab of 21 Dn's loco). From this it can be seen that the stylus had not only touched the outer rim or peripheral limit of the chart (which represents a speed of 120 Km/h), but the trace also followed the rim on several occasions, albeit for spells never exceeding even 5" at the most. The implication was that the train maintained a speed of at least 120 Km/h throughout these intervals of time. This speed-chart also demonstrates that, even when 21 Dn. had a clear run through certain way-side stations, its speed did invariably drop down to the "lesser" speed range of 80-100 Km/h.

(a) The Joint Observations of the controls in the driving cab of 21 Dn's loco revealed as under :

(i) *Brake-application*

- Handles/levers for both A-9 and SA-9 valves were in RELEASE position (i.e. not applied) on both the Control Stands;
- Dynamic brake selector handle on Right Control Stand in FULL (i.e. maximum) application position; and
- Emergency Flap Valve closed (un-operated).

(ii) *Right Control Stand features*

- ECS (Engine Control Switch) in 'RUN' position;
- Reverser in FORWARD position;
- Throttle in IDLE or 'Zero' position;
- All Control Panel Circuit Breakers in 'ON' (i.e. closed or working) position; and
- Control Stand lights in working order.

(iii) *Short-hood head-light bulb burning.*

(f) In order to avoid excessive buffing in the rear and its attendant hazards, it is a standard practice for a Driver to *first* apply the A-9 to a slight extent (and thus activate the vacuum brakes on the trailing load) *before* applying the loco's dynamic brake. A rational explanation has, therefore, to be sought to clear up 2 unusual features : firstly, why was such not the case here in respect of the A-9 lever and, secondly, how was it that the emergency valve could not be flipped up.

@ The train-timings are as per the Driver's log.

\* Although, a passenger-train like 359 Dn. should have been used for this purpose, a serious exertion cannot always be taken if an Express Train is stopped out of its normal schedule to drop repair-crews at various way side stations, if the circumstances indeed warranted this step in such exigencies. Had 57 Dn. been on time (or, running ahead of 21 Dn. as it should), it would have been utilized, in all probability, for this purpose.

(g) As regards 21 Dn's terminal speed at the moment of impact, the following would be relevant :

- (i) The reading (as signified by the point where the otherwise straight and smooth recording ends abruptly, to be followed by a messy squiggle) of 80 Km/h on the Speed Chart;
- (ii) The actual wheel-diameter of 1,084 mm as measured—in contrast to the average wheel-diameter of 1,050 mm, for which the recording system is designed to be calibrated ;
- (iii) The marginal over-estimation\* on the part of the recorded speed, when a train happens to be decelerating ; and
- (iv) The circumstance that 21 Dn. did successfully negotiate a 1 in 8½ cross-over and two additional 1 in 8½ turnouts—all in their reverse position.

\*Due to the sluggishness inherent in the response of the recording system to changes in the actual inputs, it is well-known that there is always a distinct time-lag (no matter however slight), between the actual fall in the loco's speed and the corresponding downward stroke traced by the stylus on a speed-chart.

(h) As regards the arrangements for 21 Dn's reception—its immediate predecessor (TKD 900 Dn. Goods) having arrived at 02.10 hrs, and there being no other train in between (what with several Goods trains detained at wayside Stations with loco-failures and 57 Dn. Express running very late) — "Line Clear" for 21 Dn. was sought by Bhandai and granted by Agra Cantt's 'A' Cabin as early as at 03.20 hrs. Under the instructions of the Sub-ASM, 'C' Cabin took steps at 03.51 hrs for its admission on Platform No. 3 (or, the "Black Road") and 'B' Cabin thereafter took similar steps at 03.52 hrs. to take Signal No. 52B 'Off' and also release the appropriate Slot for 'A' Cabin. It was the 'A' Cabin's contention that further measures to receive 21 Dn. could not be pursued any further, because AE Spl. was already under despatch from the Goods Yard. 21 Dn's 'TOL' Signal was received by 'A' Cabin at 04.05 hrs. from Bhandai.

#### 16. Procedure for starting an Up Goods train ex : Agra Cantt.

(a) The procedure laid down in Instruction XI(b) at pages 36-37 of the Station Working Orders of Agra Cantt. for the despatch of an Up (Goods) train from Marshalling Lines 1 to 4 is summarised below :

- (i) 'M' Cabin will advise all the relevant particulars to the Sub-ASM, as soon as the train is "ready" ;
- (ii) Sub-ASM will instruct 'A' Cabin, giving him these particulars, to obtain 'Line Clear' ;
- (iii) 'A' Cabin will, with SCOR's permission, obtain 'Line Clear' for the 'Up' Goods

train and then advise this to 'M' Cabin under exchange of PN ; and

- (iv) Both 'A' and 'M' Cabins will set the route and lower the appropriate Departure Signals, after which 'M' Cabin will issue a Starting Permit on Form T. 189-B to the Goods train's Driver.

(b) Arising principally from the difficulty in proper voice communications between Jhansi-based SCOR and Agra Cantt's 'A' Cabin, a revised instruction was issued by Jhansi Division's Operating Branch (under letter No. JHS.T.204/P/33 of 8-9-78) which reads as follows :

"It has been reported that there is much difficulty in granting line clear to Up goods trains leaving from AGC. I have, therefore, instructed that granting line clear to Up trains ex. AGC should be the responsibility of DYC AGC and he will see whether adequate margin is available or not to start the Up goods train from AGC ahead of Mail/Express train. Jhansi control will only interfere when it is not possible to accept the Up train due to no line being available at Bhandai or any other reason coming in the way of accepting the Up train from AGC."

(c) The introduction of the above procedure had not apparently solved the problem either of detention to Up Goods trains at Agra Cantt. or the subsequent mutual recriminations between the various officials concerned, which led to a revised directive (scripted in Hindi as Item 9 of 18-10-80 in the Chief Controller's Instruction Book for the period 22-9-80 to 22-12-80). The English version of this latter directive (which, by virtue of its not having been further superseded or modified, was still current at the time of the accident) reads as below :—

"Sr. DOS(M) has ordered as follows :—

To start Goods train from Agra and Jhansi, line clear will be sought by Agra and Jhansi from BHA/BJI and, if a line is available, then the line clear will be given. There is no need to ask the SCOR for this by AGC/JHS. After seeing the margin available for Mail/Express trains, Agra and Jhansi will themselves start the train. In this way, the criticism "SCOR has not granted line clear" would be countered. Please remind both the yards once again about this."

#### 17. Features relevant to AE Spl.

(a) The load for this Goods train was formed in the Marshalling yard of Agra Cantt. by 12.00 hrs of 26-1-82. Pursuant to the TXR examination, which was over by 15.30 hrs, all the requisite attention was completed by 20.00 hrs.

(b) The 'power' meant for this train (which had worked 747 Dn. into Agra Cantt. by 19.50 hrs.) had been otherwise utilized until it was brought on to its load by 01.50 hrs. of 27-1-82. The train was 'ordered' for departure at 02.30 hrs. and the TXR staff advised to get it ready.

(c) In the event, the TXR staff were able to obtain the requisite vacuum in the brake-van only by 03.05 hrs.\* (the time at which the Guard had signed on the Vacuum Brake Certificate), whereupon this Certificate was issued to the Driver at 03.15 hrs. and the 'RR' (i.e. ready report) given to 'A' Cabin by 03.20 hrs.

(d) However, as another Up Goods train (the SFC Spl, which had in the meanwhile arrived at 03.00 hrs.) was already under despatch via the Up Goods Loop, the obtaining of 'line clear' by 'A' Cabin for AE Spl. had necessarily to await the arrival of this other Goods train at Bhandai, the next Station ahead. In order to save avoidable losses of time, 'A' Cabin had taken advance action in deputing its Pointsman with a Caution Order (utilizing, due to the printed Form No. T.194-B having been out of stock, the blank obverse of Form No. T.90-B, used normally for the Train Clerk's Memo Book) at 03.35 hrs. to be issued to the crew of AE Spl. Subsequently, 'A' Cabin obtained at 03.43 hrs. 'line clear' for AE Spl. from Bhandai, under the due exchange of PNs (Private Numbers) with the local Sub-ASM also. Thereafter, 'A' Cabin quickly set the route for AE Spl. and took the appropriate Signals 'OFF' and also advised 'M' Cabin of the same by 03.44 hrs.

(e) 'M' Cabin's Yard Master (YM, hereafter) had in the meantime prepared the Starting Permit No. C 223968 on Form No. T 189-B at 03.40 hrs. for AE Spl. and sent his Pointsman to deliver the same to the Driver. The entry at page 278 of 'M' Cabin's Train Register showed that the relevant Signal (i.e. No. 29-A) was lowered at 03.45 hrs. 'M' Cabin had also alerted the Guard on Special Duty (OSD Guard, hereafter), a post operated round the clock to ensure that Diesel Locos suffer the barest minimum detention possible.

(f) 'M' Cabin's Pointsman duly delivered the Starting Permit to the Driver (who signed on the counterfoil at 03.50 hrs.); soon thereafter, 'A' Cabin's Pointsman arrived to issue the Caution Order to the Driver, who then sounded the 'long whistle' for his Guard to exchange Signals. The Driver then became aware of a sudden but slight drop in the vacuum, which prompted him to sound the appropriate whistle-code.

(g) The YM and others went towards the rear and, as the pressure in vacuum gauge dropped to 20 cm in the brake-van, the OSD Guard walked towards the front—all of them with a view to locating any trouble and setting it right, if possible. In the event, they met coincidentally near covered Wagon No. SE 38257, where a hissing sound was issuing off the loose end of the syphon pipe which had come off its mooring at the bottom of the vacuum cylinder. This

"dangling" armoured pipe was properly and snugly pressed home and the personnel retraced their steps.

(h) AE Spl. soon started at 04.05 hrs. and the general keenness with which this event must have been watched by all concerned becomes self-evident from the fact that this particular timing had been noted down as AE Spl's departure time by various officials (viz. : Head TXR, YM of 'M' Cabin, etc.). Indeed, even the 'A' Cabin noted it as such, although fully aware that AE Spl. has barely started moving at this point of time; 'A' Cabin admitted to a local practice having evolved on this specific issue, although the 'TOL' indication would be given to Bhandai only after the entire train had cleared the Up Advanced Starter No. 21-A.

(i) Although AE Spl. did start as above at 04.05 hrs., it was unable, due to wheel-slipping on the loco (which could have been due to wetness of rails), to make any progress despite the Driver releasing sand. Thus, in a matter of 5" or 6", this train could manage to move hardly 250 m\*\*. The average speed attained must have been just around 3 Km/h, which speaks for itself.

(j) Plagued thus by starting trouble, AE Spl. halted at 04.11 hrs, causing its Guard to alight and hardly had he started to proceed towards the front of the train to investigate, the collision took place right in front of 'M' Cabin, in the Train Register of which the time of the accident was recorded at page 281 as 04.12 hrs. accident had occurred.

(k) 'A' Cabin's Pointsman, who had been in the interim awaiting the Guard to pass by on AE Spl. for receiving his copy of the Caution Order, had several urgent tasks to perform, now that an accident had occurred.

(l) The Joint Observations of the controls in the driving cab of AE Spl.'s loco revealed as under :

(i) *Brake-application*

- Handles/levers for both A-9 and SA-9 valves were in RELEASE position (i.e. not applied) on both the Control Stands;
- Dynamic brake selector handle on Right Control Stand in Motoring position No. 1 (i.e. not applied); and
- Emergency Flap Valve closed (unoperated).

(ii) *Right Control Stand features*

- ECS (Engine Control Switch) in 'RUN' position;
- Reverser in FORWARD position; and
- Throttle in IDLE or 'Zero' position.

\*That it took over a full hour for the TXR staff to merely get ready a train, which had already been completely attended to just 6 hours previously, needs no further comment on the quality of the continuity of the train pipe.

\*\*This estimate makes due allowances for the distance through which AE Spl.'s loco was rammed back and its having earlier started a few meters in rear of the Fajling Mark between Marshalling Lines Nos. 1 & 2.

### V. SUMMARY OF EVIDENCE

#### 18. Evidence of Shri Gur Iqbal Singh, CASM (Cabin Asstt. Station Master) of Agra Cantt. 'A' Cabin—

(a) It was because 21 Dn. was already on 'Line Clear' that he had alerted the YM to expedite the Goods train's despatch.

(b) He became aware of 21 Dn. at 04.11 hrs, when it was probably in the vicinity of the Down Outer, and had sensed right away that it was approaching much too fast. Apprehending danger, he directed his HS lamp, showing RED, towards 21 Dn., while simultaneously shouting to his Leverman to put back the Signals for the Goods train and normalise the cross-overs, so that 21 Dn. could pass by safely on the Dn. Road. Due to paucity of time, however, the planned preventive action could not be completed in toto, with the result that 21 Dn. crossed into the yard at a speed in excess of 50 Km/h.

(c) Queried as to why he did not immediately put back to Danger the Signals meant for AE Spl, right when he got 21 Dn's "TOL beat" from Bhandai, he clarified his own expectation as that AE Spl, which had coincidentally started just at that moment, should have fully cleared into the Up Main Line within a matter of 5" or 6"; moreover, he hardly visualised the eventuality that 21 Dn. would pass several Signals at Danger.

*Note :* The above evidence was substantially corroborated by Shri Ram Prasad (the Pointsman, who was officiating as Leverman in 'A' Cabin) who gave Nos. 49, 43, 53, 54, 57, 59, 47, 21, 20, 16 & 29 as the sequence of pulling levers for the despatch of AE Spl, Nos. 29, 16, 20, 57, 59 & 54 as the sequence of levers backed in a hurry after seeing that 21 Dn. was coming too fast, and further clarified as follows :

— Before he could back the lever concerned, 21 Dn. came on Points No. 53 and soon collided with AE Spl; and

— At some stage in the resulting confusion, he must have again pulled back the lever for Signal No. 20.

#### 19. Other Eye-Witness Accounts—

(a) Shri Mangaliram (Gateman on duty at Level Crossing No. 494-C) stated that 21 Dn. ran fast the closeby Outer Signal, which (he could easily see) was exhibiting its RED aspect. Immediately upon realising that 21 Dn. was not slowing down, he had set his HS lamp to 'Red' and also shouted in vain to its Driver and then to its Guard.

(b) Shri Lala Ram (Leverman) was alone present in 'M' Cabin at the time of the accident, but he did not become aware of it until afterwards, because he was looking towards the rear of AE Spl. so as to pick up its Guard's Signal and repeat this information via the loudspeaker for the benefit of its Driver (in order to satisfy the provisions of GR 120, which prohibited a Driver from starting without the Guard's Signal).

This procedure was necessitated by the inability of the Driver and the Guard to exchange Signals prior to starting.

#### 20. Evidence relating to the presence of fog and the consequent reduction in visibility—

(a) *Observations by the surviving members of 21 Dn's Crew—*

(i) 21 Dn's Guard, Shri Jag Lal Dhusia, stated that the weather was "cloudy and drizzling" from Jhansi to Gwalior and "thickly foggy" from Gwalior onwards, causing the Driver to slow down on Station approaches.

(ii) 21 Dn's Assistant Guard (Brakesman), Shri Baboo Lal, found the weather very foggy, which had the dual effect of firstly, slowing down 21 Dn. considerably while running through Stations and secondly, creating difficulties for himself in assuring that the Station staff were exchanging Signals properly.

(b) *Situation on 27-1-82, but prior to the accident—*

(i) 02.10 hrs. : The Driver of TKD Spl. Dn. Goods train (Shri J. Alexander) found the visibility of approach Signals at Agra Cantt. to be around 100 m\* only. Yet, although no detonators were burst, he did not make any complaint on this account as the GR concerned had been known for long only in its breach.

(ii) 03.50 hrs : AE Spl's Guard (Shri Gorey Lal Goel) and Driver (Shri R. C. Sharma) were unable to exchange Signals mutually as a preliminary to starting.

(iii) 04.00 hrs. : According to 'A' Cabin's CASM (Shri Gur Iqbal Singh), the weather was foggy but, although he could not be certain if he could see the back-light of the Outer (a distance of 854.7 m @), he was quite positive that the back-light of the Main Home (a distance of 345.1 m) was sighted. The back-lights of the (closer) Routing Home (a distance of 182.8 m and which served as the VTO for this Cabin) could be distinguished without any difficulty.

(iv) 04.05 hrs : AE Spl's Guard (Shri Gorey Lal Goel) concluded that the reason for his train going only at a walking pace could have been the extremely poor visibility only, because the gauge in his brakevan continued to show 38 cm, once the train started moving.

\*According to his Diesel Assistant (Shri Narain Dass), however, the aspect of Agra Cantt's Dn. Outer could be distinguished only when the loco was hardly 5 m in rear of that Signal.

† All such distances given in parentheses have been worked out from the data presented in Annexure I(b).



- (v) 04.10 hrs. : AE Spl's Driver (Shri R. C. Sharma) could distinguish the Green aspect of Starter No. 29-A, only when he was 10 to 12 m in rear of it ; his Diesel Assistant (Shri Bhagwan Singh), however, was able to see the Starter from 15 m.
- (c) *Situation at the time of the Accident*
- (i) Shri Mangaliram (Gateman at Traffic Gate No. 494-C) deposed that, whereas there was no difficulty in sighting the Outer (a distance of only 19 m), he could also distinguish the Red aspect of the Main Home (a distance of 471.6 m), despite the slightly foggy situation.
- (ii) For the Leverman (Shri Ram Prasad) to have put into effect certain preventive action, the visibility from 'A' Cabin must have been such as to enable its CASM (Shri Gur Iqbal Singh) to sense the approach of the speeding 21 Dn. sufficiently clearly. According to the CASM, the visibility declined only after 04.30 hrs.
- (iii) According to Shri Jamuna Dass ('A' Cabin's Pointsman) the visibility was not bad even though fog had already been building up ; the deterioration occurred only after the accident.
- (iv) According to 'M' Cabin's YM (Shri Mahendra Pratap) the weather was just getting to be foggy with visibility not unduly hampered ; the weather deteriorated only after the accident.
- (v) Shri Lala Ram ('M' Cabin's Leverman) admitted to the presence of fog swirls causing indeterminate visibility, which deteriorated substantially only after the accident.
- (vi) Although 'B' Cabin's CASM (Shri R. K. Singh), the Leverman (Shri Bhikari) and the 2 Pointsmen (Sarvashri Pooran Chand and Hamid Khan) heard the loud sound made by the collision (a distance of 484 m), none of them could make out, due to foggy weather, as to what had happened exactly and had to therefore make telephonic enquiries about the same.
- (vii) According to Shri J. P. Tiwari (CASM of 'C' Cabin—also a Block Cabin), the weather was affected by only intermittent fog.
- (d) *Situation after the Accident*
- (i) Shri R. S. Kanhare (TI, Gwalior), who was travelling by 21 Dn, found the visibility restricted to about a bogie length, when he got off the train immediately after the accident.
- (ii) The Vice Principal (VP) of IRISSET (Indian Railway Institute of Signal Engineering & Telecommunication), Shri D. P. Joshi (who was a passenger on the ill-fated 21 Dn), found that the visibility from the door-way of his coach to be about 40 to 50 m. due not only to the presence of fog but also to substantial quantities of dust (which must have been thrown up into the air in the aftermath of the collision). He, therefore, found it difficult to assert from his own observation as to what the visibility might have been from an *elevated* Cabin and *without* the aggravating effect of dust.
- (iii) 04.30 hrs. : From 'M' Cabin, Shri D. P. Joshi (VP of IRISSET) could easily see that Starter No. 29-A had been taken 'OFF' (a distance of 20.70 m).
- (iv) 04.35 hrs. : Shri R. Sharma, the Sr. Divisional Mechanical Engineer (Power), found the visibility so poor that he had to pick his way very carefully, in order not to trip in the yard 'en route' to the accident site.
- (v) 04.50 hrs. : Shri Joginder Singh, Loco Inspector (Safety), found hardly 30 to 40 m of visibility at the accident site.
- (vi) 05.15 hrs. : Shri R. Sheshadri, the Safety Counsellor (S & T) was able to see from the vantage of 'A' Cabin not only the VTO but also the back-lights of Main Home Signal No. 78-A (a distance of 345.1 m) and likewise the 'GREEN' aspect displayed by the Up Advanced Starter (a distance of 537.4 m) ; the extent of visibility (which by all accounts, was deteriorating progressively with lapse of time) must have been even *better* at the time of the accident.
- (vii) 05.30 hrs. : Shri R. K. Sharma, Agra Cantt's Signal Inspector (Grade III), who had walked up to the Advanced Starter, could easily see the back-light of the Dn. Outer (a distance of 298.3 m) and also the RED aspect of the Dn. Main Home No. 78-A (at a distance of 192.3 m).
21. Evidence on the decision concerning 'Line Clear' for AE Spl.
- (a) CASM ('A' Cabin), Shri G. I. Singh, maintained that he had Jhansi SCOR's prior permission for obtaining 'Line Clear' for AE Spl. from Bhandai and Shri P. K. Srivastava (ASM, Bhandai) also deposed that, when he had advised the SCOR at 04.00 hrs. regarding AE Spl's 'TOL' indication not having been received as yet from Agra Cantt, the SCOR had advised him that he was abreast of the situation.
- (b) Even when confronted with the above statements, Shri N.K.S. Nayar (the SCOR at Jhansi) refuted them but acknowledged that he would have OK-cd AE Spl's despatch, because the situation at about 03.40 hrs. certainly left an adequate cushion, after all the pre-departure formalities had been complied with, for AE Spl. to have cleared into the Up Main Line, having regard to 21 Dn's ETA (*Expected Time of Arrival*) of about 04.15 hrs.

(c) Shri B. K. Kulshreshtha (Sub-ASM, Agra Cantt.) saw nothing either wrong or hazardous in trying to despatch the AE Spl. prior to the expected arrival of 21 Dn, with regard to the reception of which all preparatory work had already been completed by the 'B' and 'C' Cabins. In the event, neither did AE Spl. start as expected nor did 21 Dn. observe/obey the Signals at DANGER.

(d) Shri K. K. Gokhale (Sr. Divisional Operating Superintendent, Jhansi) stated that, unless fly-overs were constructed, movements across the Main Line were unavoidable. The only fool-proof way was to instal ATC (*Automatic Train Control*), which was equally beyond the ways & means situation. When the pace of train-working gradually approached the saturation capacity, then every available opportunity had necessary to be availed of to exit Goods trains from Yards. There was, therefore, nothing either intrinsically illogical or dangerous in organising AE Spl's despatch as had been done, even though extraneous factors led to a grim tragedy. The situation at Jhansi was even more serious, with more surface crossing and even the Up Goods by-pass line was on the "wrong" side of the Main Lines—all of which compelled the enforcement of even more rigorous discipline at Jhansi, envisioning the detention, if need be, to a Dn train at the Dn. Outer (even if it be carrying passengers).

**22. Evidence relating to the orientation of the rear SLR on No. 51 Link Express which left Madras Central on 25-1-82**

(a) *Shri S. Kanagasabapathy, Station Superintendent, Madras Central :*

(i) Reviewing the coaching stock position for the 90-day period from 1-11-81 to 29-1-82, he demonstrated that, of the 28 BG passenger-carrying trains which left Madras Central daily, the following deficiencies could not be helped, because of shortage of CS type coaches, SLRs and others :

— On an average 16.65\* trains ran short of authorised composition daily ;

— The daily shortage of coaches worked out, on an average to 33.58, further broken down into component-elements as under :

— SLRs . . . . .	8.09
— G5s . . . . .	20.97
— Other types . . . . .	4.52
Total . . . . .	<u>33.58</u>

(ii) Whereas the turning of coaches as an occasional exercise was feasible, it was ruled out as a fairly regular measure because not only was it far too timeconsuming in itself, but it also came in the way of the routine yard-movements which virtually inundated any major terminal complex.

(iii) A system had not yet been introduced to keep a watch on the orientation of the SLRs on the in-coming trains, because this would presuppose, contrary to the prevailing shortages, a buffer-stock of SLRs.

(iv) As regards the subject SLR, the following were the sequence of events :

— The first SLR coach (No. NR 5563) on the rake of the in-coming No. 52 Express had been marked sick (due to sharp flange on a wheel) at 03.00 hrs. of 25-1-82 ;

— As it was uncertain, due to the dire shortage of SLRs, if a replacement could at all be found, the other SLR was shunted to form the rear-most vehicle for the rake of No. 51 Express ; in this process, it had the passenger portion (instead of its luggage portion) trailing, because this coach could not be turned end-to-end ;

— As accommodation was to be found for the RMS in this very coach, paper-stickers were pasted on it as an 'ad hoc' measure ; and

— Eventually, SLR No. ER 5872 was taken off the rake of the in-coming No. 3 Mail and attached to the "front" end of No. 51's rake.

(v) As regards facilities at Madras Central Station for turning coaches end-to-end, closure of the steam loco shed at Basin Bridge had led to the virtual abandonment of the turn-table provided at that shed. Hence, when the turning of a coach (mostly, an Inspection Carriage) became inescapable, use of the triangle (Basin Bridge-Washermanpet-Korukkupet-Basin Bridge, and, rarely, Basin Bridge-Veysarpadi-Korukkupet-Basin Bridge) took 1½ hours at the very least. Because of heavy traffic density in this region, turning of coaches as a regular feature was impractical.

(b) *Shri C. G. Vittal Rao (Assistant Transportation Officer, Coaching, Madras) had this to depose :*

(i) The Southern Railway (SR) operated 86 Mail/Express trains and 56 Passenger trains which required a total of 250 SLRs, because certain Passenger trains were allowed to be operated with a single SLR positioned either in the middle (for short trains) or at the rear end (for long trains) and because the formation of certain others utilized LRs (Luggage Vans). Against this, SR had only 229 SLRs in service, which gave rise to obvious difficulties in the compliance with Safety Marshalling Instructions.

\*Further analysis shows that, of these 16.65 trains only 8.16 trains (on an average) ran short of a SLR daily.

- (ii) The non-locking of the passenger portion (if located at the outermost end of any rake) was covered by Railway Board's subsequent letter of 13-2-78. He also drew attention to the fact that punctuality of service was also an essential 'sine qua non', which explained the inescapable positioning of slip coaches, "party" coaches, etc. "outside" of the SLRs on certain occasions; this requirement also provided the background for Special Instruction (CRB's Instructions) No. (a)

"No mismarshalling of Passenger trains is permitted", which is included in the supplement on Red paper introduced in all the SR's WTTs.

- (iii) Vide Railway Board's letter No. 77/Chg. II/16/14 of 12-8-77, the idea of modifying existing GS-type coaches into GSRs with a Guard compartment (under Railway Board's sanction No. 77/M(C)/142/29 of 29-3-78) actually originated from the acute shortage of SLRs.

## VI. TESTS AND OBSERVATIONS

### 23. Visibility Test on the night of 28th/29th Jan. 82

(a) WDM2 loco No. 17596 (with Shri Jarnail Singh as Driver and Shri Ram Sunder as Diesel Assistant) was utilized for this purpose as a light engine, with its short-hood leading. In order to replicate as closely as possible the circumstances that prevailed 2 days earlier, the light engine left Bhandai at 04.10 hrs. and arrived Agra Cantt. at 04.23 hrs, having attained (under my personal direction and in temporary contravention to the Railway's SR 92-2, which enjoined certain speed restrictions to be observed by light engines) a maximum speed of 100/Km h on the run.

(b) Unfortunately, the weather was *not* foggy, but only slightly mist-laden; yet, the Dn. Outer could not be distinguished from the Sighting Board. The Dn. Outer's aspect could be made out just as the loco was passing the gradient post (which indicated a 1 in 1250 rising grade towards Agra Cantt.). This distance was subsequently got measured as 761 m.

### 24. Tests performed in 'A' Cabin

(a) Shri Md. Umar (age : 57 yrs.) was the Leverman on duty, when a trial was conducted to determine how long it could take to put back the 6 levers mentioned in the Note under para 18. It was checked up that, if pressed, even this fairly aged and slightly-built Leverman could complete this task and manipulate lever No. 53 in 22 seconds flat.

(b) The structural integrity of the interlocking as existing in 'A' Cabin was checked and found not wanting in any respect. In this process, however, I had discovered purely by chance that, once Signal No. 16 was put back to 'ON', it was possible to normalise the critical cross-over No. 53 (between the Dn. Main Line and the shunting neck) by first replacing lever No. 57 for its lock-bar. In other words, the sequence of Nos. 29, 16, 57 & 53 would have allowed 21 Dn. to proceed on the Dn. Main Line, *after* trailing through, of course, cross-over No. 54, which in itself would have been of trivial consequence. A study of the 'Locking Table' for 'A' Cabin showed this appreciation to be correct.

(c) Notwithstanding the above, the procedure actually adopted in 'A' Cabin to push back the levers in the reverse order of their pull cannot be really faulted or criticised, because I

found during this visit that even the S&T Officials accompanying me (who by their superior knowledge and greater know-how about the equipment concerned, ought to have been expertly familiar with the "nuances" or finer points of interlocking) were oblivious to this possibility. In any case, as it is not easy to think coolly or cogently in a crisis, 'A' Cabin's Leverman might be deemed to have acted as responsibly as any normal official (who is not particularly endowed with prescience) could be expected to perform under similar circumstances.

### 25. On train-working in foggy weather

(a) Some basic information on fog and its formation is provided in Annexure V(a).

(b) From what has been said in para 14(b) supra, so long as the range of visibility is in excess of 180 m, no special steps need be taken by Station Staff on the Central Railway. From para (e) of Annexure V(a), it would appear that this distance had relevance only to road traffic. With regard to rail traffic, however, this distance happens to be only a fraction of the braking distances needed by either Passenger or Goods trains. It should be borne in mind that the proper instruction relevant to this context is actually Railway Board's letter No. 67/Safety-I/26/2 of 14-5-71, which exhorts the Railways to clearly direct their Drivers to control the train-speed, in case no indication of the Stop Signal ahead is available from the "Sighting Board", as if the said Stop Signal were at 'ON' (so as to ensure that that Stop Signal is never passed at danger', should it really happen to be 'on').

(c) At this stage, it would be as well to recognize the crucial difference between the Railway and other traditional modes of transport: The Railway represents what is commonly known as a "guided transport system". 2 factors (namely, the guidance provided by the wheel-flange, which precludes any need for a steering mechanism and the "right-of-way" over the infrastructure) free the railway system of several hazards, which is why fog and such other inclement weather conditions affect rail-operations to a considerably negligible extent in comparison with serious disruptions to road-traffic or to the closing down of an air-port. In other words, even in a situation which could bring road-traffic to a halt or cause a temporary closure of an air-port, a train Driver tends to take

it for granted—either consciously or at a sub-conscious level and in spite of the admonition contained in GR 122 to constantly keep a sharp look-out—that, once he leaves a Station, the conditions are always bound to be safe for him to proceed upto the limit of the Block Section which he has entered; all that he has to do, then, is to look out for the Approach Signals and act in concert with the aspect(s) observed by him. Herein lies the emphasis laid always on the Driver's capability to sight the Signals ahead.

(d) The injunction to affix detonators on track whenever the visibility falls to below 180 m is thus meant to serve as an *independent aid* to alert the Driver to the approaching Station Limits. In other words, it might be argued that, even without this exercise of placing/bursting detonators, the existing rules and regulations are otherwise sufficient in themselves to ensure safety. No doubt, SR-83-1 issued on 21-8-81 by the Central Railway reads as follows, but to leave everything ultimately to the Driver's own judgement and sensibility could be regarded as "tempting the Devil himself":

"Whenever due to fog, heavy dust, storm or for any exceptional circumstance the visibility of the line ahead is impaired, the Driver shall exercise caution and keep his train under control ensuring the safety of the train and of any obstruction ahead particularly at level crossing gates if any."

(e) While examples of certain safeguards built into the Subsidiary Rules by the Eastern, Northern and Western Railways are given in Annexure V(b), similar provisions do not, alas, exist on the Central Railway. Subsequent to this collision (but not on account of it), vide Railway Board's letter No. 81/Safety (A&R)/29/5 dated 22-3-1982, instructions have been issued that in thick, foggy or tempestuous weather impairing visibility or when the view of the signals is obstructed, the Driver shall whistle continuously and take every possible precaution including reduction of speed as necessary so as to have the train well under control and be able to stop short of any possible obstruction on the line.

## 26. On the existing practice of placing detonators in foggy weather

(a) The procedure of placing detonators involves the covering a distance of 2 Km plus by Railway staff, considering the distance at which Warner Signals are generally located in a Lower Quadrant Signalling territory. If a Station is fog-affected, no less than 4 persons are required to reach this far in conditions of *drastically* curtailed visibility. Now, the crux of this matter lies in the question: when we deal with fellow human beings, is it practicable for staff to proceed this far, overcoming somehow the difficulty of locating opendeck girder bridges plus similar other "traps" and the risks involved in negotiating them under adverse visibility conditions and using only the standard HS lamp [vide SR 71-1 (j)] which provides little illumination anyhow.

(b) Thus, it is this very long distance to be covered that constitutes a positive deterrent to compliance with the provisions of GR 71-A. Indeed, what other impediment could have conceivably led to the circumstances narrated in para 14(e) supra? Although statistics on non-use of detonators do bear eloquent testimony to the vagaries not only of Mother Nature but also of human nature, it would be ludicrous in the extreme to suggest that during the 25-months plus period preceding this accident, the fog was never so dense (in this cold region and Jamuna-valley) as to necessitate the placement of detonators in compliance with GR 71-A. Perhaps, the situational stresses which prompted the Railway Board to issue instructions [para 12(e) supra] regarding the provision of electric bulbs on Outers/Warners can possibly explain this large-scale non-use of detonators as well.

(c) As regards the problem of man-power, the Railway Board gave, subsequent to this collision, detailed instructions, vide its letter No. 82/Safety (A&T)29/11 of 16-4-82, aimed at streamlining the process of utilizing gangmen for "fog-signalling" duties and resolving the associated snags.

(d) When it is known in advance that it is a characteristic of fog to form in patches and the swirls to be wafted in gentle breeze, to eventually result in *intermittent* drop in visibility, a more practical question-series that arise relates to the precise action-plan which is to be set into motion by the Station Master. The following examples will help focus the attention on related problems:

- (i) A Station with 'B' Class working has given 'Line Clear' to a train on a busy Trunk Route, while the Reception Signals could not be taken 'OFF' for a valid reason. Suddenly, the VTO becomes no longer visible. Now, what is SM to do? Surely, the organisation of "fog-signalling" by Gangmen will take at least an hour, if not much more, depending upon how far away from the Station these nominated Gangmen happen to be residing. What is to happen in the meantime?
- (ii) Since the fog does form predominantly patchily—at least at the outset—what would happen when these Gangmen are summoned (say at 3 AM) only to find (upon their arrival—say, at 4 AM or so) that the VTO *could* be sighted easily, as the fog swirls had got blown off in the meantime? Apart from the usual friction and recriminations, the obvious result would be for those Gangmen to take such summons lightly in the future.
- (iii) There is at present no discrimination or distinction observed as to how approaching trains, depending upon the reception arrangements, (i.e. a train to be held back for want of reception facilities or a train to be allowed into the Station but stopped there or also that train which has already been signalled to run through)

are to be alerted by the bursting of detonators. The obvious effect of this uniform policy, irrespective of the element of danger involved, would be a very heavy consumption of detonators.

(e) At this stage, it would be as well to recall that the whole exercise of providing fog-signaling is only to assist the Driver in discovering that he is approaching a Station, when he might otherwise be "all at sea", having travelled so slowly (commensurate with the restricted visibility) as to have lost his customary value-judgment with regard to both time and distance. And, the Driver is expected to respond to this helpful information by first bringing his train always to a halt in terms of GR 81(a) and then proceed, in terms of GR 81(b)(ii), very cautiously on hand signals to be given by his Assistant/Fireman.

#### 27. On the inescapable need for "fog-signaling"—

(a) For a Driver to be able to react promptly to any sudden drop in visibility, continuous alertness on his part is absolutely essential. There can be scarcely any doubt that the 'concentration' required in keeping a sharp vigil (as required, particularly during intermittently foggy weather, in order that a Driver is ever able to adjust his road-speed to a safe level, commensurate with the known braking distances, his own feel of the brakepower available on his train, and the fluctuating conditions of reduced visibility) and the difficulty in picking up Signal aspects can be so exceedingly strenuous and wearisome to the mind that the possibility of a Driver succumbing to fatigue on the run should neither be dismissed as improbable nor viewed lightly—rather, it must be reckoned as a potential safety-hazard and dealt with as such. Coincidentally, the pre-dawn timings [para (b) of Annexure V(a)] associated with fog-formation are also the worst for the efficient functioning of the human system from purely bio-physical considerations.

(b) The history of Indian Railways is sufficiently replete with instances of Drivers dozing by, inter alia, yielding to fatigue (as distinct from alcohol/drug-induced stupor), that no safety-conscious person would seriously contest this view-point. Still, it would not be out of place to mention a bizarre occurrence of recent past on the South Central Railway:

— Train and Date . . .	BRID-I Diesel Goods of 23-7-80.
— Section . . .	Gudur-Vijayawada
-- Driver . . .	Shri P. Subrahmanyam*
-- Diesel Assistant	Shri Y. Scotharamaiah*@
— Description of the incident	The train left Tettu <i>against</i> Despatch Signals at 'ON', ran through, 5 Stations (Chakicherla, Ulavapadu, Singarayakonda, Breach Cabin and Tanguturu) before realising what happened and <i>backing</i> into Tanguturu.

— Time . . . . . 2 AM to 3 AM.

\* Both had proper rest, before signing on duty on the evening of 22-7-80.

@ He had complained of stomach-pain and was allowed by this Driver to lie down.

(c) For a Driver to be in charge of a loco in an unconscious state is at any time risk-prone and the only safeguards are the VCD (Vigilance Control Device) and the ATC (Automatic Train Control). The latter is so prohibitively expensive (and inclusive, too, of substantial foreign exchange element) as to be beyond the ways and means situation faced by a "Developing Country" like India, while the former had most regrettably been discarded [para 28(a) *infra*] ostensibly in pursuance of Recommendation No. 190(i) made in Part II of the Report of Sekhri Committee (Railway Accidents Enquiry Committee-1978).

(d) Whereas it is evidently an impractical idea that Drivers sleeping on the run should be woken up by bursting detonators, surely, there is thus a lot to be gained by taking advantage of foggy weather and insist upon alerting a Driver about the approaching Station (even though he may be already quite adequately alert.

#### 28. On the VCD—

(a) Considering that there had *always been* 2 members of loco crew manning the Diesel-electric locos, *ever since* they were first introduced on the Indian Railways, it is paradoxical that the Sekhri Committee should have felt that the installation of a VCD need not be pursued "under the conditions *now* obtaining, namely 2 employees manning every diesel or electric loco". That only this particular Recommendation should have been adopted with what could be regarded as only an "unseemly haste" by the Railway Board under its letter No. 79-H(L)466/112-Pt. III of 19-8-81, must be regarded safety-wise as one of the most retrograde steps ever taken.

(b) The real reason which prompted the Railway Board to discard the existing VCDs was explained in its O.M.No. 80/Safety (A&R)/1/10 of 3-7-82 wherein it was clarified (in its comments against para 9.15) that "the operation of the VCD was found to detract the attention of the Drivers from safety functions". In the same letter, the Railway Board had accepted "the need for developing a suitable design which may be an improvement on the existing design".

(c) My own personal discussions with the fraternity of Drivers (in the era when VCD pedals were physically present but practically dummed) convinced me that they regarded this piece of equipment variously as "superfluous", a "slur on their moral fibre" and a "source of physical discomfort" (although the tension of its spring was susceptible to adjustments). It was a regular feature in those days for a Diesel loco to come out of Shed with VCD in apparent working order and for this equipment to be reported as malfunctioning almost immediately while on the run.

29. On the version of 21 Dn's Driver as to what had happened—

(a) His evidence could not be recorded by me while I visited the Hospital on 28-1-82 [para 2(g)], because the Driver, who was in obvious pain, could not be expected to be coherent in his response to even mild interrogation. Yet, I discovered that, minutes prior to my visit, Delhi Doordarshan had just completed an interview with him; there was also a report from a Special Correspondent of the Indian Express, which had already appeared in the Press. Tragically, the Driver's condition deteriorated further and he never recovered to give evidence at this Inquiry.

(b) The Superintendent of Railway Police, Agra, had advised under his letter No. SR5/Misc-2/82 of 6-2-82 that, "according to the report of the Investigating Officer of the Collision between 21 Dn Dakshin Express and a goods train at Agra Cantt. on 27-1-82, no dying declaration had been recorded of the deceased driver. The Railway's Superintendent of Agra Area advised under his letter No. SAA/AGC/T/ACC/82 of 12-2-82 that (although no written communication had been received by him to this effect) Dr. S.K. Gupta of the Sarojini Naidu Memorial Hospital had telephonically confirmed to him that no dying declaration had been recorded of the deceased driver by any of the Doctors and further that the Driver was not in a fit condition to do so.

(c) Several attempts were made with the assistance of Doordarshan's Controller of Programmes to have a re-run of the video-tape on which this Driver was interviewed by Mr. Dube, but it was discovered that the tape had been erased, being of not any special National importance. Mr. Dube himself could only recall that the Driver was generally incoherent, except while mentioning of fog.

(d) Through the courtesy of Express News Service, its Special Correspondent (Mrs. Seema Mustafa) recalled the interview she took of the late Budhoo Lal on 27-1-82, when she had found him to be fairly incoherent and in great pain. According to her, Budhoo Lal had responded to her questions with the following replies :

—That the morning fog reduced the visibility;

—That because of this heavy fog, he "was not able to see the Outer Signal", and did not realise that he had entered the Goods Yard;

—That he saw the Goods train only seconds before the accident and he regained consciousness only in the Hospital;

—That, instead of replying to other probing questions, he repeatedly spoke of "misjudgement on account of fog" and kept on apologising "I am very sorry; please forgive me";

—That, while denying having driven at a considerably high speed, he said he was moving

very slowly—"may be at 15 Km/h, not more than that", as he expected to be nearing the Station.

30. On the existing safety marshalling practices—

(a) The extant instructions on safety marshalling are embodied in Railway Board's letter No. 76-Chg. II/14/1 of 4-6-77, the essential features of which are reproduced in Annexure IV(c). In accordance with these instructions (which are further amplified by Railway Board's letter No. 77-Chg. II/14/3 of 13-2-78, with regard to removal of the erstwhile restriction about locking the passenger portion of the SLR if it happens to be oriented at the very extreme ends of the rake, for any unavoidable reason) the only over-riding criterion for safety marshalling is that at least the 2 extreme coaches at each end of a train-consist shall be anti-telescopic and steel-bodied. This is the only unexceptional requirement for Mail/Express trains.

(b) No doubt, under the guise of the ubiquitous requirement of "operational convenience", various violations of the fundamental requisite of positioning the luggage portion of a SLR as the extreme outermost compartment in a rake for a Mail/Express train (which should be the principal aim of the "safety marshalling" concept) are conceived by the "enterprising" Railways as below :

*Vide Annexure IV(a)*

(i) On 21 Dn itself, the Hyderabad-Varanasi GSCN-type Coach is positioned outside of the SLR (and immediately in rear of the engine) between Kazipet and Itarsi;

(ii) Central Railway's Panchavati Express operates with a WSCBR-type Coach (which does not have a luggage compartment) at one end of the rake (behind the engine on its outward journey and as the last vehicle on the return journey);

(iii) A Postal Van is positioned outside the SLR throughout the run (on 105 Dn/106 Up Passengers between Jhansi and Lucknow) by the Central Railway;

*Vide Annexure IV(b)*

(iv) 2 second-class 3-tier sleeper coaches are attached by the Southern Railway (treated as 'Slip Coaches', perhaps, because they had started from well beyond Madras) outside of a LR throughout the journey of No. 4 Madras-Howrah Mail;

(v) On the Madras-Bokaro Steel City Express, no less than 7 coaches (and as many as 5 coaches on its counterpart, the Bokaro Steel City-Madras Express) are positioned between (i.e. outside of) the "front" SLR and the TE;

(vi) The South Central Railway operates its Hyderabad-Warangal Kakatiya Express with a GSR (*without* a luggage compartment) at *one* end; and

(vii) Evidently as an object lesson in safety marshalling\*, the South Central Railway operates its Secunderabad-Narsapur Express *without a single SLR*. The coach which accommodates the Guards-compartment is not even positioned the outermost in this case.

(c) The Southern Railway likewise operates its 2 prestigious trains (Brindavan Express to Bangalore and Kovai Express to Coimbatore) without a SLR at *one* end, for the simple reason that the prevailing demand for booking luggage did not justify the attachment of a second SLR (which has been replaced by a GSR). Perusal of Booklets prepared by the Zonal Railways on "Rake Links, Marshalling Order and Composition of Mail/Express trains" would show examples galore of, firstly, coaches (apart from 'Slip' or 'Through' Coaches) marshalled outside of SLR and, secondly, of Mail/Express trains being deliberately operated without a SLR at one or both ends, either for operational convenience or for increasing the earnings or whatever other "desirable" purposes.

(d) Of course, it is also well-known that, due to short-fall in the availability of SLRs, there is also a gap between what is accomplished in practice and what is planned on paper as above, in regard to positioning/orientation of SLRs. Thus, it is not unknown for even Mail/Express trains to operate occasionally with just one SLR (positioned in the rear). The situation is indeed so critical that even (the then) CRB's Special Instruction\*\* that "trains which change direction 'en route' must in no case be worked with a single SLR" had to be flouted (for unavoidable reasons, no doubt) : I had myself noted, for instance, the Toofan Express arriving at Agra Cantt. (where its direction does reverse) with a single SLR, necessitating the re-positioning of that SLR at the other end.

(e) At this stage, we might pause and wonder why all the emphasis is being laid on the last coach (or, at the most, the last 2 coaches). Although it is logical to presume that only the end coach(es) will absorb most of the shock of the impact, a critical study of all collisions that have taken place so far might probably demonstrate that such need not necessarily be the case. In a similar collision at Itarsi, which I had inquired into (when 6 Up Punjab Mail collided head-on with a stationary Goods train at night on 20-10-1980), it was from the 3rd coach that the casualties

arose. Indeed, it all depends upon the train-speed, the "train-action", curvature of track (leading to off-centre disposition horizontally of buffers of adjacent coaches), differences in vertical heights of buffers between adjacent coaches, differences in the longitudinal stiffness as well as crash-worthiness of the individual units forming the trailing load and a host of other imponderables.

(f) Nevertheless, for want of anything more conclusively rational/logical, it would be quite correct to surmise that it is indeed the "outermost" vehicle at each end which is the most sensitive to damage in a collision. In fact, Railway Board's letter of 4-6-77 stated as much:

"Another underlying principle in case of Safety marshalling is that, if the collision speed is low, the first leading Anti-telescopic coach may absorb the bulk of the energy with damage confined to its ends only. However, if the magnitude of the collision is high, the coach next to the first Anti-telescopic coach will also suffer damage, although the damage on reduce progressively until the collision energy is fully absorbed."

(g) Whereas it should be a natural corollary that such end-units should be crash-worthy and also possess an in-built capacity to absorb punishments, it also follows that the positioning of the luggage compartment at the extreme end is certainly a desideratum most devoutly to be accomplished. It is with regard to this desideratum@ that the following disquieting deficiencies deserve cognizance, where passengers travelling in the outermost coaches are exposed to the maximum severity of a collision :

- (i) Short Passenger trains, authorised to work with a single SLR positioned in the middle and having PCVs (Passenger Coaching Vehicles) at either end;
- (ii) All those multitudinous Mail/Express trains [Annexures IV(a) & (b)], which have in their authorised complement *either* PCVs marshalled outside of the SLRs *or* no SLRs at all but only GSRs at one or both ends;
- (iii) The several Mail/Express trains, to/from which 'slip' coaches are attached/detached for a part of their journey;
- (iv) The occasional passenger-carrying trains, where Reserved (i.e. 'programmed' coaches for marriage parties, tourists, etc.) Bogies are carried as the outermost vehicle (in order to avoid or minimise the shunting time 'en route');
- (v) Under operational exigencies created by the acute shortage of SLRs :

\*Not to be outdone, Central Railway attaches 2. WGSD-type double-decker (i.e. of maximum occupancy) coaches *outside* of the rear-SLR on Sahyadri Express, ex : Bombay and Sinhagad Express ex : Pune.

\*\*Reproduced as such on Red Pages in Southern Railway's WTTs.

@It is with regard to this 'principle' that the suspension of the offending officials from Madras was ordered by the then Railway Minister in a highly publicised manoeuvre.

- Those Passenger trains (including Mail/Express trains), which are worked with a single SLR (positioned as about the last vehicle); and, finally,
- All those cases (where the SLRs which do happens to be marshalled the outermost), when, for want of any system or procedure to check in advance about the correct orientation of the SLR on the in-coming trains and/or the lack of facilities for remedying the situation by turning a SLR end-to-end, the passenger-portion gets positioned\* at the extreme ends.

\* On 1-2-82, while I was at Madras Central Railway Station [para 2(d)], I was amazed to notice that the very train (i.e. No. 51 Link Express) had been backed on the platform with its rear SLR (i.e. the same position as the ill-fated SLR) oriented the wrong way (i.e. with its passenger portion positioned the outermost). That this situation (which was precisely identical to what had occurred on No. 51 Link Express of exactly a week earlier i.e. on 25-1-82) should have escaped the Management's notice (despite all the awareness, attention and emphasis which was being rightly bestowed on this particular aspect and all the brouhaha/fuss made by the top echelons in the hierarchy of Railway Administration in the wake of the subject Accident) speaks eloquently of the existence of real difficulties in achieving the desideratum. In the event, when this instance of "mismarshalling" was reported by me, it had necessarily to be remedied (an official having already been "suspended" for the earlier "misdeed" of 25-1-82 served no doubt as a fillip), leading to an unavoidable "late start" for No. 51 Link Express of 1-2-82 on this account.

(h) While on the subject of crash-worthiness, it would be pertinent to note that SLR No. 6129 SC [Annexure II(a)] was of BEML manufacture and of Anti-telescopic design. As the crash-worthiness of BEML coaches was found to be inferior vis-a-vis the ICF stock, the end-wall structures of BEML coaches of post-August, 1980 manufacture had been duly strengthened. The ill-fated coach was of 1971 build.

### 31. Miscellaneous Observations at Agra Cantt.—

(a) With reference to the commutator handle of the Block Instrument (vide the foot-note under page 16) found locked in the TOL (Train on Line) position, although 21 Dn had in effect fully cleared [Annexure I(b)] the "Dn NT" track circuit, this situation would be regarded as a failure of the Block Instrument,

which could have been caused due to one or the other of several reasons as below :

- (i) Failure in the circuitry of the 'Dn NT';
- (ii) Non-operation of the 'Dn NT';
- (iii) Non-lowering of the Reception Signal; and
- (iv) Premature putting back of the lever (meant for the Reception Signal) by 'A' Cabin's Leverman.

It is also well-known that the position of the "indicator needles" in a pair of Block Instruments can be changed *only* by manipulating the commutator handle on the Instrument located in the Station/Cabin *in advance*. Thus, for the movement of any Dn. train between Bhandai and Agra Cantt, the control vests with 'A' Cabin's CASM. Whereas non-operation of the track circuit by a train is unheard of (it happens *only* in the case of trolleys, motorised on-track track-maintenance equipment and such other 'light' vehicles), nothing adverse was found with the circuitry of the 'Dn NT' (which, fortunately, remained unaffected by this Accident).

(b) As regards the non-correspondence between Main Starter Signal No. 20-A (which was at 'ON') and its lever in 'A' Cabin (which was in 'pulled' state) and between Starter Signal No. 29-A (which was at 'OFF') and its lever in 'A' Cabin (which was in its 'normal' position, although the appropriate slot *had* been released by 'M' Cabin) observed after the accident [para 13 (e)], subsequent tests did not reveal any mal-functioning.

(c) As regards the SCOR's assertion about the availability of adequate cushion or margin of time for the departure of AE Spl. before 21 Dn was due, it was decided to collate the related statistics from the available documentation. Whereas no data could be expected on the time taken for an Up Goods train to completely clear into the Up Main Line *after it had just started moving from Agra Cantt's Goods Yard* (i.e. ignoring those Through Goods trains which arrived and departed via the Up Goods Loop, bypassing the Goods Yard), details of timings (when 'Line Clear' was granted by Bhandai and when 'TOL' indication was given to Bhandai by 'A' Cabin) were called under my instructions by the Railway from 'A' Cabin's Train Registers for the period 25-12-81 to 26-1-82 (excluding the 4-day period 12th to 15th, for which the records could *not* be cross-checked with 'M' Cabin's own documentation). Particulars noted in respect of 101 trains are reproduced in Annexure VI(a), while the results of statistical analysis of this information are summarised in Annexure VI(b), whence it would be clear that there was only a 1 in 80 chance—considering its departure from Marshalling Lincs 1 to 4 [to the East of 'M' Cabin and via Point No. 49, vide Annexure



I(b)]—that an Up Goods train would take more than 30 minutes to clear into the Up Line after LC had been taken for it. Similar probabilities are 1 in 323 if all Goods trains departing from the Marshalling Lines 1 to 12 were viewed together or 1 in 156 if all Goods trains departing from the Goods Yard are synoptically considered.

(d) As per pages 72 and 75 of Appendix II to Jhansi Division's WTT No. 58, the minimum running time between Bhandai and Agra Cantt. for a Diesel Express is 8" (7.5" for Superfast Expresses with a maximum permissible speed of 110 Km/h), while an Up Diesel Goods would take 15" from Agra Cantt. to run through Bhandai.

## VII. DISCUSSION

### 32. Essential Features of this Collision—

#### (a) *The incontrovertible circumstances :*

21 Dn reached 'M' Cabin, without bursting [para 13 (1)(i)] the trailing points of cross-over No. 54-A; its path [para 13(k)(ii)] was otherwise consistent with the route meant for AE Spl, the loco of which had just passed 'M' Cabin [having taken a path set for its despatch thus far by 'M' Cabin, vide para 13(e)], when the head-on collision took place.

#### (b) *Time of occurrence :*

The accident having occurred right in front of 'M' Cabin, the time of 04.12 hrs., noted [para 17(j)] in the Train Register maintained by this Cabin, is acceptable as accurate.

#### (c) *Speed of 21 Dn at the moment of impact :*

Having regard to para 21(g), the 3% under-estimation of road-speed caused by the larger-than-average wheel-diameter was probably more than counter-balanced by the over-estimation caused by the inertial response of the stylus-recording-mechanism. The astounding fact that 21 Dn's loco did *not* derail [that the 2 locos 'interlocked' in one alignment to initially give rise to an illusion, vide para 3(d) proves this point], even after traversing in quick succession two 1 in 8½ 'Facing Points' set in reverse position, must indicate (aside of an obvious tribute to the high standard of maintenance achieved in respect of these "Points") that its speed could not have been very much in excess of 70 Km/h. As regards the severity of damage, 2 facts [namely, that the first coach was pierced through by the loco's trailing long-hood and that 2 coaches had capsized to the right, vide Annexure I(c)] served to provide an opportunity for a part of the kinetic energy of 21 Dn's rear 11 coaches to be dissipated through braking. Lastly, the Driver's version [para 29(d)], as reported in certain sections of the Press, was obviously an attempt to "whitewash" his own role. All things considered, therefore, I estimate that 21 Dn's speed at the instant of collision was slightly upwards of 70 Km/h.

#### (d) *Condition of AE Spl. at the moment of Impact :*

In a chain of vehicles with "freedom" of movement (i.e. with brakes not applied on the trailing load and the wheels rolling), the

mechanics of energy-absorption are such that, "ceteris paribus", the shock-wave is more likely to cause a "lateral" distortion rather than vertical mounting. 'Per contra', if the vehicles are themselves "seized" (i.e. with brakes-applied and translation via rolling prevented), the concertina effect of the resulting shock-wave manifests itself as often in a vertical mode as in a transverse mode or a combination of both. Hence, having regard to the disposition of its own rolling stock [the first 2 wagons having been virtually tossed up into the air, vide Annexure I(c)] and the evidence of its Guard [para 17(j)], I hold that AE Spl. was actually stationary\* 21 Dn rammed into it head-on.

#### (e) *Why did AE Spl. "stall" ?*

Whereas the brake-power 'per se' [para 10(c) and Annexure II(b)] was apparently adequate, the starting trouble [paras 17(f), (i) & (j)] of the type experienced by this train could never be ascribed to any shortfall in brake-power. The wheel-slipping on its loco could have been due possibly to the failure of the loco itself [this possibility cannot be altogether ruled out, what with several Dn Goods trains having been held up at way-side Stations with 'failed' locos, vide para 15(c) or vacuum trouble. The loco was so badly damaged that it would have been a futile exercise to determine if it had developed any defects *prior* to the collision. Whilst there was vacuum trouble [paras 17(f) & (g)] before starting, it is a moot point if the 'expressor' of abundant capacity which is equipped on a Diesel Loco should have so inadequately coped with a mere syphon pipe separating on a single wagon that the vacuum in the Guard's brake-van had dropped from 38 cm to 20 cm. Considering the material evidence left behind by the collision, I would opine that a leakage somewhere in the train-pipe was probably the source of the vacuum trouble, despite what the Guard had to say [para 20(b)(iv)] with regard to the vacuum level in his Brake-van after AE Spl. had got moving.

### 33. Arrangements for the Reception of 21 Dn and the Despatch of AE Spl.—

#### (a) *The incontestable implications of the material evidence —*

(i) Firstly, 21 Dn arrived upto 'M' Cabin without derailling and without damaging

\*The position of controls as found [para 17(1)]47/- in AE Spl's loco cab is inconsistent with this view.

[para 13(1)(i)] cross-over No. 54. Hence, the paths taken by AE Spl. and 21 Dn would together point to a route-setting corresponding either to the despatch of AE Spl. (an *Up* Goods train) on the *Down* Main Line, or to 21 Dn's reception straight into the Marshalling Yard.

- (ii) It is ridiculous (since there was no such emergency of the type that necessitated recourse to such a measure) to consider the despatching of an *Up* train on the Dn. road and no circumstantial evidence supports this possibility. Likewise, no direct reception is possible for Dn train into the Marshalling Yard and Points No. 43 would have to be Normal [contrary to the observation of para 13(k)(ii)] with both Points No. 49 and cross-over No. 53 in Reverse for Routing Home Signal No. 75 to be taken 'OFF'. In other words, with route as found, neither AE Spl. could be signalled for departure nor 21 Dn for reception.
- (iii) Having satisfied myself of the structural integrity [para 24(b)] of the interlocking provided in 'A' Cabin, I conclude, therefore, that the route-setting at the time of the Accident did *not* match any *normal* working. For this abnormal situation, a rational explanation has thus to be found.

(b) *The possible alternative hypotheses—*

- (i) Ignoring for a moment the reverse setting of cross-over No. 53, the configuration of the track lay-out towards the Goods yard [para 13(k)(ii)] as well as the position of levers [para 13(c)] are quite consistent with the movement of a rake from Marshalling Line No. 1 on-to the hunting Neck, while a Dn. train is being received into the Passenger Yard. Under this supposition, Signal No. 29-A would have been released by Shunt Signal No. 17-A [fixed underneath Signal No. 16-A on the same post\*, but not shown in Annexure I(b)]
- (ii) Alternatively, had cross-over No. 54 been in its Normal setting, the situation would tally with the despatch of AE Spl. in which case 21 Dn would have to be held up at the Outer.
- (iii) The position of levers in 'M' Cabin [para 13(e)], which happens to be in accord with both the above postulates, cannot provide any clue to resolve this issue.

(c) *Had 21 Dn's Reception Signals been put back to 'ON' in the face of its approach?*

- (i) This question crops up for 2 main reasons: firstly, 'A' Cabin was aware

of the circumstance that the 'B' & 'C' Cabins had already [para 15(h)] completed all the requisite action needed to admit 21 Dn on the Back Platform Line by 03.32 hrs. and, secondly, the material evidence [para 31(a)] of the commuter handle of 'A' Cabin's Block Instrument being locked in 'TOL' position could have been due to premature normalisation of Reception Signals.

- (ii) Having regard to paras 13(a) & (g), the manoeuvre of reversing cross-over No. 53 *after* taking 'OFF' the Reception Signals for 21 Dn would entail the putting back of 4 levers (Nos. 79, 78, 77 & 58, in that sequence) and then the pulling of lever No. 53. As it was demonstrated [para 24(a)] that this operation could be accomplished in a brief enough time-interval, we need only argue as to the motivation behind it.
- (iii) As, in the absence of even the tiniest iota of evidence which might give rise to this suspicion, any idea as absurdly insane as 'A' Cabin causing wanton destruction is not worth considering, the purpose behind the alleged reversing of cross-over No. 53 could only be to despatch an already delayed AE Spl. For such to have been truly the situation, however, 2 conditions must have existed: firstly, AE Spl. should have been ready for despatch *after* the completion of 21 Dn's reception arrangements and, secondly, 'A' Cabin should have been unaware of 21 Dn's actual approach. Any such *sudden* provocation implicit in the first condition is in fact contra-indicated by paras 17(c) & (d) (whence it is seen that 'A' Cabin received its 'ready report' at 03.20 hrs. and obtained its 'Line Clear' at 03.43 hrs.), while the second condition is equally untenable from para 15(h), whence 'A' Cabin's CASM (having already set *his* Block Instrument to 'TOL' position) must be deemed to be aware of 21 Dn's impending arrival.
- (iv) On the other hand, undisputed and adequately corroborated evidence [paras 17(f), 18(a) & 20(b)(v)] showed that Signal No. 29-A had been taken 'OFF' at 03.45 hrs. for AE Spl. the Driver of which had also received the Starting Permit at 03.50 hrs.—all of which prove [para 13(b)] that the steps to despatch AE Spl. had in fact been completed *long before* 21 Dn had entered the Bhandai-Agra Cantt. Block Section. Two issues associated with this feature are now discussed:
- Firstly, the reliability of this evidence must be regarded as entirely fool-proof

\*It was *this* post that got knocked down.

because, for all this mutual accord within the evidence deposed to have been otherwise manipulated *subsequent* to the subject accident would have certainly entailed the perpetration of a collusion of almost gigantic magnitude (between witness of varied bias, loyalties and interests) which could never have been achieved in a short space of time [para 5(a)] within which an unusually large number of officials rushed into the accident-scene; and

— Secondly, it is *essentially immaterial* for the purposes of this Inquiry, that 'A' Cabin's CASM might have *really* taken 'OFF' the Reception Signals for 21 Dn around, say, 03.43 hrs. and then *quickly* reversed this process by, say, 03.45 hrs. in order to despatch the waiting AE Spl. because such a sequence of events could have *no* effect at all on 21 Dn which had not by then arrived even at the preceding Station, Bhandai.

(v) Finally, what really explodes this theory is the attitude of 21 Dn's Driver. To wit, had any Signal(s) (already noted by him in 'OFF' aspect) been really put back to 'ON' "in his face", would he not feel justifiably aggrieved and make much of "how he himself was made a victim"? In fact, the very opposite [para 29(d)] was the case, in that the Driver was profusely apologetic to the interviewing newswoman.

(vi) Having thus critically examined this question as above, I conclude that the Reception Signals for 21 Dn had *not* been put back to 'ON' in the face of its approach.

(d) *Had AE Spl's Despatch Signals been put back to 'ON'?*

(i) This hypothesis is amply substantiated by overwhelming evidence [paras 17(f), 18(a) & 20(b)(v)] to the effect that all related Signals *had* been taken 'OFF' for AE Spl's departure. Because Signal No. 20-A locks cross-over No. 53-A *both* ways [para 13(b)], the switching of the latter from Reverse to Normal setting must have been unquestionably *preceded* by the normalisation of the former, which explains the rationale behind the sequence of levers put back ['Note' under para 18] by 'A' Cabin's Leverman.

(ii) Now, for the motive : it would be meaningless for anybody to restore its departure Signals 'ON' in the face of AE Spl. having already left the Marshalling yard, unless this action was in effect meant, in terms of GR 36(c)—which prohibited the putting back to 'ON' any Signal that had been taken 'OFF' for the passage of a train, except in case of

emergency—to prevent an accident. This was precisely what 'A' Cabin's CASM and Leverman [para 18(b)] claimed.

(iii) That the preventive action need take no more than 22 seconds [para 24(a)] having already been established, it now remains to examine its feasibility relative to two related factors, which are deliberated upon hereunder : 21 Dn's speed-profile and the range of visibility (at the precise moment, between 'A' Cabin and points to the South of it, along the track).

(iv) On the basis of an average train-speed of 90 Km/h (which is equivalent to a progress of 25 m per each second), and a 20-second time-interval (for the 45-year old Leverman-on-duty, who was in good physical condition) for the tasks performed on 'A' Cabin's leverframe, 21 Dn would have covered a distance of 500 m. The 'Facing Points' of cross-over No. 53 being located [Annexure I(b)] at a distance of 168.9 m in rear of 'A' Cabin, 21 Dn must have been around 670 m in rear of 'A' Cabin, when its Leverman responded to the CASM's appeal to let 21 Dn proceed on the Dn Main Line. The very process of sensing that 21 Dn had not stopped and that it was in fact still speedily approaching must have surely taken the CASM a few seconds. If one places this time at 10 seconds, it would imply that 21 Dn had in the meantime covered probably 280 m (with its *higher* average speed at that *farther* distance away).

(v) For this event-chain to be plausible, 'A' Cabin's CASM must have been first able to sight the 21 Dn's *head-light* from a distance of about  $670 + 280 = 950$  m or thereabouts.

(vi) This being the only supposition that fits all the material and circumstantial evidence as above, it would be correct to conclude that AE Spl. had been signalled for despatch, that, later on an effort was made (immediately as the threat posed by 21 Dn's speeding approach was recognized by 'A' Cabin's staff) to prevent an accident and that the true cause for the Block Instrument's failure [para 31(a)] was that 21 Dn had operated the 'Dn NT' track circuit *against* the Reception Signals at ON.

(e) *The implication of certain inconsistencies :*

(i) It remains to examine the 3 disparities [para 13(e)] found with regard to the position of levers in 'A' Cabin, because subsequent tests [para 31(b)] did not reveal anything amiss :

- Firstly, as to how (even after the normalisation of cross-over No. 54) lever No. 20-A was found in the *pulled* condition, it would be pertinent to note that, this Signal being “free” [para 13(b)], nothing stood in the way of its lever being pulled. Hence, the Leverman’s elucidation (vide the ‘Note’ under para 18) is plausible enough to be true.
- Secondly, as to why Signal No. 20-A still continued to be at ‘ON’ (even though, incidentally, its counterweight was also found in pulled condition), the likely answer lies in the peculiar phenomenon that, if the lever is jerked in one brisk and quick movement, occasionally the Signal arm does not lower because of the tripping\* of its “Electrical Signal Reverser”.
- Thirdly, as to the most serious inconsistency (connoting on *unsafe* failure)—that Signal No. 29-A continued to be ‘OFF’ [para 20(d)(iii)], despite its lever having been put back by ‘A’ Cabin, two possibilities suggest themselves :
  - That this Signal did correctly assume its ‘ON’ aspect, but, in the aftermath of the collision causing 2 coaches to be flung towards ‘A’ Cabin, the resulting damage to the wire-transmission generally [para 11(b)] might have *coincidentally* produced sufficient ‘tug’ on the transmission for Signal No. 29-A to cause the “lowering” of its arm; or
  - That there was so much frictional resistance in its transmission alignment, which failed to get released when the lever concerned (which had to be the very first to be put back) was pushed suddenly and too fast for the 3-lever [para 13(b)] mechanism to get “unstuck”.
- (ii) Having carefully considered the above, I do not hold that these incompatibilities could have contributed even remotely to this Accident.

(f) *Certain other allegations made by the ‘Press’ :*

Whereas it was understandable that such a grim tragedy as this should have evoked considerable all-round interest and sprouted a number of half-baked theories, a Calcutta-based Weekly Magazine, ‘Sunday’, published in one of its issues a Special Report’ entitled in a sensationally eye-catching way thus : “Was ‘Gujral factor’ responsible for the Agra Accident?” It was alleged therein that this Gujral factor (which was in effect the “inordinate emphasis on speed

for goods trains...., which sometimes makes people throw caution to the winds’) manifested itself as his expected arrival [para 5(a), and Shri Gujral was then the Railway Board Chairman] “threw things at Agra out of gear”, with the “Central Railway officials favorishly .... getting the Agra Yard cleared before the big bosses arrived”. However, it could be seen from para 17(a) that this particular train had already been formed by 12.00 hrs. of 26-1-82. Furthermore, that its ‘power’ was otherwise utilized [para 17(b)] for some time and that the ‘Southern Freight Chief’ [para 17(d)] was rightly given precedence serve to prove without a shadow of doubt that the Agra-based staff did *not* ‘raise any panic stations’ to clean up its Yard.

34. **How foggy was it really, at the time of the Accident ?**

(a) The conspicuous lack of uniformity in the assessments by witnesses, as can be gathered from a perusal of para 20, needs to be interpreted as a manifestation of the vagaries and vicissitudes [para (c) of Annexure V(a)] created by “rolling” fog patches which cause the visibility to differ greatly even from *the same* position, (depending upon the direction of sighting) and also changing from time to time (due to its intermittent appearance/disappearing). However, apart from the overall picture emerging from para 20, the weather records [para 14(g)] of the near-by Airforce Station confirmed the progressive deterioration in the range of visibility on 27-1-82 from 3 AM onwards.

(b) The reasoning leading to para 33(d)(v) does lend support to the contention of ‘A’ Cabin’s CASM that he had just spotted 21 Dn [para 18(b)] when it was in the vicinity of the Dn Outer Signal. However, for the reason that the CASM was sighting a *bright* (250 W) head-light of the Diesel loco, while its Driver was on the look-out for a comparatively *very dim* [only 4 W, vide para 13(d)] Signal lamp, the usual assumption regarding the mutual *reciprocity of visibility* between any 2 points cannot be applied to this particular situation.

(c) As to whether it was so foggy as to have necessitated the introduction of fog-signalling, 4 factors are relevant, as they represent the direction of the line-of-sight generally between ‘A’ Cabin and its VTO [Annexure I(b)] :

- (i) The visibility, which was *over* 471.6 m for a ‘Red’ light [para 20(c)(i)], must have been somewhat less for a ‘white light’ (which was the VTO for ‘A’ Cabin);
- (ii) The general visibility was *under* 484 m, vide para 20(c)(vi);

\*This is the precise reason why Levermen are instructed to pull the lever gently upto a point and only then apply a quick tug in a single brisk movement-

- (iii) Not only was the VTO visible at 05.15 hrs. (by which time the visibility deteriorated, relative to what it was at the time of the Accident) but it extended upto at least 345.1 m for white light and 537.4 m for green light [para 20(d) (vi)]; and
- (iv) At 05.30 hrs. (when the visibility would have further diminished) the visibility was at least 298.3 m for a white light.

(d) A consideration of all these factors leads to but one conclusion : that, at the time of the Accident, it could *not* have been so foggy from 'A' Cabin's vantage as to have required the recourse to fog-signalling.

### 35. As to the role of 'A' Cabin's CASM—

(a) According to the officials responsible for day-to-day transportation planning on Jhansi Division [paras 21(c)&(d)], there was nothing either amiss or extraordinary in the CASM's action in planning AE Spl's despatch. To elaborate this issue, it would be worthwhile to recapitulate [para 32(d)] that a Goods train is scheduled to take 15" to run from Agra Cantt. to Bhandai, while 21 Dn would take 8" in the reverse direction. Hence, at 03.43 hrs. (i.e. when AE Spl's 'LC' was taken), the normal expectation would be that it would reach *Bhandai* by around 04.00 hrs; in other words, it would have cleared the 'Station Limits' of Agra Cantt. some 10" *earlier* (or, around 03.50 hrs.), at which stage 21 Dn had not even reached Bhandai.

(b) Indeed, the statistical analysis [para 31 (c) and Annexure VI(b)] clearly demonstrated that there was very little likelihood of AE Spl. still remaining within the bounds of Agra Station for over 30" *after* obtaining its 'LC'.

(c) The next stage for a serious review had to be at 04.05 hrs. [para 15(h)], when 21 Dn entered the Block Section—which also happened to coincidentally synchronise with the starting (finally, as could be visualised, after what must have been an agonising delay of about 15") of AE Spl. Once it got moving, AE Spl. ought not to have taken over 5" to clear into the Up Main Line, whereas 21 Dn would take some 6" to be arriving at the Outer. The situation was by no means comfortable, but, in his assessment (which did not obviously include the possibility—let alone its probability—of 21 Dn ignoring Signals at Danger) it did not warrant the putting back the Departure Signals of AE Spl. in terms of GR 36(c). For a Diesel Goods train to be detained after it had at least started, would hardly be likely to be viewed lightly, particularly with an OSD Guard [para 17(c)] chasing it and the backdrop of various local instructions [paras 16(b) & (c)] which had sprouted to escape any involvement in the backlash caused by detentions to Diesel locos.

(d) The perception of the CASM, who was thus caught in a vice of this unprepossessing dilemma, was accordingly razor-sharp enough to

sense the hazard, despite the visibility-curtailling inclement weather, posed by 21 Dn (which was adjudged to be advancing rapidly, instead of slowing down to a halt). But for this heightened awareness to the potential of danger, the CASM and his Leverman could not have been to display such exemplary alacrity in attempting to let 21 Dn go safely by.

(e) As assayed in para 24(c), it would not be fair to hold either the CASM or the Leverman blameworthy for their failure to preferentially normalise cross-over No. 53. Unless the Cabin staff discussed their action-plan in advance logically, and with a cool mind so as to assess the comparative hazards resulting from alternative possibilities, it would have taken a genius to spot the right solution in that crisis.

(f) As the situation at Agra Cantt. and possibly at hundred of other Stations on the Indian Railways involves such "running junctions" (the movements over which are controlled by not-too-knowledgeable staff), there is everything to be gained if a Task Force (comprising Safety and S&T personnel) expertly studies each such situation and develops the most apposite "diversionary tactics" to cope with the identified hazard, to be adopted, if necessary, at the last minute in order to prevent a disaster. This process could be taken up as an intellectual exercise (in an environment that is free from stress and confusion) and (*so long as Points are not to be changed under a moving train*, for this act is by itself derailment-producing, with regrettable consequences) the procedure evolved therefrom should form a set of ideal disaster-prevention strategies which (after their approval by, say, the DRM concerned) must then be carefully explained to staff manning the Cabins.

### 36. As to the role of 21 Dn's Loco Crew—

(a) In the absence of any statements from either the Driver or his Diesel Assistant, the answers to several questions that arise must be sought from other relevant material and circumstantial evidence, beyond which it would have perforce to be conjectural only.

(b) It would be a logical surmise that the Driver was provoked by 21 Dn's already late departure ex: Jhansi [para 15(a)], which was further aggravated [para 15(e)] by its several unscheduled stoppages and other factors which compelled additional losses of time, to respond by overspeeding consistently [para 15(d) & Annexure III(b)]. There could be possibly no other reason for his frequent attainment of 120 Km/h speed, even in the undisputed presence [paras 29 (c) & (d)] of foggy weather, the effect of which was acknowledged by the Driver by his sowing down [Annexure III(b)] to upto 80 Km/h (at what must have been the approaches to the intermediate Stations, and in an obvious endeavour to control his speed sufficiently until he was able to pick up the aspects of the Signals ahead), although

he had a *clear* run ex : Hetampur through Bhandai. In other words, he must have felt himself somehow so much obligated to make up some of the time lost on other accounts that he saw nothing wrong in resorting to overspeeding knowingly. Perhaps, the psychology of Drivers to take it for granted [para 15(c)] that all is safe within a Block Section might also partially explain away the overspeeding observed.

(c) The fact that he had himself jotted down [Annexure III(a)] the timing of his run-through Bhandai establishes that the Driver could hardly have been unaware that he was approaching the stop at Agra Cantt. (the very next Station on his own 'log', against which he had in fact already made an entry on the booked arrival/departure times). How then could he have sped so fast into Agra Cantt. ?

(d) Had the visibility been normal, his speed-profile attained would indeed have been consistent with his mental attitude reflected by the aforesaid over-speeding. This becomes clear, when it is realised that the very first 'Facing Points' to be encountered in the Reverse setting would be 'B' Cabin's Points No. 31-B. situated at a distance of 1194.4 m from the Outer (and by inference, 527.6 m ahead of the Facing Points No. 53-A, which had actually been negotiated by 21 Dn). Ordinarily, then, he could have coped well within those distances to bring his speed down to about 25-30 Km/h, at which Mail/Express trains are known generally to pass 1 in 12 turnouts set in Reverse, had the Approach Signals been 'OFF'.

(e) In other words, the Driver's judgment must have been somehow impaired to render him incapable of spotting *successive Signals* and go by the aspect(s) exhibited. From the data given in Annexure I(b), it becomes clear that the Driver had overshoot the following Signals at 'ON' :—

Signal No.	Distance overshoot by (before colliding)
Dn. Outer (79-A)	896.0 m.
Main Home (78-A)	505.4 m.
Routing Home (77-A)	243.1 m.

(f) As regards the observation made in para 34(b), it is well-known that the illuminance available at any point is inversely proportional to the *square* of its distance from the light-source. Therefore, strictly speaking, if the Dn. Outer's lamp was at that point of time as bright as, say, only a 3 W bulb (because of the deficiency in its positioning), then the ratio of the range of visibility from the CASM's view-point to that from the Driver's eye would be  $\sqrt{250/3}$  or, just over 9. In other words, it was one

thing for the CASM (who was admittedly concerned about 21 Dn's impending arrival) to be able to sight the engine head-light from a distance of about 1 Km even in the prevailing foggy weather and quite a different matter entirely for the Driver to spot a dim Signal lamp. To wit, if the CASM could see the 250 W head-light from a distance of, say, 950 m [para 33(d)(v)], 21 Dn's Driver should have been able to see the Dn. Outer (and, likewise, the Main Home and the Routing Home) from a distance of  $950 \div 9 = 106$  m, other things being equal\*.

(g) That the loco crew failed to react appropriately to these Signal-aspects becomes clear from the Joint Observation [para 15(e)] of the controls in 21 Dn's driving cab and there can be a number of plausible explanations for this non-performance :

- (i) It being well-known that the approaches to each Station has its own peculiar visible landmarks (the perception of which enables the Loco Crew to straightaway identify that particular Station as being neared), the fogginess of weather might have obstructed the view of these landmarks (such as, for instance, on the Southern approach to Agra Cantt, the existence of the compound wall of the Central Ordinance Depot, with a high-level security flood-light at its corner) and deprived the Loco Crew of the benefit of this cleaning facility;
- (ii) The inadequate luminance of the 4 W bulb [rendered further obscure, vide para 13(i)] on the Dn. Outer and the generally insufficient photometric brightness of light emitted by K-Oil lamps through the not-so-clean lenses/reflectors on the other Signals concerned could have been virtually swallowed by fog-patches, particularly if they happened to be coincidentally juxtapositioned in crucial locations;
- (iii) The task of keeping a sharp vigil [para 27(a)] under foggy weather conditions plus the strain imposed by the resorting to intermittent spells of overspeeding interspersed by the braking action [Annexure III(b)] in order to pick up Signal aspects under poor visibility, might have caused the Loco Crew† to succumb to fatigue and 'nod off' for a few (precious) seconds.

† As yawns and dozing are known to be "catching", it should not be beyond the realms of possibility that *both* the Driver and his Diesel Assistant should have together yielded to sleep momentarily.

\* More to the point, since the CASM could see the VTO (over 180 m), he should have been able to see the head-light from much farther on, if the terrain characteristics permitted that.

(h) Finally, some valid explanation\* is to be sought for the Diesel Assistant's inaction [para 15(e)(i)] in operating the Emergency Flap Valve and the Driver's surprising omission [para 15(f)] to first apply the A-9 lever slightly. As regards the latter, one can only surmise that, caught unawares (until the last moment) of the need to halt his train, the Driver had used his left hand to pull the throttle back into the 'OFF' position, while simultaneously exerting with his right hand to apply the dynamic brake fully. For such an unawareness to have existed, one or the other of the 2 undernoted possibilities must have occurred :

- (i) The Loco Crew happened to fall asleep, only to be suddenly shaken up as the loco experienced a bad lurch (while negotiating the 1 in 8½ cross-over No. 53 set in Reverse); or
- (ii) The Loco Crew were oblivious to the surroundings until they were shaken up as above.

In either case, the distance traversed after entering this cross-over may be worked out from Annexure I(b) as 229.2 m, which must have been covered (at an average speed of 80 Km/h plus) in just about 10 seconds, part of which may have been lost in the Driver regaining his balance to take such action as he did whereas, in all probability his Diesel Assistant was not even able to do so.

(i) The late Budhoo Lal's Accident Index was zero, but he had been punished 4 times for "inefficient working". As regards the communication [para 2(f)] from the ABSKS, alleging that the preferential promotional prospects [para 15(b)] enjoyed by employees belonging to the Scheduled Castes was engendering a spate of accidents (including this and, inter alia, the earlier Vaniyambadi and Jolarpettai Collisions on the Southern Railway), I hold that a careful consideration of all available evidence has not produced any proof as to any nexus that any such extraneous factor may have in fact contributed to the subject accident.

(j) The late Budhoo Lal's last PME (Periodical Medical Examination) was conducted on 11-3-81 by Dr. G. K. Advani at the Railway Hospital, Jhansi, when he was declared fit in category A-One with glasses. As a standard, such medical examination includes, besides a comprehensive testing of an employee's eye-sight (for distant vision, near vision, night vision, binocular vision and colour perception) the check-up of the functioning of the heart, lungs, liver, spleen, kidneys (hernia) and the testing also of one's hearing capability. In this case, the records showed that the late Budhoo Lal's BP (blood pressure) was 142 mm/72 mm, the eye-sight with new glasses satisfactory and no

abnormality detected on any account, during the physical examination or the testing of urine, etc.

(k) The post-mortem conducted at Agra revealed no abnormality in any organs excepting for the effect of injuries causing extensive internal haemorrhages. Hence, the possibility of this Driver suffering from any physical ailment, which could have medically incapacitated him at the crucial time, may be ruled out.

(l) His accelerated promotions [see para 15(b)] were in conformity with the Government's declared policy in this respect and did not also violate the caveat recently stipulated under Railway Board's letter No. E(NG)I-75-PMI-44 of 31-5-1982 that staff (like Drivers) notified as coming under the "Safety Category" must put in 2 years of service in each grade before promotion to the next higher grade. The late Budhoo Lal's Service Record also showed that, ever since he was promoted as Driver 'A' [i.e. in September, 1978, vide para 15(b) supra], he was working continuously on the Jhansi-New Delhi sector. Hence, the question of his being relatively unfamiliar with this route and its land-marks does not arise.

(m) In the subject accident, it was not as if the Driver's technical competence (on any deficiency in this regard) which was critical, but rather the lack of alertness simultaneously on the part of both the Driver and his Assistant, for which certain postulates were expounded in sub-paras (g) & (h) above. In this context, it may also be of interest that people are rarely, if ever, conscious, in retrospect, of their having dozed off through fatigue and invariably deny/refute it. Finally, the Driver's own statement [para 29(d)] advocated miscalculation on his part on account of fog.

### 37. On Train-working in Foggy Weather—

(a) The cardinal motto to be ever observed by a Driver should be to proceed only at that speed, which *always* permits him to stop within the visible distance, for he cannot know as to what danger, if any, lurks beyond. But, enforcement of such discipline would necessarily entail the slowing down of trains on curves in cuttings and a host of other cases plagued with restricted visibility *even* in good weather. The "right-of-way" principle [para 25(e)] therefore lets a Driver proceed, subject, as usual, to any local restrictions, at the maximum permissible speed in a Block Section, whistling as required when confronted with Whistle Boards or go by the aspect of any intermediate Signalling (in the case of Gate Signals or IBH, etc.).

(b) Applying the same logic to foggy weather, the Driver should proceed so cautiously as to be able to control his train in all eventualities which may arise in a Block Section. As regards the approaches to Stations, whereas the observations made in para 27 should leave no room

\*Excluding, of course, for-fetched notions (like the Crew getting suddenly overcome by a compulsive death-wish, or their signing a suicide-pact), because mere passages at Danger was no guarantee to their success.

for any doubts as to the desirability of fog-signalling, para 26 cautions about the pitfalls that abound in the practicability of the existing system.

(c) However, it would be tantamount to partial dereliction of Management's responsibility if the need-based slowing down by trains is left entirely to the discretion of the Drivers. As it is worse than useless to pull up an errant Driver days after the event, it would be necessary for such a Driver to be stopped and cautioned as soon as possible (and, later on, counselled, suitably and disciplined, if necessary, for repeated offences of this nature). The uncertainties associated with fog-formation notwithstanding, the Control Organisation (which exercises a real-time superintendence over train-movements) must, therefore, play its role when the Drivers do *not* lose time at a stage when heavy fog is reported by Stations. As no sane person would doubt even for a moment that, given a *choice* between *late-running* due to fog and the *risk* of an accident, the public would always plump for the former, the Railway Administration has a public duty to discharge by setting up an adequate machinery at the appropriate level to eschew hazardous over-speeding.

(d) With the above in view, an Immediate Recommendation No. 3 was made along with my Brief Preliminary Narrative Report on this Accident, while suggesting also a simple remedy.

**"Immediate Recommendation No. 3 :** Train running under foggy conditions has become hazardous. It is, therefore, essential that the Railway Board review the provisions of GR 71 with a view to simplifying the procedure to what can be accomplished realistically in the present era. It is also recommended that the Railway Board should instruct the Zonal Railways to evolve a suitable machinery for watching the movement of trains during foggy weather and appropriately take up with offending Drivers who do not observe the necessary caution on the run".

**"Possible Answer\* :** One simple and workable solution lies in resorting to 'A' Class working of the Absolute Block System (i.e. not granting permission to approach unless and until the line is clear right upto the Starter) and placing detonators close-by in rear of the Cabin itself, in order to caution the Driver of only a stopping train (as distinct from run-through trains)".

(e) At their meeting held in Bombay on 11-10-82, the Chief Transportation Safety Superintendents of all the Railways had discussed this recommendation in all its implications (vide Item 9) and the Railway Board's decision,

as conveyed in its letter No. 82/Safety(A&R)/29/8 of 27-11-82, was that, while no change was called for in the present circumstances in the fog-signalling rules, Railways should ensure enforcement of the current rules and may adopt Eastern/Northern Railway Subsidiary Rules in this connection, if considered desirable.

(f) A perusal of Annexure V(b) would show that the Eastern, Northern and Western Railway had developed well-worded regulations to cover this particular subject. However, a very careful reflection would show that any restriction which tended to hold up traffic until *after* the fog-signalling machinery was set into motion, would pose severe constraints in practice, as most Sections are being worked to almost the saturation level of the available line-capacity.

(g) Whilst the Railway Board had accepted an *earlier* recommendation (vide its letter No. 80/Safety(A&R)/1/20 of 28-6-82) and exhorted Control Offices to keep a tab on Goods train movement to check over-speeding, the continuance of the extant practice [which often involved covering a distance little in excess of 2 Km under such adverse visibility, vide para 26(a)] smacks of xenophobia. For the Top Railway Management to sincerely believe that this is truly a workable proposition [para 26(c)] is possibly a tribute to the unquestioned loyalty of Gangmen, but I regret to have to reiterated that, having regard to a few practical snags raised in para 26(d), the cumbersomeness [sub-para (f) above], and if the provisions of GRs 81(a) & 81(b)(ii) are to be strictly complied with (all of which entail more delay than 'A' Class working), this procedure is not considered susceptible to long-term or sustained accomplishment (even though, like most others, it does seem 'on paper and in theory' fool-proof and near-perfect).

(h) Indeed, I have no hesitation to aver that it is such instructions as the present ones on fog-signalling that through the Railway Management into a scare, whenever staff "*threaten to work to rule*".

### 38. On the so-called Mis-marshalling of the front SLR—

(a) Now that the Ministry of Railways has both recognized and accepted, by ordering the suspension [see footnote under para 30(g)] of the official(s) responsible for mis-marshalling of the SLR on No 51 Link Express that left Madras Central on 25-1-82, that the value of human life transcends any operational inconvenience, it is imperative that the Railway Board should now address itself seriously any synoptically to the whole theme of safety marshalling (encompassing all the passenger-carrying trains) and then issue clear directives, which should be capable of accomplishment on a continuing basis.

\*In its letter No. T. 351.P.9/III of 26-5-82 to the Railway Board, the Central Railway "added" a "rider"- that, if the train could not be given such direct reception, it should be stopped at the previous Block Station/Cabin and a Caution Order served on the Driver that he was likely to be stopped at the First Stop Signal at the next Station;



(b) Para 30(g) cites a host of cases, where passenger-carrying compartments happen to be positioned the *outermost* on a train and which (although these are just as liable to be involved in a collision as any other) will not be dubbed as mis-marshalling, for the simple reason that all these are "sanctified" by the Railway Board's sanction. It is not 'managerial mores or ethics' but the *actual safety of the lives of passengers* that is being questioned when this important query is raised about the incessant exposure—day in and day out—of some passengers in collision-vulnerability-wise high-risk-prone locations.

(c) As regards mis-marshalling of an SLR, if the deed is considered *serious enough*, it would then be irrational to blame *only* the originating Station for that lapse (irrespective of whether it was an error or predicated out of an operational convenience), because every-one else responsible for train-passing duties should be deemed to have compromised themselves by their silence and those others (to whom this may have been reported) by their inaction. An issue of such *vital* concern to the safety of passengers that it can ipso facto spell a difference between life or death *must* certainly be held to fall within the purview of Rules (a)(i), (a)(ii), (b)(ii) and (b)(iii) of GR 163 (which spell-out the duties of every Railway Servant towards securing SAFETY) and of GR 176 (which requires every Railway Servant to report forthwith to his superior any *breach of rules*).

(d) Now, having argued thus far, we must infuse some pragmatism into the rationale, for there is no need to be either dogmatic or psychotic about this issue, even if it does concern life and death. Let us take, for instance, a look at another similar morbidity: the "heart attack" (medically, the ischaemic heart disease or myocardial infarction, which also affects 'life and death') and draw some parallels as below:

	<i>Heart attack</i>	<i>Train Collision</i>
Random occurrence.	Almost anyone can experience it.	No train is, in theory, exempt from this hazard.
Severity Increasing Factor.	People with anginal pain are more vulnerable.	High-speed collisions are more disastrous.
Prophylactic Action.	Hardly anyone carries even 'Sorbitrate' or similar drugs, what to speak of ampoules of injections and special longneedle injecting equipment.	Hardly any train is really cushioned at its extremities by nonpassenger-carrying portions.

Continuing this analogy further, just as it would be impractical for everyone to tote around medicines in the paranoid fear of heart attack (unless he were sensitive in some known/diagnosed manner), it might be argued that we might also allow the 'status quo' to continue in respect

of the existing Safety Marshalling concepts, *excepting* in regard to sensitive trains like Mail/Express trains (*and most indubitably so in regard to Super-fast trains*).

(c) The following view-points would, therefore, be valid:

- (i) That, as the ideal of having a non-passenger portion positioned at *both* the extreme ends of *any* rake carrying passengers had patently never been realised in the past (nor, with the trends in the ways-and-means position, is this condition likely to change in the *near* future) the Indian Railways should, through the due process of deliberate planning, strive towards the *ultimate* achievement of this desideratum on all passenger trains *throughout their run*;
- (ii) That this simple observation (that the 'sine qua non' is *not* achievable *all* the time) should *not* beget indifference (of the type which causes non-achievement of *even* the practicable) nor be cited as an excuse for not instituting [para 22(a)(iii)] an appropriately formalised machinery to ensure the optimal use of the available stock of steel-bodied/Antitelescopic SLRs.

(f) As regards the existing Booklets issued by each Railway on the composition and marshalling order of the various passenger-carrying trains plying on its system, I am *not* convinced that the "safety marshalling principles" are not being *sacrificed* for the sake of local expediencies which go euphemistically under "operational convenience". To illustrate my point, there can be no earthly reason why 2 coaches [Annexure IV(b)] should be allowed under Madras-Howrah Mail outside of the SLR *throughout its run* or why double-decker coaches [note under para 30(b)] should be allowed outside of the SLR by the Central Railway.

(g) The time has come (and, not too late), therefore, to —

- (i) Firstly, reassess the safety marshalling concepts;
- (ii) Secondly, to quantify in meaningful terms as to precisely what all that ubiquitous expression "operational convenience" is to include;
- (iii) Thirdly, to review 'de novo' the marshalling order of all passenger-carrying trains on the basis of the aforesaid concepts and norms;
- (iv) Fourthly, to formalise a system of reviewing the orientation of SLRs on trains on-the-move and stipulate the action under the identified circumstances; and
- (v) Fifthly, to give an appropriate nomenclature to the new design of SLR (with luggage compartments at both ends).

(h) If told to review this whole situation 'de novo', the Operating Departments are only likely to rationalise the existing practices and prepare grounds to justify the 'status quo'. It becomes therefore, necessary that this exercise be given to the Railway Board's Efficiency Bureau or some such agency not directly connected with the functioning of the Zonal Railways.

(i) The suspension of an employee for a "bona fide" act [para 22(a)(iv)] performed by him on 25-1-82, for the reason that, quite possibly, it was responsible for causing serious consequences at a collision that occurred on 27-1-82 (for no fault of his own)—when hundreds of identical acts are escaping the Management's notice (simply because such acts are not capable of being recognized 'a priori' as punishable offences)—seems irrational. However, if action on the lines indicated in sub-para (g) & (h) above is taken, similar incidents of this nature would be averted and, more importantly, an over-all concern for safety marshalling would be meaningfully inculcated in the minds of all Railway staff.

(j) As regards the righteous indignation expressed by the AIRMS Employees' Union [para 2(f)] against calumnious 'press reports' blaming the RMS for the overcrowding in the ill-fated SLR, my findings are already given in paras 4(e) & (f).

### 39. Measures to prevent the recurrence of similar accidents—

#### (a) *The need for a VCD :*

- (i) Had the Driver been ALERT in the first place, this accident would never have occurred. But, then, if all Drivers were sufficiently alert, many accidents could have been saved. Since the possibility of Loco Crew having fallen a prey to fatigue [paras 36(g)(iii) & (h)(i)] cannot be ruled out, the most obvious inference is that a VCD could have possibly prevented this accident.
- (ii) Whilst para 28(c) may be referred to for my own observations in this context, the Railway Board acknowledged vide its OM No. 80/Safety (A&R)/1/4 of 19-8-82 that the VCD also served as an irritant to the Drivers. And, in the long-term, it does no Management any credit to adopt a line of least resistance if that path leads to a lowering of SAFETY standards. It is not any mis-apprehension about the prestige of the Management but the SAFETY of rail-travel that is involved in revoking the earlier decision [para 28(a)] on VCDs, which must be re-introduced, properly maintained and not amenable to be dummed by "enterprising" Drivers.

(iii) If the Safety Controlling Authority is truly safety-conscious, then there should be no difficulty in enforcing a discipline on the Drivers to accept the VCD, by properly counselling them—for, all said and done, in an accident it is the Loco Crew, more than any others, who are likely to be hurt most grievously.

#### (b) *Safer Operating Practices :*

- (i) This accident would, of course, not have taken place had AE Spl. been stopped in the Yard when 21 Dn entered the Block Section or, alternatively, had 21 Dn been stopped at Bhandai to be cautioned that it might come up against the First Stop Signal at Danger at Agra Cantt. One or the other action must be regarded as an *essential*\* precautionary step.

\*Similar recommendations were made by me in the context of an equally grim tragedy that took place at Itarsi on 20-10-80, when 6 Up Punjab Mail similarly ran past Signals at Danger to enter the goods yard and collide head on with a Goods train which had similarly stalled with starting trouble. It is therefore, necessary to universalise this percept as a matter of abundant caution.

- (ii) Moreover, had the 'A' Cabin's on-duty staff been conversant with the appropriate "disaster-prevention tactics" [paras 35(e) & (f)], this particular accident could have been successfully averted.
- (iii) This type of accident cannot, of course, occur, if the simple and easily workable ideas of para 37(d) are implemented. One seriously wonders then, knowing that danger can lurk behind fog, as to why the Operating Departments feel strangled by the comparatively slight inconvenience of 'A' Class Working, which is designed to minimise the risks involved, and prefers rules which can be demonstrated to be even more delay-inducing.
- (iv) Finally, as the root-cause for any fatigue [para 36 (b)] could only be the excessively high speed-profile [Annexure III(b)] maintained by the Driver under adverse climatic conditions (most probably, through over-enthusiasm or self-motivation/'inner urge' on his part to loyally restore at least the "Divisional Punctuality" of the train, which had arrived pretty late, as it was), it would certainly be a good practice for the Controllers to follow, if a train were to be stopped out of their course for 'operational convenience' or whatever other reason, that the Driver concerned be—

- firstly, pre-warned well in advance through a written message of these out-of-schedule stoppages; and
  - more importantly, *advised* whether or not the "Divisional Punctuality" can still be maintained, having regard to the other co-existent time-losses on other accounts and the margin indicated in the WTT against that class of train for making up the lost-time.
- (c) *Guards must act responsibly :*
- (i) In terms of GR 95, Guard is *in charge* of a train, which is why GR 101(a) requires a Driver to obey the Guard in all matters affecting the movement of the train. GR 126 in turn enjoins upon the Guard to endeavour his best, if he apprehends danger, to attract his Driver's attention. As to how he may apprehend danger, the 'Handbook for Guards' (issued in 1966 by the Railway Board's Directorate of Safety) explains what "keeping a good look-out" entails and mentions in particular in its para 96(1) (vi) as follows :—
- "(1) Keeping a good look-out.—Guard should keep a good look-out on the run and watch out for any possible circumstances likely to affect the safety of the train. These circumstances may be one or the other of the following :
- (vi) train running at excessive speed—speed of the train is to be within the permissible limits and permanent and temporary restrictions on speed on certain parts of the run are to be observed."
- (ii) As regards 21 Dn's run [Annexure III(b)], an experienced Guard could hardly have remained unaware of his train 'doing' 120 Km/h against its maximum permissible speed of 100 Km/h. That he did *not* act, despite his perception [para 20(a)(i)] of the foggy weather ex : Gwalior (surely, he could have cautioned the Driver, when 21 Dn had its scheduled stoppage at Morena), establishes that either he was not sufficiently alert and alive to the hazards of over-speeding particularly in the context of the foggy weather, or that he was indifferent to this situation (in the belief that it was not actually *his* bounden duty to correct an over-speeding Driver).
- (iii) Had Shri J. L. Dhusia (the Guard) acted responsibly, as befitting an official officially in charge of 21 Dn, this Express would not have been allowed to travel this fast in foggy weather, whereby —
- the Loco Crew would not have been subjected to so much fatigue (as they might, in fact, have been) as to be overcome by it, in which case the consequences or the scenario *could* have been entirely uncalamitous; and
  - The lurch on the 1 in 8½ cross-over [para 36(h)(i)] would have been less severe at the comparatively slower speed attained under the Guard's admonition, in which case a more effective braking action could have been taken by the Driver which, together with the aforesaid lower speed-profile, would have led to much less severe a collision, with consequently far less losses both in terms of human lives and material damage.
- (iv) As such non-involvement on the part of Guards shows that they have somehow grown to take it easy, despite the adequacy of the provisions of the existing rules and regulations in this respect, it now becomes essential only to emphasise them through forceful reiteration of their own responsibilities to the Guards' attention for strict compliance.
- (d) *Curbing the tendency to over-speeding by a stricter scrutiny of speed charts :*
- (i) One fairly fool-proof measure would be to install on diesel and electric locos an on-board micro-processor which will cut-off the traction once the pre-set speed is exceeded even marginally. Such an equipment would have to be imported outright and later on indigenised, when convenient. But this idea (which was mooted out by me in the context of another accident) was considered, vide Railway Board's OM No. 80/Safety (A&R)/1/13 of 12-10-82, to be infeasible in the immediate future.
- (ii) So, besides the pulling up of errant Drivers on the run itself [paras 37(c) & (g)], another corrective action must be generated from a scrutiny of the speed-charts. At present, the machinery for calibration of speed-recorders, the calibration of the test-bench itself, and the monitoring of speed-charts/records is all left to Loco Shed Supervisors. Perhaps, this inadvertent choice of entrusting an inspectorial function to the executive is fraught with inherent limitations, so that the identification of habitual offenders (in respect of over-speeding) is, not surprisingly, a "non-starter".
- (iii) Now that each Division has a Safety set-up with its own Safety Counsellors, it would only be meet that the Railways should entrust the aforesaid safety-affecting tasks to the Safety Cells on Divisions as follows :—
- The Safety Counsellor (Loco) and any other Safety Counsellor must together scrutinize periodically the speed-charts

extracted at the various Sheds and submit their findings to the Power Officers through the DSO;

- The DSO (Divisional Safety Officer) must test-check this scrutiny and record his findings; and must also check the calibration of a speedometer/speed recorder whenever he visits a Loco Shed; and
  - A monthly summary of the monitoring work carried out as above should be submitted to the DRM as well as the CTSS of the Railway.
- (iv) Recognising that the 100 Km/h threshold is safety-wise a critical barrier (which is why special precautions and conditions are stipulated for running at a maximum speed of 110 Km/h or 120 Km/h, for which only specially up-graded locos/coaching stock are permitted), the Safety Organisation must be progressively in-

volved in ensuring that this harum-scarum over-speeding is effectively curbed at least, if not brought to an end.

(e) *Exercise of proper care in getting a Goods Train ready from the TXR view-point :*

- (i) It needs no saying that, had AE Spl. been able to proceed right ahead upon its Driver receiving the Starting Permit, it could have cleared well before 4 AM into the Up Main Line (i.e. long before 21 Dn reached even the previous Station).
- (ii) As the starting trouble was likely to be [para 32(e)] on account of leakage in the train-pipe, the need for exercising proper care in ensuring not only the prescribed minimum brake-power but also the continuity of vacuum cannot be sufficiently emphasised, particularly in view of the great stress that is being rightly laid currently on goods traffic.

## VIII. CONCLUSIONS

### 40. The Cause—

(a) Upon full consideration of the factual, material and circumstantial evidence at my disposal, I conclude that the Head-on Collision of 21 Dn Hyderabad-Hazrat Nizamuddin "Dakshin Express" with the stationary Agra-Itarsi Special Up Goods Train near the Marshalling Cabin of the Agra Cantt. Station on the Central Railway's Jhansi Division at 04.12 hrs. on 27-1-1982 was the result of 21 Dn's Driver passing 3 Approach Signals, all at Danger.

(b) The weather at Agra Cantt. was certainly foggy at that point of time and, although the visibility obtaining from 'A' Cabin did not warrant any recourse to fog-signalling, the possibility of rolling fog-patches obscuring the Approach Signals from the vision of 21 Dn's Driver cannot be ruled out. Even though the extent rules covering train-working under foggy weather do require a Driver to keep his train well under control, the terminal speed at the moment of impact was actually upwards of 70 Km/h, despite the existence of a permanent speed-limit of 50 Km/h for "any entry" into Agra Cantt. on account of Standard I interlocking.

(c) I also hold that the inability of the Goods train to start for such a long period as 15 minutes of its receiving the Starting Permit and further its incapacity to move more than about 250 metres in the next 7 minutes created a situation which contributed to this tragic Accident.

(d) This accident is accordingly classified under the category "Failure of Railway Staff".

### 41. The Gravity—

(a) Although the remaining consequences of this Accident would not have been even minimally influenced by this feature, the fatalities

might have been less in number, had 21 Dn's front SLR (the tri-composite Second-Luggage-Cum-Brake Van, which left Madras Central by No. 51 Link Express of 25-1-82 and which was, at the time of the accident, marshalled immediately next to the engine, with its passenger portion leading) been in the reverse orientation, i.e. with its luggage portion leading.

(b) The number of the said fatalities was a direct consequence also of the overcrowding in the passenger portion of the ill-fated SLR, the leading half of which was allotted to and occupied by the RMS.

### 42. The Responsibility—

(a) Individual responsibility for this collision can only devolve primarily upon 21 Dn's Driver (Late Shri Budhoo Lal) and secondarily on 21 Dn's Diesel Assistant (Late Shri Radhey Lal), both of who have already paid the highest penalty.

(b) I also hold 21 Dn's Guard (Shri Jag Lal Dhusia) culpable for his contribution in failing to attract the Driver's attention so as to check the unsafe over-speeding, which was particularly risky considering the foggy weather and the state of visibility.

(c) No one, either singly or collectively, is held responsible for the circumstances mentioned in paras 40(c), 41(a) and 41(b).

### 43. Relief Measures—

Keeping in view what has been stated in paras 2(g) and Chapter II, I was satisfied with all the relief measures pressed into service,

## IX. REMARKS AND RECOMMENDATIONS

## 44. Re-introduction of VCD\* :

(a) This subject was highlighted through the Immediate Recommendation No. 1, which accompanied my Brief Preliminary Narrative Report and it is understood that the Railway Board have now directed the Railways to *continue* to utilize the VCDs, where already provided on locos. As the Commission is a witness to a pathetically slow pace of implementation of several similar instructions (as, for instance, in the matter of recommissioning the 28 VB cut-out-cock on WDM-2 locos for synchronisation between the loco's air-brake and the vacuum brake on the trailing load), it is recommended that the Railway Board's Safety Directorate may periodically check up on this item through, say, a review of the following statistics or any other manner :

- No. of Diesel Locos owned by a Railway.
- No. of Diesel Locos, originally fitted with VCDs.
- No. of Diesel Locos, with recommissioned VCDs.
- Target date for completion of work.

(b) It is also understood that the Railway Board have directed the RDSO to evolve a suitable design of the VCD. *With all due respect*, I must sound a note of caution by stating that it is *no secret* that the RDSO is regrettably known for the extraordinarily protected durations it takes to develop virtually anything. Can any one really believe, for instance, that it has been working (?) on the design(s) for a new Tail Lamp for no less than 8 years? Before going ahead with the design, I would, therefore, suggest that a small select committee (associating, preferably, Shri I. K. Puri, who himself did a lot of innovative work in this direction, and someone from the fraternity of Diesel Loco Drivers) must formulate the essential features and the quantifiable parameters, upon which the Railway Board would doubtless like to take a quick decision. Then, if the need yet arises, the RDSO could still be entrusted with the task of "dotting the i's and crossing the t's", but definitely within a limited time-frame, so that the manufacture of the prototypes and the equipment could be quickly pushed through.

## 45. Trains to proceed cautiously in foggy weather :

(a) If, in foggy weather, a Driver is to proceed fast, only to learn of the approaching Station by bursting detonators (which, alas, are rarely used), the situation is certainly fraught with danger : obstructions, rail-fractures (which do occur in cold wintry nights) etc. would each of them spell disaster. Hence, it is imperative not only that Drivers must be suitably cautioned to proceed cautiously, but also that infractions are invariably discovered, because, without such

detection, no corrective steps are possible and, without such remedial action, over-speeding will —by force of habit—become rampant.

(b) It is true that adequate instructions do exist cautioning the Drivers in this respect. What is lacking is an effective machinery to curb the non-observance of these instructions. Hence, the Operating Departments must learn to accept their limitations and acknowledge the adverse effect of weather on punctuality, excess-time in sections, etc. Conversely, trains which do *not* lose time, when the Stations report heavy fog, *must* be regarded as "dynamite on wheels" and the errant Drivers sharply pulled up by the Section Controllers. Adequate counselling might precede punitive action, in the case of habitual offenders. The Guards of such trains must likewise be suitably taken up for not acting responsibly.

(c) It must be appropriately impressed upon the Guards that, as it is themselves who are in charge of trains, they have a responsibility to ensure that Drivers do not resort to overspeeding of any sort. If necessary, the contents [para 39(c)(i)] of the 'Handbook for Guards' should be brought under the purview of an universal SR, while simultaneously counselling the Guards properly as to how best they may accomplish these objectives.

## 46. Rules for Train Working in Foggy Weather [paras 37 &amp; 39(b)(iii)] need a fresh review :

Because of various handicaps and drawbacks (the existence of which is myopically refused to be acknowledged by the Railways), the existing policy with regard to train-working in foggy weather and fog-signalling are wellknown only for their consistent breach/violation. Even though the CTSS' Meeting of 11-10-82 might have concluded that the extant letter-perfect procedures are good and sufficient, there is truly an urgent need for the Railways to review this matter 'de novo', with a view to introducing simple and workable procedures, such as those outlined in para 37(d).

## 47. Safer Operating Policies and Practices during foggy weather [para 39(b)(i)] :

(a) If, *at night time and particularly during foggy/stormy weather*, it is anticipated on a *Double Line* that a Mail/Express/Super-Fast train might need to be held up on the approach to an important halting station for any reason, it would be a desirable procedure, as a matter of abundant caution, not to allow that train to come right up to the last possible Stop Signal, but stop it at one Stop Signal in rear and bring it forward via the "Calling on" facility, if any. In pursuance of this logic, that train should be stopped, if necessary, at the previous Station/

\*Aside of the incredible incident mentioned in para 27 (b), the following extract from pages 119 & 120 of the 'Handbook for Guards' will further strengthen the urgent and inescapable need for a VCD on Diesel Locos :

"In view of the *sleep-inducing effect of diesel engines*, such exchange of hand signals between Station Master or Cabman, Driver and Guard, assumes additional importance, inasmuch as this prevents the possibility of an unsafe condition being created by lack of alertness on the part of Driver."

Cabin and the Driver served a Caution Order that he could expect the First Stop Signal at 'ON' at the next Station.

(b) If such a train has already entered the Block Section, or if its departure is imminent, no shunting nor any other move shall be permitted, which would cross the path of that train, should it overrun a Stop Signal at Danger. And, provided that the "over-shooting" train's path is not fouled, any such latter move *already* initiated shall be terminated forthwith, to facilitate the former's reception.

#### 48. Cabin-level Disaster-Prevention Strategies [para 39(b)(ii) :

(a) Surprising as it may, *prima facie*, seem, it would have needed a lesser number of levers [para 24(b)] to be put back to avert this grim tragedy than the number actually replaced [Note under para 18] in Agra Cantt's 'A' Cabin. But this kind of expert knowledge would have required pre-meditation through preparedness/anticipation. The situation in Panel Interlocked Stations and those equipped with Route Relay Interlocking would, of course, be highly complex and must necessarily involve the active participation of S&T officials.

(b) Rather than lament with hind-sight the absence of such know-how, it would be safety-wise a leap forward, if the Railways identify the locations (such as, running junctions) which are potentially disaster-prone and then set out the planning of eleventh-hour (or, last-minute) endeavours appropriate to each identified danger. In essence, the object could be to switch an over-shooting train to an empty line, if any, or to a snag dead-end, etc, with a view to disaster-prevention as a first priority and, if that is not feasible because of local features, at least disaster-amelioration. Such measures could be developed jointly by the Safety and S&T Branches on the Divisions as an intellectual exercise and, once approved by the Administration, CASMs and Levermen could be explained the nuances of disaster-prevention strategies peculiar to their *own* Cabins. This entire process is *not* so difficult as it may look at first sight.

#### 49. Measures to curb Over-speeding :

(a) One of the causes for over-speeding is a mistaken yen for making up time-lost on other accounts. Whereas punctuality is doubtless one of the prime requisites of any transport system, its requirements can NEVER supersede those of SAFETY. Hence, whenever Mail/Express/Super-Fast trains are proposed to be stopped out of their normal course for any reason whatsoever, it is only fair that Drivers should be taken into confidence about this unusual development. It is recommended that this objective be achieved by Controllers causing the Drivers concerned to be advised on lines similar to those indicated in para 39(b)(iv).

(b) The Commission of Railway Safety has often expressed its concern that the menace of over-speeding is no longer a rarity or an exceptional feature. It is in this light that the Safety

Controlling Authority must question the prudence in entrusting the machinery to monitor the speed-charts to the Mechanical (Power) Department, which—needless to say—cannot be blamed, if it evinces a vested interest in protecting its Drivers, particularly when any actual case of over-speeding did not end up in an accident. All things considered, therefore, and moreover as over-speeding does constitute a *safety-hazard*, I would strongly commend to the Railways the scheme outlined in para 39(d)(iii), which justly associates the *Safety* set-up at the Divisional level with the tasks related to monitoring/scrutiny of speed-charts and calibration of speedometers/speed-recorders.

#### 50. Improving the Safety element in the "Safety Marshalling Instructions" :

As the outermost coaches in a load are the most susceptible to severe damage in a collision, it is a *salutary principle* that non-passenger-carrying portions should be positioned at the extreme ends of any passenger-carrying train. Since no particular train can be regarded as free from the likelihood of getting involved in a collision, this maxim must rightly apply to *all* passenger-carrying trains. Yet, as the extant "Safety Marshalling Instructions" have left behind [para 30 (g)] a large number of loop-holes, it is absolutely necessary for these instructions to be reviewed meaningfully as outlined in para 38(g), and keeping in view the above '*sine qua non*', the inescapable constraints of the system as it is (and as it will be in the immediate future) and the pragmatic view-points expressed in para 38(e). This was also the theme of the Immediate Recommendation No. 4 which accompanied by Preliminary Report.

#### 51. Improved TXR attention to Goods trains at Originating Stations :

This was the main burden of my Immediate Recommendation, No. 2, which arose from the conclusion arrived at in para 40(c). Feed-back from the Railway Board's Safety Directorate, indicating that the extant instructions as below cover the situation quite comprehensively, has been duly noted by me :

Letter	Subject
— No. 80/M(W)/814/39 of 15-10-1981.	Facilities needed to properly carry out "Intensive Examination".
— No. 80/M(W)/814/39 of 4-6-82.	TXR examination for End to-end running of Goods Trains.
— No. 79/M(N)/951/30.Pt.II of 16-7-82.	Reiteration of instructions on ensuring proper brake-power.

Yours faithfully,

Sd/-

(N. P. CITHAL)

BOMBAY, Commissioner of Railway Safety,  
2nd February, 1983. Central Circle, Bombay.  
2SSR.

## 21 Dn.'s TRAILING LOAD

1. The train-consist, at the time of the Accident, was as below, reckoning ad-seriatim from behind the TE :

S. No.	Coach No.	Type	Year of build	Date of Return for POH	Remarks \$
1.*	6129—SC . . . . .	SLR	1971	9/82	BFML
2.*	885—NR . . . . .	WFC	£	4/82	ICF L/B
3.*	6577—SR . . . . .	WGSYCN	1974	3/82	ICF A/C
4.	3903—SC . . . . .	WFC	1969	11/82	ICF A/C
5.	5014—SC . . . . .	WFC	1971	4/82	ICF A/C
6.	5043—SC . . . . .	WFC	1977	10/82	ICF A/C (1/82)
7.	5369—SC . . . . .	WGSYCN	1977	11/82	ICF A/C
8.	5424—SC . . . . .	WGSYCN	1973	11 /82	ICF A/C
9.	6819—SR . . . . .	WGSYCN	1977	4/82	ICF A/C (11/81)
10.	5202—SC . . . . .	WGSCW	1980	1/83	ICF A/C
11.	5665—SC . . . . .	WGS	£	6/82	BEML (9/81)
12.	6134—SC . . . . .	SLR	£	7/82	ICF A/C
13.@	9076—CR . . . . .	WGSYCN	1974	12/82	ICF A/C
14.@	5338—SR . . . . .	WGSYCN	1969	6/82	BEML (12/81)

\*Started journey as the rear end of 51 Dn. Link Express ex : Madras on 25-1-82.

@Slip Coaches attached in the rear on 26-1-82 at Jhansi.

£ Could not be readily deciphered at site.

\$ Figures in parenthesis under 'Remarks' indicate IOH.

2. Whilst all the coaches were of the Anti-Telescopic construction, other salient features of coaching stock are as below :

— Overall Length . . . . .	312 m.
— Overall (fully laden) weight . . . . .	560 t.
— Overall Brake Force . . . . .	2,200 t.

3. The post-accident joint-check of brake-power conducted on 27-1-82 revealed as under :

(a) Slack Adjusters

Only the four coaches, marshalled the 8th, 11th, 12th and 14th in rear of the TE, had this improvement incorporated in the brake rigging at both the ends, whereas one additional coach (the third behind the TE) had a Slack Adjuster fitted at its leading end only and two more coaches (the 5th and 13th) had it fitted at the rear end only.

(b) Direct Admission (DA) Valves

Only one coach (the 12th in rear of the Engine) had been fitted with this device, which was also seen at both the cylinders.

(c) Brake-blocks

No brake shoe was missing on any what— not even on the 2 coaches that had capsized ; all had a thickness which was within limits.

(d) Vacuum cylinders

None of the vacuum cylinders was overdue its overhead, with 29/7/81 as the earliest date of any on the last 11 coaches. The 6 cylinders on the first 3 coaches had got understandably damaged quite badly for any point marks to have survived.

(e) Piston-Strokes

(i) As regards the front 3 coaches, it was possible to test only the trailing cylinder of the SLR, when the piston stroke was found to be within limits ; the damaged condition of the other 5 cylinders precluded any testing.

(ii) As regards the rear string of 11 coaches, this parameter was within the stipulated limits, excepting that the travel was very excessive (175 mm and over) on both the pistons of three coaches (marshalled the 5th, 6th and 9th behind the engine). Indeed, the crank was touching the 'stuffing box' in these latter 3 coaches, which would imply that the development of braking action on them would be somewhat delayed because of the comparatively longer piston travel.

## AE SPL's TRAILING-LOAD

1. The vehicle-guidance was as below reckoned ad-seriatim behind the TE.

Sl. No.	Wagon No.	Class	Rly.	Year of Build	Return Date	Date of lifting at the time of the last POH**
1	2	3	4	5	6	7
1	61987	C	WR	£	—	P-24-10-81
2	24287	C	ER	1964	5/81*	
3	18149	C	SR	1948	2/85	
4	50722	C	CR	1956	—	P-7-5-75*
5	22356	C	CR	1948	6/84	
6	2987	C	SC	1956	9/84	
7	27280 $\phi$	C	CR	1945	1/84	
8	15615	C	ER	1956	9/83	
9	39804	C	NR	1968	3/83	
10	28339	C	CR	1955	11/84	
11	2554	C	SC	1958	8/84	
12	20393	C	NR	1957	1/82	
13	18598	C	ER	1957	9/81*	
14	64117	C	CR	1966	—	P-20-11-75*
15	29196 $\phi$	C	CR	£	6/84	
16 $\#$	11606 $\phi$	C	SC	1965	5/85	
17	25234	C	NR	1960	12/81*	
18 $\#$	5199 $\phi$	C@	SC	1948	8/81*	
19	73489	BRH	ER	1964	12/81*	
20	15320 $\phi$	C	SR	1956	6/79*	
21 $\#$	74850	C	SE	1970	7/79*	
22	28075	C	CR	1961	7/79*	
23	59546	C	ER	1967	8/79*	
24	32007	C	NR	£	9/83	
25	17399	C	NR	1956	4/83	
26	38562&	C	ER	1956	6/84	
27	61148&	C	WR	1953	1/85	
28	62910	C	CR	1959	11/85	
29 $\#$	63945&	C	WR	1959	1/81*	
30	77597	C	ER	1954	11/81*	
31 $\#$	17557 $\phi$	C	ER	1957	11/81*	
32	38257%	C	SE	1960	2/83	
33	64410	C	CR	1967	6/84	
34	15843	C	ER	£	3/85	
35	3682	C	ER	£	12/83	
36	31122	C	NR	1964	5/80*	

\*\* This date is given only for those wagons, the Return Date for which was not available.



## AE SPL's TRAILING-LOAD

1. The vehicle-guidance was as below reckoned ad-seriatim behind the TE.

1	2	3	4	5	6	7
37#	80952 $\phi$	C	ER	1955	11/84	
38	36777	C	SE	£	3/85	
39#	37071 $\phi$	C	SE	1957	3/84	
40#	30698 $\phi$	C	SR	1964	—	P-23-7-77*
41	39755	C	WR	1959	5/80*	
42	35710	C	SR	1965	—	P-2-12-77*
43	59810	BRH	WR	1981	8/85	
44	61288	BRH	SE	£	9/81*	
45	39260	C	WR	1968	—	P-22-7-77*
46	15810	C	SR	1956	—	P-19-1-80
47	48662	C	CR	£	2/81*	
48	79181	C	ER	1955	11/83	
49	35018	C	SE	£	11/84	
50	33759 $\phi$	C	NR	1957	—	P-13-1-77*
51	3393	C	SC	1960	4/80*	
52	29903	C	WR	1967	2/82	
53	28227	C	CR	1962	6/85	
54#	6258	C	SC	1955	12/82	
55	93612	BRH	SE	1978	8/82	
56	93437	BRH	SE	1976	2/82	
57	24502&	C	PES	1965	—	P-28-12-78
58	63354	C	CR	£	—	P-26-11-80
59	22834	C	NR	1958	12/84	
60	55358	C	CR	1957	6/84	
61	47515	C	PWS	£	2/85	
62#	24404 $\phi$	C	ER	£	—	P-18-4-76*
63	65887	C	CR	1959	3/84	
64	81231	C	ER	1955	8/85	
65	12340&	C	NR	1953	—	P-24-7-80
66	56669	C	CR	£	—	P-21-3-78*
67	33772 $\phi$	C	NR	1957	—	P-13-3-76*
68	52983	BVGT	SE	1962	9/83	

Notes :—@ Only wagon that was empty.

£ Year of Build could not be readily deciphered at the site.

§ Pakistan Railway Wagons.

\* Wagons overdue POH, 26 of them in all (out of a total of 68) ; the earliest one (S.No. 20) was overdue since 6/79— or for over 2½ years.

# Brake-power on these 10 wagons was ineffective, as per the records of the Train Examiner (TXR) staff.

 $\phi$  According to the post-accident examination, vacuum cylinders on these 12 wagons were either dummied or inoperative (although the total was a wrongly given by the Railway as 11).

&amp; Whilst the brake rigging on the first 5 wagons was sufficiently damaged to preclude any inference as what might have been its condition prior to the collision, either the crank arm or the pistons on the following 5 additional wagons was found in a "jammed" state, according to the post-accident examination.

% Due to the obvious deficiency in the clip which is meant to hold this pipe in position by the standard nut-and-bolt tightening mechanism, the armoured syphon pipe had worked loose off the bottom of the vacuum cylinder of this wagon; this was remedied later.

2. The load had in fact been "formed" at 12.00 hrs. of 26-1-82 and straightaway offered for 'train examination'. The TXR staff acknowledged the 'memo' at 12.15 hrs. and, pursuant upon this examination which lasted upto 15.30 hrs.), all requisite attention to this load was completed by 20.00 hrs.

3. This Goods train was thereupon ordered for departure at 02.30 hrs. of 27-1-82. The TE was coupled at 01.50 hrs. and the vacuum was obtained in the Brakevan at 03.05 hrs., in token of which the Guard signed the (un-machine-numbered) Vacuum Brake Certificate — which was also signed by the Driver at 03.15 hrs. The level of vacuum attained in the loco was not recorded — a minor omission — on this Certificate.

EXTRACTS FROM CENTRAL RAILWAY'S BOOKLET ON RAKE LINKS, COMPOSITION AND MARSHALLING ORDER, IN FORCE FROM 1ST JANUARY, 1981 (SHOWING EXAMPLES OF TRAINS NOT HAVING SLRs AT EITHER END, TAKEN FROM PAGES 18, 38 AND 56 OF THE BOOKLET.

201 DN/202 UP

## PANCHAVATI EXPRESS

21 DN—

201 Dn. Ex. BB.

202 Ex. MMR

HYDERABAD EXPRESS

21 DN Ex. KZJ to NDLS

ENGINE	ENGINE	ENGINE	
WSCBR	WSLR	GSCN	HYB—BSB
WGSD	WGSCZ	SLR	MAS—NDLS
WGSD	WGSCZ	FSCN	WAT—NDLS
WFCZ	WGSCZ	GSCN	BZA—NDLS
WGS	WGSCZ	FSCN	Do.
WGSCZ	WGSCZ	FC	MAS—NGP/NDLS
WGSCZ	WGSCZ	GSCN	MAS—NDLS
WGSCZ	WGSCZ	FCS	MAS—LKO
WGSCZ	WGS	GSCN	Do.
WGSCZ	WFCZ	FSCN	HYB—LKO
WGSCZ	WGSD	GSCN	Do.
WGSCZ	WGSD	WCD	KZI—JHS
WSLR	WSCBR	WFC	HYB—NDLS
		FWC	Do.
		WFC	Do.
		WGSCW	Do.
		WGSCN	Do.
		WGSCN	Do.
		WGS	Do.
		FCS	HYB—BPL—NDLS
		WGSCN	JHS—NDLS
		GSCN	JHS—NDLS
		GS	
		SLR	<u>HYB-NDLS</u>
		HYB—BSB	GSCN { ex HYB on Sunday. ex BSB on Wednesday

105 DOWN/106 Up JHS-LKO &amp; 535 Down/536 Up JHS-CNS Passenger

ENGINE		ENGINE	
SFPH	JHS—LKO (105/106)	SLR	CNB—LKO—JHS
SLR	JHS—LKO—CNB	WGS	"
FSCN	MAS—LKO (5 days)	WGS	"
GSCN	{ HYB—LKO (2 days) (51/21/105)	WGS	"
WGS	JHS—CNB—LKO	WGS	"
WGSY	"	WFC	"
WFC	"	WGSY	"
WGS	"	WGS	
WGS	"	WGSCN	{ LKO—MAS (5 days)
WGS	"	FSCN	{ LOK—HYB (2 days)
WGS	"		(106/22/52)
WGS	"	SLR	CNB—LKO—JHS
SLR	"	SPPH	LKO—JHS (106/105)

Other Examples of Trains without SLRs as the last Coach at both ends of the Train Formation.

When leaving	Marshalling order	
Train No. 4	MAS—MHW	Mail
MAS	Engine—	MAO—
D.22 25	GSCN ..	HWN
	GSCN ..	TVC—
	LR ..	HWH
	PP ..	
	WGS ..	
	WGSCW ..	
	WGSCN ..	
	WGSCN ..	
	WGSCN ..	
	WCS ..	
	WFC ..	MAS—
	WFC ..	HWH
	WFC ..	
GDR	WGFSCZAC/	
A. 0 40	WAC/WFC	
D. 0 45	WGS ..	
	LR ..	
	FCS ..	MAS—
HWH		BZA
A. 6 05	17	

Source

Pages 24 and 33 of Southern Railway's Booklet No. 24.

Pages 19 and 31 of South Central Railway's Booklet No. 19.

Nos. 55/56 NS-SC Expresses

No. 56 Express while leaving SC No. 55 Express while Leaving NS

ENGINE		ENGINE	
GSCN	...SC-MTM	GSCN	... NS-MAS
GSR	} SC-NS	GSR	} NS-SC
FC		GSCN	
FC		GSCN	
GSCN		GSCN	
GSCN		GSCN	
GSCN		GSCN	
GSR		FC	
FCS		FC	
GSCN		GSR	
11		SC-BDCR	
Ex. DKJ		10	
ENGINE		ENGINE	
GSCN	...SC-MTM	GSCN	...MTM-SC
GSR	} SC-NS	GSR	} NS-SC
GSCN		FC	
GSCN		FC	
GSCN		GSCN	
GSCN		GSCN	
GSCN		GSCN	
FC		GSCN	
FC		GSR	
GSCN		GSCN	
GSR		BDCR-SC	
10		11	

Train No. 69

Bokaro Steel City-Madras Express

MAS	Engine—	
M M	GS ..	
D.13 35	FC ..	MAS—
	GSCN ..	TATA
	GSCN ..	
	GS ..	
	SLR ..	
	GS ..	
	C ..	MAS—
	GSCN ..	BKSC
	GSCN ..	
	AS ..	
GDR	GSCW ..	MAS—
M.M.	FSCN ..	RNC
	SLC ..	MAS—
		TATA
A. 16 10	14	
D. 16 15		
EXSC	Formations of Nos. 89/90	
7 55	reverse at Waltair.	

Train No. 10

Madras-Bokaro Steel City Express

SKSC	Ex. Waltair	
D.19 00	Engine—	
	GSCW ..	RNC—
	FSCN ..	MAS
	GS ..	
	GSCN ..	
	GSCN ..	BKSC—
	FC ..	MAS
	GS ..	
	SLR ..	
	GS ..	
GDR	GSCN ..	TATA—
A. 9 40	GSCN ..	MAS
D 9 50	FC ..	
	GS ..	
	SLR ..	BKSC—
MAS		MAS
A. 12 25	14	

Nos. 25/26 HYB-WL Kakatiya Express

No. 25 Ex. HYB	No. 26 Ex. WL
Engine	Engine
SLR } HYP-	GSR } WL-HYB
WGS } WL	FCS
WGS	WGS
WGS	WGS
WGS	WGS
WGS	WGS
WGS	WGS
WGS	WGS
WGS	WGS
FCS	WGS
GSR	SLR
10	10

**THE SUBSTANCE OF SAFETY MARSHALLING INSTRUCTIONS, AS PRINTED IN THE SOUTHERN  
RAILWAY'S BOOKLET NO. 24**

**SLRs and anti-telescopic or steel bodied coaches**

- In case of Mail/Express trains, anti-telescopic or steel bodied SLRs must be marshalled as the last coach at both ends of the train formation, *except when anti-telescopic or steel bodied slip or sectional coaches are attached outside the SLR due to unavoidable operational requirements.*
- In case of SLRs which have passenger portion on one side and luggage-cum-brake portion on the other, the SLR should be marshalled in such a way that the luggage and brake portion is trailing outermost. If, for any unavoidable reason, the anti-telescopic/steel bodied SLR isn't so marshalled, *the passenger portion need not be locked.*
- In case of Mail/Express trains, *two*<sup>@</sup> anti-telescopic or steel bodied coaches should be marshalled inside the anti-telescopic or steel bodied SLRs at both ends.
- In case it is inescapable to utilise a wooden bodied SLR on Mail/Express trains, the wooden bodied SLR should be marshalled inside *two*\* anti-telescopic coaches.

**Short Trains**

- In case of short trains running with single SLR, the SLR whether anti-telescopic, steel bodied or not, should be *marshalled in the middle.*

**Reserved bogies/Saloons occupied by V.LPs; Sectional/Through Service Coaches**

- *These could be marshalled anywhere as operationally convenient,* provided that they are anti-telescopic or steel bodied. If they are wooden bodied, they should be marshalled inside the required number of anti-telescopic/steel bodied coaches.
- While determining the position of marshalling of sectional/through service coaches, the consequence of attaching/detaching these coaches en route should be born in mind.

<sup>@</sup>Only one, in the first instance, in case of Passenger trains.

\*Only one, in the first phase, for Passenger trains.

## SOME ASPECTS CONCERNING FOG

(a) 'Fog' consists of moisture droplets of radius between 1 and 10 microns, whereas 'Mist' comprises droplets of radius under 1 micron (or, under one-thousand of a millimeter).

(b) Essential pre-requisites for the formation of fog being, firstly, moisture in air, secondly, sufficient cooling of the ground and, thirdly, moderate breeze to ensure the stirring of cooled air above the ground, it follows logically that fog should occur—

- most often in winter, because of the long hours available for night-cooling ;
- the heaviest at pre-down and down timings, because of the accomplishment of the maximum cooling effect and the warmth of the Sun still to be experienced ;
- mostly inland, where the moderating influence of the sea is absent ;
- the quickest over open country where vegetation and rivers/lakes provide extra moisture ;
- most frequently in hollows/valleys, into which the (heavier) cooling air drains ; and
- the thickest in industrial belts, where particles of dust/smoke facilitate condensation.

(c) Due to the wide variations both in the moisture content and in the cooling properties of the ground surface (composed as it is of diverse materials), it is but natural that fog should form in patches/swirls. Thus, it is a common enough sight for clear visibility to alternate with dense fog patches even within a short distance or within a short space of time at the same location — until, of course, prolonged cooling reduces the air temperature all over to below the "dew point" and create a blanket of fog. By the same token, due to differences in the manner and pace of counteracting the cooling effects under the warmth of the low-altitude wintry Sun the subsequent dispersal of fog is also patchy.

(d) It is this peculiarity of patchy occurrence and uncertainty which prevents any fog-forecast from becoming reliably fool-proof. A fog-forecast can at best specify generally the area and the likely time of its formation, but it can never pinpoint precisely where and when the first patches will form and grow further into a blanket. Warnings issued can easily become discredited if fog is not seen on a particular journey at a given time, which would have the expected consequence of next-such warnings to be ignored and yet fog patches may be "suddenly" encountered to pose a hazard.

(e) According to the international definition, visibility in fog is less than 1 Km. However, upon a consideration of its potential to seriously disrupt road traffic, usage of the expression "fog" is in practice reserved for a visibility of 180 m or less, the word "mist" being used to denote better visibility upto 1 Km.

## EXTRACTS FROM SRS OF SOME OF THE OTHER RAILWAYS, AS PERTINENT TO TRAIN-WORKING IN FOGGY WEATHER

## 1. Eastern Railway

S.R.71(r) : Crossing of trains at stations during thick, foggy or tempestuous weather-On single line sections.

During thick, foggy or tempestuous weather, when under General Rule 71 and Subsidiary Rule 71(d), it is necessary to have detonator (fog) signals placed on the line to indicate to the Drivers of approaching trains the locality of signals, the following additional precautions shall be taken by "Control" on controlled sections, and by the Station Master on non-controlled sections, in arranging the crossing of trains—

- (1) Both on controlled sections, i.e. sections of the line on which stations are connected by telephone with a "Control" office and with adjoining stations, and on sections on which there is no "Control", when the conditions of weather are such as to require the posting of Fog Signal men under General Rule 71 and Subsidiary Rule 71 (d), the fact will be advised by Station Masters by telephone, and in the absence of a telephone by a telegraphic message, with "Private Number" in either case, which shall be acknowledged by a similar message to the sender by each recipient,
- (2) Except in the case of booked crossings, as shown in Working Time Table between trains carrying passengers. "Control" on controlled sections and Station Masters on non-controlled sections shall not arrange a crossing between two trains at a station, unless there is a clear margin of not less than 10 minutes between the due arrival of the two trains to be crossed.

This margin of ten minutes shall be over and above the normal running time or running time inclusive of the time allowed over any temporary restriction which may be in force at the time.

(3) The procedure prescribed in Clause (2) above, shall apply to crossings in the following cases—

- (a) When one or both of the trains carrying passengers booked to cross or take precedence or give way at a station, runs late causing the crossing to take place at another station.

(b) A train carrying passengers and a goods train of any description, including Express Goods trains, even though a booked crossing is shown in the Working Time Table.

(c) A train carrying passengers and a light engine.

NOTE—For the definition of “train”, attention is called to General Rule 1 (40).

(4) So as to avoid a detention to the train carrying passengers, a crossing shall not be arranged under Clause (3) (b) and (c) unless the non-passenger train or light engine is the first due to arrive.

(5) Not more than two trains, one of which is a train carrying passengers, shall be permitted to cross at a station, except where a sufficient number of properly isolated reception lines are provided.

Note—At stations where more than two trains are permitted to cross, a clause to this effect shall be entered in the Station Working Rules.

SR-249A.—No obstruction in thick and foggy weather when a train is approaching : In thick, foggy or tempestuous weather when permission to approach has been given for a train, no obstruction on the line shall be permitted between the outermost facing points or the block section limit boards and the last stop signal.

SR-256A.—No obstruction within station sections : In thick, foggy or tempestuous weather when permission to approach has been given for a train, no obstruction shall be permitted within the station section.

## 2. Northern Railway\*

SR. 83/1—The most obvious precaution for the Driver in such circumstances is to reduce speed so that he will be able to stop short of any obstruction or danger signal.

SR.89/2—*Checking speed of trains*—All railway officers and Inspectors who are concerned with the running of trains and the maintenance of the track, as well as Guards, shall from time to time check the speed of trains to ensure that Drivers do not exceed the maximum permissible speed limits prescribed for the track or class of locomotive or any lower speed that may be laid down either in the rules or in the permanent or temporary speed restrictions. Should they find that the authorised speed has been exceeded, they should inform the Driver at the next stop and submit a report as early as possible to the Divisional Operating Superintendent and the Divisional Mechanical Engineer.

SR.249/1—*Obstruction when train is approaching*—When permission to approach has been given for a train, no obstruction of the line between the Home signal and last Stop signal of the station shall be permitted under General Rule 249, in thick, foggy or tempestuous weather.

SR.256/1—When permission to approach has been given for a train, shunting within the Station Section permitted under GR 256 or GR 256A shall not be carried out in thick, foggy or tempestuous weather.

## 3. Western Railway :

SR.238(5)—When it is not possible owing to foggy or tempestuous weather or dust storm for the Station Master to see the position of one or more of the signals concerned “permission to Approach” must not be given unless—

(i) a railway servant appointed by the SM is stationed at least 275 metres outside the outermost signal with instructions to observe the procedure prescribed in SR 71 (d) and (e).

(ii) the SM has advised the station in rear through the electric speaking instrument of conditions prevailing and instructed him to issue caution orders to the drivers of all trains to stop at the first stop signal and observe its aspect before proceeding at a restricted speed of 8 KMPH and has obtained his acknowledgment supported by a Private Number.

---

\*As Northern Railway's S.R. 71/2 is identical to Eastern Railway's S.R. 71(r), it is not being reproduced in this Annexure.

STATEMENT SHOWING DEPARTURE PARTICULARS OF UP GOODS TRAINS ORIGINATING FROM THE  
GOODS YARD OF AGRA CANTT BETWEEN 25-12-81 & 26-1-82

Date	Train No.	Engine No.	Line No.	Timings		Diff.
				L.C.	TOL	
1	2	3	4	5	6	7
25-12-81	FG	442	R-1	13.55	14.05	10
25-12-81	ET SPL	078	M-1	14.45	15.05	20
25-12-81	FG	360	R-3	17.26	17.32	06
25-12-81	NKJ	629	M-3	21.07	21.35	28
26-12-81	ET	059	M-4	00.36	01.00	24
26-12-81	JHS	367	M-2	15.41	15.50	09
26-12-81	FG	174	R-1	19.41	19.50	09
26-12-81	708 Up	009	M-6	21.56	22.00	14
27-12-81	EJJ	794	R-7	02.08	02.20	12
27-12-81	EJJ	359	R-1	10.32	10.35	03
27-12-81	JHS	173	R-8	23.46	24.00	14
28-12-81	JHS	171	M-10	02.15	02.20	05
28-12-81	NKJ	758	M-9	03.21	03.30	09
28-12-81	JHS	349	M-4	05.16	05.50	14
28-12-81	EJJ	418	R-6	07.52	08.15	23
28-12-81	ET "I"	306	M-7	12.07	12.20	13
28-12-81	EJJ	715	R-7	18.29	18.50	21
28-12-81	NKJ	339	M-6	21.21	21.37	16
29-12-81	ET "I"	727	R-6	00.57	01.05	08
29-12-81	FG SPL	922	R-6	05.51	05.55	04
30-12-81	JHS	627	M-1	10.11	10.20	09
30-12-81	EJJ	260	R-4	17.21	17.25	04
30-12-81	EI "I"	922	M-1	19.03	19.20	17
30-12-81	NKJ	238	R-4	21.06	21.10	04
31-12-81	A/ET	615	M-1	15.11	15.30	19
1-1-82	R/ET	635	R-4	00.48	01.00	12
1-1-82	KC(E)	167	M-6	17.31	17.35	04
1-1-82	702 Up	009	R-7	23.35	23.40	05
2-1-82	NKJ	724	M-7	08.02	08.10	08

Notes : Col. 4 — 'R' represents Up & Down Reception-cum-Despatch Lines. 'M' represents Marshalling Lines.

Col. 5 — 'LC' represents the time at which 'Line Clear' was granted by Bhandai for that train, as per Train Register of Agra Cantt's 'A' Cabin.

Col. 6 — 'TOL' represents the time at which 'Train on Line' indication was given to Bhandai, as per the Train Register of Agra Cantt's 'A' Cabin.

Col. 7 — Col. 6-Col. 5, expressed in minutes, being the time taken by a Goods train for exiting from the Goods Yard completely into Main Line.

## ANNEXURE—VI(a)—Contd.

1	2	3	4	5	6	7
2-1-82	JHS	102	M-8	08-46	09-00	14
2-1-82	702 Up	824	R-8	11-40	11-45	05
2-1-82	SFC	153	R-1	13-10	13-25	15
2-1-82	AE	730	M-3	18-31	18-45	14
3-1-82	NKJ	442	M-2	07-26	07-40	14
3-1-82	EJJ	841	R-7	09-30	09-35	05
3-1-82	JHS	751	M-9	23-11	23-15	04
4-1-82	702 Up	008	M-4	07-01	07-10	09
4-1-82	E BOX	225	R-8	08-02	08-10	08
4-1-82	EJJ	202	R-5	19-16	19-20	04
5-1-82	ET 'I'	057	M-7	05-04	05-10	06
5-1-82	EJJ	010	R-5	20-59	21-40	41
5-1-82	JHS	488	M-3	23-04	23-10	06
6-1-82	KC(E)	860	M-4	07-21	07-35	14
6-1-82	NKJ	993	M-6	15-18	15-20	02
7-1-82	ET	236	R-5	15-21	15-35	14
7-1-82	FG	064	R-4	18-36	18-50	14
7-1-82	UPDSL	768	M-7	23-26	23-35	09
8-1-82	ET	820	M-11	02-11	02-25	14
8-1-82	EJJ	265	R-7	06-52	07-05	13
8-1-82	ET	564	R-7	15-24	15-30	06
8-1-82	EJJ	495	R-5	18-19	18-35	16
9-1-82	702 Up	125	R-8	00-21	00-40	19
9-1-82	NKJ	587	M-10	02-56	03-15	19
9-1-82	FG	273	R-6	13-52	14-00	08
10-1-82	EIJ	942	R-7	15-58	16-13	15
10-1-82	NKJ	738	R-5	02-56	03-10	14
10-1-82	JHS	540	M-1	03-32	04-05	33
10-1-82	AE	840	M-4	08-17	08-30	13
10-1-82	NKJ	908	M-8	12-01	12-25	24
11-1-82	702 Up	250	M-11	02-51	03-10	19
11-1-82	EJJ	162	R-5	11-01	11-18	17
11-1-82	KC(E)	582	R-7	13-23	13-30	07
11-1-82	JHS	254	M-10	17-41	17-50	09
11-1-82	ET(I)	840	M-2	23-36	23-55	19
16-1-82	JHS	178	M-10	10-11	10-25	14
16-1-82	FG	820	R-2	21-06	21-20	14
16-1-82	EJJ	635	R-6	10-11	10-25	14
17-1-82	NKJ	420	M-6	02-02	02-10	08
17-1-82	ET	679	M-3	15-26	15-45	19
18-1-82	FG	188	R-4	04-31	04-45	14
18-1-82	MET	922	M-11	11-41	11-50	09
18-1-82	JHS	010	R-2	13-07	13-30	23
18-1-82	EJJ	596	R-8	16-11	16-25	14



## ANNEXURE-VI(a)-Contd.

1	2	3	4	5	6	7
18-1-82	JHS	247	M-2	18·12	18·25	13
19-1-82	ET	263	R-1	02·36	02·50	14
19-1-82	AE	712	M-4	05·26	05·40	14
19-1-82	702 Up	582	R-6	06·26	06·40	14
19-1-82	SFG	889	R-1	08·48	09·00	12
19-1-82	NKJ	166	M-7	13·02	13·20	18
20-1-82	ET	730	M-11	04·21	04·40	19
20-1-82	JHS	724	M-8	23·12	23·25	13
21-1-82	ET 'I'	614	R-2	01·21	02·40	19
21-1-82	FG	315	R-6	08·35	08·45	10
21-1-82	EJJ	445	R-5	21·55	22·05	10
22-1-82	EJJ	849	R-5	02·17	02·50	33
22-1-82	ET 'I'	172	M-11	03·19	03·30	11
22-1-82	702 Up	066	R-8	05·21	05·45	24
23-1-82	AE	937	M-9	02·21	02·40	19
23-1-82	ET 'I'	635	M-6	10·05	10·20	15
23-1-82	KC(E)	950	M-10	14·51	15·00	09
23-1-82	ET	213	R-1	20·52	21·00	08
23-1-82	NKJ	467	M-7	21·17	21·25	08
24-1-82	AE	840	M-6	00·31	00·40	09
24-1-82	JHS	472	M-3	04·06	04·20	14
24-1-82	FG	344	R-6	06·36	06·50	14
25-1-82	JHS	307	M-10	07·51	08·00	09
25-1-82	EBOX	950	R-6	11·00	11·12	18
25-1-82	NKJ	044	M-8	15·26	15·45	19
26-1-82	ET 'I'	064	M-4	04·41	05·00	19
26-1-82	702 Up	247	M-2	06·07	06·20	13
26-1-82	JHS	609	M-3	12·49	12·55	06

**RESULTS OF THE STATISTICAL ANALYSIS OF THE TIME TAKEN BY UP GOODS TRAINS TO  
EXIT FROM THE GOODS YARD INTO THE UP MAIN LINE**

Statistic	Departing from		
	Marshalling Lines 1 to 4 only	All Marshalling Lines combined	Entire Goods Yard
<b>EXITING TIME* FOR UP GOODS TRAINS</b>			
Number of trains (sample size)	24	55	101
Minimum Time	6*	2*	2*
Maximum Time	33*	33*	41*
Mean Time $\bar{x}$	15.5*	13.29*	13.11*
Standard Deviation of sample	6.32*	6.05*	6.74*
Estimated Standard Deviation of Population...SD...	6.46*	6.10*	6.78*
$(\bar{x} + 2 \times SD)$ for $P = .99772$ @	28.42*	25.49*	26.67*
$(\bar{x} + 3 \times SD)$ for $P = .9987$ @	34.88*	31.59*	33.45**
Z for $T = 30^*$ , or $(30 - \bar{x})/SD$ #	2.24	2.74†	2.49
Probability that $T \leq 30^*$	.9875	.9969	.9936

\*Details, given in Annexure VI(a), have been analysed as below :—

- Considering only those trains, which had exited from Marshalling Lines 1 to 4 [i.e. negotiating Point No. 49, vide Annexure I(b)];
- Considering only those trains, which had departed from the Marshalling Lines 1 to 12 [i.e. negotiating either Point No. 49 or Point No. 50, vide Annexure I(b)]; and
- Considering all data, taken together.

@ According to Gaussian Theory (Normal Distribution),  $(\bar{x} + 2 \times SD)$  yields a 'Confidence Level' of 97.72% or, roughly 1 in 44 chance of this value being exceeded in fact ; likewise,  $(\bar{x} + 3 \times SD)$  yields a 'Confidence Level' of 99.87% or roughly 1 in 770 chance of even this value being exceeded in reality.

#The chances that the exiting time for an Up Goods train can exceed 30\* are as below :—

- only 1 in 80, considering the data-base for Marshalling Lines 1 to 4, or
- only 1 in 323, considering the data-base for all the Marshalling Lines, or
- only 1 in 156, considering all the Goods trains departing from the 'Goods Yard'.

**VIEWS OF THE RAILWAY BOARD ON VARIOUS PARTS OF THE REPORT**

The conclusions arrived at by the Commissioner of Railway Safety, Central Circle with regard to the cause of the accident and responsibility therefor are accepted.

*Remarks and Recommendations*

*Para 44 :* A satisfactory design of V.C.D. is still not available. Efforts are on to locate an acceptable design which is trouble-free and easy to maintain.

*Para 45 :* The recommendation has been examined but not found feasible as in the absence of prescribed speed limit, its monitoring has no value. Further, the responsibility for proper speed rests on the driver and making the guard responsible for the same will dilute driver's responsibility and can cause confusion leading to unpleasant results.

*Para 46 :* } Matter has been referred to RDSO for a detailed examination of suggestions.  
*Para 47 :* }

*Para 48 :* CRS has agreed with the G.M's comments.

*Para 49 :* It is considered desirable to continue with the present system of monitoring of speed recording charts etc. by the Diesel and Electric Sheds.

*Para 50 :* Instructions have been issued.

*Para 51 :* Goods train examination has now been rationalised. The earlier concept of safe to run examination has been dispensed with and intensive examination standard implemented for all goods trains. The maximum distance for coverage after examination has also been modified. Railways have now nominated yards for intensive examination of inter-railway goods trains. Necessary infrastructure and facilities have been created at all such nominated points to ensure meticulous examination of wagons. Instructions issued to the Railways regarding adequacy of brake power on trains.

Price : (Inland) Rs. 81.00 (Foreign) £ 9.45 or \$ 29 16 Cents.

महाप्रबंधक, भारत सरकार मुद्रणालय, नासिक-422 006 द्वारा मुद्रित  
तथा नियंत्रक, प्रकाशन विभाग, दिल्ली-110 054 द्वारा प्रकाशित  
PRINTED BY THE GENERAL MANAGER, GOVT. OF INDIA PRESS, NASIK-422 006  
AND PUBLISHED BY THE CONTROLLER OF PUBLICATIONS, DELHI-110 054  
1991