CONFIDENTIAL

Copy 1

ACCIDENT REPORT ON NRSA SUPER KING AIR 300 VT-EQM OVER TALOJA HILLS NEAR BOMBAY ON 15.7.93.

INDEX

APPENDIX

CONFIDENTIAL

ACCIDENT REPORT ON NRSA SUPER KING AIR B300 AIRCRAFT VT-EQM OVER TALOJA HILLS NEAR BOMBAY ON 15.7.1993

A.	Aircraft	:	Type : Super King Air Model : B 300 Nationality : Indian Registration : VT-EQM Engine : PT6A-60A
B.	Owner & Operator	:	National Remote Sensing Agency Balanagar, Hyderabad.
C.	Pilot-in-command No. of Crew Extent of injuries	: : :	Capt.V.Ramakrishna One Fatal
D.	No. of passengers Extent of injuries	: :	Three Fatal
E.	Place of accident	:	Jhanda Tekri Hill top, Vill.Taloja, Dist.Thane, 11 NM East of Bombay Airport.
F.	Date & Time of Accident	:	15th July, 1993 - 0625 UTC (1155 IST).

S U M M A R Y

Super King Air aircraft VT-EQM, belonging to National Remote Sensing Agency, Hyderabad was operating a ferry flight on 15.7.93 from Ahmedabad to Bombay under the command of Capt.V.Ramakrishna. During the approach to land at Bombay, contact with ATC was lost after the aircraft had reported its flight level 4000 ft. The aircraft was subsequently sighted as crashed on the top of the hills at Taloja village, located about 11 NM East of Bombay Airport. All the four occupants on board the flight including the pilot died and the aircraft completely destroyed as a result of impact with the hill.

The accident was notified to the DGCA and investigation thereto was ordered under Rule 71 of the Aircraft Rules 1937 by appointment of the Inspector of Accident.

1. FACTUAL INFORMATION :

1.1. History of the Flight :

National Remote Sensing Agency aircraft VT-EQM had departed from Ahmedabad at 0501 UTC. At the time of take off the aircraft was carrying fuel on board for 0500 hrs. endurance. There were 4 occupants in the aircraft including the Commander. The commander was occupying the left hand seat in the cockpit and the right hand seat in the cockpit was occupied by Sq.Ldr.(Retd) P. Dastidar, Navigator in NRSA. The other two occupants on board the aircraft were Shri N.V.Anjaneyulu, AME and Shri S. Panda, Aircraft Technician.

At Ahmedabad a flight plan for IFR flight was filed by the Commander indicating departure as 0430 UTC and EET (Estimated Elapsed time) as 0115 hrs. The Communication, Meteorological and ATC briefings were obtained by the Commander. The route to be followed by the aircraft was W13S at FL 100/95.

The aircraft actual departure from Ahmedabad runway 23 was at 0501 UTC and thereafter the aircraft climbed initially to FL 100/95 on route to Bhavnagar for Bombay. Subsequently at 0511 UTC the aircraft was cleared by Ahmedabad ATC to climb to FL 200/190. The route estimates passed by the aircraft to Ahmedabad ATC were Bhavnagar at 0525, RP BOWFIN at 0550, and destination Bombay at 0630 UTC.

The aircraft came in first contact with Bombay ATC on Area Control frequency (125.9 MHz) at 0526 UTC when the aircraft was maintaining FL 190. The aircraft was descended subsequently in stages to FL 150 and FL 140 during its contact with Area Control Centre. The aircraft reported to Area Control its estimate over Bombay VOR as 0615 UTC.

At 12 DME from Bombay the aircraft was changed over from Area Control Centre to Approach Control and at 11 DME maintaining FL 140, the aircraft contacted Approach Control (127.9 MHz) at 0613 UTC. The aircraft was initially given heading 180° for identification on the Radar and was also given descend clearance to FL 120. It was given further descend to FL 100. At 0614 UTC the aircraft was again asked by the Radar Controller to steer left heading 090 for identification. At 0616 UTC Approach confirmed to the aircraft of having identified it at 5 NM NNE of Bombay airport.

After having identified ,the aircraft was asked to continue heading 090 and descend to FL 070. Thereafter the aircraft was given descend to transition level 55 when the aircraft reported its level as 090. At 0619 UTC the aircraft reported FL 55 and at 0620 UTC the aircraft was asked to turn right heading 190. At 0621 UTC the aircraft was given further vectoring for heading 240 and intercept the localizer from the right. This instruction was acknowledged by the aircraft. At this stage the aircraft was 18 miles from touch down.

At 0622 UTC the aircraft was permitted to descend by Bombay Radar to 3700 ft on QNH 1001 HPa and was asked to report leaving FL 55. At this stage the aircraft confirmed leaving level 55.

Soon thereafter at 0623 UTC the aircraft was asked by the Radar its level when the aircraft reported at 4000 ft. This was the last transmission from the aircraft to the ATC. At 0629 UTC at the query from Tower regarding the distance of aircraft the Radar Controller could not locate the aircraft on the screen and that the aircraft should be touching down.

When the calls subsequently from both Tower as well as the Approach Controllers to the aircraft VT-EQM was not responded, an alarm was raised by the Bombay Tower Controller, who enquired from the following aircraft whether they have sighted any aircraft on the approach path ahead of them. Thereafter when the aircraft failed to land after its expected time at 0630 UTC of its arrival on Runway 27, full emergency was declared at Bombay airport and search & rescue operations were initiated.

The aircraft wreckage was located around 1230 UTC by an Indian Navy helicopter engaged in the search operation on the hills on the approach path of runway 27 at a distance of about 11 NM from Bombay.

The aircraft had crashed on the hill top lying in its flight path at 11 NM from Bombay Airport just before reaching the Outer Marker. The height at which the aircraft impacted the hill top was 1170 ft. AMSL. The accident occurred during day light hours at approx. time 0625 UTC (1155 IST).

1.2. Injuries to Persons :

Injury Index	Crew	Passengers	Others
FATAL	1	3	Nil
SERIOUS	-	-	-
MINOR	-	-	-
NONE	-	-	

1.3. Damage to the Aircraft :

The aircraft was completely destroyed due impact with the hilly terrain.

1.4. Other Damages :

NIL

1.5. Personnel Information :

1.5.1 Name of Commander	:	Capt. V. Ramakrishna
Date of Birth	:	04th September,1958.
Licence details	:	S.C.P.L 969,
Date of issue	:	18th May, 1993.
Validity	:	28/12/93.
1.5.2 Ratings	:	PIC rating on Pushpak King Air B200 on 8/1/91 SuperKing Air 300 on 15/06/92 Co-pilot rating on DC-3. Instrument rating No.1043 Issued on 3/11/87. Last IR check on 17/6/93. Validity 22/12/93.
1.5.3 Flying Experience (As on 25/6/93)	:	Total flying :1505 hrs. Total Instrument Flying: 145:50 hrs.

Experience on type SKA300	:	28:45 hrs
Last 6 months on type	:	18:20 hrs
Last 6 mths Inst.Flight:		7:15 hrs.
Last 6 mths Inst.Flight on type SKA 300	:	2:00 hrs.

Capt.V.Ramakrishna,for renewal of his SCPL, had undergone his last medical examination at the Air Force CME ,New Delhi on the 25th June, 1993, and was declared Fit by the Board. This was also endorsed by the ADGMS of the DGCA on the 28th June, 1993.

Scrutiny of flying training records of Capt. V.Ramakrishna reveals that for the endorsement of SKA 300 type aircraft on his CPL, the Manager Aircraft Operations of NRSA had applied to the DGCA on 11th June, 1992 , stating that considering 180 hrs PIC experience on SKA B200, the training on SKA 300 type aircraft of Capt Ramakrishna by a DGCA nominated Instructor/ Examiner was not carried out. However, the DGCA nominated instructor Capt Srivastava, had carried out dual instructions flying on SKA 300 type aircraft. Accordingly the SKA 300 type endorsement had been entered in his CPL for PIC rating on 15 June, 1992. Subsequently, on 15 April, 1993, NRSA had applied for issue of SCPL to Capt. Ramakrishna in which the Skill test by day and by night was carried out on SKA B-200 type aircraft. Thereafter the SCPL 969 was issued to Capt .Ramakrishna with PIC rating on Pushpak, SKA B-200 and SKA 300 type aircraft and Co-pilot rating on DC-3 type aircraft.

The summary of flying record of Capt. V.Ramakrishna for the period December 1991 to May 1992 submitted to the DGCA reveals that on SKA 300 type aircraft he had undergone 03:20 hrs

dual instructional flying by day which includes flying on 30 April, 1992 for 01:05 hrs as proficiency endorsement test and 0:50 hrs as Instrument Rating Check . This summary record also indicates 07:35 hrs of instructional flying by night which includes one hour of check for endorsement . The Check Reports indicate Standard proficiency. At the time of issue of SCPL 969 in April,1993 Capt Ramakrishna, had 02:00 hrs experience as co-pilot, 01:30 hrs as PIC by day and 02:00 hrs PIC by night current on SKA 300 type aircraft. He had no Instrument Flying during the above period.

Between the period 11 April, 1993 and 25 June 1993, records indicate that Capt Ramakrishna had flown SKA 300 aircraft for 13:05 hrs and has 02:00 hrs Instrument flying on type. In the month of July, 1993, the aircraft had flown for 03:15 hrs for Ahmedabad task and was flown by Capt Ramakrishna as PIC.

1.6. Aircraft Information :

Super King Air 300 aircraft VT-EQM owned and operated by National Remote Sensing Agency, Hyderabad, had a Certificate of Registration No. 2432,in Catg. A, issued by the DGCA on the 25th July, 1989. The aircraft was issued with a Certificate of Airworthiness (C of A) No. 1925 under the Normal Category, Sub-Division Aerial Work. The aircraft manufactured in 1987 had been allotted S.No. FA 128 by its Manufacturer the Beech Aircraft Corporation at Wichita , Kansas, USA. According to its C of A only one crew is necessary to operate the aircraft and its all up weight has been authorised upto 5700 kgs. The C of A on the aircraft was valid upto the 28th December, 1993.

The Super King Air 300 is a low wing retractable under-carriage type construction with semi-monocoque fuselage design with the cabin & cockpit pressurised. The tail plane & elevator are mounted on the rudder top. The aircraft is powered by two PT-6 turbo prop engines driving 4 bladed propellers.

The aircraft was modified after being delivered in India which consisted of installation of a camera well with door . The camera installation was adjacent to the airstair door. Aft of the camera installation, the aircraft had installation of a forward looking infrared camera requiring a two feet diameter hole in the fuselage. In the centre fuselage belly the aircraft had provision of installation of a 360° terrain mapping radar with the fuselage structure having an opening of appxm. 4 feet x 4 feet cut in the fuselage. A radome is installed over the radar antenna. In the accident aircraft the radome was installed over the opening. According to NRSA, the special mission equipments were removed at Ahmedabad prior to the accident flight.

The aircraft had logged 270:24 hours of flying since new and 27:04 hours of flying since last C of A renewal on the 28 December, 1992. Both the engine propellers had done 28:54 hours till the 14th July, 1993. The last C 0f A renewal checks were carried out at the Indamer Co. (P) Ltd. Juhu , Bombay and at

that time no mandatory modifications/ inspections on the aircraft were outstanding. Subsequent to the C of A renewal,the last major inspection (200 hrs/6 months) schedule was carried out on the aircraft on 17 June, 1993, by Airworks India, Bombay.

Prior to commencement of the flight from Ahmedabad, the aircraft was fuelled by India Oil Corporation at Ahmedabad airport,with Jet A-1 fuel and the quantity uplifted was 610 litres at 0800 hrs IST. The AME Shri N.V.Anjaneyulu who subsequently boarded the flight had signed the IOC delivery receipt. The Quality Control Test of the fuel batch used for the fuelling, i.e. No. JET/A-1/IOC/TSM/12/15/AD-1/66 , was carried out by IOC Ahmedabad soon after the accident which revealed that the fuel uplifted meets the specifications. The test report of the fuel sample also obtained from the DRD, Technical Centre corraborates that the fuel uplifted at Ahmedabad passes the Quality Control tests as specified in D.Eng.RD No.2494 Issue No.10/ISI 1571-1992.

1.7. Meteorological information :

1.7.1 Prior to the departure on the accident flight from Ahmedabad the pilot of VT-EQM was given Met. briefing in an oral manner by the Meteorological office at Ahmedabad. The briefing notes of the Ahmedabad Met. office and briefing register reveal that the pilot was briefed at 0330 UTC about the winds at FL 030, 050 and 070 as 290/30, 270/30, and 290/35 respectively. There was also briefing about scattered clouds at 800 ft.,1800 ft. and broken clouds at 8000 ft. The pilot Capt Ramakrishna had signed the briefing register as acknowledgement of receiving the above briefing and the documentation. According to the Director in Charge India Meteorological Deptt. at Bombay, the Commander of the aircraft VT-EQM reported to the MET office at Ahmedabad at 0330 UTC without filing any prior requisition for flight forecast. Since he was in a hurry he requested for oral briefing which was provided. **Flight Forecast was therefore not provided at Ahmedabad prior to the departure of the flight.**

On the day of departure of the accident flight, the **Ahmedabad Meteorological Centre** had issued Local Forecast at 0100 UTC valid for the airfield and 50 NM around and for the time period 0100 to 0600 UTC of 15th July, 1993. The surface winds were 270/8 kts with upper winds as follows:

3000 M	300/25 kts
2100 M	270/30 kts
1500 M	270/35 kts
900 M	270/30 kts.

The visibility indicated was 6 km with forecast for Tempo 2000 M in Haze.

The Terminal Area Forecast (TAFOR) issued on the 15th July,1993, at 0300 UTC had indicated Rain showers and scattered CB.

1.7.2 The Met. report issued at time 0610 UTC by the Met Office at Bombay airport and which was valid at the time of the accident, indicate winds as 280/06 kts, gusting upto 16 kts. visibility 3000 metres in feeble rain with scattered and broken clouds at 1000 ft & 2000 ft with overcast at 8000 ft and QNH as 1001 HPa. The trend weather reported in the said Met. report was TEMPO visibility 1500 Metres in MOD SHRA.

The **Local Forecast for Bombay and 50 NM around** valid from 0600 UTC to 1400 UTC on the 15th July, 1993,issued by the Meteorological Office ,Bombay Airport indicates surface winds as 240/10 kts gusting to 22 kts becoming 1314 240/12 kts. The forecast weather includes Tempo at 0614 Rain Showers; the Visibility 5000 M tempo reducing to 1500 M in rain showers; Clouds scattered at 450 M, 750 M with SCT CBs at 900 M.

1.7.3 Since no direct information/ document regarding weather prevailing over the crash site at Taloja Hills is available at the India Meteorological Office at Bombay, therefore, the weather observations was obtained from some of the crew who had landed just prior to the accidented aircraft and who landed thereafter using the same runway and ILS facility during the final approach. The salient observations are as follows :

The Commander of Bangla Desh Biman whose flight was to land after the accidented aircraft had stated of experiencing cloudy weather with overcast accompanied by rain which was occasionally heavy when nearing Bombay. Light turbulence becoming moderate when thru heavy rain. The approach on ILS was made in total IMC and light turbulence and at 500-700 feet became visual. There was no appreciable wind shear.

A Beech-99 commander flying his aircraft into Bombay from Pune had stated of intercepting the localiser at 12 NM ILS DME in clouds and experiencing moderate turbulence with no rains. The ILS approach including Glide slope capture was in clouds with moderate turbulence and no rains. After breaking thru clouds at 1500 ft at about 4NM on ILS DME the flight was conducted in clear weather.

The Commander of a B-737-300 coming into Bombay from Delhi had stated that weather after interception of localiser was monsoonic with heavy rains and strong winds. There was turbulence before the O.M. and there was heavy build ups in the approach funnel.

A F-27 Commander flying into Bombay from Bhopal has indicated the weather on the approach as cloudy, rainy and turbulent.

Another B-737 Commander had stated that there was no significant wind shear though the approach path was covered with clouds. He could break clouds at about 500ft on RA and an amount of rain patch was experienced by him.

The Commander of a small private jet has described the presence of severe CB overhead the VOR and during the inbound of the ILS having experienced rain and light turbulence. The movement of the weather was towards the easterly direction.

From the above Pilots observation reports and also the Local Forecast of Bombay airport valid for 50 NM around the airfield it can be inferred that the accidented aircraft during its approach on the ILS was in IMC conditions experiencing turbulence and rains. There is no evidence of wind shear in the approach path.

1.8. Aids to Navigation :

The accident aircraft had its destination as Bombay airport. The following navigational aids were available at the airport during the subject accident flight:

NDB (265 KHz) DVOR (116.6 MHz) LOC (110.3 MHz) GLIDE Slope (335 MHz) ILS DME (1001/1064 MHz)

Outer Locator (225 KHz) Middle Locator (201 KHz)

The aircraft was being vectored by the Approach Controller on the Radar for ILS approach runway 27. According to the procedure for ILS approach at Bombay airport the aircraft are required to establish on the ILS at 3700 ft. and thereafter descend on Glide slope to cross Outer Marker at a height of 2910 ft. on the QNH.

Since the aircraft wreckage was located on the slopes of hill near the outer marker at a height much below the height aircraft was cleared to and below the height aircraft is required to maintain while on ILS, therefore the serviceability status of the relevant navigational aids are examined, for the preceeding 7 days from the date of accident, as evident from the log-books, which are as follows :-

VOR/LOC/GP

10 July,1993 : Battery Charger of OM attended; % of modulation adjusted to 95.

12 July, 1993
to 15 July,1993 : VOR/DME on NOTAM due equipment problem.

15 July, 1993 : ILS/DME on CQ from 0910 to 1005 due coding motor problem.

Subsequent to the accident , the VOR/DME was on CQ from 0835 to 1050 UTC on 16th July,1993 due equipment problem. Also on the 17 July, 1993, at the Outer Marker, new battery and battery charger was installed and the facility was on CQ from 0905 to 1030 UTC. The Glide Path was on CQ from 1320 to 1815 UTC due monitor problem and the Middle Marker/locator was on CQ from 0835 to 1125 UTC due power supply breakdown. On the subsequent date

i.e 18 July, 1993 the Middle Marker/ locator was on CQ from 0520 to 0618 UTC due no power supply and on the 19th-20th July, the Outer Marker was on Aerial Maintenance and CQ withdrawn at 1325 UTC on 20 July,1993.

Aircraft which have landed prior to and after the accidented aircraft on the same runway using the ILS facility had not made any complaints about the performance of the navigational equipments. However, the records would reveal that prior to and after the accident date of 15th July, 1993, the performance of the navigational aids at Bombay airport had intermittent problems.

Against the above performance data of the VOR/LOC/ GP, the Pilot Reports for the last 15 days preceeding the accident was examined and it is revealed that during the said period only on the 11th July, 1993, a pilot report was found and acted upon as recorded :

> "At 1500, one of the aircraft reported not getting OM. Equipment on ground found working normal. Facility checked and found following aircraft getting OM normal."

Subsequent to the accident, the ILS-DME was reported on the 16th July, 1993 as not locking at 0530 UTC. Subsequently at 1550 UTC an aircraft (VWD) reported not getting Outer Marker. Again at 2200 UTC VOR-DME was reported as not locking. On the 17th July, 1993,at 0742 UTC and 0820 UTC aircraft had reported not getting outer locator. On the subsequent date 18th July, 1993,at 0357 UTC an aircraft (VWB) reported not getting outer marker and at 0638 UTC IC-176 also reported not getting outer marker. Again at 1030 UTC on the 18th July,1993, several aircraft reported not getting outer marker. This was followed at 1602 UTC report by VDB of not getting outer marker.

The Glide Path Inspection by the Calibration aircraft on 1.5.1993 i.e prior to the accident date had indicated in the report satisfactory flyability on both the Glide Path transmitters. The Outer Marker and Outer Locator are also reported to have satisfactory signal strength.

Even though aircraft preceding and aircraft following the accident aircraft on 15th July 1993, while landing on runway 27 using ILS facility had not made any specific complaints on ILS equipment performance, yet maintenance records of the equipment reveal frequent intermittent nature of problem soon after the accident.

1.9. Communication :

The aircraft was in contact with the Air Traffic Control of Bombay on Area Control Frequency 125.9 MHz and the Approach Control Frequency 127.9 MHz. The aircraft met with the accident before coming in contact with the Tower frequency. The

ATC tape transcript does not reveal any difficulty in the transmission /reception of communication between the aircraft and the ATC. The last communication from the aircraft to the ATC was at time 0623 UTC when to the Approach Controller's query of level passing the aircraft reported, "We are 4000 ft." This transmission was acknowledged by ATC. The next call from the ATC to the aircraft was at 0630 UTC by the Approach controller which remained unanswered. **There was no transmission from the aircraft to the ATC of it experiencing/declaring any inflight emergency.**

1.10. Aerodrome Information :

The aircraft took off from Ahmedabad and was to land at Bombay Airport. Bombay airport has two runways (09/27 & 14/32) and the runway 27 was in use at the time during which the aircraft met with the accident. Runway 27 has a total length of 11455 ft and is equipped with ILS with the Outer Marker located at a distance of 8.1 NM (about 15 kms) from the displaced runway threshold. The runway 27 has Precision Approach Catg II Lighting system with high intensity edge, threshold, centreline and touch-down zone lights. The transition altitude for the Aerodrome is 4000 ft. **The Minimum Holding Altitude over the VOR and also the Minimum Sector Altitude for Bombay airport in the direction of approach of the accidented aircraft is 3700 ft.**

The airport is managed by IAAI and Cat.IX fire protection is available to meet the aircraft emergencies. After the aircraft VT-EQM lost contact with Bombay ATC, at first local standby and then full emergency was declared to meet the aircraft emergency.

1.11. Flight Recorders :

The aircraft was fitted with a Fairchild A-100 Cockpit Voice Recorder Unit S.No. 54190. The aircraft did not have any Flight Data Recorder unit installed.

The CVR unit recovered from the wreckage did not have any fire marks. There was slight distortion of the case on the electronic section of the unit. There was no damage on the case section containing the tape, its mechanism and the heads. The tape removed from the recorder unit did not have any damage and was in good condition. The tape was installed on a RACAL Recorder play-back unit for preparing the transcript.

The tape transcript does not reveal any evidence of inflight emergency or any abnormality experienced by the Pilot prior to the impact. At 11 DME and at FL 140 the aircraft established contact with Radar and was under radar vector thereafter. The aircraft when identified was positioned at 5 NM NNE of Bombay and was asked to continue heading 090 and descent to FL 070. Subsequently the aircraft was told to maintain level 55. When it reported reaching that level, it was given right heading 240 to intercept localiser from the right. The last conversation on the CVR tape was the aircraft reporting it being at 4000 ft which the Radar acknowledged. There was no further recording on the tape.

The tape also does not contain evidence of any intra cockpit conversation between the Pilot and the other occupants on board. The tape transcript also does not reveal any monitoring of ATIS broadcast during the last 30 minutes of flight. Also the tape transcript does not reveal any evidence of aircraft emergency being encountered in flight by the pilot.

1.12. Wreckage and Impact information :

The aircraft inflight had impacted the rising terrain in a near level attitude and was destroyed by the impact. The wings separated from the fuselage and were found at the initial impact point. The fuselage continued to travel uphill for approx.70 ft. before coming to rest. The empennage had separated from the fuselage and was positioned on top of the fuselage. Both engines separated during initial impact. The LH engine was positioned approx. 20 ft. uphill from the initial impact point. The initial impact point altitude was 1170 ft. above mean sea level and the aircraft heading was approx. 275°.

The left main wing exhibited impact damage to its leading edge and the leading edge separated forward of the main spar. The left wing had broken at two locations viz. between the aileron and outboard flap and between outboard and inboard flap. The left outboard flap actuator measured 2" extended corresponding to flaps being in up position. The left main gear was in the retracted position. The left auxilliary fuel tank exhibited discolouration due post impact fire. There is no evidence of fire on the exterior of wing surface.

The right main wing positioned under the left wing also exhibited impact damage to its leading edge. The wing had separated from the main spar at the right wing attach point. This wing had broken in two sections between aileron and outboard flap. The outboard section had damage from the leading edge to aft spar. The right outboard flap actuator measured 2" extended which corresponds to flaps in the up position. The right main landing gear was in the retracted position.

The aileron balance cable was attached to aileron bell cranks on both wings. The aileron control cable exhibited tension overload failures.

The fuselage had broken into several sections. The copilot seat exhibited forward bending to the support structure. The seat pan was bent aft. The lap belt remained intact and its inboard attach point exhibit overload failure.

The empennage sustained impact damage to the left horizontal stabilizer. The left and right elevator trim tab actuators measured 1.75" extended which corresponds to about 5° tab down position. The rudder trim tab actuator measured 3" extended corresponding to 10° tab left position. Control continuity was available from the rudder and elevator bell crank upto the cock-

pit control.

The left engine had evidence of very heavy impact damage with its propeller shaft rotating axis displaced from the nominal engine axis by approx. 50° from left to right and upwards from horizontal by approx. 20°. Reduction gear box and accessory gear box mounted accessories were broken from the casings and all external oil, fuel, pneumatic lines and fire seals were bent/ crushed and in some cases fractured. The propeller shaft flange and reduction gear box front housing were fractured exposing a portion of the propeller shaft thrust bearing and seal. Although the accessories were separated by impact the accessory gear box and engine oil tank were essentially intact and attached to the gas generator case. The Fuel Control Unit though separated during impact had remained with the engine attached by control cable and Px line. The engine starter, generator and fuel pump had also separated.

The right engine also had evidence of heavy impact damage with distortion of flanges and the power turbine containment rig. The rotational axis of the reduction gear box was upset from the nominal engine rotation axis by appx.12° suggesting an impact upon the nose section on the outboard side. Power turbine governor remained attached to the reduction gear box with the propeller governor missing. A portion of the gear box housing from 9 O'Clock to 11 O'Clock had broken off. All accessory gear box accessories were separated and all oil, fuel, pneumatic lines and fire seals were crushed, bent and in some cases fractured and torn.

The instrument panel and cockpit pedastal examination of available instruments and lever etc position revealed :

(i) Pilot and copilot HSI indicated heading of 275°
(ii) Altimeter indicated 1160 with pressure set to 29.63" and 1003 mb.
(iii) The left propeller rpm indicator needle was at O with engine percent indicating 50% and No.2 engine percent power indicating 72%.
(iv) Pilot and copilot RMI indicating heading of 275°.
(v) The pilot HSI had heading and glide slope flag visible with course needle at 360°.
(vi) No.1 engine fuel flow indicated 150 pph.
(vii) Flap lever was in up position.
(viii) Landing gear control in up position.
(ix) Both engine condition levers at low idle stop.
(x) Pedestal had impact damage from the front forcing throttle and propeller control aftward.
(xi) Copilot control wheel had both handles broken and had a downward bend.

Both the engines retrieved from the site were strip examined in association with the representatives of the engine

Manufacturer M/S P&W Canada. The detailed engine examination has revealed that :

Both engines received severe impact damage particularly at their front ends where the reduction gear boxes and exhaust cases were broken and distorted. Both propeller shaft axes of rotation were deflected inboard from the engine nominal rotation axes. Both engine reduction gear box trains were severed between the propeller shafts and the second stage planet gear carriers. All other reduction gears were intact and had no evidence of pre-impact distress. The power turbine blade damage and displacement is consistent with impact force from the front to the rear, collision with static members and sudden stoppage. Both the compressor turbine disc and blade assemblies were heavily and continuously machined on their front due contact with static structure forced rearwards by impact from the front and casing distortion. The Combustion equipment on both the engines was free from pre-impact distortion and exhibited no signs of carbon deposition or overtemperature colouration. Both the engine compressors were free of foreign object damage or significant erosion and the drives between the compressors and the accessories gear boxes were continuous. Main oil and FCU filters on both engines were free of contaminants. The rotating propellers had sudden stoppage resulted in fracture of the left engine propeller flange, separation of the right front reduction gear box section and the severing of both engine propeller shafts from their reduction gear boxes. The damage to both the compressor turbine discs front faces resulted from the gas generators continued operation while in contact with downstream static structures pushed rearward by impact, this operation continuing till the fuel supply was available prior to separation and fracture of fuel lines and control units. The engines were operating at power when impact occurred and the propeller shaft torques at impact suggest power levels between approach and cruise and propeller RPMs at some value less than the maximum.

1.12.1 Explosive investigation :

The Bomb Detection & Disposal Squad (BDDS) Bombay of the Bureau of Civil Aviation Security was pressed into service to detect any possible traces of explosives in the aircraft wreckage and dead bodies at the crash site itself. The BDDS team led by Maj.V.L.Jadhav and carrying their equipment reached the crash site and the bodies therein on the 16th July, 1993. The BDDS examination with their Electronic Explosive Vapour detector on the wreckage and the bodies did not indicate any positive results for explosives. The wreckage which was concentrated in an area of 30 M x 5 M did not reveal any signs of pitting, vapourisation of paints, fissured fragments ,spiked fragments, curling, cupping rolled edges etc. which are characteristic features associated with explosion on board. The dead bodies did not have burnt marks & splinter injuries neither any trace of parts used for bomb mechanism such as detonator, wires, battery switch etc. could be

located at the wreckage.

In view of the above observations of the BDDS Squad, it is inferred that the aircraft VT-EQM did not crash as a result of any explosives on board.

1.13. Medical & Pathological information :

The Commander of the aircraft Capt.V.Ramakrishna had undergone his medical examination for renewal of his SCPL at the Central Medical Establishment , New Delhi on the 25th June, 1993. He was declared medically/surgically fit for renewal of his licence by the Board. The Board Findings were approved in the Final Assessment by ADGMS of DGCA on the 28th June, 1993.

The blood sample from the body of the dead Commander could not be collected for tests to detect presence of alcohol, if any, during the post mortem examination as blood could not be found for collection. However , enquiries have indicated that the rest house at Ahmedabad where the pilot had stayed the previous night do not permit/serve any form of alcoholic beverages.

1.14. Fire :

There was no fire at the crash site and on the main wreckage except that the left side auxilliary fuel tank had slight fire damage which is post impact.

There is no evidence on the aircraft wreckage and the engines of any inflight fire.

1.15. Survival aspects :

The aircraft in flight had impacted the rising terrain during the approach phase of flight with its wing flaps and the retractable undercarriage in full retracted condition. The cockpit and the cabin section of the fuselage had completely disintegrated with the nose and cockpit section having evidence of straight in collision. The injuries suffered by the persons on board are of severe crushing impact from the front.

The accident was non-survivable.

1.15.1 Post mortem reports :

The post mortem examination of the bodies of the persons receiving fatal injuries was carried out by a Government Medical Officer at the Panvel Principal Dispensary.

All the bodies had ante-mortem multiple injuries and the upper front portion consisting of the head and face have been smashed /received crushing injuries with loss of teeth and eyes.

The spinal chord in each case was also found having multiple fractures.

1.16. Search & Rescue :

After the NRSA aircraft VT-EQM was lost by the Radar Controller on his scope and also VHF contact could not be established by the Area Control with the aircraft, ATC Bombay Airport declared full emergency and Bangladesh aircraft B017 which was following VT-EQM in the approach sequence was advised to go around. The NAA authorities at the Control Tower advised Air Works at the old airport to check whether VT-EQM had by chance landed and parked there. Fire tenders of IAAI were sent towards approach side of runway 27 with the advise to look for the missing aircraft. Crash tenders equipped with RT were also sent towards Ghatkopar and Thane creek which falls on the approach path to look for the missing aircraft. The Police station in the approach area Kurla, Ghatkopar, New Bombay, Thane and Sion were telephonically informed about the missing aircraft and advised to look for it. The IAF station at Juhu aerodrome was requested to launch helicopter flight to proceed to the final approach path of runway 27 to locate the missing aircraft. The helicopter took off from Juhu at 0712 UTC. ATC deputed land parties at 0730 UTC equipped with walkie-talkies towards the approach path of 27. The military authorities at Kalina provided a vehicle and military personnel at 0930 UTC which was accompanied by NAA personnel for the search. The Naval authorities were also contacted by ATC to provide speed boats for searching in the Thane creek.

The Air Force helicopter (call sign 04) which took off from Juhu carried out low level search from 0712 UTC to 0841 UTC and the missing aircraft was not located. The Navy also was requested to launch their helicopter flight for search and rescue and at 1235 UTC Naval helicopter 438 commenced searching over the outer marker area. At 1340 UTC the Navy helicopter pilot confirmed on Approach frequency 127.9 MHz that the wreckage has been sighted and is looking for survivors. The position of the wreckage was transmitted as 4 NM on heading 270 from Taloja village at height of about 1300 ft on the hill. After some time when no survivors could be located in the aerial search the helicopter returned back to its base at 1408 UTC. The helicopter confirmed that it could read the registration marking letters "QM".

Simultaneously at about the same time of receipt of message from the helicopter of sighting the wreckage, the New Bombay police control room informed ATC of the land party having located the wreckage. In the early hours of 16.7.93, the Dy.Commissioner of police, New Bombay informed ATC of his personnel reaching the site and observed four dead bodies. On 16.7.93 morning the wreckage site on the hill site was reached by the various agencies for removal of the dead bodies and investigation purposes and retrieval of evidences.

2. ANALYSIS :

In this accident the aircraft VT-EQM had impacted inflight the rising terrain which was on its approach path. The aircraft during an ILS approach on runway 27 is required to be at a minimum height of 3700 ft. on QNH before intercepting the glide slope and be at 2910 ft. over the outer marker in its descend profile. The accident site is prior to the outer marker location and the height of the hill is 1328 ft. The aircraft had hit the hill side at 1170 ft.

In view of the above the following factors are analysed for determining the probable cause of the accident viz.

1. Engineering Factor

2. Pilot Factor

3. ATC Factor

2.1 Engineering Factor :

Prior to the accident flight, the aircraft had flown at Ahmedabad on 2 days i.e. 12th and 14th July, 1993 for a total of 3 hours 15 minutes. During this period there was no snag reported on the aircraft at Ahmedabad excepting pressurisation problem on the 12th July, 93. Prior to departure from Ahmedabad on 15th July 93, engine ground run up was carried out for 20 minutes along with preflight checks and no snag was reported. The aircraft was fuelled at Ahmedabad and the fuel quality checks reveal that the uplifted fuel meet the specification. The fuel quantity for the flight was also adequate as the endurance was for 5 hours.

Subsequent to take off from Ahmedabad and also during approach to Bombay the communication between the aircraft and ATC at Ahmedabad and Bombay reveals that the pilot had not declared having experienced any inflight engineering problem. The Cockpit Voice Recorder also does not reveal any evidence of inflight emergency which the pilot would have discussed with the engineer and/or other two technical persons also travelling on board the aircraft.

Investigation at the wreckage site revealed that the aircraft had contacted the hillside with flaps and undercarriage in retracted position. All the four corners of the aeroplane were located at the crash site eliminating any possibility of inflight structural disintegration and liberation prior to impact. There is no evidence of inflight fire prior to the impact. The aircraft was maintaining a near heading of 270°, which is the approach heading for runway 27 and the HSI was indicating heading 275°, thereby indicating that the pilot was able to fly the aircraft on the desired track. The continuity of the flying controls from the cockpit to the respective surfaces were found at the wreckage.

There is no direct evidence to show that the airborne equipment/cockpit indication pertaining to ILS had malfunctioned during flight as the involved aircraft components have been destroyed due to impact in the crash.

Investigation of both engines revealed that the combustion equipment was free from pre-impact distortion, exhibited no signs of carbon deposition and over temperature colouration. Also the engine reduction gears did not reveal any evidence of pre-impact distress. The nature of damage to the engines indicate that both power plants were operating at power at the time of impact. The damage to the propeller shafts suggests the propeller rpm of both engines were at some value less than the maximum at the time of impact.

In view of the above evidences it can be inferred that the aircraft inflight did not experience any engineering emergency that could have led the aircraft to descend to an altitude below the minimum prescribed at that stage of the flight. The engineering factor as a direct and/or indirect cause of the accident is therefore, eliminated.

2.2. Pilot Factor :

In the instant case, at the time of impact the aircraft was under radar vectoring by the Approach Controller. From the recordings of the ATC tape corroborated by that of the CVR tape, it is evident that the aircraft was descended in steps from FL 140 when it first contacted Bombay Radar. At 0621 UTC timing of the ATC tape transcript, the aircraft VT-EQM was told by radar to turn right heading 240 and intercept localizer from right. The aircraft was at level 55 at this stage. According to the CVR tape, after about 1 minute of above transmission, the aircraft is being asked by radar to descend to 3700 ft. on QNH 1001 and report leaving 55. After reporting leaving 55, the aircraft subsequently reported at 4000 ft after 51 seconds. **This indicates that the aircraft had descended from FL 55 at the rate of approx 1800 ft. per minute when it passed through the level of 4000 ft.** From the CVR and ATC tape there is no evidence that the pilot after having told to intercept the localizer had reported to ATC of intercepting the same at any time thereafter.

The wreckage site examination had revealed that the aircraft heading was 270°. Also the location of the site is in line with the extended runway 27 center line as evident from the Jeppessen vicinity chart. Further more during the investigation at site, it was observed that aircraft coming into land on runway 27 at Bombay airport directly passes over head the crash site location. There is no direct evidence to indicate that the aircraft had intercepted the localizer. However, in view of the above inferences it can be stated that the aircraft which was flying in Instrument Meteorological Conditions with low cloud base and rain, had in all probability, captured the localizer beam to be in line with the runway 27.

The aircraft being on radar vector, was asked to intercept the localizer. However, there is no evidence that the ATC had advised the aircraft of ILS approach. In the ILS approach for runway 27 after having intercepted the localizer at 3700 ft. further descend is to be made following the glide slope signal. In this procedure the aircraft would be at a height of 2910 ft. over the outer marker which is 8.1 NM from the displaced runway threshold. Prior to the outer marker, therefore, the aircraft following the glide slope signal would at a greater height than 2910 ft. In the instant case, the aircraft had impacted terrain prior to the outer marker location and at a height much below the height at which an aircraft should be when following the glide slope. **This could be possible due either the pilot not having the glide slope signal or failure to intercept the same.** Other aircraft following the accidented aircraft for landing on runway 27 and those who had preceded the accident aircraft had also executed ILS approach and no complaint was recorded by the crew of those flights regarding any malfunctioning of glide slope signal/ILS equipment. In the event a pilot making an ILS approach, does not get the glide slope signal on his airborne equipment, the descend below 3700 ft is discontinued and assistance of any other navigational aid is then taken for let down. In the instant case this probability can be ruled out as there had been no transmission by the pilot of the accidented aircraft of abandoning the descend below 3700 ft. due to airborne equipment failure or equipment failure on ground. The only alternative, therefore, is the possible failure of non-intercepting the glide slope during the approach phase.

As already stated in a preceding para that from FL 55 the aircraft was descending at 1800 ft per minute and that too in a clean configuration i.e. with both flaps and gear retracted. Also the descend was in total Instrument Meteorological Conditions with clouds and rain showers accompanied with turbulence. The last transmission from the aircraft was its descend through 4000 ft. The aircraft manufacturers in its Pilot Operating Hand book for the type aircraft in its Performance Chapter Section V gives the landing distance calculation for a **recommended 800 ft per minute approach with flaps down.** Also the Jeppessen charts for ILS runway 27, Bombay recommends that at ground speed of 140 kts the rate of descend on the glide slope should be 828 ft. per minute. In view of the above, it can be inferred that **the pilot continued his descend at a high rate without cross checking his height for glide slope capture at or after descending through 3700 ft.**

In para 1.5 above on Personnel Information, it has been elaborated that the involved pilot had only 2 hours of Instrument flying in the preceding six months on the type aircraft. His total flying experience on the type aircraft also is 28:45 hrs. of which he had logged 18:20 hrs. during the preceding six months.

The meagre flying experience of the involved pilot on the type aeroplane coupled with experiencing monsoonic weather

during the approach phase on runway 27 requiring precision instrument flying on ILS, has in all probability, led to the pilot getting disorientated on instruments inside clouds. Consequent thereto he descended much below the stipulated height without intercepting the glide slope.

2.3. ATC Factor :

The involved aircraft VT-EQM after coming in contact with Bombay Approach 127.9 MHz was vectored on radar by an appropriately rated Controller Shri P. Ohri of NAA, Bombay. From the ATC tape transcript as well as statement of the Controller it is evident that after giving the aircraft a radar vector of 180° initially he could not identify the aircraft on the screen and had, therefore, given subsequent heading 090 whence it was identified. The radar Controller Shri Ohri had further stated that he had while giving heading to steer from 090 did not inform the aircraft of vectoring him for an ILS approach. He contended that he had asked the aircraft to intercept the localizer and having observed on the scope of aircraft VT-EQM intercepting the localizer had released the aircraft to the Tower. This is contrary to the laid down procedures stipulated in DOC 4444 because in the instant case the aircraft after having been told to intercept the localizer had not yet confirmed on the RT to the Controller of it having accomplished the same.

The Radar Controller Shri P. Ohri had further admitted his lapse that before releasing the aeroplane to Tower frequency, he had not obtained report of the aircraft established on ILS, which normally happens at 10.5 NM. From the ATC tape transcript, it is revealed that after the last report from the aircraft was received at 0623 UTC on ATC timing the Radar Controller had not transmitted termination of radar service to the aircraft and also had not checked the position of the aircraft VT-EQM for the next 7 minutes till queried by the Tower Controller on the intercom. This is indicative that the Radar Controller was not monitoring the aircraft VT-EQM which was then still under his control. The Radar Controller had 5 aircraft in addition to VT-EQM from the time VT-EQM first came in contact with Radar Controller. At 0621 UTC, the Radar Controller having advised aircraft VT-EQM to intercept localiser from the right, had in actual only three additional aircraft viz. IC-176, GFA-053 and BBC-017 under his radar control. This cannot be considered as a heavy work load on a Controller so as to make him miss one particular aircraft of the lot for nearly 7 minutes after it had been advised by him to intercept the localizer.

In view of the above, even though the role of the ATC Radar Controller is not a direct cause to this accident, yet if the laid down procedures of Radar Control had been followed and the aircraft position monitored, the pilot with meagre flying experience and limited instrument flying having encountered Instrument Meteorological Conditions could have got some positive assistance from the Radar Controller to possibly take remedial measures and avoid the accident.

3. **FINDINGS :**

1. The SKA 300 aircraft VT-EQM at the time of accident had a valid Certificate of Airworthiness. It was maintained as per the approved schedules with the last major inspection schedule (200 hrs/6 months) accomplished on 17.6.93 prior to the accident.

2. The Commander of the aircraft Capt.V.Ramakrishna had a valid SCPL issued on 18th May 1993 with the type aircraft endorsed thereon with PIC rating.

3. The Commander had a total flying experience of 28:45 hrs on type. In the preceding six months he had flown 18:20 hrs. with only 2 hours of instrument flying on the type.

4. Prior to commencement of flight from Ahmedabad the aircraft had adequate fuel on board and the sample of fuel uplifted at Ahmedabad met the quality control specifications.

5. Prior to commencement of flight from Ahmedabad the Commander had obtained Meteorological briefing in an oral manner. However, Flight Forecast was not provided as the commander had not filed any prior requisition with the Met.Department.

6. The Meteorological report issued at Bombay valid at the time of accident indicated winds as 280/06 kts, gusting to 16 kts. and visibility of 3000 meters. The trend reported was Tempo visibility 1500 meters in moderate rain showers. The visibility reported was within the minima filed by NRSA and included in their Operations Manual.

7. The weather encountered by the aircraft during the approach particularly before the outer marker was total IMC with overcast accompanied by rain showers and turbulence as was experienced by other pilots who had landed before and soon after the accident.

8. The navigational aids at Bombay Airport at the time of accident flight were operating normal with no report of malfunction either on ground or by aircraft inflight using the facility before and after the accident flight. However, after the accident there had been frequent reports both on ground and from air of malfunction of various components of ILS.

9. The ATC and also the CVR tape recording do not contain any evidence of the commander having experience any inflight aircraft emergency during the approach.

10. The aircraft with its flaps and landing gear in retracted condition impacted rising terrain at 11 NM from runway 27 threshold at a height of 1170 ft. AMSL and on a heading of 275°.

11. The four corners of the aircraft were available at the crash site indicating no inflight disintegration and the flying controls continuity from cockpit end to respective surfaces was available.

12. There was no inflight fire or post impact fire on the wreckage. The left side auxiliary fuel tank had slight fire damage, which is post impact.

13. Both aircraft engines at point of impact were operating at power levels between approach and cruise and with propeller RPMs at less than maximum.

14. There is no inflight explosion of any explosive substance on board the flight.

15. The accident is non-survivable due total destruction of the cockpit and cabin sections as a result of head on impact inflight with the aircraft nose against the hill side.

16. All four persons on board including the commander received fatal injuries. The deaths have been caused due ante-mortem multiple injuries with upper front portion of the bodies receiving smash/crush injuries and multiple fractures on the spinal chords.

17. The aircraft had in all probability captured the localizer signal as vectored by the Radar Controller and was in line with the runway 27 when it impacted the hill side. However, the aircraft did not make any transmission to the ATC of its intercepting the localizer.

18. The Commander descended at approx. 1800 ft per minute from FL 55 to the cleared altitude of 3700 ft and thereafter continued descend without crossing checking his height for glide slope capture at or after descending through 3700 ft.

19. The aircraft had prior to reaching the outer marker was descended to a height much below the stipulated height of 2910 ft. on QNH over the outer marker.

20. The Radar Controller Shri P. Ohri of NAA, Bombay, while giving instructions for steering to the aircraft did not inform the aircraft of its being vectored for an ILS approach and also did not obtain confirmation from the aircraft of its having accomplished the instructions to intercept localizer. This is contrary to the laid down procedures of radar vectoring.

21. The Radar Controller did not monitor for nearly 7 minutes the accidented aircraft which was still then under radar control service, after the aircraft had reported passing through 4000 ft.

4. CAUSE :

The Commander of the aircraft having meagre flying experience on type and limited instrument flying hours encountering Instrument Meteorological Conditions descended below the ATC cleared height of 3700 ft. without intercepting the glide slope.

The Radar Controller by not effectively monitoring the aircraft position after he had advised it to intercept the localizer contributed to the cause of the accident.

5. RECOMMENDATIONS :

1. NRSA, the owner of the aircraft while deploying their pilots, should ensure that they are adequately trained and experienced in flying through actual weather conditions.

2. NRSA should in view of the nature of their flying tasks, ensure to operate their aircraft with two qualified pilots where the cockpit has proviso for two pilot seats.

3. Action as deemed appropriate may be taken against the Radar Controller for the lapses as indicated in the findings of the report.

4. NAA should carry out random checks by an appropriate level of officers, on the on-job performance of their Air Traffic Controllers.

5. NAA should organise periodic interactions between their Air Traffic Controllers and Communication wing officials for in-house assessment of equipment problems and taking remedial measures.

Bombay
30.6.1994

(K. GOHAIN)
INSPECTOR OF ACCIDENTS

Appendix
5 nos

Ap – 1

RELEVANT CVR TAPE TRANSCRIPT REGARDING ACCIDENT TO NRUA SUPER KING AIR AIRCRAFT VT-EQM AT BOMBAY ON 16.7.93

TIME (mm:ss)	FROM	TO	TEXT
14:21	Area	EQM	Quebec Mike report your distance from Bombay.
14:25	EQM	Area	Bombay Quebec Mike say again.
14:27	Area	EQM	Report your distance from Bombay.
14:33	EQM	Area	We are three zero DME from Bombay.
14:47	EQM	AREA.	Bombay Quebec Mike three zero DME sir request descent.
14:52	AREA	EQM	Quebec Mike descend to one four zero.
14:56	EQM	AREA	One four zero Quebec Mike.
17:11	Area	EQM	Victor Quebec Mike confirm report confirm maintaining one four zero.
17:16	EQM	Area	We are approaching one four zero, two zero DME.
17:19	Area	EQM	Maintain one four zero on reaching.
17:21	EQM	Area	Quebec Mike.
18:35	Area	EQM	Victor Quebec Mike confirm maintaining one four zero.
18:38	EQM	Area	Affirmative.
18:39	Area	EQM	Roger.
19:53	Area	EQM	Quebec Mike confirm distance from Bombay.
19:56	EQM	Area	Bombay Control Quebec Mike go ahead.
19:58	Area	EQM	Report your distance from Bombay.
20:00	EQM	Area	One two DME.
20:02	Area	EQM	One two DME Roger.

TIME (mm:ss)	FROM	TO	TEXT
20:27	Area	EQM	Victor Quebec Mike contact Radar on one two seven decimal nine.
20:30	EQM	Area	Roger changing over.
20:34 (06:13)	EQM	Radar	Bombay Radar Victor Quebec Mike one one DME level one four zero.
20:39	Radar	EQM	Victor Quebec Mike Bombay Radar. Turn left heading one eight zero for identification. Descent flight level one two zero.
20:49	EQM	Radar	Roger changing over turning out to one eight zero and descending to one two zero Quebec mike.
20:54	Radar	EQM	Roger.
21:08 (06:14)	Radar	EQM	Victor Quebec Mike descent flight level one hundred. Report leaving flight level one three zero.
21:14	EQM	Radar	Roger we are leaving one three zero this time call you reaching one zero zero.
21:54 (06:15)	Radar	EQM	Victor Quebec Mike Bombay Radar for identifiication. Turn left, heading zero niner zero.
22:01	EQM	Radar	Zero niner zero, Quebec Mike.
22:02	Radar	EQM	Affirm.
22:58 (06:16)	Radar	EQM	Victor Quebec Mike Bombay Radar. Identified position is 5 miles. North north east of Bombay continue heading zero niner zero descent flight level seven zero.
23:08	EQM	Radar	Same heading, level seven zero, Quebec Mike.
23:11	Radar	EQM	Affirm.
23:47	Radar	EQM	Victor Quebec Mike, Bombay Radar. Descent transition level flight level five five. Report level.

TIME (mm:ss)	FROM	TO	TEXT
23:52 (06:16)	EQM	Radar	Descent to five five. Quebec Mike.
23:55	Radar	EQM	Affirm report level.
23:57	EQM	Radar	Passing nine zero.
23:59	Radar	EQM	Roger.
25:56	Radar	EQM	Victor Quebec Mike report level.
25:58 (06:19)	EQM	Radar	Five five.
26:04	EQM	Radar	Bombay Radar Quebec Mike is level five five.
26:08	Radar	EQM	Victor Quebec Mike say again.
26:11	EQM	Radar	Level five five.
26:13	Radar	EQM	Maintain.
27:16 (06:20)	Radar	EQM	Victor Quebec Mike report type of aircraft.
27:19	EQM	Radar	Super King Air Three Hundred.
27:22	Radar	EQM	Roger.
27:25	Radar	EQM	Victor Quebec Mike Bombay Radar, turn right heading one niner zero.
27:32	EQM	Radar	Right one niner zero Quebec Mike.
27:34	Radar	EQM	Affirm.
28:18 (06:21)	Radar	EQM	Victor Quebec Mike Radar turn right heading two four zero. Intercept localiser fromm right.
28:23	EQM	Radar	Turn right two four zero.
28:24	Radar	EQM	Affirm.
28:25	EQM	Radar	Quebec Mike.
29:17 (06:22)	Radar	EQM	Victor Quebec Mike Bombay Radar. Descent three thousand seven hundred QNH one zero zero one. Report leaving level five five.

TIME (mm:ss)	FROM	TO	TEXT
29:27	EQM	Radar	Clear to three seven zero zero feet on one zero zero one Quebec Mike.
29:30	Radar	EQM	Affirm.
29:31	Radar	EQM	Report leaving level five five.
29:32	EQM	Radar	We are leaving level five five.
29:34	Radar	EQM	Roger.
30:16 (06:23)	Radar	EQM	Victor Quebec Mike Radar. Level.
30:21	EQM	Radar	Say again.
30:22	Radar	EQM	Report level.
30:23	EQM	Radar	We are four thousand feet.
30:25	Radar	EQM	Roger.
			(No transmission with EQM).

(Lalit Gupta)
Asst. Director Air Safety

(R.S. Passi)
Asst. Director Air Safety

Ap-2

~~SPECIAL~~/MET REPORT VABB 06/0Z

280/06~~KT~~G16KT.

VIS 3000 ~~KM/M~~ ~~RWY 27 RVR~~ ~~M~~

FBL RA. ~~RWY 09 RVR~~ ~~M~~

SCT 1000 FT (300 M)
BKN 2000 FT (600 M)
OVC 8000 FT (2400 M)

T 25 DP 25

(M)

QNH 1001 HPA 2956 INS

QFE 1000 HPA 2953 INS

TEMPO VIS 1500 M IN MOD SHRA:

03/7/15 0610Z

DATE DISPLAYED AT SIG OF ATS OFFICER SIG OF MET ASSTT

~~SPECIAL~~/MET REPORT VABB 0640Z

290/10KT

VIS 3000 ~~KM/M~~ ~~RWY 27 RVR~~ ~~M~~

FBL RA. ~~RWY 09 RVR~~ ~~M~~

SCT 1000FT (300M)
BKN 2000FT (600M)
OVC 8000FT (2400M)

T 25 DP 25

(N)

QNH 1001 HPA 2956 INS

QFE 1000 HPA 2953 INS

TEMPO VIS 1500M IN MOD SHRA:

03/7/15 0640Z

DATE DISPLAYED AT SIG OF ATS OFFICER SIG OF MET ASSTT

JEPPESEN 27 MAR 92 (29-1)

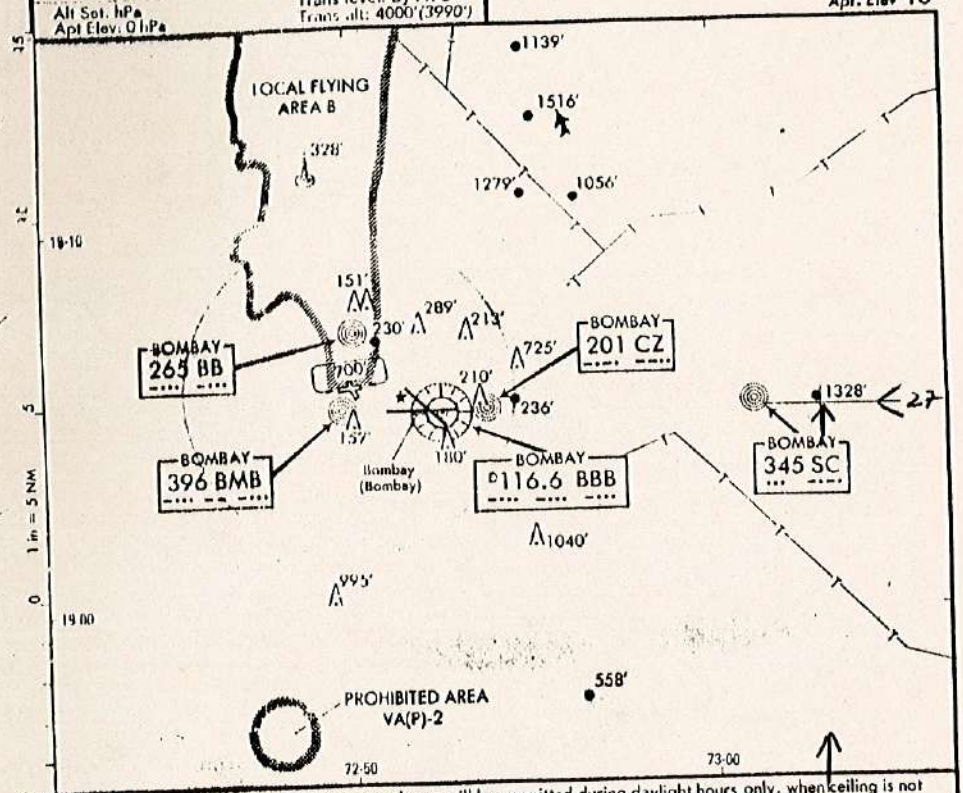
BOMBAY, INDIA
JUHU
VICINITY CHART

* JUHU Tower 123.5 122.5

Alt Set: hPa
Apt Elev: 0 hPa

Trans level: By ATC
Trans alt: 4000'(3990')

Apt. Elev 10'



The operation of light aircraft at Juhu aerodrome will be permitted during daylight hours only, when ceiling is not below 2000' and Ground visibility is not less than 5.0 km at Bombay and Juhu aerodrome.

When runway in use at Bombay aerodrome is 14/32, neither local flying at Juhu aerodrome nor in the local flying areas shall be permitted.

No instrument approach procedure established for this airport

CHANGES

AL

Ap - 4

JEPPESEN 3 MAY 91 (11-1)

BOMBAY, INDIA
BOMBAY
ILS Rwy 27

LOC 110.3 SCZ

Apt. Elev. 27'

ATIS 126.4

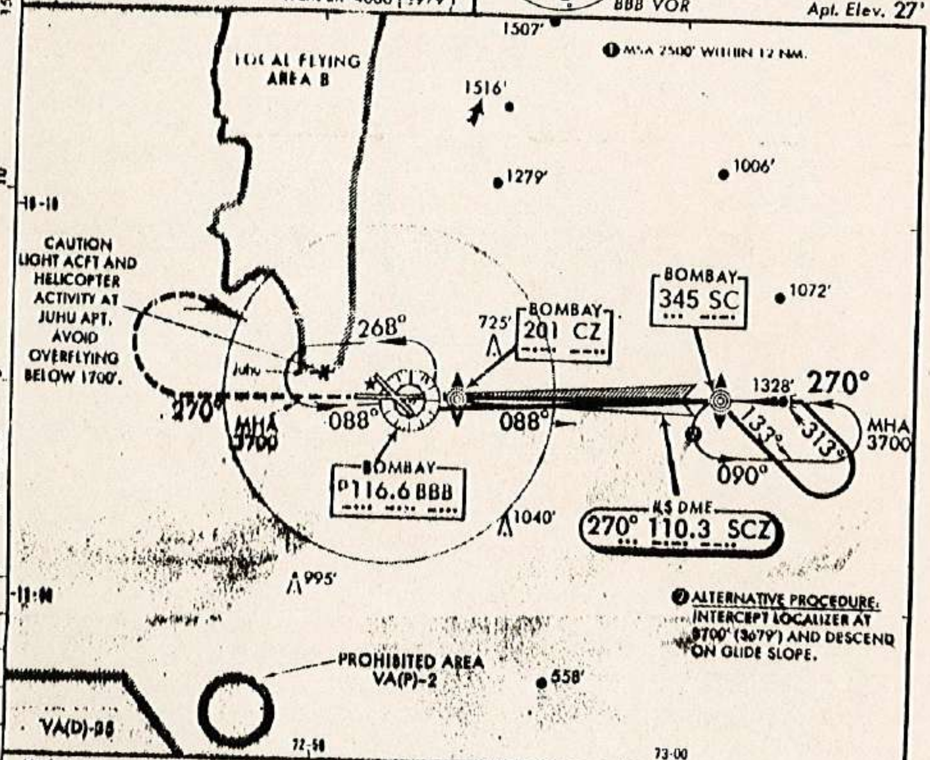
BOMBAY Approach (R) 127.9

BOMBAY Tower 118.1

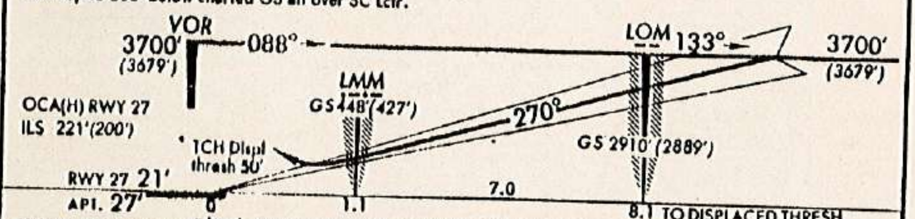
Ground 121.9

Alt Set hPa · Rwy Elev: 1 hPa · Trans level: By ATC · Trans alt: 4000'(3979')

MSA BBB VOR



Under excessively high temperature at 3000' altimeter may read up to 200' below charted GS alt over SC Lctr.



MISSED APPROACH: Climb STRAIGHT AHEAD to 2500' (2479'), then turn RIGHT to join the VOR holding climbing to 3700' (3679'), or as directed.

STRAIGHT-IN LANDING RWY 27					CIRCLE-TO-LAND		
	ILS OCA(H) 221'(200')			LOC (GS out)	Max Kt	MDA(H)	
	FULL	TDZ or CL out	ALS out				
A	1200m			SEE 11-2	100	1440'(1413')	2000m
B					135	1440'(1413')	2400m
C					180	1440'(1413')	4800m
D					205		

Gnd speed-Kts	70	90	100	120	140	160
GS 3.00°	414	532	591	710	828	946

PANS OPS Based on ... ICAO ...

CHANGES: Minimums

JEPPESEN 18 JAN 91 (18-1)

BOMBAY, INDIA

BOMBAY

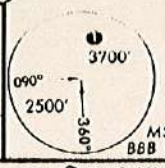
RADAR

SRA Rwy 09,14,27

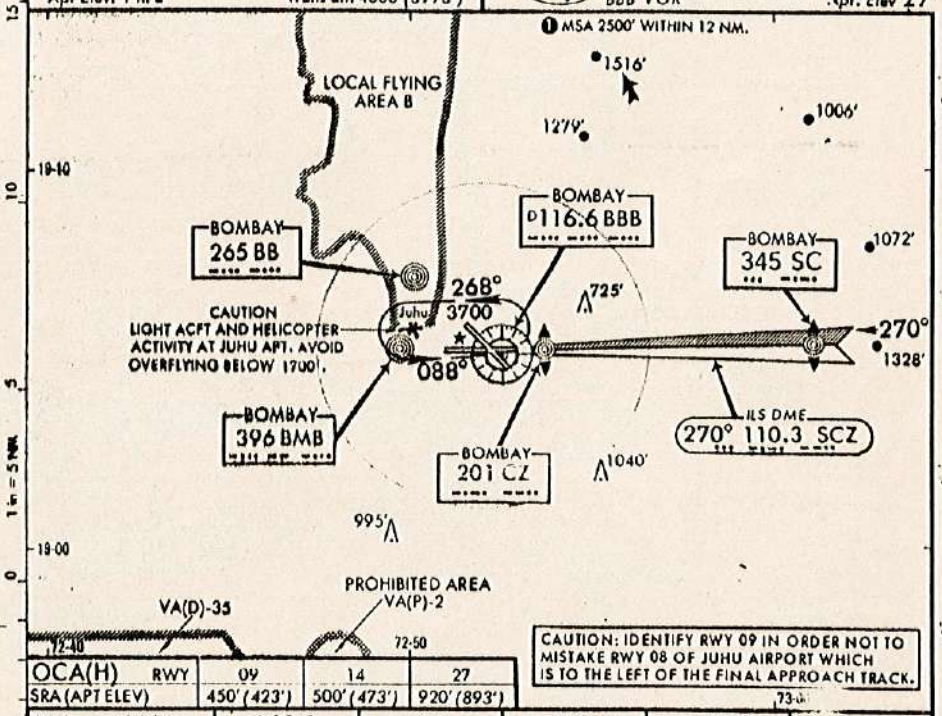
ATIS 126.4
BOMBAY Approach (R) 127.9
BOMBAY Radar (SRA) 119.3 119.5
BOMBAY Tower 118.1
Ground 121.9

Alt Set: hPa
Apt Elev: 1 hPa

Trans level: By ATC
Trans alt: 4000' (3973')



Apt. Elev 27'



CAUTION: IDENTIFY RWY 09 IN ORDER NOT TO MISTAKE RWY 08 OF JUHU AIRPORT WHICH IS TO THE LEFT OF THE FINAL APPROACH TRACK.

OCA(H) RWY	09	14	27
SRA (APT ELEV)	450' (423')	500' (473')	920' (893')

Minimum Alt/NM	6.0 FAF	5.0	4.0	3.0	2.0
SRA 09, 14	2000 MSL	1700 MSL	1300 MSL	1000 MSL	700 MSL
Minimum Alt/NM	7.0 FAF	6.0	5.0	4.0	3.0
SRA 27	2500 MSL	2100 MSL	1800 MSL	1400 MSL	1100 MSL

MISSED APPROACH:
SRA Rwy 09: Climb STRAIGHT AHEAD to 2500' MSL, then turn LEFT before reaching 12 NM to join the VOR holding climbing to 3700' MSL.
SRA Rwy 14: Climb STRAIGHT AHEAD to 2500' MSL, then turn LEFT climbing to 3700' MSL to VOR, or as directed.
SRA Rwy 27: Climb STRAIGHT AHEAD to 2500' MSL, then turn RIGHT to join the VOR holding climbing to 3700' MSL, or as directed.

RWY 09: Elev 13' RWY 14: Elev 36' RWY 27: Elev 21'

	STRAIGHT-IN LANDING						CIRCLE-TO-LAND		
	SRA 09 MDA(H) 450' (423')		SRA 14 MDA(H) 500' (473')		SRA 27 MDA(H) 920' (893')		Max Kt	MDA(H)	
		ALS out		ALS out		ALS out			
A	1200m	RVR 1500m VIS 1600m	1600m		1200m	RVR 1800m VIS 2000m	100	1440' (1413')	2000m
B							135	1440' (1413')	2400m
C	RVR 1800m VIS 2000m		2000m		3600m	4400m	180	1440' (1413')	4800m
D			2400m		4000m	4800m	205		

PANS OPS Based on Historic Class Two 15/88

Grd speed-Kts	70	90	100	120	140	160
Rwy 09,14 Descent Gradient 5.3%	376	483	537	644	752	859
Rwy 27 Descent Gradient 5.8%	411	529	588	705	823	940
MAP at 1.0 NM from threshold						

CHANGES: Chart reindexed. PAR withdrawn. SC Ltr freq.

Ap-5.

राष्ट्रीय विमानपत्तन प्राधिकरण NAA National Airports Authority

रा. वि. प्रा. 434
NAA-434

उड़ान योजना / FLIGHT PLAN

04

प्राथमिकता PRIORITY — ADDRESSEE(S) प्रेष्य

≪≡ FF → VABB ZTZX VABF ZQZX VAGO YYYY

≪≡

FILING TIME 0845 — ORIGINATOR VAAH ZTZX

→ ≪≡

P. Faizchand 15/7/91

प्रेष्य और/या उद्गम की विशिष्ट पहचान
SPECIFIC IDENTIFICATION OF ADDRESSEE(S) AND/OR ORIGINATOR

संदेश किस्म 3 MESSAGE TYPE — ≪≡ (FPL

विमान पहचान 7 AIRCRAFT IDENTIFICATION — V

उड़ान नियम 8 FLIGHT RULES

उड़ान किस्म TYPE OF FLIGHT ≪≡

संख्या 9 NUMBER — विमान की किस्म TYPE OF AIRCRAFT — SKA

पश्चवर्ती प्रक्षोभ श्रेणी WAKE TURBULENCE CAT /

उपस्कर 10 EQUIPMENT / ≪≡

प्रस्थान विमानक्षेत्र 13 DEPARTURE AERODROME — VAAH

समय TIME 0 0

≪≡

परिभ्रमण गति 15 CRUISING SPEED — स्तर LEVEL — FL 0090

मार्ग ROUTE — VAAH → VABB VIA W13S

≪≡

गंतव्य विमानक्षेत्र 16 DESTINATION AERODROME — V

TOTAL EET कुल ई. ई. टी. घंटा HR मिनट MIN

वैकल्पिक विमानक्षेत्र ALTN AERODROME

दूसरा वैकल्पिक विमानक्षेत्र 2ND ALTN AERODROME ≪≡

अन्य सूचना 18 OTHER INFORMATION

REG VT

SEL/

Dep 0550

) ≪≡

पूरक सूचना (उड़ान योजना में प्रेषित नहीं किया जाए)
SUPPLEMENTARY INFORMATION (NOT TO BE TRANSMITTED IN FPL MESSAGES)

सहनशक्ति 19 ENDURANCE — घंटा HR 03 मिनट MIN 00 — E/

विमान में बैठे व्यक्ति PERSONS ON BOARD 03 — P/

आपातकालीन रेडियो EMERGENCY RADIO — R/ UHF [U] VHF [V] ELBA [E]

बचाव उपस्कर SURVIVAL EQUIPMENT — S / ध्रुवीय POLAR [P] मरुस्थल DESERT [D] समुद्र MARITIME [M] जंगल JUNGLE [J]

जैकेट JACKETS — J / प्रकाश LIGHT [L] फ्लोरेसेंट FLUORESCENT [F] UHF [U] VHF [V]

डिंगियां DINGHIES

संख्या NUMBER — क्षमता CAPACITY — आवरण COVER — रंग COLOUR

→ D/ → → C → ≪≡

FIC/134
ADC/117

विमान का रंग और चिह्न AIRCRAFT COLOUR AND MARKINGS — RED BLUE WHITE

A/

REMARKS अभ्युक्तियां

→ N/

पायलट समादेशक PILOT IN COMMAND — RAMA KRISHNA

C/ ≪≡

) ≪≡

FILED BY के द्वारा भरा गया — RAMA KRISHNA

अतिरिक्त आवश्यकता के लिए आरक्षित जगह
SPACE RESERVED FOR ADDITIONAL REQUIREMENTS

(नीचे दी गई मद १, २, ३ और ४ सभी आंतरिक (अंतर्देशीय) उड़ानों के लिए अनिवार्य हैं। ये अंतर्राष्ट्रीय उड़ानों के लिए अनिवार्य नहीं है इसलिए इन्हें मत भरें।)
(ITEMS 1, 2, 3 & 4 LISTED BELOW ARE COMPULSORY FOR ALL INTERNAL (DOMESTIC) FLIGHTS. THESE ARE NOT COMPULSORY FOR INTERNATIONAL FLIGHTS AND HENCE NEED NOT BE FILLED IN)

संचार विवरण 1 COMMUNICATION BRIEFING — समय TIME 0835 — तारीख DATE 15/7/93 — ड्यूटी संचार अधिकारी DUTY COM. OFFICER

मौसम संबंधी विवरण 2 METEOROLOGICAL BRIEFING — समय TIME 0830 — तारीख DATE 93/07/15 — ड्यूटी पूर्वानुमान अधिकारी DUTY FORECASTING OFFICER

विमान यातायात विवरण 3 AIR TRAFFIC BRIEFING — ADC before Dep on R/T — समय TIME 0410 — तारीख DATE 15.7.93 — ड्यूटी वि. या. नि. अधिकारी DUTY ATC OFFICER

अधोहस्ताक्षरी को उपरोक्त विवरण दिए गए है। उड़ान को तदनुसार नियोजित और संशोधित किया गया।
4 THE UNDERSIGNED HAS BEEN BRIEFED AS ABOVE. THE FLIGHT IS PLANNED AND AMENDED ACCORDINGLY

समय TIME — तारीख DATE — कमान पायलट/उड़ान परिचालन अधिकारी PILOT-IN-COMMAND/FLT. OPS. OFFICER

वायु सुरक्षा निकासी
AIR DEFENCE CLEARANCE