

**REPORT ON ACCIDENT
TO
ELBEE AIRLINES
F-27 AIRCRAFT VT-SSA
AT MUMBAI
ON
03.07.97**

I N D E X

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**INVESTIGATION REPORT ON ACCIDENT TO ELBEE AIRLINES
F-27 AIRCRAFT VT-SSA AT MUMBAI ON 03.07.97**

a) Aircraft

Type : F-27
Model : MK-200
Engines : RR DART 552-7R
Nationality : Indian
Registration : VT-SSA

b) Owner & Operator : Elbee Airlines.

c) Pilot-in-Command : Capt. Hitendra Majumdar

Extent of injuries : Fatal

Co-pilot : Capt. Paresh Bulsara.

Extent of Injuries : Fatal

d) Number of passengers : Nil

Extent of Injuries : N/A .

e) Place of accident : Arabian Sea off Mumbai coast.

f) Date & time : 3.7.97; (22:19UTC of 2.7.97) Aprx
Of accident

(All timings in this report are in UTC)

SUMMARY

F-27 aircraft VT-SSA belonging to M/s Elbee Airlines was scheduled to operate cargo flight for the sector Mumbai- Bangalore on 3.7.97. The aircraft was under the command of Capt. H. Majumdar with Capt. P. Bulsara as co-pilot. The aircraft took-off from RWY 27 of Mumbai airport at 2216 UTC of 2.7.97(0346 IST of 3.7.97). After take off the pilot reported to Tower, "VSA is turning left Sir, thousand two hundred, we are entering weather otherwise", to which tower acknowledged and asked VT-SSA to contact Radar. The aircraft contacted Radar and was asked to establish radial 146 and report passing FL-80, climb level 170 for which aircraft acknowledged, "Roger, call you

establish 146 passing 70 and reaching 170 SA." This was the last transmission from the aircraft. The aircraft crashed into the Arabian Sea off Mumbai coast at about 2219 UTC. The aircraft got destroyed after impact with sea and both occupants on board died in the accident. There was no evidence of fire.

1. **FACTUAL INFORMATION**

1.1 **History of flight :**

On 3.7.97, F-27-200 aircraft, VT-SSA belonging to M/s Elbee Airlines arrived at Mumbai at 2055 UTC(of 2.7.97) after operating cargo flight Delhi-Ahmedabad-Mumbai. It was scheduled to operate Cargo flight for the sector Mumbai-Bangalore under the command of Capt. H. Majumdar with Capt. P. Bulsara as first officer. There was a cargo load of 4226 Kg on board. The aircraft took-off from R/W 27 of Mumbai airport at 2216 UTC of 2.7.97 (0346 IST of 3.7.97) with reported winds as 110/05 kts. After take-off the pilot reported to Tower at 221720 UTC (of 2.7.97), "VSA is turning left Sir, thousand two hundred, we are entering weather Otherwise" to which tower acknowledged and asked VT-SSA to contact Radar on 127.9 MHz. At 221755 the aircraft contacted the Radar on 127.9 MHz. and was asked to establish radial 146 and report passing flight level 80, climb level 170 for which aircraft acknowledged at 221809 UTC "Roger, call you establish 146 passing 70, and reaching 170 SA." This was the last transmission from the aircraft and after this there was no contact with the aircraft. After about 3 minutes, Radar gave a call to VT-SSA, but there was no response. Between 222100 and 222208 UTC, radar called VT-SSA 4 times, still there was no response. At 222230 UTC, radar called VT-SSC, which had airborne about 2 minutes prior to VT-SSA to get the position of VT-SSA. VT-SSC after making several attempts to contact VT-SSA reported to Radar that there was no response from VT-SSA.

Further at 222709 UTC, Radar also requested another aircraft, CPA750 approaching Mumbai for getting the position of VT-SSA. At 222742 UTC VT-SSC reported getting an ELT signal on 121.5 and the signal was weak. The aircraft CPA750 also reported at 222808 UTC that they were receiving weak beacon. However at 222840 UTC CPA750 reported getting strong signal on 121.5. VT-SSC which was asked for search and rescue of VT-SSA reconfirmed at 224140 UTC that the beacon was very strong at 18 miles NW of Bombay. However the trace of aircraft was not established. ATC issued an alert message and requested the Coast Guard and Navy to initiate search and rescue operations.

At about 0600 UTC, Station commander of Airforce Station Madh island reported on land line that some debris of the aircraft was sighted on the coast of Madh island. The debris contained some portion of the floorboard along with some courier mail. In spite of extensive search carried out, the main portion of the wreckage has not been located so far. The aircraft had crashed into the Arabian Sea off Mumbai coast about 5-7 NM NW from R/W 27 of Mumbai airport and got destroyed. Bodies of Capt. Majumdar and Capt. Bulsara were not traceable. However, a piece of flesh having a portion of the chest and stomach had come ashore on Mudh Island, which could not be identified as either that of commander or of the First Officer. Both the crew members were presumed to be dead. There was no evidence of fire.

1.2 Injuries to persons :

Injuries	Crew	Passengers	Others
Fatal	2	-	-
Serious	-	-	-
Minor/None	-	-	-

1.3 Damage to aircraft :

The aircraft got destroyed in the accident.

1.4 Other Damage:

Nil.

1.5 Personnel Information :

1.5.1. Pilot-in-command :

Name	:	Capt. Hitendra Majumdar
Age	:	53 Years aprx.
Licence No.	:	ALTP No. 1430 Valid upto Aug'97 restricted to R.T.R.

Total flying experience : 9322:50 hrs.

Experience on type : 4585 hrs

Experience during last 90 days : 215:25 hrs.

Experience during last 30 days : 54:35 hrs.

Experience during last 7 days : 17:25 hrs.

Experience during last 24 hrs : 3:30 hrs.

He was last medically examined on 12.5.97 and found fit.

His last Route Check was carried out on 26.2.97.

His last Instrument Rating Check was carried out on 15.1.97.

As per available records he was earlier involved in an incident in which engines of F-27 a/c flamed out in flight from Hyderabad to Delhi on 22.5.95. His license was suspended from 22.5.95 to 21.4.96.

1.5.2 Co-Pilot :

Name : Capt. Paresh Bulsara.
Age : 33 Years aprx.
Licence No. : CPL NO. 2730
Valid upto 21.11.97.

Total flying experience : 812:57 Hrs.
Experience on Type : 545:57 Hrs.
Experience during last 90 days : 149:00 Hrs.
Experience during last 30 days : 54:55 hrs.
Experience during last 7 days : 17:25 hrs.
Experience during last 24 hrs : 3:30 hrs.

He was last medically examined on 25.10.96 and found fit.

His last Route Check was carried out on 19.2.97.

His last Instrument Check was carried out on 31.1.97.
As per available records, he was not involved in any incident/accident earlier.

1.6 Aircraft Information :

F.27-200 aircraft VT-SSA bearing S/N 10670 was manufactured by M/s. Fokker Aircraft B.V. Amsterdam in the year 1984 as per the specification of Thai Government for Marine operation and was not taken for delivery. The aircraft was preserved by the manufacturer and later delivered to M/s. BUSY BEE on 11.3.86 with registration no. LN-AKA of Thailand. The aircraft was not operation for the period from 1.6.93 to 28.6.95 as it was undergoing 'C' check at AIR U.K.

The Certificate of Airworthiness(C of A)no. 2171 was issued on 4.10.95 in the name of M/s. Elbee Services Limited/Elbee Airlines Limited, Mumbai under normal category subdivision goods aircraft. The maximum total Authorised AUW of the aircraft was 20412 Kgs. The aircraft was used for cargo operation after carrying out conversion

of aircraft cabin to 'Cat.E' class cargo compartment as per STC/ST/00260DE dated 7.11.96. The last certificate of Airworthiness was revalidated on 26.6.97, which was valid upto 28.6.98. The above cargo conversion was done by M/s.Bransons Aircraft, USA at HAL facilities Bangalore on 20.1.97.

The Certificate of Registration (C of R) no. 2683, Cat.A was issued on 4.10.95. The Aeromobile wireless station licence no. A-319/1 renewed on 18.12.96 was valid upto 31.12.97. The last Major check 2c(2000hrs) was done on 27.1.97 at 9874:38 A/F hrs. Check B (500 hrs) was done on 6.5.97 at 10341:29 A/F hrs. The AUW on last take-off prior to the accident was 18845 Kgs including 3170 Kgs of fuel.

The aircraft was fitted with two ROLLS ROYCE DART 552-7R engines. Engine #1 was bearing S/N 14920 and engine #2 was bearing S/N 14921. The engines were fitted with propellers manufactured by M/s. Dowty Rotol Limited GLOUCESTER. Port Propeller and starboard propeller were bearing serial nos. DRG/6570/87 and DRG/6314/86 respectively.

Hours done by the Aircraft as on date of accident are as follows :

Total hours flown since new	:	10619.52 Hrs.
Hours flown since last C of A	:	24.57 Hrs.
Hours flown during last 6 months	:	746.51 Hrs.
Hours flown during last 3 months	:	421.19 Hrs.
Hours flown during last 1 month	:	145.22 Hrs.
Hours flown during last 24 hours	:	3.15 Hrs.

Hours done by the engines and propellers as on the day of the accident are as follows :

Port Engine : TSN 8609.34
TSO 2962.34,

Stbd.Engine : TSN 7821.24
TSO 3039.24,

Port propeller : TSN 7018.20,
TSO 2780.20.

Stbd.Propeller : TSN 7665.20,
TSO 3091.20.

All the major Mandatory Modifications of DGCA were complied with on the Airframe and engines.

Scrutiny of the snag register revealed that after issue of C of A on 26.6.97, the aircraft made a precautionary landing at Ahmedabad on 26.6.97 as after take off weather radar first showed distorted image and then went off. During final approach, the distorted image came on again. During rectification weather radar Tx/Rx unit plugs were cleaned and refitted and checked for operation and was found satisfactory. After this, there was no defect reported on the aircraft prior to the accident.

1.7 Meteorological Information :

The Met. Observations recorded at 2210 UTC and 2240 UTC are as follows :

	2210 UTC	2240 UTC
Wind	100/03 kts	(SPECI) Calm
Visibility	4000 meters	1000 meters
RWY 27 RVR	-	Above 1500 meters
Weather	Haze	MODRA
Clouds	SCT 2000'	SCT 1000'

	SCT 10000'	FEWTCU 2500'
		OVC 8000'
Temperature	25°C	24°C
Dew Point	23°C	24°C
QNH	1000 HPa	1001 HPa
Trend	NOSIG	TEMPO VIS 800M IN MODSHRA

In between the above two Met reports, a specie was also issued at 2233 UTC by Met Office indicating the latest visibility as 2000 meters in feeble rain.

From the Met report of 2210 UTC, it is evident that surface wind prevailing at that time were 100/03 Kts. The surface wind communicated to the aircraft at the time of take off by ATC at 2215:38 UTC were 110/05 Kts.

The following local forecast issued for Mumbai and 50NM area around at 2158 UTC, was valid from 2200 UTC (2.7.97) to 0600 UTC(3.7.97) :

Surface Wind 240/06 Kts, BECMG 0506 230/10 kts.

Upper Wind	0600 M	260/20 Kts	+25°
	1500 M	260/15 Kts	+20°
	2100 M	270/15 Kts	+15°
	3100 M	280/10 Kts	+11°

Weather HZ TEMPO 22/06 SHRA

Visibility 3000 M in HZ BEC 0505 5000 M in HZ
TEMPO 2000 M in SHRA.

Cloud	SCT SC 600 M	BKN AC 3000 M
	TEMPO 22/06 SCT ST 240 M	
	FEW CB 900 M - 9000 M	
	BKN AS 2400 M	

Freezing Level 5300 M

Additional Notes MOD/SEV TURB & ICING IN CB.

The following flight forecast valid from 2100 UTC of 2.7.97 to 0400 UTC of 3.7.97 for the flight of VT-SSA was obtained by the Flight Dispatcher of Elbee Airlines from the Met. Office :

VABB -- VOBG

PRESSURE

ALTITUDE

FL-185 120/15 BEC 270/15 Kts M 03

FL-140 290/10 BEC 270/30 Kts + 06

FL-100 270/10 BEC 270/30 Kts + 11

CLOUDS

Lowest Layer	SCT SC	TEMPO	SCT SC	FEW CB
Amount & Type	015	21/04	010	030, 300

Higher Layer BKN AC TEMPO BKN AS

Amount & Type 100 21/04 080

SURFACE VISIBILITY 3000M IN HZ TEMPO 2000M IN SHRA

SIGNIFICANT WEATHER HZ TEMPO 22/04 SHRA

REMARKS MOD TO SEV TURB & ICING IN CB.

Alongwith the above Flight Forecast, a composite TAF list issued at 1700 UTC, for aerodromes including Mumbai and Bangalore were also provided, which are indicated below :

VABB 021803 24006KT 3000 HZ SCT 015 SCT 025
BKN 100 TEMPO 1803 1500 SHRA BKN008 FEW 030CB

OVC 080.

VOBG 021803 25010G20KT 9999 SCT010 SCT015
TEMPO 0003 BKN 007 SCT 015.

The Satellite picture of 2100 UTC was provided by IMD, Delhi for the weather over Mumbai. The cloud coverage over Mumbai airport and neighbouring areas was reported as:

"Broken low/medium clouds embedded with moderate to intense convective clouds. Cold cloud tops with temperature ranging between -36°C to -50°C present over the area."

The Radar scope polar observations taken from weather Radar at Mumbai airport at 2100 UTC indicated two cloud patches with 4 Kms height at a distance of about 70 Kms towards West and west-south-west of Mumbai. Observations at 2200 UTC indicate that the patches observed at 2100 UTC have apparently moved towards east and more cloud patches were also observed; with a height of 4 Kms at a distance of 70 Kms towards North, with a height of 5 Kms at a distance of 40 Kms towards north-west, with a height of 5 Kms at a distance of 35 Kms towards West-South-West, with a height of 3 Kms at a distance of 40 Kms towards South West.

The observations at 2300 UTC indicated that the cloud patches have moved nearer to the station and height of 5-6 Kms were observed.

These clouds reported are usually interpreted as low and medium and the range of 4-6 Kms heights may be interpreted as cumuliform type of clouds(as per Radar picture).

1.8 Aids to Navigation :

The accident occurred about three minutes after the aircraft had taken off from Mumbai airport. The following navigational aids were available at the time of accident :

DVOR/DME (116.6 MHz), NDB (265 KHz).

Above navigational facilities were working normal during the period of accident and entries to this effect were found made in the log books. The aircraft informed ATC of taking a left turn to avoid weather and thereafter was to proceed on VOR radial 146 for its destination Bangalore. There was no transmission from the aircraft any time after take off indicating non-availability of the nav-aids.

1.9 Communication :

Prior to the accident, the aircraft was in contact with Mumbai Tower (118.1 MHz) and Mumbai Approach (127.9 MHz). During contact with these units the communication to and from aircraft was normal and there was no report whatsoever from aircraft about any kind of communication problem experienced at Mumbai airport. The aircraft was in contact with Mumbai Approach from time 221755 UTC to 221809 UTC and the transmission from/to the aircraft was normal.

1.10 Aerodrome Information :

During take off from Mumbai, RWY 27 was used by the aircraft. The said RWY has a total length of 11,455 ft and is equipped with ILS and CAT II lighting system. The runway lighting were reported to be operating normal during take off. DVOR and NDB are available as navigational aids at Mumbai airport.

The airport is managed by AAI (IAD) and has Category IX fire services to meet the aircraft emergencies within/vicinity of the aerodrome. After the aircraft had lost contact with ATC, the safety services were put on alert by declaring full emergency.

1.11 Flight Recorders :

The aircraft was fitted with a Fairchild 100 Cockpit Voice Recorder S/N 51021. It was also fitted with DFDR S/N 2851. These recorders were fitted with under water locator beacons(ULB). ULB when immersed in water keeps emitting acoustic signals for a period of about one month, which can be picked up by acoustic locator system. Extensive search was carried in the Arabian Sea off Mumbai coast using Dukane Underwater Locator System with the help of divers of coastguard. Due to adverse weather conditions, the recorders could not be located. Services of National Remote Sensing Agency were also engaged for probable locations of the aircraft and its recorders in the sea. Services of M/s. Sea Swift, a professional company employing divers were also engaged for location of the recorders as well as aircraft wreckage. But due to deteriorating weather conditions during monsoon period, there was no success. Search was continued for over a month without any success. So far so the recorders have not been located. The data from these recorders will be analysed, when the recorders are retrieved. The details of the search carried out have been explained in para 1.17.1.

1.12 Wreckage and impact information :

Some pieces of floor board and also some debris of the cargo was collected from the Mudh-island beach, which was washed off after the aircraft crashed into the sea. The floating debris included one Halon fire extinguisher in a deformed condition, wing root top rear panel near flap

track ('No Step' printed on this), a small piece of de-icing boot, out flow valve, air filter and a page of Airplane Flight Manual etc. BCAS office, Mumbai was requested to depute experts from BDDS for inspecting/examining the floating wreckage recovered from the explosion point of view. The wreckage was examined by BDDS. The Controller of Explosives, BCAS has intimated that wreckage was inspected from explosive angle. No traces of explosives were found, thus ruling out the possibility of air crash because of explosives. They further intimated that since the portion of the wreckage found was very less due to inclement weather and rough sea, it could not be concluded finally as to the reason of crash.

Examination of the recovered wreckage revealed that the aircraft got destroyed after impact with sea. The main wreckage has not been located so far inspite of extensive search carried out by various agencies, the details of which have been explained in para 1.17.1. The examination of the main wreckage shall be carried out as soon as the same is located and recovered.

1.13 Medical and pathological information :

Both the flight crew were subjected to preflight medical examination prior to undertaking the flight on 3.7.97 and nothing adverse was detected. Bodies of both the crew members were not traceable. However, a piece of flesh, having a portion of chest and stomach had come ashore on Mudh Island, which could not be identified as either that of Commander or of the co-pilot.

1.14 Fire :

There was no evidence of fire.

1.15 Survival Aspects :

The accident was not survivable.

1.16 Tests and Research :

Nil.

1.17 Additional Information :

1.17.1 Search & Rescue Operations :

ATC had issued an alert message and requested coast guard and navy to initiate search and rescue operation. The Navy and Coast Guard authorities continued their search from **3.7.97 to 5.7.97** but there was no success. On 6th July 97 Dukane Underwater Acoustic Locator system received from DGCA (HQ), which could pick up acoustic signals from CVR & DFDR was used by the divers of the Coast Guard. They were given demonstration on this equipment before it was used. A boat was sent out to the sea on **6th and 7th July, 1997** to the accident area in search of the aircraft. The boat returned without any success. Since there appeared no chance of pilots survival in the accident by that time, the search and rescue operation was given up by them and the services of National Remote Sensing Agency was utilised to take images of the aircraft from the sea bed so as to recover the aircraft along with CVR and DFDR. NRSA had flown their aircraft over the Arabian Sea off Mumbai coast and carried out Data Interpretation of Aeromagnetic data and Scanner Data survey of the accident area for about 10 hrs. It had given probable locations of the aircraft in the sea with the following co-ordinates in the order of priority :

1. 19deg 05.2405'N and 72deg 47.565'E.

2. 19deg 06.00' N and 72deg 46.240'E
3. 19deg 01.500'N and 72deg 47.565'E
4. 19deg 00.4557'N and 72deg 48.24'E

Meanwhile negotiations were held by M/s Elbee with M/s Sea Swift, a professional company employing divers to start search and to locate the aircraft wreckage from the sea. M/s Sea Swift started their operation on **8.7.97**. The divers of the company were demonstrated for handling and operating the Dukane Underwater Acoustic Locator system. The boat left Madh Jetty at 0800 IST and was out to sea for conducting search operation for 8 to 10 hrs but there was no success. The condition of the sea was extremely bad. With the monsoon 'on', the sea was very rough and the waves were as high as 20'. Special permission was obtained by Elbee airlines from the Maritime authorities to send the boat since from 7th June'97 the fishermen were forbidden by the Govt. to go to the sea because of the element of risk involved.

On **9.7.97**, search was carried out on the path of the aircraft with the help of GPS, the boat left at 0800 IST for conducting the search and returned at 1800 hrs. The sea was very rough and visibility was very poor and it was raining very heavily. The areas scanned were from 19°-03'-612"N, 72°-43'-410"E to 19°-06'-667", 72°-49'-029"E. Some signals were picked up and divers were asked to dive and locate the wreckage but the undercurrents were very strong and shallow water accompanied by muddy atmosphere underneath eluded the success. During the search strong signals were reported at full gain at 19°-05'-618"N, 72°-49'-029"E and 19°-05'-660"N, 72°-48'-884"E.

On **10.7.97**, the boat left with divers along with GPS, the sea was rough, undercurrents were very strong and it was raining heavily. Some signals were received and there were adverse under water conditions. The divers made 6

dives but could not locate the wreckage. Strong signals were received at $19^{\circ}05'444''N$, $72^{\circ}49'179''E$. During the dives it was observed that the visibility under water (below 2-3 feet) was very poor due to black dirty water. On **11th and 12th July** also the operations were carried out but there was no success due to under water currents being very strong and high tides. On **13.7.97** also it was raining continuously and the sea was rough and tides were high and undercurrents were strong. The divers could not dive during the search because of these unstable conditions. The area scanned were from $19^{\circ}04'930''N$, $72^{\circ}48'920''E$ to $19^{\circ}05'696''N$, $72^{\circ}48'729''E$. No signals could be picked up.

On **14.7.97**, since the sea was slightly calm early in the morning, the boat left at that time along with GPS and Dukane Underwater Acoustic Locator system. The search of some areas resulted in picking up signals and some buoys were installed to mark the places. The divers went down 10 times but the reported underwater currents hampered the search operations. Dukane Underwater Acoustic Locator system was checked with beacon before each dive. At $19^{\circ}05'584''N$, $72^{\circ}49'096''E$, and $19^{\circ}05'486''N$, $72^{\circ}49'139''E$ floats were installed as signals were received at these locations. At $19^{\circ}05'225''N$, $72^{\circ}48'333''E$ location which was between the parallel line of rock about 50 ft apart, strong signals were received and float was installed.

On **15.7.97**, the boat left early in the morning. The conditions at sea were similar to the previous day and divers were continuously diving into the sea but no signals could be picked up. On **16.7.97**, M/s Elbee Airlines, decided to further augment the operation with the help of another agency M/s Duke Offshore. On **17.7.97**, the divers of the company were given demonstration of Dukane Underwater Acoustic Locator system and a boat was sent out into the sea. The areas were searched from $19^{\circ}02'806''N$, $72^{\circ}46'000''E$.

007"E to 19°-05'-241"N, 72°-47'-550"E but no signals were received.

From **18.7.97** to **20.7.97**, search was continued at different locations but there was no success. On **21.7.97**, the weather was clear and the sea was considerably calm, the search was carried out at nineteen different locations and dredging of the area with the expertise of Fishermen Association on the path of aircraft was also carried out but there was no success. On **22.7.97**, the weather was quite inclement and sea was rough. The search and dredging was again carried out at different locations but there was no success. On **23.7.97**, search and dredging was carried out but there was no success.

On **24.7.97**, during dredging operation, net got neatly sliced in two parts at 19°-07'-324"N, 72°-46'-294"E but no signals were reported from this location. Dredging operation continued at some more locations but there was no success. On **25/26.7.97** due to extremely bad weather operation could not be conducted. On **27.7.97** also boats were sent out but the operation was abandoned due to bad weather after some time. On **28.7.97**, boat was sent and during dredging operation one arm rest of the seat came in the net from underneath the sea at location 19°-08'-011"N, 72°-46'-999"E but operation was abandoned due bad weather after some time. On **29.7.97**, a boat was sent out in the morning but the weather deteriorated and the boat returned in the afternoon, search was carried out at fifteen different locations. From **30.7.97** to **6.8.97**, due to extremely bad weather no operation could be carried out.

On **7.8.97**, the condition improved and a thorough search was carried out of the entire grid covering fifty six locations number of times, divers also went down but could not locate the wreckage.

Inspite of the efforts made as explained above, the wreckage has not been located so far. M/s. Elbee Airlines have been in touch with Fishermen Association and have offered a reward if any one of them could locate the wreckage. Further the matter was also taken up with National Institute of Oceanography, Goa for locating the wreckage. The evaluation is being done for the capabilities of National Institute of Oceanography, Goa to make search for the wreckage on the coastlines near Mudh Island, where water depth is less. As and when the wreckage of the aircraft is located, further investigation would be conducted.

1.17.2. During investigation it was revealed that Flight dispatcher approval of Sh. Sunil Khatri had expired on 3.12.96 and thereafter M/s Elbee Airlines failed to obtain further extension of approval from DGCA Hqrs. The matter was taken up with M/s Elbee Airlines and they intimated that since Sh. Sunil Khatri was on leave for certain periods between Dec.'96 to March'97, they forgot to request DGCA Hqrs. for extension of his approval and they regretted for their lapse. It is therefore felt that all scheduled operators while submitting the list of their approved flight dispatchers to Met. offices at airports, should also include the validity of their approval so that Met. offices give the Met. briefing to the authorised flight dispatchers. All scheduled operators are therefore required to ensure that their flight dispatchers have valid approval during performance of their duties. Met. offices should also ensure that the Met. briefing is given to the authorised flight dispatchers.

1.17.3 Use of weather radar to assess weather in take off path :

The aircraft is fitted with Bendix Weather Radar. The primary use of this radar is to aid the pilot in the

avoidance of, rather than the penetration, of thunderstorms. The Weather radar has got tilt control which is of rotary type and is used to adjust the position of the antenna relative to the horizon. The range of antenna position effected by this control is between -15 and +15 degrees. Just prior to take-off, scanning of the areas of intended flight by adjusting the tilt control to a tilt-up position to provide beam clearance of surrounding obstructions is possible. In case of any abnormal weather observed while scanning the area with tilt control, the departure can be delayed so as to avoid weather just after take-off. Proper management of the tilt control is one of the most important considerations in the operations of weather radar. An improper tilt control setting can result in valuable information not being displayed properly.

It is therefore desirable that in the interest of safety, pilots may assess the weather in the take off path after the aircraft is lined up on the runway to avoid the possibility of aircraft entering into severe weather conditions immediately after take off.

2. ANALYSIS :

2.1 Serviceability of the aircraft :

The aircraft held valid C of A and was registered under Normal category, subdivision "Goods Aircraft". It was maintained by M/s Elbee Airlines as per the approved schedules. All the relevant mandatory modifications on the airframe and engines were complied with. There was no major work carried out after its last C of A renewal on 26.6.97. On the day of accident there was no snag reported prior to its departure for Bangalore. Scrutiny of the aircraft documents/records revealed that no snag was carried forward as on the date of accident.

After the aircraft crashed into the sea, a small portion of floating wreckage which included some pieces of the floor board, some debris of the cargo, a Halon fire extinguisher in a deformed condition, wing root top rear panel near flap track, a small piece of de-icing boot, one flow valve etc. was recovered from the Mudh-island beach. The above recovered wreckage was examined from explosive angle by BDDS, Mumbai and no trace of explosives were found, thus ruling out the possibility of the accident because of explosion from the available evidence of wreckage.

The main wreckage has not been located so far in spite of extensive search carried out as explained in para 1.17.1. The examination of main wreckage will be carried out as soon as the same is located. However, the examination of engineering documentation/records and of available portion of wreckage does not indicate any possibility of aircraft serviceability being a factor to the accident.

2.2 Weather

2.2.1 The aircraft had taken off from R/W 27 at 2216 UTC (of 2.7.97). After one minute and twenty seconds of take-off, the pilot reported to Tower that "VSA is turning left Sir, thousand two hundred, we are entering weather otherwise". The accident had occurred at about 2219 UTC (i.e. about three minutes after take-off). The salient Met. Observations recorded at 2210 UTC and 2240 UTC reveals the following:

Visibility	2210 UTC 4000 mts.	2240 UTC (Specie) 1000 Mts.
Weather	Haze	MODRA

Clouds	SCT 2000'	SCT 1000'
	SCT 10000'	FEWTCU 2500'
Trend	NOSIG	OVC 8000'
		TEMPO VIS 800 M IN
		MODSHRA

In between the above two Met reports, a specie was also issued at 2233 UTC by Met office indicating the latest visibility as 2000 meters in feeble rain.

From the above trend it is evident that between the above period, the weather was setting around the airport with visibility reducing from 4000 Mts. to 2000 meters at 2233 UTC in feeble rain. It had further reduced to 1000 meters at 2240 UTC. There was also a trend in temporary reduction in visibility to 800 Mts. in moderate shear and rain.

The local forecast issued for Mumbai and 50 NM around, which was valid from 2200 UTC(of 2.7.97) to 0600 UTC (of 3.7.97) indicated moderate to severe turbulence and icing in CB. The flight forecast, which was valid from 2100 UTC (of 2.7.97) to 0400 UTC (of 3.7.97) also, indicated moderate to severe turbulence and icing in CB. The Satellite picture of 2100 UTC indicates presence of broken low/medium clouds embedded with moderate to intense convective clouds, cold cloud tops with temperature ranging between -36 deg. to -50 deg. present over the area.

The Radar polar diagram of 2100 UTC issued by Met. Office indicates that the weather development had started with the formation of two cloud patches at about 70 Kms towards West and west-south-west of Mumbai. These patches had apparently moved towards east and more cloud patches were also observed in 2200 UTC polar diagram. At 2300 UTC, the cloud patches had moved nearer to the station.

Capt. A.K. Malhotra, Flight Inspector DGCA Hqrs. who associated with operational aspects of the case has opined that correlating between Mumbai Radar and Satellite picture, the weather was obviously in the development stage. The top of clouds temperature being -36 deg. to -50 deg., the clouds top could be 25000 ft. to 32000 ft. and these clouds were obviously CB clouds which could have had severe rains visible moisture and severe turbulence. He further opined that it could be presumed that the weather developed at its peak in the region as the clouds had shifted from east to west direction and had accumulated over Mumbai.

In the log entry made subsequent to the accident, the Radar Controller, Mumbai ATC had stated the aircraft VSA was not identified on Radar neither on airborne nor later due to presence of clutters all around, specially within 10 NM West to Southeast.

The above evidences indicate that the weather was fast changing and had started setting over Mumbai from 2200 UTC onwards with presence of cloud patches in and around the airport. The weather was prevalent in West and Southwest direction. Another Elbee Airlines aircraft VT-SSC, which had taken off from Mumbai 2 minutes prior to accidented aircraft and had taken a right turn towards North (for Delhi), was identified on the Radar. Capt. Malhotra has opined that it could be assumed that the pilot (VT-SSA) had observed severe CB development on the left and in order to avoid weather has initiated a turn to the left at 1200 ft. He further opined that the aircraft should have climbed another 800 ft. or so under normal climb speed and the height of the aircraft at the time of its last contact with Radar should not have been more than 2000 ft. As per the Standard Instrument Departure procedure, the aircraft in normal circumstances would have initiated a left turn at

1700 ft. However, the aircraft was not identified on Radar after take off due to presence of clutters.

By scanning the areas of intended flight path with the proper use of tilt control of weather radar, the possibility of weather being detected just prior to departure after lining up on the runway can not be totally ruled out. However the proper use of tilt control by the pilots prior to take-off could not be ascertained in the absence of evidence.

2.2.2 The flight dispatcher of Elbee Airlines (Sh. Sunil Khatri) had obtained the Met Briefing at 1903 UTC of 2.7.97 for VT-SSA, which was expected to depart at 2200 UTC (about three hours later) for Mumbai-Bangalore-Chennai sector against a normal procedure of 1 to 1½ hrs. Enroute weather briefing was ISO/CB/TS. Metars/ Specie and RAREPS were not available at the time of briefing.

Sh. Khatri has stated that on the night of 2.7.97, he was required to file flight plans for 3 flights (VT-SSA, VT-SSB, VT-SSC) departing from Mumbai. VT-SSB was scheduled to depart at 2000 UTC, VT-SSC at 2200 UTC and VT-SSA at 2200 UTC. He went to Met Office for Met briefing after obtaining ADC number from MLU and collected the folders including that of VT-SSA, which was ready. He has also stated that Met folder was valid from 2100 UTC to 0400 UTC and TAFS had validity from 1800 UTC(2.7.97) to 0300(3.7.97). He has further stated that he obtained 2140 UTC Bombay Metar from Met Office on telephone prior to departure and orally briefed the crew of flights VT-SSA & VT-SSC and handed over the Met folder, NAV Logs, NOTAMS.

From the above, it is therefore evident that even though the estimated time of departure of VT-SSA was indicated as 2200 UTC, the briefing was taken at 1903 UTC, i.e. about 3 hours prior to departure of VT-SSA. Though the flight dispatcher has stated that the Met folders was

valid from 2100 UTC to 0400 UTC and TAFS were valid from 1800 UTC(2.7.97) to 0300(3.7.97) and he obtained 2140 UTC Bombay Metar from Met office on telephone prior to departure and orally briefed the crew, yet the weather at Mumbai and its surroundings at the time of departure required frequent updating and informing the concerned flight crew by the flight operation officer. The records do not indicate having the acknowledgement of the flight crew having received the latest weather. It is, therefore, necessary that the flight dispatchers/ flight crew should take Met. briefing as per laid down procedures. Met. department should also ensure compliance of the same. Further, during active monsoon period, the pilots operating flights in the interest of safety should visit the Met. office at the airports wherever feasible to see the weather Radar picture which can alert them of the development of the weather, if any, in the vicinity of the aerodrome and enroute.

From the foregoing, it therefore appears that the possibility of the aircraft getting in to the weather can not be ruled out and the weather is considered as a factor to the accident.

2.3 Circumstances leading to the accident

The aircraft took-off from R/W 27 of Mumbai airport for Bangalore at 2216 UTC of 2.7.97 (0346 IST of 3.7.97) under the command of Capt. H. Majumdar with Capt. P. Bulsara as Co-Pilot. After take-off the pilot reported Tower at 221720 UTC of 2.7.97, "VSA is turning left Sir, thousand two hundred, we are entering weather Otherwise" to which tower acknowledged and asked VT-SSA to contact Radar on 127.9 MHz. At 221755 UTC the aircraft contacted the Radar on 127.9 and was asked to establish radial 146 and report passing flight level 80, climb level 170 for which aircraft acknowledged at 221809 UTC "Roger, call you

establish 146 passing 70, and reaching 170 SA." This was the last transmission from the aircraft and after this there was no contact with the aircraft.

The aircraft had crashed into the Arabian Sea off Mumbai coast about 5-7 NM from R/W 27 of Mumbai airport. The main wreckage of the aircraft including flight recorders has not been located so far in spite of extensive search carried out. However a portion of floating wreckage which consisted mainly of floor board pieces and courier mail was recovered which had been sighted on coast of Mudh Island.

It is evident that to avoid weather the aircraft had taken a left turn at 1200' instead of 1700' as per the standard Instrument departure procedures. Various possibilities of the aircraft crashing into the sea under the above circumstances could be considered. It could have been that the pilot in the process of trying to avoid the weather has over-banked the aircraft, which at low speed (after take-off) has resulted in the stalling and due to insufficient height was unable to recover and crashed into the sea. However, in the absence of main wreckage and the recorders the same can not be substantiated. Another possibility is that the pilot can get disoriented after take-off from a well lit-up area, to go over the sea where there are no lights. This is referred to as flying into a black hole, which has the effect of disorienting the pilot. However, considering the experience of the pilot in this case, the above possibility appears to be remote. According to Capt. Malhotra, there could be a great possibility that due to severe gravitational load due to turbulence, the aircraft lashing could have given way and there could be an apparent shift in the CG and in the process pilot trying to control the aircraft must have applied push or pull on the control which could have further aggravated the configuration of the aircraft resulted in helping the

structured failure of the aircraft. A portion of the courier mail was also collected which was washed ashore the Mudh Island. However, since the entire wreckage including the mail could not be recovered, the possibility of loss of control due to giving away of the lashing can not be conclusively proved.

Capt. Malhotra has opined that the weather could have had severe turbulence/updrafts/downdrafts in which the aircraft could have lost stability and the pilot could have got totally disoriented and due to the severe downdrafts, loss of aircraft control could not be ruled out. From the foregoing, the most probable scenario under the circumstances appears that there is a possibility of the aircraft, after taking a left turn, getting into intense weather and the pilot losing controls at low height while negotiating the weather.

Absence of any emergency call from the aircraft was possibly due to both crew remaining occupied to regain the aircraft control till last moment.

3. CONCLUSIONS:

3.1 Findings :

- i) The aircraft held valid C of A. and was being maintained as per approved schedules.
- ii) The crew held appropriate licences while undertaking the flight.
- iii) The aircraft arrived at Mumbai at 2055 UTC (of 2.7.97) after operating cargo flight Delhi-Ahmedabad-Mumbai that was uneventful and there was no snag reported on these sectors.
- iv) The aircraft was scheduled to depart for Bangalore at 2200 UTC (of 2.7.97). Met. briefing was obtained by Flight

dispatcher of Elbee Airlines about 3 hours prior to its departure for Bangalore.

v) Enroute weather briefing was ISO/CB/TS. Metars/Specie and Rareps were not available at the time of briefing.

vi) The Flight Dispatcher reportedly obtained, the Metar of 2140 UTC on telephone and orally briefed the crew and handed over the Met folder, Nav. Logs, Notams etc. before departure of the aircraft.

vii) Radarscope observations revealed that there was weather development around Mumbai airport from 2100 UTC onwards with formation of low and medium cumuliform type of clouds with height varying from 3-6 Kms height.

viii) After crew change at Mumbai, the aircraft took-off from RWY 27 at 2216 UTC (of 2.7.97) for operating cargo flights Mumbai-Bangalore-Chennai.

ix) After one minute and twenty seconds after take-off, the pilot reported to Tower, "VSA is turning left Sir, thousand two hundred, we are entering weather otherwise", to which Tower acknowledged and asked VT-SSA to contact Radar.

x) Twenty five seconds thereafter at 221755 UTC, the aircraft contacted Radar and was asked to establish radial 146 and report passing flight level 80, climb level 170.

xi) At 221809 UTC, the aircraft acknowledged "Radar, call you establish 146 passing 70, and reaching 170 SA." This was the last transmission from the aircraft and after this there was no contact with the aircraft.

xii) The pilot had possibly lost controls just after take off while negotiating weather by taking left turn at 1200 ft before reaching the required altitude of 1700 ft for taking the left turn.

xiii) Finding no response after repeated calls to VT-SSA, Radar requested VT-SSC (which had airborne for Delhi two minutes prior to VT-SSA) and CPA 750, which was approaching Mumbai for getting the position of VT-SSA, but VT-SSA was not traceable.

xiv) ATC issued alert message and initiated search and rescue operation through Coast Guard and Navy.

- xv) At about 0600 UTC of 3.7.97, some debris of the aircraft, which consists mainly of floorboard pieces and courier mail, was sighted and recovered on the coast of Mudh Island.
- xvi) The examination of the available portion of wreckage did not indicate any possibility of explosion.
- xvii) Search of the main wreckage of aircraft, the CVR and DFDR with the help of Underwater Acoustic locator system, continued for over a month but there was no success due to roughness of the sea and adverse weather conditions during monsoon.
- xix) Efforts to locate the wreckage afterwards also did not yield any results. Further investigation will be carried out after the wreckage is located.

3.2 Probable Cause of the Accident :

The pilot possibly lost control when encountered severe weather conditions soon after take off and crashed into the sea.

Non-availability of latest weather to the pilot was the contributory factor.

4. RECOMMENDATIONS :

1. All operators to ensure that their flight dispatchers / flight crew obtain latest Met. briefing prior to departure of flight as per laid down procedures.
2. All operators may advise their pilots to assess the weather before take off to avoid the possibility of entering into severe weather conditions.

Mumbai

Date : 25.6.98


(Subhash Chander)

Inspector of Accidents



CABIN FIRE EXTINGUISHER



PORTION OF WING SURFACE SHOWING 'NO STEP'



PIECES OF FLOOR BOARD AND A PORTION OF AVIONICS BAY PANEL



PIECES OF FLOOR BOARDS AND SOUND PROOFING MATERIAL



SEAT CUSHION AND SOUND PROOFING MATERIAL



PORTION OF COURIER MAIL