

No. 50

BEA, Viscount 701, G-ANHC and Italian Air Force, F-86E collided over Nettuno, Italy on 22 October 1958. Report released by the Ministry of Defence-Aviation, Republic of Italy - April 1959

Circumstances

The Viscount, en route from London to Naples, flying on Airway Amber 1, reported over Ostia at 23 500 ft at 1144 hours advising that it was continuing to Ponza, estimating arrival over this point at 1157. At 1150 it collided east of Nettuno with an Italian Air Force Sabre which was taking part in group training of aerobatic manoeuvres. The 26 passengers and 5 crew aboard the Viscount were killed in the accident, and the pilot of the F-86 parachuted to safety. Both aircraft were destroyed.

Investigation and EvidenceActual Weather Conditions at the Time and Scene of the Accident

Along the coast of Lazio and offshore there was clear sky or very little cloud with 1/8 cumulus inland, base between 700 and 1 400 metres, and top probably around 2 000 - 2 200 metres.

At higher levels, the sky was generally clear north of the Circeo promontory. From Circeo to the lower Tyrrhenian Sea, high cloud formation existed (cirrus and cirrostratus) with base above 6 000 metres.

Visibility was good and greater than 10 kilometres in all directions.

Freezing level in the accident area was at approximately 2 200 metres. Upper winds obtained from Ciampino radio soundings at 1200 hours were light

at all levels. Particularly light winds from NE up to 1 000 metres; variable from E to SE with a maximum strength of 5 knots between 1 000 to 4 000 metres; rotating towards 240° and later 270° with maximum speed of 13 knots up to the 7 150 metre level.

Navigation Aids

The ground/air communications log indicates that the Viscount regularly transmitted the prescribed position reports over the various reporting points.

The aircraft carried DECCA, for which there are no stations in Italian territory; it could not make use of the VOR system as it was not equipped with the necessary receiving equipment. The crew, therefore, navigated solely on the basis of ADF.

General Description of Airspace (see Figure 27)

Airway Al is under the jurisdiction of ACC Rome. This centre is organized into three sectors: North - Central - South. Overflight traffic on Airway Al between Ostia NDB and Ponza NDB comes under the control of South Sector.

The segment Ostia NDB - Ponza NDB of Al crosses prohibited (vietata)\* area No. 15, (the Approach Control Zone of the Pratica di Mare military base). Prohibited (proibita)\* area No. 18 (Nettuno Artillery Range) is located to the east of Airway 1 and is contained within area No. 15.

\* Translator's Note

Throughout the report both "vietata" and "proibita" are used with reference to areas 15 and 18. Both expressions have been rendered in English by the word "prohibited" but in each case the original Italian word has been added between parentheses.

Airway A1, 60 NM in length, 10 NM wide, extends from 4 000 ft MSL to 23 000 ft MSL; the whole airspace above from 24 000 to 40 000 ft MSL is part of area 15, that is to say of the Pratica Approach Control Zone.

Control Procedure of Pratica CTR  
(Area 15)

The control procedures applying at Pratica CTR are set forth in Military Notam No. 44/47 of 27 October 1957.

That Notam, which contains additional information concerning the practical application of service instructions from Rome ACC/FIC and of agreements between Rome ACC/FIC and Pratica APP/TWR, specifies that the airspace around A1 is to be used only for IFR exits below A1.

ATC Procedures between Pratica and  
Rome Terminal Control Area

CTR Pratica (Area No. 15) lies within the airspace of the Rome Terminal Control Area.

In view of the fact that the Pratica Base is not used on a continuous basis except in specific cases, operations at the Base are limited to the period 0530 - 1300Z on week days; Rome ACC normally uses the Pratica CTR airspace for its own traffic, after appropriate coordination with Pratica APP/TWR.

ATC Procedures applied to the  
Viscount (BEA Flight 142)

On the basis of

- a) the communications between BEA 142 and Rome ACC
- b) the control strips relating to the flight

it appears that:

BEA Flight 142 was normal up to NDB Ostia and in accordance with ATC procedures. At approximately 1100Z, the controller of Sector North, in view of the presence of other traffic over Ostia NDB at 21 500 ft, and in coordination with Pratica TWR/APP, cleared BEA 142 on A1 at 23 500 ft, in conformity with the procedures in force.

At 1144 hours the Viscount reported over Ostia NDB, estimating overflight of Ponza NDB at 1157.

At 1153 hours Rome Control, having received reports of an accident (at approximately 1150 hours) in the vicinity of Anzio, called the Viscount repeatedly without receiving any reply.

The Wreckage

The wreckage of the two aircraft lay east of Nettuno; most of it was scattered over the area between C. La Secchia and the sea along a distance of about 2.7 km.

The Viscount wreckage lay mostly in the southern part of the above area, that of the Sabre mainly in the northern part.

There was, however, no clear line of division between the parts of the two aircraft, nor was there any evidence of a precise distribution pattern in the wreckage trail, except that some of the denser components of the Viscount (2 turbo-props) were found towards the southernmost part of the area.

The turbine of the Sabre was located NW of the above area and at quite a distance from the other parts, indicating a somewhat anomalous trajectory.

Figures 28 and 29 show the main components of the two aircraft and the structural break-up following the collision.

Many parts were not located, could not be identified or were broken into small fragments. The only parts of the right wing of the Sabre that could be identified were a few pieces of the wing tank, the centre hinge of the aileron and the wing tip - considerably buckled and still carrying the undamaged pitot antenna - and a few other pieces. The rest of the wing was reduced to minute and irregular fragments indicating that the wing most likely exploded.

The condition in which the forward part of the fuselage of the Sabre was found, in contrast with the aft part, leads to the conclusion that the impact occurred on the under part of the fuselage, practically at right angle to its axis, and that, therefore, the Sabre was in a dive at the moment of collision.

As regards the Viscount, it is believed that No. 1 propeller struck the left wing of the Sabre dissipating part of its rotative force and became separated from the engine after failure of the reduction gear. Practically at the same moment No. 1 engine was torn free from the wing, following deceleration caused by the collision. Since the total kinetic energy absorbed by the bending of the propeller blades, the failure of the reduction gear and the failure of the engine mountings on the wing, may be considered as small in relation to the kinetic energy of the turbo-prop, it may be assumed that the trajectories of the engine and the propeller were practically the same and such that a line plotted back from the points on the ground where these two parts were found will give an approximate indication of the point of collision.

#### The Configuration of the Collision

The wreckage clearly indicates that impact occurred between the forward left part of the Viscount and the bottom part of the Sabre which was in a dive.

The fact that only a few parts of the right wing of the Sabre were found, in

widely scattered areas, and identified, leads to the assumption that the wing disintegrated on impact.

Another clear indication of direct impact is furnished by the tears produced by No. 2 turbo-prop of the Viscount on the central section and on the right wing root of the Sabre, which impact destroyed the turbo-prop.

The condition of the leading edge of the left wing of the Sabre leads to believe that the point of impact was in Area A (see Figure 29), against the leading edge of the Viscount wing between No. 1 and No. 2 engines.

From the statements of the pilots of the flight formation, and on the basis of the likely configuration of the two aircraft and their respective speeds, it may be deduced that at the moment of impact:

- the longitudinal plane of symmetry of the Sabre was approximately in a vertical position,
- the longitudinal axis of the Sabre formed an angle B of  $70^{\circ}$  with the horizontal axis.

The angle, as seen from above, of the longitudinal planes of symmetry of the two aircraft was  $45/50^{\circ}$ . (See Figure 30)

The collision probably took place in the following manner:

- probable impact of right wing of Sabre against fuselage (nose) of the Viscount;
- impact of left wing of Sabre against Viscount No. 1 and 2 propellers with initial structural disruption of Sabre in area K (see Figure 29) and detachment of Viscount No. 1 propeller;
- impact of centre section of Sabre against No. 2 engine, with failure of centre section, and probable explosion of fuel in Sabre wing tank

resulting in disintegration of right wing;

- projection outwards of Sabre ejection seat with pilot;
- separation by inertia of Viscount No. 1 engine;
- impact of leading edge of Sabre left wing (area A in Figure 29) against leading edge of Viscount left wing, failure and separation of parts 21, 31 and 38 of Sabre left wing;
- breaking-up of Sabre rear fuselage and Viscount left wing in area H (Figure 28) as a result of mutual inter-penetration and consequent destruction of both aircraft;
- smashing of Sabre and powerplant and separation of tail assembly.

As regards the Viscount the impact most likely generated angular accelerations causing yawing and rolling.

These accelerations contributed to the disruption of the rear fuselage cone with the tailplane, and to separation of No. 4 powerplant. Failure of the right stabilizer at the root must also be attributed to the aforementioned accelerations.

The multiple fractures in the nose section (Figure 28) as well as other fractures along the fuselage appear to be attributable to the cumulative effect of impact, momentum and pressure waves (initial explosive decompression, sudden dynamic pressures, explosion of the right wing of the Sabre).

Separation of the tip of the Viscount vertical fin and of the right stabilizer appears to have been caused by the shearing action of the sheets which broke off from the nose of the fuselage.

The figures in Figure 31 attempt to reconstruct the likely sequence of the collision.

The sequence of impact as described above was of extremely short duration, in the order of 1/10 of a second.

#### Reconstruction of Flight up to the Accident

The Viscount took off from London at 0841 hours for Naples and Malta and was to follow Airways A-3, A-1 and B-28. The London-Geneva segment was flown as planned. This was ascertained from the DECCA recording which was recovered from the wreckage of the aircraft.

The Geneva-Ostia segment was also flown according to flight plan as evidenced by the time of overflight over reporting point. The aircraft flew at cruising level 21 500 ft up to the border of Milan FIR but climbed to 23 500 ft before reaching Turin after obtaining clearance from Milan ACC. This altitude was maintained until the accident, by authorization from Rome ACC. The estimated speed (262 kts) was actually made good. The last communication sent by the Viscount to Rome ACC was the message reporting over Ostia at 1144 hours.

The collision between the Viscount and the Sabre occurred shortly before 1150 hours, the time at which the first report concerning the accident was sent by the control officer on duty in the Pratica di Mare tower, who saw the cloud of smoke caused by the explosion.

Having regard to the report sent by the Viscount from Ostia at 1144 hours and to the ground speed maintained up to that moment (approximately 262 kts) it can be assumed that the sector Ostia-Ponza-Naples would have been flown in 27 or 28 minutes. It is pointed out, however, that while the initial descent, according to the flight plan, was to have commenced at Ostia; the Viscount, following authorization from Rome ACC, maintained a cruising flight of 23 500 ft beyond Ostia.

The Sabre jet formation consisting of four F-86E, including the one that collided



with the Viscount, had taken off from Pratica di Mare Airport at 1045 hours on a group tactical training exercise in the eastern part of area No. 15 specifically reserved for the 4th Air Brigade for training purposes, and prohibited to civil aircraft.

After about one hour of exercises the last phase of the training flight prior to the collision as reconstructed from the statements of the pilots of the Sabre formation was as follows:

The formation was in an area located approximately 5 km east of Anzio - on a heading of approximately  $310^\circ$  and was carrying out a reverse track manoeuvre consisting of an initial dive, followed by a climb turn to the right and a steep dive with final recovery in level flight. The formation was flying Indian file at 50 metre intervals.

The manoeuvre was initiated on a heading of approximately  $310^\circ$  and was to be completed on a reciprocal heading, that is approximately  $130^\circ$ .

Initial altitude was 25 000 ft, at the end of the initial dive 20 000 ft and back to 25 000 ft at the top of the climbing turn.

During the steep dive that followed the climbing turn, the leading aircraft collided with the Viscount.

None of the pilots of the formation saw the Viscount before the collision.

#### Discussion of Evidence

In the light of the foregoing data the following deductions are made:

##### Characteristics of collision

Obviously there was a single impact with immediate catastrophic results. In fact:

- the wreckage of the two aircraft form two distinct groups separated by a short distance;

- the wreckage of the Sabre indicates that it was in a sharp dive at the moment of impact;

- except for the turbine engine of the Sabre, all pieces of the wreckage were located close to the two main groups of components;

- no part of the wreckage shows any evidence of pre-collision damage or impact;

- the Sabre formation maintained close order until the collision of the leader;

- the pilots state that they did not see the Viscount before the collision.

#### Location of collision

There is no doubt that the collision occurred outside the Airway, in a well-publicized prohibited (vietata) area. In fact:

- all statements are in agreement as to the location inland of the black cloud sighted following the collision;

- the wreckage trail of the Viscount indicates a descent path from the NW sector approximately;

- even assuming that impact to have occurred on the eastern edge of the airway, the wreckage - bearing in mind all the circumstances - would not have fallen where it was found nor would the wreckage pattern have been the same.

The reference points given by two witnesses are sufficiently accurate to identify the location of the collision somewhere near Ponsarico.

This location coincides with:

- the distance from Ostia (48 km), in relation to the time elapsed (6 minutes approximately) and to the speed of the Viscount (500 km/h);

- the orientation of No. 1 engine and No. 1 propeller and their trajectories;
- the wreckage trails of both aircraft.

#### Deviation of Viscount from Airway

##### Flight from Ostia to Collision Point

No information was obtained from the Viscount or from other sources concerning this portion of the flight.

The only ascertained facts are the following:

- at the time of the collision the Viscount was coming from a NW sector approximately;
- wind force was negligible in relation to the speed of the Viscount (500 km/h);
- at 1144 hours the Viscount reported that it was over Ostia NDB and flying towards Ponza;
- at 1150 hours the collision had already taken place at a point approximately 48 km from the Ostia radio beacon.

It would take a minimum period of 6 minutes to cover the segment from the reporting point (Ostia) to the point of collision.

It is deduced that the actual track must have followed very closely the line joining the two points: in other words it is hardly conceivable that the Viscount departed significantly from a direct track along that segment.

##### Reasons for deviation from airway

The following three assumptions are possible:

1. voluntary deviation;

2. deviation to avoid a feared collision with Sabre formation;
3. deviation as a result of navigational error.

1. Starting from a point close to Ostia the pilot may have voluntarily headed towards the airport of destination (Naples), thus placing himself, some 6 minutes later, at the point of collision.

In support of this assumption it may be considered that the pilot of the Viscount, because of the flight level and the excellent visibility conditions, may have thought that there was no real danger in crossing the prohibited (proibita) area, thereby shortening the flight distance to Naples.

It is pointed out in this connection that the airline's schedule gives 1210 as time of arrival of Flight 142 at Naples. Having reported over Ostia at 1144 hours, the aircraft could not have arrived at Naples before 1217, having regard to the time required to cover the distance Ostia-Ponza-Naples (28 minutes) and to carry out the aerodrome procedures (5 minutes).

It is pointed out furthermore that upon reporting over Ostia the pilot did not request authorization to commence his descent, as indicated in the flight plan, but instead kept at 23 500 feet, in accordance with the clearance received from Rome ACC. The above assumption is in accordance with the direction of flight of the Viscount (approximately from a NW sector) as deduced from the wreckage trail. This direction of flight is more specifically confirmed by the position of the heading pointers (123° and 126°) read on the Master Indicator and Zero Reader and in the 31° shown on the radio compass, on the assumption, a likely one, that the power in the airborne circuits was immediately cut off at the moment of collision. Against such an assumption it may be said that any intentional deviation from the route, while not entirely to be ruled out, appears very unlikely, since the captain

of the Viscount, on the basis of his service record was an extremely conscientious and qualified pilot and therefore would hardly have broken a rule of navigation which in any event would have resulted in an insignificant saving of time over the entire duration of the flight.

2. The pilot was flying near the eastern edge of the airway and may have been induced to leave the airway with the aim of avoiding the jet formation which he had seen from a distance and which appeared to him to be carrying out manoeuvres likely to bring them on a collision course with him in the airway.

Acceptance of this assumption would imply that the captain of the Viscount, having sighted the jet formation carrying out aerobatic manoeuvres east of the airway and believing that they were flying towards the airway, decided to turn to the left. The weakness of this theory is that it assumes that the pilot of the Viscount not only sighted the Sabre formation from an excessive distance, but also that he was able accurately to determine that they were on a collision track, thus inducing him to leave the airway.

Furthermore, since such a theory presupposes that the pilot of the Viscount had sighted the Sabres from a distance it is reasonable to assume that after leaving the airway he would have manoeuvred the aircraft so as to keep the Sabre formation under constant visual observation, and hence it is difficult to explain a frontal collision in the circumstances.

3. The pilot intended to follow the Ostia-Ponza airway and gradually and unconsciously deviated from the airway as a result of navigation error.

In support of this assumption it is observed that navigation was conducted in the conditions reported hereunder:

- on the day of the accident the winds, in the vicinity of Rome, had a somewhat irregular behaviour;

in particular along the higher Tyrrhenian coast they were quite strong from the NE sector, but near Rome they practically inverted direction, and their intensity varied considerably;

- the crew were aware of this situation through the forecast received on departure from London, but nevertheless were required to make the necessary drift corrections by direct checking of the local situation; the aircraft did not carry VOR equipment;
- an ADF radio compass tuned on MF radio beacons sometimes gives unstable indications.

Under this assumption, as a result of the rapidly changing drift, the Viscount may have passed abeam and inland of Ostia NDB, whereas it reported over Ostia at 1144.

From that point it may have continued flying close to the eastern edge of the airway on a track diverging more and more from the centre line of the airway itself.

Against this assumption is the fact that navigation from London to Ostia had been normal and the consideration that the excellent visibility along the segment Ostia-Ponza permitted reaching Ponza by direct route without difficulty.

It is pointed out furthermore that along the segment Ostia-Ponza the airway passes between two prohibited (proibite) areas and this fact must have obviously made the pilot of the Viscount particularly mindful of the need to navigate accurately.

#### Conclusions

Regarding the validity of the various above-mentioned assumptions the investigating Commission expresses the following opinion:

4 members incline towards assumption No. 1 - voluntary deviation;

No member supports assumption No. 2  
- deviation to avoid a feared collision  
with the Sabre Jets;

7 members consider assumption No. 3  
the most likely - deviation as a result  
of navigational error.

#### Causes

The accident was attributed to "an  
Act of God" - since neither of the pilots  
saw the other aircraft before they collided.

A contributory cause of the accident  
was deviation of the Viscount from the  
airway which placed it in a prohibited  
(proibita) area reserved for military  
activities.

#### Recommendations

The Investigation Commission made  
the following recommendations following  
the inquiry:

1. Prohibited (proibite) areas  
reserved for military activities  
should be removed from the  
immediate vicinity of terminal  
control areas and from airways.  
In the case of military airports  
located within the terminal areas,  
the reserved airspace should be  
limited to the control zones  
established for the inbound and  
outbound procedures.
2. The system of radio aids should  
be improved so as to permit  
easier and more accurate  
navigation for aircraft. As  
regards Italian territory,  
completion of the VOR plan  
should be expedited.
3. Airlines should be urged to  
provide their aircraft with  
equipment permitting maximum  
use of the facilities provided  
along the route.
4. Control units should be provided  
with radar equipment enabling  
them to give more effective  
protection and to exercise more  
positive control both in the  
terminal areas and along airways.
5. Pilots' attention should be drawn  
to the need for strict observance  
of air traffic regulations. (It is  
pointed out in this connection  
that prohibited (vietata) area  
No. 15 was overflown 36 times  
during 1958, 14 times following  
this particular accident.)

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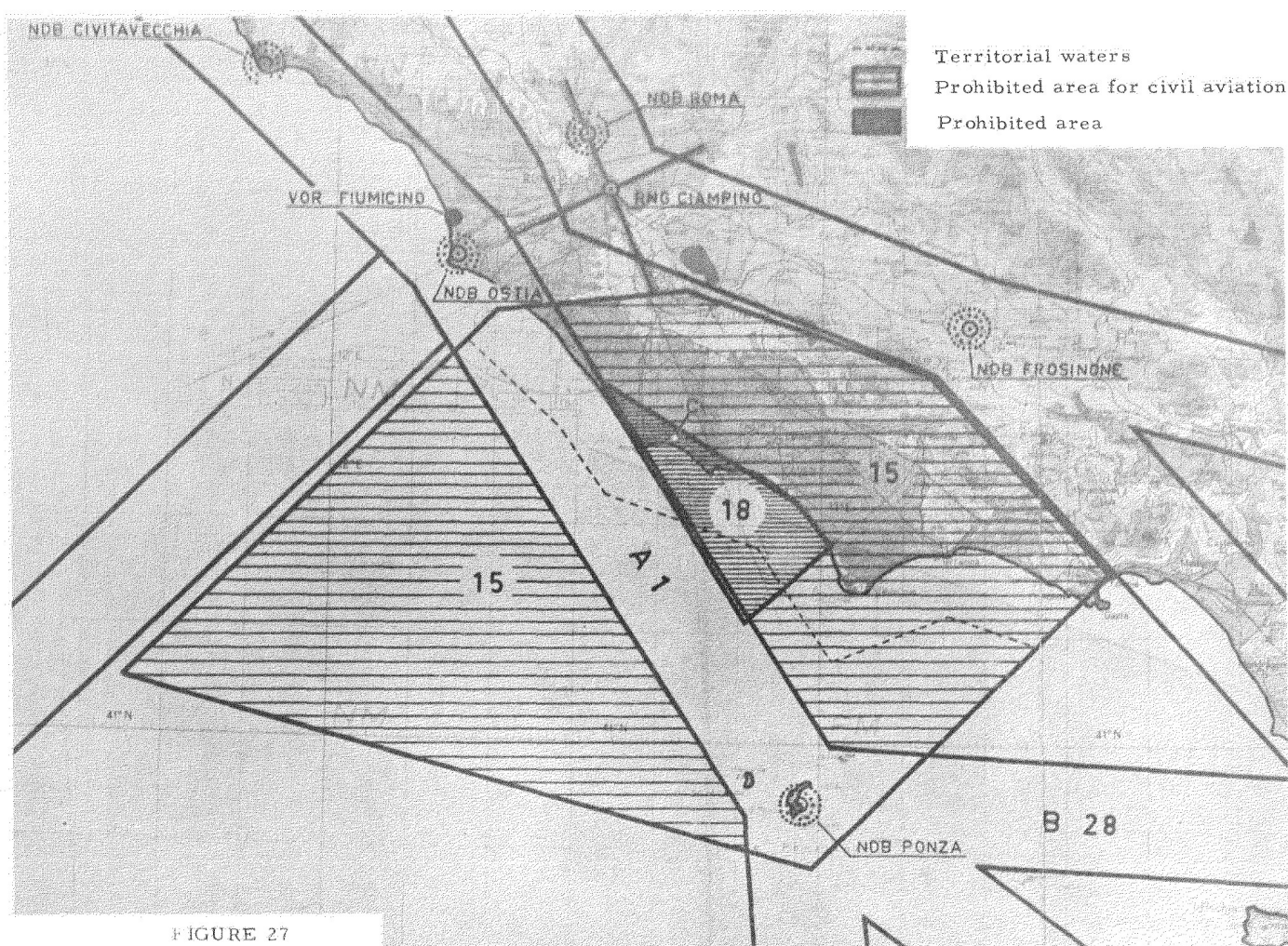


FIGURE 28

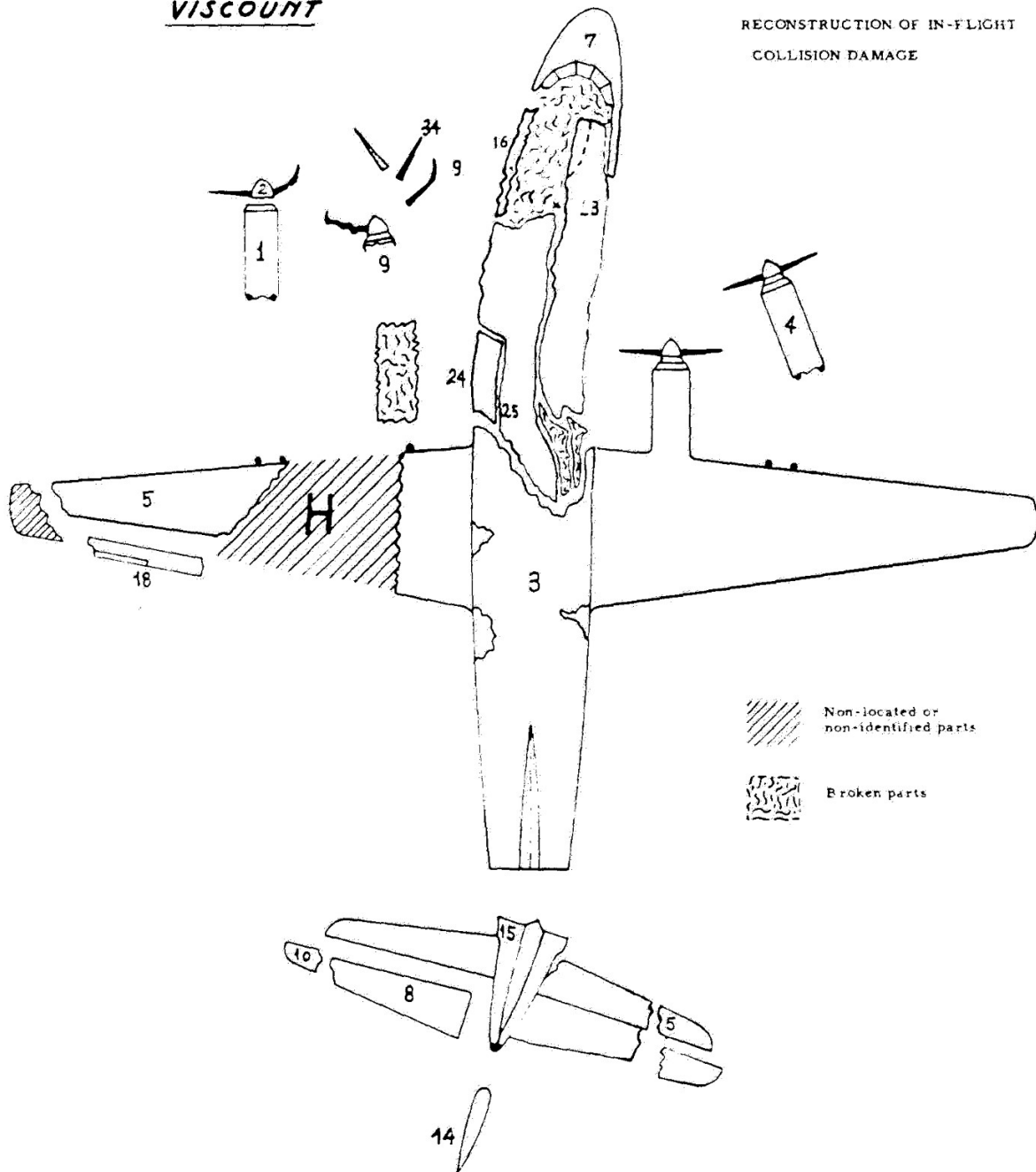
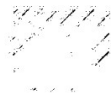
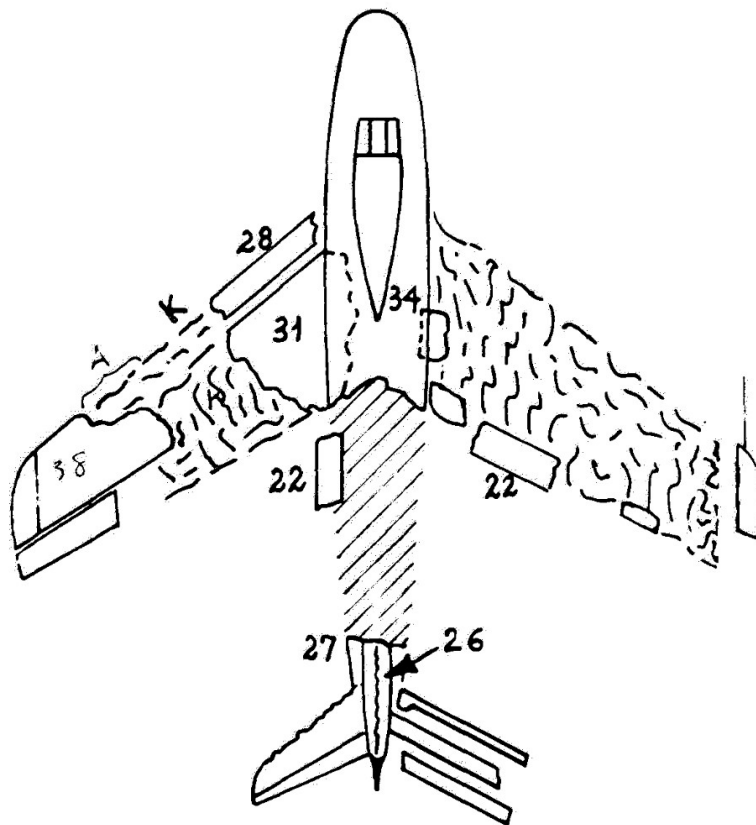
VISCOUNTRECONSTRUCTION OF IN-FLIGHT  
COLLISION DAMAGE



FIGURE 29

F 86 E

RECONSTRUCTION OF IN-FLIGHT  
COLLISION DAMAGENon-located or non-identified  
parts

Broken parts

The angle, as seen from above, of the longitudinal planes of symmetry of the two aircraft was 45/50°.

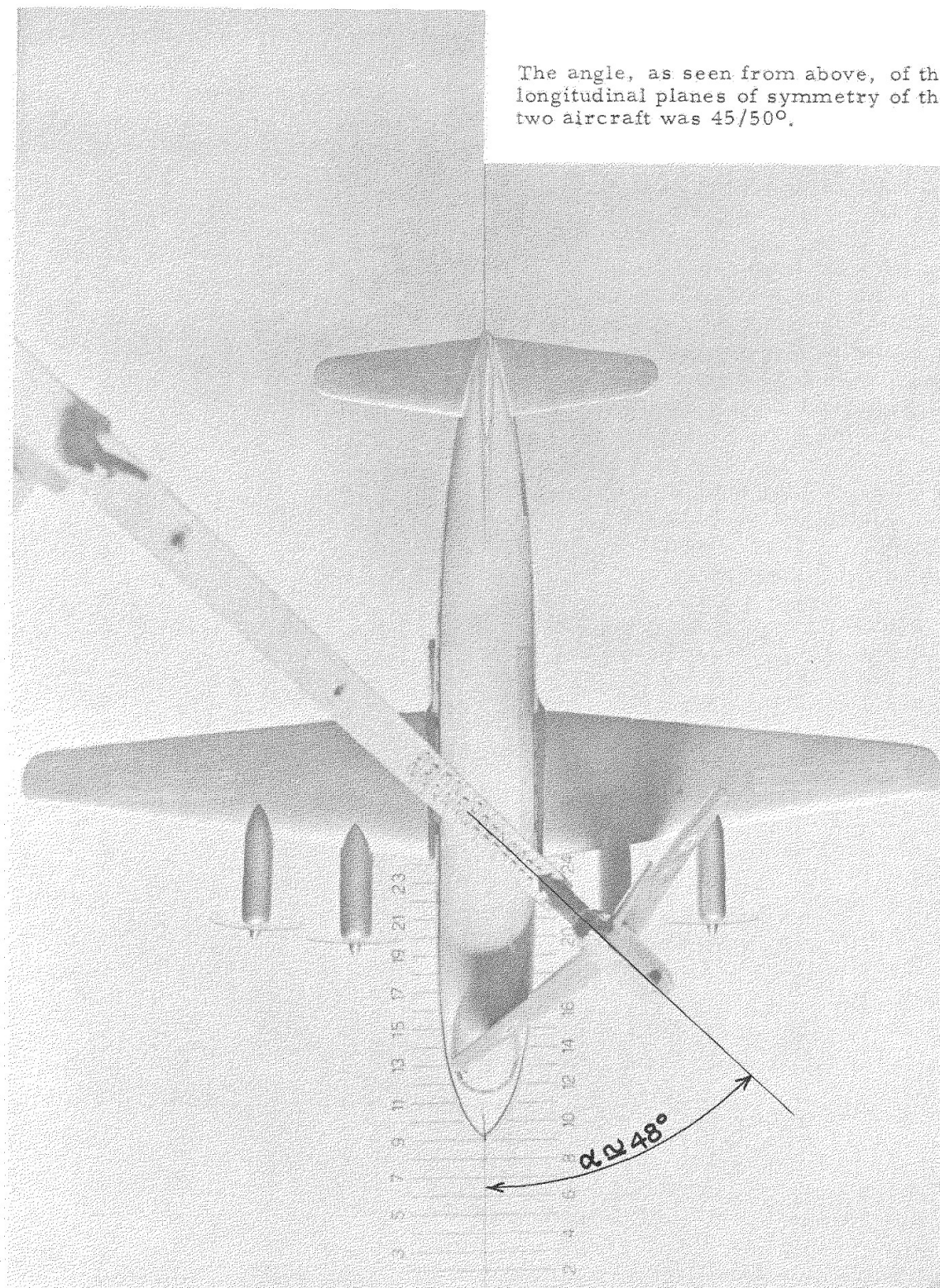


FIGURE 30

FIGURE 31

Reconstruction  
of the likely  
sequence of the  
collision.

