No. 47

Independent Air Travel Ltd., Viking, G-AIJE, accident 3 miles NE of London Airport, England, on 2 September 1958. Report released by the Ministry of Transport and Civil Aviation (UK). C.A.P. 155

Circumstances

The Viking took off from London Airport at 0554 hours GMT with a crew of 3 for a flight to Nice, Brindisi, Athens and Tel Aviv. Fifteen minutes later the captain informed London Airport that he had engine trouble and wished to return to Blackbushe. During the return flight the aircraft initially maintained 7 000 ft. Clearance was given to descend to 3 000 ft, but the descent was apparently continued to 1 000 ft without informing Control. Shortly afterwards the aircraft reported "having difficulty maintaining height" and six minutes later, at 0632 hours, it crashed killing the 3 crew members and 4 other persons on the ground.

Investigation and Evidence

The Aircraft

The aircraft was built in 1946 and had been used chiefly on research and experimental flights prior to 1957. It had flown a total of only 2 319 hours since new, of which 783 hours had been flown since renewal of the Certificate of Airworthiness, which was valid at the time of the accident. Both the engines and propellers were within approved life since overhaul.

Maintenance at Blackbushe Prior to the London - Tel Aviv Flight

The aircraft was due to leave Blackbushe at approximately midday on Monday, 1 September, in order to fly to London Airport, and it was intended that the aircraft should leave that evening for Nice en route to Tel Aviv. As a result, the time left for maintenance was limited.

The Company's engineering department was not at that time an approved inspection organization and, accordingly, any work of repair or maintenance required certification by a licensed engineer whether it involved engines, airframe or radio.

On the morning of 1 September three snags were reported, the second of which was as follows:

> "Strb. engine C.S.U. oil leak also surging - suggest change C.S.U. (or seal)."

(The C.S.U. is an abbreviation for the "constant speed unit", a finely tooled part fitted on top of the engine close to the propeller and which serves to maintain the revolutions of the propeller at a constant speed.)

Two fitters carried out a Check I on the starboard engine which was completed by 0700 hours, but the snags were left for rectification in daylight. A Check I on the port engine was then carried out and the reported snags dealt with. A new stalk seal was fitted to the starboard propeller and the C.S.U. was removed and replaced with an overhauled unit taken from store. A new gasket was fitted at the base of the C.S.U. where it connects with the engine. When the work on the engines was completed, they were given a ground run by a licensed engineer, who carried out a full feathering test on each engine during the run and certified the work. Carrying out a complete feathering test on each engine was, in fact, departing from the requirements of the approved maintenance schedule of the Company, which prescribed a

snap check only for a Check I... a full check if carelessly or too frequently conducted might tend to weaken the electric motor. The engineer explained that he had never seen the approved maintenance schedule. The fuel and oil tank contents were checked; each of the oil tanks contained between eleven and twelve gallons.

Whilst the notified snags were dealt with, it is doubtful whether the normal work of the Check I was properly carried out. Later events pointed strongly to the fact that the source of the oil leak was not in fact discovered. In short, the work of maintenance was carried out by tired men, working under pressure and without proper supervision or instruction.

Maintenance at London Airport

At London approximately one gallon of oil was found under the front of the starboard engine - either the oil leak reported previously had not been corrected or another oil leak had developed.

In view of the difference in the amounts of oil remaining in the tanks (port - 10 gallons, starboard - 6 gallons) the Commissioner found it impossible to believe that the oil had only begun to leak when the aircraft came to rest.

The Company's office at Blackbushe was informed that the aircraft was held up at London with an engine snag. This message reached the engineer in charge who knew that there was no licensed engineer in the party at London - he sent back the message that if help was needed they should contact Fields or Hunting-Clan at London Airport.

The crew called Blackbushe again and during the conversation one of the engineers, unlicensed for this aircraft, told the engineer in charge that the trouble with the aircraft was the seal on the C.S.U. and asked for a new seal. The engineer in charge said in evidence that the engineer must have meant gasket, because he knew that neither this engineer nor his companion, (another unlicensed engineer, who was to act as engineer on the flight from London to Lod Airport), would be justified in taking the C.S.U. to pieces. He stated that he had no spare C.S.U. in the stores but promised to send a spare gasket. The engineer in charge (Blackbushe) later said that the engineer had used both the words seal and gasket and had said that Fields could not supply him - presumably with a new C.S.U. He also stated that he had asked the engineer whether it was a gasket for the base of the C.S.U. which he wanted - to which the engineer assented.

The engineer in charge knew perfectly well that if a C.S.U. were taken apart and the seal exposed it could not be refitted until it had been rig tested and that none of the men at London Airport was qualified to carry out this work or to certify its proper completion.

Following the telephone conversation, the engine was cleaned off with petrol, and it then appeared that the leak was coming from the seal of the C.S.U. Accordingly, two of the engineers proceeded to remove the C.S.U. and open it, disclosing - so it was asserted - that the seal was malaligned. One of the engineers then attempted to rectify the trouble.

The gasket which was taken off when the C.S.U. was removed was reported to be in perfectly good order and examination of the seal of the C.S.U. revealed that it was not damaged. The C.S.U. was, therefore, reassembled using the old seal and the unit was reaffixed to the engine using the old gasket. (Following the crash, tests were carried out which showed conclusively that the seal was properly fitted and functioning perfectly, while the same was true of the gasket. The accident could not, therefore, have been caused by any leakage from the C.S.U.). Three engine runs were then made during which the starboard engine was completely feathered once.

If any written record of the work done at London Airport was made out, it must have been destroyed in the crash.

Loading

Prior to departure from London Airport the captain signed the load sheet which showed that the weight of the aircraft at take-off was 32 kilogrammes within the permitted maximum. However, the Commissioner believed that it was overloaded to an extent of nearly 400 kilogrammes. In spite of the overload, the aircraft, if properly handled, ought still to have been able to climb on one engine. It was not considered, therefore, that the overloading was a serious factor in the cause of the crash.

The Crew

The captain had a great deal of flying experience, having flown approximately 13 000 hours with BOAC and the Royal Air Force. He was taken ill on 17 August and was confined to bed with an infection diagnosed as streptococcal. He had been pronounced fit for duty on 26 August.

It was established that prior to 1958 he had not been given the six-monthly checks with the proper frequency or at the proper intervals.

Checks were applied on 13 April and 29 August 1958. During the former check, which was carried out in the Viking aircraft involved in the accident:

1. failure of the port engine was simulated;

2. the actual landing was not, however, carried out on the starboard engine only;

3. the aircraft was not loaded to the maximum permissible landing weight although it had been so certified;

4. the completion of the check form was lax.

It was concluded that the test was not sufficient to check the captain on his ability to fly and land the aircraft with one engine inoperative.

Similar criticisms applied to the check of 29 August, which was carried out in a DC-4 aircraft.

The first officer had had less than 1 000 hours flying of which only about 24 hours had been on twin-engined aircraft. He was employed as a probationary pilot from 30 August. The Commissioner believed that no proper six-monthly check had been carried out or could have been carried out on the first officer during a positioning flight from London to Blackbushe (10 minutes) on 30 August - as was suggested by the Company's Operations Manager and the chief pilot.

The engineer officer had been employed by the Company less than 3 weeks. He was an airframe engineer, not licensed to certify any work on the engines, and the captain had been advised by the engineer in charge (Blackbushe) to "keep his finger on him".

Fatigue

Following his return to duty and prior to the final flight the captain had not been allowed the rest times required by Article 34F of the Air Navigation (Fifth Amendment) Order, 1957. Under the regulation no pilot is to be required to make a flight in a public transport aircraft unless he has had at least ten hours rest since his preceding duty period.

On 30 and 31 August he made a series of flights. Under the Air Navigation (Fifth Amendment) Order, 1957, and under the provisions of the Company's operations manual designed to give effect to the Order, a crew is to be regarded as on duty 45 minutes before scheduled time of take-off and for 30 minutes after landing. In the result he was on duty as follows:

From 1225 hours on Saturday, 30 August, until 0200 hours on Sunday, 31 August. He, accordingly, became entitled

to 14 hours rest from 0200 hours that morning. In fact, in breach of Article 34F of the Order, he got 7 hours 15 minutes before he again went on duty. Under the Order, if the period between two duty periods is less than 10 hours, the two duty periods are to be treated as one duty period.

On Sunday, 31 August, he was on duty from 0915 hours until 1955 hours, and since this duty period was to be treated as one with that of Saturday, he had been on duty for 31 hours 30 minutes, a gross breach of Article 34E of the Order, since the maximum permissible flying duty period for a two-pilot crew is 16 hours.

However, he was again on duty on Monday, 1 September, at any rate from 1325 hours and owing to the trouble found at London Airport was evidently on the Airport and, consequently, on duty until at least 2000 hours. He cannot have had 10 hours rest from the time he left the Airport until he got back there, which on the evidence was at about 0400 hours (British Summer Time) on the morning of Tuesday, 2 September. In the meantime he had gone to bed without a meal and after drinking only a small whisky. He was disturbed at 0100 hours during a search for spares for the aircraft, did not eat his breakfast and had to be roused for the final flight.

The first officer had spent a disturbed night prior to the last flight and the engineer had not had more than approximately two hours sleep.

In short, this crew had not had the rest desirable, and to which indeed they were entitled under the regulations, before taking-off in an overloaded aircraft whose mechanical condition was suspect.

The gravity of this matter, and of the disregard of the regulations in the case of the rest time to which the captain was entitled, became apparent when it was disclosed that the Company had been prosecuted and convicted in May 1958 on 10 charges involving breaches of the regulations governing flight time limitations, and that these convictions involved both excess hours and insufficient rest accorded to pilots.

On 26 August 1958, following an investigation by the Ministry, it was pointed out during an interview with Company officials that a spot check carried out disclosed three breaches of Article 34(E) involving excess hours and three involving insufficient rest. When the facts in regard to the captain's insufficient rest are considered in the light of this interview only 4 or 5 days before, it is obvious that the regulations were being deliberately disregarded. The Operations Manager stated that he had spoken to the Managing Director of the Company (whose interest in the Company terminated on the first day of the inquiry) about breaches of the flight time regulations before the interview of 26 August, but the Managing Director took the view that a breach was not a breach provided it was reported afterwards. This was taken to mean that the Company would report the breaches with an explanation of why they had occurred and thus expect to receive a dispensation from the Ministry. This cannot serve as any explanation of a series of flagrant breaches - as the Commissioner was aware that none of them had in fact been reported and did not believe the Company had the slightest intention of reporting them. These matters were the subject of consideration with a view to prosecution when the crash occurred - thereafter action was deferred pending the inquest.

The Flight

Following take-off at 0554 hours the aircraft was cleared to Epsom (at 2 000 ft), Dunsfold (at 4 000 ft) and then to climb away to 7 500 ft at Seaford out of the Airway. Ten miles southeast of Dunsfold (at 0609 hours) the captain informed London that he had engine trouble and wanted to return to Blackbushe. He was told he could return to Dunsfold at 7 000 ft, and in

answer to a query, he advised that he was able to maintain altitude. The events of the remainder of the flight were as follows:

0611 - had throttled down one engine but had not feathered
- aircraft was descending to 5 000 ft
- was cleared to Blackbushe Beacon at 3 000 ft or over

0616 - had feathered the starboard engine but would re-start it for the landing at Blackbushe

0617 - London Airways confirmed he had passed Dunsfold
- instructed him to set course northwest for Blackbushe Beacon and told him to contact Blackbushe
- Blackbushe weather and QFE were passed to aircraft

0620 - ATC at London saw on radar that the aircraft was on the wrong course heading east of north towards Epsom - a heading error of 70°

0621 - G-AIJE was observed by another aircraft to be flying at about 2 500 ft on a northeasterly heading

0622 - Blackbushe, at the request of London ATC, asked the aircraft to confirm it was on course for the Blackbushe Beacon
- G-AIJE replied, "I have your beacon, turning and going dead ahead" - meaning presumably, a turn to the west
- when informed that he was heading for Epsom, the captain said he would "retune"

0624 - G-AIJE asked for and was given a QDM (magnetic course to Blackbushe)

0625 - was offered GCA
- replied, "I'll take GCA please ... one engine feathered and I don't seem to be able to unfeather ..."

0626 - reported "10 miles E of Blackbushe" - "having difficulty maintaining height ... 1 000 ft ....800 ft ....."

Thereafter a series of QDMs were passed; GCA attempted unsuccessfully to contact the aircraft which continued to lose height until it crashed at 0632 hours, 3 miles NE of London Airport and more than 20 miles from Blackbushe.

Eyewitnesses stated that the aircraft was flying on the port engine only, the starboard engine being feathered - facts which were confirmed by the examination of the wreckage. Examination of the wreckage further proved that prior to the accident the engines and propellers were in sound working order and that the starboard engine showed no signs of lack of lubrication. It was established that the starboard feathering motor was burned out and that this had occurred prior to the crash, a fact which explains the inability of the captain to unfeather this engine. The destruction of the sump was so complete that it was impossible to ascertain the source of any oil leak. Signs of oil sprayed from the starboard engine on to the starboard tailplane indicated, however, that there probably was an oil leak.

Discussion of Evidence

It was concluded that there probably was an oil leak which showed itself at 7 000 ft but was not considered to be serious and, therefore, the captain only throttled back instead of feathering the starboard engine.

It is difficult to understand why an experienced pilot should take the wrong course, despite the directional assistance

of the sun and a magnetic compass - there were two possible explanations:-

1. the captain or first officer tuned the ADF equipment to Epsom instead of Blackbushe; or

2. the captain was misled by the Amsterdam Beacon.

Blackbushe Beacon was established some years ago operating on a frequency of 379.5 kilocycles and to an effective range of 15 NM, interrupting its signal at intervals of 8 times per min by the code signal MB. Meanwhile, Amsterdam, which is a powerful navigational beacon with a frequency of 381 kilocycles, transmits its signal interrupted at half minute intervals with its code sign P.H.A. If a set is mistuned towards Amsterdam at a point outside the 15 mile radius of Blackbushe, the effect may be that the radio compass needle will be influenced by the Amsterdam signal and will show a false reading. If the pilot follows this bearing he will fly an incorrect course and the error is likely to increase.

The ADF panel to which the pilot has to tune his set is rather above his head and is only marked at every 10 kilocycles. It is obviously easy to mistune, and if he mistunes outside the area of 15 NM, where protection is assured, he may find that his radio compass is pointing away from Blackbushe, with the result that if he follows it blindly he is flying off course.

The aircraft was clearly informed that it was off course, but it is apparent from the reconstruction of the flight (Figure 26) that the crew did not know their exact position.

A remarkable feature of the R/T record is that the pilot does not seem to have relied at all on his magnetic compass which ought to have suggested his error long before he was warned of it.

The real crisis arose when the captain found that he could not unfeather and could not maintain height. He had feathered the starboard engine at 0616 by depressing the feathering button. There can be no real doubt that either the button was held in, or more probably stuck in, with the result that by 0625 the motor was burned out. There is a warning light fitted which would normally show red if the motor was being run unduly. This cannot have been observed, possibly due to the bright sunshine in which the aircraft was flying. Alternatively, the motor may have been damaged in the course of the feathering checks on the various ground tests.

Evidence showed that the single-engine-climb performance of the aircraft was above average. It should, therefore, have been possible to climb the fully loaded aircraft at about 200 ft/min. Nevertheless, the pilot came down from 3 000 ft to 1 000 or 800 without a word of warning, and subsequently allowed the speed to drop so that he could no longer climb on one engine. The Commissioner believed that the captain was flying the aircraft in a manner quite out of keeping with his experience and attributed this behaviour to the fact that the captain was affected with fatigue to a very marked extent.

The Directors of the Company put the whole blame for this accident on the captain. It was said that the loading responsibility was his, and his the responsibility for taking-off in the aircraft. He also had been responsible for testing his first officer and in effect, as was suggested, had chosen his crew. They were not prepared to admit any criticism of their own actions or that the actions of this captain might have been affected by the policy of the Company.

A full and searching report into the affairs of this Company made by the Officers of the MTCA in December 1958 shows that since this accident the Company has taken great pains and spent a good deal of money in putting its affairs in order, with the result that its organization now bears favourable comparison with that of other larger companies and so that, if it is

given a chance to do so, it is now able to provide a safe and proper service.

Probable Cause

The aircraft was allowed to lose height and flying speed with the result that the pilot was no longer able to exercise asymmetric control.

The conduct of the pilot and the whole course of events outlined were contributed to by the deliberate policy of this Company, which was to keep its aircraft in the air and gainfully employed regardless of the regulations or of the elementary requirements which should enjoin consideration for the conditions of working of its employees or the maintenance of its aircraft.

Any responsibility of the captain is to be viewed in the light of his position as an employee upon whose shoulders an intolerable burden was placed.

Recommendations

Six-monthly check

Recommendations in this regard were made in the report of 17 October 1957 (C.A.P. 146) on the accident at Blackbushe to Viking, G-AJBO, and were endorsed in the report of 19 July 1958 (C.A.P. 149) on the accident to Solent aircraft, G-AKNU, however, it was believed that they had not been implemented as at the time of writing of this report.

In particular, the following had been recommended:

a) that the check should be conducted on a special flight;

b) that in the case of a twin-engined aircraft it should include on at least every other occasion a landing with one engine inoperative at night;

c) that steps should be taken to facilitate the checking of a Company's records

Articles 34(B) and 34(E) of the Air Navigation (Fifth Amendment) Order 1957

These Articles provide a limitation on the flight time hours of the crew of public transport aircraft "for preventing excessive fatigue". A public transport aircraft is defined in Article 73 of the Air Navigation Order 1954 as "an aircraft carrying passengers or goods for hire or reward".

It was recommended:

- that in addition to stipulating a minimum rest time before a public transport flight and a maximum flight time for that flight a minimum rest time must also be stipulated after it and before any other flight whatever.

Tuning of ADF Equipment

It was agreed that the practice of seeking navigational guidance outside the service range of the wanted signal was undesirable.

However, assuming a pilot is warned of the risk and accordingly takes care to check the accuracy of the guidance he is receiving from his ADF equipment by the other methods available to him, there is no reason why he should not tune to a beacon from outside its strict service range.

Records of Maintenance

Article 17(8) of Air Navigation Order, 1954, deals with this subject. Its whole object is to ensure the making of the appropriate entry after each flight (as defined in Article 20(6) * and the preservation of the record of defects for a period of two years.

* "flight includes the whole of the period occupied in transit from an aerodrome to the aerodrome of next landing from the time when the aircraft is first in motion on the ground until the time when it comes to rest on landing."

It is recommended:

1. that in the case of the current record of defects any necessary amendment should be made to require that this record shall be completed in duplicate at the termination of each flight as defined by Article 20(6) and that in each such case one copy only shall be carried in the aircraft and that arrangements shall be made to ensure the preservation of the record for two years;

   (It may be useful to compare the practice in regard to load sheets where one copy is left on the ground.)

2. that the word "emergency" in the proviso to Regulation 49* should be defined as applying only to circumstances where an aircraft for some reason beyond the control of the operator or crew lands at an airport where facilities do not exist to enable the requirements of Regulation 49 to be complied with and as extending only to a flight from that airport to the nearest airport at which such facilities exist.

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* designed to cover the carrying out of temporary repairs in emergency.

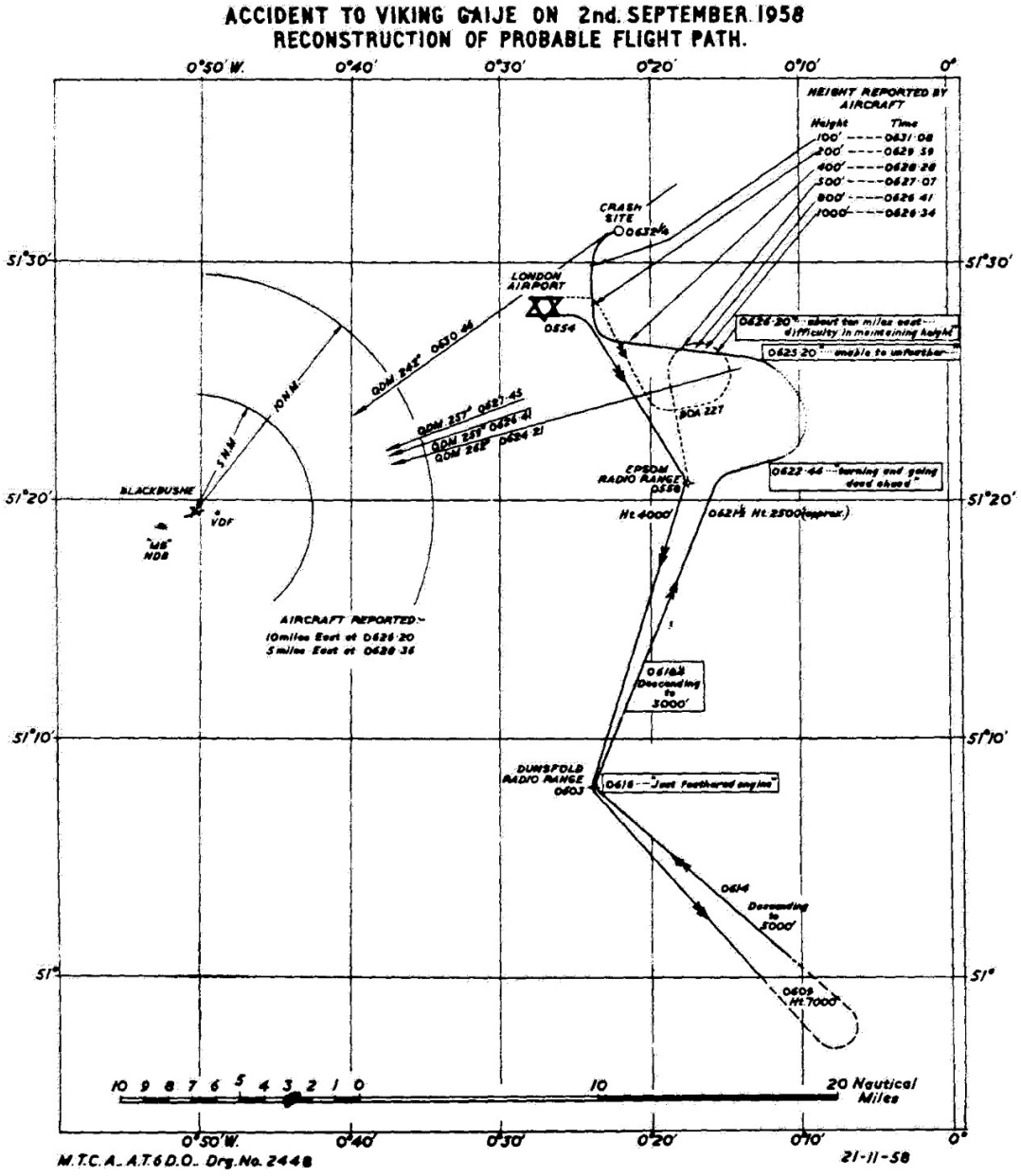
ACCIDENT TO VIKING GAIJE ON 2nd. SEPTEMBER 1958
RECONSTRUCTION OF PROBABLE FLIGHT PATH.
0°50' W.
0°40'
0°30'
0°20'
0°10'
0°
51°30'
51°20'
51°10'
51°
HEIGHT REPORTED BY AIRCRAFT
Height Time
100' ---- 0631·08
200' ---- 0629·59
400' ---- 0628·26
500' ---- 0627·07
800' ---- 0626·41
1000' ---- 0626·34
CRASH SITE
0632½
LONDON AIRPORT
0554
0626·30 "about ten miles east — difficulty in maintaining height"
0625·20 "unable to unfeather"
QDM 245° 0630·46
QDM 237° 0627·45
QDM 259° 0626·41
QDM 262° 0624·21
QDM 227
10 N.M.
5 N.M.
BLACKBUSHE
VDF
"MB" NDB
EPSOM RADIO RANGE
0558
0622·46 "turning and going dead ahead"
Ht 4000'
0621½ Ht 2500' (approx.)
AIRCRAFT REPORTED—
10 miles East at 0626·20
5 miles East at 0620·36
0618
Descending to 3000'
DUNSFOLD RADIO RANGE
0603
0616 — "Just feathered engine"
0614
Descending to 5000'
0609
Ht 7000'
10 9 8 7 6 5 4 3 2 1 0
10
20 Nautical Miles
M.T.C.A. - A.T.6 D.O. Drg. No. 2448
21-11-58

FIGURE 26