

STATEMENT OF WALTER S. LUFFSEY, ASSOCIATE ADMINISTRATOR FOR AVIATION STANDARDS, BEFORE THE HOUSE COMMITTEE ON SCIENCE AND TECHNOLOGY, SUBCOMMITTEE ON TRANSPORTATION, AVIATION, AND WEATHER, CONCERNING NAVIGATION SYSTEMS. SEPTEMBER 19, 1983.

Mr. Chairman and Members of the Subcommittee:

I am pleased to appear before the Subcommittee to discuss the kinds of air carrier navigation systems in use today. With me today is Neal Blake, FAA's Deputy Associate Administrator for Engineering.

In the North Pacific (NOPAC) for operations within the Anchorage and Tokyo Flight Information Regions airspace in the area transited by Korean Air Lines Flight 007, U.S. air carriers who will fly at Flight Levels 280 through 450 are required by the FAA to have one of the following types of navigation systems: an approved dual Inertial navigation system (INS); an approved dual OMEGA navigation system; an approved system comprised of an Inertial navigation system and an OMEGA navigation system; or an approved Doppler radar navigation system and an Inertial navigation system or OMEGA navigation system. International standards contained in ICAO Annex 2 require an aircraft, which is not under VFR rules, to have "navigation equipment which will enable it to proceed: a) in accordance with its operational flight plan; and b) in accordance with the requirements of air traffic services...."

While the U.S. operations procedures permit the use of different types of navigation systems for oceanic use, and ICAO rules are not specific on equipment, a survey of NOPAC traffic between January 10-23, 1982, showed that all aircraft flying the composite routes (R-20, R-80, A-90, R-91, and G-44) were equipped with at least INS, and, for that matter, all traffic in NOPAC was equipped with INS except for one carrier which has now equipped its oceanic aircraft with INS. It is now common international practice for oceanic aircraft to use INS, a combination of INS and OMEGA, or OMEGA.

Joint U.S./Japanese monitoring of navigation accuracy at the end points of the NOPAC composite route system between March and September 1982, found only one aircraft with a lateral position error greater than 10 nautical miles. That aircraft was 17 nautical miles from centerline, well within the accuracy required for the safety of aircraft using the composite routes. The demonstrated navigation performance of both INS and OMEGA is adequate to meet the demands for safe flight in the NOPAC composite route system where aircraft at the same altitude are separated by 100 nautical miles. The maximum permissible error for INS is 2 nautical miles per hour. Actual demonstrated performance on over 500,000 flights has shown that the average INS drift rate is, in fact, about one nautical mile per hour. The average time in the NOPAC composite route system

is approximately 5 hours; consequently the maximum permissible navigation error for INS is about 10 nautical miles at the end point. OMEGA in the NOPAC has a demonstrated accuracy of better than 4 nautical miles.

The operation of both INS and OMEGA is similar except for the INS alignment prior to use. For either system to be useful, the operator must insert the desired navigation information. The information consists of trip origin, destination, and, if required, intermediate "way points." This data is most commonly entered as latitude and longitude out to tenths of minutes.

Both INS and OMEGA have good operational histories. Nevertheless, the FAA requires U.S. air carriers to have dual systems so that redundancy is provided. Since both systems must be operating at departure, many carriers have installed three INS units or a dual INS with an OMEGA as back-up.

In addition to prescribed types of navigation equipment, all U.S. air carriers operating large turbojet aircraft are equipped with airborne weather radar for the detection of thunderstorms and other potentially hazardous weather conditions considered detectable with such equipment. The airborne weather radar must be operational prior to departing

under IFR or night VFR over a route when current weather reports indicate that thunderstorms, or other detectable weather conditions, may reasonably be expected along the route to be flown. ICAO recommended practices are comparable to these FAA requirements.

When operating over the NOPAC composite route structure, the airborne weather radar required of U.S. air carriers must be capable of day and night ground mapping. This radar must be operational prior to departing over these routes, and must be used continuously by the flight crew to monitor flight progress over these routes.

With respect to the KAL tragedy, the Members of this Subcommittee are aware that the United States is participating in the investigation being conducted by the South Korean Government. To date no formal conclusions have been reached concerning the reason or reasons why Flight 007 would have been off course. Accordingly, I can't shed any additional light on this topic nor am I in a position to speculate about the reasons given the pendency of the investigation. I can say we have gone over the communications between our controllers and Flight 007 and have found nothing which would have provided our controllers with any indication that the plane was off course. All communications up to and including the last transmission

received by the FAA were of a normal, routine nature. For your information, I am appending to my prepared statement a transcript of those communications.

Mr. Chairman, that completes my prepared statement. I will be pleased to respond to questions you may have at this time.



U.S. Department
of Transportation
**Federal Aviation
Administration**

Memorandum

Subject: Consolidated transcription on Korean flight 007
on 8-31-83 from Anchorage Tower, Anchorage Center
and Anchorage International Flight Service Station

Date: September 11, 1983

From: Joseph A. Beaudoin
Accident/Incident Analysis Branch

Reply to
Attn. of: AAT-340

<u>Agencies making transmissions</u>	<u>Abbreviations</u>
Anchorage Tower	ANC APCH
Anchorage Air Route Traffic Control Center:	
Sector RD 5/6	D 5/6
Sector D 2/3	D 2/3
Sector D 10/11	D 10/11
Anchorage International Flight Service Stn.	IFSS or E459
Tokyo Air Route Traffic Control Center	TKY CTR
Korean Air Lines Flight 007	KE007
Korean Air Lines Flight 015	KE015
United Air Lines Flight 18	UA18
Unknown Source	UNK

This transcription is in a sequential order and will identify the source from whence it was derived from at the beginning of each different segment. Duplications have been eliminated. All times indicated will be in GMT (Greenwich mean time).

Anchorage Tower

1250:12	KE007	Uh clearance Korean zero zero seven uh have information sierra Seoul at three one zero
1250:18	ANC APCH	Korean Air zero zero seven heavy is cleared to Seoul via the Anchorage eight departure then as filed climb and maintain flight level three one zero departure frequency one one eight point six squawk six zero seven two
1250:34	KE007	Korean zero zero seven cleared to Seoul Anchorage eight departure climb and maintain three one zero one one eight six six zero seven two
1250:43	ANC APCH	Korean zero zero seven heavy read back was correct

1250:59 KE007 Ground Korean zero zero seven request push gate two

1251:04 ANC APCH Korean Air zero zero seven heavy push at your discretion
plan runway three two

1251:08 KE007 Roger

1255:40 KE007 Uh-ground Korean Air zero zero seven taxi

1255:45 ANC APCH Korean Air zero zero seven heavy taxi to runway three two

1255:50 KE007 Runway three two roger

1258:33 KE007 Korean zero zero seven ready for takeoff

1258:36 ANC APCH Korean Air zero zero seven heavy roger departure frequency
will be one one eight point three same as tower cleared
for takeoff runway three two

1258:45 KE007,, Roger one one eight three

1301:12 ANC APCH Korean Air zero zero seven heavy Anchorage departure radar
contact climb and maintain flight level three one zero
turn left heading two two zero

1301:22 KE007 Roger two two zero climb and maintain three one zero roger

1302:40 ANC APCH Korean Air zero zero seven heavy proceed direct Bethel
when able

1302:45 KE007 Roger uh proceed direct to Bethel roger

1304:39 ANC APCH Handoff forty seven line

1304:45 D 5/6 Go ahead

1304:47 ANC APCH About seven west of the VOR Korean Air zero zero seven
heavy going direct Bethel

1304:51 D 5/6 He's radar

1304:54 ANC APCH He's off on the hour (unintelligible) TD

1305:13 ANC APCH Korean Air zero zero seven heavy contact Anchorage Center
one two five point seven good day

1305:18 KE007 (unintelligible) good day

Anchorage ARTCC Sector RD 5/6

1305:03 KE007 Anchorage Korean Air zero zero seven leaving five thousand
for three one zero good morning

1305:09 D 5/6 Good morning Korean Air zero zero seven rog

1327:50 D 5/6 Korean Air zero zero seven radar service is terminated
contact Center one two five point two good morning

1327:53 KE007 two five two good morning

Anchorage ARTCC Sector D 2/3

1328:01 KE007 Anchorage Center Korean Air zero zero seven good morning
now leaving three zero zero for three one zero

1328:06 D 2/3 Korean Air zero zero seven roger report Bethel

1328:11 KE007 Report Bethel roger

1350:09 KE007 Anchorage Korean Air zero zero seven

1350:12 D 2/3 Korean Air zero zero seven go ahead

1350:14 KE007 Zero zero seven Bethel at four niner flight level three
one zero estimate NABIE at one four three zero two one
niner decimal zero minus four niner two niner five
diagonal two five

1350:28 D 2/3 Korean Air zero zero seven roger report NABIE to Anchorage
on one two seven eight

1350:33 KE007 one two seven eight roger

1350:42 D 10/11 Go ahead

1350:43 D 2/3 Korean Air zero zero seven says NABIE one four three zero TJ

1350:47 D 10/11 KD

Anchorage ARTCC Sector D 10/11

1432:21 D 10/11 Korean Air zero zero seven Anchorage Center

1432:32 D 10/11 Korean Air zero zero seven Anchorage Center

1433:37 D 10/11 Korean Air zero zero seven Anchorage Center

1433:47 UNK (unintelligible)

1433:52 D 10/11 Korean Air zero zero seven Anchorage Center how do you read

1434:18 UNK *(Well wait a minute call again please)

*(best interpretation)

1434:37 D 10/11 Korean Air zero zero seven Anchorage Center
1434:50 UNK *(Three three zero I can't wait a minute)
1434:54 UNK *(Three three zero okay I got it hello)
- *(best interpretation)
1435:02 KE015 Anchorage Korean Air zero one five
1435:08 D 10/11 Korean Air zero one five Anchorage Center go ahead
1435:11 KE015 Roger Korean Air zero one five ah forwarding report ah
Korean zero zero seven position NABIE one four three two
flight level three one zero estimating ah NEEVA one five
four nine fuel remaining two zero zero decimal zero
minus four nine spot two five zero diagonal six zero
go ahead
1435:38 D 10/11 Korean Air zero one five roger ah have Korean Air zero
zero seven report NEEVA to Anchorage Center one two eight
decimal two
1435:52 KE015 Roger NEEVA one two eight decimal two good day
1436:00 KE015 Zero zero seven
1436:12 E459 Four five nine
1436:14 D 10/11 Four five nine Center channel eleven reference ah Korean
Air zero zero seven
1436:19 E459 Go ahead
1436:21 D 10/11 Ah you can cancel it
1436:22 E459 GB
1436:23 D 10/11 KD

Anchorage International Flight Service Station

1444:10 KE007 Anchorage Radio Korean Air zero zero seven
1444:15 IFSS Korean Air zero zero seven Anchorage
1444:20 KE007 Roger Korean Air zero zero seven position NABIE one four
three two three one zero estimating NEEVE one five five
three remaining fuel two zero zero decimal zero minus
four nine wind two five zero diagonal five ah diagonal
six five ah selcal code golf kilo foxtrot hotel requesting
level three three zero when available

1444:50 IFSS Korean zero zero seven Anchorage understand NABIE one four three two three one zero NEEVE one five five three is that correct

1445:00 KE007 Affirmative Korean Air zero zero seven thats affirmative

1445:20 IFSS Korean zero zero seven Anchorage roger progress standby for sel check

1445:30 KE007 Korean zero zero seven selcal ok thank you

1445:40 IFSS Korean zero zero seven Anchorage roger and ah contact Anchorage Center now one two seven decimal eight make your request with them

1445:40 KE007 Roger one two seven eight roger

Anchorage ARTCC Sector D 10/11

1600:39 KE015 Anchorage Center Korean Air zero one five

1600:43 D 10/11 Korean Air zero one five Anchorage Center go ahead

1600:46 KE015 (unintelligible) relay NEEVA report for zero zero seven their position NEEVA one five five eight flight level three one zero estimate NIPPI one seven zero eight fuel remaining one six one decimal zero minus four eight spot two seven zero diagonal five five go ahead

1601:20 D 10/11 An Korean Air zero one five understand this is a position report for Korean Air zero zero seven and advise Korean Air zero zero seven to ah report NIPPI to enroute radio thank you very much

1601:32 KE015 Roger

Anchorage International Flight Service Station

1603:55 KE007 Anchorage Radio Korean Air zero zero seven

1604:05 KE007 Anchorage Korean Air zero zero seven

1604:12 IFSS United one eight Anchorage radio

1604:21 KE007 Anchorage radio Korean Air zero zero seven

1604:31 IFSS Aircraft calling Anchorage on two niner one zero I'm unable to copy you would you give me a radio check on five six two eight now

1604:49 UA18 Anchorage radio United one eight

1604:51 IFSS United one eight I have you loud and clear this frequency go ahead sir

1604:58 UNK (unintelligible - sounds like KE007 & UA18 both talking)

1605:06 IFSS United one eight ATC is requesting you forward one five zero west progress and say again your request

1605:10 UA18 Ok we're requesting flight level three seven zero we crossed ah (KE007---Anchorage radio Korean Air zero zero seven) four eight north one five zero west one five zero zero three five zero four seven north one four zero west one five five one (unintelligible) minus four six (KE007---Korean Air zero zero seven) go ahead

1605:35 IFSS United one eight roger I copied that earlier my mistake sir thank you I have your request and will give it back to ATC standby

1605:41 UA18 / Thank you

Anchorage ARTCC Sector D 10/11

1606:25 KE015 Anchorage Center Korean Air zero one five now reaching flight level three five zero

1606:31 D 10/11 Korean Air zero one five roger flight level three five zero and would you ask Korean Air zero zero seven if he would like higher altitude prior to NIPPI

1606:40 KE015 Ah yes zero zero seven requested three three zero

1606:44 D 10/11 And ATC clears Korean Air zero zero seven climb and maintain flight level three three zero report reaching through you or through enroute radio

1606:53 KE015 Roger they are now leaving three one zero for three three zero and (unintelligible) Korean Air zero zero seven

1607:04 D 10/11 Roger

1610:30 KE015 Anchorage Center Korean Air zero one five

1610:34 D 10/11 Korean Air zero one five go ahead sir

1610:37 KE015 (unintelligible) three three zero Korean Air zero zero seven we talk on one two three four point zero

1610:45 D 10/11 Korean Air zero one five thank you and report NIPPI to enroute radio have a good flight

1610:50 KE015 Good morning

1612:35 TKY CTR This is Tokyo Center

1612:37 D 10/11 Anchorage Center two transfers first Korean Air zero zero seven

1612:44 TKY CTR Go ahead

1612:45 D 10/11 Korean Air zero zero seven flight level three three zero
NIPPI one seven zero eight the next Korean Air zero one
five

1612:55 TKY CTR (unintelligible)

1612:56 D 10/11 Korean Air zero one five three five zero NIPPI one seven
one four go ahead

1613:04 TKY CTR Roger Korean zero zero seven NIPPI ah ah Korean zero zero
seven flight level three three zero NIPPI one seven zero
eight and the Korean zero one five flight level three
five zero NIPPI one seven one four India Alpha

1613:19 D 10/11 Thank you Tango Alpha

Anchorage International Flight Service Station

1623:00 IFSS Calling Anchorage on five six say again your call sign
and go ahead sir

1623:06 KE007 Korean Air zero zero seven on five six radio check

1623:11 IFSS Korean Air zero zero seven Anchorage three by three

1623:16 KE007 Thank you

END OF TRANSCRIPT