

Review: KE007 A Conspiracy of Circumstance, By Murray Sayle

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Black Box: KAL 007 and the Superpowers,
by Alexander Dallin //
University of California Press, 130 pp., \$7.95 (paper)

KAL Flight 007: The Hidden Story,
by Oliver Clubb //
Permanent Press, 174 pp., \$16.95

Final Report of Investigation as Required in the Council Resolution
of September 16, 1983 [C-WP/7764]

International Civil Aviation Organization (Montreal), 113,
restricted, but available on serious request pp.

1818th Report to Council by the President of the Air Navigation
Commission [C-WP/7809]

International Civil Aviation Organization (Montreal), 23, restricted,
but available on serious request pp.

North Atlantic Airspace Operations Manual-Fourth Edition

Civil Aviation Authority (London), 32, available on request pp.

NOPAC Route Systems Operations Handbook Administration

Anchorage Air Route Traffic Control Center, Federal Aviation, 16,
available on request pp.

1.

Shortly before dawn on September 1, 1983, a Boeing 747 Flight KE007 of Korean Air Lines was shot down over Sakhalin Island in the Soviet Far East by an SU-15 fighter of the Soviet Air Force, with the loss of all 269 passengers and crew on board. The incident set off a contest in vituperation between the super-powers, which, a year and a half later, still reverberates. President Reagan called the shoot-down "a terrorist act to sacrifice the lives of innocent human beings," while the Soviets have never ceased charging that the aircraft was engaged on a "special mission" of electronic espionage on behalf of the United States, thus by implication justifying what they call their "termination" of the flight.

No satisfactory account of how KE007 came to be over Soviet territory prohibited to all foreign aircraft has yet been published in either country, although, after a tardy start, the Soviets now freely admit that their fighter shot it down on orders radioed to the pilot from his sector commander on the ground. The incident is still routinely used by American officials as proof of the evil they attribute to the Soviet system. The Federal Aviation Administration is prevented by court order from answering questions on the subject, and Washington officials refuse to disclose details of the intelligence operation that they agree was being conducted against the Soviet installations on Sakhalin on the night of the shoot-down.

The inevitable result of American reticence has been copious conspiracy theories, some seeming to take the Soviet propaganda campaign as their point of departure, most based on newspaper clippings and magazine articles, pored over by academics interested in politics and amateurs fascinated by the spying industry and its many tentacles. Further confusion has been contributed by the statements of lawyers active in the suits brought by relatives of the victims against the Korean airline, equipment manufacturers, and the US government. These claims now amount to \$2.3 billion and threaten to overwhelm the \$400 million in passenger liability insurance carried with Lloyds of London by the airline, which is resisting claims above \$75,000 for the death of each passenger. (Lloyds paid out \$35 million on the hull of KE007 within weeks of the shoot-down, and continues to insure the airline, which has been renamed Korean Air.)

Now the first two of what are certain to be a great many books on the subject have appeared. One, by Alexander Dallin, is a scholarly attempt to chart the wilderness of theories, conspiracy and otherwise, and identify such landmarks of fact as are known with reasonable certainty. The other, by Oliver Clubb, presents yet another such theory, naming two conspirators, the head of the Reagan administration and Captain Chun Byung In, the dead pilot in command, and indicating the presence of a cast of thousands in between (as, on this account, there must have been, there being no record of pilot and president ever having met).

It is easy to understand why conspiracy theories should sprout around this catastrophe. By any account, all but a handful of those who met a horrible death (it took twelve minutes for the aircraft, hit by a heat-seeking missile, to crash into the sea seven miles below) must have been innocent of any wrongdoing; and on the best evidence available all of them were innocent, apart from some carelessness on the flight deck not without precedent in the aviation industry. We all fly, and so, humbly, we murmur that there, but for the grace of God. To feel that such cruel suffering must have had a corresponding criminality is an understandable reaction. From one side, it was a crime by those who admit they shot down the airliner. From the other side, it was a crime by those who sent it there, as the conspiracy theorists so clearly and desperately want us to believe.

But such emotions are poor pointers to the direction in which we should start looking for the truth. It should be said at the outset that neither of the books under discussion tells the real story of KE007, although Dallin, as we shall see, is excellent on many aspects of the Soviets' actions and reactions. The two reports of the International Civil Aviation Organization (ICAO), based in Montreal, tell almost all that we want to know, but often unwittingly, and in a form the uninstructed lay person cannot follow without a guide. Offering myself as such, I had better, before going any further, declare my interest.

I live in Tokyo and, having journalistic connections in many parts of the world, began working on KE007 the day it was shot down, and continued for most of the following year, first for the London Sunday Times and Spectator, and then for a British television company that offered to finance an investigation as wide as was necessary to make a truthful documentary. Much information was available to me in Tokyo, and from there I proceeded to Anchorage, Alaska, from which KE007 took off on its last flight and where I was able to see the people responsible for air traffic control. I went to New York where the flight originated, and thence to London where, as we shall see, more important information was available.

The officials of the Federal Aviation Administration in Anchorage are under instructions not to discuss the KE007 incident, but they felt free to demonstrate to me the operations of the air route over the North Pacific which they control, both as it was on the night of August 31-September 1, 1983, and as it is now, much modified and improved. The officials of the British Civil Aviation Authority, which controls the North

Atlantic air route (North Atlantic and North Pacific are easily the world's busiest), gave me the results of computer calculations of the various possibilities of KE007's track over Soviet territory, and statistical information about the frequency of different air navigational errors on the North Atlantic route. None was available for the North Pacific, since no equipment had, at the time, been installed to detect them. I also talked at length with pilots from Pan American, Japan Air Lines, British Air, Northwest Orient, and others who regularly fly the North Pacific. (One of my informants flew the track KE007 should have flown, on the same night, without incident.)

I should, perhaps, add that I hold a certificate of competence in navigation (for yachts, not aircraft, although the basic aim and methods are similar) and have in fact navigated many ocean crossings, some alone. I have also had some experience flying in the cockpit with American and other civil and military pilots, in Vietnam and elsewhere, and even a little experience of Soviet military methods of intelligence gathering (having been arrested and interrogated in Prague in 1968). These details are not the basis for an argument from authority or, I hope, a case of vile self creeping in, but are intended as a caution. Little if any evidential value can be given to arguments by lay people about a pilot's behavior if they have no experience of what a pilot navigating an aircraft could or could not have seen, or what a fighter pilot at night must or could not have recognized (as, for instance, President Reagan's claim that "they must have seen it was an airliner").

Nor can much value be given to an assertion in *The Nation* last August, unsupported by convincing evidence, that a certain series of navigational errors and omissions was "extremely improbable." In matters of probability, statistical evidence is more persuasive than any other. While there is always a first time for everything, an argument that a thing cannot happen, or that it must be dismissed because it is improbable, collapses when there is evidence that it has already happened, somewhere else, and that there were plausible reasons why it could happen again.

Even on the day the KE007 disaster took place, it was already clear that the event was not a simple matter of right and wrong, but the result of a complex interaction of military, political, intelligence, and navigational elements; and very few people are simultaneously expert in all these fields. This, therefore, is a case that cries to heaven for logical rigor, divorced as far as is humanly possible from shock and horror-the scientific approach, in short. And here, in turn, initial inspection of the problem shows a clear fork in the line of inquiry.

The problem on which all the others turn is how, and why, KE007 got to where it was shot down. As a first approximation, there are only two possibilities: it was deliberately steered there, or it arrived by accident. One of these leads us to the romantic world of conspiracy, the other to the intricacies of modern aircraft navigational systems, how they can fail, and how often they are known to have done so. Which to choose?

Experience (four decades in my case) suggests to any seasoned investigator, academic, journalistic, or technical, that he should start with the possibility of accident. Every day that passes, with still no leak, confession, name, or anything else that could possibly be described as hard evidence of conspiracy, supports the wisdom of this choice. It would have been approved of by William of Ockham (1285-1349), who counseled: "Entia non sunt multiplicanda praeter necessitatem," or, freely rendered: "When offered a number of different theories, start with the simplest."

But the nature of the alternatives offered in this case means that we have, in fact, no choice. Of their nature, conspiracies can seldom be wholly disproved, particularly the kinds that are said to involve conspirators who are lying, faking evidence, and concealing, classifying, or destroying clues. Any difficulties that cast doubt on a conspiracy theory can be resolved by simply adding more conspirators, a process that is in this

case approaching full blast. That way lay madness, so I turned, instead, to the search for a feasible accident, and then set about trying to disprove that.

With much help, as outlined above, I found such an accident. The television documentary intended for the first anniversary of the shoot-down was, however, never made. The executive producer in charge of the project in London explained to me: "Conspiracies are sexy, accidents are not. We have to at least put forward the possibility that Reagan and the CIA were involved, or we don't have a viable program."

Well, that's show business. But an old-fashioned curiosity about the facts survived at the London Sunday Times, and my account of what happened to KE007 was eventually published there on May 20 and May 27 last year, to respectful attention in Britain and deafening silence in the United States, without, as far as I know, any conspiratorial implications. What follows is therefore for the most part published for the first time on this side of the Atlantic.

2.

The beginning and end of KE007's flight are not in dispute, and with them any inquiry must start. The aircraft departed from Anchorage, Alaska, at 1300 Greenwich mean time, 3 AM local time, scheduled to land at its home base, Seoul, South Korea, at 5:53 AM local time on September 1, 2053 GMT. It was shot down five hours and twenty-six minutes later at a spot approximately thirty miles west-northwest of the Soviet naval base at Korsakov on the southern tip of the island of Sakhalin, 365 miles off track from the international air route designated "Red 20" (R20) laid down in the flight plan filed at Anchorage.

What is the relationship between the points of takeoff and shoot-down? This is of only passing interest to conspiracy theorists, but it is central in the search for a feasible accident, since the aircraft must somehow have steered itself to the fatal spot. No large aircraft is flown manually for long distances these days. KE007 was fitted with a triple Litton Industries LTN-72R-28 Inertial Navigation System, not the most modern system, but one that was effective and in good working order.

How did it work? All navigation functions by establishing a relationship between the moving vehicle-ship, plane, or rocket - and some fixed point of reference. For Christopher Columbus, the reference points were the magnetic pole, the sun, and the stars. Even today, every airliner still carries a magnetic compass, since the airports of the world are all laid out on magnetic headings - "runway 32" at Anchorage is on the magnetic heading of 320 degrees.

The INS, however, has revolutionized airplane navigation. With the INS, the reference point is carried within the aircraft itself, in the form of a tiny platform, stabilized by gyroscopes which hold the platform steady in relation to the fixed stars. The INS can thus detect the rotation of the earth and determine the aircraft's latitude, longitude, altitude, and airspeed with astonishing accuracy.

Usually the pilot has to do little more than punch into the INS the latitude and longitude coordinates of successive intermediate points along his route, turn the rotary switch that couples the INS to the automatic pilot, and the automatic pilot will then steer the aircraft to its destination. In case an INS should fail, aircraft like 747s are equipped with three independent but electronically linked INS instruments, so that an error in one will instantly be disclosed by the other two. No simultaneous triple failure of an INS system has ever been recorded.

There has been much speculation about the possibility that KE007 was misprogrammed -- that is, the wrong coordinates were punched into one or more of the INS systems, an error known to have been made occasionally in the ten-year history of the civil use of inertial systems (and called, in the aviation business, "finger trouble"). But no one has found a feasible set of coordinates that could accidentally have been

punched into the INS that would have brought KE007 to the point where it was hit, even allowing for the maximum drift off course that has ever been recorded. Therefore, if KE007 was off course as the result of an accident, the INS could not have been steering it on its preprogrammed route.

Back, then, to the chart table. If the INS could not have accidentally flown KE007 to the fateful rendezvous, what could have? Only two other pieces of equipment aboard were capable of steering the aircraft. One was a beam-following device, which points the plane automatically in the direction of a given radio beacon. This is the highly accurate ground-based transmitter called VOR-very high frequency omnidirectional radio ranging-which aircraft often use. The VOR broadcasts pencil-thin beams of radio waves that radiate like the spokes of a wheel and so are called radials. An aircraft that has "captured a radial," as pilots put it, can fly along it with a maximum error of a mile at a distance of sixty miles from the transmitter. But there are no radio beacons in the area where the plane went down to which it could have been mistakenly tuned.

The other piece of navigational equipment was the aircraft's magnetic compass, which steers the plane on any compass heading chosen by the pilot. When the pilot selects a magnetic compass heading, the automatic pilot steers the plane along the selected heading through the INS mechanism, ignoring the coordinates that have been punched into the INS. If we consider the possibility that the plane was accidentally being flown on a magnetic compass course, we make an interesting discovery: the spot at which KE007 was shot down lies on the magnetic heading of 246 degrees from Anchorage, taking account of the winds the aircraft encountered that night, as reported by the aircraft's copilot by radio, plus or minus fifty miles to allow for the less-than-precise measurement of the wind pattern and variations in the earth's magnetic field.[1]

This leads to a further riveting discovery: the first magnetic heading out of Anchorage on KE007's assigned route is 246 degrees magnetic. This heading leads to Cairn Mountain, halfway to Bethel, the small fishing village which is the first compulsory reporting point on the flight from Anchorage across the North Pacific. But was KE007 actually flying on a heading of 246 degrees magnetic, steered by magnetic compass, at any time on the night it was shot down?

Yes, it must have been. The VOR radio beacon at Anchorage airport was not working that night, closed down, according to the FAA, for "routine maintenance." The crew of KE007 had been duly informed that the Anchorage VOR was out of action. But, as their company flight rule book then laid down (it has since been drastically revised), the crew was instructed not to couple the aircraft's autopilot to the inertial navigation system until they had confirmed, by reference to a VOR radio beam, that the first track that had been fed into the INS was correct. Bethel has, in fact, a VOR radio beacon specifically to enable pilots to check that they are on course as they fly over it.

KE007 did indeed report to Anchorage that it had passed over Bethel but in fact it had not. From radar evidence we know that KE007 was already six miles off track as it passed out of range (150 miles) of the civil surveillance radar at Kenai, near Anchorage, and it was twelve miles off track as it passed by Bethel. [2] This means that it could not have been coupled to either its own INS system or the Bethel VOR, neither of which could have permitted errors of such size so early in the flight. There is only one other possibility: KE007 was being flown by magnetic compass, or, in pilots' jargon, in "heading mode." And, from an unexpected and unintentional source-the Soviet Union-we have persuasive evidence that the aircraft did indeed fly over Soviet territory on the heading of 246 magnetic straight to the spot where it was shot down. (See the map showing the Soviet radar trace on page 45.)

But why did KE007 report by radio to the Air Route Traffic Control Center at Anchorage that it was passing over Bethel when it was already unacceptably off course? And why, for that matter, did the aircraft's crew make altogether four reports that night that they were passing "waypoints" on the international air route R20 toward its destination when we now know that KE007 must have been getting further and further off course, and never actually passed over any of them? These false reports, intentional or otherwise, have naturally fanned the fires of suspicion among conspiracy theorists, but they have an all-too-simple explanation.

As an aircraft steered by INS approaches a preprogrammed waypoint, two amber lights, called "alert lights," come on in the cockpit to inform the pilots that arrival at the waypoint is imminent. The alert lights go off again when the waypoint is reached, and almost invariably the aircraft automatically makes a small change of track. On ocean crossings the waypoints are simply arbitrary spots on the sea. (On the KE007's planned route, the compulsory reporting points have such fanciful names as NABIE, NEEVA, NIPPI, and NOKKA.) But so accurate, and normally so infallible, is the INS that air traffic controllers these days accept from the aircraft they monitor position reports that are based only on the indication of the alert lights that the waypoint has been reached.

But sometimes the pilots need to uncouple the INS and fly their aircraft manually-in severe turbulence, for instance, or to divert around thunderstorms. The progress of the flight still has to be monitored and reported to the air traffic controllers in charge of the flight. To enable this running check to be kept the alert lights continue to come on, even when the INS system is not directing the aircraft on its preprogrammed route and it is not passing over the waypoints, but has them abeam (at right angles to right or left) up to a distance of 200 miles off track. At its last position report, KE007 was over the Sea of Okhotsk, 185 miles off track. KE007's pilots could thus, all too easily, have been led to believe they were on course.

3.

Here, then, is the accident that could have put KE007 off course, unknown to its crew, from the first few minutes of its last flight. The pilot, having turned the rotary switch on the control panel to set the autopilot on a heading mode of 246 degrees magnetic toward Cairn Mountain, could have failed to recouple the autopilot to the INS. There is a good deal of circumstantial evidence that this is exactly what did happen. Two questions immediately arise: is such an unintentional and unnoticed deviation from track known to have happened before, and do informed circles in the aviation industry, and more specifically air traffic controllers, accept this as a plausible interpretation of the case of KE007?

To answer these questions, we should consult the records of the two busiest transoceanic air routes in the world, those over the North Atlantic (125,000 crossings a year, on average) and the North Pacific (24,000 crossings a year). The flight records of pilots on these route systems are more carefully controlled than those on other routes and should be of help in determining what kinds of cockpit errors do and do not occur.

The North Atlantic organized track system, which covers the Atlantic from 27 degrees north latitude to the North Pole, is controlled by the British Civil Aviation Authority (CAA) in London. The system has two "ocean gates," one on either side. On the western side there is a system of radar stations equipped to recognize civil airliners (Secondary Surveillance Radar) extending from Gander in Newfoundland to Goose Bay in Labrador. On the European side a similar chain extends from Brest in France via Shannon in Ireland and Prestwick in Scotland to Stornaway in the Hebrides.

All aircraft crossing the North Atlantic are thus checked by radar as they set off on their ocean crossing and as they arrive on the other side (the limited range of ground-based radar makes it impossible to check them

in mid-Atlantic). Aircraft that are off track are warned by the ground controllers, and in cases of gross error (more than thirty miles off course) the CAA writes to the airlines concerned, asking for the pilot's explanations of their errors. A body of statistics has thus been built up since the system was initiated in its present form in 1975 (and air traffic controllers believe that the certainty that mistakes will be detected and reported has helped air crews to concentrate on avoiding them). One such airline asked to explain a gross error was, interestingly enough, Aeroflot.

On the North Atlantic, gross errors of navigation have averaged one in ten thousand crossings, or some twelve a year at the present traffic density. (In the days of human navigators it was one per one hundred flights. No gross navigational error has caused a crash on the North Atlantic since the INS came into use.) Misuse or misprogramming of inertial navigation systems is by far the commonest cause of gross error reported, followed by failure to recouple the autopilot to the INS after it has been decoupled so that aircraft could be flown manually through storms and other turbulence. The records of the CAA show five cases of gross navigational error since 1975 caused by the autopilot inadvertently being left in the magnetic heading mode, with a recent frequency of:

1981 -- none

1982 -- one

1983 -- two

1984 -- none

The fourth edition of the North Atlantic airspace operations manual published since KE007 was shot down contains, for the first time, an insert printed on pink paper headed "Guarding Against Complacency," which states that although errors of navigation are rare, a comforting thought for air passengers, they are nevertheless known to occur. It lists among "commoner causes of error": "autopilot inadvertently left in heading mode." The CAA declines to state whether this insertion was made as a consequence of the loss of KE007. But, in a presentation to the ICAO assembly in Montreal in May 1984, the CAA offered the judgment that the autopilot having been inadvertently left on a magnetic heading is "the only reasonable explanation" of KE007 going off course.

What has been the experience of navigational errors on the North Pacific route system (NOPAC), the one from which KE007 deviated, since it was formally set up in March 1981? The answer is that no information is available on this subject between that date and October 19, 1983 (seven weeks after KE007 was shot down), because no civil radar capable of recognizing airliners had been set up to monitor the route. Shemya Island, the last American island in the Aleutian chain, was equipped with secondary surveillance radar capable of recognizing airliners passing the compulsory reporting point NEEVA, but it is a United States Air Force base not concerned with the stream of airliners that pass close by it day and night on their way between Seoul, Tokyo, and Anchorage.

Since the NOPAC system was opened in 1981, many air traffic controllers considered that the system should have an "exit radar" analogous to the "ocean gates" of the North Atlantic so that aircraft navigation could be checked and off-course aircraft warned. A site was therefore selected on the tiny St. Paul's Island off the west coast of Alaska. Progress through the US bureaucracy was, however, slow. A formal request was made by NOPAC for the St. Paul's Island radar in July 1982. That request was formally approved by Washington in September 1982. Negotiations for the purchase of real estate began in October 1982. Radar equipment had been delivered to St. Paul's by April 1984, eight months after KE007 was shot down. Work

began in July 1984, and the St. Paul's Island exit radar, operated by, and reporting to Anchorage Air Route Traffic Control Center by remote control, came into service on December 18, 1984. Its total cost was \$1,382,000. Had it been in operation on the night of August 31-September 1, 1983, the tragedy of KE007 would not have happened.

Immediately after the shoot-down, R20, the civil air route that runs closest to Soviet territory, was closed by the FAA, and air traffic controllers from Anchorage were flown to the previously all-military radar stations on Shemya Island. The route was reopened on October 19, 1983, with two civil air traffic controllers monitoring the military radar screens and checking them against airline flight plans radioed from Anchorage. Airliners that are detected off course are now warned by radio from Anchorage, on the basis of reports sent by radio from the civil air controllers at Shemya. (Shemya still has no direct radio contact with passing airliners, the result, I am informed, of the military there guarding their turf.) Discussions are currently underway about whether the present use of the Shemya military radars by civilian controllers, which the military dislike, will continue, or whether a wholly civilian system will be built on Shemya.

However, since October 19, 1983, when the first radar surveillance of the NOPAC routes was begun, no fewer than seventeen airliners have been logged off course, two of them on route R20. One case in which a plane flew forty miles off track has been explained by its pilot, who said that he joined the airway partway along its length on his way from the West Coast. Others have been fifteen, eighteen, and twenty miles off track, and were told of this right away.

KE007 would also have been so informed, had the present civil radar surveillance system on Shemya Island been in operation on the night of August 31, 1983. The lawsuit against the US government by relatives of the victims, which is now winding its way through the legal system in Washington, asserts that the FAA's supervision of the North Pacific air route was inadequate, given the known frequency of navigational errors on the North Atlantic, and that the FAA's operations manual for the NOPAC system gives inadequate warning of the dangers of the route. The manual published in March 1983 makes only one reference to possible danger:

6. An Aircraft navigating westbound on R20 between 165E and 175E should leave its assigned track by turning 90 degrees to the left. The direction of the turn is due to possible encroachment of USSR airspace.

Considering the above, the complainants would certainly seem to have a case against Washington-and it is even easier to see why, with a multibillion-dollar lawsuit pending, FAA personnel have been instructed not to discuss any aspect of the KE007 incident. The FAA gave out documents and information freely to the ICAO inquiry, the press, and other interested parties until December 22, 1983, when an order was issued by the US District Court in Washington, on the application of Korean Air Lines (not resisted by the US), forbidding any discussion or release of information until the combined multibillion-dollar lawsuits by the families of the victims are settled.

4.

Why did KE007 fly past Bethel, the first reporting point on its journey, without either picking up the Bethel VOR beam or engaging the preprogrammed inertial navigation system, as the Korean Air Lines company rule book, common sense, and "good airmanship" would all have required? We know that neither action was taken, because the aircraft was twelve miles north of Bethel, an impossible error at that stage of the flight.

The answer is drowned in the Sea of Okhotsk, but there are several feasible explanations worth recording. Captain Chun, the pilot in command, clearly should have used the fully functioning VOR at Bethel to check his INS course, and just as clearly he neglected to do so. Why? One of the passengers aboard the flight was Representative Larry McDonald from Georgia, then chairman of the John Birch Society, on his way to Seoul to attend a celebration of the thirtieth anniversary of the US-South Korean mutual security treaty. McDonald had originally booked on another Korean Air Lines flight but arrived late at Kennedy Airport in New York, missed his original flight, and transferred to the next Korean flight bound for Seoul, which happened to be KE007.

Captain Chun was informed before he took over the flight in Anchorage that he had a member of the US Congress aboard. Company policy would have directed him, as soon as the flight was at cruise height on the first stage of the journey to Seoul, to make himself known to McDonald before the congressman had settled down to sleep through the long night flight ahead. To do this Captain Chun would have descended the curved staircase from the flight deck to the first-class compartment below.

There he would have found, also traveling as first-class passengers, six off-duty colleagues from Korean Air Lines returning home to Seoul ("dead-heading," in airline parlance)-three captains, two first officers, and a flight engineer. More than likely, Captain Chun would have had a short conversation with McDonald, welcoming him aboard, and a friendly exchange with the pilots he had been flying with for decades, both in Korean Air Lines and the South Korean Air Force where they had all learned to fly.

This would have left the copilot, First Officer Son Dong Hwi, alone on the flight deck. This is not unusual: airliners carry two pilots so that one of them can perform alone, if necessary, all of the routine operations of flight, and flying conditions on the night of September 1 were smooth. Copilot Son, aged forty seven, had been with Korean Air Lines for four years, after nineteen years with the Korean Air Force, and had already flown the North Pacific route fifty-two times, the most recent two weeks before his death. Reporting the aircraft's arrival at waypoints is normally the copilot's job, and KE007 duly reported itself over Bethel (when, as we know, it was actually twelve miles north) at 1349 hours GMT, forty-nine minutes out of Anchorage, flying at the height of 31,000 feet.

We know that KE007 could not have been flying on the Bethel VOR "beam"; nor could the INS system have been coupled to the autopilot. How could the mistake have been made? At Anchorage, the incoming crew who had flown the aircraft from New York reported, on a written form, three "maintenance squawks," or faults with the aircraft's equipment. Two seem not related to the subsequent tragedy: the map light holder on the captain's side of the cockpit was damaged (no action taken), and one of the aircraft's Very High Frequency radios was noisy (it was checked on the ground and found to be operating normally).

The third item, however, leaps from the "daily maintenance report" submitted to the ICAO inquiry into the disaster. It concerned the small "heading flag" on the copilot's horizontal situation indicator, the instrument that tells the pilots whether they are flying correctly along whatever source of information is guiding the aircraft-magnetic compass, external beam, or inertial navigation system. This small striped flag appears on the face of the horizontal situation indicator to warn the pilot that the aircraft is, in fact, being flown on a magnetic heading, and not on either of the other two possibilities. But in this case, the maintenance report tells us, the mechanism was defective and the heading flag was constantly in view. In addition, the central instrument warning light (which warns of a fault such as this one somewhere in the aircraft's instrument system) was flashing, and went out when the magnetic compass system was transferred from one compass to the other (two are carried). According to the maintenance report, action on this fault was deferred until the aircraft was to reach home base in Seoul. The rules of some airlines would make this defect a no-go item, but those of Korean Air Lines did not (and the fault was, it should be noted, only on the copilot's side).

But it was, however, a fault in the very instrument that could have warned the copilot that he was flying in magnetic heading. The room for misunderstanding between pilot and copilot here is obvious, and such misunderstandings in the cockpit are a notorious cause of accidents. Once they had passed Bethel, the pilots would have had no obvious indication that they had not engaged the INS to fly the aircraft to the preprogrammed way-points unless they had looked at the INS autopilot selector switch itself -- the switch that we presume was on the magnetic heading, one treacherous notch away from where it should have been. The selector switch is not internally illuminated and is not particularly visible in the dim night-lighting of the cockpit. And it did not need to be touched again until the last few minutes of the flight. It must, unnoticed, have stayed in the heading mode guiding the plane directly on its 246 degree magnetic course. (See illustration on page 45.)

As the matter has been put to me by pilots, "You either see it when you do it, or you are not likely to look at it again, if everything else seems normal." And, as we have seen, there is a small but known frequency of cases in which pilots have made exactly this error. The ICAO report issued on December 2, 1983, considered three scenarios involving navigational error (including the flight having been flown in constant magnetic heading). It commented: "Each of the scenarios assumes a considerable degree of lack of alertness and attentiveness on the part of the entire flight crew, but not to a degree that is unknown in international civil aviation" (my emphasis).

Here, then, we have found more support for the possibility that KE007 had arrived by accident at the spot where it was shot down. One of the two authorities concerned with the supervision of congested air routes (the British Civil Aviation Authority) has, as I have said, offered the opinion that this is the "only reasonable" explanation of what happened. The other, the Federal Aviation Administration, which was actually in charge of the operation of the route that night, while silenced by the Washington court order, has taken action fully consistent with the same interpretation, namely the new civil radars on St. Paul's Island and Shemya Island.

But all the conspiracy theories that now festoon the story of KE007 begin with the assertion that the aircraft could not have arrived by accident at the point at which it was shot down. How they treat the possibility that it was an accident is therefore a useful touchstone of the seriousness of their argument, for clearly, once the thesis of the impossibility of an accident is accepted, then some form of foul play is logically the only other possibility, and the tragedy of KE007 becomes an adventure playground for conspiracy theorists. Since nothing that could be called hard evidence has been produced for any conspiracy, there is no way of choosing among the theories and no end, this side of lunacy, in sight of their production.

Professor Dallin, a distinguished historian concerned with Soviet matters, will probably not mind my saying that he is out of his depth in judging matters of aircraft operation and navigation (although, as we shall see, he is excellent on subsequent Soviet actions and reactions). Oliver Clubb is, on the other hand, a one-hundred-proof conspiracy theorist: according to him, the odds against an accident "are so astronomical that we can reject that possibility out of hand." How does he know? Clubb makes free use of such sources as the Miami Herald and People magazine. (Captain Chun's widow, according to People, reported, "You never saw such a methodical man as my husband. Just about everything had to be precisely at its proper place." Rhetorically Clubb asks: "And this was the man who had committed one gross navigational error after another in piloting Flight 007 on its deviant course? To ask that question, it seems to me, is to answer it.")

Clubb's more serious authority is, however, like that of many another conspiracy enthusiast, an article by David Pearson published in The Nation of August 18-25 last year. Pearson's editors, in what sounds like a claim for objectivity, introduce him by saying that "Pearson does not pretend to answer the question of

whether K.A.L. 007 [sic] was a spy plane," but this is far from fairly representing what Pearson does say in his piece, which expounds what Pearson calls "the most persuasive theory: that the airliner made a deliberate, carefully planned intrusion into Soviet territory with the knowledge of US military and intelligence agencies."

Pearson thus has faced the choice between accident and conspiracy, and he gives us the heaviest possible nudge in the direction of conspiracy. This is how he handles the possibility of an accident, with my own comments on each of his arguments.

The Nation: Another theory is that K.A.L. 007's pilot and co-pilot made a series of errors. The automatic pilot, it has been said, was set on its heading mode rather than on its inertial navigation systems mode. If that happened, it means two experienced pilots sat in their cockpit for five hours, facing the autopilot selector switch directly in front of them at eye level, yet failed to see that it was set improperly.

Other pilots have done it. The CAA in its supplemental warning sheet "Guarding Against Complacency" lists it among the "commoner causes" of, admittedly, very rare errors. But rare does not mean impossible.

The Nation: It means that they did not use a single INS unit to display the cross-track/track error [he means track angle error] position of the aircraft, a standard operating procedure.

This may sound reasonable. Since the pilot can, if he wants, select the INS displays showing whether the aircraft is off track, wouldn't the pilots have done so? But analysis of how the pilots must have employed the INS that night suggests why they didn't-and why many other pilots fail to do so. What were KE007's three INS panels set to display? (The type installed on KE007 had eight possibilities, plus a "Test" position.) Number one, usually called the "Captain's INS," is always set to display "Present Position," so that the aircraft can give its position by radio in case of emergency. This reads out the latitude and longitude. Had Captain Chun plotted any of these against a chart, he would have instantly seen he was off course. But he did not have the necessary maps aboard to do so. Neither the Korean Air Lines rule book nor the NOPAC manual required him to plot his position on a chart.

The number two INS must have been set by the copilot on "Distance" and "Time" to the next waypoint, since the copilot supplied these estimates regularly (and erroneously) to Anchorage and then to Tokyo. Wherever the voice transmitting the information has been identified, it is the copilot's. This is normally his job, anyway. When the waypoint lights come on, the INS readout would indeed show excessive time and distance to the waypoint. But when they go off, informing the pilots that the waypoint has been reached, the INS displays time and distance to the next waypoint-information the copilot needs for his radio message, but so minutely greater than normal that they would not (and, to the ground controllers, did not) arouse any suspicion.

Number three INS must have been set on "Wind," since KE007 supplied regular information on the winds it was encountering (these are, by another scientific miracle, calculated by the INS).

Aside from these three settings the pilots could also have selected the setting displaying the distance and angle by which the plane was off track ("cross track distance/track angle error"). But many pilots, after countless flights on track, do not do this. Are they nevertheless required to display these settings on their INS? The North Atlantic manual does indeed recommend that the displays showing such error be constantly monitored. But no such requirement was made either by the Korean Air Lines rule book or the North Pacific

Air Route manual. Captain Chun would have been well advised, and it would have been "good airmanship," to examine his cross-track distance/track angle error from time to time; but, as we have seen, all three instruments aboard were probably displaying something else. This is how accidents happen.

The Nation: It means they [KE007] failed to use their two airborne radar systems in mapping mode, although this is recommended ICAO procedure and a standard practice for pilots on the North Pacific routes.

I do not know what the term "recommended ICAO procedure" means. ICAO is a UN agency and is not in charge of the supervision of any air routes. The people who are in charge of this route, the FAA, do not mention using radar in the ground-mapping mode in their manual. It is indeed excellent practice when going west-bound on this route to use the weather radar to check that the string of the Kurile Islands is on the right-hand side of the aircraft, and that the aircraft is thus clear of Soviet territory. But, as all the competent authorities warn, there is a tendency among younger pilots today to put excessive trust in the wondrous INS system, which actually means a trust in their own skill and care in operating it, and to neglect secondary double and triple checks.

The Nation: It means they misread instruments that gave their direction to the Visual Omni Range [sic] directional beacon at Bethel, as well as the digital readouts on their distance measuring equipment.

These are schoolboy howlers, or, better, graduate-student howlers. KE007 could not have been reading the VOR at Bethel at all, mistakenly or otherwise, since it was twelve miles north of it (unless this information was planted by USAF conspirators). Distance measuring equipment requires tuning to a ground installation. If Pearson means the DME at Shemya Island, then KE007's crew had no need to "misread" it: they may simply not have read it at all. It requires switching on and tuning in the aircraft, and if this had been done it would have instantly told them they were off course.

The Nation: For a pilot with 10,627 flight hours and a co-pilot with 8,917 flight hours, such a series of errors is extremely improbable.

Quite so. But not impossible, and not unknown, either. Pilots make mistakes, as we have seen.

The Nation: The ICAO Air Navigation Commission said, "The Commission found it difficult to validate and endorse the conclusions connected with the [human error] scenarios because any one of them contained some points which could not be explained satisfactorily."

This sentence crops up monotonously in the expositions of all KE007 conspiracy theorists. Semantically, it is quite accurate: no one has "satisfactorily explained" why KE007's crew failed to check their course against the VOR at Bethel, and the best we have is surmise, as outlined above. But is Pearson saying that the ICAO report therefore endorses conspiracy theories? He clearly implies it, but, as the next quotation shows, he lets someone else from north of the border say it for him.

The Nation: Finally, human error does not explain why KAL 007 veered from course only after leaving the range of civilian air-traffic control radar, why it may have changed course at the time of its rendezvous with the RC-135, why it changed course again and made evasive maneuvers over Sakhalin. Canadian Major-General Richard Rohmer, retired, noted of the airliner's pilots, "Yes, they knew exactly where they were from the time they left Anchorage through the false waypoint checks that they transmitted past Kamchatka and over Sakhalin Island to their destruction."

The last shred of objectivity or even good faith claimed for Pearson by his editors here slips away. KE007 was already six miles off course as it left the range of Kenai civil radar near Anchorage (unless that

evidence, too, was planted by conspirators). KE007's "rendezvous with the [American intelligence aircraft] RC-135" is simply smuggling in, as a fact, the very thesis he is trying to establish. For if there was a "rendezvous" there could not have been an accident, and it only remains for him to pick his favorite conspiracy. The "evasive maneuvers" alleged by Pearson come from the radar trace of KE007's flight supplied by the Soviet Union. If, indeed, it did make them, then conspiracy once again comes winging in. But, as we shall see, the curves in the Soviet trace are open to quite another explanation, fully consistent with an accident.

Of course I am not for a second suggesting that Pearson is a Soviet dupe or sympathizer, but his acceptance of the Soviet version as established fact contrasts noticeably with the way in which he builds his case against the possibility of an accident in the navigation of KE007. As to the hyperconfident Canadian quote beginning "Yes, they knew exactly," one can only observe that a general's star is no guarantee that its wearer cannot make foolish, intemperate, or wholly uninformed judgments. We have already seen how the pilots could have firmly believed they had crossed their reporting points, while in fact they diverged further and further from them.

I have dealt with The Nation's arguments at such length because, in one form or another, they underpin all the conspiracy theories, and certainly, although no doubt independently, they reflect the thinking of "Soviet leading circles" from the moment they heard of the shoot-down until the present day. Shorn of the technicalities, they come down to a series of simple propositions: modern navigational equipment cannot fail; or, the pilots who operate it cannot make a mistake; or, they cannot make a series of mistakes; or, if they can, they must notice them.

Therefore, by The Nation's *reductio ad absurdum*, the other possibility must prevail, and the pilots in question must be in criminal league with someone, and the someone can only be the American intelligence services. This gets us into the heady world of laundered funds, trench coats, and exploding cigars so familiar from movies, TV, James Bond, and Watergate. It is a curious commentary on our times that these fables should have, for so many people, the ring of truth, and that even such a thoughtful observer as Professor Dallin should call it "a rather surprising development" that Korean Air Lines sued an obscure British magazine named *Defence Attaché* for printing one conspiracy charge, thus by implication calling the airline's personnel accomplices in murder. KAL got, rightly I think, a public apology and a "substantial sum of damages" from the magazine.

No doubt the argument for an accident, critical as it is, is difficult to follow without some knowledge of modern navigational methods, whereas we all watch television. The ready acceptance of conspiracy theories is, however, in my view, obscuring much deeper and more alarming implications about the attitudes of the superpowers, and to examine these we must follow further the last flight of KE007, which we left heading out over the Pacific, far off course from its misreported position north of the last land waypoint at Bethel.

5.

On a magnetic compass heading of 246 degrees KE007 was headed virtually straight for the Soviet naval base at Petropavlovsk on the Kamchatka Peninsula, where, according to Dallin, "something like ninety Soviet nuclear-powered submarines are based, including apparently twenty-nine missile-carrying submarines." (As soon as he gets off the subject of Korean pilots and American ground controllers and addresses himself to Soviet matters, Dallin's book takes on the unmistakable tone of someone who knows what he is talking about.) Near Petropavlovsk is the splashdown area for the Soviet missile launching site at Plesetsk where, that every night, it is not disputed that a test firing was scheduled of a "SALT-sensitive" SS-X-24 missile. (The term "SALT-sensitive" means that the missile may or may not have qualified as an

intercontinental ballistic missile under the terms of the SALT II agreement which, although unratified, is being more or less observed by both the US and the USSR. Whether a missile qualifies depends on its range, which can be estimated by measuring its speed and angle of flight after launch and analyzing the radio emissions from the rocket to the ground.)

There was thus, and no one disputes this, intense US intelligence interest in the launch planned for that night, including the stationing of the US Navy frigate Badger in the Sea of Okhotsk, a flight or flights by American RC-135 "spy planes"-Boeing 707 aircraft equipped, in more polite terms, for electronic intelligence gathering, or Elint-and the phased-array radar installation called Cobra Dane[3] on Shemya Island in the Aleutians. In addition, according to the Soviet Union, an American Elint satellite aptly called Ferret-D was circling over the Soviet Far East.

The Soviets have claimed (in response to a call from the Japanese Communist party to disclose the truth about the KE007) that "on August 31 [the night of the shoot-down] RC-135 flights were recorded in this area seven times." A Soviet interview published in Izvestia twelve days after the shoot-down quotes "radar scanners at the PVO [Protivovozdushnaia oborona-anti-air defense command] here on the desolate rocky coast of Kamchatka" as reporting that "hardly a day goes by without US or Japanese reconnaissance aircraft being spotted flying along our borders. The American aircraft carriers Midway, Coral Sea, and Enterprise cruise constantly along the coast."

As Dallin says, there is no reason to doubt the truth of these statements. This electronic snooping is, in fact, the "national means of verification" provided for in the SALT II agreement, although neither side is prepared to admit to it. When Americans do it the Soviets describe the process as "provokatsiia," "provocation." Further, Dallin writes, a

far more direct and specific reason for the escalation of tension has been the deployment of air defenses by each side and attempts by the other to test them. Both sides play this equivalent of the game of chicken-with the difference that usually the challenger at the last moment backs away rather than entering the adversary's air space, though this too has occurred more often than either side is prepared to document.

So, at 4:51 AM Kamchatka time, a Soviet radar unit tracking the flight of an American RC-135 southeast of Karaginski Island off the Kamchatka coast detected a second, unidentified aircraft. To quote Dallin:

As all Soviet reports have subsequently asserted, the two planes' blips "merged on the radar screens" and they were "monitored together for about ten minutes." Then one headed for Alaska [actually, Shemya Island], the other in the direction of Kamchatka, we are told. It has been the Soviet assertion that they could not tell which plane was the RC-135 and, in any event, what the second plane was. Under the circumstances, the Soviet investigation committee reported later, "the Area [or regional] Command of the Anti-Aircraft Defense Forces concluded that a reconnaissance aircraft was heading towards the State frontier of the USSR."

Dallin surmises, correctly on my information, that the spotting of the unidentified plane led to the cancellation of the Soviet missile test due to take place that night. US electronic monitoring would have detected this decision, and as a result the RC-135 returned to its base. Dallin quotes a commentator, Michael Westlake of the Far Eastern Economic Review: "It is possible but hard to believe that the Soviet ground-based air-defense radar systems are so deficient in signal-processing that they cannot identify an individual type of aircraft's radar 'signature.'" Yet, as Dallin adds, "all we know prompts precisely this conclusion."

At this point conspiracy theorists, to a man technologically illiterate, rush in. With all this electronic wizardry aimed at the Soviet missile test, and the Soviet counterwizardry, somewhat creakier, in action, surely someone must have perceived that the straying airliner was a straying airliner, and either shot it down regardless (proof of Soviet savagery) or failed to tip it off (proof of an American-Korean conspiracy). A little knowledge of radar and its capacities dispels both these pseudocertainties.

Radar comes in two kinds, primary surveillance radar and secondary surveillance radar. The primary kind, as used in military installations, sees aircraft only as "blips" or, in technical jargon, "paint traces" because the blip is "painted" on the viewing screen. A highly skilled operator might in favorable circumstances be able to tell a large aircraft like a 747 or 707 from a fighter plane by the size of the blip, but no more, since the size and brightness varies with the construction of the aircraft, the angle at which it is viewed, its "paint" pattern, atmospheric conditions, and many other elements.

The Soviet radar referred to here and the American "phased array" radar on Shemya Island are both primary radars, limited, like all radar, to line-of-sight or a little beyond it. ("Phased array" is simply an electronic replacement for the familiar rotating-dish antenna.) The Shemya phased array could thus detect Soviet missiles hundreds or even thousands of miles distant, if they were high enough, but would not see an airliner if it was far enough away to be below the horizon. The Soviet radars would see only a "paint trace" telling nothing about the aircraft beyond its altitude, course, and speed, from which its identity and activity would have to be deduced by the radar operators.

Secondary surveillance radar (SSR) is used by civil air traffic controllers and military controllers to recognize their own aircraft. The ground station sends a radar signal, which is reflected back by an electronic device called a transponder aboard the aircraft. This in turn prints an identifying symbol on the radar screen, as for instance KE007 31 means "Korean Air Lines Flight KE007 at flight level [height] of 31,000 feet." Operators using SSR need to know the frequency at which the transponder aboard the aircraft has been set.

Even when military aircraft carry such transponders their frequencies are not, for obvious reasons, supplied to radar operators on the other side, and the transponders are switched off in hostile surroundings, lest the plane be identified. Civilian SSR transponders are to be distinguished from IFF (identification friend/foe), a different kind of transponder designed for use, as the name suggests, in combat situations in order to avoid inadvertent attacks on friendly aircraft. No device capable of informing primary (i.e., largely military) radar that a given aircraft is civilian and not military has ever been seriously proposed, again for obvious reasons—every military aircraft contemplating a sneak attack would be fitted with a transponder capable of falsely identifying itself as civilian; and deception, as Clausewitz remarks, is the heart of the art of war.

The RC-135s, by contrast, are not radar-carrying aircraft. They are equipped with weather radar, which most big aircraft these days carry, but their purpose is to pick up electronic intelligence, which is recorded on airborne tape-recorders and analyzed later on the ground, by experts armed with very complex computers. The RC-135 is not an AWACS, or early-warning aircraft, which does carry surveillance radar and can be easily recognized by the large disc-shaped antenna housing atop its fuselage. There is thus no electronic reason why the Soviet operators should have recognized KE007 as a civil airliner. There is no reason to think that the Shemya radar observed it, let alone identified it as an airliner. It is technically possible that the RC-135 (which had to fly through the normal nightly stream of on-course airliners to get to and from its patrol area off the coast of Kamchatka) could have seen KE007 as a blip on its weather radar, but no way in which it could have determined by radar that it was an airliner, of whatever, nationality. And there is no evidence whatever that either the Soviet or American military, engrossed in their intelligence duel, had lists of airline schedules or SSR transponder frequencies or any interest in such unmilitary trivia.

The Soviet Union furnished the ICAO inquiry in Montreal with what they said was a radar trace of the "intruder aeroplane" from the point at which they first saw it on their radar screens, "flying together" with the American RC-135, to the spot over Sakhalin Island where the flight was "terminated." In general this trace, which crosses the Kamchatka Peninsula just north of Petropavlovsk, continues over the Sea of Okhotsk, and traverses the southern tip of Sakhalin Island, follows the course we would by now expect-a magnetic compass heading of 246 degrees originating in or near Anchorage, although the Soviets do not mention this. (In his book, Dallin supplies a map showing 246 degrees magnetic course originating over Bethel, based on the ICAO report. This course was computed before it was known that KE007 had passed Bethel twelve miles to the north.)

The Soviet radar trace, however, does not follow the 246 degree magnetic course exactly-a situation to be expected in the circumstances. Radar tracking of aircraft is not an exact science, as the radar pulses are bent by refraction from the ground when the target is distant and therefore close to the horizon. At the same time, an aircraft on a magnetic compass heading is under the influence both of local variations in the earth's magnetic field and the winds through which it flies. Good general agreement is what we would expect, and that is what we have, with a compass heading of 246 degrees magnetic.

But the Soviets' trace of the "intruder's" flight shows bends at either end, a shallow curve north of the Soviet Komandorski Islands, and a neat semicircle around the Soviet naval base at Korsakov on the southern end of Sakhalin Island. The Soviets make a great deal of these deviations, if in fact they occurred, and so do Pearson and the other conspiracy theorists of his school. (For reasons he does not make clear, Pearson says that KE007 "may" have changed course at the time of "its rendezvous with the RC-135" (he has no evidence that there was a rendezvous) but he is sure that "it changed course again and made evasive maneuvers over Sakhalin"-yet both of the propositions can be derived only from the Soviet radar trace.

The logic here is clear, and, as far as it goes, impeccable. If the Soviet trace accurately represents changes in course that KE007 did in fact make, then they cannot be explained either by the aircraft's flying in magnetic heading unknown to the crew, or by any conceivable misprogramming of the INS, or "finger trouble." Someone must therefore be guilty, in a conspiracy which must include some combination of the CIA, the dead pilots, Korean Air Lines, the NSA, Ronald Reagan, the FAA, the US Air Force, or all of the above. But is there no other explanation of these suspicious curves?

Indeed there is. It is well known among radar operators, and is called "slant effect." When an aircraft is far away, there is little difference between the direct line-of-sight distance from the radar scanner to the target and the distance between the radar station and the spot on the ground directly below the aircraft. We are comparing, for those who remember their high school geometry, the hypotenuse of a very long and shallow right triangle with its next longest side, which are almost the same length. But when the target aircraft approaches the radar transmitter, the line-of-sight distance or hypotenuse is very much longer than the next longest leg, and in the limiting case when the aircraft is directly overhead, at say 33,000 feet, it will still appear to be six miles distant on the radar screen. An aircraft passing straight by a radar station therefore looks to an unwary operator to be describing a curve, and Soviet, like American, military men occasionally make mistakes. What the traces are probably telling us is that the Soviets have radar installations on the Komandorski Islands and at Korsakov, interesting information which, from other sources, we already knew. As the British say, nice try, Nation.

I follow Dallin in accepting that the Soviet air-defense sector commander in Petropavlovsk, seeing on his radar what he believed was the RC-135 coming straight toward him, thought he was in for some SOP, or Standard Occidental Provokatsiia, and expected that the intruder on its nightly game of chicken would approach the Soviet twelve-mile prohibited zone, off the coast of Kamchatka, cruise impudently along it for a bit, and then turn away with the aeronautical equivalent of an upraised finger. But, to his amazement, the "intruder" kept going, straight over the coast and the Soviet Union's most important defense complex in the Far East. Too late, the commander called an air defense alert and six fighters scrambled, but, setting off on a stern chase after an airliner already at 31,000 feet and cruising at 520 knots, the fighters failed to catch the stranger, or even get a clear sight of him before he had crossed 150 miles clear across Kamchatka and continued on his way over the international waters of the Sea of Okhotsk.

Conspiracy theorists, both Soviet and Western, have made much of the Soviet claim that the "intruder," when crossing Kamchatka, was showing no navigation or anticollision lights, although all agree that the lights were on again by the time the Soviets attempted their second, lethal interception over Sakhalin. The Soviets also claim to have carried out their interception procedure, which is similar to the internationally accepted one and involves wing wagging, blinking navigation lights, and calling the intruder on the international emergency radio frequency 121.5 megahertz while he was over Kamchatka. The second claim may well be true but the alleged absence of navigation lights is much more readily explained: the Soviet fighters never got close enough to the KE007 to see whether it had its navigating and anticollision lights on or not.

Dallin quotes an unnamed Soviet official who may have been joking, and may not, as remarking privately, months later: "It took us too long to sober up the pilots enough to get them to take off." This sounds like a disgruntled civilian talking, but it equally surely represents widespread anger in the Soviet Union that an unknown aircraft was able to catch the local sector commander napping and slip unchallenged through what is known to be among the heaviest air defenses the Soviets have. Instead of surrounding the KE007 with fighter planes that undoubtedly could have forced it to land, the commander could not even describe it. But, like the "fool's mate" in chess, it is the kind of thing that could happen to anyone-once.

At this point, we can say with certainty, the American intelligence services learned that something unusual was in the wind. Soviet fighters are closely controlled from the ground, and even if the broadcasts of the garrulous sector commanders on the southern tip of Kamchatka could not be picked up by American and Japanese military monitoring stations, whose ability to do so is classified, the equally wordy replies from the airborne fighters certainly were picked up. And, it goes without saying, movements by Soviet military aircraft are of the deepest interest to the militaries of the two Pacific allies. Just as certainly, the powerful outgoing pulses of the Soviet radar chain were detected. But it is highly unlikely, going on impossible, that the returning echoes, weaker by a factor of at least a billion, could have told much to the US National Security Agency. It is technically easy to determine that someone is using radar, but not what he is using it on, or what information he is getting.

Both the Japanese and, before they were gagged by the courts, the FAA air traffic controllers in charge of the North Pacific route reported that they were not asked that night by their respective military establishments whether there were any movements of civil airliners that could account for the flurry of Soviet radio traffic. Evidently, then, both the Japanese and Americans decided that the Soviets had called an unexpected exercise to test the state of readiness of their air defenses at just the time when such an exercise would be least expected, the classically darkest hour before dawn.

However, even if the question had been put, the military inquirers would have been told that nothing was amiss, because KE007 had just reported to Tokyo Air Traffic Control, at a time when the aircraft had in fact

crossed Kamchatka and was over the Sea of Okhotsk, that it was on course over the Pacific, well clear of Soviet territory. The Tokyo controllers had no reason to doubt this report, and no means of checking it. The report was made by First Officer Son in English, and his recorded voice sounds calm and businesslike-as a colleague put it to me, "either he was unaware that he was in trouble, or the Laurence Olivier of South Korea was flying copilot that night." First Officer Son told Tokyo that KE007 would reach the next reporting point off the coast of Japan in seventy-nine minutes, at 1826 GMT. By a bizarre coincidence with overtones of Greek tragedy, it was at exactly that very hour and minute that KE007 was to be shot down, 365 miles off track over Sakhalin Island, well outside the limit at which the INS alert lights would have come on. One minute after the failure to report, the Japanese air controllers, the world's most meticulous in such matters, would have asked KE007 why the aircraft had failed to report its position, and the whole pyramid of errors would have instantly collapsed.

Until the expected position report failed to arrive, however, there was nothing to suggest to either Tokyo or KE007 that there was anything amiss, and the airliner continued over the Sea of Okhotsk toward Sakhalin. Out of fuel, the Soviet fighters returned to base on Kamchatka, but the Soviet radar continued to follow the still-unknown "intruder aircraft" (how they kept up their radar coverage over the sea is not known, at least not to me).

The Soviets may well have expected the intruder, after a particularly daring piece of provokatsiia, to make good his escape through the thin screen of the Kurile Islands (where Soviet fighters forced down a World Airways Boeing 707 loaded with US troops on their way to Vietnam in 1968, interrogated everyone aboard for a week, and then released both the aircraft and its crew and passengers).

But KE007 continued on, all unaware as far as anyone knows, toward southern Sakhalin, which is, after Petropavlovsk, the second most important Soviet military complex in the Far East. (The nearby La Pérouse [Soya] Strait is the approach to Vladivostok, and thus the only practicable route by which the Soviet garrison in the Far East can be resupplied by sea. Both sides will attempt to seize this strait in the first hours of a general war.) Southern Sakhalin is nowhere wider than eighty miles, giving the Soviet sector commander the nine minutes it took KE007 to cross it diagonally to attempt another interception and, if it failed, decide what he was going to do next.

What follows is painful to tell, but easy enough to follow. This time, forewarned, at least three Soviet fighters were in the air as the "intruder" approached the Soviet prohibited zone twelve miles off the coast of Sakhalin. They seem to have come from the nearby Soviet air base at Dolinsk-Sokol, and were directed on to their target by Soviet ground controllers whom they call Karnaval, Deputat, and Trikotazh, and who keep them under almost second-by-second control.

At 1810 GMT, fighter 805, identified as a Sukhoi-15, reported to Deputat that he had, for the first time in the Soviet's two-hour pursuit, actually laid eyes on the intruder, whose light, he says, is blinking (KE007 was equipped with a rotating red anticollision light). The fighter then told his controller that he could see the "target" - the term used throughout in these air-to-ground messages-both visually and on his airborne radar screen, and one minute later that he has locked his two AA-3 Anab heat-seeking missiles electronically on the hot gases streaming from KE007's engines. Evidently, too, he has called "the target" on the emergency radio frequency 121.5 MHz because he tells his controller: "The target is not responding to the call." The fighter got no reply, which would have been picked up by the monitoring stations in Japan, had any been made. To receive the call, KE007 had to have a Very High Frequency radio tuned to the emergency frequency. One of the three VHF radio transceivers aboard KE007 had been, we know from the Anchorage defect report, "noisy." The second would have been tuned to Tokyo, where the next VHF

communication was expected. The third had been used to contact another Korean Air Lines flight, KE015, which was also crossing the North Pacific. Very likely, KE007 was not tuned to the emergency frequency.

At this point the fighter must have been behind and below KE007, the normal attack position. He would see only a dim black shape, with no ready way of estimating its size, and the red and white lights the aircraft was showing astern. All the cabin lights would have been dimmed and the blinds drawn, at this stage in the flight, so that the passengers could sleep past sunrise. The fighter several times reported the "target's" course as 240 degrees, a reasonable approximation for the few seconds at the fighter pilot's disposal.

While the Soviet fighter was astern of him, KE007 called Tokyo Air Traffic Control, asked for and was given permission for a "step-climb," normal at the end of a long flight when the aircraft has burned off most of its fuel and can fly both higher and faster. A few seconds later the fighter, evidently on instructions from the ground, reports, "I have broken off lock-on. I am firing cannon bursts." The fighter was clearly making a hasty attempt at the Soviet interception procedure-wing wagging, firing tracer bullets, and calling on the emergency frequency-with no sign of response.

The fighter saw but misinterpreted KE007's step-climb, reporting, according to the air-to-ground transcripts: "The target is decreasing speed. I am going around it. I am already in front of the target." This is evidently some sort of maneuver intended to attract "the target's" attention, but it is brief. Twenty-four seconds later the fighter tells his ground controller: "It should have been earlier. How can I chase it, I am already abeam of the target [meaning that the fighter is flying alongside KE007, level with the airliner's wing-tip light, and all but invisible from the 747's cockpit]. Now I have to fall back a bit."

At 1823 GMT some sort of order comes from the ground controller, which the fighter pilot wants repeated: "Say again," the transcript reads. We can easily deduce what the order was, because he then reports: "I am dropping back. Now I will try rockets." And, a few seconds later, "Roger. I am in lock-on."

The transcripts, which come from both Japanese and American sources, clearly show that some sort of interception was attempted. They also show that the attempt lasted three minutes and thirty-two seconds, which includes the time taken to break the lock-on, approach KE007, make whatever signals were attempted, fall back, and lock on again. The fighter cannot have been in the vicinity of the airliner for more than a minute, at which exact time, by an evil chance, the crew was busy with a routine message to Tokyo, and the copilot (on the side of the aircraft that the fighter approached) would have had his map light on to see the knobs and switches of his radio.

A minute later, the fighter tells his ground controller, "I am closing on the target, I am in lock-on. Distance to target is eight kilometers." And then, "I have executed the launch. The target is destroyed."

6.

After such an ending, after such a pointless waste of innocent life, it is hard to devote more than a glance to some of the saloon-bar simplicities that have been advanced about KE007: that no air force should ever shoot anything that could be an airliner (which would plainly invite people to go spying and bombing in them); that no one should shoot until an aircraft has been identified (which means that anyone who simply ignored signals could fly wherever he pleased); or that interception procedures should be internationally agreed upon. (They are, more or less, but the problem of interception at night and what to do about an aircraft that apparently ignores it has never really been solved, and resists solution-it is at night that bombers fly, as well as airliners.)

The surface lessons of the tragedy are obvious; the supervision of the North Pacific air routes was inadequate, and has now been greatly improved. The Soviet air defense and warning system is sloppy and

ineffective, and they have presumably done something about it. Their military appears to work at least as rigidly "by the book" as other militaries, and possibly even more so.

The deeper political lessons are well developed by Alexander Dallin, whose work on this topic I highly recommend. How little, as he says, the superpowers really understand each other. "The same event," he writes, "which in the United States will attract passing mention in the press or on television, only to be soon forgotten by all but a handful of zealots and professionals, will be featured, repeated, inflated, and lacquered by the Soviet press and television, echoed by lecturers and propagandists, and displayed as one of a string of events which are all seen to belong to a logical chain of occurrences that unfold with a sense of historical inevitability." As Dallin reminds us, Gary Powers was shot down on a spying mission over the Soviet Union in 1960, and in 1958 a US EC-130 intelligence plane crashed in Soviet Armenia loaded with electronics experts and radio interception gear, incidents all but forgotten here that are still drummed into the close-cropped skulls of Soviet military men.

The overriding priority of the Soviet leadership, as Dallin writes, is to maintain the facade of infallibility in front of its own people, which explains the initial and continuing Soviet protestations of innocence, especially as they now find a good slice of Western opinion, baffled by the complexities of the KE007 story, agreeing or half-agreeing with them. Similarly, no one on the Soviet side seems to have perceived that the present American leadership has a large right-wing flank that needs to be appeased, at least by verbal abuse of the Soviets and their system when the latter appear to have been unrepentantly guilty of an act of inexplicable cruelty (not that I doubt, personally, that the better-informed Soviets would give much to undo the events of September 1, 1983).

But the deepest lesson of all is one we should all draw-how easily an all-too-human mistake, abetted by a conspiracy of circumstances, can defeat all of the supposedly infallible safeguards which keep the superpowers balanced on their nuclear knife-edge, and how easily our whole world, and not just one wretchedly unlucky airliner could be shot down.

Notes

[1] Source: The British Civil Aviation Authority.

[2] The information that KE007 was off track at Bethel comes from an observation made by the US Air Force radar at King Salmon on the Alaska mainland, 200 miles southeast of Bethel, not part of the civil air control system. In March this year the Justice Department informed the Washington court that the Air Force had routinely reused the tape shortly after the observation, having "no idea that it was going to be involved or that that data would be useful in the litigation at any point." Conspiracy theorists, both American and Soviet, have predictably fastened on the recycling of the tape as being part of a pattern by which the United States has allegedly been suppressing information. I can offer no explanation, or even opinion, about why it was done. It seems foolish, at best.

[3] Cobra Dane's capacities are lucidly described in an article in the February 1985 Scientific American. Like all high-frequency radar, it cannot look beyond the horizon. To ascribe to it a range of 1,400 miles in tracking an airliner at 31,000 feet (as The Nation does) is another technological illiteracy.

Letters

October 9, 1986: Duncan Campbell, THE FLIGHT OF KE007

January 30, 1986: Thomas R. Maertens, THE FLIGHT OF KAL-007

July 18, 1985: Oliver Clubb, KE007: An Exchange

