

17. Two factory development engines configured with modified rub shroud material retained their total structural integrity when subjected to fan rotor assembly imbalance of 122,000 gram-inches.
18. The postaccident tests performed by the manufacturer were more demanding and more stringent than any in-service bird strikes to date.
19. A bird control system was in effect at JFK Airport.
20. The bird control system did not assure that runway 13R was clear of birds before the takeoff of N1032F.

b. Probable Cause

[The National Transportation Safety Board determined that the probable-cause of the accident was the disintegration and subsequent fire in the No. 3 engine when it ingested a large number of sea gulls.] Following the disintegration, the aircraft failed to decelerate effectively because: (1) The No. 3 hydraulic system was inoperative, which caused the loss of the No. 2 brake system and braking torque to be reduced 50 percent; (2) the No. 3 engine for thrust reverser was inoperative; (3) at least three tires disintegrated; (4) the No. 3 system spoiler panels on each wing could not deploy; and (5) the runway surface was wet.

The following factors contributed to the accident: (1) The bird-control program at John F. Kennedy Airport did not effectively control the bird hazard on the airport; and (2) the Federal Aviation Administration and the General Electric Company failed to consider the effects of rotor imbalance on the abradable epoxy shroud material when the engine was tested for certification.

3. RECOMMENDATIONS

As a result of the accident, on April 1, 1976, the Safety Board submitted the following recommendations to the Administrator, Federal Aviation Administration:

- "1. Require immediate retest of the General Electric CF6 engine to demonstrate its compliance with the complete bird ingestion criteria of AC 33-1A. (Class I--Urgent followup.) (A-76-59.)
- "2. Require that any engine modifications necessary to comply with the bird ingestion criteria of AC 33-1A be incorporated into all newly manufactured CF6 engines. (Class II--Priority followup.) (A-76-60.)

- "3. Require that any engine modifications necessary to comply with the bird ingestion criteria of AC 33-M be incorporated into all CF6 engines in service. (Class II--Priority followup.) (A-76-61.)
- "4. Until the CF6 engine is modified, require that a bird patrol sweep runways at all airports which have recognized bird problems and are served by CFG-powered aircraft. The sweep should be made before a runway is put into operation for CF6-powered aircraft and at sufficient intervals thereafter to assure that a bird hazard does not exist. (Class I--Urgent followup.) (A-76-62.)
- "5. Advise all operators, domestic and foreign, of CF-6 engines of the catastrophic consequences of foreign objects damage and the need for appropriate caution to avoid such damage. (Class I--Urgent followup.) (A-76-63.)
- "6. Amend 14 CFR 33.77 to increase the maximum number of birds in the various size categories required to be ingested into turbine engines with large inlets. These increased numbers and sizes should be consistent with the birds ingested during service experience of these engines. (Class III--Longer-Term followup.) (A-76-64.)"

Earlier recommendations were made to the Administrator, Federal Aviation Administration as a result of this accident; these recommendations were issued, on March 8, 1976.

- "1. In coordination and cooperation with the Port Authority of New York and New Jersey, expedite the following actions:
 - (a) Determine the weather conditions, ocean tide conditions, seasonal factors, migratory patterns, and daily movement patterns **which** could be used to forecast periods of greatest bird hazards at the Port Authority of New York and New Jersey airports and take effective actions to disperse the birds before use of the affected runways is permitted.
 - (b) Remove the abandoned runway 7-25 pier at JPK.
 - (c) Remove the bird attraction to the beach adjacent to the south and east boundaries of the airport by eliminating the beach through gravel fill, dredging, a seawall or other appropriate means.
 - (d) Drain the Chapel Pond at JFK. (Class II--Priority followup.) (A-76-3.)

- "2. Require a physical inspection of a runway and adjacent areas at each controlled airport certificated under 14 CFR 139, which has a recognized bird-hazard problem on each occasion before:
 - (a) Designating that runway as the active runway, or
 - (b) Allowing takeoffs from other than the active runway.
(Class II-Priority followup.) (A-76-9.)
- "3. Frequently review the operations manual for each airport certificated under 14 CFR 139 which has a recognized bird hazard problem to assure that the provisions of their bird-hazard reduction program are adequate. (Class II-Priority followup.) (A-76-10.)
- "4. Require that a specially trained, staffed, and equipped bird-dispersal organization be established at each controlled certificated airport with a recognized bird-hazard problem. (Class III-Longer-Term followup.) (A-76-11.)
- "5. Amend 14 CFR 139.67 to require that, where the Administrator finds that a bird hazard exists, an ecological study be conducted to determine the measures necessary for an effective bird-hazard reduction program. (Class III-Longer-Term followup.) (A-76-12.)
- "6. Revise FAA Form 5280-3, Airport Certification Safety Inspection, to include more detailed criteria for use by airport certification specialists to evaluate the bird hazard potential at an airport. These criteria should include, but not be limited to, migratory patterns, local ntractants, and airport features likely to attract birds. (Class III-Longer-Term followup.) (A-76-13.)
- "7. Assist and encourage the Port Authority to implement the recommendations contained in the previous ecological studies of Port Authroity airports. Specifically, these studies offered the following remedial measures:
 - (a) For John F. Kennedy International Airport:
 - (1) Eliminate the two dumps and several sewer outlets which attract gulls.
 - (2) Drain or fill the several small marshes and ponds on the airport.

- (3) Dredge mudflats or cover them with gravel to eliminate shore bird concentrations.
- (4) Remove the wire fence at the southeast end of the airport.
- (5) Dispose of food-bearing plants such as bayberry, tall stands of phragmites, and other dense growths of vegetation used for roosting purposes. This may be done by burning, cutting, bulldozing or with herbicides.
- (6) Shoot or trap rodents and rabbits which attract birds of prey.
- (7) Employ a well supervised shotgun patrol to repel birds from critical airport areas. The patrols should use shell crackers, and to a limited extent, live ammunition.

(b) For LaGuardia Airport:

- (1) Consider the appointment to the New York Airports of an environmental specialist to coordinate the programs of bird control.
- (2) Fill temporary water areas, and alter habitat in the headland area by bulldozing or the use of herbicides.
- (3) Continue a shotgun patrol and the use of scare devices.
- (4) Communicate with the New York City Department of Public Works to explore possibilities for minimizing gull access to domestic waste. Elimination of food sources will substantially reduce the local gull population.

(c) For Newark International Airport:

- (1) Bird and other wildlife habitat at the airport be altered by drainage, cutting, bulldozing, or use of herbicides.
- (2) Grasshoppers be controlled by applying either insecticides, or through agricultural practices.
- (3) Newly constructed areas not be landscaped with ornamental trees, shrubs, or brush.

- (4) A shotgun and scare devise patrol be continued.
- (5) A collection of bird/plane and near-miss data be continued.
- (6) A man be appointed full-time to eliminate bird hazards.
- (7) The Port of New York Authority influence the termination of the Oak Island and Elizabeth Dumps, and prohibit the development of proposed sites near the airport. (Class II-Priority followup.) (A-76-14.)"

Also on March 8, 1976, the Safety Board recommended that the Federal Aviation Administration:

- "1. Rescind the Technical Standard Order (TSO) approving the American Safety, Inc., dual retractor restraint system until it is modified so that the seatbelt cannot release inadvertently. (Class I-Urgent followup.) (h-76-15.)
- "2. Issue an AD to prohibit the use of all rearward-facing flight attendant seats on DC-10 aircraft until the deficiencies of the restraint systems are corrected or until a suitable alternate restraint system is installed. (Class I-Urgent followup.) (A-76-16.)"

As a result of an earlier special investigation concerning the CF6 engine, the Safety Board issued the following recommendations to the Administrator, Federal Aviation Administration, on March 25, 1975.

- "1. Require that certification demonstration of engine anti-icing provisions be performed in a test facility which can aerodynamically simulate in-flight icing conditions.
- "2. Warn all operators of aircraft equipped with CF6-50 engines that engine damage could result when ice is shed from the fan spinner after prolonged exposure to moderate or severe icing condition at a holding pattern power setting.
- "3. Gather accurate engine performance information from selected in-service cases of bird ingestion by large turbo fan engines which resulted in engine shutdown, serious thrust loss, or excessive vibration. This information, in combination with the most recent ornithological data and advances in engine technology, should be used to evaluate the adequacy of bird ingest-ion criteria for large turbo fan engines."

FAA responses to recommendations are shown in Appendix G.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

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December 16, 1976