DOCKET NO. **SA- 516**

EXHIBIT NO. **23C**

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON,

FAA COMMENTS ON FLIGHT TEST PLAN

(6 Pages)

6/27/97

FAA Comments
on
Draft NTSB Flight Test Plan, dated June 24, 1997, 9:05 AM
Accident DCA96MA070

(TWA Flight 800)

The Federal Aviation Administration (FAA) submits the following comments and requests for changes to the above draft Flight Test Plan:

B. FLIGHT TEST GROUP: Add Mr. G. Michael Collins (425-227-2689) as the Federal Aviation Administration member of the group.

3. Test Aircraft: The first paragraph states that the "experimental" classification will be avoided, if possible. Based on the information available at this time regarding the installation of the test instrumentation, the FAA expects the testing to be conducted under an Experimental Airworthiness Certificate.

3.1 Conformity: If this section is not meant to refer to an FAA conformity inspection, the section title and text should be changed to refer to "configuration" requirements, not conformity requirements. The information in this section presents some general configuration requirements for the test airplane. The word "conformity" is associated with FAA conformity inspections of an airplane or installation, for instance the installation of the test instrumentation. A conformity inspection would verify that the work has been accomplished in accordance with the engineering change document. Because this is not an FAA (certification) flight test, a conformity inspection may not be required.

3.3.1 General:
The first paragraph refers to minimizing the changes that exist on the airplane after the test instrumentation has been removed. It states that the airplane will be returned without change, other that potential minor cosmetic marks in concealed areas. This appears to be contract type wording. If this paragraph is intended to cover the requirements for returning the airplane to Evergreen Airlines, with the understanding that Evergreen will insure that it is returned to serviceable condition, the wording should be revised to state this more clearly. If it is meant to address the requirements for returning the airplane in a condition that is ready for normal flight operations, then the wording needs to address repairing all modifications (including "cosmetic markings") to within maintenance manual limits or some other FAA approved repair method.

3.2.2.3 Air Temperature Measurements:
Existing instrumentation:

General comment for fuel tank vent thermocouples: Highly responsive (short time constant) thermocouples should be use for the vent temperature thermocouple locations:

6. This describes thermocouples located in center of each (center tank) vent inlet [4 total]. These should be located as far inside the vents as practicable (a few inches is sufficient).

8. This describes one thermocouple located in the center of the flow of the (center tank) vent stringer, at the entrance to the right wing surge tank. This should be located as far inside the channel as practicable (a few inches is sufficient).

Item 8 also describes another thermocouple in the surge tank "collector can, where the venting from all tanks is combined to pass overboard." This location is not clearly understood; is this in the inboard end of this vent tube, the outboard end, near the flame detector? The FAA requests that as a minimum thermocouples be located in the right surge tank vent at the locations described below in item (C).

9. This is the same as #8 except in the left surge tank. The FAA comment is the same as for #8.

15) Item 15 relates to checking the pressure sensors and is a duplicate to item 3 in section 3.3.3 (Pressure Instrumentation). Is this meant to require a check of the thermocouples?

Additional Thermocouples Requested by the FAA:
In addition to the above, the FAA requests that the following air temperature thermocouples be included to provide data for evaluating the flammability of the fuel tank vapor between the surge tank and the number 3 main fuel tank. This additional data and the additional fuel management operation requested in Section 5.2, comment (B), are directed at gathering data on the temperature at various points in the fuel tank vent system and in the center and main tanks during the cross feed configuration that existed on the flight engineers panel when it was recovered from TWA Flight 800. (See the comments below under section 5.2 for a the description of the cross feed configuration). The proposed instrumentation would also be recorded during the conditions already contained in the test plan to provide data related to other fuel management conditions.

As stated in the general comment above for all fuel vent thermocouples, highly responsive (short time constant) thermocouples should be used for these additional vent temperature thermocouple locations:

A) At the surge tank end of the number three main tank vent channels (2 locations) - as far inside channel as practicable (a few inches is sufficient), with thermocouple centered in channel

B) At the surge tank end of the number four main tank vent channel - as far inside channel as practicable (a few inches is sufficient), with thermocouple centered in channel

C) 1) Inside the surge tank overboard vent duct, at the outboard side of the bend (at the limit of the surge tank suppression system optical detector view), centered in the duct.
2) At the opening of the surge tank overboard vent duct into the surge tank, centered in the duct.

D) Approximately centered in each bay of the right wing surge tank (two locations).

E) Inside the main tank number three inboard and outboard vent openings, within main tank number three, as far inside tubing as practicable (a few inches is sufficient), with thermocouple centered in tubing (2 locations).

F) Inside main tank number three, near the high points of each fuel pump power conduit (just forward of where the tubing is clamped to the wing rib). The thermocouples should be at least three inches from any adjacent structure or tubing, and should be approximately six inches below the wing top skin. (2 locations)

3.2.3 Pressure Instrumentation:
A) Items 1 and 2 describes pressure "gage(s)" that will be located in the center wing tank. This appears to be a typo that should read pressure "sensors."

4.1 Airplane Occupants During the Test Flights:
This lists the specific personnel that will be permitted to be aboard the airplane during the flight testing. The draft plan identifies these personnel as "those required for operating the airplane and conducting tests." Item 8 has been added to this section and it calls out an "FAA pilot" as one of those personnel currently anticipated to be aboard for the tests.

Please clarify this addition to the list of required personnel. At this time the only FAA member of the flight test group is Mike Collins, Aerospace Engineer, SACO. The FAA does not currently anticipated that he will be required to be aboard for the operating and conducting of the flight tests.

5.1 Dispatch and data recording:

The fourth paragraph states that the target outside air temperature for dispatch is 89°F. It is our understanding that the temperature at JFK at the time the TWA 800 flight began was **82°F**, and therefore 82°F should be the target outside air temperature.

5.1 Airplane Fuel Load:
(Note: The Dispatch and data recording section is also numbered 5.1.)
The fuel type that is to be used should be specified in the test plan. Also, fuel samples should be taken for analysis following fueling and after flights that "age" the fuel.

5.2 Operational Procedures:

Additional Flight Test Conditions: The FAA requests that the following additional flight test conditions be added to the test plan:

A) At least one test flight should simulate the cold soak conditions and fuel loading temperatures that Flight 800 experienced between the previous flight into JFK and the Flight 800 profile.

This test flight could take place immediately after the flight and cruise conditions such as those defined by section 5.2.8, with the representative ground time and conditions that Flight 800 experienced between the two flights. The fuel load at the beginning of the 5.2.8 flight profile would need to be calculated to allow for refueling the main and reserve tanks before this recommended flight. This will provide fuel tank system temperature data that most closely duplicates the Flight 800 temperatures.

B) An additional flight to evaluate the boost pump power conduit ignition theory discussed previously with the NTSB. This is theory is based on the previous service history of wire chafing in the fuel pump wire conduits (located in the inboard main fuel tanks) and the fuel tank cross feed configuration that existed on the TWA Flight 800 flight engineers panel when the panel was examined by the NTSB Fuel System Sub-Group. (Fuel System Sub-Group Field Notes, dated August 25, 1996.) This additional testing will gather data on the temperature at various points in the fuel tank vent system and in the center and main tanks during this cross feed condition. The cross feed configuration is main tank number 3 feeding engines 1, 2, and 3 (both number 3 boost pumps operating for the test) and engine number 4 fed only from the number 4 tank (with one or both number 4 boost pumps operating for the test).

The pre-takeoff and takeoff conditions (fuel load, fuel temperature, ambient temperature, fuel management configuration, etc.) should be as close as possible to those believed to have existed for TWA Flight 800. The flight should follow the climb profile and power settings indicated by the flight data recorder. The cross feed configuration should be selected approximately seven minutes after takeoff. (The FAA understands that the NTSB has determined that the Flight 800 crew selected a cross feed configuration at this time in the flight.) The flight test crew should attempt to closely follow the pitch changes shown by the flight data recorder for Flight 800, particularly during the final 90 seconds of the recording. This test condition is complete when the airplane reaches 17,000 feet, as defined in the first flight profile in section 5.2.4.

5.2.4 First Flight: This describes the flight profile for the first flight and then is referred to in several subsequent flights. Additional detail should be added to insure that the conditions of TWA Flight 800 are duplicated as closely as possible. The following conditions should be reviewed:

A) When is the APU started and shut-down.

B) What is the typical TWA pack operation throughout the duration of the flight conditions:

At the gate.
Ground taxi operations
Takeoff power setting
Climb power setting
During cruise (5.2.8)

C) There is a note that instructs the flight crew to perform normal fuel tank management during the test sequences. This should be the normal TWA fuel management procedures that would have been used by the Flight 800 crew. The details of the fuel management procedure to be used should be added to the test plan.

D) The flight profile should be revised to more closely match the data from the Flight 800 flight data recorder.

5.2.8 Fourth Flight and Cruise Condition: This condition includes a pre-flight test for electromagnetic interference (EMI) on the fuel quantity indicating system (FQIS) wires.

A) Is the intent that the FQIS system be powered during this test. If it is the FQIS indications should be monitored during the EMI testing.

B) Is the EMI testing performed with the APU running, ground power, engines running?

5.2.9 Fifth Flight With Tankered Fuel: This test is conducted with 2,000 pounds of fuel added to the center wing tank (CWT). The flight profile is based on condition 5.2.4 with of the CWT fuel and in this flight all 3 air conditioning (A/C) packs are operating. The A/C pack outlets are adjusted to maintain a "comfortable cabin temperature" at 17,500 feet altitude and the flight continues until stabilized CWT temperatures are obtained. Boeing should verify that this test is conducted with the A/C packs operating in the "worst case" operational mode regarding heat rejected to the center wing tank. This should include consideration of all configurations permitted for dispatch.

9. Test Reports: The second paragraph states that raw and reduced flight test data will be provided by Boeing to the NTSB. This data should also be made available to all parties.