



Federal Aviation Administration
Special Certification Review Team
Report on:

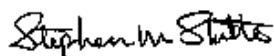
**Santa Barbara Aerospace
STC ST00236LA-D
Swissair Model MD-11 Airplane
In-flight Entertainment System**

June 14, 1999

Revised to Add Appendix B on June 9, 2000

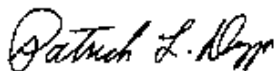
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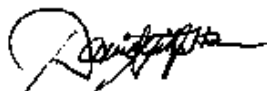


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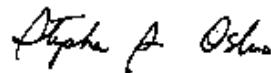
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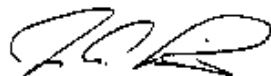
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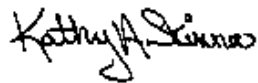
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Foreword

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This report contains the findings and recommendations of the FAA's special certification review team chartered to investigate the design, installation, and certification of the in-flight entertainment system installed on Swissair MD-11 airplanes. The in-flight entertainment system was certified under FAA Supplemental Type Certificate No. ST00236LA-D. The supplemental type certificate was approved by Santa Barbara Aerospace under its authority as a 14 CFR Part 21 Designated Alteration Station. The objectives of the special certification review were to determine if any unsafe design or installation features exist in connection with the in-flight entertainment system, and to review the practices of Santa Barbara Aerospace with regard to its approval of STC No. ST00236LA-D, including the FAA's oversight of Santa Barbara Aerospace. The special certification review was conducted in three phases beginning on November 9, 1998 and concluding on January 29, 1999.

Abbreviations

Following are abbreviations used in this report:

CFR	Code of Federal Regulations
DAR	Designated Airworthiness Representative
DAS	Designated Alteration Station
DER	Designated Engineering Representative
DMIR	Designated Manufacturing Inspection Representative
FAA	Federal Aviation Administration
FOCA	Federal Office for Civil Aviation (Switzerland)
HI	Hollingshead International
IFE	In-flight Entertainment (System)
IFEN	In-flight Entertainment Network
IFT	Interactive Flight Technologies
MDL	Master Data List
SBA	Santa Barbara Aerospace
SCR	Special Certification Review
STC	Supplemental Type Certificate

Introduction

On September 2, 1998, a Boeing Model MD-11 airplane operated by Swissair crashed near Halifax, Nova Scotia, killing all 215 passengers and 14 crew members. To date, causal factors of the accident have not been determined. However, smoke in the flight deck had been reported and there were indications of heat damage to electrical wires in the recovered wreckage. In the early phases of the accident investigation, interest was focused on the in-flight entertainment system (IFE) installed aboard the accident airplane. The modification of Swissair MD-11 airplanes, including the accident airplane, to install the IFE system was accomplished under the authority of Switzerland's Federal Office for Civil Aviation (FOCA). The basis for the FOCA's acceptance was FAA Supplemental Type Certificate (STC) No. ST00236LA-D. That STC was issued by Santa Barbara Aerospace (SBA) under its authority as an FAA Designated Alteration Station (DAS).

Recognizing the concern raised by the accident investigation regarding the IFE system, the FAA's Transport Airplane Directorate launched a special certification review (SCR). The purpose of the review was to evaluate the design, installation, and certification process of the IFE system approved by STC No. ST00236LA-D. The objectives of this review were:

- to determine if any unsafe design or installation features exist in connection with the IFE system, and
- to review the practices of SBA with regard to its approval of STC No. ST00236LA-D, including the FAA's oversight of SBA.

The FAA formed a SCR Team and tasked it with conducting the SCR under the guidelines of FAA Order 8110.4A, *Type Certification Procedures*. The review was conducted in three phases.

Phase I was an in-depth review of the design, installation, and certification of the IFE system. This included the review of certification data; conducting technical discussions with personnel involved in the design, installation, and certification of the IFE system; an on-site visit and inspection of SBA facilities in Santa Barbara, California; inspection of an MD-11 freighter on the Boeing production line; and an inspection of a Swissair MD-11 airplane at Los Angeles International Airport.

Phase II involved physical inspection and testing of the IFE system as installed on Swissair MD-11 airplanes to determine the quality of the installation and if conditions exist that could pose a safety hazard to the airplane. Phase II was supported by personnel from Switzerland's FOCA, Swissair, SR Technics, Santa Barbara Aerospace, Hollingshead International, and Interactive Flight Technologies.

Phase III consisted of fault insertion testing of the IFE system. The purpose of this testing was to introduce faults that could be encountered in the system as installed on the airplane, and to observe and record the response of the IFE system to those faults.

Description of the In-flight Entertainment System

The IFE system, known specifically as the In-flight Entertainment Network (IFEN), was designed by Interactive Flight Technologies (IFT) of Phoenix, Arizona. The IFEN system is a distributed network that combines computer, video, and audio technologies. The passenger's interface with the IFEN system is an in-seat video display that provides a touch screen video terminal, a credit/debit card swipe device, and an audio/game port. The seat display unit interfaces with a computer located underneath the seat. Other system components, most of which are located in overhead racks, work together to provide system communications and security/maintenance access for the cabin and ground maintenance crews. Communications are routed among the components via Ethernet networks. The operating system software is Microsoft Windows NT. Passenger entertainment features are selectable through a touch screen at each seat in the system.

Figure 1 is a picture of an in-seat video display in the business class section of a Swissair MD-11 airplane. Figure 2 is a picture of the screen that a passenger would use to select the desired system features. Figure 3 is a picture of Equipment Rack No. 1 that is located in the overhead of the first class section. The rack is approximately 10 feet in length and with its components installed weighs approximately 373 pounds. Rack No. 1 contains IFEN system components such as power supplies, modulators, EMI filters, cluster controllers, and a video-on-demand disk array unit. The IFEN system configuration approved by STC ST00236LA-D has three such equipment racks. The other two racks are located in the overhead area of the business and economy class sections of the airplane interior. Figure 4 is a picture of the IFEN system management terminal used by the cabin crew.



Figure 1
First/Business Class In-seat Video Display



Figure 2
Passenger Feature Selection Options Screen



Figure 3
IFEN System Equipment Rack No. 1



Figure 4
IFEN System Management Terminal

IFEN System Installation and Configuration

The IFEN system was installed on 16 Swissair MD-11 airplanes (including the accident airplane) over a period of 18 months at SR Technics facilities, located in Zurich, Switzerland.

Supplemental Type Certificate ST00236LA-D approves a configuration consisting of either 257 or 243 passengers in first, business, and economy class. However, after the STC was approved and the IFEN system installed on two of its MD-11 airplanes, Swissair made a decision to remove the IFEN system from economy class. This decision was based primarily on economic reasons. Therefore, the current fleet of Swissair MD-11 airplanes have the IFEN system installed only in first and business class. The IFEN system was installed only in the first and business class sections of the accident airplane. The STC was not amended to reflect the removal of the economy class equipment. Santa Barbara Aerospace was not involved in the equipment removal.

Chronology of STC ST00236LA-D and its Amendments

The STC was first issued on November 19, 1996, and amended five times, by SBA, over a nine-month period.

Original Issue, November 19, 1996

As issued on November 19, 1996, STC ST00236LA-D approved provisions for installation of the IFEN system. Although the original intent of the parties involved was to approve a functioning IFEN system, some IFEN system components were not available in time to support the airplane modification schedule. Therefore, only the provisions (wiring and mounting hardware) were installed. The STC was applicable to Swissair MD-11 airplane serial number

48445 and was defined by Hollingshead International (HI) Master Data List (MDL) No. 12003-511, Rev. C.

First Amendment, December 18, 1996

On December 18, 1996, the STC was amended to add provisions for another IFEN configuration. The provisions were applicable to airplane serial number 48446 and were defined by HI MDL No. 12003-521, Rev C1. At this point, STC No. ST00236LA-D is applicable to Swissair MD-11 airplanes serial numbers 48445 and 48446 for installing provisions for two IFEN system configurations. To reflect this the *Description of Type Design Change* section of the STC was revised to add "Master Data List 12003-521 Revision C1 Dated December 17, 1996 as defined in the Limitations Section of this STC". The *Limitations and Conditions* section of the STC was also changed to add "Master Data List 12003-521 applies to McDonnell Douglas MD-11 Serial Number 48446 Only."

Second Amendment, January 24, 1997

On January 24, 1997, the STC was amended a second time. This amendment deleted the -511 and -521 configurations, and replaced them with a configuration defined by HI MDL No. 12003-501, Rev. D. The -501 configuration was a fully functioning IFEN system except that the first class and bulkhead row economy seats did not have IFEN system components installed. The STC was applicable to three serial numbered Swissair MD-11 airplanes, 48445, 48446, and 48452. It was at this STC amendment level that a note was added regarding IFEN system components installed in the airplane seats. The note states: "The installation of passenger seats and all other aspects of cabin interior arrangement are NOT approved by this STC, and must be approved separately. A copy of this STC must be included in the permanent records of the modified aircraft. All of the above interior furnishings have been demonstrated to meet the flammability requirements of FAR 25.853 (b) (Amendment 25-32) and 25.1359 (d) (Amendment 25-32)." The effect of this is to remove responsibility from SBA and to place it on the seat manufacturers for ensuring that the seat mounted components are in compliance with the applicable certification requirements.

Third Amendment, February 3, 1997

The third amendment to the STC, dated February 3, 1997, approved the same configuration as the January 24, 1997, amendment. However, it removed the specific MD-11 serial number applicability limitations listed on the January 24, 1997, amendment. Removing the serial number limitation converted the STC from an approval for three aircraft into a multiple STC that approves installation of the -501 IFEN system configuration onto Swissair's fleet of 16 MD-11 airplanes.

Fourth Amendment, March 11, 1997

The fourth amendment to the STC, dated March 11, 1997, added the words "or Subsequent FAA Approved Revisions" to the *Description of Type Design* section.

This amendment had little effect on the STC. By adding the words "or subsequent FAA Approved Revisions" the STC holder can obtain design change approval without having to amend the STC document each time a design change is FAA approved. This is a normal statement to include on a STC and should have been done at the third amendment level.

Fifth Amendment, August 7, 1997

The fifth and final amendment to the STC, dated August 7, 1997, added another IFEN system configuration that was defined by HI MDL No. 12003-503, Rev. A. This is in addition to the previously approved -501 configuration.

In summary, STC No. ST00236LA-D at amendment five is the current approved STC. The STC approves the installation of two IFEN system configurations defined by HI MDL Nos. 12003-501, Revision D and 12003-503, Revision A on Swissair's MD-11 airplanes. The -501 configuration is for 257 passengers in mixed classes and the -503 configuration is for 243 passengers in mixed classes.

Santa Barbara Aerospace

Facts about Santa Barbara Aerospace Relating to STC ST00236LA-D

Santa Barbara Aerospace (SBA) acted as the certifying organization for issuing STC No. ST00236LA-D. It performed this function using its authorization as a 14 CFR Part 21 DAS. Santa Barbara Aerospace was the applicant and is the owner of the STC. Santa Barbara Aerospace did not perform any design or installation functions in support of the STC. Its involvement was limited to certification activities such as approving data to show compliance with applicable regulations, test witnessing, drawing review, and parts and installation conformity.

Santa Barbara Aerospace submitted a letter of intent to the FAA on August 19, 1996, informing the FAA of its intent to certify the IFEN system on Swissair MD-11 airplanes. FAA concurrence to the letter of intent was provided by stamping the letter "FAA ACCEPTED" along with notes indicating additional certification requirements. Santa Barbara Aerospace submitted a revised letter of intent dated October 3, 1996, incorporating the additional certification requirements.

Hollingshead International contracted with SBA to provide the certification services necessary to obtain an FAA STC. Interactive Flight Technologies also contracted with SBA to review and approve test plans and results in support of environmental testing of IFEN system components.

General Facts about SBA

During the period that STC No. ST00236LA-D was developed and issued, SBA was an authorized DAS company. Santa Barbara Aerospace's DAS certificate, number DAS-14-NM

was issued on August 11, 1994, by the FAA's Los Angeles Aircraft Certification Office. In a letter to the FAA, dated November 30, 1998, SBA voluntarily surrendered its DAS certificate. Therefore, SBA does not currently have 14 CFR Part 21 DAS authorization. Santa Barbara Aerospace has stated to the FAA its desire to be reinstated as a DAS.

Santa Barbara Aerospace recently consolidated its facilities from Santa Barbara, California to San Bernardino, California. Santa Barbara Aerospace is a licensed FAA 14 CFR Part 145 repair station (certificate number S3BR755J, issued on July 27, 1994).

Other Companies Involved in the Design, Installation, and Certification Process

In addition to SBA, several companies were involved in the design, installation, and certification of the IFEN system. The involvement and interrelationship of the companies is graphically depicted in Figure 5.

Hollingsead International

Hollingsead International (HI) was the airplane/IFEN system integrator. Interactive Flight Technologies, contracted with HI to perform the airplane/IFEN system integration engineering and installation. Hollingsead developed all necessary engineering drawings and documents for installation of the IFEN system onboard the Swissair MD-11 airplanes. Hollingsead also manufactured the wire bundles, equipment racks, and structural supports necessary for installing the IFEN system. Hollingsead holds an FAA Parts Manufacturing Approval (PMA) for the wire bundles and equipment racks. In addition, it performed the physical installation of the IFEN system on the 16 Swissair MD-11 airplanes. All installation work was accomplished by HI personnel at SR Technics facilities located at the Zurich, Switzerland airport.

Hollingsead is a licensed FAA 14 CFR Part 145 repair station (certificate number MLQD706S, originally issued in April 1953) and is an authorized 14 CFR Part 21 DAS (certificate number DAS-16-NM, issued in March 1993). However, it did not exercise either its repair station or DAS authorization in support of this STC. Hollingsead has facilities in Santa Ana and Garden Grove, California.

Interactive Flight Technologies

Interactive Flight Technologies (IFT) developed, designed, built the components for, and marketed the IFEN system. It entered a contractual agreement with Swissair to equip Swissair's fleet of MD-11 airplanes with the IFEN system.

The components of the IFEN system are manufactured by IFT or by vendors selected by them. Although some of the components are proprietary designs developed by IFT, the majority of the components are built to engineering specifications developed by IFT in conjunction with

the vendors. Interactive Flight Technologies holds PMA authorization for the IFEN system components based on a licensing agreement with SBA.

Interactive Flight Technologies is an authorized 14 CFR Part 145 repair station (certificate number 19TR42N, issued May 16, 1996). However, IFT did not perform work under its Part 145 repair station authority in support of this STC. Interactive Flight Technologies is located in Phoenix, Arizona.

Swissair and SR Technics

Swissair is a scheduled airline and operates under JAR-OPS 1 approval. SR Technics performs aircraft and engine overhaul and maintenance and is an approved JAR Part 145 maintenance organization. Both are part of separate divisions of SAirGroup. SAirGroup is a corporate affiliation comprised of several divisions including air carriers, aircraft maintenance services, ground handling services, and transportation logistics. Swissair and SR Technics are located in Zurich, Switzerland.

Swissair contracted with SR Technics to provide the facilities and support required by HI to perform the IFEN system installation work, and to ensure the overall quality of the installation. The installation of the IFEN system by HI and its oversight by SR Technics are within the scope of SR Technics' JAR 145 maintenance organization approval.

Using its JAR 145 maintenance organization approval, SR Technics returned the modified MD-11 airplanes to Swissair. Swissair was responsible for returning the modified airplanes to service.

Recaro and Rumbold

Recaro and Rumbold are airplane seat manufacturers. Recaro provided the first and economy class seats; Rumbold provided the business class seats. Recaro is located in Steinbeisweg, Germany; Rumbold is located in Camberley, England. The seat manufacturers installed IFEN system components into their seats under contract to IFT. The seats were shipped to SR Technics facilities in Zurich for installation. The installation of the passenger seats (and therefore the IFEN system components installed in them) was not approved under STC No. ST00236LA-D. Instead, this was accomplished under a different STC that was issued by the FAA's Atlanta Aircraft Certification Office. This STC, number ST01373AT, was issued on June 9, 1997, seven months after SBA first issued STC No. ST00236LA-D. Swissair obtained temporary authorization from Switzerland's Federal Office for Civil Aviation (FOCA) to operate the airplane between the time STC No. ST00236LA-D was issued and the time STC No. ST01373AT was issued.

Supplemental Type Certificate No. ST01373AT modified the interior of Swissair MD-11 airplanes by reducing the number of first class seats, relocating lavatories, and providing for two different business and economy section seating configurations. SR Technics personnel performed the modification work defined by STC No. ST01373AT.

Regulatory Authorities Involvement

Regulatory oversight of SBA's certification of the IFEN system was by the FAA. Installation of the IFEN system on Swissair MD-11 airplanes was accomplished under the oversight of the Swiss FOCA.

Switzerland's Federal Office for Civil Aviation

The FOCA accepted FAA STC No. ST00236LA-D as opposed to performing a formal validation of the IFEN system. Therefore, the FOCA did not issue a separate Swiss STC. Prior to contracting with IFT, Swissair approached FOCA with its plans for installing a passenger entertainment system onboard its MD-11 fleet. These plans included obtaining an FAA STC. The FOCA informed Swissair that installation of the proposed system would be allowed if, among other things, Swissair ensured FAA certification and proof that the system was installed in accordance with the certification requirements. The proof provided was via FAA Form 337 submitted to SR Technics by Hollingsead. The use of FAA Form 337 in this manner is acceptable and does not violate FAA regulations. The FOCA approved subsequent modifications to the IFEN system.

Federal Aviation Administration

The FAA provided regulatory oversight of SBA, and followed normal DAS oversight procedures with regard to STC No. ST00236LA-D.

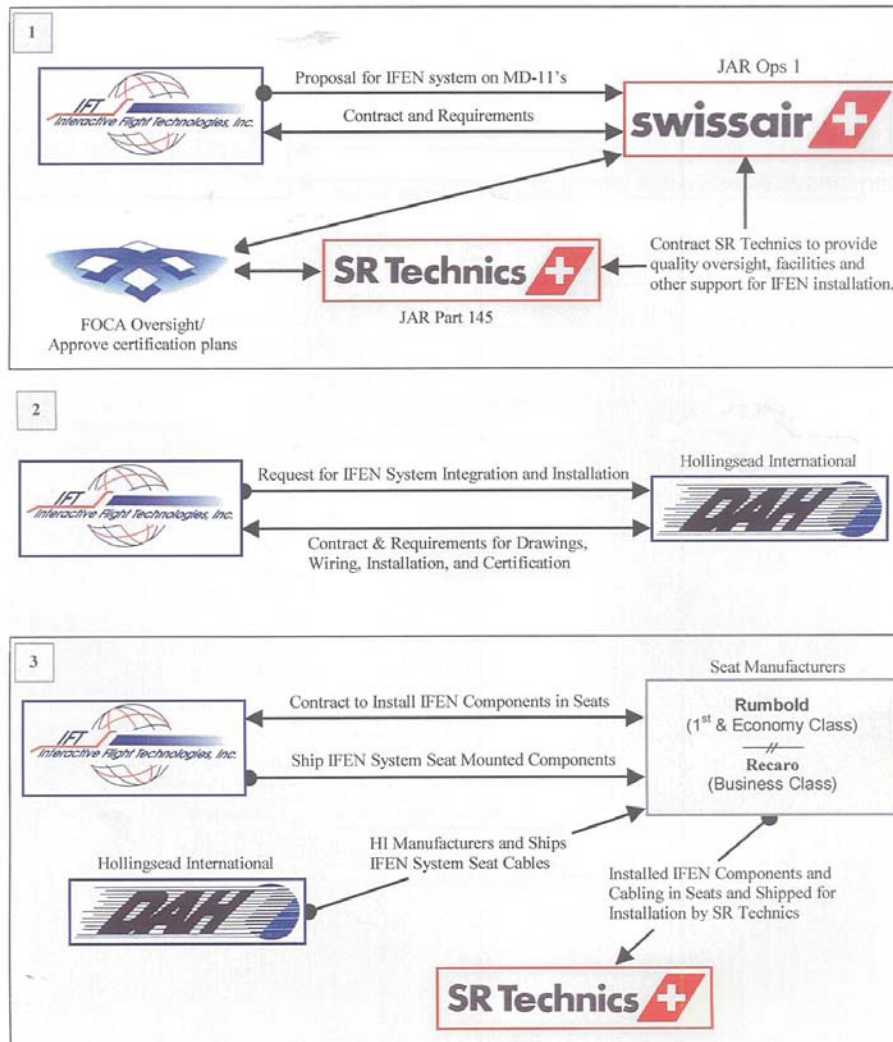


Figure 5
Development and Certification Process for the
Swissair MD-11 IFEN System

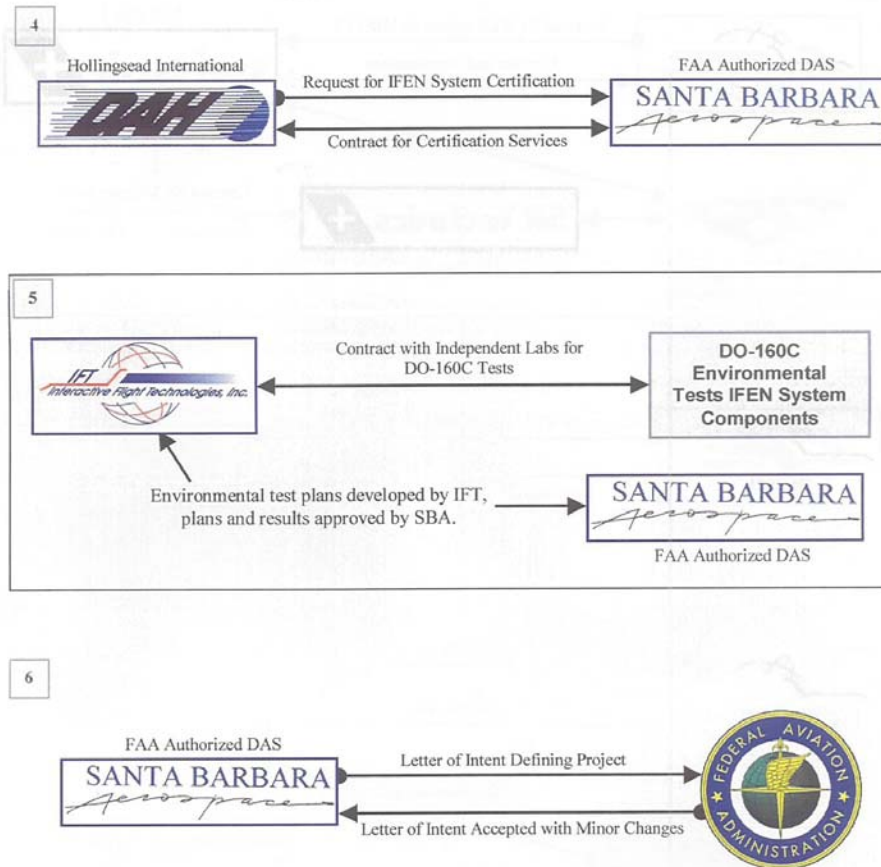


Figure 5, (continued)
Development and Certification Process for the
Swissair MD-11 IFEN System

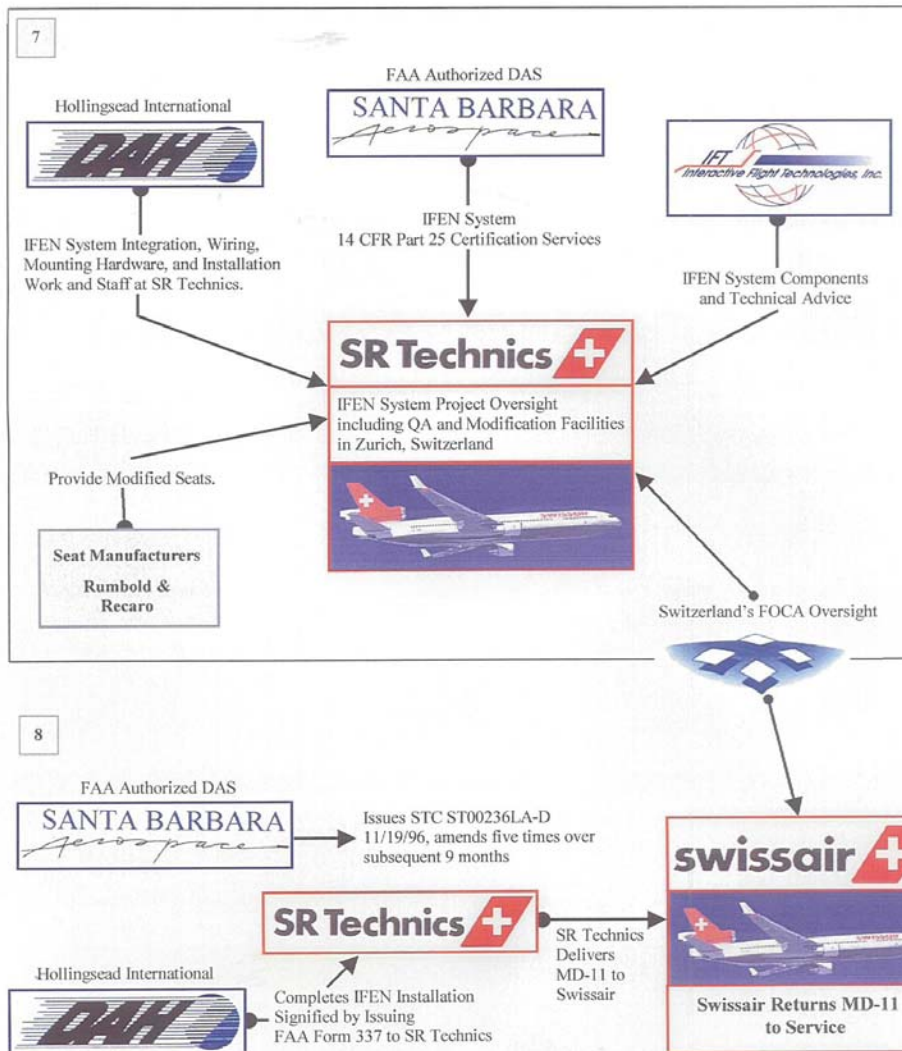


Figure 5, (continued)
Development and Certification Process for the
Swissair MD-11 IFEN System

Findings of the FAA's SCR Team

Based on the SCR Team's review and the evidence obtained, the following are the findings of the SCR Team:

Finding 1

The current design of the IFEN system electrical power switching is not compatible with the design concept of the MD-11 airplane with regard to the response by the flightcrew to a cabin or flight deck smoke/fumes emergency. In addition, the current IFEN system design does not provide the flightcrew and/or cabin crew with the ability to remove electrical power by a means other than pulling the system's circuit breakers.

The airplane manufacturer's design concept of the airplane results in power being removed from the main cabin systems when the CAB BUS switch is engaged during a smoke/fumes emergency. However, the design of the IFEN system installation circumvented flightcrew procedures for responding to a smoke/fumes emergency by connecting the IFEN system to an electrical bus that is not de-energized when the CAB BUS switch is activated.

Although, the power to the IFEN system would eventually be removed via activation of the SMOKE ELEC/AIR rotary switch, the flightcrew would expect that selection of the CAB BUS switch would isolate all non-essential power to the cabin. The source of electrical power for the IFEN system was based on electrical power demands and electrical bus reliability.

Although the cabin crew is able to deactivate individual in-seat video displays (ISVD) from the IFEN system management terminal, deactivation does not remove electrical power from the ISVD's and other IFEN system components.

Finding 2

In many instances Santa Barbara Aerospace, as the STC applicant and DAS holder, did not follow proper certification procedures.

The following are examples where SBA failed to follow proper certification procedures as a STC applicant and as a DAS holder:

- SBA issued an amendment to STC No. ST00236LA-D, dated August 7, 1997, before compliance to all applicable certification requirements had been demonstrated. Specifically, certification flight testing was accomplished on October 22, 1997, over two months after the amendment to the STC was issued by SBA.
- SBA failed to issue a Type Inspection Authorization prior to conducting certification flight testing for both the -501, and the -503 IFEN system configurations.
- SBA failed to complete various certification forms as required in its DAS procedure manual indicating that DAS specialists had reviewed and approved certification data (e.g., flammability, weight and balance, and flight test reports).

- SBA failed to update preliminary structural substantiation and weight and balance reports to reflect the actual weight of the IFEN system installation on the airplane.
- SBA, as the STC applicant, did not provide a statement of conformity (14 CFR Part 21.53) prior to the DAS inspector conducting the FAA installation conformity inspections. In addition, the DAS inspector found non-conformities after the applicant stated that inspections had been performed and the installation was in conformance to design data.
- A review of the type design data revealed numerous instances where the data is inadequate or inaccurate, including Master Data Lists Nos. 12003-501/-503, and does not meet the requirements of 14 CFR Part 21.31.
- SBA issued PMA licensing agreements to Interactive Flight Technologies for IFEN system components that were not approved as part of the STC (i.e., IFEN system components that are installed in the seat assemblies).
- SBA failed to complete the maintenance manual requirements of 14 CFR Part 21.50.
- SBA failed to address Master Minimum Equipment List (MMEL) considerations.

Finding 3

The FAA oversight of SBA for STC No. ST00236LA-D project was in accordance with established procedures. However,

- the FAA's established procedures did not clearly define how the FAA should document concurrence with the proposed STC project and/or any additional requirements, inspections, tests, or clarifications, and
- the FAA procedures did not require SBA to notify the FAA if the project's scope and/or schedule were significantly revised.

Finding 4

The FAA failed to ensure that problems identified during scheduled SBA DAS audits were corrected.

The FAA did not follow-up and verify the accomplishment of corrective actions as proposed by SBA in response to problems identified during FAA audits conducted in March 1996, and May 1998. In addition, as indicated by the findings of this SCR, SBA failed to accomplish the corrective actions.

Finding 5

The engineering evaluation found the IFEN system wiring and component installations on Swissair MD-11 airplanes acceptable, despite minor drawing and installation discrepancies.

During SCR Phase I, the review of detail and installation drawings revealed a lack of detail in the areas of wire crimping, wire bend radius, terminal torque, wire routing, and wire

separation. However, during Phase II the detailed engineering review of the IFEN system installation on four Swissair MD-11 airplanes did not reveal any major deficiencies.

Finding 6

During FAA conformity inspections conducted on three Swissair MD-11 airplanes in SCR Phase II, non-conformities between the installation drawings and the actual installation were identified, and a number of installation drawings were found inadequate. However, these discrepancies were minor and do not adversely impact safety.

Examples of discrepancies include:

- spacers on cable runs were not installed in some areas as required by the installation drawings,
- power cable routing was not defined for some installation areas,
- a grounding strap was not installed in accordance with its installation drawing, and
- part quantities were not adequately defined on some drawings.

Finding 7

The personnel that the SCR Team interfaced with during the review were deemed knowledgeable and qualified.

Santa Barbara Aerospace's DAS Staff for STC No. ST00236LA-D were also FAA designees (DER's, DMIR's, or DAR's). All were in good standing with the FAA in their delegated technical areas and technically qualified to determine compliance to certification regulations. However, in some instances they did not demonstrate a thorough knowledge of the MD-11 type design, design philosophy, design standards, airplane manufacturer's operational assumptions, and Swissair operational procedures. In fact, there are no FAA requirements for training of SBA DAS Staff on DAS procedures or expectations, or requirements for training with regard to familiarity with,

- the airplane manufacturer's type design,
- subsequent modifications made to the airplane,
- the manufacturer's design practices,
- operational assumptions, and
- operator procedures.

The qualifications for appointment of the DAS staff closely follow the qualifications for appointment of other designees (i.e., DER's, DMIR's, DAR's). However, the DAS coordinator's qualifications and appointment process is not as well defined as those for DER's, DMIR's, or DAR's.

The DAS coordinator has the overall responsibility for ensuring the completion of the STC process in accordance with established FAA procedures and the requirements of SBA's DAS procedures manual. However, in many instances SBA's DAS coordinator failed to follow DAS procedures for STC No. ST00236LA-D (reference Finding 2 for examples).

Finding 8

No abnormal operational features of the IFEN system, or its affect on other airplane systems, were identified during operational testing.

During SCR Phase II, operational testing of the IFEN system was performed on Swissair MD-11 airplane registration identification HB-IWA. The testing was performed in accordance with an FAA developed test procedure. Airplane electrical power was from the auxiliary power unit generator and the galleys were operated throughout the test in order to simulate a complete in-flight airplane environment. IFEN system operation and parameters such as voltage, current, temperature, and harmonic distortion were measured and recorded. In addition, other airplane systems were monitored for any possible interference, or other effects, that might be induced by the IFEN system.

The testing exercised all IFEN system operational parameters. In addition, various types of power interruptions were simulated in order to observe its effect on the IFEN system. During the testing, which lasted for approximately eight hours, the IFEN system functioned as expected. No IFEN system operational or airplane system anomalies were observed.

Finding 9

Neither the IFEN system components nor wiring produced conditions that could be considered unsafe when exposed to the types of faults that could be encountered during airplane operation.

During SCR Phase III, fault insertion testing of the IFEN system was conducted on an MD-11 IFEN system mock-up at Interactive Flight Technologies facilities in Phoenix, Arizona, January 27-28, 1999. The purpose of the test was to expose the system to faults that could occur during airplane operations. The IFEN system response was observed and recorded in accordance with an FAA developed test procedure. The test configuration consisted of a functional IFEN system that represented the configuration as currently installed on the Swissair MD-11 airplanes. Figure 6 is a picture of the test rack containing the equipment that resides on equipment racks 1, 2, and 3 on the airplane. Figure 7 is a picture of the in-seat video displays used to simulate the first and business class sections of the airplane.

The fault testing conducted was rigorous in nature in that it exposed the IFEN system to potentially serious types of faults. One example of this was the AC to DC short test. During this test condition, a single-phase 115 volt ac power supply input wire was shorted directly to the +48 volt dc output of the power supply. As expected the main power supply breakers tripped. The fault was removed, IFEN system power was restored, and the system booted up and operated normally. The short caused no apparent damage to the system components or wiring.



Figure 6

Test rack at IFT Facilities in Phoenix. Simulates airplane equipment Racks Nos. 1, 2, and 3.



Figure 7

In-seat video displays, seat electronic boxes and seat disconnect units used for fault insertion testing.

SCR Team Recommendations

The following are the recommendations of the SCR Team:

Recommendation 1

The design of the IFEN system installation should be revised such that its source of electrical power is an airplane electrical bus connected to, or controlled by, the CAB BUS switch. The new design should be compatible with the airplane manufacturer's design concept with regard to the flightcrew procedure for dealing with a smoke/fumes emergency. (Reference Finding 1)

Recommendation 2

A means should be provided to enable the flightcrew and/or cabin crew to manually remove power from the IFEN system by means other than pulling circuit breakers. (Reference Finding 1)

Recommendation 3

The Type Design data for STC No. ST00236LA-D that the SCR Team determined to be inadequate or incomplete should be reviewed and corrected, as necessary, by SBA to ensure compliance with 14 CFR Part 21.31. (Reference Findings 2, 5, and 6)

Recommendation 4

If SBA applies for reinstatement of its DAS authorization, the FAA should ensure that SBA is fully aware of its responsibilities and accountability as a STC applicant and DAS holder. The FAA should ensure that the DAS coordinator is qualified to fulfill his/her responsibilities. In addition to performing regularly scheduled ACSEP and Engineering Audits of SBA, the FAA also should conduct at least one unannounced audit. Also, SBA's DAS procedures manual should be reviewed and revised with particular attention given to:

- specifying the requirements for defining a project's scope and schedule;
- specifying who will perform the design and installation work if other than SBA, and specifying the level of oversight SBA will have on the companies performing the design and installation work;
- specifying requirements for notification to and concurrence from the FAA if the project's scope and/or schedule are significantly revised; and
- specifying requirements for ensuring that all preliminary compliance data reflects what is actually installed on the aircraft before the issuance of an STC.

(Reference Findings 2 and 7)

Recommendation 5

The FAA should review and revise its internal policies and procedures to ensure SBA accomplishes corrective actions it proposes in response to problems identified during FAA audits. (Reference Finding 4)

Recommendation 6

The FAA should review and revise its internal policies and procedures to ensure its response to a DAS Letter of Intent clearly documents concurrence with the proposed project and/or any additional requirements, inspections, tests, or clarifications. The response also should highlight the requirements for notifying the FAA if the project's scope and/or schedule are significantly revised. (Reference Finding 3)

Recommendation 7

The FAA should require that any organization having DAS authority provide formal training to their DAS staff on the roles and responsibilities of DAS specialists and on DAS procedures. The training should highlight that DAS specialists should be familiar with:

- the airplane manufacturer's type design,
- subsequent modifications made to the airplane,
- the manufacturer's design practices,
- operational assumptions, and
- operator procedures.

Periodic refresher training also should be part of the training program. (Reference Finding 7)

Recommendation 8

The FAA should initiate an effort to determine if the findings of this special certification review are representative of the DAS industry as a whole, and take appropriate action.

Implementation Plan for the SCR Team Recommendations

The table below lists the recommendations of the Special Certification Review Team and provides details concerning the implementation of the recommendations. A lead organization is also identified, although this does not preclude the participation of other FAA organizations in the implementation activity.

The implementation details are sufficient to provide a clear picture of the actions necessary to implement the associated recommendation. However, for each recommendation it will be necessary for the lead organization to generate a detailed implementation plan and schedule. It is important for the lead organization to work closely with the Transport Airplane Directorate's Airplane and Flightcrew Interface Branch (ANM-111) to obtain technical assistance, to ensure a thorough understanding of the background and reasoning that supports the recommendations, and avoid duplication of effort.

Recommendation No. 1	Implementation of Recommendation No. 1	Lead Organization
The design of the IFEN system installation should be revised such that its source of electrical power is an airplane electrical bus connected to, or controlled by, the CAB BUS switch. The new design should be compatible with the airplane manufacturer's design concept with regard to the flightcrew procedure for dealing with a smoke/fumes emergency.	The FAA's Los Angeles Aircraft Certification Office, in conjunction with the Transport Airplane Directorate Standards Staff will issue an Airworthiness Directive (AD) to mandate design changes to ensure that the IFEN system electrical power is connected to, or controlled by, the CAB BUS switch.	ANM-100L In conjunction with ANM-111
Recommendation No. 2	Implementation of Recommendation No. 2	Lead Organization
A means should be provided to enable the flightcrew and/or cabin crew to manually remove power from the IFEN system by means other than pulling circuit breakers.	The FAA's Los Angeles Aircraft Certification Office, in conjunction with the Transport Airplane Directorate Standards Staff will issue an Airworthiness Directive (AD) to mandate a design change to include an electrical power interruption (ON/OFF) mechanism for the IFEN system that is accessible to the flight and/or cabin crew. This mandated change can be incorporated in the AD issued in response to Recommendation No. 1.	ANM-100L In conjunction with ANM-111

Recommendation No. 3	Implementation of Recommendation No. 3	Lead Organization
The Type Design data for STC No. ST00236LA-D that the SCR Team determined to be inadequate or incomplete should be reviewed and corrected, as necessary, by SBA to ensure compliance with 14 CFR Part 21.31.	The FAA's Los Angeles Aircraft Certification Office will work with Santa Barbara Aerospace in developing a plan (and schedule) for bringing the certification data of STC ST00236LA-D into compliance with the requirements of 14 CFR Part 21.31.	ANM-100L
Recommendation No. 4	Implementation of Recommendation No. 4	Lead Organization
<p>If SBA applies for reinstatement of its DAS authorization, the FAA should ensure that SBA is fully aware of its responsibilities and accountability as a STC applicant and DAS holder. The FAA should ensure that the DAS coordinator is qualified to fulfill his/her responsibilities. In addition to performing regularly scheduled ACSEP and Engineering Audits of SBA, the FAA also should conduct at least one unannounced audit. Also, SBA's DAS procedures manual should be reviewed and revised with particular attention given to:</p> <ul style="list-style-type: none"> • specifying the requirements for defining a project's scope and schedule; • specifying who will perform the design and installation work if other than SBA, and specifying the level of oversight SBA will have on the companies performing the design and installation work; • specifying requirements for notification to and concurrence from the FAA if the project's scope and/or schedule are significantly revised; and • specifying requirements for ensuring that all preliminary compliance data reflects what is actually installed on the aircraft before the issuance of an STC. 	<p>The FAA's Los Angeles Aircraft Certification Office (LAACO) will work with Santa Barbara Aerospace (SBA) to develop a plan for reauthorization of SBA as a DAS. The plan will address the findings and recommendations of the Special Certification Review Team and be based on existing regulatory and guidance material covering DAS authorization. In the case that regulatory guidance is found to be lacking, the LAACO will identify the deficient areas to, and work with, the Transport Airplane Directorate to develop new or revised policy, procedures, and/or guidance material.</p> <p>Prior to finalization of the reauthorization plan it will be coordinated with the office of the Director, Aircraft Certification Service (through the Transport Airplane Directorate).</p>	ANM-100L In conjunction with ANM-100 and AIR-1

Recommendation No. 5	Implementation of Recommendation No. 5	Lead Organization
<p>The FAA should review and revise its internal policies and procedures to ensure SBA accomplishes corrective actions it proposes in response to problems identified during FAA audits.</p>	<p>The FAA's Aircraft Engineering Division should review and revise, or develop, as necessary, national policies, procedures, and/or guidelines regarding appropriate ACO action in response to DAS audit findings. Training of ACO engineers in compliance and enforcement actions should be considered. Each Directorate should ensure that their ACO's take action to ensure that the national policies, procedures, and/or guidelines for audit follow-up actions are integrated into each DAS audit plan and schedule.</p>	<p>AIR-100 with follow-on action by all Directorate's and ACO's</p>
Recommendation No. 6	Implementation of Recommendation No. 6	Lead Organization
<p>The FAA should review and revise its internal policies and procedures to ensure its response to a DAS Letter of Intent clearly documents concurrence with the proposed project and/or any additional requirements, inspections, tests, or clarifications. The response also should highlight the requirements for notifying the FAA if the project's scope and/or schedule are significantly revised.</p>	<p>The FAA's Aircraft Engineering Division should develop guidelines for proper type and content of an ACO's response to a DAS Letter of Intent (LOI) and any supplements or revisions to the LOI. Each Directorate should ensure that their ACO's integrate the LOI response guidelines into their office procedures manual and DAS procedures manual as appropriate.</p>	<p>AIR-100 with follow-on action by all Directorate's and ACO's</p>

Recommendation No. 7	Implementation of Recommendation No. 7	Lead Organization
<p>The FAA should require that any organization having DAS authority provide formal training to their DAS staff on the roles and responsibilities of DAS specialists and on DAS procedures. The training should highlight that DAS specialists should be familiar with:</p> <ul style="list-style-type: none"> • the airplane manufacturer's type design, • subsequent modifications made to the airplane, • the manufacturer's design practices, • operational assumptions, and • operator procedures. <p>Periodic refresher training also should be part of the training program.</p>	<p>The FAA's Aircraft Engineering Division should develop national policies, procedures, and/or guidelines for qualification and training of DAS staff (coordinators and specialists) which address the concerns identified in this recommendation. Full implementation of this recommendation will require a systems approach, meaning that simply issuing new policy requiring DAS staff to have this type of knowledge will not fully address the issues. Consideration should be given to the level of knowledge the DAS staff should have regarding the identified areas of concern. Further consideration must also be given to the impact these requirements would have on the airplane manufacturer, as their cooperation would be necessary. As a further example, to address the airplane manufacturer's operational assumptions without addressing how an operator actually uses a particular feature could possibly create safety concerns if the operator does not use the feature in a manner the airplane manufacturer assumed it would be used.</p>	<p>AIR-100 with follow-on action by all Directorate's and ACO's</p>

Recommendation No. 8	Implementation of Recommendation No. 8	Lead Organization
<p>The FAA should initiate an effort to determine if the findings of this special certification review are representative of the DAS industry as a whole, and take appropriate action.</p>	<p>Using the results of this special certification review as a baseline, the FAA's Aircraft Engineering Division should form a review team to review DAS processes in general. The goal of the review team will be to identify systemic problems in the DAS system. This applies to DAS holders and the FAA's oversight of them. The team should develop solutions to any problems identified and incorporate the solutions into new or existing national policy, procedures, and/or guidelines. Each Directorate should ensure that their ACO's take action to use the results of the DAS review in their oversight of their DAS holders.</p>	<p>AIR-100 with follow-on action by all Directorate's and ACO's</p>

The following items are areas of concerns identified by the SCR Team, but not explicitly or fully addressed in the SCR Team report.

		Lead Organization
Additional	<p>The Director of the Aircraft Certification Service should task the STC Review team with the following:</p> <ul style="list-style-type: none"> • review existing safety analysis requirements for non-essential systems, • integration of STC designs into the airplane manufacturer's type design, and • address the issue of what is considered to be adequate type design data (e.g., SBA type design data for STC ST00236LA-D was determined by the SBA SCR Team to be in non-compliance with 14CFR 21.31). 	AIR-1
Additional	<p>The Transport Airplane Directorate should initiate a review of STC certified in-flight entertainment (IFE) systems to determine if the same type of problems exist as was found during the SBA SCR with regards to the electrical power source for the IFE system (i.e., is the electrical power source/switching compatible with the airplane manufacturers design concept).</p>	ANM-100
Additional	<p>The FAA's Aircraft Engineering Division should review and develop policy that addresses the issue of DAS's providing certification services without performing actual engineering design work or installation work.</p>	AIR-100

Appendix A

FAA Supplemental Type Certificate ST00236LA-D

United States of America
Department of Transportation — Federal Aviation Administration
Supplemental Type Certificate

Number ST00236LA-D

This certificate, issued to Santa Barbara Aerospace, Inc.
495-B South Fairview Avenue
Santa Barbara, CA 93117

notifies that the change in the type design for the following product with the limitations and conditions
therefor as specified herein meets the airworthiness requirements of Part 25 of the Federal Aviation
Regulations.


Original Product — Type Certificate Number: A2ZE
Make: McDonnell Douglas
Model: MD-11

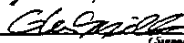
Description of Type Design Change:
Provisions only installation of Interactive Flight Technologies Entertainment System per Hollingshead
International Master Data List 12003-511 Revision C Dated November 19, 1996.

Limitations and Conditions:
McDonnell Douglas MD-11 Serial Number 48445 ONLY. A copy of this STC must be included in the
permanent records of the modified aircraft.

This certificate and the supporting data which is the basis for approval shall remain in effect until
revoked, suspended, or a termination date is otherwise established by the Administrator of the
Federal Aviation Administration.

Date of application: August 9, 1996
Date of issuance: November 19, 1996

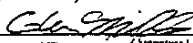



Date received:
Date amended:
By direction of the Administrator

Glen Mills (Signature)
DAS Coordinator
Santa Barbara Aerospace DAS14NM
(Title)

Any alteration of this certificate is punishable by a fine of not exceeding \$1,000, or imprisonment not exceeding 3 years, or both.
This certificate may be transferred in accordance with FAR 21.57.

FAA Form 8110-2 (10-86)

Original Issue, dated November 19, 1996

<small>United States of America</small> Department of Transportation — Federal Aviation Administration Supplemental Type Certificate	
<i>Number</i> ST00236LA-D	
<i>This certificate issued to</i>	Santa Barbara Aerospace, Inc. 495-B South Fairview Avenue Santa Barbara, CA 93117
<i>certifies that the change in the type design for the following product with the limitations and conditions therefor as specified herein meets the airworthiness requirements of Part 25 of the Federal Aviation Regulations.</i>	
<i>Original Product — Type Certificate Number:</i>	A22WE
<i>Make:</i>	McDonnell Douglas
<i>Model:</i>	MD-11
<i>Description of Type Design Change:</i> Provisions only installation of Interactive Flight Technologies Entertainment System per Hollingshead International Master Data List 12003-511 Revision C Dated November 19, 1996, or Master Data List 12003-521 Revision C1 Dated December 17, 1996 as defined in the Limitations Section of this STC.	
<i>Limitations and Conditions:</i> Master Data List 12003-511 applies to McDonnell Douglas MD-11 Serial Number 48445 Only. Master Data List 12003-521 applies to McDonnell Douglas MD-11 Serial Number 48448 Only. A copy of this STC must be included in the permanent records of the modified aircraft.	
<i>This certificate and the supporting data which is the basis for approval shall remain in effect until surrendered, suspended, revoked, or a termination date is otherwise established by the Administration of the Federal Aviation Administration.</i>	
<i>Date of application:</i>	August 9, 1996
<i>Date of issuance:</i>	November 19, 1996
<i>Date received:</i>	December 18, 1996
<i>By direction of the Administrator</i>  Glen Mills DAS Coordinator Santa Barbara Aerospace DAS14NM (Title)	
	
<small>Any alteration of this certificate is punishable by a fine of not exceeding \$1,000, or imprisonment not exceeding 3 years, or both.</small>	
<small>FAA Form 8110-2 (10-88)</small>	
<small>This certificate may be transferred in accordance with FAR 21.47.</small>	

STC Amendment 1, dated December 18, 1996

8107

United States of America
Department of Transportation—Federal Aviation Administration

Supplemental Type Certificate

SUPERSEDED
 BY AMENDMENT 2/97
 REISSUANCE DATE:

Number ST00236LA-D

This certificate, issued to Santa Barbara Aerospace, Inc.
495-B South Fairview Avenue
Santa Barbara, CA 93117

certifies that the change in the type design for the following product with the limitations and conditions
therefor as specified herein meets the airworthiness requirements of Part 25 of the Federal Aviation
Regulations.

Original Product—Type Certificate Number: A22WE
Make: McDonnell Douglas
Model: MD-11


Description of Type Design Change:
 Installation of Interactive Flight Technologies Entertainment System per Hottelgased International Master
 Data List 12003-501 Revision D Dated January 24, 1997.

Limitations and Conditions:
 McDonnell Douglas MD-11 Serial Numbers 48445, 48446 and 48452 Only. The installation of passenger
 seats and all other aspects of cabin interior arrangement are NOT approved by this STC, and must be
 approved separately. A copy of this STC must be included in the permanent records of the modified
 aircraft. All of the above interior furnishings have been demonstrated to meet the flammability
 requirements of FAR 25.853(b) (Amendment 25-32) and 25.1359(d) (Amendment 25-32).

This certificate and the supporting data which is the basis for approval shall remain in effect until
revoked, suspended, or until a termination date is otherwise established by the Administrator of the
Federal Aviation Administration.

Date of application: August 9, 1996 *Link issued:*

Date of issuance: November 19, 1996 *Date received:* December 18, 1996, January 24, 1997



By direction of the Administrator

[Signature]

Gen Mills
DAS Coordinator
Santa Barbara Aerospace DAS14NM
(Title)

Any alteration of this certificate is punishable by a fine of not exceeding \$1,000, or imprisonment not exceeding 3 years, or both.

FAA Form 01-10-3 (10-66) This certificate may be transferred in accordance with FAR 21.67.

STC Amendment 2, dated January 24, 1997

United States of America
Department of Transportation — Federal Aviation Administration
Supplemental Type Certificate

Number ST00236LA-D

This certificate, issued to

Santa Barbara Aerospace, Inc.
495-B South Fairview Avenue
Santa Barbara, CA 93117

*certifies that the change in the type design for the following product with the limitations and conditions
therefor as specified herein meets the airworthiness requirements of Part 25 of the Federal Aviation
Regulations.*

Original Product — Type Certificate Number: A22WE

Make: McDonnell Douglas

Model: MD-11

Description of Type Design Change:

Installation of Interactive Flight Technologies Entertainment System per Hollingsead International Master
Data List 12003-501 Revision D Dated January 24, 1997.

Limitations and Conditions:

The installation of passenger seats and all other aspects of cabin interior arrangement are **NOT** approved
by this STC, and must be approved separately. This approval should not be incorporated on any
certificated product of this model on which other approved modifications are incorporated, unless it is
determined that the interrelationship between this change and any of those other previously incorporated
modifications will not introduce any adverse effect upon the airworthiness of the certificated product. A copy
of this STC must be included in the permanent records of the modified aircraft. All of the above interior
furnishings have been demonstrated to meet the flammability requirements of FAR 25.853(b)
(Amendment 25-32) and 25.1358(d) (Amendment 25-32).

*When this certificate and the supporting data which is the basis for approval shall remain in effect, until sus-
pended, suspended, revoked, or a termination date is otherwise established by the Administrator of the*

Federal Aviation Administration.

Date of application: August 9, 1996

Date issued:

Date of issuance: November 19, 1996

Date amended: December 18, 1996, January 24, 1997
February 3, 1997

By direction of the Administrator



Glen Mills
(Signature)
Glen Mills
DAS Coordinator
Santa Barbara Aerospace DAS14NM

(Title)

Any alteration of this certificate is punishable by a fine of not exceeding \$1,000, or imprisonment not exceeding 3 years, or both.

This certificate may be transferred in accordance with FAR 21.47.

FAA Form 8110-2 (10-88)

STC Amendment 3, dated February 3, 1997

United States of America
Department of Transportation — Federal Aviation Administration
Supplemental Type Certificate

Number ST00236LA-D

This certificate, issued to Santa Barbara Aerospace, Inc.
495-B South Fairview Avenue
Santa Barbara, CA 93117

*certifies that the change in the type design for the following product with the limitations and conditions
therefor as specified herein meets the airworthiness requirements of Part 25 of the Federal Aviation
Regulations.*

Original Product — Type Certificate Number: A22WE
Make: McDonnell Douglas
Model: MD-11

Description of Type Design Change:
Installation of Interactive Flight Technologies Entertainment System per Hollingshead International Master
Data List 12003-501 Revision D Dated January 24, 1997 or Subsequent FAA Approved Revisions.

Limitations and Conditions:

The installation of passenger seats and all other aspects of cabin interior arrangement are NOT approved
by this STC, and must be approved separately. This approval should not be incorporated on any
certificated product of this model on which other approved modifications are incorporated, unless it is
determined that the interrelationship between this change and any of those other previously incorporated
modifications will not introduce any adverse effect upon the airworthiness of the certificated product. A copy
of this STC must be included in the permanent records of the modified aircraft. All of the above interior
furnishings have been demonstrated to meet the flammability requirements of FAR 25.853(b)
~~(Amendment 25-32) and 25.1359(d) (Amendment 25-32).~~

~~This certificate, and the supporting data which is the basis for approval shall remain in effect until
revoked, suspended, revoked, or a termination date is otherwise established by the Administrator of the
Federal Aviation Administration.~~

Date of application: August 9, 1996

Date received:

Date of issuance: November 19, 1996

Date amended: December 18, 1996, January 24, 1997
February 3, 1997, March 11, 1997

By direction of the Administrator



Glen Mills
DAS Coordinator
Santa Barbara Aerospace DAS14NM

(Signature)

(Title)

Any alteration of this certificate is punishable by a fine of not exceeding \$1,000, or imprisonment not exceeding 3 years, or both.

This certificate may be transferred in accordance with FAR 21.47.

STC Amendment 4, dated March 11, 1997

United States of America
Department of Transportation — Federal Aviation Administration
Supplemental Type Certificate

Number ST00236LA-D

This certificate issued to

Santa Barbara Aerospace, Inc.
495-B South Fairview Avenue
Santa Barbara, CA 93117

*notifies that the change in the type design for the following product with the limitations and conditions
therefor as specified herein meets the airworthiness requirements of Part 25 of the Federal Aviation
Regulations*

Original Product — Type Certificate Number: A22WE

Make: McDonnell Douglas

Model: MD-11

Description of Type Design Change:

Installation of Interactive Flight Technologies Entertainment System per Hollingshead International Master
Data List 12003-501 Revision D Dated January 24, 1987, or Hollingshead International Master Data List
12003-503 Revision A Dated July 28, 1997, or Subsequent FAA Approved Revisions.

~~The installation of passenger seats and all other aspects of cabin interior arrangement are NOT approved~~
by this STC, and must be approved separately. This approval should not be incorporated on any
certificated product of this model on which other approved modifications are incorporated, unless it is
determined that the interrelationship between this change and any of those other previously incorporated
modifications will not introduce any adverse effect upon the airworthiness of the certified product. A copy
of this STC must be included in the permanent records of the modified aircraft. All of the above interior
furnishings have been demonstrated to meet the flammability requirements of FAR 25.853(b)
(Amendment 25-32) and 25.1359(d) (Amendment 25-32).
~~This certificate and the supporting data which is the basis for approval shall remain in effect until
suspended, withdrawn, or a termination date is otherwise established by the Administrator of the
Federal Aviation Administration.~~

Date of application: August 9, 1996

Date received:

Date of issuance: November 19, 1996

Date issued: December 18, 1996, January 24, 1997
February 3, 1997, March 11, 1997
August 7, 1997



Signature of Glen Mills
Glen Mills
DAS Coordinator
Santa Barbara Aerospace DAS14NM

(Title)

Any alteration of this certificate is punishable by a fine of not exceeding \$1,000, or imprisonment not exceeding 3 years, or both.
This certificate may be transferred in accordance with FAR 21.47.

FAA Form 8110-2 (10-68)

STC Amendment 5, dated August 7, 1997

Appendix B

Implementation Activity for the SCR Team Recommendations

Implementation Activity for the SCR Team Recommendations

This appendix contains information regarding activities the FAA has undertaken to implement the recommendations contained in this report. The information provided is an accurate summary of current activities through June 9, 2000. Please be advised that these activities are subject to change. The Santa Barbara Aerospace (SBA) Special Certification Review (SCR) Team recommendations are repeated in this appendix for ease of reference.

**NO CHANGES HAVE BEEN MADE TO THE REPORT'S MAIN BODY OR
APPENDIX A. (Note: The table of content has been updated to reflect the addition of
Appendix B.)**

SBA SCR Team Recommendation Number 1: The design of the IFEN system installation should be revised such that its source of electrical power is an airplane electrical bus connected to, or controlled by, the CAB BUS switch. The new design should be compatible with the airplane manufacturer's design concept with regard to the flightcrew procedure for dealing with a smoke/fumes emergency.

SBA SCR Team Recommendation Number 2: A means should be provided to enable the flightcrew and/or cabin crew to manually remove power from the IFEN system by means other than pulling circuit breakers.

Implementation Activity for Recommendations Numbers 1 and 2

On September 29, 1999 the FAA issued Airworthiness Directive (AD) 99-20-08 (Docket number 99-NM-216-AD, Federal Register 64 FR 52221, published September 28, 1999), which applies to Model MD-11 airplanes. That AD prohibits the installation of the In-flight Entertainment Network (IFEN) in accordance with data approved by Supplemental Type Certificate (STC) ST00236LA-D, dated November 19, 1996; Amendment 1, dated December 18, 1996; Amendment 2, dated January 24, 1997; Amendment 3, dated February 3, 1997; Amendment 4, dated March 11, 1997; or Amendment 5, dated August 7, 1997.

In effect, the AD requires that any US-registered Model MD-11 airplane that currently has an IFEN system installed by STC ST00236LA-D must remove the IFEN system from the airplane. The AD also prohibits future installation of the IFEN system as defined by STC ST00236LA-D on any US-registered Model MD-11 airplane.

Further action is not necessary for Recommendations Numbers 1 and 2.

SBA SCR Team Recommendation Number 3: The Type Design data for STC No. ST00236LA-D that the SCR Team determined to be inadequate or incomplete should be reviewed and corrected, as necessary, by SBA to ensure compliance with 14 CFR Part 21.31.

Implementation Activity for Recommendation Number 3

Further action is not necessary for Recommendation Number 3 since SBA surrendered STC ST00236LA-D to the FAA and the FAA issued AD 99-20-08. The surrender of the STC by SBA to the FAA terminates the STC (reference 14 CFR section 21.51) and the AD prohibits persons from using the STC data to install the IFEN system on Model MD-11 airplanes.

SBA SCR Team Recommendation Number 4: If SBA applies for reinstatement of its DAS authorization, the FAA should ensure that SBA is fully aware of its responsibilities and accountability as a STC applicant and DAS holder. The FAA should ensure that the DAS coordinator is qualified to fulfill his/her responsibilities. In addition to performing regularly scheduled ACSEP and Engineering Audits of SBA, the FAA also should conduct at least one unannounced audit. Also, SBA's DAS procedures manual should be reviewed and revised with particular attention given to:

- specifying the requirements for defining a project's scope and schedule;
- specifying who will perform the design and installation work if other than SBA, and specifying the level of oversight SBA will have on the companies performing the design and installation work;
- specifying requirements for notification to and concurrence from the FAA if the project's scope and/or schedule are significantly revised; and
- specifying requirements for ensuring that all preliminary compliance data reflects what is actually installed on the aircraft before the issuance of an STC.

Implementation Activity for Recommendation Number 4

Further action is not necessary for Recommendation Number 4 because SBA surrendered their Designated Alteration Station (DAS) authority (Air Agency Certificate Number DAS-14-NM, issued August 11, 1994) to the FAA on November 30, 1998, and in 1999, they filed for bankruptcy. Therefore, SBA will not apply for reinstatement as a DAS.

SBA SCR Team Recommendation Number 5: The FAA should review and revise its internal policies and procedures to ensure SBA accomplishes corrective actions it proposes in response to problems identified during FAA audits.

Implementation Activity for Recommendation Number 5

On July 2, 1999, the FAA issued a memorandum titled *Follow-on Corrective Actions Pertaining to Aircraft Certification Systems Evaluation Program Findings at Delegated Facilities*. The purpose of the memorandum is to remind all Aircraft Certification Offices (ACOs) to continue to adhere to the procedures that ensure Aircraft Certification Systems Evaluation Program (ACSEP) findings and those findings resulting from engineering evaluations, audits, and routine oversight that require corrective action are addressed by the managing ACO. The memorandum directs ACOs to immediately implement the intent of the procedures called out in Draft Order 8100.XX (*DAS, DOA, and SFAR 36 Authorization Procedures*), as well as Notice 8100.13 [*Aircraft Certification Systems Evaluation Program (ACSEP) Criteria for Delegated Facilities*]. When published, Draft Order 8100.XX will require ACOs to conduct periodic technical data evaluations and ensure timely corrective action of all findings, whether discovered by ACSEP or any other means. Furthermore, ACOs will be required to re-evaluate the findings to ensure closure of the corrective actions.

The need for further action for Recommendation Number 5 will be assessed following the completion of the DAS audits that are part of the implementation activity for Recommendation Additional Task Number 2 (refer to page B-7 of this appendix for further information regarding Additional Task Number 2).

SBA SCR Team Recommendation Number 6: The FAA should review and revise its internal policies and procedures to ensure its response to a DAS Letter of Intent clearly documents concurrence with the proposed project and/or any additional requirements, inspections, tests, or clarifications. The response also should highlight the requirements for notifying the FAA if the project's scope and/or schedule are significantly revised.

SBA SCR Team Recommendation Additional Task Number 3: The FAA's Aircraft Engineering Division should review and develop policy that addresses the issue of DAS's providing certification services without performing actual engineering design work or installation work.

Implementation Activity for Recommendations Number 6 and Additional Task Number 3

On March 10, 2000, the FAA issued a memorandum titled *AIR-100 Policy Memorandum #00-01, Proper DAS Program Notification (Letter of Intent) Contents and FAA Response*. The memorandum prescribes Aircraft Certification Service policy addressing what should be contained in DAS-submitted program notifications, and ACO response guidelines. [Please note that the terminology "program notification" is being introduced in the Draft Order 8100.XX (*DAS, DOA, SFAR 36 Authorization Procedures*) and is replacing the term "letter of intent."] The contents of Memorandum #00-01 will be incorporated in Draft Order 8100.XX.

The memorandum addresses the issues identified by the SBA SCR Team with regard to SBA's letter of intent content and the FAA's response to the letter of intent. The memorandum applies to all FAA ACOs and the DASs under their oversight. It will ensure that DAS program notification and the ACO response is standardized across the Aircraft Certification Service.

Additionally, on March 13, 2000, the FAA issued a memorandum titled *AIR-100 Policy Memorandum #00-02 (Designated Alteration Station Certification Activities Performed on Foreign-Registered Test Articles, and/or at Off-Site Locations)*. The memorandum prescribes Aircraft Certification Service policy addressing foreign-registered test articles and off-site activities of DASs, including activities to be performed in other countries. The content of the memorandum is consistent with the guidance given in Draft Order 8100.XX (*DAS, DOA, and SFAR 36 Authorization Procedures*).

Together, AIR-100 Policy Memorandums #00-001 and #00-02 address the issue of DAS's providing certification services without performing actual engineering design work or installation work. Under the new policy, DASs must specify who, if other than the DAS, will perform the design and installation work (excluding certification activities) and the scope of each parties' involvement in the design and installation work, and provide a description of how the DAS will manage the other parties' activities to ensure that all certification requirements are met. This includes certification activities performed at a location other than the DAS's approved repair/maintenance facility.

NOTE: AIR-100 Policy Memorandums #00-01 and #00-02 can be downloaded from the following web address: <http://av-infor.faa.gov/dst>

SBA SCR Team Recommendation Number 7: The FAA should require that any organization having DAS authority provide formal training to their DAS staff on the roles and responsibilities of DAS specialists and on DAS procedures. The training should highlight that DAS specialists should be familiar with:

- the airplane manufacturer's type design,
- subsequent modifications made to the airplane,
- the manufacturer's design practices,
- operational assumptions, and
- operator procedures.

Periodic refresher training also should be part of the training program.

Implementation Activity for Recommendation Number 7

The FAA is currently developing policy to implement this recommendation. The policy will be coordinated with other on-going activities addressing similar issues.

SBA SCR Team Recommendation Number 8: The FAA should initiate an effort to determine if the findings of this special certification review are representative of the DAS industry as a whole, and take appropriate action.

Implementation Activity for Recommendation Number 8

To implement this recommendation, the FAA developed a survey that was sent to all FAA-authorized DASs and their managing ACOs. The areas covered by the survey questions include general company information, DAS personnel information, internal DAS processes, DAS STC information, communication between the DAS and the FAA, DAS audits, and DAS specialist training. The areas covered by the survey questions sent to the ACOs include DAS management, engineering and ACSEP audits follow-on activity, and DAS project management.

The answers to the survey questions will help to validate the effectiveness of the DAS STC processes and identify any needed policy changes. The answers were also used in part to select four DASs on which the FAA will perform in-depth process and technical audits. The results of the surveys and the audits will also be used, in part, to support the development of Draft Order 8100.XX (*DAS, DOA, and SFAR 36 Authorization Procedures*). The audit activity is scheduled to be completed by the end of 2000.

SBA SCR Team Recommendation Additional Task Number 1: The Director of the Aircraft Certification Service should task the STC Review team with the following:

- review existing safety analysis requirements for non-essential systems,
- integration of STC designs into the airplane manufacturer's type design, and
- address the issue of what is considered to be adequate type design data (e.g., SBA type design data for STC ST00236LA-D was determined by the SBA SCR Team to be in non-compliance with 14 CFR 21.31).

Implementation Activity for Recommendation Additional Task Number 1

The STC Process Review Team was presented with Additional Task Number 1 for consideration. Several of the recommendations made by the STC Process Review Team indirectly address the issues presented in Additional Task Number 1. The recommendations call for: coordination by the Project ACO (the ACO that will issue the STC) with the Certificate Management ACO (the ACO with oversight responsibility of the type certificate holder) regarding the proposed modification; additional training for FAA personnel including training on the possible effects of STCs on existing structures and systems, and definitions of the scope of STC modifications; and development of a mentoring program that would team experienced FAA specialists with junior or recently hired FAA specialists.

The benefits of implementing the STC Process Review Team recommendations include producing higher quality approvals (better type design data, certification basis development, compliance to the regulations, etc.), standardization within the FAA, and making pertinent type certificated data available to support the STC.

Note: The objective of the STC Process Review Team was to determine the effectiveness of the current STC process as it relates to complex design and modification approvals and any potential safety-related approvals. Reviewing existing safety analysis requirements for non-essential systems is beyond the scope of the STC Process Team objectives. This item will be addressed in new in-flight entertainment system certification policy now under development within the FAA.

SBA SCR Team Recommendation Additional Task Number 2: The Transport Airplane Directorate should initiate a review of STC certified in-flight entertainment (IFE) systems to determine if the same type of problems exist as was found during the SBA SCR with regards to the electrical power source for the IFE system (i.e., is the electrical power source/switching compatible with the airplane manufacturers design concept).

Implementation Activity for Recommendation Additional Task Number 2

The FAA performed a review of certain IFE systems certified by STC between 1992 and 2000, including both FAA ACO- and DAS-issued STCs. Each of the STCs was reviewed using the same set of guidelines. The guidelines covered electrical power source for the IFE system, IFE system power removal method, impact on flightcrew non-normal/emergency procedures, impact on cabin crew procedures, the integrity/quality of wire installation design, and the need for any IFE system periodic or special maintenance. The reviews were completed in March 2000.

The results of the reviews indicate some of the STC-approved IFE systems have safety concerns that need to be corrected. To ensure that mandatory corrective action is applied in a standardized manner to each of the STC's, a standardized set of guidelines were developed. The ACOs will use these guidelines as they are developing mandatory action to correct the safety concerns.