NATIONAL TRANSPORTATION SAFETY BOARD
OFFICE OF AVIATION SAFETY
WASHINGTON, D.C.

October 26, 2010

ADDENDUM B

SURVIVAL FACTORS GROUP CHAIRMAN'S FACTUAL REPORT

A. ACCIDENT : LAX08PA259

LOCATION	:	Weaverville, California
DATE	:	August 5, 2008
TIME	:	1941 Pacific Daylight Time (PDT)
AIRCRAFT	:	Sikorsky S-61N Helicopter, N612AZ, Operated by Carson Helicopter Services

B. SUMMARY

On November 5, 2007 and May 19, 2008, a DER submitted, on behalf of Carson Helicopters, Inc. (CHI[1]), a certification plan and engineering substantiation data for the installation of Martin Baker Crash Attenuating Troop Seat System (CATSS) on S61 helicopters.[2] CATSS is an energy absorption troop seat that is approved for mounting on a sidewall. The data included information for the modification of two configurations of the Sikorsky S-61 helicopter: a 20 passenger seat configuration for the standard S-61 fuselage and a 17 passenger configuration for the shorter S-61N fuselage. The data also showed the installation of aluminum channel seat rails and fittings attached to the S-61 fuselage frame structure. The fittings and rails were presented in Carson drawings.

The DER's substantiation data included documents DM0733-1"Certification Plan for a Seat Installation in an S61N Helicopter for Carson Helicopters, Inc" and DM0733-2 "Structural Substantiation for a Side Facing Seat Installation on Sikorsky S61 Helicopters" that consisted of engineering data and calculations for the installation of the seats and approval of the data by an FAA Designated Engineering Representative (DER).

[1] CHI and Carson Helicopter Services, Inc. (CHSI) are separate legal entities that hold their own FAA issued operating certificates. Both CHI and CHSI companies have the same president and share facilities in Grants Pass, Oregon.

[2] The DER submitted the certification plan and package to the FAA's Anchorage Aircraft Certification Office who was responsible for the subsequent approval of STC SR02327AK issued December 5, 2008.

Safety Board staff's review of DM0733-1 and DM0733-2 found that FAA (DER) McClenahan first determined that the seat installation design was not required to conform with the latest admendments of Title 14 Code of Federal Regulations (CFR) Part 29.561 "Emergency Landing Conditions General" and Part 29.562 "Emergency Landing Dynamic Conditions." To establish if CHI's installation was required to meet these current standards the DER used the guidance in FAA Advisory Circular (AC) 21.101 "Establishing the Certification Basis of Changed Aeronautical Products". In relation to 14 CFR Part 29.561, the DER stated:

> The new requirements are not practical. The latest amendment level of FAR 27.561[3] requires significant load increases to the seat installation. It is an economic burden to substantiate these loads. The crew seats are not changed by this project and do not meet the higher amendment levels. Therefore, the higher amendment levels would not substantially increase safety and is an economic burden.

In relation to 14 CFR Part 29.562 the DER stated:

> The new requirements are not practical. FAR 27.562 requires dynamic testing for seat installation. It is an economic burden to substantiate these requirements. The crew seats are not changed by this project and do not meet the dynamic testing requirements. Therefore, this regulation would not substantially increase safety and is an economic burden.

Upon establishing that CHI's installation was not required to meet the current requirements of 14 CFR Part 29.561 and 29.562, the DER approved the information contained in DM0733-2. DM0733-2 contained the interface loads between the CATSS seat and the installation of Carson's fittings attached to the fuselage. According to the information contained in DM0733-2, Carson's attach fitting support structure are equivalent to 4G forward, 4G downward, 1.5G upward, and 2G sideward. See Attachment 10 of this report for excerpts from DM0733-1, and DM0733-2.

Cynthia L. Keegan
Senior Survival Factors Engineer

[3] Title 14, CFR Part 27 differs from 14 CFR Part 29 in that Part 27 regulations apply to normal category rotorcraft with maximum weight of 7,000 pounds and or less and 9 or less passenger seats, whereas, 14 CFR Part 29 regulations apply to rotorcraft with a maximum weight greater than 20,000 pounds and depending on its category carries between 9 or more passengers.

Carson Helicopter Services
Weaverville, California
August 5, 2008
LAX08PA259

National Transportation Safety Board

Washington, D.C.

Attachment 10

DM0733-1"Certification Plan for a Seat Installation in an S61N Helicopter for Carson Helicopters, Inc",
DM0733-2 "Structural Substantiation for a Side Facing Seat Installation on Sikorsky S61 Helicopters"

8 Pages

McCLENAHAN ENGINEERING
470 ALAMOSA DRIVE
SPARKS, NV 89441

DOCUMENT: DM0733-1

TITLE: CERTIFICATION PLAN FOR A SEAT INSTALLATION IN AN S61N HELICOPTER FOR CARSON HELICOPTERS, INC.

BY: D. H. McClenahan

DATE: November 5, 2007

REV: IR

DATE: 11/5/07

1.0 INTRODUCTION

This document presents the certification plan for installing side facing seats in an S-61N helicopter. The seats are certified to TSO C127a (shown in Figures 1.2 and 1.3) and will attach to the side walls of the helicopter. These seats replace two place seats on the right side and one place seats on the left side of the fuselage. Rails that attach to the fuselage frames will be added to the helicopter for seat attachment.

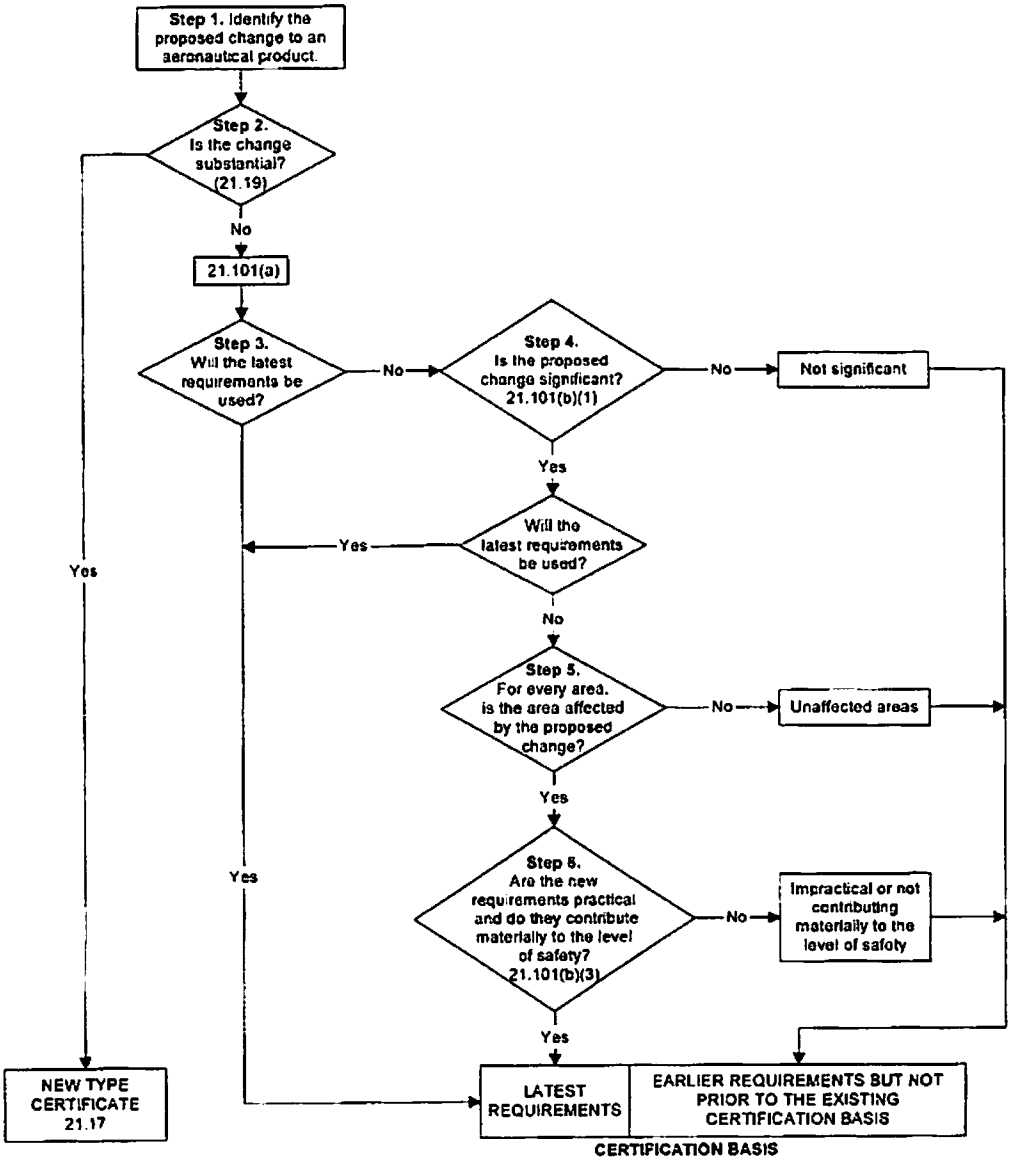
This modification consists of two aircraft configurations; a 22 place arrangement for a standard S-61N and an 18 place arrangement for the short fuselage modified by Carson Services STC SH640NE. These configurations are shown in Figure 1.1. The short fuselage is currently approved for 19 and 21 passengers. The short fuselage has cockpit emergency exits for the crew, and passenger exits on the left and right side of the helicopter. In addition, there are one left and one right window exits at FS 266. The right hand window exit is blocked when the side facing seat is installed. This does not create an egress issue because FAR 29.807 requires two type IV doors for 10-19 passengers and the two exits meet or exceed this requirement. The emergency exit marking for these exits will be removed.

The standard fuselage is approved for 24, 26, and 28 passenger configurations. The standard fuselage has the same exits as the short fuselage but has one additional door on the right side. Blocking the two window exits do not create an egress issue because FAR 29.807 requires one type II door and one type IV door for 20-39 passengers. The three exits meet or exceed this requirement.

4.0 CHANGED PRODUCT RULE

The type certificate for the S-61N is 1H15 and the certification basis is CAR 7. However, FAR 21.101(a), the changed product rule, requires a new applicant for STC to comply with the airworthiness requirements effective on the date of the STC Application. AC 21.101-1, Reference 5, provides guidelines for compliance with the Changed Product Rule (CPR). The flow chart for these guidelines are provided on the following page. This project will comply with the latest amendment of CFR Part 29, amendment 29-45, except for 29.561, 29.562 and 29.1557(d). 29.561 and 19.1557(d) will comply with amendment 29-0 and since 29.562 was not effective until amendment 29-29, this regulation will not be part of the compliance checklist.

FIGURE 1: ESTABLISHING THE CERTIFICATION BASIS FOR CHANGED PRODUCT



NOTE 1: In the vast majority of cases, the applicant will proceed to Step 4 as the initial step in the process. See paragraph 6 for guidance.

NOTE 2: For excepted products under 14 CFR § 21.101(c), see paragraph 9. For conditions under 14 CFR § 21.101(d), see paragraph 10.

Justification for paragraphs 29.561 at amendment level 29-0 and not including 29.562 are shown below. The steps follow AC 21.101-1 format.

29.561

Step 1. The proposed change is a seat installation in an S-61 helicopter.
Step 2. The change is not substantial.
Step 3. The latest amendment of FAR 29.561 will not be used. The original amendment level of 29-0 will be used.
Step 4. The proposed change is significant. The load factors are increased.
Step 5. The proposed change only affects the cabin interior.
Step 6. The new requirements are not practical. The latest amendment level of FAR 27.561 requires significant load increases to the seat installation. It is an economic burden to substantiate these loads. The crew seats are not changed by this project and do not meet the higher amendment levels. Therefore, the higher amendment levels would not substantially increase safety and is an economic burden.

29.562

Step 1. The proposed change is a seat installation in an S-61 helicopter.
Step 2. The change is not substantial.
Step 3. FAR 29.562 will not be used. The original amendment level of 29-0 will be used and this amendment did not include FAR 29.562.
Step 4. The proposed change is significant. The dynamic testing is required.
Step 5. The proposed change only affects the cabin interior.
Step 6. The new requirements are not practical. FAR 27.562 requires dynamic testing for the seat installation. It is an economic burden to substantiate these requirements. The crew seats are not changed by this project and do not meet the dynamic testing requirements. Therefore, this regulation would not substantially increase safety and is an economic burden.

29.1557(d)

Step 1. The proposed change is a seat installation in an S-61 helicopter.
Step 2. The change is not substantial.
Step 3. The latest amendment of FAR 29.1557(d) will not be used. The original amendment level of 29-0 will be used.
Step 4. The proposed change is significant. The requirements for color contrasting are increased.
Step 5. The proposed change only affects the cabin interior.
Step 6. The new requirements are not practical. The latest amendment level of FAR 27.1557(d) defines new color contrasting requirements. The exit marking was applied prior to the effectivity date of the latest regulation. It is an economic burden to substantiate color contrasts. Therefore, the higher amendment levels would not substantially increase safety and is an economic burden.

McCLENAHAN ENGINEERING
470 ALAMOSA DR.
SPARKS, NV 89441

DOCUMENT: DM0733-2

TITLE: STRUCTURAL SUBSTANTIATION FOR A SIDE FACING SEAT INSTALLATION ON SIKORSKY S61 HELICOPTERS

BY: D.H. McClenahan

DATE: May 19, 2008

REV: B

DATE: 10/29/08

1.0 INTRODUCTION

This document provides structural substantiation for installing side facing seats in an S-61N helicopter. The seats are TSO approved (shown in Figures 1.4 and 1.5) and will attach to the side walls of the helicopter. These seats replace two place seats on the right side and one place seats on the left side of the fuselage. Rails that attach to the fuselage frames are added to the helicopter for seat attachment (Figure 1.3).

This modification consists of two aircraft configurations; a 20 place arrangement for a standard S-61N and an 17 place arrangement for the short fuselage modified by Carson Services STC SH640NE. These configurations are shown in Figures 1.1 and 1.2. The short fuselage is currently approved for 19 and 21 passengers. The standard fuselage is approved for 24, 26, and 28 passenger configurations.

The type certificate for the S-61N is 1H15 and the certification basis is CAR 7. However, FAR 21.101(a), the changed product rule, requires a new applicant for STC to comply with the airworthiness requirements effective on the date of the STC Application. AC 21.101-1, Reference 5, provides guidelines for compliance with the Changed Product Rule (CPR). The flow chart for these guidelines are provided on the following page. This project will comply with the latest amendment of CFR Part 29, amendment 29-45, except for 29.561, 29.562 will comply with amendment 29-0 and since 29.562 was not effective until amendment 29-29, this regulation does not apply.

2.0 INTERFACE LOADS

The load factors are defined by FAR 29.561. FAR 25.785 requires a 1.33 fitting factor for the seat and seat belt attachments for the loads specified in FAR 29.561. FAR 29.785 also requires a 170 lb occupant. The seat weighs 15 lbs and therefore all accelcrations will be multiplied by 185 lbs.

A summary of the load factors is shown in Table 2.1. Thc seat is side facing and therefore, a forward load is a side load on the seat. The seat is certified to a TSO and therefore, only the attachment of the seat to the helicopter structure rcquires substantiation.

TABLE 2.1 – Ultimate Load Factors in Aircraft Reference Coordinate System (without fitting factor)

Load Direction	Acceleration
Forward	4.0g
Side	2.0g
Down	4.0g
Up	1.5g

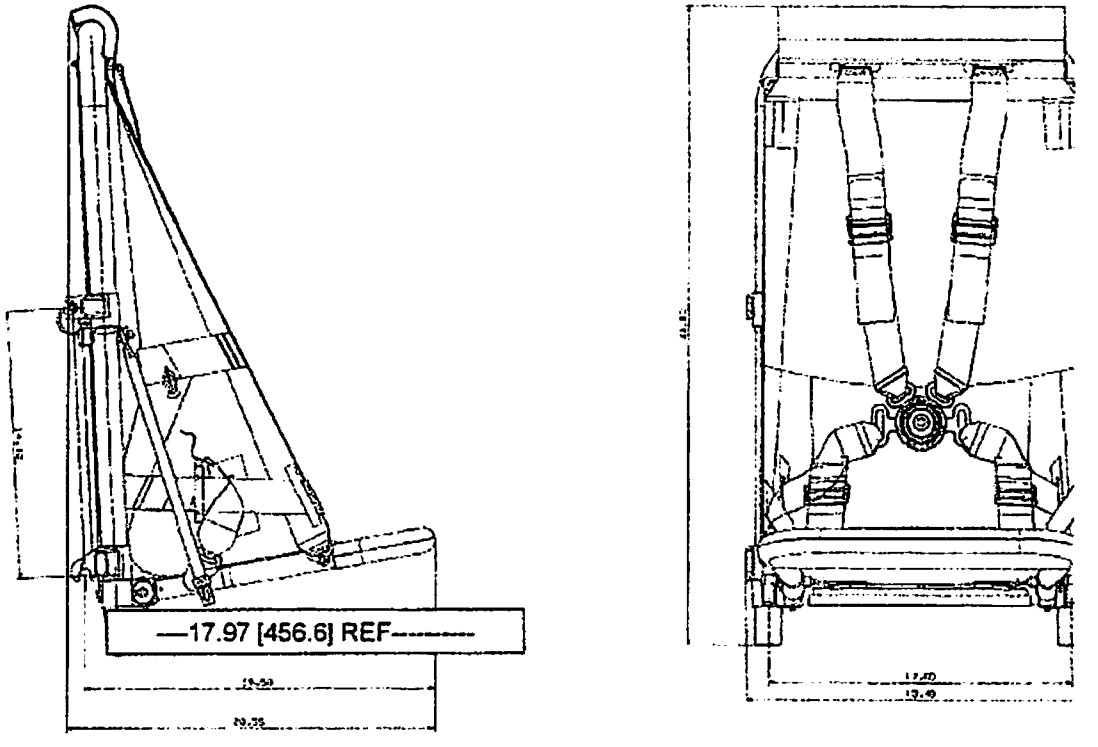


Figure 2.1 – Seat Dimensions