Type Acceptance Report TAR 97/07 – Revision 2 SIKORSKY S-76 Series

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Executive Summary

New Zealand Type Acceptance has been granted to the Sikorsky S-76 series helicopter based on validation of FAA Type Certificate number H1NE. There are no special requirements for import.

Applicability is currently limited to the Models and/or serial numbers detailed in Appendix 1, which are now eligible for the issue of an Airworthiness Certificate in the Standard Category in accordance with NZCAR §21.191, subject to any outstanding New Zealand operational requirements being met. (See Section 5 of this report for a review of compliance of the basic type design with the operating Rules.) Additional variants or serial numbers approved under the foreign type certificate can become type accepted after supply of the applicable documentation, in accordance with the provisions of NZCAR §21.43(c).

NOTE: The information in this report was correct as at the date of issue. The report is generally only updated when an application is received to revise the Type Acceptance Certificate. For details on the current type certificate holder and any specific technical data, refer to the latest revision of the State-of-Design Type Certificate Data Sheet referenced herein.

1. Introduction

This report details the basis on which Type Acceptance Certificate No. 97/07 was granted in the Standard Category in accordance with NZCAR Part 21 Subpart B.

Specifically the report aims to:

- (a) Specify the foreign type certificate and associated airworthiness design standard used for type acceptance of the model(s) in New Zealand; and
- (b) Identify any special conditions for import applicable to any model(s) covered by the Type Acceptance Certificate; and
- (c) Identify any additional requirements which must be complied with prior to the issue of a NZ Airworthiness Certificate or for any subsequent operations.

2. Aircraft Certification Details

(a) State-of-Design Type and Production Certificates:

Manufacturer/TC Holder: Sikorsky Aircraft Corporation

Type Certificate: H1NE

Issued by: Federal Aviation Administration

Production Approval: FAA Production Certificate Number 105

Manufacturer: Keystone Helicopter Corporation

Production Approval: Production under Type Certificate only and PC 121NE

Issued by: Federal Aviation Administration

(b) Models Covered by the Part 21B Type Acceptance Certificate:

(i) Model: S-76A

MCTOW: 10,500 lb. [4763 kg]

Max. No. of Seats: 2 cockpit, 13 cabin

Noise Standard: US Federal Noise Control Act 1972

Engine: Rolls Royce 250-C30 or 250-C30S

Type Certificate: E1GL (See TAR 15/21B/2)
Issued by: Federal Aviation Administration

(ii) Model: S-76B

MCTOW: 11,400 lb. [5171 kg] – with PT6B-36 engines

11,700 lb. [5307 kg] - with PT6B-36A or -36B engines

Max. No. of Seats: 2 cockpit, 13 cabin

Noise Standard: US Federal Noise Control Act 1972

Engine: Pratt & Whitney Canada PT6B-36, -36A or -36B

Type Certificate: E-20 (See TAR 19/21B/26)

Issued by: Transport Canada

(iii) **Model:** S-76C

MCTOW: 11,700 lb. [5307 kg]

Max. No. of Seats: 2 cockpit, 13 cabin

Noise Standard: FAR Part 36 Appendix H

Engine: S-76C: Safran Helicopter Engines (ex Turboméca) Arriel 1S1

Type Certificate: E.073 (See TAR 15/21B/3)

Issued by: European Aviation Safety Agency

S-76C+: Safran Helicopter Engines (ex Turboméca) Arriel 2S1 S-76C++: Safran Helicopter Engines (ex Turboméca) Arriel 2S2

Type Certificate: E.001 (See TAR 12/21B/2)

Issued by: European Aviation Safety Agency

3. Application Details and Background Information

The applicant for New Zealand type acceptance of the S-76A was from the Order of St John – Auckland Regional Trust Board, via Wing and Rotor Aviation Ltd, by CAA Form 24021/02 dated 5 May 1997. The first-of-type example was serial number 760012 registered ZK-ISJ. The S-76 is a twin-turbine Transport Category rotorcraft with four-bladed main and tail rotors and retractable landing gear, which can carry up to 13 passengers.

Type Acceptance Certificate No. 97/07 was granted on 4 August 1997 to the Sikorsky S-76A based on validation of FAA Type Certificate H1NE. Specific applicability is limited to the coverage provided by the operating documentation supplied. There are no special requirements for import into New Zealand.

This report was raised to Revision 1 to include the S-76C models. The application was from Sikorsky Aircraft Corporation, dated 19 September 2017. The first-of-type examples were serial numbers 760711 and 760743 (both S-76C++ manufactured by Keystone Helicopter Corporation) registered ZK-HQO and ZK-HQC respectively for The Northland Emergency Services Trust for operations in the EMS role. Type Acceptance was granted on 27 March 2018.

Revision 2 to this report added the S-76B model. The application was from Oceania Aviation Limited dated 24 January 2019. The first-of-type example was serial number 760447 registered ZK-IBI. Type Acceptance was granted on 10 July 2019.

The various S-76 models are distinguished primarily by a change in engine type, with associated increases in engine power and maximum all-up weight. There have also been significant changes to airframe systems and avionics. The first Model S-76A was fitted with the Allison 250-C30 or C30S engine. The S-76B was developed by the fitting of the PT6B-36 engine. Subsequently Sikorsky developed the "S-76A+" and S-76A++" versions, which involved the installation by STC of the Turbomeca Arriel 1S and 1S1 engines respectively. The S-76C was the production version with the Arriel 1S engine, and included a Continuous OEI Power Rating. "S-76C+" and "S-76C++" are marketing designations for S-76C models fitted with Arriel 2S1 or 2S2 engines respectively. Initially Sikorsky offered a number of avionics configurations for the S-76 Series, but from S-76C serial number 760511 onwards the Collins cockpit became standard.

4. NZCAR §21.43 Data Requirements

The type data requirements of NZCAR Part 21B Para §21.43 have been satisfied by supply of the following documents, or were already held by the CAA:

(1) State-of-Design Type certificate:

FAA Type Certificate Number H1NE

FAA Type Certificate Data Sheet number H1NE at Revision 45 dated 10 June 2015

- Model S-76A (Transport Helicopter, Category B) approved 21 November 1978
 (Transport Helicopter, Category A) approved 9 January 1979
- Model S-76B (Transport Helicopter, Category B) approved 31 October 1985
 (Transport Helicopter, Category A) approved 3 February 1987
- Model S-76C (Transport Helicopter, Category B) approved 15 March 1991
 (Transport Helicopter, Category A) approved 12 April 1991

(2) Airworthiness design requirements:

(i) Airworthiness Design Standards:

The certification basis of the Sikorsky S-76A is FAR Part 29, effective February 1 1965, including amendments 29-1 through 29-11; in addition, portions of amendment 29-12, specifically paragraphs \$29.67, \$29.71, \$29.75, \$29.141, \$29.173, \$29.175, \$29.931, \$29.1189(a)(2), \$29.155(c)(2), and \$29.1557(c); plus portions of amendment 29-13, specifically paragraph \$29.965; and amendment 29-21, specifically paragraphs \$29.1, \$29.79, \$29.1517 and \$29.1587 were added. There was one special condition applied, one equivalent level of safety finding and one partial exemption granted.

For the Model S-76B certification basis portions of Amendment 29-24 were added, specifically paragraph §29.1325(f), plus three equivalent safety findings were made.

For the Sikorsky S-76C specific additions to the basic certification basis are: §29.1325 of amendment 29-24; amendment 29-26, specifically §29.67(a)(2) and (3)(b), §29.923(k), §29.1045(c), §29.1047(a)(4) and §29.1521(h); and §29.811 of amendment 29-30.

For the S-76C with Arriel 2S1 ("S-76+") specific additions to the basic certification basis are: §29.1325 of amendment 29-24; and amendment 29-26, specifically §29.67(a)(2) and (3)(b), §29.923(k), §29.1045(c), §29.1047(a)(4) and §29.1521(h); §29.811 of amendment 29-30; and amendment 29-34, specifically §29.67(a)(1)(i), §29.923(a),(b)(1) and (3), §29.1143(f), §29.1305(a)(24) and (25), §29.1521(i) and (j) and §29.1549(e).

For the S-76C with Arriel 2S2 ("S-76C++") specific additions to the certification basis are: §29.1325 of amendment 29-24; amendment 29-26, specifically §29.67(a)(2) and (3)(b), §29.923(k), §29.1045(c), §29.1047(a)(4) and §29.1521(h); 29.811 of amendment 29-30; amendment 29-34, specifically paragraphs §29.67(a)(1)(i), §29.923(a),(b)(1) and (3), §29.1143(f), §29.1305(a)(24) and (25), §29.1521(i) and (j) and §29.1549(e).

These airworthiness design standards are acceptable certification bases in accordance with NZCAR Part 21B Paragraph §21.41 and Advisory Circular 21-1A, because FAR 29 is the basic standard for Transport Category Rotorcraft called up under Part 21 Appendix C. There are no non-compliances and no additional special conditions have been prescribed by the Director under §21.23.

(ii) Special Conditions:

S-76A through S-76C:

29-82-NE-3 (Docket No. 17721) dated 27 March 1978:

- 1. <u>Takeoff Power Check Procedures</u>. A means must be provided to permit the pilot to determine that the engines are capable of developing the power used in establishing the applicable performance data prescribed in §§ 29.51 through 29.79.
- 2. <u>Engine Failure Warning System</u>: Unless a clear and prompt indication of engine power loss is provided to the pilot in all flight regimes, an engine failure warning system must be installed to warn the pilot of the failure of an engine and to identify which engine has failed. The warning must be clear and distinguishable from all other warnings.
- 3. Operation Without Normal Electrical Power: In addition to the requirements of FAR §29.1309 and 29.1351, it must be shown by analysis, test, or both, that the helicopter can be operated safely in VFR conditions, for a period of not less than five minutes with the normal electrical power system (electrical power sources excluding the battery) inoperative, with critical type fuel (from the standpoint of flameout and restart capability), and with the aircraft initially at the maximum certificated altitude.

S-76C Series:

29-ASW-3 (Docket No. 91-ASW-1) dated 30 January 1992; Turbomeca Arriel Model 1S1 Engine Tachometer Box: The S-76C will have a novel or unusual design feature associated with installation of the Turbomeca Arriel Model 1S1 engine. This design feature is associated with the tachometer box which is installed as an approved accessory to the Arriel Model 1S1 engine. The special condition contains additional safety standards necessary to establish a level of safety equivalent to that provided by the applicable airworthiness standards.

S-76C+ *and S-76C*++:

29-ASW-16 (Docket No. 96-ASW-2), 25 August 1996; Protection for Electrical and Electronic Systems From High Intensity Radiated Fields: Each system that performs critical functions must be designed and installed to ensure that the operation and operational capabilities of these critical functions are not adversely affected when the helicopters are exposed to high intensity radiated fields external to the helicopters.

<u>29-004-SC (Docket No. SW004)</u>, <u>17 June 1998</u>; In addition to the requirements of FAR 29.1049, acceptable hovering cooling provisions must be shown for specific conditions, and in addition to the requirements of FAR 29.1521 the 30-minute power ratings limitations must be established.

(iii) Equivalent Level of Safety Findings:

S-76B:

§29.1181(a) Designated Fire Zones, Regions Included: and §29.1203(a) Fire Detector Systems: A number of equivalent safety findings relating to fire protection were made for the S-76B installation due to the unconventional configuration of the PT6 engine, based on similar installations previously approved on other aircraft types.

§29.1013(e) Oil Tanks, and §29.1189(a) Shutoff Means: An equivalent safety finding was granted against the requirement for an oil shut-off valve based on isolation of the oil system, similarity to the S-76A system and the service history of the S-76A.

S-76A through S-76C:

§29.173(b) Static Longitudinal Stability: An equivalent safety finding was granted to the S-76 to allow operation without a Pitch Bias Actuator (PBA) or with an inoperable PBA, based on an engineering evaluation by the FAA. Applicability of the ELOS was subsequently expanded to include the S-76B and S-76C models.

(iv) Exemptions:

S-76A through S-76C:

§29.911(h) Exit Markings: This partial exemption was granted to allow a two inch wide band around each exterior cabin and cockpit door handle, in lieu of outlining the whole door, on the basis the size of the exits and their relationship to the windows, the coloured band, plus the size of the helicopter, provides sufficient conspicuity of the exits.

(v) Airworthiness Limitations

S-76A Airworthiness Limitations and Inspection Requirements – SA 4047-76-2-1 S-76B Airworthiness Limitations and Inspection Requirements – SA 4047-76B-2-1 S-76C Airworthiness Limitations and Inspection Requirements – SA 4047-76C-2-1

(3) Aircraft Noise and Engine Emission Standards:

(i) Environmental Standard:

The S-76A and S-76B Models have been certificated under the US Federal Noise Control Act of 1972 while the S-76C Model has been certificated for noise under FAR Part 36 Appendix H, including Amendment 36-14. For the Models S-76C+ and S-76C++ this was updated to Amendment 36-20.

(ii) Compliance Listing:

Data from FAA Advisory Circular 36-1H Change 1:

			Noise Levels (ePNdB)		
Model:	Engine:	MAUW:	Flyover:	Takeoff:	Approach:
S76C	Arriel 1S1	11,700 lb.	93.2	96.0	97.7
S76C+	Arriel 2S1	11,700 lb.	91.6	93.9	96.1
S76C++	Arriel 2S2	11,700 lb.	91.6	93.9	96.1

(4) Certification Compliance Listing:

(i) S-76A: Document SER-760210 – Compliance Checklist S-76A

(ii) S-76B: Compliance Summary – Data Submittals S-76B @ 11400 lb Gross Weight

(iii) S-76C: S-76C Compliance Checklist

(iv) S-76C+: S-76C+ Compliance Checklist

(v) S-76C++: Document SER-761915 – Compliance Checklist for FAA Certification of S-76C with Arriel 2S2 Engines (S-76++)

(5) Flight Manual:

(i) S-76A: FAA Approved Rotorcraft Flight Manual Sikorsky Model S-76A Publication SA 4047-76-1 – CAA Accepted as AIR 2589

(ii) S-76B: FAA Approved Rotorcraft Flight Manual Sikorsky Model S-76B Publication SA 4047-76B-1 – CAA Accepted as AIR 3901

(iii) S-76C: FAA Approved Rotorcraft Flight Manual Sikorsky Model S-76C Publication SA 4047-76C-1 – CAA Accepted as AIR 3657

(iv) S-76C+: FAA Approved Rotorcraft Flight Manual Sikorsky Model S-76C Applicable when equipped with Turbomeca Arriel 2S1 engines. Publication SA 4047-76C-10 (for serial numbers prior to 760511) CAA Accepted as AIR 3658

FAA Approved Rotorcraft Flight Manual Sikorsky Model S-76C+ Applicable when equipped with Turbomeca Arriel 2S1 engines. Publication SA 4047-76C-14 (for serial numbers 760511 and subsequent) CAA Accepted as AIR 3659

(v) S-76C++: FAA Approved Rotorcraft Flight Manual Sikorsky Model S-76C Applicable when equipped with Turbomeca Arriel 2S2 engines.

Publication SA4047-76C-15 (for serial numbers 760607 and subsequent)
CAA Accepted as AIR 3660

(6) Operating Data for Aircraft:

(i) Maintenance Manual:

S-76A Maintenance Manual – Publication SA 4047-76-2 S-76B Maintenance Manual – Publication SA 4047-76B-2

S-76C Maintenance Manual – Publication SA 4047-76C-2

Composite Materials Manual for Sikorsky S-76 – Publication SA 4047-76-5

Corrosion Control Manual for Sikorsky S-76 – Publication SA 4047-76-8

Structural Repair Manual for Sikorsky S-76 – Publication SA 4047-76-12

Wiring Manual for S-76C++ (760607 and Subsequent) – Publication SA 4047-76C-3

(ii) Current service Information:

Alert / Customer Service Bulletins and Customer Service Notices

(iii) Illustrated Parts Catalogue:

S-76A Illustrated Parts Catalogue – Publication SA 4047-76-4 S-76B Illustrated Parts Catalogue – Publication SA 4047-76B-4 S-76C Illustrated Parts Catalogue – Publication SA 4047-76C-4

(7) Agreement from manufacturer to supply updates of data in (4) and (5):

CAA 2171 form from S-76 Program Manager dated 7 July 1997.

CAA is now provided access through the website www.sikorsky360.com

(8) Other information:

Sikorsky S-76 Helicopter NZCAA Variant Overview presentation dated October 2017

Document SER-760283 – S-76 Electrical Load Analysis Report (S-76A s/n 760062)

Document SER-760490 – S-76 Electrical Load Analysis Report (S-76B s/n 760262)

Document SER-761043 – Electrical Load Analysis Report (S-76C s/n 760407)

5. New Zealand Operational Rule Compliance

Compliance with the retrospective airworthiness requirements of NZCAR Part 26 has been assessed as they are a prerequisite for the grant of an airworthiness certificate.

CAR Part 26 - Subpart B - Additional Airworthiness Requirements

Appendix B – All Aircraft

PARA:	REQUIREMENT:	MEANS OF COMPLIANCE:
B.1	Marking of Doors and Emergency Exits	FAR29.811, Ref Sikorsky Letter CAL-97-3863
B.2	Crew Protection Requirements – CAM 8 Appdx. B # .35	Not Applicable – Agricultural Aircraft only

Appendix E – Helicopters

PARA:	REQUIREMENT:	MEANS OF COMPLIANCE:
E.1	Doors and Exits: Air transport helicopters	
	(i) are operable from the inside and outside;	FAR §29.783(c)
	(ii) are unobstructed by seats, seat backs or other equipment;	FAR §29.803(a)
	(iii) have a means of locking to prevent inadvertent opening	FAR §29.809(a)-(d).
	and indication to crew of not being fully closed and locked.	Ref Sikorsky letter CAL-97-3863
E.2.1	Emergency Exit Marking	FAR §29.811(b), (e) and (f). Ref Sikorsky letter CAL-97-3863

Compliance with the following additional NZ operating requirements has been reviewed and were found to be covered by either the original certification requirements or the basic build standard of the aircraft, except as noted:

CAR Part 91 – Subpart F – Instrument and Equipment Requirements

PARA:	REQUIREMENT:		MEANS OF COMPLIANCE:		
91.505	Seating and Restraints – S	afety belt/Shoulder Harness	FAR §29.785		
91.507	Pax Information Signs – Smoking, safety belts fastened		FAR §29.1413(a)		
	_		FAR §29.853(c)(2)	FAR §29.853(c)(2)	
91.509	(1) ASI	FAR §29.1303(a)	(8) Coolant Temp	N/A – Turbine	
Min.	(2) Machmeter	N/A	(9) Oil Temperature	FAR §29.1305(9)	
VFR	(3) Altimeter	FAR §29.1303(b)	(10) Manifold Pressure	N/A -Turbine	
	(4) Magnetic Compass	FAR §29.1303(c)	(11) Cylinder Head Temp.	N/A – Turbine	
	(5) Fuel Contents	FAR §29.1305(a)(3)	(12) Flap Position	N/A – not fitted	
	(6) Engine RPM	FAR §29.1303(12)	(13) U/c Position	FAR §29.729(e)	
	(7) Oil Pressure	FAR §29.1303(a)(6)	(14) Ammeter/Voltmeter	FAR29.1351(b)(6)	
91.511	(1)Turn and Slip	FAR §29.1303(g)	(3) Anti-collision Lights	FAR §29.1401	
Night	(2) Position Lights	FAR §29.1387 through §29.1397	(4) Instrument Lighting	FAR §29.1381	
91.513	VFR Communication Equ	ipment	FAR29.1307:		
			Standard fit is dual Collins		
91.517	(1) Gyroscopic AH	FAR §29.1303(f)	(5) OAT	FAR §29.1303(e)	
IFR	(2) Gyroscopic DI	FAR §29.1303(h)	(6) Time in hr/min/sec	FAR §29.1303(d)	
	(3) Gyro Power Supply	FAR §29.1303(g)(2)	(7) ASI/Heated Pitot	FAR §29.1323(f)	
	(4) Sensitive Altimeter	FAR §29.1303(b)	(8) Rate of	FAR §29.1303(i)	
			Climb/Descent		
91.519	IFR Communication and I	Navigation Equipment		is dual Collins VIR-32, single ADF-462,	
			TDR-90 transponder, DME		
91.523			Quantity 1 first aid kit requ		
	(a) More Than 9 pax – Fir			ned on an individual aircraft basis	
			Quantity 1 Fire Extinguish		
01.500	ELE EGO CLOC 10C M	F 6 22/11/2007	Compliance to be determined on an individual aircraft basis		
91.529	ELT – TSO C126 406 MF		Operational requirement - Compliance as applicable		
91.531	Oxygen Indicators – Volu			Compliance as applicable	
91.533	Oxygen for non-Pressurise		Not fitted as standard.		
	Above FL100 – Suppleme	· · · · · · · · · · · · · · · · · · ·	Maximum operating altitud	le is 15,000 feet H _d .	
	Therapeutic for 1% of Pax1201 PBE for each crew member				
01.541			G. 1 1C. C. H. TDD	100 1'1 TDD04'	
91.541			Standard fit is Collins TDR90 while TDR94 is an option		
91.543	ž j		Not applicable – not turbo jet or turbo fan.		
91.545	Assigned Altitude Indicate		Not applicable to Helicopte		
A.15	ELT Installation Requiren	nents	Standard fit ELT is Artex ELT-100M or Artex C406-N-HM.		
			ELT antenna mounted in helicopter tail STA 420, RBL 5, WL 106.		
			Stressed to 100G in x,y,z a:	xes.	

CAR Part 135 – Subpart F – Instrument and Equipment Requirements

PARA:	REQUIREMENT:			MEANS OF COMPLIANCE:	
135.355	Seating and Restraints – Shoulder harness flight-crew seats		it-crew seats	FAR §29.785	
135.357	Additional Instruments	(Powerplant and Propel	ller)		
	(1) Powerplant	; Reversible Pitch Prope	eller	(1) FAR §29.1305; (2) Not Applicable	
135.359	Night Flight	Landing light, Pax con	npartment	FAR §29.1383	
135.361	IFR Operations	Speed, Alt, spare bulbs	s/fuses	Compliance to be determined on an individual aircraft basis	
135.363	Emergency Equipment (Part 91.523 (a) & (b)) Quantity 1 first aid kit required. To be determined on an individual aircraft basis			first aid kit required. To be determined on an individual aircraft basis	
			Quantity 1 Fire Extinguisher required: FAR §29.853(f)		
135.367	Cockpit Voice Recorder (TSO C123) S-76 is approved for single-pilot IFR operations when appropriately equipped (See				
	(Required if RFM requires 2 crew) TCDS Note 15.) Compliance to be determined on an individual aircraft basis			e 15.) Compliance to be determined on an individual aircraft basis	
135.369	Flight Data Recorder (TSO C124) Required to be fitted as the S-76 Series is type certificated for 13 passengers				
	(Required if TC for more than ten pax.) Compliance to be determined on an individual aircraft basis				
	S-76C series: FAR29.1457 and 29.1459: Standard fit is a Universal CVR-120 "CVFDR" which meets both TSO C123 and TSO				
	C124 and is fitted with a Dukane underwater beacon which meets TSO C121.			meets TSO C121.	
135.371	Additional Attitude Indicator Not Applicable – Not turbo jet or turbofan powered				

- NOTES: 1. A Design Rule reference in the Means of Compliance column indicates the Design Rule was directly equivalent to the CAR requirement, and compliance is achieved for the basic aircraft type design by certification against the original Design Rule.
 - 2. The CAR Compliance Tables above were correct at the time of issue of the Type Acceptance Report. The Rules may have changed since that date and should be checked individually.
 - 3. Some means of compliance above are specific to a particular model/configuration. Compliance with Part 91/119 operating requirements should be checked in each case, particularly oxygen system capacity and emergency equipment.

Attachments

The following documents form attachments to this report:

Copy of FAA Type Certificate Data Sheet Number H1NE

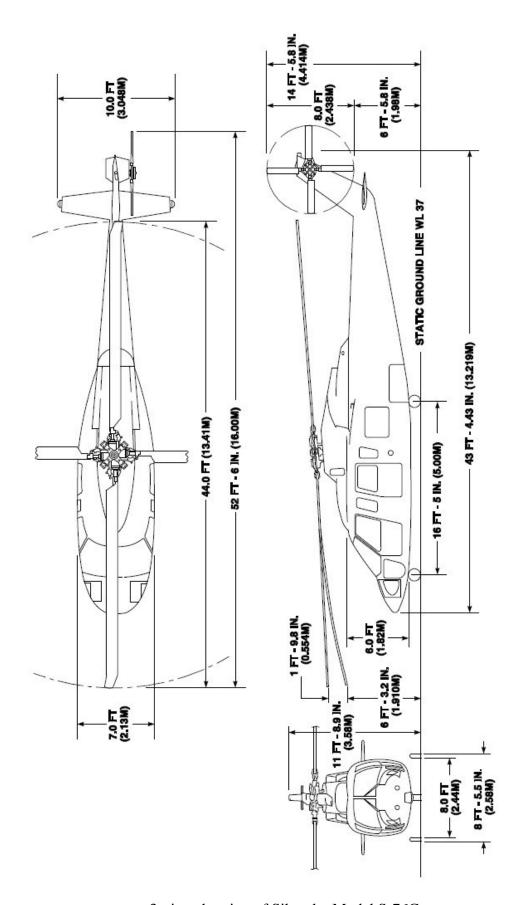
Sign off

David Gill	Checked – Greg Baum
Team Leader Airworthiness	Team Leader Product Certification

Appendix 1

List of Type Accepted Variants:

Model:	Applicant:	CAA Work Request:	Date Granted:
S-76A	Auckland Regional Trust	97/21B/17	4 August 1997
S-76C Series	Sikorsky Aircraft Corporation	18/21B/8	27 March 2018
S-76B	Oceania Aviation Limited	19/21B/20	10 July 2019



3-view drawing of Sikorsky Model S-76C++