PSM 1-6-13



DHC-6 TWIN OTTER

AIRWORTHINESS LIMITATIONS – AVIONICS

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Revision 4 – Sep. 19/18

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1. Revision 4 is a complete re-issue of PSM 1-6-13. It has been updated to incorporate EFIS-006 Display Units.

2. Remove and destroy Revision 3 of PSM 1-6-13 and replace with the attached Revision 4.

Note: We recommend that this transmittal letter be kept for record purposes and inserted at the front of the manual.

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Incorporate Revision 1, dated June 8, 2012.

1. Revision 1 is a complete reissue of PSM 1-6-13, Airworthiness Limitations – Avionics.

2. Remove and destroy Initial Release of PSM 1-6-13 and replace with the attached Revision 1.

Note: We recommend that this transmittal letter be kept for record purposes and inserted at the front of the manual.

LIST OF EFFECTIVE PAGES

This list shows the effective pages in the manual, with their latest revision date. An asterisk (*) indicates pages added or replaced at the latest revision. Technical changes to the content are indicated by a black vertical line next to the change or the paragraph that contains the change.

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LOG OF REVISIONS

This manual is valid only when it incorporates all revisions issued. The revised portion of a given page is indicated by a change bar in the left column. Transport Canada approval of each revision is recorded below.

Rev. No.	Pages Affected	Subject	Approval/Date
Revision 1	Page 6	FAA Regulations added.	June 8, 2012
Revision 2	All, document re-issued.	Update for Phase 2A Avionics Upgrade design changes including addition of Avionics System Airworthiness Limitations (AWL's) and related conditions of design approval; miscellaneous editorial changes. Manual structure reformatted to accommodate inclusion of Phase 2A Limitations.	23 December 2015
Revision 3	All, document re-issued.	Update for Super-Lite Avionics option; miscellaneous editorial changes.	7 July 2017
Revision 4	All, document re-issued.	Complete re-issue of manual, change bars against changes: Limiations Page 2 – To include EFIS-006 Display Units.	14 SEPTEMBER 2018

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AIRWORTHINESS LIMITATIONS – AVIONICS

1. GENERAL

This document contains system Airworthiness Limitations (AWL's) and associated Critical Design Configuration Control Limitations (CDCCL's) for the avionics suite of the Viking Air Limited (VAL) DHC-6 Series 400 aircraft with the Phase 2 Avionics Upgrade incorporated and with optional Apex Super-Lite Avionics.

This document is to be used in conjunction with the DHC-6 Series 400 Aircraft Maintenance Manual (AMM) PSM 1-64-2, the Inspection Requirements Manual PSM 1-6-7, and other applicable supplementary maintenance and inspection requirements and documents.

This document, used in conjunction with the above-reference maintenance and inspection documents, constitutes the Instructions for Continued Airworthiness (ICA's) associated with the avionics suite of the Viking Air Limited DHC-6 Series 400 aircraft. Information in this document must be incorporated in the operator's Scheduled Aircraft Maintenance Program as specified.

It is not the intention of this document to supersede any information in other aircraft manuals, except in those areas listed herein.

Maintenance Manual (PSM 1-64-2) information (system description, operation, location, removal, installation, testing and other maintenance procedures) is contained in the Aircraft Maintenance Manual (AMM), PSM 1-64-2.

Line Replaceable Unit (LRU) part numbers and other necessary part numbers are contained in the Illustrated Parts Catalogue (IPC), PSM 1-64-4.

Scheduled and unscheduled maintenance program tasks are contained in the Inspection Requirements Manual, PSM 1-6-7.

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2. AVIONICS SUITE DESCRIPTION

The DHC-6 Series 400 avionics suite is developed around a four-screen Honeywell Primus Apex® Electronic Flight Instrument System (EFIS). The suite fully integrates Primary Fight Display (PFD), Flight Director (FD), communication, navigation, engine instrument displays, electrical and other systems displays, and Crew Alerting System (CAS) messages through Apex. Options are provided for some Apex and federated equipment items and safety systems including but not restricted to a three-axis Autopilot (AP), Electronic Checklists (ECL's), electronic charts, TCAS I (optional TCAS II), EGPWS, Fight Data Recorder (FDR), Cockpit Voice Recorder (CVR) and Emergency Locator Transmitter (ELT) systems.

An Electronic Standby Instrument System (ESIS) is provided through the L-3 Avionics GH-3100 or GH-3900.2 ESIS. The ESIS installation includes a remote magnetometer and an independent standby emergency battery. Airframe signals are interfaced to Apex through two Data Acquisition Units (DAU's).

Phase 2 introduces a number of type design standard and optional design changes. The initial Phase 2 certification, referred to as Phase 2A / 2A+ includes the following design changes:

a. Integrated Primary Flight Displays (IPFD's) – These are standard type design for any Series 400 aircraft equipped with Phase 2A Apex software.

b. Flight Director (FD) – Standard to type design for Phase 2A aircraft.

c. Three-axis Autopilot (AP) – Optional on Phase 2A aircraft.

d. The AP includes an electric Pitch Trim System (PTS) that can be operated in a manual electric mode by the flight crew when the AP is disconnected, or automatically by the AP. Viking is not offering an electric PTS without the AP option.

e. Various Phase 2A / 2A+ options that reside in Primus Apex® including:

   (1) Synthetic Vision System (SVS) (SmartView).

   (2) Vertical Situation Display (VSD).

   (3) Dual Flight Management systems.

   (4) SBAS GPS's and SBAS GPS based flight management system approaches.

   (5) TCAS II with Resolution Advisory (noting that in Phase 1, a CAS 67A TCAS II hardware installation was approved for TCAS I (TA only) functionality, however it could not be configured for TCAS II (TA & RA) functionality due to a handshaking issue with Apex).

   (6) 512 Word Flight Data Recorder (FDR).

   (7) ADS-B Out functionality – Incorporation of this functionality requires updated Apex software and upgraded Mode S transponders.

   (8) A 14,000 pound aircraft flight management system database (ACDB).

   (9) External (non-Apex) video source display (on one of MFD's) (referred to as RIB video).

   (10) Stormscope.

   (11) A green engine display option (normal conditions are display in green, this option is for aircraft registered in the United States under FAA jurisdiction).

Table 1 summarizes Phase 2A and 2A+ design changes organized as Viking Modifications (MOD's) and Standard Option Orders (S.O.O.'s).

Table 1 Summary of MOD's and S.O.O.'s Introduced in Phase 2A/ 2A+ Upgrade

Description	Reference Mod or S.O.O. Number	Remarks
Honeywell Apex Avionics Upgrade Consisting of Integrated Primary Flight Displays (IPFD's), Flight Director (FD), and 512 Word FDR ARINC 717 Apex Outputs	MOD 6/2303	512 Word FDR outputs are for Apex ARINC 717 output data stream only. For installation of 512 Word FDR, refer to Mod 6/2332.
SBAS GPS Receivers	MOD 6/2304	For installation of SBAS-capable GPS receivers only. SBAS GPS-based approaches are enabled as part of S.O.O. 6225.
512 Word FDR	MOD 6/2332	
ADS-B Out Transponder Upgrade	MOD 6/2354	For transponder upgrade only, ADS-B functionality is part of S.O.O. 6347.
Electronic Check List (ECL)	S.O.O. 6213	ECL's for the Series 400 are only approved for normal procedures.
TCAS II with Traffic Advisory (TA) and Resolution Advisory (RA)	S.O.O. 6219	In Phase 1, TCAS II was configured for TA's only. In Phase 2, TCAS II equipped aircraft have both TA's and RA's enabled. Aircraft are equipped with either TCAS I (type design standard per Mod 6/2303) or optional TCAS II.
Stormscope	S.O.O. 6220	
Autopilot	S.O.O. 6221	
Synthetic Vision System (SVS) (Primus Apex® SmartView)	S.O.O. 6222	
Flight Management System Aircraft Database (ACDB) 14,000 Pound	S.O.O. 6224	This is the ACDB only and is not a design approval for 14,000 pound operations.
SBAS Navigation and Approach Capability	S.O.O. 6225	
FAA Engine Display Configuration	S.O.O. 6280	Only US-registered (FAA) aircraft are eligible for this modification.
Vertical Situation Display (VSD)	S.O.O. 6312	
Dual Flight Management Systems	S.O.O. 6313	
ADS-B Out Functionality Enabled	S.O.O. 6347	

Additional avionics suite system description, operation, location, removal, installation, testing and other information is contained in the Aircraft Maintenance Manual.

Viking offers a simplified avionics suite that is better suited to certain types of operations, such as for float operations. This simplified avionics suite is referred to as Super-Lite. Table 2 summarizes Apex Super-Lite MOD's and S.O.O.'s.

Modern avionics, and in particular EFIS, require protection from High Intensity Radiated Fields (HIRF) and from the direct/indirect effects of lightning. To achieve this protection, it is required that certain design features of the aircraft avionics suite installation on the DHC-6 Series 400 be maintained through periodic inspections and checks, and, where applicable, specified unscheduled maintenance tasks. Required inspections and checks are specified in the Inspection Requirements Manual PSM 1-6-7. It is particularly important that the integrity of avionics suite shields, bonds, wire routing, and airframe component bonds be maintained.

Table 2 Summary of MOD's and S.O.O.'s Introduced in Super-Lite

Description	Reference Mod or S.O.O. Number	Remarks
Prerequisitie Phase 2 MOD's for Super-Lite		
Honeywell Apex Avionics Upgrade Consisting of Integrated Primary Flight Displays (IPFD's), Flight Director (FD), and 512 Word FDR ARINC 717 Apex Outputs	MOD 6/2303	This is a prerequisite Phase 2 MOD for Super-Lite.
SBAS GPS Receivers	MOD 6/2304	For installation of SBAS-capable GPS receivers only. SBAS GPS-based approaches are enabled as part of S.O.O. 6225. This is a prerequisite Phase 2 MOD for Super-Lite.
ADS-B Out Transponder Upgrade	MOD 6/2354	For transponder upgrade only, ADS-B functionality is part of S.O.O. 6347. This is a prerequisite Phase 2 MOD for Super-Lite.
Baseline Super-Lite Conversion		
Honeywell Apex Super-Lite Avionics Baseline	S.O.O. 6388	Super-Lite Avionics baseline consisting of MOD 6/2303 Phase 2 Avionics baseline with single DME, single Transponder, single GPS, no TAWS, no TCAS, no ADF's, no weather radar, no CVR, and no FDR.
Super-Lite Options		
Single Charts	S.O.O. 6214	
Autopilot	S.O.O. 6221	
Synthetic Vision System (SVS) (Primus Apex® SmartView)	S.O.O. 6222	
Vertical Situational Display (VSD)	S.O.O. 6312	
Dual Flight Management Systems	S.O.O. 6313	
SBAS Navigation and Approach Capability	S.O.O. 6225	
ADS-B Out Functionality Enabled	S.O.O. 6347	

Table 2 Summary of MOD's and S.O.O.'s Introduced in Super-Lite

Description	Reference Mod or S.O.O. Number	Remarks
Electronic Display of Normal Check List (ECL)	S.O.O. 6213	ECL's for the Series 400 are only approved for normal procedures.
Dual GPS Receivers	S.O.O. 6380	
Dual Mode S Transponders	S.O.O. 6381	
TCAS I	S.O.O. 6382	
TCAS II with TA and RA *in lieu* of Phase 1 TCAS II installation with TA only.	S.O.O. 6219	In Phase 1, TCAS II was configured for TA's only. In Phase 2, TCAS II equipped aircraft have both TA's and RA's enabled. Aircraft may be equipped with no TCAS (Super-Lite Baseline), TCAS I (S.O.O. 6382), or TCAS II (S.O.O. 6219).
Weather Radar	S.O.O. 6383	
CVR	S.O.O. 6384	
512 Word FDR	S.O.O. 6385	
Dual DME's	S.O.O. 6386	
TAWS	S.O.O. 6387	
Single ADF	S.O.O. 6405	
Dual ADF	S.O.O. 6217	

3. AIRWORTHINESS LIMITATIONS

3.1 Approvals

The Airworthiness Limitations section is approved by the Minister and specifies maintenance required by any applicable airworthiness or operating rule, unless an alternative program has been approved by the Minister.

The DHC-6 Series 400 avionics suite developed around the Honeywell Primus Apex® EFIS results in new Airworthiness Limitations including conditions of design approval as specified in the following sections.

Approved: 
Transport Canada Civil Aviation (TCCA)

Date: 19-Sept-2018

Note The following is applicable to United States Registered Aircraft.

The Airworthiness Limitations Section is FAA approved and specifies inspections and other maintenance required under 14 CFR §§ FAR 43.16 and 91.403 of the Federal Aviation Regulation unless an alternative program has been FAA approved.

3.2 Limitations

Table 3 identifies Airworthiness Limitations (AWL's) based on associated Critical Design Configuration Control Limitations (CDCCL's) for the Avionics Systems of the DHC-6 Series 400 aircraft with the Phase 2 Avionics Upgrade.

Note Phase 2 aircraft (including Super-Lite aircraft) must embody MOD 6/2303 (refer to Table 1 and Table 2). Irrespective of other Apex and avionics options and installations, any aircraft with Apex Load 4.4 software is a "Phase 2" aircraft and any aircraft with S.O.O. 6388 is a Super-Lite aircraft.

Note Compliance with Airworthiness Limitations is mandatory.

Table 3 – Phase 2 Airworthiness Limitations Including Conditions of Design Approval

Identifier	Affected System	Description	Remarks
General			
GEN-001	All Avionics Systems	For purposes of the avionics upgrades, the DHC-6 Series 400 is a Class IV aircraft in the meaning of FAA Advisory Circular (AC) 23.1309-1E.	

Table 3 – Phase 2 Airworthiness Limitations Including Conditions of Design Approval

Identifier	Affected System	Description	Remarks
Apex Configuration and Options			
EFIS-001	Apex Software	Phase 2 and Super-Lite aircraft must use Apex 12 Slot Software Configuration Load 4.4 (Part Number EB60002734-0104).	Irrespective of other Apex and avionics installations and options, any aircraft with Apex Load 4.4. software is a “Phase 2” aircraft. The installation of Apex Load 4.4 software is by incorporation of MOD 6/2303.
EFIS-002	Apex Options	The following Apex option is prohibited on the DHC-6 Series 400: dual charts.	
EFIS-003	Electronic Check List (ECL)	Use of a ECL is approved for Normal Procedures only. Use of ECL for Abnormal and Emergency procedures is prohibited.	
EFIS -004	ECL	Approved content of ECL is controlled through Viking S.O.O. 6213.	
EFIS-005	Engine Displays	US-registered (FAA) aircraft must be configured for normal conditions engine display in green in accordance with S.O.O. 6280.	Engine display configuration is established with an Apex Options File parameter.
EFIS-006	Display Units	All four display units (DU’s) must be the same model type either KDU 1080 or KDU 1080-2, mixed configurations are prohibited.	KDU 1080-2 display units are incorporated by Mod 6/2450.
Flight Management System (FMS)			
FMS-001	ESIS / Apex Navigation Interface	Navigation (SRN or LRN) interfacing of Apex with L-3 Avionics GH-3100 or GH-3900.2 ESIS is prohibited.	
FMS-002	SBAS-Based Approaches	With the Apex options file set to SBAS-based navigation including LPV approaches predicated on SBAS GPS capability enabled, for Phase 2A aircraft (two GPS units required) or with Super-Lite aircraft with two GPS units, both GPS LRU’s must be 066-01201-0105 KGS 200 GPS receivers. For Super-Lite aircraft with one GPS LRU installed, it must be a 066-01201-0105 KGS 200 GPS receiver.	Installation is based on MOD 6/2304 and S.O.O. 6225.

Table 3 – Phase 2 Airworthiness Limitations Including Conditions of Design Approval

Identifier	Affected System	Description	Remarks
FMS-003	FMS Aircraft Database (ACDB)	Apex must use FMS ACDB's identified by Honeywell P/N MM60000461-002 (12,500 pounds) or Honeywell P/N 60000461-004 (14,000 pounds). Use of the 14,000 pound ACDB does not constitute a design approval for operations over 12,500 pounds.	The 14,000 pound ACDB is identified by Honeywell P/N 60000461-004 as called up in S.O.O. 6224.
GPS Receivers			
GPS-001	GPS Installation	Apex on Phase 2 aircraft is approved for use with non-SBAS or SBAS-enabled KGS 200 GPS receivers. Only Phase 2 aircraft may be equipped with either the non-SBAS Honeywell KGS 200 (P/N 066-01201-0101) GPS receiver (two for Phase 2 aircraft) or the SBAS enabled KGS 200 (P/N 066-01201-0105) GPS receivers (two for Phase 2 aircraft and one or two for Super-Lite aircraft).	
GPS-002	GPS Installations	Phase 2 aircraft with two GPS receivers must have either two 066-01201-0101 GPS receivers or two 066-01201-0105 GPS receivers, mixed configurations are prohibited. Super-Lite aircraft must have one or two 066-01201-0105 GPS receivers.	
GPS-003	GPS Installations	With the Apex options file set to SBAS-based navigation including LPV approaches disabled, the GPS receivers for Phase 2 aircraft must be either the 066-01201-0101 or 066-01201-0105 receivers. The one or two GPS receivers on Super-Lite aircraft must always be the 066-01201-0105 GPS receiver.	

Table 3 – Phase 2 Airworthiness Limitations Including Conditions of Design Approval

Identifier	Affected System	Description	Remarks
GPS-004	GPS Installations	Installation of SBAS-enabled 066-01201-0105 GPS receivers (two for Phase 2 aircraft and one or two for Super-Lite aircraft) must only be accomplished on aircraft with Apex Load 4.4 (also see Airworthiness Limitation EFIS-001).	SBAS-enabled KGS 200 receivers are incompatible with Apex Phase 1 (Load 1.3) software. MOD 6/2303 is a prerequisite modification to MOD 6/2304.
GPS-005	GPS Installations	Installation of the Honeywell 066-01201-0102, -0103, and -0104 KGS 200 GPS receivers *in lieu* of either the -0101 or -0105 GPS receiver is prohibited.	
Automatic Flight Control System (AFCS)			
AFCS-001	Flight Director	Flight Director enabled is type design standard for Phase 2 and Super-Lite aircraft subject to operating limitations in Supplement 50 (Phase 2 aircraft), Supplement 55 (Super-Lite aircraft) or in other approved supplements.	For aircraft without Flight Director enabled (this may arise for special mission or for other operational and certification reasons), contact Viking.
AFCS-002	Autopilot	Minimum Use Height (MUH) of the AP is 200 feet AGL. Minimum Engage Height (MEH) of the AP is 400 feet AGL.	Use of the AP at lower MUH (for example for CAT II) approaches or at lower MEH is prohibited (also refer to Supplement 50 for Phase 2 aircraft and Supplement 55 for Super-Lite aircraft).
AFCS-003	Autopilot	Disengage of the AP on GA is controlled at an aircraft level, the Apex options file parameter for "**afcsCpGaEnable**" must be set to "**Enable**."	AP use during Go-Around (GA) is prohibited (also refer to Supplement 50 for Phase 2 aircraft and Supplement 55 for Super-Lite aircraft). On the DHC-6 Series 400 automatic disengage of the AP on GA is implemented at an aircraft level.
AFCS-004	Apex Option Flyaway Parameter	Phase 2 and Super-Lite aircraft must have Apex Options File "**afcsFlyAway**" must be set to "**Disable**."	
AFCS-005	Gear Configurations	Flight Director (FD) and Autopilot (AP) use are approved on Standard Gear Wheels (SGW), Intermediate Floatation Gear (IFG), and wheel ski aircraft.	

Table 3 – Phase 2 Airworthiness Limitations Including Conditions of Design Approval

Identifier	Affected System	Description	Remarks
AFCS-006	Gear Configuration	FD and AP use has been evaluated on Wipline Model 13000 Amphibious Float aircraft modified in accordance with TCCA STC SA11-7 or SA93-103 or FAA STC SA2CH. FD and AP have been determined to be compatible with this gear configuration and with Seaplane Floats subject to appropriate operating procedures and limitations.	The Amphibious Float and Seaplane Float STC holders are responsible for ensuring that STC documents are updated to reflect operating procedures and limitations appropriate to FD and AP use with Amphibious Floats or Seaplane Floats installed.
Transponders and ADS-B Out			
TRP-001	Transponder Configuration	Transponders must be KXP 2290A if ADS-B Out functionality is enabled on Apex.	Honeywell KXP 2290 and KXP 2290A transponders are eligible for Phase 2 and Super-Lite aircraft installation. Installation of the ADS-B Out enabled KXP 2290A transponders is through MOD 6/2354. The enabling of ADS-B Out functionality through Apex is controlled through S.O.O. 6347. For Phase 2 aircraft and for Super-Lite aircraft with two transponders, both installed transponder LRU's must be KXP 2290A for ADS-B Out functionality. Mixing KXP 2290 and KXP 2290A configuration is prohibited. For Super-Lite aircraft with just one transponder, the installed transponder LRU must be KXP 2290A if ADS-B Out functionality is enabled.
TCAS II			
TCAS-001	TCAS II RA Configuration	Phase 2 aircraft and Super-Lite aircraft equipped with optional TCAS II must have the TCAS II Resolution Advisory (RA) functionality enabled. Phase 2 aircraft TCAS II hardware installation with only TCAS I functionality enabled is prohibited.	Phase 1 aircraft with Apex Load 1.3 equipped with TCAS II had only Traffic Advisory (TA) functionality enabled, RA functionality was disabled.

Table 3 – Phase 2 Airworthiness Limitations Including Conditions of Design Approval

Identifier	Affected System	Description	Remarks
Super-Lite			
SUPER-001	Minimum Number of DME	The minimum number of DME on Super-Lite aircraft is one.	A zero DME configuration is incompatible with Apex.
SUPER-002	Minimum Number of Radar Altimeters	The minimum number of radar altimeters on Super-Lite aircraft is one.	A zero radar altimeter configuration is incompatible with Apex.
SUPER-003	Minimum Number of Transponders	The minimum number of Mode S transponders is one.	A zero transponder configuration is incompatible with Apex.
SUPER-004	Minimum Number of Display Units	The minimum number of display units (DU's) is four.	Three DU configurations (one Primary Flight Display [PFD] and two Multi-Function Displays [MFD's] or two PFD's and one MFD) are not approved.
SUPER-005	Minimum Number of Audio Control Panels	The minimum number of Audio Control Panels (ACP's) is two.	
SUPER-006	Minimum Number of Multi-Mode Digital Radios	The minimum number of Multi-Mode Digital Radios is two.	