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MANUAL REVISION TRANSMITTAL
Manual 300
Operation, Maintenance Manual, and Logbook for Propeller System
HM-5V1-A1000-A and HM-6V1-A1000-A

REVISION 4 dated November 2018

Attached is a copy of Revision 4 to Hartzell Propeller Inc. Manual 300.

Page Control Chart for Revision 4:

Remove
Page No.

COVER
Cover and Inside Cover

REVISION HIGHLIGHTS
pages 1 and 2

LIST OF EFFECTIVE PAGES
pages 9 and 10

INTRODUCTION
pages 1-1 thru 1-14

Insert
Page No.

COVER
Cover and Inside Cover

REVISION HIGHLIGHTS
pages 1 and 2

LIST OF EFFECTIVE PAGES
pages 9 and 10

INTRODUCTION
pages 1-1 thru 1-14

NOTE 1: When the manual revision has been inserted in the manual, record the information required on the Record of Revisions page in this manual.

NOTE 2: Pages distributed in this revision may include pages from previous revisions if they are on the opposite side of revised pages. This is done as a convenience to those users who wish to print a two-sided copy of the new revision.

This page may be discarded after proper filing of the revision.

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Manual No. 300
Revision 4
November 2018

HARTZELL

**Operation, Maintenance Manual,
and Logbook for
Propeller Systems
HM-5V1-B1000-A
HM-6V1-A1000-A**

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REVISION 4 HIGHLIGHTS

Revision 4, dated November 2018, incorporates the following:

Front matter (Cover, Revision Highlights, etc.), has been revised to match this revision.

Minor language/format changes and renumbering, if applicable are marked with a revision bar, but are not listed below.

- INTRODUCTION

- Removed the section, "Required Publications"
- Revised the section, "Maintenance Practices"
- Revised the section, "Overhaul (Major Periodic Inspection)"
- Added the section, "Reference Publications"
- Revised the section, "Definitions"
- Revised the section, "Abbreviations"
- Added the section, "Hartzell Propeller Inc. Product Support"
- Added the section, "Hartzell Propeller Inc. Recommended Facilities"

REVISION 4 HIGHLIGHTS1. Introduction

A. General

- (1) This is a list of current revisions that have been issued against this manual. Please compare it to the RECORD OF REVISIONS page to ensure that all revisions have been added to the manual.

B. Components

- (1) Revision No. indicates the revisions incorporated in this manual.
- (2) Issue Date is the date of the revision.
- (3) Comments indicates the level of the revision.
 - (a) New Issue is a new manual distribution. The manual is distributed in its entirety. All the page revision dates are the same and no change bars are used.
 - (b) Reissue is a revision to an existing manual that includes major content and/or major format changes. The manual is distributed in its entirety. All the page revision dates are the same and no change bars are used.
 - (c) Major Revision is a revision to an existing manual that includes major content or minor content changes over a large portion of the manual. The manual is distributed in its entirety. All the page revision dates are the same, but change bars are used to indicate the changes incorporated in the latest revision of the manual.
 - (d) Minor Revision is a revision to an existing manual that includes minor content changes to the manual. Only the revised pages of the manual are distributed. Each page retains the date and the change bars associated with the last revision to that page.

<u>Revision No.</u>	<u>Issue Date</u>	<u>Comments</u>
Original	Feb/09	New Issue
Revision 1	Sep/13	Reissue
Revision 2	Apr/16	Minor Revision
Revision 3	Apr/17	Minor Revision
Revision 4	Nov/18	Minor Revision

LIST OF EFFECTIVE PAGES

Chapter	Page	Rev. Level	Date
Cover/Inside Cover	Cover and Inside Cover	Rev. 4	Nov/18
Revision Highlights	1 and 2	Rev. 4	Nov/18
Record of Revisions	3 and 4	Rev. 2	Apr/16
Record of Temporary Revisions	5 and 6	Rev. 2	Apr/16
Service Document List	7 and 8	Rev. 3	Apr/17
List of Effective Pages	9 and 10	Rev. 4	Nov/18
Table of Contents	11 and 12	Rev. 2	Apr/16
Introduction	1-1 thru 1-14	Rev. 4	Nov/18
Description and Operation	2-1 thru 2-8	Rev. 1	Sep/13
Installation and Removal	3-1 and 3-2	Rev. 1	Sep/13
Installation and Removal	3-3	Rev. 2	Apr/16
Installation and Removal	3-4	Rev. 3	Apr/17
Installation and Removal	3-5 thru 3-7	Rev. 1	Sep/13
Installation and Removal	3-8	Rev. 3	Apr/17
Installation and Removal	3-9 thru 3-28	Rev. 1	Sep/13
Installation and Removal	3-29 and 3-30	Rev. 2	Apr/16
Installation and Removal	3-31 thru 3-34	Rev. 1	Sep/13
Testing and Troubleshooting	4-1 and 4-2	Rev. 3	Apr/17
Testing and Troubleshooting	4-3	Rev. 1	Sep/13
Testing and Troubleshooting	4-4 and 4-5	Rev. 3	Apr/17
Testing and Troubleshooting	4-6 thru 4-8	Rev. 1	Sep/13
Inspection and Check	5-1	Rev. 3	Apr/17
Inspection and Check	5-2 thru 5-6	Rev. 2	Apr/16
Inspection and Check	5-7 thru 5-10	Rev. 1	Sep/13
Inspection and Check	5-11	Rev. 3	Apr/17
Inspection and Check	5-12 thru 5-18	Rev. 2	Apr/16
Maintenance Practices	6-1	Rev. 3	Apr/17
Maintenance Practices	6-2 thru 6-8	Rev. 1	Sep/13
Maintenance Practices	6-9	Rev. 2	Apr/16
Maintenance Practices	6-10 thru 6-21	Rev. 1	Sep/13
Maintenance Practices	6-22 thru 6-26	Rev. 3	Apr/17
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1. Statement of Purpose

CAUTION: KEEP THIS MANUAL WITH THE PROPELLER OR WITH THE HOVERCRAFT ON WHICH IT IS INSTALLED, AT ALL TIMES. THE LOGBOOK RECORD WITHIN THIS MANUAL MUST BE MAINTAINED, RETAINED CONCURRENTLY, AND BECOME A PART OF THE HOVERCRAFT AND ENGINE SERVICE RECORDS.

- A. This manual supports Hartzell Propeller Inc. aluminum hub Hovercraft propellers with composite blades. The 5 blade propeller model number HM-5V1-B1000-A was previously identified as propeller model number 103245. Refer to Table 2-1, Propeller Model Designation.
- B. The purpose of this manual is to enable qualified personnel to install, operate, and maintain Hartzell Propeller Inc. aluminum hub Hovercraft propellers.
- C. This manual covers several design types.

NOTE: All propeller models covered by this manual use composite propeller blades.

D. General

- (1) Contact the Hartzell Propeller Inc. Product Support Department concerning any maintenance problems or to request information not included in this manual.
 - (a) Hartzell Propeller Inc. Product Support may be reached during business hours (8:00 a.m. through 5:00 p.m., United States Eastern Time) at (937) 778-4379 or at (800) 942-7767, toll free from the United States and Canada.
 - (b) After business hours, you may leave a message on our 24 hour product support line at (937) 778-4376. A technical representative will contact you during normal business hours. Urgent COG (Craft on Ground) support is also available 24 hours per day, seven days per week via this message service.
 - (c) Additional information is available on our website at www.hartzellprop.com.

NOTE: When calling from outside the United States, dial (001) before dialing the above telephone numbers.

- (2) This manual is to be used by personnel who are trained and experienced with Hartzell Propeller Inc. products.
- (3) This manual provides operation, installation, and line maintenance information for the Hartzell Propeller Inc. propeller Hovercraft system with composite blades.
- (4) Installation, removal, operation, and troubleshooting data is included in this publication; however, the Hovercraft manufacturer's manuals should be used in addition to this information.

2. General**A. Personnel Requirements****(1) Inspection, Repair, and Overhaul**

- (a) Compliance to the applicable regulatory requirements established by the Maritime and Coastguard Agency (MCA) or foreign equivalent is mandatory for anyone performing or accepting responsibility for any inspection and/or repair and/or overhaul of any Hartzell Propeller Inc. Hovercraft product.
- (b) Personnel performing maintenance on propellers are expected to have sufficient training and certifications (when required by the applicable authority) to accomplish the work required in a safe manner.

B. Maintenance Practices

- (1) The propeller and its components are highly vulnerable to damage while they are removed from the engine. Properly protect all components until they are reinstalled on the engine.
- (2) Use only the approved consumables, e.g., cleaning agents, lubricants, etc.
- (3) Safe Handling of Paints and Chemicals
 - (a) Always use caution when handling or being exposed to paints and/or chemicals during propeller overhaul and maintenance procedures.
 - (b) Before using paint or chemicals, always read the manufacturer's label on the container and follow specified instructions and procedures for storage, preparation, mixing, and application.
 - (c) Refer to the product's Material Safety Data Sheet (MSDS) for detailed information about physical properties, health, and physical hazards of any chemical.
- (4) Observe applicable torque values during maintenance.
- (5) Before installing the propeller on the engine, the propeller must be statically balanced. New propellers are statically balanced at Hartzell Propeller Inc. Overhauled propellers must be statically balanced by the overhaul facility before return to service.
 - (a) Dynamic balance is recommended, but may be accomplished at the discretion of the operator, unless specifically required by the Hovercraft or engine manufacturer.
 - 1 Perform dynamic balancing in accordance with the Maintenance Practices chapter of this manual.
 - 2 Additional procedures may be found in the Hovercraft Propeller Maintenance Manual 301.

- (6) As necessary, use a soft, non-graphite pencil or crayon to make identifying marks on components.
- (7) As applicable, follow military standard NASMS33540 for safety wire and cotter pin general practices. Use 0.020 inch (0.50 mm) or 0.032 inch (0.82 mm) diameter stainless steel safety wire unless otherwise indicated.

CAUTION: DO NOT USE OBSOLETE OR OUTDATED INFORMATION. PERFORM ALL INSPECTIONS OR WORK IN ACCORDANCE WITH THE MOST RECENT REVISION OF THIS MANUAL. INFORMATION CONTAINED IN THIS MANUAL MAY BE SIGNIFICANTLY CHANGED FROM EARLIER REVISIONS. FAILURE TO COMPLY WITH THIS MANUAL OR THE USE OF OBSOLETE INFORMATION MAY CREATE AN UNSAFE CONDITION THAT MAY RESULT IN DEATH, SERIOUS BODILY INJURY, AND/OR SUBSTANTIAL PROPERTY DAMAGE. FOR THE MOST RECENT REVISION LEVEL OF THIS MANUAL, REFER TO THE HARTZELL PROPELLER INC. WEBSITE AT WWW.HARTZELLPROP.COM.

- (8) The information in this manual revision supersedes data in all previously published revisions of this manual.
- (9) The Hovercraft manufacturer's manuals should be used in addition to the information in this manual due to possible special requirements for specific Hovercraft applications.
- (10) Approved paint must be applied to all composite blades. For information concerning the application of paint, refer to the Maintenance Practices chapter of this manual. Operation of blades without the specified coatings and finishes is not permitted.

3. Component Life and Service**A. Overhaul (Major Periodic Inspection)**

- (1) Overhaul (Major Periodic Inspection) is the periodic disassembly, cleaning, inspection, repairing as necessary, reassembly, and testing of a component.

NOTE: Throughout the text of this publication the terms Major Periodic Inspection and Overhaul are considered interchangeable.

- (2) The overhaul interval is based on hours of service (operating time) or on calendar time.
 - (a) At such specified periods, the propeller hub assembly and the blade assemblies should be completely disassembled and inspected for cracks, wear, corrosion, and other unusual or abnormal conditions. As specified, certain parts should be refinished, and certain other parts should be replaced.
- (3) Contact the Hartzell Propeller Inc. Product Support Department for specific information concerning overhaul (major periodic inspection).

B. Rework

- (1) Rework is correction of major damage caused by physical mishap or failure.
- (2) Rework is done on an irregular basis as necessary and required. The propeller may have to be re-balanced after rework procedures.
- (3) Certain rework procedures, such as shot peening, must be performed at the Hartzell Propeller Inc. factory or in a facility that has been approved by Hartzell Propeller Inc.
- (4) The amount, degree, and extent of major damage determine whether or not a component can be reworked without overhaul.

C. Repair

- (1) Repair is correction of minor damage caused during normal operation. It is done on an irregular basis, as required.
- (2) The amount, degree, and extent of damage determine whether or not a component can be repaired without overhaul.

D. Component Life

- (1) Component Life is expressed in terms of total hours of service (Time Since New, TSN) and in terms of hours of service since overhaul (Time Since Overhaul, TSO).
- (2) Both references are necessary in defining the life of the component. Occasionally a part may be “life limited,” which means that it must be replaced after a specified period of use.
- (3) Overhaul returns the component or assembly to zero hours TSO (Time Since Overhaul), but not to zero hours TT (Total Time).
- (4) Rework or repair without overhaul does not affect TSO or TT.

E. Propeller Critical Parts

- (1) Procedures in this manual may involve Propeller Critical Parts. These procedures have been substantiated based on Engineering analysis that expects this product will be operated and maintained using the procedures and inspections provided in the ICS for this product. Refer to the Illustrated Parts List chapter for the applicable propeller model for the identification of Propeller Critical Parts.
- (2) Numerous propeller system parts can produce an aircraft Major or Hazardous effect, even though those parts may not be considered as Propeller Critical Parts. The operating and maintenance procedures and inspections provided in the ICS for this product are, therefore, expected to be accomplished for all propeller system parts.

4. Reference Publications

A. Hartzell Propeller Inc. Publications

Active Hartzell Propeller Inc. Service Bulletins, Service Letters, Service Instructions, and Service Advisories.

Hartzell Propeller Inc. Manual 135F (61-13-35) - Composite Propeller Blade Maintenance Manual

Hartzell Propeller Inc. Manual 165A (61-00-65) - Illustrated Tool and Equipment Manual - Available on the Hartzell Propeller Inc. website at www.hartzellprop.com

Hartzell Propeller Inc. Manual 202A (61-01-02) - Standard Practices Manual, Volumes 1 through 11 - Volume 7, Consumable Materials and Packaging and Storage is available on the Hartzell Propeller Inc. website at www.hartzellprop.com

Hartzell Propeller Inc. Manual 301 - Hovercraft Propeller Maintenance and Overhaul Manual

B. References to Hartzell Propeller Inc. Publications

- (1) Special tooling is required for procedures throughout this manual. For further tooling information, refer to Table 3-1, Special Tools and Equipment in the Installation and Removal chapter of this manual and Hartzell Propeller Inc. Illustrated Tool and Equipment Manual 165A (61-00-65).
 - (a) Tooling references appear with the prefix "TE" directly following the tool name to which they apply. For example, a template which is reference number 133 will appear as: template TE133.
- (2) Consumable materials are referenced in certain sections throughout this manual. Specific approved materials are listed in Table 3-2, "Consumable Materials List" in the Installation and Removal chapter of this manual and in the Consumable Materials chapter of Hartzell Propeller Inc. Standard Practices Manual 202A (61-00-02).
 - (a) The reference number for a consumable material will appear with the prefix "CM" directly following the material to which it applies. For example, an approved adhesive which is reference number 23 will appear as: approved adhesive CM23. Only those items specified may be used.

5. Definitions

A basic understanding of the following terms will assist in maintaining and operating Hartzell Propeller Inc. propeller systems.

<u>Term</u>	<u>Definition</u>
Annealed	Softening of material due to overexposure to heat
Blade Angle	Measurement of blade airfoil location described as the angle between the blade airfoil and the surface described by propeller rotation
Brinelling	A depression caused by failure of the material in compression
Chord	A straight line distance between the leading and trailing edge of an airfoil
Cold Rolling	Compressive rolling process for the retention area of single shoulder blades that provides improved strength and resistance to fatigue
Composite Material.....	Kevlar® (yellow) or graphite (black) fibers bound together with or encapsulated within an epoxy resin
Constant Force	A force that is always present in some degree when the propeller is operating
Constant Speed	A propeller system that employs a governing device to maintain a selected engine RPM
Corrosion	Gradual material removal or deterioration due to chemical action
Crack	Irregularly shaped separation within a material, sometimes visible as a narrow opening at the surface
Debond	Separation of two materials that were originally bonded together in a separate operation
Delamination.....	Internal separation of the layers of composite material
Depression	Surface area where the material has been compressed but not removed
Distortion	Alteration of the original shape or size of a component

<u>Term</u>	<u>Definition</u>
Erosion.....	Gradual wearing away or deterioration due to action of the elements
Exposure.....	Leaving material open to action of the elements
Feathering.....	The capability of blades to be rotated parallel to the relative wind, thus reducing aerodynamic drag
Gouge	Surface area where material has been removed
Hazardous Propeller Effect...	The hazardous propeller effects are defined in Title 14 CFR section 35.15(g)(1)
Horizontal Balance.....	Balance between the blade tip and the center of the hub
Impact Damage	Damage that occurs when the propeller blade or hub assembly strikes, or is struck by, an object
Major Propeller Effect	The major propeller effects are defined in Title 14 CFR section 35.15(g)(2)
Nick	Removal of paint and possibly a small amount of material
Non-Aviation Certified	Intended for non-aircraft application, such as Hovercraft or Wing-In-Ground effect (WIG) applications. These products are certificated by an authority other than FAA. The hub and blades will be stamped with an identification different from, but comparable to TC and PC.
Non-Aviation Experimental ...	Intended for non-aircraft application, such as Hovercraft or Wing-In-Ground-effect (WIG) applications. These products are not certificated by any authority. There is no identification stamp comparable to TC and PC on the hubs and blades. Experimental parts are normally stamped with an "X" at or near the end of the part number.
Onspeed	Condition in which the RPM selected by the pilot through the propeller control lever and the actual engine (propeller) RPM are equal
Overhaul	The periodic disassembly, inspection, repair, refinish, and reassembly of a propeller assembly to maintain seaworthiness

<u>Term</u>	<u>Definition</u>
Overspeed	Condition in which the RPM of the propeller or engine exceeds predetermined maximum limits; the condition in which the engine (propeller) RPM is higher than the RPM selected by the pilot through the propeller control lever
Overspeed Damage.....	Damage that occurs when the propeller hub assembly rotates at a speed greater than the maximum limit for which it is designed
Pitch	Same as “Blade Angle”
Pitting	Formation of a number of small, irregularly shaped cavities in surface material caused by corrosion or wear
Porosity	An aggregation of microvoids. See "Voids"
Propeller Critical Parts	A part on the propeller whose primary failure can result in a hazardous propeller effect, as determined by the safety analysis required by Title 14 CFR section 35.15
Reversing.....	The capability of rotating blades to a position to generate reverse thrust to slow the Hovercraft or back up
Scratch.....	Same as “Nick”
Single Acting	Hydraulically actuated propeller that utilizes a single oil supply for pitch control
Split.....	Delamination of blade extending to the blade surface, normally found near the trailing edge or tip
Superseded.....	Parts that are considered seaworthy for continued operation but may no longer be available
Synchronizing	Adjusting the RPM of all the propellers of a multi-engine craft to the same RPM
Synchrophasing	A form of propeller sychronization in which not only the RPM of the engines (propellers) are held constant, but also the position of the propellers in relation to each other
Track	In an assembled propeller, a measurement of the location of the blade tip with respect to the plane of rotation, used to verify face alignment and to compare blade tip location with respect to the locations of the other blades in the assembly

<u>Term</u>	<u>Definition</u>
Underspeed	The condition in which the actual engine (propeller) RPM is lower than the RPM selected by the pilot through the propeller control lever
Variable Force	A force that may be applied or removed during propeller operation
Vertical Balance	Balance between the leading and trailing edges of a two-blade propeller with the blades positioned vertically
Voids	Air or gas that has been trapped and cured into a laminate
Windmilling.....	The rotation of a Hovercraft propeller caused by air flowing through it while the engine is not producing power

6. Abbreviations

<u>Abbreviation</u>	<u>Term</u>
AN	Air Force-Navy (or Army-Navy)
CMM	Craft Maintenance Manual
COG	Craft on Ground
Ft-Lb.....	Foot-Pound
ICS	Instructions for Continued Seaworthiness
ID	Inside Diameter
In-Lb.....	Inch-Pound
IPS	Inches Per Second
kPa.....	Kilopascals
Lbs	Pounds
MCA	Maritime and Coastguard Agency
MIL-X-XXX.....	Military Specification
MPI.....	Major Periodic Inspection (Overhaul)
MS.....	Military Standard
MSDS.....	Material Safety Data Sheet
N•m	Newton-Meters
OD.....	Outside Diameter
POH	Pilot's Operating Handbook
PSI	Pounds per Square Inch
RPM	Revolutions per Minute
TBO.....	Time Between Overhaul
TC	Type Certificate
TSN.....	Time Since New
TSO.....	Time Since Overhaul
UID.....	Unique Identification

7. Hartzell Propeller Inc. Product Support

- A. Hartzell Propeller Inc. is ready to assist you with questions about your propeller system. Hartzell Propeller Inc. Product Support may be reached during business hours (8:00 a.m. through 5:00 p.m., United States Eastern Time) at (937) 778-4379 or at (800) 942-7767, toll free from the United States and Canada. Hartzell Product Support can also be reached by fax at (937) 778-4215, and by email at techsupport@hartzellprop.com.
- B. After business hours, you may leave a message on our 24 hour product support line at (937) 778-4376 or at (800) 942-7767, toll free from the United States and Canada. A technical representative will contact you during normal business hours. Urgent AOG support is available 24 hours per day, seven days per week via this message service.
- C. Additional information is available on the Hartzell Propeller Inc. website at www.hartzellprop.com.

NOTE: When calling from outside the United States, dial (001) before dialing the above telephone numbers.

8. Warranty Service

- A. If you believe you have a warranty claim, it is necessary to contact the Warranty Administrator at Hartzell Propeller Inc. Hartzell Propeller's Warranty Administrator will provide a blank *Warranty Application* form. It is necessary to complete this form and return it to the Warranty Administrator for evaluation **before proceeding with repair or inspection work**. Upon receipt of this form, the Warranty Administrator will provide instructions on how to proceed. The Hartzell Propeller Inc. Warranty may be reached during business hours (8:00 a.m. through 5:00 p.m., United States Eastern Time) at (937) 778-4379, or toll free at (800) 942-7767. Hartzell Propeller Inc. Warranty Administration can also be reached by fax at (937) 778-4215 or by email at warranty@hartzellprop.com.

NOTE: When calling from outside the United States, dial (001) before dialing the above telephone numbers.

9. Hartzell Propeller Inc. Recommended Facilities

- A. Hartzell Propeller Inc. recommends using Hartzell Propeller Inc. approved distributors and repair facilities for the purchase, repair, and overhaul of Hartzell propeller assemblies or components.
- B. Information about the Hartzell Propeller Inc. worldwide network of aftermarket distributors and approved repair facilities is available on the Hartzell website at www.hartzellprop.com.