BELL 429

ROTORCRAFT FLIGHT MANUAL

SUPPLEMENT

DUAL CARGO HOOK

429-706-081

CERTIFIED
14 AUGUST 2014

This supplement shall be attached to the BHT-429-FM-1 when the Dual Cargo Hook kit (429-706-081) is installed.

Information contained herein supplements information in the basic Flight Manual. For Limitations, Procedures, and Performance Data not contained in this supplement, refer to the basic Flight Manual.

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NOTICE PAGE

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LOG OF REVISIONS

Original	0	14 AUG 14	Revision	2	11 AUG 21
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FLIGHT MANUAL

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Original	**0**	**14 AUG 14**	**Revision**	**2**	**11 AUG 21**
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8/11/2021

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CHIEF, FLIGHT TEST
FOR
DIRECTOR — NATIONAL AIRCRAFT CERTIFICATION
TRANSPORT CANADA

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GENERAL INFORMATION

The Dual Cargo Hook kit (429-706-081) consists of:

- **Electrical modification (introduces switches, CBs, wiring and brackets)**
- **Airframe modification (reinforcements and lugs)**
- **Pilot collective replacement (additional switches)**
- **Holes in the structure for the mechanical cables**
- **Aerodynamic fairing**
- **Electrical and mechanical cable disconnect fittings bracket**
- **Mechanical release handles with associated release cables**
- **Miscellaneous hardware required to install the above**
- **Two cargo hook assemblies affixed to a beam assembly mounted to four hard points (lugs) on the underside of the helicopter**

Each cargo hook has its own electrical release and backup mechanical release. The cockpit emergency mechanical release levers (EMERG CARGO REL) are mounted onto the base of the pilot collective and may be used together to release both cargo hooks simultaneously. The electrical release system consists of a two-position arming switch located on the center pedestal labeled ARM/OFF, with the primary cargo hook release switch (CARGO REL) on the cyclic grip and the secondary cargo hook guarded release switch (HEC HOOK REL) on the collective head. An external manual release is located on the left side of each cargo hook for use by the ground crew to release the cargo hook load beam.

The primary cargo hook is located at FS 225.0. It is rated for 1322 pounds (600 kg) for Human External Cargo (HEC) and 3000 pounds (1360 kg) for Non-Human External Cargo (NHEC) operations. For FAA registered helicopters only, the primary cargo hook is limited to 660 pounds (300 kg) for HEC.

The secondary cargo hook (HEC hook) is located at 9.84 inches (250 mm) to the right (starboard) of the helicopter's centre line at FS 225.0 (5715 mm). It is rated for 1322 pounds (600 kg) and is used for HEC operations only. For FAA registered helicopters only, HEC operations are limited to 660 pounds (300 kg). Decals are attached to the rear face of the hook mounting beam indicating which hook is the CARGO HOOK (yellow) and which is the HEC HOOK (blue) along with the appropriate maximum load limit information.

The HEC hook is utilized as a safety backup to the CARGO hook during HEC operations. The HEC load is simultaneously attached by separate independent strops to each of the hooks. In normal operations, the load is reacted through the CARGO hook alone. The safety strop attached to the HEC hook remains slack up to coning angle of 30°. The safety strop and the HEC hook only react to the load in the event of failure of CARGO hook to support the load.

Section 1

LIMITATIONS

1-3. TYPES OF OPERATION

Operation of helicopter with no load on external cargo suspension hooks is authorized under standard airworthiness certificate for VFR and IFR without removing the load beam, fairing, and hooks from helicopter.

With a load attached to suspension assembly, operations shall be conducted in accordance with appropriate operating rules for external loads.

The Dual Cargo Hook Kit is approved for both Non-Human External Cargo (NHEC) operations and Human External Cargo (HEC) operations.

HEC operations shall utilize personnel carrying device simultaneously attached to both cargo hooks by separate independent strops to each of the hooks (Figure 2-3).

In normal HEC operations, the load is reacted through the CARGO hook alone. The HEC hook is utilized as a safety backup to the CARGO hook. The safety strop attached to the HEC hook remains slack up to coning angle of 30°. The safety strop and the HEC hook only react to the load in the event of failure of CARGO hook to support the load.

The external load equipment certification approval does not constitute operational approval. Operational approval for external load operations must be granted by the local aviation authority.

If an operator is on board to observe the load from the cabin door, direct communication is required between the pilot and operator. The operator must be secured in the passenger compartment with an approved safety harness. Communications between the pilot, operator, and the human HEC shall be through established hand signals and/or approved radio-ICS system.

Towing loads touching the ground or water surface have not been flight demonstrated.

1-6. WEIGHT AND CENTER OF GRAVITY

The weight and CG location of the mounting beam and hooks is:

- Beam weight (fully dressed) is 56.5 pounds (25.63 kg)
- Fore/aft CG is 224.27 inches (5696.4 mm)
- Lateral butt line is +1.865 inches (+47.37 mm)

If necessary, the ballast should be readjusted to return empty weight CG to within allowable limits.

1-6-A. WEIGHT

For HEC, maximum external load is 1322 pounds (600 kg).

For FAA registered helicopters only, for HEC, maximum external load is 660 pounds (300 kg).

For NHEC, maximum external load is 3000 pounds (1360 kg).

Maximum gross weight of helicopter and external load operations is 8000 pounds (3628 kg).

1-6-B. CENTER OF GRAVITY

Refer to Gross Weight Center of Gravity Limits charts (BHT-429-FM-1).

1-7. AIRSPEED

For HEC operations, maximum permitted airspeed is 60 KIAS.

For NHEC operations, maximum permitted airspeed is 120 KIAS or placarded V_{NE}, whichever is less.

CAUTION

AIRSPEED WITH EXTERNAL CARGO IS LIMITED BY CONTROLLABILITY. CAUTION SHOULD BE EXERCISED WHEN CARRYING EXTERNAL CARGO, AS HANDLING CHARACTERISTICS MAY BE AFFECTED BY SIZE, WEIGHT, AND SHAPE OF CARGO LOAD.

1-20. INSTRUMENT MARKINGS AND PLACARDS

Refer to Figure 1-3 for placards and decals.

1-21. PERFORMANCE

1-21-A. HUMAN EXTERNAL CARGO REQUIRING CATEGORY A PERFORMANCE

For HEC operations requiring Category A performance, the maximum combined gross weight of the helicopter and external load shall not exceed the gross weight indicated for the applicable ambient conditions in the Hover Ceiling OGE – 2-Minute OEI Power Chart (Figure 4-6).

1-21-B. HUMAN EXTERNAL CARGO NOT REQUIRING CATEGORY A PERFORMANCE

For HEC operations not requiring Category A performance, refer to appropriate Hover Ceiling OGE chart (BHT-429-FM-1) for OGE hover performance (relative to GW) for conditions of pressure altitude (H_P) and OAT.

1-22. HEC HOOK

Use of only the HEC hook (secondary hook) for cargo operations is not permitted.

1-23. PERSONNEL CARRYING DEVICE

Each personnel carrying device attached to the hooks shall be approved.

CARGO HOOK

Location: Cargo hook beam - cargo hook (yellow)

MAXIMUM EXTERNAL LOAD LIMIT

CARGO HOOK ONLY 3000 LBS NON HEC

BOTH HOOKS 660 LBS HEC

For FAA Registered Helicopters Only

MAXIMUM EXTERNAL LOAD LIMIT

CARGO HOOK ONLY 1360 Kgs (3000 Lbs) NON HEC

BOTH HOOKS 600 Kgs (1322 Lbs) HEC

Location: Cargo hook beam

HEC HOOK

Location: Cargo hook beam - HEC hook (blue)

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Figure 1-3. Placards and Decals

Section 2

NORMAL PROCEDURES

2-2. FLIGHT PLANNING

2-2-A. GROUND CREW INSTRUCTIONS

Instruct ground personnel to discharge helicopter static electricity before attaching cargo by touching airframe with ground wire; or, if a metal sling is used, hookup ring can be struck against cargo hook. If contact has been lost after initial grounding, helicopter shall be electrically regrounded and, if possible, contact maintained until hookup is completed.

CAUTION

SOME COMBINATIONS OF SMALL PRIMARY RINGS AND LARGE SECONDARY RINGS COULD CAUSE FOULING DURING RELEASE.

CAUTION

NYLON-TYPE STRAPS (OR SIMILAR MATERIAL) OR ROPE MUST NOT BE USED DIRECTLY ON THE CARGO HOOK LOAD BEAM. IF NYLON STRAPS OR ROPE MUST BE USED, THEY SHOULD BE FIRST ATTACHED TO A STEEL PRIMARY RING. VERIFY THAT THE RING WILL FREELY SLIDE OFF THE LOAD BEAM WHEN IT IS OPENED. ONLY THE PRIMARY RING SHOULD BE IN CONTACT WITH THE CARGO HOOK LOAD BEAM.

Instruct ground personnel to check that only one primary ring, with correct cross-section dimensions, is captured in load beam and only one secondary ring is captured in primary ring. Additional rings, slings, or shackles shall be attached to secondary load ring (Figure 2-1 and Figure 2-2).

NOTE

The HEC hook (secondary hook) is only to be used when HEC is being carried.

The hook's structural attachments are not designed to continuously carry offset loads. Therefore, during normal HEC operations, the HEC hook is to remain unloaded during all phases of flight including load displacement up to a coning angle of 30° in any direction. Refer to Figure 2-3 for formula to be used to determine the length of the secondary (safety) strop.

2-3. PREFLIGHT CHECK

2-3-B. EXTERIOR CHECK

1. Cargo hooks suspension assembly and fairing — Condition and security.
2. Cargo sling — Condition, proper length.
3. Cargo hooks — Each hook; verify movement is free in all directions. Check mechanical release connections and electrical release connections for condition and security.

2-4. INTERIOR AND PRESTART CHECK

2-4-A. INTERIOR CHECK

1. BATT switch — ON.
2. CARGO HOOK switch — ARM. Verify CARGO HK ARM message is displayed on EICAS.
3. Cyclic CARGO REL button — Press and release; CARGO HK ARM message should momentarily disappear and CARGO hook (yellow decal) should open. Manually close hook and verify that it latches closed.
4. Collective HEC HOOK REL button — Press and release; CARGO HK ARM message should momentarily disappear and HEC hook (blue decal) should open. Manually close hook and verify that it latches closed.
5. EMERG CARGO REL handles — Pull each release handle individually. Each release lever should travel approximately 0.5 inch (12 mm) before actuating the opening of the appropriate cargo hook. Manually close each hook and verify each one latches closed with the external manual release on each cargo hook touching their end stop.
6. CARGO HOOK switch — OFF.

2-13. AFTER ENGINE AND ROTOR START

If two-way hand-held radios are to be used to establish communication between the occupants of the helicopter and persons being carried external to it:

1. CARGO HOOK switch — ARM. Verify CARGO HK ARM message is displayed on EICAS.
2. Two-way transmission tests on all hand-held radio sets are to be accomplished with at least one set external to the helicopter and one internal to it.

   During two-way transmission tests, there must be no abnormal functioning of the helicopter systems or spurious indications on displays, instrumentation, or warning devices.

NOTE

The cargo hooks must remain closed at all times.

3. CARGO HOOK switch — OFF.

2-14. LOAD ATTACHMENT

1. CARGO HOOK switch — ARM. Verify CARGO HK ARM message is displayed on EICAS.
2. RPM switch — 104%.
3. Open cargo hook(s) as applicable — Both hooks for HEC loads, CARGO hook only for Non-HEC loads.
4. Hover helicopter at sufficient height to allow ground personnel to discharge static electricity and attach the strop(s) to the cargo hook(s), as applicable.
5. Ascend vertically, directly over load, then slowly lift load from surface.
6. Yaw pedals — Check for adequate directional control.
7. Hover power — Check torque/MGT required to hover with external load.
8. Take off into wind, if possible, allowing adequate load clearance over obstacles.

9. **RPM switch — AUTO prior to 60 KIAS if intending to exceed 60 KIAS (with Non-HEC load).**

10. **Airspeed within limits.**

WARNING

EMERG CARGO REL HANDLES WILL FUNCTION, REGARDLESS OF CARGO HOOK/HEC HOOK REL/ CARGO REL SWITCH POSITION.

2-15. LOAD RELEASE

1. **RPM switch — 104% at 60 KIAS or less.**

2. **Verify CARGO HK ARM message displayed on EICAS, for planned release.**

3. **Flight path and approach angle — As required for wind direction and obstacle clearance.**

4. **Execute approach to a hover with load clear of surface. When stabilized at a hover, descend slowly until load contacts surface. Maintain tension on sling.**

5. **For HEC loads, cyclic CARGO REL button and collective HEC HOOK REL — Press to release sling from hooks.**

   For Non-HEC loads, cyclic CARGO REL button — Press to release sling from hook.

6. **CARGO HOOK switch — OFF.**

7. **RPM switch — AUTO.**

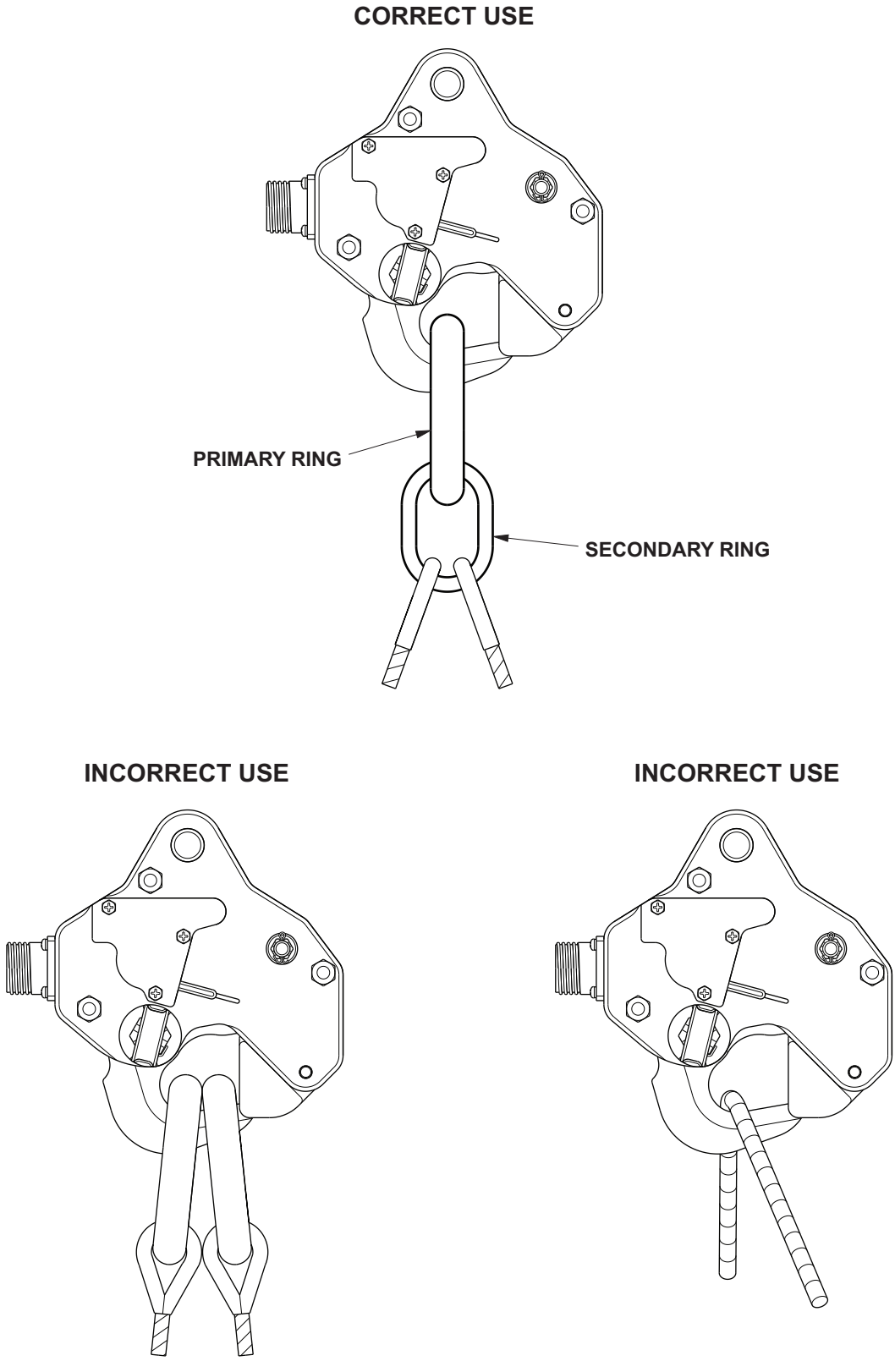

Figure 2-1. Loading of Hook(s)

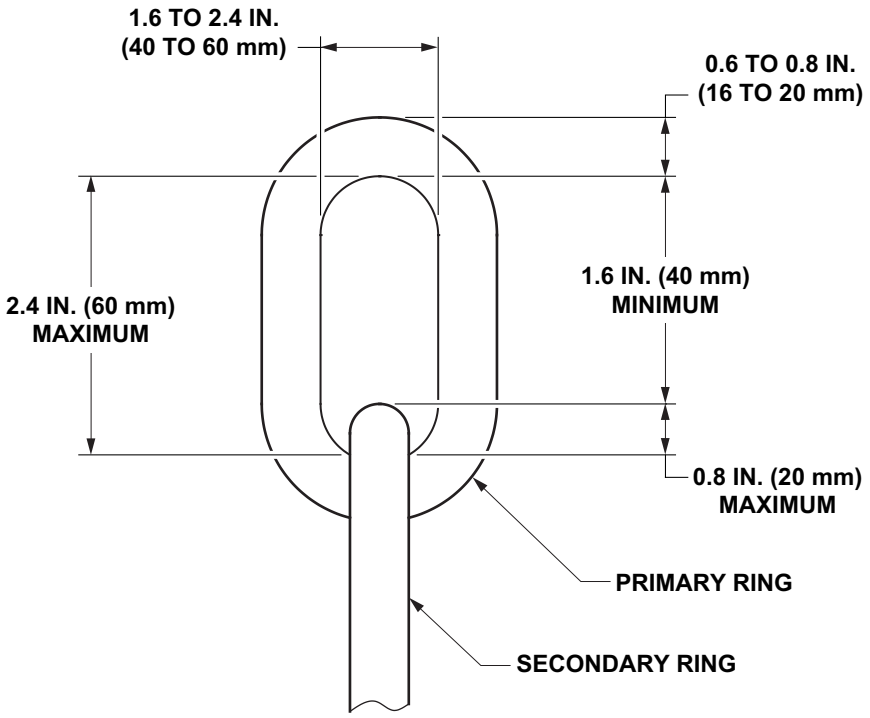

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Figure 2-2. Ring Dimensional Criteria

DETERMINATION OF HEC SAFETY STROP LENGTH

Either of the following formulas is to be used to determine the length of the secondary (safety) strop:

ENGLISH UNITS $b = [\sqrt{(a^2 + 0.673 + (0.82 \times a))} + 0.5]$ **feet**

METRIC UNITS $b = [\sqrt{(a^2 + 0.063 + (0.25 \times a))} + 0.15]$ **meters**

where "a" is the length of the primary strop and "b" is the length of the secondary strop.

EXAMPLE:

if a = 100 feet (30.48 meters), then

$$b = [\sqrt{(100^2 + 0.673 + (0.82 \times 100))} + 0.5] = 100.91 \text{ feet}$$

or

$$b = [\sqrt{(30.48^2 + 0.063 + (0.25 \times 30.48))} + 0.15] = 30.76 \text{ meters}$$

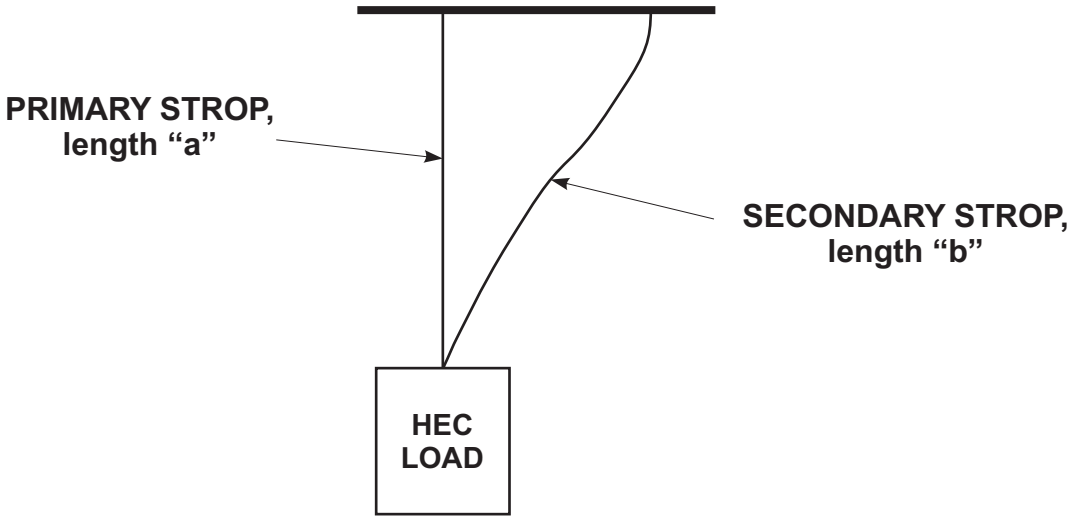


Figure 2-3. Determination of HEC Safety Strop Length

Section 3

EMERGENCY AND MALFUNCTION PROCEDURES

3-13. CARGO FAILS TO RELEASE ELECTRICALLY

1. Pull EMERG CARGO REL handles to release load.

Table 3-4. Advisory (Green, White, or Cyan) Lights/Messages

MESSAGE	SYSTEM CONDITION	REQUIRED ACTION
CARGO HK ARM	Cargo hook electrical release is armed.	CARGO HOOK switch — As required.

Section 4

PERFORMANCE

4-5. HOVER CEILING

Refer to BHT-429-FM-1 for out of ground effect hover performance.

There is no change from BHT-429-FM-1 performance with no load attached to cargo hook.

Performance may be affected by size and shape of external load.

4-11. HUMAN EXTERNAL CARGO OPERATIONS REQUIRING CATEGORY A PERFORMANCE

4-11-A. FLIGHT PLANNING

Prior to commencement of HEC operations requiring Category A performance, determine helicopter GW at which an OGE hover can be maintained at 2 MIN OEI power.

EXAMPLE:

What maximum gross weight could be expected for following conditions?

H_P	1750 feet
OAT	+10°C
Wind	37° off nose at 25 knots

SOLUTION:

a. Use Crosswind/Headwind Component Chart (Figure 4-12): Enter at 25 knots reported wind scale, follow 25 arc until 37°. Headwind component is 20 knots. (Factored headwind is 10 knots.)

NOTE

Unless otherwise authorized by operating regulations, pilot is not authorized to take credit for performance increase resulting from more than 50% of actual headwind component for OEI hover.

b. To determine maximum GW, use Hover Ceiling OGE — 2-Minute OEI Power chart (Figure 4-6): Enter on left of chart at 1750 feet H_P. Move right following grid lines to intersect the +10°C line. Move vertically down to top of the Unfactored Headwind graph (at zero wind). Move parallel to trend lines to the 10 knot (Factored Headwind) graph line. Move vertically down to Gross Weight axis and read 6385 pounds.

NOTE

In the event of an OEI event, once HEC is on the ground, the remaining time at 2 MIN OEI power is to be used with the 2 MIN OEI limiter selected and N_R drooped to 100% for the transition to forward flight. Once forward flight is achieved, pilot reduces power to maximum continuous OEI or 30-minute OEI, as applicable.

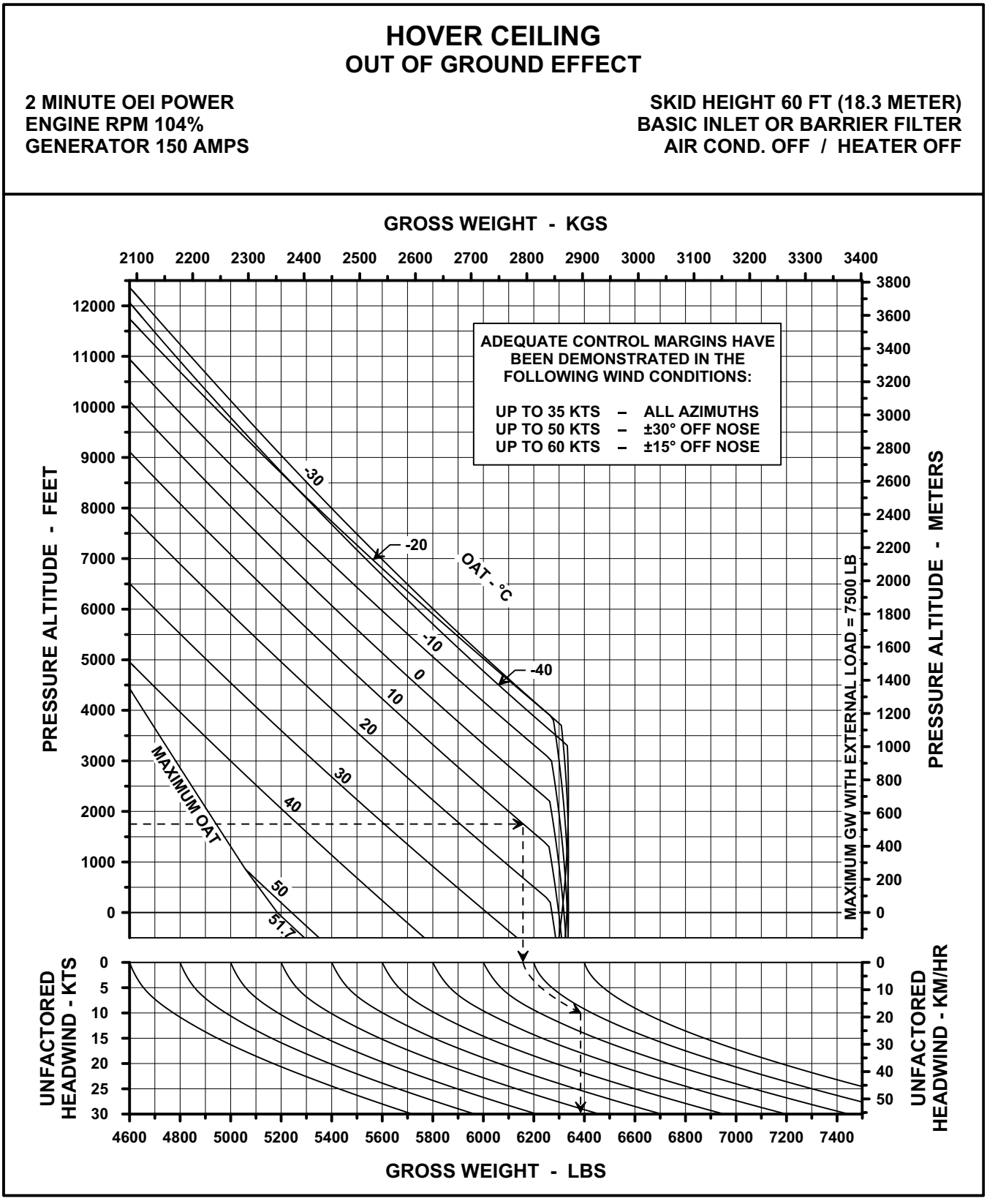
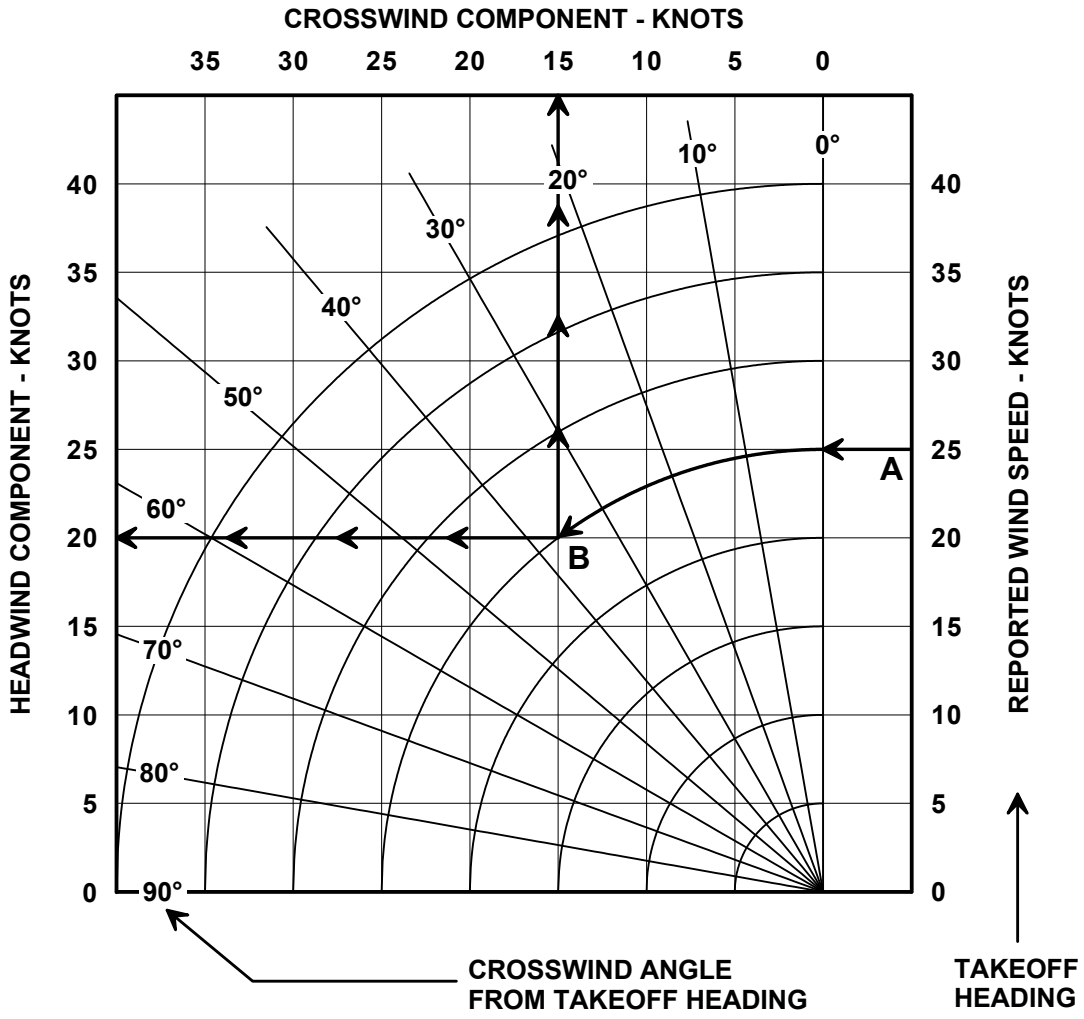


Figure 4-6. Hover Ceiling OGE — 2-Minute OEI Power



EXAMPLE:

1.	AIRCRAFT HEADING	163°
2.	REPORTED WIND DIRECTION	200°
3.	DIFFERENCE BETWEEN WIND DIRECTION AND AIRCRAFT HEADING	37°
4.	REPORTED WIND SPEED	25 KNOTS
5.	ENTER CHART AT REPORTED WIND SPEED, POINT A.	
6.	PROCEED LEFT, FOLLOWING SHAPE OF CURVED LINES, TO CROSSWIND ANGLE FROM AIRCRAFT HEADING, POINT B.	
7.	PROCEED VERTICALLY UPWARD TO CROSSWIND COMPONENT SCALE AND READ CROSSWIND COMPONENT	15 KNOTS
8.	PROCEED LEFT HORIZONTALLY TO HEADWIND COMPONENT SCALE AND READ HEADWIND COMPONENT	20 KNOTS

→ (NOTE: REDUCE HEADWIND COMPONENT BY APPROPRIATE APPROVED FACTOR AND USE RESULT AGAINST "UNFACTORED HEADWIND" SCALE IN PERFORMANCE CHARTS)

Figure 4-12. Crosswind/Headwind Component Chart

Section 5

WEIGHT AND BALANCE

5-2. EMPTY WEIGHT CENTER OF GRAVITY

Load on hook is at FS 225.0 (5715 mm).