HERCULES

ABOUT THIS MANUAL

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WARNING: THIS MANUAL IS DESIGNED FOR MICROSOFT® FSX USE ONLY. DO NOT USE FOR FLIGHT.

The ‘C-130 X-perience’ FLIGHT MANUAL is organized into four Parts:
Each Part is provided as a separate Acrobat® PDF document available via:

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Part I – User’ Manual
Part II – Systems and Equipment
Part III – Normal Procedures

Part IV – Flight Characteristics and Performance Data - this document

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THIS MANUAL PROVIDES ADDITIONAL INFORMATION ONLY, WHICH IS NOT AVAILABLE ON THE WEB SITE.

'C-130 X-PERIENCE' FLIGHT MANUAL

PART IV - FLIGHT CHARACTERISTICS AND PERFORMANCE DATA

CONTENTS

CHAPTER 1 - OPERATING LIMITATIONS

INTRODUCTION

The aircraft has certain well-defined operating limitations. Maximum performance requires that these limitations be considered carefully.

AIRSPEED LIMITATIONS

The limiting airspeed for a mission is interrelated with the cargo weight and maneuver load factors required for the mission and the gust load that may be encountered in turbulence. Recommended and maximum airspeeds are shown on the Limit Flight Speed versus Altitude Chart. These speeds are referenced to specific fuel-cargo combinations on the Weight Limitations Chart of the respective figures and to the allowable maneuver load factors. Any cruise speed up to the recommended speed may be utilized up to and including moderate turbulence.

CAUTION

The maximum speed should never be exceeded. The maneuver load factors and the weight distribution shown on the weight limitations charts should also be observed carefully.

Note

Operation in the areas between recommended speed limits and maximum speed limits is permissible for initiating penetrations from 20,000 feet at 250 KIAS provided the corresponding maneuver load factors are not exceeded.

The aircraft should not be operated in conditions of severe turbulence, because gusts can be encountered that may impose excessive loads. However, if flight in severe turbulence cannot be avoided, flight should be in the range of 65 knots above power-off stalling speed for the operating gross weight not to exceed 180 KIAS.

NEVER EXCEED THE FOLLOWING AIRSPEEDS FOR THE CONDITIONS NOTED:

1. FLAPS EXTENDED:

Percentage	Airspeed (KIAS)
10	220
20	210
30	200
40	190
50	180
60	165
70	155
80	150
90	145
100	145

2. LANDING GEAR EXTENDED - Do not exceed 170 KIAS with the landing gear extended.

3. LANDING LIGHTS EXTENDED - Do not exceed 170 KIAS with landing lights extended.

4. AIR REFUELING DROGUE OPERATION

High-speed drogues: Do not exceed 250 KIAS when extending or retracting the high-speed drogues. Maximum airspeed with the high-speed drogues extended is 250 KIAS.

Low-speed drogues: Do not exceed 120 KIAS when extending or retracting the low-speed drogues. Maximum airspeed with the low-speed drogues extended is 130 KIAS. The minimum recommended air refueling speed with low-speed drogues is 105 KIAS.

5. AUTOPILOT OPERATION

WARNING

With the autopilot in operation, do not exceed 270 KIAS or the recommended speed limit, whichever is less.

6. PAINTED FLIGHT CONTROL SURFACES - Do not exceed 250 KIAS when any flight control surface is painted, unless the following has been accomplished:

   a. The underside of the ailerons and elevators and either side of the rudder have been stenciled as follows:

CAUTION

Subsequent repainting restricted to minor touchup unless performed at depot level.

7. AFT CARGO DOOR AND/OR RAMP OPEN - Do not exceed 150 KIAS with the ramp (or ramp and cargo door) open regardless of whether the paratroop doors are open or closed or the position of the paratroop deflectors. Do not exceed 185 KIAS with the ramp up and locked and the cargo door open.

8. PARATROOP AIR DEFLECTORS - Do not exceed 150 KIAS when operating the paratroop air deflectors or with the air deflectors extended, regardless of whether the paratroop doors are open or closed.

9. PARATROOP DOORS – Do not exceed 150 KIAS when operating with the paratroop doors open.

10. FLIGHT WITHOUT LANDING GEAR DOORS - Do not exceed 200 KIAS with landing gear up or 170 KIAS with landing gear down if any gear door is removed.

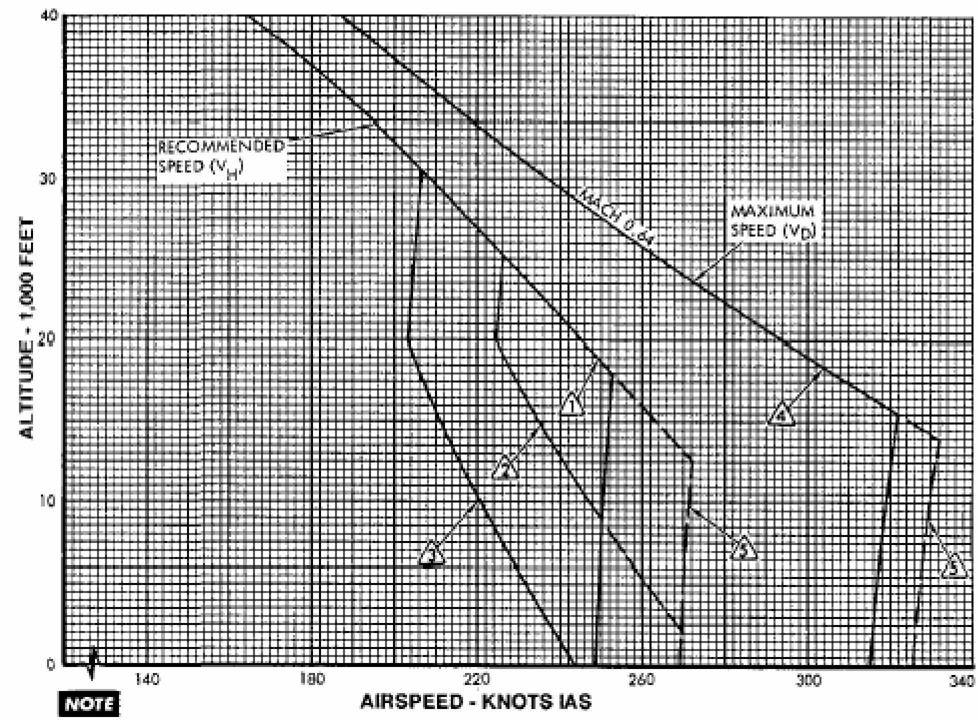
   a. Main landing gear - All doors of the affected wheel well must be remove.
   b. Nose landing gear - Both forward and aft doors removed or aft door removed with forward door installed.

CAUTION

Flight is not permitted with the forward door removed and the aft door installed.

Refueling Pods On or Off

MODEL: KC-130F MODIFIED BY AFC NO. 242



NOTE

RECOMMENDED SPEED

⚠1 V_H - **MAXIMUM RECOMMENDED SPEED FOR AREA A OF WEIGHT LIMITATIONS CHART.**

⚠2 V_H - MAXIMUM RECOMMENDED SPEED FOR AREA B OF WEIGHT LIMITATIONS CHART.

⚠3 V_H - MAXIMUM RECOMMENDED SPEED FOR AREA C OF WEIGHT LIMITATIONS CHART.

MAXIMUM SPEED

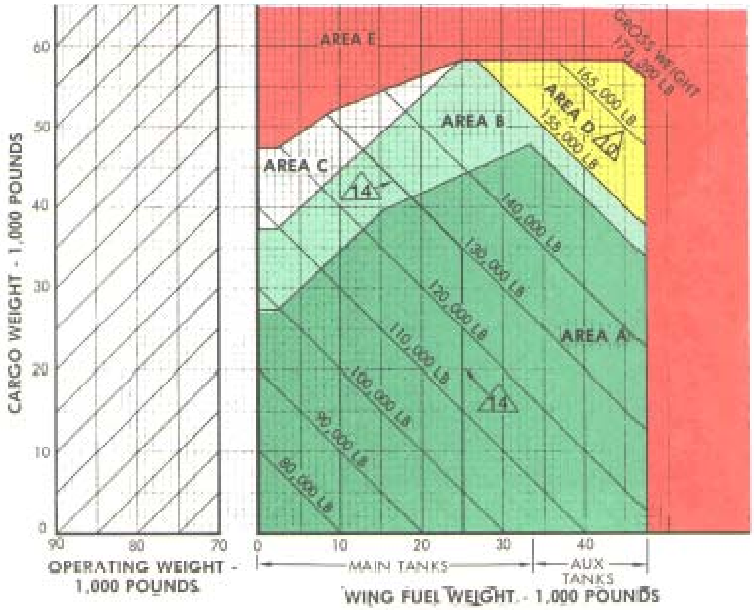
⚠4 V_D - MAXIMUM SPEED FOR AREAS A, B, C, AND D OF WEIGHT LIMITATIONS CHART.

⚠5 DASHED LINES APPLY WHEN REFUELING PODS ARE REMOVED.

6. FOR THUNDERSTORM OPERATION, REDUCE AIRSPEED TO 65 KNOTS ABOVE POWER-OFF STALL SPEED, NOT TO EXCEED 180 KIAS.
7. NORMAL PENETRATIONS UP TO 250 KNOTS IAS ARE PERMISSIBLE IN SMOOTH TO MODERATELY TURBULENT AIR BELOW 20,000 FEET.
8. THESE CHARTS ARE BASED ON THE FUEL MANAGEMENT PROCEDURES IN CHAPTER 6 AND ON THE STANDARD DAY DENSITY OF JP-5 (6-8 POUNDS/GAL.).

Refueling Pods Off

MODEL: KC-130F MODIFIED BY AFC NO. 242



	STATUS	LOAD FACTOR LIMITS UP TO V_H	V_H TO V_D	MAX RECOMMENDED SPEED FROM SHEET 1
A	RECOMMENDED	-1.0 TO 3.0G	0.0 TO 2.5G	V_H 1
B	RECOMMENDED	0.0 TO 2.5G	0.0 TO 2.5G	2
C	RECOMMENDED	0.0 TO 2.5G	0.0 TO 2.5G	3
D	CAUTIONARY	0.0 TO 2.25G	0.0 TO 2.25G	3
E	NOT RECOMMENDED			

NOTE CONTINUED – ALSO SEE SHEETS 1 AND 2 FOR NOTES APPLICABLE TO THIS SHEET.

15 TO THE LEFT OF THIS LINE, MAXIMUM LANDING RATE OF SINK IS 540 FPM PROVIDED EACH OUTBOARD WING TANK CONTAINS LESS THAN 6,600 POUNDS OF FUEL. TO THE RIGHT OF THIS LINE, OR IF EITHER OUTBOARD WING TANK CONTAINS MORE THAN 6,600 POUNDS OF FUEL, MAXIMUM LANDING RATE OF SINK IS 300 FPM.

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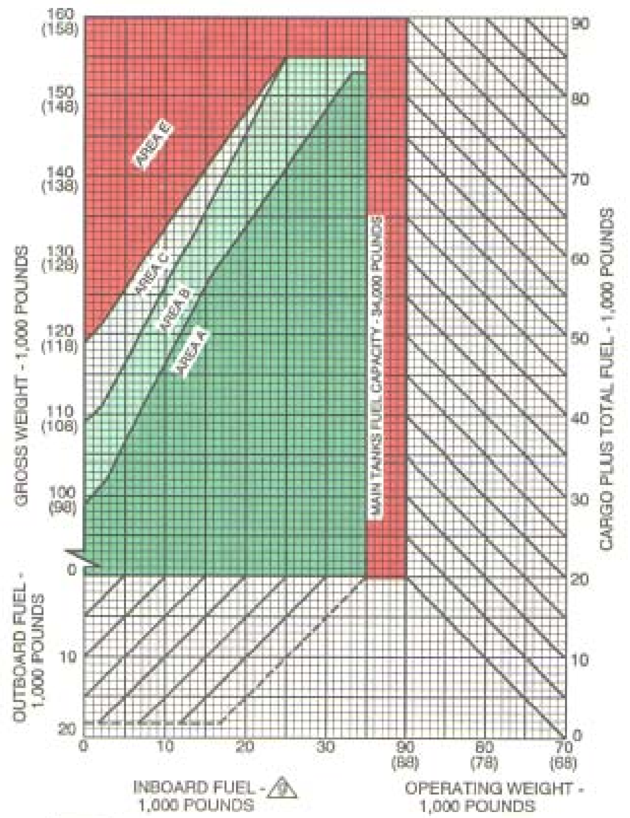
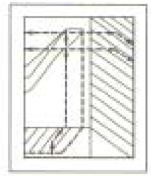
MODEL: KC-130F MODIFIED BY AFC NO. 242





NOTE CONTINUED FROM SHEET 4

16. ENTER THE INBOARD FUEL SCALE AT THE SMALLER OF:
    a. ACTUAL WEIGHT OF FUEL IN TANKS NO.2 AND NO.3.
    b. WEIGHT OF FUEL IN TANKS 1 AND 4 MINUS 1,386 POUNDS.

17. AREA COLOR CODE AND STATUS FOR MANEUVER LOAD FACTOR LIMITS AND MAX RECOMMENDED SPEED DATA ARE THE SAME AS DEPICTED FOR PRIMARY FUEL MANAGEMENT.

18. LIMITS FOR MAXIMUM LANDING RATE OF SINK OF 540 FPM ARE THE SAME AS GIVEN BY NOTE 15 EXCEPT AUXILIARY TANKS CONTAIN ANY FUEL UP TO CAPACITY.

19. WEIGHTS IN PARENTHESIS ARE FOR AIRPLANES WITHOUT EXTERNAL TANKS.

Figure 1. Limit Flight Speed versus Altitude Chart and Weight Limitations

ACCELERATION LIMITATIONS

Never exceed the structurally safe maneuver load factor for the applicable flight conditions and for the aircraft load distribution. The limit load factor for fuel load and cargo load combinations is given in the Weight Limitations Chart. Do not exceed 60° angle of bank with flaps retracted or 45° angle of bank with flaps extended for symmetrical and unsymmetrical maneuvers with the flaps retracted. Symmetrical maneuvers (pull-ups and push downs) involve no aileron deflections. Unsymmetrical maneuvers include a combination of aileron and elevator inputs (turns and rolling pullouts). The aircraft accelerometer indicated the acceleration (g) at its location which is quite different from the g at the cg or other locations. The accelerometer should be used as an indicator of cg load factor only for sustained trims or pull-ups. Since feel is often misleading, particularly when the pilot’s attention is diverted or distracted, abrupt and unnecessary maneuvering must always be avoided.

LOAD FACTORS

A load factor is the ratio of the load imposed on the object to the weight of the object. It is expressed in terms of g’s, 1.0g being 1 times the weight of the object. The letter “g” stands for gravity, the accelerating pull the Earth exerts on all objects. Since gravity is acceleration, it is easy to understand that other types of acceleration also can produce load factors. The accelerations in which the pilot is most interested occur as a result of changes in his flightpath, such as turns, pullups, and touchdowns on landings.

Because the aircraft structure (particularly the wings) can only withstand certain maximum force action on it, it is necessary to limit the number of g’s (the load factor) that may be safely applied. A load factor in excess of these safety limits may result in structural damage to the aircraft.

CAUTION
The maximum maneuver load factor with any flap extension is 2.0g.

Note
The wing load factors on the weight limitations charts are valid only when the fuel sequence in FUEL MANAGEMENT.

WEIGHT LIMITATIONS

Aircraft weight limits may be divided into two categories: gross weight limits and limits on cargo-fuel weight combinations. Taxi and landing gross weights are limited by landing gear strength and takeoff gross weight is limited primarily by wing strength, performance, and handling characteristics. Cargo-fuel combinations, as functions of airspeed, maneuver load factor, and degree of atmospheric turbulence, are limited by wing strength.

GROSS WEIGHT LIMITS

Aircraft gross weight limits are summarized in Figure 2 for the conditions indicated. Use of gross weights in excess of those recommended must be authorized by the commanding officer.

CONDITION	GROSS WEIGHT – POUNDS					LIMITATIONS
	C-130K	KC-130F NOT MODIFIED BY AFC 242		KC-130F MODIFIED BY AFC 242		
		PODS ON	PODS OFF	PODS ON	PODS OFF	
MAXIMUM TAXI Recommended Overload	 135,000 145,000	 135,000 145,000	 135,000 145,000	 155,000 173,114	 155,000 173,390	Refer to TAXI AND GROUND LIMITATIONS
MAXIMUM TAKE-OFF Recommended Overload	 135,000 145,000	 135,000 145,000	 135,000 145,000	 155,000 173,114	 155,000 173,390	
MAXIMUM LANDING Recommended Overload	 135,000 145,000	 135,000 145,000	 135,000 145,000	 155,000 173,114	 155,000 173,390	300 fpm rate of sink
NORMAL LANDING	118,000	118,000	118,000	130,000	130,000	540 fpm rate of sink

Figure 2. Gross Weight Limits

MAXIMUM TAKEOFF GROSS WEIGHT

Takeoff gross weights must take into account the available runways, surrounding terrain, airfield elevation, atmospheric conditions, mission requirements, and the urgency of the mission.

CAUTION

Gross weights exceeding those required for the mission will result in unnecessary risk and wear of the aircraft. The use of the overload takeoff weights reduces the aircraft service life, increases maintenance, requires increased caution to avoid damaging the aircraft, and is not intended for routine use.

LANDING GROSS WEIGHTS

The aircraft is designed to be able to land at any gross weight up to the maximum for takeoff, provided limiting relationships between landing gross weight, contact rate of sink, and fuel weight are observed. The aircraft is designed for a maximum contact rate of sink of 540 feet per minute at gross weights up to the normal landing gross weight with the fuel weight limitations. The aircraft may be landed at a contact rate of sink of 300 fpm at the maximum landing gross weight that is equal to the maximum takeoff gross weight or with capacity fuel.

Note

Although the aircraft can be landed at the maximum landing gross weight (overload), it is recommended that fuel be dumped to reduce gross weight to the maximum landing gross weight (recommended).

PROHIBITED MANEUVERS

Aerobatics of any kind (including those that produce a negative g condition), intentional spins, excessively nose-high stalls, steep dives, and any other maneuvers resulting in excessive accelerations are strictly prohibited. Do not exceed a 60° angle of bank with flaps retracted or a 45° angle of bank with flaps extended. Do not make hard rudder kicks that result in large angles of yaw.

TAXI AND GROUND LIMITATIONS

CAUTION

Turns with brakes locked on one side are prohibited. When possible avoid braking in turns at any taxi speed, since damage to the nose landing gear and supporting structure may result. If hard braking is required during a turn, record it in the aircraft records.

At gross weights up to 135,000 pounds for C-130F aircraft, or 155,000 pounds for KC-130F aircraft modified by AFC 242, taxiing over rough terrain should be avoided. If this is unavoidable, extreme caution must be exercised and very low taxi speed observed. Do not exceed the following taxi speeds, regardless of runway conditions:

1. 5 knots with nosegear deflected 60°.
2. 20 knots with nosegear deflected 20°.

Note

For taxi limitations on rough terrain airfields, see SUBSTANDARD AIRFIELD OPERATIONS.

For overload gross weights, 135,000 to 145,000 pounds for C-130F aircraft, or 155,000 to 173,390 pounds for KC-130F aircraft modified by AFC 242, observe the following taxi limitations:

1. Taxi and takeoff are permissible only on surfaces where qualities of smoothness and freedom from dips, depressions, and holes are comparable to those of a major air base.
2. Maximum taxi speed is 10 knots.
3. Taxi shortest distance possible.
4. Use minimum braking during all taxi operations.
5. Use only light braking while turning.
6. Limit nose gear steering angle to 20°.
7. Avoid abrupt or uneven application of brakes.

SUBSTANDARD AIRFIELD OPERATIONS

ROUGHNESS CHARACTERISTICS (1)		A		B		C	
		RECOM’D	ALLOWABLE WITH CAUTION	RECOM’D	ALLOWABLE WITH CAUTION	RECOM’D	ALLOWABLE WITH CAUTION
LANDING (1)	GROSS WT (LB)	118,000 (2)	135,000 (3)	118,000 (2)	--------------	--------------	111,00
	FUEL (LB)	25,000	47,328	25,000	--------------	--------------	6,600 (4)
TAKEOFF (1)	GROSS WT (LB)	135,000	--------------	118,000	125,000	--------------	111,00
	FUEL (LB)	47,328	--------------	25,000	47,328	--------------	6,600 (4)
LANDING (6)	GROSS WT (LB)	130,000 (2)	155,000 (3)	120,000 (2)	--------------	--------------	111,00
	FUEL (LB)	25,000	47,328	25,000	--------------	--------------	6,600 (4)
TAKEOFF (6)	GROSS WT (LB)	155,000	--------------	120,000	135,000	--------------	111,00
	FUEL (LB)	47,328	--------------	25,000	47,328	--------------	6,600 (4)

PARAMETER	**ROUGHNESS CHARACTERISTICS**		
	A – SMOOTH (REGULARY MAINTAINED)	**B – INTERMEDIATE** (MAINTAINED ONLY AS NECESSARY)	**C – EMERGENCY** (NO PREPARATION OR MAINTENANCE)
DEVIATION FROM SURROUNDING SURFACE LEVEL	±2 INCHES IN 50 FEET	±4 INCHES IN 25 FEET	±6 INCHES IN 25 FEET
MAXIMUM GRADIENT LONGITUDINAL TRANSVERSE	±2% ±7%	±4% ±3%	±6% ±3%
MAXIMUM CHANGE IN LONGITUDINAL ELEVATION	2 FT IN 100 FT 4 FT IN 200 FT 8 FT IN 400 FT 2% OVER 400 FT	3 FT IN 100 FT 6 FT IN 200 FT 10 FT IN 400 FT 2% OVER 400 FT	3 FT IN 100 FT 6 FT IN 200 FT 10 FT IN 400 FT 2% OVER 400 FT
MAXIMUM CHANGE IN GRADIENT	2% IN ANY 50 FT LENGTH	3% IN ANY 50 FT LENGTH	4% IN ANY 50 FT LENGTH
MAXIMUM ALLOWABLE PUTTING (MEASURED FROM SURROUNDING SURFACE – NOT EDGES OR RUN)	2 IN.	4 IN.	6 IN.
SOLID OBJECTS PROJECTING FROM SURFACE	NONE	3 IN. FROM FIRM OR UNDISTURBED SURFACE	6 IN FROM UNDISTURBED SURFACE
POT HOLES OR DEPRESSIONS	2 IN. DEPTH MAXIMUM FOR ALL DIAMETERS	6 IN. DEPTH, 15 IN. MAX DIA, 4 IN. DEPTH, ANY DIA	8 IN. DEPTH 2 FT MAX DIA
LOOSE OR SOFT FILL	NONE	NONE ADJACENT TO ROCKS, STUMPS, OR RIGIT SURFACES	ALL NEEDED TO FILL DITCHES OR HOLES. PACK WITH FEET OR USE HAND TAMPER

NOTE:

(1) The lower table defines roughness characteristics which impose the gross weight and fuel weight limits of this table
(2) Maximum touchdown rate of sink is 540 fpm. Outboard tank fuel is limited to 6,000 pounds per side.
(3) Maximum touchdown rate of sink is 300 fpm.
(4) Outboard tank fuel is limited to 2,000 pounds per side.
(5) KC-130 not modified by AFC 242 and C-130F.
(6) KC-130 modified by AFC 242.

Figure 3. Gross Weight and Fuel Weights for Substandard Airfield Operations

Substandard airfields are defined as those that lack the flotation properties necessary for everyday normal operations or that have unusually rough, undulating, pitted, or rutted runways and/or taxiways. They may be either paved or unpaved. Conversely, unpaved surfaces (gravel, dirt, etc.) need not be considered substandard if the surface is hard and smooth. Any airfield on which the tires produce easily visible rots should be considered substandard.

Note

Planning for substandard airfield operations should allow for increased maintenance and accelerated inspections according to the severity of the environment and the frequency of such operations.

Figure 3 defines the weight limitations for operating on substandard airfields. Contact rates of sink should be expected to be significantly higher on substandard airfields than on standard airfields. Thus, the “recommended” landing gross weights and fuel weights shown in Figure 3 are within the structural limits for touchdown at 540 fpm. The “recommended” weights of Figure 3 are considered safe for the specified limits of roughness. The “allowable with caution” weights incur unknown risks that increase with an increase in weight and/or airfield roughness specified in Figure 3. The decision to use the “allowable with caution” weights shall be made by proper authority.

Where Figure 3 shows a fuel weight limitless than the capacity of the main tanks, additional fuel, if needed to meet mission requirements, may be retained in the auxiliary tanks. Since the gross weight is limited, the fuel in the auxiliary tanks will be at some sacrifice of cargo capability. Following takeoff, use the fuel in the auxiliary tanks before using the fuel remaining in the main tanks.

In addition to the weight limitations of Figure 3, observe the following to minimize maintenance and the chance of damaging the aircraft.

1. In-flight refueling pods must be removed.
2. Taxi at minimum speed (approximately 10 knots or less).
3. Minimize braking if porpoising results.
4. Minimize nose gear loads by use of elevator during takeoff and landing rollout.

MAXIMUM PASSENGER LOAD FOR EXTENDED OVERWATER FLIGHTS

In order to ensure sufficient liferaft capacity, no more than 80 persons, including crewmembers, may be carried on extended over-water flights that operate more than 50 nm from the nearest shore line. Extended over-water operations with mixed cargo/passenger loads are restricted to a maximum of 35 occupants per unobstructed overhead exit. When normal egress routes are obstructed by cargo tiedown arrangements, passenger capacity shall be reduced accordingly.

CHAPTER II - FLIGHT CHARACTERISTICS

INTRODUCTION

The aircraft was designed for support and utility operations from small fields and emergency airstrips. In this, and in all other areas of flight operations including formation and instrument flying, the aircraft has satisfactory flight characteristics. The outstanding and most useful characteristic in all ground and flight operating conditions is the capability of the aircraft for rapid acceleration and its immediate and precise response to power and control applications. The flight characteristics of the aircraft with the refueling pods installed are very similar to those with the pods removed. With the pods installed, the aircraft has an increase in directional stability, and there is also a highly damped lateral oscillation during cruise in moderate and heavy turbulence.

STALLS

The stall characteristics of the Hercules are conventional for a four-engine propeller transport aircraft. With flight idle power, stall warning buffet initially occurs at 4 to 15 percent above stall speed, depending upon configuration, and progresses to moderate or heavy buffet at the stall. The greatest stall warning airspeed margin exists in the landing configurations. The stall of the Hercules is characterized by either a mild pitch down or a mild rolloff to the right or left depending on slightly unequal power settings. Flight control response is normal and satisfactory throughout the stall entry, stall, and recovery. The rolling tendency is easily controlled by use of ailerons and rudder. Power off stalling speeds for typical configurations and fight attitudes are given in Figure 4. Use care to avoid accidental stalls. Should a stall be entered, it is recommended that recovery be made as follows:

WARNING

In order to minimize altitude loss during stall recovery, the aircraft angle of attack must immediately be reduced below the stall angle of attack. Since the maximum lift coefficient occurs at only a few degrees less than stall, a rapid but small reduction of aircraft nose attitude, simultaneous with the addition of power, will minimize altitude loss.

1. If in level flight, immediately lower the nose and apply power to limit loss of altitude. Use coordinated ailerons and rudder to counteract any wing-dropping tendency. Move controls smoothly, avoid abrupt actions. Avoid diving the aircraft and abrupt or accelerated pullup after recovery.

2. If in climbing or banked attitude, immediately lower the nose, level the wings, and apply power to limit loss of altitude. Move controls smoothly and avoid abrupt actions. Avoid diving the aircraft and abrupt or accelerated pullup after recovery.

3. Heavy gross weight cruise configuration power-on stalls may be accompanied by lightening rudder and elevator control forces. Recovery should be made by smoothly applying nosedown elevator.

PRACTICE STALLS

Any practice stall entry and recovery should be made at gross weights of 120,000 pounds or less. Practice at a minimum altitude of 10,000 feet above the ground. The aircraft should be trimmed at a speed not less than 1.4 times the stall speed for the entry configuration and weight and should not be adjusted until recovery is completed.

During stall entry, the nose should be raised at a rate to produce an airspeed decrease of approximately 1 knot per second. The throttle should be increased above FLIGHT IDLE only as necessary to prevent NTS action from occurring during entry into the stall. The synchrophase master switch should be OFF. When stall warning in the form of light airframe buffeting occurs, recovery should be initiated. Avoid abrupt control movements and avoid any control action that may result in sudden attitude change or in excessive acceleration of buffeting.

The following conditions adversely affect stall characteristics and/or performance and should be taken into consideration prior to any practice stall training.

1. High power settings.

2. Asymmetric power.

3. One or more engines producing negative torque or causing a negative torque signal.

4. Retrimming or continually trimming the elevator nose up during stall entry or recovery.

5. Changing flap deflection during stall entry or recovery.

6. Increasing power during stall entry.

7. Practicing stalls at too low an altitude or over an overcast.

8. High fuel weights, low cargo weight conditions.

9. Aft center of gravity position.

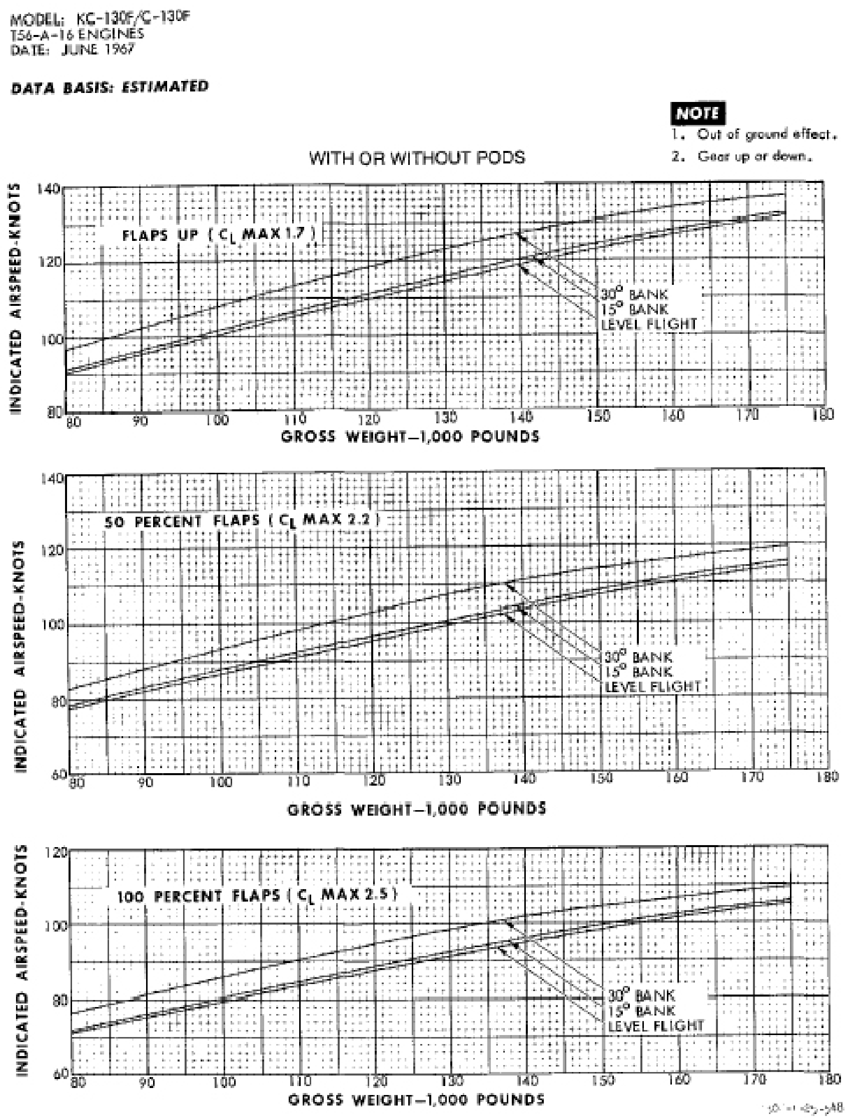


Figure 4. Power-Off Stalling Speeds – Sea Level – ICAO Standard Atmosphere

WARNING

Stalls should be discontinued at the onset of buffet. Power-on stalls should not be attempted because of excessive nose-high attitude required.

SPINS

Spins are a prohibited maneuver and should never be entered into intentionally. Accidental spins can be prevented by immediate recovery from any stall condition. If a spin is accidentally entered, it is anticipated that a normal recovery for multiengine aircraft will be effective. As in any maneuvering flight, proper care should he taken to avoid exceeding the structural limits of the aircraft by a sudden pullup.

LEVEL-FLIGHT CHARACTERISTICS

The range between slow- and high-speed flight is unusually large, but control and stability are normal for any trimmed condition. During landing at light gross weights, the aircraft has a tendency to float because of the large wing area, the propeller blade angle, and the flight idle horsepower.

MANEUVERING FLIGHT

Maneuvering flight within the category of acrobatics is prohibited. Do not make hard t-udder kicks that result in large angles of yaw. Normal maneuvers may be accomplished with moderate pilot effort, since control movement is assisted by the boost system. There are not conditions of normal maneuvering flight that will produce a reversal of control pressures, and maneuvers can be accomplished with ease. The recommended speed for minimum radius turns is the best climb speed at that altitude.

FIN STALL

WARNING

- Fin stall maneuvers are prohibited.
- The aircraft shall not be maneuvered to high sideslip angles.

If the aircraft is maneuvered to abnormally high sideslip angles (15° to 20°), a tin stall resulting in large yawing transients and a decrease in directional stability can be encountered. This is an unusual flight maneuver and will not result from power transients, gusts, wake turbulence, or execution of normal flight maneuvers. The tin stall condition is more likely to occur during abnormally high left rudder input steady heading sideslip maneuvers if held until tin buffet occurs. Fin stall can be encountered at all speeds between stall speed and approximately 170 knots in all flap configurations with power on. The susceptibility of encountering the fin stall condition is greatest at low speed with power on. Consequently, under these conditions, rapid yawing maneuvers can be produced with relatively small abrupt rudder inputs or abnormally large rudder deflections and should be avoided. As the aircraft attitude approaches the critical sideslip angle, heavy vertical fin buffet will develop.

A large change in yaw angle that could result in tin stall may also be caused by either a large asymmetric power condition or a rudder boost unit malfunction. Determination of which condition is causing the abnormal yaw angle can be made by checking the engine controls and instruments for normal operation and that the rudder controls are functioning normally.

FIN STALL RECOVERY

Fin stall recovery must be initiated at the onset of buffet and can be accomplished by one of three methods:

1. Returning the rudder to neutral.
2. Rolling to a wings-level attitude.
3. Retarding all throttles to flight idle.

Note

If flight conditions permit, pushing the nose down will assist in recovery. Ensure that adequate flying speed is maintained at all times.

DIVING

Conduct dives or descents within the airspeed limitations. Avoid abrupt pullups at any time.

CAUTION

Abrupt pushover to a negative g condition with flaps either up or down should be avoided. This type of maneuver will result in a reduction in maneuvering longitudinal stability, in that the angle of pitch down and the negative g condition continue to increase even after the stick direction has been reversed. After movement of the stick toward the former position is begun, there is a time lag before the aircraft starts to reverse its pitching motion. Final recovery from the maneuver requires considerable pull force. This is because of the large pitching inertia of the aircraft and the longitudinal rotational effect on the hinge moments of the elevator. These characteristics could result in an excessive positive load factor because of an abrupt recovery.

FLIGHT CHARACTERISTICS WITH ASYMMETRIC POWER

The aircraft has excellent flight characteristics even when an engine is inoperative. All control surfaces are booster-operated so that no great amount of pilot force is necessary to correct the turning action caused by uneven power conditions. With the aircraft trimmed for existent flight conditions, the sudden loss of power on one engine will result in laterally unbalanced thrust and a consequent yawing tendency (yawing moment about a vertical axis through the center of gravity) toward the side with the loss of power. In addition, the aircraft will tend to roll toward the failed engine, and the aileron deflection required to prevent roll will exacerbate the yawing tendency. As the aircraft begins to yaw, the balance ball will displace in the opposite direction (away from the failed engine). In order to counter the yawing moment to maintain directional control, the rudder must be deflected so that the vertical tin will produce a side force (toward the side with the failed engine) sufficient to create an equal but opposite yawing moment. The slowest airspeed at which rudder authority is sufficient to produce the side force required to counter the yawing movement is the minimum control airspeed for the existent conditions (asymmetry of thrust, center of gravity location, environmental conditions, etc.).

With the wings level, the side force produced by the vertical tin will cause the aircraft to sideslip toward the failed engine sufficiently, so that the sideforce is countered by the aircraft resistance to sideslip (lateral drag). Because the sideslip is in the same direction as the side force that causes it, the leading edge of the vertical tin will actually be at a negative angle of incidence with respect to the relative wind. Thus, large rudder deflections will be required which will increase drag and which, at low airspeed with large asymmetry of thrust, may be insufficient to maintain directional control. With the wings held level and the heading maintained by rudder deflection, the balance ball, acting as a spirit-tilled level, will be centered. The sideslip will cause a sharp reduction of overall aircraft performance because of increased drag and will give the pilot the same visual and instrument indications as a crosswind from the side with more power.

Banking the aircraft away from the loss of power will introduce a horizontal component of the lift vector in the direction of the bank. If the aircraft is then controlled through the rudder to maintain a steady heading while banked away from a loss of power, the horizontal component of the lift vector will be in a direction approximately opposite to the side force required of the vertical tin. Thus it will reduce sideslip and improve aircraft performance through reducing drag. Furthermore, with less sideslip the vertical fin will be more efficient in producing side force (lateral lift), so less rudder deflection will be required forgiven conditions that will enable directional control at lower airspeeds than with the wings level. At a given airspeed, less rudder pedal force will be required to achieve the smaller rudder deflection necessary, making it easier for the pilot to control the aircraft. With the aircraft banked but in steady-heading flight, the balance ball will seek the vertical low point that will be displaced from the centered position in the direction of the bank angle (i.e., away from the loss of power).

Five degrees of bank with the aircraft cross-controlled to maintain a steady heading will result in balance ball displacement of approximately two-thirds of the ball width in the direction of the bank angle (away from a failed engine). This displacement will establish a balanced flight condition approximately sufficient to compensate for a large amount of asymmetric power. With 5° of bank, the horizontal component of the lift vector will be more than 8 percent of the aircraft gross weight, while the additional lift requirement will be less than 0.5 percent.

So long as the balance ball is maintained at about two-thirds of a ball width deflection away from a failed engine as its new reference position, turns may be made in either direction with equal effect, keeping in mind that the neutral reference roll attitude includes the previously established 5° of bank.

In the event of sudden engine failure while at high power settings, it is recommended that the pilot not recenter the balance ball but accomplish the following:

1. Establish and maintain a balance ball position displaced two-thirds of a ball width from center in a direction away from the failed engine.

2. Utilize 5° of bank away horn the failed engine as the new neutral reference for roll attitude.

Note

If the amount of power asymmetry is subsequently reduced, less bank angle and balance ball displacement will be required to maintain a minimum sideslip condition.

PRACTICE MANEUVERS WITH ONE OR MORE ENGINES INOPERATIVE

Engine failures may be simulated for practice, when desired. To simulate a feathered propeller, retard one or more throttles to FLIGHT IDLE position. The checklist procedure for engine failure can be called out without actually performing the operations named. Practice maneuvers at a safe altitude. Select a base point and set up a simulated field elevation. Traffic patterns can be flown at the normal altitude above this base point.

WARNING

During takeoff, or while airborne, do not move the throttles below the FLIGHT IDLE position. Placing any propeller in the TAXI range may result in immediate loss of control of the aircraft.

EFFECT OF SPEED ON TRIM

During engine-out operation, as in all other types of operation, trim is affected by speed. After trim is set, any increase of airspeed increases the effect of the trim tabs. Conversely, any decrease of airspeed reduces the effect of trim tabs.

LANDING AND GO-AROUND

Landings and go-arounds with feathered engines may be simulated at altitude by flying a traffic pattern over a basic altitude. Roll out most of the trim as touchdown point is reached. During a go-around practice, note the altitude lost between the go-around decision and the time the aircraft is safely in a climb condition. Note the aircraft acceleration characteristics during these maneuvers.

CHAPTER III - PERFORMANCE DATA - (T56-A-16 ENGINES)

NOTE

1. Stop based on two engines in reverse, one engine in ground idle, one propeller windmilling.
2. An RSC value of 10 is equivalent to one inch of slush or water.
3. Use 50% of reported headwinds and 150% of reported tailwinds with the wind correction grid if wind is measured at a source other than the runway. This is recommended procedure which may be revised at the discretion of the pilot dependent upon the source of measurement of the wind data.

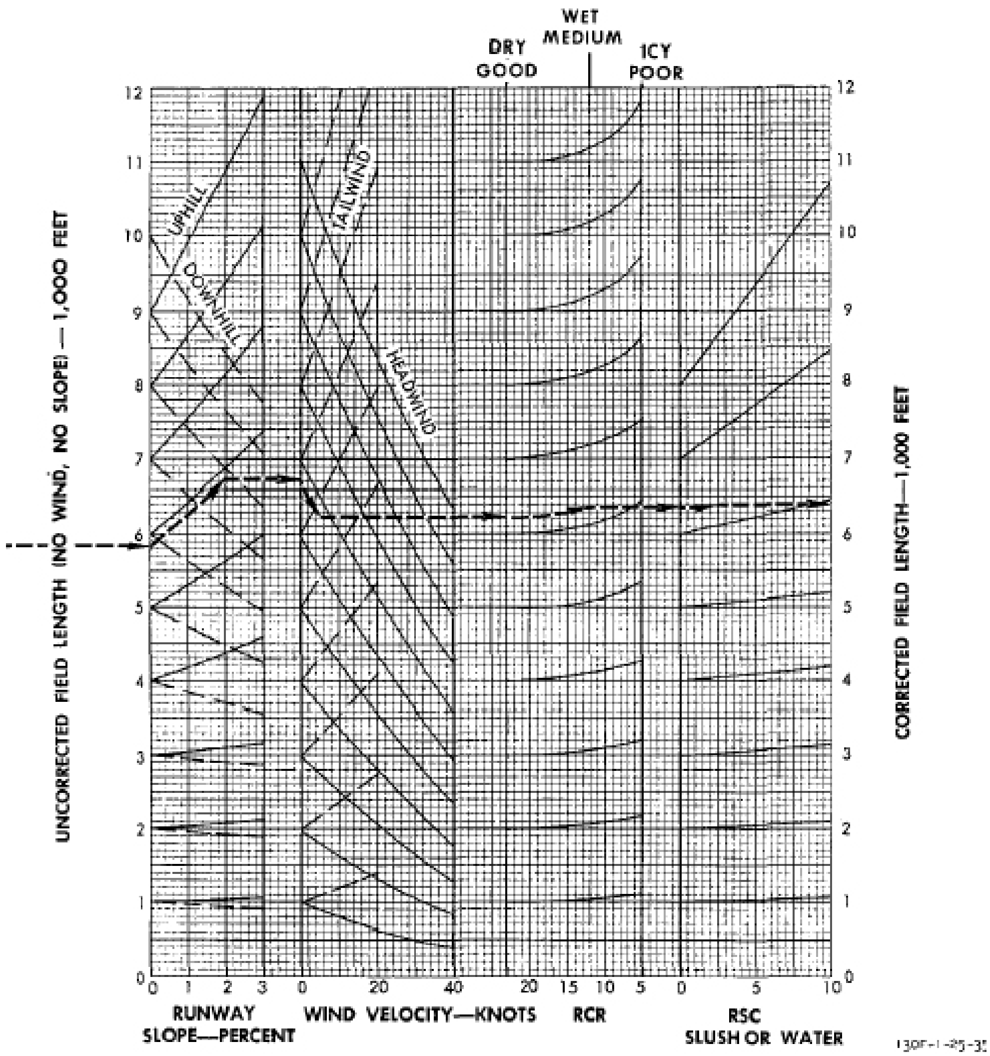


Figure 5. Critical Field Length (Without Nosewheel Steering – Four Engines – Maximum Power – 50-Percent Flaps – No ATO – With or Without Pods)

MODEL: KC-130F/C-130F
T56-A-16 ENGINES

DATE: NOVEMBER 1968
DATA BASIS: ESTIMATED

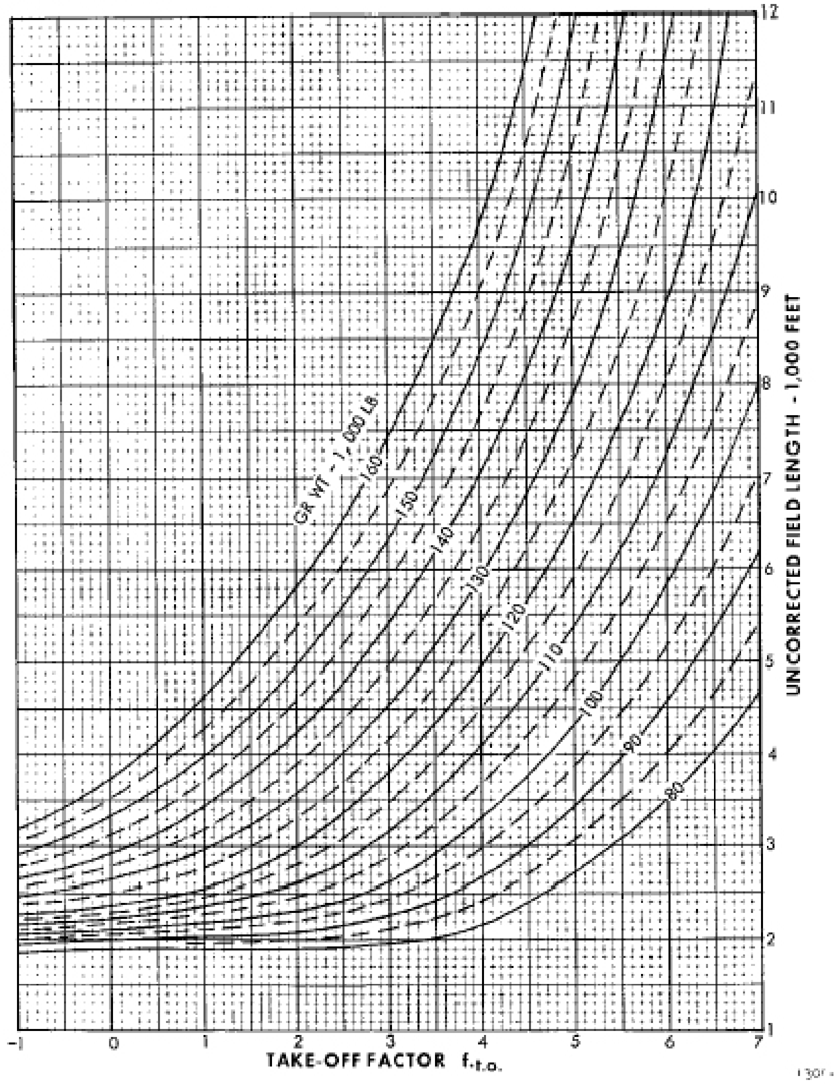


Figure 6. Critical Field Length (With Nosewheel Steering – Four Engines – Maximum Power – 50-Percent Flaps – No ATO – With or Without Pods)

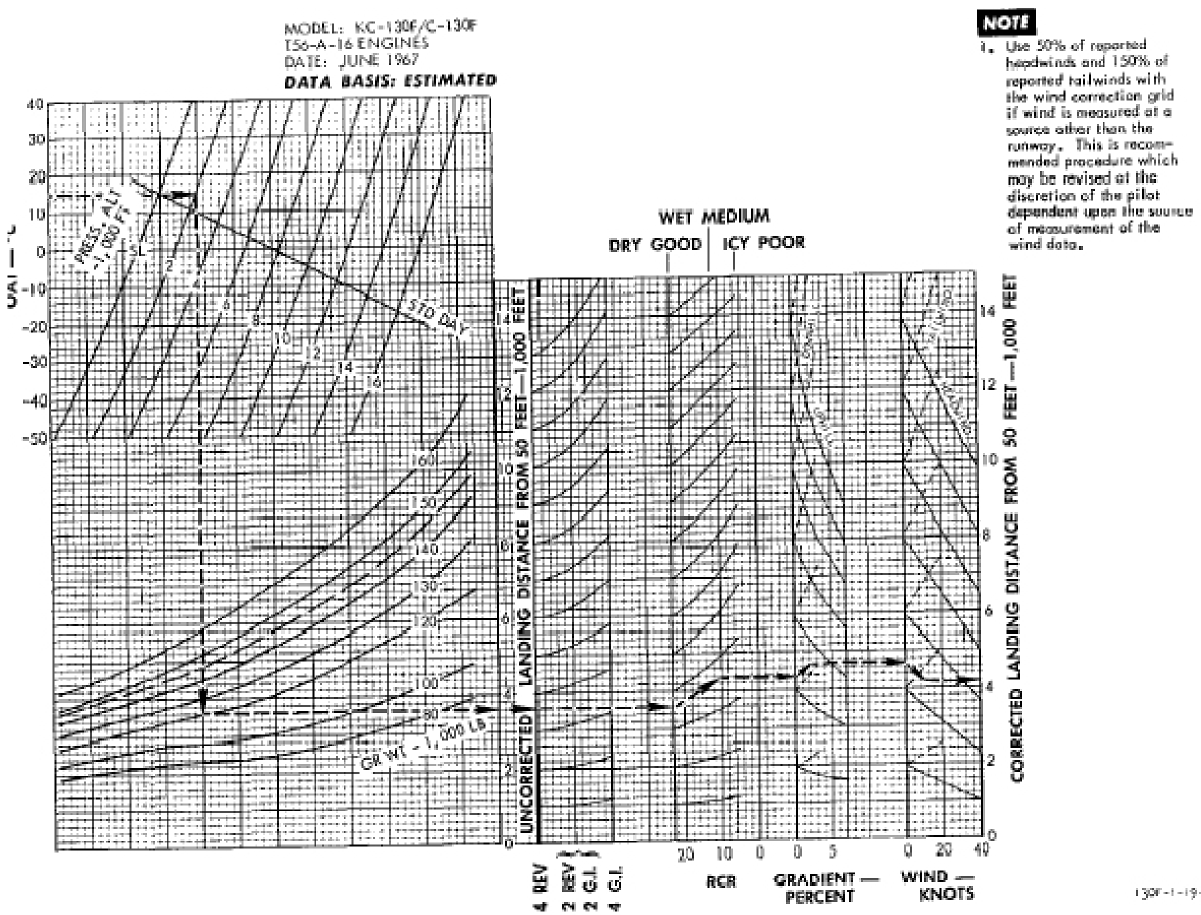


Figure 7. Landing Distance From 50 Feet (100-Percent Flaps – With or Without Pods)

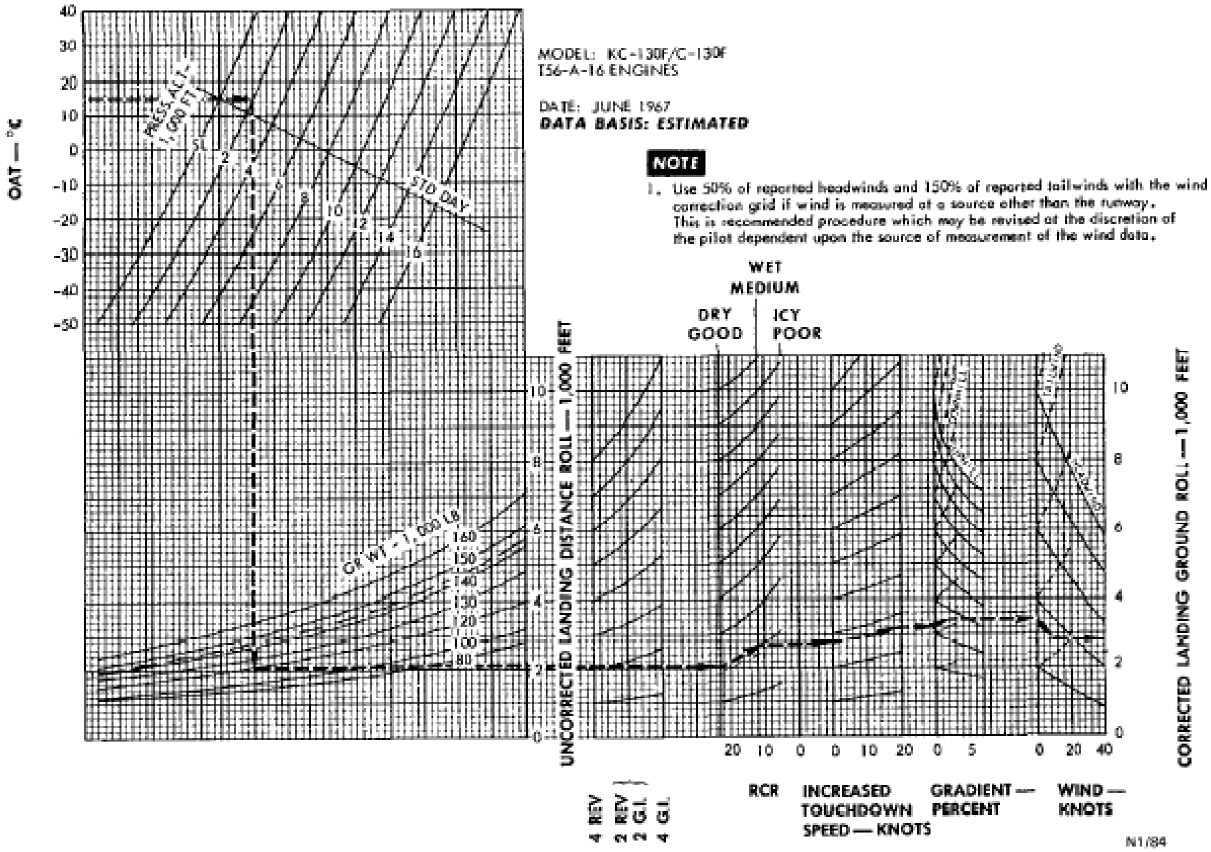


Figure 8. Landing Ground Roll (100-Percent Flaps – With or Without Pods)

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