NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

Attachment 9 - B707 AFM Excerpts

OPERATIONAL FACTORS

DCA11MA075

CONTENTS

A. ACCIDENT

Operator: Omega Aerial Refueling Services, Inc.
Location: Point Mugu Naval Air Station, California
Date: May 18, 2011
Airplane: Boeing 707-321B, Registration Number: N707AR

B. NATIONAL TRANSPORTATION SAFETY BOARD (NTSB) OPERATIONS GROUP

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C. SUMMARY

On May 18, 2011, at approximately 1727 pm local time (0027 UTC), Omega Air flight 70, a Boeing 707-321B (N707AR), crashed on takeoff at the Point Mugu Naval Air Station[1], Point Mugu, California. The airplane impacted beyond the departure end of runway 21 and was destroyed by post-impact fire. All three flight crewmembers aboard escaped with minor injuries.

[1] Naval Base Ventura County.

D. B707 Airplane Flight Manual Excerpts

1.0 Takeoff and Normal Operations

Procedures marked with * are guidance material.

TAKE-OFF - NORMAL OPERATION

* NORMAL TAKE-OFF PROCEDURE (All Engines Operating) R

Prior to take-off, review stabilizer setting, number of turbocompressors on, engine thrust settings, V_1, V_R, V_2 and field length required for the gross weight and ambient conditions applying corrections, if necessary, for significantly altered ambient conditions or loading.

If take-off gross weight is limited by one-engine-inoperative obstacle clearance requirements, determine minimum gross height for obstacle clearance, scheduled flap retraction height and final take-off climb speed.

1. Set approximately 70% to 80% N_1 RPM (1.2 to 1.4 EPR) prior to brake release or as the airplane is aligned with the runway.

2. Release brakes and advance thrust levers to the rolling take-off EPR.

3. Adjust levers, as necessary, to assure take-off thrust setting between 40 and 80 knots airspeed.

   NOTES: This thrust setting procedure is used for crosswind or tailwind take-offs to avoid engine surging.

   For water injection (if installed) take-offs avoid rapid thrust lever advancement after brake release until wet thrust is attained.

   An alternate thrust setting procedure is to set brakes and advance thrust levers to the target EPR for static take-off. Release brakes and, between 40 and 80 knots airspeed, adjust levers as necessary, to chart thrust setting for normal rolling take-off.

4. Use nose wheel steering until reaching approximately 80 knots, above which speed directional control is maintained with rudder.

5. Monitor engine performance and IAS throughout take-off roll.

6. At V_R, smoothly initiate rotation to take-off attitude, reaching not less than V_2 at a height of 35 feet.

* 7. Retract landing gear after a positive rate of climb has been established.

TAKE-OFF - NORMAL OPERATION

R

* NORMAL TAKE-OFF PROCEDURE (All Engines Operating) (Continued)

NON-OBSTACLE LIMITED CLIMB-OUT

1. Airspeed - At least V_2
2. Accelerate to V_2 + 30 knots, but not greater than flap placard speed, before initiating flap retraction.

   NOTE: The minimum flaps up maneuvering speed is V_2 + 50 knots.

OBSTACLE LIMITED CLIMB-OUT

1. Airspeed - V_2 + 10 knots maximum, V_2 minimum

   NOTE: Do not exceed V_2 + 10 knots until reaching either scheduled flap retraction height or the minimum gross height for obstacle clearance, whichever is lower.

2. Maintain flaps 14° to the height scheduled for flap retraction.
3. Accelerate to V_2 + 30 knots before initiating flap retraction.
4. Accelerate to at least V_2 + 50 knots (final take-off climb speed) and continue climb until 1500 feet has been exceeded.

   NOTE: If minimum gross height for obstacle clearance is above flap retraction height, do not exceed final take-off climb speed until this minimum height is attained.

TAKE-OFF PROCEDURE WITH FAILED ENGINE

When an engine failure occurs, the take-off is normally refused when the failure is recognized prior to V_1 and is normally continued when it is recognized after passing V_1. At V_1, the take-off may be either continued or refused.

ENGINE FAILURE PRIOR TO V_1 (Anti-skid System Operating)

Certification performance of this airplane is based on the following procedure.

1. Immediately apply full brakes and retard all thrust levers to Idle position.
2. Speed brakes - 60°
3. Apply reverse thrust as desired.

* NOTE: Reverse thrust was not utilized in establishing refused take-off distances scheduled in this manual.

Procedures marked with * are guidance material.

TAKE-OFF - NORMAL OPERATION

* TAKE-OFF PROCEDURE WITH FAILED ENGINE (Continued)

ENGINE FAILURE PRIOR TO V_1 (Anti-skid Inoperative) R

Certification performance of this airplane is based on the following procedure.

1. All Thrust Levers - IDLE
2. Speed Brake Lever - 60 DEGREES
3. Symmetric Reverse Thrust - APPLY AS DESIRED

NOTES: Reverse thrust was not utilized in establishing refused take-off distance scheduled in this manual.

Use of reverse thrust markedly increases deceleration and also improves braking capability by spoiling lift.

4a. Wheel Brakes (Gross weight 250,000 pounds or 113,400 kilograms and above) - APPLY LIGHT PRESSURE INITIALLY

After initial light braking, increase brake pressure as the airplane decelerates. Higher pressures may be applied for higher gross weights; at maximum airplane gross weight, maximum braking may be used.

b. Wheel Brakes (Gross weight below 250,000 pounds or 113,400 kilograms) - APPLY BRAKES UNTIL BRAKING ACTION IS FELT, THEN RELEASE BRAKES MOMENTARILY. REPEAT PROCEDURE UNTIL STOPPED.

As airplane decelerates, increase brake pressure. Modulate pressure very carefully or locked wheels will occur with resulting blown tires.

ENGINE FAILURE AFTER V_1

When the take-off is continued, control the rate of rotation to target V_2 at the 35 foot height. Retract landing gear after a positive rate of climb has been established; then,

Non-Obstacle Limited Climb-Out

Follow normal all-engines-operating take-off climb-out procedures and speeds.

Obstacle Limited Climb-Out

Follow normal all-engines-operating obstacle limited climb-out procedures except:

Maintain V_2 to the scheduled flap retraction height:

Accomplish flap retraction and acceleration to V_2 + 50 knots (final take-off climb speed) in level flight: and,

* Do not exceed final take-off climb speed until minimum gross height for obstacle clearance is attained.

MINIMUM CONTROL SPEEDS

ONE ENGINE INOPERATIVE

Minimum Control Speed (Air), V_{MCA} = 120 Knots IAS (Maximum Take-Off Thrust)
Minimum Control Speed (Ground), V_{MCG} = 125 Knots IAS (Maximum Take-Off Thrust)

NOTE: The minimum control speeds shown above are the maximum values from the charts in Section IV. See charts, Section IV, for variations in minimum control speed with ambient conditions.

2.0 Takeoff Trim Setting

BOEING 707 Intercontinental 320

CERTIFICATE LIMITATIONS

AIRPLANE FLIGHT MANUAL

TRIM SETTING REQUIRED DURING TAKE-OFF

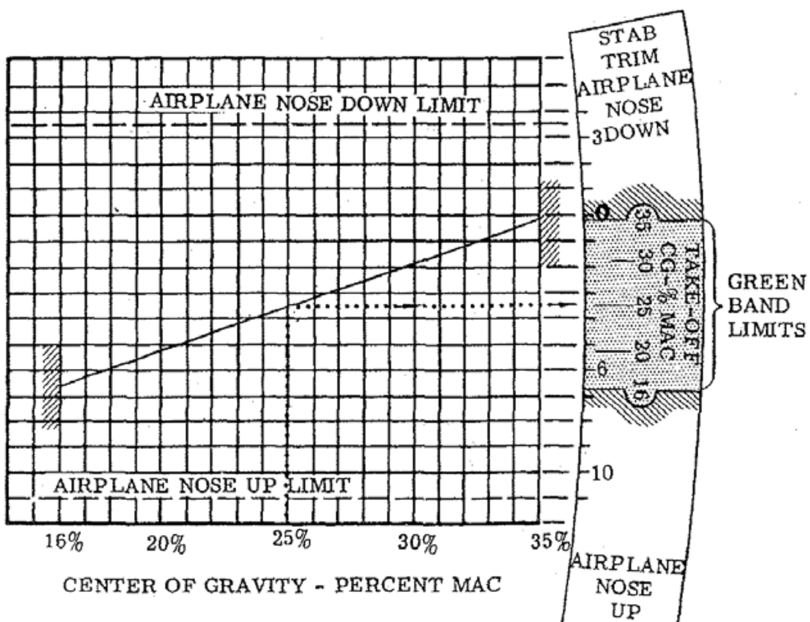
FLAPS- TAKE-OFF SETTING

NOTE:
Applicable when exact Center of Gravity Location is known through calculated or graphical determination.

EXAMPLE:
GIVEN:
CG at 25% MAC
FIND:
Take-Off Stabilizer Setting
SOLUTION:
Enter at 25% MAC
Read out 3-1/2 units Airplane Nose Up Stab Trim Setting

When an approved tabular load schedule is used, the stabilizer trim setting shall be determined from the table provided with the particular approved tabular load schedule.

At lower weights, forces during rotation will be lighter and additional nose down trim (not to exceed 1 unit) may be used, if desired. Take-off trim setting is not to exceed green band limitation.



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3.0 Emergency Operating Procedures

BOEING 707 Intercontinental

AIRPLANE FLIGHT MANUAL

EMERGENCY OPERATING PROCEDURES

SECTION II

EMERGENCY OPERATING PROCEDURES

The operating procedures contained in this manual have been developed and recommended by the manufacturer and approved by the FAA for use in the operation of this aircraft. These procedures are for guidance only in identifying acceptable operating procedures and are not to be considered mandatory or in any way construed as prohibiting an operator from developing his own equivalent procedures.

Recall items are minimum immediate action items. Reference items are accomplished as soon as time permits.

Silencing of aural warnings will facilitate crew coordination in performance of emergency procedures. Pressing either master fire warning light or the bell reset will silence aural fire warning and rearm the master fire warning system.

FIRE

The flight crew should always go on 100% oxygen whenever a hand held fire extinguisher is to be discharged in the cockpit.

ENGINE FIRE, SEVERE ENGINE DAMAGE OR ENGINE SEPARATION

If fire warning light illuminates steadily and bell rings; or severe engine damage or engine separation is indicated:

Recall

1. Thrust Lever - CLOSE
2. Essential power selector - ON OPERATING GENERATOR
3. Start Lever - CUTOFF
4. Engine fire switch - PULL
   If fire warning light remains illuminated:
5. Fire extinguisher discharge switch - PUSH AND HOLD ONE SECOND

Reference

If after 30 seconds the fire warning light remains illuminated:
1. Fire extinguisher transfer switch - TRANSFER
2. Fire extinguisher discharge switch - PUSH AND HOLD ONE SECOND

If fire warning light remains illuminated:
3. Landing gear - UP
4. Wing flaps - UP
5. Airspeed - AT LEAST 250 KNOTS. DO NOT EXCEED VMO
6. Do not lower flaps or use speed brakes unless emergency landing imminent.
7. Land at the nearest suitable airport.

4.0 Takeoff Weight Limitations

MAXIMUM ALLOWABLE TAKE-OFF WEIGHT

FIELD LENGTH AND CLIMB PERFORMANCE LIMITS

CHART PRESENTATION (Continued)

The charts are designed to yield the maximum allowable gross weights and the most flexible operating speeds for any runway situation, including those where clearway or stopway are present. The chart types are described below.

Runway Length Corrections

"Corrected runway length" is simply the actual runway length available, with existing slope and wind, converted to a zero-slope, zero-wind runway length which would allow the same take-off weight. For example, a 10,000 foot runway with 1 percent downhill slope and a 10 knot headwind becomes a corrected runway length of over 11,000 feet. This means it would require a level runway over 11,000 feet long under zero wind conditions to accommodate the same maximum take-off weight as the 10,000 foot runway with favorable slope and wind. Similarly, uphill slope or a tailwind reduce the corrected runway length, since the actual runway is suitable for a lesser take-off weight as a result of these conditions. Engine airbleed effects are also handled by adjusting the actual runway length before entering the next chart.

Maximum Take-Off Weight (Field Length Limits)

These charts in Section I, show field length limitations on take-off weight as a function of airport pressure altitude and ambient temperature. They account for engine thrust and air density effects on airplane performance. Separate charts are required for the "flat" and "full" rated modes of engine operation, and for wet and dry thrust when water injection is installed.

Use of water injection (if installed) is permitted within the temperature-altitude regions shown on the wet thrust charts; however, due to the weight of water required, dry take-off performance may result in a higher payload at temperatures a few degrees higher than the minimums for wet thrust operation.

Runway Length and V_1 Adjustments

This chart shows corrected runway lengths and V_1 speeds (in terms of the ratio V_1/V_{1B}) for the engine failure case. On this airplane the all-engines-operating field length requirements are usually more critical, so the chart is used merely to find the effects of runway slope and wind on V_1. For special cases such as clearway and stopway, brake energy limitations, anti-skid inoperative, additional stopping margin, or maximum and minimum V_1 limits, where the one-engine-inoperative field length requirement may become limiting, the corrected runway length from this chart is compared with the length obtained from the Runway Length Corrections chart, and the lesser distance used to find gross weights in the Maximum Take-off Weight (Field Length Limits) charts. The gross weight-field length relationship on the latter charts is calculated for the all-engines-operating condition, but a simple relationship exists between this distance and the balanced field length distance, which is accounted for by the warped reference line in the Runway Length and V_1 Adjustments chart.

MAXIMUM ALLOWABLE TAKE-OFF WEIGHT

INTRODUCTION

Charts in this section and in Section I permit calculation of the maximum take-off weight allowed by the operating regulations, and of the associated take-off speeds and flight path information. The explanatory discussion is divided into two categories: limitations due to minimum field length and climb performance requirements, and limitations due to flight path and obstacle clearance problems. This is followed by detailed procedures for using the charts for normal and special conditions, and illustrative examples.

Some take-off performance charts have a WET or DRY label next to the chart title: WET charts apply to airplanes with water injection provisions when WET take-off thrust settings are used.

FIELD LENGTH AND CLIMB PERFORMANCE LIMITS

DEFINITIONS

A field-length limited take-off weight is obtained when the field length required by operating regulations is equal to the field length available. Field length available usually means the runway length, but at some airports it may include clearway or stopway or both. Field length required considers the take-off distance, the take-off run, and the accelerate-stop distance as defined in the INTRODUCTORY INFORMATION. The term take-off run has no significance unless clearway is utilized.

The relationship between take-off distance and accelerate-stop distance depends on recognition of engine failure speed at V_1. When the engine failure speed is chosen so that these distances are equal, the maximum weight to satisfy the one-engine-inoperative field length requirements will be obtained for a given runway length. This is called a "balanced field length."

For various reasons, V_1 might be selected to make the take-off distance longer than the accelerate-stop distance or vice versa. This is called an unbalanced field length, and would result in a lower take-off weight limit from a given runway. For any combination of unbalanced distances, slope or wind effects, there is some reference field length which will support the same take-off weight with zero slope or wind. This reference distance is labeled "Corrected Runway Length". R

A climb-performance-limited take-off weight is obtained when the available climb gradient with one engine inoperative is equal to any of the minimum gradients required by the regulations for the various segments of the take-off flight path.

CHART PRESENTATION

Take-off field length requirements and climb performance vary chiefly with airplane gross weight and take-off thrust available, but runway slope, wind and turbocompressor operation have important secondary effects. With so many variables to consider, several charts are required to find the maximum allowable take-off weight for a given runway, or conversely, the take-off distance required for a given gross weight. The various speeds associated with the take-off, V_1, V_R and V_2, are derived from separate charts, while additional charts show limitations on gross weight or V_1 due to tire speed or brake energy restrictions.

DETERMINATION OF MAXIMUM ALLOWABLE TAKE-OFF WEIGHT

Maximum Allowable Take-Off Weight - The least value determined from the following considerations:

1. Design structural weight limitations.
2. Take-off distance requirements for the appropriate airport and atmospheric conditions.
3. Climb performance requirements for the appropriate altitude and temperature.
4. Brake energy limitations on maximum engine failure speed.
5. Tire speed limitations on lift-off speed.
6. Obstacle clearance considerations.

NOTE: This section contains sufficient information to determine a flight profile for any combination of weight, altitude, and temperature within approved operational limits. If obstacle clearance is limiting, take-off weight must be reduced until the required clearance is obtained.

7. Maximum allowable landing weight or enroute climb requirements for a particular flight.

DETERMINATION OF MAXIMUM ALLOWABLE LANDING WEIGHT

Maximum Allowable Landing Weight - The least value determined from the following considerations:

1. Design structural weight limitations.
2. Runway length available.
3. Climb performance requirements for the appropriate altitude and temperature.

DEMONSTRATED CROSSWIND

For performance scheduling, the full headwind component may be used provided the corresponding crosswind component does not exceed 26 knots at a 10 foot height (33 knots reported wind at 50 foot height). This crosswind value is not considered to be limiting.

MAXIMUM ALLOWABLE TAKE-OFF WEIGHT

FIELD LENGTH AND CLIMB PERFORMANCE LIMITS

CHART PRESENTATION (Continued)

Maximum Take-Off Weight (Climb Limits)

These charts, in Section I, show take-off weight limits as a function of airport altitude and temperature which meet the minimum climb gradient requirements of the regulations. Corrections for engine airbleed used for turbocompressor operation and wing anti-icing are shown as sliding scales.

Maximum Take-Off Weight (Tire Speed Limits) R

These charts, in Section I, show take-off weight limits which must be observed to keep the lift-off speed from exceeding the placard speed of the tires. These limits do not apply when 225 mph tires are used.

Take-Off Speeds

These charts show the various take-off speeds, V_1, V_R and V_2 as functions of altitude, temperature and gross weight. Separate charts are required for wet thrust (if installed). Minimum control speed limitations on the take-off speeds are shown on the charts.

Maximum Brake Energy Limit Speed

The brake energy capacity of this airplane is sufficient to handle refused take-off stops from V_1 under most normal operating conditions. On long runways, especially with downhill slope and tailwind, brake energy capacity can limit V_1 at some airports. The brake energy limit chart shows maximum allowable V_1 as a function of temperature, altitude, gross weight, runway slope, and wind component. V_1 or gross weight or both must be reduced to stay within these limits.

TAKE-OFF FLIGHT PATH

PRESENTATION

The take-off flight path is the calculated height versus distance relationship assuming failure of the most critical engine during take-off, and is used for determining obstacle clearance. It is divided into logical segments defined by changes in airplane configuration, engine thrust, or speed as illustrated in the example diagram in this section. The flying technique necessary to achieve this flight path is not mandatory for take-off operations where obstacle clearance is not a problem or where analysis has shown that the clearance required by operating regulations is available using an alternate technique.

MAXIMUM ALLOWABLE TAKE-OFF WEIGHT

R

TAKE-OFF FLIGHT PATH

PRESENTATION (Continued)

Both the gross and the net take-off flight paths may be obtained from the charts. The gross flight path governs the time spent in each climb segment, and is used to determine the actual heights at which transition from one segment to another is made. The net flight path is the gross flight path reduced by one per cent gradient capability. Vertical obstacle clearance must be demonstrated on the basis of the net flight path plus 35 feet. The flight path is completed when a gross height of 1500 feet has been attained, and transition to the enroute configuration completed, unless obstacle height requires further extension of the net flight path.

The obstacle clearance charts show net flight path profiles, reduced by 35 feet, as a function of second segment net gradient. Knowing the distance and elevation difference between an obstacle and "reference zero", these dimensions can be spotted on the appropriate obstacle clearance chart to find the required climb gradient. If the available gradient is sufficient to clear the obstacle, the take-off weight determined by other limitations is satisfactory; otherwise the weight must be reduced to correspond with the required gradient shown on the charts.

When weight is reduced to achieve obstacle clearance, note that the horizontal distance between the obstacle and reference zero increases, since field length required is less. On a sloped runway the obstacle height also changes with respect to reference zero, so an iterative process is required to find the exact minimum gradient and maximum weight for obstacle clearance.

Occasionally the flight path analysis must be extended beyond the flap retraction point to show clearance of high and very distant obstacles which cannot be avoided by turning. For this purpose the Maximum Level-off Height, Third Segment Distance and Final Take-Off Climb charts are included.

For such cases, the maximum take-off weight can be obtained only by calculating and plotting the flight path segment by segment, using the gradients and distances from the various charts, for two or more assumed take-off weights, and interpolating for the maximum weight which will clear the obstacle.

Allowances for fuel burnoff, and performance changes as height is attained, have been accounted for in the flight path charts, so they should be used with brake release gross weights, airport temperatures and airport pressure altitudes, where these variables are chart inputs.

The various segments and other terms relating to the take-off flight path are defined below. These definitions were not included in the Definitions Section because their details apply to the specific airplane model of this flight manual and their meanings could be different for other airplane types.

1. Reference Zero. This is the reference to which the coordinates of the various points in the take-off flight path are referred. It is defined as the end of the take-off distance and 35 feet below the flight path at this point.

MAXIMUM ALLOWABLE TAKE-OFF WEIGHT

TAKE-OFF FLIGHT PATH

PRESENTATION (Continued)

2. First Segment. This segment extends from the 35 foot height to the height at end of gear retraction at a constant V_2 speed. The time for this segment is 18.5 seconds (15.5 second gear retraction time plus 3 seconds delay after lift-off) less the time to flare to 35 feet from lift-off. The First Segment is presented on the Obstacle Clearance charts as a function of second segment net gradient at 400 feet above airport altitude.
3. Second Segment. This segment extends from the end of the first segment to a gross height of at least 400 feet at a constant V_2 speed. The Take-off Climb (Second Segment Gradient) Chart was constructed to account for a gross height of 400 feet. If the Second Segment is extended to a greater height, the same chart may be used provided the additional height increment above 400 feet is accounted for. For example, assume a gross height 900 feet above the airport elevation is required. Since this is 500 feet higher than the chart basis, enter the chart with a temperature 1.0°C less than airport temperature (standard lapse rate of 2.0°C per 1,000 feet) and an altitude 500 feet higher than airport pressure altitude.
4. Maximum Level-off Height. At low climb gradients the airplane cannot take off, climb 1500 feet and accelerate to flaps up within the 5 minute time limit on take-off thrust. The gross level-off height is the maximum height at which the acceleration segment can be scheduled; the corresponding net height is used to check obstacle clearance. Both heights are presented as functions of second segment net gradient at 400 ft. On wet thrust take-offs, both the wet and dry second segment gradients must be read, since the maximum level-off height depends on the change in gradient going from wet to dry thrust.
5. Maximum Wet Thrust Height. (Airplanes with water injection provisions only). This is the maximum height to which the Second Segment can be extended in the 2.5 minute time limit on wet take-off thrust. Both the gross and net height are presented as functions of Second Segment Net Gradient (Wet). For high altitude wet thrust take-offs, the maximum wet thrust height may not exceed 10,000 feet pressure altitude to comply with Engine Water Injection Limitations. For determining obstacle clearance, the second segment climb may be continued at dry take-off thrust to a height which will permit acceleration and flap retraction within 5 minutes total time from brake release.
6. Third Segment. This segment assumes a level flight acceleration during which the flaps are retracted. The speed increases from V_2 to $V_2 + 30$ knots, where flap retraction begins, and thereafter to $V_2 + 50$ knots and flaps up, all at take-off thrust. The Third Segment Distance Chart is presented as a function of second segment net gradient (dry). If the chosen gross level-off height is greater than 400 feet the second segment net gradient must be adjusted for the additional height increment before entering this chart. On wet thrust take-offs the 2.5 minute time limit on wet thrust is assumed to occur at the end of the second segment, therefore the second segment net gradient for dry thrust is always used to enter this chart.
7. Final Take-off Segment. This segment extends from the level-off height to a gross height of 1500 feet or more, at a constant speed of $V_2 + 50$ knots flaps up, with maximum continuous thrust. The Final Take-off Climb gradient chart is constructed for conditions 1500 feet above airport altitude; input temperature and altitude must be adjusted when the chart is used for calculations beyond a gross height of 1500 feet.

MAXIMUM ALLOWABLE TAKE-OFF WEIGHT R

TAKE-OFF FLIGHT PATH

PRESENTATION (Continued)

8. Gross Height - Pressure Altitude Conversion. Obstacle clearance heights are measured vertical distances, and do not necessarily correspond to the indicated change in height on a pressure altimeter under different temperature conditions. The Gross Height - Pressure Altitude Conversion chart is a reversible chart from which the indicated pressure altitudes at which the flight path segments are completed can be determined. Conversely, if take-off flight path procedures are based on pressure altitude indications, the corresponding actual heights may be found from which to construct the segments of an obstacle clearance flight path. Since this chart represents linear mathematical equations depending only on definitions of standard atmosphere, the families of straight lines may be extrapolated as necessary for heights in excess of 1500 feet.
9. Wind Effect on Flight Path. The effect of wind is to increase or decrease the apparent climb gradients or horizontal distances on each segment of the flight path. On the Obstacle Clearance charts this is accomplished by shifting the obstacle distances. When a flight path must be calculated segment by segment, the effect of wind must be considered on each segment. The notes on the various charts with respect to use of wind corrections should be carefully observed, and the Wind Correction chart used when indicated.

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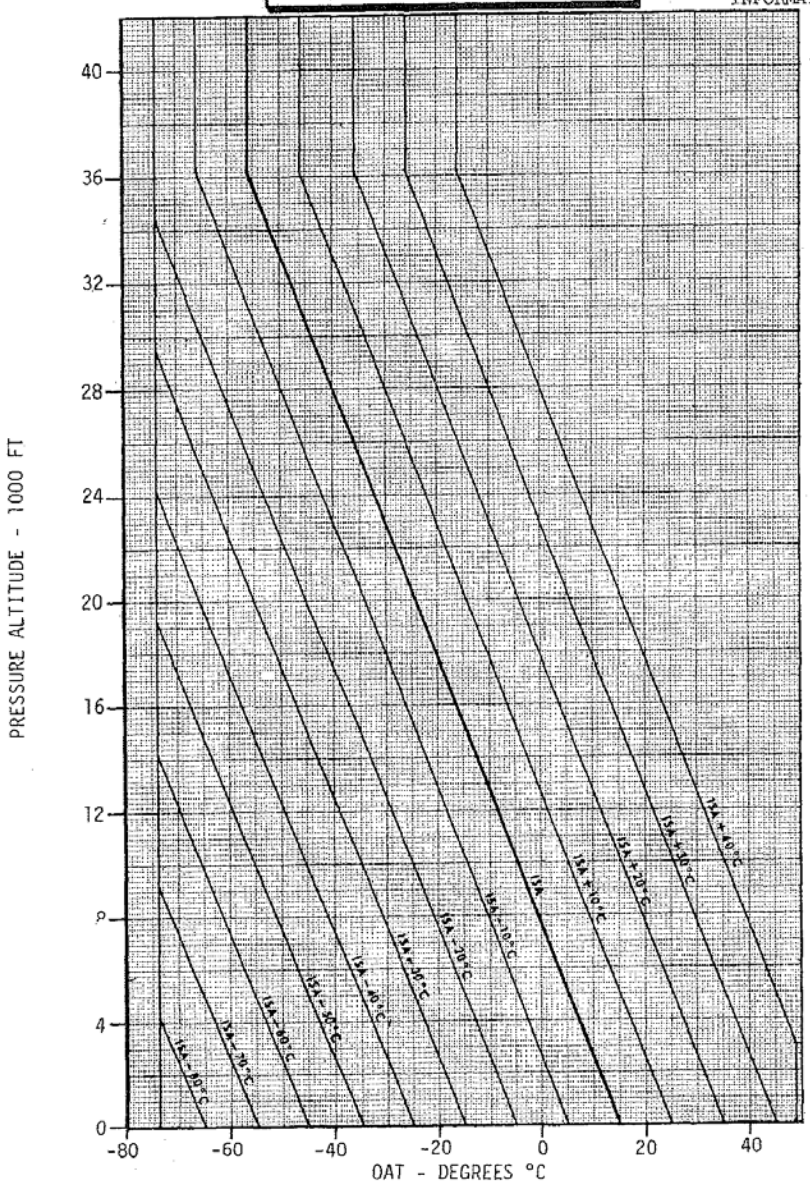
AIRPLANE FLIGHT MANUAL

PERFORMANCE INFORMATION

RELATION OF TEMPERATURE TO ISA



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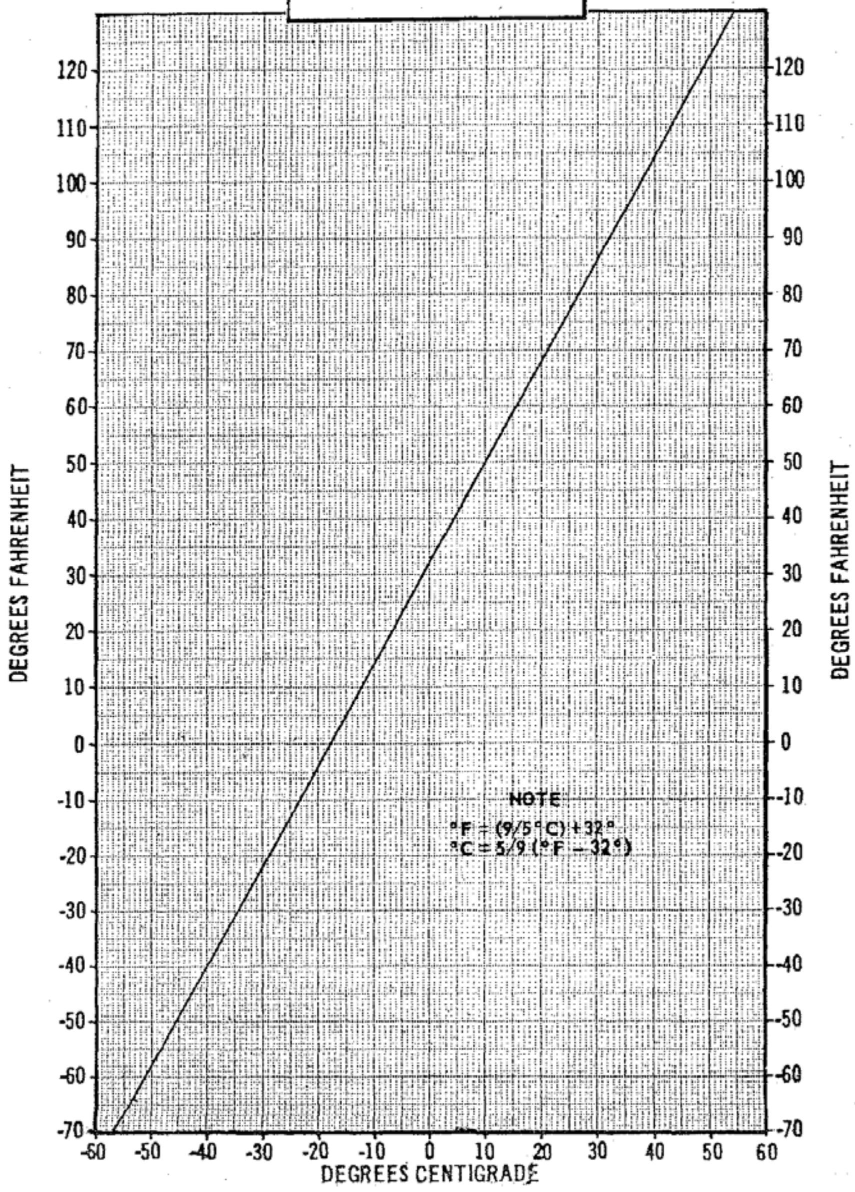
TEMPERATURE CONVERSION CHART



5.0 Wind Component Chart

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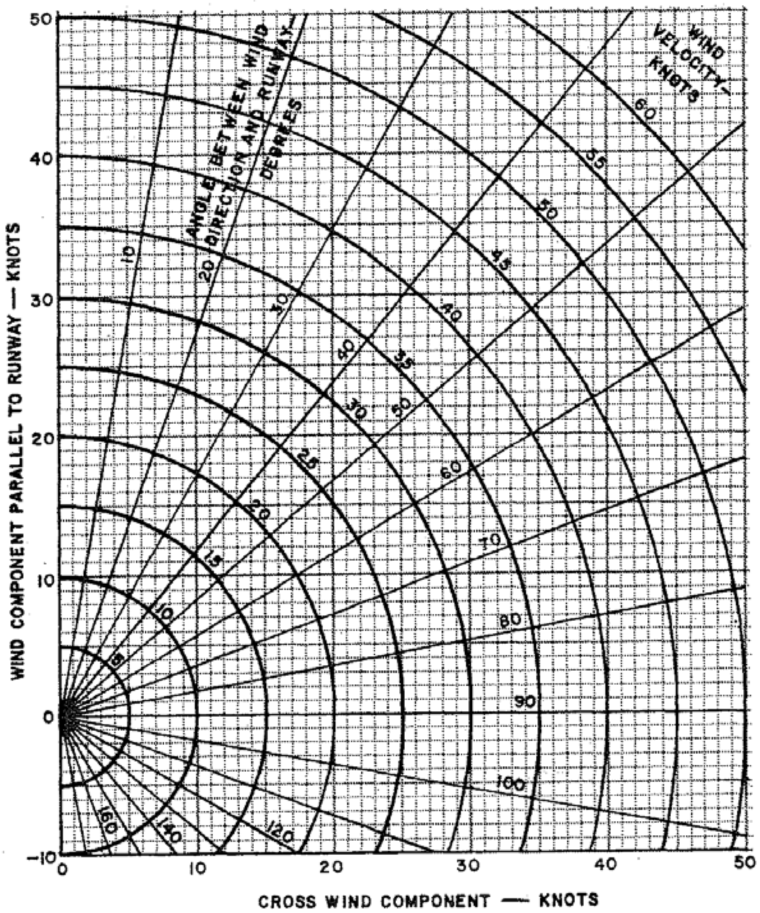
PERFORMANCE
INFORMATION

AIRPLANE FLIGHT MANUAL

WIND COMPONENT

THE MAXIMUM CROSSWIND VALUE HAS NOT BEEN DETERMINED.

FOR PERFORMANCE SCHEDULING, THE FULL HEADWIND COMPONENT OF THE TOWER REPORTED WIND VELOCITY MAY BE USED PROVIDED THE CORRESPONDING CROSSWIND COMPONENT DOES NOT EXCEED 33 KNOTS.



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Section IV Page 10

6.0 Certificate Weight Limitations

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CERTIFICATE
LIMITATIONS

AIRPLANE FLIGHT MANUAL

SECTION I - CERTIFICATE LIMITATIONS

Observance of the limitations contained in Section I of this manual is required by law

W E I G H T   L I M I T A T I O N S

Maximum taxi weight is 336,000 pounds (structural limit).

NOTE: Any weight in excess of maximum inflight weights must be fuel (and water, if installed) consumed during taxi and takeoff. (See After Take-Off, Section III.)

Inflight Weight Flaps Up	Structural Limit	Minimum Fuel Required in Each Tank at 6.5 lb/gal: Outboard Reserve	Outboard Main	Inboard Main
Maximum*	326,000 lb	2855 lb	14,350 lb	25,700 lb
Alternate Maximum	331,600 lb	2855 lb	15,100 lb	25,700 lb

* Each outboard main tank must be full (less fuel used for engine start and two minutes fuel sampling) and contain a minimum of 15,100 pounds of fuel at 6.5 lb per gal when these maximum weights are exceeded.

NOTE: Whenever the fuel density is less than 6.5 lb per gal, the above maximum (or alternate maximum) inflight flaps-up structural weight limits must be reduced by a weight equal to the minimum weight of fuel required in the wing tanks at 6.5 lb per gal minus the actual weight of fuel in the wing tanks.

Maximum landing weight is 247,000 pounds (structural limit) or less as limited by Performance Limitations and Center of Gravity Limits chart, this section, or as defined by Landing Field Length Required, Section IV.

Maximum zero fuel weight is 195,000 pounds.

Maximum inflight flaps up weight at which reserve tanks can be empty is 285,000 pounds.