Flight Characteristics

SECTION VI

TABLE OF CONTENTS

MINIMUM CONTROL SPEEDS.

Minimum control speeds are not determined by a maximum lift coefficient, but by directional stability and estimated regions of buffet. Minimum control speeds for empty and launch weights are shown in figure 6-1.

SPINS AND SPIN RECOVERY.

WARNING

Intentional spins in this airplane are prohibited.

VENTRAL ATTACHED.

Fully developed spins are not apt to occur with the ventral attached, except possibly due to reduced directional stability at an angle of attack in excess of 20 degrees. If there is any yawing or rolling due to this reduced stability and a spin is entered, the stick should immediately be moved in the direction of spin rotation and full opposite rudder (against rotation) should be applied. When the spin has stopped, the stick should be centered and moved forward to prevent a spin in the opposite direction, and the rudder neutralized.

CAUTION

Do not immediately attempt to level the wings by moving the stick against the direction of rotation.

VENTRAL JETTISONED.

With the ventral jettisoned and the airplane at an angle of attack in excess of 17-1/2 degrees, a spin may be developed from which recovery may be difficult or impossible; therefore, jettisoning of this surface should be delayed as long as possible before entering the landing pattern. Recommended recovery is the same as when the ventral is attached: The stick should be moved in the direction of spin rotation and full opposite rudder should be applied. When rotation stops, the stick should be centered and moved forward to prevent a spin in the opposite direction, and the rudder neutralized.

FLIGHT CONTROL EFFECTIVENESS.

PITCH CONTROL.

For flight above approximately Mach 1.4, the maximum normal acceleration obtainable can be limited by the maximum stabilizer deflection available. Maximum normal acceleration can also be limited by an estimated initial buffet effect between Mach .5 and Mach 1.0. Below Mach .5, the limit is imposed by the reduced directional stability at angles of attack above 20 degrees. At low speeds, the angle of attack for buffet onset due to airflow separation on the wing is about 13 degrees. Turbulence behind the vertical stabilizer may cause considerable buffet at any angle of attack. Therefore, buffet onset should not be considered as a stall warning until buffet characteristics have been determined from flight experience.

ROLL CONTROL.

Adequate roll control is available throughout the Mach number range from high-speed flight to landing speeds. Rate of roll is limited to 50 degrees per second when the SAS roll gain selector knob is set on high gain. At lower angle of attack, there is slight favorable yaw (yaw in direction of roll application). As the angle of attack increases above Mach .6, there is a decrease in this yaw. At low Mach numbers and in the transonic region, there is very little change in roll effectiveness with angle of attack. Roll effectiveness increases with an increase in angle of attack above Mach 2.6. Roll coupling does not present a problem with or without SAS, except at extremely high Mach numbers at high altitudes. Roll coupling does not occur at as low an altitude with SAS in as it does with SAS out, and in either case, roll coupling would not occur below approximately 100,000 feet. Maximum rates of roll at other Mach numbers and altitudes are limited by the maximum differential horizontal stabilizer deflection.

MINIMUM CONTROL SPEEDS

GEAR AND FLAPS UP, LOWER VERTICAL STABILIZER ATTACHED

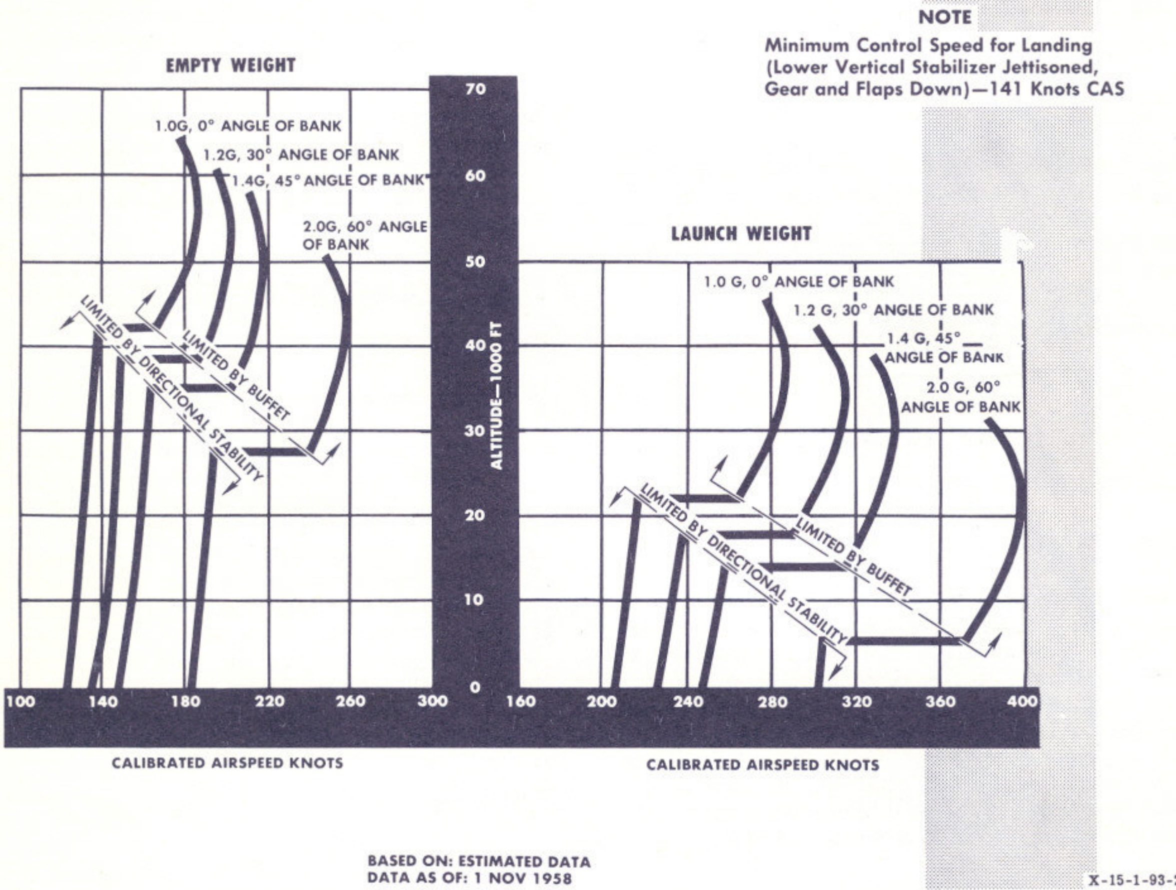


Figure 6-1

YAW CONTROL.

Pilot feel is supplied as a function of surface deflection, and the variation of pedal force with pedal travel is linear. The upper and lower (ventral) vertical stabilizers give good directional control throughout the flight range. The ventral is effective in retaining stability at high angles of attack where the upper vertical stabilizer is partially blanketed by the wing and fuselage. At high Mach numbers and high angles of attack, this increase in effectiveness of the ventral produces an appreciable amount of roll in a direction opposite to the yaw. Although the ventral is jettisoned before landing, the upper vertical stabilizer supplies adequate directional control for low-speed flight up to 17-1/2 degrees angle of attack.

SPEED BRAKES.

At supersonic Mach numbers, in addition to increasing the effectiveness of the vertical stabilizers and improving directional stability, the speed brakes increase longitudinal stability. As angle of attack increases, the effect of the speed brakes on longitudinal and directional stability also increases. In addition to improving stability at high Mach numbers, the speed brakes obviously provide additional drag to the airplane. At subsonic Mach numbers, the speed brakes reduce both the longitudinal and the directional stability. During the glide, which would occur at lower altitudes, the basic drag of the airplane gives high rates of descent, and the increase in rate of descent due to use of the speed brakes is undesirable.

FLIGHT CONFIGURATION CHARACTERISTICS.

LAUNCH.

Launch from the carrier airplane can be accomplished satisfactorily for 1 G flight conditions during carrier airplane acceleration, climb, and cruise as well as the design launch conditions.

WARNING

- If a -5-degree stabilizer deflection is used for an empty-weight launch, the airplane will rotate about the forward part of the pylon, slide outboard, and hit the engine nacelles and wing tip. Full-weight launches with -5-degree stabilizer deflection are acceptacle; however, it is recommended that a stabilizer deflection of zero to +5 degrees be used for all launches.
- The airplane rolls outboard upon release from the carrier. Roll control is very sensitive at this point, and no more than 2 degrees differential stabilizer deflection should be used if a correction is to be made.

GLIDE.

Figure 6-2 presents rate-of-descent - Mach number combinations for maximum glide distances at various altitudes and gross weights. A sample problem is provided with the chart.

RATE OF DESCENT AND MACH NUMBER FOR MAXIMUM

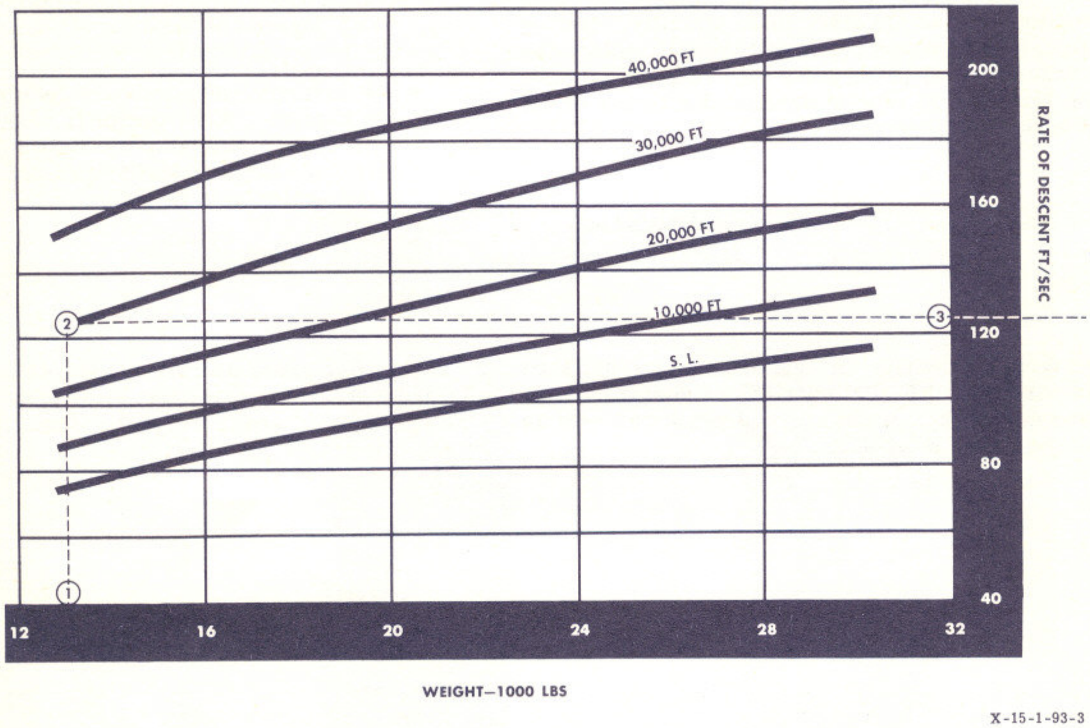
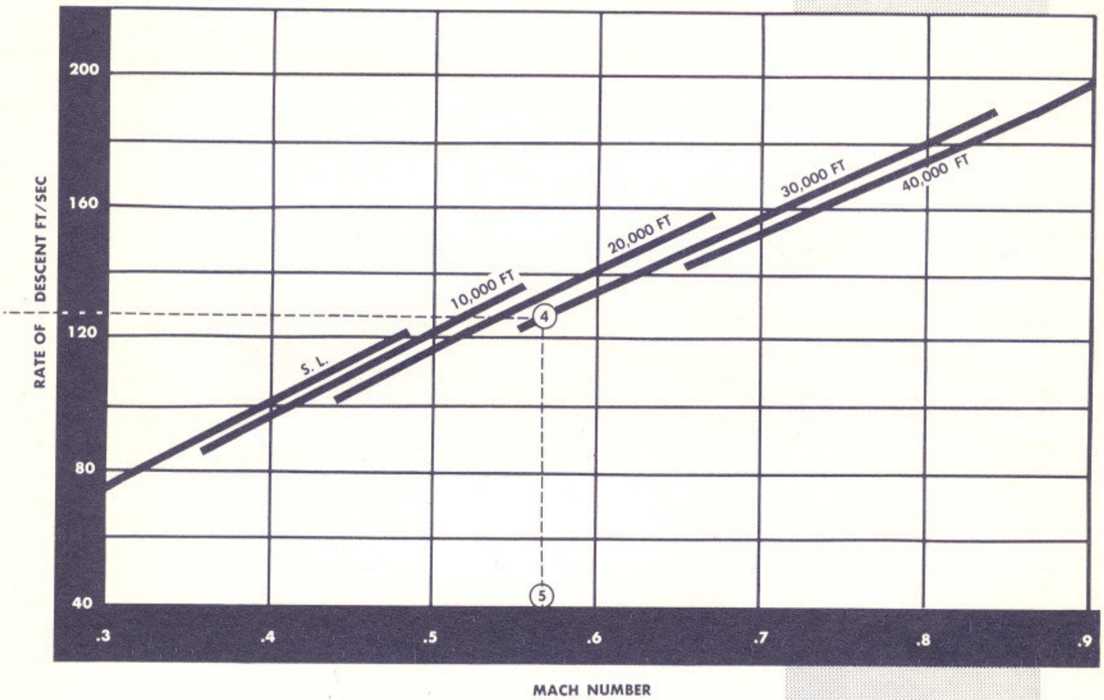


Figure 6-2

GLIDE DISTANCES

BASED ON: ESTIMATED DATA
DATA AS OF: 1 NOV. 1958



1. ENTER CHART FOR GROSS WEIGHT AT START OF GLIDE (FOR EXAMPLE, 13,000 LBS).
2. MOVE VERTICALLY UP TO CURVE REPRESENTING ALTITUDE AT START OF GLIDE (30,000 FEET).
3. MOVE HORIZONTALLY TO RIGHT TO RATE OF DESCENT LINE (125 FEET/SECOND).
4. CONTINUE HORIZONTALLY TO RIGHT TO ALTITUDE AT START OF GLIDE (30,000 FEET).
5. DROP VERTICALLY TO READ MACH NUMBER (.57) TO OBTAIN 125 FEET/SECOND RATE OF DESCENT.

X-15-1-93-4