NAVWEPS 01-245FDC-1

NATOPS Flight Manual

NAVY MODEL

RF-4B
AIRCRAFT

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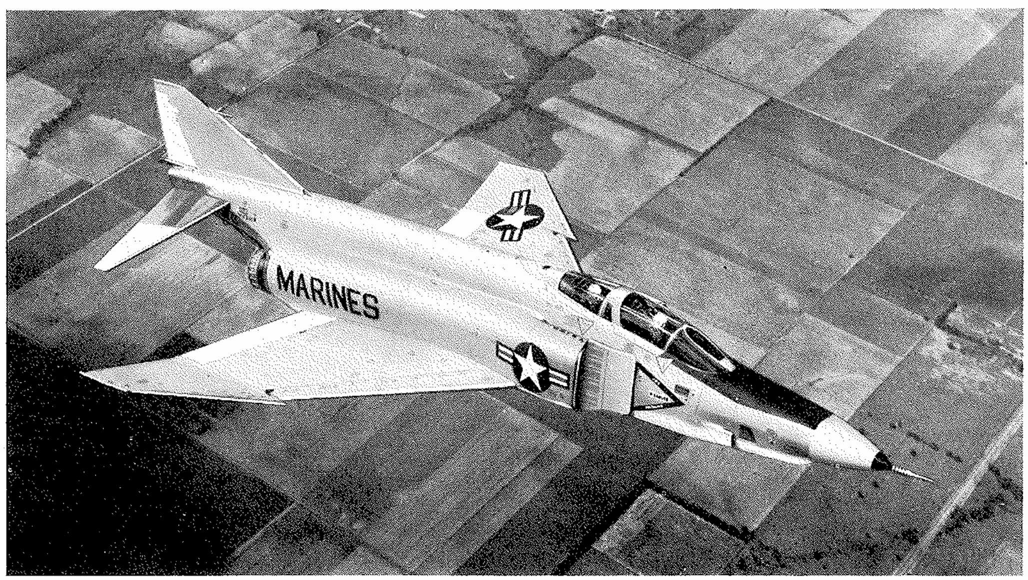

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15 December 1965

Stall Speeds

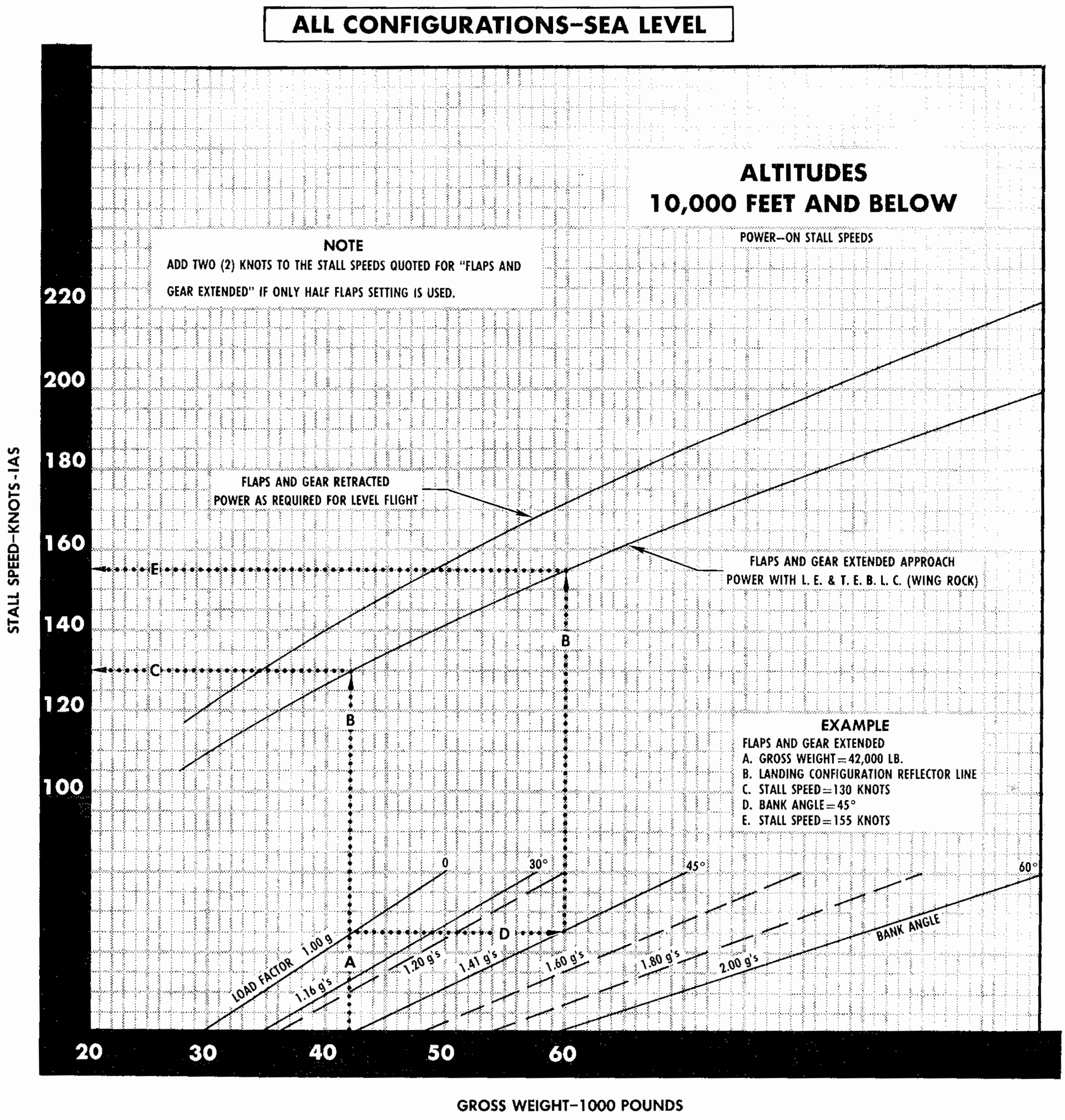


Figure 4-1

INVERTED SPINS

The inverted spin is flatter (nose within approximately 30° of the horizon) and is less oscillatory than the upright spin. An inverted spin may be encountered following improper control use in a post-stall gyration out of a vertical or inverted climb. The spin is not stable in that pro-spin controls (rudder and/or aileron with the spin) must be held to continue the spin. The inverted spin is typified by less than zero "g" and an indicated angle of attack of zero (0) units. Spin direction can be determined visually by the apparent yaw motion of the airplane and/or by deflection of the turn needle.

RECOVERY PROCEDURES

The best spin prevention procedures is to avoid stalling the airplanes. Stall is prevented by proper control of angle of attack and careful use of controls at slow airspeeds. When faced with an unusual attitude and decaying airspeed in an approach to stall, use

EXTERNAL STORE EFFECTS

All spin tests and demonstrations were performed without external stores and at a mid CG range (31.5 to 32.7% MAC). External stores and CG variation should not materially effect the spin recovery procedures. Tests also show that speed brake position has little effect. It is recommended that stores not be jettisoned in the spin.

ALTITUDE CONSIDERATIONS

Altitude loss in a steady state spin is approximately 2500 feet per turn. It usually takes 5000 feet to break a steady state spin and regain control speed plus another 10,000 feet to pull out holding onset buffet (no more than 15 units angle of attack). Total recovery altitude is approximately 15,000 feet. Recovery from a post-stall gyration may take considerably less altitude depending upon the extent and nature of the gyration. If the pilot considers that there is insufficient altitude for recovery, the crew should eject at the earliest possible moment.

ANGLE OF ATTACK

The angle of attack indicator is the primary instrument to verify uncontrolled flight/spins. During upright uncontrolled flight/spins, angle of attack will indicate 30 units. During inverted uncontrolled flight/spins, angle of attack will indicate 0 units. During uncontrolled flight, when these indications are observed, initiate appropriate spin recovery procedure immediately. See figure 4-2 for Angle-of-Attack Conversion Charts.

STABILITY AND CONTROL

In discussing stability and control, it must be realized that a large variation exists throughout the flight envelope. Stability varies with Mach number and also with c.g. location. Control effectiveness is also effected by Mach number, but just as much, if not more so, by "q" (dynamic pressure). The effects of Mach number, c.g. location, and "q" as pertaining to stability and control will be discussed under Subsonic, Transonic, and Supersonic Flight regions.

SUBSONIC REGION

Landing Configuration

In this configuration, the airplane exhibits positive longitudinal static stability except for an area about 10 knots before stall where a mild stick force lightening occurs. This is followed by a regaining of static stability after the stall so that if back pressure is released, the airplane recovers by itself. In the speed range between 130-180 knots, where most landing configuration flying is done, the airplane demonstrates almost neutral stick force stability up to about 150 knots and mildly positive stick force stability above this speed. This is due to control system friction and rather weak stick centering at this low "q". Stabilator effectiveness is reduced with full flaps due to an aft center-of-pressure shift and a change in the downwash pattern over the tail. However, adequate effectiveness still remains for all known configurations. Since ground effect also decreases stabilator effectiveness, the aft stick stop may be bumped during flare-out from a high sink rate landing. Stabilator effectiveness is not sufficient to hold the nose up after landing since the center of rotation is now about the main gear instead of the c.g. Lateral directional control response in the landing configuration is good; however, the adverse yaw resulting from the strong positive dihedral effect causes roll rate to be somewhat decreased when high roll rates are commanded without use of coordinating rudder. The ARI (Aileron-Rudder Interconnect) feeds in rudder automatically to counteract yaw so that when large amounts of aileron are being used, the turns will be coordinated. Except for unusually asymmetrical external loadings or very rough gusty air, only small lateral control motions are required for landing. The approach to stall is characterized by a decrease in lateral stability which becomes evident by a mild wing-rock (±5-10 degrees) which gets progressively worse as speed is reduced.

Clean Configuration

Lateral and directional control response is good in the clean configuration and the airplane exhibits good pilot feel. Rate of roll is quite high in this area and directional stability is strong enough so that ball-centered turns are made without the use of rudder. During abrupt aileron rolls, where some adverse yaw is experienced, the yaw damper is effective in keeping the ball centered.

TRANSONIC REGION

High Altitude

In the transonic region, longitudinal static stability becomes more positive and stabilator effectiveness somewhat reduced, resulting in slightly higher maneuvering stick force gradient. Transition from transonic to subsonic speeds while holding "g's" on the airplane results in a mild to moderate nose rise. If corrective action is not taken, this could place the airplane in buffet at the higher altitudes or cause a significant load factor increase at the lower altitudes. This is characteristic of most swept-wing airplanes and is a result of going from an area of higher stability and lowered stabilator effectiveness to an area of lowered static stability and higher stabilator effectiveness. Speed brakes increase the nose rise tendency during transition from transonic to subsonic speeds. Lateral and directional control in the transonic region is about the same as that experienced in the subsonic region except that roll rate capability is higher. Roll rates are highest in the transonic regions; however, in both transonic and subsonic regions, roll rate resulting from full aileron is much too great for any practical use.

Low Altitude

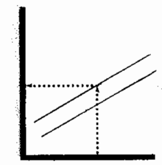
Transonic flight at low altitude presents low stick force gradient and high stabilator effectiveness which results in an area of high sensitivity and possible

LANDING SPEEDS

AIRPLANE CONFIGURATION
ALL DRAG INDEXES
FULL FLAPS, GEAR DOWN

REMARKS
ENGINE(S):(2) J79-GE-8
ICAO STANDARD DAY

GUIDE



DATE: 15 MARCH 1965
DATA BASIS: ESTIMATED

FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL

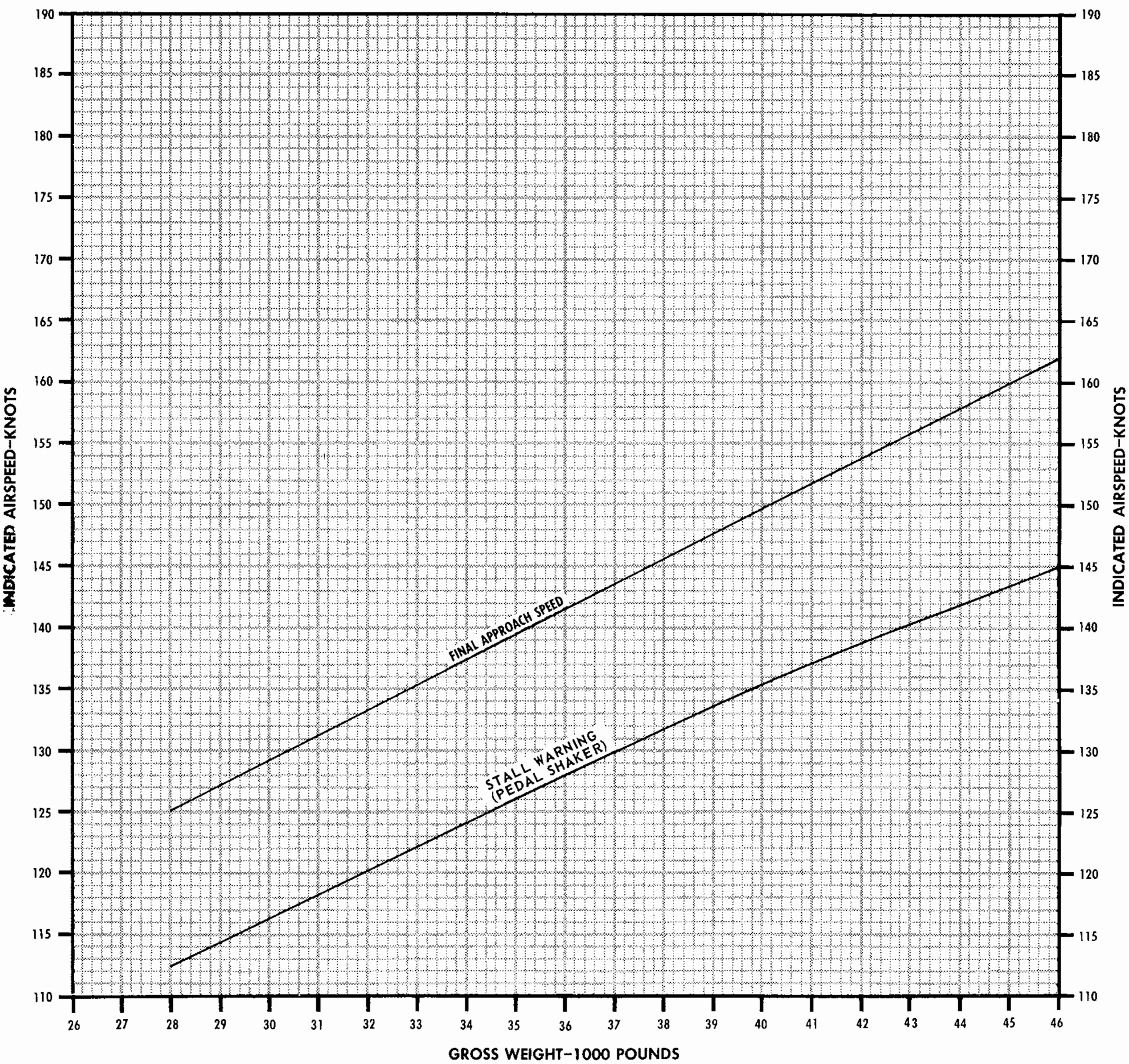


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Figure 11-36