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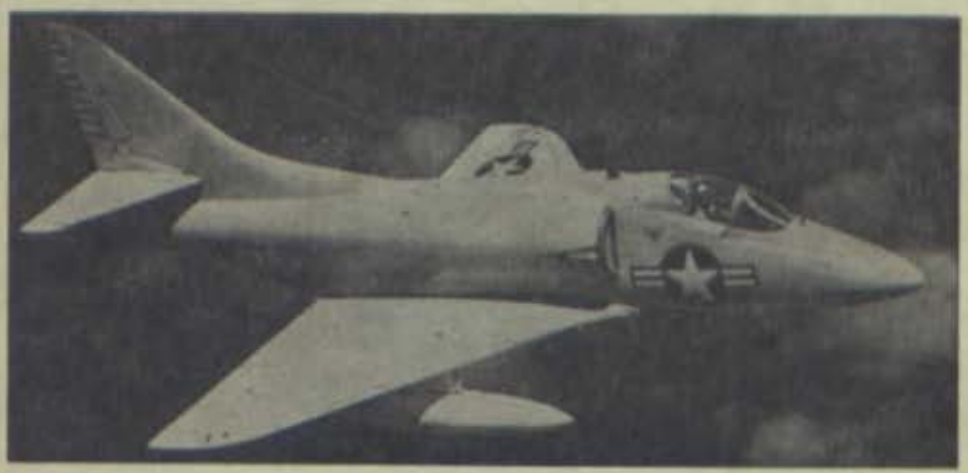
Second Revision

14

NAVAL AIR TRAINING AND OPERATING PROCEDURES STANDARDIZATION MANUAL

A-4A/B/C



DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS

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WASHINGTON 25, D.C.

15 October 1963

LETTER OF PROMULGATION

1. The Naval Aviation Training and Operating Procedures Standardization Program (NATOPS) is a positive approach towards improving combat readiness and achieving a substantial reduction in the aircraft accident rate. Standardization, based on professional knowledge and experience provides the basis for development of an efficient and sound operational procedure. The standardization program is not planned to stifle individual initiative but rather, it will aid the Commanding Officer in increasing his unit's combat potential without reducing his command prestige or responsibility.

2. This Manual is published for the purpose of standardizing ground and flight procedures and does not include combat tactics. Compliance with the stipulated manual procedure is mandatory. However, to remain effective this manual must be dynamic. It must stimulate rather than stifle individual thinking. Since aviation is a continuing progressive profession, it is both desirable and necessary that new ideas and new techniques be expeditiously formulated and incorporated. It is a user's publication, prepared by and for users, and kept current by the users in order to achieve maximum readiness and safety in the most efficient and economical manner. Should conflict exist between this manual and other publications, this manual will govern.

3. Check lists and other pertinent extracts from this publication necessary to normal operations and training should be made and may be carried in Naval aircraft for use therein. It is forbidden to make copies of this entire publication or major portions thereof without specific authority of the Chief of Naval Operations.

4. This NATOPS Manual is effective upon receipt. It supersedes the NATOPS Manual A-4A/B/C (REV. 1) of 18 January 1963, which shall be destroyed without report.

J. S. THACH
Vice Admiral, USN
Deputy Chief of Naval Operations (Air)

RECORD OF CHANGES

Change No.	Date of Change	Date Entered	By Whom

List of Effective Pages

SUBJECT MATTER	PAGE NUMBERS	EFFECTIVE PAGES
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RECORD OF CHANGES	II	ORIGINAL
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A-4 NATOPS MANUAL

CONTENTS

CHAPTER I

Indoctrination

100 INTRODUCTION

This Manual is applicable to A-4 aircraft. Chapter I establishes minimum requirements for training, initial qualification, and currency in specified areas. Subsequent chapters provide the operational information considered necessary to ensure safe and efficient operation of the A-4, when used in conjunction with the Flight Manual and the Naval Warfare Publications series. Unit Commanders are authorized to waive flight hour minimums and/or OFT/WST training requirements where recent experience in similar models warrants. However, adequate preparation and guidance of the pilot for the initial flight and subsequent flights so that he safely attains and maintains a reasonable degree of proficiency in the operation of the A-4 is of prime importance. Too often, under pressure of operational commitments, this groundwork is abbreviated or deleted. This can result only in a deterioration of individual and unit effectiveness. For this reason, Commanding Officers must continuously ensure adherence to these basic criteria whenever possible. Procedures for submitting changes and requesting waivers are contained in OPNAV Instruction 3510.9 (current revision).

110 GROUND TRAINING

Ground Training should be continuous throughout the career of the A-4 pilot. The overall syllabus will vary according to local conditions, facilities, directives from higher authority, and the Unit Commander's estimation of squadron readiness. However, there are certain specific requirements which must be met to ensure that the pilot is properly indoctrinated and briefed prior to flight.

a. Ground Training Requirements. Ground Training and other related requirements for all pilots prior to familiarization flights in the A-4 are as follows:

1. Current medical clearance.
2. Aviation physiological training as set forth in OPNAV Instruction 3740.3 (current revision).
3. NAMO Pilot Familiarization course (if available) or equivalent lectures by RCVG, operating A-4 squadron, or other qualified personnel.
4. Lectures from RCVG, operating A-4 squadron, or other qualified personnel on the following subjects:

   Flight characteristics (including stalls and spins) and operating limitations.

   Use of safety and survival equipment and related procedures.

   Aircraft preflight, ground handling, hand signals, and normal flight procedures.

   Cockpit troubleshooting procedures.

   Emergency procedures.

   Past aircraft accidents as an aid in preventing future accidents of like nature.

   Local Course Rules, flying area, instrument procedures, and SAR facilities.
5. Blindfold cockpit check.
6. Minimum of 2 hours of flight and emergency procedures simulation in the OFT/WST within the two week period prior to the first Fam. flight. If OFT/WST is not available, a comprehensive oral and/or written examination on emergency procedures must be substituted.
7. Practice dry-run ejection accomplished in appropriate type A-4 ejection seat in complete flight gear.
8. Supervised Engine Start and Taxi Checkout.

9. Satisfactory completion of examinations on A-4 operating limits, normal and emergency procedures, course rules, aircraft systems, and NATOPS Manual.
10. Aviators' required reading pertinent to flight.

b. Ground Training Subjects. The following subjects should be included in the normal Ground Training Syllabus, depending upon the squadron mission, model aircraft, and qualifications of the pilot:

(1) Technical Training.
1. Flight Manual.
2. Auxiliary equipment.
3. Flight safety equipment.
4. Aircraft servicing procedures.

(2) Mission Training.
1. Bombing and rocket theory and pipper control.
2. Glide bombing, rocket, and missile procedures.
3. Strafing procedures.
4. LABS equipment.
5. LABS/laydown delivery.
6. Patterns and procedures for local targets.
7. Close air support and GCBS procedures.
8. The A-4 NWDS and CWDS to NWIP 41-3.
9. Special weapons.
10. Aviation ordnance.
11. Weapons loading.
12. High and low altitude navigation.
13. APG 53 Radar operating procedures.
14. Aerial refueling.
15. Night flying.
16. MLP and carrier procedures.
17. Pertinent publications in the NWP and NWIP series.

(3) Instrument Training.
1. Instrument flight (general).
2. REST Computer.
3. Airways navigation.
4. Local climbout and penetration.
5. GCA/CCA.
6. Special equipment.

(4) Flight Safety.
1. AAR reviews.
2. Aircraft emergencies: Practiced whenever possible in the OFT/WST. Where such a trainer is available, its use is mandatory during familiarization, and quarterly thereafter. In addition, a refresher hop or an oral or written review of emergency procedures is required after any layoff from flying in excess of four weeks.
3. Use of barricade/emergency field arresting gear.

(5) Intelligence.
1. Mission planning material.
2. Orders of battle.
3. Aircraft and ship recognition.
4. Escape and evasion.
5. Authentication procedures.

(6) Survival.
1. Physiological and medical aspects.
2. First aid.
3. Survival on land/sea.
4. Pilot rescue techniques.

(7) Communications.
1. Radio communications.
2. Visual communications (including flashing light Morse code refresher).

120 FLIGHT QUALIFICATIONS

Minimum requirements for qualification and currency are set forth below for each phase of flight. They are established as such with the considerations that operational commitments will not be unduly restricted and that the individual pilot will not be deprived of the opportunity to attain the overall capability. Where these considerations are not a factor, Command prerogative should be exercised to increase minimums when desired. Unit Commanders are authorized to waive these minimum requirements and/or OFT/WST training where recent experience in similar models warrants.

a. Familiarization.
1. Prerequisite to flight is compliance with the Ground Training requirements set forth in Section 110a.

2. Comply with the general conditions specified in Section 410.
3. Initial checkout flights will consist of a minimum of 5 hours.

b. Instruments. Minimum requirements prior to actual instrument flight are as follows:

1. 10 hours in A-4 aircraft in the last 6 months.
2. At least one A-4 flight in the last 30 days.
3. Current Instrument Card.
4. Demonstration of instrument proficiency in assigned model.

c. Weapons and Mission Training. Prerequisites for weapons and mission training are:

1. Completion of appropriate training set forth in Section 110b.
2. Minimum of 10 hours in the A-4.
3. For weapons delivery or mission training requiring a high-speed low-level run-in, a minimum of 15 hours in A-4 aircraft.

Basic qualifications and currency requirements for various missions and weapons deliveries are set forth in OPNAV Instruction 03740.8 (current revision).

Minimum requirements prior to night weapons training are as follows:

1. Same as night-flying minimums, except 50 hours in A-4 aircraft and 10 hours in the last 30 days.
2. Day-proficient in type delivery.
3. Familiar with target area and procedures.

d. Night Flying. Minimum requirements prior to night flights are as follows:

1. Current Instrument Card.
2. 10 hours in A-4 within the last 3 months.
3. For carrier based operations, one day carrier landing will be required prior to the night carrier landing if 10 days or more have elapsed since the last night arrestment.

e. FMLP and Carrier Qualification. Minimum requirements prior to day FMLP are:

1. 10 hours in A-4 aircraft and one flight in the last 30 days.
2. Familiarity with the slow-flight characteristics of the aircraft.
3. Proficiency in instrument flying in assigned model.
4. Proper briefing in day FMLP procedures.

Minimum requirements prior to night FMLP are:

1. Demonstration of proficiency in day FMLP.
2. 5 hours night time in the A-4.
3. One A-4 flight in the last 10 days; otherwise one day flight will be required prior to the night FMLP period.
4. Proper briefing in night FMLP procedures.

Minimum requirements prior to day carrier qualification are as follows:

1. Certification by the Unit Commander as day Field Mirror Landing qualified.
2. 50 hours in A-4 aircraft.
3. Proper briefing in carrier landing, catapult, and deck procedures.

Minimum requirements prior to night carrier qualifications are as follows:

1. Current day carrier qualification in the A-4.
2. 10 hours night time in the last 6 months in the A-4.
3. Certification by the Unit Commander as night Field Mirror Landing qualified.
4. Proper briefing in night carrier landing, catapult, and deck procedures.
5. A minimum of two satisfactory arrested landings shall be completed during the daylight hours preceding night qualification landings.

For day and night FMLP qualification, the exact number of FMLP periods required depends on the experience and ability of the individual pilot, and will be determined by the Unit Commander. Minimum carrier landings for initial qualification are:

Day

1. 2 touch-and-go landings.
2. 10 arrested landings.
3. 2 day CCA approaches from Marshall point.

Night

1. 6 night arrested landings.
2. 2 night CCA approaches from Marshall point (to be conducted only

after satisfactory completion of day CCA qualification).

For maintaining carrier qualification, qualification is considered current for six months after the date of the last carrier landing in type. Refresher requirements to requalify are as follows:

1. Six to twelve months: four day and two night arrested landings.
2. Over twelve months: initial requirements, both day and night.

f. Cross-Country Flight. Minimum requirements prior to cross-country flight are as follows:

1. Current Instrument Card.
2. 15 hours in A-4 to include 3.0 hours instrument time.
3. Jet Flight Log. (Kneeboard card will be submitted for Command approval.)
4. Flight packet, which includes security, accounting, servicing data, and accident forms.
5. Familiarity with aircraft servicing, starter-probe installation, and stowage.

130 FLIGHT CREW REQUIREMENTS

(Not Applicable)

140 PERSONAL FLYING EQUIPMENT REQUIREMENTS

The following flying equipment shall be carried or worn on every flight:

1. Fire-retardant, high-visibility flight suit. (Khaki suit may be worn in combat areas.)
2. Identification tags.
3. Flight gloves.
4. Flight safety boots/field shoes (ankle-high lace type).
5. Anti-buffet helmet adorned with high-visibility paint or scotch light tape (in noncombat areas).
6. MK IIIC life preserver with whistle, dye marker, compass, shark chaser, and two MK 13 MOD O Day-and-Night Distress Signals.
7. Sheath knife in a special canvas pocket, sewn to the torso harness in such a manner that the chest strap passes through the sheath.
8. Approved personal survival kit (PSK-2 or SEEK-1).
9. Parachute.
10. Oxygen mask.
11. Anti-"g" suit.
12. Integrated torso harness.
13. Exposure suit on all overwater flights when the water temperature is 59° F. or below, or OAT at 32° F. or below, or the combined air/water temperature is 120° F. or below. During daylight, when within gliding distance of land, exposure suit need not be required when the water temperature is above 50° F. Operational Commanders (COMFAIR's, COMFAIRWING's, COMCARDIV's, COMAEWING's and CO's of CV for ISE) are authorized to waive the requirement for wearing all types of exposure suits if the possibility exists that high ambient cockpit temperature could cause extreme debilitation through excess loss of body fluids. Wet suits are authorized for rescue aircrewmen.
14. Pistol with tracer ammunition for all overwater flights, night flights, and flights over sparsely populated areas. An approved signalling device is authorized as a substitute for the pistol when operational and/or security conditions warrant.
15. One-cell flashlight attached to torso harness.
16. Two-cell flashlight with red lens for all night and cross-country flights.
17. Other survival equipment appropriate to the climate or required by any unusual conditions that may be peculiar to the area.

All survival equipment will be secured in such a manner that it is easily accessible and will not be lost during ejection or upon landing.

CHAPTER II
Shore Based Procedures

200 GENERAL

Shore based training will be directed toward preparation for deployment, with the exception of Administrative Commands (including the RCVG's). These preparations will include intensive weapons training, culminating in competitive exercises and the maintenance of pilot proficiency in carrier landings and/or short field operations, if required.

210 SCHEDULING

The Commanding Officer or his designated representative is responsible for the promulgation of the flight schedule, when based ashore. The flight schedule is an order of the Commanding Officer. It shall be followed rigidly. Variations require the approval of the Commanding Officer or his designated representative.

220 BRIEFING

Briefings will be conducted using a prepared briefing guide and the appropriate mission card. The briefing shall cover those items pertinent to the specific mission assigned. Any format which is complete, concise, and orderly, and which can be readily used by the Flight Leader as a briefing guide will be suitable. Each pilot will maintain a kneepad and record all data necessary to successively assume the lead and complete the assigned mission. This, however, does not relieve the Flight Leader of the responsibility for all pilots in the operation and conduct of the flight.

The briefing guide will include the following items, when applicable:

a. General.
   1. Aircraft assigned, call signs, event number, and deck spot.
   2. Fuel load, stores, and aircraft gross weight.
   3. Engine start, taxi, and takeoff times.
   4. Rendezvous instructions, takeoff distance and speed, line speed.

b. Mission.
   1. Primary.
   2. Secondary.
   3. Operating area/target.
   4. Control agency.
   5. Time on station or over target.

c. Navigation and Flight Planning.
   1. Duty runway/predicted Foxtrot Corpen for launch and recovery, and position in the force.
   2. Climbout.
   3. Operating area procedures and restricted areas.
   4. Mission plan, including fuel/oxygen management and PIM.
   5. Bingo/low state fuel.
   6. Marshal/holding (normal and emergency).
   7. Penetration procedures and minimums.
   8. GCA/CCA procedures and minimums, missed approach.
   9. Recovery: course rules, pattern, breakup, landing, waveoff.
   10. Divert and emergency fields/ready deck.

d. Communications.
   1. Frequencies.
   2. Controlling agencies.
   3. Radio procedure and discipline.
   4. ADIZ procedures.
   5. IFF/SIF.
   6. Navigational aids.
   7. Hand/light signals.

e. Weapons.

1. Loading.
2. Arming.
3. Special routes because of ordnance aboard.
4. Pattern.
5. Armament switches.
6. Aiming point/sector setting.
7. Run-in/entry airspeed.
8. Minimum release/pullout altitudes.
9. Duds, hung-ordnance procedures, dearming, jettison area.
10. Safety.

f. Weather.

1. Local area, en route, and destination (existing and forecast).
2. Weather at alternate/divert fields.
3. Winds, jetstream, temperature, and contrail band width.

g. Emergencies.

1. Takeoff aborts.
2. Radio failure.
3. Loss of NAVAIDS.
4. Loss of visual contact with flight.
5. Lost plane procedures.
6. Downed pilot and SAR.
7. Aircraft emergency procedures and system failures.

h. Air Intelligence and Special Instructions.

1. Friendly/enemy force disposition.
2. Current situation.
3. Targets.
4. Reports and authentication.
5. Escape and evasion.
6. Lookout doctrine.
7. Safety precautions.
8. Succession to the lead.

230 LINE OPERATIONS

a. Preflight Inspection and Prestart Checks. Pilots shall perform Preflight Inspection and Prestart Checks of the aircraft as described in the appropriate Flight Manual. They shall ensure that all ejection seat safety pins have been removed prior to starting the engine.

b. Starting and Poststart Procedures. The start shall be accomplished in accordance with the Flight Manual, with the exception that the throttle is moved to IDLE 6 seconds after GTC air is supplied. At field elevations above 3000 feet MSL, move throttle to IDLE at 4 seconds or sooner to prevent wet starts. Poststart Checks shall be accomplished as described in the Flight Manual. Additional checks and hand signals for use between pilot and Plane Captain for Starting and Poststart Checks are contained in Table 2-1. These signals have been designed to work equally well, whether shore based or carrier based, and in daylight or darkness. Standard signals from Chapter VI of this Manual or from NWP 41(A) will apply in other cases. During night operations, extreme care must be taken to be positive with all signals. In this regard, when using the flashlight to illuminate a hand which is giving a signal, always direct the flashlight away from the person being signalled.

STARTING AND POSTSTART SIGNALS

SIGNAL		MEANING	RESPONSE	
DAY	NIGHT	DAY AND NIGHT	DAY	NIGHT
1. Pilot holds one finger vertically.	Same.	Start GTC.	P/C executes.	Same.
2. Plane Captain holds two fingers vertically, then points to: Pilot (for pilot-controlled start) or	Same.	GTC is up to speed and READY light is lit. GTC hose connected. 1. This will be a pilot-controlled start.	None.	Same.

Table 2-1. Pilot-to-Plane Captain Signals. (Sheet 1)

SIGNAL		MEANING	RESPONSE	
DAY	NIGHT	DAY AND NIGHT	DAY	NIGHT
2. (Cont.) Self (for ground-controlled start). NOTE 2		1. This will be a ground-controlled start		
3. Pilot holds two fingers vertically.	Same.	1. If pilot-controlled start, START-ABORT switch is depressed. 2. If ground-controlled start, P/C open GTC air valve.	P/C returns rotating two-finger signal when GTC hose inflates.	P/C rotates flashlight vertically when GTC hose inflates.
4. Pilot holds three fingers vertically.	Same.	1. Pilot-controlled start: START-ABORT switch has popped up. P/C remove starting probe. 2. Ground-controlled start: Engine R. P. M. is midway between START and IDLE. P/C close GTC air valve and remove starting probe.	1. P/C checks for GTC hose collapse, removes starter probe, and secures access panel. 2. P/C closes GTC air valve, checks for hose collapse, removes starter probe, and secures access panel.	Same.
5. If necessary, P/C attract pilot's attention by waving arms over head. Give "cut" signal by slashing motion of index finger across throat.	If necessary, P/C attract pilot's attention with flashlight. Give "cut" signal by repeated slashing of flashlight across throat.	Secure start/cut engine.	Pilot move throttle to OFF.	Same.
6. Pilot makes opening and closing motion of thumb and forefinger, with remaining fingers extended.	Same.	P/C flash generator field.	P/C executes.	Same.
7. P/C gives "OK" signal by forming circle with thumb and forefinger, with remaining fingers extended.	Same.	Hydraulic pressure is 3000 p.s.i. on wheel well gauge/gauges.	Pilot acknowledges with "thumbs-up".	Pilot move horizontally-held flashlight up and down several times.

Table 2-1. (Sheet 2)

SIGNAL		MEANING	RESPONSE	
DAY	NIGHT	DAY AND NIGHT	DAY	NIGHT
8. A-4A/B ONLY: P/C points two fingers at eyes.	Same.	Approach and AOA indexer lights check. Pilot depress press-to-test button on AOA/LABS timer control panel. P/C depress plunger of retraction-release microswitch on left main landing gear for period of about 10 seconds.	Pilot and P/C execute. Pilot check indexer lights for illumination.	Same.
9. P/C holds vertical fist in front, makes large horizontal circle with fist. NOTE 2	Same, except with vertically held flashlight pointed upward. NOTE 2	Pilot move all controls through full travel, checking for proper throw and feel, no hydraulic ladder lights on when flight controls are moved rapidly. Then position flight controls as follows: full left rudder, stick full aft and port.	Pilot execute. P/C check control surfaces for correct deflection.	Same.
10. P/C holds hand in front, palm down, and makes: Open, or Closing motion with thumb and fingers in alligator-mouth fashion. NOTES 2 & 3	Same. NOTES 2 & 3	1. Lower flaps. 2. Raise flaps.	Pilot execute. P/C check both flaps for: 1. Full deflection and security. 2. Full retraction and security. If satisfactory, give pilot "thumbs-up" after check is complete.	Same.
11. P/C gives previous signal, followed immediately by "plus" sign formed by index fingers. NOTES 2 & 3	Same. NOTES 2 & 3	Pilot raise or lower flaps to 1/2 deflection as signalled.	Pilot execute. P/C check both flaps for 1/2 deflection and security. If satisfactory, give pilot "thumbs-up" after check is complete.	Same.
12. P/C holds hand in front, palm vertical, and makes: Open or Closing motion with thumb and fingers in alligator-mouth fashion. NOTES 2 & 3	Same. NOTES 2 & 3	1. Extend speedbrakes. 2. Retract speedbrakes.	Pilot execute. P/C check both speedbrakes for: 1. Full extension, leaks, security. 2. Full retraction. If satisfactory, give pilot "thumbs-up" after check is completed.	Same.

Table 2-1. (Sheet 3)

SIGNAL		MEANING	RESPONSE	
DAY	NIGHT	DAY AND NIGHT	DAY	NIGHT
13. P/C holds hand in front and Suddenly lowers other fist, with thumb extended downward to meet horizontal palm of extended hand, or Suddenly raises other fist, with thumb extended upward to meet horizontal palm of extended hand. NOTES 2 & 3	Same, except points flashlight vice thumb toward extended palm of hand in direction desired. NOTES 2 & 3	1. Lower arresting hook. 2. Raise arresting hook.	Pilot execute. P/C check: 1. Hook down and for effective snubber action. 2. Hook retracted and centered. If satisfactory, give pilot "thumbs-up" after check is completed.	Same.
14. Pilot makes vertical fist with thumb extended up, and then moves thumb down.	Same.	I am ready to perform trim checks.	P/C give appropriate trim signals.	Same.
15. P/C holds one finger aloft. NOTE 4	One dash on flashlight. NOTE 4	Cycle and set rudder trim to 0°, using trim indicator.	Pilot execute. P/C points index finger toward vertical palm of other hand in direction rudder must be moved if not faired by pilot. When faired, P/C give next sequential signal. Pilot check indicator for possible error and note.	Pilot: same. P/C same, except use flashlight vice finger to indicate direction rudder must be moved.
16. P/C holds two fingers aloft. NOTE 4	Two dashes on flashlight. NOTE 4	Cycle override in both directions and set the elevator trim to 6° noseup, using trim indicator. (If a setting other than 6° noseup trim is desired, the pilot shall inform P/C of desired setting prior to start.)	Pilot execute. If necessary, P/C point index finger toward horizontal palm of other hand in direction elevator leading edge must be moved for desired setting. Pilot check indicator for possible error and note.	Pilot: same. P/C: same, except use flashlight vice finger to indicate direction elevator must be moved.
17. P/C holds three fingers aloft. NOTE 4	Three dashes on flashlight. NOTES 4 & 5	Cycle and set aileron trim so that stick is centered laterally. Check aileron followup tab for correct response and faired ± 1/8" with aileron trailing edge.	Pilot execute. P/C check followup tab ± 1/8" from faired with aileron on trailing edge.	Same.
18. Pilot points one finger at eye.	Same.	P/C check all exterior lights BRIGHT, then DIM. (Modify locally, as necessary, according to situation.)	P/C execute. Give pilot "thumbs-up" after checking lights BRT, then check on DIM.	Same.

Table 2-1. (Sheet 4)

SIGNAL		MEANING	RESPONSE	
DAY	NIGHT	DAY AND NIGHT	DAY	NIGHT
19. P/C holds nose, then gives "thumbs-up or down".	Same.	Aircraft has no visible fuel, oil, or hydraulic leaks. Fuel has ceased draining from gang drain.	Pilot acknowledge with "thumbs-up".	Same.
20. P/C forms circle with thumb and forefinger, then extracts forefinger of opposite hand from circle, using "pull-away" motion.	Same, except makes "pull-away" motion with flashlight.	Can I remove landing gear and external store racks safety pins?	Pilot give "thumbs-up" (YES) or "thumbs-down" (NO). If yes, P/C removes pins and holds for pilot to count before stowing in pin bag in left-hand wheel well or aft hell hole.	Same, except pilot moves horizontally-heid flashlight up and down several times (YES) vice "thumbs-up" signal, or left and right several times (NO) vice "thumbs-down" signal.
21. Fist pounded on palm of other hand (pilot to flight deck personnel).	(Use radio.)	Replace catapult holdback tension bar.	Execute.	Same.

Table 2-1. (Sheet 5)

NOTE 1. Where night signal is listed as "Same", unless otherwise indicated, signal is identical to day signal, except red flashlight is used to illuminate hand (if appropriate).

NOTE 2. Prior to giving this signal, the affected area must be checked visually by the P/C to ensure that there exists no hazard to personnel.

NOTE 3. Normally, these three signals will be given in close sequence without hesitation, i.e., flaps, speedbrakes, hook.

NOTE 4. P/C shall be stationed at port wingtip, within sight of pilot, for the trim signals.

NOTE 5. After giving three-dash signal, P/C illuminates followup tab from inboard end.

NOTE 6. For use prior to night flight or at pilot's discretion.

SIGNAL		MEANING	RESPONSE	
DAY	NIGHT	DAY AND NIGHT	DAY	NIGHT
Emergency hold signal followed by wiping brow then pointing to brakes.	Same, except with wands.	Your aircraft has hot brakes.	Comply with local hot brakes procedures.	Same.

Table 2-2. Postflight Signals - Ground Crew to Pilot.

c. Ground Limitations. Warmup time and ground limitations for the listed electronic equipment are as follows:

Item		Warmup
ARC-27A	(Note 1)	1 minute.
ARA-25	(Note 1)	1 minute.
ARN-21	(Note 2)	90 seconds.
APX-6B	(Note 1)	1 minute.
APA-89		1 minute.
ASQ-17B	(Note 1)	1 minute.
ASN-19A		None.
GYRO (A-4A/B)		OFF, flag not visible.
AJB-3	(Note 3)	70 ± 10 seconds.

Item		Warmup
AFCS	(Note 4)	30 seconds.
APG-53A	(Note 5)	3 minutes.

NOTE 1: 30 minutes ground limitation, without air conditioning.

NOTE 2: Warmup in REC position.

NOTE 3: 60 seconds time delay (gyro runup), plus 10 seconds autosync. period.

NOTE 4: AJB-3 must first be at speed.

NOTE 5: 5 minutes ground limitation for tube power supply, no limitation for transistorized power supply.

240 TAXI, TAKEOFF, AND LANDING

a. Taxi. When ready to taxi, signal the Plane Captain to remove chocks. Advance throttle to 60 percent before releasing the brakes. Release brakes, and when the desired taxi speed is reached, retard throttle to IDLE. Use caution in confined or restricted areas.

In order to avoid foreign object damage to engines, pilots shall maintain a minimum taxi interval of 200 feet, unless taxiing in close formation with wingtip clearance and with aircraft intakes clear of leader's exhaust. While taxiing, determine that nose strut is not overinflated by observing that nose strut will compress when brakes are applied firmly.

The oxygen mask should be donned while taxiing whenever the canopy is closed and the pressurization is ON.

b. Takeoff. Upon completion of the Pretakeoff Checklist and after receipt of clearance from the tower, the aircraft will line up on the runway. Each pilot should check adjacent aircraft for correct trim settings, flap position, canopy CLOSED, speedbrakes CLOSED, no fuel or hydraulic leaks, Ejection-Control Ground-Safety Handle UP, and for visible overboard venting of oil vapor just prior to takeoff.

Half-flaps setting should be used for takeoff during normal shore based operations.

For a single takeoff, the centerline of the runway should be used as a directional guide. During formation takeoff (maximum of two aircraft), the leader should take position on the downwind side of the runway, with the other aircraft forming an echelon in tactical order. Lateral separation should be ensured to prevent embarrassing difficulties should one aircraft blow a tire or abort. Where section takeoffs are utilized, one section shall be airborne before the next section commences takeoff roll. Where individual takeoffs are made with two or more planes, the second airplane shall commence takeoff roll not less than 5 seconds behind the first airplane. When the crosswind component exceeds 8 knots, individual takeoffs will be made. Individual takeoffs are not recommended when the crosswind component is in excess of 15 knots. The angle-of-attack indicator may be used to attain the proper takeoff attitude. The pilot will inform the tower immediately by radio if takeoff is aborted. Formation takeoffs are not permitted with dissimilar type aircraft.

As the engine accelerates through 90 percent during the acceleration check, release brakes to prevent skidding the tires. Check acceleration time, ensuring that it is within acceptable limits and that engine smoothly accelerates through the 80 percent hangup point. (Timing of acceleration may be omitted during section takeoffs.) When engine stabilizes initially, check EPI. 98 percent r.p.m. and 600° C EGT are considered minimum acceptable parameters of engine performance for normal takeoffs. Where runway length is critical, 99.5 percent and 600° should be the minimums. Use brakes to maintain directional control until rudder becomes effective (about 70 knots). On rough runways, nosewheel bounce may be experienced. Apply forward stick as necessary to maintain nosewheel on the deck. Check the predicted line speed at selected distance marker. This checkpoint should be selected so as to allow normal braking technique to stop the aircraft on the runway remaining. 5 knots prior to predicted takeoff speed, raise the nose to a takeoff attitude and allow aircraft to fly itself off the deck. After comfortably airborne, retract landing gear and apply brakes momentarily to stop main gear tire rotation before wheel enters wheel well. Raise the flaps at 170 KIAS or above.

Be prepared for the possibility of unusual noise or vibration during the first minute after takeoff, caused by an unbalanced nosewheel tire or a loose nosewheel-well fuse panel cover. An unbalanced nosewheel tire creates a strong vertical vibration of decreasing frequency which can be sensed to emanate from the nose section. When the nosewheel-well fuse panel cover has not been properly secured, usually a corner of the panel will extend outside the nosewheel door after gear retraction and batter its snaps against the skin. This noise is a loud and metallic hammering (similar to the sound of a metal rivet gun) which seems to come from directly under the pilot's feet. This noise lasts until the snaps tear from the fabric, usually in about two minutes. DO NOT assume that either of the above causes is necessarily present if unusual noises occur after takeoff. DO analyze engine instruments and feel of aircraft. Be prepared to take action unless noise/vibration ceases as indicated above.

c. Landing. The flight shall normally approach the breakup point in echelon, parade formation, at 250 knots. A 3-to-5 second break will provide an adequate downwind interval. Immediately after the break, extend speedbrakes and retard throttle to 70 percent. Speedbrakes will normally remain extended throughout approach and landing. As the aircraft decelerates to 225 knots or less, lower the landing gear and extend full flaps. As the airspeed decreases to 170 KIAS readjust power to maintain desired pattern airspeed commensurate with gross weight. Complete the Landing Checklist and check wheel brakes prior to reaching the 180-degree position. Crosscheck airspeed with AOA indexer indication. If a discrepancy exists, recheck landing configuration and gross weight.

Optimum angle-of-attack approaches to touchdown will be made. Where a mirror is available, its use is recommended. Attempt to control meatball, lineup, and angle of attack/airspeed as precisely as for a carrier approach in order to maintain proficiency in this technique.

Upon touchdown, the following technique shall be followed:

1. Power to IDLE.
2. Raise flaps.
3. Allow nosewheel to fall through and hold full-forward stick, deflected into the wind as necessary.
4. Use wheel brakes as necessary.
5. If the crosswind component is 10 knots or more, take interval to allow each aircraft to land on upwind side of runway, which will allow for possible "arcing" downwind. Should more than 15 knots of 90-degrees crosswind component exist, a diversion to an alternate field is recommended.

Prior to turning off runway, aircraft speed must be slowed to about walking speed. ON A GO-AROUND, WAVEOFF, OR TOUCH AND GO, DO NOT RAISE LANDING GEAR UNLESS LEAVING PATTERN.

d. Securing Engine. Upon returning to the line, pilots will ensure their aircraft are cleaned up (speedbrakes IN, flaps UP) and stabilizer trim set at 0 degrees. Once in the line, keep the aircraft turning up until gear safety pins have been inserted and the "cut" signal has been given by the Plane Captain. Secure all electrical equipment prior to shutdown. Pull DOWN the RAPEC Ground Safety Handle and install ejection seat and canopy safety pins. Note and record engine rundown time on the yellow sheet.

250 FIELD ARRESTMENT

There are several types of field arresting gear. These types include the anchor chain cable, water squeezer, and Morest-type equipment. All of these types require engagement of the arresting hook in a cable pendant rigged across the runway. Location of the pendant in relation to the runway will classify the gear as follows:

1. Midfield gear. - Located near the halfway point of the runway. Usually requires prior notification in order to rig for arrestment in the direction desired.
2. Abort gear. - Located 1500 to 2500 feet short of the upwind end of the duty runway and usually will be rigged for immediate use.

3. Overrun gear. - Located shortly past the upwind end of the duty runway. Usually will be rigged for immediate use.

Some fields will have all of these types of gear, others none. For this reason, it is imperative that all pilots be aware of the type, location, and compatibility of the gear in use with the A-4, and the policy of the local air station with regard to which gear is rigged for use, and when. The approximate maximum engagement speed for field arrestment of the A-4 at a gross weight of 16,000 pounds, by type of arresting gear, is as follows:

E-5 (Chain type)	155 kts.
E-14 (Water squeezer)	160 kts.
Morest	130 kts. *

*Maximum allowable gross weight - 14,500 pounds.

As various modifications to these basic types are in use, exact speeds will vary accordingly. Certain aircraft service changes may also affect engaging speed and weight limitations and should be considered in setting limitations to be observed in each unit or locale. Severe damage to the aircraft is usually sustained if an inadvertent engagement is made in the wrong direction. When diverting from carrier to shore base, make sure the hook is retracted prior to landing to prevent the possibility of engaging abort or overrun gear in the wrong direction.

In general, the arresting gear is engaged on the centerline at as slow a speed as possible. Burn down to 1500 pounds or less fuel remaining. If arrestment is to be made at night, the pilot should request that the position of the arresting gear be illuminated. While burning down, make practice passes to accurately locate the arresting gear. Engagement should be made with the feet off the brakes, shoulder harness locked, and with the aircraft in a three-point attitude. After engaging the gear, good common sense and existing conditions now dictate whether to keep the engine running or to shut it down and abandon the aircraft. In an emergency situation, first determine the extent of the emergency by whatever means are possible (instruments, other aircraft, LSO, RDO, tower, or other ground personnel). Next, determine the most advantageous arresting gear available and the type of arrestment to be made under the conditions which prevail. Whenever deliberate field arrestment is intended, notify control tower personnel as much in advance as possible and state estimated landing time in minutes. If gear is not rigged, it will probably require 10 to 20 minutes to prepare it for use. If foaming of the runway or area of arrestment is required or desired, it should be requested by the pilot at this time.

a. Short Field Arrestments. If at any time prior to landing it is known that a directional control problem exists or a minimum rollout is desired, a short field arrestment should be made and the assistance of an LSO requested. The LSO should be stationed near the touchdown point and equipped with a radio. Inform the LSO of the desired touchdown point. If midfield gear or Morest type is available, it should be used. If neither are available, use abort gear. Make a flat approach, with sink-rate as low as possible. Touch down on centerline, approximately 300 feet short of the arresting gear, with the hook extended. The hook should be lowered while airborne and a positive hook-down check should be made, if possible. Use an approach speed commensurate with the emergency experienced. Landing approach power will be maintained until arrestment is assured or a waveoff is taken. Be prepared for a waveoff if the gear is missed. After engaging the gear, retard the throttle to IDLE or secure engine and abandon aircraft, depending on existing conditions.

b. Long Field Arrestments. The long field arrestment is used when a stopping problem exists with insufficient runway remaining (i.e., aborted takeoffs, icy or wet runways, loss of brakes after touchdown, etc.). Lower the hook, allowing sufficient time for it to extend fully prior to engagement (normally 1000 feet prior to reaching the arresting gear). Do not lower the hook too early and weaken the hook point. Line up the aircraft on the runway centerline.

Inform the control tower of your intentions to engage the arresting gear, so that aircraft landing behind you may be waved off. If no directional control problem exists (crosswind, brakes out, etc.), secure the engine.

c. Field Barrier. At many Air Force bases and some USN/USMC fields, there is some form of jet barrier, usually a Davis type. Compatibility of the A-4 with this type of gear has not been determined and its use is not recommended.

280 DEBRIEFING

Each flight shall be followed with a thorough debriefing by the Flight Leader as soon as practical. All phases of the flight shall be covered, paying particular attention to those areas where difficulty was encountered and to the effectiveness of any tactics employed or weapons expended. To derive maximum benefit, constructive criticism and suggested improvements as to doctrine, tactics, and techniques should be given and received with the frankness, purpose, and spirit of improving the proficiency of the unit, as well as that of the individual pilot.

CHAPTER III
Carrier Based Procedures

300 GENERAL

The training program of fleet squadrons must be designed to give solid support to the premise that flight from a carrier deck is a routine event. The squadron will be afforded much less flexibility in the execution of the daily flight schedule aboard ship. The parent carrier will promulgate an air plan based upon the operation order under which the ship is operating. If the operation order specifies "air group training" for a particular day, the squadron may express a preference in advance for the type of training for which it desires to be scheduled. However, once the air plan is published, changes are seldom permitted because of the complex planning activities the Air Department and air group must complete for the next day's flight operations.

310 SCHEDULING

Aboard ship, the flight schedule is promulgated by the Operations Department and becomes an order of the Commanding Officer of the ship. Since the Commanding Officer of the squadron is at all times responsible for the combat-readiness of his unit, he submits his training needs to the Air Group Commander. The Air Group Commander or his delegated representative coordinates air group scheduling with the ship. Intelligent consideration of a pilot's time requirements is a basic and pertinent factor in flight scheduling.

320 BRIEFING

See Section 220.

330 FLIGHT AND HANGER DECK OPERATIONS

331 FLIGHT DECK

a. Day.

(1) Preflight.

1. Upon receipt of the order "Man aircraft" from Air Operations, pilots will proceed expeditiously to assigned planes. Preflight, Start, and Poststart Checks shall be accomplished in accordance with Section 230.
2. During his Preflight Inspection, the pilot should record the expected gross weight of the aircraft for catapult launch in a designated area, on both sides of the forward fuselage, using a black grease pencil.
3. Pilots shall ensure that the tension bar retainer clip is installed securely and is in good condition.
4. A complete inspection of the aft fuselage may not always be possible due to aircraft spotting.
5. Note the relationship of arresting hook to deck-edge scupper. Do not lower hook during Poststart Checks unless the hook point will drop on the flight deck.
6. Do not initiate start if GTC is in a position where its exhaust may damage aircraft.

(2) Poststart.

1. Engines will normally be started 10 to 15 minutes prior to launch, and the customary functional checks will be performed. Occasionally, due to various reasons, Poststart Checks must be accomplished in an expeditious manner. This will require good teamwork between pilot and Plane Captain; nevertheless, all

mandatory Poststart Checks will be completed prior to launch.

2. The canopy shall either be open or fully closed and locked. It should be closed when necessary to prevent damage from wind or jet blast.
3. Chocks and tiedowns will be removed upon signal from the Plane Director.
4. The pilot shall indicate to the Plane Director when the aircraft is ready for flight.
5. Set Emergency Jettison Select Switch to ALL prior to launch.
6. Taxi with flaps fully retracted.

(3) Taxi.

1. Taxiing aboard ship is generally similar to that on land, with some variation of power required due to increased wind and turbulence and decreased braking effectiveness because of higher tire pressures and the condition of the deck. For these reasons, particular attention should be given to keeping speed under control.
2. While taxiing with appreciable wind over the deck, pilots should avoid attempts to turn large angles to the relative wind or to the jet blast of another aircraft. However, it is imperative that the director's signals be followed closely at all times.
3. Under high wind conditions, direction control is sometimes difficult. If the nosewheel cocks, add throttle to 70-80 percent and use rapid intermittent brake to bounce the nose strut, while moving slowly forward. This should decrease the weight on the nosewheel long enough for it to swivel in the desired direction. If this procedure is not effective, hold brakes, retard throttle to IDLE, and signal for the assistance of a tiller bar. Normally, under heavy crosswind conditions, a tiller bar and wingwalkers should be provided.
4. The pilot will set the flaps to the appropriate takeoff position when signalled by the catapult director. This signal should be given just prior to attachment of the catapult holdback cable.
5. If a tiller bar is being used, use both brakes together and with the same pressure to maintain speed at the equivalent of a slow walk. Using brakes singly may injure the tiller bar man.

b. Night.

(1) Preflight. External preflight will be made utilizing the pilot's red lens flashlight. In addition to normal cockpit preflight, ensure that external light switches are properly positioned for Poststart Exterior Lights Check. Positioning of exterior light switches will depend somewhat on the exterior light configuration. The Master Exterior Lights Switch, Anticollision Light Switch/Fuselage Light Switch, and the Taxi Light Switch should always be in the OFF position prior to start. The general rule of not showing unnecessary white lights on the flight deck at night should be observed. Wing-and taillights should be set in DIM position for the Poststart Checks. Instrument lights and console lights control should be rotated from the OFF position to provide reduced illumination of the ladder lights. Direct cockpit emergency floodlights on the instrument panel and kneeboard light as desired.

(2) Poststart. Adjust cockpit lights intensity to desired level. After normal systems checks are completed, perform Exterior Lights Check. Move the Master Exterior Lights Switch to ON. White fuselage lights may be checked by momentarily placing the switch to DIM. Upon completion of Exterior Lights Check, place Master Exterior Lights Switch to the OFF position and set wing-and taillight switches to the BRT position.

(3) Taxi. During night carrier deck operations, the tempo of operations, both in volume and speed, is considerably reduced from day operations. Slow and careful handling of aircraft by both plane directors and pilots is mandatory. If the pilot has any doubt as to the plane director's signals, STOP.

332 HANGAR DECK

Occasionally the aircraft assigned will be manned on the hangar deck. Procedures differing from those on the flight deck are outlined below.

a. Preflight. Unless the aircraft is already on the elevator, it will be towed or pushed for access to the flight deck. The signal to stop a plane that is being moved by other than its own

power is a whistle blast. Leave the hardhat off. Any whistle blast signifies an immediate STOP. If the plane director is lost from view, STOP. The aircraft will be raised to flight deck level and either respotted or started on the elevator.

340 LAUNCH AND ARRESTMENT OPERATIONS

a. Day.

(1) Launch Operations. Normal catapult launches provide the A-4 with 10-15 knots excess endspeed. The pilot must be prepared to rotate to the attitude required to maintain level flight or to an attitude which results in a slight climb. When the end of the catapult power stroke is felt, the energy stored in the compressed nose strut during the power stroke will rotate the aircraft to approximately the correct attitude for level flight without pilot effort. With stabilizer trim setting specified in the applicable launching bulletin, the aircraft should maintain this attitude for level flight, unless the pilot induces some other condition by incorrect positioning of the elevator. To preclude this, the "hands-off" technique is recommended. This technique is as follows:

Cup the hand just aft of the stick prior to the catshot in order to limit aft stick travel to 2-3 inches or less during the power stroke. During the catapult power stroke, restrain arm movement as much as possible by pressing the arm against the side and/or thigh. As acceleration forces decrease at or near the end of the power stroke, the longitudinal stick centering device will return the stick to the trimmed (and optimum) position. Allow the stick to return to this position before grasping it. As the aircraft becomes airborne, slight aft stick pressure may be required to maintain optimum attitude. The pilot must avoid any large longitudinal control inputs as the aircraft becomes airborne, yet be prepared to correct any wing drop that may occur.

Variations from the desired 10-15 knots excess endspeed also have considerable affect on "flyaway qualities" after the power stroke. At minimum endspeeds, stabilizer trim will be insufficient to maintain level flight, the nose will drop, and the aircraft will lose altitude unless back pressure is applied promptly after becoming airborne. If buffet is encountered, pitch should immediately be decreased to that required for level flight by relaxing back pressure, and the commencement of the climb should be delayed until sufficient excess airspeed is available to effect a climb without encountering buffet.

At endspeeds in excess of 15 knots, the stabilizer trim setting will be too great, causing a noseup rotation, and a sharp climb will occur unless checked by forward stick pressure.

The landing gear should be retracted at or above 300 feet. Raise the flaps when the airspeed is 170 KIAS or above. Check the alignment of the RMI with the Standby Compass, once in stabilized flight.

Rotation to optimum attitude by reference to instruments (10-12 degrees nose-high on the gyro horizon) should be practiced frequently during day operations in order to gain proficiency required for night catapult launches. However, it is necessary that the pilot be aware of other traffic in proximity (such as bolters, waveoffs, or other aircraft being launched), and not be solely on instruments as is the case during night catapult operations.

If launching in instrument conditions or at night, the pilot should not be required to change radio, IFF/SIF, or NAVAID channels until a safe altitude (2,500 feet) and airspeed are attained. If military necessity requires changing channels below 2,500 feet, the change shall be made with the aircraft stabilized in level flight.

(2) Aircraft or Catapult Malfunction. If, after established at 100 percent, the pilot determines that the aircraft is down, he so indicates to the catapult officer by SHAKING HIS HEAD FROM SIDE-TO-SIDE. NEVER, repeat NEVER, raise the hand into the catapult officer's view to give a "thumbs-down" signal. It is possible that the catapult officer may construe the signal to be a salute to fire the catapult. When the catapult officer observes the "NO-GO" signal, he should immediately give a "Suspend" signal. If his response is not immediate, call on land/

whenever possible. Execute a normal shutdown when the "cut-engine" signal is received. Do not release brakes until a three-point tiedown has been accomplished. Plane Captains should be instructed not to install the access ladder until this has been accomplished.

When possible, rundown time should be recorded and the compressor section observed for abrupt blade stoppage or abnormal noises. Excessive engine rundown time will have little significance when parked into the wind on the bow. Pull down the RAPEC Seat Ground-Safety Handle and install seat and canopy safety pins.

If the aircraft is struck below to the hangar deck, keep the canopy closed and the oxygen mask on until on the hanger deck and signalled to shut the engine down. At this time, the canopy should be opened, the oxygen system secured, and the mask and hardhat removed. Aircraft handling personnel will move the aircraft from this point. Engine rundown noise will make it very difficult to hear the whistle signals; consequently, the pilot must be alert for both hand and whistle signals. Keep the rolling speed slow and under control by simultaneous use of the brakes, especially when the aircraft is being moved backwards, as abrupt brake application may tip the aircraft and cause damage to the aft fuselage. Whenever the plane director is not in sight, STOP.

b. Night. For all night launches, the emergency red floodlights should be illuminated and directed at the instrument panel.

(1) Launch Operations. Catapult hookup at night is identical to day operations. However, the difficulty of "getting on" the catapult at night is increased by the fact that it is difficult for the pilot to determine his speed. The pilot must rely upon and follow closely the directions of the plane director. As the aircraft approaches the catapult, the plane director should position himself forward and remain stationary to give the pilot a visual reference for controlling taxi speed as the aircraft approaches the shuttle.

Upon receiving the tensioning signal from the catapult director, release brakes. Immediately increase power to 100 percent, in anticipation of the two-finger signal from the catapult officer. When satisfied that the aircraft is ready for launch, the pilot so signifies by placing the Master Exterior Lights Switch to the ON position, which should turn the wing-and taillights on BRT. The pilot must be prepared to establish a wings-level climbing attitude on instruments. An initial attitude of 10-12 degrees noseup is recommended. Ensure a positive rate of climb is obtained. Retract the landing gear at 300 feet altitude or above. Retract flaps at 170 KIAS or above. During night launches, do not make clearing turns. Switch all lights to BRIGHT and FLASHING at 2,500 feet or higher.

(2) Aircraft or Catapult Malfunctions. The pilot's "NO-GO" signal for night catapult launch consists in not turning his exterior lights on. The pilot should also call on land/launch frequency, "Suspend #_____ catapult; aircraft is down." Maintain 100 percent r.p.m. until the catapult officer walks in front of the wing and gives the "throttle-back" signal. Do not turn exterior lights on unless completely ready to be launched.

(3) Arrested Landing and Exit From the Landing Area. All night recoveries will be made utilizing TACAN/CCA approaches. The LSO will normally take control when the aircraft is approximately one mile from the ramp. The pilot should have all exterior lights on BRIGHT and STEADY (fuselage and anticollision lights OFF). Following arrestment, immediately place Master Exterior Lights Switch to OFF. Taxi out of the landing area slowly. Do not stare fixedly at the plane director's wands but use them as the center of the scan pattern.

350 DEBRIEFING

Debriefing shall be accomplished after every flight. In addition to a complete review and analysis of all phases of the flight, it should include the individual debrief of each pilot by the LSO.

CHAPTER IV

Flight Procedures

400 GENERAL

Many publications deal with the flight procedures for the A-4. This Chapter presents the essence of good procedures, for guidance. Where amplification is desirable, the applicable publication is referred to.

410 TRANSITION OR FAMILIARIZATION

a. Requirements. Transition and familiarization will be accomplished in accordance with the requirements outlined in Chapter I. This training will be conducted in the replacement air group or in the squadron, as directed by the appropriate Commander. It is desirable that pilots with no recent jet experience demonstrate their proficiency in two-seated, swept-wing jet trainers prior to flying the A-4.

Familiarization flights should be designed to acquaint the pilot with the flight characteristics of the A-4 while it is flown at various attitudes, altitudes, and configurations.

b. Procedures. The following procedures shall be followed for the first familiarization flight, in addition to those required for other flights:

(1) Before Flight. The chase pilot shall accompany the Fam. pilot during his Preflight Inspection and Start. The Fam. pilot shall be the lead aircraft on the takeoff.

(2) During Flight. Perform those prebriefed maneuvers which will give a general feel of the aircraft, both in the clean and dirty configurations. Stalls and confidence maneuvers will be practiced in designated areas and at altitudes which will ensure straight and level flight above 10,000 feet upon completion.

(3) Return to Field and Landings. The Fam. pilot will lead the flight back to the field. Landings on the first two Fam. flights will be monitored by a chase pilot or by a qualified A-4 pilot at the end of the runway with radio communications. If the approaches are chased, the chase pilot will fly a comfortable yet reasonably close wing position on the Fam. pilot throughout all landings and will coach the Fam. pilot when necessary. Chase aircraft will not descend below 100 feet and should follow the configuration changes of the Fam. pilot during the approach.

c. Weather Considerations. All familiarization flights will be conducted under conditions which will permit climb and descent in VFR conditions and which will permit visual contact with the ground at all times.

420 INSTRUMENTS

a. Basic Instruments. The procedures to be used in performing basic instrument maneuvers in the A-4 are as follows:

(1) Climb Schedule. Climb schedule for basic instrument flights will be 310 knots IAS to 0.72 IMN to 240 knots minimum at higher altitudes.

(2) Speed Changes.

1. To reduce airspeed, reduce power to approximate power setting necessary for airspeed desired and extend speedbrakes. Retract speedbrakes 5 knots above desired airspeed. During transition, retrim aircraft as necessary.
2. When increasing airspeed, advance power to 100 percent. When desired airspeed is

attained , reduce power to approximate power setting necessary to maintain desired airspeed and altitude.

3. Between 20,000 and 25,000 feet the following are approximate power settings for given speeds. After transition is made it may be necessary to adjust power slightly to maintain airspeed exactly.

Airspeed	Approximate Power Setting (Percent)
300 knots	92-93
250 knots	87-89
200 knots	83-86

(3) Turns and Reversals.

1. Turns and reversals will be performed at 300 knots. At bank angles steeper than 30 degrees, it will be necessary to advance throttle to maintain airspeed.
2. Banks used will be 30, 45, and 60 degrees.
3. Turns will be made in both directions with each of the above angles of bank. Turns will be maintained for twice the number of degrees as the angle of bank. (For a 30-degree bank, turn right or left for 60 degrees of turn; for a 45-degree bank, turn right or left for 90 degrees of turn, etc.)

(4) Vertical S-1 Pattern.

1. The pattern describes a "W," in that it is a series of descents and climbs of 1,000 feet of altitude, while maintaining constant airspeed and heading.
2. The pattern will be performed at 250 knots in a clean configuration with speedbrakes IN. Approximate descent power setting is 86 percent and approximate climb power setting is 93 percent.
3. Rate of descent will be 1,000 ft./min. and should be timed with the clock. It will be necessary to lead all transitions by 5 seconds.

(5) Vertical S-2 Pattern.

1. A vertical S-2 pattern is similar to the vertical S-1 pattern, except that a constant one-half standard-rate turn is maintained throughout the pattern.
2. After 1 minute, the pilot should have lost 1,000 feet and turned 90 degrees. At the end of the second minute, he should have climbed 1,000 feet and turned 180 degrees. After the third minute, he should have descended 1,000 feet and turned through 270 degrees. After the fourth minute, he should have climbed 1,000 feet, bringing him back to the original heading and altitude.

(6) Vertical S-3 Pattern. The vertical S-3 pattern is similar to the S-2 pattern, except that the turn is reversed after 180 degrees of turn.

(7) Yankee Pattern. Figure 4-1 is a diagram of the Yankee Pattern, with approximate power settings given.

b. Jet Penetrations.

(1) General. A penetration is a maneuver which combines a high rate of descent with a constant airspeed and maintains the aircraft within a specified airspace. It is designed to minimize fuel consumption, the effects of turbulence, icing, and wind, and serves to place the aircraft in position for a low approach. Prior to commencing a penetration, the following checklist should be completed.

1. Air conditioning.. FULL HOT.
2. Windshield defrost..... FULL INCREASE or ON.
3. Altimeter..... SET. (Include altimeter error noted prior to takeoff.)
4. Shoulder harness..... LOCKED.
5. Pitot heat..... ON.

(2) Clean Penetration. The clean penetration is conducted at 250 KIAS, speedbrakes OUT, and a rate of descent of 4,000 to 6,000 f.p.m. This will require an initial power setting of about 80 percent. At penetration fix and 230 KIAS, the nose is lowered to about 7 degrees nosedown to start penetration. As airspeed reaches 245 knots, speedbrakes are extended. Maintain 250 knots and adjust power as necessary to maintain 4,000 - 6,000 f.p.m. rate of descent. Be positive that you do not misread the altimeter by 10,000 feet. It is important that the pilot be conscious of the appearance of the YOKE flag during each penetration, as it

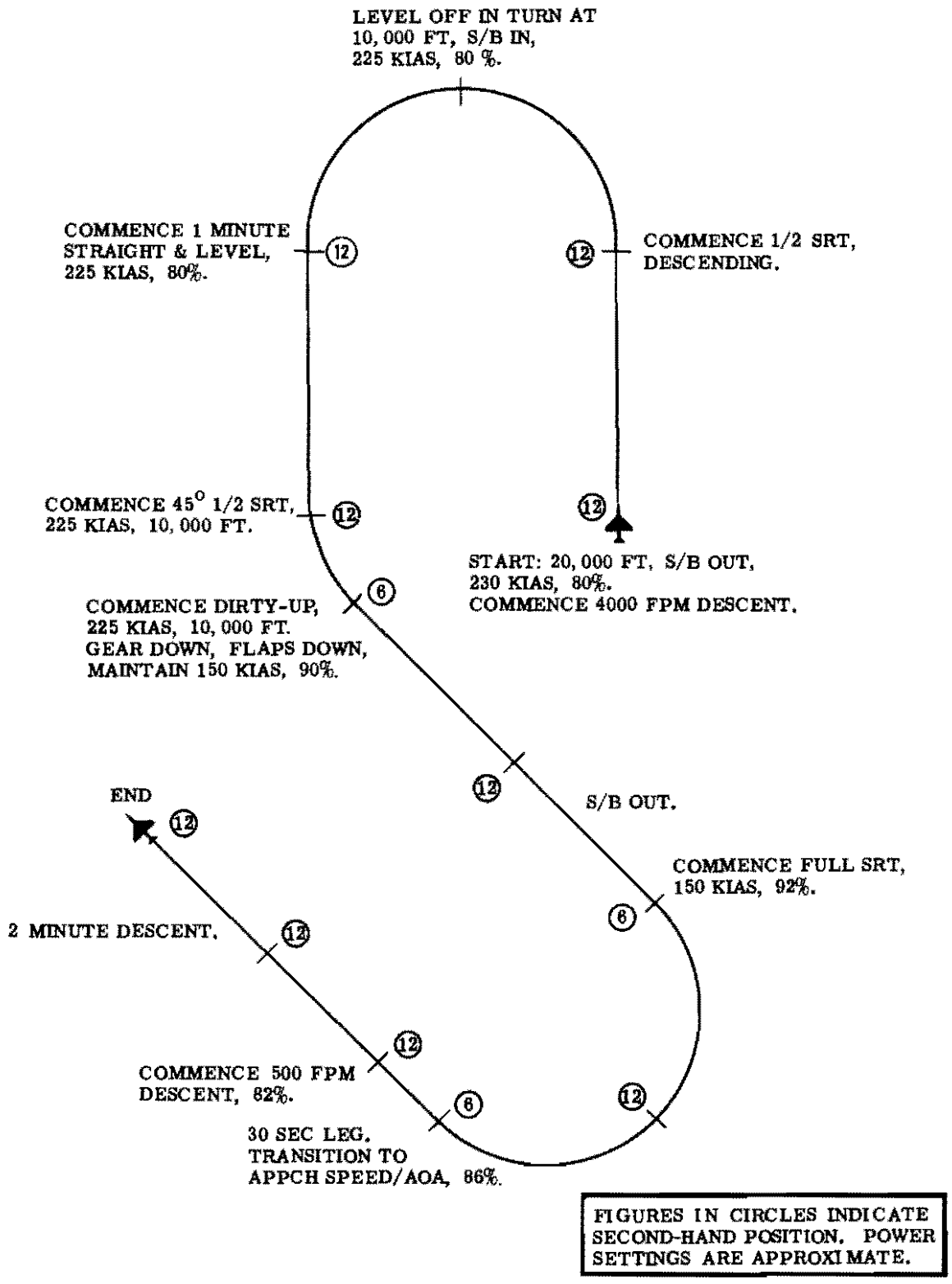


Figure 4-1. Yankee Pattern.

signals that the aircraft is now below 10,000 feet MSL.

In the event of low fuel state, a penetration can be accomplished utilizing IDLE r.p.m. and speedbrakes IN. Maintain 250 KIAS and adjust power as necessary to provide 4,000 - 6,000 ft./min. rate of descent. The windshield may frost up during this type of descent due to reduced defrost air circulation.

Start transition to level flight about 1,500 feet above the desired altitude. There is a tendency to lose altitude after bottoming out of the penetration and dirty-up which can be avoided by leading with adequate power. At level-off during single-aircraft approaches, slow to and maintain gear-down speed. Gear and flaps shall be lowered in order to reach the "gate" in a landing configuration at desired approach speed. For individual approaches of two or more aircraft, maintain 250 knots until reaching a briefed distance prior to the "gate" (normally 4 miles). Each aircraft shall report passing this point.

(3) Dirty Penetration. The "dirty" penetration is recommended when one member of the flight has radio and/or NAVAIDS failure and it is necessary to penetrate in section to a minimum ceiling. "Dirty-up" is accomplished "VFR on top." When performed at night, the lead aircraft will keep his lights on STDY/BRT and his fuselage/anticollision light OUT. The controlling agency must be advised of the airspeed deviation prior to initiating this type of penetration.

The dirty penetration is performed at 170 knots, wheels and flaps DOWN, speedbrakes OUT, and a rate of descent of 3,000 to 5,000 F.P.M. Just prior to reaching initial penetration fix, slow to 225 knots, drop wheels and flaps. Upon reaching the fix, reduce throttle to 80 percent, drop the nose about 7 degrees below horizon, and extend the speedbrakes. Maintain 170 knots. Start transition to level flight about 1,500 feet above the desired altitude.

c. Ground-Controlled Approach. Achieving the precision necessary to make successful GCA's to minimums will require practice, alert flying, and smooth, coordinated control of power, attitude, and altitude. Turns in the pattern will be standard rate, with the following exceptions:

1. Do not exceed 30 degrees of bank.
2. Do not exceed 15 degrees of bank on final approach. Use positive rudder control in all turns.

The following throttle settings and speeds are prescribed for use in the GCA pattern for an aircraft gross weight of 13,000 pounds. Adjust airspeed as necessary from that shown for other gross weights.

	Approximate R.P.M. (Percent)	Approximate Airspeed (Knots)
Downwind (clean)	78-80	225
Downwind (dirty)	86-90	150
Base	86-90	150
Final (level)	84-88	*125
Final (glidepath)	80-84	*125

*Optimum angle of attack.

(1) Glidepath. Prior to descent down the glidepath, complete the Landing Checklist. Assuming that the airspeed has been properly adjusted to final approach speed prior to reaching the glidepath, the following entry procedure will be used: When the controller says, "You are approaching glidepath. Commence standard rate of descent," DO NOT commence descent. When the controller says, "You are up and on the glidepath," reduce throttle, drop nose slightly, and establish an initial rate of descent in accordance with the following table. The rates of descent are approximations for a 3-degree glide slope:

Condition	F.P.M.
No wind	700
Light wind	600
10 knots or more	500

(2) Waveoff. When instructed, or when at GCA minimums and the field is not in sight, wave off by adding full throttle, retracting speedbrakes (if applicable), then rotating the nose to a climbing attitude. When a positive climb is indicated by the rate of climb and altimeter, raise the gear and commence a turn, if required. Do not raise the flaps until the

wings are level and airspeed is 170 knots minimum. When the controller advises, "Wave off, tower instruction," this is a mandatory waveoff.

(3) Practice. All hooded GCA approaches shall be accompanied by a safety pilot who will maintain a chase position as directed by GCA (normally 5 or 7 o'clock, 500 feet out, 500 feet aft, slightly stepped-up). Chase aircraft will not descend below 100 feet and at all times will maintain the same configuration as the lead aircraft. The lead aircraft will maintain contact until cleared under the hood by the chase pilot after completion of a satisfactory radio check. The lead aircraft will go contact when he initiates an early waveoff, when directed by GCA or the safety pilot, or upon reaching 500 feet above the terrain. For level turns in the pattern, it will be necessary to add 2 percent r.p.m. 1 percent r.p.m. change will vary the rate of descent 100 ft./min.

d. Section Penetrations/GCA. Section penetrations and/or GCA's will be necessary when certain failures occur which preclude making an instrument approach without airborne assistance (loss of NAVAID's, radio failure, flight instruments failure, etc.). In section penetrations/GCA's, the wingman flies a comfortable parade formation, close enough to ensure visual contact on the side opposite the missed-approach turn, unless a 10-knot crosswind component exists. In this case, the wingman should be positioned on the upwind side. (In the case of radio failure, it will be necessary for the leader to monitor the surface wind and position the wingman accordingly.)

The wingman will follow the configuration changes of the leader. Appropriate signals for use in the penetration or GCA pattern are contained in Table 4-1. After turning onto final, the leader should use a speed 10 knots faster than optimum angle-of-attack airspeed. After the leader signals that the runway is in sight, the wingman should anticipate a spread-section landing. The wingman should not descend below the leader once the descent on final is started until the leader signals the runway is visible and the wingman has the runway in sight. The leader will execute a low-visibility approach or another GCA, if conditions (fuel, weather, etc.) permit. The leader should land if, in his opinion, it is inadvisable to wave off. USE EXTREME CAUTION.

e. Low-Visibility Approaches. A low-visibility approach is used in conditions of low ceiling and/or visibility, when:

1. The approach heading of the aircraft varies from the runway heading to such a degree that it precludes an immediate landing from that direction.
2. The runway is crossed at an airspeed and/or altitude which precludes an immediate landing.

This approach should be made only when unable to maintain visual contact with the ground.

Procedure

1. When approaching a runway with a landing direction that is approximately 180 degrees from the heading of the aircraft, fly two-thirds of the runway length, then execute a 9-degree SRT turn to the right, followed by a 270-degree SRT reversal to the left to the runway heading. Maintain an airspeed about 10 knots above optimum approach speed/AOA and at or above minimum circling altitude until the runway is again in sight.
2. When approaching the runway in the proper direction, but too high and fast for a landing, maintain an airspeed about 10 knots above the optimum approach speed/AOA and execute a 360-degree left or right SRT. Adjust position by adding a straightaway downwind if necessary. Remain at or above circling minimums until the runway is again in sight.
3. When the aircraft is approximately 90 degrees from the landing runway, cross at not more than one-third of the runway length from the approach end, at 90 degrees from the runway heading. Hold this heading for 20 seconds and then execute a right or left SRT, as appropriate, for the runway heading.

f. Carrier-Controlled Approach.

(1) General. The pattern, procedures, and terms used for carrier-controlled approaches shall be in accordance with COMNAVAIRLANT Instruction P3710.16 or COMNAVAIRPAC Instruction P3710.14 series (as applicable). For supplementary information, refer to NWP 41(A).

(2) Procedures. A CCA approach is similar to a straight-in jet penetration. Maintain maximum endurance airspeed while holding. Lower the hook upon entering the holding pattern. Single aircraft must plan to leave the Marshal point at EAC. If the flight consists of two or more aircraft, the Flight Leader normally should plan to be at Marshal in time to make a half standard-rate 180-degree left turn, break off from the flight, and return to the Marshal point at his EAC. Subsequent aircraft in the flight break at 30-second intervals. As each pilot reaches the Marshal point, he commences his letdown at 250 KIAS, 4,000 ft./min. rate of descent, speedbrakes OUT, and about 80-82 percent. At 5,000 feet ("platform"), the rate of descent is reduced to 2,000 ft./min., although penetration speed is maintained at 250 KIAS. Level off at 1,000 feet, retract speedbrakes, and adjust power to maintain 250 KIAS to the 10-mile gate. At this point, transition to 150 KIAS by retarding throttle to 70 percent. Extend speedbrakes and drop wheels and flaps as airspeed drops below 225 KIAS. Adjust power to maintain 150 KIAS. All aircraft shall be in the landing configuration prior to reaching the 6-mile gate. Unless otherwise directed, a gradual descent to 600 feet will be made departing the 6-mile gate. Upon reaching 600 feet, transition to final approach speed (optimum angle of attack/airspeed). This altitude and airspeed will be maintained until in visual contact with the "meatball" at about 1-1/4 miles, or until informed by the final controller or LSO to commence letdown at 500 ft./min., or as directed. Fly into the "meatball" until it is centered and commence the descent, maintaining optimum AOA/airspeed. The use of the speedbrakes may not be desirable when the approach is made at aircraft gross weights (in excess of 13,000 pounds) and configured with drag stores, i.e., buddy stores, MCBR's, etc., due to the high thrust required during the approach. After transition is made to landing configuration, all turns should be standard rate. Do not exceed 30 degrees of bank at any time. Do not exceed 15 degrees of bank after leaving 600 feet on final approach.

PENETRATION/INSTRUMENT APPROACH (NO RADIO)			
SIGNAL		MEANING	RESPONSE
DAY	NIGHT		
Opening and closing 4 fingers and thumb in pinching motion.	3 dashes w/external lights.	Extend speedbrakes commencing approach.	Execute when leader extends speedbrakes.
Rotary movement of clenched fist in cockpit as if cranking wheels.	2 dashes w/external lights.	Extend wheels and full flaps.	Execute when leader extends wheels, flaps.
Pointing indexfinger toward runway/ship in stabbing motion, repeatedly.	1 dash w/external lights.	Landing runway/ meatball and ship in sight.	Ashore: Take landing interval. Carrier: Break off and land.

NOTE: Configuration change should be executed promptly upon completion of the signal.

Table 4-1. Flight Signals Between Aircraft.

(3) Section CCA. A section CCA may be necessary in the event a failure occurs affecting navigation aids, communications equipment, or certain other aircraft systems. Normally, the aircraft experiencing the difficulty will fly the starboard wing position during the approach. The section leader will detach the wingman when the "meatball" is sighted and continue straight ahead, offsetting as necessary to the left to determine if the wingman lands successfully. Commence a slow descent to not lower than 300 feet altitude and turn all lights to BRT and FLASH abeam the ship. This will provide the wingman with a visual reference and leader, should he bolter or wave off. The wingman should not detach unless he has the "meatball" in sight. He should also "fly formation," and not instruments AND formation AND be looking for the carrier. Necessary visual signals are contained in Table 4-1.

g. Weather Considerations.

1. Flights should not be conducted through areas of clear icing or severe turbulence, if they can be avoided.
2. Climbing through heavy rain to freezing altitudes will often result in temporary failure of the A-4 main generator. Pilots should be well apprised of the effect such a loss will have on their ability to continue flight to destination under instrument conditions. Usually, descending to below the freezing level will restore normal operations.
3. Flights which are conducted at high altitudes following climbout through rain or in aircraft cold-soaked during a previous flight will occasionally experience control system icing (aileron or elevator). This is seldom of a serious nature and the controls may be kept free by frequent movement of the control stick fore and aft, or right and left, through neutral. If this is not effective, use trim as necessary and descend below freezing level. See subsection 538,1.
4. In order to conduct flights in accordance with the latest weather information available, pilots on IFR flight plans in the continental United States should make maximum use of "pilot-to-forecaster" services. In addition, radar following can be requested of ARTCC on assigned frequency to assist in circumnavigation of storm centers. In the event a thunderstorm penetration is unavoidable, the procedures outlined in the Flight Manual should be followed.

h. Loss of Visual Contact.

1. When visual contact with the flight is lost during VFR conditions, proceed to a predetermined point for rendezvous.
2. When visual contact with the flight is lost during instrument conditions, comply with procedures outlined in NWIP 41-3, subsection 302b.

430 FORMATION AND TACTICS

The basic principles and maneuvers promulgated in NWIP 41-3 and NWP 41(A) are generally applicable. The following instructions apply specifically to the A-4.

a. Rendezvous.

(1) Turning Rendezvous. The turning rendezvous is made at 250 KIAS (unless otherwise briefed). After all aircraft are in a loose-trail position, the leader commences a 180-degree turn, using 30 degrees of bank. Each member of the flight waits until the plane ahead passes through a 30-degree bearing from his 12 o'clock position, and then rolls into a 45-degree banked turn to the inside of the leader's turn. When the leader bears 45 degrees relative to the joining aircraft, wingmen ease the turn as necessary to maintain 45 degrees of bearing until joined either on the preceding aircraft or on the flight. Wingmen may add power to gain no greater than a 15-knot speed advantage over the leader to avoid becoming "sucked." As the aircraft approach the leader, the closure rate is adjusted so as to join on the man ahead or on the inside of the leader's turn. After joining on the inside of the leader, a crossunder is made to the outside, assuming normal wing positions.

(2) Circling Rendezvous. A circling rendezvous is used when aircraft are separated by extended or indefinite distances or time intervals. The pattern is normally a port orbit, using 30 degrees of bank around a geographic fix. Altitude must be specified and airspeed will be 250 KIAS (unless otherwise briefed). Upon arrival, each aircraft flies directly over

the fix, slightly below the rendezvous altitude, to provide altitude separation upon entry into the pattern. The first aircraft to arrive should establish the orbit. Subsequent aircraft should be able to sight other aircraft in the circle from directly over the fix. When sighted, a hard turn in the direction of the orbit turn should be made to establish a 45-degree bearing relative to the joining aircraft. Vary the bank as necessary to maintain the bearing until joined. Do not use an airspeed advantage in excess of 15 knots. As the leader is closed, check closure rate so as to stop on the inside of the turn; then cross under to a normal wing position on the outside.

(3) TACAN Circling Rendezvous. A TACAN circling rendezvous is used when aircraft are separated by extended or indefinite distances or time intervals and it is not possible to use a geographic fix (at sea or above an overcast). The pattern will be a port orbit tangent to the designated TACAN radial at a specified distance and altitude. Normally, each pilot flies outbound on the assigned radial, maintaining the briefed climb schedule or rendezvous speed. Upon reaching the joinup circle, each pilot commences a port orbit, using 30 degrees of bank (or more) until visual contact is made with the Flight Leader. If necessary, request the leader's position. The leader will state his position around the orbit, using the figures 1, 2, 3, or 4, corresponding to 000 degrees, 090 degrees, 180 degrees, and 270 degrees, respectively, relative to the designated radial, as shown in Figure 4-2. Each pilot then plans his turn to cut across the orbit for rendezvous. ARA-25 may be used to assist in picking up the leader.

(4) Running Rendezvous. A running rendezvous is effected by closing from the rear on a prebriefed heading or radial. This rendezvous should be accomplished with the leader climbing at 250 KIAS and 90 percent (unless otherwise briefed). If it is to be made level, the leader should normally be at 250 KIAS at the designated altitude.

(5) ARA-25 Running Rendezvous. The ARA-25 rendezvous is useful for joining aircraft under all conditions, and particularly during a straight-course running rendezvous. The procedure to be used for the latter is as follows:

1. Trailing aircraft select ADF position on the UHF control.
2. The Flight Leader will transmit a short count every minute and when climbing include the passing altitude.
3. Trailing aircraft will position themselves so that as the leader transmits the short counts, the number 1 needle points 5 degrees left or right of the nose position. The number 2 aircraft will hold the leader to his left, number 3 to his right, etc.
4. As the trailing aircraft approach the Flight Leader, they will turn to keep him 5 degrees (left or right, respectively) off the nose position. The amount of turn required to maintain the leader in this position will increase as the separation is reduced. Continue until visual sighting is obtained.

(6) ARA-25 Circling Rendezvous. If a circling rendezvous is to be made, the Flight Leader will maintain prebriefed airspeed, 30 degrees of bank, a specified altitude, and broadcast a short count and heading every minute. The trailing aircraft will correct heading to keep the number 1 needle on the nose when the leader transmits. From the change in azimuth of the number 1 needle between short counts, approaching aircraft will be able to determine their proximity to the lead aircraft. Approaching the Flight Leader, the needle will change more degrees in azimuth between counts, requiring larger corrections to keep the leader on the nose. At this time, the leader can probably be detected visually and a standard rendezvous completed.

(7) Low-Visibility Rendezvous/ Rendezvous on Different Model Aircraft. This type of rendezvous should be performed in emergency situations only when directed by higher authority or when the urgency of the mission dictates. The rendezvousing aircraft should be flown at a safe maneuvering airspeed. The initial procedures will be as previously described for standard rendezvous. However,

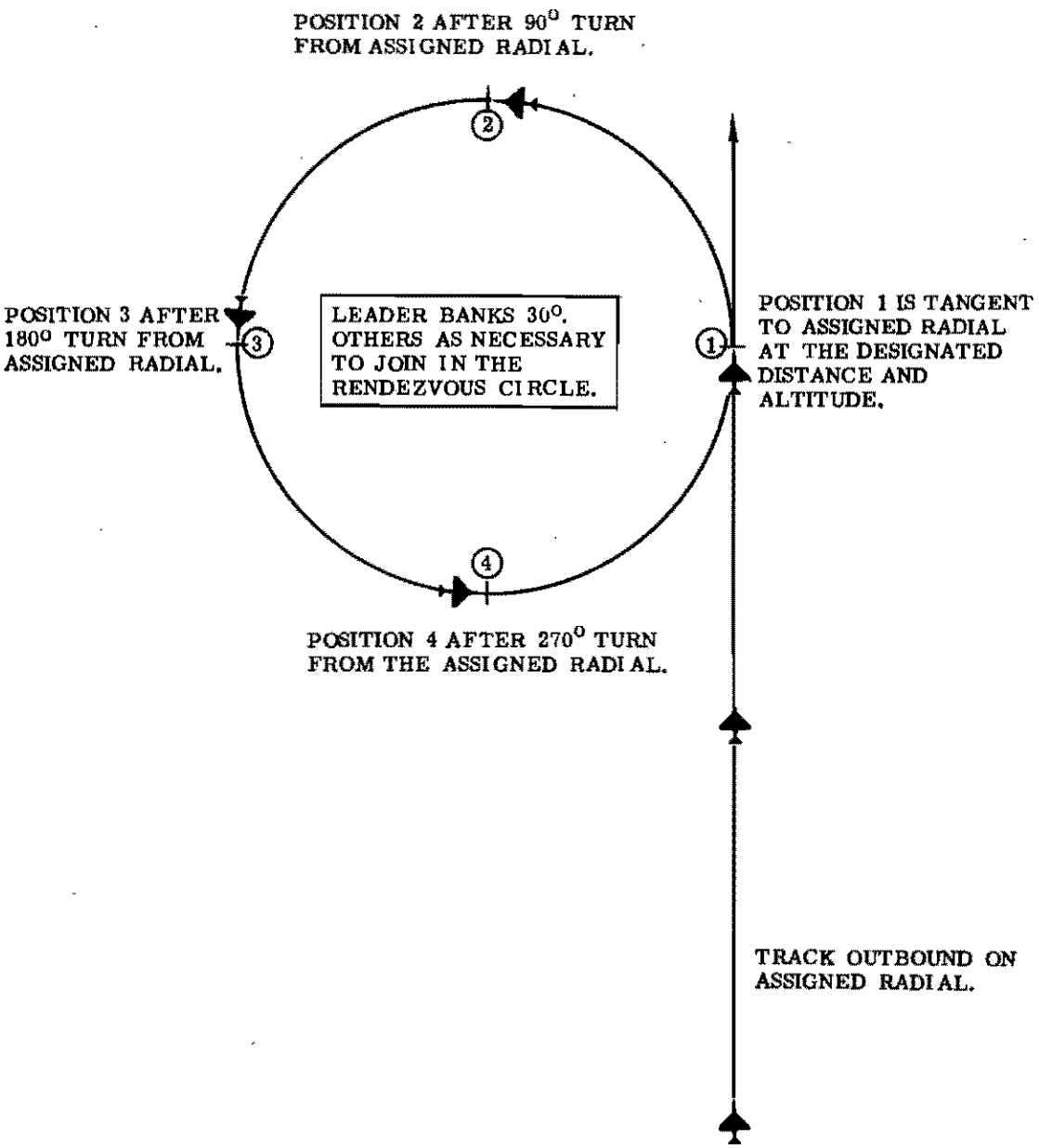


Figure 4-2. TACAN Circling Rendezvous.

the latter stages should be modified as outlined below.

1. Establish radio contact, if possible, and determine indicated airspeed and intended flightpath of the aircraft to be joined.
2. Place all lights on BRIGHT and FLASHING (if applicable).
3. Rendezvous about 1,000 feet out, slightly aft of abeam (4 or 8 o'clock) the lead aircraft.
4. Cautiously close, while assuring constant nose-to-tail clearance. Maintain a constant relative bearing. Changes in relative bearing will cause foreshortening or lengthening of the aircraft fuselage and make determination of closure rate difficult.
5. A rendezvous on a different model aircraft and/or in low-visibility conditions is extremely conducive to vertigo. A high degree of caution and good judgment must be exercised throughout the rendezvous. At no time should a rapid-closing situation be allowed to develop.

(8) Safety Rules For Rendezvous.

1. During all rendezvous, safety shall be the prime consideration.
2. Keep all aircraft ahead constantly in view and join in order.
3. During rendezvous, only enough stepdown should be used to ensure vertical clearance on the aircraft ahead.
4. When necessary, a wingman should abort the rendezvous by leveling his wings, sighting all aircraft ahead, and flying underneath them to the outside of the formation. He should then remain on the outside until all other aircraft have joined.
5. To avoid overshooting, all relative motions should be stopped when joining on an inside wing position. A crossunder to the outside may then be made.
6. During a running rendezvous, use caution in the final stage of joinup, as relative motion is difficult to discern when approaching from astern.

b. Formation.

(1) Free-Cruise Formation (four-plane division). This formation will normally be employed for all operations away from home base, unless another formation is signaled. Within each section, the wingman's position is 35 degrees to 45 degrees abaft the section leader's beam, with sufficient distance abeam to clear the wingtips and sufficient distance astern to clear the tail of the lead aircraft. The vertical stepdown of the wingman will be sufficient to clear the leader's aircraft and jetwash. The second section leader's position is approximately 45 degrees abaft the division leader's beam and slightly stepped down. The second section leader must maintain a distance out on the assigned bearing line which will provide clearance with the lead section wingman and which will also permit visual communications between division leader and section leader. During steep turns or hard maneuvering, the second section and wingmen within each section are free to slide as necessary to avoid large power changes.

(2) Parade Formation (four-plane division). This formation will normally be employed when the flight is operating around home base and in conditions of low visibility. Positions are essentially the same as in cruise formation, except that the line of bearing is moved forward. Within each section, the wingman's position is 35 degrees abaft the section leader's beam. This position can be established by lining up the wingtip light with the break in the fuselage. Proper stepdown is eye-level with the wing of the leader. The second section leader's position on the division leader is identical to the leader's wingman, but on the opposite side. Numbers 2, 3, and 4 aircraft shall maintain position with power changes. Sliding during turns is not permitted.

c. Tactics.

(1) Defensive Tactics. In order to accomplish its primary mission and return, the best defensive tactic of the light-attack aircraft is to avoid enemy air opposition. Should this be unsuccessful, the pilot must then attempt to thwart the attacks and continue to make progress on the desired base course. A knowledge of foreign aircraft capabilities is necessary in

order to determine the defensive maneuvers to be employed. Refer to NWIP 41-3 and the CWDS for basic defensive tactics and tactical formations.

Practice tactics involving dogfighting or gunsight tracking exercises should be performed only when authorized by the Commanding Officer and properly briefed. Unless specifically exempted by the unit CO, a minimum altitude of 10,000 feet AGL will be observed.

(2) Offensive Tactics. Conventional and nuclear weapons strikes against enemy targets should be preceded by thorough briefings and preflight preparation. A detailed planning of the strike by the entire flight shall be conducted. The procedures and doctrine for those air-to-surface missions that the A-4 is capable of performing are contained in NWIP 41-3 and applicable supplements.

(3) Search. Although the search mission is not an air-to-ground evolution involving ordnance, the light-attack aircraft is capable of covering large areas quickly and therefore may be assigned a search task at any time. Procedures outlined in NWP 37(A) are pertinent.

440 NIGHT FLYING

441 NIGHT LIGHTING DOCTRINE FOR SHORE BASED OPERATIONS

a. Line Area. Prior to start, turn wing-and taillights to STDY and DIM, all others to OFF. This is the minimum lighting that should be used whenever the engine is running. Turn the Master Exterior Lights Switch ON so that when the engine starts the exterior lights will come on. Perform the customary Poststart Checks, including the Exterior Lights Check. Signal the Plane Captain when ready to taxi by flashing the exterior lights. Taxi in the line area with fuselage lights/anticollision lights OFF and remaining navigational lights DIM.

b. Taxiing. Once clear of the line area, turn all lights to BRT and FLASH. Keep lights in this configuration during taxi to ensure that there is no confusion between aircraft and other lights.

c. At Approach End of Runway. While completing the Takeoff Checklist in the turnup area, keep all lights BRT and FLASH. If there are other aircraft in the turnup area, it may be necessary to DIM all lights in order to prevent pilots of other aircraft from losing their night adaptation. When ready for takeoff, turn all lights to BRT and FLASH. This will signal the Flight Leader that you are ready to take off.

It may be necessary to modify the above procedure at certain fields to conform to local operating procedures. Generally, at fields where both MLP and normal takeoff and landings are permitted the tower will require normal traffic to have lights on BRT/FLASH and MLP traffic BRT/STDY.

d. Takeoff. For single-plane takeoff, lights will normally be BRT/FLASH, except where local operating procedures require steady lights. For a section takeoff, the leader will turn his lights DIM/STDY when in position on the runway, while the wingman will have his lights on BRT and STDY. After turnup to 90 percent, the wingman will indicate his readiness to go by switching his lights to BRT and FLASH. The leader will signal "Brake release and adding power," by blinking his exterior lights.

e. Operating Clear of Traffic Pattern. For single-aircraft flights, once clear of the pattern, lights will be BRT/FLASH.

When joining in formation, the following procedure will be utilized: As the man behind calls "ABOARD" (when he is in such a position that dimming the lights of the aircraft ahead will not affect his rendezvous), the pilot ahead will turn his anticollision lights OFF and other lights DIM/STDY (fuselage light intensity as briefed or as desired by wingman). Normal lighting for aircraft in formation, other than last aircraft, will be wing and tail DIM and all other lights OFF. As each aircraft breaks for rendezvous practice, the pilot will turn all lights to BRT/FLASH.

For night section penetrations, the leader will have his fuselage/anticollision lights OFF

and remaining lights on BRT/STDY. The wingman will leave all lights BRT/FLASH if VFR letdown is to be made. However, at any time that instrument conditions will be encountered, the wingman will turn all lights to BRT/STDY and anticollision lights OFF prior to entry into the clouds.

f. Landing Pattern. When returning to the base for normal breakup and landing, the lights will be STDY/DIM, except that the last aircraft will be BRT/FLASH. The break will be signaled by each man, just prior to break, blinking the exterior lights. All lights will be turned to BRT/FLASH after each aircraft is well clear of the formation to avoid blinding other members of the flight. Keep lights on BRT/FLASH as long as you remain in the traffic pattern, unless otherwise directed by competent authority (such as tower or LSO). Single planes entering the break will remain on BRT/FLASH as they were in the operating area.

After final landing and clearance of the duty runway, keep the lights on BRT/FLASH for taxi. When in the line area, turn the fuselage light OFF and other lights to DIM/STDY.

442 NIGHT RENDEZVOUS

Rendezvous at night are similar to daytime, except that in the final portion the pilot should try to close to a position slightly astern rather than directly toward the plane ahead. Pilots must be sure not to carry excess airspeed in the rendezvous. The leader must fly airspeed and altitude.

Whenever it is necessary for a pilot to go to the outside of the rendezvous, he will report this to the Flight Leader. Stay on the outside of the rendezvous until the remaining members of the flight have rendezvoused and then add power as necessary to join up. Pilots joining from astern will move out to the side in order to enhance their judgment of closure rates as well as to ensure safe clearance.

443 NIGHT FORMATION

It is important to maintain the correct bearing so that the wingman can be seen by the leader. Ensure that wingtip clearance is maintained at all times. The pilot should not fly so close that he feels uncomfortable. Avoid staring at the aircraft ahead and getting fixation on its lights. Turns will be made as in instrument conditions, rolling around the leader's axis on both inside and outside of turns.

Where no light signal exists for a certain maneuver, the radio should be used. Speedbrake signals may be given on the radio by transmitting, "_____flight, speedbrakes now." Channel changes will be given on the radio and should be acknowledged both before and after making the shift.

444 NIGHT BREAKUP AND LANDING

a. Breakup. A normal night breakup from a tactical night flight will be done as in Section 240c., except that a 5-7 second break interval will be used. Keep aircraft ahead in sight.

b. Landing. For night landings, the pilot must doublecheck the gear, as it is easy to confuse three UP indications for three DOWN. Techniques used in the pattern are the same as for daytime. Pilots must avoid any tendency to flare the landing. Make the final portion of every approach with a constant rate of descent and attitude right down to the runway.

c. Waveoffs and Touch-and-Go Landings. On waveoffs and following touch-and-go landings, climb straight ahead to at least 300 feet and 150 knots before turning downwind. Avoid looking back over the shoulder at field lights at night, as this is conducive to vertigo.

450 WEAPONS

451 GENERAL

Weapons-delivery training must encompass two major goals: first, the development of precision weapons skills during shore based training periods; and second, the maintenance of this proficiency while deployed. The basic principles of air-to-surface weapons delivery are described in NWIP 41-3. The detailed specifics of these deliveries are set forth in the NWDS and CWDS to NWIP 41-3.

a. Gunsight Alignment. Due to the light structural support of the gunsight reflector plate, care must be exercised by both pilots and ground personnel to avoid disturbing the accuracy of the gunsight. Boresighting must be accomplished frequently under the strict supervision of qualified personnel, if acceptable accuracy is to be maintained.

b. Conventional Weapons Training Deliveries. For conventional deliveries, various entry altitudes, airspeeds, and dive angles are recommended. Any delivery is acceptable, providing the restrictions on airspeed, altitude, and dive angle contained in NWIP 20-1 and other applicable publications are observed.

460 MISSION PLANNING

The training objective is the orderly development of pilot techniques in preflight planning, climbout, high-altitude navigation and cruise control, air refueling, low-level navigation, and high-speed approaches to the delivery maneuver.

461 NAVIGATION

a. Planning. The proposed route must be drawn on the charts to be used during the flight. Along each leg of the route, the magnetic course should be clearly indicated. After the weather briefing (which will include predicted winds), the pilot should compute the predicted groundspeed and mark off equidistant checkpoints at 3-minute intervals for the high-level legs. The charts should be glued or taped together. After annotation is complete, trim to final size and fold to facilitate use in the cockpit. WAC or ONC charts are usually satisfactory for high-level navigation; sectional charts or charts scaled 1 : 500,000 are preferable for the low-level segments of the route. Appropriate time and fuel consumption data shall be logged on a data card as the flight progresses. The planned route, profile, charts, and data card should be reviewed with the chase pilot prior to flight. Preflight briefing should include the pilot's intended action, in case some deviation from the flight plan is required en route.

b. Pilot's Navigation Equipment. The following charts and equipment should be carried by the pilot on every navigational flight:

1. Complete WAC/ONC coverage of the route (JN strips may be substituted).
2. Sectional chart coverage for the low-level portion.
3. Terminal publication (high altitude).
4. En route supplement.
5. En route charts (high, intermediate, and low altitude).
6. Computer.
7. Radio channelization card.
8. Performance data card.
9. Elapsed-time clock or stopwatch.

462 CRUISE CONTROL

General cruise control techniques and specific fuel figures are found in the NWDS. A HOWGOZIT chart is recommended (refer to NWIP 41-3). Additional comments and suggestions follow.

a. Climbout. Zero time may be designated by the pilot as the aircraft departs the task force, at brake release on the runway, or at some specific point after takeoff. The exact time should be logged and the stopwatch started. Acceleration to initial climbspeed should be effected prior to passing through 1,000 feet. A cross-check of both compasses should be made periodically and on each new heading established.

b. High-Altitude Cruise. Shortly after leveling at altitude and establishing cruising speed, the pilot should note the fuel used in the climb and check actual fuel flow against the planned consumption rate. Transfer from the external tanks will then be commenced. Each pilot should develop his ability to judge distances on the ground from his position and altitude. This sense of distance is quite necessary for accurate navigation at high altitude. Of interest is the fact that the blind area beneath the aircraft extends approximately 15 miles in width and 20 miles ahead. Landmarks at considerable distances from the desired track may frequently be used.

c. Descent. The idle descent is the best device for transition from the high to the low portion of the profile. The normal technique is to reduce throttle to IDLE and hold altitude until the initial descent airspeed is reached, then maintain the airspeed schedule. Some difficulty may be experienced during the transition from high-to low-altitude contact navigation because of the rapid change in perspective. To counteract this, the pilot may desire to transfer to sectional charts at some time prior to letdown. The pilot should avoid commencing the first low-level leg with a large course change whenever possible.

d. Low Level. In low-level navigation, the pilot should keep himself positively oriented at all times. If the pilot fixes his position off the planned track, a 30-degree cut toward the track will return the attacker to track at the rate of one mile every 20 seconds. Start the time before the cut-turn and stop prior to return to base course. Slight airspeed corrections should be made when a checkpoint is reached as little as 10 seconds early or late. A 35-knot speed change over a 10-minute period will gain or lose one minute. If doubt exists in the pilot's mind regarding his position, he should increase his altitude until he is oriented. If a turning checkpoint is missed, he should make the turn at no later than 30 seconds past ETA, then climb to approximately 1,000 feet for reorientation. The pilot should periodically cross-check RMI heading with the standby compass for possible precession error.

e. Chase Plane. Initial practice missions should be chased by an experienced pilot. On the low-level portion, the chase aircraft should be positioned near the 5 or 7 o'clock position and stepped up. The chase pilot shall monitor the flight, paying close attention to course, speed, altitude, and fuel state. The chase pilot is responsible for the safety of the flight, and should deviate from the flight plan, if safety considerations dictate.

f. High-Speed Run-in. At a point at least 12 miles from the initial point, full power should be added to accelerate to delivery speed. Weapon monitor procedures and the final armament panel configuration (except for uncaging the LABS gear) shall have been completed prior to this time. Delivery and escape are described in the A-4 NWDS.

470 FIELD MIRROR LANDING PRACTICE AND CARRIER QUALIFICATION

471 FIELD MIRROR LANDING PRACTICE

a. Pattern Entry Procedure.

(1) Individual Entry. Call the tower for entry to the FMLP pattern. Request 800-foot break-altitude. Otherwise, follow the normal field entry procedures into the break. Enter the break at 250 knots at 600 feet. When cleared to break and the proper interval of the aircraft downwind is assured, roll into a 45-degree banked turn and commence descent to 500 feet above the terrain. Reduce power to 70 percent and extend speedbrakes. At 225 knots, lower gear and full flaps. Adjust angle of bank to provide correct distance abeam. Pilots shall cross-check airspeed against the angle-of-attack indexer to ensure calibration of the indexer prior to turning off the 180-degree position.

(2) Formation Entry. The leader of the formation will enter the break as described above for single-plane entry. When cleared to break, the leader will give the breakup signal and execute a break by rolling into a 45-degree banked turn and descending to 500 feet above the terrain, as outlined above. The remaining aircraft in the formation will take a 10-second break interval.

b. Pattern.

(1) Downwind. Maintain 500 feet above the terrain at a comfortable airspeed, but no faster than 150 knots. Complete the Landing Checkoff List. Check wheel brakes.

(2) 180-Degree Position. Altitude should be 500 feet above the terrain. Plan to lose sufficient airspeed on the downwind leg to arrive at the 180-degree position at the optimum angle of attack or approach speed. The approach airspeed will vary with aircraft gross

weight. Distance abeam will vary with wind conditions, but 1-1/4 miles abeam is a normal position.

(3) 90-Degree Position. Altitude should be 500 feet above the terrain with the airplane at optimum angle of attack/airspeed. Slightly past the 45-degree position, the "meatball" should be visible. Any tendency to drop the nose at this time will result in picking up a low "meatball." Maintain altitude until the "meatball" appears in the center of the mirror.

(4) Final. When the "meatball" appears in the center of the mirror, it will be necessary to reduce power slightly and ease the nose over, maintaining optimum angle of attack/airspeed. Proper glide slope and approach speed are maintained by keeping the "meatball" centered by coordinated adjustments of power for altitude corrections and of attitude for airspeed corrections. The straightaway, with wings level, should be about 3/4 to 1-1/4 miles.

Once the "meatball" is sighted, the approach should be monitored by cross-checking MEATBALL, LINEUP, ANGLE-OF-ATTACK INDEXER/AIRSPEED. Make necessary corrections immediately but smoothly.

(5) Landing. Keep the aircraft on the glide slope and centerline all the way down. Do not flare. Keep the "meatball" centered right down to the deck. When touchdown is made, add full power and retract speedbrakes immediately. Take off straight ahead until reaching at least 300 feet and 150 knots. Turn downwind for the next pass when aircraft ahead is approximately in the 10 o'clock position on the downwind leg. Do not exceed 150 knots in the pattern. About 30 degrees angle of bank turning downwind should establish the correct distance abeam.

(6) Waveoff. Anytime a waveoff is received, either with waveoff lights or by radio, immediately add full power, retract speedbrakes, and transition to a climbing attitude to prevent further loss of altitude. Make all waveoffs directly down the runway until at least 300 feet of altitude and 150 knots are attained.

(7) Departing the Pattern. Remain below 600 feet until well clear of the FMLP pattern.

472 CARRIER QUALIFICATION

a. Communications. The Flight Leader will check in with the ship on the designated frequency when within radio range. The ship should issue all instructions from that time until the flight has completed qualification landings.

b. Pattern Entry Procedures. Entry procedures for CQ will be as outlined in Section 340a.(3).

c. Desired Pattern (Day). See Figure 4-3.

d. Waveoff/Bolter Pattern. Waveoff will be straight up the angled deck when given close-in. Pilots must bear in mind that a late waveoff or inflight engagement is possible. The aircraft should be lined up with the centerline to prevent the possibility of aircraft damage. A bolter occurs when the aircraft touches the deck with the hook down but fails to engage a cross-deck pendant. This is generally caused by landing long or by a hook skip. After a waveoff or a bolter, turn to parallel the ship's recovery course (Foxtrot Corpen) on the port side. DO NOT CROSS THE BOW while flying upwind. Be alert for other aircraft launching from the catapult or entering the pattern from the break. The aircraft ahead will have priority for the turn downwind. If in doubt, use the radio. At night, always call, "Turning downwind." A waveoff to the right will be made when "overshooting the landing line to the extreme," or for other reasons of safety considerations. When waving off to the right, stay well clear of the plane-guard helicopters.

e. Night Pattern. All night recoveries will be CATCC controlled. Do not turn downwind prior to reaching 600 feet. Do not exceed 30 degrees of bank at any time. The night pattern should be flown entirely on instruments until in a position to acquire the "meatball" visually. However, it is prudent to remain alert to the transmissions of other aircraft and to make a brief visual check when it becomes apparent another aircraft is in close proximity.

480 AERIAL REFUELING

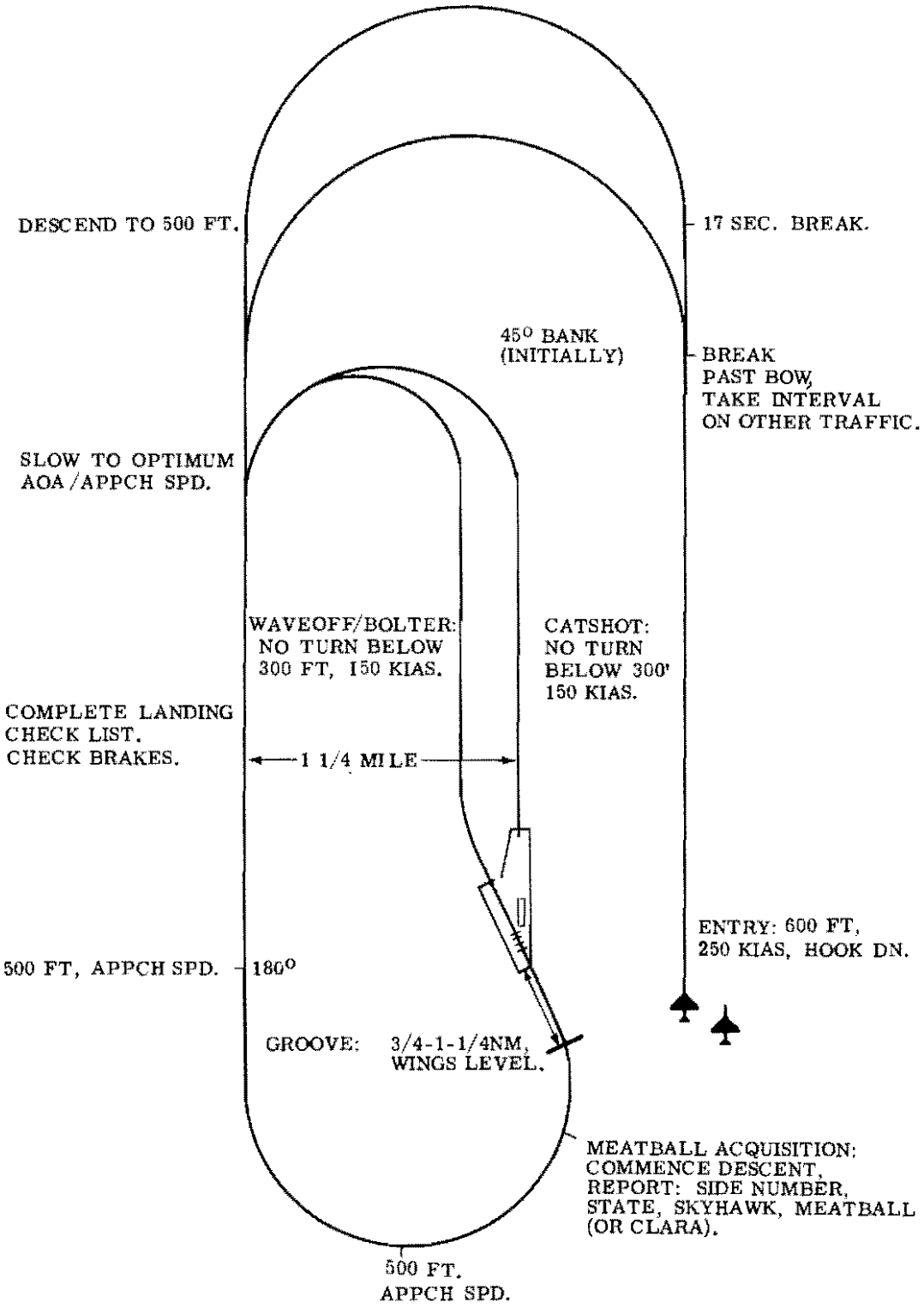


Figure 4-3. Day Carrier Pattern.

481 FLIGHT PROCEDURES FOR TRAINING AND REFRESHER

Refueling training should be accomplished at various altitudes in accordance with current directives.

a. Rendezvous. Rendezvous as briefed, using procedures contained in Section 430a.

b. Prior to Refueling.

1. After rendezvous has been effected, the leader will position the flight in loose echelon, away from the tanker, on the opposite side from the tanker escort (if assigned). The Flight Leader's position will be abeam the tanker, with at least 200 feet separation in case a store turbine blade flies off during unfeathering. The Flight Leader will then pass the lead to the tanker pilot.
2. When the flight is in position, the leader will signal the tanker to unfeather (1-finger turnup signal).
3. The tanker will unfeather, ensuring airspeed is 250 KIAS or less.
4. The Flight Leader will indicate by a "thumbs-up" or "down" whether or not the turbine unfeathered. If the turbine does not unfeather, the tanker will secure store and not make further attempts to unfeather, unless failure to provide fuel would place receiver aircraft in jeopardy.
5. If the turbine unfeathers on the first attempt, the tanker responds to the "thumbs-up" signal of the Flight Leader by extending the drogue.
6. As the drogue extends, the flight should fall back so that leader is abeam and level with the drogue, with about 100 feet lateral separation. Drogue extension will slow tanker speed. The tanker should adjust power to maintain desired refueling speed. 230 KIAS is recommended; however, plug-ins may be made anywhere in the store operational envelope of 200 to 300 KIAS. All aircraft will remain clear of the area directly behind the drogue during extension or retraction, in the event the hose and drogue separate from the store. If drogue extension is not snubbed as it approaches the fully extended position, do not attempt plug-ins.
7. The tanker pilot, as leader of the refueling formation, has the primary responsibility for maintaining a good lookout for other aircraft, although other members of the flight are responsible for assisting to the maximum extent possible.
8. Any evidence of a hydraulic leak from the buddy store during refueling operations should immediately be reported to the tanker pilot and the store secured.
9. If refueling at an altitude of 10,000 feet or below, turn air conditioning to RAM prior to plug-in to prevent possible ingestion of fuel vapor into the cockpit if a malfunction occurs.
10. If a tanker escort is assigned, the escort pilot will fly a close parade position on the tanker throughout the evolution (except during the moment of unfeathering the turbine) and will inform the tanker when the dumping has been completed. The escort will watch for store malfunctions and provide assistance in case of tanker radio failure. The tanker escort, when assigned, will give any necessary signals for actuation of the turbine and drogue. The escort will not take part in the refueling sequence when another formation is refueling.

c. Refueling.

1. The leader should detach and move into a position 20 feet behind and below the drogue, on a plane with the trailing hose, to minimize turbulence from the tanker's wake. Call "____, lining up," before sliding into position behind the tanker. Observe the amber light on the tanker store, indicating the store may be engaged. If the light is not on, use caution during engagement, as hose tensioning and reel-in may be inoperative. The most likely cause, however, is a burned out bulb. Trim the aircraft slightly nosedown to remove any slop from the elevator control system and move forward and up the hose reference until the tip of the probe is 5 to 10 feet directly behind the drogue. Pause here long enough to get stabilized, then add enough power to close and engage the drogue at a closure speed of about 3 knots. Either the tanker or the probe and drogue may be used as the primary visual reference; however, both must be sighted to make consistent and safe engagements. Closing speeds in excess of 5 knots may cause hose-whip, with ensuing damage to probe, hose and drogue, or both. Also, if misaligned at high closure speeds, damage to the radome, nose section, pitot tube, or canopy may occur. If the drogue is missed, stay below the drogue and back straight out until the drogue is in sight. Avoid looking up too high for the drogue. In this case, the pilot may unconciously pull back on the

stick and climb into the drogue. Instead, use the tanker as a reference until safely aft of the drogue.

2. After engaging the drogue, continue to push in the hose until the amber light is out, and then call "_____, contact." The last 20 feet of hose to unreel from the store has a white stripe every two feet. At least two stripes must be pushed into the store before the transfer will occur. Do not fly so close that no stripes are visible. Maintain a position so that if some opening between the tanker and the receiver occurs, the transfer will not be interrupted. This position should also be along the general reference of the hose before plug-in and will keep the nose centered slightly above the lip of the aft end of the store.

3. Breakaway is accomplished by the receiver reducing power in order to open from the tanker at about 3 knots. Back straight away and down, following the line of the trailing hose. Stay behind the drogue until all members of the flight are sighted. To facilitate this, it is necessary that all members of the flight properly maintain their position in echelon. When the receiver aircraft is clear of the area behind the hose and drogue, call "_____, clear."

4. After breaking away, the leader will move to the opposite side of the tanker, where he will supervise the refueling, giving help as necessary. After the leader is clear of the drogue, the number-2 man in the flight will move into position and make his plug-in. He will then disengage and join the leader in loose, outside echelon, as before. Each member in turn will make plug-ins and upon completion will move to the next position on the leader.

d. After Refueling.

1. When all members of the flight have successfully completed the hookups and are clear of the drogue, the Flight Leader will signal to secure the store by moving the flight forward in echelon until the leader is again abeam the tanker, with at least 200 feet separation. When the tanker pilot observes the entire flight in this position, he will retract the drogue and feather the air trubine. The Flight Leader will indicate that the turbine is feathered by giving a "thumbs-up."

2. Upon completion of refueling, the Flight Leader should resume lead of his flight, breaking away from the tanker in an easy turn until well clear. The tanker maintains straight and level flight until adequate separation from the receiver aircraft is assured.

482 MISSION REFUELING

The procedures for mission refueling are covered in detail in the NWDS for the A-4.

483 TANKER PROCEDURES

a. Tanker Control Procedures. Tanker procedures can be found in the Flight Handbook. A checklist should be made for use by the tanker pilot.

484 TANKER SAFETY PRECAUTIONS

1. Do not start the turbine or extend or retract the drogue when over populated areas or when other aircraft are close abeam or behind.
2. Do not extend the drogue after it has been retracted when a hydraulic leak has been observed.
3. Do not extend the drogue if there is any evidence of a possible electrical failure.
4. Do not energize the turbine after dumping fuel unless failure to provide fuel will place another aircraft in jeopardy.

485 STORE LIMITS

The following limitations apply to the store:

1. Maximum speed for unfeathering is 300 KIAS; for extension of the drogue and refueling, it is 300 KIAS or .80 IMN.
2. Maximum speed for drogue retraction is 250 KIAS. (If the drogue will not retract fully at 250 KIAS, slow to 230 KIAS or less and recycle drogue.)
3. The Ship Tank Switch will be in the TO STORE position only with the aircraft in straight and level flight; or during refueling operations when the tanker's wing fuel is required for transfer to the receiver aircraft, the tanker will be wings-level, and at least 50 gallons of fuel will have already been delivered to the receiver.

486 NIGHT REFUELING

Night refueling is performed in essentially the same manner as during the day. The tanker should have all lights on BRT and STDY, except the anticollision lights. The buddy store lights

should be on DIM. The tanker lights illuminate enough of the tanker and the drogue to allow the receiver pilot sufficient light for the approach lineup. The receiver pilot should request adjustment of the tanker lights to meet his requirements.

Take up an initial position on the tanker and use the same procedures described for day refueling in subsection 481c. When in position aft of the drogue, correct altitude can be determined by the receiver pilot sensing the tanker's jetwash on his vertical stabilizer. The receiver aircraft lights should be on BRT and STDY. The receiver's fuselage light will provide sufficient illumination to see the drogue from 10-20 feet aft. Use the probe light also, if so equipped.

The tendency in night air refueling is to start the approach too far aft. This makes it very difficult to judge relative motion, and usually results in a high closure rate.

490 FLIGHT TEST PROCEDURES

a. Test Pilots. The most important single factor in getting good test flights on the aircraft is to pick experienced, conscientious test pilots. Commanding Officers will designate, in writing, those aviators within their command who are currently eligible to perform this duty.

b. Test Flights. Test flights will be performed when directed by, and in accordance with, the directives of BUWEPS, Type Commanders, or other appropriate authority.

c. Test Forms. BUWEPS Instruction 4700.2 (current edition) should be consulted for requirements for test flight forms.

CHAPTER V

Emergency Procedures

500 GENERAL

The course of action which a pilot will take when faced with an emergency situation is based upon his knowledge of the aircraft and of emergency procedures. For this reason, initial training must be thorough in these areas, but should not be considered complete. Aircraft systems and procedures must be frequently reviewed on a regular basis. Periodic emergency drills in the OFT/WST are ideally suited for realistic simulation of almost all emergencies that may be experienced. Above all, the pilot must be able to recognize emergency situations, analyze the possible courses of action, select the best one, and then take the action necessary in accordance with the procedures of good airmanship.

1. NWP 41(A) contains general considerations which are applicable in various emergency situations.
2. NWP 37(A) discusses SAR organization and procedures.
3. The FLIP En Route Supplement covers current procedures for two-way radio failure VFR-IFR, recommended procedures for any emergency phase (uncertainty, alert, distress, lost), and procedures for use with a rescue interceptor, both day and night.
4. Operation plans and orders of carrier force Commanders and Commanders of other forces employing aircraft contain provisions for handling aircraft in distress and for rescue of personnel.
5. When an emergency is experienced while operating in the continental limits of the United States, the IFF Function Select Knob will be placed in the EMERGENCY position, with the Mode-3 Switch forward and Mode-1 Code 00 and Mode-3 Code 77 set on the SIF Control Panel, unless otherwise directed by competent authority.

This Chapter contains the specific step-by-step procedures to be used for all emergencies likely to be encountered in the A-4. Use it as the primary guide for studying remedial procedures for various emergencies. They are based primarily on the Flight Manual, but are modified to include squadron and fleet experiences and other procedures not covered in the Flight Manual. The information contained in the Flight Manual must be used to provide additional knowledge of systems operation and malfunctions.

In general, the emergencies a pilot will encounter fall into one of four categories. These are: Ground Emergencies, Takeoff Emergencies, Inflight Emergencies, and Landing Emergencies. It is likely that most emergencies will require some deviation from the procedures set forth for a simple failure, because of varied conditions: i.e., compounded emergencies, facilities available, weather factors, etc. Consequently, thoughtful analysis of each situation is necessary, and the selection of the course of action to be taken rests with the pilot.

510 GROUND EMERGENCIES

a. Engine Fire During Start.

1. Throttle - OFF.
2. Manual Fuel Shutoff Valve - EMERG. OFF.
3. Apply starting air.
4. Allow starter to motor the engine until the fire has disappeared.
5. If the fire is not promptly extinguished, the fireguard should apply CO_2 to the engine intake duct.
6. If the fire persists (or if no starting unit is available), abandon the aircraft.

b. Wing or Accessory Section Fire. If ground personnel determine that fire is in the wing or accessory section, they should signal to the pilot to abandon the aircraft, apply CO_2 to the fire, and assist in the pilot's egress as much as possible. Before abandoning the aircraft, the pilot should perform the following:

1. Throttle - OFF.
2. Manual Fuel Shutoff Valve - EMERG. OFF.
3. Secure starting air.

c. Brake Failure During Taxi.

1. Throttle - OFF.
2. Notify the tower, if possible, before communications are lost.
3. Allow the aircraft to coast to a stop. In the event of a single brake failure, use the remaining brake to stop the aircraft. Ground-loop, if required to remain on the taxiway or flight deck.
4. Retract the landing gear as a last resort to stop the aircraft, if circumstances warrant.

d. Hot Brakes.

1. When excessive braking has occured (such as after an aborted takeoff), or hot brakes are suspected, notify the tower to alert the crash crew and to warn other personnel to stand clear. A dragging brake will also produce excessive heat at the wheel. In each case, the amount of heat will vary. A badly dragging brake (indicated by necessity of r.p.m. in excess of IDLE to maintain taxi speed) could raise wheel temperatures to a point where a normal takeoff would heat the wheel enough to produce an explosive failure.
2. Taxi the aircraft to the hot-brake area. If no specific hot-brake area has been designated, taxi the aircraft clear of the duty runway and taxiways in use. Park so that the wheel axle points toward the clear area. Allow a minimum of 45 minutes for brakes to cool prior to moving.
3. If operational necessity requires immediate takeoff, leave the landing gear extended at least 3 minutes after takeoff to provide sufficient cooling of the wheel assembly to prevent an explosive failure. (Refer to BUWEPS Instruction 13420.1 for additional information on this subject.)

520 TAKEOFF EMERGENCIES

a. Aborting Takeoff. There are many circumstances which may require aborting a takeoff. Among them are: unacceptable Engine Acceleration Check, less than normal takeoff r.p.m./EGT, illumination of Fire Warning Light, runaway nosedown trim, loss of oil pressure, Fuel Transfer Light ON, smoke in the cockpit, abnormally slow aircraft acceleration to takeoff speed, blown tire, etc. To successfully carry out an abortive takeoff, the pilot must be aware of the airfield facilities which may be at his disposal and their location. The effects of wind component must be considered. Any runway may be divided into three portions for takeoff emergencies.

When aborting a takeoff, proceed as follows:

(1) Between Brake Release and Line Speed Check.

1. Throttle to IDLE (or closed).
2. Speedbrakes - OPEN.
3. Stick forward.
4. Simultaneously with the above steps, broadcast, "(Identification), aborting takeoff," to warn following aircraft and the tower.
5. Flaps as set.
6. Normal braking without blowing tires.
7. Hook DOWN 1,000 feet prior to arresting gear, if required.

(2) Between Line Speed Check and Go/No-Go Point. (The go/no-go point is defined as the point beyond which maximum braking will not stop the aircraft on the runway remaining.)

1. Throttle - CLOSED.
2. Speedbrakes - OPEN.
3. Stick forward.
4. Simultaneously with the above steps, broadcast, "(Identification), aborting takeoff," to warn following aircraft and the tower.
5. Flaps as set.
6. Maximum braking without blowing tires.
7. Hook DOWN 1,000 feet prior to arresting gear, if available.

(3) Beyond the Go/No-Go Point When Arresting Gear is Available.

1. Reduce power, but maintain minimum safe ejection speed or above.
2. Maintain directional control and steer for the center of the arresting gear.

3. Simultaneously with the above steps, broadcast, "(Identification), aborting takeoff," to warn following aircraft and the tower.
4. Hook DOWN 1,000 feet prior to arresting gear.
5. Eject, if the hook skips the arresting gear.

Beyond the go/no-go point when the go/no-go point is beyond the arresting gear (or none is available): Eject (if fire indications or power loss are confirmed, as covered in Section 520f, below).

b. Blown Tire on Takeoff. If a tire blows on takeoff, the pilot must decide whether to abort or continue the takeoff. The following generalities are pertinent:

1. If a tire blows early in the takeoff roll before a moderate amount of rudder effectiveness is available (about 70 KIAS), the takeoff should be aborted.
2. At high gross weights where takeoff distance utilizes most of the runway available, the increased drag of the blown tire may preclude successful takeoff. Abort the takeoff at any airspeed if arresting gear is available and if it is apparent that lift-off cannot be accomplished prior to reaching the end of the runway.
3. If a successful takeoff is made with a blown main or nose tire, after airborne delay retraction of the landing gear until rotation has ceased. If possible, get a visual check of the condition of the tire by another aircraft to determine whether or not retraction can be safely accomplished without having the wheel hanging up in the wheel well. Usually, the tire will also be hot, and a minimum of three minutes should be allowed with the gear extended to permit the tire to cool.
4. The braking effectiveness of a blown tire is less than that of a tire in good condition. Consequently, to deliberately blow a good tire to "balance" another that has blown is not good procedure.

c. Runway Nosedown Trim. If unable to rotate the nose to a takeoff attitude 5 knots below the predicted takeoff airspeed, the pilot must decide whether to abort, apply corrective noseup trim (using the Manual Override), or eject. In this case, foresight can prevent this situation. Use the Takeoff Checkoff List on the instrument panel immediately prior to takeoff roll and glance at the trim indicators when approaching lift-off distance. An added precaution is to ensure that the stick is grasped in such a manner that the trim button cannot be moved inadvertently.

d. Engine Failure During Takeoff. If engine failure is suspected during takeoff, ascertain that the throttle is at MILITARY. Improper adjustment of the throttle friction may allow the throttle to retard, thereby giving the impression of engine failure. In the event of a confirmed engine failure, fire, or structural failure on takeoff, and the airspeed is less than 90 KIAS, abort the takeoff, as above. In the event of a confirmed engine failure, fire, or structural failure on takeoff, and the airspeed is above 90 knots on the ground or when airborne, EJECT unless the aircraft can be stopped on the runway remaining.

e. Engine Failure During Catapulting. In the event of a confirmed engine failure during catapulting, EJECT. If unable to eject, ditch the airplane straight ahead in a nose-high (but not in a stalling) attitude to prevent diving after contact with the water. Accomplish the following, if time permits:

1. Landing Gear Handle . . . . . UP.
2. Emergency Bomb Release . . PULL.
3. Throttle . . . . . OFF.
4. Remain braced until all shocks stop.
5. Canopy Jettison Handle. . . . PULL.
6. Pull Harness Release Handle and leave the airplane immediately after it comes to a complete stop.

Refer to DITCHING and UNDERWATER ESCAPE, subsection 549.

f. Engine Failure After Takeoff. If the engine fails after the airplane becomes airborne and insufficient runway remains to make a safe landing, convert excess airspeed to altitude. (Buffet onset indicates the attitude which will provide maximum altitude gain.) Ensure that power loss is not due to inadvertent retarding of the throttle because of insufficient throttle friction. If time permits, extend the emergency generator and jettison external stores. EJECT at or just prior to the peak altitude while the aircraft is still ascending.

If unable to eject, accomplish as many of the following as possible.

1. Throttle. . . . . .OFF.
2. Landing gear . . . . . .UP, if insufficient runway remains for landing.
3. Emergency generator . . .EXTEND.
4. Emergency Bomb Release Handle . . . . . .PULL.
5. Flaps . . . . . .AS SET.
6. Manual Fuel Shutoff Valve..EMERG. OFF.
7. Land straight ahead.

Refer to FORCED LANDINGS, subsection 548.

g. Stores Jettison. Stores may be jettisoned on the main or emergency generator operation by selecting the desired position of the Emergency Jettison Select Switch and pulling the Emergency Bomb Release Handle. Observe the jettison speed limits, if feasible.

h. Retraction-Safety Solenoid Inoperative. To raise the gear with the Retraction-Safety Solenoid inoperative:

1. Release the Landing Gear Control Lock and rotate the gear handle toward the UP position.
2. Move the Retraction Release Switch aft and simultaneously raise the gear handle to the full UP position.

After airborne, if it becomes necessary to perform the above, it may indicate that the emergency generator has inadvertently extended or that the main transformer rectifier has failed. Look for corroborating evidence of these before taking any action other than that listed above.

i. Unsafe Gear-up Indication. Gear indications of UNSAFE after the gear retraction cycle is completed are usually caused by faulty microswitches, failure to remove the landing gear safety pins, or, in the case of the nose gear, possibly by nose-strut overinflation. Proceed as indicated:

(1) Main Gear Unsafe or Down, Gear Handle Up.

1. Maintain 225 KIAS or less.
2. Cycle the gear in an attempt to get an UP indication.
3. If unable to get an UP indication by cycling, get a visual check by aircraft or ground personnel. Continue the mission if the gear doors are closed and flush with the aircraft. Otherwise, burn down and land.

(2) Nose Gear Unsafe or Down, Gear Handle Up.

1. Maintain 225 KIAS or less.
2. Get a visual check by other aircraft or ground personnel to ascertain whether nose gear door is closed and flush with the aircraft. Cycle the gear, if the door is reported to be closed, in an attempt to get an UP indication. Continue the mission.
3. Whenever a visual check cannot be made, lower the gear as soon as practicable, burn down, and land. Do not cycle the gear.
4. In the event a visual check indicates that the nose gear is not fully retracted or that the nosewheel door is not fully closed, do not cycle. Lower the gear as soon as practicable, burn down, and land.

530 INFLIGHT EMERGENCIES

531 ENGINE MALFUNCTIONS

a. Loss of Thrust. Possible causes are inadvertent reduction of throttle by the fuel control balance mechanism (or broken throttle linkage), PRIMARY fuel control failure, or icing.

1. Check the throttle for position and engine response.
2. Shift to MANUAL fuel control unless other action is indicated. (See FUEL CONTROL MALFUNCTIONS, subsection 532.)
3. If icing is suspected, shift to MANUAL and change altitude, if possible.

b. Chugs and Stalls. Possible causes are icing, PRIMARY fuel control failure, rapid engine acceleration while operating at excessive angle of attack at high altitudes, or adding throttle too fast while operating in MANUAL fuel control.

1. Reduce power as necessary to regain normal operation. If chugs/stalls persist, increase airspeed by diving.
2. If Primary fuel control failure is suspected, shift to MANUAL.
3. If icing is suspected, shift to MANUAL and change altitude, if possible.
4. If pilot-induced and no other adverse symptoms are apparent, continue the

flight, but record the circumstances upon return.

c. R.P.M./EGT Malfunctions. Fluctuating r.p.m. not corresponding to similar indications of fuel flow or EGT should be assumed to be a faulty tachometer system. Use airspeed and throttle position for power reference if r.p.m. is unreadable. If fuel flow or EGT is also fluctuating, assume a PRIMARY fuel control malfunction and shift to MANUAL.

Fuel flow meter or EGT fluctuations should be treated similarly, i.e., unless engine performance is determined to be erratic from more than one source, assume an instrument error. Otherwise, shift to MANUAL fuel control.

d. Engine Overtemping. During climbs or operations at MILITARY power, minor overtemping may occur, but should be controlled by reducing r.p.m. slightly to maintain EGT within limits. Above 31,000 feet, it may be necessary to reduce r.p.m. to prevent overtemping. This is acceptable, as long as EGT limits can be maintained at not less than 98 percent at 35,000 feet and 96.5 percent at the maximum operating altitude. If engine performance does not meet this criteria or EGT is abnormally high at other power settings, it indicates a loss of engine efficiency due to increased friction (bearing failure, turbine rub, etc.), damaged blading, or incorrect tailpipe nozzle area. Attempt to maintain EGT within limits. However, do not reduce r.p.m. below that necessary to maintain flight, providing overtemping is the only malfunction indicated.

e. Oil Pressure Loss. Always confirm oil pressure loss or low readings with the alternate system flip-flop or pressure gauge. If confirmed, proceed as in ENGINE FAILURE, subsection 533. If a discrepancy exists between indications, it is recommended that the aircraft return to base and land as soon as possible.

f. Fuel Boost Pump Failure. With an inoperative boost pump, gravity flow of fuel to the engine-driven fuel pump provides an adequate supply of fuel for all power conditions up to 6,000 feet, and there are reported instances of successful full-power operation as high as 27,000 feet. At a power setting of 90 percent, operation at 35,000 feet and higher is possible.

When the boost pump fails, reduce throttle to a setting commensurate with altitude. Avoid zero g, negative g, or inverted flight. Ensure positive g during speedbrake operation.

g. Engine-Driven Fuel Pump. Either gear stage of the engine-driven fuel pump is capable of supplying the engine with enough fuel for all operations. Should one gear stage fail, a bypass routes the fuel flow around the defective gear stage, allowing the other stage to function without interference. There will be no indication to the pilot of such failure.

h. Throttle Linkage Failure. On airplanes incorporating EB 240, if the linkage breaks between the cockpit throttle lever and the engine fuel control unit (at settings above IDLE), the fuel control will automatically seek about 87 percent r.p.m. (with fuel control in PRIMARY). This will normally provide sufficient thrust to maintain flight. If 87 percent will not maintain flight:

1. Retract speedbrakes, wheels, and flaps.
2. Increase airspeed, if feasible, to maximum endurance airspeed or faster.
3. If still unable to maintain altitude, jettison stores as necessary.

If EB 240 is not incorporated and the throttle linkage breaks, the fuel control will automatically retard to IDLE or less, and usually the engine will flame out.

For landing procedures, see subsection 545, p. or q.

532 FUEL CONTROL MALFUNCTIONS

A malfunction of the fuel control may result in fluctuating r.p.m., EGT, and fuel flow, a sudden drop in fuel flow, inability to accelerate the engine above 78-82 percent (r.p.m. hangup), or a complete loss of power. When any of these occur and the engine is still running, proceed as follows:

1. Throttle . . . . . IDLE.
2. Fuel Control Switch . . . MANUAL.
3. Advance throttle slowly and smoothly to the desired setting. Use caution

in manipulating throttle to prevent overspeeding, excessive EGT, or flameout.

When shifting to MANUAL, the throttle must be positioned at IDLE or to a setting that will result in the same or less r.p.m. in MANUAL than that existing at the time MANUAL is selected, or severe overspeeding, overtemping, or flameout may occur. At 6,000 feet or below, MANUAL may be selected safely at MILITARY throttle setting only if the r.p.m. is at 100 percent. If the r.p.m. is less than MILITARY, the throttle must be reduced accordingly prior to selecting MANUAL to assure continued operation. Above 6,000 feet, always retard the throttle to IDLE before shifting. At 35,000 feet, military power in MANUAL is achieved with the throttle about 1/2 inch forward of the IDLE detent. Consequently, shifting to MANUAL with the throttle positioned farther forward than 1/2 inch from IDLE will assuredly result in overspeed, overtemp, or flameout. At high altitudes, small movements of the throttle may result in large changes in r.p.m. and EGT. Do not return to PRIMARY fuel control operation while in flight if the shift to MANUAL was due to fuel control malfunctioning. If the shift was made for the purpose of practicing switchovers, return to PRIMARY as follows:

1. Throttle . . . . . IDLE.
2. Fuel Control Switch . . . . PRIMARY.
3. Advance throttle as desired.

Fuel control acceleration hangup occurs in the 78-82 percent r.p.m. range, usually after prolonged flight at high altitude. Occasionally, hangup will not be present at the end of the flight, but will occur prior to launching on the flight, subsequent to the cold-soak. Modified fuel controls have practically eliminated this failure, but the pilot should always be prepared for its occurrence during an approach, even though the prescribed Landing Pattern Acceleration Check has been performed. Shifting to MANUAL fuel control will restore the ability to accelerate above the hangup range.

533 ENGINE FAILURE

Symptoms of imminent engine failure, singly or in combination, are:

1. Loss of thrust, not due to throttle movement or icing.
2. Fluctuating r.p.m. and EGT, not eliminated by shifting to MANUAL fuel control.
3. Abnormally high EGT in relation to engine r.p.m.
4. Oil pressure dropping, or less than 24 p.s.i.
5. Abnormal vibration, or loud or explosive sound(s) apparently emanating from the engine.

If any of the above symptoms appear, gradually adjust power to the minimum r.p.m. consistent with the requirements of level flight and land as soon as possible, executing the precautionary approach, described in subsection 542, at the nearest suitable landing facility. If the symptom is loss of oil pressure, or if bearing failure is suspected, any throttle change may cause complete bearing failure and engine seizure. However, 87 percent r.p.m. is recommended, if feasible. Do not reduce engine r.p.m. below that necessary for level flight until landing on the runway is assured or until the decision is made to eject, as increased engine friction may prevent the engine from accelerating once the throttle has been retarded. With a bearing failure, operation at a very low power setting may actually hasten engine seizure.

a. Procedure on Encountering Engine Failure.

(1) Flameout. In the event of a flameout, proceed as follows:

1. Throttle - OFF.
2. Emergency generator - EXTEND.
3. Check for evidence of fire. (Refer to FIRE, subsection 534.)
4. If fire is present or existed prior to shutdown, do not attempt to restart the engine. (See EJECTION, subsection 535.)
5. If no fire exists, start the engine as described below.

(2) Air Start.

1. Throttle - OFF.
2. Emergency generator - EXTEND. (Avoid negative g flight in order to prevent air being trapped in the engine-driven fuel pump inlet line and to minimize fire hazard.)
3. Fuel Control Switch - MANUAL.
4. If practicable, descent to 20,000 feet, or below, at best glide speed.

5. Establish 180 ± 20 KIAS glide.
6. Air Start Switch - ON.
7. If ASC 155 and EB 328 are incorporated, proceed as follows: Position throttle at 500 PPH fuel flow. Slowly advance throttle to a maximum of 1,000 PPH. Do not increase throttle beyond this point until light-off is obtained. When fuel flow rate is not known (inoperative or missing fuel flow indicator), position throttle midway between OFF and IDLE.
8. If EB-328 is not incorporated, proceed as follows: Position throttle abeam IDLE (not around "horn"), then retard to set 800 PPH fuel flow. If throttle is retarded beyond this point, priming fuel and ignition may not be available. When fuel flow rate is not known (inoperative or missing fuel flow indicator), position throttle abeam IDLE and retard to midway between OFF and IDLE.
9. If equipped with operating fuel flowmeter and no fuel flow is observed when throttle is positioned as indicated in 7 or 8 above, recheck Fuel Control MANUAL, Manual Fuel Shutoff Control NORM. If this does not provide fuel, open throttle toward MIL until fuel flow is indicated. If still unable to indicate fuel flow, further starting attempts will be futile.
10. After relight, for any configuration, throttle should be retarded, if necessary, to maintain EGT within limits. Do not advance throttle beyond specified setting until EGT peaks and starts down. Then advance throttle to IDLE, maintaining EGT within limits.
11. Advance throttle slowly and smoothly to desired setting, maintaining EGT within limits. As engine accelerates and r.p.m. approaches 80 percent, EGT sensitivity to throttle movement will be greatest.
12. Air Start Switch - OFF.
13. If relight does not occur within 30 seconds (JP-4) or 45 seconds (JP-5), retard throttle to the OFF position. Turn Air Start Switch OFF and wait 10 seconds to permit airflow through the engine to purge fuel from the combustion chamber and tailpipe before attempting another start. Optimum relight range of fuel flow is 500 - 850 PPH. JP-4 lights more readily at the lower part of the fuel flow range, JP-5 at the higher part.

(3) Abbreviated Air Start. When loss of thrust/engine flameout occurs at low altitude, the following abbreviated air start may be attempted, if there is sufficient time to do so without jeopardizing the pilot's chance of successful ejection.

1. Throttle . . . Approximate setting required for r.p.m. indicated. If ASC 155 is not incorporated, throttle must be retarded to approximately the 70 percent position or less to enable the Air Start Switch to be turned ON.
2. Air Start Switch. . . . ON.
3. Fuel Control Switch. . MANUAL.
4. Emergency generator . . . . . EXTEND.
5. Emergency Bomb Release Handle . . . . PULL.
6. If engine relight is successful, advance throttle slowly to prevent overtemping or flameout. Turn Air Start Switch OFF after relight.
7. If the preceding abbreviated air start is unsuccessful or the altitude peaks with no evidence of a relight, EJECT.

b. Maximum Glide. The recommended speed for maximum gliding range is approximately 200 knots IAS for gross weights up to 16,000 pounds, clean configuration, and altitudes up to 35,000 feet. At 40,000 feet, it is 220 knots; 45,000 feet, 250 knots. See Figure 5-1 for approximate gliding ranges from various altitudes.

534 FIRE

Illumination of the FIRE Warning Light is usually the first indication of fire or overheat condition in the engine compartment or tail section. However, failure of the sensing elements or moisture in the FIRE Warning Relay will also cause the FIRE Warning Light to illuminate. The pilot should be alert for corroborating evidence that a fire actually exists before executing any drastic emergency procedure based on illumination of the FIRE Warning Light. (Sensing-element failures may occur during prolonged periods of airframe buffeting caused by low-altitude operation with speedbrakes out at high power settings,

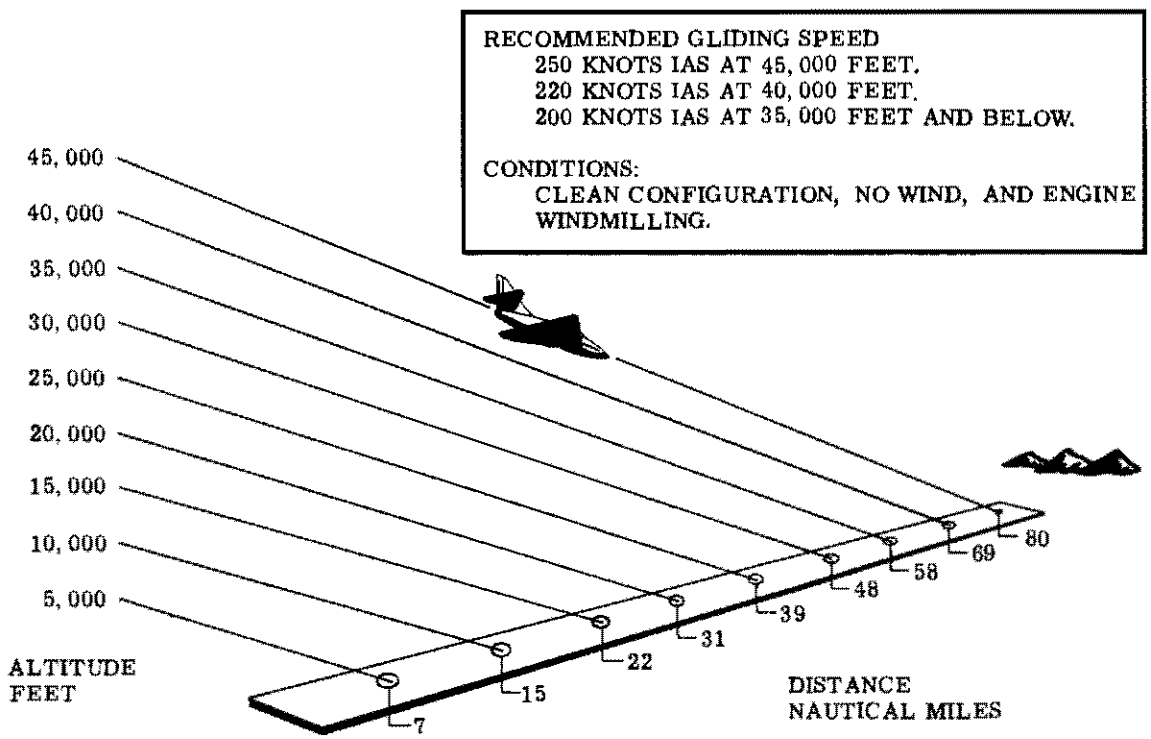


Figure 5-1. Maximum Glide.

such as burning down to make an early recovery time at landing weight.) FIRE Warning Relay malfunctions occur frequently after parked aircraft have been subjected to heavy rains.

An actual fire will almost always be accompanied by one or more of the following:

1. Scorched or pungent odor in the LOX System.
2. Emission of smoke or flames from the tailpipe or other area.
3. Flickering or steady ladder lights, stiffening in elevator or aileron control pressures, partial or complete loss of one or more flight controls.
4. Explosion or unusual vibration.
5. Rising EGT and decreasing r.p.m.; excessive EGT.

One or more of the above indications may be used to confirm a FIRE Warning Light indication that a fire exists. The possibility exists that a fire could be present without illumination of the FIRE Warning Light. Whenever possible, confirmation of fire indications should be made through visual sighting by the pilot, a wingman, or other personnel, if practicable.

If the FIRE Warning Light illuminates, the pilot should perform one of the following two procedures, depending on the presence or absence of other indications of fire.

a. Fire Warning Light: Other Indications of Fire.

1. Throttle . . . . . OFF.
2. Manual Fuel Shutoff Knob . . . . . EMERG. OFF.
3. Emergency generator . . . . . EXTEND.
4. If the fire is extinguished by moving the throttle to OFF and cutting off the fuel supply to the engine, as evidenced by the FIRE Warning Light going OUT and the disappearance of other indications of fire, do not attempt to restart the engine. Depending on the sequence of events and indications, immediate ejection may be indicated. However, the pilot must decide when to eject, taking into consideration aircraft altitude, attitude, airspeed, and condition; weather, chances for improving the rescue/survival environment by gliding toward land or a ship, and other factors. (See EJECTION, subsection 535.)

b. Fire Warning Light: No Other Indications of Fire.

1. Throttle . . . . . Minimum required for flight.
2. Be alert for other indications of fire. Whenever possible, get a visual check for smoke or flames from the wingman or other personnel. If no one is available to make this check, the pilot should bank the aircraft and observe his flightpath for smoke. If fire is confirmed, proceed as outlined in Fire Warning Light: Other Indications of Fire.
3. If there is no other indication of fire, it is most likely that a false FIRE Warning Light indication exists.
4. Land as soon as possible at the nearest suitable landing facility. Shut down the engine immediately after touchdown. Move the Manual Fuel Shutoff Knob to EMERG. OFF. Abandon the aircraft as soon as the aircraft comes to a stop, if there is any evidence that a fire actually exists.

c. Wing Fire. A fire in the wing could be caused either by fuel leakage or defective electrical wiring.

1. Jettison all combustible external stores.
2. Follow the procedure for Electircal Fire, if indicated.
3. If the fire continues to burn or is obviously fuel-fed, EJECT.

d. Electrical Fire. When a fire seems to be electrical in origin, proceed as follows:

1. Turn OFF all electrical equipment.
2. If the fire is extinguished, turn ON only necessary equipment, one by one, to determine the offending circuit, if it is again energized.
3. If the fire cannot be extinguished in this manner, the pilot must decide whether to land as soon as possible or EJECT.

e. Smoke or Fumes in the Cockpit. There are several sources of smoke or irritating fumes in the cockpit. These are:

1. The air-conditioning system.
2. The bleed-air line may not be connected to the "g" suit valve, or there may be an improper assembly of the valve.
3. A torn canopy seal.
4. The bleed-air line may not be connected to the turn-and-bank indicator.
5. An electrical fire in the cockpit.

Note that selecting "RAM" on the Cabin Pressure Switch will correct only the smoke or

fumes from the first source listed, while all others remain unaffected.

f. Elimination of Smoke or Fumes From the Cockpit.

1. Eliminate the possibility that smoke or fumes are mistaken for fog from the air-conditioning system by increasing the Temperature Control to AUTO-HOT.
2. Select RAM.
3. If the smoke or fumes are not eliminated, life the oxygen mask for a cautious smell. Do not inhale deeply due to the possible presence of 7808 oil fumes which are highly toxic.
4. In the event the odor smells like burning or hot electrical insulation, proceed as in Electrical Fire, paragraph d, above.
5. If it is determined that the smoke or fumes are not electrical in origin, be alert for other evidence of fire. (See previous paragraphs in this subsection.)
6. If the smoke or fumes cannot be eliminated and so limit the vision that a safe landing could not be made, or if they are accompanied by excessive cockpit temperatures, jettison the canopy.
7. Land as soon as possible.

535 EJECTION

Ejection may be necessary as a result of fire, engine failure, structural failure, midair collision, or when the aircraft becomes uncontrollable. In each case, the pilot must decide when to eject, using the following as a guide:

1. Ejection is mandatory under the following conditions, except when unusual circumstances clearly indicate to the pilot that the cause of safety to himself and others will be better served by a flameout approach than by ejection.

   Serious, uncontrolled fire.

   If the aircraft is in uncontrolled flight at 10,000 feet AGL or below.

   When engine flameout occurs below 1,500 feet AGL and 250 KIAS.

   If repeated relight attempts are not successful between 20,000 and 10,000 feet, eject by 10,000 feet AGL.

   If still on first or second relight attempt when passing through 10,000 feet AGL and it appears that a relight is likely, the air start attempt may be continued to a minimum of 5,000 feet AGL.

   Certain landing gear configurations. (See Figure 5-6.)
2. If the engine flames out below 10,000 feet AGL, zoom to convert excess airspeed to altitude. Attempt a normal/abbreviated air start as time permits. If the peak altitude is 5,000 feet AGL and the air start attempt is not successful, eject no lower than 5,000 feet AGL. If the peak altitude is below 5,000 feet AGL and an air start attempt is made during the zoom and there is no evidence of a relight, eject at the peak altitude. If no air start attempt is made, eject at the peak altitude.
3. If the decision to eject is made at high altitude, it is recommended that the pilot eject at a minimum of 10,000 feet AGL, or higher, if conditions so indicate. (See Ejection Summary, Figure 5-2.)

Using the rocket catapult seat, ejection may be accomplished on the ground at 90 KIAS and above and at all other altitudes and airspeeds within the flight range of the airplane (see Figure 5-3), except for abnormal flight conditions of steep angles of bank (or inverted flight and high rates of descent at very low altitudes). For all practical purposes, in predicting minimum terrain clearance altitude from the charts, dive-angle and angle-of-bank chart altitudes are additive up to 60 degrees of dive. In dives steeper than this, bank angle is negligible. The possibility of injury to shoulders and hips from flailing and wind-blast damage to personal gear makes it imperative that the airspeed be reduced to 350 KIAS or less prior to ejection, whenever possible. Inverted and severe yaw positions should be corrected, if feasible, prior to ejection and every attempt made to reduce speed.

Usually, the pilot will have time enough to accomplish several things to prepare himself for a successful ejection prior to pulling the face curtain. However, when the emergency condition requiring ejection is such that ejection must be made without hesitation, simply grasp the Face Curtain Handle (or Secondary Ejection Handle) and pull forcefully to the fullest extent until the seat ejects.

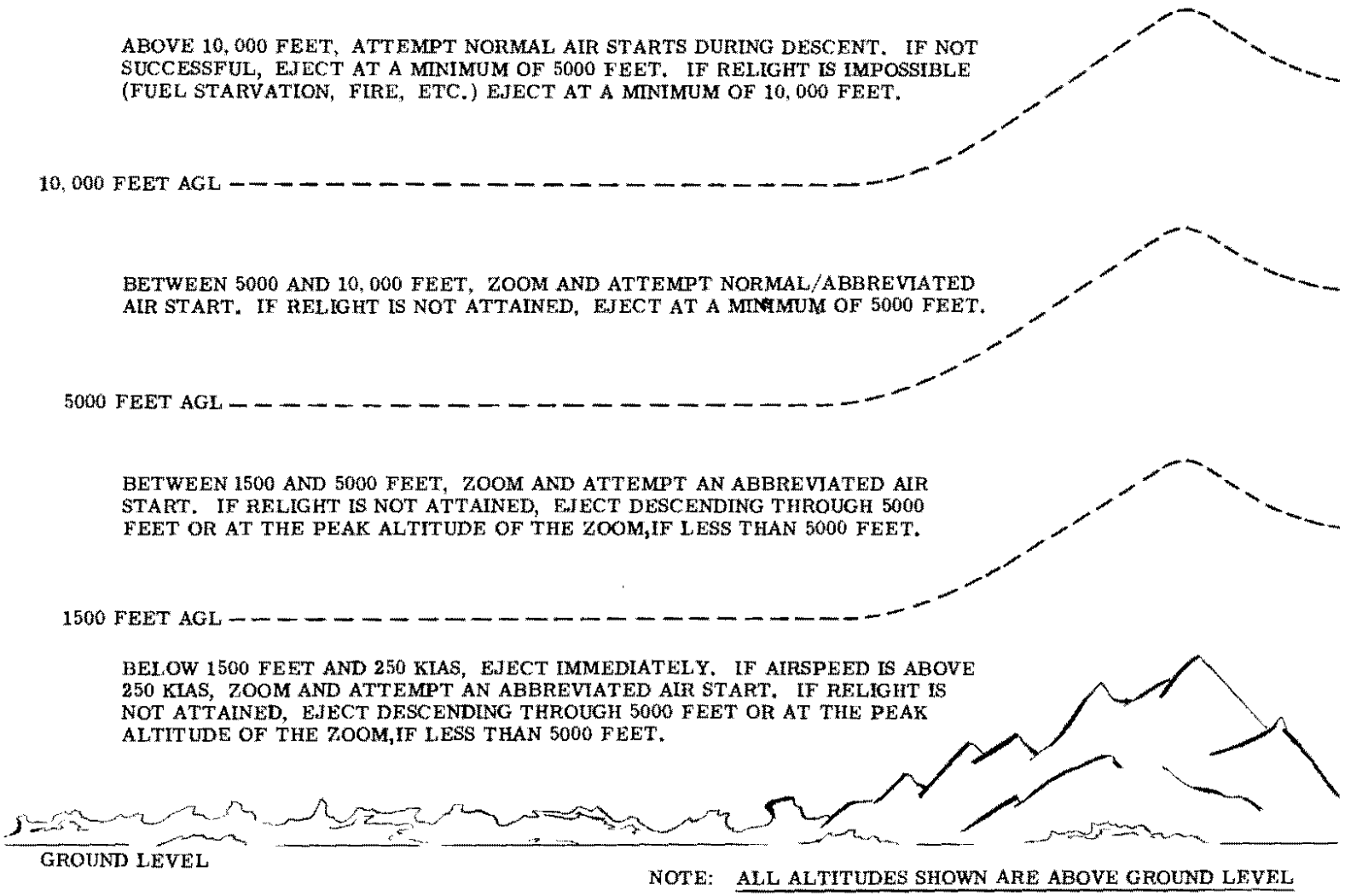
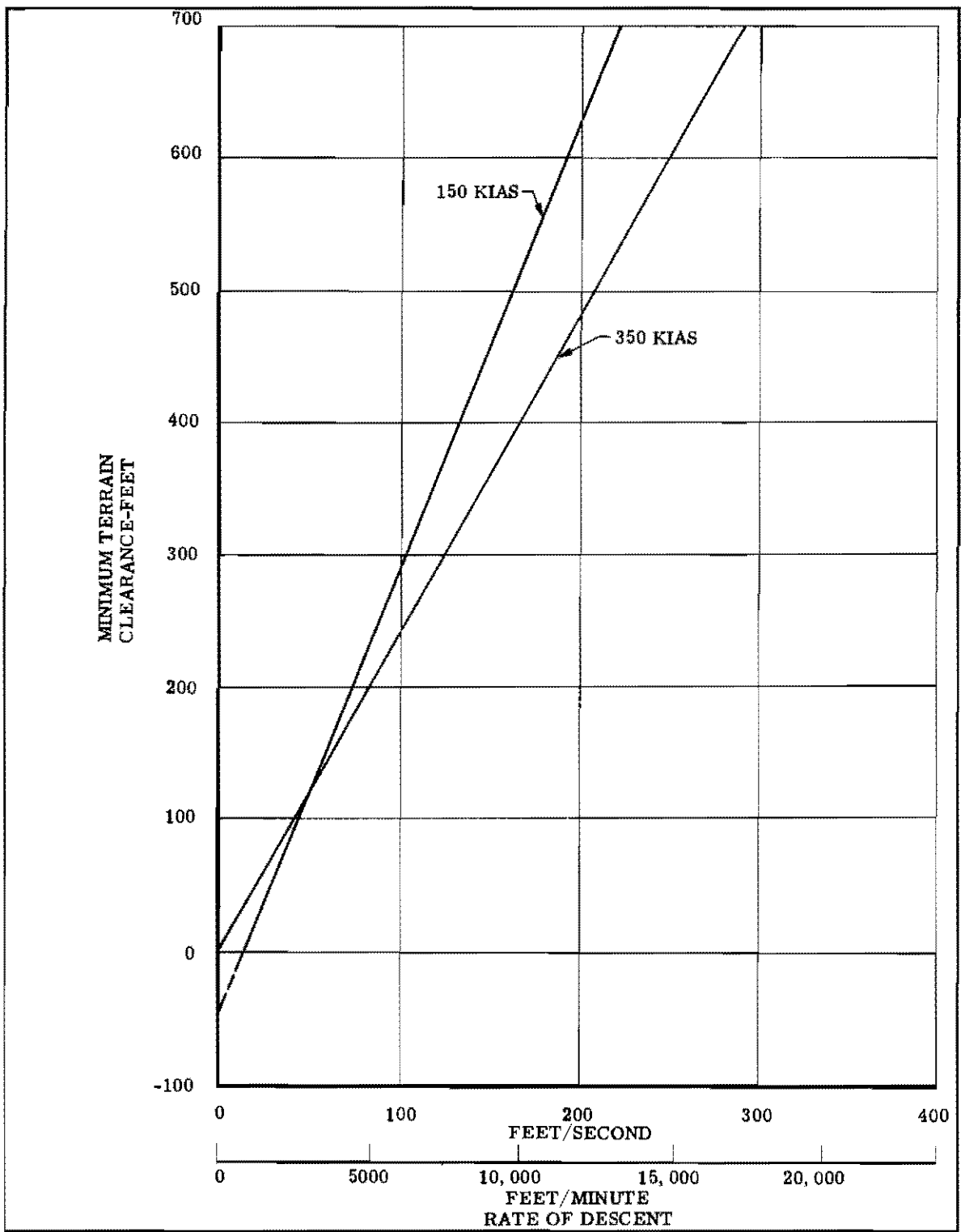
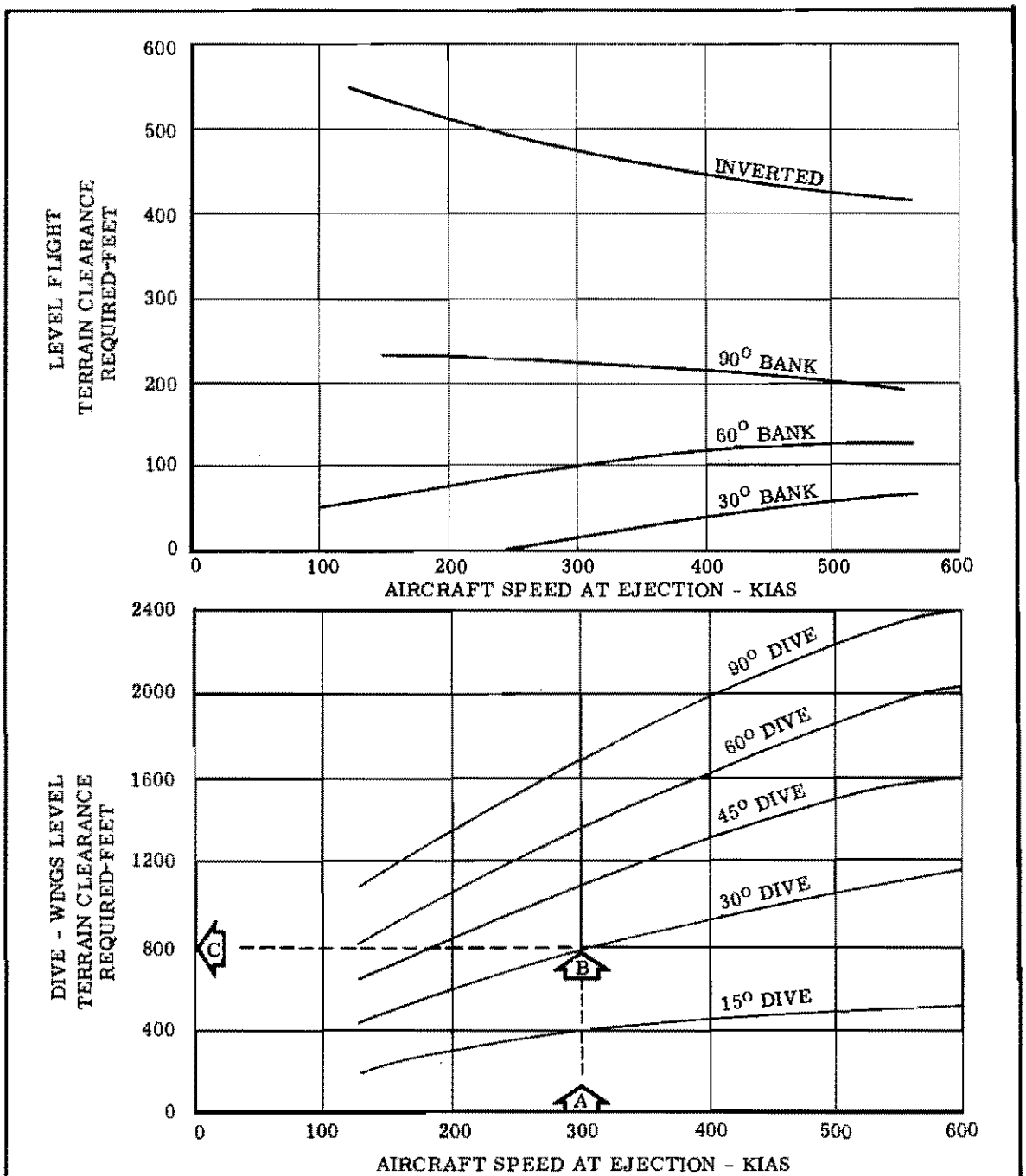


Figure 5-2. Summary of Action to be Taken When Flameout Occurs at Various Altitudes.



DATA AS OF: 1 FEBRUARY 1960.
DATA BASIS: TEST DATA AND CALCULATIONS.

Figure 5-3. Terrain Clearance for Safe Ejection (Sheet 1).



REMARKS:

1. BASED ON TEST DATA AND CALCULATIONS ALLOWING PILOT'S PARACHUTE TO FULLY DEPLOY PRIOR TO GROUND CONTACT.

DATA AS OF 1 FEBRUARY 1960.
DATA BASIS: TEST DATA AND CALCULATIONS.

EXAMPLE:

1. ENTER DIVE-WINGS LEVEL CHART AT 300 KIAS (A)
2. FOLLOW VERTICALLY UPWARD TO 30° DIVE LINE (B)
3. READ HORIZONTALLY FOR 800 FEET MINIMUM ALTITUDE FOR SAFE EJECTION (C)

Figure 5-3. Terrain Clearance for Safe Ejection (Sheet 2).

a. RAPEC Ejection Sequence.

1. Face Curtain Handle (or Secondary Ejection Handle) pulled:

   Canopy jettisons.

   Interlock cam disengages.

2. Face Curtain Handle (or Secondary Ejection Handle) pull continued:

   Catapult initial charge fires.

   Seat travels up guide rails.

   Emergency oxygen supply is initiated.

   Harness Release Actuator is armed.

   Oxygen and radio lines disconnect.

   Rocket sustainer charge ignites as seat leaves rails.

3. Seat and pilot are accelerated upward approximately 200 feet.

4. 3/4 of a second after ejection:

   Harness and survival gear release from seat.

   Ejection Control Handle disconnects.

   Separation bladders inflate.

   Parachute Opener is armed as pilot separates from seat.

5. Two seconds after seat separation:

   Parachute deploys (below 10,000 feet).

6. Descent:

   Remove parachute "D" ring from pocket on riser.

   Remove ripcord housing retaining clip from attachment to shoulder harness/riser strap.

   Remove oxygen mask before landing.

b. Controlled Ejection. The following procedure is recommended, if time permits:

1. Throttle . . . . . OFF.
2. Slow the airplane as much as possible.
3. Emergency generator. . . . . EXTEND.
4. IFF. . . . . EMERGENCY.
5. Transmit MAYDAY position report.
6. Shoulder harness. . . LOCKED.
7. Visor. . . . . DOWN.
8. Air-Conditioning Switch . . . . . RAM.
9. Turn IFF to OFF just prior to ejection to provide radar indication of the exact location of ejection.
10. Leave feet on the rudder pedals.
11. Sit erect, with spine straight and head firmly against the headrest.
12. Grasp the Face Curtain Handle with both hands and pull forcefully to the fullest extent. The canopy interlock prevents firing of the catapult before the canopy is jettisoned. Consequently, if the curtain is pulled very fast, a pause or stop may be felt. If this occurs, the force of continued pull on the face curtain may be less than that necessary for seat extraction. It will then be necessary for the pilot to jerk as hard as possible on the Face Curtain Handle in order to obtain maximum pulling force. If the seat still does not fire, release the face curtain and apply a strong, steady, two-handed pull on the Secondary Ejection Handle. Normally, the canopy should jettison when the curtain is pulled over the helmet, and the catapult should fire when the handle passes the nose or chin.
13. If pulling the Face Curtain Handle (or Secondary Ejection Handle) fails to jettison the canopy, substitute the following emergency procedure:

    Retain a firm grip on the Face Curtain Handle (or Secondary Ejection Handle) with one hand, but do not pull it farther out. Hold elbow inboard.

    PULL Canopy Jettison Handle firmly.

    After the canopy leaves, continue pulling the Face Curtain Handle (or Secondary Ejection Handle) with both hands.

    As a last resort, if the canopy still remains, it may be removed by the force of the airstream by unlatching it manually, if airspeed is in excess of 125 KIAS. Beware of a rapid rearward movement of the Canopy Lever when this is done. Retain the Face Curtain Handle (or Secondary Ejection Handle) with one hand during this procedure.

14. If ejection occurs above the preset altitude, the parachute will not deploy automatically until after descent below the preset altitude (10,000 feet). If ejection occurs below the preset altitude and the Automatic Barometric Ripcord Actuator seems not to function (i.e., after the time delay of 2 seconds), open the parachute with the manual ripcord (D-ring) when clear of the seat. The manual ripcord overrides the barometric release. If high-altitude ejection is made, free-fall to approximately 10,000 feet before opening the parachute. If the parachute must be

opened manually after a high-speed ejection, wait at least 4 seconds after ejection to permit speed to reduce.

15. In the event the integrated harness is not automatically released following ejection, seat separation may be accomplished while falling by pulling the Harness Release Handle, located on the right side of the pilot's seat. Lean forward to clear the chute from the back of the seat and push clear of the seat. Actuation of the Harness Release Handle following ejection will disconnect the Automatic Parachute Actuator and will therefore require manual pulling of the ripcord.
16. The emergency oxygen bottle will be actuated automatically upon ejection. However, should the oxygen appear not to be flowing, pull the green ring on the left-front inside corner of the seat pan.
17. During the parachute descent, before ground or water contact, ensure that the ripcord grip (D-ring) has been removed from its pocket and that the ripcord housing retainer clip has been separated from attachment to the shoulder harness/riser strap. Failure to do this may result in a fixed attachment between the parachute pack and the parachute riser and preclude release of the parachute, even though both upper rocket jet fittings have been released and are free. Attach the Liferaft Lanyard Snap to the torso harness right-hand lap belt D-ring, if descending into the water.
18. Below 10,000 feet altitude, but before contact, remove the oxygen mask.
19. In the event a parachute landing is made into the water or in a high wind which prevents normal spilling of the parachute canopy, disconnect both quick-disconnect fittings that attach risers to the torso harness suit, thus jettisoning the parachute canopy. Do not disconnect the parachute riser releases until after contact with the ground or water.

536 BAILOUT

Bailout from high-performance aircraft is extremely hazardous, even under the most favorable conditions (level flight, slow airspeed), and is considered a "last-resort" method of escape. However, if the seat cannot be ejected, the following bailout procedures are suggested:

1. Disconnect oxygen and anti-blackout hoses.
2. Pull the green ring on the seat pan for emergency oxygen.
3. Jettison the canopy.
4. Pull the Harness Release Handle.
5. Lean forward to clear the parachute past the headrest.
6. Apply full nosedown trim, but maintain level flight by holding the stick back.
7. Let the stick snap forward while holding the arms against the body.
8. When clear of the airplane and below approximately 10,000 feet, pull the ripcord D-ring.

Alternate Method

1. Disconnect oxygen and anti-blackout hoses.
2. Pull the green ring on the seat pan for emergency oxygen.
3. Jettison the canopy.
4. Trim the airplane for nosedown, and roll inverted.
5. Lean forward to clear the parachute past the headrest.
6. Pull the Harness Release Handle to separate from the seat.
7. When clear of the airplane and below approximately 10,000 feet, pull the ripcord D-ring.

537 STRUCTURAL FAILURE OR DAMAGE

(Including Bird-Strikes)

Loss of structural integrity may result from midair collision, exceeding structural limits, bird-strikes, etc. The following procedure generally applies:

1. Reduce airspeed as much as practicable. If at low altitude, zoom to convert airspeed to altitude.
2. Determine whether adequate control of the aircraft is available for continued flight. If not, eject.
3. If able to control the aircraft, climb to minimum recommended ejection altitude, 10,000 feet or higher, at a reduced airspeed in order to prevent further damage.
4. Operate the engine at the minimum setting required to maintain level flight or slow climb if it is suspected that foreign objects may have entered the engine. Ingesting a bird usually will not damage the engine blading, but may plug up the 5th-stage bleed-air ports, resulting in ineffective lubrication of the center and rear main bearings and subsequent engine seizure.
5. Whenever possible, get a visual inspection by another aircraft to assist in evaluating the damage sustained.

6. Examine the slow-flight characteristics of the aircraft in the landing configuration at 10,000 feet or above prior to attempting a landing. Do not stall.
7. Land at the nearest suitable facility, using a precautionary approach, modified as necessary, unless the damage is determined to be negligible. If a bird has been ingested into the engine, even though there is no visible damage or indications of engine malfunctions, a prompt landing should be made, since a possibility exists that the engine may seize. Assume that the bird has been ingested if it strikes the sides of the fuselage forward of the engine intake ducts.

538 SYSTEMS FAILURES

a. Hydraulic Systems Failure. Failure of any hydraulic system will render all equipment serviced by that system inoperative. Illumination of either the Utility or the Control Hydraulic System Warning Light indicates a loss of pressure to one or the other of the tandem hydraulic systems. No means are available to the pilot to restore hydraulic system pressure.

A-4A airplanes are equipped with a single hydraulic system. Illumination of the UTIL HYD Warning Light and a stiffening of the controls indicate a complete hydraulic system failure. In A-4B/C airplanes with the tandem hydraulic installation, illumination of both UTIL HYD and CONT HYD Warning Lights and a stiffening of the controls indicate a complete hydraulic failure. In A-4B airplanes, the rudder is the only control that will stiffen if the flight-control hydraulic system is lost, since it is not powered by the utility hydraulic system. In any model, if a hydraulic system is lost in flight, be alert for evidence of fire, as the possibility exists of an engine section fire.

b. Complete Hydraulic Failure. In the event of a complete hydraulic system failure, as defined above, the following procedure should be followed for flight-control disconnect:

1. Terminate any accelerated maneuver.
2. Reduce airspeed to 200 KIAS, if possible. Lateral-control forces are high on manual control except at low speeds.
3. Trim the airplane laterally. Extend the stick (A-4A/B).
4. Manual Flight-Control Handle . . PULL.
5. Trim immediately, if necessary.
6. Terminate the flight as soon as practicable.

The Manual Flight-Control Handle should be pulled fully out (about 1 foot) with a rapid and positive motion. This action will assure a "clean" disconnect and will aid in preventing a tendency for the airplane to roll as the switch to manual control is made. The manual flight-control mechanism cannot be reset in flight once it has been disengaged.

If, for any reason, the Manual Flight-Control Handle is pulled while hydraulic pressure is still available, a metallic thud will be heard when the stick is moved. This sound, caused when hydraulic pressure slams the piston against the end of the cylinder, is normal for the system under the above conditions and should not be a cause for alarm.

When an intentional disconnect has been made for reasons other than the above and utility system pressure is available, it is possible to engage and utilize the AFCS (A-4C aircraft only).

c. Main Generator Failure. Partial or complete failure of the main generator to provide the aircraft with the required output may be caused by icing, blown fuse, generator drive transmission in underspeed condition or inoperative, and other mechanical or electrical discrepancies. Partial failures may result in a loss of one or more phases of a. c., or reduced or fluctuating frequency or voltage, and may be very difficult to detect from cockpit indications. The most likely signs of a partial failure will be TACAN unlocking and spinning, loss of air conditioning, erroneous attitude presentation on the gyro horizon with or without an OFF Warning Flag indication, or abnormally slow trim motor speed.

If the main generator should fail completely, all electrical equipment will be rendered inoperative immediately. The most easily recognizable indications of complete main generator failure occur simultaneously, as follows:

1. Fuel boost . . . . . OUT.
2. Oil pressure . . . . . OUT.

3. Landing Gear Indicators . . UNSAFE.
4. Flap Position Indicator. . . OFF.
5. Attitude Gyro Indicator. . . OFF FLAG VISIBLE.
6. Trim Position Indicators. . OFF SCALE
7. UHF/TACAN . . . . . INOPERATIVE.
8. Exterior/interior lights . . . . . INOPERATIVE.

When a main generator failure is known or suspected, pull the Emergency Generator Release Handle. At altitudes above 25,000 feet, first reduce throttle to 90 percent or less, as the fuel boost pump will be lost and the engine may flame out. When operating on the emergency generator, the Emergency Generator BYPASS Switch must be set at NORMAL. If electrical power is not partially restored when the emergency generator is extended, ensure that the BYPASS Switch is in NORMAL.

To prevent damage to the emergency generator, do not release the emergency generator at airspeeds above 500 knots IAS or 0.91 IMN. At low indicated airspeeds, the emergency generator may not be capable of supplying adequate electrical power to support the equipment powered from the primary bus. For this reason, during operation with the emergency generator extended, the following precautions should be observed:

1. During flight at night or in adverse weather conditions, and indicated airspeed in excess of 140 knots should be maintained until the flight can be maintained by visual reference.
2. During landing approaches, an indicated airspeed of 140 knots should be maintained as long as power for the operation of the Horizontal Stabilizer Actuator is desired.

When an icing condition or heavy rain is the cause for extending the emergency generator, remember that the use of the BYPASS Switch (in aircraft so equipped) will restore normal electrical system operation, once the aircraft is clear of such conditions.

d. Transformer Rectifier Failure. Failure of the main d.c. transformer rectifier, energized through the forward monitored bus, is indicated whenever the d.c.-powered equipment malfunctions at the same time that the a.c. equipment, powered through the same bus, functions normally. If the Seat Actuator functions but the power to the Drop-Tank Transfer, LABS, the speedbrakes, the Retraction-Release Solenoid, TACAN, and the normal elevator trim are lost, and the Fire Warning Light is inoperative when the Press-to-Test Button is depressed, a main transformer rectifier failure is evident. A failure of the primary transformer rectifier, energized through the primary bus, and the only one energized when the emergency generator is operating, is indicated if the Horizontal Stabilizer Trim Manual Override functions but no power is available for the AOA Indicator, the Wheels-and-Flaps Indicator, the Trim Indicators, the radio controls, cabin pressurization, and the Flip-Flop Indicators on EPI.

DO NOT deploy the emergency generator, even when electrical system trouble is clearly diagnosed as either a main or a primary transformer rectifier failure. The main generator energizes both the main and the primary d.c. power sources, and, in this case, if the emergency generator is extended, it will only cause the loss of additional electrical functions.

e. Exterior Lights Failure. If exterior lighting is lost:

1. Maintain a sharp lookout to prevent collision with other aircraft.
2. Join up on another aircraft, if possible.

f. Interior Lights Failure. If interior lighting is lost, use the cockpit emergency floodlights or a flashlight to illuminate the instruments on the console.

g. TACAN Failure.

(1) Loss of Bearing. When bearing information is lost, any of the following may be used (listed in order of preference):

1. A-4C: Select alternate antenna position.
2. ARA-25 homing feature.
3. UHF-DF steer.
4. Mileage indication may be used to find the station as follows:

   Identify the station.

   Turn as necessary to stop mileage and establish an arc from the station.

Note the RMI heading at the wingtip which is thought to be in the direction of the station.

Turn left or right toward the noted heading.

If mileage increases, turn to the reciprocal heading. Otherwise, continue inbound to half the initial distance and repeat the previous three steps until the DME reading is 20 miles or less. Then continue inbound on the predetermined heading. Observe the station passage and range when the distance begins to increase.

(2) Loss of DME.

1. A-4C: Select alternate antenna position.
2. To determine the range, turn 30 degrees off the inbound heading to the station until a bearing change of 10 degrees from the original bearing is accomplished. Note the time required. Turn to place the station on the nose again. Time to the station is approximately three times that required to change the bearing 10 degrees.

(3) Ground Station Interference. This is recognized by an erroneous lock-on by the number 2 needle, by erroneous mileage, and by usually garbled identification. Use DR until free of interference from the undesired station or select other means of navigating.

(4) Other Malfunctions. Tube failure or improper adjustment may cause a 40-degree error in lock-on in either direction from the correct bearing. ID 307 malfunctioning may cause errors in lock-on in multiples of 40 degrees in either direction from the correct bearing. Detection of these discrepancies may be accomplished by observing the rapid drift of the number 2 needle 40 degrees from its previously stabilized position or by observing that the rate of closure on the DME is less than normal with the number 2 needle on the nose of the aircraft.

1. Change channels so as to unlock the number 2 needle, then return to the proper channel in an attempt to get a proper lock-on.
2. Take a heading 40 degrees more or less than indicated by the number 2 needle and fly to the station, observing DME closure rate.
3. Use ARA-25 or UHF-DF facilities, if available.

h. Compass System Failure. If the compass system will not remain in SYNC during the slaved operation, switch to FREE DG and set correct north or south latitude in on the C-8 and AJB-3 Compass Controllers. Set heading to match the Standby Magnetic Compass. If the Compass Card fails or is unreadable due to spinning, use the Standby Compass. Note the magnetic deviation on the Deviation Card when using the Standby Compass, as deviation errors of up to 10 degrees are possible.

i. Horizontal Stabilizer Runaway Trim.

1. In the event of runaway longitudinal trim, FIRST use the MANUAL OVERRIDE Control in the opposite direction to stop the runaway and to obtain immediate corrective trim actuation. When the acceptable trim has been regained, the emergency generator should be deployed, if necessary, to prevent a recurrence of the runaway.
2. Remain on the hydraulic power control system.
3. If unable to retrim, adjust airspeed as necessary to minimize stick forces.

At speeds above approximately 450 KIAS in the A-4A airplane with a full (-4 degrees) nosedown runaway, the buildup of speed and negative 'g' will exceed the pilot's ability to effect control with the elevators, even with both hands on the stick. This critical situation can only be overcome or avoided by timely use of the MANUAL OVERRIDE. The use of the MANUAL OVERRIDE is not contingent on the prior deployment of the emergency generator, but such deployment does provide the only means of deenergizing the Stick Switch/Relay Control Circuit, which is the likely cause of runaway trim.

j. Aileron Trim Runaway.

1. Stop runaway aileron trim by extending the emergency generator.
2. Remain on the hydraulic power control system.
3. Burn down and land.

With the trim jammed at maximum deflection in either direction, the forces required to return the stick to neutral will be moderate.

NOTE: Do NOT disconnect the flight-control system.

At high speeds on manual control, lateral forces will be uncontrollable if aileron trim has runaway.

k. Rudder Trim Runaway.

1. Stop runaway rudder trim by extending the emergency generator.
2. Remain on the hydraulic power control system.
3. Burn down and land.

The force required to return the rudder to neutral will be moderate.

l. Frozen Controls (Icing). Icing may cause freezing of the lateral or longitudinal flight controls. If this occurs, DO NOT pull the disconnect and attempt to fly using manual control, but proceed as follows:

1. Extend the stick (A-4A/B).
2. Strike the stick smartly. It may require as much as 50 pounds of force or more to free the controls.
3. If unable to free the controls, fly with the trim tabs and rudder to an altitude below the freezing level and repeat the above procedure.

The possibility of experiencing this condition can be minimized by setting the horizontal stabilizer trim to 0 degrees prior to engine shutdown to prevent rain and spray entering the elevator control mechanism area when the aircraft is on the deck and by moving the controls through full-travel just prior to takeoff.

m. Speedbrake Failure. In the event of a speedbrake control valve solenoid or d.c. electrical failure, operate the speedbrakes as follows:

1. Speedbrake Switch . . . . OPEN or CLOSE, as required.
2. Emergency Speedbrake Knob . . . . . PULL to OPEN or push to CLOSE, as required.

The Emergency Speedbrake Control may be used to override the electrical signal, but the handle must be held in the desired position. In case of hydraulic and electrical failures when the speedbrakes are open, they may be closed to the trail position by momentary actuation of the manual control.

n. Fuel Quantity Indicator Failure. If the indicator needle will not move or if it continuously rotates, manage the fuel, using the flowmeter and the best estimate of fuel remaining. If in company with other aircraft, and the initial full-load and the mission performed have been identical, the fuel remaining will usually be within a few hundred pounds of that of the accompanying aircraft. Land as soon as practicable, in either case.

o. Fuel Transfer Failure. If the wing tank transfer pump fails, the only fuel available will be that in the fuselage fuel tank, except as noted below. A fuel transfer pump failure will first be indicated by a steady illumination of the Fuel Transfer Caution Light on the instrument panel. When the fuel remaining in the fuselage tank falls below approximately 1,100 pounds (the fuel level at which the wing tank capacitance units are removed from the indicating circuit), there will be an abrupt drop in fuel quantity indication to a reading corresponding to the fuel remaining in the fuselage tank. If the wing tank is full and the fuselage tank is not, the drop-tank fuel will flow directly to the fuselage tank in those airplanes with pressure-fueling capability (A-4B/C), if the Drop-Tank Selector Switch is in PRESS.

1. Whenever the Fuel Transfer Light comes ON and remains ON, assume that the usable fuel remaining is either 1,600 pounds or the indicated fuel quantity (whichever is less).
2. Turn the Drop-Tank Selector to PRESS (A-4B/C).
3. Land as soon as possible.

Illumination of the Fuel Transfer Light in flight or on the ground, when engine r.p.m. is approximately 70 percent or below, or when wing fuel is actually depleted, is a normal characteristic of this system. Maneuvering flight may cause intermittent illumination of this light.

p. Fuselage Tank Float Valve Failure. If the fuselage tank float valve sticks in the closed position, the Fuel Transfer Caution Light will not illuminate, and the only indication of a failure will be the abrupt drop in fuel quantity to approximately 1,100 pounds, the reading corresponding to the fuel remaining in the fuselage

tank. Whenever the fuel quantity drops unexpectedly to 1,100 pounds, and whether or not the Fuel Transfer Caution Light is illuminated, proceed as follows:

1. Turn the Drop-Tank Transfer Switch to PRESS (A-4 B/C).
2. Land as soon as possible.
3. The float valve may be unseated by a rapid oscillation of the control stick, within the structural limits of the airplane. If this action unseats the valve, landing at the nearest suitable facility is still recommended, as there is a possibility that the valve will stick again.

q. Drop-Tank Transfer Failure. Unless the Drop-Tank Fueling Switch in the aft engine compartment is placed in the OFF position after fueling the drop-tanks and prior to takeoff, normal fuel transfer from the drop-tanks will not be possible in the air. However, drop-tank transfer may be accomplished by extending the emergency generator.

r. Oxygen System/Mask Failure. If no oxygen is available because of system depletion or failure, or if mask malfunctioning or contaminated oxygen is suspected, proceed as follows:

1. Turn the Oxygen Switch OFF and pull the green ring. Descend rapidly to a cabin altitude of 10,000 feet or below.
2. Remove the mask if unable to breathe or when bailout oxygen is depleted.
3. If the fuel remaining permits, descend to 10,000 feet pressure-altitude or lower and select RAM air.
4. Land as soon as practicable.

s. AJB-3 Failure. Failures may occur where roll, pitch, or heading indications are lost, singly or in combination. The OFF Warning Flag will always promptly indicate the loss of 28 V.D.C. or the loss of the C phase of a.c. If the A, B, or A and B phase are lost, the indicator will continue to function for an indefinite period without the OFF flag indication, although the information presented may be erroneous. Many other failures can occur that will not be indicated by the OFF flag. Only marginal backup instrumentation is provided by turn and bank, magnetic compass, etc., to permit continued flight unless the standby gyro, provided by ASC 200, is installed and functioning. Intentional flight in instrument conditions with any type of AJB-3 failure should be avoided whenever possible.

t. VGI Failures. Failures may occur where roll, pitch, or both, are lost, and not necessarily accompanied by the OFF flag. The VGI OFF indication appears only when the B phase of a.c. power is lost, either by itself, or along with the A phase, the C phase, or both, (complete power failure). If any phase of a.c. power is lost, the precession errors will increase, and the gyro will become more susceptible to tumbling. Should the VGI be determined to be unreliable, the primary flight instruments will be the only reference available for continued flight in instruments, unless the cause is main generator icing. In this case, extending the emergency generator will restore normal operation. If the gyro tumbles, the FAST ERECT Button (ASC 182), if installed, may re-erect the gyro, provided that the pilot is able to maintain nearly straight and level flight during the erection process. The 'fast' erection rate is approximately 15-20 degrees/minute. The use of the FAST ERECT Button is limited to either a 1-minute depressed and 2-1/2-minutes cooling period, or a 2-minutes depressed and 5-minutes cooling period. From the above, it is apparent that if the gyro tumbles to a roll or pitch position 90 degrees from normal, it should take about 10 minutes to "fast-erect" the gyro to normal, if the cooling periods are observed. Electrical failure of the Fast-Erect Circuit will probably occur if the specified cooling period is not observed.

u. Pitot Static System Failures. When airspeed indications are lost or suspected to be erroneous, the altimeter and rate-of-climb indications will probably be similarly affected. Turning the Pitot Heat ON should promptly restore normal operation, if the malfunction was due to pitot tube icing. If it is apparent that icing is not the cause, turn the Cockpit Pressurization Switch to RAM and break the glass from the Rate-of-Climb Indicator with a sharp instrument. This may restore operation by providing a source of static pressure, but

instrument readings will not be accurate. There will be a pronounced lag, and the rate-of-climb indications will be reversed. Use the Cabin Altimeter as a rough cross-check on altitude.

v. AFCS Malfunctions.

1. If the AFCS becomes erratic, depress the AP Button on the stick to disengage it from any mode of operation. If this is not effective, operate Standby Switch to OFF.
2. If normal aileron trim is not restored upon disengagement of the AFCS, moving the AFCS Aileron Trim NORM/EMERG Switch to EMERG should restore normal operation.

w. Loss of Air-Conditioning Temperature Control. Occasionally, malfunctions will occur which cause the air-conditioning system to provide either full-hot or full-cold air to the cockpit. In early aircraft, selecting OFF on the dual ON-OFF TEMPERATURE SELECTION Knob should provide RAM air in the cockpit. In later aircraft, manual positions are provided for the Temperature Control Knob with which the pilot can select a desired temperature level. If the manual temperature is inoperative and the pilot becomes uncomfortably hot or cold, the NORMAL/RAM Switch should be turned to RAM. If it is not practical to operate in RAM, adjusting the eyeball diffusers and defrost control to minimize airflow or changing altitude should extend the period the adverse temperature can be endured. Land before debilitating effects reduce the pilot's capability to do so safely. As a last resort, if the cockpit temperature is unbearable and the pilot is unable to switch to RAM operation, the canopy should be jettisoned, if this would improve the situation.

x. Loss of Canopy. If the canopy is lost at high altitude, immediately extend the Ejection Control Safety Handle to prevent an inadvertent ejection and descend to a warmer altitude to prevent frostbite. If surface temperatures are near the freezing level or below, an immediate landing should be made before the pilot is incapacitated. If able to descend to an altitude where a comfortable temperature exists, the pilot should decide whether to return to home base or land at the nearest suitable facility. As cabin pressurization is lost, avoid the use of the UHF transmitter above 27,500 feet, since keying the transmitter causes arcing within the ASQ-17 and eventual failure.

y. Refueling Store Failures.

(1) Hose Jettison. Hose jettison may be desirable when store hydraulic pressure is lost or when an electrical malfunction occurs which prevents retraction of the hose or drogue. When hose jettison is elected, proceed as follows:

1. Reduce airspeed to 250 KIAS or less.
2. Hold back the spring-loaded Channel Guard.
3. Lift the Hose Jettison Switch and move to the JETTISON (aft) position.
4. Do not change the position of the Hose Jettison Switch after jettisoning the hose and drogue.

If hose jettison is accomplished at speeds in excess of 250 KIAS, excessive tension on the hose due to hose stretching may pull the hose from the crimper after the guillotine is fired. Hose jettison is possible on emergency generator operation only in A-4C aircraft. It is desirable, but not mandatory, to jettison the hose and drogue prior to dumping fuel.

(2) Drogue and Coupling Lost and/or Hose Severed (other than hose-cutter severance).

1. Move the Drogue Position Switch to RET.
2. Operate the Hose Jettison Switch to JETTISON and leave in this position until after engine shutdown. This is the only means of feathering the ram-air turbine blades.

(3) Store Hydraulic/Electrical System Failure. If a failure occurs which prevents retraction of the hose and drogue, proceed as follows:

1. Ashore: Jettisoning the hose and drogue is necessary only if indicated by other considerations, such as field arrestment required, decreased drag necessary for safe return, etc.
2. Carrier based: Jettison the hose and drogue, if possible, prior to landing. Make a normal approach. Advise the ship of the condition so that flight deck personnel can be warned.

Dump the fuel, retain the fuel in store, or return the fuel to the airplane tanks.

Whenever the hose and drogue can be retracted but the air turbine will not feather, observe whether or not the drogue position indication is "RET". If it does not indicate "RET", this indicates that the drogue is not fully stowed. Reduce airspeed to 210 KIAS or less and cycle the drogue in an attempt to get a RET indication. If still unable to get a RET indication or if the drogue indicates a RET initially, no further corrective action is available. Make a normal approach (either ship- or shore-based). Observe store limiting airspeed of 300 KIAS or .80 IMN whenever the air turbine is unfeathered.

(4) Loss of Feathering Control. If unable to feather the store air turbine after drogue retraction, check the Drogue Position Indicator. If the drogue indicates RET, observe store limiting airspeed of 300 KIAS or .80 IMN for the remainder of the flight, but no adverse effects should be expected. If the drogue position indicates TRA but the drogue is reported to be retracted, slow to 230 KIAS and recycle the drogue in an attempt to get a RET indication. If not successful, slow to 200 KIAS and recycle. If still unsuccessful, observe store limiting airspeed of 300 KIAS or .80 IMN for the remainder of the flight. No adverse effects should be expected, except that after a shore based landing the drogue will probably trail out and sustain damage.

Shipboard, make a normal approach. Advise the ship of the possible necessity to tie up or carry the drogue as the aircraft is taxied from the landing area.

539 LOST/DOWNED PLANE PROCEDURES

a. Lost Plane Procedures. If unable to orient yourself, either using available NAVAIDS or visually, proceed as follows.

(1) With Radio.

1. Admit being lost.
2. If at low altitude, climb to increase communications/radar detection range and endurance.
3. Conserve fuel by flying at maximum endurance airspeed until oriented.
4. Call EMERGENCY IFF/SIF codes.
5. Switch to GUARD Channel, 243.0 mc.
6. Broadcast the word "PAN" or "MAYDAY" three times, as appropriate.
7. Transmit the type of aircraft, estimated position, course, speed, altitude, and fuel supply in minutes.
8. State difficulty.
9. State assistance desired or intentions.
10. Transmit for D/F steer as requested.
11. Once in contact with a radio facility, make a broadcast that you are in contact with _____ and ask all others to remain SILENT unless called. Do not shift frequency or ground stations unless necessary.
12. Comply with the instructions given.
13. When oriented and the decision is made as to destination, use maximum range airspeed to get there.

(2) With Receiver Only.

1. Same as above procedure, if applicable.
2. Fly two triangles to the right (1-minute legs). Repeat this pattern every 10 minutes. Meanwhile, maintain estimated best course.
3. Monitor the GUARD Channel and comply with the instructions given by the responding station.

(3) Without Radio.

1. Same as procedure (1), if applicable.
2. Fly two triangles to the left (1-minute legs). Repeat this pattern every 10 minutes. Meanwhile, maintain estimated best course.
3. Maintain lookout for an interceptor. Refer to FLIP Planning Document or En Route Supplement Emergency Procedures for current day-and-night interceptor procedures and signals.

(4) Remember the Five "C's".

1. Confess.
2. Communicate.
3. Climb.
4. Conserve.
5. Comply with instructions.

b. Downed Plane Procedures.

(1) Single Aircraft. If the situation permits prior to ejection, crashlanding, or ditching, make every effort to switch IFF/SIF codes to EMERGENCY settings and send a MAYDAY message on the GUARD Channel. Conditions existing after abandoning the aircraft will dictate whether to remain near the scene of the crash or attempt to find assistance.

(2) Section. If one member of a section goes down, the other member should:

1. Establish contact with a ground station, preferably a GCI site or radar control agency. Switch IFF/SIF to EMERGENCY and UHF to GUARD.
2. Make every effort to follow the pilot during descent, keeping him in sight at all times. Note as accurately as possible his position on the ground or in the water, using bearings and distances from known prominent landmarks or navigational aids in order to direct rescue planes or boats to the scene.
3. Maintain sufficient altitude to assure radio contact with the rescue facility.
4. Request the assistance of other aircraft if necessary to maintain communications with and continuous surveillance of the survivor.
5. Leave the area with sufficient fuel remaining to POSITIVELY ensure return to base or an alternate field.

(3) Division. Everything previously mentioned holds true if there are more than two members in the flight. Some additional procedures can be followed which generally will ensure a greater likelihood of a successful rescue. These are:

1. The other member of the section in which the downed pilot was flying will follow the pilot during his descent and circle the survivor at low altitude and at maximum endurance airspeed, keeping him in sight at all times.
2. Other members of the flight will remain at altitude, alert the appropriate SAR facilities, relay communications, and conserve fuel.

(4) Other Considerations.

1. The Flight Leader will shift all communications to the local SAR frequency when directed by the SAR coordinator.
2. All aircraft not specifically requested to assist will remain clear of the area.
3. Arrange for a relief onstation in a timely manner, fuel permitting.
4. The pilot on low station must not become distracted from the primary requirement of flying his aircraft. Maintain flying speed. Do not fly into the ground or water.
5. Turn off the emergency IFF/SIF code when departing from the scene.

540 LANDING EMERGENCIES

541 NO-RADIO PATTERN ENTRY AND LANDING (VFR)

a. Day. Determine the duty runway by observing traffic or the tetrahedron. Enter the break, maintaining a vigilant lookout for other aircraft. Rock the wings slowly (about 20 degrees of bank) until over midfield. Make a standard break to the downwind. Doublecheck gear down at the abeam position. During the approach, periodically check the tower for a light signal. If a red light or no light is received, wave off (fuel permitting) and enter downwind. Do not raise the landing gear unless departing the pattern. Be alert for aircraft breaking above. Airfields with dual runways should attempt to designate either the left or right side for no-radio landings.

b. Night. In the event of radio failure with the external lights operative, follow the day procedure, adding a series of rapid, manual flashes, with the external lights on BRT/STDY, to the wing-rock.

When complete electrical power is lost at night, the only course of action open to the pilot, short of ejection, is to maintain an extremely vigilant lookout and observe traffic or the tetrahedron to locate the duty runway. If landing traffic cannot be observed on the runway to ascertain that the runway is clear, attempt to alert the tower, prior to landing, by making a low pass parallel to the lighted runway, close aboard the tower, jazzing the throttle. Land, if possible, when the pattern is clear of traffic.

542 PRECAUTIONARY APPROACHES

The Precautionary Landing Approach is designed to afford the pilot a means of landing safely and expeditiously, while allowing him to eject safely if the engine should fail during the approach. A Precautionary Approach should be made when imminent engine failure is suspected and an aircraft "save" is deemed possible. When this situation occurs, the most important factor is to land the aircraft as soon as possible at the nearest suitable field. Two types of Precautionary Approaches are recommended: the High Precautionary Approach and the Low Precautionary Approach.

a. High Precautionary Approach. The high Precautionary Approach (HPA) is depicted in Figure 5-4. The pattern consists of a 360-degree approach, with checkpoints at the initial, the 180-degree, and the 90-degree positions. The HPA allows a successful landing to be made if a flameout should occur during the approach when pilot ejection might be undesirable or impossible. The HPA should be used only in situations when visual contact with the intended landing runway can be maintained at all times during the approach. A suitable field for an HPA is a facility with crash equipment and a minimum of 8,000 feet of runway, with a crosswind component of less than 15 knots. Select a field with either arresting gear or a long, long runway. When practicable, enter the HPA at the Initial Point (High Key). (Initial Point is defined as a position above and slightly to the right of the intended landing point with the aircraft headed in the direction of the landing runway.) Otherwise, intercept the approach at the most convenient point but not later than the 90-degree position.

The pattern described is for an airplane gross weight of 12,500 pounds or less (empty external tanks or no stores). If the fuel is exhausted, speed and altitude may be lowered slightly. Add 5 knots for each 1,000 pounds increase over 12,500 pounds.

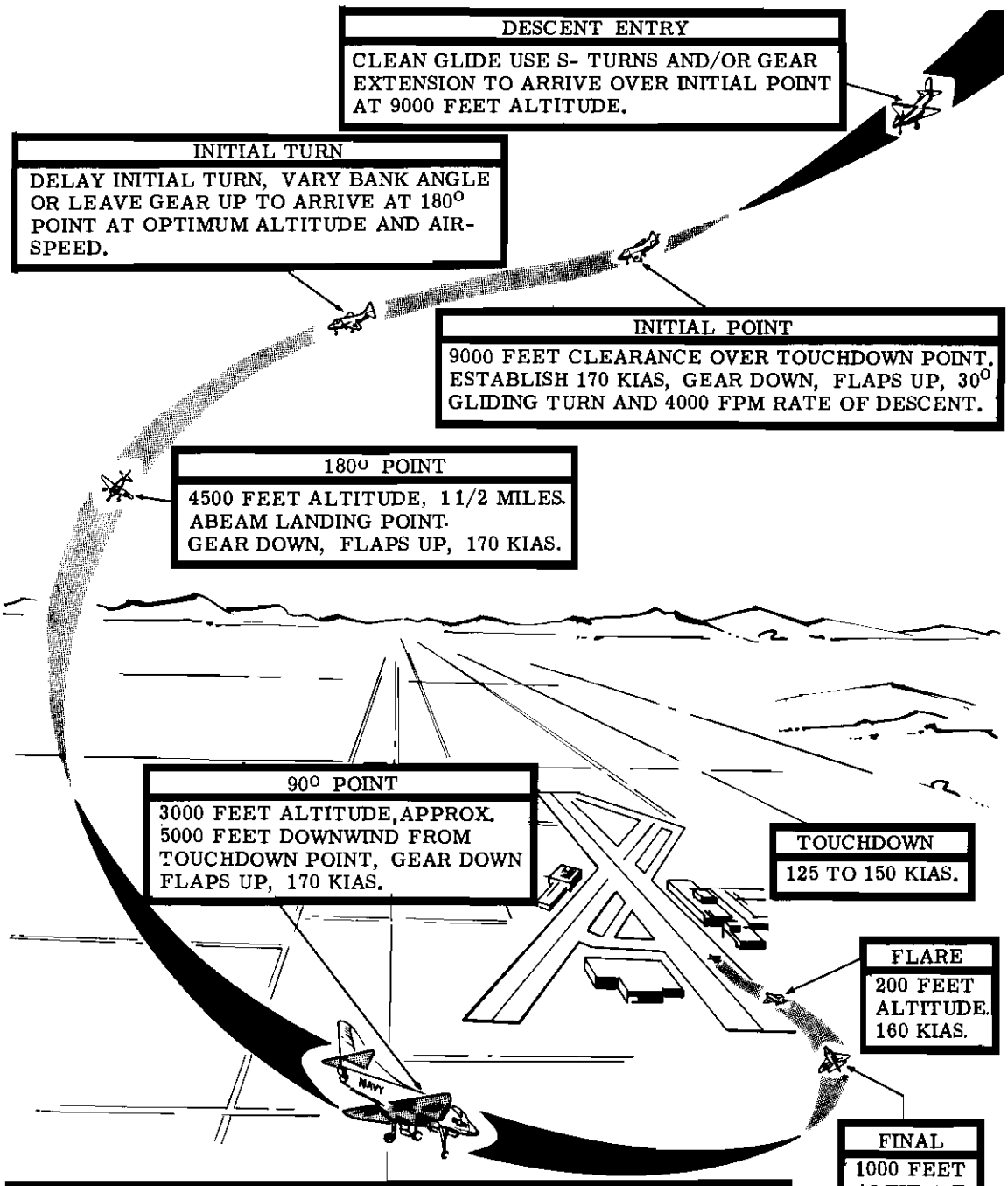
(1) Entry. Plan to arrive at the Initial Point at 9,000 feet above the runway, with wheels DOWN, flaps UP (unless a high power setting makes it desirable to extend them), speedbrakes EXTENDED, power set 70-87 PERCENT, shoulder harness LOCKED, aircraft trimmed for 170-210 KIAS, and emergency generator EXTENDED.

(2) Initial Point. A 30-degree bank is established at the Initial Point at 170-210 KIAS. If the Initial Point is reached with less than 9,000 feet or it is not practical to pass through the Initial Point, the lowering of gear, speedbrakes, and flaps (if desired) may be delayed so as to arrive at the "180" with 4,500 feet or at the "90" with 3,000 feet. The wheels must be down and locked at the 90-Degree Point, since it may require as much as 25 seconds or more for them to extend and lock. If the altitude at the Initial Point is higher than 9,000 feet, the Initial Turn may be delayed slightly. When a crosswind prevails, the bank angle at the Initial Point should be shallowed or steepened, as required, in order to arrive at the correct distance abeam at the 180-Degree Point.

(3) 180-Degree Point. When the 180-Degree Point is reached, the pilot should consider the altitude, rate of descent, and position to determine if a correction should be made to the bank angle. He should be approximately 1-1/2 miles abeam the runway at 4,500 feet altitude above the terrain. By varying the pattern, successful approaches may be made if the altitude at the 180-Degree Point is in error by 500 feet.

(4) 90-Degree Point. At the 90-Degree Point, the aircraft should be approximately 5,000 feet downwind of the intended landing point (first one-third point of runway) and at an altitude of about 3,000 feet above the terrain. The Final Turn should be planned to reach the straightaway with about 1,000 feet of altitude. The minimum approach speed of 170 knots should be maintained until the Final Straightaway Approach is reached.

(5) Final Approach and Landing. The Final Approach should start with approximately 1,000 feet of terrain clearance (with an allowable minimum of 500 feet), aiming at the intended Touchdown Point, one-third of the way down the runway. The pilot must make his decision whether to eject or to continue the approach by 500 feet AGL, as this altitude



POSITION	OPTIMUM	USABLE BAND
APPROACH SPEED - KIAS	170	160-190
INITIAL POINT - (ALTITUDE)	9000'	7500' (GEAR UP)
180° POINT - (ALTITUDE)	4500'	4000' - 5000' (GEAR DOWN)
90° POINT - (ALTITUDE)	3000'	2800' - 3200' (GEAR DOWN)
FINAL APPROACH - (ALTITUDE)	1000'	500' MINIMUM
OPTIMUM CONFIGURATION:GEAR DOWN - FLAPS UP. ALL ALTITUDES SHOWN ARE TERRAIN CLEARANCE.		

Figure 5-4. High Precautionary Approach (HPA).

represents the lowest altitude at which a safe ejection can be expected because of pilot reaction time and the attendant sink-rate. 160 knots should be maintained until flare is initiated at 200-300 feet of altitude. Excess altitude on the Final may be dissipated by shallow S-turns or by nosing over to pick up additional speed. Reduce power as necessary, depending on the rate of descent, altitude, airspeed, and when, in the judgement of the pilot, a successful landing on the runway can be made. Touchdown speeds following the flare may be varied from 125 to 150 knots.

(6) Flameout in HPA Pattern. If the pilot becomes committed to a flameout landing in the HPA because safety considerations preclude ejection, he should execute the following general procedure, as time permits:

1. Throttle . . . . . OFF.
2. Manual Flight-Control Handle . . . . . PULL.
3. Emergency Speedbrake Control . . . . . PUSH.
4. Jettison all external stores (using Emergency Bomb Release Handle, if deemed necessary).
5. Manual Fuel Shutoff Knob . . . . . EMERG. OFF.

The high rate of descent incident to this approach will require the use of fine judgement in deciding exactly where and at what rate the flare must be made to effect a safe landing. This will be dangerously aggravated by the use of flaps or speedbrakes in an actual flameout approach. Slips are not advisable due to the resulting increased rate of descent and the high lateral control forces on the manual system which would make flaring critical.

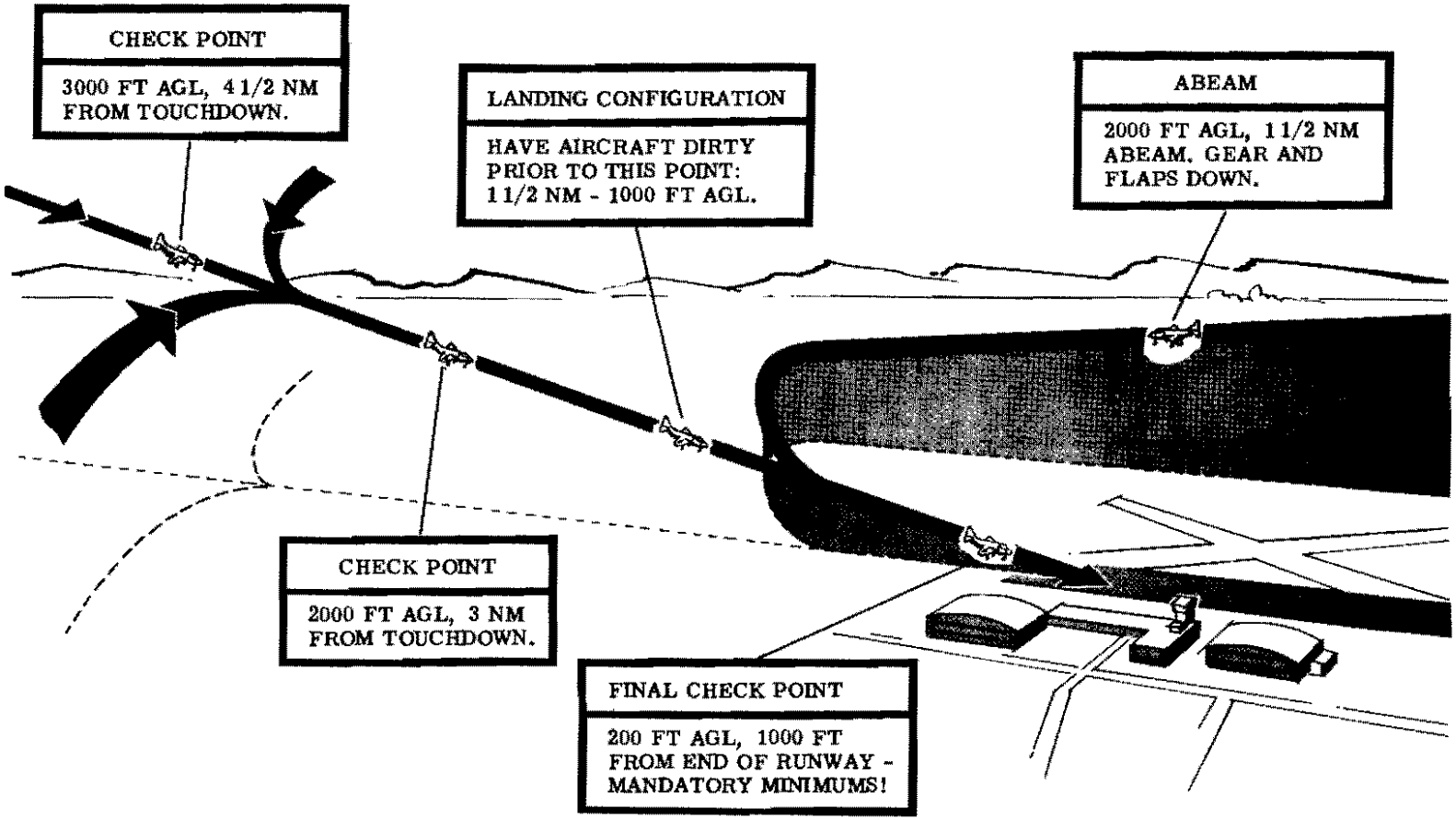
(7) Practice HPA's. Practice HPA's are conducted as above, except that it is not necessary to extend the emergency generator. If practiced in an airport control zone, they will be conducted only when there is positive control of traffic and the traffic pattern is clear of other aircraft. The pilot should strive to hit safely and consistently a point in space no lower than 500 feet, and from which a safe landing could be made. The high sink-rate associated with this approach requires that practice HPA's shall not be conducted lower than 500 feet above ground elevation.

b. Low Precautionary Approach (LPA). The Low Precautionary Approach (LPA) is depicted in Figure 5-5. It may be used whenever circumstances make it desirable; such as low ceiling or visibility, loss of oil pressure, or other engine difficulties which make it undesirable or impossible to reduce r.p.m. below 87 percent. The variations in pattern entry and altitude allow a wide margin of flexibility. A suitable field for an LPA is one with a minimum of 5,000 feet of hard-surfaced runway. Select a field with crash equipment and arresting gear, if practicable.

(1) Entry. Approaches to the field for an LPA are divided into upwind or downwind categories. If upwind of the landing runway, plan to pass through a normal left or right base at 2,000 feet AGL, executing a 180-Degree Approach, slightly deeper than a normal landing approach, intercepting the depicted flightpath on the Final. If downwind of the landing runway, plan a modified Straight-in Approach to intercept the depicted flightpath.

(2) Straight-In Approach. If a Straight-in LPA is selected, the Initial Point is 3,000 feet AGL at 4-1/2 miles from the Touchdown Point. However, the pilot may choose to intercept the depicted flightpath at the desired point in Landing Configuration - gear DOWN, flaps DOWN, speedbrakes AS NECESSARY. Have the aircraft "dirty" by 1-1/2 miles from touchdown, if possible. Turn the gunsight ON and set 110 mils. At the Initial Point (or wherever the LPA flightpath is intercepted), set the pipper on or alongside the Touchdown Point (1,000 feet down the runway from the approach end). Hold it there and drive downhill. Use speedbrakes as necessary to maintain 160 knots. The rate of descent will be 1,500 to 1,800 feet/minute, depending on the wind.

(3) Final Approach and Landing. The pilot must make his decision either to eject or continue the approach by 200 feet AGL, since this altitude represents the lowest altitude a



THE STRAIGHT-IN FLIGHT-PATH DEPICTED MAY BE INTERCEPTED AT THE MOST CONVENIENT POINT PRIOR TO THE FINAL CHECK POINT. THE CHECK POINTS ARE GUIDELINES ONLY.

Figure 5-5. Low Precautionary Approach (LPA).

safe ejection can be expected because of the pilot's reaction time and the attendant sink-rate. Do not descend below 200 feet AGL until 1,000 feet from the end of the runway. This Final Checkpoint is the first point in the LPA from which a safe landing on the runway can be made if the engine fails.

Just short of the end of the runway, reduce power as necessary and land. After touchdown, secure the engine. If necessary, drop the hook 1,000 feet prior to engaging the arresting gear.

(4) Practice LPA's. Practice LPA's are conducted as above. If practiced in an airport control zone, they will be conducted only when there is positive control of traffic. Due to the higher than normal sink-rate used in making this approach, pilots are cautioned that significant power reduction should not be made during practice approaches until the sink-rate has been reduced to a normal rate, by flaring as the Touchdown Point is approached. It is recommended that initial practice be monitored by a chase pilot or by a qualified A-4 pilot or LSO on the end of the runway, with two-way radio communications. Always wave off if the sink-rate gets out of control.

c. Ejection. If the engine fails at any point in either the HPA or LPA above the minimum safe ejection altitude, the pilot will eject unless unusual circumstances clearly indicate to him that the cause of safety to himself and others will be better served by continuing the approach flamed-out rather than by ejection.

543 LANDING: USE OF EMERGENCY FIELD ARRESTING GEAR

Refer to Section 250.

544 LANDING WITH LANDING GEAR MALFUNCTIONS

Table 5-1 furnishes course of action guidance for emergency landings with landing gear malfunctions. These are recommendations only and are based on experience and statistical data available to date. It is recognized that sea, deck, weather, operational, and pilot considerations may indicate different actions. The general considerations which follow are pertinent.

a. General. Whenever any landing gear is damaged or not down and locked, but all gear can still be retracted, retract the gear. Retain and land on empty tank/tanks, empty rocket packs, or other lightweight inert stores whenever possible. Jettison the drop-tanks, if they cannot be emptied. Prior to landing with any of the above malfunctions, burn down to 1,500 pounds or less fuel remaining to ensure that the wing fuel is expended and the fire hazard minimized.

b. Carrier. The barricade will be used for all carrier landings with landing gear malfunctions. Consult the Flight Manual for the maximum aircraft gross weight for barricade engagement and the applicable Recovery Bulletin for maximum allowable engaging speed and emergency mirror/lens settings. Such stores as empty tanks, empty rocket packs, or other lightweight inert stores will not interfere with barricade engagement, but, if torn loose, they may present a hazard to flight deck personnel. The LSO should adjust the optical landing system vertically, if necessary, for the particular carrier deck in question to ensure that the aircraft contacts the flight deck just prior to barricade engagement. Fly a normal approach; on speed, on meatball, on centerline. Do not dive for the deck or engage the barricade while in flight. Anticipate the loss of the meatball for a short period late in the approach, as the barricade stanchions may obscure the mirror. For all malfunctions shown, the cross-deck pendants between the ramp and the barricade should be removed to ensure the optimum attitude of the aircraft for barricade engagement. Approach light indications will not be available to the LSO with the landing gear retracted nor will indexer indications be available to the pilot.

c. Field. Always request the assistance of an LSO. When the arrestment is to be made at night, have the position of the arresting gear illuminated. If the landing must be made with fuel in the wing or external tanks, it is

GUIDE TO EMERGENCY LANDINGS WITH LANDING GEAR MALFUNCTIONS

FINAL CONFIGURATION	CARRIER		FIELD Arresting Gear Available.			FIELD No Arresting Gear.	
	Land or Eject?	Notes	Land or Eject?	A/G Used?	Notes	Land or Eject?	Notes
All gear up.	LAND	1	LAND	No.	3,4	LAND	3
Nose gear up.	LAND	1,2	LAND	Yes.	5,6	LAND	5,8
Stub nose gear.	LAND	1	LAND	Yes.	5,6	EJECT	
One main gear up.	LAND	1	EJECT	No.	7	EJECT	
Stub main gear.	LAND	1	EJECT	No.		EJECT	
One main gear up, nose gear up.	EJECT		EJECT	No.		EJECT	
Both main gear up.	EJECT		EJECT	No.	4	EJECT	

Note 1. All cross-deck pendants should be removed prior to landing to preclude abnormal attitude during barricade engagement and to prevent damage to the pendants.

Note 2. If time considerations preclude the removal of cross-deck pendants, land with the hook up to prevent severe nosedown rotation, should arrestment occur prior to barricade engagement.

Note 3. Make a flat approach at normal approach speed. Touch down lightly, with a low sink-rate. If 10 knots or more of crosswind component exists, it may be desirable to use the arresting gear where available.

Note 4. An alternative is to make a field arrested landing. Land as specified in Note 3, except delay touchdown until the LSO advises that the hook has picked up a wire. Wave off if the wire is missed.

Note 5. Burn down to 600 pounds prior to landing.

Note 6. Make a short field arrestment from a flat approach at normal approach speed. Trim full NOSEUP approaching touchdown. At touchdown, do not retard throttle. Hold noseup until arrestment. Wave off if the wires are missed.

Note 7. An alternative to ejection for this condition is to land in an approach similar to that in Note 6, except slightly fast and with the touchdown point immediately prior to the arresting gear. Grease this one on holding the wings level with the lateral stick as long as possible. An LSO is probably a necessity for this situation unless the gear location is prominently marked.

Note 8. Make a flat approach at normal approach speed. Trim full NOSEUP approaching touchdown. At touchdown, secure the engine. Lower the nose slowly before elevator effectiveness is lost.

Table 5-1.

recommended that the intended landing area be foamed. Do not land wheels-down in "abort" type gear unless enough runway remains for runout. Normally, 1,500 feet should be adequate.

545 LANDING: OTHER FAILURES

a. Landing: No Utility Hydraulic Pressure. Intermittent illumination of the Utility System Ladder Light will usually warn the pilot of the impending loss of utility system pressure prior to the complete loss of pressure. When this is observed and it is practical to do so, slow to 225 KIAS and lower the landing gear and flaps, placing the Flap Selector in the LOCKED (center) position after extension. Return to base and land. Be prepared to disconnect the flight-control power mechanisms if the controls should stiffen. (See Hydraulic Systems Failure, subsection 538 a., b.)

If it is not practical to dirty-up because of fuel considerations, slow to 300 KIAS or below. Return to base or an alternate field. Lower the wheels, using the Emergency Landing Gear Extension procedure set forth in subsection 545b. Wing flaps and speedbrakes will not be available unless extended and locked prior to utility system failure.

Because the wheel brakes are completely independent of the airplane's hydraulic system, the pilot should realize that he will have brakes, even though he makes a field landing with complete hydraulic failure. Should the pilot have a complete hydraulic failure, he can also extend his arresting hook. Compressed air pressure and the weight of the arresting hook cause extension when the Arresting Hook Handle is moved to the DOWN position. However, the pilot cannot retract the arresting hook without hydraulic pressure.

The arresting hook should not be extended in flight for a field landing with hydraulic failure. The brakes should be sufficient, and the arresting hook should be used only as a last resort, just prior to engagement. This will preclude dragging the hook on the runway, perhaps damaging it to the extent of complete failure.

b. Emergency Landing Gear Extension. Utility hydraulic system failure will necessitate lowering the landing gear with the emergency release system as follows:

1. Airspeed . . . . . 130-225 KIAS (low end of airspeed range recommended).
2. Landing Gear Handle . . . . . DOWN.
3. Emergency Landing Gear Release. . . . . PULL.
4. If the landing gear does not extend fully or lock down, increase the airspeed and apply positive g loading in an attempt to get a gear-down indication.

After lowering the landing gear by the emergency release system, the gear handle should be left in the DOWN position until the ratchet in the emergency system has been reset and cavitation in the gear-down hydraulic pressure line has been eliminated by the application of hydraulic power. This procedure should be followed to prevent a failure of the ratchet and damage caused by premature closing of the gear doors. However, if utility system pressure is available and circumstances warrant, the landing gear can be raised by means of the Landing Gear Handle.

c. Unsafe Gear Indications. The most likely causes of failure of the landing gear to indicate DOWN after completion of the gear extension cycle are: faulty microswitches, sticking Gear Position Indicator, utility system hydraulic failure, or failure of the main landing gear actuating cylinder. If all gear remain UNSAFE or UP with the gear handle down, the utility hydraulic system has most likely failed. Use the Emergency Landing Gear Extension procedure set forth in paragraph b, above.

(1) Main Gear Only Unsafe, Gear Handle Down.

1. Maintain 225 KIAS or less.
2. Get a visual check from another aircraft or from qualified ground personnel to determine if the cause is a faulty indication or that the gear is actually not down and locked.
3. Even though the gear is visually determined to be down and locked, make a short field arrestment, if arresting gear is available. The engine should be kept running at IDLE after the arrestment to provide hydraulic power until the ground crew inserts the gear pins. If arresting gear is not available, make a normal landing. To ensure the gear is down and locked (unless the gear indicates DOWN after touchdown), have the ground crew install the gear pins before turning off the runway. The gear pins cannot be installed if the gear is other than safe. When slow, angle off the runway onto any paved area, if it is possible to do so without making a definite turn and there is an obvious necessity to clear the runway for other aircraft to land.
4. If a main gear is determined to be unsafe or no visual check is possible, cycle the gear in an attempt to get a DOWN indication. As soon as both mains indicate DOWN, cease cycling. (The nose gear extension may require as much as two minutes because of back pressure in the return line, if the cause is a broken nut in the main landing gear actuating cylinder). If unable to get a DOWN indication or a visual check and the cycling gear proves ineffective, proceed as indicated in Table 5-1 for the particular situation which exists.

(2) Nose Gear Only Unsafe, Gear Handle Down.

1. Maintain 225 KIAS or less.

2. Attempt to get a DOWN indication by cycling the gear.
3. If unable to get a DOWN indication by cycling, get a visual check by other aircraft or by qualified ground personnel.
4. Even though the gear is visually determined to be down and locked, make a short field arrestment, if arresting gear is available. The engine should be kept running at IDLE after the arrestment to provide hydraulic power until the ground crew inserts the gear pins. If arresting gear is not available, make a normal landing. To ensure that the gear is down and locked (unless the gear indicates DOWN after touchdown), have the ground crew install the gear pins before turning off the runway. The gear pins cannot be installed if the gear is other than safe. When slow, angle off the runway onto any paved area, if it is possible to do so without making a definite turn and there is an obvious necessity to clear the runway for other aircraft to land.
5. If unable to get a DOWN indication or a visual check and cycling proves ineffective, proceed as indicated in Table 5-1 for the particular situation which exists.

(3) Visual Checking That the Landing Gear Is Down and Locked. For inflight checking of the main gear in the down-and-locked position, a high-visibility fluorescent red-orange paint stripe is applied to the inboard side of the main gear drag link in two places. When these stripes are lined up, the gear is down and locked. A more positive check that the main gear is down and locked is observing that the overcenter lever at the midpoint of the drag links is positioned forward and parallel to the lower surface of the wing. The nose gear should be checked down and locked by visually sighting through the ground safety-pin hole.

d. Landing: No Flaps. When unable to extend the flaps for landing, add 10 knots to the normal pattern and approach speeds. (AOA donut approach speed is about 18 KIAS above normal.) Fly a slightly wider pattern, approximately 1-1/2 miles abeam.

e. Landing: No Speedbrakes. Utilize the standard pattern entry, approach, and landing when making a no-speedbrakes approach. The power settings required will normally fall within the vibration range for the engine, but for the short time involved it should cause no concern. The airspeed will be more sensitive to changes in the nose position. In the event of a waveoff, acceleration time to 100 percent will be slightly longer, but the overall difference from a speedbrake pass is negligible.

f. Landing: Stuck Slat. Add 10 knots to the normal approach speed. Trim out any adverse lateral control pressures. Be alert to apply prompt correction, should the slat extend during the approach. Aboard ship, observe the maximum engaging speed, if possible.

g. Landing With an Asymmetric Load. With asymmetric loads of up to 1,200 pounds, landing should be made upwind or downwind, whichever is required to put the crosswind component under the heavy wing, providing other factors are considered, such as runway length and gross weight, and that the rollout will be shortened appreciably by securing the engine. Normal approach speeds to a minimum of 125 knots should be utilized. The same procedure should be used for disconnected landings with asymmetric loads.

h. Landing With the Flight Controls Disconnected. With the flight controls disconnected and all other systems operative, a normal approach should be utilized. If the utility hydraulic system is inoperative, modify the approach as specified for landing with no flaps.

i. Landing: No Airspeed Indication. Landing with the Airspeed Indicator inoperative can be accomplished safely. The Angle-of-Attack Indicator/Indexer should provide the pilot with a safe landing approach attitude reference. The wing slats, when halfway out with gear and flaps down, will also serve to indicate a safe landing approach speed of 140 to 145 knots.

j. Landing with Runaway Nosedown Trim. In the event a landing must be made with full NOSEDOWN trim which cannot be corrected by use of the Horizontal Stabilizer MANUAL OVERRIDE, proceed as follows:

1. Burn down to 1,000 pounds fuel remaining.

2. At a safe altitude, place the aircraft in landing configuration. Wing flaps should not be extended.
3. Cautiously reduce airspeed to a reasonable approach speed commensurate with the runway length available for stopping. The airspeed selected should also provide two inches of additional backstick for use if gusts or turbulence cause a nose-down pitch during the approach. Landing may be made as soon as the above conditions are met. (At 600 pounds fuel remaining, CG should have moved aft far enough to provide the requisite 2 inches excess backstick at optimum approach speed ("DONUT") with the flaps retracted. Extending the flaps will reduce the amount of backstick available.)

k. Landing with Runaway Noseup Trim. Make a normal approach and landing with full flaps. A moderate amount of forward stick pressure will be required at normal approach speeds.

l. Landing: Known Brake Failure. Landing with one or both brakes inoperative should be treated as follows. If arresting gear is available, make a short field arrestment, preferably into the midfield gear. Be prepared to wave off if the arresting gear is missed. If arresting gear is not available, land wheels-up on empty tanks, racks, or lightweight inert stores.

m. Landing: Brake Failure After Touchdown. When a brake failure occurs after touchdown, wave off, if possible, and proceed as in Landing: Known Brake Failure. If it is not practical to do so, and arresting gear is available, extend the arresting hook approximately 1,000 feet prior to engagement. Attempt to engage on the centerline. It may be desirable to maintain sufficient airspeed to provide rudder effectiveness for directional control. Where no arresting gear is available and waving off is not feasible, retract the landing gear and secure the engine if it is apparent that the aircraft will not remain on the prepared surface. The decision to jettison inflammable external stores and/or retract the landing gear must be made, and action taken, prior to securing the engine. If airspeed is in excess of 90 knots, ejection is another alternative to be considered.

n. Landing With a Blown Main Tire. Little difficulty should be experienced in landing with a blown main tire. If it is known, prior to landing, that the tire is blown, a short field arrestment is recommended. If there is no arresting gear available, secure the engine after touchdown to minimize landing roll. In crosswind conditions, always use the arresting gear, if available. Land on the left, right, or center of the runway, depending on crosswind and which tire is blown. For instance, with left tire blown, a crosswind from the right, and no arresting gear available, land on the right side of the runway to provide the maximum distance for arcing to the left. In this case, both wind effect and the increased drag of the blown tire are additive, tending to drift the aircraft across the runway to the left. If the tire blows during normal landing rollout, use full rudder, if necessary, and brakes as required to maintain directional control. Usually, a blown tire will not even be noticeable until 80 knots or less. If the stopping distance appears marginal, secure the engine. If the use of abort or overrun gear becomes apparent, drop the hook 1,000 feet prior to engagement. More braking effectiveness can be obtained from a good tire than a blown one; consequently, it is poor technique to intentionally blow the good tire.

o. Landing With a Blown Nose Tire. When landing with a blown nose tire, a short field arrestment is recommended. Obtain a positive hook-down check with the tower or the LSO. Make practice passes, burning down to 800 pounds for the final pass to provide an aft CG. Make a flat approach at normal approach speed. Trim full NOSEUP just prior to touchdown. Touch down with minimum sink-rate and hold the nose off until passing over the wires. Do not retard the throttle below approach power setting until the arrestment is felt. Wave off if the wires are missed. If there is no arresting gear available, fly the same type of approach, secure the engine on touchdown, and lower the nose gear slowly before elevator effectiveness is lost. Little difficulty should be experienced

with this landing, with or without arresting gear available.

p. Landing With Throttle Linkage Broken: Airfield. On airplanes incorporating J65 Engine Bulletin 240, if the throttle linkage breaks, the engine fuel control unit (unless it is at idle) automatically seeks approximately the 87 percent r.p.m. position. Normal flight can be maintained. Maximum rate of climb can be attained at 210 knots (clean configuration). Field landings and waveoffs can be accomplished. The approach should be made without external stores (except empty drop-tanks).

Perform the landing pattern checks as for a normal landing and fly the normal field landing pattern, with the following exceptions:

1. Downwind leg . . . . . GEAR DOWN, FULL FLAPS, slightly wider than normal. Use the speedbrakes to control airspeed. Airspeed should be 5-10 knots above the optimum for gross weight.
2. Final approach:

   Fly a long, flat approach, 5-10 knots above the optimum.

   Use the speedbrakes to control airspeed.

   Do not let airspeed fall below the optimum approach speed or permit a sink-rate to develop in excess of that required to reach the desired touchdown point.
3. After touchdown, lift the guard and move the Manual Fuel Shutoff Knob outboard and aft into the EMERG OFF detent. (The time interval from actuation of the Manual Fuel Shutoff Knob until initial engine deceleration is approximately 4 seconds. This delay tends to increase the landing rollout; but the absence of idle thrust after the engine runs down decreases it.)
4. Waveoff:

   Speedbrakes . . . .CLOSE.

   Fly "donut" airspeed.

   Landing gear. . . .UP when the sink-rate is stopped.

   Keep the flaps fully extended until the rate of climb is established, then slowly milk them up.

q. Landing With Throttle Linkage Broken: Carrier. If fuel permits, divert. Otherwise, make practice passes with the hook up, similar to that specified above. 87 percent r.p.m. at 13,000 pounds or less gross weight should provide sufficient thrust for a bolter, if airspeed is not permitted to fall below the optimum for the particular aircraft gross weight. If unable to control the aircraft well enough to effect a safe arrested landing, eject.

546 LANDING AT HIGH GROSS WEIGHTS

Occasionally, the problem will arise of landing at a gross weight in excess of the recommended maximum, due to emergencies, fuel transfer problems, etc. Ashore, the problem is simply one of stopping, since the sink-speed at touchdown can be minimized, and the stopping distance may be reduced by increased braking, securing the engine, and/or using the arresting gear.

Aboard ship, if it is necessary to make a heavy landing, the most important consideration is to keep the sink-speed to a minimum. If time permits, the mirror should be changed to a 3.5-degree glide slope, in accordance with the Recovery Bulletins. Diving for the deck would be very bad procedure. The Angle-of-Attack Indexer will show the best approach speed for the weight and should not be exceeded. If the downwind leg angle-of-attack check results in a high airspeed, it is best to fly the high airspeed rather than conclude that the angle-of-attack system is in error. There may be fuel in the tanks or in the buddy store, or there may be hung ordnance of which the pilot is not aware. If a gross discrepancy exists, inform the LSO, who can tell by the aircraft attitude and the SPN-12 reading which instrument is correct. Another important point is to land wings-level and on the centerline. A late lineup correction may result in a collapsed landing gear. Landings in excess of the maximum gross weight recommended in the Flight Manual or Recovery Bulletin should be made only in an emergency, as the structural limits of the landing gear or arresting hook may be exceeded.

547 LANDING ON A WET OR ICE-COVERED RUNWAY

Landing on ice-covered runways should be avoided whenever possible. Such conditions

are usually reported in NOTAM's, when they exist. Generally, one or more of the following techniques may be used when it is necessary to land on wet or icy runways.

1. Secure the engine on touchdown or when it becomes apparent that the aircraft cannot be stopped on the runway remaining with the engine running.
2. Touch down so as to use as much of the available runway as practical.
3. Divert to a field with better landing conditions, particularly if the crosswind component is in excess of 8 knots. If this is not feasible, consider the use of the arresting gear.
4. Due to the decreased friction coefficient, braking technique must be modified to prevent locking the wheels, which further decreases braking effectiveness. Tap the brakes lightly. If a skid is felt, the pilot must release the brakes and resume tapping when the track straightens out.
5. Land no faster than the optimum approach speed. Burn down as much as practicable to reduce the optimum approach speed and minimize the stopping distance.
6. Use full rudder, if necessary, to track straight down the runway.
7. Where abort gear is available, drop the hook 1,000 feet prior to engagement, if its use becomes necessary.
8. Aerodynamic braking may be desirable where the crosswind component is less than 8 knots.
9. As a last resort, land wheels-up on racks or empty tanks after burning down to 1,500 pounds or less fuel remaining.

548 FORCED LANDINGS

a. Landing on Unprepared Surfaces. Landing on unprepared terrain is extremely hazardous. Provided that sufficient altitude is available, ejection is preferable to attempting an emergency landing on any surface other than a runway. When power is available, more deliberation can usually be given to evaluating the many variables affecting a safe emergency landing, such as direction and speed of the wind and the type of surface or terrain on which the landing is to be made. On areas other than prepared runways and surfaces of known adequate hardness, the landing should always be made with the wheels retracted. If the nature of the emergency is such that all wheels will not fully extend, the landing gear should be left in the retracted position. Prior to any wheels-up landing, the canopy and all external stores should be jettisoned, except empty drop-tanks and lightweight inert stores which help absorb the force of the landing. The oxygen mask should be left on during crash landings. Adjust the seat to approximately the midposition to afford maximum protection from the load-limiting device. Remain braced until the shocks stop. Use the normal approach speeds throughout the landing pattern and attempt to touch down at or slightly above the normal landing speed.

b. Emergency Exit. If it is necessary that the pilot leave the airplane immediately, the canopy should be jettisoned by pulling the Canopy Jettison Handle and then pulling the Harness Release Handle. Observe the following precautions:

1. After pulling the Harness Release Handle, the oxygen hose must be manually disconnected from the console before departing the cockpit.
2. Except in those aircraft not equipped with a trigger-actuated canopy bungee (early A-4A's, early B's, and late C's), do not use the Manual Canopy Lever prior to actuation of the Canopy Jettison Handle, as the canopy will not jettison unless it is closed and locked. In all models, it is preferable to jettison with the canopy closed.
3. Do not pull the Harness Release Handle while the airplane is moving.
4. If time permits, safety the ejection controls by pulling the Safety Handle on the pilot's headrest to the DOWN and LOCKED position to preclude inadvertent ejection after the airplane has come to rest.

c. Emergency Entrance. When it is necessary to gain entrance to the cockpit in an emergency, it may also be necessary to effect the quick and safe removal of the pilot from his seat and parachute. This entry-and-rescue operation requires that certain procedures be followed and that certain precautions be taken. See Figure 5-6.

An external control for jettisoning the canopy is provided on each side of the fuselage. Push in on the rescue access door and PULL the red Canopy Jettison Handle that extends;

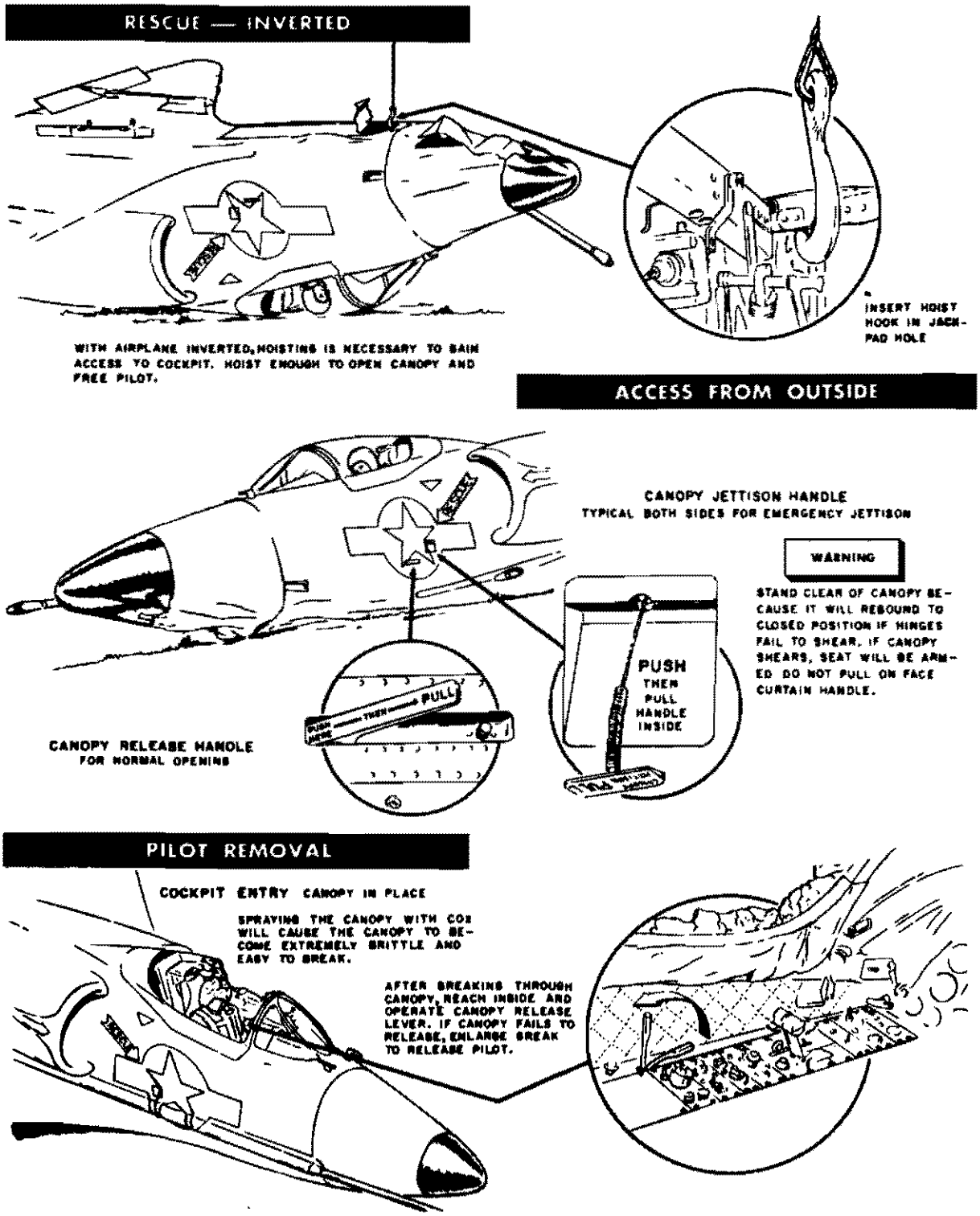


Figure 5-6. Emergency Entrance.

this will jettison the canopy if it is closed and locked.

WARNING: When the canopy is jettisoned, the seat catapult interlock is extracted, and care must be exercised to avoid firing the seat catapult charge. On all airplanes with RAPEC seats, pull the Seat Catapult Safety Handle DOWN prior to removal of the pilot from the seat.

To release the pilot from the seat without the parachute and survival equipment attached, unfasten the harness "rocket jet" fasteners (four places) and disconnect the pilot's oxygen hose from the seat pan oxygen hose. Pulling the Harness Release Handle releases the pilot from the seat with the parachute and survival equipment attached.

549 DITCHING

a. Ditching at Sea. A forced landing at sea should be made only as a last resort. Ejection is recommended whenever feasible. Whenever possible, ditch while power is still available.

If power is not available, the pilot must necessarily choose between either a high sink-rate or increased speed, both extremely dangerous approaches to the water. Moreover, the pilot has the difficult problem of determining exactly how high to flare above the water without stalling, often without any visual references to assist in height determination. As many as possible of the following should be accomplished if water ditching is imminent:

1. Shoulder harness . . LOCKED.
2. Landing gear. . . . . UP.
3. Jettison all external stores.
4. Wing flaps . . . . . DOWN.
5. Place seat in the midposition.
6. IFF/SIF . . . . . EMERGENCY.
7. Transmit MAYDAY position report.
8. Helmet visor over the eyes.
9. Emergency oxygen (just before touchdown) . . . . . PULL.
10. All armament switches . . . . . SAFE.
11. Arresting hook DOWN to "feel" for the water.

Land into the wind, if there are no swells, and in light seas. Land along the top of and parallel to the swells if they are large roller swells and if the wind is less than 25 knots. Land into the wind in higher force winds to take advantage of the lowered forward speed, but recognize the possibility of ramming a wave or of striking the tail on a wave crest and nosing in. Maintain sufficient airspeed to flare the airplane just before touchdown. DO NOT STALL. Remain braced until all shocks stop. Abandon the airplane as soon as possible, jettisoning the canopy and using the Harness Release Handle.

b. Underwater Escape. In the event of submersion from porpoising, remain braced until all shocks stop. Keep the oxygen mask on. Jettison the canopy. In the event of malfunctioning of the canopy jettison system, the pilot can open the canopy, using the Manual Canopy Control Handle. Use the Harness Release Handle to disconnect from the seat and to retain the survival gear. Disconnect the oxygen hose from the console. Lean forward to clear the parachute past the headrest and to ensure separation of the shoulder harness fittings. Pull with the hands on the upper edge of the windshield bow and push with the feet to escape.

In extreme circumstances, the pilot also has two other methods of getting through the canopy: by using either his service revolver or his survival knife to crack it open. The use of the revolver should include having the helmet and oxygen mask on, with the helmet visor down over the eyes and as much of the body as possible covered for protection from flying plexiglass. The revolver must not be fired if immersed in water. It has been found possible to crack the plexiglass with the survival knife by holding the knife with both hands, the blade pointing up, and striking the canopy above the head with the point of the knife.

During an underwater escape, the survival gear should be retained. Attempting to exit by releasing the "rocket jet" quick-disconnect fittings will also require manually disconnecting the pilot-to-seat pan oxygen/communication connection on the torso harness. Because this method requires breaking 5 connections, it is recommended that the survival

gear be retained. Also, much buoyancy can be gained from the survival gear. Releasing the left "rocket jet" fitting prior to surfacing should prevent head-down flotation.

Most airplanes are equipped with an UNDERWATER CANOPY JETTISON RELIEF VALVE, designed to facilitate removal of the canopy under water. It is recommended, however, that the canopy be jettisoned by pulling the Canopy Jettison Handle prior to submersion.

c. Underwater Escape Procedure.

1. Remain braced until all shocks stop.
2. Emergency oxygen supply . . . ON.
3. Canopy Jettison Handle . . . . PULL.
4. Disconnect the oxygen hose from the left console.
5. Harness Release Handle . . . PULL.
6. Lean forward to separate the harness linkage and clear the parachute past the headrest.
7. Pull forward with the hands on the top of the windshield bow and push with the feet.
8. When clear of the cockpit, pull both toggles on MK IIIC flotation gear.

It is recommended that pilots periodically practice exiting from the cockpit with the parachute and pararaft to ensure separation from the seat and clearing the headrest. The canopy should not actually be jettisoned in practice. Proper oxygen mask fit will prevent water from seeping in during the critical underwater escape.

CHAPTER VI

Communications

600 GENERAL

Because of the nature of jet operations, voice radio is normally used for communications between aircraft. Occasionally, however, conditions of radio silence are prescribed for certain operations. Proficiency in the use of visual signals must therefore be maintained by all pilots.

Information and additional references concerning the following categories of radio/electronic communications are contained in Chapter VI of NWP 41(A):

1. Communications Procedures and Terminology.
2. Operational Use of Voice Radio.
3. Standard Fleet Weather Reporting Procedures.
4. Contact Reports.
5. Aircraft Identification Procedures.
6. IFF/SIF Procedures.

610 RADIO COMMUNICATIONS

a. Radio Discipline. Good operating procedures must be practiced by each pilot if radio communication is to be effective. Compliance with the basic, commonsense guidelines of correct radio operation which follow, will eliminate the most frequent breaches of good radio discipline:

1. Use proper R/T voice procedure and terminology.
2. Do not cut in on other transmissions.
3. Make only necessary transmissions and then be as brief as possible.
4. Use complete call signs to avoid confusion.
5. Mentally phrase a message prior to keying the mike.
6. Delay the transmission about 1 second after keying the mike to avoid loss of the first syllable.
7. Transmit on the Guard Channel only in an emergency.
8. Leave the UHF Selector Switch on T/R & G position.
9. Take pride in a "silent" flight, if it can be accomplished safely and effectively.
10. Do not switch the radio or IFF/SIF frequency codes below 2,500 feet except for urgent military necessity. If this necessity arises, the aircraft should be in stabilized, level flight before changing frequencies or codes.

b. ARC-27 Sensitivity. To ensure peak reception of UHF signals, the Sensitivity Control on the UHF control box should be set immediately below the point at which background noise occurs. This normally occurs with the SENS-Knob Index near the 1 o'clock position. If unable to create noise by a clockwise movement of this knob, or if unable to eliminate it by a counterclockwise movement, the ASQ-17 sensitivity is not adjusted properly. The Guard Receiver has a separate Sensitivity Control which eliminates background noise. The pilot has no control of this setting.

620 VISUAL COMMUNICATIONS

Aircraft visual communications include those made with the hands or other parts of the body, aircraft maneuver, code transmission, or lights. Ground-to-air signals also include panel signals or other displays.

Information and additional references concerning the following categories of visual communications are contained in Chapter VI of NWP 41(A).

1. Air Station Control Tower Light Signals.
2. Standard Ground Handling Signals.
3. Signals Between Ground and Aircraft for Use by Downed Pilots. These include: body signals, international ground-air emergency codes and aircraft replies, paulin signals, pyrotechnics, miscellaneous, ground search party signals, and RESCAP rescue signals.

621 USE OF VISUAL COMMUNICATIONS

Visual signals should be used between aircraft whenever practicable, provided no loss in operational efficiency results. Those signals with which the pilot is primarily concerned are contained in this Manual as follows:

1. Pilot-to-Plane Captain Signals. Table 2-1.
   Postflight Ground Crew-to-Pilot Signals. Table 2-2.
2. Flight Signals Between Aircraft:
   No-Radio Penetration/ Instrument Approach Signals. Table 4-1.
   General Conversation. Table 6-1a.
   Takeoff, Changing Lead, Leaving Formation, Breakup, and Landing Table 6-1b.
   Formation. Table 6-1c.
   Electronic Communications and Navigation. Table 6-1d.
   Armament. Table 6-1e.
   Aircraft and Engine Operation. Table 6-1f.
   Air Refueling. Table 6-1g.
   Emergency and HEFOE Code. Table 6-1h.
3. Signals From Aircraft to Carrier, Indicating Aircraft Landing. Table 6-2
4. Signals From Carrier to Aircraft, Indicating Aircraft Landing. Table 6-3.
5. Arming and Dearming Signals. Table 6-4.
6. Signaling Distress Between Aircraft and Surface Ships. Subsection 623.
7. Surface Ship-to-Aircraft One-Letter Code. Subsection 624.

622 NIGHT TACTICAL SIGNALS

Night tactical signals are usually given on voice radio, but they may be transmitted by the use of external lights or by a maneuver, using the appropriate signal as shown. Maneuvers at night should be kept to a minimum consistent with the effective performance of the assigned task.

623 SIGNALS BETWEEN AIRCRAFT AND SURFACE SHIPS

If an aircraft which is not in radio communications with a ship wishes to attract attention to survivors or to an aircraft in distress, a standard procedure is used. The aircraft first circles the ship closely at low altitude. This circle is made at least once. The pilot then flies across the bow of the ship at low altitude, with the hook up, changing power setting and rocking the wings. After this, he heads in the direction of the distress incident. Flight across the bow and in the direction of the incident is repeated until the ship acknowledges by following the aircraft.

The ship should either follow the aircraft or indicate by the visual signal "NOVEMBER" that this is impossible. The action taken must be reported to the OTC. Surface ships may use signals from the One-Letter Code, given in subsection 624, when assisting a distressed aircraft.

624 SURFACE SHIP ONE-LETTER CODE

A one-letter aircraft code is available to surface ships for the controlling of aircraft. The code is peculiar to aircraft operations and is limited to that use. The signals are made only by flashing light or deck panels. Letters and their meanings are as follows:

Code	Meaning
B	Make passes.
C	Land aboard.
D	Delay; re-form; remain within signal distance until further notice. (When the delay in recovery will be for more than five minutes, the number of minutes, in tens, may

Code	Meaning
	be flashed after the letter "D". Example: A 20-minute delay would be indicated by flashing the signal "D2".)
F	Flaps are not down.
G	Jettison droppable fuel tank(s).
H	Hook is not down.
K	Your (my) plane is damaged (unless otherwise directed, plane should land aboard carrier last).
M	Proceed to base or carrier in accordance with doctrine or orders. (Unless otherwise briefed, this signal will mean to proceed to the designated Bingo field, or, if not designated, to the nearest suitable field.)
Q	Jettison bombs.
R	Radio failure. (By aircraft, utilizing the external lights or white fuselage lights.)
S	Flight Commander fly alongside and read signals.
U	Turn off (on) running lights.
W	Lower landing gear.
X	Previous landing order canceled.
Z	Do not land aboard; land plane in water or eject.

GENERAL CONVERSATION			
SIGNAL		MEANING	RESPONSE
DAY	NIGHT		
Thumbs up, or nod of head.	Flashlight moved vertically up-and-down repeatedly.	Affirmative. ("Yes," or, "I understand.")	
Thumbs down, or turn of head from side-to-side.	Flashlight moved horizontally back-and-forth repeatedly.	Negative. ("No," or, "I do not understand.")	
Hand cupped behind ear as if listening.		Question. Used in conjunction with another signal, this gesture indicates that the signal is interrogatory.	As appropriate.
Hand held up with palm outward.		Wait.	
Hand waved back-and-forth in an erasing motion in front of face, with palm turned forward.	Letter "N" in code, given with external lights.	Ignore my last signal.	
Hand held up with thumb and forefinger forming an O and remaining fingers extended.		Perfect, well done.	
Employ fingers held vertically to indicate desired numerals 1 through 5. With fingers horizontal, indicate number which added to 5 gives desired number from 6 to 9. A clenched fist indicates 0. (Hold hand near canopy when signalling.)		Numerals as indicated.	A nod of the head ("I understand"). To verify numerals, addressee repeats. If originator nods, interpretation is correct. If originator repeats numerals, addressee should continue to verify them until they are understood.

Table 6-1a. Flight Signals Between Aircraft.

TAKEOFF, CHANGING LEAD, LEAVING FORMATION, BREAKUP, LANDING			
SIGNAL		MEANING	RESPONSE
DAY	NIGHT		
1. Section takeoff leader raises either forearm to vertical position.		1. I have completed my Takeoff Checklist and am ready for takeoff.	1. Stands by for reply from wingman, holding arm up until answered.
2. Wingman raises forearm.		2. I have completed my Takeoff Checklist and am ready for takeoff.	2. Wingman lowers arm and stands by for immediate takeoff.
3. Leader lowers arm.		3. Takeoff path is clear, I am commencing takeoff.	3. Execute section takeoff.

Table 6-1b. Flight Signals Between Aircraft.

TAKEOFF, CHANGING LEAD, LEAVING FORMATION, BREAKUP, LANDING (Continued)			
SIGNAL		MEANING	RESPONSE
DAY	NIGHT		
1. Leader pats self on the head, points to wingman.	2. Leader shines flashlight on hardhat, then shines light on wingman.	Leader shifting lead to wingman.	1. Wingman pats head and assumes lead. 2. Wingman shines flashlight at leader, then on his hardhat. Turns external lights to DIM/STDY and assumes lead.
Leader pats self on head and holds up two or more fingers.		Leader shifting lead to division designated by numerals.	Wingman relay signal; division leader designated assumes lead.
Pilot blows kiss to leader.		I am leaving formation.	Leader nods ("I understand") or waves goodby.
Leader blows kiss and points to aircraft.		Aircraft pointed out leave formation.	Wingman indicated blows kiss and executes.
Leader points to wingman, then points to eye, then to vessel or object.		Directs plane to investigate object or vessel.	Wingman indicated blows kiss and executes.
Division leader holds up and rotates two fingers in horizontal circle, preparatory to breaking off.		Section break off.	Wingman relays signal to section leader. Section leader nods ("I understand") or waves goodby and executes.
Leader describes horizontal circle with forefinger.	Series of "I's" in code, given by external lights.	Breakup (and rendezvous).	Wingman take lead, pass signal after leader breaks, and follow .
Landing motion with open hand: 1. Followed by patting head. 2. Followed by pointing to another aircraft.		Refers to landing of aircraft; generally used in conjunction with another signal. 1. I am landing. 2. Directs indicated aircraft to land.	 1. Nods. ("I understand") or waves goodby. 2. Aircraft indicated repeats signal, blows a kiss, and executes.

Table 6-1b. Flight Signals Between Aircraft.

FORMATION SIGNALS			
SIGNALS		MEANING	RESPONSE
DAY	NIGHT		
Open hand held vertically and moved forward or backward, palm in direction of movement.		Adjust wing position forward or aft.	Wingman moves in direction indicated.

Table 6-1c. Flight Signals Between Aircraft.

FORMATION SIGNALS (Continued)			
SIGNALS		MEANING	RESPONSE
DAY	NIGHT		
Open hand held horizontally and moved slowly up or down, palm in direction of movement.		Adjust wing position up or down.	Wingman moves up or down as indicated.
Open hand used as if beckoning inboard or pushing outboard.		Adjust wing position laterally toward or away from leader.	Wingman moves in direction indicated.
Hand opened flat and palm down, simulating dive or climb.		I am going to dive or climb.	Prepare to execute.
Hand moved horizontally above glareshield, palm down.		Leveling off.	Prepare to execute.
Head moved backward.		Slow down.	Execute.
Head moved forward.		Speed up.	Execute.
Head nodded right or left.		I am turning right or left.	Prepare to execute.
Thumb waved backward over shoulder.	Series of "00's" in code, given by external lights.	Take cruising formation or open up.	Execute.
1. Holds up right (or left) forearm vertically, with clenched fist or single wing-dip.	1. Single letter "R" (or "K") in code, given by external lights.	1. Wingman cross under to right (or left) echelon or in direction of wing-dips.	1. Execute.
2. Same as above, except with forearm horizontal or double wing-dip.	2. Series of "RR's" (or "KK's") in code, given by external lights.	2. Section cross under to right (or left) echelon or in direction of wing-dips.	2. Execute.
Triple wing-dip.		Division cross under.	Execute.
	Series of "VV's" in code, given by external lights.	Form a Vee or balanced formation.	Execute.
Series of zooms.	Series of "VV's" in code, given by external lights.	Close up or join up; join up on me.	Execute.
Rocking of wings by leader.		Prepare to attack.	Execute preparation to attack.
Rocking of wings by any other member of flight.		We are being, or are about to be, attacked.	Standby for and execute defensive maneuvers.
Lead plane swishes tail.		All aircraft in this formation form stepdown column in tactical order behind leader.	Execute. Leader speeds up slightiy to facilitate formation of column.
Shaking of ailerons.	Long dash, given with external lights.	Execute signal; used as required in conjunction with another signal.	Execute last signal given.

Table 6-1c. Flight Signals Between Aircraft.

ELECTRONIC COMMUNICATIONS AND NAVIGATION			
SIGNAL		MEANING	RESPONSE
DAY	NIGHT		
Tap earphones, followed by patting of head, and point to other plane.		Take over communications.	Repeat signals, pointing to self, and assume communications lead.
Tap earphones, followed by patting of head.		I have taken over communications.	Nod ("I understand").
Tap earphones and indicate by finger numerals number of channel to which shifting.		Shift to radio frequency indicated by numerals.	Repeat signal and execute.
Tap earphones, extend forearm vertically, and rotate fingers, formed as if holding a grapefruit, followed by 4 numbers.		Manually set up ARC-27 on frequency indicated.	Repeat signal and execute.
Tap earphones, followed by question signal.		What channel (or frequency) are you on?	Indicate channel (or frequency) by finger numerals.
Tap earphones and point to plane being called, followed by finger numbers indicating frequency.		You are being called by radio on channel indicated by finger numbers.	Repeat numbers. Check receiving frequency and switch to channel indicated by originator. Dial in manually, if necessary.
Vertical hand, fingers pointed ahead and moved in a horizontal sweeping motion, with four fingers extended and separated.		What is bearing and distance to the TACAN station?	Wait signal or give magnetic bearing and distance with finger numerals. The first three numerals indicate magnetic bearing and the last two or three, distance.
Vertical hand, with 4 fingers extended and separated, pointed ahead in a fore-and-aft chopping motion, followed by a question signal.		What is bearing to TACAN station?	Repeat signal and give bearing in three digits.
Arm and vertical hand, with 4 fingers extended and separated, moved ahead in a fore-and-aft circular motion, followed by question signal.		What is distance to TACAN station?	Repeat signal and give distance in two or three digits.
TACAN bearing or distance signal, followed by thumbs up or down.		TACAN bearing or distance, up or down.	Thumbs up or nod ("I understand").
TACAN bearing signal, followed by finger numerals.		Switch to TACAN station indicated.	Repeat and execute.

Table 6-1d. Flight Signals Between Aircraft.

ELECTRONIC COMMUNICATIONS AND NAVIGATION (Continued)			
SIGNAL		MEANING	RESPONSE
DAY	NIGHT		
Hand held up. First and fourth fingers extended, moved in fore-and-aft chopping motion, followed by:			
1. 4 numbers.		1. Set up UHF/ADF on frequency indicated.	1. Repeat signal and execute.
2. Question signal.		2. What is UHF/ADF bearing?	2. Repeat chopping motion, followed by wait, or three numerals indicating magnetic bearing.
3. Up or down signal.		3. My UHF/ADF is up or down.	3. Thumbs up or nod ("I understand").
Two fingers pointed toward eyes (meaning IFF/SIF signals), followed by:			Repeat, then execute.
1. "CUT".		1. Turn IFF/SIF to "STANDBY".	
2. 3-digit numerals.		2. Set mode and code indicated: first numeral - mode, second and third numerals - code.	
1. Open hand held up, fingers together, moved in fore-and-aft chopping motion (by leader).		1. Course to be steered is present compass heading.	1. Nod of head ("I understand").
2. Followed by question signal.		2. What is your compass heading?	2. Repeat signal and give compass heading in finger numerals.
3. Followed by three-finger numerals.		3. My compass heading is as indicated by finger numerals.	3. Nod or clarify, as appropriate.

Table 6-1d. Flight Signals Between Aircraft.

ARMAMENT			
SIGNAL		MEANING	RESPONSE
DAY	NIGHT		
1. Pistol-cocking motion with either hand. 2. Followed by question signal. 3. Followed by thumbs-down signal.		1. Ready or safety guns, as applicable. 2. How much ammo do you have? 3. I am unable to fire.	1. Repeat signal and execute. 2. Thumbs up - "over half"; thumbs down - "less than half." 3. Nod head ("I understand").
1. Shaking fist. 2. Followed by question signal. 3. Followed by thumbs-down signal.		1. Arm or safety bombs, as applicable. 2. How many bombs do I have? 3. I am unable to drop.	1. Repeat signal and execute. 2. Indicate with appropriate finger numerals. 3. Nod head ("I understand").
1. Shaking hand, with fingers extended downward. 2. Followed by question signal. 3. Followed by thumbs-down signal.		1. Arm or safety rockets, as applicable. 2. How many rockets do I have? 3. I am unable to fire.	1. Repeat signal and execute. 2. Indicate with appropriate finger numerals. 3. Nod head ("I understand").

Table 6-1e. Flight Signals Between Aircraft.

AIRCRAFT AND ENGINE OPERATION			
SIGNAL		MEANING	RESPONSE
DAY	NIGHT		
Raise fist with thumb extended in drinking position.		How much fuel have you?	Repeat signal, then indicate fuel in hundreds of pounds by finger numbers.
Rotary movement of clenched fist in cockpit as if cranking wheels.	Letter "W" in code, given by external lights.	Lower or raise landing gear and flaps, as appropriate.	Repeat signal. Execute when leader changes configuration.
Leader lowers hook.	Letter "H" in code, given by external lights.	Lower arresting hook.	Wingman lower arresting hook. Leader indicate wingman's hook is down with thumbs-up signal.
Open and close four fingers and thumb.		Extend or retract speedbrakes, as appropriate.	Repeat signal. Execute upon head-nod from leader or when leader's speedbrakes extend/retract.

Table 6-1f. Flight Signals Between Aircraft.

AIR REFUELING			
SIGNAL		MEANING	RESPONSE
DAY	NIGHT		
One-finger turnup signal.		By receiver: Start turbine and extend drogue.	Tanker execute. Receiver give thumbs up when turbine starts.
Form cone-shape with hand, all fingers extended aft (make signal close to canopy).			Tanker execute. Receiver give thumbs up if:
1. Cone moved aft.		1. By receiver: Extend drogue.	1. Drogue extends properly.
2. Cone moved forward.		2. By receiver: Retract drogue.	2. Drogue retracts fully and air turbine feathers.
Make hand into cup-shape, then make repeated pouring motions.		By tanker: I am going to dump fuel.	By receiver: Nod. Give thumbs up when fuel dumping commences.
Slashing motion of index finger across throat.		By tanker: I have stopped dumping fuel.	By receiver: Give thumbs up if fuel dumping has ceased.

Table 6-1g. Flight Signals Between Aircraft.

EMERGENCY			
SIGNAL		MEANING	RESPONSE
DAY	NIGHT		
Arm bent across forehead, weeping.		I am in trouble.	Escort disabled plane, assuming lead, if indicated, and return to base or nearest suitable field.
1. Followed by HEFOE signal and code.	1. HEFOE signal and code.	1. I am having trouble with indicated system.	
2. Followed by landing signal.	2. HEFOE signal and code, followed by wheels signal.	2. I must land immediately.	
MALFUNCTIONING OF EQUIPMENT (HEFOE CODE)			
Clenched fist held to helmet visor and then indicating by finger numbers 1 to 5 the affected system.	Flashlight held close to top of canopy, pointed toward wingman, followed by 1-to-5 dashes to indicate system affected.	Number of fingers or dashes means: 1. Hydraulic system. 2. Electric system (including TACAN and flight instruments) 3. Fuel system. 4. Oxygen system. 5. Engine.	Day: Nod, or thumbs up ("I understand"). Night: Vertical movement of flashlight. Pass lead to disabled plane, or assume lead, if indicated.

Table 6-1h. Flight Signals Between Aircraft.

EMERGENCY AND BINGO			
SIGNAL		MEANING	RESPONSE
DAY	NIGHT		
Fly close aboard the port side at 200 feet with the hook down. If in landing pattern, rock wings intermittently from 45° position until in the groove, or at 1 mile and 1/2 mile on a long straight-in.	Same, with all lights STDY/BRT. If in landing pattern, rapidly flash lights at 1 mile and at 1/2 mile.	I must land immediately.	
Fly close aboard the starboard side at 200 feet with hook up.	Same, with all lights FLASH/BRT.	I desire to land as soon as practicable.	
Fly close aboard port side at 200 feet, clean configuration, rocking wings (if fuel permits).	Same, with all lights FLASH/BRT (if fuel permits).	Am bingoing to beach.	

Table 6-2. Signals from Aircraft to Carrier, Indicating Aircraft Landing.

SIGNAL		MEANING	RESPONSE
DAY	NIGHT		
Blinking green light from tower.	Same.	Burn down and land.	Execute.
Blinking red light from tower.	Same.	Maximum conserve. Stay within visual distance of the ship.	Execute.
Flashing green "CUT" lights on mirror.	Same, and/or all runway lights on.	A clear and ready deck.	Land.
Flashing red "waveoff" lights on mirror.	Runway lights OUT, with centerline lights ON or OFF.	Fouled deck.	Do not land.
Flashing green "CUT" and red "waveoff" lights on mirror.	Same, with runway lights flashing ON and OFF.	Aircraft is in groove, proceed to divert field.	Aircraft is in groove, execute.

Table 6-3. Signals from Carrier to Aircraft, Indicating Aircraft Landing.

ARMING SIGNALS			
SIGNAL		MEANING	RESPONSE
DAY	NIGHT		
Arming supervisor makes pistol-cocking motion with either hand.	Same.	Pilot check all armament switches OFF or SAFE.	Pilot execute. Raise both hands to view of arming supervisor after checking switch positions. (Hands remain in view during check and hookup.)
Arming supervisor points at crew-member. (Used if applicable.)	Same.	Crew perform stray-voltage checks.	Arming crew execute. Give arming supervisor THUMBS UP if no stray voltage exists.
Arming supervisor raises fist, with thumb extended upward to meet horizontal palm of other hand.	Same.	Arming crew (as applicable) hook up rocket pigtails and/or arm 20 mm's.	Arming crew execute. Give arming supervisor THUMBS UP when arming is completed and clear the immediate area.
Arming supervisor give pilot: 1. Thumbs up. 2. Thumbs down.	Same.	1. Aircraft is armed and all personnel and equipment are clear of area. 2. Aircraft is down for ordnance.	1. Pilot hold until arming crew is clear of arming area. 2. Pilot return to line.
DEARMING SIGNALS			
SIGNAL		MEANING	RESPONSE
DAY	NIGHT		
Dearming supervisor makes pistol-cocking motion with either hand.	Same.	Pilot check all armament switches OFF or SAFE.	Pilot execute. Raise both hands to view of dearming supervisor after checking switch positions. (Hands remain in view during dearming.)
Dearming supervisor points at crewmember.	Same.	Crew disconnect rocket pigtail and/or disconnect feet mech. air supply hose, clear rounds from feed mech. throat. (If jammed, also disconnect electrical lead to feed mech. to disable firing circuit.) Comply with appropriate local and technical instructions for the type armament concerned.	Crew execute.
Dearming supervisor gives pilot thumbs up.	Same.	Aircraft is dearmed and crew and equipment are clear of aircraft.	Pilot hold until arming crew is clear of arming area, then return to line.

Table 6-4. Arming and Dearming Signals.

CHAPTER VII

Special Mission

700 GENERAL

The capabilities of the A-4 are such that it may be assigned a variety of special missions. Among these could be included such tasks as search, spray, and missile flights. These missions will be included herein as they become applicable.

701 BULLPUP

Both the Flight Handbook and NWIP 41-3 contain complete and concise instructions and techniques for handling, carrying, and delivering the BULLPUP Missile. These instructions should be thoroughly understood and complied with.

APPENDIX A

Selected References

1. A-4A/B Flight Manual and Confidential Supplement.
2. A-4C Flight Manual and Confidential Supplement.
3. A-4A/B/C Handbook of Maintenance Instructions.
4. NWP 41(A), Naval Air Operating Procedures.
5. NWIP 41-3, Attack Aircraft Manual.
6. Nuclear Weapons Delivery Supplement to NWIP 41-3.
7. Conventional Weapons Delivery Supplement to NWIP 41-3.
8. OP 2225, Bomb Ballistic Tables for Dive Bombing.
9. OP 2532, Firing Table: Air-to-Ground, 2.75" Aircraft Rockets MK 4 and Mods.
10. OP 2395, Ballistic Tables for Strafing with 20mm. Aircraft Guns M3 and MK 12 Mod. Ø.
11. NWIP 20-1, Naval Weapons Selection - Aircraft.
12. FXP-2(A), Naval Aircraft Exercises.
13. NWIP 22-3(A), Employment of Aviation in Amphibious Operations.
14. NWP 37(A), National Search and Rescue Manual.
15. NWP 43, Evasion and Escape.
16. BUWEPS Instruction 4700.2(Test Flights).
17. CNAL/CNAP Instruction P3710.16E/14, Carrier Air Traffic Control Procedures.
18. OPNAV Instruction 3510.9A, NATOPS Program.

Standardization Evaluation Supplement

A-4 NATOPS Manual

CONTENTS

ORIGINAL
(REVERSE BLANK)

Standardization Evaluation Supplement

S-100 STANDARDIZATION EVALUATION PROGRAM

S-101 GENERAL

a. Concept. The standard operating procedures prescribed in the NATOPS Manual represent the optimum method of A-4 aircraft operation. The Standardization Evaluation (STAN/EVAL) Check is intended to evaluate individual and unit compliance with these procedures. This will be accomplished by observing and grading individual/unit adherence to standard operating procedures on a continuing basis. The purpose of the Check, whether performed by the Standardization Instructor or the Standardization Evaluator, is to enhance combat readiness by ensuring knowledge of and compliance with optimum operating procedures.

b. Applicability. Annual Standardization Evaluation Checks will be administered to all pilots currently qualified in A-4 series aircraft. The Check will be conducted as prescribed in OPNAV Instruction 3510.9 (current revision) and in the implementing directives of the appropriate Air Type Commander in accordance with the provisions of this Supplement.

c. Implementation. Implementation instructions for the Standardization Evaluation Program will be promulgated by the Air Type Commander, as specified in OPNAV Instruction 3510.9 (current revision).

S-102 DEFINITIONS

Grading Criteria - The parts of this Supplement which prescribe the standards to be used in determining grades as a result of the performance observed or recorded during the Standardization Evaluation Check.

Qualified - A very reliable pilot who has a good knowledge of standard operating procedures and a thorough understanding of aircraft capabilities and limitations.

Conditionally Qualified - A pilot who meets the minimum acceptable standards and is considered safe and is qualified to fly the aircraft solo/unchased. He needs more practice in specific areas to become qualified, and such flying may be of the self-practice type.

Unqualified - A pilot who fails to meet the minimum acceptable standards as established by these criteria. This pilot should have supervised instruction until he has gained a Qualified or Conditionally Qualified rating.

Standardization Evaluation Recheck - A Standardization Evaluation Check administered to a pilot who has been placed in an Unqualified status. Only those areas in which an unsatisfactory level of knowledge or adherence to prescribed procedures was exhibited will be observed during this Check.

Emergency - An aircraft component or system failure, or condition which requires instantaneous recognition, analysis, and proper action.

Malfunction - An aircraft component or system failure or condition which requires recognition and analysis, but which permits more deliberate action than that required for an emergency.

Area - A routine of flight preparation, flight, and postflight procedures which are observed and graded during a Standardization Evaluation Flight.

Subarea - A subordinate routine of flight preparation, flight, and postflight procedures which are observed and graded during a Standardization Evaluation Flight in order to determine the Area grade.

Critical Area - Any major area or subarea which covers items of significant importance to the overall mission requirement or the marginal performance of which would jeopardize safe conduct of the flight shall be specified as a Critical Area. An Unqualified rating in any Critical Area will result in an overall grade of "Unqualified."

Pilots' Question Bank - A categorized list of questions and answers prepared and kept current by the model manager for the use of Standardization Instructors/ Evaluators in conducting standardization training. These questions will be used exclusively when administering a Standardization Evaluation Check.

S-120 GROUND EVALUATION

The Ground Phase will consist of an oral examination on aircraft systems and Preflight Inspection capability, a written examination (both open and closed book), and an OFT/ WST Procedures Check.

S-121 ORAL EXAMINATION

An oral examination of the pilot's Preflight Inspection capability will be conducted in addition to the normal Preflight Inspection accomplished prior to the Standardization Evaluation Flight. (The latter inspection may be unobserved in order to facilitate launch time.) This examination is designed to evaluate the examinee's overall knowledge of the aircraft's systems and components and his ability to recognize malfunctions or determine any improper preparation for flight of the various systems and components during the Preflight Inspection.

The examinee will perform a detailed inspection of the aircraft, using the Pocket Checklist. The examiner will discuss each system or component as it is inspected or checked to ascertain the examinee's knowledge.

S-122 WRITTEN EXAMINATION

a. Open Book. The open book examination will be composed of not less than 25 questions selected by the examiner from this category of the Pilots' Question Bank. The questions in this category will be based on the tables, graphs, and charts from the Flight Manual, the Supplement to the Flight Manual, and the NATOPS Manual.

b. Closed Book. The closed book examination will consist of not less than the number of questions indicated below for each subject. The questions will be selected by the examiner from the Closed Book category of the Pilots' Question Bank.

1. Local Area Procedures 5
2. NATOPS Manual, Flight Manual 30
3. Emergency Procedures and Malfunctions 25
4. Safety-of-Flight messages/revisions to the Flight Manual (if applicable) . . . . 1 for each.

Questions on Emergency Procedures as well as some questions on Safety-of-Flight items relating to operating procedures and critical aircraft and engine limitations will be designated by an asterisk (*). An incorrect answer to any question in this category will result in a grade of "Unqualified" being assigned to this protion of the Ground Evaluation.

S-123 OFT/WST PROCEDURES CHECK

The OFT/WST (if available) will be utilized to evaluate the pilot's knowlege and performance of normal procedures and his reaction to simulated emergencies and malfunctions. In areas not served by OFT/WST facilities, the Procedures Check should be conducted in a Cockpit Orientation Trainer. If neither of these devices is available, the Procedures Check should be conducted by oral examination and discussion with the examinee in the cockpit of the model aircraft in which he is current. The following list of procedures and conditions are those which will be simulated during the OFT/ WST Procedures Check, whenever possible. Critical emergency procedures which require an immediate response are designated by an asterisk (*).

a. Interior Inspection. (Pocket Checklist.)

b. Engine Starting Procedures.

1. Wet start.
2. Clear engine.

3. Fire during start. *
4. Normal start.
5. Oil pressure failure.

c. Ground Tests. (Pocket Checklist.)

d. Before Takeoff. (Pocket Checklist.)

e. Takeoff. (Pocket Checklist.)

1. Aborting takeoff (fire, thrust loss, runaway trim). *

f. After Takeoff. (Pocket Checklist.)

1. Retraction Release Solenoid inoperative.
2. Unsafe nose gear indication after gear retraction.
3. Flameout below 250 KIAS after gear retraction. *

g. During Flight.

1. Fuel Transfer Pump failure.
2. Fuel Tank Float Valve sticks closed.
3. Fuel Boost Pump failure.
4. Oil Pressure failure (flip-flop, gauge, or both), low, fluctuating, out.
5. Runaway aileron trim.
6. Main Generator failure.
7. Flight-Control Hydraulic failure only.
8. Complete loss of both Hydraulic Systems.
9. Speedbrake failure.
10. Loss of oxygen supply.
11. Engine failure above 20,000 feet.
12. Fire Warning Light ON and remains ON (other indications of fire).
13. Maximum glide.
14. Ejection. *
15. Bailout.
16. Transformer Rectifier failure (primary or main).
17. Electrical fire in flight.
18. EGT and/or r. p. m. failure.
19. Gyro Horizon failure.
20. Runaway elevator trim.
21. Fuel Quantity Gauge failure (rotates).
22. Engine icing.
23. 300 gallon drop-tank on wing station will not transfer.
24. Loss of Airspeed Indicator.
25. Surging engine (r. p. m. and TPT) or loss of thrust.
26. Fuel flow fluctuation/failure.
27. Fire Warning Light ON (no other indications).
28. Throttle linkage failure.
29. Smoke/fumes in cockpit.
30. Air conditioning goes full-hot.
31. Smoke/fumes in cockpit in RAM position.
32. Runaway rudder trim.
33. Ditching (land/sea).

h. Pre-traffic Pattern Checklist. (Pocket Checklist.)

1. Utility Hydraulic System failure.

i. Traffic Pattern Checklist. (Pocket Checklist.)

1. Loss of wheel brake(s).
2. Unsafe main or nose gear indication.
3. One main gear up.

j. Landing and Rollout. (Pocket Checklist.)

1. No Airspeed Indicator.
2. Runaway nosedown trim.

k. Stopping the Engine. (Pocket Checklist.)

l. Before Leaving the Aircraft. (Pocket Checklist.)

S-124 NAMT SYSTEMS CHECK

(Not Applicable.)

S-130 FLIGHT EVALUATION

The Flight Evalutation is designed to measure the degree of standardization demonstrated by the pilot being evaluated. It is not intended to measure the proficiency and/or ability of those evaluated beyond a point necessary to assure safety of flight. Within reasonable limits, any individual evaluated should be able to attain a grade of "Qualified", based upon demonstrated knowledge, without regard to special proficiency or ability.

All phases of the Ground Evaluation must be satisfactorily completed prior to commencement of the Flight Evaluation.

The Flight Evaluation may be completed on any flight which will permit the pilot to demonstrate standard procedures in the preparation for and execution of a representative type of

mission for the model concerned. With the concurrence of the Evaluator/Instructor, the unit concerned may select the mission which is best suited to aircraft configuration, training phase, target facilities, etc. Only those areas which are required by the particular mission and which can be actually observed by the Evaluator/Instructor will be graded.

The Flight Evaluation will be flown in day VFR conditions to facilitate observations and grading by the Evaluator/Instructor flying chase.

a. Safety Considerations During Standardization Evaluation Flights. Due to the broad significance of safety, it is impractical to list all contingencies without at the same time developing a lengthy and voluminous grading criteria. Generally, mission success is subject to compromises due to safety infractions, violations, omissions, or deviations, beginning with Mission Planning and ending with the Postflight Debriefing. The following paragraphs provide additional guidance in these areas.

(1) Violations of Pertinent Directives or Procedures which have a direct bearing on the safe completion of the mission or negligence in following any procedure or directive to the extent of jeopardizing the safety of the pilot or aircraft will constitute an overall grade of "Unqualified." The degree of jeopardy involved, in the absence of specific criteria, must be an Evaluator/Instructor determination based on experience and good judgement.

(2) The Latitude Given Examiners in Grading Safety Items must be exercised with care. The examiner should avoid assumptions in concluding that a safety discrepancy exists. To reason that a safety discrepancy could possibly occur as a result of a remote set of circumstances, is unfair to the pilot being examined. The examiner must observe a discrepancy that contributes directly to an unsafe condition to justify an overall grade of "Unqualified" for safety reasons.

(3) When an Inflight Safety Discrepancy Is Evident or is dangerously imminent, and the pilot appears to be unaware of the condition or has not taken appropriate action, the examiner will correct the situation by directing or taking the necessary corrective action immediately. Safety of flight will not be compromised due to any reluctance on the part of the examiner to correct the discrepancy.

(4) If a Grade of "Unqualified" Is Given, a brief descriptive statement concerning the safety discrepancy will be entered on the A-4 NATOPS Standardization Evaluation Report Form. The statement should be recorded "Safety Discrepancy."

b. Use of Judgement on Standardization Evaluation Flights. The grading criteria establish standards for grading pilot performance, but this does not relieve the Evaluator/Instructor from using good judgement based upon experience. In those items where a pilot fails to meet the minimums set forth in the grading criteria but the examiner, through past experience and judgement, knows the error to be caused by contributing factors such as weather, turbulence, etc., he may then assign the pilot a grade of "Qualified." However, the reason for such action must be recorded on the worksheet and Report Form. If the pilot being evaluated consistently made poor or wrong decisions, a statement to this effect will be reflected in the worksheet and the Remarks portion of the Standardization Evaluation Report Form, regardless of whether or not the pilot successfully completed the Standardization Evaluation Check. The only way the final grade and degree of performance of the pilot can be determined is by use of the grading criteria. Unless an obviously unsafe act has been observed (which would automatically and immediately terminate the flight), the Flight Examiner should not attempt to determine during the flight if the examinee passes or fails, or to what degree he passes or fails.

(1) Minor Discrepancies and/or Omissions. Minor discrepancies and/or omissions are defined as those which will not adversely affect the successful completion of the mission or jeopardize the safety of the pilot and/or aircraft.

(2) Momentary Deviations. Deviations from the tolerances set forth in the grading criteria which are momentary in nature will not be considered in grading, provided the individual being checked is alert in applying corrective action, the deviation does not jeopardize the safety of the pilot or aircraft, and the deviation does not exceed the limitations prescribed for a Conditionally Qualified grade. Cumulative momentary deviations will result in downgrading.

S-131 GRADING AREAS/SUBAREAS

Areas in which pilot adherence to standardized operating procedures can be observed are listed below. Critical areas or subareas are indicated by an asterisk (*).

a. Flight Planning.
   (1) Flight Planning.
   (2) Briefing.
   (3) Personal Flying Equipment.
b. Preflight Inspection.
   (1) Aircraft Acceptance.
c. Taxi.
   (1) Pretaxi Procedures.
   (2) Taxi.
   (3) Arming. (If Applicable.)
   (4) Pretakeoff.
   (5) Clearances/Communications.
d. Takeoff.
   (1) Visual Safety Check.
   (2) Lineup and Takeoff Interval.
   (3) Directional Control.
   (4) Lift-off.
   (5) After Takeoff.
e. Departure Procedures.
   (1) IFR Departure.
   (2) VFR Departure.
f. Rendezvous.
   (1) Rendezvous Procedures.
g. En Route Procedures.
   (1) IFR Procedures.
   (2) VFR Procedures.
h. Weapons.
   (1) Target Procedures.
   (2) Rendezvous Procedures.
i. Air Refueling.
   (1) Rendezvous.
   (2) Refueling Procedures.
j. Instrument Approach.
   (1) Holding.
   (2) Penetration.
   (3) GCA.
   (4) Missed Approach.
k. VFR Landing Pattern.
   (1) Pattern Entry.
   (2) Approach.
   (3) Landing.*
l. Emergency Procedures.
   (1) Emergency Procedures. (Evaluated only in case of an actual emergency.)*
m. Postflight Procedures.
   (1) Dearming Procedures.
   (2) Taxi.
   (3) Yellow Sheet.
   (4) Debriefing.
n. Aircraft Control.
   (1) Aircraft Control.
o. Communications.
   (1) R/T Procedures.
   (2) Visual Signals.
   (3) IFF/SIF Procedures.

S-140 GRADING INSTRUCTIONS

S-141 ORAL EXAMINATION GRADING CRITERIA

The oral examination grade will be determined by the Evaluator/Instructor and entered in the Oral Examination section of the Standardization Evaluation Worksheet. The minimum acceptable grade is "Qualified." The criteria for determining area adjectival ratings are outlined in the following paragraph.

Qualified	Demonstrated an adequate knowledge of aircraft systems operation to carry out basic missions safely and successfully. Exterior and Interior Inspection was completed in accordance with the BUWEPS Pocket Checklist, with only minor errors or omissions which would not affect mission accomplishment or safety. Demonstrated an adequate knowledge of inspection requirements.
Unqualified	Showed an obvious lack of understanding of aircraft systems operation. Revealed weakness that could result in unsuccessful or unsafe operation of the aircraft. Omitted items during the Preflight Inspection which could jeopardize the success or safety of the mission.

S-142 WRITTEN EXAMINATION GRADING CRITERIA

The results of both written examinations will be entered in the Written Examination section of the Standardization Evaluation Worksheet. Minimum acceptable grades are listed in the following paragraphs.

a. Open Book.

Qualified	Completed the examination with a minimum grade of 3.5.

b. Closed Book.

Qualified	Completed the examination with a minimum grade of 3.3 and did not miss any questions designated as critical.

S-143 OFT/WST PROCEDURES CHECK GRADING CRITERIA

The results of the OFT/WST Procedures Check will be recorded in the OFT/WST Procedures section of the Standardizatlon Evaluation Worksheet. The minimum grade ls "Qualified" (as determined by the Evaluator/Instructor). The criteria for determining area adjectival ratings are outlined in the following paragraphs.

a. Normal Procedures.

Qualifled	Demonstrated an adequate knowledge of procedures, with only minor deviations and/or omissions.
Unqualified	Exhibited an obvious lack of familiarity with procedures which resulted in serious or numerous oversights which would affect the safety or completion of the mission.

b. Emergency Procedures.

Qualified	Recognized emergencies promptly, analyzed them properly, and took necessary corrective action. Reaction was slow only in those situations which could not be realistically simulated.
Unqualified	Demonstrated improper and unsafe cockpit procedures. Failed to recognize emergencies, analyzed them improperly, or took improper corrective action. Failed to recognize and act in obvious situations which required immediate reaction until the condition had developed beyond salvation.

S-144 NAMT SYSTEMS CHECK GRADING CRITERIA

(Not Applicable.)

S-145 FLIGHT EVALUATION GRADING CRITERIA

The Flight Evaluation section of the Standardization Evaluation Worksheets should be used for data collection during the Flight Phase. Adjective grades for all areas and subareas evaluated during the Flight Check should then be determined and entered in the Standardization Evaluation Worksheets. An Unqualified rating in any critical area or subarea will result in an overall grade of "Unqualified". To determine the area grade for areas containing two or more subareas, numerical weight factors will be assigned to the adjective grades as follows:

2 - Qualified.
1 - Conditionally Qualified.
0 - Unqualified.

When all areas/subareas have been assigned a numerical weight factor, the following formula will be used to determine the area and/or the overall Flight Evaluation grade:

$$\frac{\text{Sum of area/subarea numerical values}}{\text{Number of areas/subareas evaluated}} = \text{Area (or Final Evaluation) grade.}$$

To convert the final numerical grade to an adjective grade, the following applies:

2.0 -1.5 - Qualified.
1.49-1.1 - Conditionally Qualified.
1.09-0 - Unqualified.

Example (subarea numerical values):

$$\frac{2+2+1+2+1}{5} = 8/5 = 1.6 = \text{Qualified (area adjective grade).}$$

The criteria for determining area/subarea adjective ratings is outlined in the following paragraphs. An asterisk (*) designates a critical area or subarea.

a. Flight Planning.

(1) Flight Planning.

Qualified	Flight planned in accordance with local, FLIP, OPNAV, and other governing instructions for the type of mission. Special factors which would affect the mission (such as mil lead, fuel management, weather, winds aloft, etc.,) have been computed and/or recorded, if applicable.
Conditionally Qualified	Same as Qualified, except with minor omissions or errors, none of which would adversely affect the successful completion of the mission or jeopardize safety.
Unqualified	Flight planning was incomplete and resulted in discrepancies which would prevent successful completion of the mission or jeopardize safety.

(2) Briefing.

Qualified	Adequately covered all applicable items and presented briefing in an acceptable manner.
Conditionally Qualified	Used prescribed briefing guide but omitted one or more applicable items, none of which would affect successful mission completion or jeopardize safety.
Unqualified	Did not use briefing guide. Briefing was inadequate to safely or successfully complete mission.

(3) Personal Flying Equipment.

Qualified	Had all required items of personal equipment necessary for the mission and area over which the flight was to be conducted.
Unqualified	Did not possess all required items of personal flying equipment.

b. Preflight Inspection.

(1) Aircraft Acceptance.

Qualified	Checked the ten previous yellow sheets (if available) for previous discrepancies and corrective action taken. Checked fuel, oil, and oxygen quantities, aircraft status, and other pertinent data (such as LABS settings, armament load) prior to flight.
Unqualified	Failed to check previous yellow sheets for discrepancies and corrective action taken. Failed to check aircraft status and/or other pertinent data prior to flight.

c. Taxi.

(1) Pretaxi Procedures.

Qualified	Performed pretaxi procedures as briefed with no deviations or omissions.
Conditionally Qualified	Performed pretaxi procedures as briefed, but with minor deviations and omissions.
Unqualified	Deviated from the briefed procedures to the extent that ground or flight safety was jeopardized.

(2) Taxi.

Qualified	Taxi clearance (if required) was obtained prior to departing flight line. Taxiing was accomplished as briefed and in accordance with the local Air Operation Manual.
Unqualified	Commenced taxiing without clearance (if required) or taxied contrary to instructions from controlling agency. Taxi speed or interval unsafe for existing conditions.

(3) Arming. (If Applicable.)

Qualified	Observed local arming procedures and safety precautions.
Unqualified	Obvious lack of knowledge of or noncompliance with local arming procedures or safety precautions.

(4) Pretakeoff.

Qualified	Executed engine runup and completed necessary checks as indicated by proper takeoff configuration.
Unqualified	Engine runup not performed. Obvious failure to use checklist indicated by improper takeoff configuration.

(5) Clearances/Communications.

Qualified	Taxi, takeoff, ATC clearances (if applicable) requested in timely manner with a minimum of transmissions required to understand clearance. Complied with instructions given. Readback of ATC clearance (if required) was generally correct.
Conditionally Qualified	Delay incurred due to failure to make timely request for taxi, takeoff, or ATC clearance. Transmissions were repeatedly incomplete, requiring additional questions and calls. Repeated transmissions were required to understand simple clearance.
Unqualified	Any unsafe act due to noncompliance with taxi or takeoff clearance. Could not communicate information or understand clearances without superfluous time and words.

d. Takeoff.

(1) Visual Safety Check.

Qualified	Visually checked adjacent aircraft for proper configuration, leaks, etc., prior to takeoff.
Unqualified	Did not make required safety check.

(2) Lineup and Takeoff Interval.

Qualified	Lineup and takeoff interval was appropriate for existing conditions.
Conditionally Qualified	Minor deviation from specified procedures for lineup or takeoff interval, but not to the extent of being unsafe.
Unqualified	Lineup and/or takeoff interval was unsafe.

(3) Directional Control.

Qualified	Good directional control was evident during takeoff roll.
Conditionally Qualified	Improper use of brakes or poor directional control.
Unqualified	Directional control was unsafe.

(4) Lift-off.	
Qualified	Transition to takeoff attitude and lift-off executed smoothly and without severe rotation.
Conditionally Qualified	Overcontrolled or rough attitude control during or after lift-off.
Unqualified	Rotation to takeoff attitude or attitude control after takeoff was so erratic as to be unsafe.
(5) After Takeoff.	
Qualified	Retraction of wheels and flaps was safely accomplished.
Conditionally Qualified	Erratic aircraft control during retraction of wheels and flaps.
Unqualified	Unsafe aircraft control during retraction of wheels and flaps.
e. Departure Procedures.	
(1) IFR Departure.	
Qualified	Departure executed in accordance with clearance.
Conditionally Qualified	Same as Qualified, except for minor deviations not constituting a violation of the clearance.
Unqualified	Major deviation constituting a violation of the clearance. Airspeed or attitude unsafe.
(2) VFR Departure.	
Qualified	Departure executed in accordance with local traffic rules and clearance.
Conditionally Qualified	Same as Qualified, except for minor deviations.
Unqualified	Violated local traffic rules to the extent of being unsafe.
f. Rendezvous.	
(1) Rendezvous Procedures.	
Qualified	Executed rendezvous safely and in accordance with procedures as briefed or currently prescribed.
Conditionally Qualified	Same as Qualified, but with minor errors in technique.
Unqualified	Rendezvous executed in a manner that indicated lack of knowledge of technique required. Resulting delay would adversely affect or preclude accomplishment of the briefed mission. Rendezvous was unsafe.
g. En Route Procedures.	
(1) IFR Procedures.	
Qualified	Complied with clearance and instructions given by controlling agency.
Conditionally Qualified	Same as Qualified, except for minor deviations not constituting a violation of the clearance.
Unqualified	Major deviation constituting a violation of the clearance.
(2) VFR Procedures.	
Qualified	Maintained cruising Mach, altitude, and/or heading as briefed or as dictated by governing regulations and existing conditions.
Conditionally Qualified	Generally maintained a cruising Mach altitude and/or heading less-than-optimum for existing conditions, but which would not have prevented the successful completion of the mission.
Unqualified	Did not meet the criteria for Conditionally Qualified. Demonstrated an obvious lack of knowledge of basic requirements or regulations which would have adversely affected mission completion or safety.

h.	Weapons.	
	(1) Target Procedures.	
	Qualified	Conformed to prescribed procedures for weapons delivery and local target pattern.
	Conditionally Qualified	Same as Qualified, except for minor deviations or omissions.
	Unqualified	Obvious lack of knowledge of procedures for weapons release or local target pattern. Any unsafe act.
	(2) Rendezvous Procedures.	
	Qualified	Executed rendezvous safely and in accordance with procedures as briefed or currently prescribed.
	Conditionally Qualified	Same as Qualified, but with minor errors in technique.
	Unqualified	Rendezvous executed in a manner that indicated lack of knowledge of technique required. Rendezvous was unsafe.
i.	Air Refueling.	
	(1) Rendezvous.	
	Qualified	Minimum radio communications. Good joinup procedures.
	Conditionally Qualified	Excessive radio communications. Poor joinup with tanker.
	Unqualified	Failed to rendezvous with tanker. Formation dangerous. Any unsafe act.
	(2) Refueling Procedures.	
	Qualified	Followed prescribed procedures for hookup and breakaway.
	Conditionally Qualified	Same as Qualified, but with minor deviations or omissions.
	Unqualified	Endangered self or other aircraft. Did not know or follow prescribed procedures.
j.	Instrument Approach.	
	(1) Holding.	
	Qualified	Entered holding pattern in accordance with current directives. Remained within pattern limits.
	Conditionally Qualified	Same as Qualified, except with minor deviations. Aircraft control was erratic.
	Unqualified	Unorthodox pattern entry. Cannot remain in prescribed pattern. Unsafe altitude or airspeed.
	(2) Penetration.	
	Qualified	Complied with prescribed procedures and instructions received. Tracking procedure was good. Leveled off smoothly at the prescribed altitude.
	Conditionally Qualified	Same as Qualified, except for minor deviations from procedures and/or instructions received not affecting flight safety.
	Unqualified	Did not meet the criteria for Conditionally Qualified.
	(3) GCA.	
	Qualified	Followed all instructions without delay or deviation. Transitioned to landing configuration, observing airspeed limits for gear and flap extension. Responded promptly and smoothly to corrections by final controller, resulting in only minor deviations from glide slope and heading.
	Conditionally Qualified	Same as Qualified, but with deviations which did not affect safety of flight and did not result in a technique waveoff.
	Unqualified	Exceeded the criteria for Conditionally Qualified.

(4) Missed Approach.

Qualified	Followed Missed-Approach procedures as published or instructed. Did not descend below minimum altitude. Maintained good control during transition to climb and throughout aircraft configuration change, with only minor deviations.
Conditionally Qualified	Same as Qualified, except occasionally overcontrolled during transitions and/or other deviations not jeopardizing safety of flight.
Unqualified	Did not meet the criteria for Conditionally Qualified.

k. VFR Landing Pattern.

(1) Pattern Entry.

Qualified	Pattern entry and break executed as prescribed by Local Course Rules and/or instructions received from controlling agency. Local Hung-Ordnance procedures complied with (if applicable).
Conditionally Qualified	Same as Qualified, with minor deviations not jeopardizing safety.
Unqualified	Did not meet the criteria for Conditionally Qualified. Poorly planned or improperly executed entry to the traffic pattern. Obvious lack of knowledge of or compliance with local Hung-Ordance procedures (if applicable).

(2) Approach.

Qualified	Conformed to prescribed procedures for pattern and transitioning to landing configuration.
Conditionally Qualified	Same as Qualified, with minor deviations from pattern altitude or airspeed, but not to the extent of being unsafe. Forgot speedbrakes .
Unqualified	Did not meet the criteria for Conditionally Qualified. Exceeded gear and flaps extension airspeed limitations or failed to lower the landing gear prior to the 180° position.

(3) Landing. *

Qualified	Adequate straightaway on final to determine degree of crosswind effect. Touchdown was effected at a safe distance down the runway without a noticeable flare. Mirror was used where available. Flaps were retracted promptly after touchdown. Good directional control during rollout.
Conditionally Qualified	Same as Qualified, except minor deviations not considered unsafe. Did not use mirror (if available). Flared on landing. Did not retract flaps promptly after touchdown.
Unqualified	Did not meet the criteria for Conditionally Qualified.

l. Emergency Procedures.

(1) Emergency Procedures. *

Qualified	Properly analyzed the emergency system (if any emergency actually occured) and took appropriate action without deviation, error, or omission.
Conditionally Qualified	Same as Qualified, except all required action was accomplished safely, but not in the correct sequence.
Unqualified	Failed to recognize an obvious emergency or deviated from specified procedures to the extent of endangering safety of flight.

m. Postflight Procedures.

(1) Dearming Procedures.

Qualified	Conformed to local dearming procedures.
Unqualified	Obvious lack of knowledge or violation of local dearming procedures. Any unsafe act.

(2) Taxi.

Qualified	Taxi was completed safely and at proper interval for existing conditions. Complied with prebriefed or specified procedures.
Unqualified	Did not meet the criteria for Qualified. Any unsafe act.

(3) Yellow Sheet.

Qualified	OPNAV 3760.2 (Yellow Sheet) completed without errors or omissions.
Conditionally Qualified	Same as Qualified, except minor omissions that have no safety significance.
Unqualified	Did not meet the criteria for Conditionally Qualified. Failed to record a discrepancy involving safety of flight.

(4) Debriefing.

Qualified	Examinee thoroughly debriefed the mission. Completed error analysis with definite corrective action prescribed, if indicated.
Conditionally Qualified	Minor omissions. Inadequate error analysis.
Unqualified	Inadequate debriefing, with major items omitted. No error analysis. Corrective action omitted.

n. Aircraft Control.

(1) Aircraft Control. (Applies to Entire Flight.)

Qualified	Good leader. Smooth on controls. Considerate of wingman. Wingman would have no problem maintaining position.
Conditionally Qualified	Rough on controls. Has little consideration for wingman. Not unsafe.
Unqualified	Very rough on controls. Would be unsafe as formation leader in IFR conditions. No consideration for wingman. Any unsafe maneuvers.

o. Communications.

(1) R/T Procedures.

Qualified	Complied with procedures prescribed by Military and FAA Regulations. Transmissions were made correctly on the proper frequency without interruption of other transmissions. Monitored frequencies and/or facilities at the appropriate time. Transmissions were received, understood, properly acknowledged, and complied with. Was familiar with communications equipment and facilities. Utilized backup facilities without hesitation.
Conditionally Qualified	Same as Qualified, except for minor deviations or delays which indicated lack of thorough familiarity with procedures, equipment, or facilities, but which would not preclude successful completion of the mission or jeopardize safety.
Unqualified	Failed to transmit or receive mandatory reports through omission or lack of familiarity with equipment or procedures. Any violation of Military/FAA Regulations. Any violation of safety.

(2) Visual Signals.

Qualified	Used standard visual signals correctly and without confusion. No delay due to questionable signals.
Conditionally Qualified	Same as Qualified, except for minor deviations and delays.
Unqualified	Used nonstandard signals, resulting in misinterpretation and confusion. Excessive delays or mission success was jeopardized due to use of questionable signals.

(3) IFF/SIF Procedures.

Qualified	Used proper route codes. Complied with all interrogation instructions.

Unqualified	Failed to use equipment properly, resulting in confusion and undue delay. Obvious lack of knowledge of IFF/SIF procedures.

S-146 FINAL GRADE DETERMINATION

The final grade assigned for the Standardization Evaluation Check will be the grade assigned for the Flight Phase, except that when the minimum standard for any part of the Ground Phase is not attained, a final grade of "Unqualified" will be assigned for the entire Standardization Evaluation Check and so entered in that block of the Standardization Evaluation Report.

S-147 FORMS AND RECORDS

a. Report Form. The Standardization Evaluation Report Form (Form S-1) will be used to report the complete results of the Standardization Evaluation Check. Upon completion of the Check and Critique, the applicable sections of the Report will be prepared in duplicate by the Evaluator/Instructor for each pilot checked. All areas/subareas graded as "Unqualified" must be amplified in the "Remarks" column. The original of the completed Report will be delivered to the Commanding Officer for review and comment.

b. Worksheets. The Oral/Written Examination Worksheet (Form S-2),the OFT/WST Procedures Worksheet (Form S-3), and the Flight Evaluation Worksheets (Form S-4) will be used as applicable in administering all phases of the Standardization Evaluation Check, in the determination of grades, and in the preparation of the Standardization Evaluation Report and the Critique. Specific results of individual parts of the Check which are indicative of deficiencies in the level of required pilot knowledge or degree of adherence to standard procedures should also be recorded.

c. Records. The Standardization Evaluation Report will be retained by the squadron for a period of one year after completion or until a subsequent Check has been completed. Upon successful completion of a Standardization Evaluation Check, an entry to that effect will be made on the Qualification and Achievements page of the individual's Aviator's Flight Logbook by the Evaluator/Instructor conducting the Check.

S-148 CRITIQUE

The Critique is the terminal point in the Standardization Evaluation Check and will be given by the Evaluator/Instructor administering the Check. The Critique involves processing the data collected and the oral presentation of the Standardization Evaluation Report. Deviations from standard operating procedures will be covered in detail, using all collected data and the worksheets as a guide. Upon completion of the Critique, the pilot will receive the completed copy of the Standardization Evaluation Report for certification and signature. The completed Stardardization Evaluation Report will then be presented to the Unit Commanding Officer.

APPENDIX A

Standardization Evaluation Report

Form S-1				
NATOPS ANNUAL STANDARDIZATION EVALUATION REPORT – A-4				
NAME (Last, First, Middle Initial)			RANK	FILE NUMBER
ACTIVITY/LOCATION		DATE	TYPE AIRCRAFT	
TOTAL FLIGHT TIME	TOTAL TIME IN TYPE		DATE OF LAST NATOPS CK.	

EVALUATION				
GROUND PHASE		GRADE		
AREA	DATE COMPLETED	U	CQ	Q
Oral Examination				
Written Examination (Open Book)				
Written Examination (Closed Book)				
Pilot Procedures Evaluation (OFT)				
Overall Ground Phase				
Overall Flight Phase				

Final Overall Grade		
Remarks of Evaluator/Instructor		
Date	Rank, Name of EVAL/INST	Signature
Date	Rank, Name of Examinee	Signature
Remarks of Unit Commander and Corrective Action		
Date	Rank, Name of Unit Commander	Signature

Form S-1

A-4 FLIGHT EVALUATION GRADING FORM

AREA	SUBAREA GRADES						AREA GRADE
	(1)	(2)	(3)	(4)	(5)	(6)	
a. Flight Planning.							
b. Preflight Inspection.							
c. Taxi.							
d. Takeoff.							
e. Departure Procedures.							
f. Rendezvous.							
g. Enroute Procedures.							
h. Weapons.							
i. Air Refueling.							
j. Instrument Approach.							
k. VFR Landing Pattern.							
l. Emergency Procedures.							
m. Postflight Procedures.							
n. Aircraft Control.							
o. Communications.							

AREA TOTAL	
NO. AREAS GRADED	
NUMERICAL AVERAGE	
FLIGHT PHASE ADJECTIVE GRADE	

APPENDIX B
Standardization Evaluation Worksheets

(Reproduce Locally)

Form S-2

A-4 STANDARDIZATION EVALUATION

ORAL EXAMINATION

GRADE	
Q	U

Knowledge of Systems:

Engine	Electrical:
Fuel	Instruments
Hydraulic	Radio/NAV
Ordnance	Radar
Oxygen	AFCS

WRITTEN EXAMINATION (Open Book)

GRADE	
Q (3.5 or above)	U (Less than 3.5)

WRITTEN EXAMINATION (Closed Book)

GRADE	
Q (3.3 or above)	U (Less than 3.3)*

* Or misses one or more "critical" questions.

List Areas of Obvious Weakness

_____

_____

Pilot _____ Unit _____ Date _____

Form S-3

e. Takeoff. (Pocket Checklist.)

1. Aborting takeoff (fire, thrust loss, runaway trim). *

f. After Takeoff. (Pocket Checklist.)

1. Retraction Release Solenoid inoperative.
2. Unsafe nose gear indication after gear retraction.
3. Flameout below 250 KIAS after gear retraction. *

g. During Flight.

1. Fuel Transfer Pump failure.
2. Fuselage Tank Float Valve sticks closed.
3. Fuel Boost Pump failure.
4. Oil Pressure failure (flip-flop, gauge, or both) low, fluctuating, out.

Form S-3

5. Runaway aileron trim.
6. Main Generator failure.

7. Flight Control Hydraulic failure only.
8. Complete loss of both Hydraulic Systems.
9. Speedbrake failure.
10. Loss of oxygen supply

11. Engine failure above 20,000 ft.
12. Fire Warning Light ON and remains ON (other indications of fire).
13. Maximum glide.
14. Ejection. *
15. Bailout.

16. Transformer Rectifier failure (primary or main).
17. Electrical fire in flight.
18. EGT and/or r.p.m. failure.

Form S-3

19. Gyro Horizon failure.
20. Runaway elevator trim.
21. Fuel Quantity Gauge failure (rotates).
22. Engine icing.

23. 300 gal. drop-tank on wing station will not transfer.
24. Loss of Airspeed Indicator.
25. Surging engine (r.p.m. and TPT) or loss of thrust.
26. Fuel flow fluctuation/failure.

27. Fire Warning Light ON (no other indications).
28. Throttle linkage failure.
29. Smoke/fumes in cockpit.
30. Air conditioning goes full-hot.
31. Smoke/fumes in cockpit in RAM position.
32. Runaway rudder trim.

33. Ditching (land/sea).

Form S-3

h. Pre-Traffic Pattern Checklist. (Pocket Checklist.)

1. Utility Hydraulic System failure.

i. Traffic Pattern Checklist. (Pocket Checklist.)

1. Loss of wheel brake(s).
2. Unsafe main or nose gear indication.
3. One main gear up.

j. Landing and Rollout. (Pocket Checklist.)

1. No Airspeed Indicator.
2. Runaway nosedown trim.

k. Stopping the Engine. (Pocket Checklist.)

l. Before Leaving the Aircraft. (Pocket Checklist.)

Form S-3

PILOT OFT/WST PROCEDURES EXAMINATION

GRADE			
NORMAL PROCEDURES		EMERGENCY PROCEDURES	
Q	U	Q	U

List Errors and Areas of Obvious Weakness

Form S-4

A-4
NATOPS EVALUATOR/INSTRUCTOR
STANDARDIZATION EVALUATION WORKSHEET

FLIGHT PHASE

NAME _____ RANK _____

UNIT _____ DATE OF FLT _____

FLIGHT EXAMINER _____ RANK _____

These worksheets will be used in conjunction with the A-4 NATOPS Grading Criteria. Individual pages should be arranged to suit the particular mission to be flown. An asterisk (*) after an item designates a critical area or subarea.

Form S-4

BRIEFING CHECKLIST

A. GENERAL

EVENT # _____

ACFT. #	LINEUP	CALL SIGNS

FUEL LOAD		TIMES:START	
STORES WT.		TAXI	
BASIC WT.		TAKEOFF	
ACFT. GROSS WT. =		LAND	
LINE SPEED		LIFT-OFF SPEED	
TAKEOFF DISTANCE		DECK SPOT	

B. MISSION

PRIMARY		SECONDARY	
OP. AREA/TGT.		CONTROL AGENCY	
TIME ON STATION		TIME ON TGT.	

Form S-4

C. NAVIGATION AND FLIGHT PLANNING

FOX CORPEN/ RUNWAY: LAUNCH	_____	PIM	_____
RECOVERY	_____	RENDEZVOUS	_____
FORCE DISPOSITION	_____	OP. AREA PROCED.	_____
CLIMBOUT	_____	FUEL/02 PLAN	_____
MISSION PLAN	_____	MARSHAL: NORMAL	_____
RESTRICTED AREAS	_____	EMER-GENCY	_____
BINGO/LOW STATE	_____		
HOLDING	_____	MINIMUMS	_____
PENETRATION PROCED.	_____	MINIMUMS	_____
GCA/CCA PROCEDURES	_____	ALTERNATE	_____
MISSED APPROACH	_____	DIVERT/EMERG. FLD.	_____
READY DECK	_____	PATTERN	_____
RECOVERY: COURSE RULES	_____	LANDING/W.O.	_____
BREAKUP	_____		

D. COMMUNICATIONS

FREQUENCIES	_____	CONTROL AGENCIES	_____
RADIO PROCEDURE	_____	RADIO DISCIPLINE	_____
ADIZ PROCEDURES	_____	IFF/SIF	_____
NAVAIDS	_____	HAND/LIGHT SIGNALS	_____

Form S-4

E. WEAPONS

LOADING	_____	ARMING	_____
SPECIAL ROUTES?	_____	PATTERN	_____
SWITCHES	_____	AIMING INFO	_____
ENTRY IAS	_____	RELEASE IAS	_____
RELEASE ALT.	_____	MINIMUM ALT.	_____
SECTOR SETTING	_____	RUN-IN IMN	_____
DUDS	_____	HUNG ORDNANCE	_____
JETTISON	_____	DEARMING	_____
SAFETY	_____		

F. WEATHER

LOCAL	_____	EN ROUTE	_____
DESTINATION: EXISTING	_____	FORCAST	_____
ALTERNATE/DIVERT: EXISTING	_____	FORECAST	_____
WINDS/JETSTREAM	_____	TEMPERATURE	_____
CONTRAIL BAND	_____		

Form S-4

G. EMERGENCIES

TAKEOFF ABORTS	_____	RADIO FAILURE	_____
LOST NAVAIDS	_____	VISUAL CONTACT LOST	_____
LOST PLANE PROCED.	_____	DOWNED PLANE/SAR	_____
ACFT. EMERGENCIES	_____	SYSTEM FAILURES	_____

H. AIR INTELLIGENCE AND SPECIAL INSTRUCTIONS

FRIENDLY/ENEMY FORCE DISPOSITION	_____	SITUATION	_____
TARGETS	_____	REPORTS	_____
AUTHENTICATION	_____	E. & E.	_____
LOOKOUT DOCTRINE	_____	SAFETY PRECAUTIONS	_____
SUCCESSION TO LEAD	_____		

Form S-4

FLIGHT EVALUATION

A. FLIGHT PLANNING.

(1) FLIGHT PLANNING.

COMPLETE.		Remarks:
MINOR OMISSIONS.		
INADEQUATE.		

(2) BRIEFING.

ADEQUATE.		
MINOR OMISSIONS.		
INADEQUATE.		

(3) PERSONAL FLYING EQUIPMENT.

COMPLETE EQUIPMENT.		
MISSING MANDATORY ITEMS.		

B. PREFLIGHT INSPECTION.

(1) AIRCRAFT ACCEPTANCE.

ADEQUATE.		
DID NOT OBTAIN REQUIRED INFO.		

Form S-4

C. TAXI.

(1) PRETAXI PROCEDURES.

AS BRIEFED.		
MINOR DEVIATIONS.		
JEOPARDIZED SAFETY.		

(2) TAXI.

AS BRIEFED. COMPLIED WITH COURSE RULES.		
FAILED TO GET CLEARANCE. NONCOMPLIANCE WITH CLEARANCE. UNSAFE ACT.		

(3) ARMING. (If Applicable.)

OBSERVED LOCAL ARMING PROCEDURES.		
NONCOMPLIANCE WITH LOCAL PROCEDURES, NATOPS, OR UNSAFE ACT.		

(4) PRETAKEOFF.

CHECKS COMPLETED.		
IMPROPER CONFIGURATION, NO RUNUP PERFORMED.		

Form S-4

(5) CLEARANCES/COMMUNICATIONS.

TIMELY, COMPLETE, CLEAR.		
MINOR OMISSIONS, PILOT-CAUSED DELAYS, SOME REPEATS.		
NONCOMPLIANCE WITH CLEARANCE, UNACCEPTABLE R/T PROCEDURE.		

Form S-4

D. TAKEOFF.

(1) VISUAL SAFETY CHECK.

ACCOMPLISHED CHECK.		
FAILED TO MAKE CHECK.		

(2) LINEUP AND INTERVAL.

APPROPRIATE.		
MINOR DEVIATION.		
UNSAFE.		

(3) DIRECTIONAL CONTROL.

GOOD.		
IMPROPER BRAKE USE.		
UNSAFE.		

(4) LIFT-OFF.

NORMAL.		
ROUGH.		
UNSAFE.		

Form S-4

(5) AFTER TAKEOFF.

SAFE RETRACTION OF WHEELS AND FLAPS.		
ERRATIC CONTROL DURING RETRACTION.		
UNSAFE CONTROL DURING RETRACTION.		

Form S-4

E. DEPARTURE PROCEDURES.

(1) IFR DEPARTURE.

COMPLIED WITH CLEARANCE.		
MINOR DEVIATIONS.		
VIOLATED CLEARANCE, AIRSPEED/ALTITUDE UNSAFE.		

(2) VFR DEPARTURE.

COMPLIED WITH COURSE RULES.		
MINOR DEVIATIONS.		
UNSAFE, VIOLATION.		

Form S-4

F. RENDEZVOUS.

(1) RENDEZVOUS PROCEDURES.

AS BRIEFED.		
MINOR TECHNIQUE ERRORS.		
UNSAFE, NOT AS BRIEFED.		

G. EN ROUTE PROCEDURES.

(1) IFR PROCEDURES.

COMPLIED WITH CLEARANCE.		
MINOR DEVIATIONS.		
VIOLATED CLEARANCE.		

(2) VFR PROCEDURES.

AS BRIEFED.		
MINOR DEVIATIONS.		
DEVIATED TO EXTENT MISSION COULD NOT BE COMPLETED, UNSAFE, VIOLATED REGULATIONS.		

Form S-4

H. WEAPONS.

(1) TARGET PROCEDURES.

COMPLIED WITH LOCAL TARGET PROCEDURES.		
MINOR DEVIATIONS.		
VIOLATED TARGET PROCEDURES, UNSAFE ACT.		

(2) RENDEZVOUS.

AS BRIEFED.		
MINOR TECHNIQUE ERRORS.		
UNSAFE, NOT AS BRIEFED.		

Form S-4

I. AIR REFUELING.

(1) RENDEZVOUS.

AS BRIEFED.		
MINOR DEVIATIONS.		
UNSAFE, NOT AS BRIEFED.		

(2) REFUELING PROCEDURES.

FOLLOWED PRESCRIBED PROCEDURES.		
MINOR DEVIATIONS.		
UNSAFE, MAJOR DEVIATIONS.		

Form S-4

J. INSTRUMENT APPROACH.

(1) HOLDING.

COMPLIED WITH CURRENT DIRECTIVES.		
MINOR DEVIATIONS.		
UNORTHODOX ENTRY, UNSAFE.		

(2) PENETRATION.

COMPLIED WITH CLEARANCE AND PRESCRIBED PROCEDURES.		
MINOR DEVIATIONS.		
UNSAFE.		

(3) GCA.

COMPLIED WITH INSTRUC-TIONS AND PRESCRIBED PROCEDURES.		
DEVIATED, BUT NOT UNSAFE TO THE EXTENT TECHNIQUE WAVEOFF RESULTED.		
UNSAFE, TECHNIQUE WAVEOFF.		

(4) MISSED APPROACH.

COMPLIED WITH PRESCRIBED PROCEDURES.		
MINOR DEVIATIONS.		
UNSAFE.		

Form S-4

K. VFR LANDING PATTERN.

(1) PATTERN ENTRY.

COMPLIED WITH LOCAL COURSE RULES AND TOWER INSTRUCTIONS. HUNG-ORDNANCE PROCEDURES FOLLOWED, IF APPLICABLE.		
MINOR DEVIATIONS.		
UNSAFE ACT, NONCOMPLIANCE WITH COURSE RULES, CLEARANCE, OR HUNG-ORDNANCE PROCEDURES.		

(2) APPROACH.

COMPLIED WITH PRESCRIBED PROCEDURES.		
MINOR DEVIATIONS, NO SPEEDBRAKES.		
UNSAFE, FORGOT WHEELS.		

(3) LANDING.*

COMPLIED WITH PRESCRIBED PROCEDURES.		
MINOR DEVIATIONS, FLARE LANDING, SLOW FLAP RETRACTION AFTER TOUCHDOWN.		
EXCEEDS ABOVE CRITERIA, UNSAFE.		

Form S-4

L. EMERGENCY PROCEDURES.

(1) EMERGENCY PROCEDURES.*

CORRECTLY ANALYZED AND ACTED (IF ANY ACTUALLY OCCURRED).		
MINOR SEQUENTIAL DEVIATIONS.		
FAILED TO RECOGNIZE SYMPTOMS OR UNSAFE DEVIATION FROM PRESCRIBED PROCEDURES.		

Form S-4

M. POSTFLIGHT PROCEDURES.

(1) DEARMING.

COMPLIED WITH LOCAL DEARMING PROCEDURES.		
VIOLATED LOCAL PROCEDURES. ANY UNSAFE ACT.		

(2) TAXI.

COMPLIED WITH PRESCRIBED PROCEDURES AND CLEARANCE.		
NONCOMPLIANCE, UNSAFE.		

(3) YELLOW SHEET.

COMPLETED WITHOUT ERROR.		
MINOR OMISSIONS.		
SAFETY OF FLIGHT DISCREPANCY OMITTED.		

(4) DEBRIEFING.

COMPLETE.		
MINOR OMISSIONS.		
INADEQUATE.		

Form S-4

N. AIRCRAFT CONTROL.

(1) AIRCRAFT CONTROL. (Entire Flight.)

SMOOTH, CONSIDERATE LEAD.		
ROUGH, LITTLE CONSIDERATION FOR WINGMAN.		
VERY ROUGH, UNSAFE LEADER IN IFR, UNSAFE MANEUVER.		

Form S-4

O. COMMUNICATIONS.

(1) R/T PROCEDURES.

COMPLIED WITH PRESCRIBED PROCEDURES.		
MINOR DEVIATIONS, DELAYS, LACK OF THOROUGH FAMILIARITY WITH EQUIPMENT/ FACILITIES.		
FAILED TO MAKE MANDATORY REPORTS, VIOLATED MILITARY/FAA REGULATIONS, UNSAFE ACT OR OMISSION.		

(2) VISUAL SIGNALS.

USED STANDARD SIGNALS.		
MINOR DEVIATIONS.		
NONSTANDARD SIGNALS, EXCESSIVE DELAYS.		

(3) IFF/SIF PROCEDURES.

USED PROPER CODES.		
IMPROPER USE OF EQUIPMENT OR CODES.		