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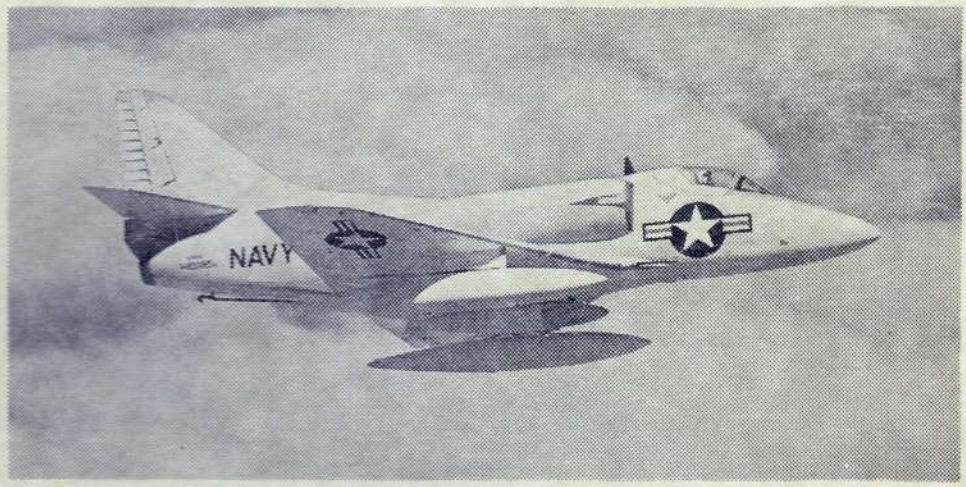
NAVAL AIR TRAINING AND OPERATING PROCEDURES STANDARDIZATION MANUAL

A4D



ISSUED BY THE OFFICE OF THE
CHIEF OF NAVAL OPERATIONS

DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
WASHINGTON 25, D.C.

IN REPLY REFER TO

4 May 1961

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. The NATOPS Manual is published for the purpose of standardizing operational information that does not appear in the flight manual or the Naval Warfare Publication series. It is written by knowledgable users for the user. 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. Thus, it is a user's publication, prepared by and for the user, and kept current by the users, in order to achieve maximum readiness safely, efficiently and economically. 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 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.

R. B. PIRIE,
Vice Admiral, USN
Deputy Chief of Naval Operations (Air)

RECORD OF CHANGES

Change No.	Date entered	By whom	Initials

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CHAPTER I
INTRODUCTION

100 INTRODUCTION

The primary purpose of the indoctrination and familiarization phase of the training cycle is to prepare the pilot for initial flight and to provide sufficient guidance in this and subsequent flights so that he will attain a reasonable degree of proficiency in the operation of the A4D aircraft. Too often, under pressure of operational committments this groundwork is abbreviated, shirked, or deleted. This can only result in a deterioration of individual and unit effectivneess. For this reason commanding officers must continuously insure adherence to these basic criteria.

101 GROUND TRAINING SYLLABUS

Ground training should be continuous throughout the career of the A4D pilot, and should include the following as a minimum.

101.1 *Safety*

A thorough indoctrination and continuous review of the following:

a. Aircraft preflight, ground handling, and normal flight procedures.

b. Aircraft systems.

c. Bailout and survival equipment and procedures.

d. Aircraft cockpit troubleshooting procedures.

e. *Aircraft emergencies:* Practiced whenever possible in the weapons system trainer. Where such a trainer is available it's use is mandatory during familiarization, and periodically thereafter. In addition, a review hop is required after any layoff from flying in excess of four (4) weeks.

f. Past aircraft accidents, as an aid to prevent future accidents of like nature.

g. Local course rules.

101.2 *Instrument training*

Normally each pilot will be scheduled for a yearly review and renewal of his instrument card and procedures in a formal instrument school. This does not relieve the individual unit of its obligation to keep its pilots current in instruments procedures in the A4D. In particular, the pilot should constantly review the airways navigation, local climb out, penetration, and GCA procedures.

101.3 *Weapons training*

In addition to the formal delivery training which each pilot receives, the following topics are to be presented and periodically reviewed:

a. Bombing theory and Pipper control.

b. Basic guide bombing and rocket procedures.

c. Basic strafing procedures.

d. LABS equipment, use and capabilities.

e. Basic LOFT procedures.

f. Local pattern procedures.

g. Close air support procedures.

h. The NWDS to NWIP–41–3 for the A4D.

i. Low level procedures.

j. High altitude navigation procedures.

k. Weapon loading procedures.

101.4 *Air intelligence training*

a. Mission planning materials.

b. Orders of battle.

c. Aircraft and ship recognition.

d. A4D tactical capabilities against foreign aircraft capabilities.

e. Escape and evasion.

101.5 *Night operations*

a. Night light procedures.

b. Night safety.

101.6 *MLP and carrier procedures*

a. Day MLP procedures.
b. Night MLP procedures.
c. Carrier qualification procedures.

101.7 *A4D–2N procedures*

In addition to the above items the following will be required for those pilots flying the A4D–2N:

a. Radar procedures.
b. Night and all-weather navigation procedures.

102 FLIGHT TRAINING SYLLABUS

The syllabus outlined below sets forth the minimum requirements (where indicated) for each phase of training considered necessary to check out a pilot in the A4D. The flight training of an A4D pilot will continue throughout his squadron tour. This training consists, in general, of the following:

102.1 *Familiarization*

a. Prerequisites to flight:
(1) NAMO pilot course.
(2) OFT—2 hours.
(3) Open book examination to flight handbook.
(4) Closed book examination on emergency procedure.
(5) Refer to sections 101 and 401.
(6) Current survival requirements.
b. Flights will include the following:
(1) Initial checkout flights (5 hours).
(2) Section tactics.
(3) Division tactics.

102.2 *Instruments*

a. Minimum requirements prior to actual instrument flight are as follows:
(1) 15 hours in A4D aircraft.
(2) Current instrument card.
(3) Demonstrate instrument proficiency in A4D.
b. Flights will include the following:
(1) Airways navigation.
(2) Climbouts.
(3) Penetrations.
(4) GCA procedures.
(5) CCA procedures.

102.3 *Weapons*

a. Dive bombing.
b. Glide bombing.
c. Minimum altitude bombing.
d. Loft bombing.
e. Rockets.
f. Close air support.
g. Missile training.

102.4 *Mission training*

a. Low level navigation.
b. High altitude D/R navigation.
c. Inflight refueling.

102.5 *Night flying*

a. Minimum requirements prior to night flights are as follows:
(1) Current instrument card.
(2) Ten hours in A4D within the last 3 months with minimum of 15 hours in A4D type aircraft.
(3) Two type instrument flights in A4D.
(4) One A4D flight within the last 10 days otherwise, 1 day flight will be required prior to night flight.
b. Flights will include the following:
(1) Familiarization.
(2) Formation.
(3) Instrument/navigation.

102.6 *MLP and carrier qualification*

a. Minimum requirements prior to day carrier qualification are as follows:
(1) Field mirror landing qualified.
(2) Fifty hours in A4D.
b. Minimum requirements for night carrier qualification are as follows:
(1) Currently day carrier qualified in A4D.
(2) Minimum of 6 day carrier landings last 90 days.
(3) Minimum of 15 hours night time in A4D including 10 hours in last 6 months.
(4) Night field mirror landing qualified as certified by commanding officer and landing signal officer.

102.7 *Cross country flight*

a. Minimum requirements prior to cross country flight are as follows:
(1) Current instrument card.
(2) Twenty-five hours in A4D to include 5 hours instrument time.
(3) Flight planning card (clipboard) will be submitted.

(4) Flight packet which includes security, accounting, and servicing data.

(5) IFR flight plan shall be filed.

103 FLIGHT CREW REQUIREMENTS (Not applicable in the A4D)

104 PERSONNEL FLYING EQUIPMENT REQUIREMENTS

104.1 *Personnel flying equipment*

Flying equipment will be utilized by all personnel engaged in flights as set forth in OPNAV Instruction 3710.7A. The following equipment will be worn on every flight:

a. Anti-buffet helmet adorned with high visibility paint or scotch light tape.

b. Oxygen mask.

c. Anti "G" suit.

d. Fire retarded high visibility flight suit (khaki suit may be worn in combat areas).

e. Ankle-high lace boots.

f. Life preserver with whistle, die marker, compass, mirror, and shark chaser.

g. Integrated torso harness.

h. Sheath knife—not to be worn exposed or attached to the life preserver but to be stored in a special canvas pocket sewn to the flight suit.

i. A two-cell flashlight with red lens (for all night and cross-country flights.)

j. A one-cell flashlight attached to torso harness.

k. A pistol with tracer ammunition for all overwater, night flights, and flights over sparsely populated areas.

l. Flight gloves.

m. Identification tags.

n. Exposure suit on all overwater flights when the water temperature is 59° or below, or OAT is 32° F. or below, or the combined air/water temperature is 120° or below. During daylight, within gliding distance of land, exposure suit need not be required when the water temperature is above 50° F.

o. Approved personnel survival kit.

p. Parachute.

q. Other survival equipment appropriate to the climate of the area.

104.2 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 operations will be slanted toward preparation for deployed activities. These preparations will include, of necessity, intensive weapons training, culminating with competitive exercises as required. In addition the proficiency of pilots in carrier landing and/or short field operations must be maintained.

201 SCHEDULING

201.1 The commanding officer or his designated delegate is responsible for the promulgation of the flight schedule when based ashore. The flight schedule becomes an order of the commanding officer. It shall be followed rigidly and variations require the approval of the commanding officer or his designated representative. Refer NWP–41, page 6–4.

202 BRIEFING

202.1 The briefing will be conducted using a briefing guide and the appropriate mission card. Each pilot will maintain a kneepad and record all flight numbers, call signs and all other 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.

202.2 The briefing guide will include the following applicable items:

a. *General:*

(1) Aircraft assigned, call signs, and deck spot.

(2) Gross aircraft weight.

(3) Engine start, taxi and takeoff times.

(4) Visual signals and rendezvous instructions.

b. *Mission:*

(1) Primary.

(2) Secondary.

(3) Operating area.

(4) Control agency.

(5) Time on station or over target.

c. *Weapons:*

(1) Loading.

(2) Safety.

(3) Arming, dearming or aiming.

(4) Duds.

(5) Special routes because of ordnance aboard.

(6) Minimum release altitudes.

d. *Communications:*

(1) Frequencies.

(2) Radio procedure and discipline.

(3) Navigational aids.

(4) Identification and ADIZ procedures.

e. *Weather:*

(1) Local area.

(2) Local area and destination forecast.

(3) Weather at alternate.

(4) High altitude weather for the jet stream, temperature, and contrail band width.

f. *Navigational and flight planning:*

(1) Operating area procedures and P.I.M.

(2) Climbout.

(3) Mission plan including fuel/oxygen management.

(4) Marshal.

(5) Penetration.

(6) GCA or CCA.

(7) Recovery.

g. *Emergencies:*

(1) Aborts.

(2) Divert fields.

(3) Bingo and low state fuel.

(4) Waveoff pattern.

(5) Ready deck.

(6) Radio failure.

(7) Loss of visual contact with flight.

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(8) Down pilot and aircraft emergencies.

(9) System failures.

h. *Air intelligence and special instructions:*

(1) Friendly or enemy force disposition.

(2) Current situation.

(3) Targets.

(4) Safety precautions.

i. The leader will inspect all flight members for the proper flight gear.

203 LINE OPERATIONS

203.1 Pilots shall perform preflight inspection of aircraft in accordance with the flight handbook. Special emphasis will be placed on items directly affecting safety or flight.

203.2 Prestart and post start checks shall be accomplished as described in the flight handbook. Tail-hook check will be included.

203.3 *Starting procedures:* The start shall be accomplished in accordance with the flight handbook. Pilot-controlled starts will be conducted if possible. Hand signals between pilot and starting turbine operators shall be as follows:

Signal	*Meaning*
a. Pilot gives 1-finger turn-up motion.	Start GTC.
b. GTC operator gives thumbs-up signal.	GTC up to speed.
c. If unable to get a pilot-controlled start pilot will give 2-finger signal.	Ready for starting-air.
d. 3 finger signal	Cut off starting-air.

203.4 *Poststart signals*

a. The following signals will be used by the pilot and/or plane captain during the poststart check of the aircraft. Standard signals apply in other cases.

Meaning	*Signal*
(1) Hydraulic check.	Plane captain gives double "OK" signal to pilot with fingers.
(2) Safety pin removal.	P/C forms circle with thumb and forefinger on one hand, holds forefinger of opposite hand horizontal to circle using "pullaway" motion. Holds pins for pilot to count before stowage.
(3) Flash generator field.	Pilot make pinching motion with thumb and forefinger.
(4) Raise or lower flaps.	Plane captain place both hands together parallel to the deck then open and close hands using the heel of the hands as a pivot.
(5) Open or close speed brakes.	Plane captain use same motion as for flaps except on a vertical plane.
(6) Raise and lower hook.	Raise or lower fist with thumb extended to meet horizontal palm of opposite hand held in front of body.
(7) Aileron control check.	P/C moves forearm side to side as though moving stick.
(8) Elevator control check.	P/C moves forearm forward and back as though moving stick.
(9) Rudder control check.	P/C hold hand vertically, twist left and right with wrist.
(10) Horizontal stabilizer check.	P/C uses forearm matching movement of stabilizer through entire range. Then signals "stop" and indicates final setting by finger numbers.
(11) Cut engine	Slashing motion at throat with extended fingers of hand.
(12) Approach and angle of attack lights (day).	Point two (2) fingers toward eyes.

203.5 *Ground limitations*

a. Warmup time and ground limitations for the listed electronic equipment are as follows:

Item	*Warmup*
ARC–27	2 minutes.
ARA–25	2 minutes.
ARA–21	90 seconds.
APX–6	60 seconds.
APA–89	60 seconds.
ASQ–17 [1]	2 minutes.
ASN–19A	None.
GYRO (A4D–1, 2)	"Flag."
AJB–3	70 sec ±10.[2]
AFCS	[3].

[1] 15 minutes ground limitation.

[2] 60 seconds time delay (gyro runup) plus 10 seconds autosync period.

[3] AJB–3 must first be at speed.

204 TAXI—TAKEOFF—LANDING

204.1 *Taxi*

a. When ready to taxi, advance throttle to 60 percent, and allow thrust to develop 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.

b. 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 aircraft intakes clear of leader's exhaust.

c. Taxi will be accomplished in accordance with local field instructions.

204.2 *Takeoff*

a. Upon completion of the pretakeoff checklist, and after receipt of clearance from the tower the aircraft will line up on the runway.

b. 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 shall take position on the downwind side of the runway with other aircraft in tactical order abeam. Lateral separation shall be insured 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 10 seconds behind first airplane. During crosswind conditions, individual takeoffs shall be made. Especially during night and limited visibility conditions, the angle of attack indicator can be used very effectively to attain the proper takeoff attitude. The pilot will inform tower immediately by radio if takeoff is aborted. No formation takeoff is permitted with dissimilar model aircraft.

204.3 *Landing*

a. Aircraft shall enter the traffic pattern in accordance with published course rules of the field.

b. The flight shall normally approach the breakup point in echelon, parade formation, at 250 knots. A 3- to 5-second break interval will provide adequate downwind interval. After breakup, each pilot shall commence transition to landing configuration, utilizing the landing checkoff list. Wheel brakes will be checked. Speed brakes will remain extended throughout approach and landing.

c. Prior to mirror qualification, pilots will make optimum angle-of-attack approaches to touchdown. Pilots shall attempt to control meatball, lineup, power, and angle of attack/airspeed as precisely as they would for a real carrier approach, in order to maintain their proficiency in this technique.

d. 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.

(4) Use wheel brakes to stop when below 80 knots.

(5) In crosswinds (more than 5 knots) use forward stick deflected laterally into the wind as necessary, and 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 90° crosswind component exist, a diversion to an alternate field is recommended, or land in arresting gear.

e. Prior to turning off runway, ensure that aircraft is slowed to taxi speed.

204.4 *Securing engine*

Upon returning to the line, pilots will insure their aircraft are cleaned up (speed brakes IN and flaps UP). 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 and install ejection seat and canopy safety pins.

205 FIELD ARRESTMENTS

205.1 There are several types of field arrestment equipments; in addition, aboard ship emergency landings can be made into the barricade. The latter will be covered in chapter 3. The types of arresting gear include the anchored chain cable type and/or the Morest type equipment. At most Air Force bases and many USN/USMC fields there is some form of jet

barrier, usually a Davis type. It is imperative that all pilots be aware of the type, location, and load limitations of the gear in use. Normally, the abort, or short field, and overrun, or normal arresting gear, are rigged at all times. In general, the arresting gear is engaged on the centerline at as slow a speed as possible.

a. *Short field arrestment:* At any time before landing you know that a directional problem exists or a minimum rollout is desired, the short field equipment is utilized. In addition, an LSO, equipped with a radio, should be stationed near the touchdown point to aid the pilot in landing. The hook should be lowered while airborne and a positive hook check made. The pilot lands just short of the arresting gear with his shoulder harness locked and his feet off the brakes. Be prepared for a waveoff if the gear is missed.

b. *Normal or long field arrestment:* This situation occurs when a problem exists with insufficient runway remaining. Lower the hook in sufficient time for it to effectively extend. (Normally at 1,000 or 2,000 feet in front of arrestment gear.) Do not lower the hook too early and scrape off the hook point. If the arrestment is to be made at night, the pilot should request to have the position of the arresting gear illuminated.

c. *Field barrier:* Barrier arrestment of A4D aircraft is not recommended at anytime.

206 DEBRIEFING

206.1 Each flight shall be followed with a thorough debriefing by the flight leader as soon as is 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.

CHAPTER III

CARRIER BASED PROCEDURES

300 GENERAL

The training program of the squadron must be designed to give solid support to the premise that the flight from the carrier deck is a routine event. The squadron will be afforded much less flexibility in the execution of the daily flight schedule aboard ship than experienced ashore. 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 which the air department and air group must complete for the next day's flight operations, and which must be based upon a firm schedule.

301 SCHEDULING

301.1 Aboard ship the flight schedule is promulgated by the operations department and becomes an order of the commanding officer of the ship. The air group commander or his delegated representative coordinates air group scheduling with the ship. Since the commanding officer of the squadron is at all times responsible for the combat readiness of his unit, he must coordinate his needs with the ship through the CAG delegated representative. (See NWP–41 p. 8–4.) Intelligent consideration of pilot's time requirements is a basic and pertinent factor in flight scheduling.

302 BRIEFING

302.1 Flight leaders briefing shall be conducted in accordance with prepared briefing forms. Certain general items shall be covered for every flight. In addition, there shall be a detailed briefing form for each type of mission for which the squadron may be scheduled.

302.2 The general briefing shall include the items in section 202.1.

302.3 The detailed mission brief shall cover those items pertinent to the specific mission assigned. Any format which is complete, concise, factual and orderly, and which can be readily used by the flight leader as a briefing guide, will be suitable.

303 FLIGHT AND HANGAR DECK PROCEDURES

303.1 Upon receipt of the order "Man aircraft" from air operations, pilots will proceed expeditiously to assigned planes. A pilot's preflight inspection shall be performed in accordance with flight handbook.

303.2 In addition to a notation on the yellow sheet, the oxygen crew shall provide pilots positive indication of the date/time the aircraft was serviced with liquid oxygen. A notation in black grease pencil, in a designated area on the fuselage, is a simple and effective way of accomplishing this notification.

303.3 Pilots shall insure that the hold back fitting retainer cover is tight enough to retain the forward half of the hold back fitting in flight.

303.4 The pilot, as part of his preflight inspection, will indicate by black grease pencil in a designated area on both sides of the forward fuselage, the gross weight of the aircraft for catapult launching.

303.5 Aircraft shall be started upon signal from primary flight control. Do not initiate start if GTC is in position where exhaust may damage aircraft. Starting procedures in accordance with paragraphs 203.2 and 203.3 shall be used.

303.6 In addition to the regular handbook checks, the tailhook and angle of attack will be checked for proper operation when signaled.

303.7 Pilot shall indicate to the plane director when aircraft is ready for flight. Standard flight deck signals will be used in accordance with NWP–41. Taxi with flaps up. While taxiing, it is imperative that director's signals be followed closely. Flaps will be placed in takeoff position just prior to moving onto the catapult.

303.8 In taxiing, with appreciable wind down the deck, pilots must avoid attempts to turn large angles to the relative wind or to the jet blast of another aircraft. Under heavy crosswind conditions manned steering bar and wing walkers shall be utilized.

303.9 All pilots must be advised to exercise caution when poor braking conditions exist, especially when combined with a crosswind.

304 LAUNCH AND ARRESTMENT OPERATIONS

304.1 *Catapult procedures*

a. Standard catapult signals promulgated in NWP–41 and augmented by the air officer shall be followed by all pilots.

b. Prior to signaling ready for launch, pilots shall recheck attitude gyro, directional gyro, E.P.I., trim indicator, and flap setting.

c. When the pilot is ready for the catapult shot he shall give the standard ready signal. For day catapult he shall give the catapult officer a positive hand salute. For night catapult he shall turn all exterior lights (fuselage light out) to DIM by use of the exterior master light switch.

d. Clearing turns immediately after launch from the bow catapults shall not normally be made. Gentle clearing turns from waist catapults are required. Pilots shall not be required to change radio or navigational aid channels until safe altitude (2,500) and airspeed are attained. If military necessity requires changing channels at low altitude the change shall be made with the aircraft in stabilized level flight.

304.2 *Breakup and landing*

a. Under IFR conditions, aircraft shall be brought aboard in accordance with NWP–41, para 332.

b. Under VFR conditions, the formation element (either section or division) shall approach the breakup position by flying alongside the carrier close aboard to starboard, or parallel course, at 800 feet, at 250 kts. Aircraft shall be in parade formation with hooks down.

c. Breakup shall be effected ahead of the ship, utilizing a 16- to 19-second break interval to establish a 35-second ramp interval. Close adherence to pattern details by all pilots is a requisite for uniform landing intervals. Pattern given in paragraph 407.2c is recommended. In addition each pilot shall be exactly on approach airspeed, speed brakes out, at the 180° point in the pattern. A radio call shall be initiated giving state and side number. The wheel brakes will be checked prior to landing. On final approach, a call including side number and "meatball" will be made. Recommended airspeeds and altitudes are included in paragraph 407.2c.

d. Upon touchdown the pilot will advance the throttle to 100 percent and retract speed brakes. As soon as a good arrestment is ascertained the throttle will be reduced to idle. When fully arrested the flaps and hook will be raised in preparation for rapid clearing of the landing area. As the aircraft is allowed to roll back, the left brake will be tapped to facilitate realinement of the nose gear. Hold both brakes when signaled by the director. Apply power in anticipation of "Come ahead" signal unless roll back is indicated by the director. If roll back is directed, release brakes and allow aircraft to roll back until brake signal is received. Then apply brakes judiciously to prevent possible tailpipe damage. Ordinarily, wing walkers are available to assist in leaving the landing area. With light fuel landing, the usual wind over the deck will give a substantial crosswind component while taxiing clear of the landing area tending to tip

the aircraft. Water, oil, and hydraulic fluid is often on the flight deck. Caution in the use of power and brakes is essential. The optimum wind over the deck is 25 kts±5 kts. This will hold the island burble to an acceptable level and gives similar perspective and landing conditions to the pilot.

305 DEBRIEFING

305.1 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 ISO.

CHAPTER IV

FLIGHT PROCEDURES

400 GENERAL

Many publications deal with the flight procedures in the A4D. This chapter presents the essence of good procedure for guidance. Where amplification is desirable the applicable publication is referenced.

401 TRANSITION OR FAMILIARIZATION

401.1 Transition and familiarization will be accomplished in accordance with procedures 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 considered essential that pilots with no recent jet experience demonstrate their proficiency in two-seated, swept-wing jet trainers prior to flying the A4D.

401.2 Familiarization flights are designed to acquaint the pilot with the flight characteristics of the A4D while it is flown through all altitudes of flight.

a. Stalls and confidence maneuvers will be practiced in designated areas and at altitudes which will insure straight and level flight above 10,000 feet upon completion.

b. All familiarization flights will be conducted under VFR conditions. With weather minima of 1,500 foot ceiling, broken clouds or better, and 5 miles visibility.

c. Practice precautionary landings to "touch and go" landings are permitted under the supervision of a chase pilot who will fly a comfortable yet reasonably close wing position throughout the approach. Landings on the first three familiarization flights should be monitored by an instructor at the end of the runway using radios.

402 INSTRUMENTS

402.1 *Basic instruments*

a. *General:* This guide describes the procedures to be used in performing basic instrument maneuvers in the A4D.

b. *Climb schedule:* Climb schedule for basic instrument flights will be 310 knots CAS to 0.72 CMN to 240 knots minimum at higher altitudes.

c. *Speed changes:*

(1) To reduce airspeed, reduce power to approximate power setting necessary for airspeed desired. Extend speed brakes, 5 knots above desired airspeed, retract speed brakes. 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 kts	92–93
250 kts	87–89
200 kts	83–86

d. *Turns and reversals:*

(1) Turns and reversals will be performed at 300 knots. At angles steeper than 30° of bank it will be necessary to advance throttle to maintain airspeed.

(2) Banks used will be 30°, 45°, and 60°.

(3) Turns will be made in each direction with each of the above angles of bank. Turn

will be maintained for twice the number of degrees as the angle of bank. (For 30° bank turn right and left 60° of turn, for 45° bank turn left and right 90° of turn etc.)

e. *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 speed brakes 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.

f. *Vertical S–2 pattern:*

(1) A vertical S–2 pattern is similar to the vertical S 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°. At the end of the second minute he should have climbed 1,000 feet and completed 180°. After the third minute he should have descended 1,000 feet and turned through 270°. After the fourth minute he should have climbed 1,000 feet, bringing him back to the original heading and altitude.

g. *Vertical S–3 pattern:* The vertical S–3 pattern is similar to the S–2 pattern except that the turn is reversed at the end of each climb.

h. *Yankee pattern:* Following is a diagram of the Yankee pattern with approximate power settings given:

402.2 *Jet penetration*

a. *General:* A penetration is a maneuver which combines a high descent rate 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.

b. *Penetration:*

(1) Clean penetration:

(a) The clean penetration will be conducted at 250 knots indicated, 80 percent r.p.m. with speed brakes out. This configuration will result in a descent of 4,000 to 6,000 r.p.m. As throttle is reduced the nose is lowered to 13° nose down to start penetration. As airspeed reaches 245 knots speed brakes shall be opened. Maintain 80 percent and 250 knots.

(b) Level off:

(1) Start transition to level flight between 1,000 and 1,500 feet above the desired altitude.

(2) At level off slow to and maintain gear down speed. Gear and flaps will be lowered in order to reach the "gate" in a landing configuration at approach speed. Maintain 140 knots until contact, then reduce to final landing speed.

(2) *Dirty penetration:* The "dirty" or gear and flaps down type of jet penetration will be conducted at 170 knots with 65 percent r.p.m. and speed brakes out.

(a) Entry:

(1) Prior to reaching initial penetration fix slow to gear down speed, drop gear and flaps. Maintain 170 knots.

(2) As station or fix passage occurs, reduce throttle, drop the nose 13° and put speed brakes out. Maintain 170 knots.

(3) Descent rate may vary between 4,000 and 6,000 f.p.m.

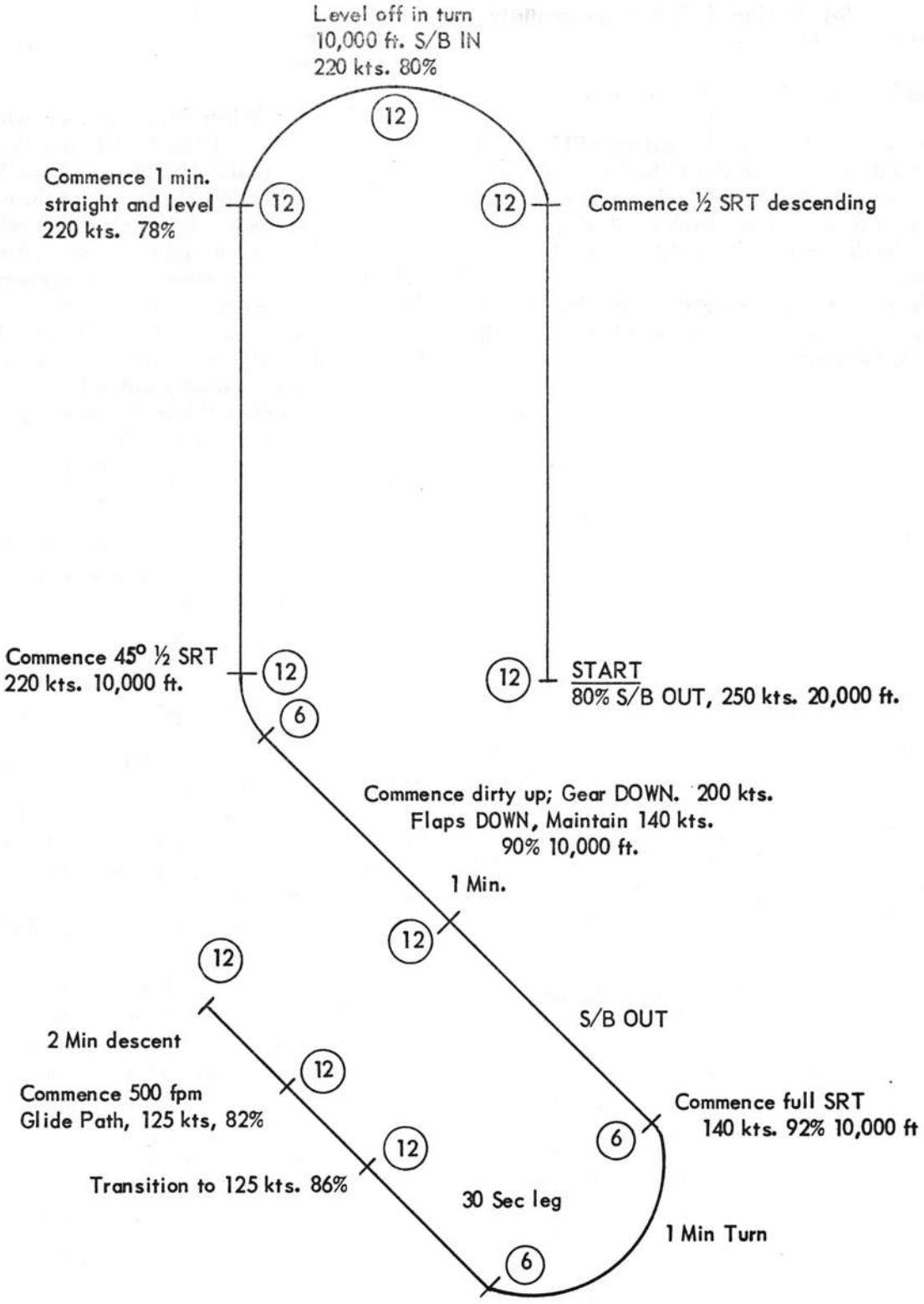
(3) *When to use dirty penetration:*

(a) A dirty penetration may be desirable for section letdown where minimum ceiling exists at destination and "dirty up" can be accomplished VFR on top. It is imperative that the controlling agencies be notified of the slow prior to initiating penetration. This type of penetration will normally require a minimum of 1,500 pounds of fuel over high station.

(b) The dirty penetration is recommended when one member of the flight has radio/NAVAIDS failure and it is necessary to penetrate in section to a minimum ceiling. In such case radio failure precludes giving gear and flap signal on the radio during the level off portion of the penetration. When these conditions occur at night the lead aircraft will keep his lights on STDY/BRT and his fuselage Light *OUT*. The following flashlight signals will be given by the lead aircraft to lower the gear, flaps and brakes while still at altitude:

(1) Rotating the flashlight in a circular motion—lower wheels.

(2) Moving the flashlight up and down—lower flaps.



Note: Figures in circles indicate second hand position.

(3) Moving flashlight horizontally—actuate speed brakes.

402.3 *Ground controlled approach*

a. *Turns:* Turns in the pattern will be standard rate except for the following exceptions: (1) Never exceed a 30° bank at any time. (2) DO NOT exceed 15° bank on final approach. In rough air positive rudder control will be used.

b. *Power and speeds:* The following throttle settings and speeds are suggested for use in the GCA pattern:

	Approximate R.P.M. (percent)	*Approximate airspeed (kts.)*
Downwind (clean)	78–80	200
Downwind (dirty)	86–90	140
Base	86–90	140
Final (level)	84–88	[1] 130–125
Final (glide path)	80–84	[1] 130–125

[1] Optimum angle of attack.

c. *Transitions:* With the problem of high sink rates and critical altitude separation for GCA work it behooves the pilot to make all speed transitions and altitude transitions smoothly. This will require alert flying and leading with proper power to prevent the common tendency to sink after slowing aircraft. Pitch control should be smooth and after the airspeed has stabilized pitch changes should be held to a minimum. Pitch changes to an excess of 5° after "dirtying up" are considered overcontrolling. After airspeed has been stabilized, altitude control by means of smooth throttle changes is to be emphasized.

d. *Glide path:* Prior to initiating glide path insure that speed brakes are out. Assuming that the airspeed has been properly adjusted to final approach speed prior to reaching the flight path the following entry procedures will be used: (a) When the controller says "You are approaching glide path; commence the standard rate of descent." DO NOT commence descent. (b) When the controller says "You are up and on glide path", reduce throttle, drop nose slightly and establish an initial rate of descent in accordance with the following table:

The following rates of descent are approximations for a 3° glide slope:

	F.p.m.
No wind	700
Light wind	600
10 kts. or more	500

e. *Waveoff:* When instructed, or when at GCA minimum and the field is not in sight, wave off by adding 100 percent throttle, retracting speed brakes, 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 150 knots minimum. When the controller advises "waveoff, tower instructions", this is a mandatory waveoff.

f. *Section GCA:* When the necessity arises, section penetrations and GCA approaches can be made. All pilots should be familiarized with the section penetration and GCA.

In section GCA the wingman will fly a parade wing position on the upwind side and follow the configuration changes of the leader. The minimum approach speed will be 130 knots. On approaching the runway for landing and with the runway in sight (signaled by leader) the wingman will drop back and out to establish a landing interval on his side of the runway.

g. *Practice:* All hooded GCA approaches will be accompanied by the safety chase pilot who will maintain a chase position as directed by GCA (normally 4–5 o'clock, 500 feet out, slightly stepped up). Chase aircraft will not descend below 300 feet and at all times will maintain same configuration as lead aircraft. The lead aircraft will remain contact until cleared under the hood by GCA or the chase aircraft after making a radio check. The lead aircraft will go contact when he initiates an early wave off or when directed by GCA or the chase pilot or upon reaching 500 feet above the terrain. For level turn in the pattern it will be necessary to add a 2 percent r.p.m. Approximately 1 percent r.p.m. change will change the rate of descent 100 f.p.m.

402.4 *Carrier controlled approach*

a. *CCA procedures:* Aircraft shall return to ship/marshall under VFR/IFR/night operations in accordance with NWP–41, paragraph 321. Bringing an aircraft back to a safe land-

ing through adverse flying conditions demands the utmost proficiency, mutual confidence and cooperation within the pilot/air control team. Refer NWP–41, section 331. This confidence is justified only when each member of the team has a complete understanding of what is required and abides by certain mandatory actions During the arrival and landing phase of air traffic control in adverse weather, the following mandatory actions will be insured:

(1) Landing interval for night or instrument approaches will be 60 seconds.

(2) Each pilot will plan his flight path to depart Marshall at his approved EAT.

(3) 250 knots and 4,000 feet per minute rate of descent with S/B OUT will be maintained by jets until 4,000 feet is reached. A reduced rate of descent will then be used in letting down to an altitude of 1,000 feet.

(4) All jets will pass through gate 1 (10 miles) at 1,000 feet, 250 knots, in level flight.

(5) All jets will maintain altitude and reduce A/S to 150 kts. between gate 1 (10 miles) and gate 2 (7 miles). All pilots will be in final landing configuration upon reporting gate 2.

(6) A gradual descent to 500 feet and transition to approach speed (optimum angle of attack/airspeed) will be made after passing gate 2. This altitude and angle of attack/airspeed will be maintained until visual contact of the "meatball" is made at about 1 mile or until informed by final control to commence letdown at a prescribed rate of descent.

b. *Turns:* Turns in the pattern will be standard rate except for the following exception: (1) Never exceed a 30° bank at any time. (2) Do not exceed 15° of bank on final approach. In rough air positive rudder control will be used.

c. *Speeds:* The following speeds will be adhered to for use in the CCA pattern:

Location	*Airspeed*
Marshall Point	220 kts. or maximum endurance.
Penetration	250 kts. 4,000 ft./min. descent. S/B OUT.
Transition	250 kts. Slow rate of descent to 2,000 ft./min.
Gate 1 (1,000 feet)	Commence transition to landing configuration. Reduce A/S to 150 kts.
Gate 2 (1,000 feet)	Transition to optimum angle of attack/airspeed. S/B OUT.
Final "meatball" (500 feet)	Optimum angle of attack/airspeed. S/B OUT.

d. *Transition:* Refer to paragraph 402.3.3.

e. *Waveoff and foul deck procedures:* Refer to paragraph 407.2.4 and NWP–41, paragraph 350.

f. *Section CCA:* Refer to NWP–41, paragraph 370. In addition, during IFR or at night the escort will not detach until he has intercepted the glide slope and has the "meatball" in sight. The escort will then detach after giving the escorted aircraft the "breakup" signal. The wingman should *fly formation* and not be flying formation/instruments and looking for the carrier.

402.5 *Weather considerations*

a. Flights should not be conducted through areas of clear icing or severe turbulence if such can be avoided.

b. Prolonged flights in heavy rain will often result in temporary failure of the A4D primary electrical system. Pilots should be well apprised of the effect such a loss will have on their ability to continue flight to destination under instrument conditions.

c. Flights which are conducted at high altitudes following climbout through rain will often experience control system icing (aileron or elevator). This is seldom a serious nature and the controls can be kept free by frequent movement of the control stick fore and aft, or right and left, through neutral.

d. In order to conduct flights in accordance with the latest weather information available, pilots on IFR flight plans over continental United States shall make maximum use of "pilot to forecaster" services. In addition, Radar following can be requested (stargazer) to assist in circumnavigation of storm centers. In the event of a thunderstorm being unavoidable, the following procedures should be observed:

(1) Reduce airspeed to approximately 250 knots.

(2) Set attitude gyro horizon to proper position.

(3) Turn on pitot heat.

(4) Lower seat to increase head-to-canopy clearance.

(5) Assure shoulder harness locked.

(6) Go on instruments prior to entering storm.

(7) Maintain power setting, attitude and heading.

(8) Expect heavy precipitation, turbulence and lighting.

(9) Turn cockpit lights up bright. White flood lights on, if installed.

(10) Maintain a straight course through storm.

402.6 *Loss of visual contact*

a. When visual contact with the flight is lost during VFR conditions, proceed to a predetermined point for rendezvous.

b. When visual contact with the flight is lost during instrument conditions or at night refer to procedures outlined in NWIP 41–3, paragraph 302.

403 NIGHT FLYING

403.1 *Night lighting doctrine*

a. *Lighting during ground operations:*

(1) *In line area:*

(a) Prior to start turn all exterior light switches on bright, except fuselage, and the taxi light so that as the aircraft starts the external lights will come on. After lights have been checked by the plane captain, turn the wing, tail, and formation light to DIM.

(b) When ready to taxi, signal the plane captain to pull chocks by flashing the fuselage lights by means of the manual coder key.

(c) Taxi in line area with fuselage lights OFF, and remaining navigational lights dim.

(2) *Taxiing:*

(a) Once clear of the line area, turn all lights to BRIGHT and FLASH. Keep lights in this configuration during taxi to insure that there is no confusion between aircraft and taxiway lights.

(3) *At approach end of runway:*

(a) While completing takeoff checklist in the turnup area, keep all lights BRIGHT 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.

(b) When ready for takeoff, turn all lights to BRIGHT and FLASH. This will signal flight leader that you are ready to takeoff. When the flight leader sees all aircraft in the flight with the lights on BRIGHT/FLASH, he will call the tower for takeoff clearance.

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

b. *Takeoff:*

(1) For single plane takeoff lights will normally be FLASH/BRT except where local operating procedures require steady lights.

(2) For section takeoffs the leader will turn his lights OFF when in position on the runway, while the wingman will have his lights on BRT and STDY. After turn up 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 takeoff power by turning his lights to DIM and STEADY.

c. *Operating clear of traffic pattern:*

(1) For single aircraft flights, once clear of the pattern, lights will be BRIGHT/FLASH.

(2) Normal lighting aircraft in formation, other than last aircraft, will be FUSELAGE lights OUT and all other lights on DIM.

(3) 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 effect his rendezvous) the pilot ahead will turn his fuselage light OUT, and other lights STDY/DIM.

(4) As each aircraft breaks for rendezvous practice, the pilot will turn all lights to FLASH/BRT.

(5) For night section penetrations the leader will have his FUSELAGE lights OUT and remaining lights on STDY/BRT. The wingman will leave all lights FLASH/BRT if VFR letdown is to be made. However, at any time that instrument conditions will be encoun-

tered the wingman will turn all the lights to STOY/BRT prior to entry into the clouds.

d. *Landing pattern:*

(1) When returning to the base for normal breakup and landing, the lights will be STDY/DIM except for the last aircraft who will be on FLASH/BRT. The break will be signalled by each man just prior to break by a series of short flashes. All lights are turned to FLASH/BRT after each aircraft is well clear of the formation to avoid blinding other members of the flight.

(2) Keep lights on FLASH/BRT as long as you remain in traffic pattern, unless otherwise directed by competent authority (Tower or LSO).

(3) Single planes entering the break will remain on FLASH/BRT as they were in the area.

(4) After final landing and clear of the duty runway, keep the lights on FLASH/BRT for taxi. When in the line area turn the fuselage light out and other lights to DIM.

e. *Light signals:* The following fuselage light signals will be used for maneuvering aircraft in the formation. Any formation signals not listed here will be given by use of the radio.

(1) R, . — .; Right echelon: All Aircraft position on the right side of leader.

(2) K, — . —; Left echelon: All Aircraft position on the left side of leader.

(3) V, . . . —; Balance formation: Leader's wingman cross to other side of the formation and thereby balance formation. Only given when flight is in Echelon.

(4) M, ——; Radio failure.

403.2 *Night rendezvous*

a. A rendezvous at night should be similar to daytime except 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. Leader must fly airspeed and altitude.

b. 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 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 insure safe clearance.

403.3 *Night formation*

a. Normal night formation will be a parade formation. It is important to maintain the correct bearing so that the wingman can be seen by the leader. Insure that wingtip clearance is maintained at all times. The pilot should not fly so close that he does not feel comfortable. At no time should wingtip clearance exceed 15 to 20 feet since it is difficult to determine relative motion beyond this distance. 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 a turn.

b. On night chase flights where more spacing is desired between aircraft, the wingman will take a free cruise position.

c. Where no light signal exists for a certain maneuver, the radio should be used. Speed brake signals will be given over the radio by transmitting "---------- flight, speed brakes NOW". Channel changes will be given on the radio and should be acknowledged prior to making the shift.

403.4 *Night breakup and landing*

a. Breakup: A normal night breakup from a tactical night flight will be done as in paragraph 204.3 except that a 5-second interval will be used. Light signals will be in accordance with paragraph 403.1d. Keep aircraft ahead in sight.

b. *Night landing:*

(1) For night landings, the pilot must doublecheck gear since with night interior lighting it is easy to confuse three up indications for three downs.

(2) Techniques 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 constant rate of descent and attitude right down to the runway.

(3) On waveoffs and following touch-and-go landings, climb straight ahead to at least 300 feet maintaining 150 knots, before turning downwing. Avoid looking back over the

shoulder at field lights at night as this is conducive to vertigo.

404 FORMATION AND TACTICS

404.1 *Formation*

The basic principles and maneuvers promulgated in Chapter 2 of NWIP 41–3 are generally applicable. The following instructions apply specifically to the A4D.

a. *Rendezvous:*

(1) *Turning rendezvous:*

(a) During all rendezvous safety of flight shall be the prime consideration. Pilots shall keep all aircraft ahead of them in sight at all times. Closure rates shall be the minimum consistent with those necessary for timely rendezvous.

(b) The turning rendezvous will be made at 250–300 knots and at an altitude briefed by the leader. After all aircraft are in a loose trail position, the leader will commence a 30° bank turn. Each member of the flight will wait until the leader passes through a 30° bearing from his 12 o'clock position. As the leader reaches this position, wingmen will roll into a 45° bank to the inside of the leaders turn. When the leader is on a 45° bearing, wingmen will ease out of their turns and maintain this 45° bearing all the way into the rendezvous. In order to insure against being "sucked," wingmen will add power to gain no greater than a 15-knot speed advantage over the leader. As the wingmen close on the leader, they shall shift their rendezvous to the man ahead and check their closure rates as if to stop on the inside of the turn. Then they shall slide to the outside, assuming normal wing positions.

(c) If at any time it becomes impossible to maintain bearing on the leader and still keep the man ahead in sight, wingmen shall shift the rendezvous to the man ahead and fly a loose wing position on him until join up is completed. If the aircraft ahead are lost from sight, pilots will level their wings, fly to the outside of the turn, add power to maintain position, wait until all other aircraft are joined, and then effect a runing rendezvous, as last aircraft in the flight.

(2) *Running rendezvous:*

(a) A running rendezvous may be required in order to expedite the flights mission. In this event wingmen will need excess power and airspeed. Caution should be observed in the final stages of running rendezvous since relative motion is difficult to discern when joining from the rear. Wingmen will stay on the side and low during running rendezvous in order to keep the aircraft ahead in sight at all times. The leader shall keep his flight informed of airspeed changes.

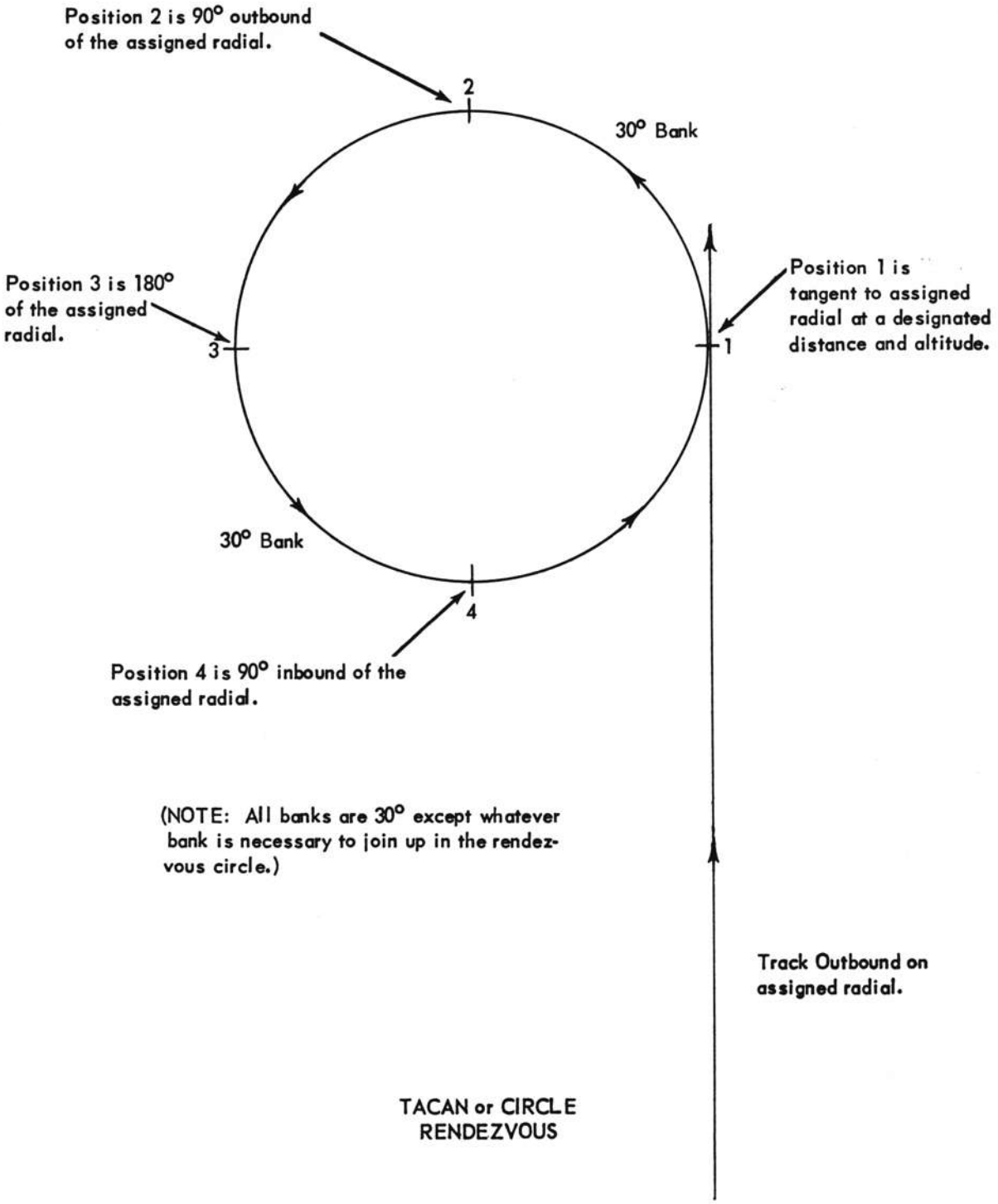
(b) This rendezvous shall be accomplished at 250 knots, 95 percent, on a prebriefed heading or radial. Refer to NWP–41, page 3–4.

(3) *Tacan/circle rendezvous:*

(a) Tacan/Circle rendezvous may be desired when aircraft are separated by long distances or time intervals. The pattern will be left hand, circular, and tangent to a designated radial, with a specified distance and altitude. Each pilot will fly out the assigned rendezvous radial while maintaining the prescribed climb schedule in accordance with paragraph 402.1b. Upon reaching the joinup circle, each pilot will commence a port orbit using 30° of bank and request, if necessary, the leaders position. The leader will state his position using the figures 1, 2, 3, and 4 corresponding to 000°, 090°, 108°, and 270° around the orbit. Each pilot then plans his turn to cut across the orbit for rendezvous. The use of the ARA–25 may be required to assist in picking up the leader. Refer NWP–41 page 3–8.

(b) All pilots are cautioned to exercise particular vigilance to insure that they do not accidentally cut out, or otherwise embarrass other flight members while performing rendezvous techniques.

b. *Cruising 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° to 45° 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° abaft the division leader's beam, 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


Position 2 is 90° outbound of the assigned radial.
2
30° Bank
Position 3 is 180° of the assigned radial.
3
Position 1 is tangent to assigned radial at a designated distance and altitude.
1
30° Bank
4
Position 4 is 90° inbound of the assigned radial.
(NOTE: All banks are 30° except whatever bank is necessary to join up in the rendezvous circle.)
Track Outbound on assigned radial.
TACAN or CIRCLE RENDEZVOUS

communications between division leader and section leader. During steeps turns or hard maneuvering, the second section and wingman within each section are free to slide as necessary to avoid large power changes.

c. *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 line of bearings are moved forward. Within each section, the wingman's position is 35° 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 even 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. Nos. 2, 3 and 4 aircraft shall maintain positions with power changes. Sliding during turns is not permitted.

c. *Combat formation (four-plane division)*: This formation will be employed for defense against anticipated air-to-air attacks. The second section shall position itself approximately 5,000 feet abeam and nearly level with the lead section. Under certain circumstances where cloud cover or sun dictates a stepped up or stepped down formation may be desirable. Within each section wingmen shall take position on the outside of the formation approximately 45° abaft the section leader's beam and with about 600 to 1,000 feet separation from his aircraft.

404.3 *Defensive tactics*

In order to accomplish its primary mission (delivery of air-surface attack) and return, the best defensive tactics of the light attack aircraft is to *avoid* enemy air opposition. Should this be unsuccessful, the VA pilot must then attempt to thwart the attacks and continue to make progress on desired base course. Knowledge of foreign aircraft capabilities provided in paragraph 101.4 will dictate certain defensive maneuvers. Refer to NWIP 41–3, chapter 5, for basic defensive tactics.

a. Early sighting of an attacking fighter is the first consideration. Adherence to lookout doctrine is essential. NWIP 41–3, paragraph 2–7, illustrates the recommended lookout doctrine. Loose shoulder straps are essential. The second section should step up or down as sun and cloud conditions dictate.

404.4 *Air-to-ground tactics*

Strikes against all weapon targets should be preceeded by thorough briefings and preflight preparation. Detailed planning of the strike by the entire flights shall be conducted. The A4D is capable of the following air-to-ground missions, as described in NWIP 41–3, chapter 4:

1. Armed reconnaissance.
2. Flak suppression.
3. Strafing.
4. Close air support.

404.5 *Nuclear weapons tactics*

Refer to the nuclear warfare delivery supplement to NWIP 41–3 for the A4D.

404.6 *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 NWIP–37 are pertinent. The highest search altitude permitted by weather conditions and size of search object should be utilized in order to increase the area coverage per aircraft assigned.

405 WEAPONS

405.1 *General*

Weapons delivery training must encompass two major goals. First, the development of precision bombing and rocketry skills during shore-based training periods; and second, the maintenance of this proficiency while deployed. It is pointed out that the detailed specifics which describe the maneuvers to be used in actual delivery of the various weapons are established in NWIP 41–3 and the NWDS to NWIP 41–3. Because of the completeness and detail of these publications only those items requiring emphasis will be reiterated herein. For conventional deliveries, various altitudes, airspeeds, and dive angles are recommended, but any maneuver will be acceptable providing the

restrictions on altitude and dive angle as contained in NWIP 20–1 and FXP–2 are met.

405.2 *Boresight procedures*

Due to the poor mounting of the A4D gunsight to the aircraft it is not uncommon for an error to develop soon after it has been boresighted. A hard landing, excessive G's or pilots and ground personnel using the gunsight as a handhold, all can knock the gunsight out of alinement. Therefore foresighting in the A4D, particularly during concentrated weapons training, should be accomplished frequently.

405.3 *Trim procedures*

Aircraft should be pretrimmed for release speed prior to first run and should not be trimmed in the run, during training maneuvers.

405.4 *45° Glide bombing procedure*

a. *Entry to pattern:* Flight will enter the target area on dive heading at roll in airspeed 250 knots and altitude 12,000 feet above the target. After passing over the target, the flight will break up with a 10 second interval. Make break with a 45° bank level turn. Adjust power as necessary to maintain entry airspeed up to the roll in point. While flying to the roll in point check switches and set sight angle.

b. *Roll in:* Entry to the run will be 90° entry from such a position that a 45° dive angle will be attained. Target will appear close to the aircraft just inside of the wingtip. Speed at roll in point should be 250 knots IAS at 12,000 feet with power set at 85 percent, speed brakes out. Turn master Arm ON and call "_____ rolling in—speed brakes." Commence roll in as target approaches the beam, or at the position desired for wind direction.

c. *Run:* As nose is dropped to proper position below the target, aircraft should be on dive heading. At this point execute rapid roll to wings level position. When wings are rolled level, aircraft should be approximately 9,500 feet and pipper should be 88 MILS below the target. This is the basic pipper control point for a no-Wind MK–76 setting. During glide, pipper should be allowed to track smoothly up to target. Pipper motion will be slow initially, but as airspeed increases and aircraft gets closer to target, pipper tracking speed will increase. After rolling wings level check drift as soon as possible and determine by estimate if a correction is necessary to slow down or speed up pipper or move it left or right in order for it to arrive at predetermined position in relation to the target at release altitude.

d. *Release:* Release should occur at 4,000 feet above target elevation with 400 knots IAS. If run and tracking have been performed correctly, pipper should cross the line perpendicular to glide heading through the center of the target at release altitude of 4,000 feet. At release, pipper should be the predetermined number of MILS left or right of the bullseye to correct for release altitude winds.

e. *Recovery:* After release initiate a 4 G wings level recovery. Minimum recovery altitude is 1,500 feet. As the nose comes up to the horizon, pull in speed brakes and add power to 96 to 97 percent and turn master arm OFF. As G's are removed from the aircraft, initiate climbing 30° to 45° bank turn. Avoid rolling pullouts. Locate and keep man ahead in sight. Allow airspeed to fall off in climb, but as airspeed approaches 250 knots reduce nose attitude and maintain 250 knots in climb back to roll in point.

f. *Sight angle:* Basic no wind sight angle and range and crosswind corrections are determined from NavWeps OP–2225. Cross wind correction can be determined with respect to feet or MILS. Pilots should develop the habit of using MILS exclusively since combat targets are not going to have footage rings around them.

405.5 *30° Rocket procedure*

a. *Entry to pattern:* Entry and break up will be the same as the procedure described for glide bombing. Break altitude will be 7,000 feet above target elevation, airspeed 275 knots, break interval 10 seconds. While flying to the roll in point check switches and set sight angle.

b. *Roll in:* Entry to the run will be 90° entry from such a position that a 30° glide angle will be attained. Target will appear to be slightly farther away from the aircraft than in 45° glide bombing. The target should be slightly outside the wing tip. Speed at the roll point should be 275 knots IAS at 7,000 feet with power set at 85 percent. Turn Master Arm ON

and call "_____ rolling in". Commence roll in as target approaches the beam or at the desired position for wind conditions. Speed brakes are left IN throughout the run. On subsequent runs power should be adjusted as necessary to attain desired airspeed at release.

c. *Run:* As nose is dropped to proper position on the target, aircraft should be on dive heading, and rapid roll to wings level should be made. As wings are rolled level, the altitude should be approximately 5,500 feet above target. The pipper at this point, due to the small sight angle and relatively large angle of attack, will be 16 MILS above the target bullseye (when using 2.75 feet FFAR's). During the glide as the airspeed increased the angle of attack will decrease and the pipper will track slowly to the bullseye. At 4,000 feet the pipper should be only 6 MILS above and at release the pipper will be on the bullseye. Pipper should be positioned right or left to correct for existing wind conditions.

d. *Release:* Release should be 2,500 feet above target elevation at 410 knots IAS. The pipper will track slowly from a position 16 MILS above the target to bullseye during the run. The pipper will also track right or left depending on the crosswind component during the run. Rockets are fired by squeezing the trigger on the stick.

e. *Recovery:* After release initiate a 4 G wings level recovery. Minimum recovery altitude is 1,000 feet above the target. Do not attempt to spot your own rocket hit. As nose comes up to the horizon, add power to 96 to 97 percent and turn master arm switch OFF. As G's are removed from the aircraft, initiate a climbing 30° to 45° bank turn as soon as possible consistent with interval on the aircraft ahead. Avoid rolling pullouts. Allow airspeed to fall off in the climb to 275 knots and maintain this speed in climb back to roll-in point.

f. *Sight angle:* Basic no wind sight angle and range and cross wind corrections are determined from the appropriate NAV-WEPS publication.

405.6 *Loft bombing*

Loft bombing training and final delivery techniques for all types of bombs are contained in the NWDS to NWIP 41–3. These techniques are sound and proven, and are kept current by COMOPTEVFOR. Consequently only such specific items as training pattern procedures will be considered here. Following is a recommended pattern.

a. *Entry to pattern:* After making contact with the target and receiving clearance to enter the target area the flight leader will lead the flight down the run in line at 4,000 feet or below the clouds in echelon. The flight will break with a 45-second interval thereby giving a 90-second interval between runs. After the break the aircraft will continue at break altitude, airspeed and power setting to the roll-in point. While flying to the roll-in point the pilot should check his armament switches for proper position.

b. *Roll in:* Cross the roll-in point on an approximate reciprocal heading to the run-in heading. Roll-in point should be far enough abeam the run-in line and far enough downwind to allow a comfortable turn-in to the run-in. Add full power at roll-in point and make appropriate voice call. Commence a 45° bank turn to the run-in heading. Roll-in will be from 4,000 feet or from below the clouds. It will be necessary to dive off this atlitude to reach minimum altitude for run-in. Maintain sufficient altitude until out of turn to keep run-in track in sight.

c. *Run in:* After completing turn, lose altitude down to the desired minimum. At this point airspeed should be up to run-in Mach. When airspeed is reached reduce power as necessary to maintain run-in Mach. As early as possible when lined up on run-in heading, at correct attitude and altitude, and when a minimum of correction will be necessary to maintain track, the labs gear should be UNCAGED, if applicable. UNCAGE in a wings level position and keep wings level for 3 seconds. In HI-ANGLE lofting there should be at least 75 seconds between aircraft to allow for bomb trajectory.

d. *Maneuver:* At IP depress bomb pickle. Fly the maneuver as outlined in chapter 4 of NWDS.

e. *Recovery:* Recovery should be made using instruments. After roll out and 30° glide is established, reduce power to 410° EGT (80 to 85 percent), and descend to 4,000 above the terrain if pattern permits.

Turn to take sufficient interval on man ahead. When out of turn on an approximate reciprocal of run-in heading level wings and maintain altitude and place labs switch to CAGED, if applicable. This should be done with the aircraft in straight and level flight and not necessarily when needles are centered. Endeavor to maintain straight and level flight for at least 10 seconds to allow labs gear to fully CAGE. Maintain 80 to 85 percent and fly at 4,000 feet or below the clouds on downwind leg to roll-in point.

405.7 *Minimum altitude bombing*

Minimum altitude bombing training and final delivery techniques are contained in NWDS to NWIP 41–3.

a. *Pattern:* Entry to pattern, roll-in and run-in for minimum altitude bombing are similar to techniques described previously for loft bombing except run-in altitude is 75 feet. About 12,000 feet short of target the aircraft will be "zoomed" to 275 feet above terrain. The minimum interval at the target is 20 seconds.

b. *Recovery:* As soon as the bomb has been released descend to 75 feet for at least 5 seconds and then commence a climbing turn back to the downwind, pulling the rpm back to a downwind setting and turning the master arm switch OFF.

406 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 approach to the delivery maneuver.

406.1 *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 and distance should be clearly indicated. After the weather briefing (which will include predicted winds) the pilot should compute the predicted groundspeed and mark off equidistance checkpoints at 5 or 10 minute intervals, for the high-level legs and at 1, 2, or 3 minute intervals along the low-level legs. The charts should be taped together and cut in order to facilitate their use in the cockpit. WAC or ONC charts are usually satisfactory for high-level navigation; and sectional charts or charts scaled 1 : 500,000 are preferable for the low-level part of the route. Appropriate time and fuel consumption data shall be logged on a data card as the flight progresses. Prior to flight, the planned route, profile, charts, and data card should be checked by the operations officer or his representative and by the chase pilot. Preflight briefing shall 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 minimum charts and equipment should be carried by the pilot on every navigational flight:

a. Complete WAC/ONC coverage of the route (JN strips may be substituted).

b. Sectional chart coverage for low-level portion.

c. Terminal publication (high altitude).

d. En route supplement.

e. En route charts (high and low altitude).

f. Computer.

g. Radio channelization card.

h. Performance data card.

i. Elapsed timeclock or stopwatch.

c. *Preflight check:* When the pilot is assigned his aircraft he must determine if there are any specific equipment characteristics, such as an airspeed indicator error, to be accounted for. His preflight inspection should include checks of the weapon, drop tanks, compasses, TACAN, altimeter, clock, and final inventory of his charts and required data cards.

406.2 *Cruise control*

General cruise control techniques and specific fuel figures are to be found in the NWDS. A HOWGOZIT chart is recommended. Refer to NWIP 41–3, para 1312. Additional comments and suggestions are included herein.

a. *The 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 climb speed should be effected prior to passing through 1,000 feet. Then the climb schedule shall be maintained until cruising altitude is attained.

A cross-check of both compasses should be made on each new heading established.

b. *High altitude cruise:* Shortly after leveling off at altitude and establishing cruising speed, the pilot should check actual fuel flow against the planned consumption rate. Then transfer from the external tanks will be commenced. Each pilot shall continually strive to 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. Land marks 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 the 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 times prior to letdown. The pilot should avoid commencing the first low level leg with a large course change.

d. *Low level:* In low-level navigation, it is mandatory that the pilot keep himself positively oriented at all times. A slight heading correction should be made when the pilot fixes his position and determines it to be off the intended track by 1 or 2 miles. Slight airspeed corrections should be made when a check point is reached as little as 30 seconds early or late. 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 constantly compare his two compasses.

e. *Chase plane:* Every practice mission should be chased by an experienced pilot. On the low-level portion the chase aircraft should be positioned about 300 feet behind and in a stepped up position. The chase pilot shall monitor the flight paying close attention to course, speed, altitude, and fuel state. The chase pilot will be responsible for the safety of the flight and if safety considerations dictate can deviate from the flight plan.

f. *High speed run-in:* At a point 15 to 24 miles from the initial point, full power should be added to accelerate to the 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 shall be inaccordance with the A4D NWDS.

g. *Retirement and return:* Upon completion of the delivery maneuver, the pilot will execute his low-level runout, as planned. He will then climb to altitude and establish a maximum range cruise-climb for his return to base.

407 MIRROR LANDING PRACTICE AND CARRIER QUALIFICATION

407.1 *Mirror landing practice*

a. *Speed brakes:* The procedures listed herein are those to be followed in making MLP passes with speed brakes out. When flaps are lowered during the initial break, speed brakes remain OUT and power is increased accordingly. Speed brakes OUT will cause the speed to drop off quickly when power is reduced. Conversely, speed brakes OUT will cause speed to increase slowly when the power is added. When executing a waveoff or takeoff following a successful MLP pass, speed brakes will be retracted as power is added. The climb and the turn downwind will be made with the brakes IN. The speed brakes should be put OUT prior to reaching the 180° position, so that the pilot will be on speed with his power adjusted as he hits the 180° position.

b. *Pattern entry procedure:*

(1) *Individual entry:* Most of the time entry to the MLP pattern will be individual. Call the tower for entry to the MLP pattern. Request an 800-foot break altitude for entry into the pattern. Follow the normal field entry procedures into the break. Enter the break at 250 knots at 800 feet. When cleared to break and proper interval of the aircraft downwind is assured roll into a 45° bank turn and commence a descent to 450 feet above the terrain. Reduce power and actuate speed brakes. At 200 knots lower gear and at 165 knots lower

full flaps. Roll out on downwind leg and set up for correct 180° position. Pilots shall cross-check airspeed against angle-of-attack indexer prior to turning off the 180° 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° bank turn and descending to 450 feet above the terrain as outlined above. Remaining aircraft in the formation will take a 10-second break interval.

a. *Pattern:*

(1) *Downwind:*

(a) Maintain 450 feet above terrain at comfortable air speed but no faster than 150 knots.

(b) Complete landing checkout list. Speed brakes OUT.

(2) *180° Position:*

(a) Altitude should be 450 feet above the terrain. Plan to lose sufficient airspeed on downwind leg to arrive at the 180° position at the optimum angle of attack or approach speed. The approach speed will vary with fuel weight, and the following are recommended: Over 2000#/125K; under 2000#/122K.

(b) Abeam distance will vary with wind conditions, but 1¼ mile abeam is a normal position.

(c) Commence level turn and increase power slightly to maintain airspeed and altitude. Throughout approach, control altitude and rate of descent with power and airspeed with stick.

(3) *90° Position:*

(a) Altitude should be 450 feet above terrain with airplane at optimum angle of attack/airspeed.

(b) Slightly past the 90° position pick up the "meatball." Any tendency to drop the nose at this time will result in picking up a low meatball. Maintain altitude until meatball appears in the center of the mirror.

(4) *Final:*

(a) When the meatball appears in the center of the mirror it will be necessary to reduce power slightly and ease nose over to maintain angle of attack (or airspeed) and at the same time set up proper rate of descent.

(b) The straightaway with wings level should be 15 seconds.

(c) Once the meatball is sighted the approach should be monitored by cross-checking of MEATBALL, LINE UP, POWER, ANGLE OF ATTACK INDICATOR/AIRSPEED.

(d) Make necessary corrections immediately but smoothly. Keep the aircraft on the glide slope all the way down. Do not flare. Keep the meatball centered right down to the deck.

(5) *Landing:*

(a) Landing should occur with no change in attitude of the aircraft. The meatball should appear to slide out the side of the mirror on touchdown.

(b) When touchdown is made, full power is added and speed brakes retracted. Pull up straight ahead until reaching 300 feet and when comfortable, turn downwind for next pass. Make sure that sufficient interval is maintained on aircraft ahead. Do not exceed 150 knots in the pattern. Do not exceed 30° angle of bank turning downwind.

(c) At any time that you are given a waveoff, either with waveoff lights or by radio, immediately add full power, retract speed brakes, transition to a climbing attitude and prevent further loss of altitude.

(d) Make all takeoffs and waveoffs directly down the runway until 300 feet of altitude is attained for comfortable turn downwind. Extend speed brakes when downwind.

407.2 *Carrier qualification*

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

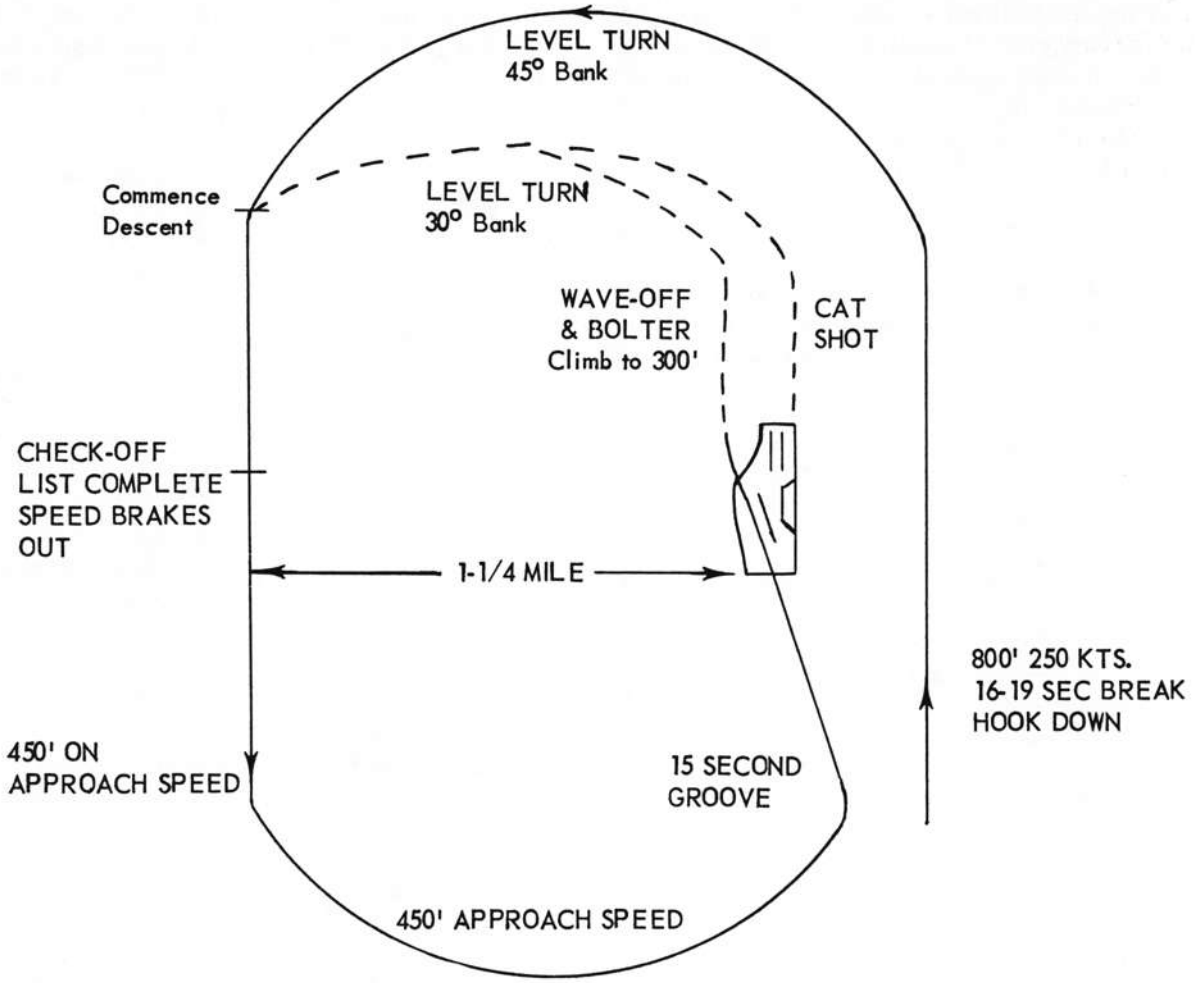
b. *Pattern entry procedures:* Entry procedures for CQ will be as outlined in paragraph 407.1b except that the hook will be dropped and checked down prior to break and a 16- to 19-second interval will be used in the break.

c. *Desired pattern (day only)*

(1) All altitudes are above flight deck level.

(2) Figure No. 1:

d. *Wave off/bolter pattern:* Waveoff will be straight up the angled deck when given close in. Pilots must bear in mind that on a late waveoff an inflight engagement is possible.



The aircraft should be lined up with the centerline to prevent the possibility of aircraft damage. A bolter is a landing where the aircraft touches the deck, hook down, but fails to engage a crossdeck pendent. This is generally caused by landing long or by a hook skip. For a waveoff or a bolter, turn to parallel the ships recovery course (Foxtrot Corpen). DO NOT CROSS THE BOW while flying upwind. Be alert for other aircraft launching off 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 due to "Overshooting the landing line to the extreme" or other reasons for safety considerations. When waving to the right stay well clear of the plane guard helicopters. At night, follow CCA procedures in accordance with NWP–41 para. 350.

e. *Deck procedures—Night:*

(1) The procedures for night are essentially the same as for day. Refer to NWP 41 for night deck procedures. The following procedures are emphasized:

(a) Use slower taxi speed.

(b) Aircraft lights are out at all times while on deck.

(c) Be on instruments when catapulted.

f. *Night pattern:* All night recoveries will be CCA controlled. Do not turn downwind prior to reaching 700 feet. Do not exceed 30° bank at any time. Slow to correct angle of attack/approach speed. It is emphasized that the night pattern is flown entirely on instruments until in a position to acquire the "meatball" visually.

408 FLIGHT TEST PROCEDURES

408.1 *Test pilots*

The most important single factor in getting good test flights on the aircraft is to pick

experience, conscientious test pilots. Inexperienced pilots should not be assigned to this duty. An up-to-date list signed by the commanding officer, of those within the command who are eligible to perform this duty will be maintained. A minimum of 100 hours in type is required.

408.2 *Test flights*

Test flights will be performed as directed by BuWeps, type commanders, or appropriate authority. Test hops should be conducted in accordance with BUWEPS INSTRUCTION 3700.2.

408.3 *Test forms*

BUWEPS INSTRUCTION 3700.2 should be consulted concerning test forms and tests to be performed.

409 INFLIGHT REFUELING

409.1 *Flight procedures*

a. *Rendezvous:* The tanker will take off first and proceed to the briefed orbit point. The remainder of the flight will make a standard takeoff, and proceed to rendezvous with the tanker aircraft. The initial rendezvous with the tanker will be at 250 knots to allow sufficient power differential to safely effect the rendezvous.

b. *Formation position:* Once the rendezvous has been effected, the leader will position the refuling flight in a loose echelon on the tanker. The aircraft will take up a free cruise formation where each member of the flight can observe the refueling technique of the others and not have to concentrate on flying a close wing formation. All members of the flight must maintain a good lookout for other aircraft.

c. *Refueling:* Once the flight is in position the leader will report this to the tanker. The following procedure will then be used:

(1) The tanker will slow to 230 knots IAS. This airspeed will be used at all altitudes.

(2) After reaching 230 knots, the tanker will stream the drogue. During this procedure all members of the flight will avoid taking a position directly abeam of the tanker in case a store turbine blade flies off when propeller starts turning. Avoid a position directly behind the drogue, as it is being extended, since there have been instances when the hose and drogue have come completely free on extension.

(3) The leader will report to the tanker when the turbine is turning and the drogue is fully extended (amber light "on"—portside of store).

(4) The leader will then commence his approaches in accordance with procedures outlined in the NWDS for the A4D. After breaking away the leader will move to the opposite side of the tanker where he will remain for the remainder of the flight. He will supervise the refueling, giving help as necessary. After the leader has crossed under, the No. 2 man in the flight will move over into position and make his plug-ins. He will then move over and join on the leader. Each member in turn will make plug-ins and upon completion will move to the next position on the leader. When all members of the flight have successfully made two hookups, the tanker will secure the store. The flight will then stay in loose formation on the tanker as he makes a 100 percent climb or an 80 percent S/B OUT descent to the next refueling altitude. Maximum speed in the climb or descent must not exceed the limitations of the store. Refueling should be accomplished at both high and low altitudes in accordance with current fleet directives. Any evidence of a hydraulic leak on the buddy store should immediately be reported to the tanker pilot and the store secured.

409.2 *Mission flight refueling*

The procedures for mission refueling are covered in detail in the NWDS for the A4D.

409.3 *Tanker procedures*

a. *Tanker Control Procedures:* Tanker procedures can be found in the flight handbook. A checklist should be made for use of the tanker pilot.

b. *Tanker safety precautions:*

(1) Do not start the turbine or extend the drogue 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 dump fuel unless absolutely necessary. If fuel has been dumped execute a series of negative "G" pulses on the aircraft in order to float the raw fuel which has been trapped on the hose reel section out into the airstream. Delay a minimum of ten (10) minutes before landing.

(5) Pilots should be cautioned against actuating store switches at low altitudes, when on instruments.

(6) Do not energize the turbine after dumping fuel.

(7) *Store limits:* The following limitations will apply to the store: Normal refueling speed is 230 knots. Maximum speed for extension and stowing is 250 knots. If drogue will not retract fully, slow to 200 KIAS and recycle drogue. With the buddy store full, do not turn the ship-tank switch to the "TO STORE" position unless straight and level. While in the "TO STORE" position avoid any high pitch dives or climbs and also avoid putting negative G's on the aircraft.

409.4 *Night inflight refueling*

a. Night inflight refueling is performed in essentially the same manner as in the day.

b. The tanker should have all lights on BRIGHT and STEADY, including the fuselage light. The buddy store lights should be on DIM. The tanker lights illuminate enough of the tankers and 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.

c. Take position directly aft of the tanker so that the tanker fuselage light is blanked from view. The glow from the fuselage light will afford some light. Correct altitude can be determined by the receiver pilot sensing the tanker's jet wash on his vertical stabilizer.

d. 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.

e. The receiver aircraft lights should be on BRIGHT and STEADY. The receiver's fuselage light will provide sufficient illumination to see the drogue from 10–20 feet aft.

f. Plug-ins normally will be performed between 10,000 and 20,000 feet.

CHAPTER V

EMERGENCY PROCEDURES

500 GENERAL

The basic flying skills must be continuously developed. Knowledge of the aircraft and emergency procedures must be reviewed on a regular basis so that the pilot will take the correct course of action when he faces difficulties. The initial training should be thorough in this respect, but should not be considered as permanent in its effect. Above all, the pilot must recognize and *admit* his emergency situation, then takes positive steps in accordance with procedures of good airmanship. Refer to emergency procedures promulgated in NWP–41 and applicable portions of the SAR procedures of NWP–37. The A4D emergency procedures section in the flight handbook should be referred to constantly.

501 GROUND EMERGENCIES

501.1 *Engine fire during starting*

a. Throttle off.

b. Signal for start.

c. Allow starting unit to motor the engine until fire has disappeared.

d. If fire continues for considerable length of time, continue cranking and signal for CO2 to be applied to engine air intake duct.

e. If fire persists (or if no starting unit is available) :

(1) Fuel value control to "EMERGENCY OFF."

(2) Abandon the aircraft.

501.2 *Electrical fire*

a. Turn off all electrical equipment and secure the engine.

b. Abandon the aircraft.

502 INFLIGHT EMERGENCIES

502.1 *Lost plane procedures*

a. *With radio:*

(1) Admit being lost.

(2) Conserve fuel.

(3) Turn IFF to emergency.

(4) Switch to guard channel and declare an emergency.

(a) Broadcast "MAYDAY, MAYDAY, MAYDAY."

(b) Transmit estimated position, course, speed, altitude and fuel supply in minutes.

(c) State the difficulty.

(d) Make request for assistance or state intentions.

(e) Transmit for D/F steer as requested.

(5) 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. Climb to increase both range of your radio and the endurance of your aircraft. Conserve your fuel supply and fly maximum endurance power until you know where you want to go. Then use maximum range power to get there. Conform to established procedures and do not try to second guess your benefactor lest you get lost again.

b. *With receiver only:*

(1) Same as 502.1a.

(2) Fly two triangles to right (1-minute legs) repeat pattern each 10 minutes. Meanwhile maintain estimated best course.

(3) Monitor GUARD channel and comply with instructions given by responding station.

c. *With no radio:*

(1) Same as 502.1a.

(2) Fly two triangles to left (1-minute legs repeat pattern each 10 minutes. Meanwhile maintain estimated best course.

(3) Maintain lookout for interceptor. The interceptor will put his running lights on STEADY. Follow him. If he turns lights from STEADY and breaks formation with lights on STEADY (night) or fishtails (day) resume your orbit.

d. Remember the five "C's."

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

502.2 *Ejection*

a. Ejection is the primary means of escape from the A4D in flight. Pilots should be thoroughly indoctrinated to leave any aircraft that cannot be landed with power on a prepared surface.

b. Immediate ejection is recommended in the following emergencies.

(1) *Confirmed* fire in flight.
(2) Loss of control of aircraft.
(3) Flame out, when engine will not restart by 5,000 feet above the terrain.
(4) Flame out below 250 kts IAS below 1,500 feet.

c. *Preflight:* A complete preflight of the ejection seat system, in accordance with flight handbook instructions, by the pilot is mandatory in order to assure its functioning when needed.

d. *Ejection procedures:* Refer to the appropriate flight handbook.

502.3 *Engine failure*

Engine failure during flight.

(1) Throttle off.
(2) Extend emergency generator.
(3) Place fuel control switch to MANUAL.
(4) Attempt air start in accordance with procedures in flight handbook.
(5) If restart attempts are unsuccessful, eject above minimum safe ejection altitude.

502.4 *Fire*

a. In flight:

(1) Fire may be indicated by the following:

(a) Explosion or unusual vibration.
(b) Abnormal Engine instrument readings.
(c) Fire warning light.
(d) Fumes and smoke in cockpit.
(e) Burning odor in oxygen system.
(f) Report by wingman or other personnel.

(2) If fire is confirmed (and is not a minor electrical fire)—eject.

502.5 *Engine malfunction*

a. Surging (usually caused by faulty fuel control):

(1) Retard throttle to idle.
(2) Shift to MANUAL fuel control.
(3) Make all subsequent throttle movements smoothly.
(4) Land as soon as practicable.

b. Low oil pressure:

(1) Maintain power at 85 to 90 percent. Regulate airspeed with speed brakes.
(2) Land as soon as possible using constant throttle as long as possible. Make good precautionary landing; this is no time for a poor or hurried approach.

502.6 *Systems failures or malfunctions*

a. Follow procedures promulgated in flight handbook.

b. Schedule pilots for periodic (not over 3 months) emergency refresher sessions in the OFT/NAMTD Trainer.

503 TAKEOFF AND LANDING EMERGENCIES

503.1 *Engine failure*

a. Follow procedures promulgated in flight handbook.

503.2 *Wheel brake failure:*

a. With one or both wheel brakes inoperative, a normal landing, followed by engagement of field arresting gear, is the best procedure for landing without damage.

(1) Alert tower for preparation of field arresting gear and request LSO.
(2) Burn down to 1,500 pounds of fuel or below, if practicable.
(3) Make normal approach with touchdown 1,000 feet short of arresting gear.

(4) Get tailhook down check prior to landing.

(5) Maintain aircraft on runway centerline.

(6) Shut down engine when definitely committed to full stop landing.

503.3 *Landing gear malfunction:* Gear-up landings, with or without external stores or tanks, can be made upon runways with good assurance of personal safety. Partial main gear landing can be made into arresting gear with the same assurance of safety. There are numerous variations of this emergency, dependent upon (1) which landing gear fails to extend or lock down, and (2) whether arresting gear is available.

a. All gear up, nose gear indicates unsafe:

(1) If nose gear does not indicate "up and locked" upon retraction, extend gear. DO NOT RECYCLE.

b. Failure of all three gears to extend:

(1) Follow procedure outlined in the flight handbook.

(2) Check "down and locked" indication.

(3) In event indicators show "unsafe" get a visual check from another aircraft. Do not rely upon verification by ground personnel; assume gear is unsafe and make an arrested landing.

(4) If the previous procedure is ineffective take action as outlined in the configuration chart.

c. All gear down, one or more indicated unsafe:

(1) Get visual check by another aircraft.

(2) If external visual check reveals all down and locked make normal landing.

(3) Recycle gear in an attempt to get down and locked indication. Cease recycling when both main gear indicate down and locked. If nose gear does not indicate down and locked increase airspeed to 225 kts. and apply a positive "G" but *do no recycle.*

(4) If all gear are still down, but one or more are determined by visual check not to be locked, make attempt to fully retract gear and follow chart outlined on succeeding page.

AIRFIELD OPERATIONS

The following recommendations are predicated on the availability of field arresting gear:

Cannot change configuration (with or without external tanks)

(1) 2 main landing gear gone, 1 down---------- Burn down to *at least* 1,500 pounds of fuel and make inflight engagement of *midfield* arresting gear or eject.

(2) Nose gear up or at trail, main gear down---- Burn down to 600 pounds of fuel and touchdown just short of arresting gear with full nose up trim.

(3) Both main gear up or at trail, nose gear down- Burn down to at least 1,500 pounds and touchdown just short of arresting gear.

(4) All gear at trail or up---------- Burn down to at least 1,500 pounds and touchdown just short of arresting gear.

Can change configuration (with or without tanks)

(1) With any landing gear at trail or damaged-- Retract remaining gear, burn down to at least 1,500 pounds and land just short of arresting gear.

Note 1. If it is at all possible the pilot should always burn down to 1,500 pounds, which insures that the wing tanks are empty and reduces the possibility of fire if the wing is punctured during the landing.

Note 2. If the drop tanks cannot be emptied, then they must be jettisoned prior to landing. If this is not accomplished a serious fire will almost certainly develop when the tank bottoms scrape through on the rollout after landing.

Note 3. It is particularly desirable to burn down as much as possible whenever landing with a nose gear malfunction. This moves CG aft and allows nose to be held off for a longer period of time after touchdown.

Note 4. Request assistance of an L.S.O.

Shipboard operations

Emergency	With tanks			Without tanks		
	Wheels	Barricade	Hook	Wheels	Barricade	Hook
No hook	Down	Yes		Down	Yes	
Nose gear up	Up	Yes	Down	Two main down	Yes	Up.
Main gear up	Retract nose	Yes	Down	Eject	Eject	Eject.
One main up		Yes	Down		Yes	Down.
All gear up		Yes	Down	Eject	Eject	Eject.
Utility hydro-failure less than three wheels down, hook down.		Yes	Down		Yes	Down.
Stub gear	All down	Yes	Down	All down	Yes	Down.

Note 1. Anytime all gear not down and locked but can be retracted, retract gear and land on empty tanks. Without tanks land with gear lever down.

504 DOWNED PLANE PROCEDURE

504.1 Flight leader transmit "MAYDAY" three times on GUARD. Turn on emergency IFF.

504.2 All aircraft not specifically requested to assist remain clear of the area. Flight leader designate one aircraft to follow distressed plane or pilot down. This aircraft shall:

a. Orbit survivor, keeping him in sight.

b. Conserve fuel.

c. Transmit information concerning survivor's actions and condition to flight leader.

d. Remain on station until relieved, fuel permitting.

504.3 Flight leader designate one aircraft, if available, to altitude over scene of emergency with emergency IFF "ON" to facilitate establishment of fix by rescue facility. This aircraft will attempt to give the following information to base:

a. Position

b. Situation

c. Intentions

d. Estimated time remaining on station.

504.4 Flight leader shift all communications to local SAR frequency as soon as possible.

504.5 All aircraft turn Emergency IFF "OFF" upon leaving scene of crash.

CHAPTER VI

COMMUNICATIONS

600 GENERAL

Because of the high airspeed and altitude of jet operations and the open formations which are generally utilized, it is evident that primary means of communications between aircraft is voice radio. Strict radio discipline is required, and conditions of radio silence are often prescribed for certain operations. Therefore, proficiency in the utilization of visual signals must be maintained by all pilots.

601 RADIO COMMUNICATIONS

601.1 Good operating procedures must be practiced by every pilot in the squadron if UHF radio is to be effective. The following rules of operation shall be enforced:

a. Use proper R/T voice procedure.

b. Do not cut in on other transmissions.

c. Make only necessary transmissions.

d. Mentally phrase message prior to keying the mike.

e. Delay transmission about 1 second after keying the mike to avoid loss of first syllable.

f. Use complete call signs to avoid confusion.

g. Make all transmissions as brief as possible.

h. Leave the UHF selector switch on T/R & G position.

i. Transmit on the guard channel only in an emergency.

j. Take pride in a "silent" flight if it can be accomplished safely and effectively.

k. *Do not* switch radio frequencies below 2,500 feet except for military necessity. If operations dictate at a lower altitude, the aircraft must be in stabilized level flight before changing channels.

601.2 Pilots are encouraged to exercise all radio and electronic aids each flight, in order to maintain proficiency and check proper operation of equipment.

601.3 If cabin pressurization is lost above 27,500 feet avoid use of UHF transmitter to prevent arcing.

601.4 All pilots shall be carefully instructed in the proper use of sensitivity control of the UHF equipment.

602 VISUAL COMMUNICATIONS

Communications between aircraft shall be conducted visually, provided no loss in operational efficiency results. Flight leaders shall insure that all pilots in formation receive and acknowledge signals given. Visual signals are promulgated in NWP–41 and, together with the following, are considered a minimum signal vocabulary for all pilots to know:

602.1 *Air refueling*

Signal	*Meaning*	*Response*
a. Rapid circular motion with forefinger----	By tanker pilot: I am starting my turbine. By receiver pilot: Start your turbine.	By receiver pilot: Give thumbs-up if prop commences rotating properly.
b. Make cone shape with hand, all fingers extended, toward face; then point either (1) forward or (2) aft.	DROGUE is to be: (1) Retracted, or (2) extended.	Execute. By receiver pilot: Give thumbs-up, if drogue retracts or extends properly.
c. Make hand into cup shape then make repeated pouring motions.	By tanker pilot: I am going to dump fuel. By receiver pilot: Dump fuel.	Nod.
d. Throat cutting motion after fuel dumping has begun.	Stop dumping----------	Execute.

602.2 *Malfunction of equipment*

In case of radio failure where the pilot has experienced another system failure or malfunction, the "HEFOE" signals will be utilized. This signal is initiated during day flights by holding a clenched fist to the helmet visor and then indicating by finger numbers the nature of his difficulty. At night, the pilot will initiate the signal by holding his flashlight close to the top of the canopy and then flash the appropriate signal as follows:

Signal		*Meaning*
Day (*fingers*)	*Night* (*dashes*)	
a. 1	1	H—Hydraulic system.
b. 2	2	E—Electrical system.
c. 3	3	F—Fuel system.
d. 4	4	O—Oxygen system.
e. 5	5	E—Engine.

CHAPTER VII

SPECIAL MISSION

700 GENERAL

The capabilities of the A4D are such that it may be given a variety of special missions. Among these could be grouped 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.

SELECTED REFERENCES

1. A4D-½ Flight Handbook and Confidential Supplement.
2. A4D-2N Flight Handbook and Confidential Supplement.
3. Nuclear Warfare Delivery Supplement to NWIP-41-3.
4. NWP-41. Naval Air Operating Procedures.
5. NWIP-41-3. Attack Aircraft Manual.
6. NWIP-41-1. Aircraft Operating Manual.
7. NAVWEPS-OP-2225. Ballistic Tables for Dive Bombing.
8. NWIP-20-1. Naval Weapons Selection—Aircraft.
9. A4D Handbook of Maintenance Instruction.
10. NWP-37. Search and Rescue.
11. NWIP-22-3.
12. FXP-2.
13. BUWEPS Instruction 3700.2.

EXAMINATION QUESTIONS NATOPS MANUAL

1. List maximum direct crosswind component for landing the A4D.
2. What is the minimum taxi interval between aircraft?
3. At what speed and time interval for break would you use during breakup for field landings?
4. Describe hand signals for both pilot and GTC operators used in starting the A4D.
5. What procedures are used for crosswind landings?
6. What phases of the flight shall be covered during debriefing?
7. Who is responsible for promulgation of scheduling ashore? Afloat?
8. What additional items must be covered during briefings when operating aboard a carrier?
9. What is the minimum altitude for changing radio channels during night flying?
10. During VFR (day) conditions, what is the break altitude and speed for shipboard operations?
11. What is the break interval for carrier operations?
12. Why will speed brakes be used on all carrier approaches?
13. When will the speed brakes be retracted during a carrier landing?
14. What technique is used after arrestment to facilitate clearing the landing area?
15. What is night lighting doctrine for section takeoffs?
16. Describe night lighting doctrine for a division coming into the break until they are clear of the duty runway.
17. What cockpit indication do you have of failure of one of the elements of the fuel pump?
18. What drives the fuel transfer pump and where does it get this power?
19. In the event of an electrical failure, will drop tank fuel be transferred? Why?
20. Besides a fuel transfer warning light, what indication will you have that fuel transfer has failed?
21. What three (3) methods may be used to jettison canopy for ejection?
    (a)
    (b)
    (c)
22. What is the maximum relative wind allowable for the canopy when in the open position?
23. What is the maximum acceleration time of a warmed-up engine from idle to MIL? From 82 percent to MIL?
24. What is the minimum recovery altitude for practice 45° glide-bombing run? A 30° rocket run?
25. What is the minimum interval between aircraft in high-angle loft bombing?
26. In flying aircraft with Aero 18C LABS gear, how many seconds do you allow to cage LABS gyros?
27. Do you cage in straight and level flight or with needles centered?
28. Describe recovery after bomb release in a loft maneuver.
29. What is the best defensive tactic for light attack aircraft against enemy air opposition?
30. What should a wingman do if he loses sight of leader on instruments?
31. What are the minimum flight-hour requirements in type for the following evolutions?
    (a) Night flight.
    (b) Instrument flight.
    (c) Cross-country.
    (d) Test flight.
    (e) Car-quals.
32. List hand signals between aircraft for the following situations:
    (a) Asking fuel state.

(b) Oxygen troubles.
(c) Radio receiver failure.
(d) Hydraulic leak.
(e) Open speed brakes.

33. What does a glowing MANUAL FUEL WARNING LIGHT indicate?
34. How do you check to insure that the fuel system will shift to MANUAL?
35. Does the pilot have any indication in flight that there is oil going to the center and rear main bearings?
36. What is normal oil consumption? Minimum oil consumption?
37. When does the fuel boost pressure indicator read NORAML? When does it read OUT?
38. What limits inverted flight to 30 seconds?
39. What is the function of the vortex generators?
40. What caution must be observed when using the PILOT REL handle to free yourself from the seat on an ejection?
41. What constitutes a HOT START? False start? What do you do?
42. What r.p.m. range should be avoided for steady state operations?
43. What is your minimum ejection altitude considering your aircraft to be in level or a climbing attitude?
44. You notice a sudden rise in EGT and a rumbling in the tail section and your wingman reports you are smoking: What do you do?
45. Upon return to base, your horizontal stabilizer trim is inoperative and trim is stuck at zero: What action will you take for landing? What if your trim is stuck at 7° nose up?
46. While on a routine flight you suddenly notice the fuel transfer light come on. Your fuel indicator reads 3,800 pounds of fuel. What action should you take, and Why?
47. You are returning to your base, low on fuel. The gage reads 300 pounds and you are making a straight-in approach. Your engine is at idle during the approach and letdown. Your fuel pressure indicator suddenly goes to OUT. What is probably going to happen within 15 to 20 seconds later, and what should you do?
48. Following a normal landing, you have passed the arresting gear and have about 3,000 feet of runway remaining when you experience brake failure. Assuming all other systems to be operating normally, what would you do?
49. Upon returning to the base you attempt to extend the landing gear by normal means. This proves unsuccessful, as does the emergency system. You are able to get the two main gear down but not the nose wheel. What are some of the possible courses of action?
50. Maximum field landing gross weight is?
Maximum takeoff weight is?
Maximum FCLP weight is?
51. When making a field arrestment because of brake failure, what distance before the gear should the hook be dropped?
52. What precaution should be taken when taxiing aboard ship under strong crosswind conditions?
53. When are clearing turns made off the catapult?
54. What is the desired interval between landing aircraft aboard ship?
(a) Day.
(b) Night.
55. Where in the landing pattern should the approach configuration and airspeed be attained?
56. What publication contains standard catapult signals?
57. What approximate rate of descent should be maintained during a normal penetration?
58. When should a dirty penetration be used?
59. What is the maximum angle of bank that should be used on GCA final?
60. When should the speed brakes be extended in the GCA pattern?
61. What approximate rate of descent, no wind, will be required on the GCA glide slope?
62. What mechanical difficulty is most likely to result during prolonged flights in heavy rain?

63. List the procedures to be followed if it becomes necessary to fly through a thunderstorm.
64. During a night rendezvous, when should a member of the flight call "Aboard"?
65. Describe the procedures for a TACAN rendezvous.
66. List the minimum charts and equipment to be carried on navigation flights.
67. During a low level navigation flight a turning point is missed. What action should be taken?
68. What procedure should be followed if a pilot becomes uncertain of his position on a low navigation mission?
69. What is the normal distance abeam in the carrier landing pattern?
70. What precaution should a flight leader take when the tanker pilot unfeathers the propeller on the Buddy Store?
71. What publication contains complete procedures for tanker control?
72. What precaution should be taken after dumping fuel from a Buddy Store?
73. What do the following fuselage light signals R, K, V, and M, indicate?
74. While flying, when is it permissible to wear a non-high-visibility flight suit?
75. A review flight in an OFT if required after a layoff from flying of how many weeks?
76. Why should UHF transmitter not be used if cabin pressurization is lost above 27,500 feet?
77. Prior to making a dirty penetration, what flashlight signals can be anticipated by wingman if he has lost his radio prior to commencing descent?
78. On waveoffs and/or touch-and-go landing at an airfield, to what altitude should the pilot climb straight ahead prior to turning downwind?
79. What are the positions of the wingmen and section leader while flying parade formation?
80. Illustrate the free cruise lookout doctrine for a division of aircraft.
81. While on a night instrument cross-country flight you experience a loss of all NAVAIDS. What action should you take?
82. What are the lost plane procedures with and without radio?
83. Discuss what you would do if on a night instrument flight and you lost your gyro?
84. What are the warm-up and ground-operation limitations on the following electrical/electronics equipment:
    (a) ARC–27A.
    (b) AJB–3.
    (c) AFCS.
    (d) ASQ–17.
    (e) APX–6B.
    (f) ARA–25.
    (g) ARN–21.
85. What is the air start procedure after a flameout in the A4D while in primary fuel control? Manual?
86. What is the recommended speed for maximum gliding range for gross weights up to 16,000 pounds, clean configuration, and engine windmilling?
87. Describe your actions after experiencing throttle linkage failure while airborne until you have the aircraft safely on deck.
88. List the ejection procedures for RAPEC seat.
89. List the emergency procedures for lowering the landing gear in the event of utility hydraulic pressure failure.
90. In making radio transmissions, what technique is necessary to insure complete message is transmitted?
91. If you must land with main landing wheels up at an airfield, what is the maximum desired fuel load? Why?
92. If both main gear are down and nose wheel at trail, what is the recommended fuel load? Why?
93. If you cannot lower main gear, have no tanks installed, and the only landing site available is a carrier deck, what procedure should be used?
94. What procedure would you use if you notice a LOW oil pressure indication?

95. Describe the CCA pattern from Marshall Point to landing aboard a carrier.
96. To what altitude do you climb ahead of the ship on a night bolter prior to turning downwind?
97. During MLP, what items are included in your scan pattern after sighting the "meatball"?
98. What are the "HEFOE" signals and how are they indicated for both day and night?
99. When shore based, what would your decision be if one main landing gear is gone and the others are down and locked? Discuss with or without tanks and can or cannot change landing gear configuration.
100. What is your opinion of the NATOPS program? Be specific.
101–125. Questions on local operations to be formulated by local command.

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