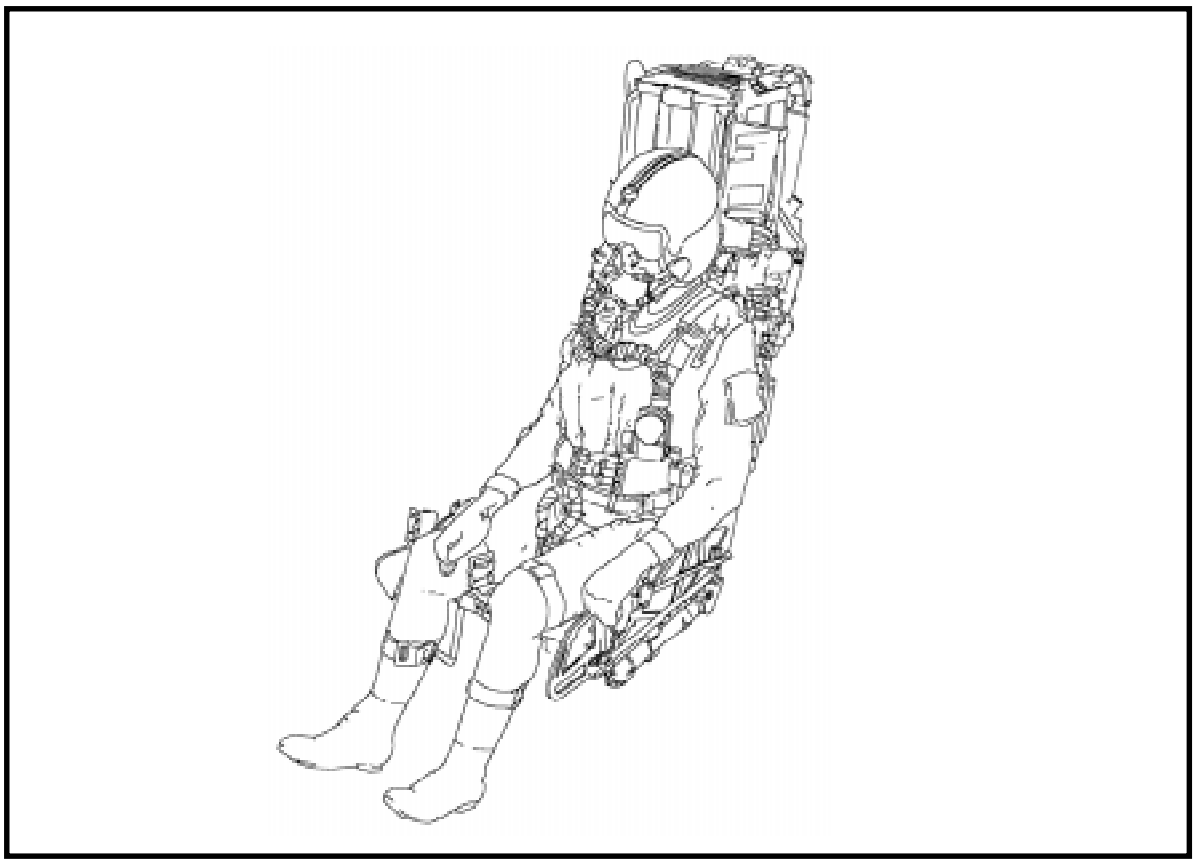
NAVAL AIR TRAINING COMMAND

NAS CORPUS CHRISTI, TEXAS CNATRA P-1286 (REV. 9-99) PAT

NAVAL AIRCREW COMMON EJECTION SEAT (NACES)



LECTURE GUIDE

1999

T-45A LECTURE GUIDE

CHANGE SUMMARY PAGE

CHANGE NUMBER	DATE ENTERED	CHANGE DESCRIPTION	INITIALS

THIS PAGE INTENTIONALLY LEFT BLANK.

LECTURE GUIDE
LIST OF EFFECTIVE PAGES

EFFECTIVE PAGES	PAGE NUMBERS
FRONT MATTER	
Original	i thru iv
SE-01	
Original	1-i thru 1-ii
Original	1-1 thru 1-50

EFFECTIVE PAGES	PAGE NUMBERS

THIS PAGE INTENTIONALLY LEFT BLANK.

FLIGHT SUPPORT LECTURE GUIDE

COURSE/STAGE: T-45A UJPT, E2-C2, ADV, & IUT Seat

LESSON TITLE: Aeromedical Aspects of Emergency Egress (NACES)

LESSON IDENTIFIER: T-45A UJPT, E2-C2, ADV, & IUT Seat-01

LEARNING ENVIRONMENT: Classroom

ALLOTTED LESSON TIME: 2.0 hr

TRAINING AIDS: Static Display NACES Ejection Seat, LRU-23/P Life Raft

STUDY RESOURCES:

* T-45A NATOPS Flight Manual A1-T45AB-NFM-000

LESSON PREPARATION:

Study:

* T-45A NATOPS Flight Manual A1-T45AB-NFM-000
  - Part I, Section 2.18, "Ejection Seat System"

REINFORCEMENT: N/A

EXAMINATION: N/A

(9-99) ORIGINAL

THIS PAGE INTENTIONALLY LEFT BLANK.

LESSON OBJECTIVES

1.8.1.10.3.1
State components and operating characteristics of the NACES

1.3.5.1.5
Recall procedures for checking/testing the ejection seat

1.3.5.1.4.2
Recall purpose and function of ejection seat components and controls

1.3.5.1.3
Recall the operating characteristics of the ejection seat

1.8.1.10.3.5
Recall types and causes of injuries which can be sustained during ejection

1.8.1.10.3.6
Recall ideal body position for ejection

1.8.1.10.3.4
Identify NACES safety and operating features

1.8.1.10.3.7
Recall factors which could cause delay in initiating ejection

1.8.1.10.4.3
Recall ejection sequences

1.3.5.1.4.7
Recall Mild Detonating Cord (MDC) location and operating characteristics

1.8.1.10.4.4
Recall parachute descent procedures

1.8.1.10.4.2
Recall procedures for emergency egress

1.8.1.10.3.8
Recall procedures for deploying the NACES LRU-23/P Life Raft

1.8.1.10.5.3
Recall search and rescue (SAR) procedures

MOTIVATION

The academic lecture for NACES teaches you how to eject safely from the T-45A. This is a scenario for which every naval aviator must be prepared. When ejection from the aircraft is inevitable, it is absolutely necessary that you follow the procedures you will learn in the NACES lecture.

Inadequate preparation for ejection seat procedures may result in potentially dangerous situations for you and/or another pilot. Knowing what to do can save your life. You will practice these skills in CO-02S.

OVERVIEW

This lesson will prepare you theoretically and procedurally for ejection seat procedures in a situation that calls for ejection from the T-45A aircraft.

In addition to a general overview of NACES, this lesson covers specific characteristics of the T-45A ejection seat system including:

* Preflight Safety Checks
* Leg Restraint Line Utilization
* Seat Performance
* Ejection Injuries
* Seat Operation
* Factors in Delayed Ejection
* Ejection Sequence
* Parachute Descent Procedures
* Emergency Ground Egress
* NACES LRU-23/P Life Raft
* SAR Procedures

Sg 0, fr 5

RUSSIAN TECHNOLOGY

Sg 0, fr 6

BREAK UP AND RENDEZVOUS

Sg 1, fr 1

AEROMEDICAL ASPECTS OF EMERGENCY EGRESS

*** Preflight safety checks**

* Leg restraint line utilization

* Seat performance

* Ejection injuries

* Seat operation

* Factors in delayed ejection

* Ejection sequence

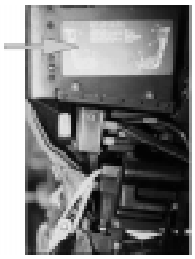
* Parachute descent procedures

* Emergency ground egress

* NACES LRU-23/P Life Raft

* SAR procedures

Sg 1, fr 2



PREFLIGHT SAFETY INSPECTION CHECKLIST

PRESENTATION

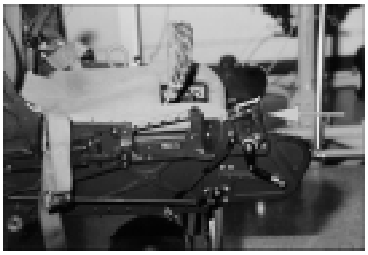
I. Preflight safety checks **1.8.1.10.3.1, 1.3.5.1.5, 1.3.5.1.4.2**

NOTE: Your preflight safety inspection checklist is located on the left-hand side of the head-box parachute container.

A. SAFE/ARMED handle - ensure SAFE/ARMED handle is in SAFE position

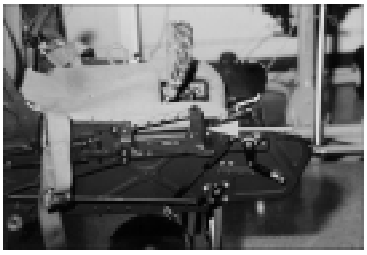
B. Emergency restraint release handle - fully down and locked

Sg 1, fr 3



SAFE/ARMED HANDLE

Sg 1, fr 4

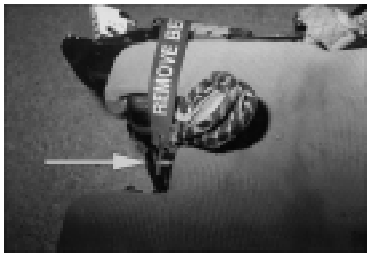


EMERGENCY RESTRAINT RELEASE HANDLE

Sg 1, fr 5

SAFE/ARMED HANDLE

Sg 1, fr 6



EJECTION CONTROL HANDLE SAFETY PIN

Sg 1, fr 7

SAFETY PINS

C. Seat SAFE/ARMED handle - in ARMED position

D. Ejection control handle safety pin - removed and stowed

NOTE: The ejection control handle safety pin and the MDC safety pin should be linked together with red webbing.

E. Catapult manifold valve

1. Ensure the catapult manifold valve is secure

2. Ensure the hose is connected

3. Ensure the retaining pin is installed

F. Top latch mechanism spigot - ensure that it's flush with the end of the top latch plunger

G. Electronic sequencer window

1. Ensure the window is black

2. Unsafe for flight if it's white

H. Parachute withdraw line - correctly secured to the parachute deployment rocket stirrup

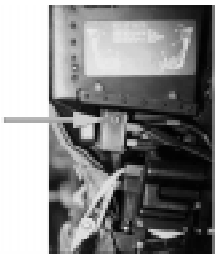
Sg 1, fr 8

CATAPULT MANIFOLD VALVE

Sg 1, fr 9

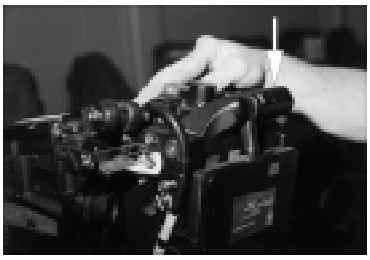
TOP LATCH MECHANISM

Sg 1, fr 10



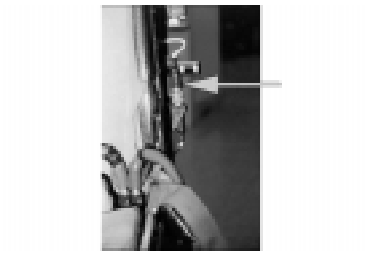
ELECTRONIC SEQUENCER INDICATOR WINDOW

Sg 1, fr 11



PARACHUTE WITHDRAW LINE

Sg 1, fr 12

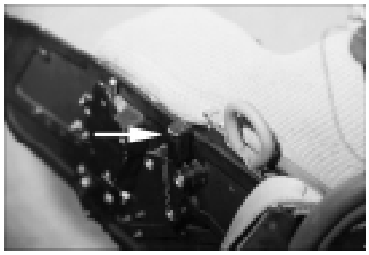


CANNON PLUG

Sg 1, fr 13

SEAT HEIGHT ADJUSTMENT SWITCH

Sg 1, fr 14



SHOULDER HARNESS CONTROL LEVER

Sg 1, fr 15

EMERGENCY OXYGEN OPERATING HANDLE

I. Cannon plug - securely fastened to the seat

J. Seat height adjustment switch (silver toggle switch)

1. Utilize to adjust seat so that there is at least a fist of distance from the top of your helmet to the canopy

K. Shoulder harness control lever

1. Utilize to lock/unlock the upper harness

2. Locked: cannot lean forward; unlocked: can lean forward on inertial reel

L. Emergency oxygen operating handle

1. Utilize when the onboard oxygen system fails

2. Pull up and aft to initiate emergency oxygen

II. Leg restraint line utilization **1.3.5.1.4.2**

A. Leg restraint lines

1. Ensure garters are buckled and properly adjusted with hardware on inboard side of the legs

2. Check that leg restraint lines are secured to seat and floor and not twisted

3. Check that leg restraint lines are routed through the quick-release buckles first and then connected to the garters

Sg 2, fr 1

AEROMEDICAL ASPECTS OF EMERGENCY EGRESS

* Preflight safety checks
* **Leg restraint line utilization**
* Seat performance
* Ejection injuries
* Seat operation
* Factors in delayed ejection
* Ejection sequence
* Parachute descent procedures
* Emergency ground egress
* NACES LRU-23/P Life Raft
* SAR procedures

Sg 2, fr 2

LEG RESTRAINT LINES

Sg 3, fr 1

AEROMEDICAL ASPECTS OF EMERGENCY EGRESS

* Preflight safety checks
* Leg restraint line utilization
* **Seat performance**
* Ejection injuries
* Seat operation
* Factors in delayed ejection
* Ejection sequence
* Parachute descent procedures
* Emergency ground egress
* NACES LRU-23/P Life Raft
* SAR procedures

Sg 3, fr 2

Seat Performance

* +Gz Delivered
  - Sustained - 12-18 +Gz acceleration (These values are for the 98 percentile and 3 percentile aviators)
* Human Tolerances
  - Sustained - 20-25 +Gz acceleration

III. Seat performance, weight limits, and envelope for optimum ejection **1.3.5.1.3**

A. Seat performance

1. +Gz Delivered

a. Sustained - 12-18 +Gz acceleration

NOTE: These values are for the 98 percentile and 3 percentile aviators.

2. Human tolerances

a. Sustained - 20-25 +Gz acceleration

3. "Zero-Zero" ejection

   a. Ground level with no forward airspeed

   b. Will travel approximately 155 ft in the vertical direction for the 98 percentile aviator and 200 ft for the 3 percentile aviator

   c. Use "Zero-Zero" as a last resort only

B. Seat weight limits

1. The NACES nude body weight limits are 136 lb minimum and 213 lb maximum

2. The CNO nude body weight limits are 100 lb minimum and 235 lb maximum

   NOTE: Being underweight puts one at increased risk of acceleration injury, and being overweight puts one at risk of inadequate ejection.

Sg 3, fr 3

Seat Performance
(cont.)

* "Zero-Zero" Ejection

  - Ground level with no forward airspeed

  - Will travel approximately 155 ft in the vertical direction of the 98 percentile aviator and 200 ft for the 3 percentile aviator

  - Use "Zero-Zero" as a last resort only

Sg 3, fr 4

Seat Weight Limits

* +Gz Delivered

  - The NACES nude body weight limits are 136 lb minimum and 213 lb maximum

  - The CNO nude body weight limits are 100 lb minimum and 235 lb maximum

Sg 3, fr 5

Envelope for
Optimum Ejection

* Altitude - above 2,000 ft
* Attitude - straight and level (the NACES is NOT a vertical seeking seat)
* Airspeed - 325 KIAS or below

C. Envelope for optimum ejection

1. Altitude - above 2,000 ft

2. Attitude - straight and level (the NACES is NOT a vertical seeking seat)

3. Airspeed - 325 KIAS or below

NOTE: These values are for “optimum” ejection only. They are not required for a successful ejection.

IV. Ejection injuries **1.8.1.10.3.5, 1.8.1.10.3.6**

A. Spinal injuries

1. The spine in the correct position will perform as a shock absorber

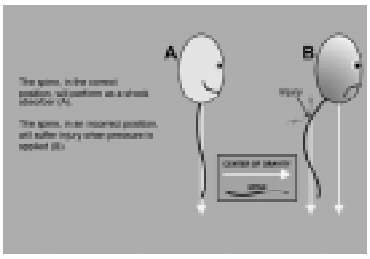
2. The spine in an incorrect position will suffer injury when pressure is applied

Sg 4, fr 1

AEROMEDICAL ASPECTS OF EMERGENCY EGRESS

* Preflight safety checks
* Leg restraint line utilization
* Seat performance
* **Ejection injuries**
* Seat operation
* Factors in delayed ejection
* Ejection sequence
* Parachute descent procedures
* Emergency ground egress
* NACES LRU-23/P Life Raft
* SAR procedures

Sg 4, fr 2



SPINAL INJURIES

Sg 4, fr 3

Dynamic Overshoot

* A.K.A. “seat slap”
* Causes
  - -Gz lifting you off the seat
  - Pulling legs back; anticipating ejection
  - Legs too long for seat/cockpit

B. Dynamic overshoot

1. A.K.A. “seat slap”
2. Causes
   a. - Gz lifting you off the seat
   b. Pulling legs back - anticipating ejection
   c. Legs too long for seat/cockpit

   NOTE: Every inch the bottom of your thighs are from the seat-pan is equivalent to 30-40 Gz.

Sg 4, fr 4

Windblast Injuries

* Flail injuries
* Chances of injuries are increased by
  - High speed ejections
  - Improperly worn equipment (loose fitting torso harness, sleeves over gloves, visor up, mask off, etc.)
  - No firm grip on the ejection handle or torso harness

C. Windblast injuries

1. Flail injuries
2. Chances of injuries are increased by
   a. High-speed ejections
   b. Improperly worn equipment (loose-fitting torso harness, sleeves over gloves, visor up, mask off, etc.)

      NOTE: Ensure gloves are placed over sleeves, not sleeves over gloves.

   c. No firm grip on the ejection handle or torso harness

Sg 4, fr 5

GLOVES

D. Parachute opening shock

1. Causes

a. Loose or poorly fitting torso harness

b. Manually overriding the seat at too high an altitude (deploying the parachute at 30,000 ft will cause between 17-20 units of G force to be placed on the parachute and the occupant)

E. Burns - occur when flight gear is

1. Not worn (always wear gloves; wear clear visor at night)

2. Worn incorrectly (roll down sleeves, visor down, mask on, flight suit zipped)

3. Improperly maintained (do not wear gear that is torn or worn thin)

Sg 4, fr 6

Parachute Opening Shock

* Causes

- Loose or poorly fitting torso harness
- Manually overriding the seat at too high an altitude (deploying the parachute at 30,000 ft will cause between 17-20 units of G force to be placed on the parachute and the occupant)

Sg 4, fr 7

Burns

* Occur when flight gear is

- Not worn (always wear gloves; wear clear visor at night)
- Worn incorrectly (roll down sleeves, visor down, mask on, flight suit zipped)
- Improperly maintained (do not wear gear that is torn or worn thin)

Sg 4, fr 8

Ideal Body Position

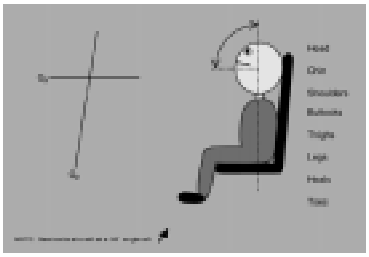
* **Chin** elevated 10 degrees - look up at the "stand-by" or "wet" compass
* **Head** pressed firmly against headrest - try to press the back of your head through the headrest
* **Shoulders** and back pressed against the seat
* **Buttocks** and lower back pressed against the seat (proper preflight and cinching of lower Koch fittings will make this easy)

Sg 4, fr 9

Ideal Body Position (cont.)

* **Thighs** pressed firmly against the seat pan and knees pressed outboard against the seat bucket
* **Feet** extended to the rudder pedals and heels on the deck

Sg 4, fr 10



IDEAL BODY POSITION

F. Ideal body position

1. Chin elevated 10 degrees - look up at the "stand-by" or "wet" compass
2. Head pressed firmly against headrest - try to press the back of your head through the headrest
3. Shoulders and back pressed against the seat
4. Buttocks and lower back pressed against the seat (proper preflight and cinching of the lower Koch fittings will make this easy)
5. Thighs pressed firmly against the seat pan and knees pressed outboard against seat bucket
6. Feet extended to the rudder pedals and heels on the deck

NOTE: Getting into the proper body position should be mentally rehearsed like "popping" to attention.

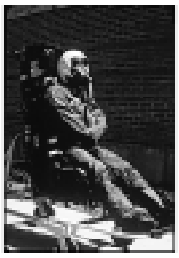
G. Injury

1. The majority of injury comes from improper hand/arm position (i.e., not holding elbows against the sides of the body; not hooking thumbs inside ejection handle or upper Kochs)

2. Body position and equipment problems are other contributing factors for spinal damage and facial trauma

3. Post ejection problems (impact with trees, hard PLF's due to operator error with steering system, and low altitude ejection) are also causes of injury

Sg 4, fr 11, p 1

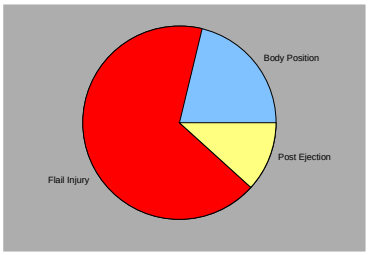


IDEAL BODY POSITION

Sg 4, fr 11, p 2

NOT IDEAL BODY POSITION

Sg 4, fr 12



INJURY

Sg 5, fr 1

AEROMEDICAL ASPECTS OF EMERGENCY EGRESS

* Preflight safety checks
* Leg restraint line utilization
* Seat performance
* Ejection injuries
* **Seat operation**
* Factors in delayed ejection
* Ejection sequence
* Parachute descent procedures
* Emergency ground egress
* NACES LRU-23/P Life Raft
* SAR procedures

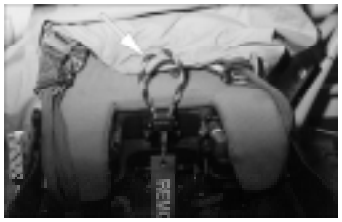
Sg 5, fr 2

EJECTION INITIATION HANDLE

Sg 5, fr 3

EJECTION INITIATION HANDLE

Sg 5, fr 4



NEW EJECTION INITIATION HANDLE

V. Seat Operation **1.8.1.10.3.4**

The NACES ejection seat has only one ejection initiation handle: the lower ejection handle. There is no overhead/face curtain ejection handle.

NOTE: The NACES ejection handle requires 30-60 lb of force to initiate ejection.

A. Ejection initiation handle

1. Mounted on a link and crossbar which allows the occupant to initiate ejection by pulling 30 degrees off of the vertical

   NOTE: Some aircraft at NAS Kingsville will have the new ejection initiation handle without the web backing.

B. Hand position

1. One-handed method

   a. Grasp the handle with one hand while the off hand grasps the wrist of the pulling hand

2. Two-handed method

   a. Grasp the handle with both hands ensuring both hands fit inside handle

3. Torso harness grip

   a. Recommended grip for the occupant who is not initiating ejection

   b. Some instructor pilots recommend both occupants pull the ejection handle or “race to the handle”

      NOTE: Do what is briefed!

Sg 5, fr 5, p 1

Hand Position

* There are two accepted NATOPS hand positions for initiating ejection:
  - One-handed method
  - Two-handed method

Sg 5, fr 5, p 2

ONE-HANDED METHOD

Sg 5, fr 5, p 3

TWO-HANDED METHOD

Sg 5, fr 6

TORSO HARNESS GRIP

Sg 6, fr 1

AEROMEDICAL ASPECTS OF EMERGENCY EGRESS

* Preflight safety checks
* Leg restraint line utilization
* Seat performance
* Ejection injuries
* Seat operation
* **Factors in delayed ejection**
* Ejection sequence
* Parachute descent procedures
* Emergency ground egress
* NACES LRU-23/P Life Raft
* SAR procedures

Sg 6, fr 2

FACTORS IN DELAYED EJECTION

VI. Factors in delayed ejection **1.8.1.10.3.7**

A. Delay in committing to a course of action/failure to make a timely decision

1. Loss of situational awareness

a. Unaware of or misperception of terrain features

b. Unrecognized spatial disorientation

c. Temporal distortions

2. Lack of crew coordination

a. ICS failure

b. Copilot syndrome

c. Ambiguous brief

3. Ego

a. “Mechanic in the sky”

b. Fear of stigma

c. Fear of being grounded

4. Gaining altitude

5. Avoiding populated areas

B. Decision to eject

1. Failure to eject is still the leading cause of death in the tactical jet community

2. Other causative factors are initiating ejection below 2,000 ft AGL and ejection out of the ejection envelope

C. Summary of ejection

1. Try to get into a good body position but do not delay ejecting solely for this purpose

2. Rehearse the ejection scenario mentally as you brief it

3. Know your seat capabilities and limitations

Sg 6, fr 3

Decision to Eject

* Failure to eject is still the leading cause of death in the tactical jet community
* Other causative factors are initiation ejection below 2,000 ft AGL and ejection out of the ejection envelope

Sg 6, fr 4

Summary of Ejection

* Try to get into a good body position but do not delay ejecting solely for this purpose
* Rehearse the ejection scenario mentally as you brief it
* Know your seat capabilities and limitations

Sg 7, fr 1

AEROMEDICAL ASPECTS OF EMERGENCY EGRESS

* Preflight safety checks
* Leg restraint line utilization
* Seat performance
* Ejection injuries
* Seat operation
* Factors in delayed ejection
* **Ejection sequence**
* Parachute descent procedures
* Emergency ground egress
* NACES LRU-23/P Life Raft
* SAR procedures

Sg 7, fr 2, p 1

Ejection Sequence

* Ejection is initiated by pulling the ejection handle or by the command sequencing system
* Harness power reel the positions occupant
* IFF (identification friend or foe) is actuated
* MDC cord (mild detonating cord) detonates and shatters canopy (or seat's canopy breakers penetrate canopy)

VII. Ejection sequence **1.8.1.10.4.3, 1.3.5.1.4.7, 1.8.1.10.3.1**

A. Ejection sequence

1. Ejection is initiated by pulling the ejection handle or by the command sequencing system
2. Harness power reel positions the occupant
3. IFF (identification friend or foe) is actuated
4. MDC cord (mild detonating cord) detonates and shatters canopy (or seat's canopy breakers penetrate canopy)

5. Telescopic catapult fires and seat moves up rails

6. Legs pivot back and are pulled down by leg restraint lines

7. Emergency radio beacon and emergency oxygen activate

8. Under-seat motor fires after catapult is fully telescoped

9. All actions after this point are controlled by the sequencer (the brain of the ejection seat)

10. Drogue chute is deployed

11. Parachute is deployed

12. Seat/man separation occurs or is initiated

Sg 7, fr 2, p 2

Ejection Sequence
(cont.)

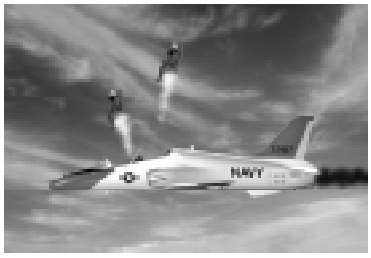
* Telescopic catapult fires and seat moves up rails
* Legs pivot back and are pulled down by leg restraint lines
* Emergency radio beacon and emergency oxygen activate
* Under-seat motor fires after catapult is fully telescoped

Sg 7, fr 2, p 3

Ejection Sequence
(cont.)

* All actions after this point are controlled by the sequencer (the brain of the ejection seat)
* Drogue chute is deployed
* Parachute is deployed
* Seat/man separation occurs or is initiated

Sg 7, fr 3



HOW LONG WILL EJECTION TAKE? IT DEPENDS ON THE MODE.

Sg 7, fr 4, p 1

Sequencer's
Five Modes of Ejection

* Mode 1 - Low altitude/low airspeed
  - Below 8,000 ft/0-300 KIAS
  - Parachute deployment and seat/man separation occur within .45 seconds
* Mode 2 - Low altitude/medium airspeed
  - Below 10,000 ft/300-500 KIAS
  - Parachute deployment and seat/man separation occur within 1.1 seconds

Sg 7, fr 4, p 2

Sequencer's
Five Modes of Ejection
(cont.)

* Mode 3 - Low altitude/high airspeed
  - Below 8,000 ft/above 500 KIAS
  - Parachute deployment and seat/man separation occur within 1.3 seconds
* Mode 4 - Medium altitude/any airspeed
  - Between 18,000 ft and 10,000 ft
  - Parachute deployment and seat/man separation occur within 2.9 seconds

B. Sequencer's five modes of ejection

1. Mode 1 - Low altitude/low airspeed
   a. Below 8,000 ft/0-300 KIAS
   b. Parachute deployment and seat/man separation occur within .45 seconds
2. Mode 2 - Low altitude/medium airspeed
   a. Below 10,000 ft/300-500 KIAS
   b. Parachute deployment and seat/man separation occur within 1.1 seconds
3. Mode 3 - Low altitude/high airspeed
   a. Below 8,000 ft/above 500 KIAS
   b. Parachute deployment and seat/man separation occur within 1.3 seconds
4. Mode 4 - Medium altitude/any airpseed
   a. Between 18,000 ft and 10,000 ft
   b. Parachute deployment and seat/man separation occur within 2.9 seconds

5. Mode 5 - High altitude mode

   a. Any altitude above 18,000 ft

   b. Parachute deployment and seat/man separation occur when seat reaches 18,000 ft

Sg 7, fr 4, p 3

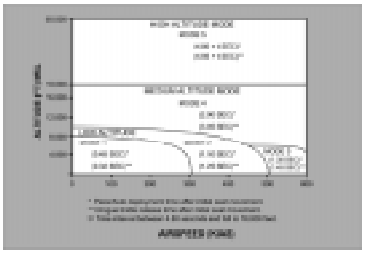
Sequencer's
Five Modes of Ejection
(cont.)

* Mode 5 - High altitude mode

  - Any altitude above 18,000 ft

  - Parachute deployment and seat/man separation occur when seat reaches 18,000 ft

Sg 7, fr 5



MODES OF EJECTION

Sg 7, fr 6

NACES Seat Descent Time on Drogue

* Seat descent speed on drogue depends on height
  - @ 50,000 ft=approx 300 ft/sec
  - @ 18,000 ft=approx 200 ft/sec

* Example
  - Ejection seat initiated @ 30,000 ft
  - Seat falls at approx 250 ft/sec
  - In 4.8 sec seat falls approx. 1,200 ft
  - 30,000 ft minus 1,200 ft = 28,800 ft
  - 28,800 ft minus 18,000 ft = 10,800 ft
  - Falling 10,800 ft @ 250 ft/sec = approx 43.2 sec

THEREFORE T=43.2 SEC

C. Seat descent time on drogue

1. Seat descent speed on drogue depends on height

   a. At 50,000 ft, approx 300 ft/sec

   b. At 18,000ft, approx 200 ft/sec

D. Barostatic release unit - back-up system if automatic sequencing system fails

1. Four seconds after passing 14,000 ft - 16,000 ft the BRU cartridge will fire
2. The parachute deployment rocket motor will fire
3. The upper and lower harness locks will release
4. Seat/man separation will occur

Sg 7, fr 7

Barostatic Release Unit

* Back-up system if automatic sequencing system fails
  - Four seconds after passing 14,000 ft - 16,000 ft the BRU cartridge will fire
  - The parachute deployment rocket motor will fire
  - The upper and lower harness locks will release
  - Seat/man separation will occur

Sg 7, fr 8

Manual Override

* Reason for overriding the automatic system

- Ejection over mountainous terrain
- If set malfunctions (i.e., the automatic sequencing system and the barostatic release unit fail)

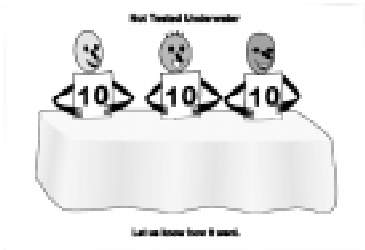
Sg 7, fr 9

MANUAL OVERRIDE HANDLE

Sg 7, fr 10

MANUAL OVERRIDE HANDLE

Sg 7, fr 11



NACES

E. Manual override - reasons for overriding the automatic system

1. Ejection over mountainous terrain
2. If seat malfunctions (i.e., the automatic sequencing system and the barostatic release unit fail)

F. NACES GQ 5000 Parachute

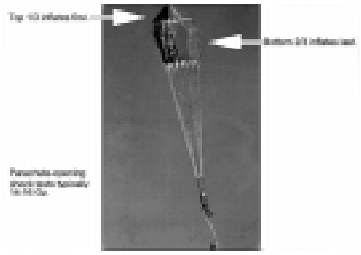
1. Conical-shaped
2. Top 1/3 made of nil porosity material
3. Bottom 2/3 made of medium porosity material
4. Flying diameter 22 ft, line length 21 ft
5. Rate of descent (no drive) 22 ft/sec
6. Rate of descent (with drive) 20 ft/sec
7. Rate of turn 22 degrees/sec

Sg 7, fr 12

Parachute

* NACES GQ 5000 Parachute
  - Conical-shaped
  - Top 1/3 made of nil porosity material
  - Bottom 2/3 made of medium porosity material
  - Flying diameter 22 ft, line length 21 ft
  - Rate of descent (no drive) 22 ft/sec
  - Rate of descent (with drive) 20 ft/sec
  - Rate of turn 22 degrees/sec

Sg 7, fr 13



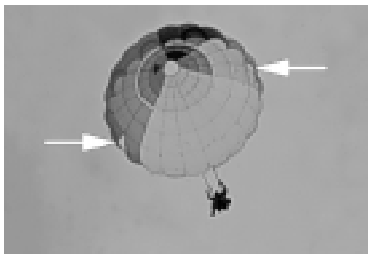
PARACHUTE

Sg 7, fr 14

Steering System

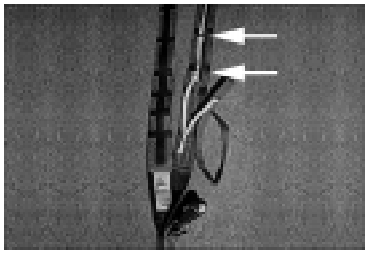
* Lemoigne lines/slotted drive
  - Opens drive slot on either side of canopy
  - Provides means to steer/ control descent
  - Reduces descent speed and drive
  - Helps cut down oscillations
  - Pull down with left hand to turn left
  - Pull down with right hand to turn right

Sg 7, fr 15



SLOTS

Sg 7, fr 16



LEMOIGNE LINES/SLOTTED DRIVE

G. Steering system - Lemoigne lines/slotted drive

1. Opens drive slot on either side of canopy
2. Provides means to steer/control descent
3. Reduces descent speed and drive
4. Helps cut down oscillations
5. Pull down with left hand to turn left
6. Pull down with right hand to turn right

VIII. Parachute descent procedures **1.8.1.10.4.4**

A. Parachute descent

1. Inspect canopy/inflate life preserver unit
2. Release life raft
3. Options
   a. Assess situation
   b. Activate steering
   c. Loosen mask
   d. Raise visor
   e. Snap lobes
   f. Stow gloves
   g. Jettison seat kit
4. Koch fittings - after completing your PLF (Parachute Landing Fall), release the parachute fittings

Sg 8, fr 1

AEROMEDICAL ASPECTS OF EMERGENCY EGRESS

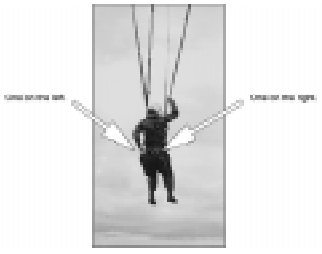
* Preflight safety checks
* Leg restraint line utilization
* Seat performance
* Ejection injuries
* Seat operation
* Factors in delayed ejection
* Ejection sequence
* **Parachute descent procedures**
* Emergency ground egress
* NACES LRU-23/P Life Raft
* SAR procedures

Sg 8, fr 2

Parachute Descent Procedures

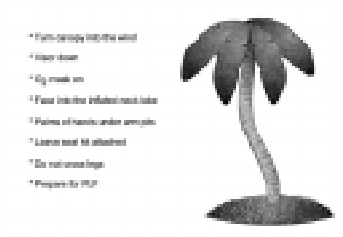
* Inspect canopy/inflate life preserver unit
* Release life raft
* Options (assess situation, activate steering, loosen mask, raise visor, snap lobes, stow gloves, jettison seat kit, etc.)
* Koch fittings - after completing your PLF (Parachute Landing Fall), release the parachute fittings

Sg 8, fr 3



RIGID SEAT SURVIVAL KIT (RSSK) RELEASE HANDLE

Sg 8, fr 4



TREES

B. Trees

1. Turn canopy into the wind
2. Visor down
3. O_2 mask on
4. Face into the inflated neck lobe
5. Palms of hands under arm pits
6. Leave seat kit attached
7. Do not cross legs
8. Prepare for PLF

C. Buildings

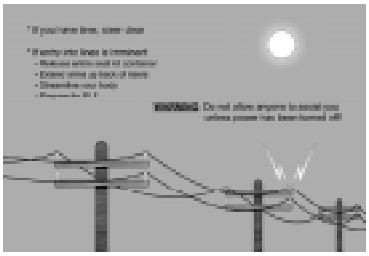
Sg 8, fr 5

BUILDINGS

1. If you have time, steer clear
2. Turn canopy into wind
3. Assume PLF position
4. Remain alert for dead air/air pockets which can cause canopy collapse or oscillations
5. Release Koch fittings when firmly on deck

D. Power lines

Sg 8, fr 6



POWER LINES

1. If you have time, steer clear
2. If entry into lines is imminent
   a. Release entire seat kit container
   b. Extend arms up back of risers
   c. Streamline your body
   d. Prepare for PLF

WARNING: Do NOT allow anyone to assist you unless power has been turned off!

E. Major parachute malfunctions/damage

NOTE: None are common but can occur.

1. Partial line over

   a. One or more suspension lines loop over canopy

   b. Usually not serious but can cause sideways slip

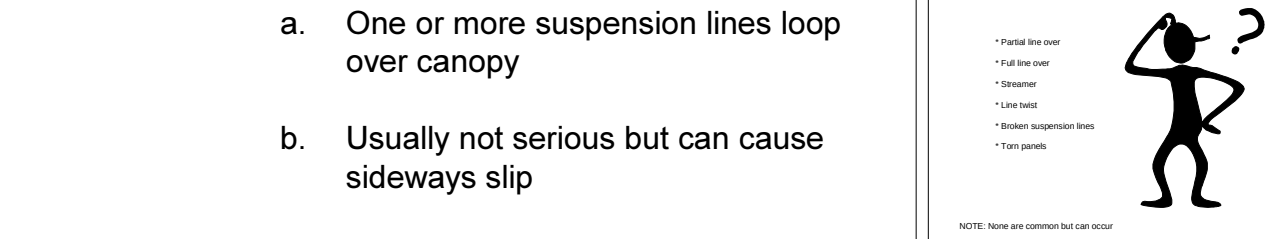
   c. To correct

      (1) Grab riser on side of smaller lobe and pull sharply (turn head away) and release riser

      (2) Repeat

      (3) Close to ground; ignore and prepare for PLF

Sg 8, fr 7



MAJOR PARACHUTE/MALFUNCTIONS DAMAGE

Sg 8, fr 8

Partial Line Over

* One or more suspension lines loop over canopy

* Usually not serious but can cause sideways slip

* To correct:

  - Grab riser on side of smaller lobe and pull sharply (turn head away) and release riser

  - Repeat

  - Close to ground; ignore and prepare for PLF

Sg 8, fr 9

Full Line Over

* One or more suspension lines loop over apex of canopy
* More serious than partial line over because it can cause faster descent, spiraling line can burn canopy resulting in canopy failure
* Correct the same way as partial line over

Sg 8, fr 10

Streamer

* Caused by static electricity holding hem of canopy together causing canopy not to inflate
* Rare in synthetic parachutes like the GQ 5000
* To correct
  - Grasp risers/suspension lines and violently pull and shake to separate

Sg 8, fr 11

Line Twist

* Suspension lines twist together between the canopy and risers (like twisting in a swing)
* To correct
  - Grasp risers/suspension lines and pull apart while pedaling feet (as in a swing)

2. Full line over
   a. One or more suspension lines loop over apex of canopy
   b. More serious than partial line over because it can cause faster descent, spiraling, and lines can burn canopy resulting in canopy failure
   c. Correct the same way as partial line over
3. Streamer
   a. Caused by static electricity holding hem of canopy together causing canopy not to inflate
   b. Rare in synthetic parachutes like the GQ 5000
   c. To correct
      (1) Grasp risers/suspension lines and violently pull and shake to separate
4. Line twist
   a. Suspension lines twist together between the canopy and risers (like twisting in a swing)
   b. To correct
      (1) Grasp risers/suspension lines and violently pull apart while pedaling feet (as in a swing)

5. Parachute damage

   a. Torn panels

      (1) Caused by high speed opening shock or line overs

      (2) No corrective action

      (3) Prepare for hard landing

   b. Broken suspension lines

      (1) Variety of causes

      (2) No corrective action

      (3) Prepare for hard landing

6. Parachute landing fall (PLF)

   a. Knees bent

   b. Feet together

   c. Eyes on the horizon

   d. Arms up with hands on Koch fittings

   e. Land on balls of feet

   f. Then to side of calf

   g. Then to side of thigh

   h. Roll onto your back

Sg 8, fr 12

Parachute Damage

* Torn panels
  - Caused by high speed opening shock or line overs
  - No corrective action
  - Prepare for hard landing
* Broken suspension lines
  - Variety of causes
  - No corrective action
  - Prepare for hard landing

Sg 8, fr 13

Parachute Landing Fall (PLF)

* Knees bent
* Feet together
* Eyes on the horizon
* Arms up with hands on Koch fittings
* Land on balls of feet
* Then to side of calf
* Then to side of thigh
* Roll onto your back

Sg 9, fr 1

AEROMEDICAL ASPECTS OF EMERGENCY EGRESS

* Preflight safety checks
* Leg restraint line utilization
* Seat performance
* Ejection injuries
* Seat operation
* Factors in delayed ejection
* Ejection sequence
* Parachute descent procedures
* **Emergency ground egress**
* NACES LRU-23/P Life Raft
* SAR procedures

Sg 9, fr 2

Emergency Ground Egress

* Failure of the ejection system initiation
* Canopy is open when emergency arises
* Collision with other aircraft or equipment
* Following barricade arrestment
* Minor fires, fuel spills, smoke/ fumes in cockpit, not completely strapped in

IX. Emergency ground egress **1.8.1.10.4.2**

A. Consider emergency ground egress when

1. Failure of the ejection system initiation
2. Canopy is open when emergency arises
3. Collision with other aircraft or equipment
4. Following barricade arrestment
5. Minor fires, fuel spills, smoke/fumes in cockpit, not completely strapped in

NOTE: This is a general NACES lecture - refer to the T-45A NATOPS for approved emergency procedures for ground egress.

B. Manual override handle (MOR)

1. Utilizing the MOR handle on the ground will

   a. Safe the seat

   b. Release leg restraint lines

   c. Disconnect seat kit from seat

2. Utilizing the MOR handle on the ground will NOT

   a. Disconnect oxygen/comms lines

   b. Open canopy

   c. Release Koch fittings

Sg 9, fr 3

MANUAL OVERRIDE HANDLE (MOR)

Sg 9, fr 4

Manual Override Handle

* Utilizing the MOR handle on the ground will
  - Safe the seat
  - Release leg restraint lines
  - Disconnect seat kit from seat
* Utilizing the MOR handle on the ground will NOT
  - Disconnect oxygen/comms lines
  - Open canopy
  - Release Koch fittings

Sg 9, fr 5, p 1

Emergency Ground Egress

1. Notify other crew member if possible
2. Ejection seat SAFE/ARMED handle - SAFE
3. Throttle - OFF
4. PARKING BRAKE handle - PULL
5. Canopy - OPEN

* If canopy cannot be opened

6. MDC firing handle - PULL

C. Emergency ground egress

1. Notify other crew member if possible
2. Ejection seat SAFE/ARMED handle - SAFE
3. Throttle - OFF
4. PARKING BRAKE handle - PULL
5. Canopy - OPEN

* If canopy cannot be opened

6. MDC firing handle - PULL

WARNING: Before pulling the handle, lower the helmet visor, close the eyes and keep the hands and body as far away as possible from the MDC pattern on the canopy.

* To evacuate with the survival kit

7. Upper Koch fittings - RELEASE

8. Emergency restraint release - PULL

WARNING: For water egress, pull the emergency oxygen actuator and do not disconnect the oxygen/communication hose. Inflate LPU after exiting the aircraft.

Sg 9, fr 5, p 2

Emergency Ground Egress (cont.)

WARNING: Before pulling the handle, lower the helmet visor, close the eyes and keep the hands and body as far away as possible from the MDC pattern on the canopy.

* To evacuate with the survival kit

7. Upper Koch fittings - RELEASE

8. Emergency restraint release - PULL

WARNING: For water egress, pull the emergency oxygen actuator and do not disconnect the oxygen/ communication hose. Inflate LPU after exiting the aircraft.

Sg 9, fr 5, p 3

Emergency Ground Egress (cont.)

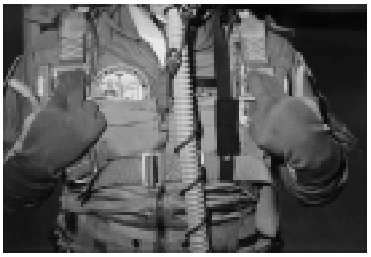
* To evacuate without the survival kit

7. Koch fittings - RELEASE UPPER AND LOWER
8. Emergency restraint release - PULL
9. Oxygen/communications hose - DISCONNECT

Sg 9, fr 6

LOWER KOCH FITTINGS

Sg 9, fr 7



UPPER KOCH FITTINGS

* To evacuate without the survival kit

7. Koch fittings - RELEASE UPPER AND LOWER
8. Emergency restraint release - PULL
9. Oxygen/communications hose - DISCONNECT

X. NACES LRU-23/P Life Raft **1.8.1.10.3.8**

A. Three inflation chambers

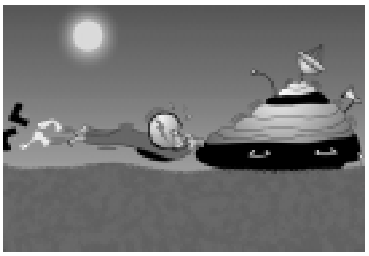
1. Main chamber inflates automatically

Sg 10, fr 1

AEROMEDICAL ASPECTS OF EMERGENCY EGRESS

* Preflight safety checks
* Leg restraint line utilization
* Seat performance
* Ejection injuries
* Seat operation
* Factors in delayed ejection
* Ejection sequence
* Parachute descent procedures
* Emergency ground egress
* **NACES LRU-23/P Life Raft**
* SAR procedures

Sg 10, fr 2



NACES LRU-23/P LIFE RAFT

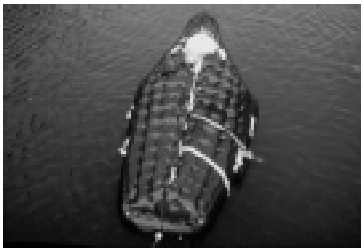
Sg 10, fr 3

INFLATION CHAMBER - DECK

Sg 10, fr 4

INFLATION CHAMBER - HOOD

Sg 10, fr 5



COLD WEATHER READY

2. Inflatable deck
3. Inflatable hood

B. Manually inflate the deck

C. Manually inflate the canopy

XI. Search and rescue (SAR) procedures **1.8.1.10.5.3**

A. First to arrive/on scene commander (OSC)

1. Orbit at an altitude sufficient to initiate the SAR effort. Initiate MAYDAY call on guard, then contact NQI APP CNTRL 300.4 MHz/ Button #13 (PRIMARY) or NQI TWR 346.0 MHz/Button #3 (ALTERNATE); or GUARD 243.0 MHz/GRD as a last resort

Sg 11, fr 1

AEROMEDICAL ASPECTS OF EMERGENCY EGRESS

* Preflight safety checks
* Leg restraint line utilization
* Seat performance
* Ejection injuries
* Seat operation
* Factors in delayed ejection
* Ejection sequence
* Parachute descent procedures
* Emergency ground egress
* NACES LRU-23/P Life Raft
* **SAR procedures**

Sg 11, fr 2, p 1

Search and Rescue (SAR) Procedures

* First to arrive/on scene commander (OSC)
  1. Orbit at an altitude sufficient to initiate the SAR effort. Initiate MAYDAY call on guard, then contact NQI APP CNTRL 300.4 MHz/Button #13 (PRIMARY) or NQI TWR 346.0 MHz/Button #3 (ALTERNATE); or GUARD 243.0 MHz/GRD as a last resort

Sg 11, fr 2, p 2

SAR Procedures (cont.)

* OSC (cont.)

2. Initial SAR report
   a. MAYDAY, MAYDAY, MAYDAY, (your call sign)
   b. Location of crash site (NQI RADIAL/DME)
   c. Type of aircraft involved and its call sign

Sg 11, fr 2, p 3

SAR Procedures (cont.)

* OSC (cont.)

   d. Number of persons in mishap and their apparent condition, or if they attempted to abandon their aircraft. Do NOT use aircrew's names
   e. Your fuel state endurance (in minutes). If low state, coordinate an on-station relief
   f. Brief description of crash site (i.e., private or public property, any obvious property damage or civilian injury)

2. Initial SAR report

   a. MAYDAY, MAYDAY, MAYDAY, (your call sign)

   b. Location of crash site (NQI RADIAL/ DME)

   c. Type of aircraft involved and its call sign

   d. Number of persons in mishap and their apparent condition, or if they attempted to abandon their aircraft. Do NOT use aircrew's names

   e. Your fuel state endurance (in minutes). If low state, coordinate an on-station relief

   f. Brief description of crash site (i.e., private or public property, any obvious property damage or civilian injury)

NOTE: After initial contact, SAR units will be switched to 282.8 MHz (SAR common) by the SAR coordinator for radar service and overall coordination.

3. IFF/SIF - emergency/7700 or as assigned by SAR coordinator

4. Use TACAN and local area charts to determine the crash position and to assist SAR units

5. Perform low altitude survey to determine aircrew's condition. If two aircraft are on scene, OSC should orbit high for comm relay

   NOTE: Student aviators 2,500 ft MSL and 250 KIAS minimum.

6. Pilots will compute a bingo fuel to land with sufficient reserve. Honor your bingo

Sg 11, fr 2, p 4

SAR Procedures
(cont.)

* OSC (cont.)

NOTE: After initial contact, SAR units will be switched to 282.8 MHz (SAR common) by the SAR coordinator for radar service and overall coordination.

3. IFF/SIF - emergency/7700 or as assigned by SAR coordinator

4. Use TACAN and local area charts to determine the crash position and to assist SAR units

5. Perform low altitude survey to determine aircrew's condition. If two aircraft are on scene, OSC should orbit high for comm relay

Sg 11, fr 2, p 5

SAR Procedures
(cont.)

* OSC (cont.)

NOTE: Student aviators: 2,500 ft MSL and 250 KIAS minimum.

6. Pilots will compute a bingo fuel to land with sufficient reserve. Honor your bingo

Sg 11, fr 3, p 1

SAR On Scene Commander's Checklist

* Identification

- Number of survivors
- Establish an order of communication
- Determine injuries
- Check all assets' time on station and equipment on board which may help pinpoint survivor location, etc.

Sg 11, fr 3, p 2

SAR On Scene Commander's Checklist (cont.)

* Location

- Request general terrain description
- Determine signaling devices
- Request beeper for homing
- Request survivor(s) give vectors to his position
- Pinpoint location of each survivor

B. SAR on scene commander's checklist

1. Identification
    a. Number of survivors
    b. Establish an order of communication
    c. Determine injuries
    d. Check all asset's time on station and equipment on board which may help pinpoint survivor location, etc.
2. Location
    a. Request general terrain description
    b. Determine signaling devices
    c. Request beeper for homing
    d. Request survivor(s) give vectors to his position
    e. Pinpoint location of each survivor

3. Recovery

   a. Brief helo and remainder of SAR team

      (1) Number and physical condition of survivor(s)

      (2) Distance to survivor(s) from a known geographical check point

      (3) Terrain description

      (4) Altitude of recovery area

      (5) Wind speed and direction

      (6) Describe survivor(s) signal devices

      (7) Describe ingress/egress routes

      (8) Emergency safe landing areas

Sg 11, fr 3, p 3

SAR On Scene Commander's Checklist (cont.)

* Recovery

- Brief helo and remainder of SAR team
  - Number and physical condition of survivor(s)
  - Distance to survivor(s) from a known geographical check point
  - Terrain description
  - Altitude of recovery area

Sg 11, fr 3, p 4

SAR On Scene Commander's Checklist (cont.)

* Recovery (cont.)

- Wind speed and direction
- Describe survivor(s) signal devices
- Describe ingress/egress routes
- Emergency safe landing areas

Sg 11, fr 3, p 5

SAR On Scene Commander's Checklist (cont.)

* Recovery (cont.)

- Direct survivor(s) to
  - Prepare and ignite smoke
  - Vector helo if necessary
  - Retain helmet for recovery

b. Direct survivor(s) to

(1) Prepare and ignite smoke

(2) Vector helo if necessary

(3) Retain helmet for recovery

SUMMARY

In this lesson, you covered the procedures and techniques for:

* Preflight Safety Checks
* Leg Restraint Line Utilization
* Seat Performance
* Ejection Injuries
* Seat Operation
* Factors in Delayed Ejection
* Ejection Sequence
* Parachute Descent Procedures
* Emergency Ground Egress
* NACES LRU-23/P Life Raft
* SAR Procedures

CONCLUSION

This lesson is theoretical preparation for hands-on exploration of NACES. Familiarity with and mastery of the ejection seat system will enable you to react quickly and possibly save your life.

Sg 12, fr 1

AEROMEDICAL ASPECTS OF EMERGENCY EGRESS REVIEW OPTIONS

1. Entire lesson
2. Preflight safety checks
3. Leg restraint line utilization
4. Seat performance
5. Ejection injuries
6. Seat operation
7. Factors in delayed ejection
8. Ejection sequence
9. Parachute descent procedures
10. Emergency ground egress
11. NACES LRU-23/P Life Raft
12. SAR procedures
13. End this lesson

Please click on your selection.

Sg 12, fr 2

THE END

NOTES