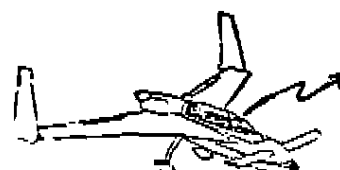
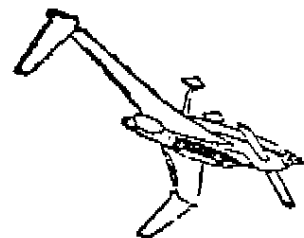
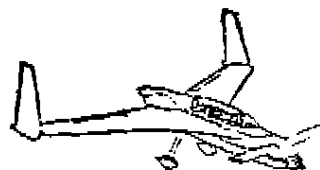
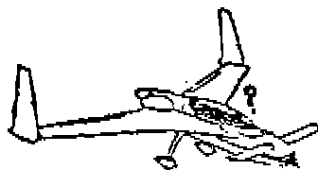


FORMATION FLYING

BY NORM HOWELL, USAF



"COL RUTAN,
DO CONTROL
YOURSELF

THE

EZ

WAY !!

FORMATION FLYING - WHY + HOW

RULES - F.A.R. 91.65

THE NO-NO'S

MUTUAL SUPPORT

② FUN!! ②

BUT... FAR'S DON'T SAY

WHAT TO BRIEF!!!

GOOD FORMATIONS START WITH
A GOOD BRIEFING

UNSAFE FORMATIONS DON'T BRIEF

- Doesn't have to be this detailed
- At least cover:
 - Call Sign
 - Route / Altitude of flight
 - Radio Channel Changes
 - Recovery, Pattern + Landing

VISUAL

START ENGINE/RUNUP
(or)
PITCHOUT

RADIO CHANGE

FUEL CHECK

Tighten FORMATION
OR REJOIN
LOOSEN FORMATION

CROSSUNDER

SIGNALS

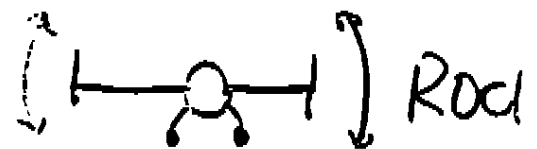


TAP HEADSET
PREBRIEFED

TWO

EIGHT

Drinking Motion



MORE VISUAL SIGNALS

ECHELON TURN

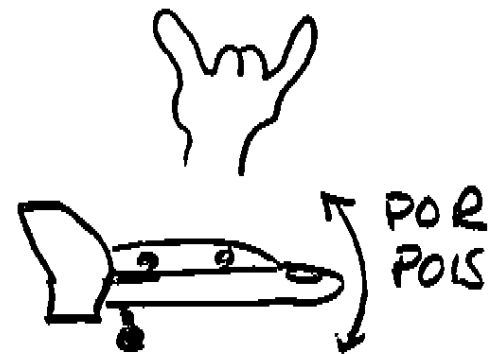
TACTICAL OR ?

XMITTER OUT

RCVR OUT

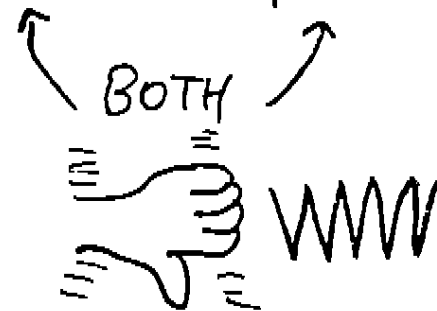
RADIO FAILURE

LAND NOW



Wave hand in front of nose

Wave hand by ear



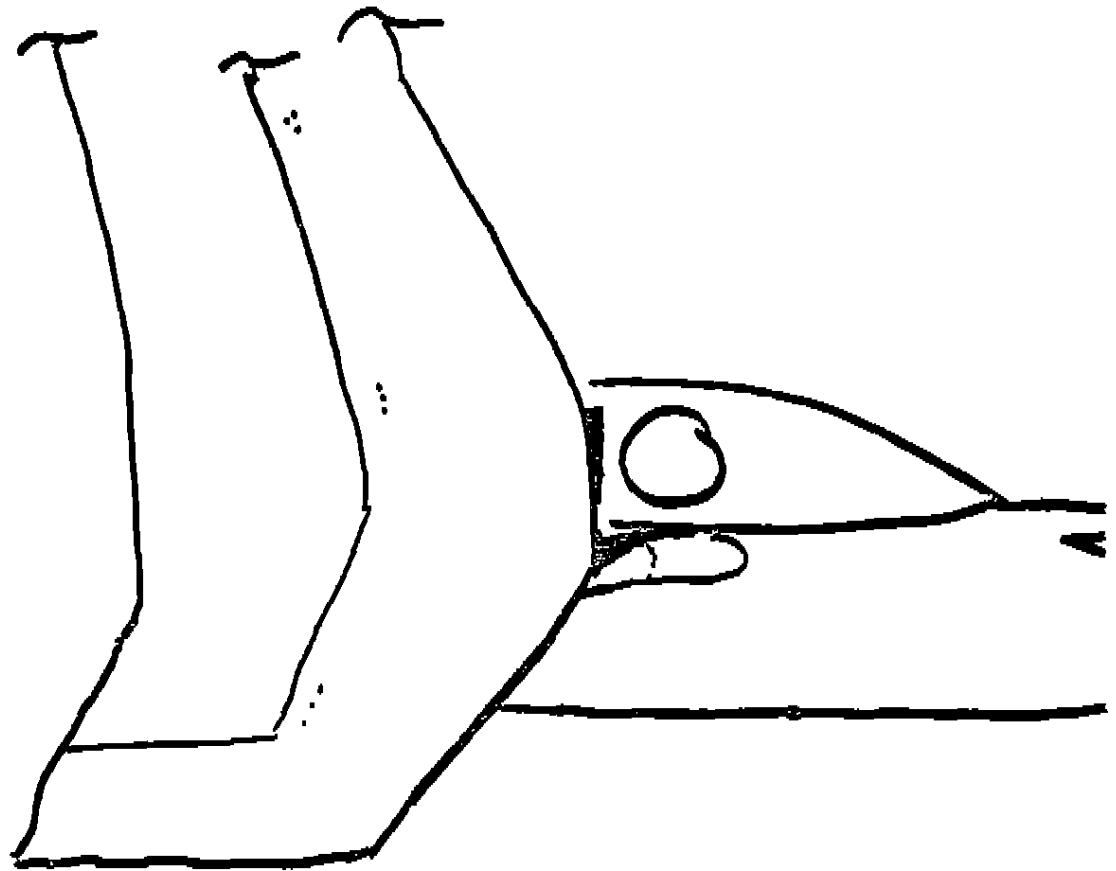
NORDO W/ EMERGENCY!

HEFOE SYSTEM

FIST @ TOP
OF CANOPY, THEN:

- 1) Hydraulic
- 2) Elec
- 3) Fuel
- 4) Oxygen
- 5) Engine

FLYING THE WING

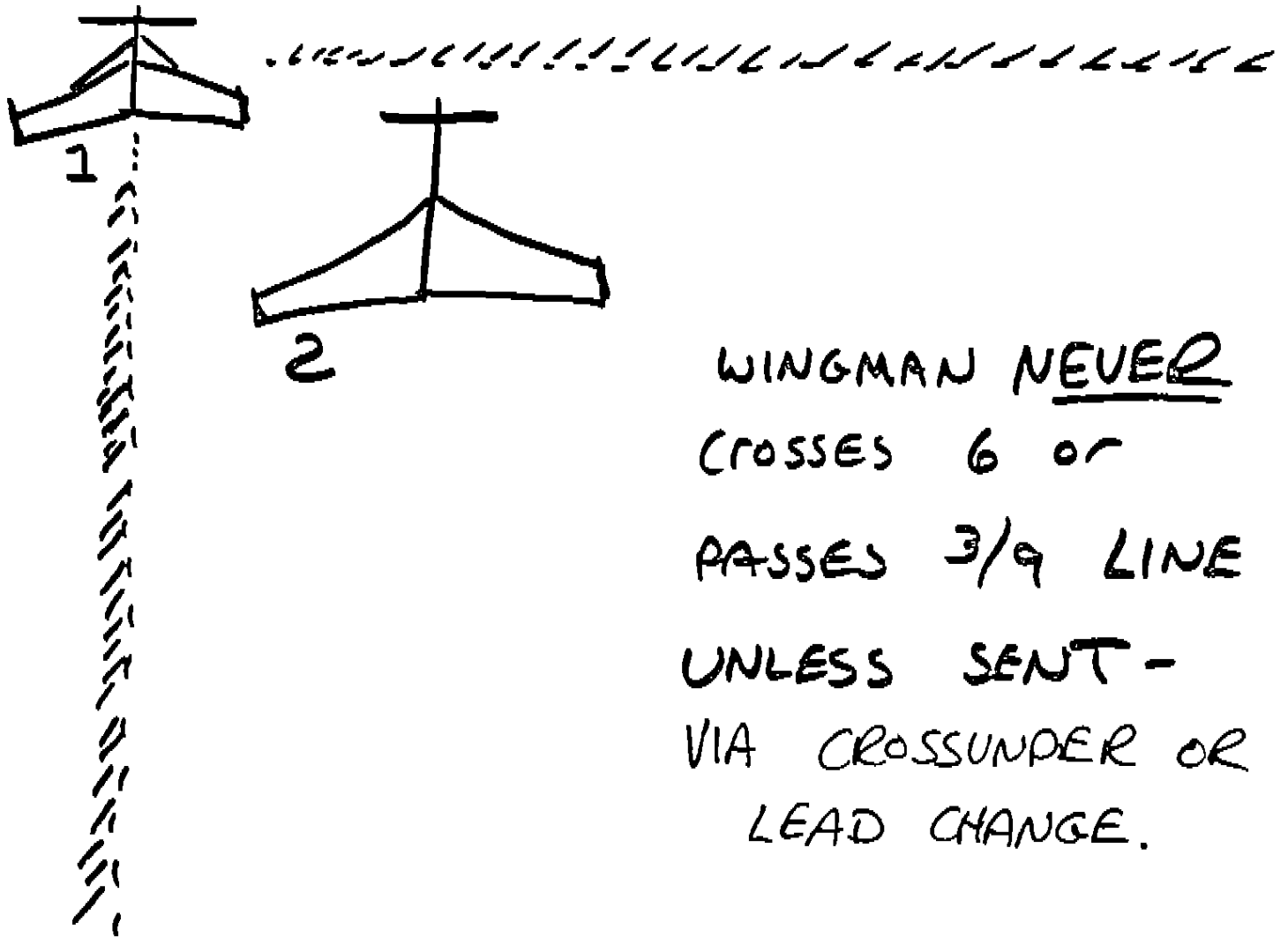


"3 D"
+ RELAX!

- 1) LOOK DOWN
WING LINE (LEVEL)
- 2) WINGLET BEHIND
F/C/P HEAD (FORE/AFT,
- 3) MAINTAIN COMFORTABLE
LATERAL SPREAD

RELATIVE POSITION IS EVERYTHING!

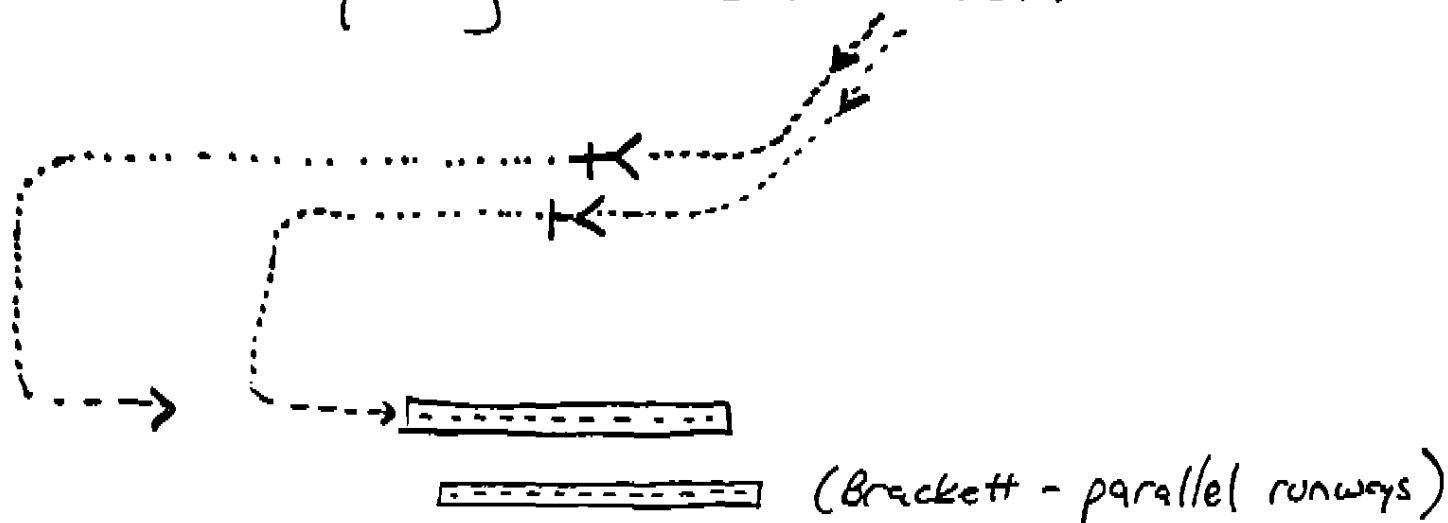
WINGMAN POSITION



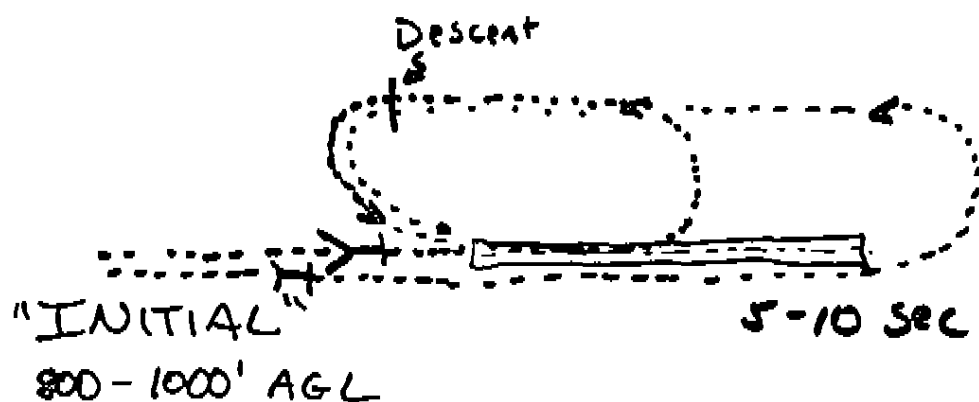
WINGMAN NEVER
CROSSES 6 or
PASSES 3/9 LINE
UNLESS SENT -
VIA CROSSUNDER OR
LEAD CHANGE.

FORMATION BREAKUP IN THE PATTERN

1) Take spacing on BASE TURN

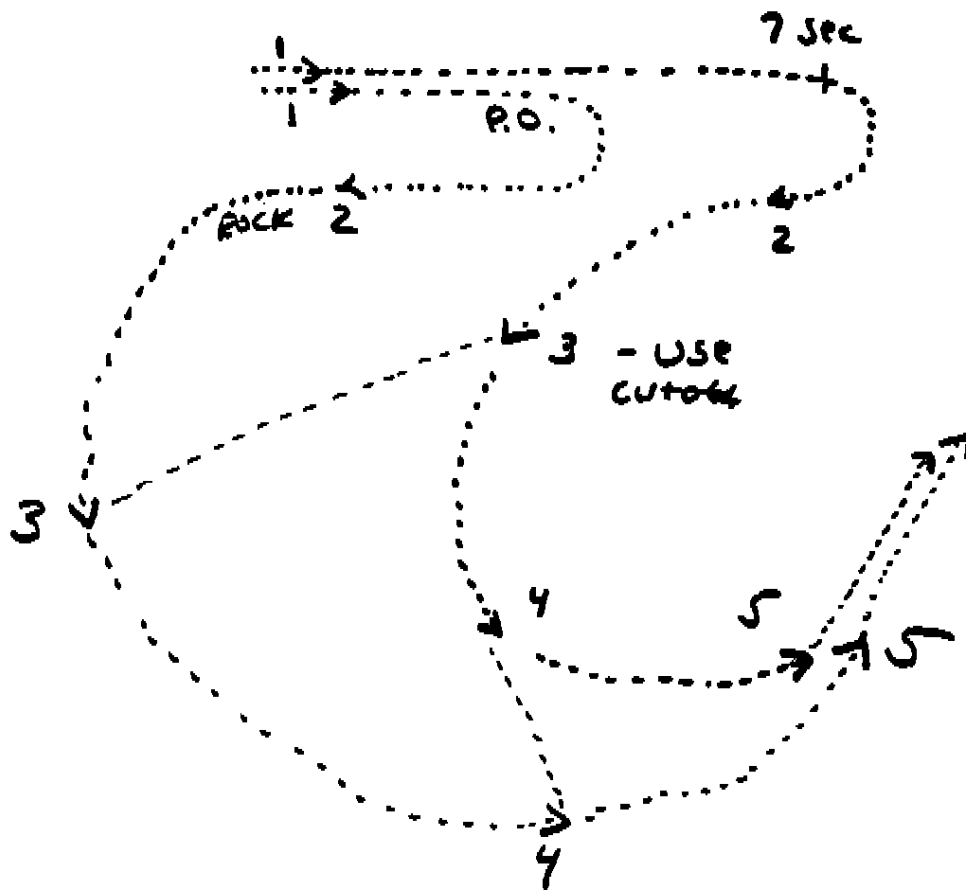


2) 360° Overhead Pattern



PITCHOUT AND REJOIN

- Practice Rejoins - Turn & St Ahead



USE GEOMETR
'STEAD OF

GRUTE
FORCE

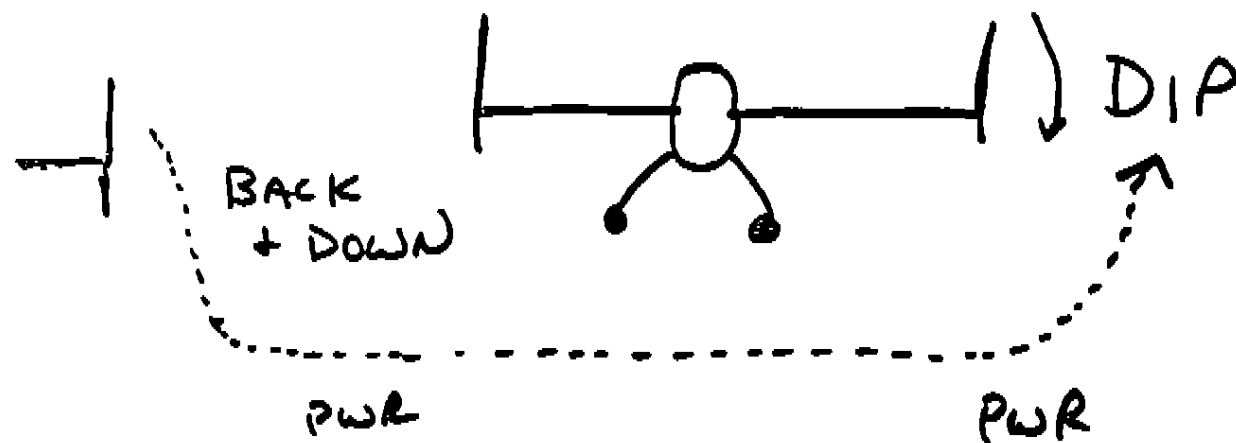
PRACTICE THESE LEFT AND RIGHT

USE 20-30 knots overtake

OVERSHOOT!?!/

9

CROSS UNDER



COMMON "MISSTEAKS"

- Using too much bank
- looking at + flying at #1
- forgetting about power + dropping aft

REMEMBER IT ONLY TAKES
1° or 2°

OF HEADING DIFFERENCE TO CROSS
TO THE OTHER SIDE! RELATIVE
MOTION! (10)

NORM'S NOTES

Disclaimer - A presentation you listen to is no substitute for inflight instruction - ~~use what you want and don't use what you don't want~~ "It's better to be safe than to look back!"

(No No #1) 2

Formation Flying - Why + How

Rules - FAR 91.65 "Operating near other Aircraft"
to maintain ops

No. No #2

W. W. Support

Fun!

Difference FAR2 - What to Brief and what to do?!

Good formation starts with a good briefing

No
No #3!

Cell Sign

WX

Norms - T.O. - Departure - Rejoin ~~Re~~ Type - Airspeed

Route of Flight

Altitude of Flight

Radio Frequencies + Changing
maneuvers and Parameters

Rejoin Airspeeds

maneuver Limitations

Lead Change - Visual / Radio

Ops Checks - Fuel, Oil PSI, Electrical system, Temps

Emergency Procedures

Eng failure

Mid Air Collision Potential

NORDO (HEFOE system)

Breaking out Sight (Lead)

Hexad to Flight

in front of or underneath

field to Do So

(11)

Recovery to Airport

Pattern Type / Flight Break up / Landing

Text Book

Debrief (Important!)

Briefing ^{Need} Not be this detailed - cover as minimum call signs
Route of flight, radio changes recovery Pattern + Landing

Heard / Visual signals

Start Engine / Precision / Runup

Radio Channel Change (incl preferred 122.77)

Fuel Gauging Increase Power Decrease Power

Cross up's - Loosen Formation - Tighten Formation
24 4 Rejoin

Echelon Turn

HEFOE, NOBBO, Rec Fail, Xmit Fail

Lead Immediately + Descend to Lower Altitude

Tactical Formation (Line Abreast)

Gear Down (Nod)

Landing Break Down (Nod)

Visual Lead Change

Ops Check

Ground Ops - St Engines - Listen to ATIS - 3 min - Good Frig

Takeoff

Wing T/O Not Recommended - Advanced!

Lineup - wingsman - Upwind

10 sec T.O. Spacing or parallel runways

Rejoin After Takeoff

Seq. Altered

Turning - cover sector

Lead Responsibilities

Clear

Plan Flight

Monitor Wingman

No-No # 4 and 5

Wing Responsibilities

Be in position

Have Discipline

Clear thru lead

Break out if needed (No-No # 6)

Flying the Wing

Relax position + motion

Level with wing L.E.

Winglet behind head

Close enough - be comfortable - see airplane Route vs close

Relax!

Turn into (collision avoidance)

Turn away

Lozy 8 + wing work practice - fun!

No-No - II ? + 8 - wing position contract

Pitchout and Rejoin

Visual Signal

Pitch out

Signal for Rejoin

Principle - Use known airspace advantage and

angular cutoff (picture)

Overshoot behind + outside - not natural

Cross under

Visual Signal

Drop down + back

Adding Distance! not Bank D.

Add power

move into position

Echelon Turn

Vis. sign.

Tough! match bank -

Sticks = In Out

Bank = Up Down

More Power = Outside of Turn

Match Bank in Rollout

Use in Pattern?

Break out

S H 1 T

Lost Wingmen (Wx)

Level 15-15 sec

Turn Toward

Turn Away

Lead - Take Charge! Get outside split

Trail Formation

More advanced

Use extra power when bank rises

Fuse Aligned

Lead Lower 1/2 of wingspan

Watch Red line!

Returning to Airport

Break up flight?

Turn to Base (parallel runways)

360° Overhead pattern - 10 seconds

Wing Landing - Advanced! BSOTP

Taxi Back

As Flight or Signals?

Debrief

FORMATION BRIEFING GUIDE

Call Sign

Weather and NOTAMS

Takeoff: Lineup, Type Takeoff (10 second spacing)

Joinup after Takeoff: Type, Rejoin Airspeed

Route Of Flight

Altitude Of Flight

Radio Frequencies to be used and manner of changing

Maneuvers and Parameters

Maneuver Limitations

Rejoin Airspeeds

Ops Checks: Fuel, Oil Psi, Temps, Electrical Sys

Lead Change: Visual/Radio

Emergency Procedures

Offer lead to stricken aircraft

Total engine failure

Mid Air Collision Potential

Transmitter/Receiver Failure, or NORDO

Emergency with NORDO: HEFOE System

Breaking Out of Formation S.H.I.T

Lost Wingman.

Recovery to Airport

Pattern Type/Flight Breakup/Landing

Taxi Back/Ground Ops

Debrief

IT'S BETTER TO BE LATE THAN TO LOOK BAD

Remember the No-No's!

1. **Never** attempt formation flying without having received proper instruction in flight.
2. **Never** "drop in" on an airplane or another formation. Remember FAR 91.65!
3. **Never** attempt formation flight unless you are confident of the other pilot's ability and judgement.
4. The leader **never** does anything abruptly.
5. The leader **never** takes the formation into dangerous conditions.
6. The wingman must **never** lose sight of the leader.
7. You should **never** attempt to operate a camera or camcorder while flying on the wing.
8. The wingman should **never** cross lead's 3/9 line unless being offered the lead.

FORMATION VISUAL SIGNALS

Start engine, runup, pitchout - index finger describes a circle horizontally

Radio channel change - Tap headset, then signal frequency

Prebriefed "common" frequency - hold up fist

Manual frequency - signal numbers one at a time, pull hand out of view between digits, fist for "0", fingers vertically for 1 thru 5, horizontally for 6 thru 10.

Fuel Quantity Check - perform drinking motion with hand. Answer back # of gallons remaining, or "OK" signal.

Increase Power - Left fist moves forward

Decrease Power - Left fist moves aft

Loosen formation - Yaw aircraft (watch Dutch roll)

Tighten formation or rejoin - Rock wings

Echelon turn - hold up 1st and 4th fingers in a "ram's horn"

Transmitter Failure - wave hand in front of mouth, side to side

Receiver failure - wave hand by ear, back and forth

Total Radio Failure - Do both the above (Helen Keller)

NORDO with another Emergency - HEFOE System

Hold fist at top of canopy, then signal digits 1 thru 5, as appropriate: 1) Hydraulic, 2) Electrical, 3) Fuel, 4) Oxygen, 5) Engine.

I Must Land Immediately - Fist at top of canopy, thumb pointing down, then move fist rapidly up and down

Descend to a Lower Altitude - Hand held flat, palm down, make descending motion

Tactical Line Abreast - Porpoise aircraft

Lower Gear - Fist over shoulder, thumb down. Execute on head nod.

Lower Landing Brake - Make biting motion with hand. Execute on head nod.

Lower Flaps - Hand over shoulder, then bend down at wrist. Execute on head nod.

Visual Lead Change - Yaw aircraft to loosen formation. Make fist with 1 finger held up, then move back and forth three times, third time wind up with 2 fingers up. Wingman moves up, big head nod as he passes 3/9 line, lead changes at that point. Switch responsibilities, new leader rocks in new wingie. "Lead wags and points, 2 nods and rocks."

Ops check, descent check, etc. - Make checkmark sign with hand

Condition OK - make "OK" sign with hand

Cross Under - Dip wing to desired side