

STANT



**347 TFW
DOW**

NEW INFORMATION PAMPHLET NO.28

AN/APX-80A
SEE YOU IN A FLASH

OR ...



SHOW US YOUR SQUAWK!

MAR 80

MAR 80

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347TFW/DOW Says:

THANKS! - to Mr Jim Mayo and the personnel of the CRS/COM-NAV Shop for their assistance in compiling this NIP.

CRS/COM-NAV Shop is located in Bldg 757, phone 3492. Feel free to visit with Mr Mayo, and the CRS/COM-NAV personnel - a visit will increase your knowledge of the system and maintenance considerations.

"This stuff reminds me of pornography written by a ten-year-old kid"

Major Max Burner, USAF



When the rubble of Man's Folly is being excavated by builders of the next civilization, they will bear witness to the destiny of our plight. On the bottom of the heap will be found the glorious warriors—the ones who died first—knowing nothing of themselves or their enemy. Higher in the debris will be found the bodies of those who lacked not desire, but capability. And beside them, those whose ability lacked determination. And, what of those warriors who knew their enemy and were prepared? Some are atop the rubble; they died leading those below. Some were rejected before the fight and cannot be found. And to the rest..... the Burden of Victory!

414th FWS

IFF INTERROGATOR

1. INTRODUCTION:

a. The AN/APX-80A can be quite useful during combat and training operations. Positive ID through use of part of this system led to some BVR and night MIG Kills in SEA. Red Flag operations have proved the value of the APX-76 portion of the APX-80A by allowing crew members to sort out players/threats without requiring a radar skin paint (skin paints don't tell you what you need to know anyway). This allowed them to anticipate or avoid the threat. The AN/APX-81A portion is not installed in 347TFW aircraft for training missions.

b. The AN/APX-80 is useful during training for:

1. Intercept training.
2. Tanker rendezvous
3. Positive ID.
4. ACBT/DACT training. (The real war will be multi-bogey and multi-bandit).
5. Mid-air collision avoidance.
6. Determination of threat positioning during low altitude ingress (The real war will be multi-bogey and multi-bandit). Primary air-to-ground units can not expect to carry out their mission unopposed by enemy air. To assume no or low opposition, ignores the realities of aircraft numbers and types available to enemy Air Forces. Air-to-ground units must not only be configured with air-to-air munitions for self-defense, but also trained to survive against the air threat.

» c. WE PREFERABLY WOULD HAVE THE AN/APX-81 PORTION INSTALLED FOR COMBAT OPERATIONS.

2. REFERENCES: (For more detailed info)

- a. T.O. 1F-4E-34-1-1-2. (Classified)
- b. FWS Text, "Aerial Attack-APX-81A Appendix". (Classified)

3. MAINTENANCE of the system is related to the manning of the CRS/COM-NAV shop, training of maintenance personnel, availability of parts, time available to work on the aircraft/system and the quality of aircrew writeups.

4. AIRCREW WRITEUPS AND TROUBLE SHOOTING (AN/APX-76).

a. Did the Loop check work? It is possible for the Loop check to work properly due to the close proximity of the on board IFF; and the system still may not work when airborne. This could be because of a bad cable in the system.

b. Did the system work properly against known airborne squawks? The Loop check could be bad, but the system could still work properly when airborne if your on board IFF was bad (i.e., didn't trip the Loop check).

c. Did green CHAL light illuminate when you attempted to interrogate?
With the interrogate button? With the TEST/CHAL switch in TEST? ...in CHAL?

d. It is possible to receive APX targets even though a fault condition exists (i.e., no green CHAL light when interrogating) in both the APX TEST position and in normal operation. Be sure to note this during system debrief.

e. If there is no radar video (with radar in Operate) and all other functions of the radar appear normal, it is probable that there will be no APX targets since radar video and APX video are mixed. (Note that the AN/APX-76 is designed to work properly with the radar in the STBY mode. Interrogating with the radar in Standby removes clutter from the scope).

f. What was the position of the RCP Video Select Button and the FCP Scope Display Select Switch, if there was a PAVE SPIKE pod loaded and connected to the aircraft? See Note 3 on page 12.

5. THE SYSTEM:

a. The AN/APX-80A is an IFF Interrogator capable of interrogating friendly IFF systems. This system has combined the best qualities and versatile capabilities of its predecessor the AN/APX-76 to enhance reliability and aircrew tasking. It also controls the AN/APX-81A. The capabilities of the AN/APX-81A are classified (see T.O. 1F-4E-34-1-1-2).

b. Overview

- (1) Switch Functions
- (2) AN/APX-80A Displays
- (3) AN/APX-80A Bits
- (4) AN/APX-80A Tactical Application (for detail see your weapons officer).
- (5) AN/APX-81A (Ref -34-1-1-2 and FWS Text)

6. AN/APX-80A SWITCHOLOGY: Figures 1 & 2 show the Interrogator Set Control Panel used to select modes and codes, monitor system performance, and self test. The AN/APX-80A control panel is used to select modes and codes for MK-X SIF/MK-X11 Mode 4 transponder reception.

a. Mode Select Switch. This button switch, located in the upper left corner of the control set, selects the AN/APX-76A MK-X or MK-X11 modes to be interrogated/received. It has six selectable positions: 1, 2, 3, 4a, 4b, and Blank (white square). Positions 1, 2, 3 select the MK-X mode and positions 4a/4b select the secure mode 4 of the MK-X11. Mode 4a selects the code of the day at launch time and 4b selects the immediate follow-on code. The blank position turns the AN/APX 76A to Standby. The different modes are selected by depressing

AN/APX-80A CONTROLS & INDICATORS

F-4E

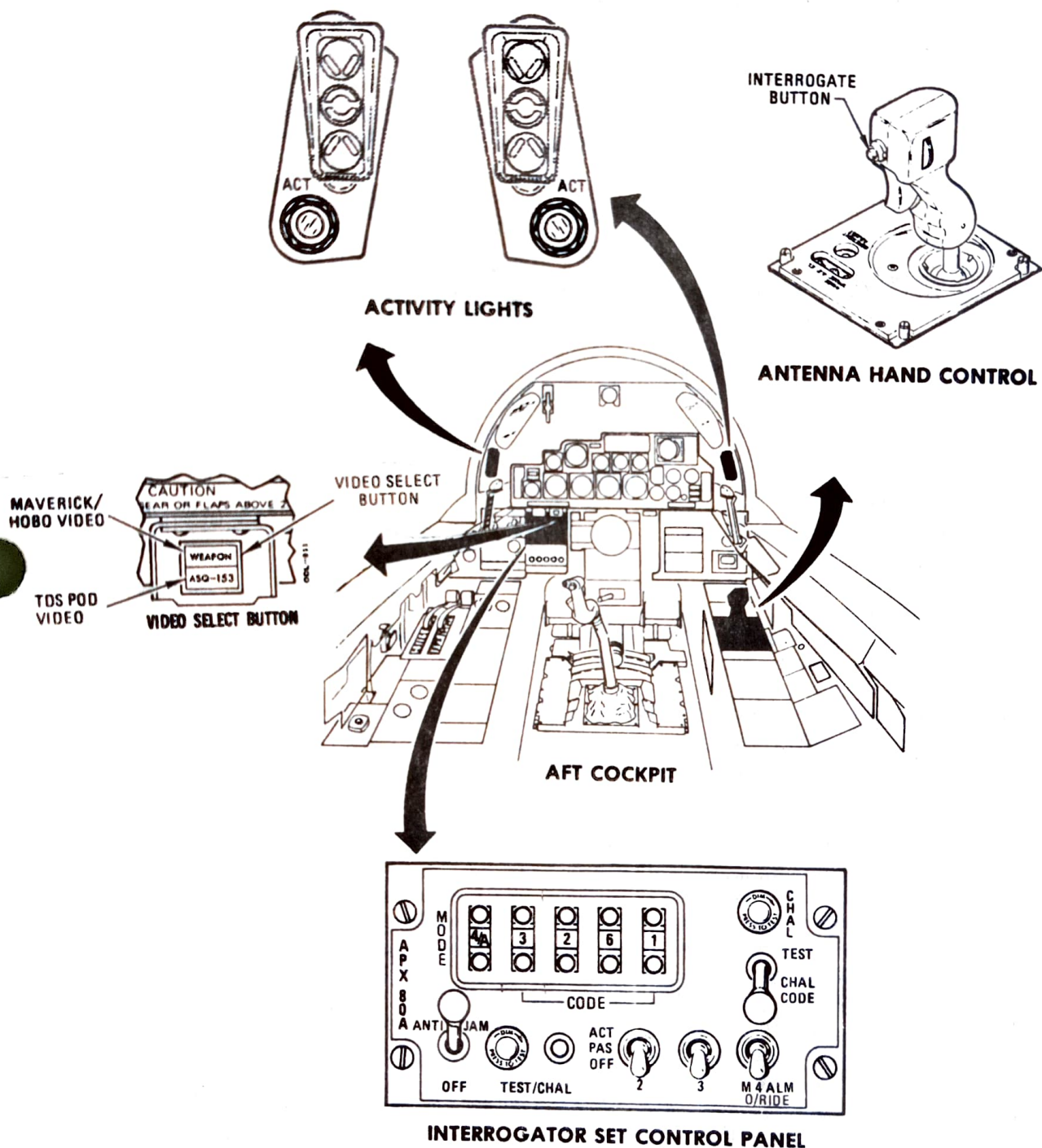
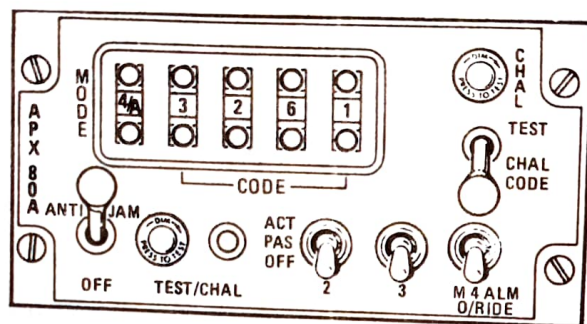


Figure 1 AN/APX-80A Controls and Indicators

the buttons located above and below the display window. The upper button advances the mode selector and the lower button reverses the mode selector. When position 4b is selected, the mode cannot be advanced further; therefore, to go from 4b to the Blank position, the lower button has to be pressed and the modes cycled through to Blank (white square in view in the window = Standby).



INTERROGATOR SET CONTROL PANEL

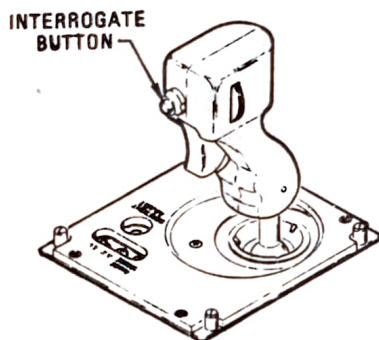
Figure 2 AN/APX-80A Control Panel

- b. Code Select Switches. These button switches, located adjacent to the mode select switch, control the 4 digit codes which can be set in modes 1, 2, or 3. They serve no function for modes 4a/4b (modes 4a/4b must be set on the ground by avionics personnel). Each window displays digits 0 through 7 and codes are selected by depressing the buttons above and below the window. The upper button advances the numbers and the lower button reverses the numbers.
- c. Challenge Light. The Challenge Light (Labeled CHAL), located in the upper right corner of the control panel, is illuminated during AN/APX-76A Interrogations and during AN/APX-76A Self Test Interrogations.
- d. TEST/CHAL Code Switch. This 3 position switch, located on the right side of the control panel under the CHAL Light, accomplishes two functions. The upper portion, labeled TEST, is used to initiate the loop test function of the AN/APX-76A, using the onboard MK-X11 Kit Transponder. The lower position, labeled CHAL CODE, interrogates for a specific mode and code only. (Responses different from the selected mode and code are not displayed on the AN/APQ-120 Radar Scope). The center position disables both the TEST and the CHAL CODE functions described above.
- e. Antijam Switch. Located in the extreme lower left hand corner of the control panel, this switch was designed for ANTIJAM CONTROL. It is not electrically connected.
- f. Mode 4 Alarm Override Switch. Is not connected/functional in 347TFW aircraft.

g. TEST/CHAL LIGHT and BUTTON SWITCH. These controls, located in the lower left on the control panel adjacent to the Antijam Switch, serve to bit check the AN/APX-81A system.

h. AN/APX-81A type 2 and 3 Interrogator Control Switches. Due to classification, these control switches and their function will not be discussed in this NIP. Refer to -34-1-1-2 for information pertaining to the APX-81A.

i. AN/APX-80A Interrogate Button. Located on the top front of the radar antenna hand control (Figure 3), this button when depressed transmits interrogation pulses from the AN/APX-76A. The AN/APX-76A will interrogate 5 to 10 seconds with the button held depressed. At the end of the interrogation cycle the button has to be released and depressed again to start each interrogation cycle. See Note 3 on page 12.



ANTENNA HAND CONTROL

Figure 3 Antenna Hand Control and
AN/APX-80A Interrogate Button

j. AN/APX-81A Activity Lights. The Activity Lights are located under the angle of attack indexer lights in the rear cockpit of the F-4E. Their operation pertains to the AN/APX-81A and will not be discussed in this text. See T.O. 1F-4E-34-1-1-2 and FWS text.

k. Control Transponder Set. This unit (Figure 4), although not part of the AN/APX-80A, includes numerous switches and indicators associated with the control of the On-Board MK-X/X11 Transponder. The operation of the AN/APX-80A is not directly effected by the Transponder Control, however the loop test operation of the AN/APX-76A requires that the Transponder be enabled and that the Transponder modes and codes be compatible. The controls affecting the AN/APX-76A Loop Test are:

- (1) IFF-Mode 4 ON-OFF: Place in ON
- (2) Code-Hold-A-B-Zero: Place in A
- (3) Master-OFF-STBY-LOW-Norm-Emerg: Place in Low (Squawk Low)

1. The KIT-1A/TSEC and KIR-1A/TSEC installed as part of TCTO 1F-4E-551 and TCTO 1F-4E-587, provides the MARK XII secure IFF for the F-4. Both units are located in the lower equipment bay and are coded before flight. The KIT, which receives and responds to Mode 4 interrogations from other stations, is used to check AN/APX-76A Mode 4 capability. (The KIT is in turn checked for proper operation if the IFF is not replying to Mode 4 interrogations, the cockpit MASTER CAUTION light and the IFF Warning Light on the telelight panel will illuminate.) The KIR contains the Mode 4 interrogation code which enables the AN/APX-76A to trigger other Mode 4 equipped transponders.

IDENTIFICATION SYSTEM CONTROL PANEL

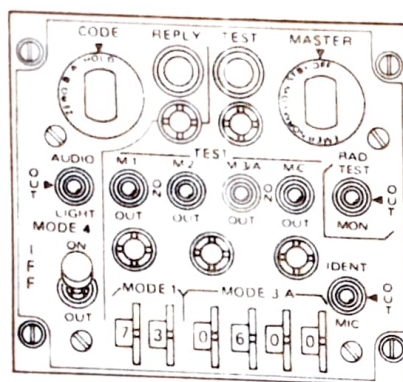
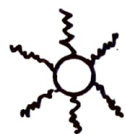
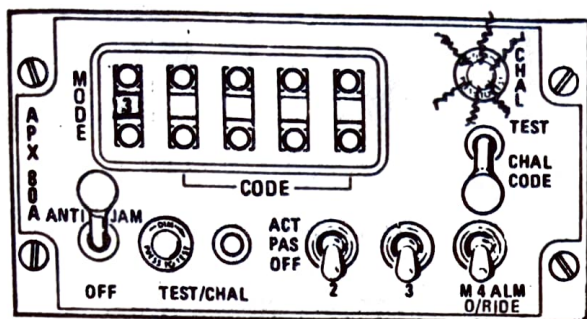


Figure 4 Control Transponder Set

7. SCOPE DISPLAYS: A multitude of radarscope displays and Indicator Lights occur depending upon the circumstances and whether the AN/APX 76-A, AN/APX-81A or both are activated. Operation Displays are presented here for the AN/APX-76A only; Refer to -34-1-1-2 for AN/APX-81A Displays. For simplicity and ease of interpretation of the various displays, illustrations of the radarscope, AN/APX-80A control panel, and activity lights will be used.

a. AN/APX-76A Displays

(1) Interrogation of Mode Responses from Two Aircraft. When Interrogation is initiated, by using the interrogator button on the hand control, MK-X/X11 replies are displayed from any transponder within range. With Mode 1, 2, or 3 selected, and without regard to code selection, a single line is displayed and the CHAL Light is illuminated. The mode line is 0.5NM nearer in range than actual target position except for 100 and 200 NM scope ranges. At these ranges it is displayed 1NM nearer. Figure 5 illustrates a Mode only response from two targets.



Indicates that the light is illuminated

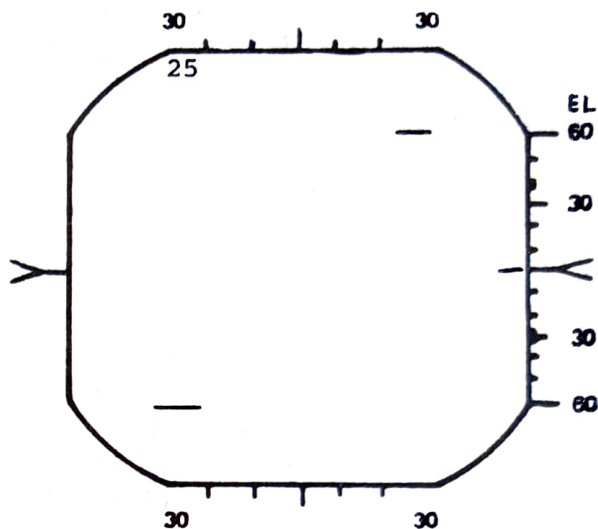
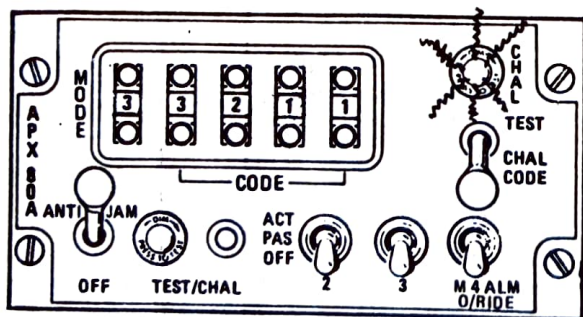


Figure 5 AN/APX-76A Interrogation With Mode Only
Responses from 2 Aircraft (no skin paints)

(2) Interrogation of Both Mode and Code Responses. When the four digit code of the target transponder is selected, as well as the mode, an additional line appears on the display 0.5NM farther in range than the target (1NM in 100 and 200 NM scope ranges). Note: To receive a Mode 1 correct code reply, the last two digits in the code window must be zero. Figure 6 shows the display with both mode and code selected on the AN/APX-80A control panel.



Indicates that the light is illuminated

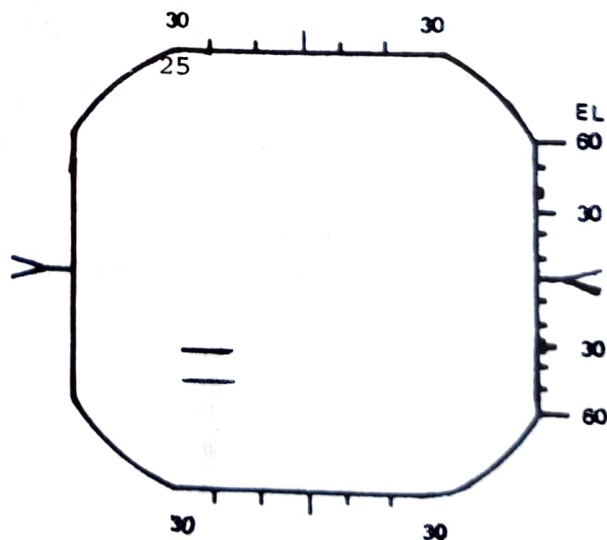


Figure 6 AN/APX-76A Interrogation: Shows
Mode Plus Code Response from 1 aircraft
(No skin paint)

(a) Note that activation of the CHAL Code switch eliminates all target responses that are not the same code as that selected on the AN/APX-80A control panel. In some cases, at very long ranges, even with the correct code selected, only a mode line is displayed due to weak signal strength. In Mode 4 (4a or 4b) selection, regardless of the code selection, or even if no code is selected, the display always contains both mode and code lines from a target response.

(3) AN/APX-76A and AN/APQ-120 simultaneous displays. When the radar is used in conjunction with the AN/APX-76A, the radar skin paint appears in between the Mode and Code lines, as shown in Figure 7.

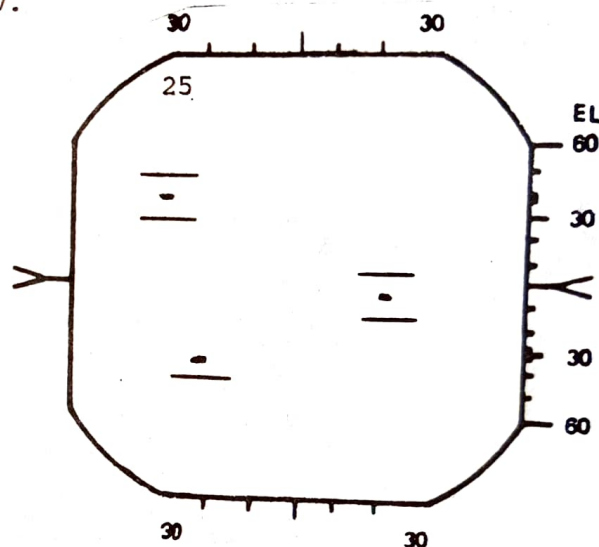
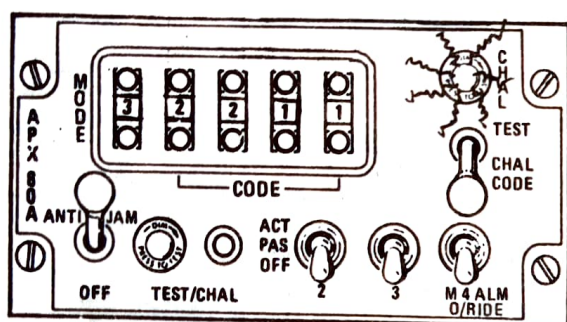


Figure 7 AN/APX-76A Interrogation: Two Mode and Code Responses with Radar Skin Paints; one Mode only response with Radar Skin Paint (Here interrogating with Interrogate button on Radar Antenna Control Handle; 2 Aircraft squawking 3-2211 and 1 aircraft squawking 3 but with a different code).

(4) Displays associated with the MK-X11 IFF/SIF AND/OR Emergency Squawk. Various unusual displays are encountered when the AN/APX-76A receives an IDENTIFICATION (IDENT) or EMERGENCY Squawk. Generally, they consist of one or more additional lines (up to three pairs) depending on which AN/APX-76A mode or code is being interrogated. Normal displays should occur when receiving a Mode 2 or Mode 3 IDENT. Multiple displays will occur for Mode 1 IDENT and Emergency. Figure 8 shows an example of a possible IDENT display. If the aircraft being interrogated is transmitting in EMERGENCY, various multiple line displays are possible depending on the mode and code selections on the AN/APX-80A control panel and on the IFF/SIF switch selection in the target aircraft.

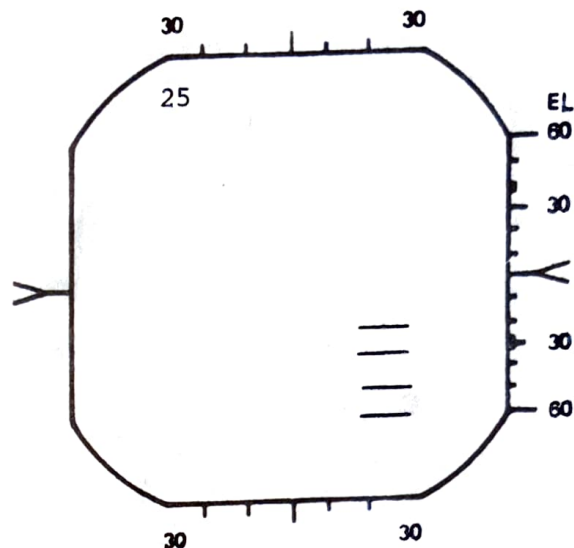
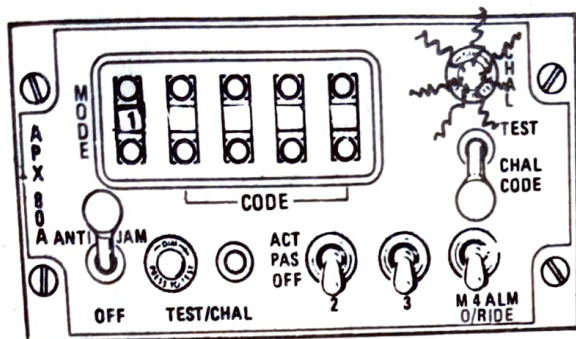


Figure 8 Possible AN/APX-76A Interrogation of Target Transmitting Ident with the mark X11 IFF/SIF

8. AN/APX-80A DISPLAYS WITH RADAR LOCK ON. All AN/APX-76A modes are usable with an AN/APQ-120 Radar Lock on. Responses are displayed in the B-sweep. Figure 9 depicts an AN/APX-76A interrogation with a Radar Lock on.

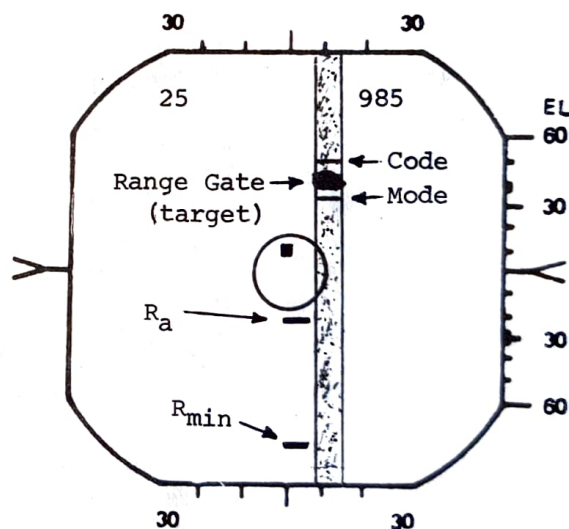


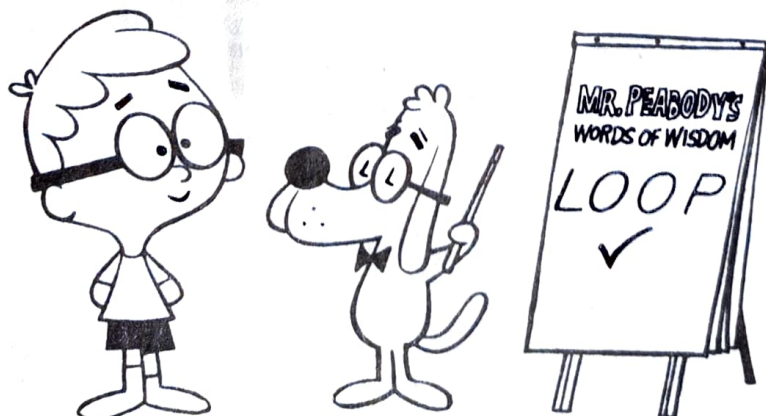
Figure 9 AN/APX-76A Interrogation of Target after Lock-On

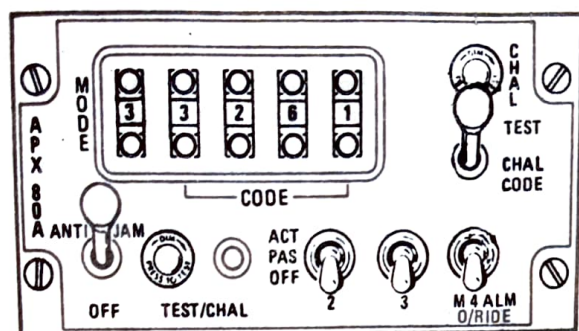
8. LOOP CHECK:

a. The check out of the AN/APX-76A is accomplished through the use of a loop check. Basically, the AN/APX-76A interrogates the aircraft's On-Board IFF/SIF through Back-Lobe Radiation, and if the AN/APX-76A and Transponder are operational, a mode and code line is displayed on the radar scope at 3.5NM and 4.5NM respectively. The proper procedures are (after engine start and on internal power):

- (1) (WSO) Radar-Stby
- (2) (WSO) Radar Mode - MAP-B/Radar
- (3) (WSO) Radar Range - 10
- (4) (WSO) DSCG Scope - RDR
- (5) (WSO) AN/APX-76A-Mode-Set (As Desired)
- (6) (WSO) AN/APX-76A-Code-Set (As Desired)
- (7) (AC) Mode 4-4a (If Required)
- (8) (AC) Mode 4 Tone/Light-Set (As Desired)
- (9) (AC) IFF/SIF Master Switch-Stby
- (10) (AC) IFF/SIF Mode-Enabled (Proper mode selected)
- (11) (AC) IFF/SIF Code-Set (As Desired)
- (12) (AC) IFF/SIF Master Switch - Low
- (13) (WSO) CHAL Code/Test Switch - TEST

b. The WSO should note an AN/APX-76A interrogate light (green CHAL light) plus two IFF markers extending completely across the scope at 4NM, (one line at 3.5NM and the other line at 4.5NM) as shown in Figure 10. The test period will last a maximum of 10 seconds. Note that you will receive two lines if testing correct Mode and Code. You will receive only the bottom (near) line if the correct Code is not set. In the Loop Check, a third target (line) may appear; usually below (nearer than) the Mode line. This is known as a "Phantom Pulse". This pulse may also occur for any returns within 1 mile of the aircraft.





INTERROGATOR SET CONTROL PANEL



Phantom Pulse May Appear

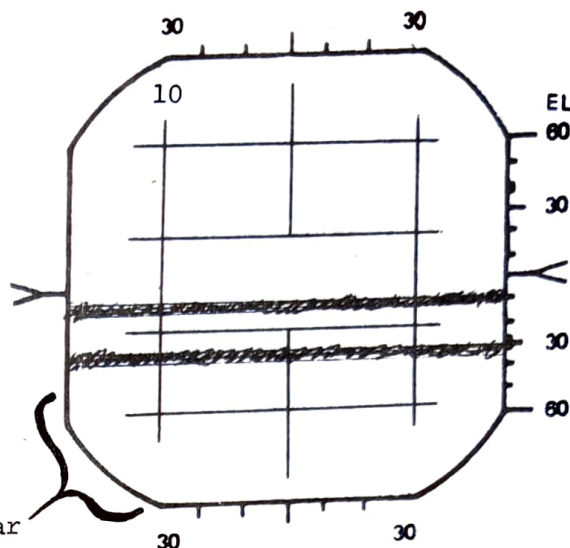


Figure 10 AN/APX-76A Loop Check Display

c. There is a 90-120 second warmup time for the MK-X11 IFF/SIF and the AN/APX-76A.

d. Mode 4

(1) If the KIT (IFF) is not properly keyed, the IFF light on the Telelight Panel will remain illuminated any time the IFF is turned on.

(2) If the KIR (APX-76) is not properly keyed, the green CHAL light will not illuminate when attempting to interrogate Mode 4A or 4B.

(3) If the KIT and KIR are properly keyed and there is an IFF malfunction; the MASTER CAUTION light and the IFF light on the Telelight Panel will illuminate when the Loop check or Mode 4 interrogation is attempted.

(4) When there is an IFF failure in Mode 4, the IFF light and MASTER CAUTION light will illuminate when a ground station (threat or friendly) interrogates Mode 4. This has tactical implications - one of them is spelled H-A-W-K.

e. The Loop check display occasionally breaks up during ground checks, especially in Mode 4, due to ground reflections from nearby equipment or aircraft shelters. A positive Loop check may be difficult if the aircraft is in a revetment or hangar.

9. CONSIDERATIONS IN AN/APX-80A UTILIZATION:

a. The cueing provided by the AN/APX-80A is a definite aid in acquiring a radar skin paint. Subsequent to AN/APX-80A detection of a target return, the most efficient means of obtaining a radar contact is to select narrow scan, concentrate the search pattern on the desired azimuth, and scan the vertical sector. The large vertical beam width ($\pm 30^\circ$) of the AN/APX-80A is a disadvantage in determining target elevation at long ranges. In a flight of two, the aircraft with the operable AN/APX-80A might select B-narrow while the wingman stays in B-wide to sanitize the arena.

b. Because of the myriad of information available to the AN/APX-80A equipped F-4E aircrew, care must be taken to prevent a delay in taking the required actions to attack or avoid a threat, in expectation of solving the entire battle situation.

c. AN/APX-80A displays are always visible through ground clutter, but scope presentation can be cleared of clutter by selecting radar STANDBY. The AN/APX-80A functions fully with the radar in STANDBY.

d. The AN/APX-80A is beneficial during reattacks, or after a defensive separation if the aircrew decides to reenter the engagement. The threat locations are easily determined by turning towards the general area of the previous threat indications and depressing the interrogate button.

e. The AN/APX-80A can be quite valuable as an aid to determining airborne threat and threat positioning during your low altitude ingress.

NOTE 1: The above AN/APX-80 applications can be utilized in training scenarios by assigning your friendly fighters discrete mode 1 Squawks.

NOTE 2: The AN/APX-80A is intended to be used as an aid to aircrews. Therefore aircrews should be cautious of structuring their tactics around the AN/APX-80A, but should incorporate the AN/APX-80A into existing tactics.

NOTE 3: APX-80A use with a PAVE SPIKE pod loaded. In order to initiate IFF interrogation and display it on the RCP scope, the WSO must select RDR on the RCP DSCG scope mode knob and press the interrogate button on the antenna control handle (or use the TEST/CHAL CODE switch). However, if the pilot has TV selected for display (on his scope display select switch) the WSO must also deselect PAVE SPIKE (i.e., ASQ-153) on the RCP video select button prior to interrogation in order to allow display of APX markers on the radar scope. (The WSO does not have to deselect ASQ-153 if the pilot has RDR selected on his scope display select switch). Also note that APX markers may be displayed on only the FCP radar scope if the pilot has RDR selected on his scope display select switch and the WSO uses the TEST/CHAL Code switch to initiate interrogation (In this case, the WSO is using the PAVE SPIKE pod and has a TV picture; the antenna control handle is functioning in the PAVE SPIKE mode and cannot be used for interrogation).

NOTE 4: Depending on your source, some people contend that the AN/APX-80 should be in STBY (white square visible in the Mode window) before power is applied to the radar in order to avoid transient voltage damage during radar

Turn on. The people in the Com war shop say this has no effect on the system.

NOTE 5: *AN/APX-80 markers are also visible in MAPPI mode of Radar operation.*

turn on. 347TFW CRS/COMM-NAV experts say that this will have no effect (ill or good) on the functioning of the system.

NOTE 5: AN/APX-76 markers are also visible in the MAP-PPI mode of radar operation.

B I G P I C T U R E



3-4311



4A



3-1200



2-5522



1-1100



1-3300



2-3345



4B



FTR

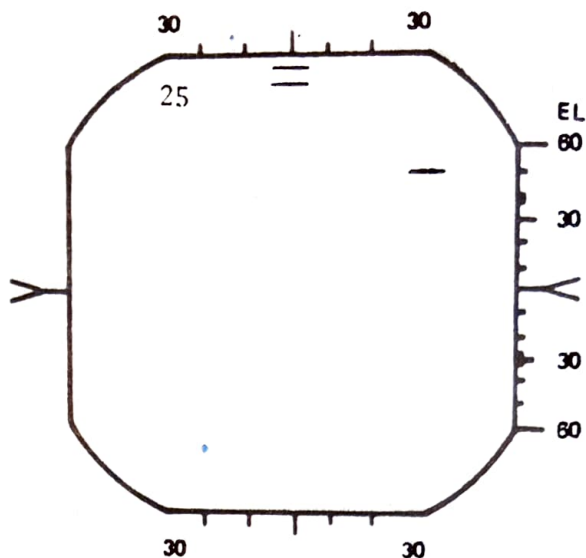
Assumptions:

1. These are the only aircraft in the area.
2. The aircraft are squawking only the modes and codes shown.

Several Situations are shown on the following pages based on this Big Picture.

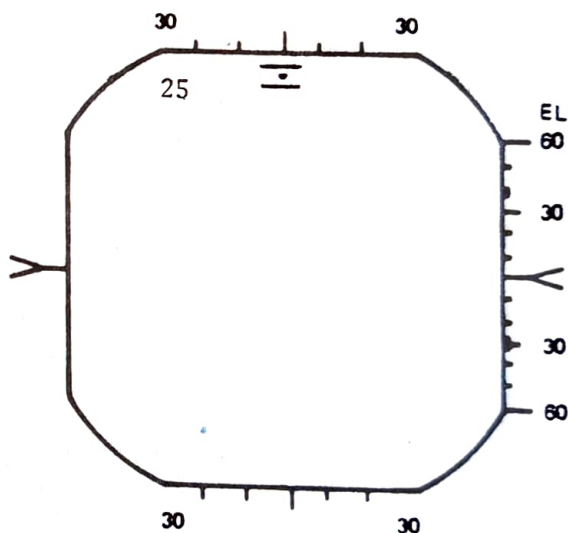
SITUATION #1

You are interrogating
3-4311 with the
interrogation button on
the Radar Hand Control.



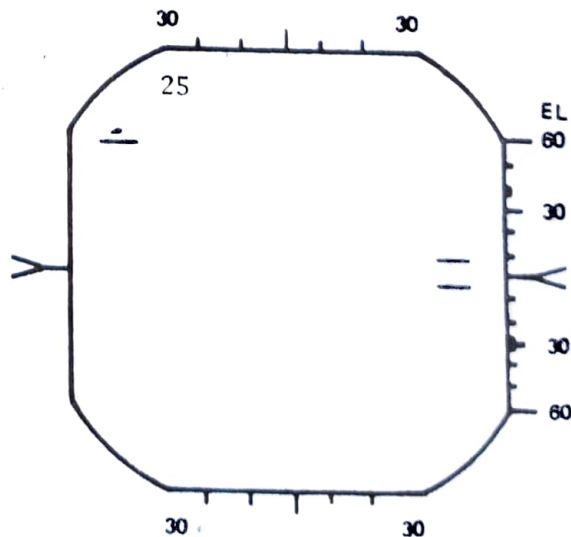
SITUATION #2

You are interrogating
3-4311 with the TEST/
CHAL code switch (You
also have a skin paint
on the aircraft squawking
3-4311).



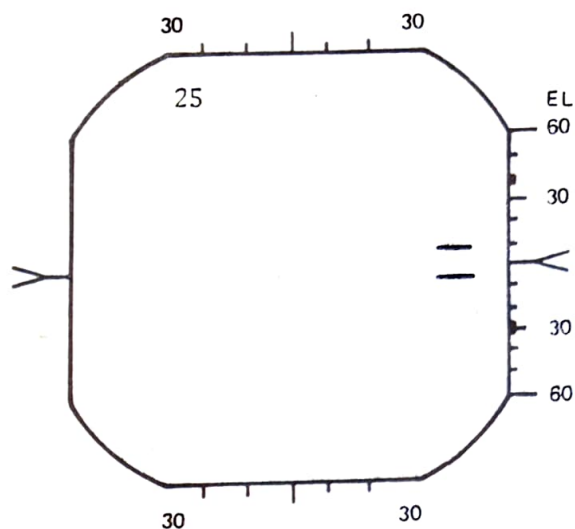
SITUATION #3

You are interrogating
2-3345 with the
interrogate button.
(You also have a skin
paint on the aircraft
squawking 2-5522).



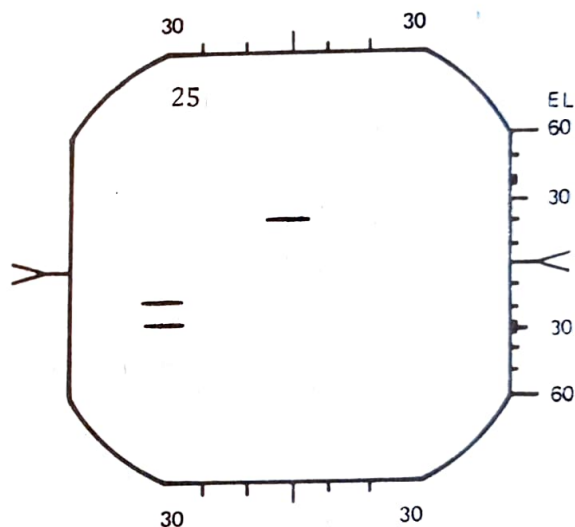
SITUATION #4

You are interrogating
2-3345 with the TEST/
CHAL code switch.



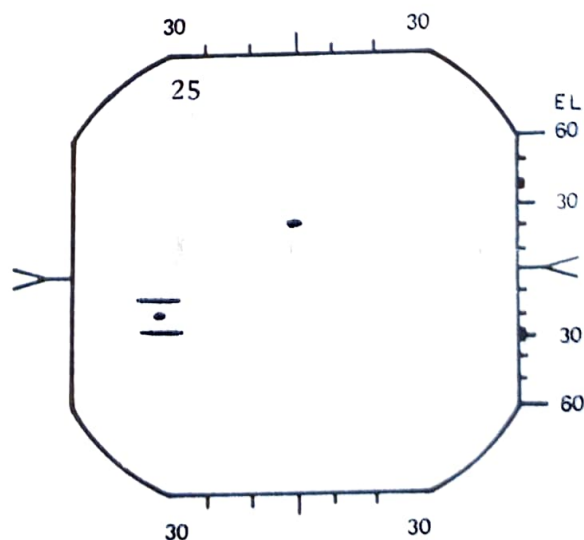
SITUATION #5

You are interrogating
1-3300 with the
interrogate button.



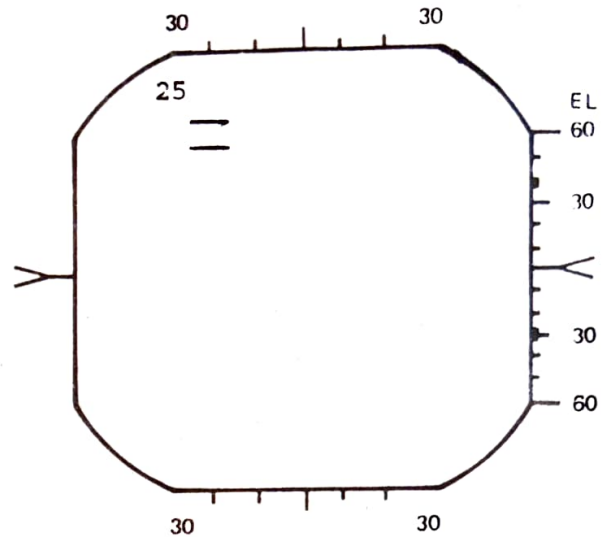
SITUATION #6

You are interrogating
1-3300 with the TEST/
CHAL code switch (You
have a skin paint on
both aircraft squawking
mode 1)



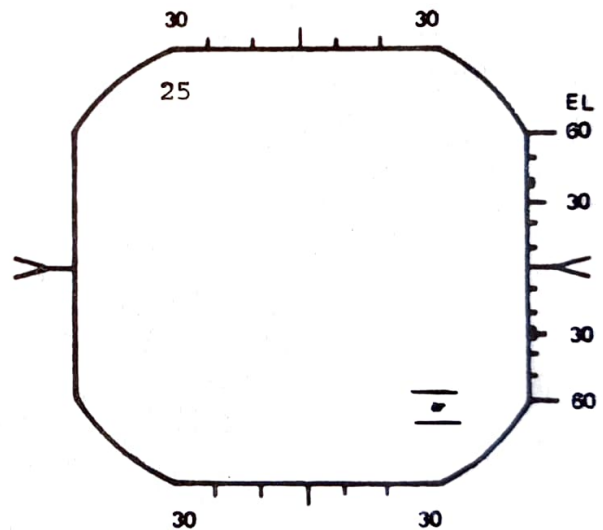
SITUATION #7

You are interrogating 4A with either the interrogate button or the TEST/CHAL switch.



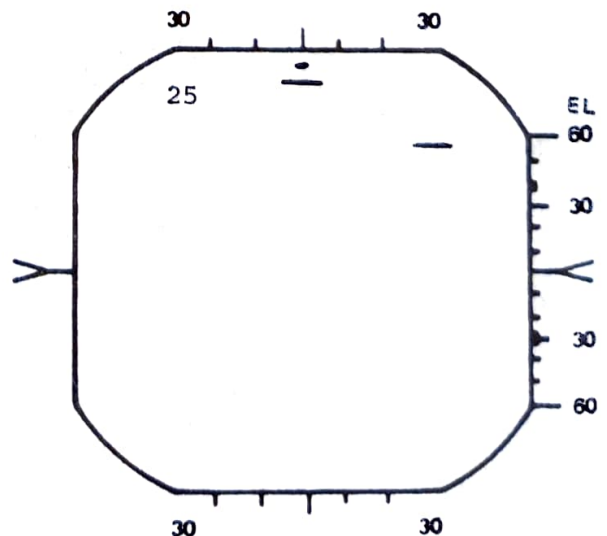
SITUATION #8

You are interrogating 4B with either the interrogate button or the TEST/CHAL code switch (You have a skin paint)



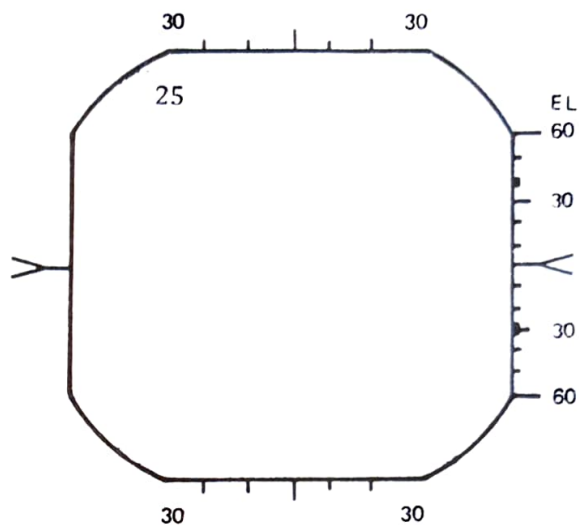
SITUATION #9

You are interrogating 3-1400 with the interrogate button (You have a skin paint on the aircraft squawking 3-4311)



SITUATION #10

You are interrogating
3-1400 with the TEST/
CHAL switch.



Hostile bears 20° right for
20 miles....The target 45°
left for 10 miles is friendly.

