HAVE DOUGHNUT
TACTICAL EVALUATION

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HAVE DOUGHNUT
TACTICAL EVALUATION
Purpose

- Evaluate the effectiveness of existing tactical maneuvers by USAF and USN combat aircraft against the MiG-21
- Exploit the tactical capabilities of the MiG-21 in an air-to-air environment
- Optimize existing tactics and develop new tactics as necessary to defeat the MiG-21
- Evaluate the design, performance, and operational characteristics of the MiG-21
TAC Evaluation
Evaluation Aircraft

- Offensive and Defensive Evaluation
  - F-4C/D/E
  - F-105D/F
  - F-111A
  - F-100D
  - F-104D
  - F-5A

- Defensive Evaluation
  - RF-101
  - RF-4C
  - B-66

1968 TAC Inventory Versus the MiG-21F-13
TAC Evaluation
MiG-21F Limitations and Deficiencies

- Poor forward and rearward visibility
  - Limited forward by sight glass, bulletproof glass, and windscreen
    - F-4 and F-105 normally are acquired at 3-5 miles range
  - Limited rearward by seat flap, narrow canopy, and structure
    - 50-degree blind cone in rear

- Low airspeed limit below 15,000 ft
  - 0.98 Mach or 595 KIAS
    - Buffet severe at and above these airspeeds and aircraft is unusable as a weapon system

- Weapon system
  - 30mm cannon limited to 60 rounds
  - Severe pipper jitter precludes tracking corrections during firing
  - Sight precesses excessively
    - Target tracking impossible over 3 Gs
  - Range only radar susceptible to chaff and jamming
TAC Evaluation
MiG-21F Limitations and Deficiencies

- High longitudinal control forces below 15,000 ft
  - Above approximately 510 KIAS cannot command a high pitch rate
- High airspeed bleed-off at high G
  - Bleed-off is excessive, but it does improve the turn radius
- Poor engine acceleration response to throttle movement
  - Idle to Military Power takes 14 seconds on the ground
  - Formation flight difficult
    - Requires combined use of speedbrakes and throttle movement
- Afterburner puff above 15,000 ft gives away visual cue
  - White puff of unburned fuel when going in and out of afterburner
- Poor directional stability
  - Excessive pilot effort for air-to-ground tracking in turbulence

Some serious exploitable limitations and deficiencies
The F-4 can control the engagement below 15,000 ft
- Can exploit the MiG-21 airspeed limitation and airspeed bleed-off at high G
- Orient the attack towards the MiG-21 blind cone and operate in the vertical to defeat the MiG-21
F-4 level acceleration is superior up to 30,000 ft
- Significant advantage in military power
- Slight advantage in afterburner power
- Below 15,000 ft the F-4 can easily accelerate to above the useable airspeed of the MiG-21

- Good F-4 zoom capability
  - Significant advantage in military power up to 30,000 ft
  - Slight advantage in afterburner power up to 20,000 ft

- MiG-21 has superior instantaneous turn capability
  - But it loses airspeed more rapidly
F-4D vs. FISHBED C
Delta Longitudinal Acceleration (KCAS/sec)
(Turnrate vs. Mach)
Maximum Afterburning Power

Solid boundary is F-4D envelope.
Dashed boundary is FISHBED C envelope.

F-4D with 4(AIM-7), and 50% internal fuel; 37770 lb; 20000 ft
versus FISHBED C with 2(AA-2) and 50% internal fuel; 13550 lb; 20000 ft
- Force the engagement to low altitude and keep speed
  - Fight below 15,000 ft and maintain at least 450 KCAS
- Retain a high energy level and accelerate in an unloaded condition as necessary
- When defensive establish maximum angle off
- Maneuver vertically below 15,000 ft - avoid slow speed reversals
- Avoid prolonged turning engagements - disengage and keep energy for possible reattack
- Get into the MiG-21 rear hemisphere blind cone
- Good visual scan needed to see the MiG-21
- Run away below 15,000 ft above 0.98 Mach/595 KIAS when offensive advantage or mutual support is lost

SPEED IS LIFE!!!