

HAVE DOUGHNUT TACTICAL EVALUATION



**Thomas R. Woodford
Senior Intelligence Analyst
Aerodynamic Systems Division**

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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



TAC Evaluation

F-4C/D/E



- **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**



TAC Evaluation

F-4C/D/E

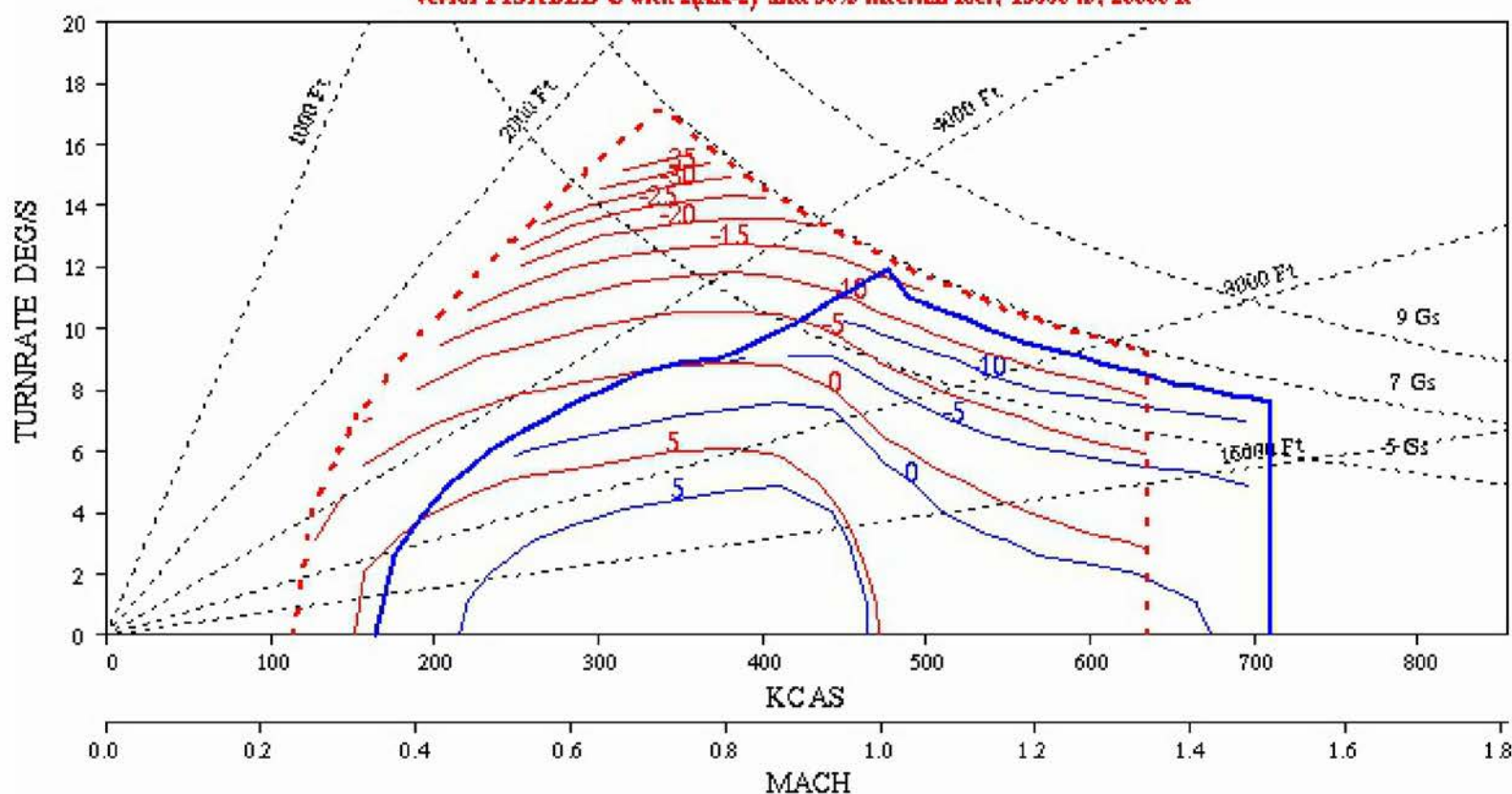
- **F-4 level acceleration is superior up to 30,000 ft**
 - Significant advantage in military power
 - Slight advantage in afterburner power
 - Below 15,000 ft the F-4 can easily accelerate to above the useable airspeed of the MiG-21
- **Good F-4 zoom capability**
 - Significant advantage in military 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; 13880 lb; 20000 ft





TAC Evaluation **F-4C/D/E**



- **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!!!