

3 September 1970

SUBJECT: Attack Geometry and Energy Maneuverability Analysis

1. Attack Geometry Analysis:

a. Results of an attack geometry analysis developed by HQ AFSC (SDJ) have been employed by HQ USAF (SA) to point out the advantages and disadvantages of lag, pure and lead pursuit attacks when using missiles and/or guns against a maneuvering target. In brief, the results show that lead pursuit is the best attack since it requires the least maneuver demand for the attacker and for a missile launched from such an attack. (Conversely, in an effort to counter such an attack, the defender is forced to maneuver more violently than for the other attack options.) } *not true*

b. These results also reveal that the simulation effort used to support the AIM-82 is largely irrelevant since the initial conditions and follow-up attacks were oriented toward employing lag pursuits. These results also cause one to question the validity of all previous "one on one" simulation efforts that have used lag pursuit strategies as a basis for determining the relative merit of maneuvering fighter systems.

2. Energy Maneuverability:

a. In addition to establishing the value of various pursuit attacks, SDJ has created an advanced energy maneuverability concept which has been used to develop a general maneuver strategy for fighter versus fighter combat. The powerful rules developed from this concept, coupled with independent verification of these rules (by modern control and optimization theory) have surfaced an analysis format that considers relevant performance factors (and inhibits the use of irrelevant data) when comparing the relative merits of competing fighter systems.

b. The results of this effort and how it should be employed have been given by briefings to:

- (1) Aerospace Research Pilot School at Edwards AFB
- (2) USAF Fighter Weapons School at Nellis AFB
- (3) Fighter Requirements Directorate at HQ USAF

(4) Director of Operational Requirements and Development Plans (Major General Smith) at HQ USAF

(5) Director of Concepts and Doctrine (Major General Bray) at HQ USAF

(6) USAF Chief Scientist (Mr. J. J. Welch)

(7) Representatives of SA at HQ USAF

(8) Representatives of General Dynamics, Lockheed, LTV, McDonnell-Douglas, and Northrop Corporations

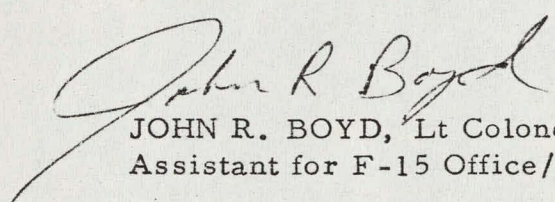
(9) David Taylor Model Basin of the USN

(10) DDR&E (Messrs. Al Simon and Bob O'Donohue)

c. Without exception, the briefings have been well received. In addition, the ideas embodied in the new concept are already being cranked into analytical and simulation efforts by HQ USAF (SA) for the purpose of evaluating existing fighter designs. Northrop Corporation is using it for the same purpose and for the purpose of developing superior configurations and performance in new fighter designs. The Fighter Weapons School has begun to embrace the new concept for the purpose of developing new tactics. The evidence they have accumulated to date supports the contention that the general maneuver strategy developed from the "advanced concept" is superior to previous strategies.

3. Correlation:

Correlation of the attack geometry analysis with the ideas embodied in the advanced energy maneuverability concept suggests that these methods may be employed to produce yet a new synthesis and another advance in our knowledge of the air battle arena. Clearly, such an advance, if accomplished, can be the basis for developing a higher order superiority in tactics and design. Pertinent progress in this direction will be reported as it becomes available.



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