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AIRBORNE PERFORMANCE MEASUREMENT ASSESSMENT: LOW ALTITUDE TACTICAL FORMATION IN TWO OPERATING ENVIRONMENTS

By

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July 1980
Interim Report for Period June 1978 – October 1978

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NOTICE

This interim report was submitted by the Operations Training Division, Air Force Human Resources Laboratory, Williams Air Force Base, Arizona 85224, under Project 1123, with HQ Air Force Human Resources Laboratory (AFSC), Brooks Air Force Base, Texas 78235. Dr. Joseph C. DeMaio was the Principal Investigator for the Laboratory.

This report has been reviewed by the Office of Public Affairs (PA) and is releasable to the National Technical Information Service (NTIS). At NTIS, it will be available to the general public, including foreign nations.

This technical report has been reviewed and is approved for publication.

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A methodology was developed to assess pilot performance in low altitude tactical formation (LATF) and to relate overall performance to performance on subtasks necessary to mission success. The methodology was employed to evaluate the performance of 28 pilots assigned to an operational A-7 squadron. The methodology was found to provide a consistent measure of pilot performance and to reveal the importance of certain pilot skills to the LATF task. Performance ratings were obtained under routine operating conditions and under conditions of simulated combat. Differences were obtained in performance ratings under the two conditions. Implications for currency training were discussed.

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PREFACE

This study was conducted by the Operations Training Division of the Air Force Human Resources Laboratory, Air Force Systems Command, in coordination with Headquarters, Tactical Air Command and was supported by the 354 Tactical Fighter Wing and 354 Tactical Fighter Squadron at Davis-Monthan Air Force Base, Arizona. The study supports Project 1123, Flying Training Development; Task 112302, Training Methods and Media. Mr. James F. Smith was the Project Scientist; Dr. Bernell J. Edwards was the Task Scientist; and Dr. Edward E. Eddowes was the Work Unit Manager. This report covers research performed between June and October 1978.

The authors extend their appreciation to the members of the 354 Tactical Fighter Squadron for their interest, advice and cooperation throughout this study. The authors would also like to thank Mr. Richard Greatorex, Mr. Tien Fu Sun, and Lt Mike Williamson of the Flying Training Division for their assistance in analyzing the data.

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This report describes the development of procedures for measuring pilot performance in the low altitude tactical formation (LATF) task. The LATF performance measurement procedures were developed as a part of the Air Force Skills Maintenance and Reaquisition Training research program (Project SMART). The objective of Project SMART is to identify and define pilot skills necessary for combat readiness, to develop procedures for measuring performance on these skills, and to determine training requirements for maintenance of necessary proficiency levels. The development of performance measurement procedures for LATF differed substantially from that of an earlier effort by Project SMART which generated performance measurement procedures for the pop-up weapons delivery (see Pierce, DeMaio, Eddowes, & Yates, 1979). The pop-up is a short duration (less than 40 seconds) maneuver, which can be described by a sequence of discrete stages. In the pop-up, specified parameters define performance requirements for each stage, and an objective criterion, bomb score, exists against which performance on the maneuver can be evaluated. These characteristics make the pop-up amenable to a sequential performance analysis of the type used by Pierce et al.

On the other hand LATF is a flexible, long duration (over one hour) task. During LATF, subtasks are performed repeatedly as needed and in no particular sequence. Task requirements vary from sortie to sortie, and they also vary with position in the formation. Because of this flexibility, mission performance is not evaluated as easily for LATF as it is for the pop-up. The LATF task cannot be described by a sequence of stages nor defined by specified parameters as can the pop-up. Neither can LATF performance be measured against an objective criterion, such as the bomb score measure used with the pop-up.

The basic objective of LATF is to provide ingress to a high threat target area without exposing the formation to ground based or airborne threats. This objective is accomplished through the use of two tactics: (a) flying at low altitude and using terrain features to mask the formation and (b) performing in a mutual support role which will permit members of the formation to detect and neutralize any threat which might be encountered. In the routine, operational environment, these formation tactics are not amenable to standardization and objective measurement due to the lack of appropriate measurement hardware. Therefore, it was decided not to attempt to divide the LATF mission into a sequence of segments which demand proficiency at certain skills. Rather, it was decided to investigate the contribution of various skills/proficiency factors to overall mission quality, without considering where in the mission sequence particular skills might be important.

Development of the evaluation methodology began with pilot interviews to determine skill areas which might be critical to mission success. An evaluation form was then constructed on which pilots could rate their performance on the skill areas and on the mission as a whole. Rating data were collected on routine LATF missions and in LATF missions at the simulated combat exercise, Red Flag.

Objective

The present study was conducted to determine what areas of skill proficiency are required for successful LATF flying. It also investigated how well routine flying prepared pilots for flying in a simulated combat environment.

II. METHOD

Subjects

The subjects for this study consisted of 28 pilots of the 354 Tactical Fighter Squadron (TFS) on active flying status at Davis-Monthan AFB. All subjects but five were rated mission ready in the A-7 aircraft. Five subjects were rated minimum qualified.

Materials

Research materials consisted of the LATF Individual Performance Evaluation Form shown in Appendix A. This form was constructed at the start of the research effort using information obtained in interviews with members of the 354 TFS.

Procedure

At the start of the research effort, six pilots from the 354 TFS were interviewed to provide a data base for use in constructing the LATF Individual Performance Evaluation Form. Selection of pilots for interviews was based on availability. The range of flying experience of these pilots was from fewer than 100 flying hours in an operational A-7 unit to over 3000 flying hours in the A-7, including combat experience.

The pilots were interviewed informally in groups of two. At the start of the interviews, the pilots were asked to describe a typical LATF mission, using a map and other visual aids to describe particular formation procedures (e.g., navigation turns, ridge crossings) and points in the mission when particular procedures might be employed. Next, they were asked what pilot skills or functions they felt had an impact on the success of the mission or on the quality of an individual's performance as a member of the formation.

Three general skill areas/pilot functions were identified as being important to LATF: (a) factors relating to the mutual support role and to the defensibility of the formation, (b) low altitude flying/terrain masking, and (c) navigation. Pilot functions which were felt to describe a pilot's performance in the mutual support role were (a) visual lookout, which permits the formation to detect a threat, and (b) maintaining position in the formation, which permits it to neutralize the threat. Pilots did not feel that the lowest altitude actually flown during the mission was an adequate measure of low altitude flying performance because this was too greatly influenced by minimum altitude restrictions. Therefore, it was decided to use comfort level (CL) and minimum altitude capability (MAC) estimates of the pilot's own capacity to fly at low altitude rather than to use the lowest altitude actually flown. CL is defined as the lowest altitude that members of the formation can detect a threat and perform intense, evasive maneuvering. Minimum altitude capability is defined as the altitude at which intense maneuvering is severely restricted and maintenance of that altitude is the primary defensive response (*Low Altitude Flying*, 1978). Factors which were felt to index the quality of navigation performance were accuracy of the formation's time on target (TOT) and distance off target (DOT). Some pilots expressed doubt that either of these factors would be of much importance in determining overall quality of routine missions because only the flight leader was responsible for navigation and because squadron members were generally very familiar with all routes routinely flown. However, others felt that all formation members were responsible for navigation awareness if not actual navigation.

It was suggested that an individual's performance was affected by that of the other element member. If one element member maintained position well, then performance of the other member would be enhanced. It was also suggested that the quality of the formation was enhanced when members were accustomed to flying together. Familiarity with element member was not felt to enhance performance on a particular task but was felt to improve the coordination and integrity of the formation.

An LATF individual performance rating form was constructed which included all of the factors determined to be relevant from the interview data. In addition, total flying hours, days since last LATF mission, and a rating of overall LATF performance on the mission were included. Ratings of performance on the formation tasks were made on an 8-point scale with a rating of 1 being least positive and a rating of 8 being most positive. Four measures of low altitude flying performance were obtained: MAC, CL (straight and level), CL (in turns), and CL (over rough terrain); these were given in feet above ground level (AGL). Navigation measures, TOT and DOT were in seconds of error and 1/8-mile of error, respectively.

Following each LATF mission, a researcher was on hand to pass out and collect forms and to answer any questions about the forms. All flight members rated their own performance on all variables but one.

Each individual rated the performance of their element member on maintaining position; this rating was made on the same form as the individual's self-ratings.

III. RESULTS

From July to September 1978, 106 evaluation forms were collected on three-ship and four-ship formation flights. Of these, 31 were omitted from the data analysis because of missing data.

Data analysis was accomplished by performing a step-wise, linear multiple regression with the overall formation performance variable as the criterion variable (Helmstadter, 1972). This analysis provided the best fitting linear multiple regression equation and multiple correlation coefficient, a Pearson product-moment correlation matrix for all variables, and the means and variances for all variables. The multiple correlation coefficient between the performance rating on the subtasks and the overall rating was used to assess the reliability of the measurement system. There were two reasons for employing this within-subject measure rather than the correlation between element members' ratings. The first reason was that several variables (e.g., visual lookout, comfort level) could be rated only by the individual and not by the other element member. The second reason was that flight members discussed the mission both during the flight and during the debrief, which usually preceded filling out the LATF form. It was felt that this discussion might cause an undue inflation of the between-member correlation.

The results of the regression analysis are shown in Table 1. A highly consistent relationship was obtained between pilots' overall performance rating and their ratings on formation subtasks (R=.92). Four variables were found to contribute to the pilots' ratings of their own overall formation performance. In order of the magnitude of their contribution to the regression, these were (a) maintaining position (own performance), (b) visual lookout, (c) maintaining position (element member's performance), and (d) familiarity with element member. The first two variables showed a relatively strong relationship to the (overall rating) criterion. Nearly 35% of the contribution of the visual lookout variable to the regression was due to correlation with the criterion; nearly 56% of the contribution of the maintaining position (self) variable was due to correlation with the criterion. By contrast, roughly 80% of the contribution of the familiarity and maintaining position (element member) variables was due to correlation with other variables in the regression equation.

Table 1. **Multiple Regression Analysis of the Formation Performance Self-Rating Data for Routine Operations**

Correlation Matrix

Variable Name	EF	VL	CL	PS	PE	OR
EF	1.0					
VL	.46	1.0				
CL	−.17	.01	1.0			
PS	.55	.70	.04	1.0		
PE	.49	.66	.23	.77	1.0	
OR	.59	.78	.09	.88	.79	1.0

Basic Regression Statistics

Standard Error of Estimate	.53
Multiple R	.92
Coefficient of Determination	.85
Corrected Coefficient of Determination	.84

Variable	Type	Regression Coefficient	Std Err of Regression Coefficient	Standardized Regression Coefficient	Partial Correlation Coefficient	Partial F Value With 1 and 70 Deg Freedom	Sig Level
OR	Dependent	–	–	–	–	–	–
	Constant	.04	.29		.02	.02	.89
EF	Freevar	.06	.03	.11	.22	3.77	.06
VL	Freevar	.29	.07	.27	.43	16.28	.00
CL	Freevar				.15		.21
PS	Freevar	.47	.07	.49	.58	36.08	.00
PE	Freevar	.18	.07	.18	.27	5.69	.02

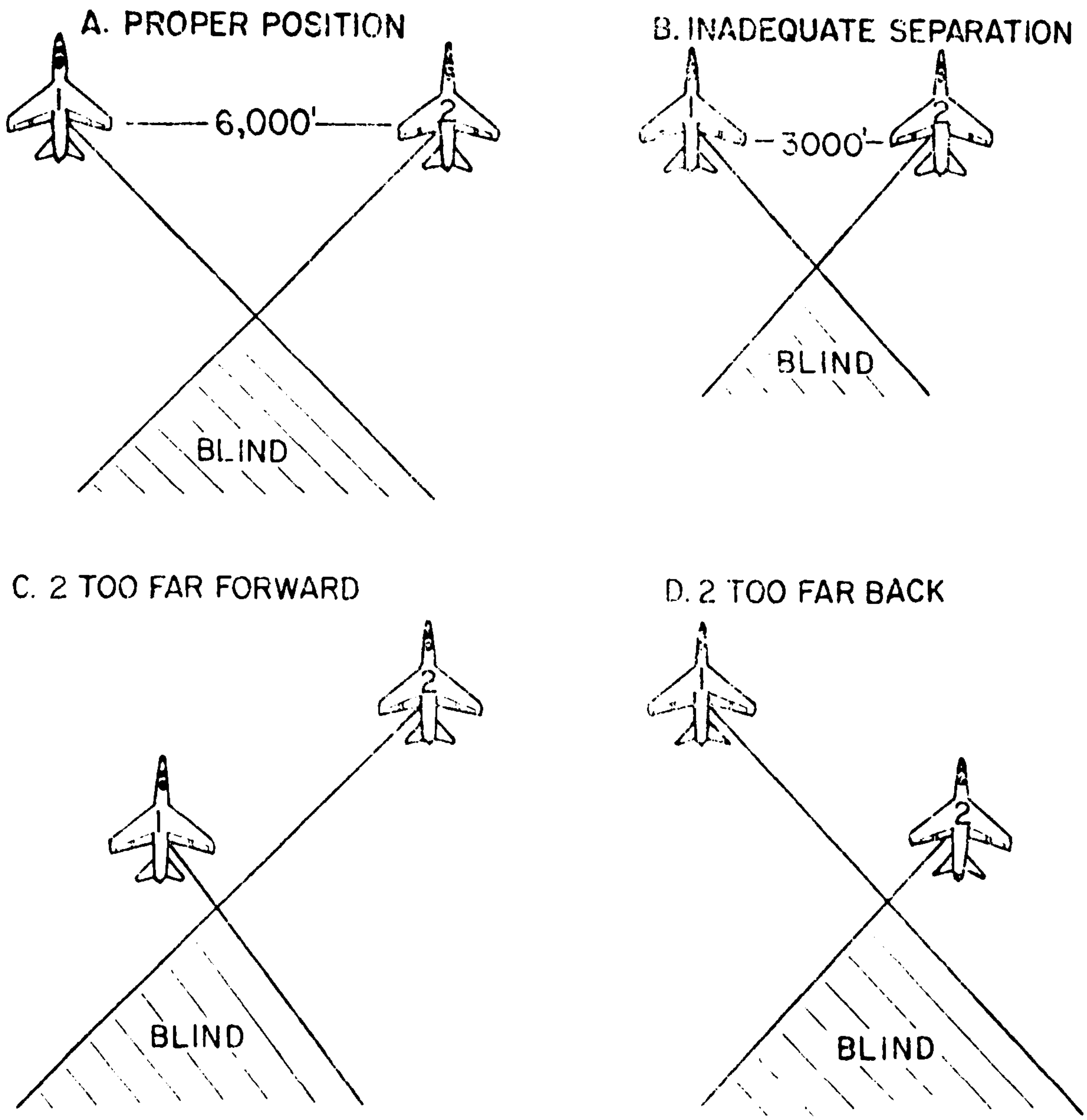
Legend

OR	Overall Rating
EF	Familiarity with Element Member
VL	Visual Lookout
CL	Comfort Level
PS	Maintaining Position (Self)
PE	Maintaining Position (Element Member)

Note: Overall performance rating is the criterion variable.

IV. DISCUSSION

Two subtasks performed during the LATF mission were found to affect a pilot's ratings of overall mission performance. Both of these tasks are related to the mutual support role. Visual lookout is critical to the success of the formation because it is this function which permits the formation to detect and respond to a threat before it is too late to respond effectively to the threat. Maintaining good formation position facilitates the mutual support function in two ways. The first is that it facilitates the visual lookout function. The formation can best detect a threat in the 5 o'clock to 7 o'clock cone if the rear element members are line abreast and at 5,000 to 10,000 feet separation (see Figure 1). In this position, each pilot can clear the element member's 6 o'clock position to a distance of over 8,000 feet. As the separation between the two aircraft decreases, the distance to which a threat can approach undetected decreases. If one member of the element moves ahead of line abreast, this exposes the element member's 6 o'clock position to attack. If a member moves behind line abreast, then that member's own 6 o'clock position is exposed.



Note: Figure 1A is correct line abreast position for a two-ship formation element. Separation between element members is 5,000 to 10,000 feet. Figure 1B, C, and D represent incorrect position and the blind area in the 5 to 7 o'clock cone moves closer to one or both aircraft. Also improper position impairs ability of the element to respond to a threat.

Figure 1. **Effect of position on formation performance.**

Good formation position is also necessary for proper response to a threat, once it has been detected. If two members of an element have inadequate separation, they can be attacked simultaneously and will impede each other's response. If they have too much separation, too much time will be required for one member to get into position to respond to an attack on the other.

The maintaining position (element member) variable was also found to be a significant contributor to the overall performance rating. That is, the pilots rated their own overall performance higher when they rated their element member's performance high. This variable does not have its effect through direct action on a role of the formation but rather through its effect on pilot workload. When the element member maintains good formation position, this reduces the amount of effort that the pilot must expend to maintain position. This workload reduction permits the pilot to devote more effort to other formation tasks. This effect can be seen in the high correlation between position (element member) and the pilot performance variables.

The last contributor to the regression equation, familiarity with element member, differs from the others in that it is not a performance or a skill variable. It also differs from the individual performance variables in that a substantial part of its contribution (80%) comes from its correlation with other variables in the regression equation. This variable also has its effect through reduction of pilot workload. When members of the formation are familiar with each other, they are better able to anticipate each other's actions and to plan for them. They are also less likely to misunderstand each other's signals or to make inappropriate responses.

The navigation variables both showed a very high degree of accuracy but neither contributed to the regression equation. Eighty-three percent reported a distance error of 1/8 mile or less; 60% reported a time on target error less than 20 seconds. A separate analysis was not conducted on flight leaders' data since the high degree of navigation accuracy and low variability obtained made it seem unlikely that these variables would make a significant contribution even for this group. The low altitude flying ability variables, too, did not contribute significantly to the regression equation. From these data, it is not possible to determine whether this was due to minimum altitude restrictions or was an accurate assessment of the perceived importance of these variables.

V. STUDY II: RED FLAG OPERATING ENVIRONMENT

During the course of the data collection effort, several pilots expressed the opinion that more enlightening data on LATF could be obtained at Red Flag. Red Flag is an operation designed to simulate the high threat combat environment. Pilots plan and fly combat sorties over a 2-week period. On each mission, they are subject to attack by groundbased threats and airborne "aggressor" forces. This procedure provides the squadron an opportunity to test its ability to function effectively in an environment of high threat (Joss, 1978). It also puts great pressure on individual squadron members to perform at their best.

At the invitation of the 354 TFS, Project SMART researchers continued data collection with the squadron during its Red Flag exercise. The purpose of the study was to evaluate LATF performance under conditions simulating those of actual combat.

VI. METHOD

Subjects

The subjects were 20 pilots of the 354 TFS who were detailed to Red Flag. They were some of the same pilots who participated in the Davis-Monthan phase of the research.

Materials

The materials consisted of a combination of LATF performance evaluation and pop-up weapons delivery performance evaluation on one form. During normal operations, data on the two tasks were collected on separate forms; however, it was felt that collection at Red Flag would be expedited by combining both tasks on one form. In combining the forms for use at Red Flag, it was necessary to eliminate some variables. Since analysis of the Davis-Monthan data had not yet been completed, this was accomplished by eliminating non-performance variables (e.g., time since last low altitude mission) and those which showed a low individual correlation with the overall rating (e.g., MAC). In the present report, only the LATF data were considered. An example of the form is shown in Appendix B.

Procedure

Squadron personnel attended Red Flag in two groups. Each group included roughly one-half of the pilots in the squadron available for this assignment and stayed at Red Flag for 2 weeks. Thus, the data collection period was 1 month.

A Project SMART researcher was on hand at the end of each LATF mission to pass out and collect the forms. Since all of the pilots had participated in the Davis-Monthan phase of the study, they were familiar with the forms and procedure.

VII. RESULTS

In condensing the LATF form for use at Red Flag, the variable, maintaining position (element member's performance), was omitted. Therefore, its importance to the overall rating could not be assessed. As with the data from the Davis-Monthan phase, a step-wise, linear multiple regression analysis was performed on the data from 30 LATF performance evaluations. The overall performance rating was again used at the criterion variable.

Mean ratings obtained at Red Flag were compared with those obtained at Davis-Monthan. Familiarity with element member was rated significantly higher at Red Flag (see Table 2), and CL was significantly lower than that obtained at Davis-Monthan.

Table 2. **Comparison of Mean Self-Ratings for Routine Operations and Simulated High-Threat Conditions**

Variable	Davis-Monthan Mean	Davis-Monthan SD	Red Flag Mean	Red Flag SD	t(83)	p
Familiarity	4.6	2.3	5.6	1.7	2.13	.05
Visual Lookout	5.0	1.3	5.4	1.5	1.34	.2
Comfort Level (Ft)	211.0	138.0	155.0	56.0	2.12	.05
Position (Self)	5.5	1.4	5.7	1.8	0.6	.5
Position (Element Member)	4.2	1.3	–	–	–	–
Overall	5.4	1.3	5.7	1.5	1.01	.35

The best fitting linear multiple regression equation obtained for the Red Flag data differed from that obtained for the Davis-Monthan data in two ways. The first was that the proportional contribution of the visual lookout variable in the regression equation increased substantially at Red Flag (34% vs. 21%). The second was that the variable, familiarity with element member, dropped out of the regression equation (see Table 3). As mentioned previously, data were not collected on the variable, maintaining position (element member).

Table 3. **Multiple Analysis of Formation Performance Self-Rating Data for Simulated High-Threat Conditions**

Correlation Matrix

Variable Name	EF	VL	CL	PS	OR
EF	1.0				
VL	.21	1.0			
CL	.31	.25	1.0		
PS	.23	.70	.28	1.0	
OR	.25	.79	.31	.81	1.0

Basic Regression Statistics

Standard Error of Estimate	.77
Multiple R	.87
Coefficient of Determination	.76
Corrected Coefficient of Determination	.74

Variable	Type	Regression Coefficient	Std Err of Regression Coefficient	Standardized Regression Coefficient	Partial Correlation Coefficient	Partial F Value With 1 and 70 Deg Freedom	Sig Level
OR	Dependent						
	Constant	.88	.54		.30	2.68	.11
EF	Freevar				.08		.69
VL	Freevar	.43	.13	.43	.53	10.76	.00
CL	Freevar				.12		.55
PS	Freevar	.43	.11	.53	.60	15.40	.00

Legend

OR	Overall Rating
EF	Familiarity with Element Member
VL	Visual Lookout
CL	Comfort Level
PS	Maintaining Position (Self)
PE	Maintaining Position (Element Member)

Note: Overall performance rating is the criterion variable.

VIII. DISCUSSION

The increase in the familiarity rating is a product of the difference in the strategy employed by flight leaders in making formation assignments at Red Flag. Under normal operating conditions, formation assignments are made on the basis of training and scheduling requirements. At Red Flag, formation assignments are made to optimize the effectiveness of the squadron. Thus, a particularly strong squadron member may be assigned to a weaker member whose difficulties the stronger understands and for which that individual can compensate, or two members who are particularly compatible may be assigned together. On the whole, the strategy leads to formations consisting of members who are more familiar with each other.

Pilots reported a drop of roughly 56 feet in CL at Red Flag. This drop occurred despite the fact that pilots were less familiar with the terrain. This would be expected to make pilots feel less comfortable at low altitude. Yet, they report feeling comfortable at lower altitude than during routine operations. This suggests that the lowering of CL does not reflect the fact that pilots are more comfortable at lower altitude but rather that they are less comfortable at higher altitude. During routine operations, flying at too high an altitude is not the best practice but is a conservative error. At Red Flag, such an error is more serious and can compromise mission success or result in being "shot down" by anti aircraft artillery or by an airborne aggressor. Thus, it is much more important to be "comfortable" at low altitude in the simulated combat environment of Red Flag.

Despite the increased importance of low altitude flying as reflected by the lowering of CL, CL does not contribute significantly to the regression equation. These data do not fully answer the question of why low altitude flying is not seen as an important contributor to LATF, but they do suggest that minimum altitude restrictions alone are not the reason. At Red Flag, there are fewer altitude restrictions, although there are minimums, and restrictions are imposed by the formation itself. Thus at Red Flag, CL, which is a measure of individual flying ability, decreases; but this change is not seen as important to a pilot's performance as part of the formation.

A pilot's response to the higher threat environment at Red Flag can also be seen in the importance given to the visual lookout task. The proportional contribution of the visual lookout variable in the regression equation increased from 21% at Davis-Monthan to 34% at Red Flag. Unlike the routine training environment, the Red Flag environment contains actual threats which must be detected and neutralized if a mission is to be completed successfully. Thus, there is a real pressure to perform the visual lookout task well. In addition, the presence of threats provides a means for the pilots to assess more precisely the quality of their own performance at this task.

The last variable to be considered was not found to be a significant contributor to pilot rating of performance at Red Flag. That is familiarity with element member. In discussing the Davis-Monthan data, it was suggested that the familiarity variable has its effect through a reduction in workload when flying with a familiar element member. The data from Red Flag suggest that flight leaders take advantage of this workload reduction in making formation assignments for optimal effectiveness. This can be seen in the significantly higher familiarity rating obtained at Red Flag. However, despite this strategy, familiarity was not found to be a significant contributor to the quality of performance. It might be argued that the failure of familiarity to contribute to mission quality is a result of the assignment strategy. However, since the standard deviation of the familiarity variable at Red Flag did not differ from that obtained at Davis-Monthan ($F(1,104)=1.8$, $p=.05$) where familiarity did contribute to the regression, this explanation can be ruled out.

The failure of familiarity to contribute overall performance quality suggests that familiarity with element member did not serve to reduce pilot workload in the high threat environment. This might be expected if, at Red Flag, pilots did not follow the behavior patterns which they follow in routine operations. Being familiar with one's element member will not provide any advantage if that member does not behave as expected. Thus, the failure of familiarity to contribute to the regression equation suggests that pilot behavior becomes more variable to some degree upon entering the Red Flag environment. This conclusion is supported by numerous reports of atypical, and often counterproductive, behavior at Red Flag. It is not possible to determine from the present data how long the period of initial reorientation lasts at Red Flag. However, data from actual combat situations suggest that reorientation may persist for the first ten sorties (Joss, 1978). If the period of reorientation were to last this long at Red Flag, then it would encompass nearly the entire length of the Red Flag training exercise. Such a situation might greatly impair the effectiveness of the exercise in preparing pilots to enter the combat environment.

There are two possible approaches which might be taken to minimize the need for pilot reorientation and so to maximize the training effectiveness of exercises like Red Flag. One would be to increase the length of the exercise, giving pilots additional time to adapt to the increased stress of the exercise. The second would be to increase the realism of the routine training done before the exercise. This could be accomplished by employing routine "Red Baron" missions on which the formation is subjected to a surprise airborne attack. This approach is currently used to a limited extent. However, its effectiveness could be enhanced if it were practiced more regularly. In addition, frequently overlooked procedures might be practiced to improve the simulation of unfamiliar types of combat-related missions (Millard & Michel, 1978). Routine training realism might also be enhanced by conducting "mini-Red Flag" exercises in which aggressors operate with the squadron at its home base. This procedure, too, is in limited use, but scheduling of the exercises is not designed to integrate them optimally with Red Flag operations. Thus, there can be a long interval between the two operations which may reduce the effectiveness of both.

Any approach to increasing the realism of combat readiness training involves risk of increased costs, increased accident rates, or disruption of normal operations. Implementation of such programs therefore must be preceded by thorough research to insure that training gains are not offset by these negative factors. The present research suggests that greater realism could improve training by increasing pilots' ability to adapt quickly to the combat environment. Further research is required to determine the best approach to increasing training realism in order to achieve optimal training effectiveness.

IX. CONCLUSIONS

1. Pilot performance self-rating methodology was successfully applied to the low altitude tactical formation task. Pilot performance ratings were found to have high internal consistency.

2. Skill areas found to be important to the quality of an individual's formation performance were related to the mutual support role of the formation. Specific skill areas were (a) visual lookout, clearing the area for threats and (b) maintaining position in the formation.

3. The quality of an individual's performance was found to be affected by the other member of the element. An individual's performance rating increased when that individual's rating of the element member's performance increased. Also, individuals rated their performance better when they flew with a familiar element member.

4. Data suggested that, when placed in a simulated combat environment, pilots may experience a period of reorientation and atypical behavior similar to that reportedly experienced in the actual combat situation. Further research is planned to determine to what degree this reorientation period impairs training effectiveness and to assess the utility of different training techniques for reducing this impairment.

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APPENDIX A: LOW LEVEL TACTICAL FORMATION PERFORMANCE QUESTIONNAIRE

Pilot ID____________________ Flight________________ Date__________

1. What type of formation was flown on this mission?

    ____Box ____Wedge ____Fluid 2 ____Other (Specify)

2. What was your position in this flight? ____Flight Leader

    ___Element Leader ___Wingman Front ___Wingman Rear ___Fighting Wing

3. Rate your familiarity with your element member?

    N/A 0 — Unfamiliar ... Very Familiar

    1 2 3 4 5 6 7 8

    (Circle one numeral)

4. How accurately did your flight arrive at its destination:

    a. Arrival Time: ___±10 Sec ___±10–20 Sec ___±20–40 Sec ___±40–60 Sec ___±60–90 Sec ___±90–120 Sec ___Unsure

    b. Distance: ___1/8 Mi ___1/8 – 1/4 Mi ___1/4 – 1/2 Mi ___1/2 – 1 Mi ___1 – 1 1/2 Mi ___>1 1/2 Mi ___Unsure

5. How many times was your flight engaged/detected during the mission?

    a. Rate your performance in providing visual lookout support.

    Unsatisfactory ... Excellent

    1 2 3 4 5 6 7 8

    (Circle one numeral)

6. What do you feel was your Minimum Altitude Capability on this mission (lowest altitude flown with no concurrent task)? __________ Ft

7. What do you feel was your Comfort Level on this mission (lowest altitude at which concurrent tasks could be performed)? For straight flight? _____ Ft

    For turns? _____ Ft Over rough terrain? ___ Ft

8. Formation maneuvering:

    a. Rate your performance in maintaining position:

    N/A 0 — Unsatisfactory ... Excellent

    1 2 3 4 5 6 7 8

    (Circle one numeral)

    b. Rate your element members performance in maintaining position:

    N/A — Unsatisfactory ... Excellent

    1 2 3 4 5 6 7 8

    (Circle one numeral)

9. Rate your *overall* performance on the low level tactical formation phase of this mission:

    N/A 0 — Unsatisfactory ... Excellent

    1 2 3 4 5 6 7 8

    (Circle one numeral)

10. Error Analysis: ______________________________

APPENDIX B: PILOT SELF-ASSESSMENT

Pilot ID________________________ Flight __________________ Date _________

Pop-Up

Pass 1	2	3	4	
____	____	____	____	LOS
____	____	____	____	Airspeed
____	____	____	____	Altitude
____	____	____	____	Bomb Score

Pilot Ratings: S – Satisfactory M – Marginal U – Unsatisfactory

____	____	____	____	PUP Acquisition
____	____	____	____	Pull Up Point
____	____	____	____	Target Acquisition
____	____	____	____	Airspeed
____	____	____	____	Dive Angle
____	____	____	____	Track Time
____	____	____	____	Release Parameters
____	____	____	____	Recovery
____	____	____	____	Overall Performance

Low Level Tactical Formation

Rate the following (1 = Poor; 8 = Excellent)

1. Familiarity with element member

   Unfamiliar (Circle one numeral) Familiar

   1 2 3 4 5 6 7 8

2. Time on Target

   OFF TOT ON TOT

   1 2 3 4 5 6 7 8

3. Comfort Level (Lowest Altitude Flown Comfortably):

   High (Circle one numeral) Low

   1 2 3 4 5 6 7 8

4. Give Comfort Level: CL _________ FT AGL

5. Visual Lookout (Check 6 O'Clock)

   N/A Unsatisfactory (Circle one numeral) Satisfactory

   0 1 2 3 4 5 6 7 8

6. Maintaining Position:

   Unsatisfactory (Circle one numeral) Satisfactory

   1 2 3 4 5 6 7 8

7. Overall Low Level Performance:

   Unsatisfactory (Circle one numeral) Satisfactory

   1 2 3 4 5 6 7 8

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