SECURITY CLASSIFICATION OF THIS PAGE					
REPORT	DOCUMENTATIO	N PAGE			Form Approved OMB No. 0704-0188
1a. REPORT SECURITY CLASSIFICATION		16. RESTRICTIVE	MARKINGS	IT II.	FILE LIPY
"-loonified		None STIC TILL COT			
		Approve	d for public	r REPORT	186.
		Unlimited Distribution.			
AD-A205 215					
		N/A			
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6. NAME OF PERFORMING ORGANIZATION	6b. OFFICE SYMBOL	78 NAME OF M	ONITORING ORGA	NIZATION	いい。
Directorate of Training and	ATTO-TDS-ST	None			
6C ADDRESS (City State and ZIP Code)	A12Q-105-51	7b ADDRESS (Ch	ty. State, and ZIP	Code)	
Cdr, USAAVNC, ATTN: ATZQ-TDS-	ST		,,	,	$\Box = 2$
Fort Rucker, AL 36362-5163		N/A			
8a. NAME OF FUNDING / SPONSORING ORGANIZATION	8b OFFICE SYMBOL (If applicable)	9 PROCUREMEN	T INSTRUMENT ID	ENTIFICAT	TION
USAAVNC	N/A				
8c. ADDRESS (City, State, and ZIP Code)		10 SOURCE OF	UNDING NUMBER	ts.	
Cdr, USAAVNC, ATZQ-TDS-ST		PROGRAM	PROJECT	TASK	WORK UNIT
Fort Rucker, AL 36362-5163		N/A	N/A		
11 TITLE (Include Security Classification)			<u> </u>		
MULTISIM A Minimum Airstochin	Combat Simulati	on Conchilit			
MOLIISIA, A MINIBOR ATT-CO-ATT			y		
12. PERSONAL AUTHOR(S)					
DEES, DR. JAMES W. and CORNELL	, CPI TIMUTHY K.		T /Year Month	(Jew) 115	
Final FROM 8	/88 TO 12/88	1988 Dece	mber		11
16. SUPPLEMENTARY NOTATION					
N/A					
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FIELD GROUP SUB-GROUP					
	simulation	ir-to-air, a	erial comba	ι,	
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9. ABSTRACT (Continue on reverse if necessar)	y and identify by block i	number)			
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have been avoided for security	reasons. The f	ollowing sum	narv statem	ents al	re, therefore.
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20. DISTRIBUTION / AVAILABILITY OF ABSTRACT 21 ABSTRACT SECURITY CLASSIFICATION					
ALE UNICLASSIFIED/UNICHITED LI SAME AS	Unclassified				
Dr. James W. Dees	(205) 255-	6022/3148	ATA	LO-TDS-ST	
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A MINIMUM AIR-TO-AIR COMBAT SIMULATION CAPABILITY

REPORT OF A PILOT STUDY

JAMES W. DEES, PhD CPT Timothy R. Cornett

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ACKNOWLEDGEMENTS

This was a sizeable task put together in a very short time period. Such a large task required an intense effort from a large number of people. Special thanks are owed to the personnel of the Singer Corporation. This includes Singer's Associate Program Manager, Joan McTiernan; from the engineering staff, Arnold Tester, Robert Fegan, John Sibbles, Gary George, Ron Matusof, Sam Knight, Dave Ditch, Steve Schwalm, Leonard Hiteshew, and Rick Lane. In addition, the many personnel of Training Systems Division for the Blackhawk, Cobra, and AH-64 who made all the maintenance adjustments on the simulators must receive a special, if necessarily general, thanks. The four pilots who participated in the study were especially dedicated. These were CW4 Robert Monette, CW4 John Quatlbaum, CW3 Keith Turk and CW3 Phil Malone.

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James W. Dees, PhD CPT Timothy R. Cornett 6 December 1988

EXECUTIVE SUMMARY

This is an unclassified report of a pilot study, i.e., a study in which insufficient data are available to provide statistically conclusive results. All references to weapons performance have been avoided for security reasons. The following summary statements are, therefore, limited to general evaluations of the capabilities of the networked simulators.

According to the aviator participants, the networking of the simulators proved to be a very valuable training experience which could easily be enhanced by better planning if the equipment were more routinely available. The networked AH-1 and AH-64 simulators allowed an evaluation of the effectiveness of various weapons and tactics used in helicopter air-to-air combat (ATAC). This included the ability to obtain comparative hit and kill ratios for each aircraft as a function of range and weapon. It was also possible to evaluate the additional simulator requirements for helicopter ATAC simulation. The field of view of the visual system was insufficient both horizontally and vertically. In close range engagements, one or both simulated aircraft were frequently out of the visual field of the other for extended periods of time. A number of valuable crew comments were provided, as is a list of desired performance measures. The automated weapons scoring capabilities of both simulators were inadequate for testing purposes.

James W. Dees, PhD

CPT Timothy R. Cornett

6 December 1988

1. INTRODUCTION

In August 1988, The Singer Corporation demonstrated a relatively simple networking of the AH-64 Combat Mission Simulator (CMS), AH-1 Flight and Weapons Simulator (FWS), and UH-60 Flight Simulator (FS) at Fort Rucker. At the end of this demonstration, three night shifts were made available for a quick research evaluation of this capability. One AH-64 and one AH-1 crew volunteered to participate in an ATAC pilot study involving their respective aircraft. The sample size of this pilot study is inadequate to draw any conclusions with certainty. However, in this instance, there is so little information on the use of simulators in training helicopter ATAC that even the tentative suggestions of a pilot study are of interest.

2. PROCEDURE

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A total of 45 runs was conducted according to the following scenario:

a. Each run began at 1000, 2500 or 4000 meters distance between the two aircraft with both aircraft at an altitude of 50 meters.

b. Each run began with one of three aircraft orientations:

- (1) Head-on
- (2) AH-64 advantage, i.e., AH-64 behind the AH-1
- (3) AH-1 advantage, i.e., AH-1 behind the AH-64

c. The disadvantaged aircraft, if there was one, would either be instructed to run for cover, then turn and fight after reaching cover, or would be instructed to immediately turn and fight.

d. In 30 runs, each crew had its choice of weapons. However, in order to assure a greater amount of data on the rockets, HELLFIRE and TOW weapons, one of these weapons was dictated for use in each of the 15 remaining runs.

e. If the run was not terminated by a kill or crash, it was terminated at the end of three minutes.

1

3. RESULTS

Only the AH-64 CMS provided suitable data on each firing episode. The AH-1 FWS only provided a summary snapshot for each run. With the exception of these summary data, no AH-1 FWS data were available. Table 1 provides the total number of rounds fired by each AH-64 weapon type as a function of range.

4. CONCLUSIONS

a. The simulation of the gun on the AH-1 included tracers, while the simulation of the gun on the AH-64 did not. According to the gunners, this made the simulated AH-1 gun much more effective.

b. Since neither simulator had an overhead visual system, one crew could fly over the other, then close and kill a blind target. These are artificial conditions. In most actual combat, the existence of surface to air missiles would prohibit ATAC at the altitudes practiced by these crews. Both an overhead visual system and the presence of realistic ground threats are mandatory for the realistic simulation of helicopter ATAC.

c. All four aviator participants stated that the training they received was very valuable. Simply networking two or more attack helicopter simulators together for the purpose of ATAC training will provide a substantial training benefit. However, the following factors should be considered as time and finances permit:

(1) The simulators are already very close to full utilization. In order to provide all of our aviators with adequate networked training on our present simulator fleet, additional simulators would be required.

(2) A wider field of view visual system would be of great benefit in ATAC simulation. An overhead visual scene is particularly important.

(3) A better weapons scoring system is required for most testing. The scoring available on the AH-64 CMS is marginal for test purposes. The scoring system available on the AH-1 FWS is very close to useless. A list of the desired measurements is provided at Appendix B.

(4) The crew in each simulator should be able to talk securely, i.e., without their conversation being overheard by the crew in the other simulator as was the case in this investigation.

2

(5) Enough simulators should be connected to allow the use of air-to-air tactics, i.e., there should be a wingman.

(6) The aviators in both simulators turned off the motion systems, but expressed a desire to have 'g' seats to provide motion onset cues.

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TABLE	1
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AH-64 TOTAL ROUNDS FIRED									
RANGE 100 M	NUMBER GUN RNDS	PILOT GUN RNDS	COPILOT GUN RNDS	NUMBER ROCKETS	NUMBER HELLFIRE				
20 & UP	0	0	U	0	22				
19-20	50	0	50	0	:)				
18-19	ני	0	с С	0	2				
17-18	0	С	0	0	0				
16-17	0	0	С	0	0				
15-16	10	0	10	0	1				
14-15	: 7	0	17	0	0				
13-14	16	0	16	0	1				
12-13	5	Э	5	0	1				
11-12	85	85	0	0	1				
10-11	50	0	50	1	0				
9-10	32	С	32	2	0				
8-9	58	38	20	2	1				
7-8	62	:5	47	7	0				
6-7	115	34	3	18	0				
5-6	195	45	150	4	0				
4 - 5	247	214	33	3	0				
3-4	234	235	48	28	0				
2-3	287	245	42	40	0				
1-2.	198	:47	51	17	0				
0-1	207	:39	59	9	0				
SUM	1918	:247	671	131	29				

APPENDIX A

CREW COMMENTS

AH-1 FILOT

1. Crew should be able to talk securely rather than having an open mike where they can be overheard in the other simulator.

2. Pitch and roll constraints should be left out. Mast bumping restriction left in.

3. Should use vectors to assure the opposing aircraft meet each other rather than having an advantaged and disadvantaged aircraft.

4. An overtorque of 120% would crash us. Leave it in the simulator. That's good.

5. The three minute time limit on the run was good, but should fight it out.

6. Concerning cockpit fatigue, you are tired during the graveyard shift, but that is a realistic combat condition.

7. You need a wingman.

8. With a load of 2 TOW, 500 20 mm and 12 rockets plus full fuel, weight and balance were not considered.

9. This exercise on the simulator teaches patience. You must be within range for the 20 mm to be effective.

10. The limited field of view behind, below, and above was a real handicap, but the training was great.

AH-1 COPILOT GUNNER

1. It was a good learning experience.

2. The experience level between the AH-64 and AH-1 crews was very different.

3. A crash in the cobra occurs with a high angle of bank. A 'g' load criterion should be used instead.

4. You need a top canopy to be able to follow in steep banking maneuvers.

5. Simulators don't show the incoming rounds. They should.

5

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6. Tracers are needed on both aircraft simulators. They helped on the AH-1 FWS.

AH-64 PILOT

1. The scenarios used in the study would be a good introduction to acquisition and recognition training.

2. This is basic air-to-air training.

3. You should go into more advanced scenarios with terrain, mission, and orders, and see what the trainees do.

4. To be a superb air-to-air trainer, you need better visuals and a "g" seat. A wider field of view is required. Better detail would help, but is not critical.

5. How do you deploy to acquire, i.e., do you conceal yourself and go into an overwatch? This should be investigated.

6. A better data recording capability is needed.

7. You need dedicated crews. The tactical expertise was poor in this study.

8. You need isolated communications within crews.

AH-64 COPILOT GUNNER

1. Test results are not valid because of crew inexperience in the first part of the test. Late Friday night, the data was fairly good.

2. No planned setup and ability evaluation.

3. For valid data, 4000 meters should have been first, then moved in closer. The three minute scenarios were good.

5. Communications within the crew must be isolated.

6

APPENDIX B

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SUGGESTED MEASURES IN ADDITION TO

THOSE AVAILABLE NOW ON THE AH-64 CMS

- 1. Time to first hit by each aircraft
- 2. Time to kill by each aircraft
- 3. If there is an advantaged aircraft, the number of times the advantaged aircraft is killed before his adversary is killed
- 4. Number and type of ordnance expended by each adversary at the time of each of the above criteria.
- 5. Type of ordnance which resulted in each hit
- 6. Type of ordnance which resulted in each kill
- 7. Altitude difference between firing and target aircraft at time of hit or miss by missile, rocket, or gun burst (Firing aircraft higher will be positive.)
- 8. Slant range between firing and target aircraft at time of hit or miss by missile, rocket, or gun burst
- 9. Differince between angular velocity of target aircraft and munition at time of hit or miss (Gun fire will be considered in bursts. Greater target velocity will be positive.)
- Difference between the angular acceleration of target aircraft and munition at time of hit or miss (Gun fire will be considered in bursts. Greater target acceleration will be positive.)

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